

TII National Roads and Greenways Conference 2022



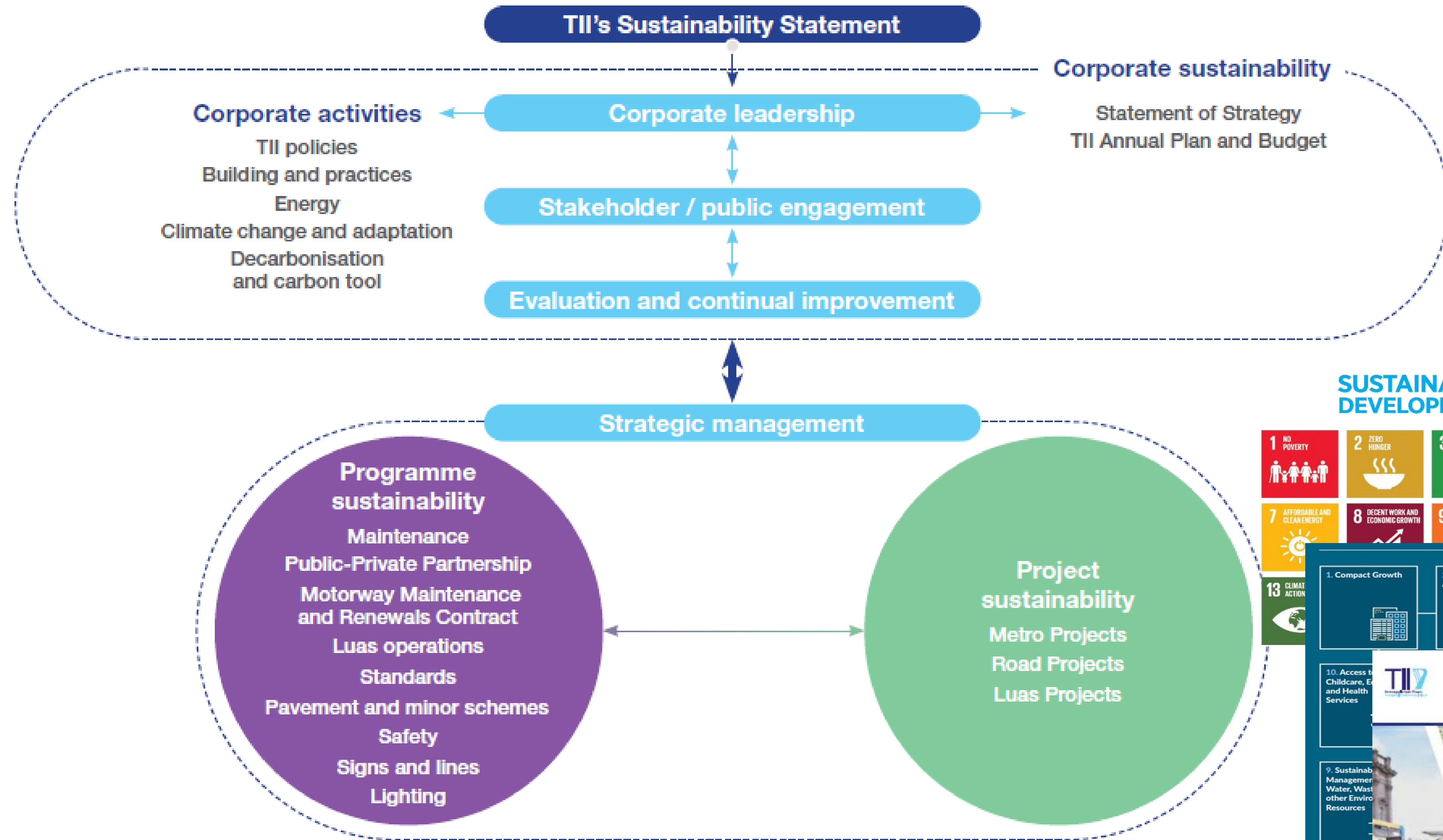

Sligo Radisson Hotel 22nd and 23rd September 2022

TII approach for Climate and Carbon Assessment for Major Projects

Dr Vincent O'Malley,
Head of Environmental Policy & Compliance, TII



TII's Sustainability Implementation Plan

SUSTAINABLE DEVELOPMENT GOALS

13 CLIMATE ACTION

1. Compact Growth
2. Enhanced Regional Accessibility
3. Strengthened Rural Economies and Communities
4. Sustainable Mobility

