

LUAS LIFE CYCLE ASSET RENEWAL PROGRAMME

PRELIMINARY BUSINESS CASE

November 2021



Quality information

| Prepared by | Checked by | Verified by | Approved by |
|-------------|------------|-------------|-------------|
| RE | DL | CM | DL |

Revision History

| Revision | Revision date | Details | Authorized | Position |
|----------|---------------|--------------|------------|----------|
| | 09/04/21 | Draft Report | DL | PM |
| 1 | 15/09/21 | V1 | DL | PM |
| 2 | 20/09/21 | V2 | DL | PM |
| 3 | 30/09/21 | V3 | AD(TII)/DL | PM |
| 4 | 04/10/21 | V4 | DL | PM |
| 5 | 18/11/21 | V5 | DL | PM |
| 6 | 22/11/21 | V6 | DL | PM |

Distribution List

| # Hard Copies | PDF Required | Association / Company Name |
|---------------|--------------|----------------------------|
| | | |
| | | |
| | | |
| | | |
| | | |

Prepared for:

Transport Infrastructure Ireland (TII)

Prepared by:

AECOM Ireland Limited
4th Floor
Adelphi Plaza
Georges Street Upper
Dun Laoghaire
Co. Dublin A96 T927
Ireland

T: +353 1 238 3100
aecom.com

© 29th March 2021 AECOM Ireland Limited. All Rights Reserved.

This document has been prepared by AECOM Ireland Limited (“AECOM”) for sole use of our client (the “Client”) in accordance with generally accepted consultancy principles, the budget for fees and the terms of reference agreed between AECOM and the Client. Any information provided by third parties and referred to herein has not been checked or verified by AECOM, unless otherwise expressly stated in the document. No third party may rely upon this document without the prior and express written agreement of AECOM.

Table of Contents

| | |
|--|----|
| Executive Summary | 7 |
| 1. Introduction | 10 |
| 2. Rationale for Intervention..... | 12 |
| 2.1 Policy Context..... | 12 |
| 2.2 Strategic Context | 14 |
| 2.3 Operational Context..... | 16 |
| 3. Programme Detail | 18 |
| 3.1 Objectives | 18 |
| 3.2 Stakeholders..... | 19 |
| 3.3 Identification and Prioritisation of Options for Renewal Works | 19 |
| 3.4 Scope and activities of proposed Programme..... | 20 |
| 3.5 Programme Logic Model | 21 |
| 4. Appraisal Methodology | 23 |
| 4.1 Appraisal Requirements | 23 |
| 4.2 Approach and Methodology..... | 23 |
| 4.3 Assumptions | 24 |
| 5. Programme Costs and Revenue | 26 |
| 5.1 Costs..... | 26 |
| 6. Financial Appraisal..... | 28 |
| 6.1 Sources of Funding Analysis | 28 |
| 6.2 General Financial Analysis | 28 |
| 6.3 Exchequer Cash Flow Analysis | 29 |
| 7. Economic Appraisal | 30 |
| 7.1 Multi-Criteria Analysis | 30 |
| 8. Risk Analysis | 33 |
| 8.1 Risk Management..... | 33 |
| 8.2 Sensitivity Analysis | 38 |
| 9. Procurement | 40 |
| 9.1 Form of Contract..... | 40 |
| 9.2 Procurement Strategy..... | 40 |
| 10. Governance, Monitoring and Evaluation..... | 42 |
| 10.1 Programme Governance Structure..... | 42 |
| 10.2 Approval / Initiation of Individual Projects..... | 44 |
| 10.3 Monitoring and Reporting | 44 |
| 10.4 Key Performance Indicators | 45 |
| 11. Conclusions and Recommendations | 47 |
| Appendix A Asset Management Plan & Procurement Option | 48 |

Figures

| | |
|--|----|
| Figure 0.1 Annual and cumulative renewal costs (including inflation, and excluding VAT) | 8 |
| Figure 0.2 Total renewal costs by asset group (excl. inflation and VAT)..... | 8 |
| Figure 1.1 Luas Network Map | 10 |
| Figure 2.1: Project Ireland 2040's National Strategic Outcomes | 12 |
| Figure 2.2 Department of Transport Modal Hierarchy | 15 |
| Figure 3.1 Luas asset group | 20 |
| Figure 3.2: Logic Path Model for the LCAR Programme | 22 |
| Figure 5.1: Annual and cumulative renewal costs (including inflation, and excluding VAT) | 26 |
| Figure 5.2: Total renewal costs by asset group (excl. inflation and VAT)..... | 27 |
| Figure 10.1 LCAR Governance Structure | 42 |

Tables

| | |
|--|----|
| Figure 0.1 Annual and cumulative renewal costs (including inflation, and excluding VAT) | 8 |
| Figure 0.2 Total renewal costs by asset group (excl. inflation and VAT)..... | 8 |
| Figure 1.1 Luas Network Map | 10 |
| Figure 2.1: Project Ireland 2040's National Strategic Outcomes | 12 |
| Figure 2.2 Department of Transport Modal Hierarchy | 15 |
| Figure 3.1 Luas asset group | 20 |
| Figure 3.2: Logic Path Model for the LCAR Programme | 22 |
| Figure 5.1: Annual and cumulative renewal costs (including inflation, and excluding VAT) | 26 |
| Figure 5.2: Total renewal costs by asset group (excl. inflation and VAT)..... | 27 |
| Figure 10.1 LCAR Governance Structure | 42 |

Executive Summary

Since its creation, Transport Infrastructure Ireland (TII) has delivered major improvements to Ireland's infrastructure, including Dublin's light rail network, the Luas. Since 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, 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 current 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 renewals across the entire Luas light rail network.

There is a clear rationale for the LCAR Programme. The Luas network is a crucial national asset which delivers many benefits such as enhanced regional accessibility and sustainable travel. Luas plays an important role in Dublin City Centre, particularly along the commuter corridors where it facilitates public transport services and removes cars from the city roads. There is also a strong policy basis for investing in the maintenance and renewal 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.

The objectives of the LCAR programme are to:

- Replace obsolete or unsupportable assets that no longer or will no longer be able to achieve the asset objectives.
- Integrate new technologies or new methods of work which have tangible benefits for Luas.
- Replace and renew of components that are worn or reached end of life service.
- Improve reliability and supportability.
- Increase the operational life and functionality of in-service assets.
- Ensure compliance with relevant standards as applied to the asset groups.
- Maintain the improvement of the safety of Luas operations.
- Deliver interventions that have a tangible sustainability benefit to the ongoing Luas operations.
- Improve the passenger experience and relieve congestion.

Noting that TII has already developed a robust needs prioritisation process to identify and prioritise necessary renewal works; the business case has not focused on developing multiple 'options' or alternative programmes; but on detailing and evaluating 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 LCAR Programme. The overall cost of the Programme is significant at €54.6 million over the six years. While this corresponds to an average annual spend of €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 -€68.8 million, while the real net impact on the Exchequer would be -€43.7 million.

