LUAS UPGRADES (PTLU) PROGRAMME

PRELIMINARY BUSINESS CASE

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Executive Summary

Since its creation, Transport Infrastructure Ireland (TII) has delivered major improvements to Ireland's infrastructure, including Luas, Dublin's light rail network. From its launch in 2004 the Luas system has expanded to provide an extensive light rail network that links the people, towns and businesses across the Greater Dublin Area (GDA); reducing journey times, enhancing regional accessibility, and supporting Ireland's economic development.

In recent years, additional focus has also been put on maintaining and renewing existing infrastructure. The National Development Plan (NDP) 2021-2030 has acknowledged Ireland's past underinvestment in existing assets and has called on government and public sector bodies to prioritise maintenance and renewal spending in order to protect the value of these past investments. This business case relates to a programme of 'minor enhancements' across the entire Luas light rail network.

This business case documents the contents, costs, risks and funding requirements for the PTLU (Public Transport Luas Upgrades) programme, to ensure compliance with the requirements of the Public Spending Code (PSC) and Common Appraisal Framework (CAF). The projects within the PTLU Programme go beyond the general operation and maintenance which is undertaken by the Operator (currently Transdev). The scope of the programme includes projects which are not covered by the Operator contract. These projects focus on upgrading and carrying out minor works on Luas assets to ensure the standard of Luas operations is maintained.

There is a clear rationale for the PTLU Programme considering that Luas is a crucial asset within the national public transport network. It plays a particularly important role in the Dublin City Centre by acting as a direct route along commuter corridors via a sustainable mode of transport - connecting the outer reaches of the GDA directly to the city centre; facilitating a link to the national rail network via Heuston, and creates a safer space for active modes in the city centre via the removal of personal vehicles. There is also a strong policy basis for investing in the minor enhancement of existing assets, as it helps to protect the value of past investments, and to ensure that Ireland's infrastructure continues to operate effectively, reliably and safely and adapts to the changing urban landscape around it. It also aligns with sustainability goals in maximising existing assets and implementing sustainable initiatives such as energy efficiency and active travel projects.

The objectives of the PTLU programme are to:

- Deliver minor enhancement works that will allow for increased user accessibility to the Luas Network
- Deliver upgrades that ensure Luas operates to the latest safety requirements and ensures the safety of both users and staff
- Deliver upgrades to the public realm
- Deliver upgrades that will improve the intermodal facilities for active modes
- Deliver upgrades that will contribute to TII's sustainability goals
- Deliver upgrades that will improve operational flexibility and capacity

Noting that TII has already developed necessary minor enhancements works; the business case has not focused on developing multiple 'options' or alternative programmes. These minor enhancements are diverse but have not been included in separate enhancement or renewal programmes. The approach of capturing all these minor enhancements in a single programme is assessed as the correct 'Do Something' approach, against the 'Do Nothing' options, where these minor enhancements are not performed.

This consisted of both a financial and economic appraisal examining the costs associated with the PTLU Programme. The overall cost of the Programme is significant at €29.4 million over the five years. While this corresponds to an average annual spend of €5.9 million, the exact spending profile varies from year-to-year according to the sequencing of investment works proposed by TII. The net impact to TII in real terms is expressed by the Financial Net Present Value (FNPV), which is -€50.7 million, while the real net impact on the Exchequer would be -€22.6 million.

Figure 0.1 Annual and cumulative renewal costs (incl. inflation, and excl. VAT)

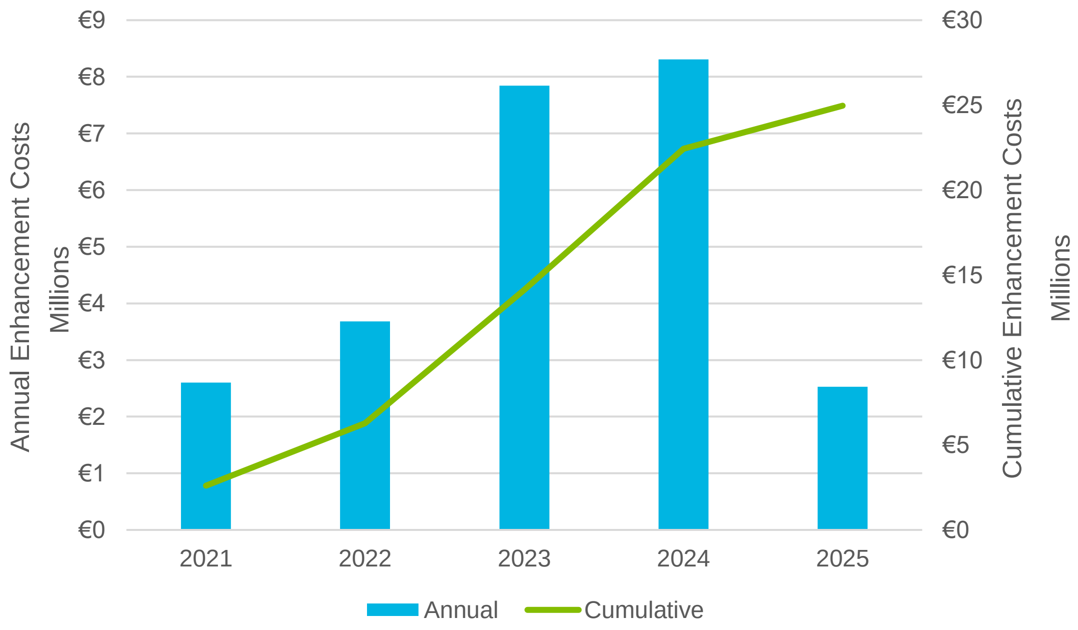


Figure 0.2 Total costs by asset group (incl. VAT and excl. inflation)

Figure 0.2 Total costs by asset group (incl. VAT and excl. inflation) has been redacted

It should be noted that the costs and activities contained in this business case are indicative and, in the absence of detailed tender prices, reflect TII's best estimate based on the cost information currently available.

Conclusion

This business case has described the main activities and asset groups that will feature in this Programme, and it is anticipated that most of the works carried out will ultimately fall within this scope. However, a process has been outlined for continued monitoring and reporting which is aimed at ensuring that the PTLU Programme is delivered in line with its objectives, the approved budget, timeframe, scope of activities. This includes a mechanism for reporting and seeking approval for significant changes to the Programme, which allows for the business case to be updated as time goes on. These also meet reporting criteria set out in the NTA PAG's. It is vital that TII follow these processes and continue to critically monitor and evaluate the progress of the Programme over the duration of the Programme.

1. Introduction

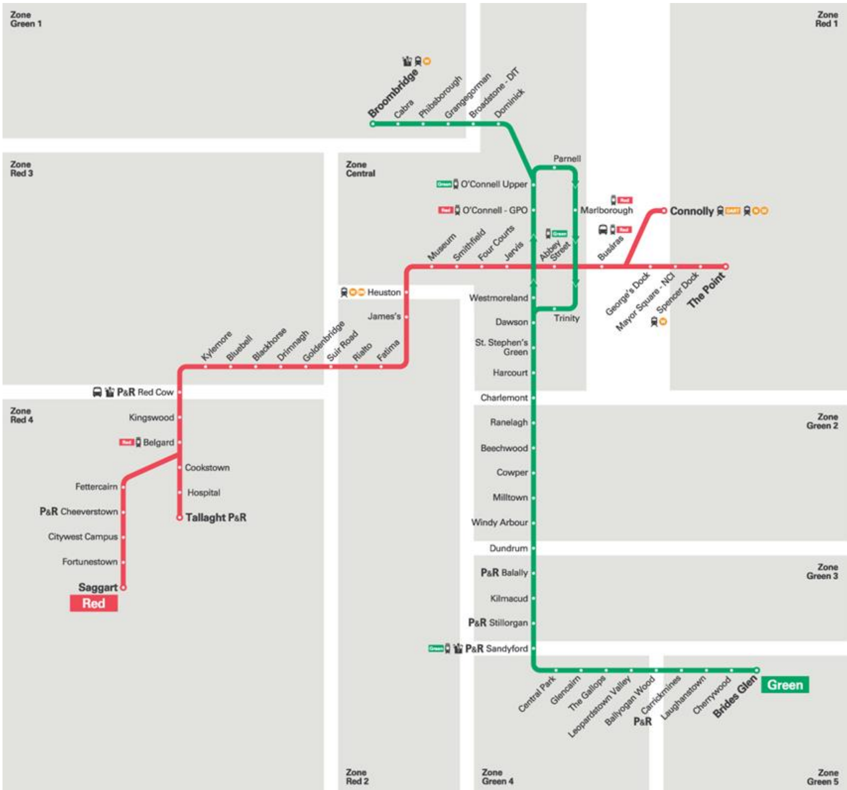
Since its creation, Transport Infrastructure Ireland (TII) has delivered major improvements to Ireland's infrastructure, including Luas, Dublin's light rail network. From its launch in 2004 the Luas system has expanded to provide an extensive light rail network that links the people, towns and businesses across the Greater Dublin Area (GDA); reducing journey times, enhancing regional accessibility, and supporting Ireland's economic development.

While TII continues to deliver new light rail projects in accordance with national policy objectives, in recent years, additional focus has also been put on enhancing existing systems. The current National Development Plan (NDP) 2021-2030 has acknowledged Ireland's past underinvestment in existing assets and called on government and public sector bodies to prioritise maintenance and renewal spending to protect the value of these past investments. TII have invested significantly in existing assets and have implemented several programmes that are aimed at maintaining and enhancing the reliability, quality and safety of the existing Luas network.

This business case relates to a programme of 'minor enhancements' across the entire Luas light rail network. This network is shown in Figure 1.1 and consists of:

- Red Line, which connects Dublin Docklands to Saggart and Tallaght.
- Green Line, which connects Broombridge to Brides Glen.

Figure 1.1 Luas Network Map



As this network plays a critical role in the GDA, it is vital that it operates and is maintained to the highest standard. As well as day-to-day maintenance and repairs which are carried out by the Luas operator, this requires renewals, minor enhancements and upgrades of key equipment and systems to ensure that they continue to function reliably, safely and efficiently.

TII have prepared two rolling five-year programmes for the period 2021 to 2025 to address this requirement, Life Cycle Asset Renewals (LCAR) and Public Transport Luas Upgrades (PTLU). The LCAR programme is responsible for renewals, whilst the PTLU programme is responsible for minor enhancements and upgrades.

This business case documents the contents, costs, risks and funding requirements for the PTLU programme, to ensure compliance with the requirements of the Public Spending Code (PSC) and Common Appraisal Framework (CAF). The projects within the PTLU Programme go beyond the general operation and maintenance which is undertaken by the Operator (currently Transdev). The scope of the programme includes projects which are not covered by the Operator contract. These projects focus on upgrading and carrying out minor works on Luas assets to ensure the standard of Luas operations is maintained.

