

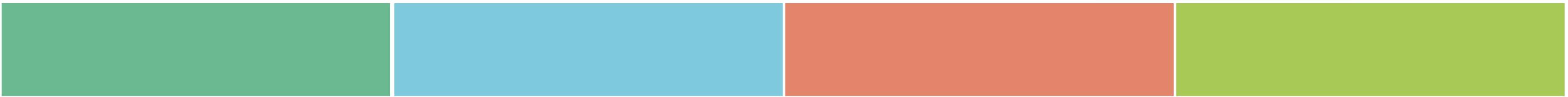
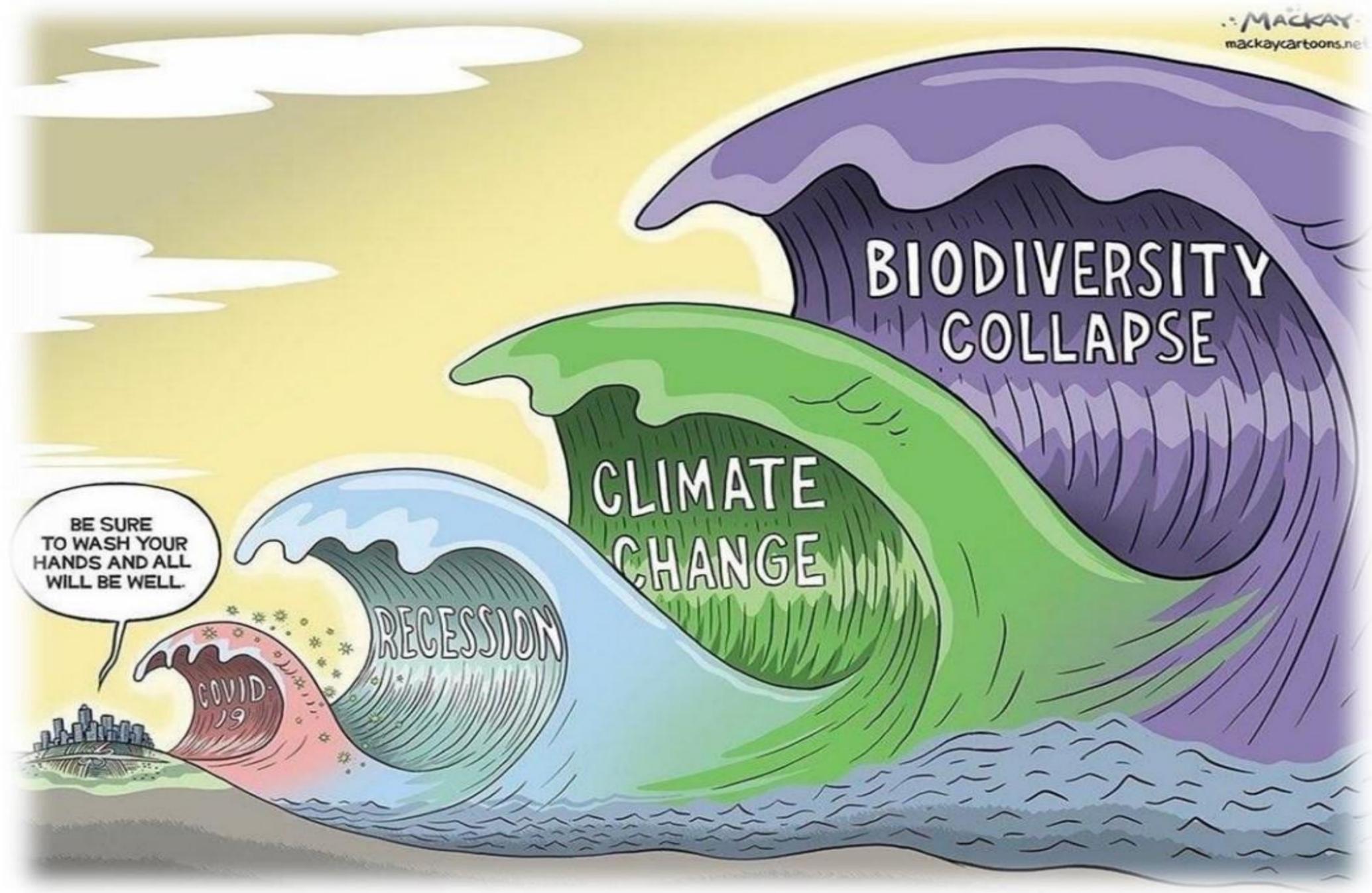
# NATIONAL ROADS AND GREENWAYS CONFERENCE 2024

Session 6: Decarbonisation

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



# Session 6: Decarbonisation



# Programme: Session 6

## Session 6: Decarbonisation

*Chair: Dr Vincent O'Malley, Head of Environment, TII*

11.10am	<b>Climate Action Plans; implications for road authorities</b>	<i>John Martin, Head of Climate Engagement /Governance, Department of Transport</i>
11.30am	<b>Challenges in rehabilitating peat bogs for biodiversity and carbon sequestration</b>	<i>Gerry Baker, Senior Hydrogeologist, Arup</i>
11.50am	<b>Green Procurement and Carbon Ladder</b>	<i>Micheál O'Connor and PJ Hourigan, TII</i>
12.10pm	<b>New Human Health and Population standard for the planning of national roads</b>	<i>Jenny Dunwoody, Arup</i>
12.30pm	<b>Noise Mitigation and Standards</b>	<i>Dr Eoin King, Lecturer, Mechanical Engineering, University of Galway</i>



# Climate Action Plans; Implications for Road Authorities

*John Martin, Head of Climate Engagement/Governance, Department of Transport*





An Roinn Iompair  
Department of Transport

# Climate Action Plan | 2024

‘Decarbonising Ireland’s transport system and implications for transport infrastructure’

TII National Roads and Greenways Conference

04 October 2024

# (1) Climate Action Plan Process - Background



- Climate Action Plans are underpinned by Statute:
- Section 4(4) – *“The Minister shall, in each year, commencing with the year 2021, submit a draft of the climate action plan to the Government for approval”*;
- **Section 6A** – Setting of 5-year Carbon Budgets (Climate Change Advisory Council)
- **Section 6C** – Setting of Sectoral Emission Ceilings for High Impact Sectors (Ministerial function)



---

*Number 32 of 2021*

---

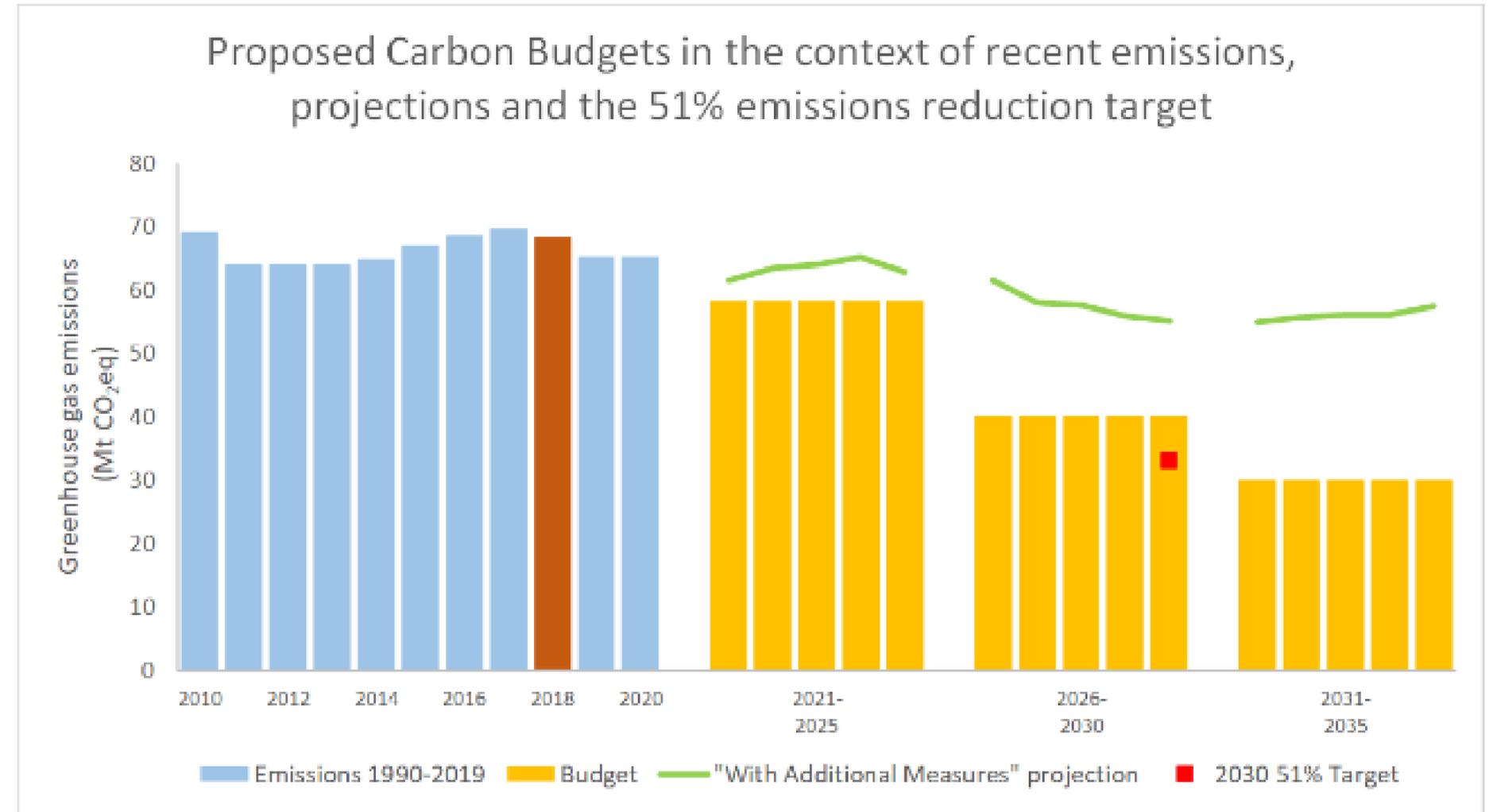
**Climate Action and Low Carbon Development (Amendment) Act 2021**

---

# (1) Climate Action Plan Process - Background



- **2021-2025:** 295 Mt CO<sub>2</sub> eq. an average of -4.8% for the first budget period.
- **2026-2030:** 200 Mt CO<sub>2</sub> eq. an average of -8.3% for the second budget period.
- **2031-2035:** 151 Mt CO<sub>2</sub> eq. an average of -3.5% for the third provisional budget



# The Six Vital High Impact Sectors

## Powering renewables

# 75%

reduction in emissions by 2030

We will facilitate a large-scale deployment of renewables that will be critical to decarbonising the power sector as well as enabling the electrification of other technologies.

Accelerate the delivery of onshore wind, offshore wind, and solar.

Dial up to 9 GW onshore wind, 8 GW solar, and at least 7 GW of offshore wind by 2030 (with 2 GW earmarked for green hydrogen production).

Support at least 500 MW of local community-based renewable energy projects and increased levels of new micro-generation and small-scale generation.

Phase out and end the use of coal and peat in electricity generation.

New, dynamic Green Electricity Tariff will be developed by 2025 to incentivise people to use lower cost renewable electricity at times of high wind and solar generation.

## Building better

commercial/public | residential  
**45% | 40%**

reduction in emissions by 2030

We will increase the energy efficiency of existing buildings, put in place policies to deliver zero-emissions new builds and continue to ramp up our retrofitting programme.

Ramp up retrofitting to 120,000 dwellings to BER B2 by 2025, jumping to 500,000 by 2030.

Put heat pumps into 45,000 existing and 170,000 new dwellings by 2025, up to 400,000 existing and 280,000 new dwellings by 2030.

Generation up to 0.8 TWh of district heating by 2025 and up to 2.5 TWh by 2030.

## Turning transport around

# 50%

reduction in emissions by 2030

We will drive policies to reduce transport emissions by improving our town, cities and rural planning, and by adopting the Avoid-Shift-Improve approach: reducing or avoiding the need for travel, shifting to public transport, walking and cycling and improving the energy efficiency of vehicles.

Change the way we use our road space.

Reduce the total distance driven across all car journeys by 20%.

Walking, cycling and public transport to account for 50% of our journeys.

Nearly 1 in 3 private cars will be an Electric Vehicle.

Increase walking and cycling networks.

70% of people in rural Ireland will have buses that provide at least 3 trips to the nearby town daily by 2030.

## Making family farms more sustainable

# 25%

reduction in emissions by 2030

We will support farmers to continue to produce world-class, safe and nutritious food while also seeking to diversify income through tillage, energy generation and forestry.

Significantly reduce our use of chemical nitrogen as a fertilizer.

Increase uptake of protected urea on grassland farms to 90-100%.

Increase organic farming to up to 450,000 hectares, the area of tillage to up to 400,000 ha.

Expand the indigenous biomethane sector through anaerobic digestion, reaching up to 5.7TWh of biomethane.

Contribute to delivery of the land use targets for afforestation and reduced management intensity of organic soils.

## Greening business and enterprise

# 35%

reduction in emissions by 2030

We're changing how we produce, consume, and design our goods and services by breaking the link between fossil fuels and economic progress. Decarbonising industry and enterprise is key to Ireland's economy and future competitiveness.

Reduce clinker content in cement and substitute products with lower carbon content for construction materials, ensuring 35% reduction in emissions by 2030 (against 2018).

Reduce fossil fuel use from 64% of final consumption (2021) to 45% by 2025 and further by 2030.

Increase total share of heating to carbon neutral to 50-55% by 2025, up to 70-75% by 2030.

Significantly grow the circular economy and bioeconomy.

## Changing our land use

Exact reduction target for this sector is yet to be determined.

The first phase of the land use review will tell us how we are using our land now. Then, we can map, with evidence, how it can be used most effectively to capture and store carbon and to produce better, greener food and energy.

Increase our annual afforestation rates to 8,000 hectares per annum from 2023 onwards.

Rethink our Forestry Programme and Vision. Promote forest management initiatives in both public and private forests to increase carbon sinks and stores.

Improve carbon sequestration of 450,000 ha of grasslands on mineral soils and reduce the management intensity of grasslands on 80,000 ha of drained organic soils.

Rehabilitate 77,600 hectares of peatlands.

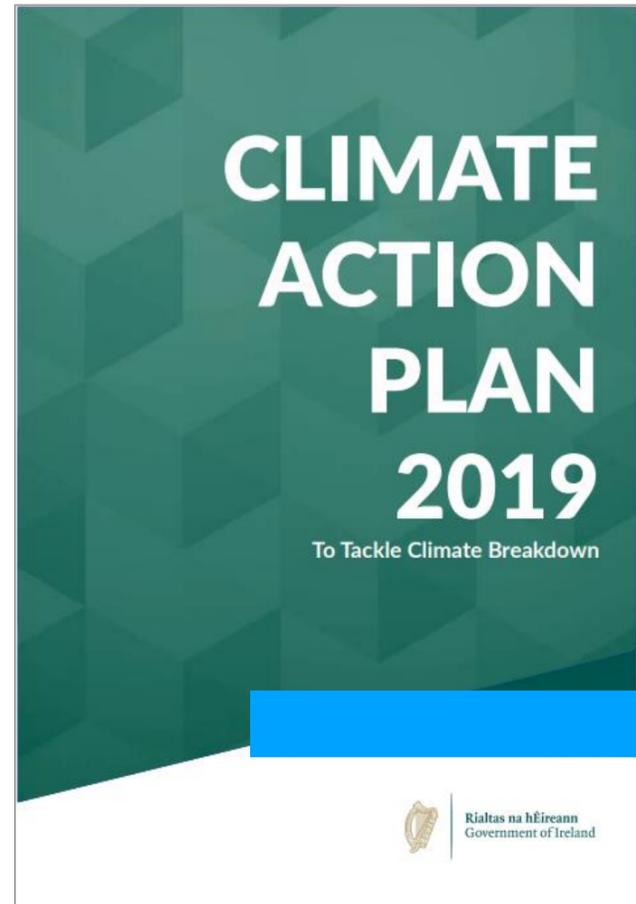
### Table - Sectoral Emission Ceilings<sup>3</sup>

(Figures for MtCO<sub>2</sub>eq for 2018 and 2030 have been rounded. This may lead to some discrepancies)

Sector	2018 Baseline (MtCO <sub>2</sub> eq.) <sup>4</sup>	Sectoral Emission Ceilings for each 5-year carbon budget period (MtCO <sub>2</sub> eq.)		Indicative Emissions in Final Year of 2021- 2025 carbon budget period (MtCO <sub>2</sub> eq)	Indicative Reduction in Emissions in Final Year of 2021-2025 budget period compared to 2018	Emissions in final year of 2026-2030 carbon budget period (MtCO <sub>2</sub> eq)	Reduction in Emissions final year of 2026-2030 carbon budget period compared to 2018	Agreed CAP21 Ranges
	2018	2021-2025	2026-2030	2025	2025	2030	2030	2030
Electricity	10	40	20	6	~40%	3	~75%	60 – 80%
Transport	12	54	37	10	~20%	6	~50%	40 – 50%
Built Environment - Residential	7	29	23	5	~20%	4	~40%	45 – 55% <sup>5</sup>
Built Environment - Commercial	2	7	5	1	~20%	1	~45%	
Industry	7	30	24	6	~20%	4	~35%	30 – 40%
Agriculture	23	106	96	20	~10%	17.25	~25%	20 – 30%
LULUCF <sup>6</sup>	5	XXX	XXX	XXX	XXX	XXX	XXX	40 – 60%
Other (F-Gases, Waste & Petroleum refining)	2	9	8	2	~25%	1	~50%	N/A
Unallocated Savings <sup>7</sup>			-26			-5.25		
<b>TOTAL<sup>8</sup></b>	<b>68</b>	<b>XXX</b>	<b>XXX</b>	<b>XXX</b>	<b>XXX</b>	<b>XXX</b>	<b>XXX</b>	<b>N/A</b>
Legally binding Carbon Budgets and 2030 Emission Reduction Targets <sup>9</sup>	-	295	200	-	-	34	51%	-

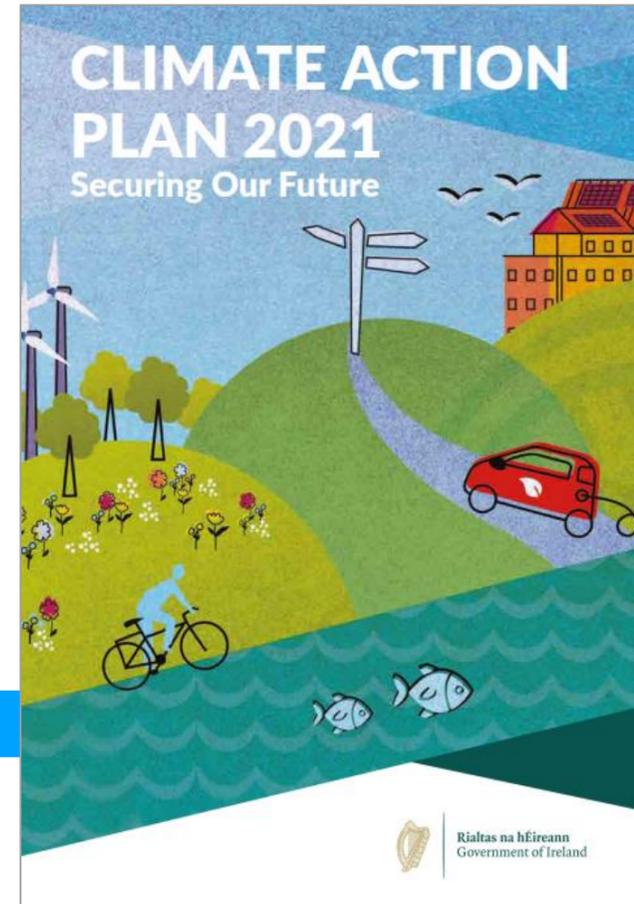
Source: <https://www.gov.ie/en/publication/76864-sectoral-emissions-ceilings/>

# (2) From 2019 to today...



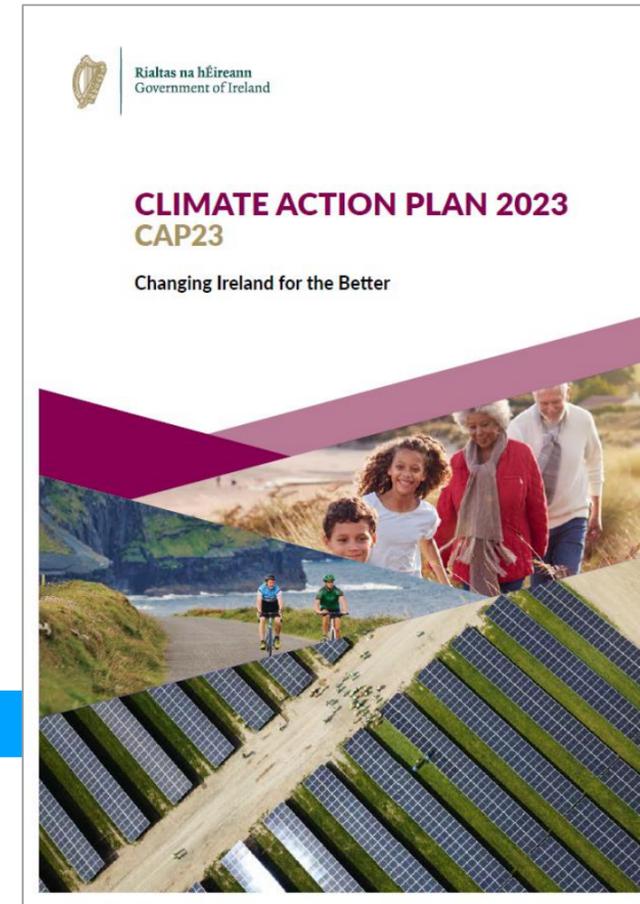
June 2019

Pre-dated Amendment Act;  
Previous Govt



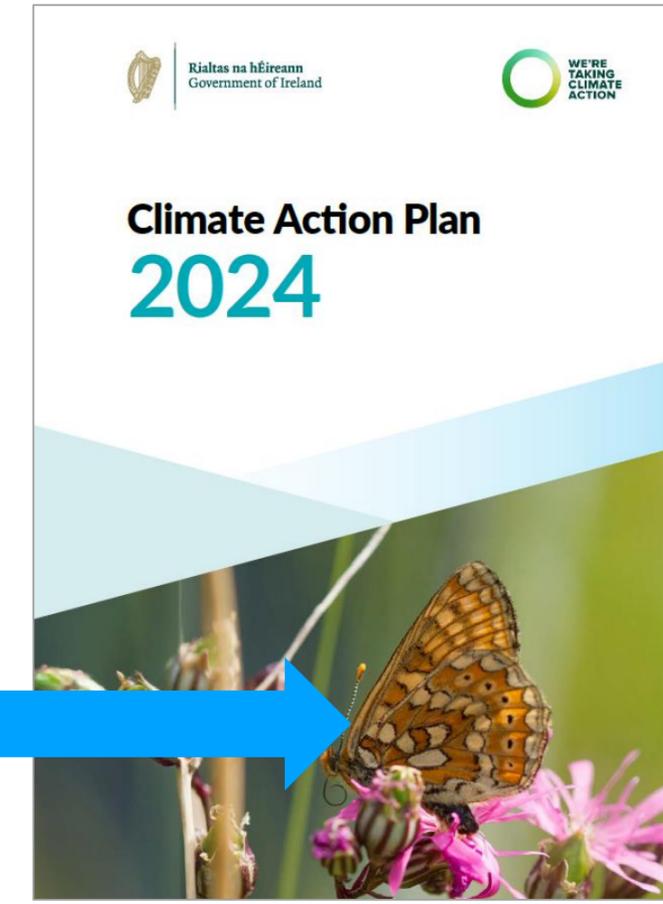
November 2021

First Plan under new Act;  
New Government



December 2022

First Statutory Plan under Carbon Budgets / Sectoral Emission Ceilings.