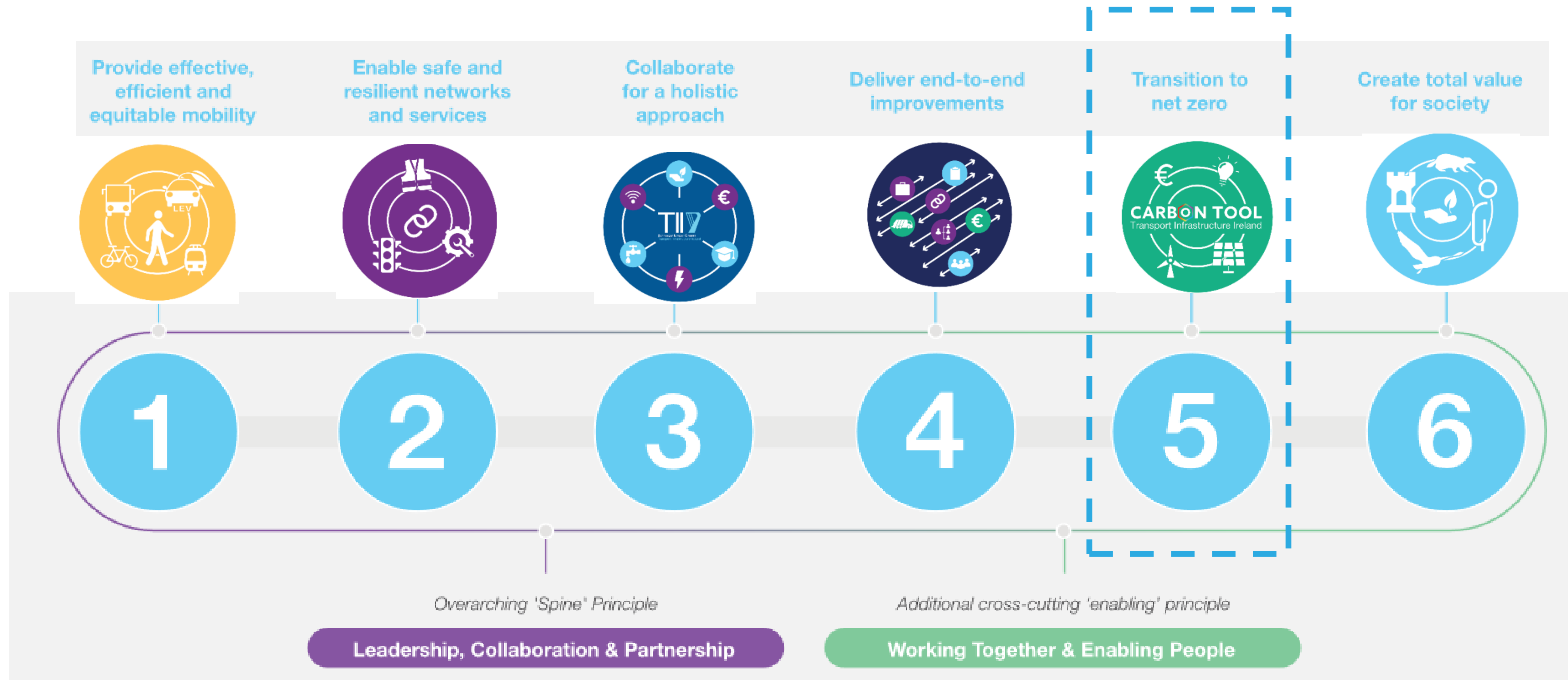
TII Statement of Strategy 2021 to 2025

9. Sustainable Management of Water, Wastewater and other Environmental Resources

10. Access to Childcare, Education and Health Services

July 2021

TII's Sustainability Implementation Plan: Principles of sustainability



Transition to Net Zero

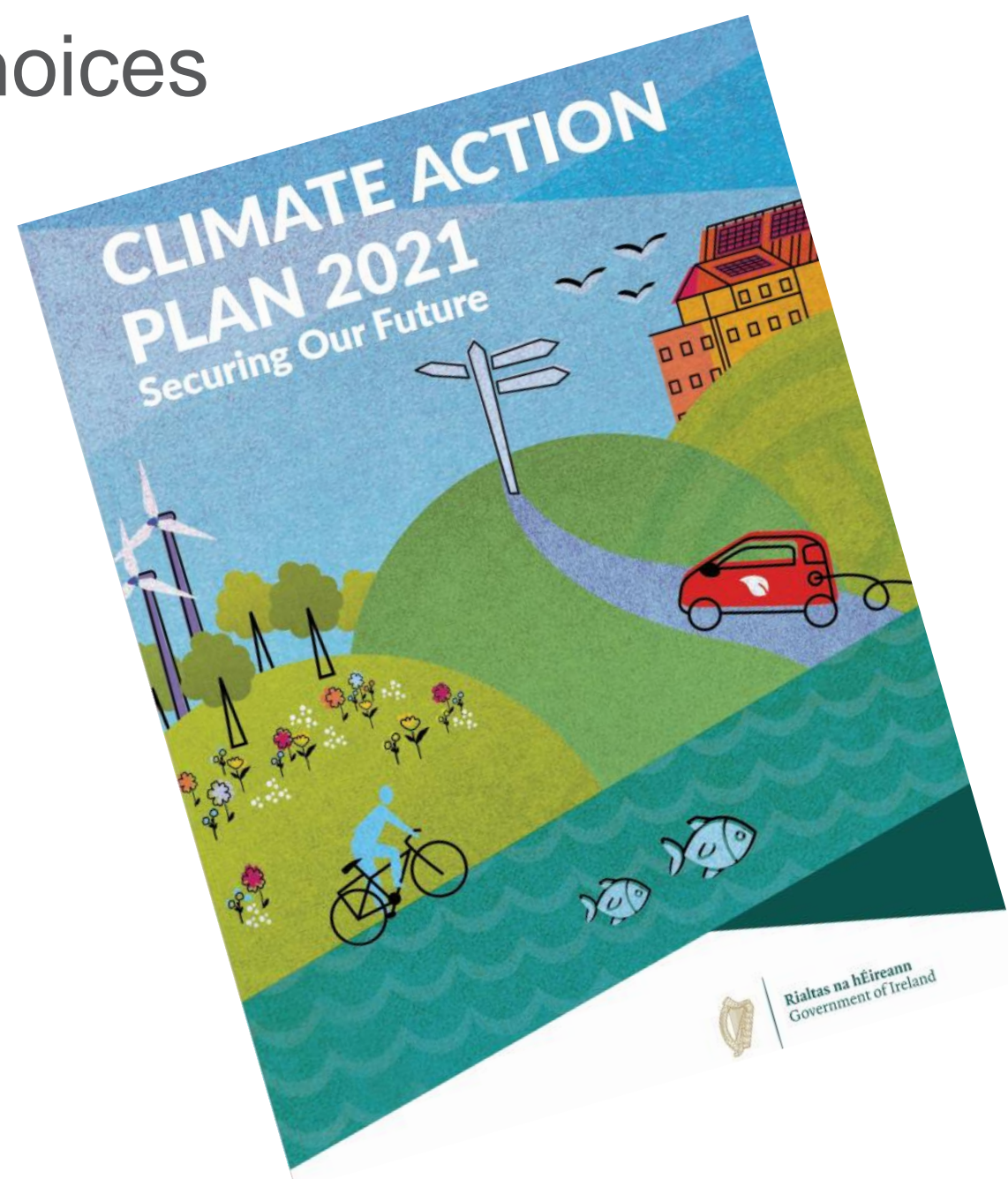
Transition to net zero



CARBON TOOL
Transport Infrastructure Ireland

5

Reduce the carbon impact of construction, operation and use of the transport network through responsible use of resources, reuse and repurposing, as well as driving the net-zero transition, while enabling customers to make more sustainable choices



Net Zero Target

SIP Action 5.2
TII to define and achieve a science-based, net zero target.

CLIMATE ADAPTATION

SIP Action 2.4
TII to review and update the 2017 'Strategy for Adapting to Climate Change on Ireland's Light Rail and National Road Network' document and continue to take opportunities to support improved monitoring of, and response to, weather-related impacts on the networks.

TII Climate Action Roadmap



Breakdown of Carbon Emissions

Road User Emissions (95%)



Corporate Emissions (1%)



Construction (embodied) and Lifetime Maintenance Emissions (4%)

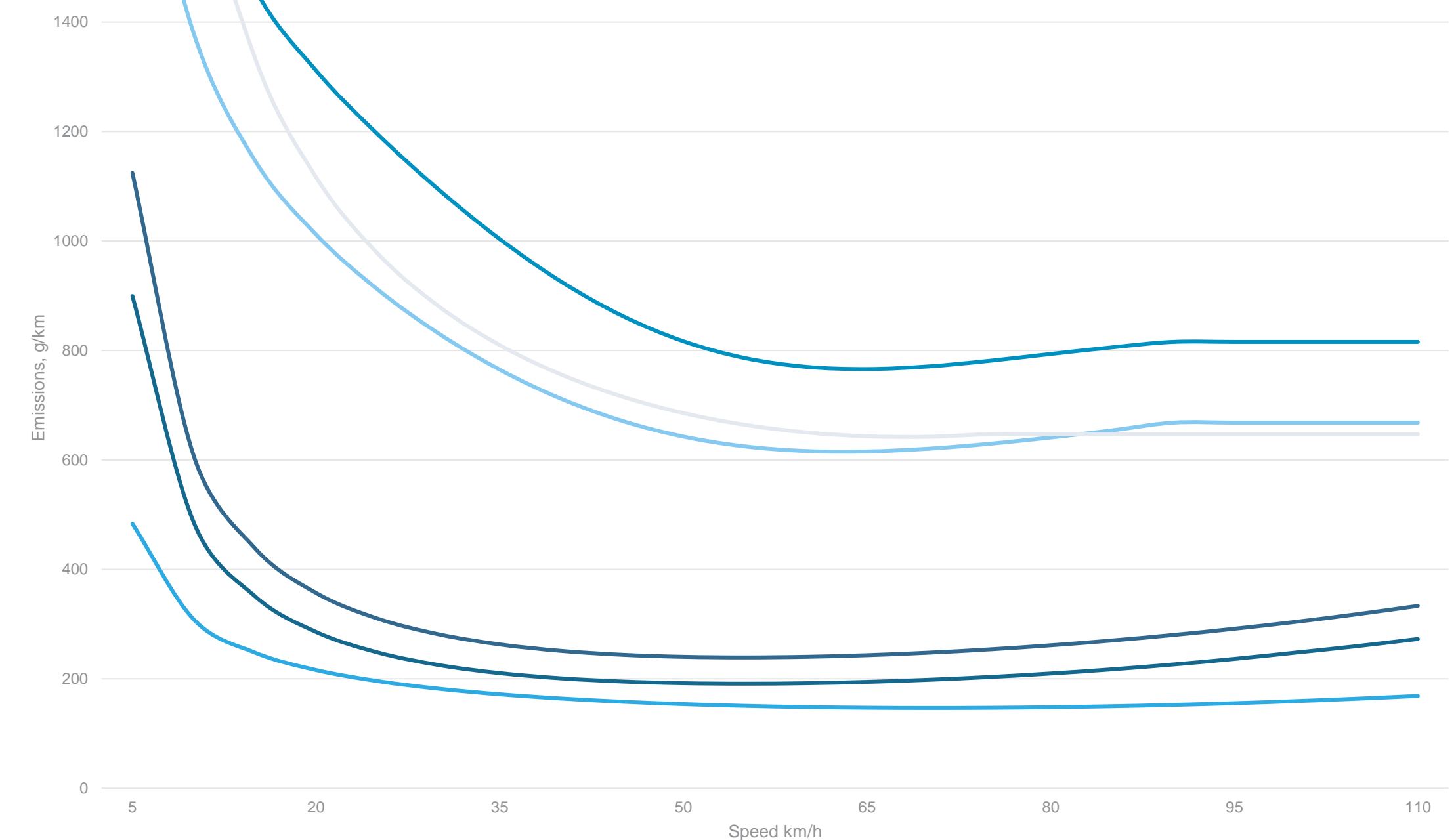


- TII Road Emissions Model
- Air Quality Guidance for National Roads, Light Rail, and Rural Cycleways.
- Air Quality Assessment Standard for Proposed National Roads