As the Sponsoring Agency of this PTLU Programme, TII will also be required to seek approval and funding from the National Transport Authority (NTA), the Approving Authority.

The structure of the business case is as follows:

- Section 2 describes the rationale for intervention for this Programme, including the policy, strategic and operational context.
- Section 3 provides a more detailed description of the PTLU Programme, including its objectives, scope, and planned the activities.
- Section 4 outlines the appraisal methodology and assumptions.
- Section 5 details the costs and associated with the Programme.
- Section 6 summarises the results of the financial appraisal.
- Section 7 summarises the results of the economic appraisal.
- Section 8 includes a risk assessment and sensitivity analysis.
- Section 9 sets out the procurement strategy.
- Section 10 describes the structures in place for governance, monitoring and evaluation.

Conclusions and recommendations are summarised at the end of the document.

2. Rationale for Intervention

2.1 Policy Context

The **National Development Plan (NDP) 2021-2030** sits within the National Planning Framework and outlines the Government's near-term capital investment priorities. The most recent NDP was developed for the period between 2021 and 2030 and provides for €165 billion worth of capital investment based on the ten 'National Strategic Outcomes (NSO), shown in Figure 2.1. This includes investment in the national road network, public transport, and sustainable urban development.

Figure 2.1: Project Ireland 2040's National Strategic Outcomes

In 2020, after the formation of a new Government, the review of the NDP was brought forward to take account of the changed environment faced by Ireland, and to better reflect the major priorities set out in the new Programme for Government. This review was structured in two phases with associated outputs. Phase 1, which was completed in Quarter 1, 2021, drew upon several pieces of research and policy papers, addressing various strands of the NDP Review process, with the aim to build an evidence base for finalising the drafting of the revised NDP. Phase 2 prompted a strategic dialogue with government departments and resulted in them agreeing the new six-year rolling departments capital allocations and an overall ten-year capital ceiling to 2030.

This updated NDP is a "forceful response" to the infrastructural deficits identified in the 2017 review of the previous capital plan. This separate 2017 review, carried out by the Irish Government Economic and Evaluation Service (IGEES), noted that capital investment in Ireland tended by be very pro-cyclical in the past, expanding unsustainably during the Celtic Tiger era, and rapidly contracting during the post-Global Financial Crisis recession. To mitigate this, the review emphasised the need to maintain a constant ‘steady-state’ level of public investment in order to maintain economic growth and to reduce inflationary pressures on the Irish economy. Investment in infrastructure is also necessary to accommodate future demographic change, advance social progress, and promote greater balance between Ireland’s regions. While this includes new infrastructure, it also emphasised the importance in maintaining and renewing existing assets to ensure the continued efficiency and effectiveness of past investments. Particular requirements were identified in terms of transport infrastructure, such as the continued maintenance, renewal and upgrades of the Luas system in Dublin.

In line with ‘NSO 2 - Enhanced Regional Accessibility’, the NDP states that *“it is a priority to ensure that the existing extensive transport networks, which have been greatly enhanced over the last two decades, are maintained to a high level to ensure quality levels of service, accessibility and connectivity to transport users.”* This priority is restated under ‘NSO 4 – Sustainable Mobility’ in recognition of dependence of reliable public transport services on quality infrastructure: *“As already outlined under NSO 2: Enhanced Regional Accessibility, a significant priority must be to maintain the existing network of road, rail and bus infrastructure to ensure acceptable levels of service to transport users given a number of years of underinvestment reflecting the severe constraints on public capital investment.”*

This principle carries through to **TII’s Statement of Strategy 2021-2025**. One of TII’s key goals is to *“operate, maintain and extend the life of national roads and light railway infrastructure to ensure the safety and efficiency of our transport networks, ensure appropriate management of environmental resources, and contribute to the transition to a low-carbon and climate-resilient society”*. The strategic objectives proposed under the goal pertaining to existing infrastructure include to:

- *“Maintain and change existing infrastructure to reduce transport-related deaths, injuries and risks.*
- *Extend the life and optimise use of our transport infrastructure, to minimise the need to build new infrastructure.*
- *Maintain our transport systems to ensure they are safe, resilient and available for use.*
- *Introduce measures to support the reduction of carbon and other emissions in our operations.*
- *Support use of emerging technologies such as connected co-operative and automated mobility*.
- *Provide the information that our customers need.”*

In addition to the ‘Existing infrastructure’ goal, several relevant strategic objectives are listed under the ‘Services’ goal. This is aimed at operating TII’s light rail, tolling and traffic control systems and contribute to the electrification and digitalisation of transport, benefitting customers and contributing to sustainable mobility and decarbonisation of transport. One of the strategic objectives of this goal states that it will:

- *“Make best use of TII’s light rail system and national roads services, supported by innovation and ongoing performance improvements.*

In 2021 TII also published its *Sustainability Implementation Plan* which contains the following six principles that focus on the key priority areas for the sustainable development agenda within TII, and align with this proposed programme:

- Provide effective efficient and equitable mobility (e.g. accessibility, capacity, performance)
- Enable safe and resilient networks and services (e.g. safety, accessibility, performance)
- Collaborate for a holistic approach (e.g. enhancements, stakeholder consultation)
- Deliver end to end improvements (e.g. enhancements generally)
- Transition to net zero (e.g. enhancements generally, energy efficiency projects, PV arrays etc)
- Create total value for society (e.g. enhancements generally, energy efficiency projects, PV arrays etc)

The **Climate Action Plan (CAP) 2021** aims to provide for an additional 500,000 daily public transport and active travel journeys by 2030 if the transport carbon reduction targets are to be met. In order to achieve this, the CAP states that this will require the development of infrastructural supports that will allow for an improved system and meet demand efficiencies.

The CAP targets continued enhanced investment in the public transport network as a means by which Ireland can progress towards decarbonisation on transport. The key ambition is to provide the public with reliable and realistic sustainable mobility options to better enable mobility choices. This includes both maintaining and improving reliability and journey time of public transport services.

These policies provide an overarching rationale for investment in vital national assets in order achieve a steady-state level of funding and to ensure their continued effectiveness in achieving government policy goals.

2.2 Strategic Context

This section focuses on the strategic importance of the Luas, and how its continued operation is vital to achieving key national and local policy goals.

The Luas network is made up of two tram lines, the Luas Red Line which is 21km long and the Luas Green line which is 22km long, with the lines crossing in Dublin city centre. It was built to reduce travel time and traffic congestion within the Greater Dublin Area and began operating in 2004. In 2009 the Connolly to Docklands extension was constructed, the extension from Sandyford to Cherrywood in 2010 and the extension to City West, in 2011. In 2017 the Red and Green Lines were connected as part of the Luas Cross City project, although this is only an engineering link, not for passenger service. Overall, the Luas network comprises of 69 stops and has a fleet of 73 trams. The highest annual number of passengers to date on the Luas was recorded in 2019, 48.1 million, which was an increase from the previous year of 15%. This growth reflects both the benefits of the capacity enhancements continuously carried out and the significance of Luas as a key part of the transport system.

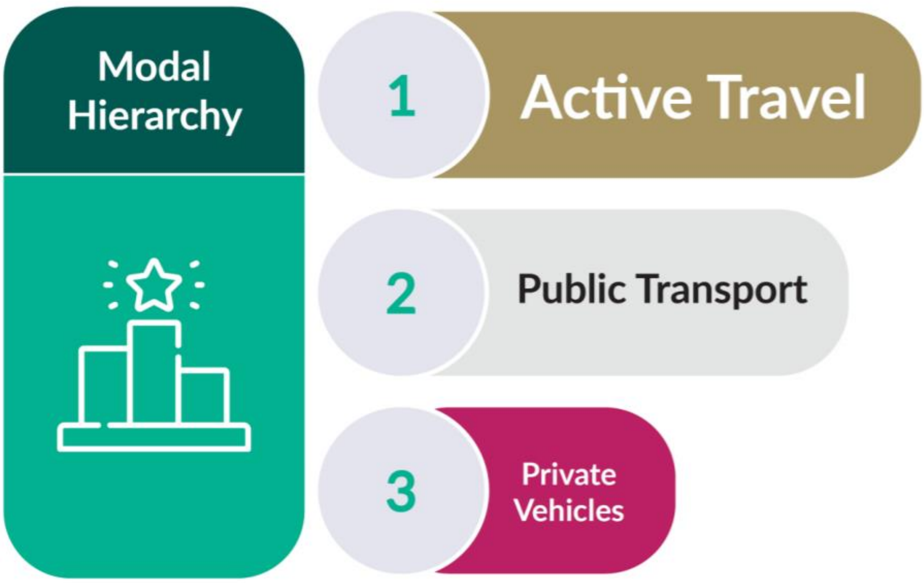
The NTA have recently issued the draft **Transport Strategy for the Greater Dublin Area 2021-2042** which aims to provide an *"effective transport system for the Greater Dublin Area"*. The strategy highlights the importance of the Luas across the Greater Dublin Area, noting that the system provides a service *"every 3 to 4 minutes which can carry up to 5,000 passengers per hour", increasing to "every 2 minutes and 10,000 passengers per hour" during peak times*, The strategy also emphasises that *“significant investment is required to develop this system into a full network and provide the capacity required in the future”* and to maintain the *“frequent and reliable”* service that the Luas provides.

The Strategy also states that *“All public transport infrastructure deteriorates over time and needs replacing. Significant investment is required on an on-going basis to replace vehicles, shelters, information signage, station facilities etc.”.* It concludes that all transport operators *“must insure that infrastructure and fleet is kept up-to-date and that the level of investment to maintain the steady state is available every year, in addition to the level of investment in new infrastructure”.*

Finally, in relation to pedestrian and cycling facilities, which are an area of investment for this programme, it states *“pedestrian infrastructure is required to be maintained at an acceptable level of service at a minimum. Footpaths can experience significant wear and tear and damage over time from weather effects as well as from damage from vehicles. It is the intention that the condition of footpaths is maintained to a high standard across the GDA.”* For cycling facilities such as bike parking, it states the *“need for sufficient cycle parking at rail stations, transport interchange locations and mobility hubs.”*

Facilitating active modes has been identified as a high priority within the Department of Transport’s forthcoming land transport investment framework. Future transport planning will prioritise sustainable modes, and the land transport investment framework sets out a hierarchy of travel modes to be accommodated and encouraged when investments and other interventions are to be made as shown in Figure 2.2. Within this programme more facilities for active modes, such as cycling, are being enhanced whilst also improving the accessibility to public transport. As such, the investment required in this programme for these upgrades aligns with the modal hierarchy.