Figure 0.1 Annual and cumulative renewal costs (including inflation, and excluding VAT)

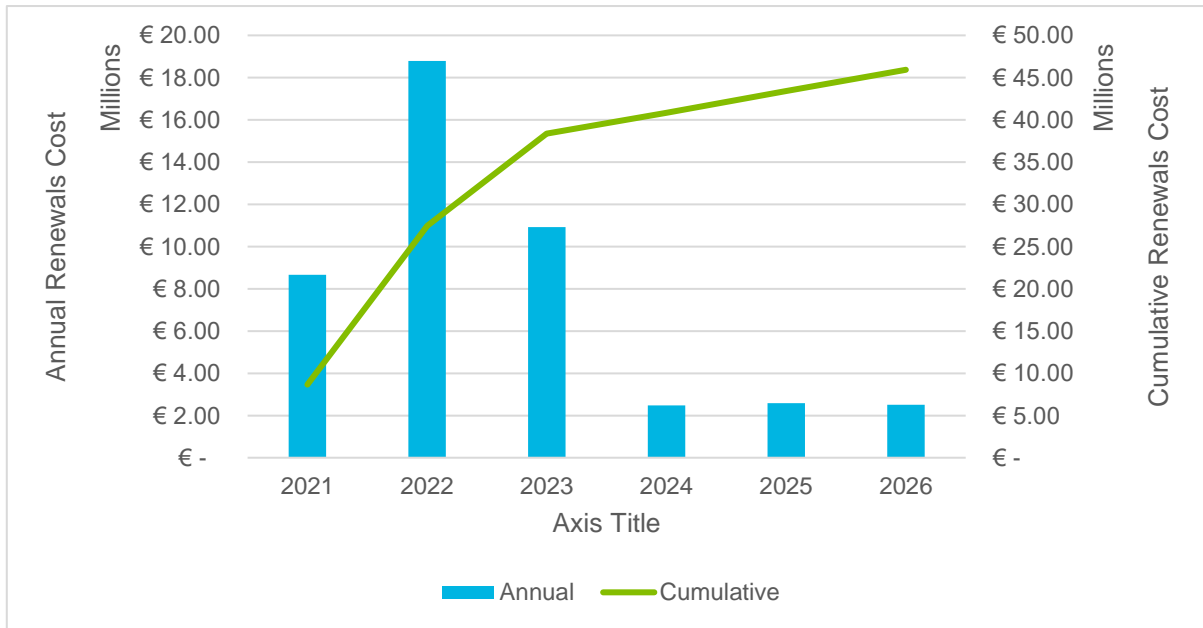


Figure 0.2 Total renewal costs by asset group (excl. inflation and VAT)

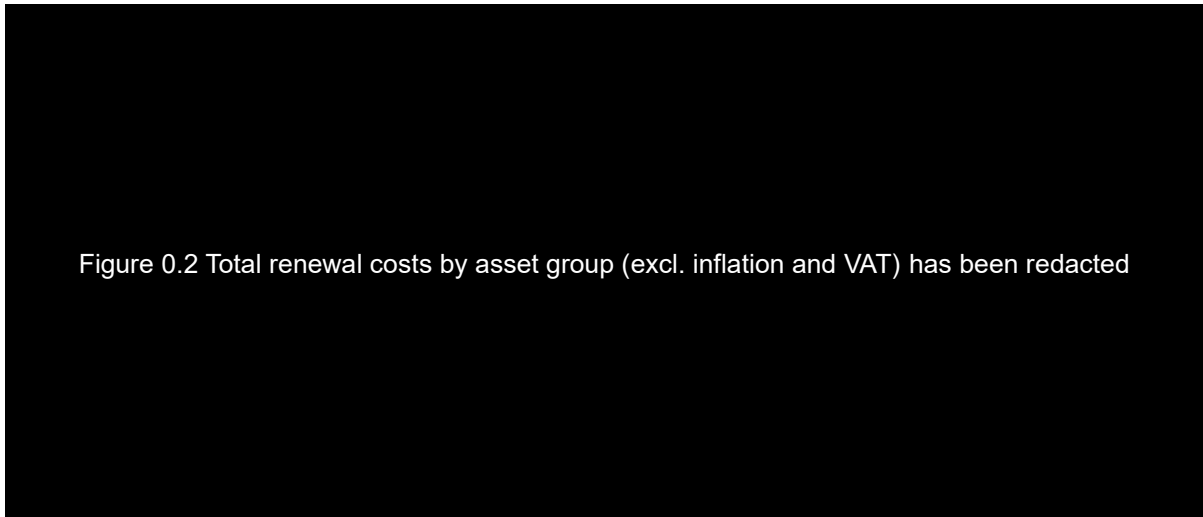


Figure 0.2 Total renewal costs by asset group (excl. inflation and VAT) has been redacted

Conclusion

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 and the Operator’s best estimate based on the cost information currently available. 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 Programme is delivered in line with the approved budget, timeframe, scope of activities.

The business case also examined potential procurement strategies and concluded that the optimal arrangement varies depending on the nature of the intervention and the asset group and is considered on a case-by-case basis. For some LCAR interventions, TII can appoint specialist contractors (via

competitive tendering processes) to enter into separate contracts for the supply of discrete elements of the programme. Other LCAR interventions can be performed by the Luas Operator via contract variation.

1. Introduction

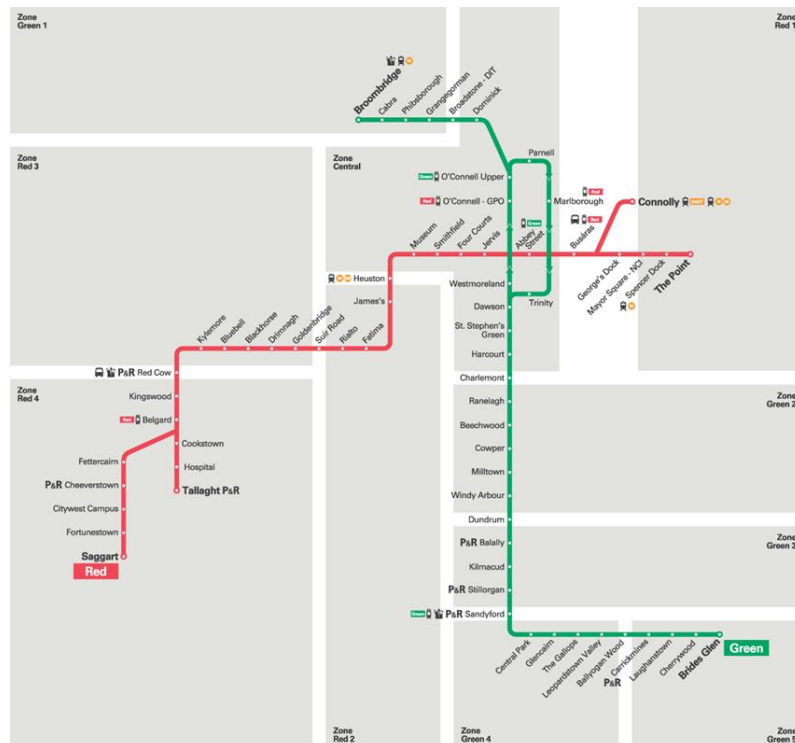
Since its creation, Transport Infrastructure Ireland (TII) has delivered major improvements to Ireland’s infrastructure, including Dublin’s light rail network, the Luas. Since its launch in 2004 the Luas system has expanded to provide an extensive light rail network that links the people, towns and businesses across the Greater Dublin Area, 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 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. TII have also invested significantly in existing assets and have implemented several current expenditure programmes that are aimed at maintaining the reliability, quality and safety of its existing network.

This business case relates to a programme of renewals 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, this requires the renewal,

replacement and upgrade of key equipment and systems to ensure that they continue to function reliably, safely and efficiently.

As a result, TII have prepared a six-year Lifecycle Asset Renewal (LCAR) Programme for the Luas for the period 2021 to 2026. The LACR Programme differs from a general operation and maintenance programme in that it focuses on replacing Luas assets that impose constraints on the Luas and limit the ability of the operator to achieve its service objectives. These assets are currently operated by a private company, Transdev, on behalf of TII.

This business case documents the contents, costs, risks and the funding requirements for this Programme, to ensure compliance with the requirements of the Public Spending Code and Common Appraisal Framework. As the Sponsoring Agency for this Programme, TII may also be required to seek approval and funding from the National Transport Authority, who is the Approving Authority, so this business case aims to fulfil these requirements.