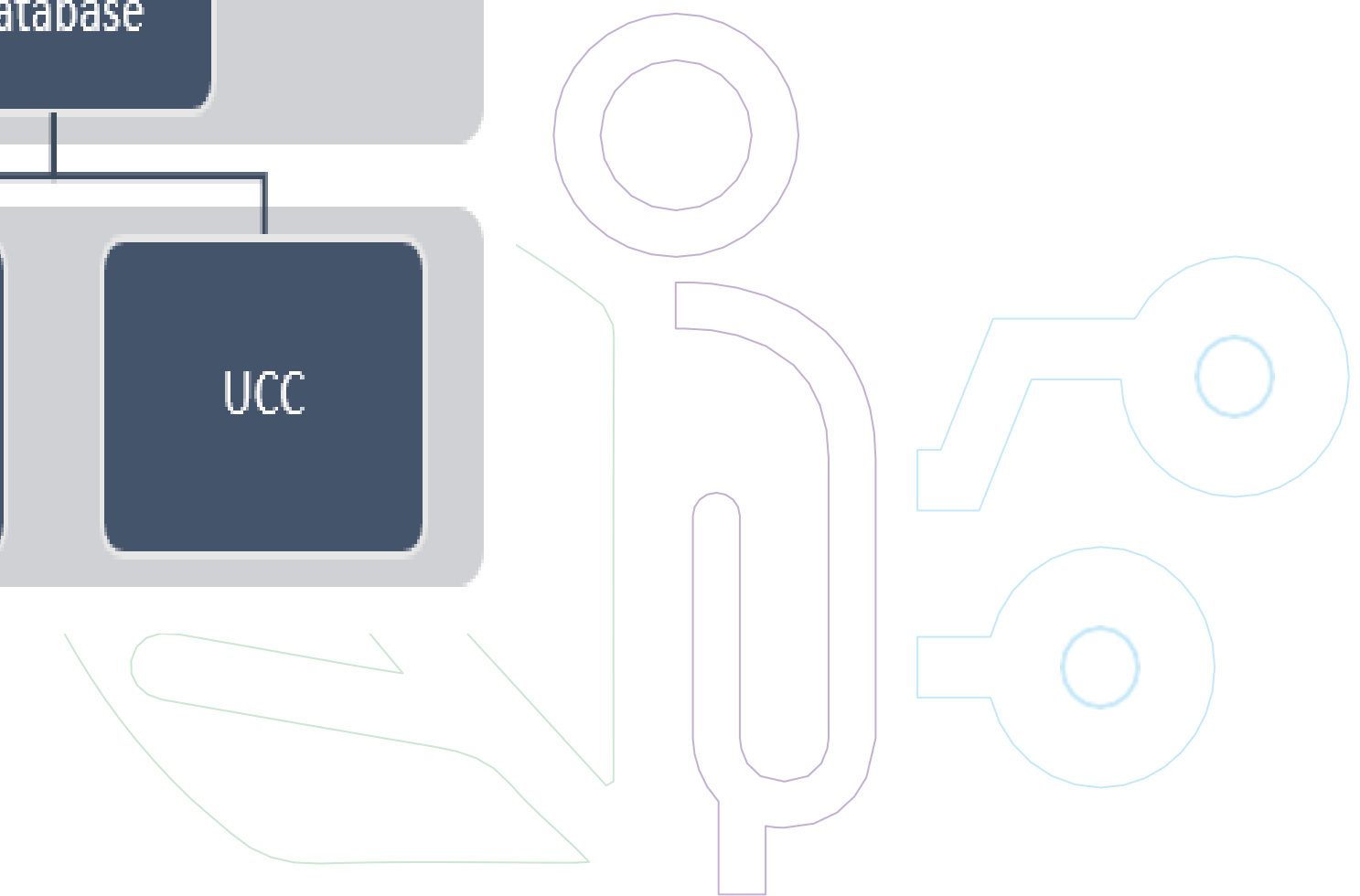
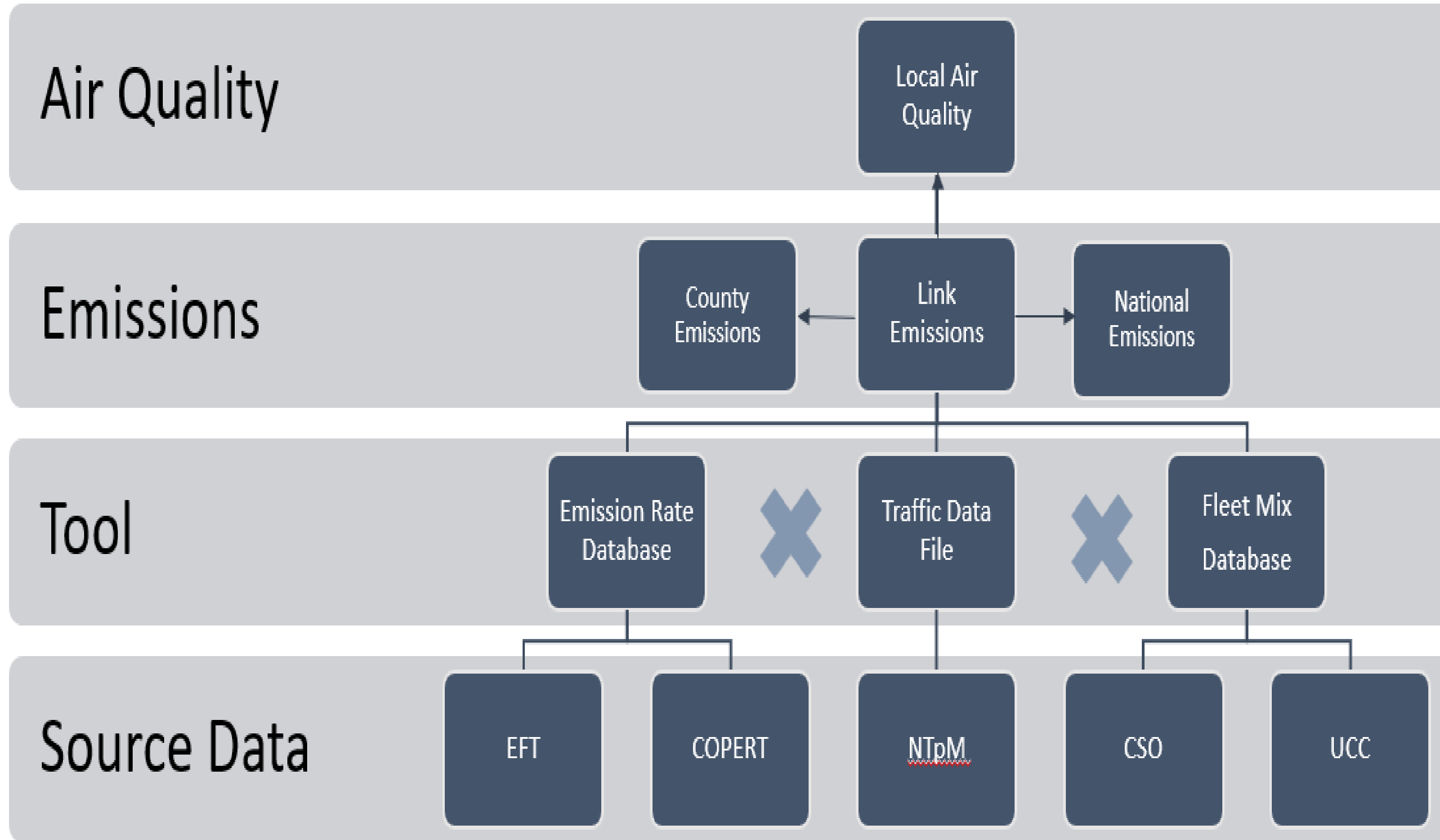
- TII Carbon Assessment Tool for Road and Light Rail Projects and Guidance Document
- Climate Guidance for National Roads, Light Rail, and Rural Cycleways.
- Climate Assessment Standard for Proposed National Roads
- Carbon Benchmarking
- Earthworks Assessment Tool

- The REM calculates the GHG and non GHG emissions (e.g. Nitrogen Dioxide and particulates) generated from vehicles using the national road network.
- Excellent for assessing the impact of interventions or policies (e.g., Speed Limit Reductions) at a local regional or national scale on such emissions
- Project planning during the different stages of the EIA process
- A link based tool which is crucial for understanding emission variations with speed
- Annual reporting of emissions (e.g., TII Indicator Report)

Relationship between CO₂e emissions and speed, by vehicle type (2018 fleet)



TII Road Emissions Model



TII AECOM

- Introduction
- Input Parameters**
- Outputs
- Downloads
 - Guides and Templates
 - Outputs
- Quick User Guide

Run

Inputs Home

Standard Input Options

These are the basic parameters required to run the model.

Enter Project Name

Select Emission Year

Select Fleet Mix

Select Pollutants

Navigate to Traffic Data Input file

[Browse...](#) 2030 VDM Reference Scenario_inputs.csv

Upload complete

[Clear Traffic File](#) [Preview Traffic File](#)

Include catalyst fails

Advanced Input Options

Advanced model parameters can be configured in the collapsible boxes below.

Fleet Database Selection

Select fleet database to use in calculations. More information on these fleet databases are provided in the user guide.

Select Fleet Database

Business as Usual

Intermediate Case

Climate Action Plan

Origin Data Selection

Include the origin data in run

[View Origin Data](#)

Euro Class Selection

Receptor File Input

Bus Flow Input

REM Advanced Features

Future Fleet projections

Three options available for future fleet projections:

- Business As Usual (BaU);
- Intermediate Case; and
- Climate Action Plan (CAP)

Origin data selection

- The user can incorporate origin data to adjust the fleet profile within counties based on a predefined origin breakdown. This is based on the origin data in the TII National Transport Model (NTpM).

Euro Class Selection

- By changing Euro Class the user can adjust and exclude specific Euro classes for tests such as Clean Air Zones.

Bus Flows and Fleet

- The ability to add bus fleet is also an advanced option

Euro Class Selection

The input boxes below can be used to select euro classes to remove from the fleet for the calculation. More information on these options are provided in the user guide. Note that this is optional, leaving the inputs blank will include all euro classes in the calculation.

Select LDV Petrol Euro Classes to Remove

Select LDV Diesel Euro Classes to Remove

Select HDV Euro Classes to Remove

Bus Flow Input

Input bus traffic input file and euro splits data to include pollutant concentrations from buses within the calculation. Note that this is optional, the bus traffic input file can be downloaded from the downloads menu.