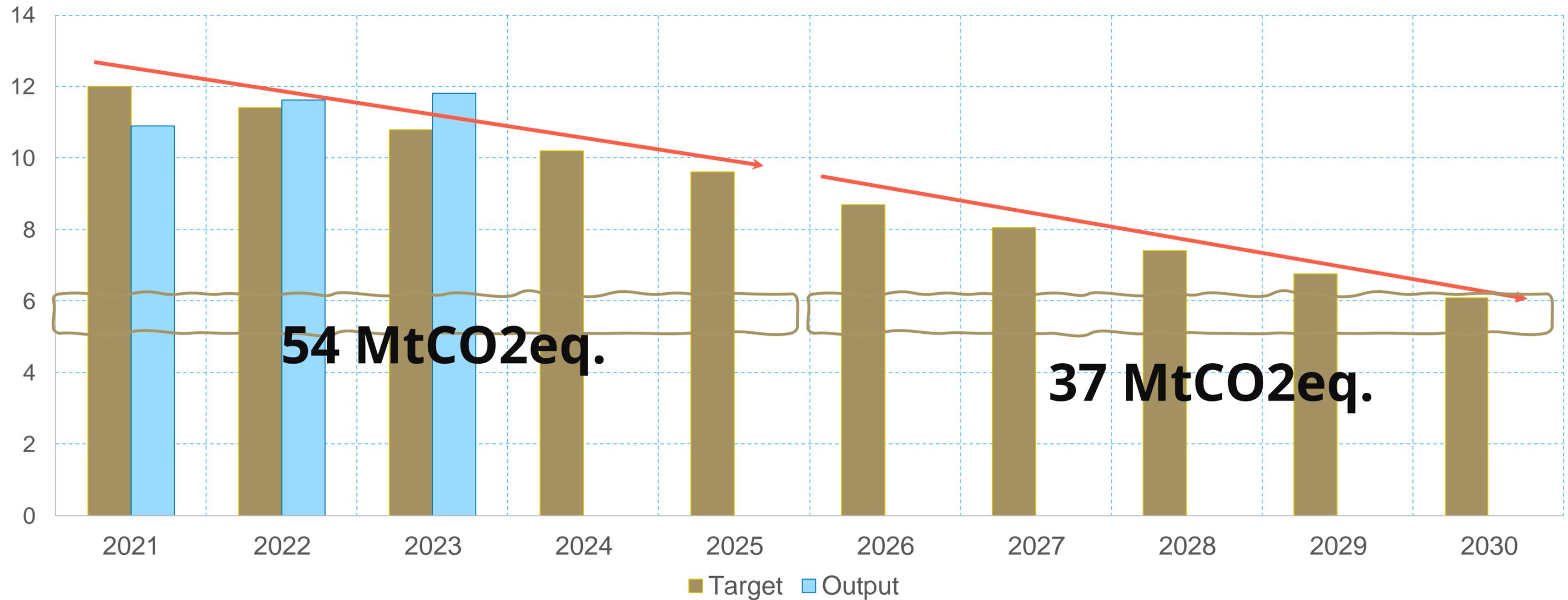
April 2024

1<sup>st</sup> Plan to undergo full SEA / AA and associated consultation.

# (3) Transport Emissions – State-of-Play



Indicative Carbon Budgets v Output



# (3) Transport Emissions – State-of-Play



## 2022 to 2023



### Transport emissions

Emissions increased by 0.3% in 2023 following a 6% increase in 2022

Transport

**+0.3%**

At the end of 2023, there were almost 110,000 electric vehicles in Ireland, approximately 56% of the Climate Action Plan target for 2025.

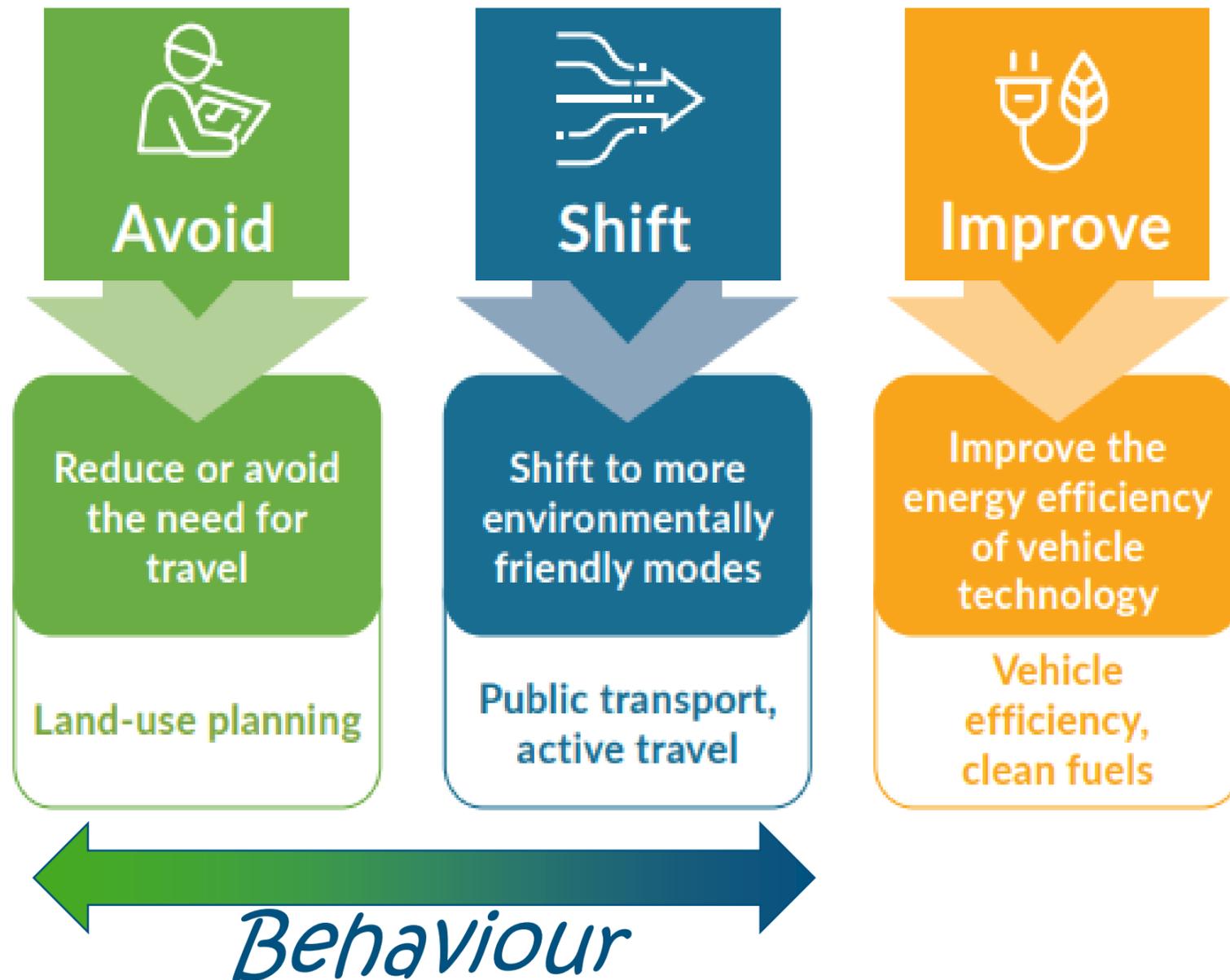
- Emissions in 2023 only grew by 0.3%, compared with +6% Y-o-Y increases in the previous 2 years
- At the end of 2023, transport emissions were at **64%** of Carbon Budget for 2021-2025
- To remain within Carbon Budget for 2021-2025, we must limit emissions to **<19.4 Mt** over 2024-2025
- Any excess emissions for CB1 would be deducted from Carbon Budget for 2026-2030

## (4) CAP24 - Transport Chapter

- Transport is detailed in Chapter 15 of CAP24
- 50 Pages from pp.244
- 22 High Level Actions set out in Annex of Actions
- Essentially carrying over from CAP23 policies
- Targets set at National Level
- Regional, local and project level targets not defined
- Updated Actions
- Some new areas of emphasis...



# (4) CAP24 - Transport Chapter



Develop services, communities, and infrastructure in such a way that **AVOIDS** the need to travel as much as we do today

Improve the relative attractiveness of sustainable travel modes (Public Transport, Cycling and Walking), to **SHIFT** away from car use; private car modal share from over 70% (today) to just over 50% in 2030; and

Compliment these by increasing the proportion of EV's in our car fleet to 30% by 2030, which will **IMPROVE** the efficiency of the national car fleet; electrification of the freight and public transport sector will also be key.

# (4) CAP24 - Transport Chapter



Enhanced Governance & Accelerating Implementation

Communications Strategy

Haulage and Logistics

Transport Adaptation for Enhanced Climate Resilience

## AVOID

## SHIFT

## IMPROVE

Enhanced Spatial and Land-use Planning

Demand Management Strategy

Roadspace Reallocation

Strategic Transport Planning

Active Travel Infrastructure Programme

Major Public Transport Infrastructure Programme

Public Transport Services and Escort to Education Journeys

Smart, Shared and Integrated Mobility

Decarbonising Public Transport & School Transport Services

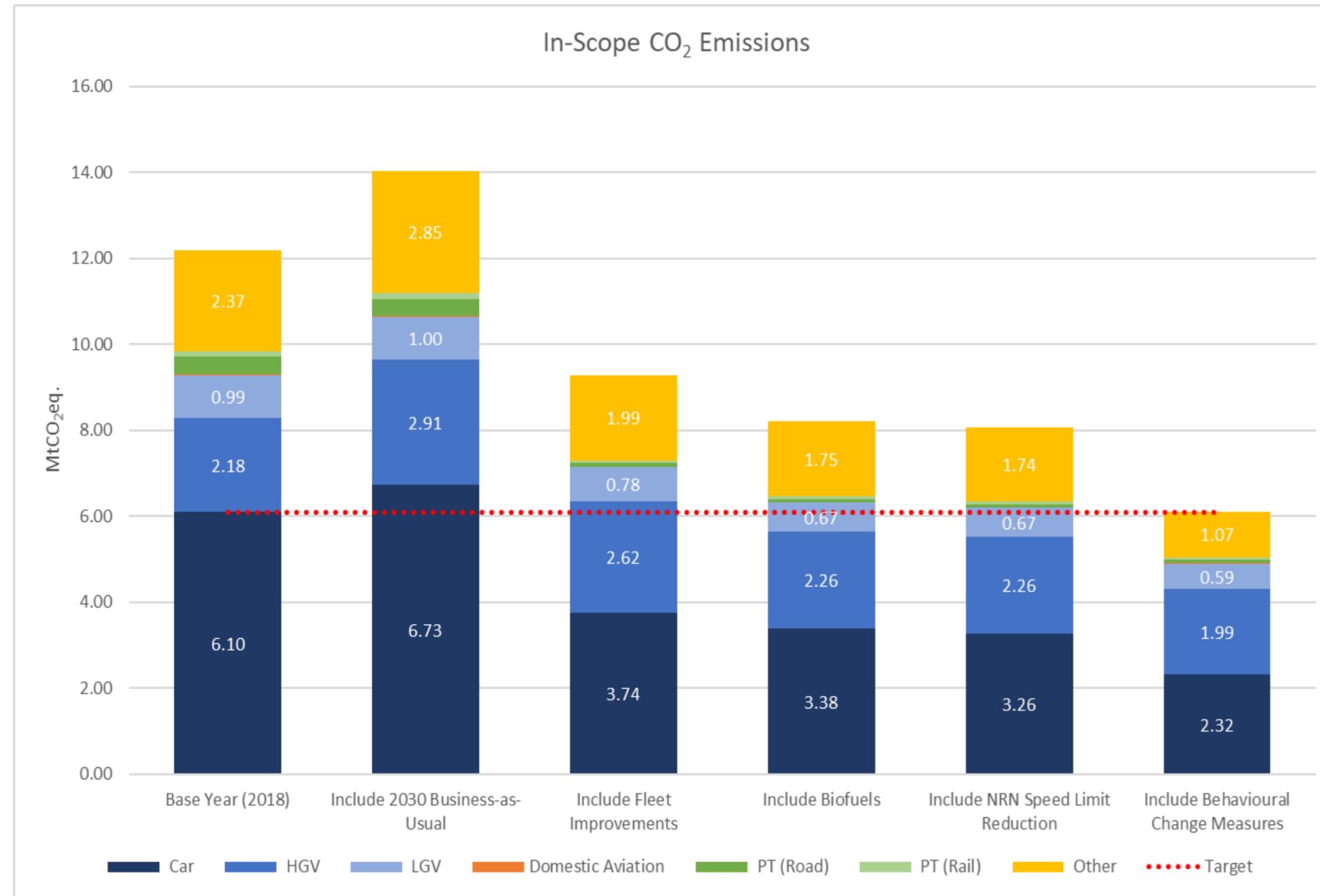
EV Charging Infrastructure Strategy / ZEV WP

Renewable Fuels for Transport

# (4) CAP24 - Transport Chapter



Policy  
Pathway to  
2030



## (4) CAP24 - Transport Chapter – Cross-cutting Actions



### Enhanced Governance & Accelerating Implementation...

- Progress **Sustainable Mobility Policy Leadership Group** work programme, including oversight / delivery of SMP Action Plan and Progression of Pathfinder Programme
- Develop framework to oversee **emerging skills requirements for e-mobility**.
- Supporting fuel technology improvement in transport through a dedicated **working group on alternative fuels in transport**.

## (4) CAP24 - Transport Chapter – Cross-cutting Actions



### Communications and Engagement...

- Continue to roll out future phases of “**Your Journey Counts**” national advertising campaign.
- Climate Action and Sustainable Mobility **Public Engagement Strategy** to build awareness and inspire ownership for action in individuals, private organisations and public sector bodies, while also increasing support and acceptance for the delivery of critical infrastructure
- **ZEVI information and engagement programme** to include targeted campaign to support uptake and achievement of EV targets commencing Q4 2023

# (4) CAP24 - Transport Chapter – Cross-cutting Actions



Rialtas na hÉireann  
Government of Ireland

# YOUR JOURNEY COUNTS

Bike it, walk it, bus it, train it.  
Help reduce Ireland's transport emissions.



€1 million per day  
is being invested in  
Ireland's walking and  
cycling infrastructure

Rialtas na hÉireann  
Government of Ireland

## (4) CAP24 - Transport Chapter – Cross-cutting Actions



### Haulage, Freight and Logistics...

- Advance decarbonisation elements of **Road Haulage Strategy**
- Establish national **certification/accreditation system for eco-driving courses** / consider mechanisms and incentives for operators to adopt and maintain eco-driving practises
- **Enhanced rail connectivity to ports** – rehabilitation of Shannon-Foynes freight line
- Re-evaluation of the policy framework for the **decarbonisation of ports** (review of National Ports Policy); key recommendations of the draft All-Island Strategic Rail Review on enhanced rail connectivity to our ports - to improve and encourage greater integration of rail freight and rail passenger transport with our seaports.

# (4) CAP24 - Transport Chapter – 'AVOID' Actions



## AVOID

- Delivery of National Demand Management Strategy
- Metropolitan Area Transport Strategies – programme of review, update, appraisal

## Metrics (by 2030)

Reduce total vehicle kilometres  
driven by 20%

50% reduction in fuel usage

# (4) CAP24 - Transport Chapter – ‘SHIFT’ Actions



© Transport Infrastructure Ireland / Aecom, 2023

Metrics (by 2030)

50% increase in daily  
active travel Journeys

Increase Active Travel Modal share from  
20% to 28%

# (4) CAP24 - Transport Chapter – ‘SHIFT’ Actions



## SHIFT – Active Travel

- Advance roll-out of walking/cycling infrastructure in line with National Cycle Network and CycleConnects plans (110 km of walking/cycling infrastructure in 2024)
- Development and publication of Policy Statement on **Mobility Hubs**
- SMP Pathfinder: Accelerate implementation of **Safe Routes to School Programme**
- Rollout of expanded **Regional Bike sharing schemes** in Limerick, Cork, Waterford and Galway, including enhanced e-bike provision

### Metrics (by 2030)

50% increase in daily  
active travel Journeys

Increase Active Travel Modal share from  
20% to 28%

# (4) CAP24 - Transport Chapter – ‘SHIFT’ Actions



© John Martin, 2023

## Metrics (by 2030)

130% increase in daily Public  
Transport Journeys

Increase Public Transport Modal share from  
8% to 19%

# (4) CAP24 - Transport Chapter – 'SHIFT' Actions



## SHIFT – Public Transport

- Advance DART+ and BusConnects Programmes
- Continue investment in passenger and freight rail, (per All-Island Strategic Rail Review)
- Prioritise and accelerate delivery of NTA  
Connecting Ireland and new town services, via demand responsive transport pilot initiatives, and conventional & non-conventional modes of public transport services