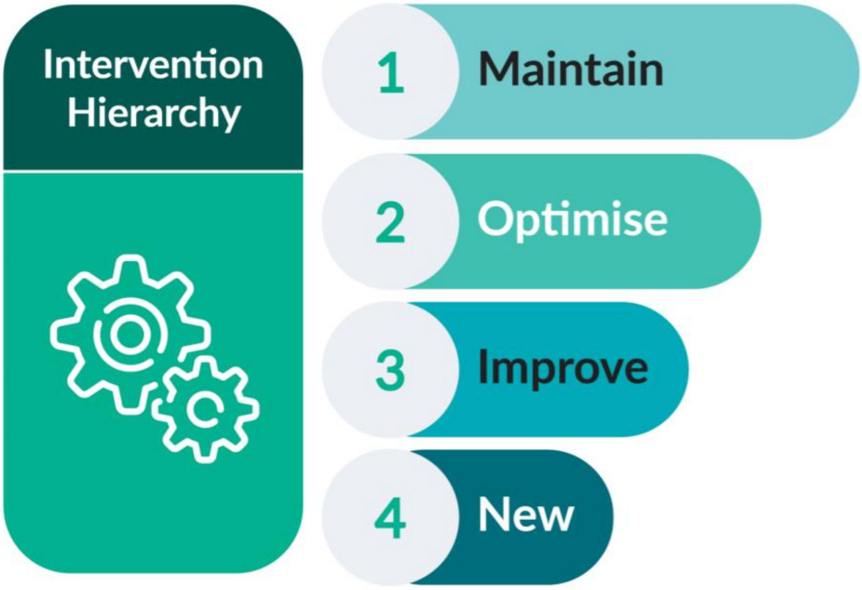
Figure 2.2 Modal Hierarchy



The **Department of Transport’s forthcoming land transport investment framework** also sets out four high level investment priorities which help to make the best use of existing assets, such as Luas. The works planned under the PTLU programme will fall under the first three priorities, maintain, optimise and improve (table 2-1 Environmental Report pg 11) as detailed in the examples below.

Proposed climate resilience measures fall under **maintain** priority, whilst rail turnback improvements address the **optimise** priority. Other planned interventions such as active travel and accessibility / public transport interchange, safety and public realm improvements will fall under the **improve** priority.

Figure 2.3 Intervention Hierarchy



Luas fulfils an important strategic role both within the public transport network and within Dublin City centre, its relevance to the Project Ireland 2040 'National Strategic Outcomes' is summarised in the Table 2.1 below.

Table 2.1 Strategic importance of the Luas to the National Strategic Outcomes

National Strategic Outcome	Luas
2 – Enhanced Regional Accessibility	Luas provides a direct, quick and high-capacity connection to the heavy rail network. This greatly enhances regional accessibility as it provides a direct route into Dublin City Centre for people travelling on both the Intercity and Commuter Rail Networks as well as the DART.
4 – Sustainable Mobility	Luas is an important part of the public transport system, particularly for services to-and-from Dublin City Centre. On average, 120,000 passengers use Luas services daily. By providing direct access along commuter corridors, it has reduced the number vehicles in Dublin City Centre. This has positive impacts on sustainable mobility, providing more road space for bus services and improving the safety and quality of pedestrian and cyclists' journeys.

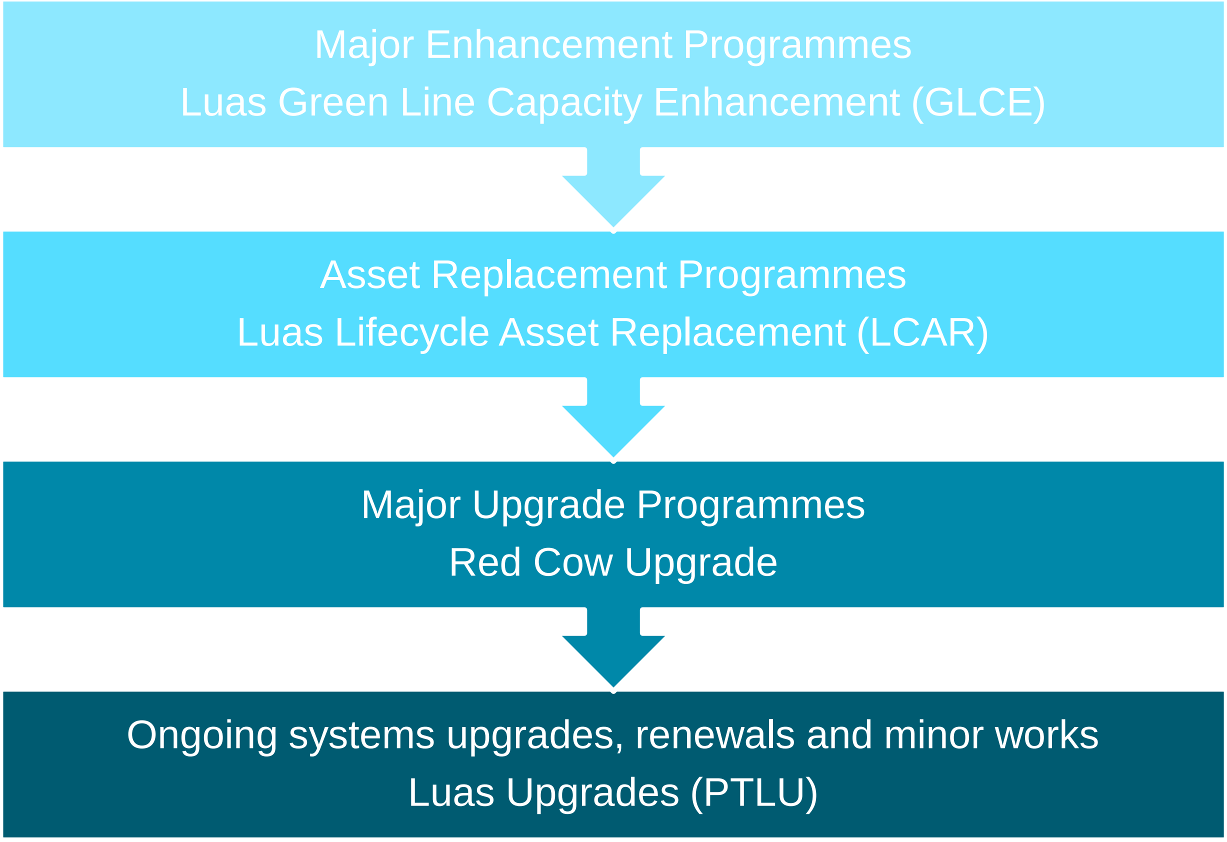
7 – Enhanced Amenity and Heritage	By reducing traffic in Dublin City Centre, Luas has greatly improved the amenity and heritage of the city. With reduced congestion, decreased air and noise pollution, and a safer street environment, Dublin is now a more pleasant place to spend time for residents, workers and tourists.
8 – Transition to a Low-Carbon and Climate-Resilient Society	Through consistent maintenance and enhancement of the Luas, more commuters are choosing to use it. This facilitates Ireland's transition towards a low-carbon society, as fewer emissions associated with the use personal vehicles are produced.

Given the strategic importance of Luas at both a national and local level, it is vital that it is proactively maintained to protect the value of the investment, and to ensure that it continues to operate and fulfil its strategic role. This means that it is important for TII to carry out necessary minor enhancements to ensure that accessibility and quality is maintained at an acceptable level for all users. The aim of the PTLU Programme is to carry out these interventions where they don't fall under general maintenance or the LCAR programme.

2.3 Operational Context

Project Ireland 2040 was published in 2018, whilst the **Regional Spatial and Economic Strategy for the Eastern and Midland Region (EMRA RSES)** was published in 2019. Within these documents, investment proposals were identified. Figure 2.4 briefly summarises the Luas investment priorities included in these documents.

Figure 2.4 Luas investment priorities



While not stated as a part of a specific programme, continuous investment in the Luas has been identified as a priority, to:

- Improve accessibility to stops and facilities.
- Improve interchange facilities with other transport modes and provide information.
- Maintain existing network in a steady state.

The PTLU programme aligns with these investment proposals and meets the objective to improve the attractiveness and convenience of light rail through a programme of minor enhancements. The works detailed in this programme enable continuous investment in the system to improve accessibility and improve interchange facilities with other transport modes.

The specific matters that the PTLU programme will address are:

- **Improvements to intermodal facilities –** Opportunities to improve facilities which facilitate, support and encourage interchange between different transport modes
- **Accessibility issues** – ensuring that the Luas service is accessible to vulnerable groups.
- **Public realm Improvements** – ensuring that the Luas continues to attract more users
- **Address safety concerns** – complying with latest safety regulations and responding to changing requirements / addressing specific incidents

- **Sustainability Interventions** – Energy efficiency and sustainability interventions and also active travel projects
- **Track/signalling Improvements** - Provide improved operational flexibility, resilience and capacity in some instances.

While the enhancement / optimising of Luas asset is a central issue to be addressed by the PTLU Programme, the programme also addresses change in standards and expectations from Luas users. Increased government spending on active modes of transport (cycling and walking) necessitates related enhancements for Luas also and as such the enhancement of cycling facilities and public realm areas is included within the programme. The PTLU programme also includes initiatives to improve accessibility for vulnerable users, as when passengers with disabilities make a journey, they have the same expectations as other members of the public.

3. Programme Detail

This section describes the details of the proposed PTLU Programme. It includes:

- Summary of the objectives of the PTLU Programme.
- Outline of the prioritisation and option selection process.
- Description of the scope and proposed activities.
- Identification of the stakeholders and constraints.
- A Programme Logic Model to summarise the overall programme rationale.

3.1 Objectives

Both Red and Green Lines of Luas represent valuable capital assets and play vital roles in public transport in Dublin. This infrastructure represents significant investment by the state and as such there is a need to ensure that both lines receive the required investment on a continuous basis to ensure that they can continue to be operated efficiently and safely into the future. More specifically, the objectives of this programme are to:

- Improve user accessibility and integration with other public transport.
- Ensure Luas operates to the latest safety requirements to maintain the safety of both users and staff.
- Improve the quality of the public realm across the Luas network.
- Improve the intermodal facilities for active modes.
- Increase public transport sustainability and promote active travel
- Improve operational flexibility and resilience.

The objectives for the PTLU programme were subject to significant stakeholder engagement in order to align them with the project. Significant reviews and reassessments were carried out as the PTLU Programme progressed into the Preliminary Business Case stage.

These objectives and progress towards achieving them can be monitored via on going monitoring of the Luas network performance, as these processes and periodic reviews are already established.

3.2 Stakeholders

The main stakeholders involved in overseeing the delivery of the PTLU Programme include:

- **Transport Infrastructure Ireland (TII)** owns the Luas and is the Sponsoring Agency for this programme. In addition to general planning and oversight through its contract with the operator of these assets, TII will be responsible for obtaining approvals and funding for the PTLU Programme.
- **The Operator** and Asset Manager of the Luas is responsible for the day-to-day service operation and maintenance activities. The current Operator is Transdev, who was awarded the contract following a competitive tender process for a period that runs until 2025. TII will be required to liaise with the operator regarding any works proposed, to gain access to and avoid disruption to

the network, to get feedback regarding proposed work and to make arrangements for the completed works to be taken into charge. The operator will also provide resources for any possessions and isolations required to access the network.