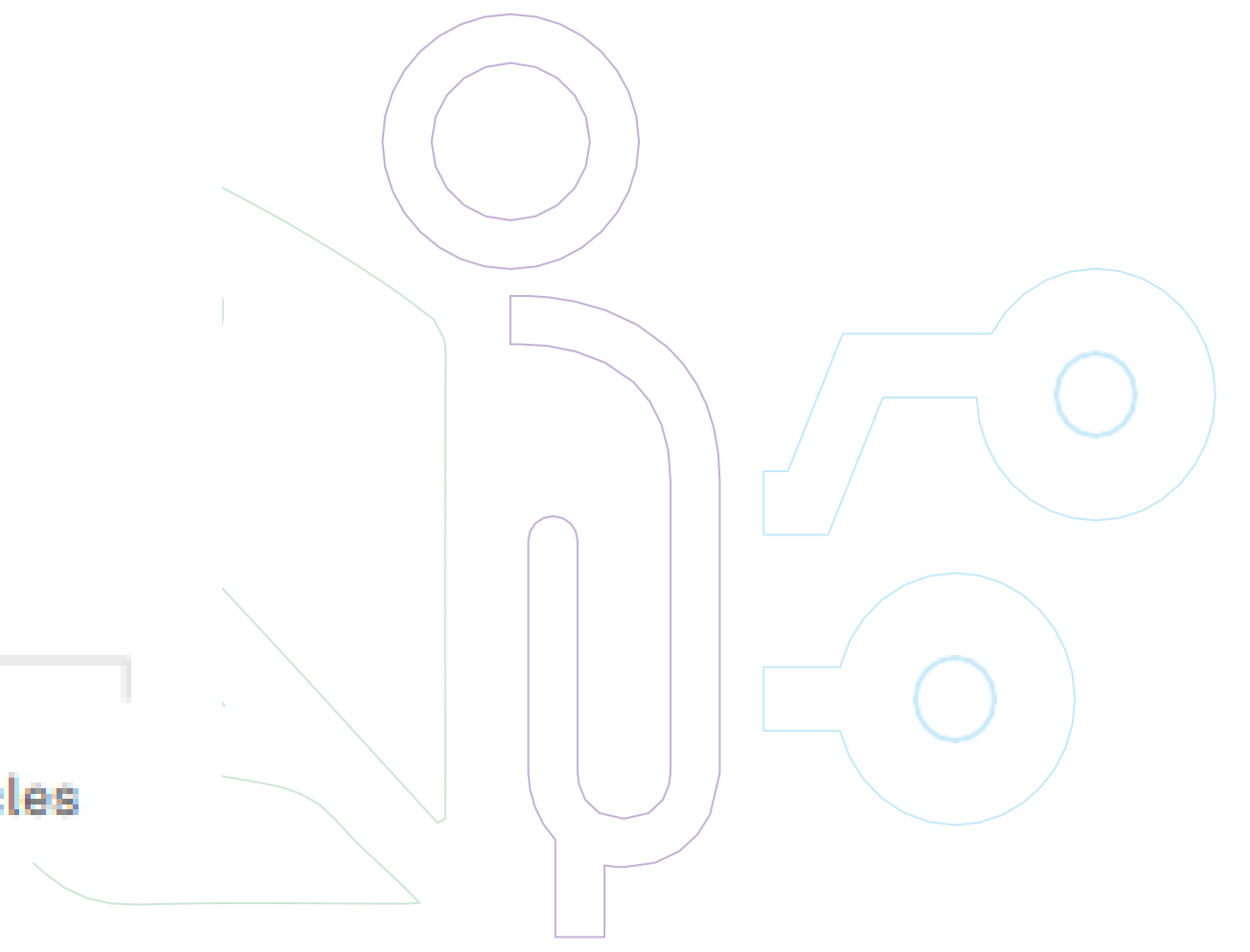
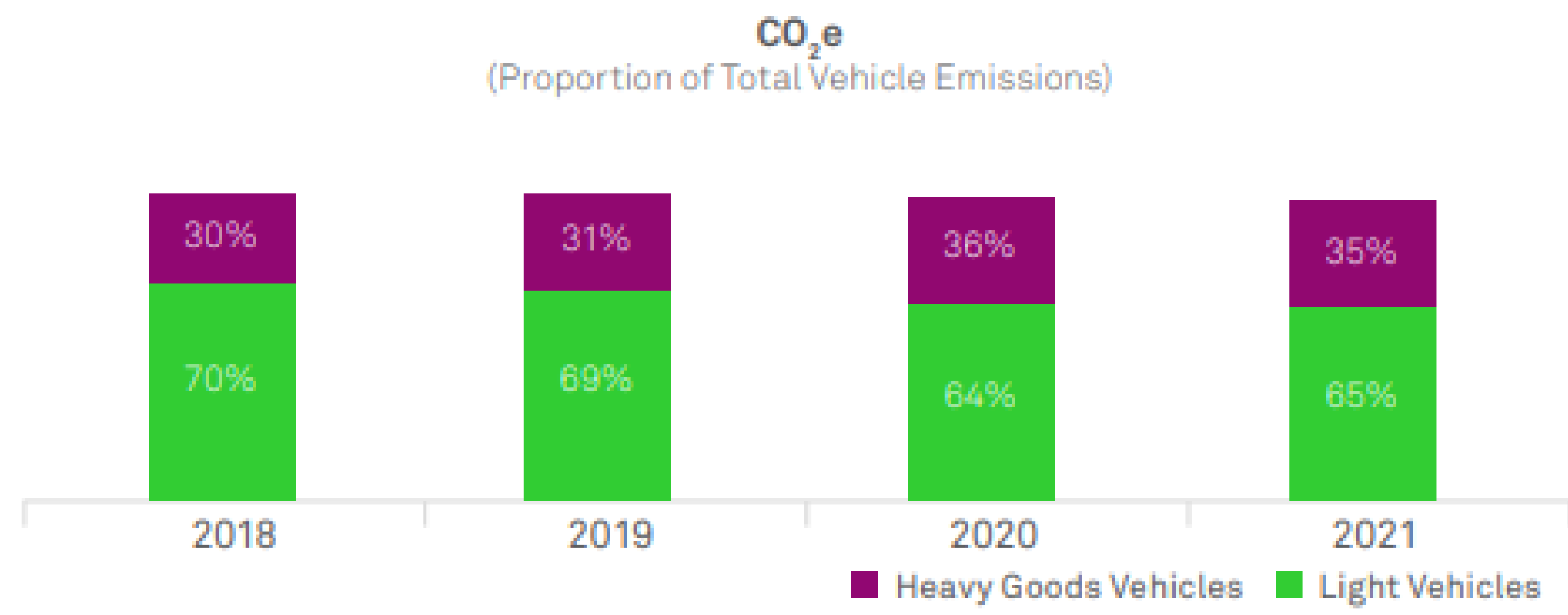
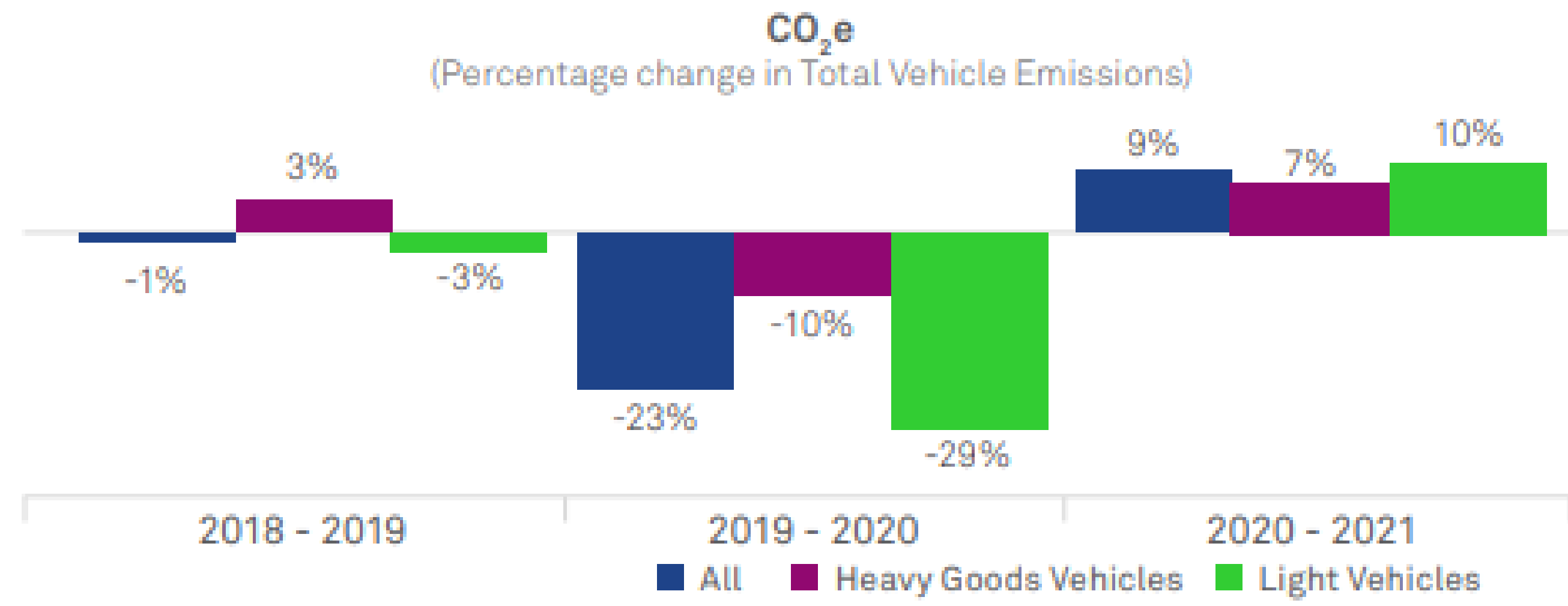
Include bus emissions in run