### Metrics (by 2030)

130% increase in daily Public

Transport Journeys

Increase Public Transport Modal share from

8% to 19%

# (4) CAP24 - Transport Chapter – 'IMPROVE' Actions



## Metrics (by 2030)

Battery EV share of total passenger car fleet = 30%

EV share of new registrations = 100%

EV share of total LGV fleet = 20%

95,000 commercial EVs

ZE share of new heavy duty vehicle registrations = 30%

3,500 HGVs

1,500 EV buses in PSO bus fleet

Expansion of electrified rail services

Biofuels Blend Rate - E10:B20

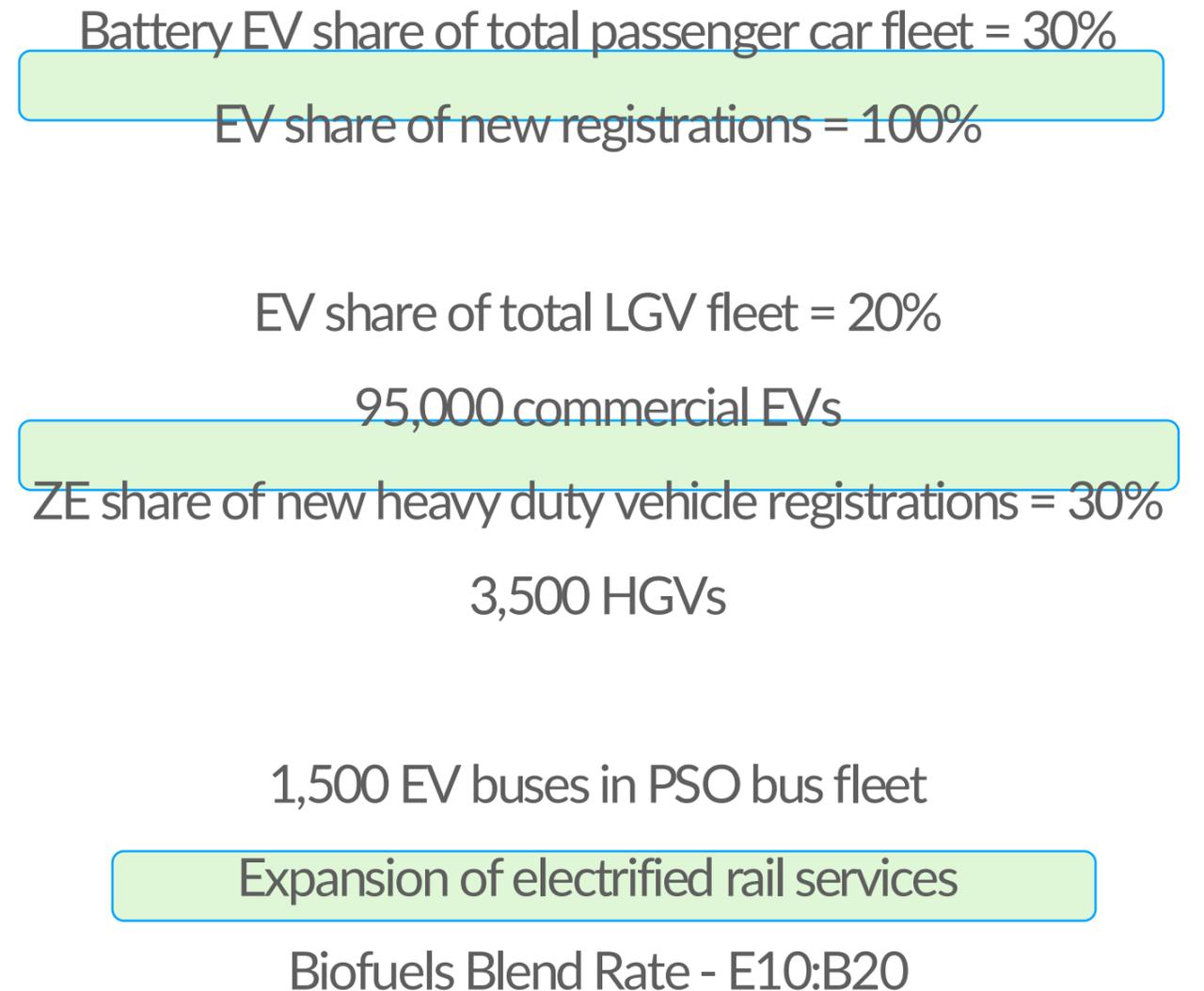
# (4) CAP24 - Transport Chapter – 'IMPROVE' Actions



## IMPROVE

- Ongoing delivery of Destination Charge Point Scheme – including sports clubs / community facilities
- Roll out of key elements of EV Infrastructure Strategy
- Implement the measures in the Renewable Transport Fuel Policy Statement 2023-2025
- Advance PSO electric bus fleet procurement, incl. depot charging upgrades
- Identify measures to improve sustainability of School Transport Scheme

## Metrics (by 2030)



# (5) Consultation & Stakeholder Engagement



- **CAP24** was the first plan to undergo formal SEA / AA and associated consultation;
- Ongoing consultation with stakeholders is important:
- Helps to **inform** policy development, and raise **awareness** around policy pathways



# (5) CAP24 – Delivery Risks and Challenges



**Inflation and Exchequer (Capital) Funding**

**Project Delivery Delays, including Planning**

**Funding PT Services (Public Service Obligation / Current)**

**Supply Chain Issues**

**Public and Political Acceptance**

**Market Capacity and Skills**

**Charging Infrastructure and Renewable Transport Fuels**

## (6) What will CAP25 look like?

- CAP23 represented a major policy shift for decarbonising the Transport Sector;
- This was **refined** and **carried** through into CAP24;
- **CAP25** will provide an update on progress, and set out next steps in implementing already agreed policies...
- No major change or addition foreseen to CAP23-CAP24 policies.



### Climate Action Plan CAP25



*December 2024*

## (7) Looking forward



- 2024 EPA projections estimate the transport sectoral emissions to reduce by 29% of 2028 levels by 2030 (our target is 50% reduction);
- Challenges are emerging for the sector in meeting its Carbon Budget 1 targets
- This will in turn present resultant challenges for Carbon Budget 2 targets.

# (7) Looking forward



- D/Transport engaging with modelling team in the National Transport Authority (NTA), and wider stakeholders, to:
  - *recalibrate our existing emissions modelling (as set out in CAP23 and CAP24);*
  - *develop and refine proposals for amplified or additional decarbonisation policies;*
  - *assess the decarbonisation potential of these proposed measures, and set national targets, through recalibrated modelling, to refine a renewed policy pathway for CAP26 and beyond; and*
  - *look forward to longer-term pathways for Carbon Budget 3 (2031-2035).*
- Proposed measures and policies will be subject to a socio-economic impact assessment to ensure a Just Transition.
- Recalibrated policy pathways to be finalised by mid-2025 and
- Set out in **next year's review** of the **Climate Action Plan (CAP26)**.



An Roinn Iompair  
Department of Transport

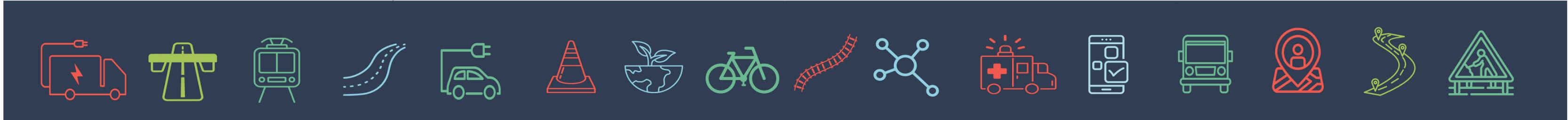
# Climate Action Plan | 2024

Thank you.

TII National Roads and Greenways Conference  
04 October 2024

# Challenges in rehabilitating peat bogs for biodiversity and carbon sequestration

*Gerry Baker, Senior Hydrogeologist, Arup*



# Challenges in rehabilitating peat bogs for biodiversity and carbon sequestration

TII National Roads and Greenways Conference 2024

# Outline

- Peatlands Context
- TII Guidance
- Controls on Carbon Flux
- Controls on Biodiversity
- Defining Rehabilitation Objectives
- Peat Deposition Areas
- New Research



*Abbeyliex Peatland Restoration Boardwalk, Co. Laois, Ireland*

# Peatlands - Context

What are peatlands?



*Sphagnum & Sundew*

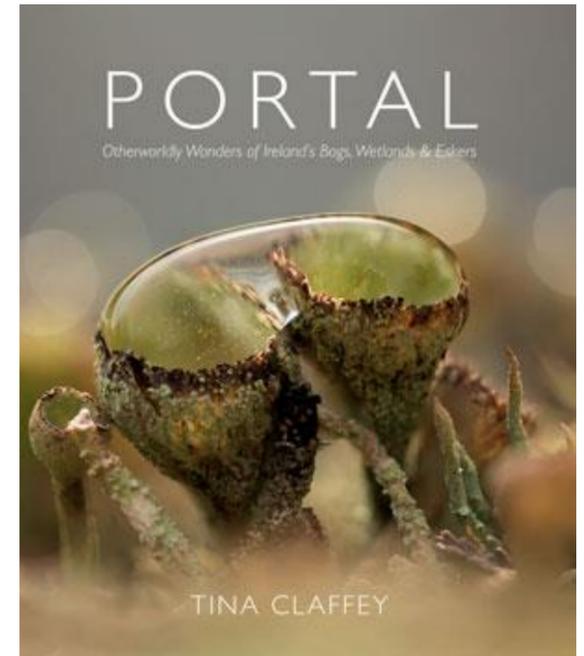


*Pixie Lichen Cups*



*Sphagnum moss*

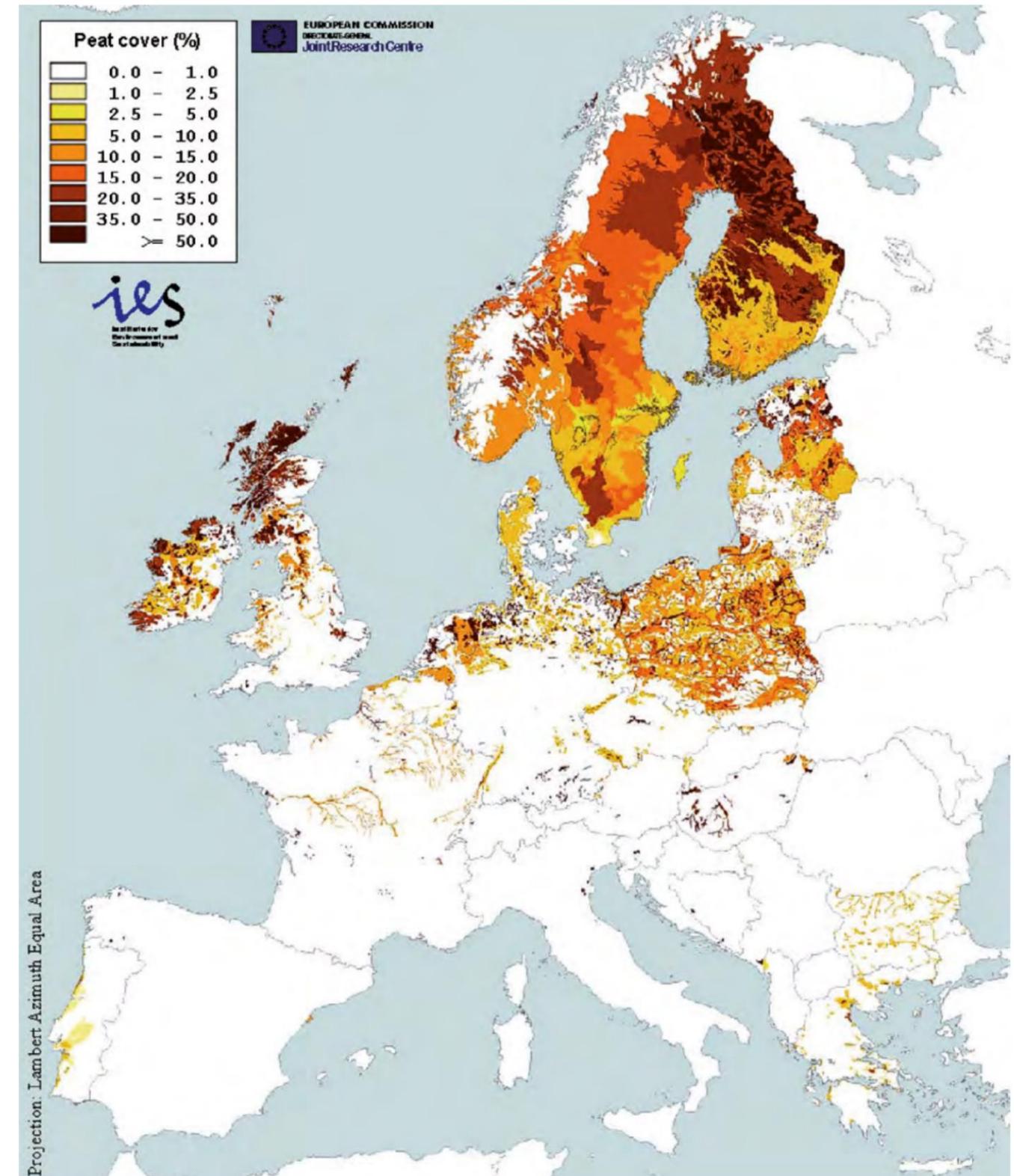
ARUP



<https://www.tinaclaffey.com/>

# Why are peatlands important?

- Contain more than 40% of all soil carbon
- Contain more carbon than all the earth's other vegetation types combined



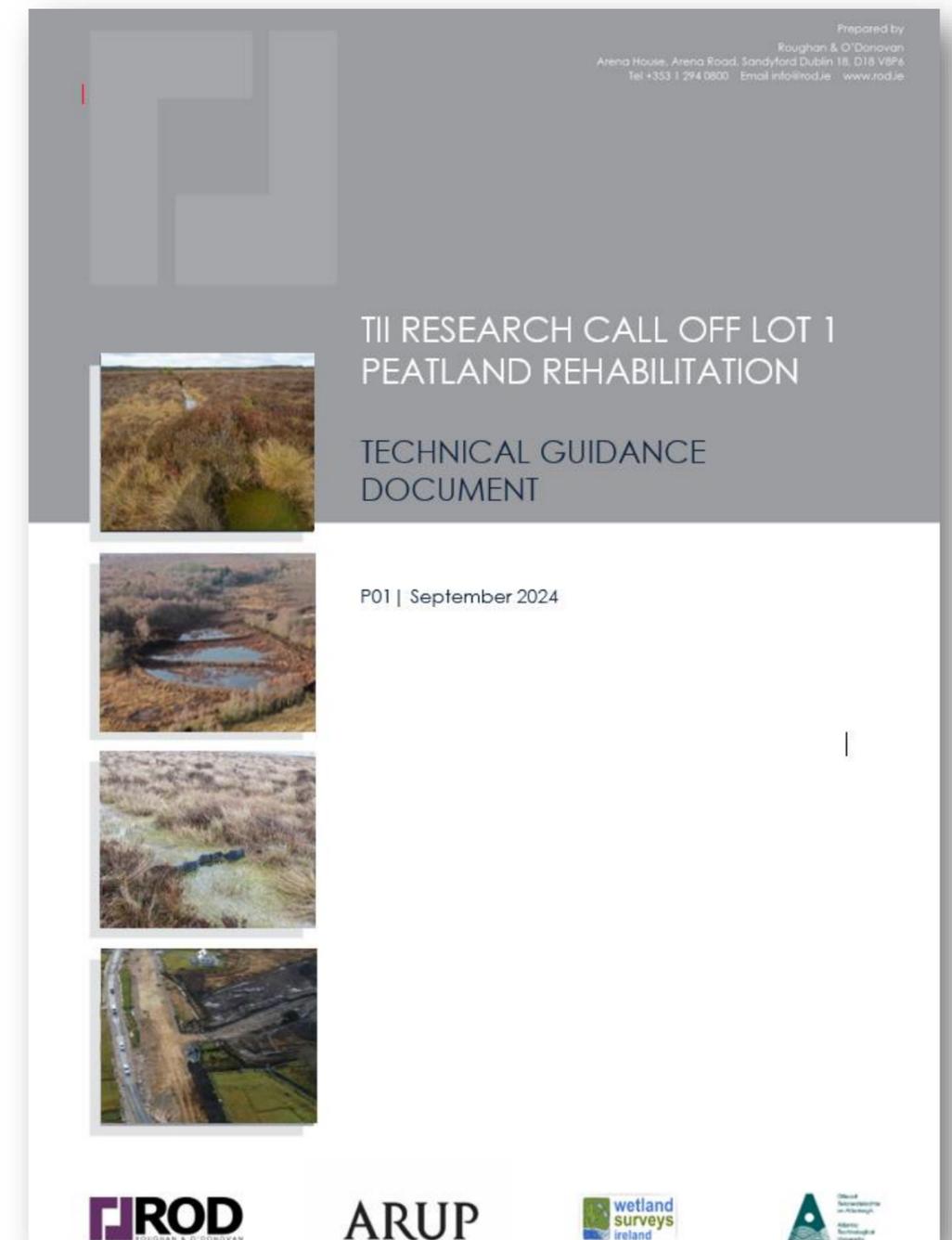
*European Peatland Distribution*

# TII Peatland Guidance

**TII309 Lot 1 “Methodologies for the Sustainable Management of Earthworks as a means of Rehabilitating Degraded Peatlands and Enhancing the Biodiversity of Peatland Habitats.”**

## Project Objectives:

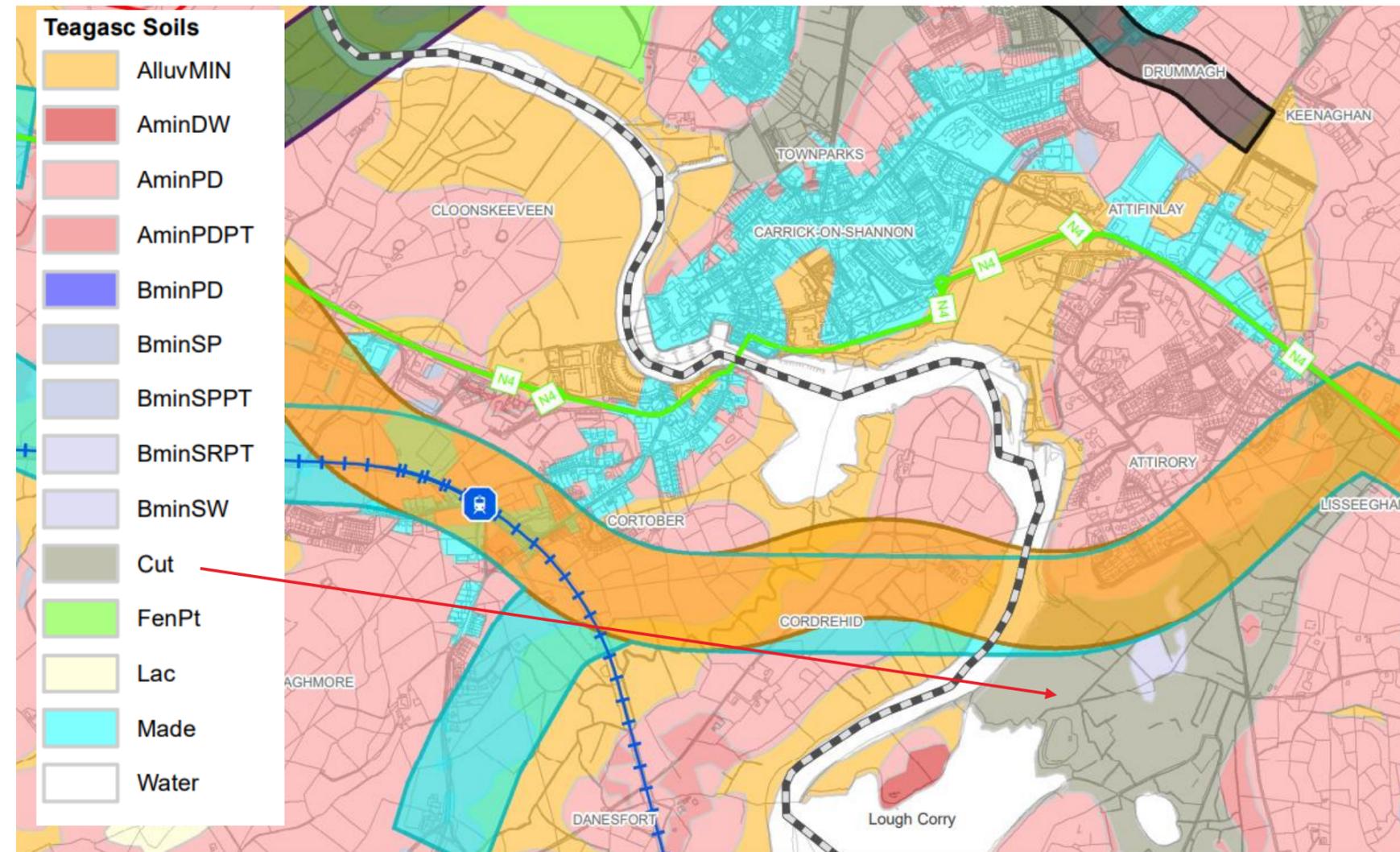
- Comprehensive literature review of environmental legislation related to biodiversity, soils, land waste, groundwater and surface waters
- Prescriptive account of how to assess peat related impacts and mitigation measures during the various phases of national road projects
- How to conduct a comprehensive baseline assessment of peatland areas with a view to rehabilitation.
- Provide methodologies on whole life cost analysis, carbon accounting, site investigation, quantifying biodiversity gains, flood risks



# Peatlands in TII Projects

Where does peat become part of the conversation?