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 Renewals 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, with supporting tables contained in the Appendices.

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; including 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 to 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
- Enable safe and resilient networks and services
- Collaborate for a holistic approach
- Deliver end to end improvements
- Transition to net zero
- Create total value for society

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 to 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.

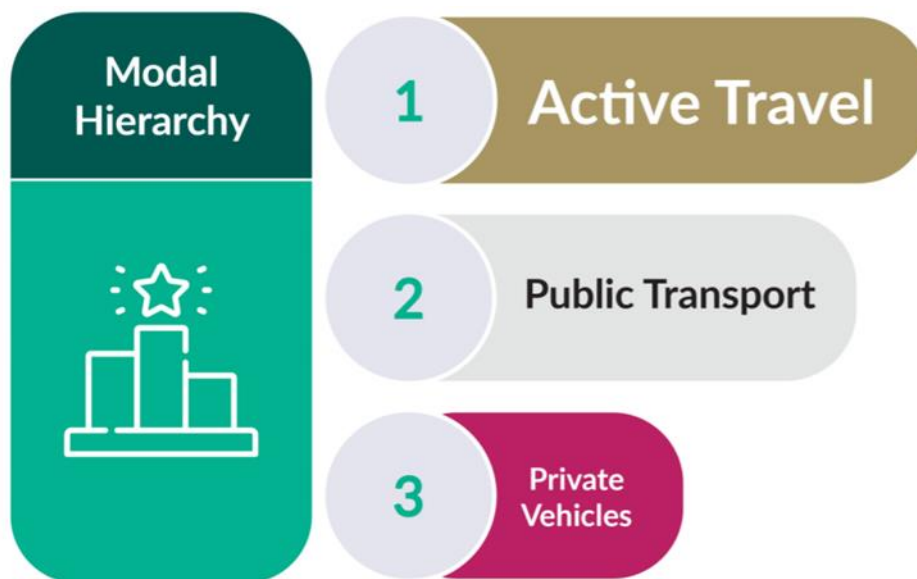
The NTA have recently issued the draft **Transport Strategy for the Greater Dublin Area 2021-2042** which aims to develop an “*effective transport system for the Greater Dublin Area*”. The strategy highlights the importance of the Luas across the Greater Dublin Area, noting that the system provides

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. This illustrates the high level of demand which exists for the service. 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”.

Facilitating public transport has been identified as a priority within the **Department of Transport forthcoming land transport investment framework**. Future transport planning will prioritise sustainable modes, and the 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 renewal investment for public transport, such as the Luas, is being addressed. As such, the investment identified by this programme for the renewal of existing Luas infrastructure aligns with this hierarchy and the emphasis placed on public and active modes of transport.

Figure 2.2 Department of Transport Modal 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 below.

Table 2-1 Strategic importance of the Luas to the National Strategic Outcomes

| National Strategic Outcome | Luas |
|----------------------------|------|
|----------------------------|------|

| | |
|--|---|
| 2 – Enhanced Regional Accessibility | The 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 | <p>The Luas is also an important corridor for public transport, particularly for services to-and-from Dublin City Centre. On average, 120,000 passengers use this service daily.</p> <p>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.</p> |
| 7 – Enhanced Amenity and Heritage | By reducing traffic in Dublin City Centre, the 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 renewal of the Luas thus maintaining the high standard of the service, more commuters are choosing to utilise the service. This facilitates Irelands transition towards a low-carbon society, as less 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 in order 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 works to ensure that safety, journey reliability and quality is maintained at an acceptable level for users.

2.3 Operational Context

Day-to-day maintenance activities of the Luas are carried out by a single specialist operator (Currently Transdev Dublin Light Rail (TDLR)) who have been appointed by TII for a long-term contract, following a competitive tender process. Under this contract TDLR are responsible for the routine, corrective and preventative maintenance of the Luas, as stipulated in the Asset Management Plan developed by TII.

This business case includes a programme of works (as identified in the Luas Asset Management Plan) to maintain service levels and safety standards for the next six years. This programme of network, systems and rolling stock renewals covers the period from 2021-2026.

The following factors have been considered in developing the Asset Management Plan:

- **Design Life** – As Luas was opened in 2004, some equipment will reach its expected end-of-life between 2021 and 2026 and will require replacement.
- **Obsolescence** – While equipment reaching the end of its design life is generally expected, unforeseen notifications from manufacturers and suppliers that they will no longer support

certain equipment or software can lead to early obsolescence. Similarly, technological advances may cause original systems or equipment to quickly become inefficient, making their replacement with more advanced technology the most efficient and cost-effective option.

- **Legal and Safety Standards** – As legal and safety standards evolve over time, this may also necessitate the renewal / upgrade of key systems or equipment prior to the end of its official design life.

In the context of this programme, upgrades refer to the replacement of infrastructure and assets that are now outdated and/or have reached the end of their working life. Assets are typically upgraded or replaced to maintain service levels and safety standards. Given the range of systems and equipment in place in the Luas network, TII and the Operator must anticipate any potential infrastructural deficits and plan and controlled manner. The timing of renewals investment should be optimised to ensure that the investment is not incurred before it is needed, but not deferred so that degradation has incurred that would need to be remedied at a greater cost later. Renewals investment projects should also be co-ordinated so that they are efficiently delivered and operate together, and with minimal disruption to the day-to-day operation of the national road network.

Failure to adequately plan for these issues could lead to the unexpected failure/outage of key systems or equipment, with potentially catastrophic consequences. In the event of an unexpected system or equipment failure, TII may be forced to close the Luas while they work to address the issue which, given the importance of the Luas to the Greater Dublin Area, could lead to severe journey disruptions. This would not only affect commuters, but also other public transport services and traffic congestion; all of which would likely face disruption and delays. The risks of failing to act proactively means that it is important for TII to carry out necessary renewal works to equipment and systems on the Luas, in order to ensure that safety, journey reliability and quality is kept at an acceptable level for users and staff.

3. Programme Detail

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

- Summary of the objectives of the LCAR 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

The entire Luas System including the Red and Green Lines, the depots, vehicles, structures and systems are valuable capital assets which play a vital role 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 are renewed and refurbished on a continuous basis to ensure that they can be operated efficiently and safely into the future.

The depot facilities for both the Red and Green lines enable maintenance, repair and servicing facilities and large stabling areas capable of accommodating the trams. These depots also house central control rooms, the operator's main offices, and the vehicle and infrastructure maintenance offices. As such these are also valuable capital assets which need continuous investment to optimise operational performance.

Optimal timing of renewals investment should be planned to ensure that the investment is not incurred before it is needed and not deferred such that existing degradation would need to be remedied at a greater cost later. Renewals investment projects should be co-ordinated so that they are efficiently delivered and operate together where possible. More specifically, the objectives of this programme are to:

- Replace obsolete or unsupportable assets that no longer or will no longer be able to achieve the asset objectives.
- Integrate new technologies or new methods of work which have tangible benefits for Luas.
- Replace and renew of components that are worn or reached end of life service.
- Improve reliability and supportability.
- Increase the operational life and functionality of in-service assets.
- Ensure compliance with relevant standards as applied to the asset groups.
- Maintain the improvement of the safety of Luas operations.
- Deliver interventions that have a tangible sustainability benefit to the ongoing Luas operations.
- Improve the passenger experience and relieve congestion.