Navigate to bus traffic input file

No file selected

Euro Category	NO _x Fraction	PM ₁₀ / CO ₂ Fraction
Pre-Euro	0	0
Euro I	0	0
Euro II	0	0
Euro III	0	0
Euro IV	0	0
Euro V EGR	0	0
Euro V SCR	0	0

TII Road Emissions Model Outputs



Air Quality Guidance and Standard

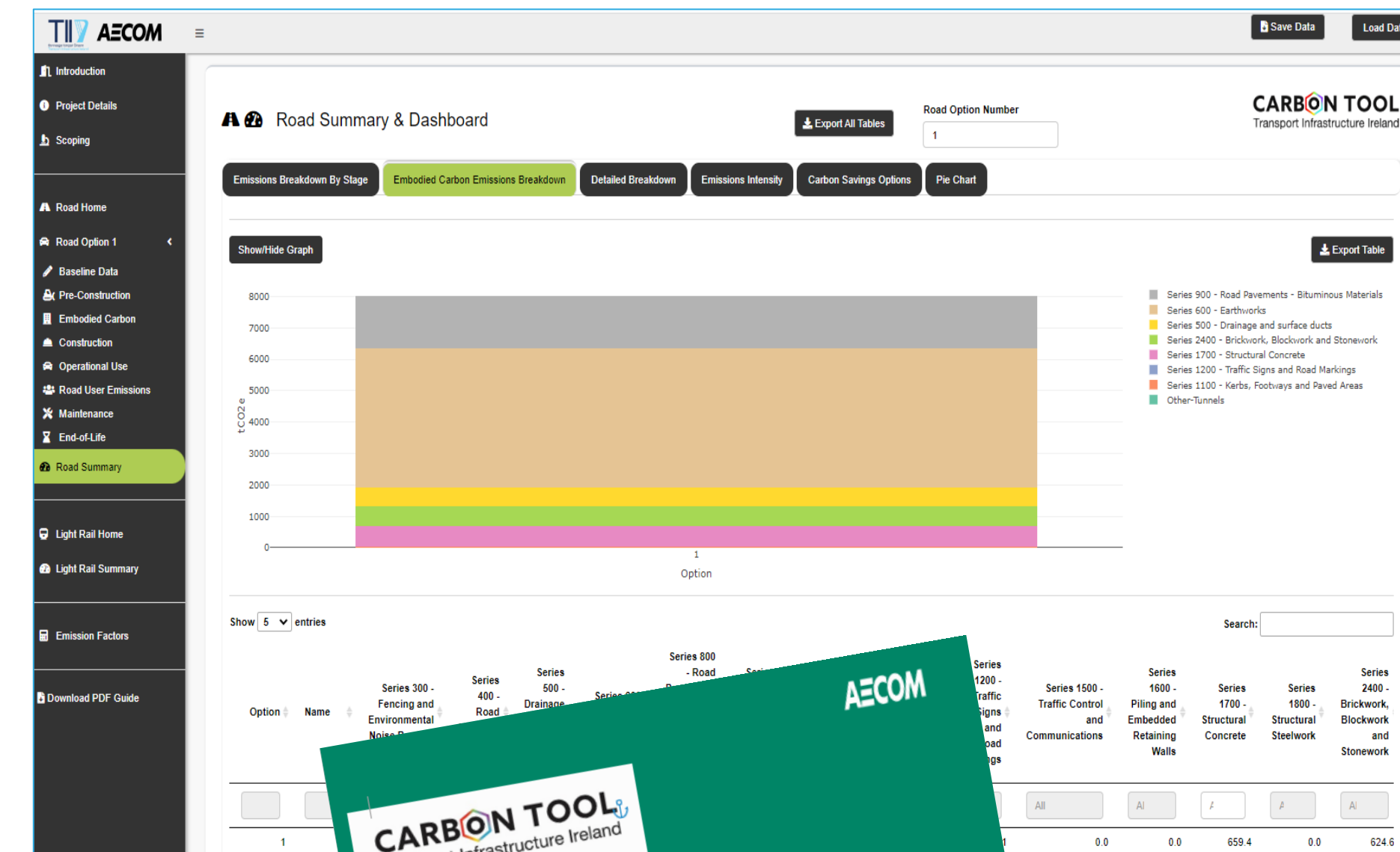


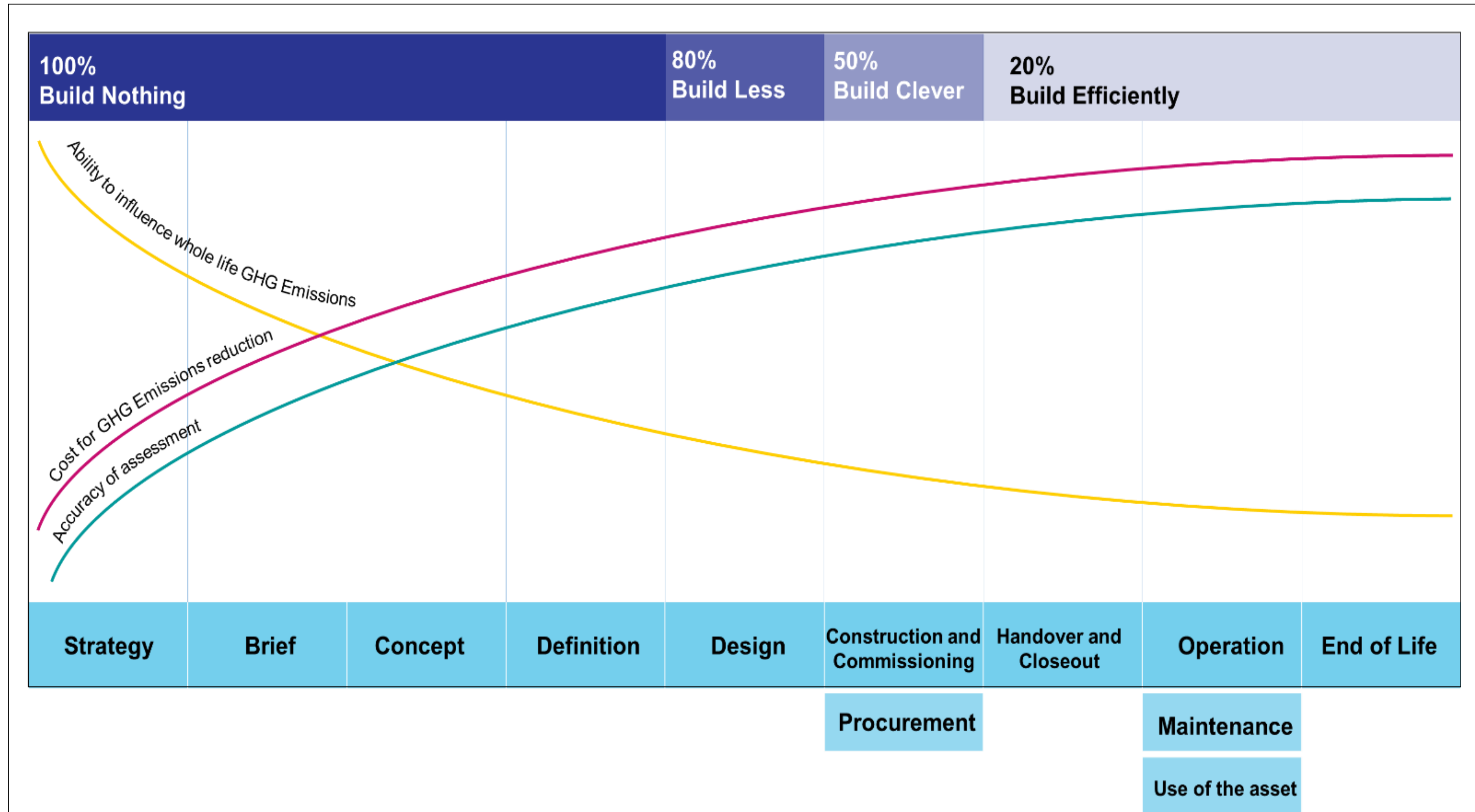
These documents outlines a methodology for undertaking an Air Quality Assessment that is consistent with relevant legislation and in line with TII's planning phases.