- **National Transport Authority** is the Approving Authority for the PTLU Programme and will be the primary source of any funding required. The Department will also be involved in the Monitoring and Evaluation processes, in evaluating the regular monitoring reports prepared by TII.
- Given their role in the Luas services in Dublin, other stakeholders such as **Dublin City, Fingal, South and Dun Laoghaire Rathdown Councils,** the **Commission for Rail Regulation** and the **Department of Transport (DoT)** may be involved in the implementation of the Programme at certain points.
- State agencies such as the **Health and Safety Authority (HSA)**, **Environmental Protection Agency (EPA)**, **Waterways Ireland** may have to be satisfied that works are in accordance with their standards.
- Other important stakeholders include An Garda Siochana, the Emergency Services, Public Transport Operators (e.g. Irish Rail, Dublin Bus, Bus Eireann and others) and Utilities (e.g. Irish Water, ESB, Bord Gáis etc.)

There will be other firms involved in the actual delivery of the works such as engineering and architectural design, main contractors and specialist subcontractors.

The specific roles and responsibilities of some of these stakeholders will be elaborated in Section 10, in relation to the Programme's governance and monitoring structure.

3.3 Prioritisation of Minor Enhancements Works

This section describes the process by which TII identified and developed a preferred programme of minor enhancement works.

Since Luas began operating in 2004 TII have sought to collate information on its performance from the various stakeholders previously listed in section 3.2. One of the uses of this information is to identify potential enhancements / upgrades and TII have been engaged in implementing minor upgrades to the network from its inception.

Information that TII has gathered may take the form of issues, deficits or requests for improvements which are then translated into proposed interventions. It is at this stage of the development process that options are considered as part of reaching the proposed solution / intervention.

These interventions are collated by TII and evaluated under the following headings; safety, environmental impact, maintainability, operational flexibility, accessibility, planning, cost, resources, priority and timescale. The output of this evaluation is a proposed multi-annual programme of works.

Noting that TII has already developed a programme of necessary minor enhancements works; the business case has not focused on developing multiple 'options' or alternative programmes. The approach of capturing all these minor enhancements in a single programme is assessed as the correct

'Do Something' approach, against the 'Do Nothing' options, where these minor enhancements are not performed.

In order for a project to be included in the upcoming year and approved for funding a more detailed appraisal / prioritisation is carried out and approved internally before being submitted to TII for approval.

The proposed programme of works is prepared by the Steering Group for approval internally in TII in advance of submission to NTA.

Planning and implementation of the projects is then undertaken by the individual working groups under the supervision and monitoring of the Steering Group.

In relation to the PTLU Programme, the focus is on minor enhancements to allow for increased accessibility, safety, connectivity, intramodality and operational flexibility. While these enhancements are relatively minor in nature, they are critical to maintaining the excellent service and safety level of Luas operations.

While this proposed programme is based on TII's assessment of the indicative cost and optimal sequencing of the upgrade works over the Programme duration, it should be emphasised that the exact profile of expenditure is likely to vary over the duration of the programme.

3.4 Scope and activities of proposed Programme

The objectives of the programme (Section 3.1) outlined the overall objectives of the programme of works. The anticipated type of activities within the PTLU Programme will take place across six main classification groups, which are shown below . The type of works planned within these programme classifications is described in more detail in Table 3.1 and Table 3.2. It should also be noted that many of the projects will align with more than one of the classification groups.

Table 3.1 PTLU Programme classifications

Safety	Upgrades that ensures Luas operates to the latest safety requirements and ensures the safety of both users and staff.
Environment and Sustainability	Upgrades that improve the sustainability of Luas as a public transport system and service as well as promote and increase active travel.
Accessibility and Integration	Upgrades that will allow for increased passenger accessibility to the Luas network and improved integration with other public transport systems. Upgrades that will improve cyclist facilities and improve pedestrian access.
Performance and Maintainability	Upgrades to the Luas network that will enable the service to operate in the event of line disruption.

	Upgrades to the Luas network that will enable improve the maintainability and resilience of Luas infrastructure and Rolling Stock.
Capacity	Upgrades to the Luas network that will increase the passenger carrying capacity of a section of the network to meet forecast demand.
Public Realm	General upgrades to public realm including upgrades to ensure improved integration with other public spaces and amenities.

Table 3.2 PTLU programme classification details

Safety	• Painting of crossing mats and new signage at Luas crossings • Safety related hardscaping improvements on the Luas network • Ancillary building review and upgrades • Monitoring of old railway cutting retaining walls at Phibsborough stop • Abbey stop eastbound platform widening (hardscaping) • Installation of signalised pedestrian crossing at Heuston
Environment and Sustainability	• Installation of photo voltaic (PV) arrays on Luas depot buildings • Replacement of Luas public lighting luminaires with LEDs • Installation of bicycle repair stations and bicycle racks at Luas stops
Accessibility and Integration	• Changes to hardscaping around Busarás stop to improve accessibility • Windy Arbour hardscaping improvements
Performance and Maintainability	• Refurbishment and commissioning of emergency crossovers • Procurement of a portable OCS pole(s) • Smithfield Crossover upgrades • Provision of a crossover at Heuston
Capacity	• Provision of a tram turn back facility at St. Stephen's Green
Public Realm	• Abbey stop public realm improvement scheme • Desire lines improvements scheme • Asset audit public realm and landscaping improvements

As each activity in the PTLU Programme is ultimately driven by enhancement opportunities identified by TII (see section 3.3), the scope of activities included in the programme is likely to evolve over the duration of the programme as new issues are identified.

3.5 Programme Logic Model

A Programme Logic Model is an analytical tool to demonstrate the coherency of a proposal in achieving certain outcomes and objectives. The Model summarises the relationship between the project or activities that are carried out under the Programme, and the outcomes that these are aimed at achieving. Each element of the Programme is tracked in terms of:

- **Inputs –** What resources TII and other actors input to the Programme.
- **Activities –** What is done with these resources.
- **Outputs –** What is produced as a result of this activity.
- **Results -** The direct effect of the output on the user.
- **Impacts -** The wider operational, economic, social or environmental impacts.

Figure 3.1 shows the Logic Path Model (LPM) of the PTLU programme and illustrates how the implementation of targeted works result in the programme objectives set out in Section 3.1.

Figure 3.1: Logic Path Model for the PTLU Programme

Programme Identification		Programme Delivery				Direct Results for TII and users	Wider impacts of the Luas Network
Issues Identified	**Set Objectives**	**Inputs**	**Activities**	**Key Outputs**	**KPI Monitoring**	**Results**	**Impacts**
Lack of intermodal facilities at some of the stops **Accessibility issues regarding vulnerable users** **Safety concerns as Luas assets were no longer in compliance with the latest safety regulations.** **Changing public realm requirements** **Increased operational flexibility and capacity required**	Deliver minor enhancement works that will allow for increased user accessibility to the Luas Network Deliver upgrades that ensure Luas operates to the latest safety requirements and ensures the safety of both users and staff Deliver upgrades to the public realm Deliver upgrades that will improve the intermodal facilities for active modes Deliver upgrades that will contribute to TII's sustainability goals Deliver upgrades that will improve operational flexibility and capacity	Public funding Project management and administrative support from TII Resources from sub-contractors Programme oversight mechanisms	Luas Upgrades Programme	Upgraded classification groups, including: • Accessibility upgrades • Network upgrades • Safety upgrades • Intermodal upgrades	Programme KPI monitoring achieved through; • Delivery Cost; and • Time Objective KPI monitoring achieved through: • Ongoing condition monitoring; • Reliability/down time analysis; • Safety incident monitoring; and • Passenger surveys	Delivery of upgrades of Luas network assets Delivery of a quality customer service for users of the Luas network Upgrades that will maintain and improve the safety performance of Luas lines Infrastructural upgrades that allow for improved accessibility of the Luas service for all users Continued efficiency and effectiveness of past investments	Preservation of the economic and social benefits of the Luas, including: Enhanced regional Accessibility and continued support of access to Dublin City Centre Sustainable Mobility and sustained provision of direct access along commuter corridor Enhanced Amenity and Heritage and continued reduced congestion, decreased air and noise pollution in Dublin City Centre Transition to a Low-Carbon Society: continued reduction of emission associated with private vehicles

4. Appraisal Methodology

This section of the report outlines the approach taken towards the appraisal of the PTLU Programme. Section 4.1 summarises the main requirements from the Public Spending Code and other appraisal guidance. 4.2 describes the methodology used for the financial and economic appraisal, while 4.3 shows the key assumptions underpinning this process.

4.1 Appraisal Requirements

The PTLU Programme is appraised in accordance with public sector appraisal guidelines, including:

- The Department of Public Expenditure & Reform's *Public Spending Code.*
- the Department of Transport's *Common Appraisal Framework.*
- Transport Infrastructure Ireland's *Project Appraisal Guidelines.*

The *Public Spending Code* (PSC) is the primary source of appraisal guidance for the public sector and sets the standards and requirements for public projects and programmes. Although the focus of the PSC is mainly on capital projects, and guidance on current expenditure programmes is comparatively less detailed, many of the broad requirements can be assumed to be the same. All projects are required to include a financial appraisal (measuring monetary flows), as well as an economic appraisal (measuring wider societal values). Economic Appraisal can consist of a Cost-Benefit Analysis (CBA), Cost-Effectiveness Analysis (CEA) or Multi-Criteria Analysis (MCA), with the choice of methodology guided by the project and the decision context.

The *Common Appraisal Framework* (CAF) stems from PSC and was developed to provide more detailed guidance for transport projects and programmes. Similar to the PSC, guidance is mainly focused on capital projects, although there is slightly more detail regarding current programmes. Programmes with an annual value of over €5 million are required to undergo a 'Detailed Economic Appraisal' and MCA is a more appropriate form of appraisal in instances where "the measurement of benefit is difficult or impossible". The CAF also sets requirements for monitoring and evaluation of programmes, including Mid-term and Ex-post Evaluations at the midpoint and end of the programme respectively.

In addition to transport sectoral guidance, TII developed the Project Appraisal Guidelines (PAG) to provide additional guidance for the appraisal of its own projects and programmes.

4.2 Approach and Methodology

The appraisal approach is shaped by the specific decision context of this options available for PTLU Programme. Of note is that the business case is developed for a programme, rather than a singular capital investment and that TII are required to maintain the asset, thereby limiting the options available to TII for the PTLU Programme. Current appraisal guidance is generally predicated on a choice between the continuation of the existing situation ('Do Nothing/Do Minimum'), and alternative courses of action where additional investment results in differing outcomes ('Do Something'). The nature of this decision context generally has a significant effect on the appraisal methodology, as it determines the options that can be considered, as well as the financial and economic appraisal necessary to compare these options.