The objectives for the LCAR programme were subject to significant stakeholder engagement in order to align them with the project. Significant reviews and reassessments were carried out as the LCAR 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 LCAR Programme include:

- **Transport Infrastructure Ireland (TII)** who own the Luas network and is the sponsoring agency for this LCAR Programme. In addition to general planning and oversight through its contract with the operator of these assets, TII will be responsible for obtaining approval and funding for the LCAR Programme. TII also directly designs/procures/executes elements of the LCAR capital works.
- **The Operator** of the Luas is responsible for day-to-day operation and maintenance of the Luas network. In addition, the operator may be required to implement some aspects of the renewal programme subject to agreed variations to their O&M contract. The current Operator is Transdev, who was awarded the contract following a competitive tender process for a period that runs until 2025.
- **National Transport Authority** is the Approving Authority for the Luas LCAR Programme, and will be the primary source of any funding required. The Department of Transport 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 Council, South Dublin County Council and Dún Laoghaire-Rathdown County Council** may be involved in the implementation of the Programme at certain points.

Furthermore, there will be a multitude of other firms involved in the actual delivery of the works. In this respect, Transdev will have a consultative role in the provision of advice both to TII and contractors undertaking the works and in the procurement of contractors and direct overseeing of works. The Health and Safety Authority (HSA) and/or the Commission for Railway Regulation (CRR) will oversee works to ensure accordance with their standards. Firms will need to be contracted which are capable of undertaking the works. These may include engineering design consultancies, design and build contractors and specialist firms. All works performed must be compliant with the TDLR safety management system (SMS).

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 Identification and Prioritisation of Options for Renewal Works

This section describes the process by which TII identified and developed a preferred programme of renewal works. While this proposed programme is based on TII assessment of the indicative cost and optimal sequencing of renewal and upgrade works over the Programme duration, it should be emphasised that the exact profile of expenditure may change.

The Operator is required to collate and present data on the performance of the Luas assets. This information is combined with data from other sources (including inspections, surveys and industry

advise) and used by TII to inform the content of asset renewal programmes and the Asset Management Strategy. This strategy identifies potential deficits based on the drivers described in Section 2.3 above, as well as the necessary upgrade or renewal works required to address these. TII have developed a six-year investment programme for the 2021-2026 period.

After identifying potential defects or issues, each was assessed against critical factors for Luas operations, safety, operational performance and reputational impact. The assessment results in a six year schedule of renewal works.

For works which are scheduled for the upcoming year a further classification is carried out to assess priority. The result is a determination which may fall into one of 3 categories:

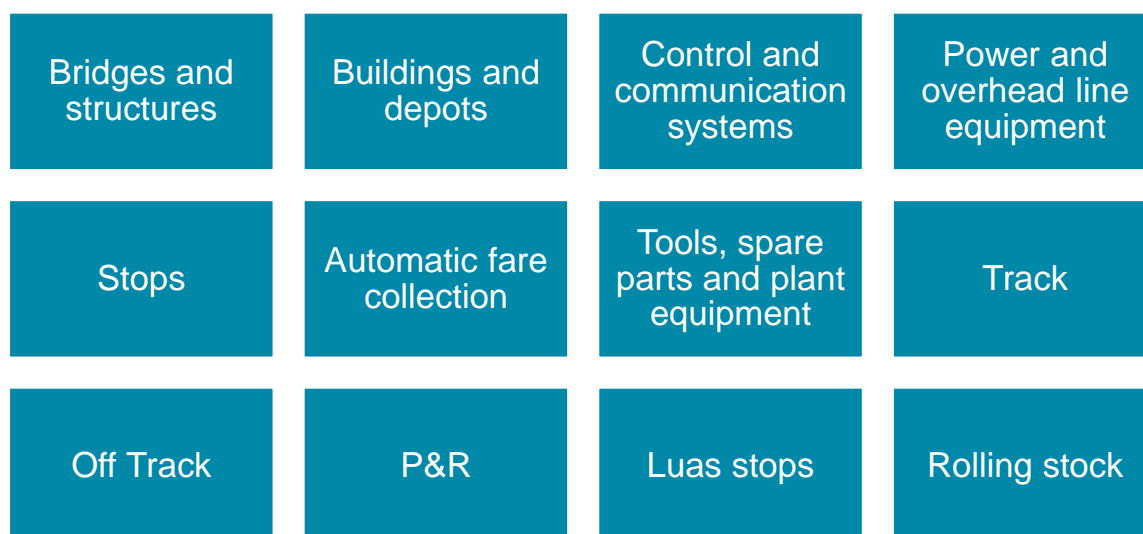
- **Category 1** – interventions which must be performed within the upcoming calendar year to ensure no loss and/or compromise to Luas operations.
- **Category 2** – interventions which if not performed within the calendar year may lead to loss and/or compromise to Luas operations.
- **Category 3** – planned interventions for performance in the upcoming year for which tangible benefits will be realised if performed as planned.

Of the issues identified, the majority fall under Category 1, with the remaining classified under Category 3. However, the ongoing review of this classification via an annual review of the programme work plan will highlight where particular intervention should be reprioritised.

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. For clarification, the programme includes capital investments and improvements over the next six years and does not include the contracted operation of the lines. The anticipated type of activities within the Luas LCAR Programme will take place across the twelve main asset groups, which are shown in Figure 3.1 below.

Figure 3.1 Luas asset group



The type of works required for these asset groups typically include:

- **Control and communications systems** - upgrade of Luas operational systems such as communications systems (i.e. radio), control systems and CCTV.
- **Bridges and structures** - upgrade of the bridge structures within the Luas network.
- **Buildings** - upgrades to depots, including lighting, technical rooms/kiosks.
- **Luas stops** - upgrades to Luas stops including lighting, civil installations, distributed systems, and lifts/escalators.
- **Automatic fare collection** – upgrades to the Automatic Fare Collection System (AFCS).
- **Track** – upgrades and replacements of the existing Luas tracks.
- **Depot fixed equipment** - upgrades to depot equipment such as washing plants.

However, as each activity in the Renewals Programme is ultimately driven by deficits, the scope of activities included in the programme is likely to evolve over the duration of the programme as new issues are identified.

For more information on the on the assets management plan for LCAR, please refer to Appendix A.