- Desk study at Phase 1 & 2
- GSI, EPA, Teagasc Mapping



Comhairle Contae Ros Comáin  
Ros Comáin  
Roscommon  
County Council

Key Plan

Consultant

Corporate House  
City East Business Park  
Ballybit, Galway, Ireland

Job Title

N4 Carrick-on-Shannon to Dromod Project

Carrick-on-Shannon to Dromod

Scale: 1: 20000 @A3

Role: Soils and Geology

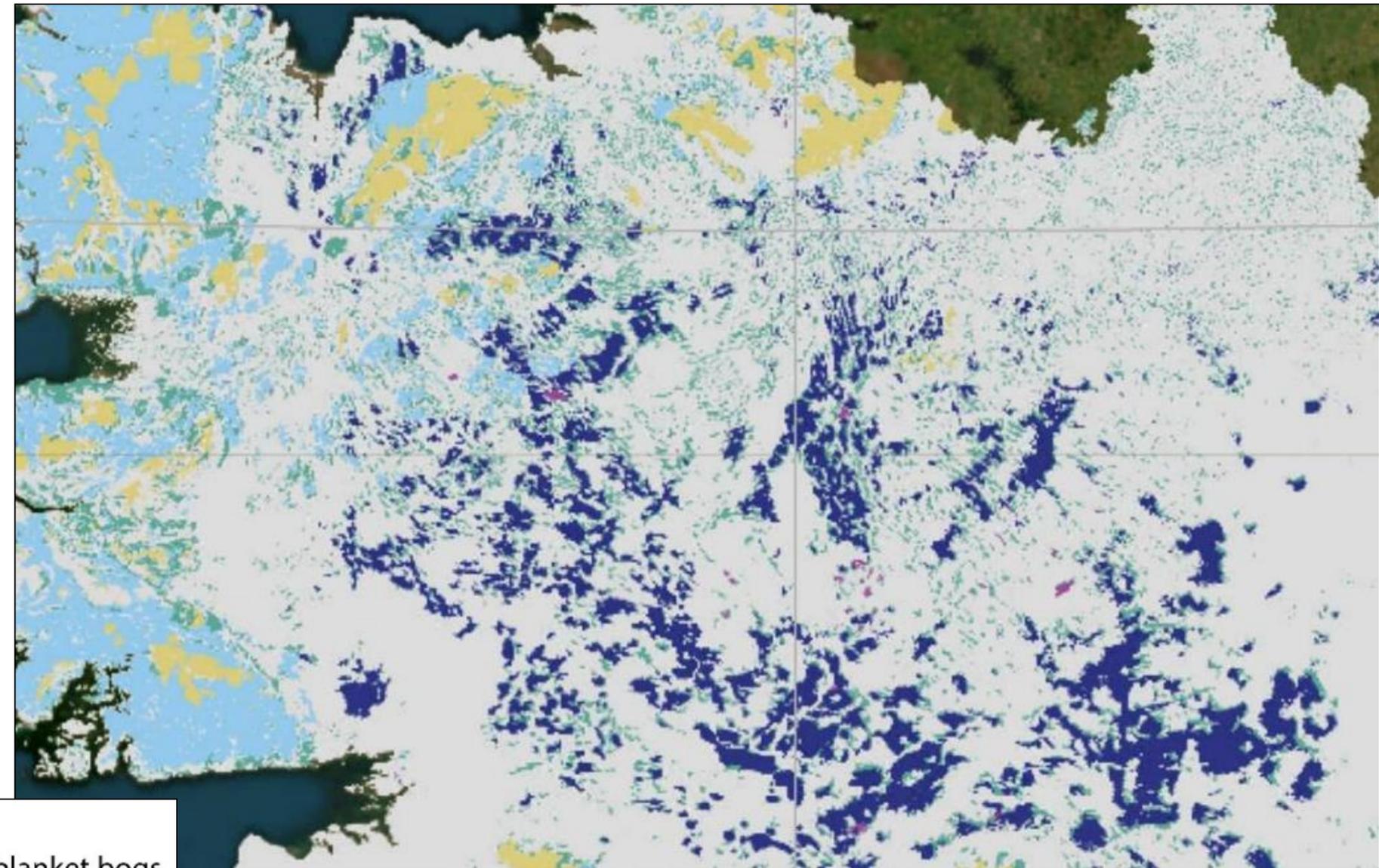
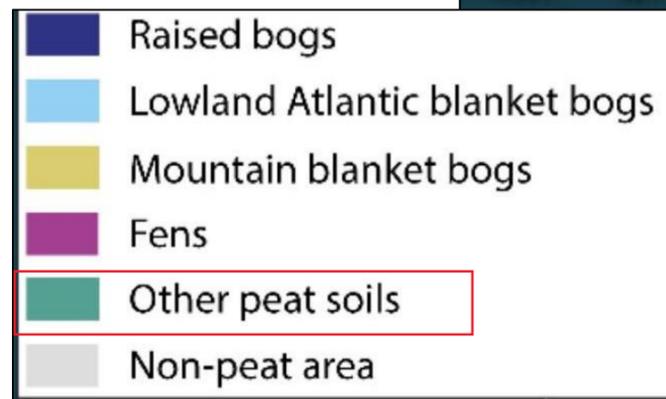
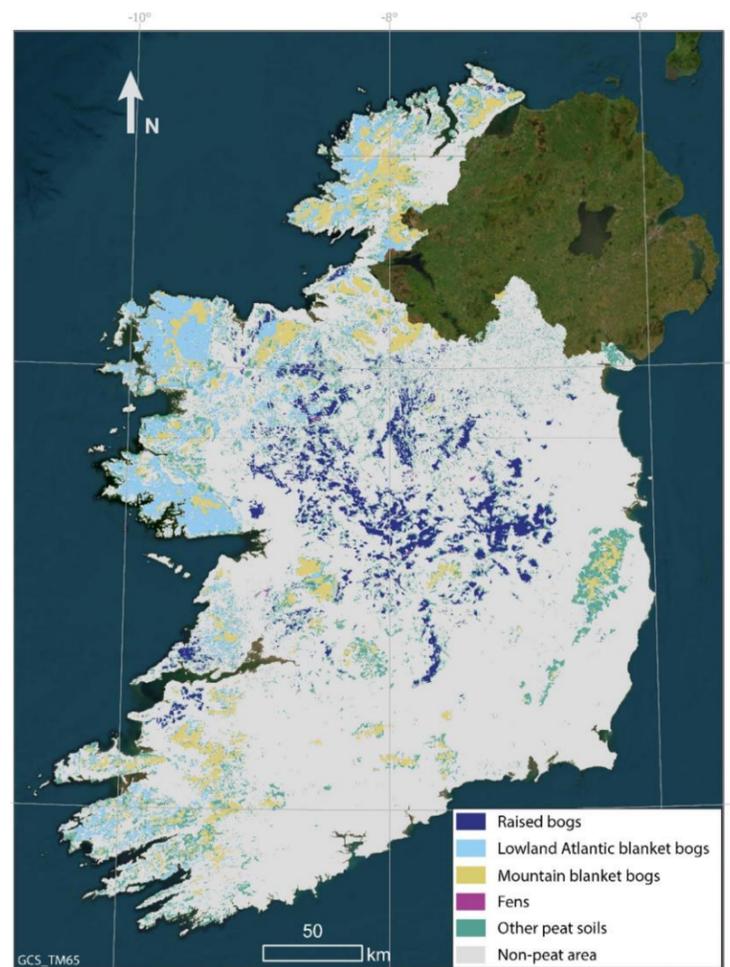
Date: December 2021

P04	22/07/2022	AG	MMcE	RT
P03	01/03/2022	AG	MMcE	RT
P02	28/01/2022	AG	MMcE	RT
P01	03/12/2021	AG	MMcE	RT
Issue	Date	By	Chkd	Appd

# Peatland Coverage

## New Mapping Implications

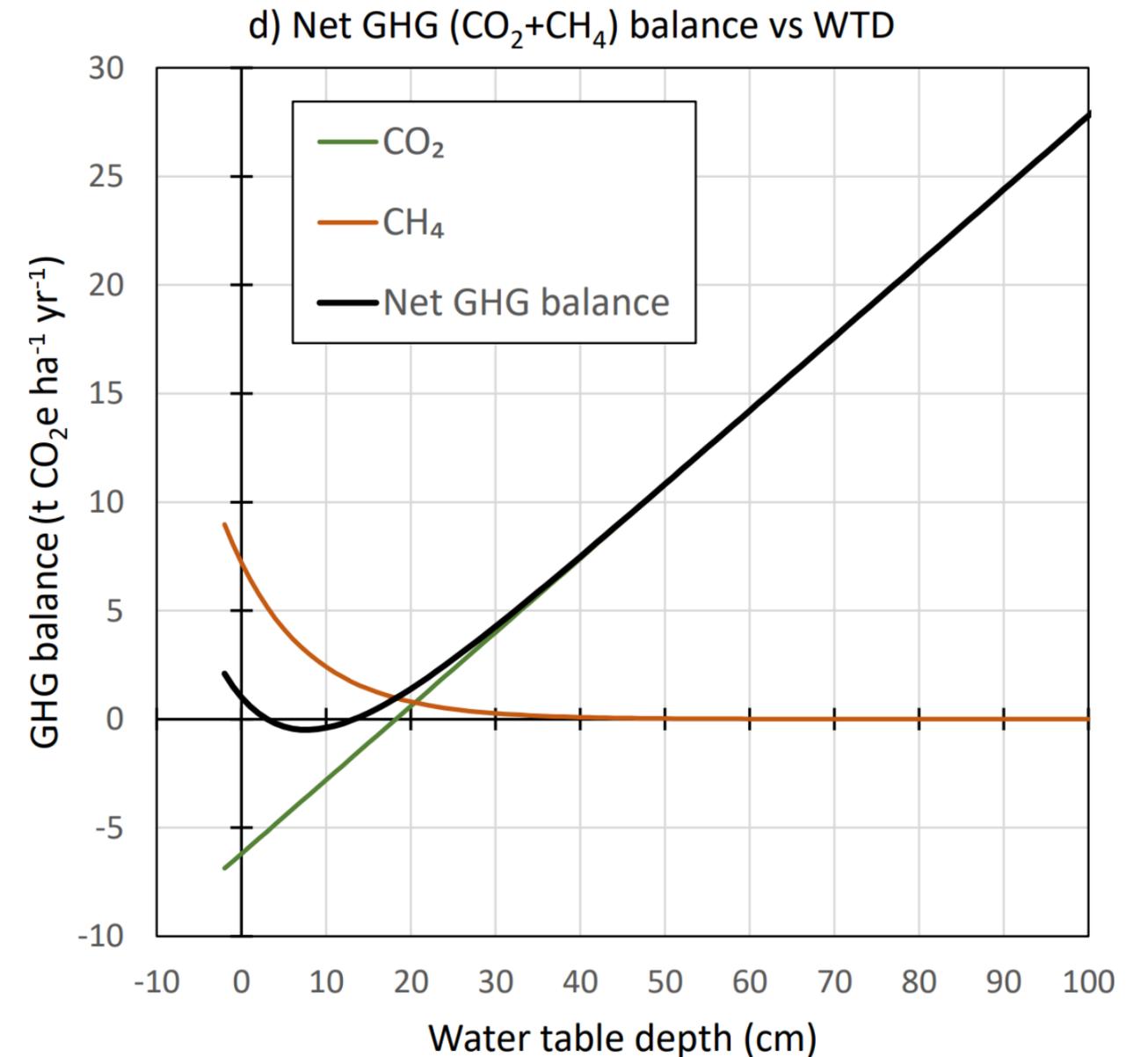
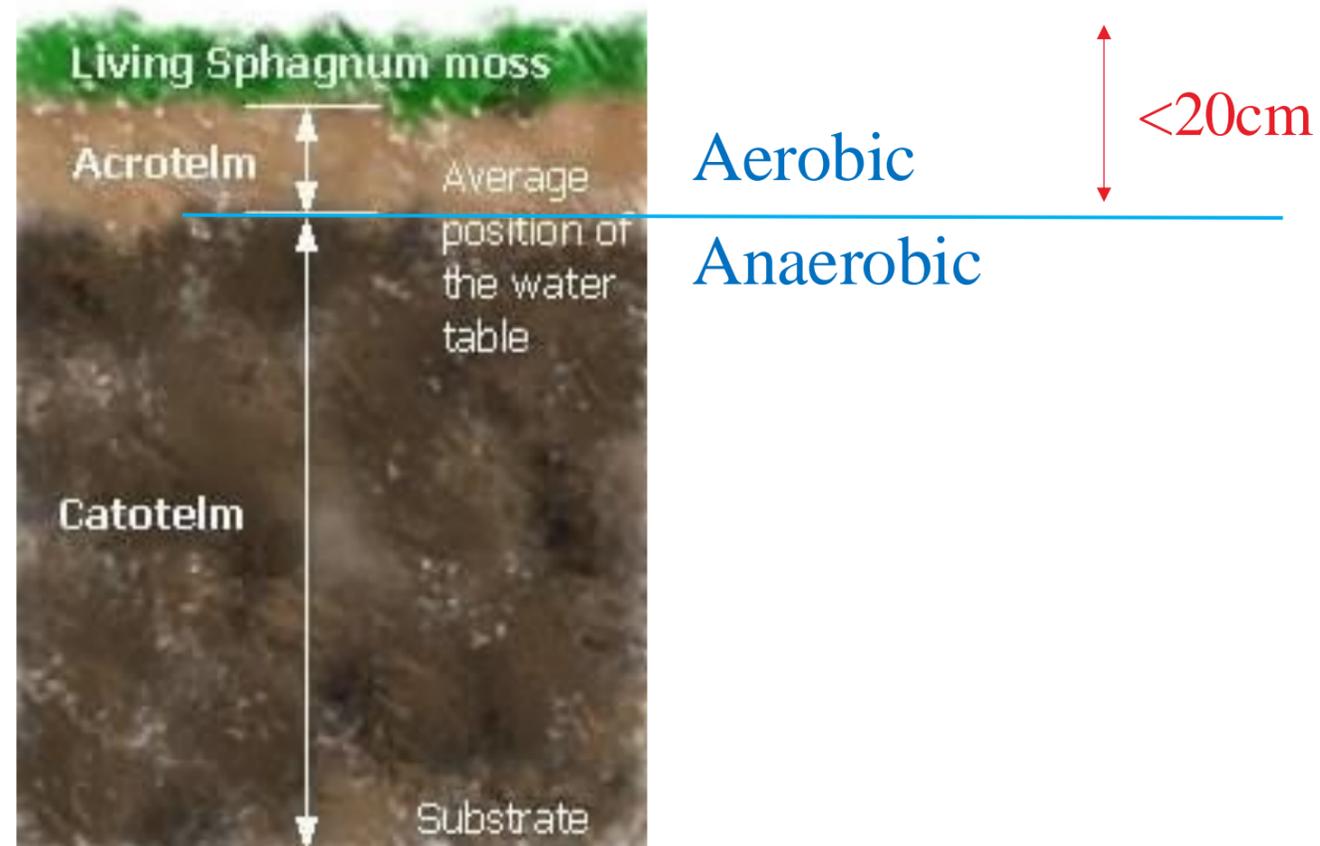
- 2024 research<sup>1</sup> highlights 13% greater coverage of peat soils than previously mapped
- Shallow peat soil now included (>10cm)



# Controls on Peatland Carbon

## Importance of the water table

- Healthy Bog has a very shallow water table



Evans, et. Al. (2021). *Overriding water table control on managed peatland greenhouse gas emissions*. Nature, 593, 548-552.

# Peatlands in TII Project

## Avoiding Peatlands

- 2009 TII Options Selection Guidance
- Geology importance based on volume
- Hydrogeology importance based on SAC/NHA designation

Box 4.1: CRITERIA FOR RATING SITE ATTRIBUTES - Estimation of Importance of Soil and Geology Attributes

Importance	Criteria	Typical Examples
<b>Very High</b>	Attribute has a high quality, significance or value on a regional or national scale Degree or extent of soil contamination is significant on a national or regional scale Volume of peat and/or soft organic soil underlying route is significant on a national or regional scale*	Geological feature rare on a regional or national scale (NHA) Large existing quarry or pit Proven economically extractable mineral resource
<b>High</b>	Attribute has a high quality, significance or value on a local scale Degree or extent of soil contamination is significant on a local scale Volume of peat and/or soft organic soil underlying route is significant on a local scale*	Contaminated soil on site with previous heavy industrial usage Large recent landfill site for mixed wastes Geological feature of high value on a local scale (County Geological Site) Well drained and/or highly fertility soils Moderately sized existing quarry or pit Marginally economic extractable mineral resource

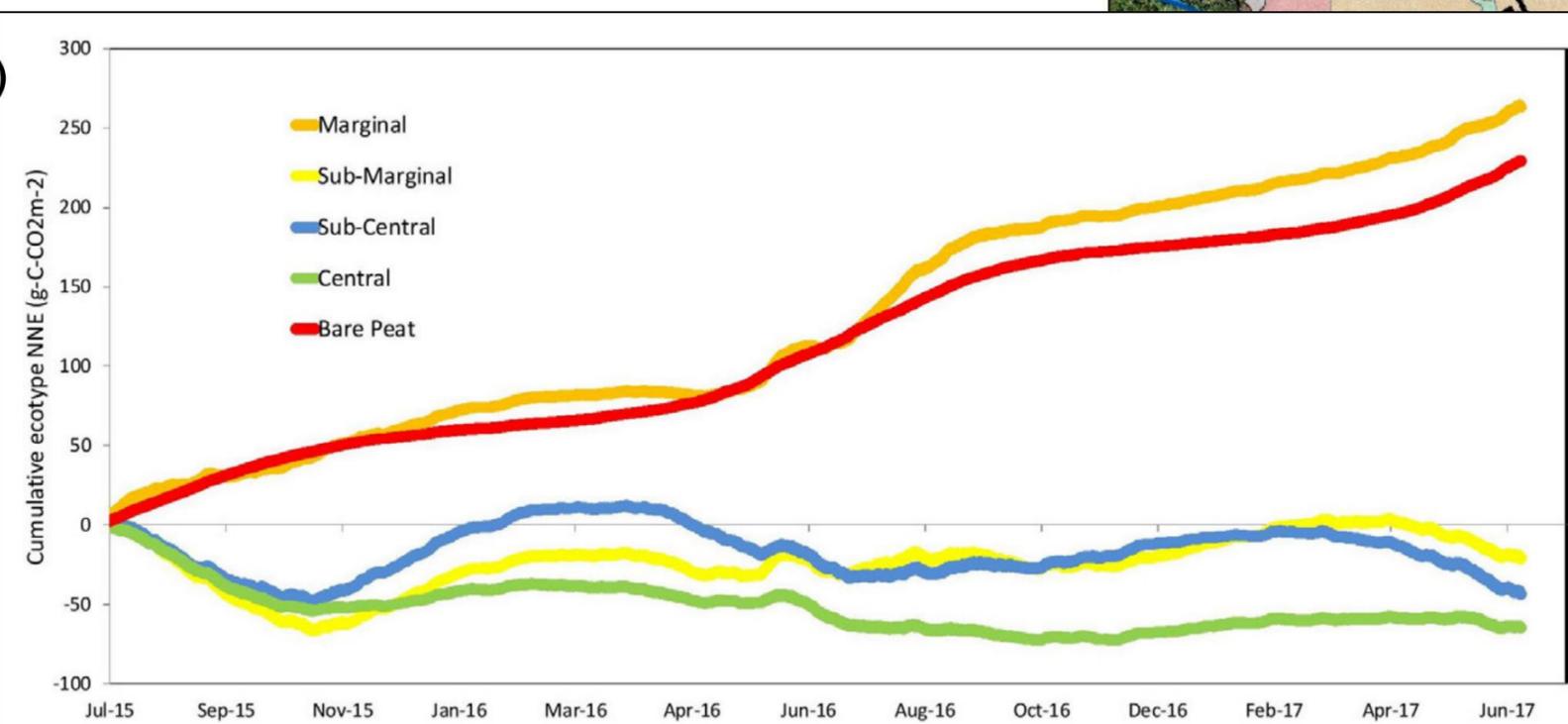
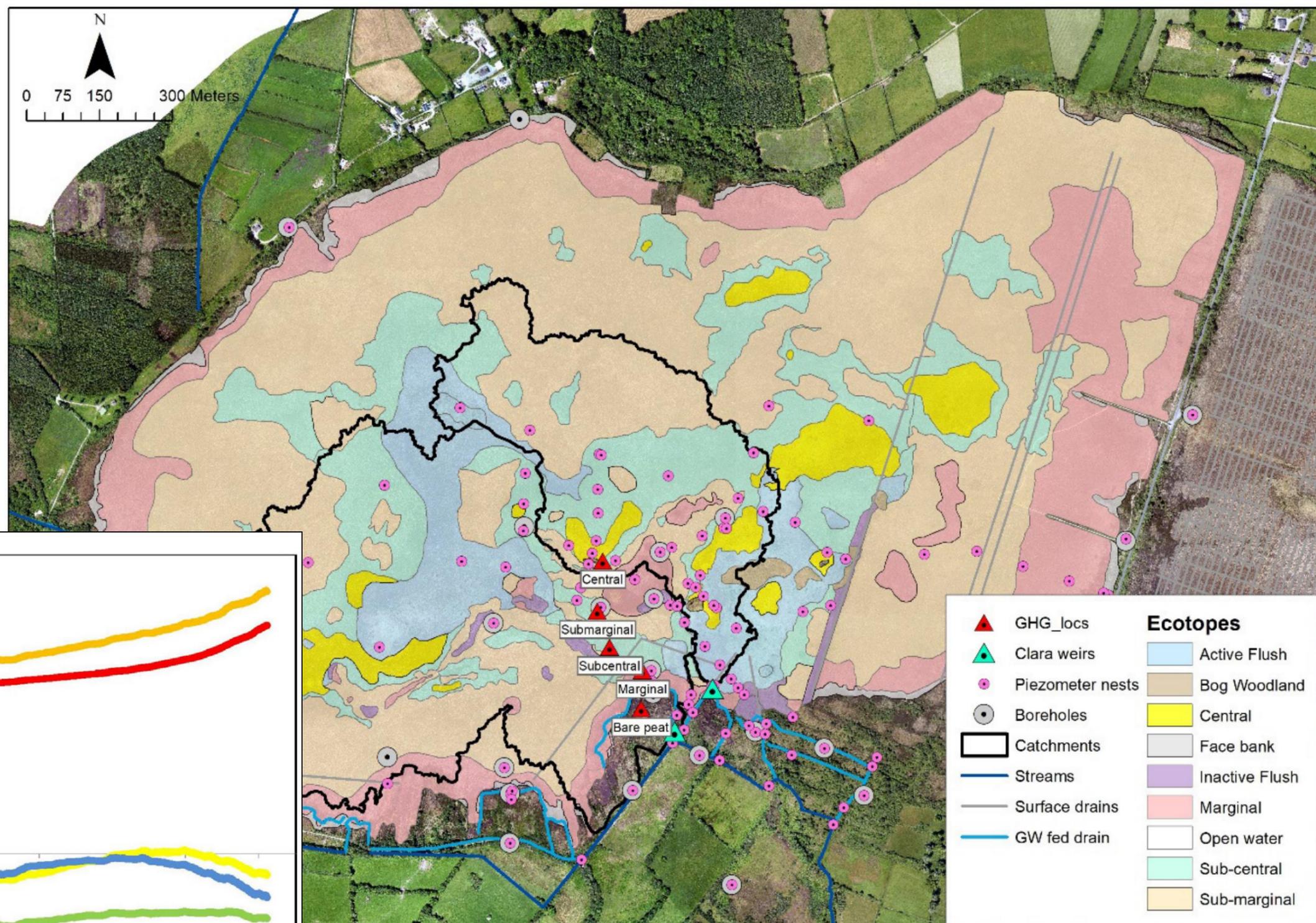
Box 4.3: CRITERIA FOR RATING SITE ATTRIBUTES - Estimation of Importance of Hydrogeology Attributes