As the works planned for the PTLU programme are minor yet also diverse in nature, these works may not have aligned with the objectives of other programmes, such as the LCAR Programme. As such, the 'Do Something' approach where all minor enhancement works are compiled together into a programme has been chosen. Regarding the 'Do Nothing' approach, once again as the works in this programme are minor in nature, and do not individually represent a high priority, not carrying out the works is default comparison scenario.

In contrast to a typical capital investment project, TII is not beginning from a blank slate. The Luas is an existing asset that forms critical components of the light rail network, meaning that minor upgrades and repairs are required to ensure that the Luas continues to operate in a steady state, especially in an environment of changing standards, technologies and increased user expectations. When setting options, the Public Spending Code notes that appraisers should avoid establishing scenarios known as the 'Catastrophic Do-Nothing'; that is, a 'Do-Nothing' option where the consequences of doing nothing may lead to catastrophic and unacceptable outcome for human health, safety or public policy. Given the significance of this critical asset and the high standards under which they it required to operate by Irish and European law, it is clear that a 'Do-Nothing' option (i.e. to cease maintenance and renewal spending) could represent an unacceptable 'Catastrophic Do-Nothing' scenario and should be avoided in the context of this business case. This means that the business case must begin with the assumption that these assets will continue to operate in all reasonable scenarios, and that all scenarios should include a minimum level of maintenance and enhancement is required to ensure that they do so safely and efficiently. TII have identified the necessary upgrade works described previously in Section 3.4 and have developed this proposed PTLU Programme to reflect these requirements.

Therefore, as the business case is focused on achieving a singular defined outcome, the continued operation of the Luas; MCA is appropriate form of economic appraisal for the proposed PTLU Programme. MCA is often used for projects and programmes that are aimed at achieving a defined outcome, and establishes the economic costs associated with achieving this outcome.

4.3 Assumptions

Table .4.1below sets out the key assumptions used for the financial and economic appraisal of this Programme.

Table .4.1: Appraisal Assumptions

Assumption	Description	Value
Inflation	Annual change in the Consumer Price Index (CPI), based on European Commission forecasts for Ireland[1].	2021: 1.5% 2022: 1.2% Long-run: 2%
Tender Price Inflation	Annual rate of inflation for construction expenditure, based on AECOM forecasts[2].	2% per annum

[1] European Commission, 2021. 'Summer Economic Forecast'. Available at: https://ec.europa.eu/info/business-economy-euro/economic-performance-and-forecasts/economic-performance-country/ireland/economic-forecast-ireland_en
[2] AECOM, 2021. 'Ireland Annual Review 2021'. Available at: https://ireland.aecom.com/

Discount Rate	Rate to account for the time value of money, as specified in the Public Spending Code.	4%
Programme Period	The length of the Programme period	5 years
Programme start date	Beginning of construction period	
Labour Component of Expenditure	The estimated proportion of expenditure that relates to labour, for the purposes of income tax and Shadow price adjustments.	17% (Construction/Renewals) 40% (Professional and other expenditure)[3]
Average effective income tax rate	The average effect income tax rate on labour spending, for the purposes of the Exchequer Cash Flow Forecast	16.6%[4]
Shadow Price of Labour	PSC-specified adjustment made to the labour component of expenditure to account for increased employment arising from the project	80% of labour component of expenditure
Shadow Price of Public Funds	PSC-specified adjustment made to the publicly-funded share of expenditure to account for the distortionary impact of taxation	130% of publicly-funded expenditure

[3] From CSO Supply and Use Input-Output tables, 2015.
[4] Revenue Commissioners, 2020. 'Summary of income tax returns'. Available at: https://www.revenue.ie/en/corporate/information-about-revenue/statistics/income-distributions/it-calculation.aspx

5. Programme Costs & Revenue

5.1 Costs

This section outlines the estimated costs which will be incurred from the PTLU Programme over the course of the five-years

5.1.1 Enhancements and upgrades

The PTLU Programme developed by TII requires a level of investment additional to day-to-day operations, maintenance and renewals.

The total nominal cost of the PTLU Programme between 2021 and 2025 is estimated at €25 million (or €29.4 million with VAT included). However, the annual cost will vary depending on the sequencing of investment; with the indicative sequencing shown in Figure 5.1 below.

Figure 5.1: Annual and cumulative renewal costs (incl. inflation, and excl. VAT)

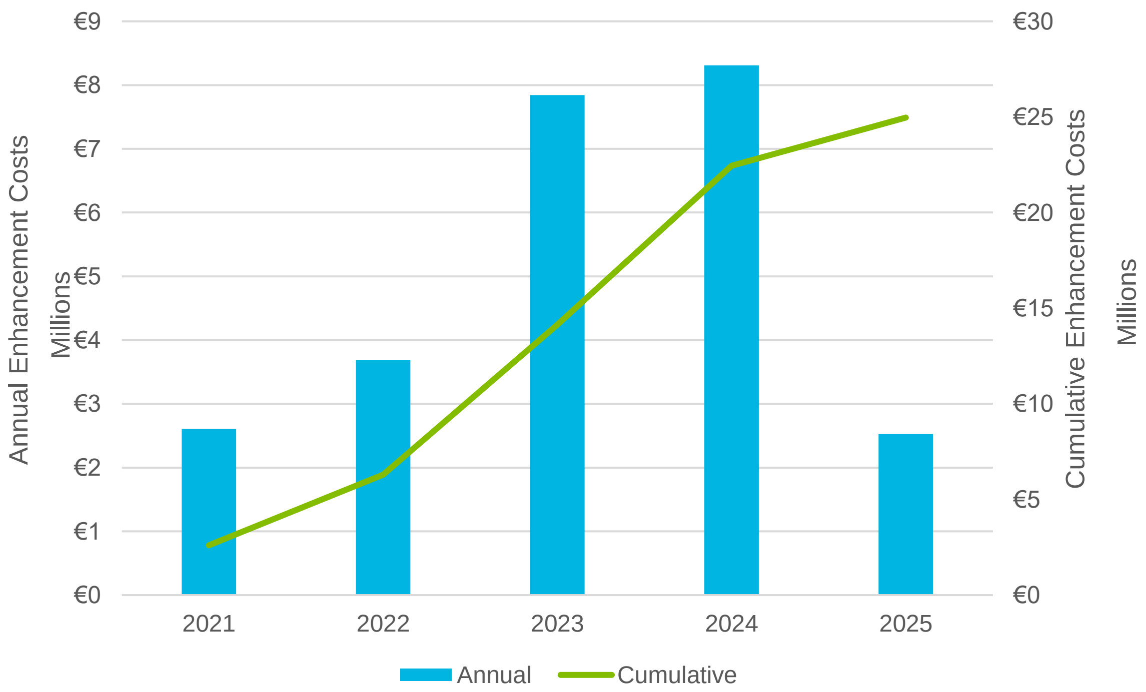


Figure 5.2 shows how the PTLU expenditure, including VAT, is expected to be split over the programme asset groups. [redacted]

Figure 5.2: Total costs by asset group (incl. VAT and excl. inflation)

Figure 5.2: Total costs by asset group (incl. VAT and excl. inflation) has been redacted

6. Financial Appraisal

The Financial Appraisal considers only the financial costs and benefits (monetary flows) of a project or programme to an organisation, whereas wider societal costs and benefits (that do not necessarily have a monetary value) are considered in the Economic Appraisal. While these broader objectives are important in determining a programme's value for money, the Financial Appraisal is necessary for determining whether the project is affordable for the sponsoring agency and the government.

A number of standardised outputs identified in the PSC will be presented in this section for the PTLU Programme. These include:

- 'Sources of Funding' or 'Affordability 'Analysis.
- General Financial Analysis.
- Exchequer Cash Flow.

Sensitivity Analysis will also be carried out to demonstrate the impact of changes in cost and revenue on these outputs, and the results of this analysis are contained in Section 8.

6.1 Sources of Funding Analysis

The purpose of Sources of Funding Analysis is to consider the impact of a proposed project or programme on the financial resources of the Sponsoring Agency, and to consider the likely sources of funding.

Table 6.1 shows the anticipated cost of the PTLU Programme in nominal terms (i.e. including inflation and VAT). Over a five-year period, the total cost of the Programme to TII would be €25 million; or €29.4 million once VAT is included. The annual average cost would be approximately €5 million (or €5.9 million including VAT), although it should be emphasised that the yearly funding requirements will differ based on the profile of the PTLU Programme and inflation, as shown in Figure 5.1. It is assumed that NTA will be the source of funding.

Table 6.1: Nominal costs of the PTLU Programme for the period 2021 to 2025

Cost	Total Cost	Average Annual Cost
Luas Minor Enhancements Programme Cost	€25m	€5m
Nominal Cost (excl. VAT)	**€25m**	**€5m**
VAT	*€4.4m*	*€0.9m*
Nominal Cost	**€29.4m**	**€5.9m**

6.2 General Financial Analysis

A General Financial Analysis is mandatory for all business cases, the purpose of which is to forecast cash flows over the course of the PTLU Programme in real terms, and to return a 'Financial Net Present Value' (FNPV). FNPV is a measurement of net financial flows calculated by subtracting the present values of financial outflows from the present values of financial inflows over the appraisal period.

6.3 Exchequer Cash Flow Analysis

The exchequer cash flow analysis is specified in the Public Spending Code for the appraisal of publicly-funded projects or programmes. It identifies and quantifies the financial flows that impact the Exchequer as a result of a proposed project or programme.

6.3.1 Exchequer Outflows

In the Exchequer Cash Flow Analysis, exchequer outflows consist of any expenditure that comes from taxation of central government funds, such as direct exchequer funding or capital grants from government departments and agencies.

For this Programme, the exchequer outflows mainly consist of the *net* exchequer funding requirement (i.e. the cost of the PTLU programme).

6.3.2 Exchequer Inflows

Exchequer inflows consist of any revenue that accrues to the exchequer, which generally consists of any taxation generated as a result of the Programme. Two main exchequer inflows are applicable to this Programme:

Value-Added Tax – As VAT has been excluded from the costs paid by TII in the financial and economic appraisal, any VAT paid on capital and operating costs should not be included as a net inflow in this Exchequer Cash Flow Analysis.

Income Taxes – Spending on labour for the PTLU Programme will result in income tax being paid to the government, which represents a net exchequer inflow. The labour component of all expenditure was estimated based on the assumptions outlined in Section 4, with 16.6% of this labour component assumed to relate to income taxes paid to the government.

6.3.3 Net Exchequer Cash Flow

The present value of exchequer inflows is €2.3 million, while the present value of exchequer outflows is €24.9 million. This represents a net exchequer outflow of €22.6 million over the programme period.