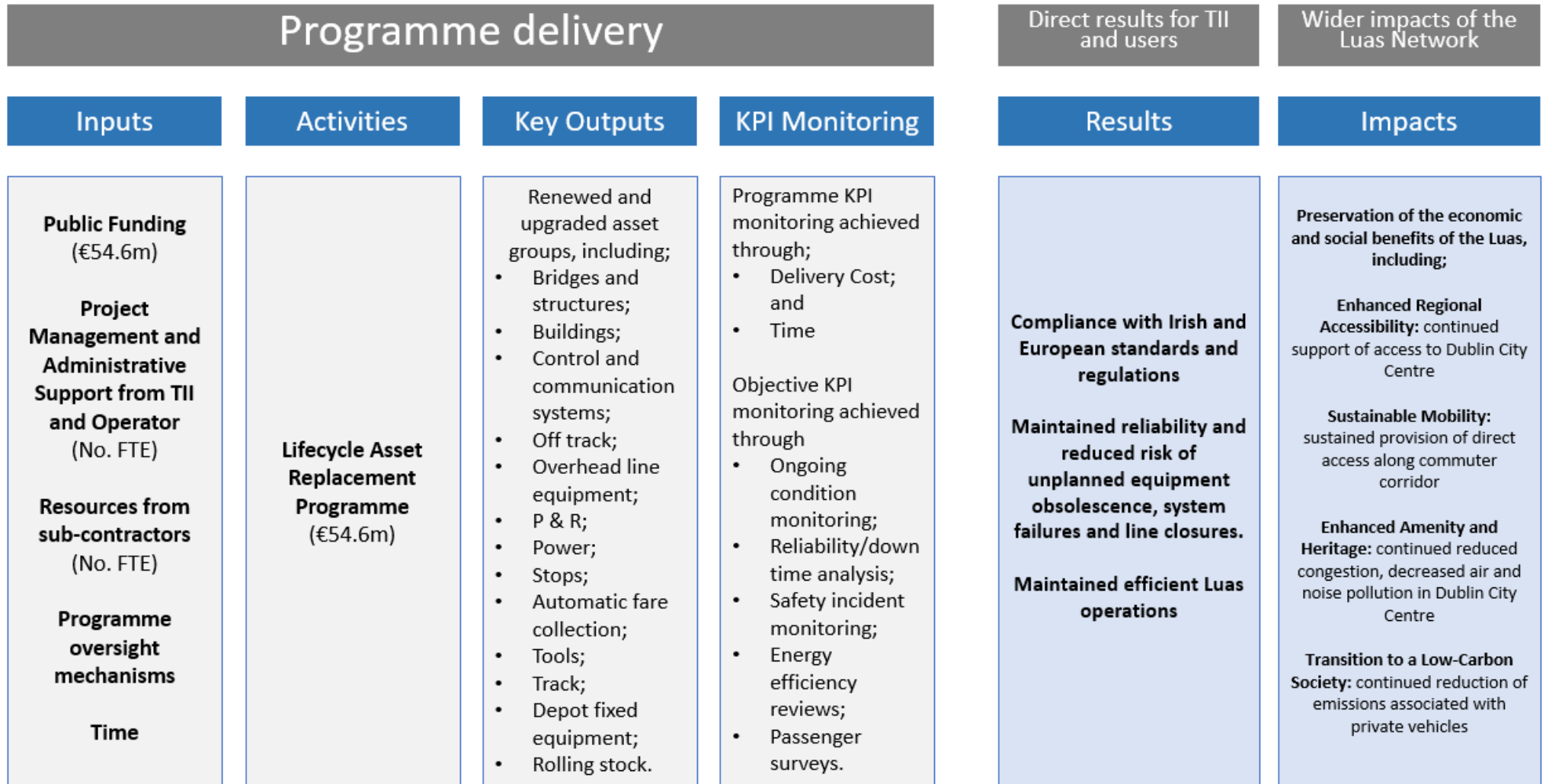
3.5 Programme Logic Model

A Programme Logic Model is an analytical tool to demonstrate the coherency of a proposal in achieving certain outcomes and objectives. The Programme Logic 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.

As Figure 3.2 shows, the main objective of the Renewals Programme is to deliver targeted works that improve the reliability, safety and efficiency of Luas operations. The LCAR Programme will have the effect of ensuring that these assets continue to operate and deliver wider societal impacts, such as enhanced regional accessibility and sustainable mobility.

Figure 3.2: Logic Path Model for the LCAR Programme



4. Appraisal Methodology

This section of the report outlines the approach taken towards the appraisal of the Maintenance and Renewals 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 Luas Lifecycle Asset Renewals 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 PSC notes that the Sanctioning Authority and approvals process may vary from organisation to organisation, but that the Government is the Sanctioning Authority for projects with a total cost of over €100 million.

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 Luas' lifecycle and asset renewals 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 LCAR 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.

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 a certain level of maintenance and renewals is required to ensure that they continue to operate safely and efficiently. 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 would 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) would 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 renewals to ensure that they do so safely and efficiently. TII have identified the necessary renewal and upgrade works as part of the Asset Management Strategy described previously and have developed this proposed LCAR Programme to reflect these requirements.

Therefore, as the business case is focused on achieving a singular defined outcome, the continued operation of the Luas; and as the Asset Management Strategy was used to determine the necessary works required to do so, MCA would be the most appropriate form of economic appraisal for the proposed LCAR Programme. MCA is often used for projects and programmes that are aimed at achieving a defined outcome, and establishes the economic costs and benefits associated with achieving this outcome.

4.3 Assumptions

Table 4-1 below 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 | 6 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 and Revenue

5.1 Costs

This section outlines the estimated costs which will be incurred from the Renewals Programme over the course of the six-year programme.

5.1.1 Renewals

In addition to the day-to-day operations and maintenance, TII developed a programme of renewals and upgrades for the Luas. Renewals are generally necessitated by the expiry of the design life of assets and equipment, or as a result of obsolescence notices by manufacturers leading to early replacement. Upgrades are generally in response to infrastructural deficits identified by the Operator, such as a need to adhere to legal standards, or to improve the safety and efficiency of network operations. The programme also includes overhauls of equipment and infrastructure to extend the useful live of the asset and improve functionality.

The total nominal cost of the renewal works between 2021 and 2026 is estimated at €45.9 million (or €54.6 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 (including inflation, and excluding VAT)

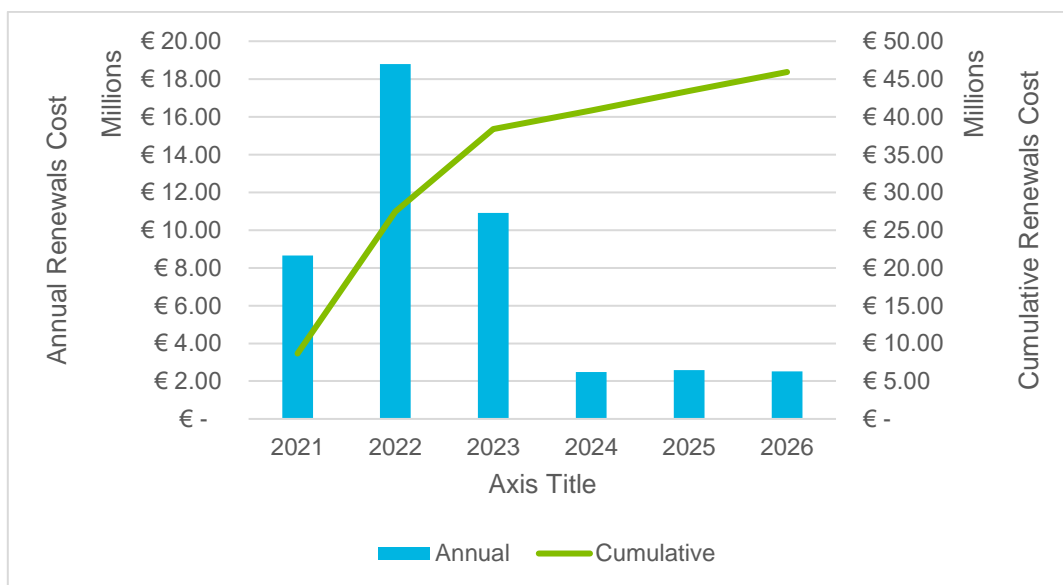


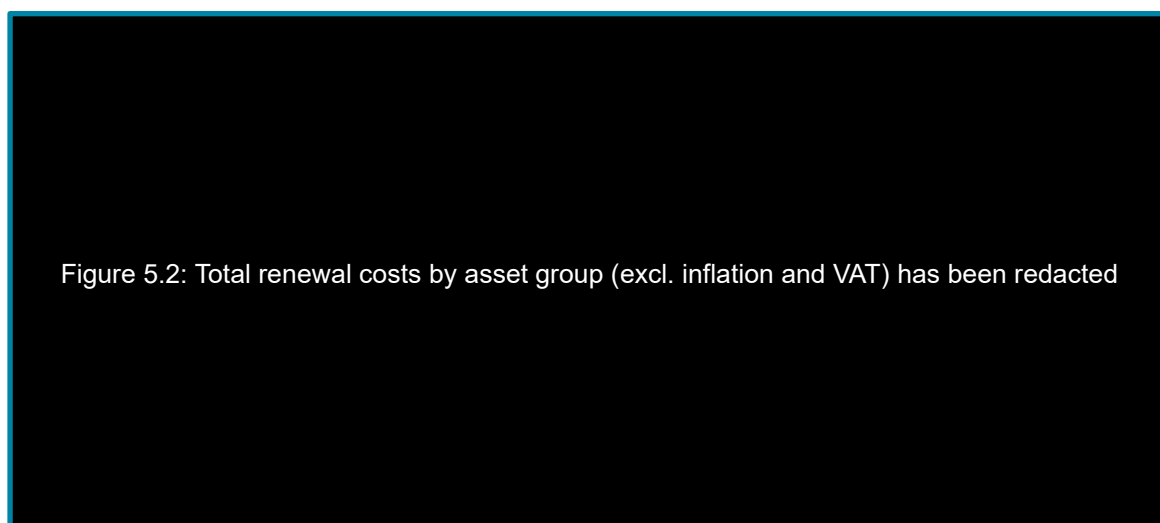
Figure 5.2 shows how the renewals expenditure is expected to be split over the main asset groups, although it should be noted that in contrast to Figure 5.1, inflation is excluded. redacted