- Gives context on Ireland's air quality regulatory and policy framework
- Aligns with TII's Project Thresholds and Phases
- Provides guidance on how to score options for the Project Appraisal Guidelines
- Outlines the air quality assessment methodology:
 - ❖ Baseline Air Quality
 - ❖ Study Area
 - ❖ Index of Overall Change in Exposure
 - ❖ Local Air Quality Assessment for human health and sensitive designated habitats
 - ❖ Regional Assessment (TII REM Tool)
 - ❖ Construction Air Quality Assessment
 - ❖ Evaluation of Significance
 - ❖ Mitigation

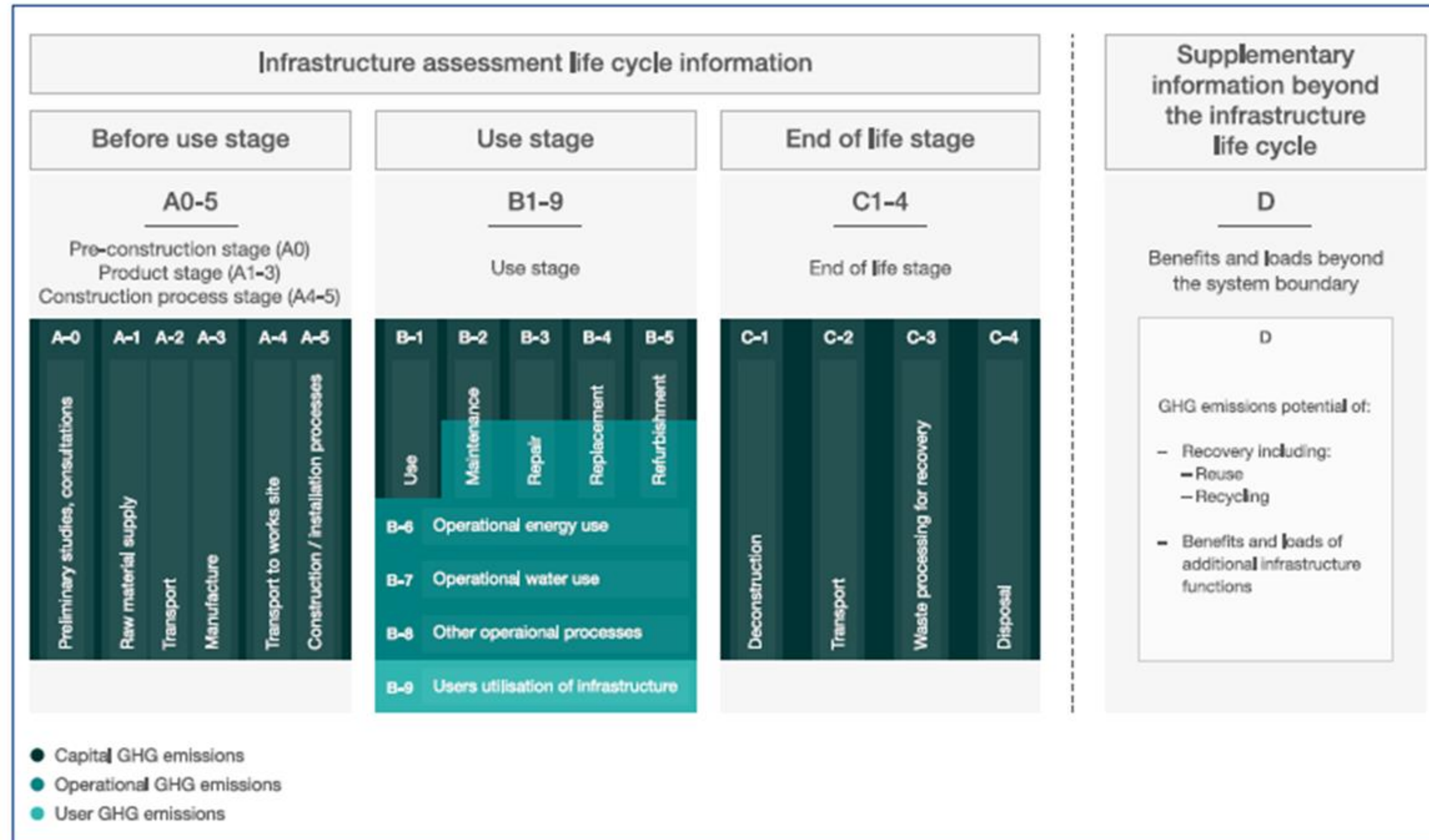


- Initially developed and launched in 2018 using Microsoft Excel and aligned to PAS 2080
- Assesses the embodied carbon associated with the construction and maintenance of road and light rail projects and facilitates the integration of carbon reduction measures into transport infrastructure planning, construction and operation.
- Evolved beyond excel and transitioned to a web-based application, with additional built-in functionality to allow for editing, tracking and benchmarking of project data.
- The Tool has Ireland specific calculations for assessing embodied and operational carbon for light rail and road infrastructure projects.
- Option to insert Environmental Product Declaration's into the Tool
- Aligned to TII's project Phases.
- Audience – primarily climate practitioners but it is also used by Design Team to show reductions in carbon between designs.





Graphic adapted from PAS2080 Carbon Management in Infrastructure (2016)

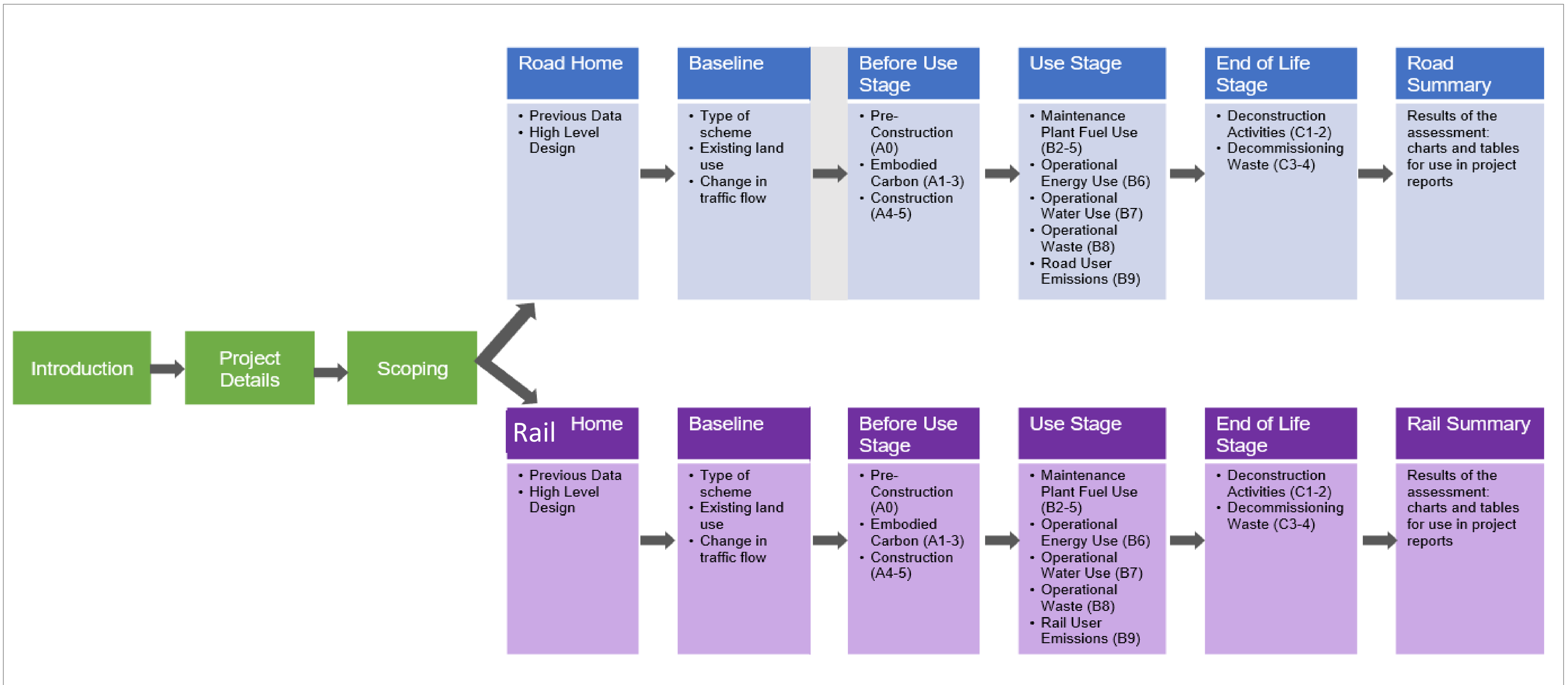


Graphic adapted from PAS2080 Carbon Management in Infrastructure (2016)

Carbon Data Availability

TII Project Phase – Road Projects	Data input pages within the Tool that should be completed for each Project Phase								
	Project Details	Scoping	Baseline Data	High Level Design	Pre-construction	Embodied Carbon	Construction	Use	End of Life
Phase 0: Programme Overview & Requirement Definition	Qualitative details available	No quantitative data likely to be available for assessment of GHG emissions.							
Phase 1: Project Concept & Feasibility	Qualitative details available	No data likely to be available at this project phase and no statutory requirement for analysis.							
Phase 2: Option Selection	Qualitative and estimated quantitative details available	Limited quantitative data might be available e.g. a partial Bill of Quantities, road user emissions (road projects), traction energy demand (light rail projects).							
Phase 3: Design & Environmental Evaluation	Quantitative data should be available for quantitative analysis and should be entered into the Tool for all areas that have been scoped into the EIA. Details of identified carbon savings opportunities should be completed.								
Phase 4: Statutory Processes	The assessments undertaken in previous phase will form the Climate Chapter of EIA Report for submission of the statutory consent documentation for the project as per the scoping report.								
Phase 5: Enabling & Procurement	Revised, updated and refined information should be entered into the Tool for all areas that have been scoped into the EIA. This should include all design changes. Details of identified carbon savings opportunities should be completed.								
Phase 6: Construction & Implementation	Actual and detailed data from the project should be entered into the Tool for all areas that were scoped into the EIA (this is to allow for changes during the project to be tracked according to the same project boundaries). Details of implemented carbon savings opportunities should be completed.								
Phase 7: Closeout & Review	Final data from the project should be entered into the Tool for all areas that were scoped into the EIA. Details of final carbon savings achieved should be completed within each project phase, where information is available								

Structure



Baseline data

- Scheme type and Existing land use

Pre construction

- Clearance and demolition activities, land use change and vegetation loss, water use during clearance and demolition

Embodied carbon

- Raw materials embodied carbon, transport

Construction

- Excavation, construction activities, water use, construction workers travel to site, construction waste

Operational use and Maintenance

- Energy, water, waste, landscaping and vegetation
- Embodied carbon
- Plant fuel life

Road user emissions

- Inputted from the REM Tool

End of Life

- Deconstruction activities
- Decommissioning waste

Pre-Construction Road Option 1

Toggle Guidance Notes

The Pre-Construction stage considers activities that will take place at the pre-construction stage of a project, specifically clearance and demolition works.