7. Economic Appraisal

While the financial appraisal examines costs and benefits from the perspective of the Sponsoring Agency, the economic appraisal includes a wider range of costs and benefits to users and society. However, as the Luas is already an existing asset that has gone through its own appraisal process in the past, the purpose of the economic appraisal in this business case is not to re-establish the benefits of the asset; but rather to outline the relative costs and benefits of the approach that TII has proposed for the PTLU programme.

The economic costs include the PTLU programme, and adjustments for the of Shadow Price of Labour and Public Funds. The present value of these costs is -€50.7 million.

7.1 Multi-Criteria Analysis

An MCA is applied to determine the overall performance of the PTLU Programme against the option of a 'Do-Minimum' scenario. This technique allows for the combining of a range of positive (benefits) and negative (costs) effects in a single framework to allow for an easier comparison to the alternative 'Do-Minimum' option. This preliminary appraisal will encompass a qualitative and quantitative approach. The non-monetary economic costs and benefits of the PTLU Programme have been summarised in the MCA below. The criteria being assessed are:

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

For each criteria and sub-criteria, the impact is summarised with a statement, and an impact rating based on the seven-point scale displayed in Table 7.1

Table 7.1 Economic costs and benefits impact rating scale

Impact Rating						
Major Negative	Moderate Negative	Minor Negative	Negligible /No Impact	Minor Positive	Moderate Positive	Major Positive

It should be emphasised the MCA mainly examines the costs and benefits of the proposed PTLU Programme itself, rather than the wider benefits associated with the Luas. This MCA is shown in Table 7.2 on the following page.

Table 7.2 Multi-criteria analysis

Economy	Assessment	Impact
Transport Efficiency & Effectiveness	The PTLU Programme primarily targets minor enhancements and upgrades, and these upgrade works may result in improvements in the efficiency and effectiveness of transport operations.	Moderate Positive
Transport Reliability	A benefit resulting from the PTLU programme is enhanced facilities. By pursuing targeted minor enhancements over the programme period, TII will significantly reduce the risk of any unforeseen equipment or system failures, and by extension, the risk of unplanned rail line closures. Such closures would have a major negative impact not only on the Luas users whose journeys would be directly delayed, but on other public transport services that would be disrupted in Dublin. The PTLU programme will therefore have a major positive impact in improving journey reliability for public transport services.	Moderate Positive
Wider Economic Impact	While maintained reliability for users is a significant benefit of the PTLU programme on its own, the significance of the Luas to Ireland's international connectivity that this will also have major benefits for the wider Irish economy. The Luas plays a particularly important role for the movement of people in the Greater Dublin Area, and the minor enhancements of this asset helps to ensure that this flow of people around Dublin remains smooth and uninterrupted.	Major Positive
Funding Impacts	The total cost of the PTLU would be approximately €29.3 million over five years (€5.9 annually), the impact in terms of funding requirements is moderately significant.	Moderate Negative
Delivery	One of the benefits of a minor enhancement programme is that TII and the Operator can plan and carry out enhancement works in a way to maximise efficiency and minimise disruption. As part of the PTLU programme, TII has packaged similar works into single projects that can be implemented concurrently. Compared to a piece-meal approach, where individual projects are carried out only when the immediate need arises, this allows TII to take advantage of economies of scale, minimise closure time, and is likely to result in cost savings in the long-run.	Minor Positive
Safety		
User & Staff Safety	Proactive enhancement works are critical to ensuring the safe operation of these assets for staff and users, and reducing the risks associated with unexpected asset or equipment failures. Many of the proposed projects directly target safety, such as the works to existing substations to ensure compliance with new building regulations and fire certification.	Major Positive
Security	The Programme is unlikely to have any additional significant impacts on this sub-criteria.	No impact
Accessibility & Social Inclusion		
Vulnerable Groups	The addressing of accessibility issues around Busarás will continue to allow vulnerable groups in need of these assets to continue to access the Luas network.	Minor Positive
Deprived Geographic Areas	The Programme is unlikely to have any additional significant impacts on this sub-criteria.	No impact
Integration		
Transport Integration	As outlined in the policy context section, the PTLU programme has a firm basis in government transport policy. The National Development Plan, regional transport strategies, the DoT's forthcoming transport investment framework and TII's Statement of Strategy all recognise the importance of investing in the enhancement and maintenance of existing infrastructure. The assets in question also form critical components of the national rail	Major Positive

	network, meaning that their continued operation and enhancement will help to progress many of the objectives contained in national transport and development policies.	
Geographic Integration	The Programme is unlikely to have any additional significant impacts on this sub-criteria.	No impact
Land Use Integration	The Programme is unlikely to have any additional significant impacts on this sub-criteria.	No impact
Other government policy	The Programme is unlikely to have any additional significant impacts on this sub-criteria.	No impact
Environment		
Air Quality & Climate	The PTLU Programme will have a positive impact on climate, as continued enhancement of accessibility and the intermodal facilities of the Luas will allow more people to access this service. Ensuring that less emissions associated with personal vehicle use are produced.	Minor Positive
Noise and Vibration	The Programme is unlikely to have any additional significant impacts on this sub-criteria.	No impact
Landscape and Visual Quality	The Public Realm improvements detailed in this programme will bring improvements to the landscape and visual quality.	Minor Positive
Biodiversity	The Programme is unlikely to have any additional significant impacts on this sub-criteria.	No impact
Cultural, Archaeological and Architectural Heritage	The PTLU Programme will have a positive effect on this sub-criteria, as the continued maintenance of the Luas will allow for a continued safer street environment for residents, workers and tourists, with decreased congestions and decreased noise pollution.	Minor Positive
Land use, soils and geology	The Programme is unlikely to have any additional significant impacts on this sub-criteria.	No impact
Water resources	The Programme is unlikely to have any additional significant impacts on this sub-criteria.	No impact

8. Risk Analysis

This section of the report considers the main risks associated with the implementation of the PTLU Programme. The Public Spending Code requires that business cases include a Risk Management Strategy, which identifies the main risks faced by the project/programme and proposes measures to avoid or mitigate these risks. It also requires that financial and economic appraisals account for uncertainty or risk when estimating costs or benefits by carrying out sensitivity analysis on these values.

This section contains the Risk Management Strategy for the PTLU Programme. While risks will arise at all levels of the Programme, this section focuses on Programme-level risks; those that could impact the success or failure of the Programme as a whole, rather than the project-level risks faced when implementing specific aspects of the Programme. The result of this section is a 'Risk Register' containing the risks that have been identified and assessed, as well as details of any risk management measures undertaken by TII.

The section also contains the results of the sensitivity analysis, which shows the impact of changes in cost, revenue, and the expenditure profile on the financial and economic appraisal outputs.

8.1 Risk Management

8.1.1 Assessment Methodology

The risk management strategy for this programme is carried out in accordance with NTA *PAG's* and TII's *Risk Management Policy for Public Transport* Projects and *Risk Management Process for Public Transport Projects* and associated documents.

This Risk Management Strategy considers both external and internal risks to the Programme. 'External risks' are those that are outside the control of the sponsoring agency, and these have been identified and organised according to the 'PESTLE' model:

- **Political (labelled as 'P' in the Risk Register) –** Change of governments, cross cultural policy decisions, change in government structures.
- **Economic (E) –** The strength of the labour market, currency fluctuations, effect of the global economy on Ireland.
- **Socio-cultural (S) –** Demographic impacts on the demand for services. Changes in stakeholder expectations.
- **Technological (T) –** Obsolescence of current systems, cost of procuring technology, opportunities arising from changes in efficiency/ new technologies.
- **Legal (L) -** EU requirements/laws which impose requirements.
- **Environment (En) –** Impact of Climate Change, compliance with changing standards, impact on wildlife etc.

In contrast, 'Internal / Operational Risks' (O) are within the control of the sponsoring agency, and include risks associated with cost, timing, activities and governance.

Once identified, it is necessary to assess the risk, and to determine the potential effect it could have on the Programme. A 'Risk Matrix' was developed and used to assess, classify and rate each risk. Risks were assessed along two dimensions: 'Impact', referring the potential impact this risk could have on the overall success of the Programme; and 'Likelihood', referring to how likely the risk is to occur. These were used to develop an overall 'Risk Rating' according to Table 8.1 below. After risks were identified and assessed, measures for avoiding or mitigating these risks were also considered.

Table 8.1: Risk Matrix

		Likelihood				
		Very Unlikely	Unlikely	Possible	Likely	Very Likely
Impact	Negligible	Low	Low	Low	Low	Low-Medium
	Minor	Low	Low-Medium	Low-Medium	Low-Medium	Medium
	Moderate	Low-Medium	Low-Medium	Medium	Medium	Medium-High
	Major	Medium	Medium	Medium-High	Medium-High	High
	Severe	Medium	Medium-High	Medium-High	High	High

8.1.2 Assessment

Table 8.2 displays the risk register for the PTLU Programme. Seven programme-level risks were identified; one of which is 'external', and the remainder 'internal'. These risks were assessed and rated, with three classified as 'Medium-High' risk, one as 'Medium', and three as 'Low-Medium'.

Mitigation measures were also outlined for each risk, although some commonalities are clear. Crucially, effective management of programme-level risks depends on the governance structures that are put in place, and this section highlights the importance of effective oversight and reporting mechanisms, as well as the need to continually review projects and expenditure to ensure that they remain relevant to the Programme's objectives.

This register does not include project-level risks, such as safety management. During the implementation period, risks associated with specific projects should be identified and assessed as part of the approval processes for individual projects.

Table 8.2: Risk Register

	Risk Type	Description of risk	Impact	Likelihood	Risk Rating	Risk Assessment and Management
E1	Funding	Reduction in central funding due to external economic conditions.	Severe	Unlikely	Medium-High	Ireland is facing into a period of significant economic and fiscal uncertainty as a result of the COVID-19 Pandemic and Brexit, which may cause the government to cut government spending in an effort to reduce the deficit. If this was to affect the funding allocated for the PTLU Programme, this could have a severe impact on its success by preventing necessary works from being carried out. However, the likelihood of severe funding cuts is considered to be low. Firstly, the government has signalled that it will prioritise maintenance and renewal expenditure in the NDP[5]; a clear break from the approach taken during the Great Recession where maintenance budgets were cut throughout the transport sector. Secondly, the strategic importance of the Luas to the Governments policy priorities, such as regional accessibility, means that enhancement of the Luas is likely to remain a priority for Government. Both of these suggest that the risk of significant funding reductions is low.
O1	Programme	The programme of works fails to deliver on its stated objectives.	Medium-High	Very Unlikely	Low-Medium	Simply put, the success of any programme depends on its ability to achieve its objectives, so it is essential that the activities carried out under the PTLU Programme have a clear relevance to its objectives. Otherwise, the Programme may ultimately be ineffective at achieving the goals for which it was intended. This business case clearly sets out the objectives, activities and scope of the Programme, and the Programme Logic Model in Section 3.5 clearly shows the relevance of each action to the overall Programme. The Operator has carried out extensive work to identify and prioritise projects in line with these objectives, and the relationship between these activities and outcomes is well understood. The Operator will also be required to produce individual business cases for all projects to demonstrate their congruence with the overall Programme.
O2	Change Risks	Risk of changes to the Programme's scope or activities.	Major	Possible	Medium-High	As the PTLU Programme progresses, it is likely that new issues or projects will be identified that are not explicitly set out within the original business case; but are nevertheless necessary to maintain the safety and functionality of the Luas. As these activities have not been explicitly incorporated into the Programme or budget, this may have major impacts on cost, time or other activities in the Programme. TII has a dedicated Steering Group set up to oversee Luas Upgrades with membership from Operations and Public Transport Capital programmes which will ensure any additional projects not identified explicitly within the original business case are appraised appropriately.