This text has been redacted

This text has been redacted

redacted The high spending in 2022 and 2023 are associated with rolling stock replacements. Low spending is forecasted from 2024 to 2026, with work consisting of construction works to fencing/walls, continuous rail replacement and power and overhead line equipment replacements.

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



The rolling stock spend indicated is for major vehicle overhauls. The light-rail vehicles on the Luas are required to undergo manufacturer specified overhauls at mandated intervals (typically every 300K km travelled). These overhauls are major interventions which are performed over and above the standard routine and corrective vehicle maintenance. These overhauls have been scheduled based on projected vehicle kilometres run over the duration of the programme.

In the LCAR Program there are two major overhauls upcoming as follows:

- 1.2M km Overhauls – Red Line Fleet. Commencing early 2022. *redacted*
- 900K km Overhauls – Green Line Fleet. Commencing mid-2023. *redacted*

These overhauls are specified by the vehicle manufacturer (Alstom) and are required to achieve the service levels specified within the O&M contract for the Luas Operator (Transdev).

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 LCAR 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 LCAR Programme in nominal terms (i.e. including inflation and VAT). Over a six-year period, the total cost of the Programme to TII would be €45.6million; or €54.6 million once VAT is included. The annual average cost is approximately €7.6 million (or €9 million including VAT), although it should be emphasised that the yearly funding requirements will differ based on the profile of the Renewals Programme. It is assumed that National Transport Authority will be the source of funding.

Table 6-1: Nominal costs of the LCAR Programme for the period 2021 to 2026

| Cost | Total Cost | Average Annual Cost |
|---------------------------------|---------------|---------------------|
| Renewals Programme Cost | €45.6m | €7.6m |
| Nominal Cost (excl. VAT) | €45.6m | €7.6m |
| VAT | €8.7m | €1.5m |
| Nominal Cost | €54.3m | €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 LCAR 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 renewals 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 Renewals 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 4.3, 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 €1.9 million, while the present value of exchequer outflows is €45.6 million. This represents a net exchequer outflow of €43.7 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. 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 their renewal.

7.1 Multi-Criteria Analysis

An MCA is applied to determine the overall performance of the LCAR 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 LCAR 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 LCAR Programme itself, rather than the wider benefits associated with the Luas. The output from this MCA is shown in Table 7.2 on the following page.

Table 7.2: Multi-criteria analysis

| Economy | Assessment | Impact |
|---|---|-------------------|
| Transport Efficiency & Effectiveness | While the LCAR Programme primarily targets safety and reliability, certain renewal and upgrade works may result in improvements in the efficiency and effectiveness of transport operations when compared to the 'Do-Minimum' scenario. | Moderate Positive |
| Transport Reliability | The primary benefit of the LCAR Programme is improved transport reliability. By pursuing a targeted renewal and upgraded Programme 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 LCAR Programme will therefore have a major positive impact in improving journey reliability for public transport services. | Major Positive |
| Wider Economic Impact | While maintained reliability for users is a significant benefit of the LCAR 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. As outlined previously, the Luas plays a particularly important role for the movement of people in the Greater Dublin Area, and the reliability of this asset helps to ensure that this flow of people in and out of Dublin remains smooth and uninterrupted. | Major Positive |
| Funding Impacts | The total cost of the Renewals Programme would be approximately €54.3 million over six years, the impact in terms of funding requirements is significant. | Moderate Negative |
| Delivery | One of the benefits of a single, long-term renewals programme is that TII and the Operator can plan and carry out renewal or upgrade works in a way to maximise efficiency and minimise disruption. As part of the Needs Prioritisation process, 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 maintenance and renewal 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 health and safety, such as the replacement of lighting at Luas stops, and the servicing of lifts/escalators. | Major Positive |
| Security | The programme of works proposed for the Control and Communications Systems in particular will have a positive impact on security, through the upgrade of signalling, communications and CCTV systems. This will allow TII and the Operator to more closely monitor developments on the network, control access, and will enhance the security of these assets. | Moderate Positive |
| Accessibility & Social Inclusion | | |
| Vulnerable Groups | The servicing of lifts/escalators will continue to allow vulnerable groups in need of these assets to continue to access the Luas network. | Minor Positive |
| Deprived Geographic Areas | The continued provision of a service that offers a mode of transport in disadvantaged areas and areas of low car ownership (e.g. areas of high dependency on public transport). | Minor Positive |
| Integration | | |

| | | |
|--|---|-------------------|
| Transport Integration | As outlined in the policy context section, the LCAR Programme has a firm basis in government transport policy. The National Development Plan, regional transport strategies and TII's Statement of Strategy all recognise the importance of investing the maintenance and renewal of existing infrastructure and aim to prioritise achieving a steady-state level of funding for this purpose. The assets in question also form critical components of the national rail network, meaning that their continued operation and maintenance will help to progress many of the objectives contained in national transport and development policies. | Major Positive |
| 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 Renewals Programme will have a positive impact on climate, as continued maintenance of the Luas will allow more people to access this service. Ensuring that less emissions associated with personal vehicle use are produced. | Moderate Positive |
| Noise and Vibration | Track asset interventions replace worn rail which is a significant contributor to airborne noise emissions. TII are also performing trials on hardened rail types which are likely to greatly reduce airborne noise emissions from Luas operations. | Moderate Positive |
| Landscape and Visual Quality | Interventions performed on the Off-track asset group include significant soft landscaping works and earthworks. These will impact positively on the landscape, reduce the maintenance requirements and improve its resilience to weather events. | Moderate Positive |
| Biodiversity | The Programme is unlikely to have any additional significant impacts on this sub-criteria. | No impact |
| Cultural, Archaeological and Architectural Heritage | The Renewals 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 | One of the largest consumers of water in Luas operations are the tram washing facilities (included within the spare parts plant and tools asset group). The programme includes improvements of these systems to reduce water consumption | Minor Positive |

8. Risk Analysis

This section of the report considers the main risks associated with the implementation of the LCAR Programme. The PSC 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 appraisal 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 LCAR 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