Importance	Criteria	Typical Examples
<b>Extremely High</b>	Attribute has a high quality or value on an international scale	Groundwater supports river, wetland or surface water body ecosystem protected by EU legislation e.g. SAC or SPA status
<b>Very High</b>	Attribute has a high quality or value on a regional or national scale	Regionally Important Aquifer with multiple wellfields Groundwater supports river, wetland or surface water body ecosystem protected by national legislation – NHA status Regionally important potable water source supplying >2500 homes Inner source protection area for regionally important water source
<b>High</b>	Attribute has a high quality or value on a local scale	Regionally Important Aquifer Groundwater provides large proportion of baseflow to local rivers Locally important potable water source supplying >1000 homes Outer source protection area for regionally important water source Inner source protection area for locally important water source

# Controls on Biodiversity

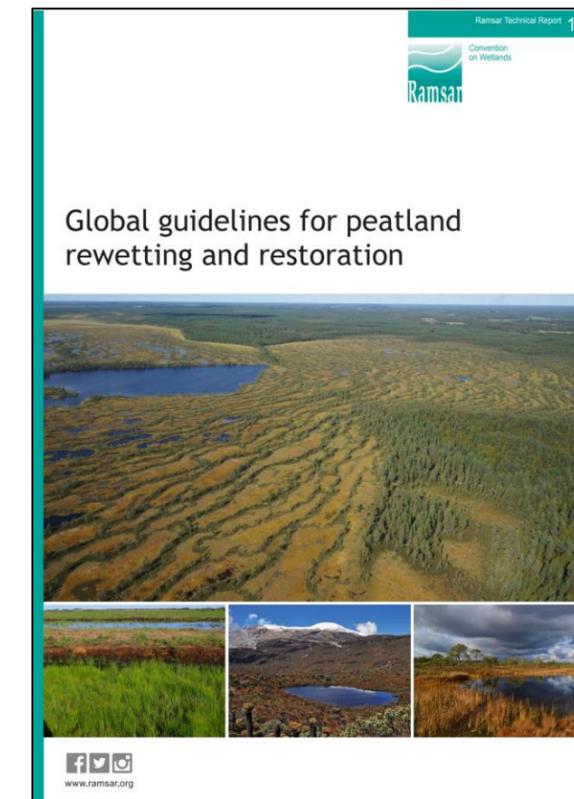
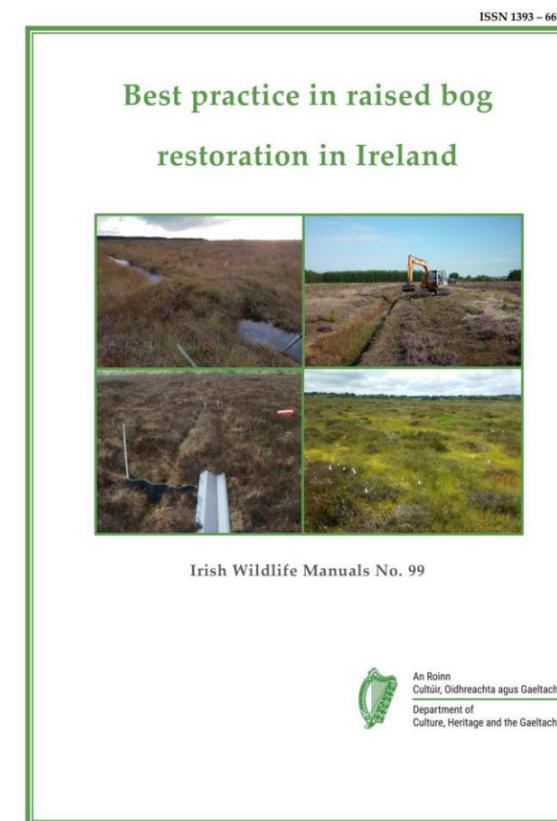
## Ecotope Distribution + Water

- Bog Ecotope
  - Central,
  - Sub-central,
  - Sub-marginal,
  - Marginal



# Peatland Restoration Strategies

- Drain blocking
- Removal of forestry and scrub
- Installation of marginal bunds on cutover
- Inoculation with Sphagnum
- Raised Bog excavation/ re-profiling



Sphagnum inoculation site on Girley Bog, Co. Meath

<https://www.ipcc.ie/advice/peatland-management-diy-tool-kit/restoration-of-sphagnum-moss-growth-on-peatlands/>



From BnM- Methodology Paper for the Enhanced Decommissioning, Rehabilitation and Restoration on Bord na Móna Peatlands – Preliminary Study Showing Kellys Grove Bog June 2021.

# Hydrological Criteria for Peatland Rehabilitation

## Raised Bog

- Objective based on ecotype

Ecotope	Water Level (mbgl) <sup>1</sup>	Slope/ Hydraulic Gradient <sup>1</sup>
Central	<0.1	<0.3%
Sub-central	<0.2	<0.7%
Sub-marginal	>0.2	>0.7%
Marginal		>1%

## Blanket Bog

- Steeper slopes viable due to higher rainfall

## Fen

- Depends on habitat requirements, could include re-establish artesian conditions



Peat Drain Dam (Plastic Sheet Piles) at Cloncroe Bog

# Understanding the Water Balance

## Ground Investigation & Groundwater Monitoring in Peat

- Peat depth probing
- Peat coring and geophysics
- Piezometers for groundwater readings
- Soil Moisture Measurements
- Cone penetration tests
- Remote Sensing

ARUP



Standpipe with geomembrane prior to installation

Peat Cores



Surface humidity



# TII Project Potential Impacts on Peat

- Excavation
- Deposition
- Compaction
- Drainage

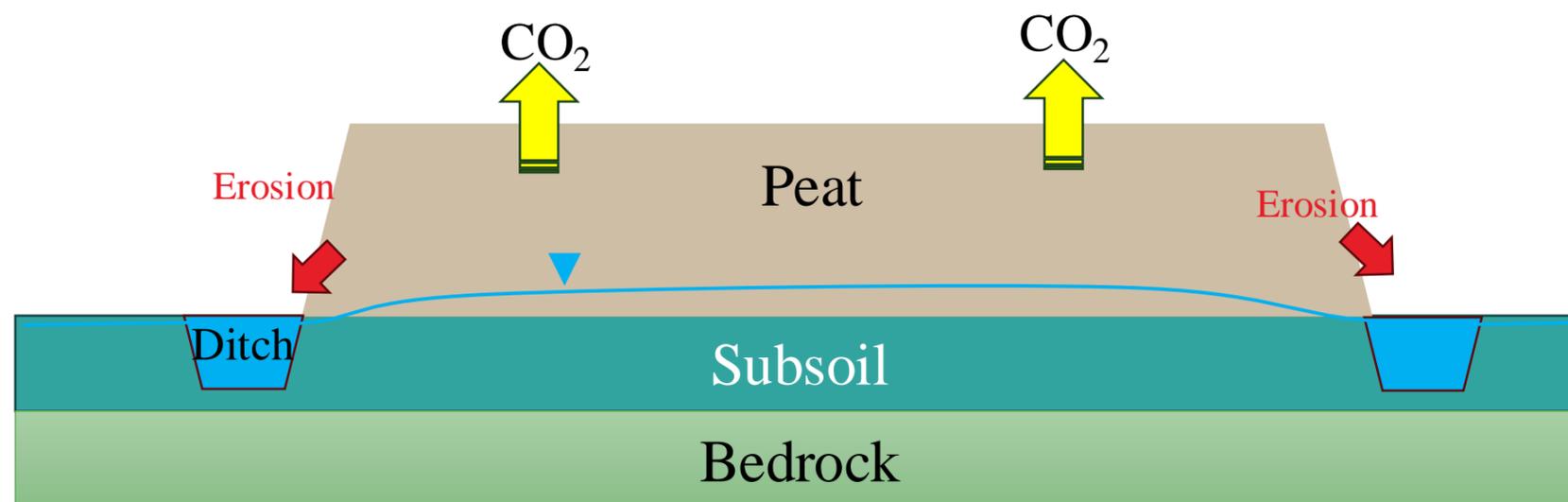


N6 Peat Infilled Borrow Pit

# Peat Deposition Areas

## N6 Pollboy Deposition, Ballinasloe<sup>1</sup>

- 115,000m<sup>3</sup> peat excavated and deposited on top of wet grass land
- Peat deposited 2m thick with Birch/Willow planting
- Erosion by perimeter drains
- Peat drainage leading to decomposition and carbon loss estimated<sup>2</sup> as 11,670 tCO<sub>2</sub>eq over lifetime of project



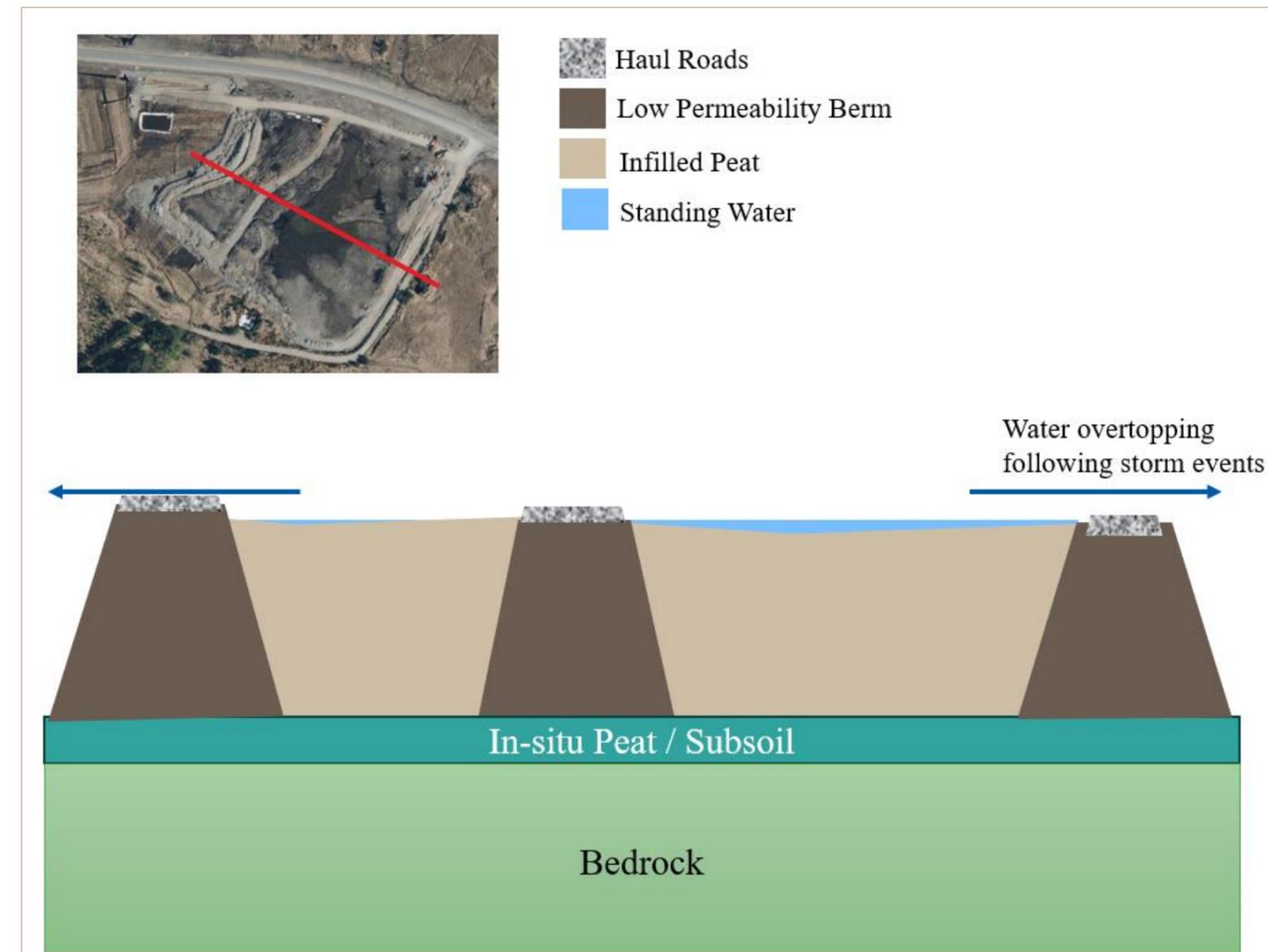
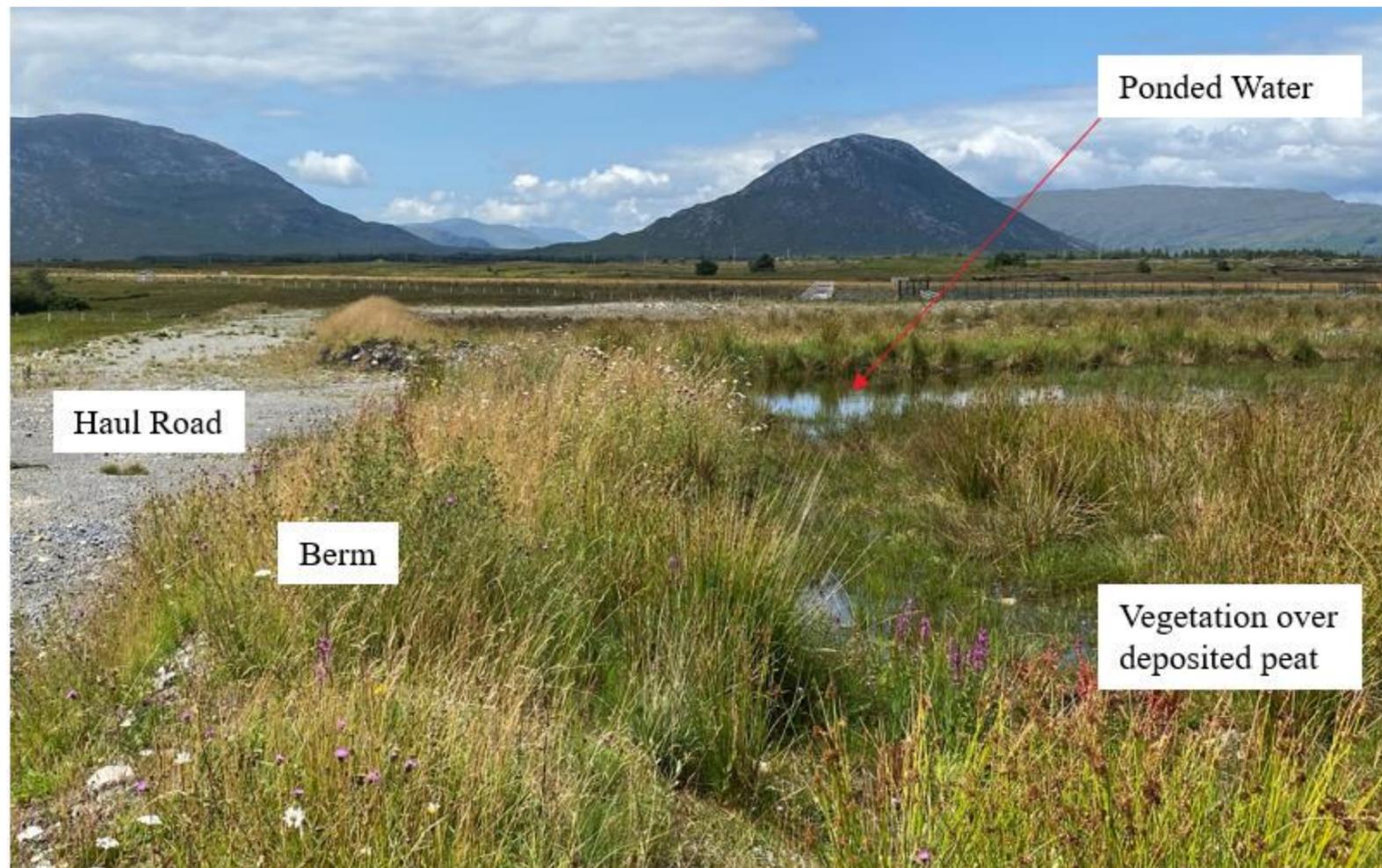
1: RPS (RPS Group), (2004) Environmental impact statement (EIS) N6 Galway to East Ballinasloe. Galway, Ireland, Vol. 1

2: Duggan et. al. (2015) An embodied carbon and embodied energy appraisal of a section of Irish motorway constructed in peatlands. Construction and Building Materials, 79, 402-419.