[5] National Development Plan 2018 - 2027

	Risk Type	Description of risk	Impact	Likelihood	Risk Rating	Risk Assessment and Management
O3	Cost	Works exceed their allocated cost, leading to funding shortfalls for other activities in the Programme.	Moderate	Likely	Medium-High	As part of the project prioritisation process, TII has developed preliminary cost estimates for the works that are anticipated based on market rates and the cost of similar works undertaken in the past. As these are preliminary estimates and could vary based on the exact specifications or timing, it is very likely that the final cost of works will differ from these estimates. This could have a moderate impact on the Programme's success by reducing the budget available for other works. Through the Programme's monitoring and reporting processes, the outturn will be closely monitored to allow for potential issues to be identified and addressed at an early stage.
O4	Governance	Risks relating to unclear roles, oversight or responsibility for delivery.	Moderate	Unlikely	Low-Medium	TII has well-established processes in place for the governance of projects and programmes, which this business case has articulated in the context of the PTLU Programme. As required by the PSC, this governance structure includes designated responsibility for delivery, effective oversight mechanisms, and a process for reporting on and monitoring progress. TII has a dedicated Steering Group set up to oversee a number of project working groups for Luas Upgrades with membership from Operations and Public Transport Capital programmes. The membership, roles and responsibilities of each group are clearly prescribed in the terms of reference for each group.
O5	Capacity	TII or its contractors lack the capacity to deliver the necessary activities.	Moderate	Very Unlikely	Low-Medium	TII has numerous Frameworks in place for works and services and has already demonstrated a capacity to deliver. Strong programme and project scheduling will be in place to ensure that if any additional bespoke or open tenders are required that this time will be factored into the appropriate project programmes.
O6	Resilience	Failure to adequately identify threats and opportunities.	Moderate	Unlikely	Medium	TII has undertaken an extensive prioritisation process to identify risks to the safe and efficient operation of these assets, including separate risk assessments for different asset groups. This has identified the main risks to which the Programme will respond over the next five years, as well as the measures required to ensure the continued safe and efficient operation of the Luas. This will be continually updated by the Steering Group during the Programme to ensure it remains relevant and up-to-date.

8.2 Sensitivity Analysis

Current appraisal guidance requires that sensitivity analysis be carried out in all business cases to test the effect of changes in costs, revenue or benefits on the success of a project or programme. This is especially important for programmes where the total cost is based on indicative estimates for a series of projects or activities. Changes in the cost, scope or sequencing of individual activities can ultimately have an impact on the cost of the overall programme and the funding required, making sensitivity analysis useful for understanding the range of potential costs over the PTLU Programme period.

The impact of changes in costs will be assessed as part of this sensitivity analysis.

8.2.1 Changes in cost

The tables below show the impact of changes in the programme cost on the financial appraisal outputs; namely the:

- Total Funding Requirements (nominal net cash flow)
- the net Exchequer Cash Flow, and
- the Economic Net Present Value.

The sensitivity tests are based on incremental changes (+/- 20 percentage points) to the renewal costs.

Table 8.3: Sensitivity Analysis – Total Funding Requirements for the period 2021 to 2025

	+20%	+10%	+0%	-10%	-20%
Costs	-€35.2m	-€32.2m	**-€29.4m**	-€26.4m	-€23.4m

Table 8.4: Sensitivity Analysis - Exchequer Cash Flow for the period 2021 to 2025

	+20%	+10%	+0%	-10%	-20%
Costs	-€27.1m	-€24.9m	**-€22.6m**	-€20.3m	-€18.1m

Table 8.5: Sensitivity Analysis - Economic Net Present Value for the period 2021 to 2025

	+20%	+10%	+0%	-10%	-20%
Costs	-€60.8m	-€55.8m	**-€50.7m**	-€45.6m	-€40.6m

Finally, Table 8.6 below summarises the range of values arising from the 'best-case' and 'worst-case' scenarios tested above. As the table shows, there is a relatively wide range of values in these outputs over the Programme period. The nominal funding requirements show the widest range of between €23.4 million and €35.2 million, although the net impact of the exchequer would be much less once VAT and income tax receipts have been factored in.

Table 8.6: Sensitivity Analysis - range of values

	Nominal funding requirements	Exchequer Cash Flow	ENPV
Central	*€29.4m*	*-€22.6m*	*-€50.7m*
Best Case	€23.4m	-€18.1m	-€40.6m
Worst Case	€35.2m	-€27.1m	-€60.8m

9. Procurement

This section outlines the procurement approach taken for the PTLU Programme. It describes the current contract in place for the enhancement of the Luas, as well as potential alternative approaches to future procurement of the Programme.

9.1 Procurement Strategy

The programme has two main inputs which require procurement consideration, project management and design resources and the project works themselves.

Resources: Design and project management resources. Requirements are assessed on a programme and project level regularly. Use internal resources or utilise TII frameworks.

Works:

TII have appointed a main contractor on a single supplier framework and it's envisaged that most of the works in the PTLU programme will be carried out under this framework.

TII will assess each project individually to determine its procurement requirements with proposed course of action contained in the project execution plan. Main options identified are as follows

a. Use single supplier framework

b. Establish specialist framework for certain works (e.g. OHLE or track replacement)

c. Open tender

d. Seek quotation from operator to undertake works

10. Governance, Monitoring and Evaluation

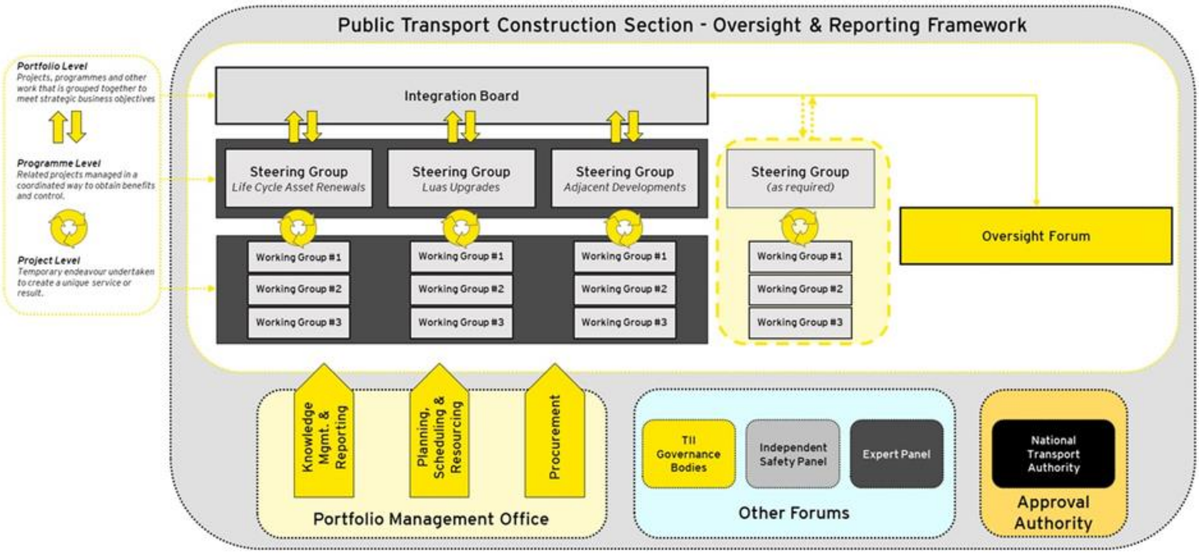
To ensure that an intervention achieves its objectives and delivers value for money for the exchequer, the PSC requires that both capital projects and programmes have a robust process to monitor progress and evaluate efficacy. This is especially important for programmes where expenditure and delivery are ongoing, as it allows the Sponsoring Agency to verify that the programme's activities are achieving their expected outcomes within the overall budget and programme and provides opportunities to take corrective action if necessary.

This section examines the Programme Governance Structure for the implementation of the PTLU Programme between 2021 and 2025, as well as the processes for conducting mid-term and ex-post evaluations. This Monitoring and Evaluation Plan is informed by the requirements outlined in the NTA's *Project Approval Guidelines*, Department of Public Expenditure and Reform's *Public Spending Code,* the Department of Transport's *Common Appraisal Framework*, and Transport Infrastructure Ireland's *Project Appraisal Guidelines.*

10.1 Programme Governance Structure

TII public transport capital programmes business unit is implementing an oversight reporting and collaboration architecture to cover all public transport projects / activities with the exception of major NDP projects. This will include both the PTLU and LCAR programmes, the unit dealing with adjacent developments and any other future initiatives. This structure is shown in Figure 10.1. The architecture of the structure is based on adopting a portfolio management approach for managing a number of separate programmes or major projects.

Figure 10.1 PTLU Oversight reporting and collaboration architecture



The governance structure for the PTLU Programme will consist of three main levels, which are:

- Portfolio Level, responsible for oversight of the PTLU Programme and ensuring that will meet its strategic objectives.
- Programme Level, responsible for related projects on the PTLU Programme, which will be managed in a coordinated way to obtain benefits.
- Project Level, which are temporary and undertaken to create a unique service or result.

At **portfolio** level there are three main forums; Public Transport Portfolio Steering Committee Meeting, Oversight Forum and Integration Board. These are explained in further detail below.

1. **Public Transport Portfolio Steering Committee Meeting**: This meeting is held quarterly and covers all public transport projects and programmes apart from Metrolink. This committee sets the parameters for the delivery of the programmes/projects. The committee comprises representatives from NTA, Head of Capital Programmes, Head of Public Transport Capital Projects and Head of Projects Services, with attendance of individuals requested as required such as Project / Programme managers etc.

2. **Oversight Forum**: This meeting is held quarterly at a minimum or more frequently as required and covers both the PTLU and LCAR programmes, adjacent developments and any other non-major projects initiatives which may arise. The Forum will be responsible for setting and communicating the strategic priorities to be adopted by the Integration Board, Steering Groups and Working Groups. The Oversight Board will ensure that the portfolio operates in accordance with the policies and procedures approved by the Approving Authority. The forum comprises Head of Capital Programmes, Head of Public Transport Capital Projects (Chair), Head of Commercial Operations and the Head of Light Rail Business with attendance of individuals requested as required such as Luas Operations Manager, Head of Project Services and Head of Public Transport Construction.