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 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 (Table 8-1). 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 the table 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 Programme. Nine programme-level risks were identified; three of which are ‘external’, and the remainder ‘internal’. These risks were assessed and rated, with four classified as ‘Medium-High’ risk, two 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 or traffic 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 | <p>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 Programme, this could have a severe impact on its success by preventing necessary works from being carried out.</p> <p>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; 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 maintenance of the Luas is likely to remain a priority for Government. Both of these suggest that the risk of significant funding reductions is low.</p> |
| T1 | Technology | Change in technology leads to equipment obsolescence and a need for early replacement | Major | Possible | Medium-High | <p>Major technological changes (e.g. autonomous vehicles) may require TII to replace equipment in these assets at a faster pace than envisaged by current manufacturers' guidelines. This could have a major impact on the cost of Programme and result in the redundancy of previous investments.</p> <p>To mitigate against the effects of major technological changes, TII should carry out horizon-scanning exercises and regularly update this risk register as part of its prioritisation and annual reporting processes; and if necessary, take corrective action to ensure that all planned work or equipment installations remain relevant and fit-for-purpose. The completion of individual business cases prior to the approval of each project will also ensure that this work continues to be justified in light of prevailing technological trends.</p> |
| L1 | Legal | Change in regulations or legal standards leads to equipment obsolescence and a need for early replacement | Minor | Possible | Low-Medium | <p>As with T1, potential changes in legal or operating standards may also require TII to re-evaluate its choice of equipment, or to replace equipment before the end of its typical lifespan. However, as significant legal changes are likely to be signalled in advance by authorities, the impact is considered to be minor compared to technological changes.</p> <p>The process for mitigating against this risk is similar to T1 and involves horizon-scanning for potential changes as part of the reporting and prioritisation processes. TII should also proactively engage with authorities and regulators to ensure that it is kept informed of any potential legal changes that may impact the Luas operations.</p> |

| | Risk Type | Description of risk | Impact | Likelihood | Risk Rating | Risk Assessment and Management |
|----|--------------|---|----------|---------------|-------------|---|
| O1 | Programme | The programme of works fails to deliver on its stated objectives. | Severe | Very Unlikely | Medium | <p>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 LCAR Programme have a clear relevance to its objectives. Otherwise, the Programme may ultimately be ineffective at achieving the goals for which it was intended.</p> <p>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. TII 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 demonstrate the congruence of individual project with the overall Programme.</p> |
| O2 | Change Risks | Risk of changes to the Programme's scope or activities. | Major | Possible | Medium-High | <p>As the LCAR 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.</p> <p>Although TII has already carried out a detailed project identification and prioritisation process to inform this business case, the nature of maintenance and renewal work means that this risk remains a possibility. However, the implementation of individual projects will be in accordance with TII project management guidelines. It will also be required to demonstrate the need for each project and its congruence with the overall programme, so to TII to avoid scope creep and to ensure that all works are in line with the programme's objectives.</p> |
| O3 | Cost | Works exceed their allocated cost, leading to funding shortfalls for other activities in the Programme. | Moderate | Very Likely | Medium-High | <p>As part of the project prioritisation process, the TII has developed preliminary cost estimates for the works that are anticipated based on manufacturers' prices and the cost of similar work 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.</p> <p>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.</p> |

| | Risk Type | Description of risk | Impact | Likelihood | Risk Rating | Risk Assessment and Management |
|-----------|------------|---|----------|---------------|-------------|---|
| 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 LCAR 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. The Operators contract for the Luas clearly enunciates the roles and responsibilities of different stakeholders, including KPIs against which performance can be evaluated. |
| O5 | Capacity | TII or its contractors lack the capacity to deliver the necessary activities. | Moderate | Very Unlikely | Low-Medium | The procurement process will attempt to filter out those who have neither the expertise nor the scale to deliver on a contract via quality criteria such that where non-incumbents are successful, there is appropriate assurance regarding their ability to perform the Contract requirements. |
| O6 | Resilience | Failure to adequately identify threats and opportunities. | Major | 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 six years, as well as the measures required to ensure the continued safe and efficient operation of the Luas. This will be continually updated during the Programme's implementation 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 Programme period.

Two scenarios will be assessed as part of this sensitivity analysis:

- The impact of changes in cost and revenue.
- The impact of changes in the spending profile over the programme period.

8.2.1 Changes in cost and revenue

Tables 8.3 to 8.5 show the impact of changes in the programme cost on the financial appraisal outputs, based on incremental changes (+/- 20 percentage points) to the renewal costs. The impact of a change in cost is measured for:

- Total Funding Requirements (nominal net cash flow) (Table 8-3).
- the net Exchequer Cash Flow (Table 8-4).
- the Economic Net Present Value (Table 8-5).

The sensitivity tests are.

Table 8-3: Sensitivity Analysis – Total Funding Requirements for the period 2021 to 2026

| | +20% | +10% | +0% | -10% | -20% |
|-------|---------|---------|----------------|---------|---------|
| Costs | -€66.4m | -€60.8m | -€55.3m | -€49.8m | -€44.2m |

Table 8-4: Sensitivity Analysis - Exchequer Cash Flow for the period 2021 to 2026

| | +20% | +10% | +0% | -10% | -20% |
|-------|----------|-------|----------------|---------|-------|
| Costs | -€55.4.m | -€48m | -€43.7m | -€39.3m | -€40m |

Table 8-5: Sensitivity Analysis - Economic Net Present Value for the period 2021 to 2026

| | +20% | +10% | +0% | -10% | -20% |
|-------|----------|---------|----------------|---------|-------|
| Costs | -€82.6.m | -€75.7m | -€68.8m | -€61.7m | -€55m |

Finally, Table 8-6 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 €44.2 million and €66.4 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 | €55.3m | -€43.7m | -€68.8m |
| Best Case | €44.2m | -€40m | -€55m |
| Worst Case | €66.4m | -€55.4m | -€82.6m |

9. Procurement

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

9.1 Form of Contract

The Luas network is currently operated by a private Operator under contract to TII. This contract covers the day-to-day activities required to keep this asset available and fully operational. While TII assume most of the general commercial and financial risks associated with the operation of Luas, the operational and engineering risks are borne by the Operator. The contract defines several Key Performance Indicators (KPI) against which the Operator's performance is evaluated, such as the time that the Luas is available for use or the frequency of corrective maintenance, and failure to meet these KPI by the Operator can result in financial penalties and a reduction in their payment.

The Luas O&M contract was awarded to Transdev in 2019 following a competitive tender process, for a period of six years.

LCAR projects to be delivered directly by TII via contracted service providers will be procured in accordance with public procurement guidelines.

9.2 Procurement Strategy

Some of the activities contained in the LCAR programme have a predetermined procurement strategy, in that they have been specifically included in the Luas O&M contract, such as the tram overhauls. For the majority of the activities TII will assess each project individually to determine its procurement requirements with proposed course of action contained in the project execution plan for each activity / group of activities. Main options identified are as follows

1. Use existing single supplier framework
2. Establish specialist framework for certain works (e.g. OHLE or track replacement)
3. Open tender
4. Seek quotation from operator to undertake works

Firstly, given the importance of the Luas, it is essential that both the client and operator have the specialist knowledge and experience required to operate, maintain and manage these assets. TII's tendering and selection process is designed to ensure that the successful tenderers have the financial, technical, and operational capacity to deliver the relevant services, and it has allowed TII to leverage both domestic and international expertise and best-practice in operating and maintaining its most critical assets.

Some of the scopes of the works to be carried out in the LCAR Programme will require specialist services, such as the replacement of overhead powerlines. Carrying out specific procurements for these activities will allow each contractor to focus on the specifics of the individual elements of the programme within their scope of supply. This approach will enable contractors to identify innovative solutions and provide services in a more focused and efficient manner.

In some instances, given the nature of the asset, and/or existing contractual arrangements such as service level type contracts between the operator and individual companies, it may be more efficient to commission the operator to carry out the renewal works in question, and the O&M contract makes provision for such actions.

For detailed information on which procurement option will apply to each asset group, please refer to Appendix A.