# Peatland Restoration Areas

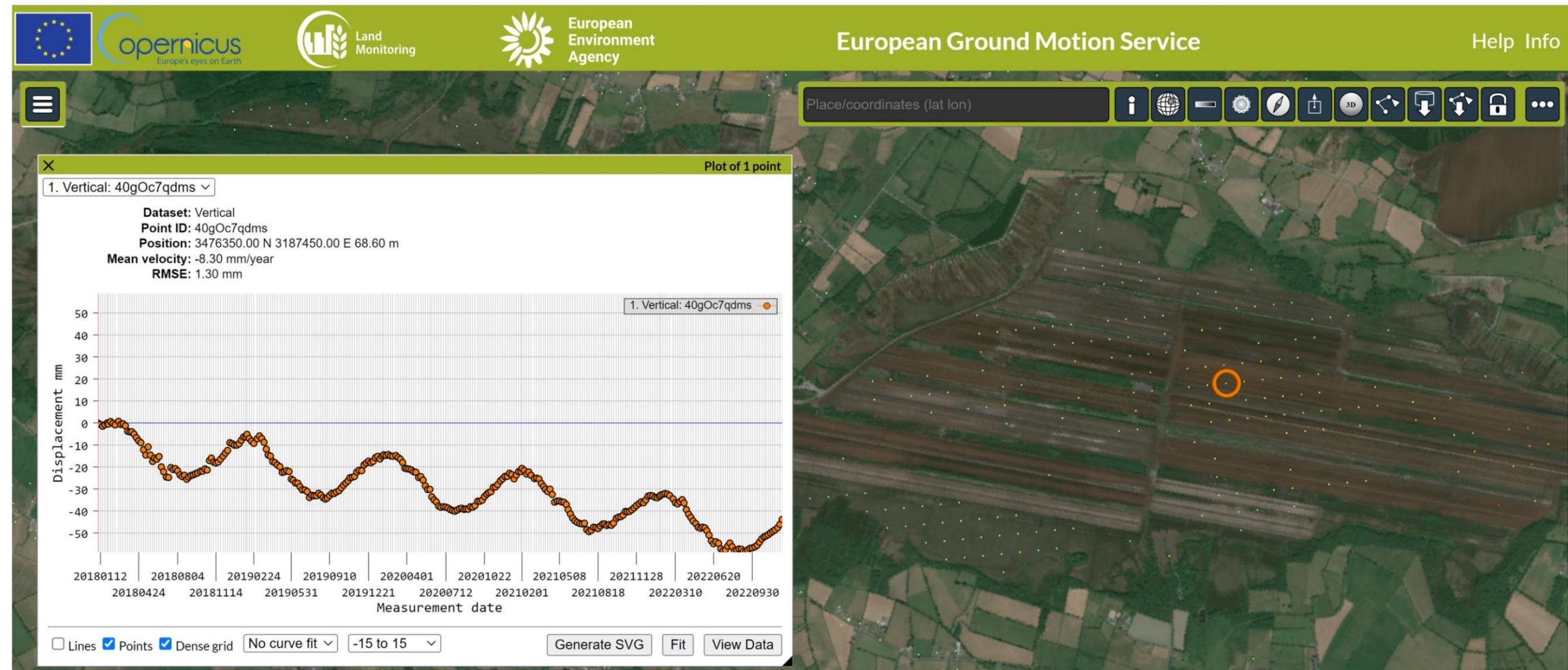
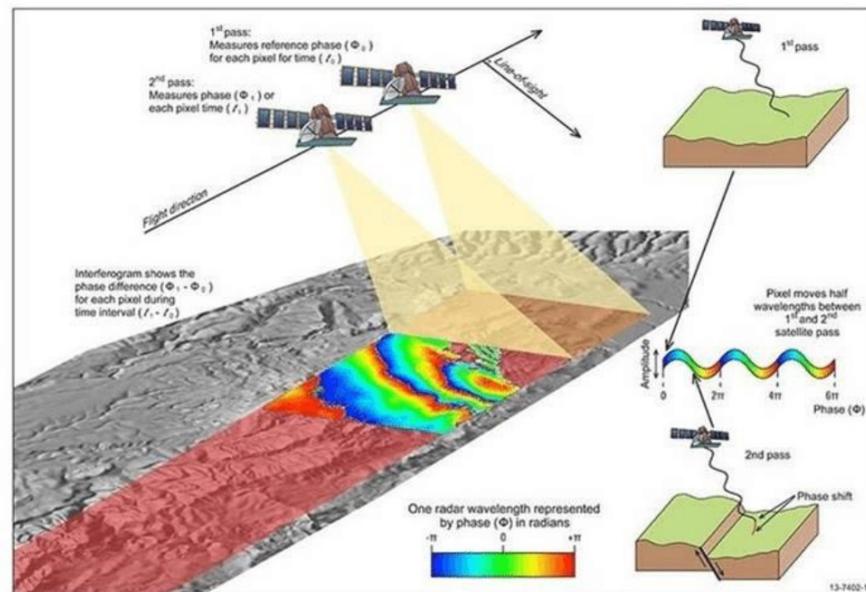
## N59 Maam Cross<sup>1</sup>

- 2 No. Peatland Restoration Areas & 5 No. Deposition Areas
- 190,600m<sup>3</sup> peat deposited within perimeter and internal berms (1.5m) cohesive fill
- Peat slope 1% to promote flow to perimeter

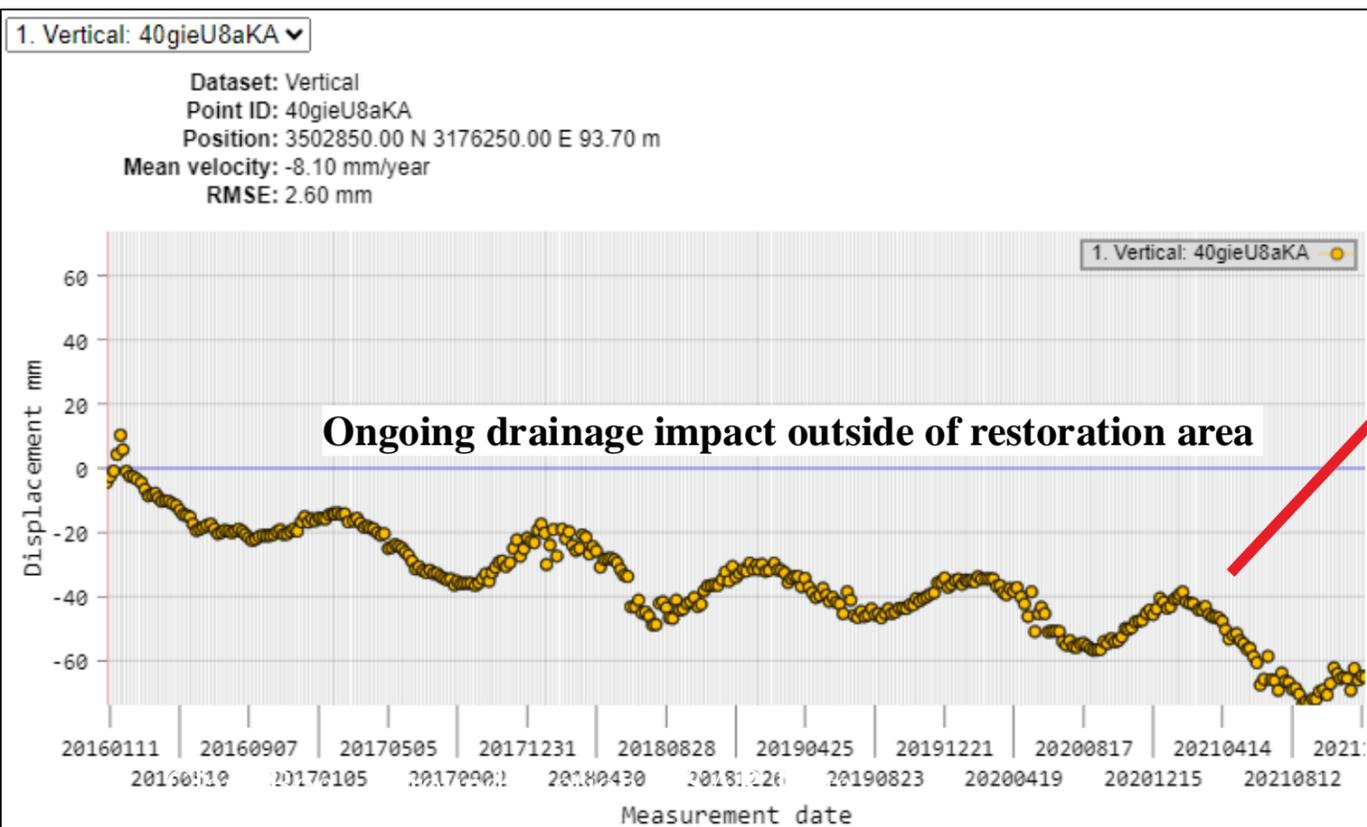
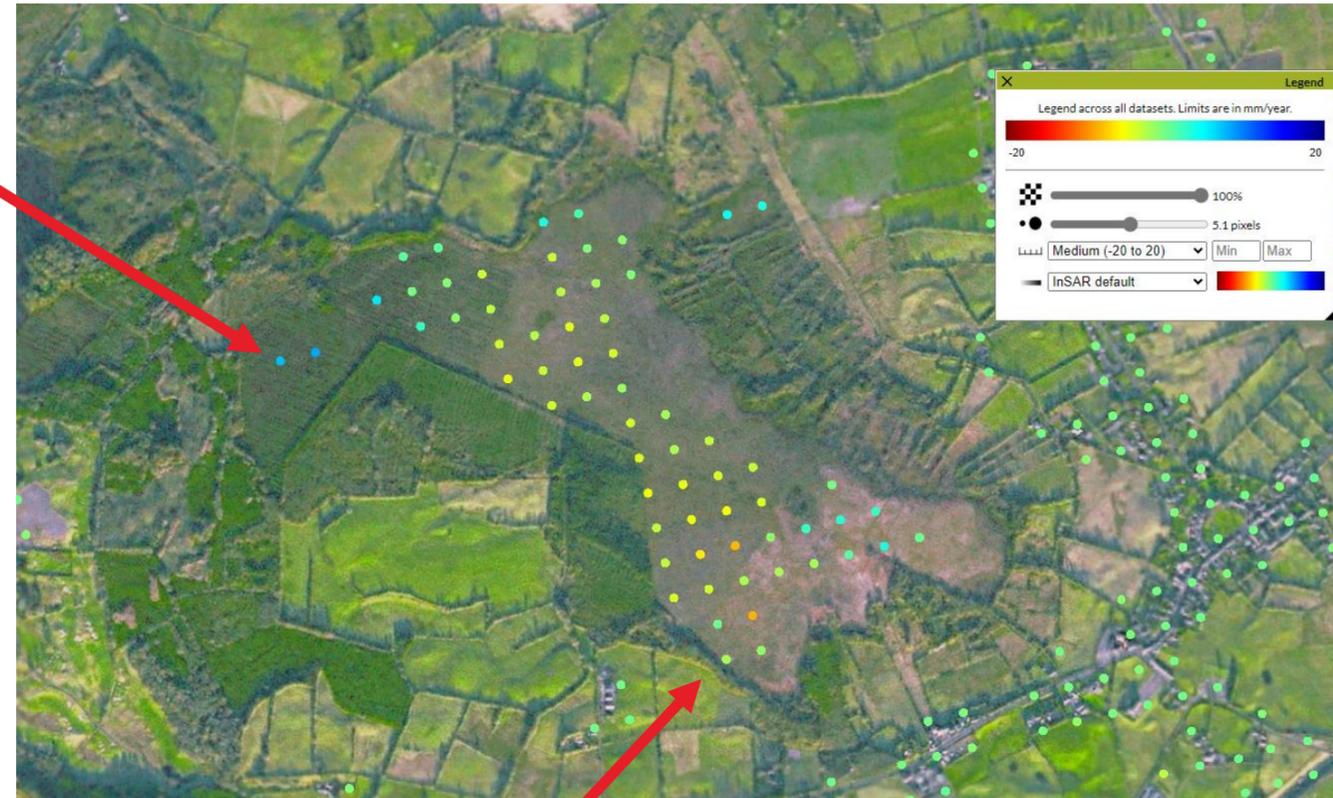
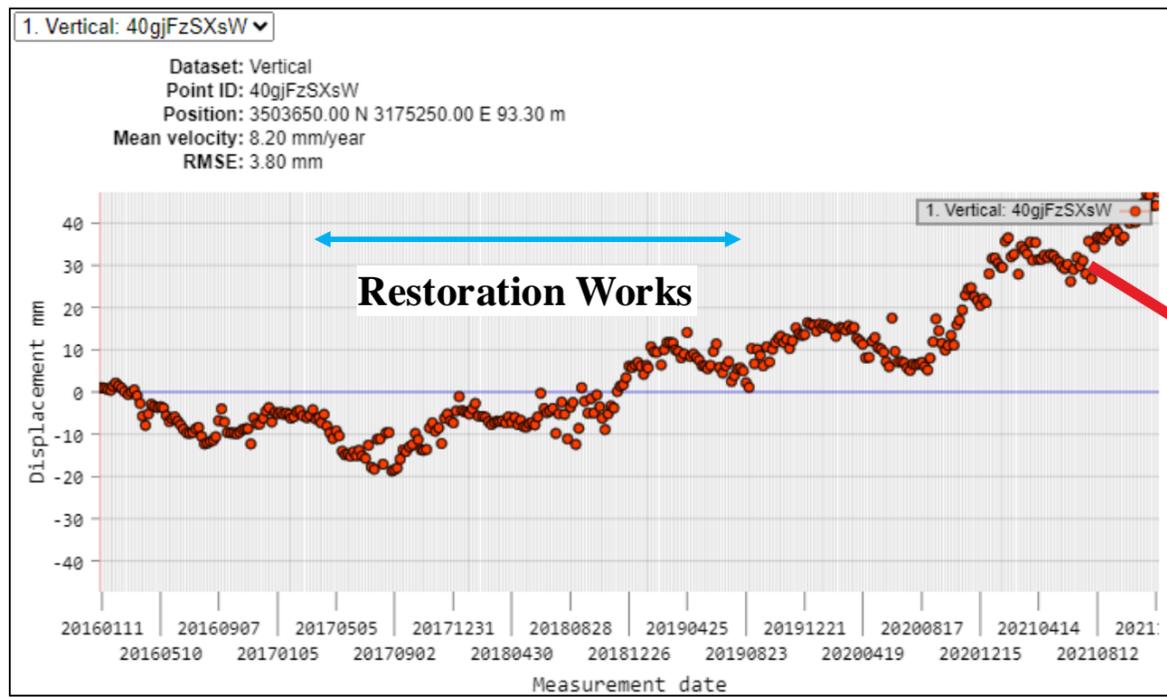


# Mire Breathing

- Raised bogs swell in winter with rainfall and recede in summer
- EGMS provides open source InSAR data monitoring ground movements at millimetre accuracy
- Significant subsidence in some drained bogs >60mm



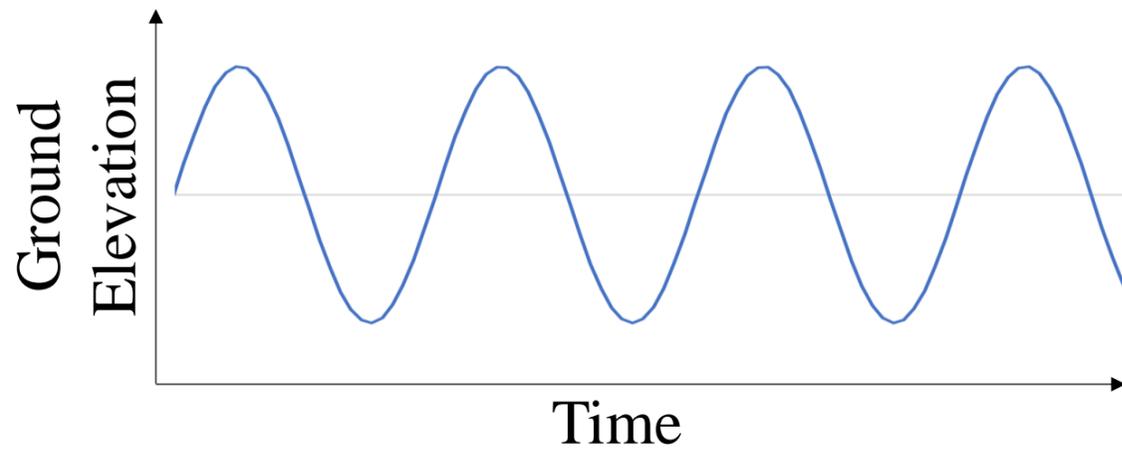
# Cloncrow Bog



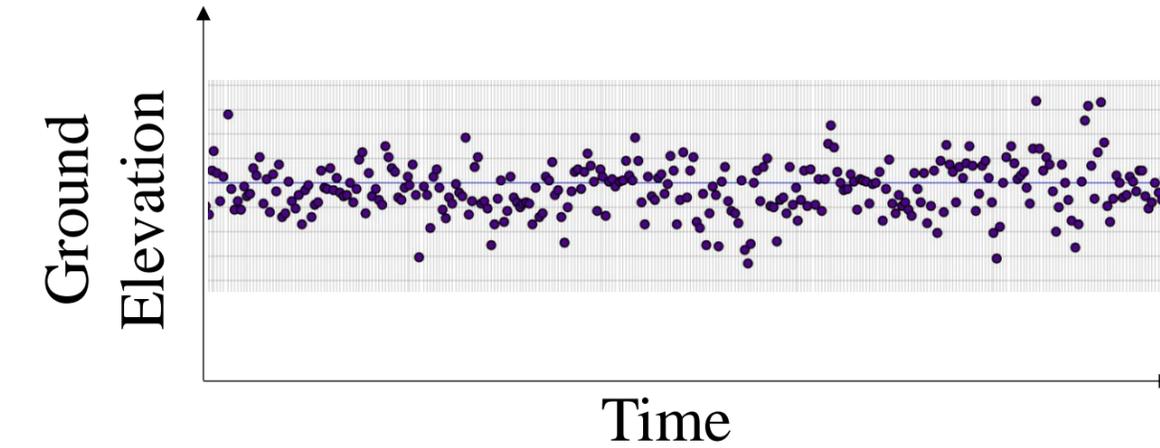
*Drain blocking for peatland restoration*

# Peatland Health Diagnostics

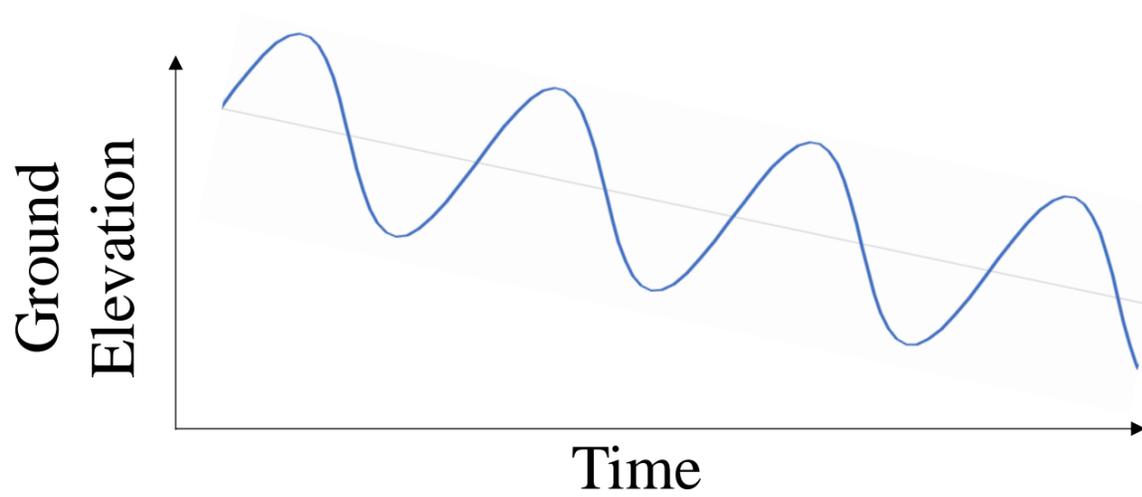
ARUP



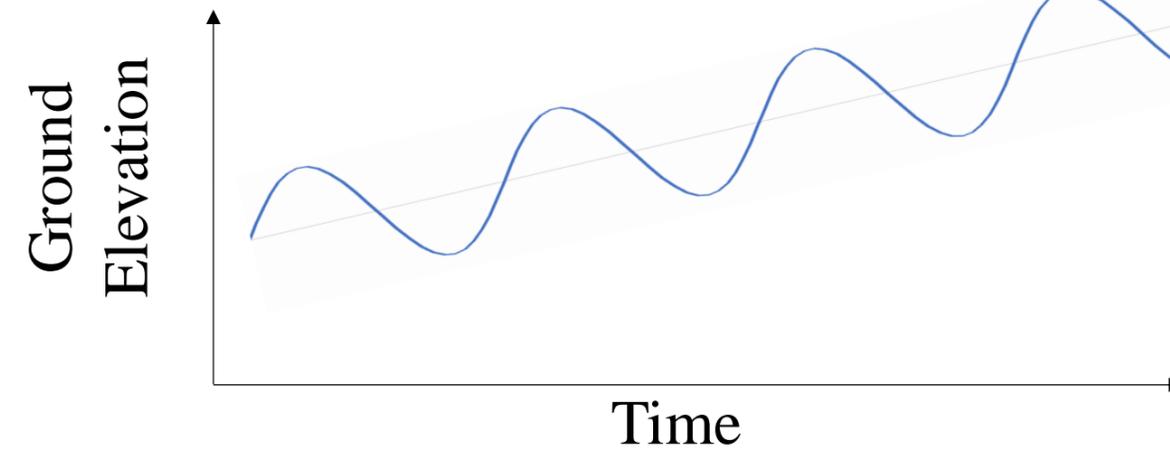
Well Balanced  
"Healthy"



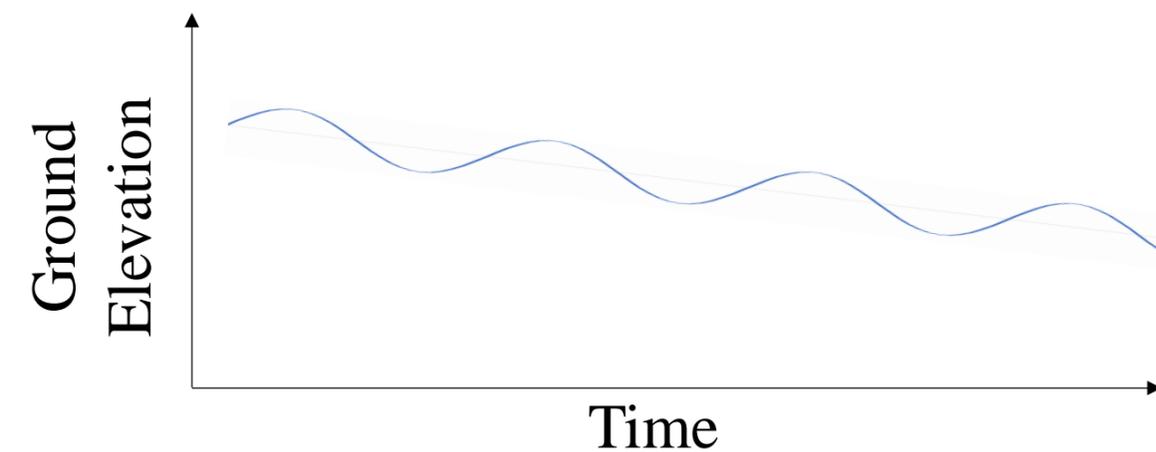
No seasonality =  
mineral soil  
"Dead!"