The data input tables require:

- Drop-down selection of clearance activities
- The area of land to be cleared (must be a positive value, in the units provided in the Units column of the table)
- The volume of water, in litres, to be used during clearance and demolition activities

When the land clearance type is unknown, the 'General Clearance - general site clearance' factor should be selected, which represents an average factor taking into account a combination of different Carbon savings opportunities (both proposed and implemented) should be entered in the tables provided for each activity detailed, as applicable.

Clearance and Demolition Activities | **Land Use Change and Vegetation Loss** | Water Use During Clearance and Demolition Activities | Carbon Saving Opportunities

Land Use Change and Vegetation Loss Emissions (tCO₂e): 6,050.00

Vegetation Type	Quantity	Unit	Carbon Sink tCO ₂ e (removed)	Comments
Peat bogs	15.00	ha	6,050.00	
Mixed Forest	0.00	ha	0.00	
Mixed Forest	0.00	ha	0.00	
Mixed Forest	0.00	ha	0.00	
Mixed Forest	0.00	ha	0.00	

At every stage there is an option to capture carbon saving opportunities

Climate Change Risk Assessment

- Asset/entire projects vulnerability Assessment
- Cumulative impacts with other projects

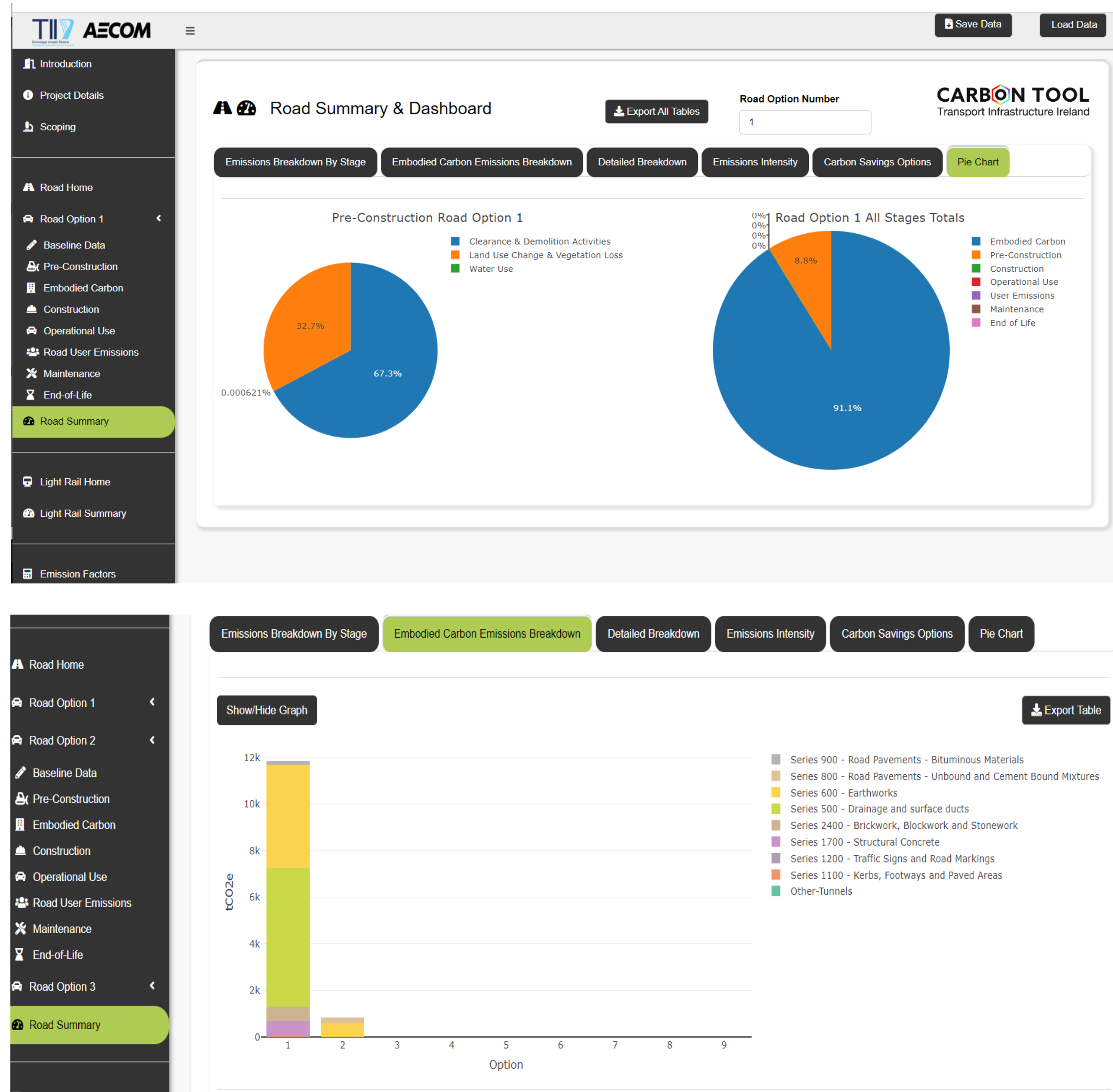
GHG Outputs

Roads/Light Rail Summary and Dashboard presents the output carbon footprint.

Emissions can be viewed via:

- Stage
- Embodied carbon
- Emissions intensity
- Carbon saving options etc.,

Visual breakdowns – pie and bar charts are available, and the data outputs can be exported via CSV file.



Climate Guidance and Standard



These documents provides guidance on the methodology, scope and processes underlying a climate assessment for National Roads, Light Rail, and Rural Cycleways projects.

- They build on existing best practice guidance for the transportation sector.
- describes the minimum requirement to establish a comprehensive and consistent description and understanding of the climate factors relevant to National Roads, Light Rail, and Rural Cycleways.
- CA process does not replace the requirement for, or supersede, any national, regional, county, or local-level climate assessments
- **The Standard Document sets out the methodology for Climate Assessment for proposed National Roads.**