10. Governance, Monitoring and Evaluation

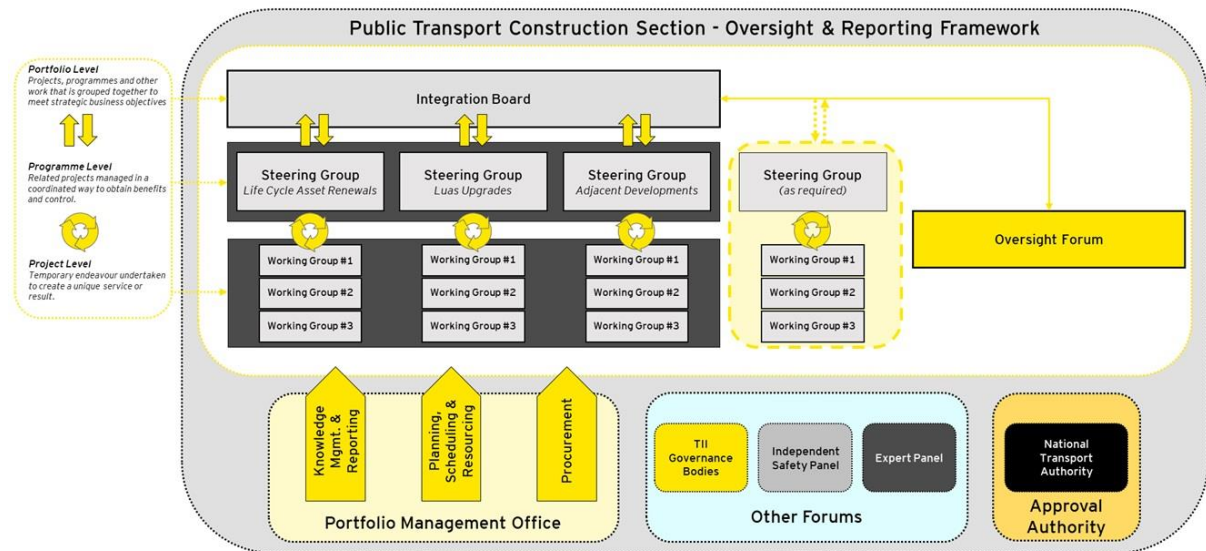
To ensure that an intervention achieves its objectives and delivers value for money for the Exchequer, the PSC requires that both capital projects and programmes have a robust process to monitor progress and evaluate efficacy. This is especially important for programmes where expenditure and delivery is 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 LCAR Programme between 2021 and 2026, 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 LCAR Governance Structure



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

- Portfolio Level, responsible for oversight of the LCAR Programme and ensuring that it will meet its strategic objectives.
- Programme Level, responsible for related projects on the LCAR 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 directions 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 LCAR Programme is based on a series of renewal works for the Luas network. 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 LCAR 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 LCAR 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 LCAR 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 6 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 the table below.

Table 10-1 Indicative reporting schedule

| Reporting Deliverable | Delivery date |
|---------------------------------------|--------------------------------|
| Monthly Progress / Commercial Reports | Monthly 2021-2026 |
| 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.⁵ 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 3.5, 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 categories of KPIs of relevance to the Programme KPIs: '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. These KPIs are

⁵ <https://www.nationaltransport.ie/wp-content/uploads/2020/12/NTA-Project-Approval-Guidelines-Document.pdf>

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.

Programme KPIs for the LCAR Programme are summarised in the table below.

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 LCAR 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 LCAR. The interventions included in LCAR 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 LCAR Programme. The Luas network is a crucial national asset which delivers many benefits such as enhanced regional accessibility and sustainable travel. Luas plays an important role in Dublin City Centre, particularly along the commuter corridors where it facilitates public transport services and removes cars from the city roads. There is also a strong policy basis for investing in the maintenance and renewal 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.

As a result, the objectives of this Programme are mainly to ensure that Luas continues to function safely and effectively. Noting that TII has already developed a robust needs prioritisation process to identify and prioritise necessary renewal works; the business case has not focused on developing multiple 'options' or alternative programmes; but on detailing and evaluating 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 LCAR Programme. The overall cost of the Programme is significant at €54.6 million over the six years. While this corresponds to an average annual spend of €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 -€68.8 million, while the real net impact on the Exchequer would be -€43.7 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 and the Operator'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 operations and maintenance programme will require a degree of flexibility to allow the operator to 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 Programme is delivered in line with 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. It is vital that TII follow these processes and continue to critically monitor and evaluate the progress of the Programme over the decade.

The business case also examined potential procurement strategies and concluded that the optimal arrangement varies depending on the nature of the intervention and the asset group and is considered on a case-by-case basis. For some LCAR interventions, TII can appoint specialist contractors (via competitive tendering processes) to enter into separate contracts for the supply of discrete elements of the programme. Other LCAR interventions can be performed by the Luas Operator via contract variation.

Appendix A Asset Management Plan & Procurement Option

| LcAR | Schedule 2021-26 | | | | | | | | | | |
|----------------|-----------------------------------|-----------------------------------|--|---|---|------|------|------|------|---|--|
| Asset Group ID | Description | Asset Sub Group | Procurement Route | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | | |
| BR | Bridges and structures | Bridges/structures | The contents of this column have been redacted | | | x | | | | | |
| BL | Buildings | Electrical Substations | | | | x | | | | | |
| | | Tech Room / Kiosks | | | Currently no planned works within this period | | | | | | |
| CN | Control and Communication Systems | Radio | | | x | | | | | | |
| | | PID | | | | x | | | | | |
| | | EHP | | | | | x | | | | |
| | | CCTV & PA | | | | | x | | | | |
| | | Systems Server Renewal/Resilience | | | x | x | x | | | | |
| | | Signalling | | | Currently no planned works within this period | | | | | | |
| | | AVLS - Cabinet | | | | | x | x | | | |
| OF | Off track | Fencing/walls | | | | x | | | | | |
| OH | OHLE | Overhead Line Replacement | | | x | x | x | x | x | x | |
| PR | Park & Ride | Park & Ride | | | Currently no planned works within this period | | | | | | |
| PW | Power | Electrical Substations | | | | x | x | | x | x | |
| ST | Stops | Furniture | | | Currently no planned works within this period | | | | | | |
| | | Lighting | | | | x | | | | | |
| | | Lifts/escalators | | | | x | | | | | |
| AF | AFC | TVMs/ TXPs | | | Currently no planned works within this period | | | | | | |
| | | P&R Payment System | | | Currently no planned works within this period | | | | | | |
| | | PCI-DSS-P2E | | | Currently no planned works within this period | | | | | | |
| | | Keypad p2p encryption | | | Currently no planned works within this period | | | | | | |
| | | Luas taxsaver website refresh | | | Currently no planned works within this period | | | | | | |
| | | TVM Screens | | | Currently no planned works within this period | | | | | | |
| | | Leap card payments at TVMs | | | Currently no planned works within this period | | | | | | |
| | | AFC Server upgrade | | | x | x | | | | | |
| | | New validators | | | x | | | | | | |
| TL | Tools (IMC Special) | RRVs | | | | x | | | | | |
| | | Vehicle storage shed | | | Currently no planned works within this period | | | | | | |
| | | Offsite spares storage | | | x | | | | | | |
| TR | Track | Rail replacement | | | x | x | x | x | x | x | |
| | | Rail - other | | | Currently no planned works within this period | | | | | | |
| | | Rail S&C | | | Currently no planned works within this period | | | | | | |
| | | Edilon works | | | | | | | | | |
| | | Civils | | Currently no planned works within this period | | | | | | | |
| DP | Depot fixed equipment | Wash plant | | | x | | | | x | | |
| | | Wheel lathe | | x | x | | | | | | |
| | | Lifting Jacks | | x | x | | | | | | |
| | | Sand plant | | Currently no planned works within this period | | | | | | | |
| RS | Rolling stock | 300K Overhauls | | | | x | | x | | | |
| | | 600k Overhauls | | x | | | | | | | |
| | | 900K Overhauls | | | | x | x | | x | | |
| | | 1.2M Overhauls | | | x | x | | | | | |