Depleting  
"Getting Sick"



Increasing  
"Improving"

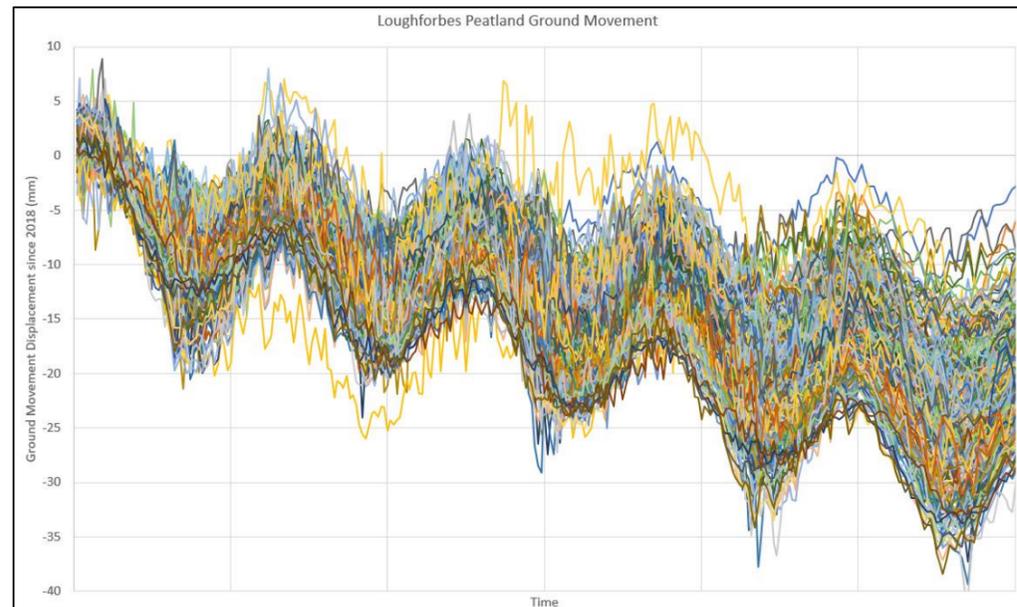


Seasonality  
reduced as peat  
thickness  
depleted "Sick"

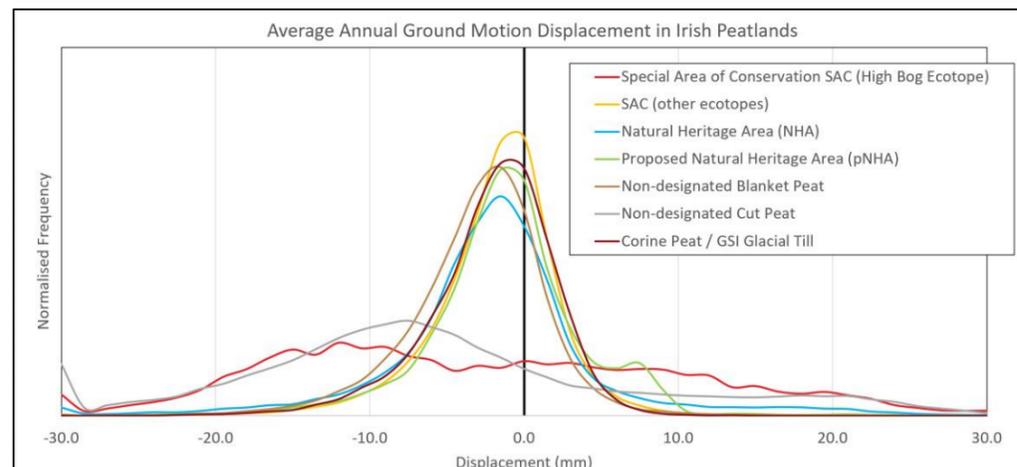
# EGMS Analysis at scale

## Analysis of all peatlands in Ireland

- Extract EGMS data for all peat areas.
- Attribute data with geology and habitat designations
- Compile for individual SACs to determine most significantly impacted



Name	Average Displacement (mm)	Sum of Displacement	No. Points	Volume Balance (m3)	Water Balance (m3)
Kilsallagh Bog SAC	-2	-284	158	448,886	403,997
Lisnageeragh Bog and Ballin...	1	363	252	914,851	823,366
Shankill West Bog SAC	5	244	48	117,213	105,492
Lough Ree SAC	14	5839	414	24,172,816	21,755,534
Flughany Bog SAC	-16	-2104	131	2,756,551	2,480,905
Clara Bog SAC	-4	-109	28	30,502	27,452
Bellanagare Bog SAC	-15	-11752	794	93,308,398	83,977,558
Callow Bog SAC	-23	-7576	328	24,849,939	22,364,990
Carrowbehy/Caher Bog SAC	-17	-3271	194	6,346,481	5,711,788
Cloonchambers Bog SAC	-13	-2289	171	3,914,693	3,523,224
Derrinea Bog SAC	-15	-713	49	349,210	314,289
Cloonshanville Bog SAC	-9	-1108	123	1,363,385	1,227,047
Garriskil Bog SAC	13	1595	127	2,025,875	1,823,287
Carrowmagappul Bog SAC	2	555	304	1,686,403	1,517,762
Lough Forbes Complex SAC	-13	-3359	262	8,800,012	7,920,011
Corliskea/Trien/Cloonfelliv	-5	-2170	425	9,221,695	8,299,526
River Moy SAC	-14	-6411	464	29,745,330	26,770,797
Carn Park Bog SAC	-3	-241	80	193,200	173,880
Crosswood Bog SAC	5	332	66	219,023	197,121
Drumalough Bog SAC	-18	-2085	119	2,481,384	2,233,245
Ballynamona Bog and Corkip...	-11	-442	39	172,571	155,314
Moneybeg and Clareisland E...	9	937	104	974,397	876,957
Ardagullion Bog SAC	11	446	41	182,934	164,640
Mount Hevey Bog SAC	5	107	23	24,713	22,242
Brown Bog SAC	11	107	10	10,722	9,650
Camderry Bog SAC	3	546	175	955,232	859,709
Clooneen Bog SAC	6	513	85	436,252	392,627
Corbo Bog SAC	5	402	85	342,006	307,806
Curraghlahanagh Bog SAC	-3	-397	132	523,876	471,488
Tullaghanrock Bog SAC	-18	-1056	60	633,886	570,497



# Conclusions

- Peatland important for biodiversity, carbon, water quality & flooding
- New TII Peatland Guidance in progress
- Peat traditionally viewed as a problem for projects
- Early identification and investigation crucial
- Guidance to help identify opportunities for nature-based solutions
- Ambition is to look beyond immediate project footprint and deliver significant benefit

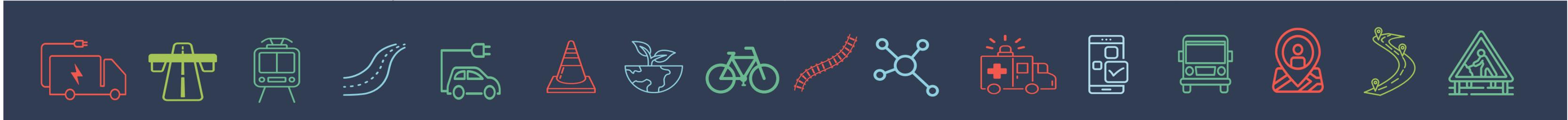


ARUP

# Green Procurement and Carbon Ladder

*Micheál O'Connor, TII*

*PJ Hourigan, TII*



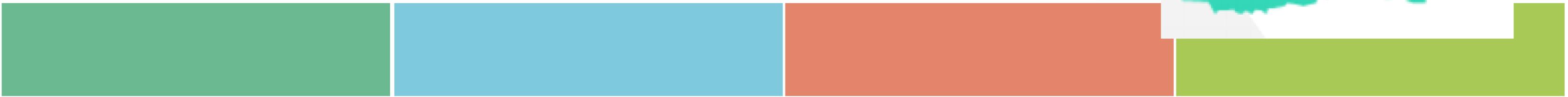
# CO<sub>2</sub> Performance Ladder Trial on the M7 Kildare Bypass Pavement Scheme

Micheál Ó Connor, Senior Procurement Executive, TII  
PJ Hourigan, Asset Management Engineer, TII



# Summary of Presentation

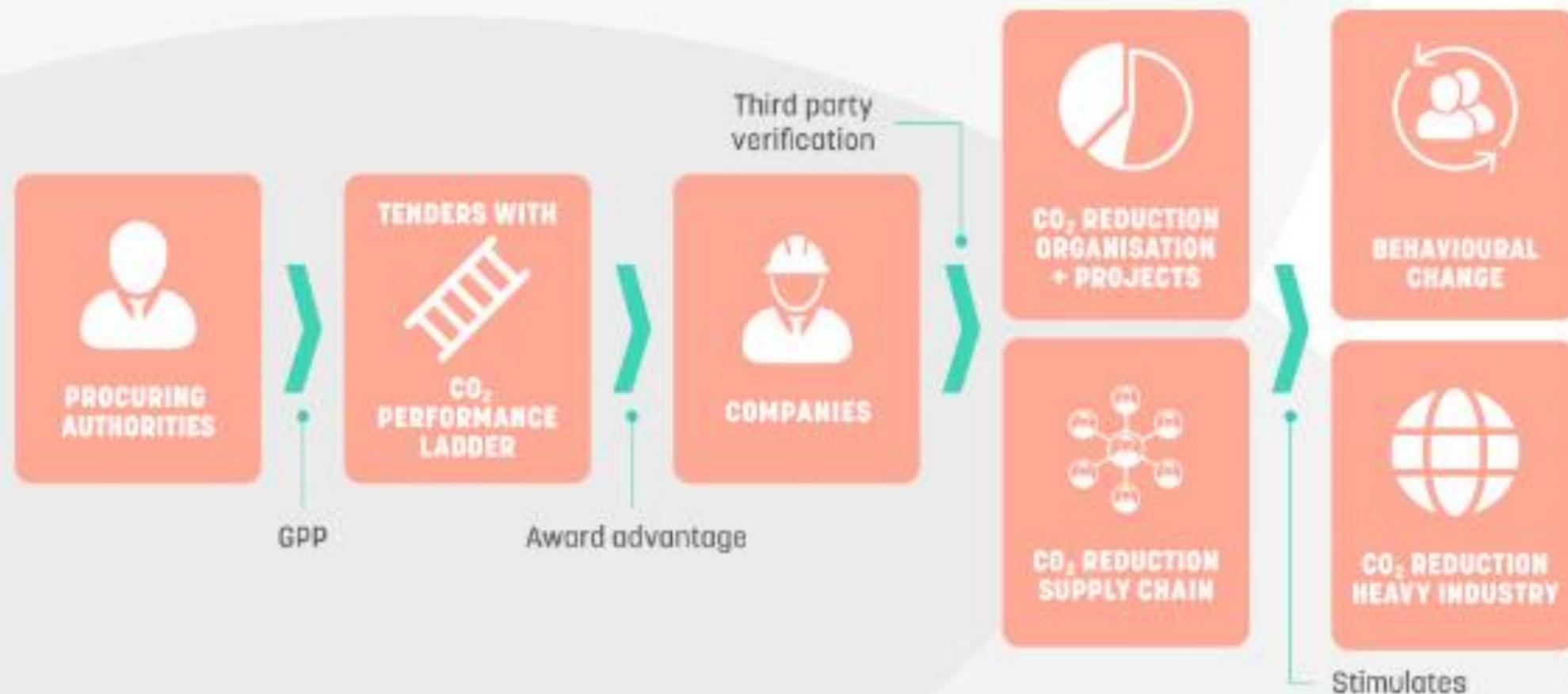
- What is the CO2 Performance Ladder
- CO2 Performance Ladder as a green procurement tool and as a management system.
- TII Pilot Project implementation.
- Update on TII's Pilot Project post contract award, including the 21% carbon reduction achieved.
- Feedback from Contractor on Pilot Project



# What is the CO<sub>2</sub> Performance Ladder

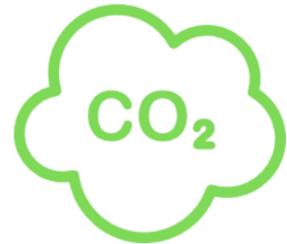
## Theory of Change

The CO<sub>2</sub> Performance Ladder is an effective procurement tool that uses the 'Power of Procurement' to stimulate structural decarbonisation.



CO<sub>2</sub> reduction is rewarded with award (financial) advantage for the bidding companies. The higher the ambition level of the company, the higher the award advantage.

# Why is this Important to TII



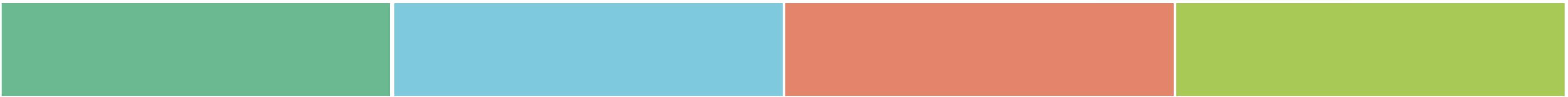
- Contribute to 2030 targets for reducing CO2e emissions and improving energy efficiency.



- Deliver on TII's Vision.



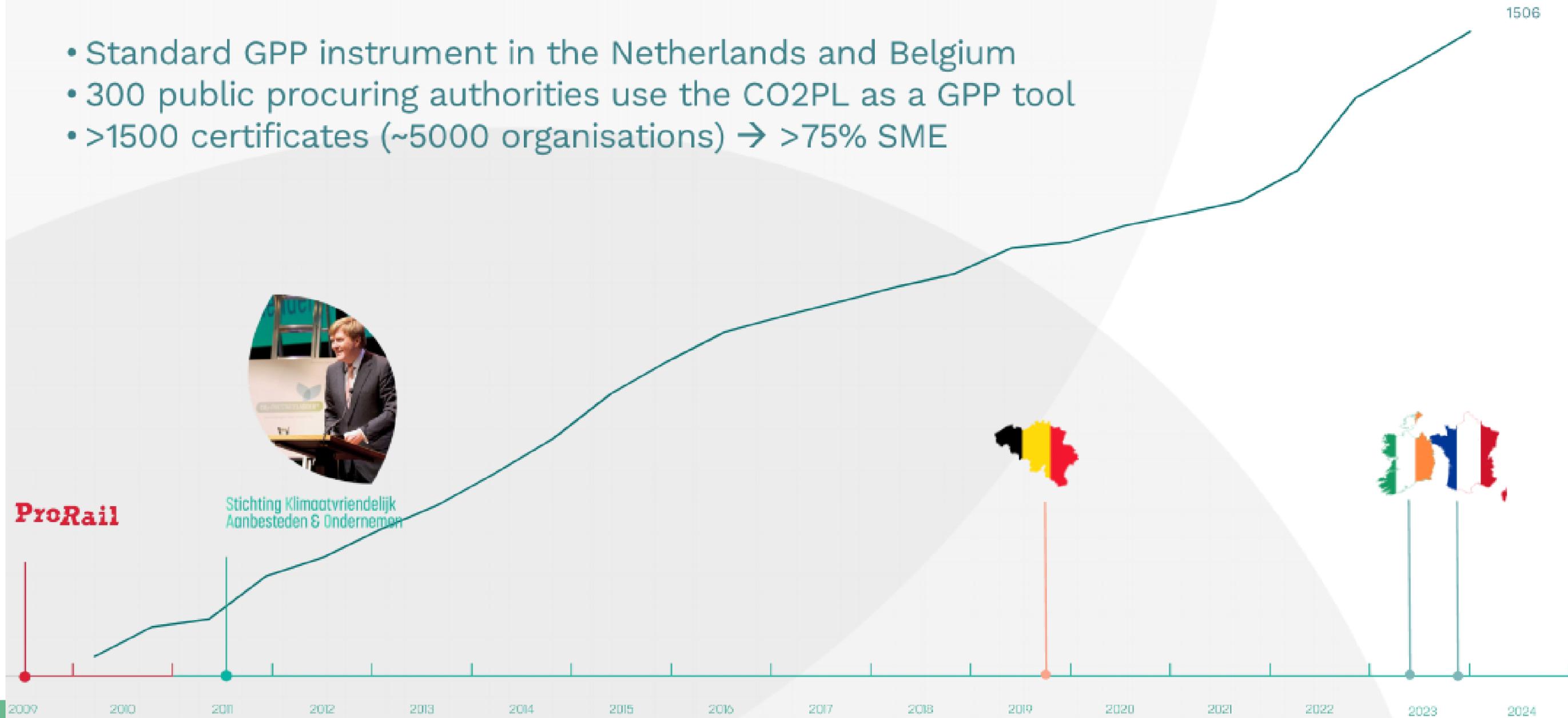
- Comply with Green Public Procurement Strategy and Action Plan 2024 – 2027.



# Background CO<sub>2</sub> Performance Ladder

## 15 years CO<sub>2</sub> Performance Ladder

- Standard GPP instrument in the Netherlands and Belgium
- 300 public procuring authorities use the CO2PL as a GPP tool
- >1500 certificates (~5000 organisations) → >75% SME



ProRail

Stichting Klimaatvriendelijk  
Aanbesteden & Ondernemen



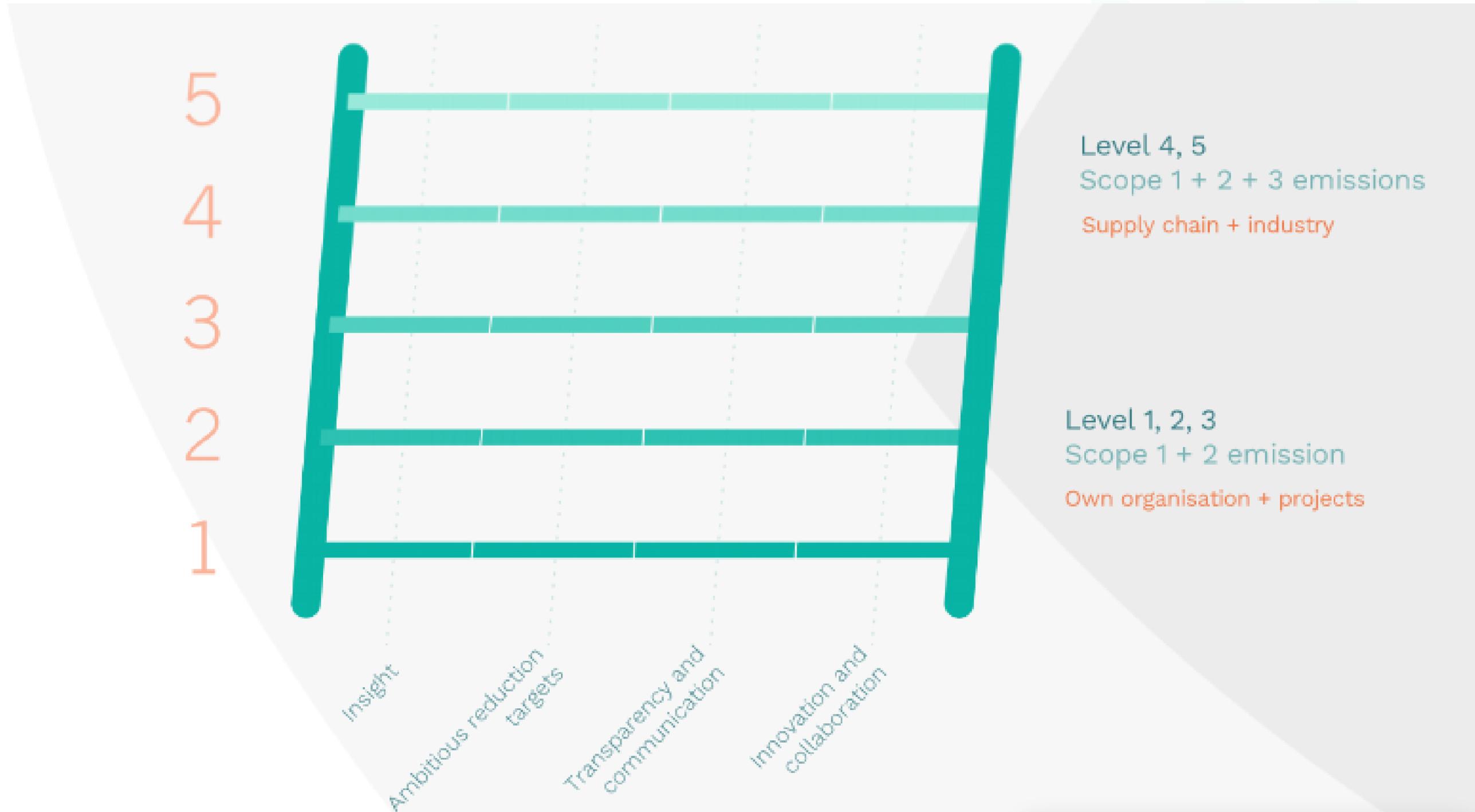
# CO2 Performance Ladder as a green procurement tool

Green (public)  
procurement tool

CO <sub>2</sub> Ambition level	Award advantage
Level 5	10 %
Level 4	7 %
Level 3	4 %
Level 2	2 %
Level 1	1 %



# CO2 Performance Ladder as a management system



# TII Pilot Project implementation.

1

Familiarise your organisation with the ladder.

2

Selection of suitable project (M7 Kildare Bypass Pavement Scheme).

3

Market Consultation.

4

Incorporate CO2 Performance Ladder in Tender Documents.