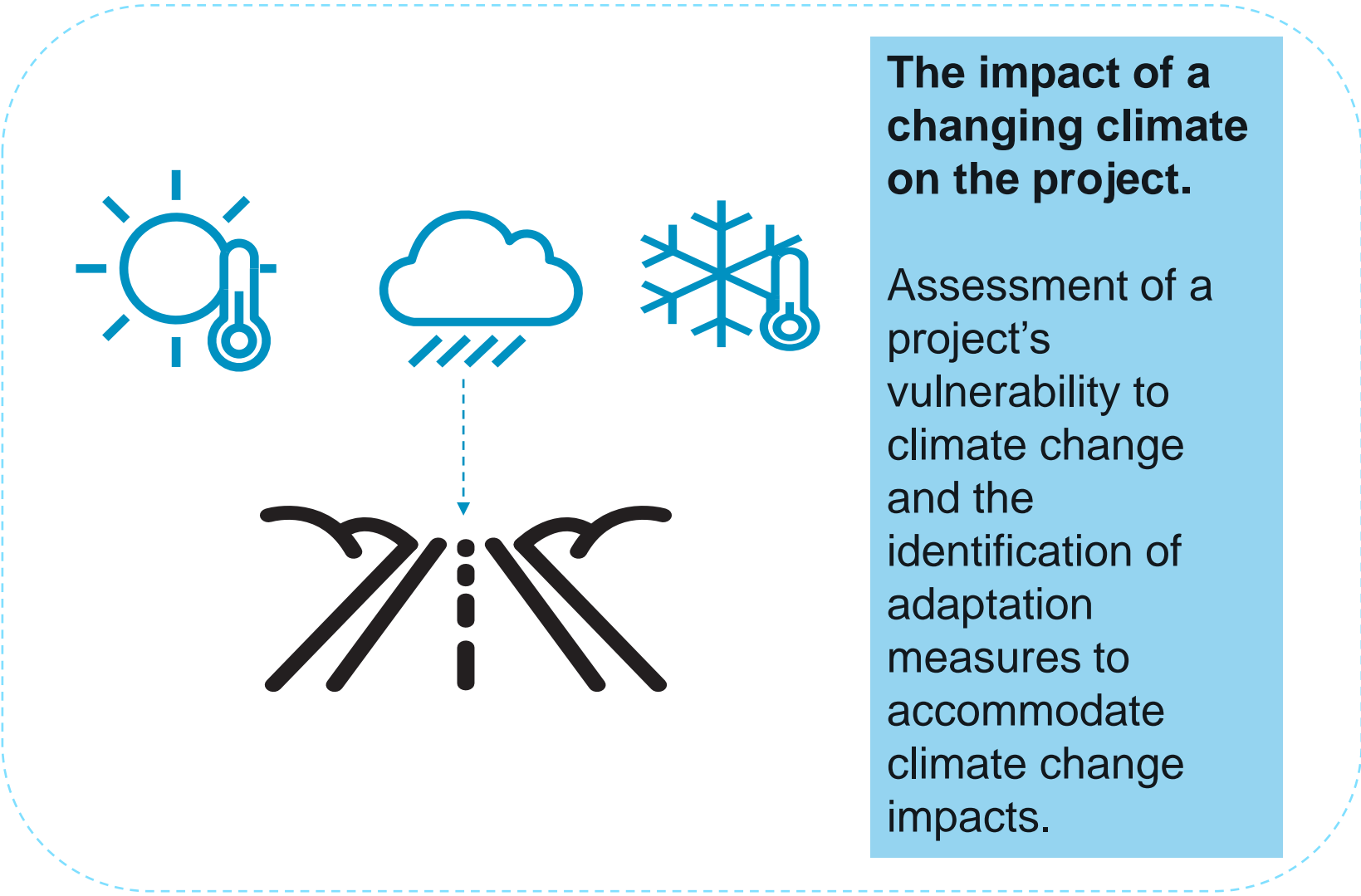
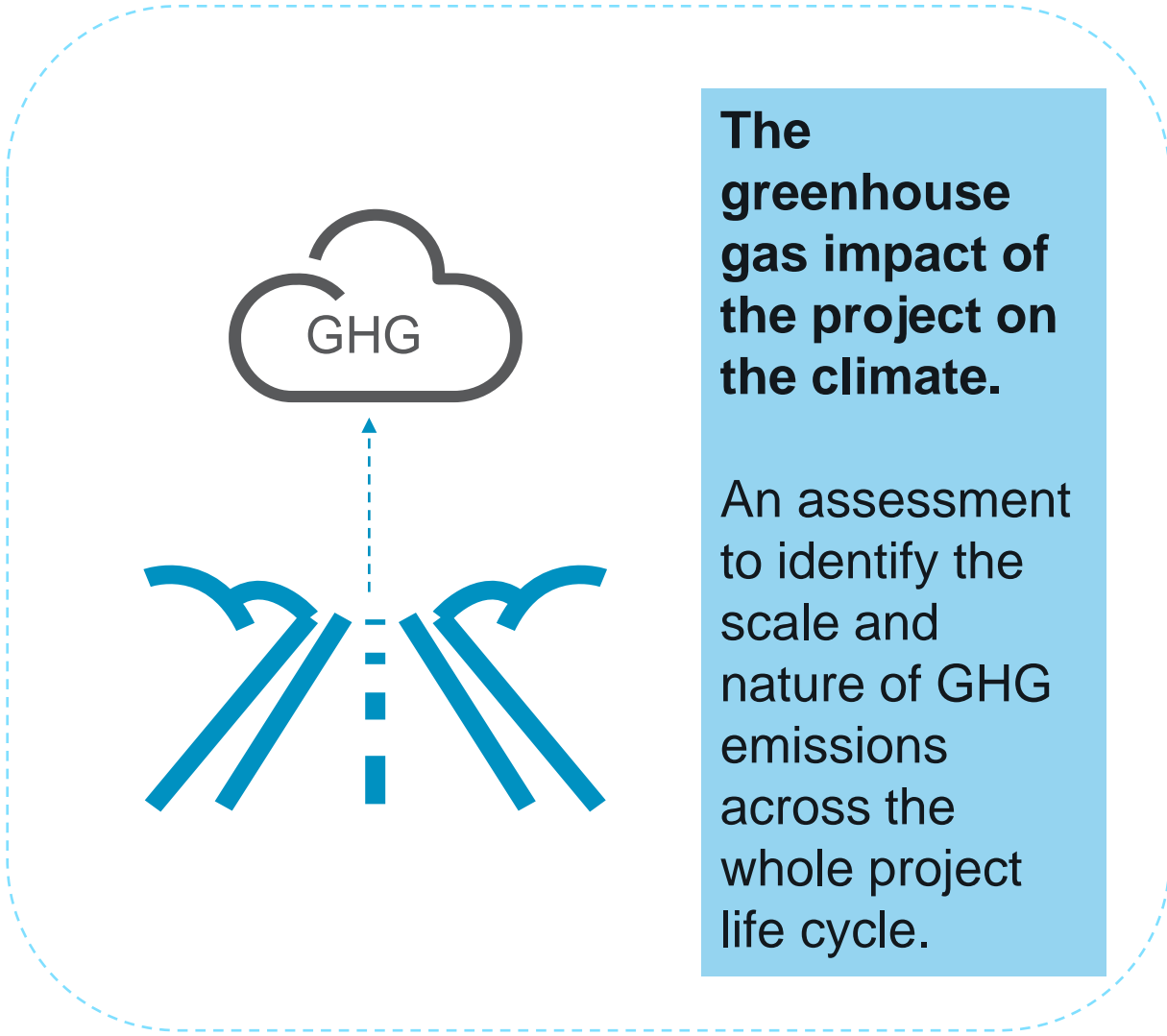
Climate Guidance and Standard



1. Greenhouse Gas Emissions Assessment

2. Climate Change Risk Assessment

National and TII Specific Policy
National Planning Framework
Climate Action Plan
TII Sustainability Implementation Plan



Informs
Option Selection and Statutory planning processes



Project Carbon Benchmarking



Aim:

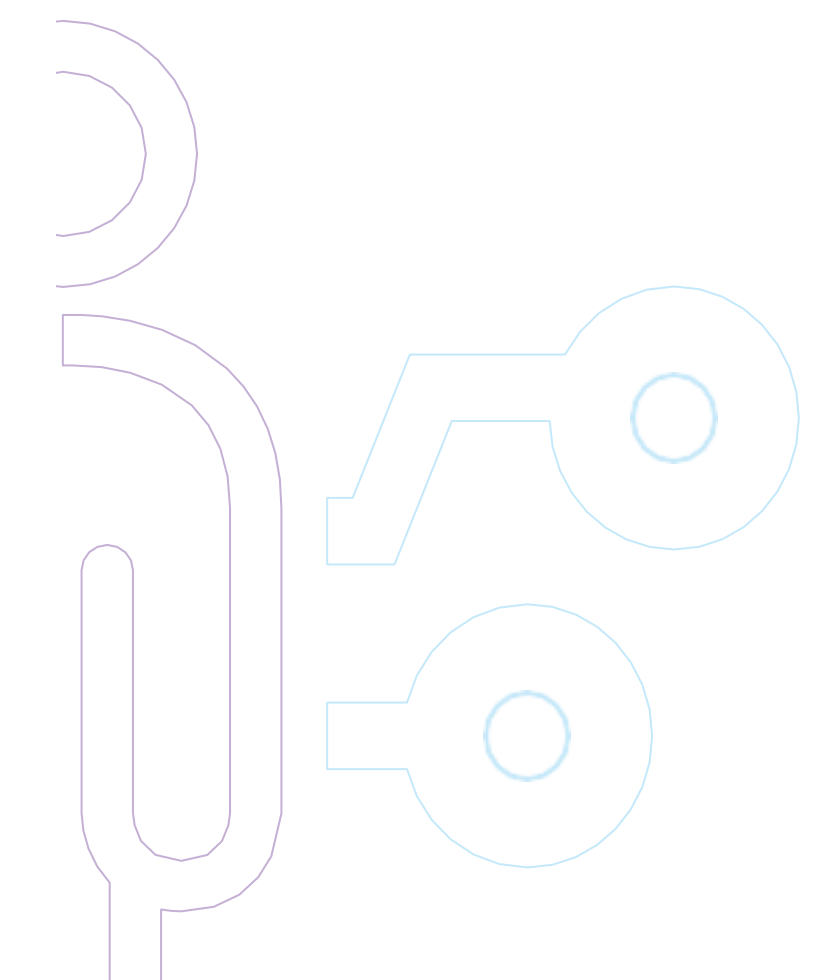
- To establish the quantity of carbon produced during the construction of our road projects:
 - At a strategic level, plan against anticipated sectoral carbon budgets and assess the level of carbon needed to construct future road projects
 - At a project level, provide high level carbon estimates at early design stages (e.g. optioneering); and
 - Provide a benchmark against which to compare/validate the carbon performance of other road schemes when practitioners are using the Carbon Tool.

Challenges:

- Quantity of data, in an inconsistent format – processing to provide calculations is very labour intensive
- Obtaining detailed Bill of Quantities from contractors – only need the quantity of materials (not costs)

Table 4 - Emissions summary

		Project	
		N69 Listowel Bypass	N63 Liss Abbey
Project summary	Road Types	Type 1 Single Carriageway	Type 2 single carriageway
	Project phase (of data received)	Detailed Design	EIA
	Length of road (km)	5.95	2.30
	No. of lanes	2	2
	Individual lane width (m)	3.65	3.50
	Shoulder details	Hard shoulder. 2.5m	Hard strip 0.5m
Emissions Summary (tCO2e)	Total emissions over design life	→ 160,049	→ 15,548
	Total operational emissions (incl. maintenance)	→ 26,597(17%)	→ 2,935 (19%)
	Total construction emissions	133,453 (83%)	12,613 (81%)
	Construction emissions per km of road	22,429	5,484
	Construction emissions per km of road per lane incl. shoulders	→ 11,215	→ 2,742



TII approach for Climate and Carbon Assessment for Major Projects

Questions



Acknowledge:

All my colleagues in the Environment Policy & Compliance and Strategic Planning Sections

Virginia Kangley (Capital Programme)

Ambrose Clarke, Fergus Meehan, Martin Curley (RDO's)

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