3. **Integration Board**: This meeting is held monthly and has overall responsibility for ensuring the strategic direction and requirements of the oversight forum are communicated to the Steering Groups for implementation. The Integration Board will also coordinate any day to day portfolio level issues (e.g. risk, resources, priorities, budgets) and have responsibility for reporting to the Approving Authority and the Board of TII. This Board is comprised of Head of Public Transport Construction, Luas Operations Manager and Head of Project Services.

At **programme** level Steering groups are in place to manage each individual programmes of projects e.g. LCAR, PTLU. For PTLU, the Steering Group will meet monthly (at least) and provide monthly progress reports to the Integration Board. The Steering Group will maintain a programme level risk register and a pipeline of programme projects for design, procurement and implementation. The Steering Group will ensure Programme/Project Appraisals are undertaken as required and that each project has a Project Execution Plan in place that is approved and being followed by the project Working Group.

At **project** level working groups are in place for individual projects or groups of projects as required, and will be led by individual project managers with representatives from appropriate TII departments/sections, and will be responsible for the planning and implementation of the relevant projects under their remit in accordance with the necessary policies and guidelines. The working groups will meet on a monthly basis at least or more frequently as required and will report on a monthly basis to the relevant Steering Group. The Working Groups will be responsible for Project Appraisal (as required), and for maintaining a Project Execution Plan, Programme, Risk register and Budget for each project and sourcing recourses including procurement of services and works as needed.

10.2 Approval / Initiation of Individual Projects

The PTLU Programme is based on a series of minor enhancement works for the Luas. The detail and costs of many of these projects is relatively high level at this point, meaning that they may vary from those included in this business case. As a result, the following process will apply to the initiation and approval of individual projects.

The PTLU programme will have its own programme level PEP and along with the business case will be deemed to satisfy the deliverables for the early phases 1 to 3 depending on the project particulars.

At project initiation stage a draft project level PEP will be prepared by the project team and approved internally by the PTLU Steering Group. This PEP could be prepared for individual projects or a group of projects if the characteristics are the same. The PEP will contain any project specific information that is different from that included in the Programme Project Execution Plan (PEP). This PEP is a pre-prepared template, based on a checklist / form, which can be filled out, with any irrelevant sections or sections where the PEP is relevant, ticked accordingly. The sort of information that might be included in the PEP is if the task / project requires a specific management team or resources or has specific/different stakeholders etc.

Once approved this PEP will be submitted to NTA for review / approval and will also be used to agree the project band, phases, hold points and deliverables which will be recorded on a Project PAG checklist. Following NTA approval the project can proceed.

10.3 Monitoring and Reporting

10.3.1 Programme Reporting

A system of regular reporting of expenditure and progress is required by the NTA *Project Approval Guidelines* and is necessary for effective programme management and oversight.

TII will prepare a monthly report for the PTLU Programme, which will generally summarise:

- The main activities or projects carried out.
- The cost of these activities compared to the expected out-turn; plans for the following month.
- Other significant developments or risks affecting the programme or its success.

This report could explicitly note any deviations from the original programme, based on any individual business cases that were submitted during the reporting period (see below).

The exact requirements for reporting for each project may vary throughout its life, and these requirements will be agreed with NTA prior to commencing work and as the project progresses through the various project phases.

In addition, TII will also submit various financial reporting such a rolling 5 year multi-annual budget (Quarterly), proposed yearly budget for the coming year (Annually), Budget/cashflow updates for the year (Quarterly).

At the end of each project TII will submit a close out reporting detailing the outcome of the project both from a financial and technical perspective and whether the project achieved its stated objectives.

In addition to the aforementioned reports, a Mid-term Evaluation report and an Ex-post Evaluation report are required at the midpoint and endpoint of the programme period respectively. These reports examine the programme's progress in greater depth than the regular reports, placing greater emphasis on its efficacy and whether it has been successful in achieving its goals.

This delivers on the requirement for a system of regular reporting and an indicative reporting schedule is outlined in Table 10.1 below.

Table 10.1 Indicative reporting schedule

Reporting Deliverable	Delivery date
Monthly Progress / Commercial Reports	Monthly 2021-2025

Various financial reports	Monthly / Quarterly / Annually
Project close-out reports	As required
Mid-term Evaluation	2023
Ex-post Evaluation	2026

As per the NTA PAG progress reporting, regular progress meetings between the NTA, the Sponsoring Agency and any other relevant body or bodies should take place on a monthly basis.[6] These progress meetings may cover the entire programme or individual projects / groups of projects may require separate meetings. In addition to these progress meetings NTA and TII hold a monthly finance meeting to discuss matters such as funding, budget forecasts, financial reporting etc.

10.3.2 Change Control

The robust reporting and monitoring process described above should ensure that issues are identified and addressed in a timely manner. The reporting pack will contain details of any variations issued on contracts and claims received as well as their projected impact on the respective contracts.

A financial threshold will also be agreed with NTA to apply to variations over which level they will require approval from NTA.

10.4 Key Performance Indicators

A 'Key Performance Indicator' (KPI) is an indicator or metric used to monitor the effectiveness of an organisation, project or programme at achieving its objectives, and are an important component in carrying out Mid-term or Ex-Post Evaluations. KPIs are derived from the Programme Logic Model outlined in Section 0, which itself summarises the mechanisms by which the programme is intended to achieve the objectives set by TII.

10.4.1 Programme KPIs

There are two main categories of KPIs of relevance to this Programme: 'delivery' and 'performance'. Delivery KPIs mainly relate to the inputs, activities and outputs, and whether TII and its contractors are delivering the Programme in line with the parameters set out in the business case. Delivery KPIs are especially important to the monitoring and reporting processes, as it helps to determine whether the Programme is being delivered on time and within budget, and whether further corrective action is necessary.

Delivery KPIs for the PTLU Programme are summarised in Table 10.2 below.

[6] https://www.nationaltransport.ie/wp-content/uploads/2020/12/NTA-Project-Approval-Guidelines-Document.pdf

Table 10.2 Programme delivery KPIs

KPI	Description
Delivery Cost	The actual outturn of programme activities, compared to the budgeted cost.
Time	The actual timeframe for carrying out programme activities, compared to the proposed programme.

10.4.2 Objective KPIs

Objective KPIs relate to the outcomes of the PTLU Programme and are used to determine whether the activities carried out under the Programme have been effective in achieving its objectives. They are especially important during the Evaluation stages of the Programme and will aid in the design and specification of future maintenance and renewals programmes. These KPI's will be determined through on going monitoring of the network performance via established processes. Periodic reports and reviews will be assessed to judge if the objectives of the programme have been achieved. Examples of these periodic reports and reviews are;

- Overall condition monitoring: these regular reviews of the condition of Luas assets at Luas stops and can be used to check if previously degraded assets have been replaced or renewed.
- Reliability/Down time monitoring: as assets are renewed in line with the programme, monitoring the Luas reliability regularly will provide a metric to measure if the objective of improved reliability has been achieved.
- Safety and security system reporting: this will measure progress against the objective of maintaining the improvement of the safety of Luas operations, as assets are renewed to comply with latest safety standards.
- Facilities – cleanliness and condition: these reports can be assessed to check if the objective of improvements to passenger experience has been attained.
- Excess waiting time monitoring: the wait time on average for a passenger at a stop above the scheduled waiting time can be used to monitor both improvements to passenger experience and reliability.

However, it should be noted that the Luas system has many factors that affect its performance, which can also have an impact on the KPI's being monitored for PTLU. The interventions included in PTLU ensure that the Luas system operates at a steady state, and that assets do not deteriorate to the point that it impacts the primary function of the system before it is replaced. Ensuring this steady state and continued operation of the Luas by reducing the amount of system failures, and continued monitoring of the level of failure/incident reports can be used to monitor the effect of the interventions, but other factors outside the scope of this programme may also have an impact.

11. Conclusions and Recommendations

There is a clear rationale for the PTLU Programme considering that Luas is a crucial asset within the national public transport network. It plays a particularly important role in the Dublin City Centre by acting as a direct route along commuter corridors via a sustainable mode of transport - connecting the outer reaches of the GDA directly to the city centre; facilitating a link to the national rail network via Heuston, and creates a safer space for active modes in the city centre via the removal of personal vehicles. There is also a strong policy basis for investing in the minor enhancement of existing assets, as it helps to protect the value of past investments, and to ensure that Ireland's infrastructure continues to operate effectively, reliably and safely and adapts to the changing urban landscape around it. It also aligns with sustainability goals in maximising existing assets and implementing sustainable initiatives such as energy efficiency and active travel projects.

As a result, the objectives of the PTLU Programme are mainly to ensure that the Luas is accessible to all users, increase intermodal facilities for active modes such as cycling, improved safety and performance improvements to key infrastructure along the network. Noting that TII has already developed necessary minor enhancements works; the business case has not focused on developing multiple 'options' or alternative programmes. These minor enhancements are diverse but have not been included in separate enhancement or renewal programmes. The approach of capturing all these minor enhancements in a single programme is assessed as the correct 'Do Something' approach, against the 'Do Nothing' options, where these minor enhancements are not performed.

This business case has detailed and evaluated the cost implications of this proposed investment programme for TII and the Exchequer. This consisted of both a financial and economic appraisal examining the costs associated with the PTLU Programme. The overall cost of the Programme is significant at €29.4 million over the five years. While this corresponds to an average annual spend of €5.9 million, the exact spending profile varies from year-to-year according to the sequencing of investment works proposed by TII. The net impact to TII in real terms is expressed by the Financial Net Present Value (FNPV), which is -€50.7 million, while the real net impact on the Exchequer would be -€22.6 million.

It should be noted that the costs and activities contained in this business case are indicative and, in the absence of detailed tender prices, reflect TII's best estimate based on the cost information currently available. This is a reality for most current expenditure programmes and as it can result in the actual outturn over the programme period differing from the initial estimates, it is important for business cases to illustrate the range of potential scenarios that may occur. As such, sensitivity analysis was carried out to demonstrate the impact of changes in cost or revenue on these outputs.

While any minor enhancement programme will require a degree of flexibility to allow TII respond to unexpected issues or changes, from a public policy perspective, it is important that projects and programme largely operate within the parameters for which a business case has been approved. This business case has described the main activities and asset groups that will feature in this Programme, and it is anticipated that most of the works carried out will ultimately fall within this scope. However, a process has been outlined for continued monitoring and reporting which is aimed at ensuring that the PTLU Programme is delivered in line with its objectives, the approved budget, timeframe, scope of activities. This includes a mechanism for reporting and seeking approval for significant changes to the Programme, which allows for the business case to be updated as time goes on. These also meet reporting criteria set out in the NTA PAG's. It is vital that TII follow these processes and continue to critically monitor and evaluate the progress of the Programme over the duration of the Programme.