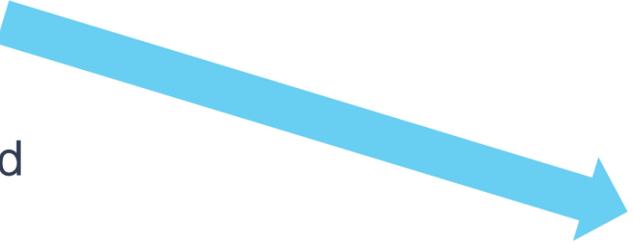
# CO<sub>2</sub> Performance Ladder Requirements for this Tender

## Revisions Required to Tender Documents

- Minor text additions to include the provisions of the CO<sub>2</sub> Performance Ladder process
- ITT: Updated Appendix 5 Comparative Cost of Tender table to include notional discount
- ITT: Included Appendix 6 which details the CO<sub>2</sub> Performance Ladder process
  - Options for achieving Implementation Levels
    - Certified Project Statement or CO<sub>2</sub> Awareness Certificate
  - Award advantage (notional discount on tender sum) for implementation level
  - Non-performance charges details
    - 1.25(difference between achieved award advantage and desired implementation level)
- Additional Information: Include CO<sub>2</sub> Performance Ladder Handbook 3.1

## Additional Documents to be Submitted by Tenderers

- Implementation Level Form
- Works Proposal to include a one page submission detailing how the Tenderer intends to achieve their proposed implementation level



Implementation Level	Award Advantage
1	1%
2	2%
3	4%
4	5%
5	7%

# Tender Return & Winning bidder

**All 5 tenderers committed to either ambition level 3 or 4**

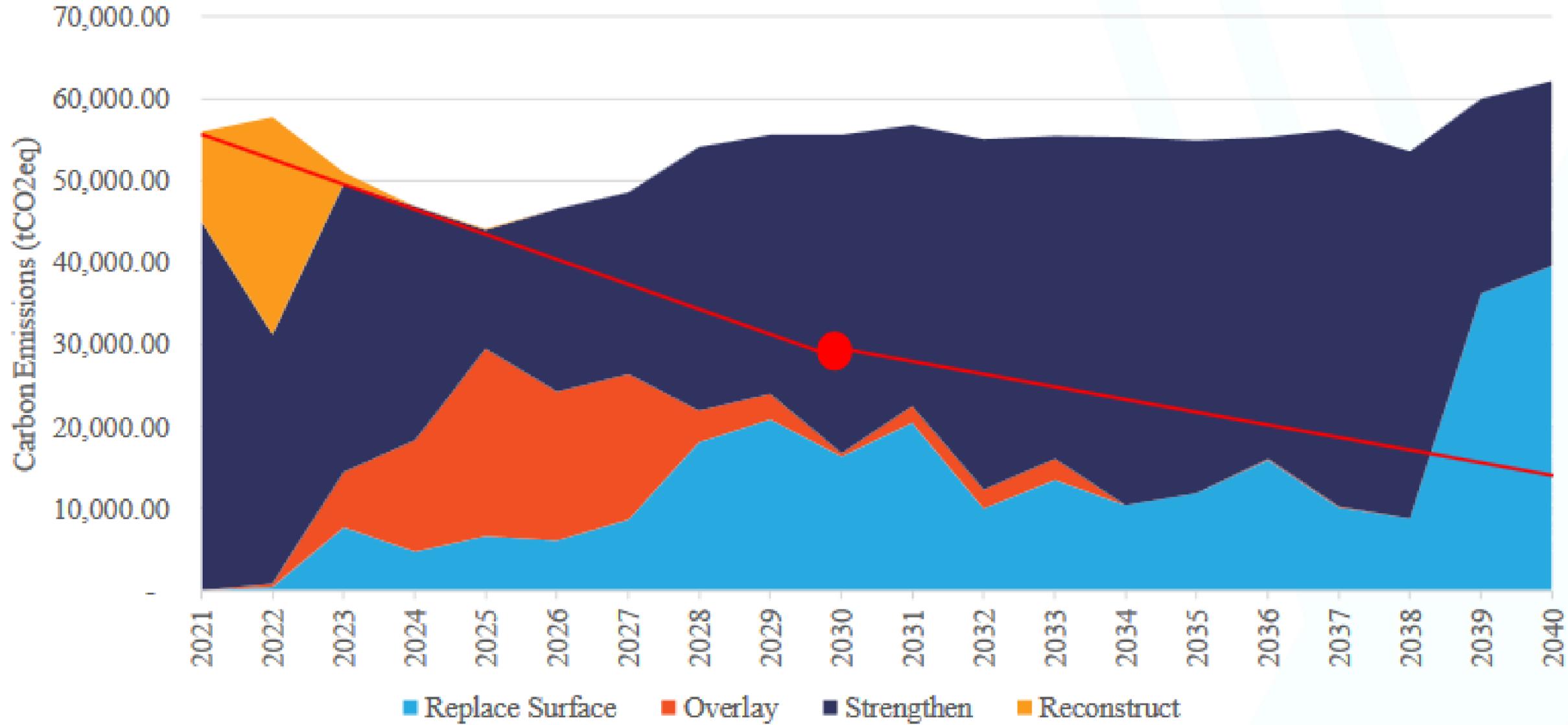
**Winning Bidder committed to level 4**

**The contract sum was in line with the estimate for the works.**



# Technical Motivation for CO2 Performance Ladder Trial

€110 millions Investment Scenario



<https://www.tii.ie/media/iseputzak/rgc-2023-52-stephen-smyth-tii-olivier-mainardis-arup-tackling-carbon-in-tii-pavement-assets.pdf>



# The Pilot Scheme

## Project Details

### M7 Kildare Bypass Pavement Scheme

- Pavement Asset Repair and Rehabilitation (PARR) Scheme
- 11.5km of Motorway (in one direction)
- Estimated contract value of €4 million
- 3 month duration
- Asphalt surface course renewal
- Diversion required
- Night works to minimise disruption

## Contract Overview

- Sanctioning Authority & Contracting Authority
  - TII
- Designer, Document Compliers & Employers Representative
  - Atkins Réalis

## Procurement Overview

- Existing pavement framework for high speed pavement works
- Pre tender consultation to encourage buy-in to the CO<sub>2</sub> Performance Ladder
- Capital Works Management Framework
  - PW-CF5 contract documents



# CO2 Performance Ladder as a Project Management Tool



- Forecast baseline CO<sub>2</sub> emissions
- Identify CO<sub>2</sub> reduction measures

- Agree CO<sub>2</sub> reduction measures that impact the design/contract

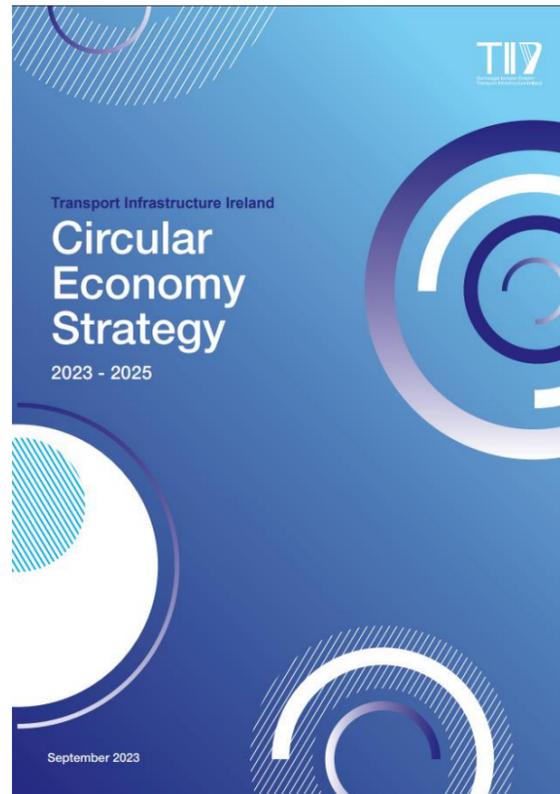
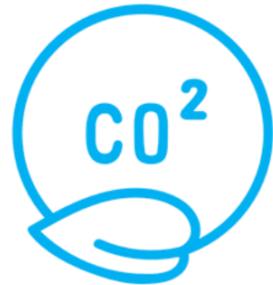
- Verification of the implementation of site measures

- Calculation of expended CO<sub>2</sub> emissions
- Award of Implementation Level
- Compile Project File

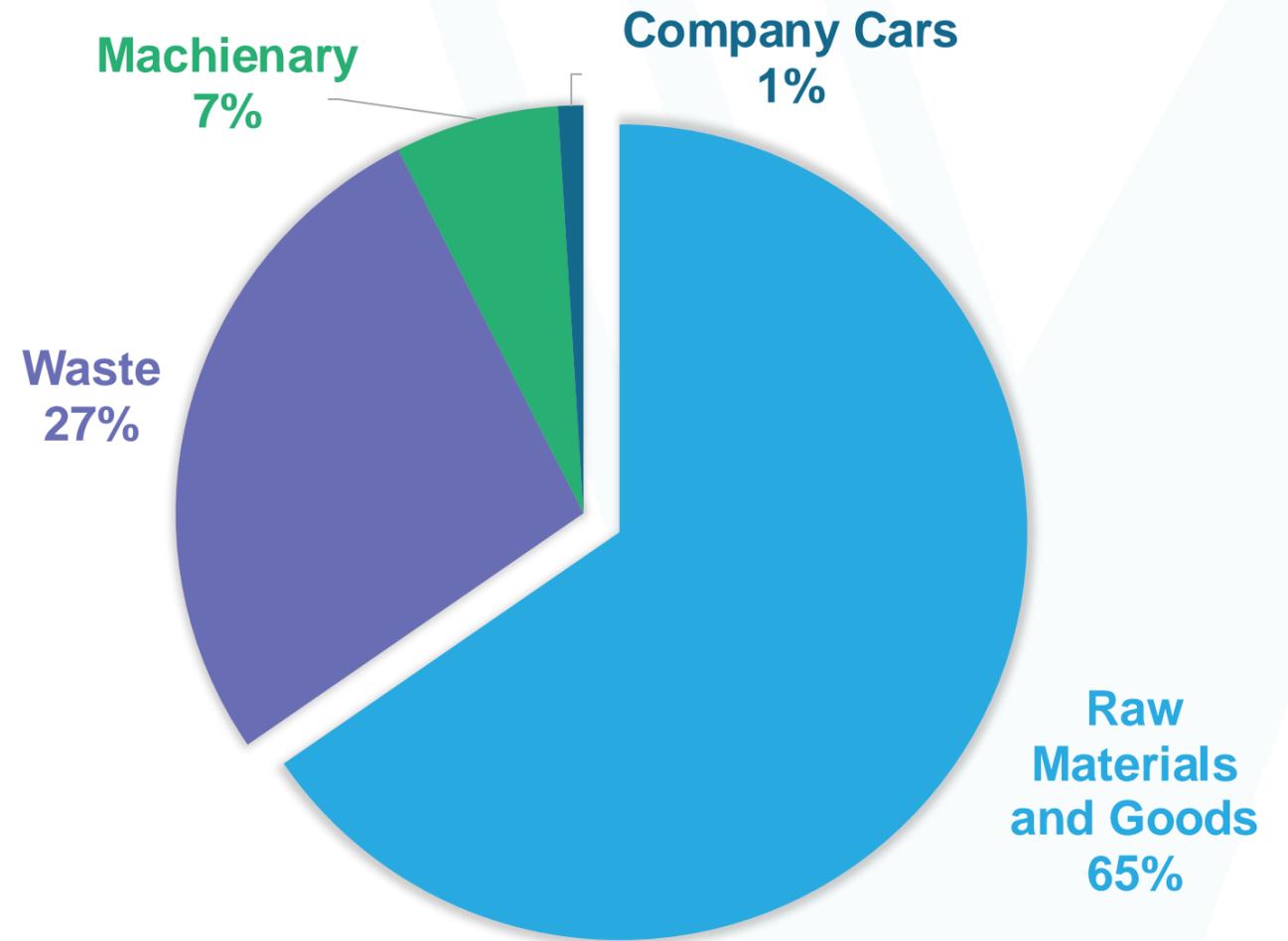
# CO2 Reduction Dialog

## Potential CO2 Reduction measures

- Use of recycled material in the surface course
- Use of asphalt planings to reduce waste
- Reduce thickness of the surface course
- Use of alternatives to diesel
- Change in operational behaviours
- Extend site working hours



## CO2 Emissions Forecast



# Materials Innovation

## HRA RAP Trial

- Reuse of asphalt planings to reduce waste
- Site won planings reused in the new trial surface course materials:
  - 15% RAP HRA
  - 35% RAP HRA
- 500m of “standard” HRA constructed as a control section, to be used as a baseline for future evaluation of the trial materials.



Environmental Product Declaration in Accordance with EN 15804+A2 & ISO 14025 / ISO 21930			
Material Type	HRA 35/14 F Surf 40/60 Des (Tullamore)	HRA 35/14 F Surf 40/60 Des (15% RAP Tullamore)	HRA 35/14 F Surf 40/60 Des (35% RAP Tullamore)
GWP – Total (A1 – A3)	76.5kg CO <sub>2</sub> eq.	71.6kg CO <sub>2</sub> eq.	67.4kg CO <sub>2</sub> eq.
Difference to “standard” material	-	-6.4%	-11.9%



## We achieved a 21% reduction in carbon emissions



### Carbon Reduction Success

**Scope 1** ↓ 84.5%

**Scope 3** ↓ 20.3%

### Key Initiatives Behind Our Carbon Reduction Success

We implemented several key initiatives aimed at minimising environmental impact. One of the primary measures was our collaboration with TII and Kilsaran in reusing road planings in the Hot Rolled Asphalt (HRA), a first of its kind initiative. We also embraced sustainability by the use of Hydrotreated Vegetable Oil (HVO) as an alternative fuel, significantly reducing our carbon emissions compared to traditional diesel. To further reduce our carbon footprint, we focused on decreasing idling times and unnecessary travel through a combination of staff education and the adoption of best practices, leading to lower fuel consumption and emissions. Additionally, by optimising processes and enhancing efficiency, we successfully minimised the amount of material waste generated and additional fuel usage during the project. These combined efforts highlight our commitment to sustainability and responsible environmental management.

### Material and Travel Reduction

**Total Reduction in = 311T CO2e**

126T from Equipment

165T from Material

20T from Cars and Travel

Thank you everyone, for your dedication and hard work in making this project a success and significantly reducing our environmental impact

# Criteria Example-Communication



3C

## Communication

1. The contractor communicates structurally internally and externally about the CO<sub>2</sub> footprint (scope 1 & 2 and business travel), the quantitative reduction objective(s) and the measures in the project.

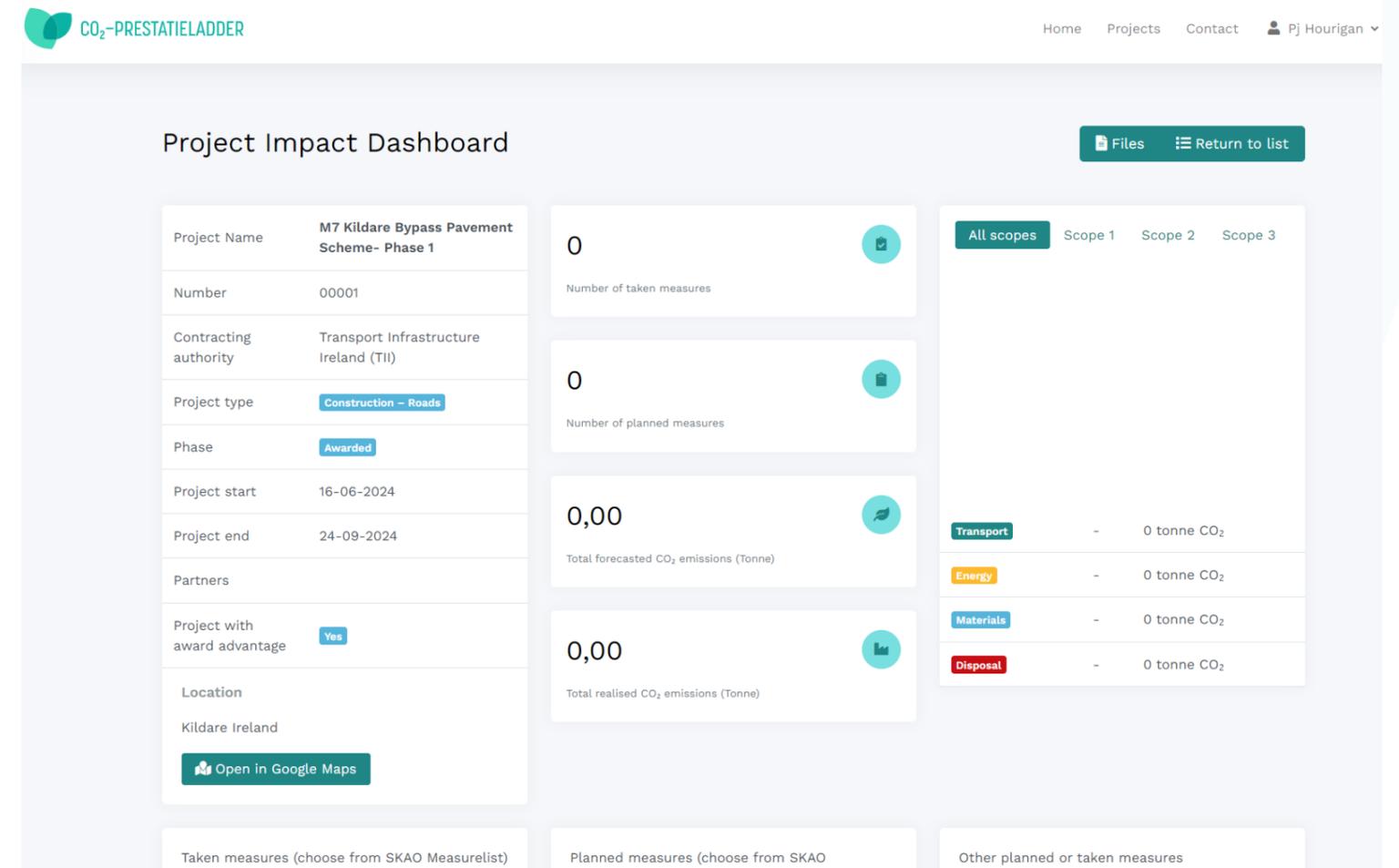
The communication includes at least the energy policy and the reduction objectives of the project, a description of the reference(s) used, options for individual contribution, information regarding current energy consumption and trends within the project.



# Deliverables

## What Do we get as a Client?

- Certified Project Statement or CO2 Awareness Certificate
- Project Impact Dashboard
  - Details CO2 reduction data
  - Details CO2 measures implemented
- The Project File, can be requested
  - Provides insight into project emissions
  - Details of compliance with CO2 Performance Ladder criteria



**CO<sub>2</sub>-PRESTATIELADDER** Home Projects Contact Pj Hourigan

### Project Impact Dashboard

Files Return to list

Project Name	M7 Kildare Bypass Pavement Scheme- Phase 1
Number	00001
Contracting authority	Transport Infrastructure Ireland (TII)
Project type	Construction - Roads
Phase	Awarded
Project start	16-06-2024
Project end	24-09-2024
Partners	
Project with award advantage	Yes
Location	Kildare Ireland <a href="#">Open in Google Maps</a>

0  
Number of taken measures

0  
Number of planned measures

0,00  
Total forecasted CO<sub>2</sub> emissions (Tonne)

0,00  
Total realised CO<sub>2</sub> emissions (Tonne)

All scopes Scope 1 Scope 2 Scope 3

Transport	-	0 tonne CO <sub>2</sub>
Energy	-	0 tonne CO <sub>2</sub>
Materials	-	0 tonne CO <sub>2</sub>
Disposal	-	0 tonne CO <sub>2</sub>

Taken measures (choose from SKAO Measurelist) Planned measures (choose from SKAO) Other planned or taken measures

# Contractor Feedback

It is good that our current decarbonization efforts are being recognised and this process is not duplicating efforts



Now that we know the process, we can replicate the process for future competitions

We have a good process to record all of the on site information, that was beneficial for the audit



The Auditor guided us calculating the forecasted CO2 emissions and evaluating potential CO2 reduction initiatives

# Success!



Jons Civil Engineering Company Ltd

11,234 followers

8h • 🌐

Congratulations to everyone on the M7 Kildare Bypass Pavement Scheme for achieving level 4 on the CO2 performance ladder, the first project in Ireland to achieve this as part of the Tender Pilot Scheme with [Transport Infrastructure Ireland](#). The CO2 Performance Ladder is a tool that helps organisations reduce their carbon emissions while taking a transparent and collaborative approach. We achieved a 21% reduction in carbon emissions, 84.5% in Scope 1 and 2 and 20.3% in Scope 3. This was only possible for the huge effort and organisation by the extended site team, collaboration with TII and our Key Subcontractors. [[Kilsaran](#), [Highway Markings Ltd](#), Ryan Road Planing, McGuire Haulage and [Traffic Management Installations Ltd.](#)]

[#co2ladder](#) [#sustainability](#)



# Summary

## Significant 21% CO<sub>2</sub> reduction achieved!

- Positive buy-in from all Tenderers
- Tenderers preference for CO<sub>2</sub> Awareness Certificate (company wide certification) for Implementation Level
- Opportunity to acknowledge and reward Tenderers who are working towards decarbonisation

## CO<sub>2</sub> Performance Ladder

- Proven green procurement and project management tool
- Tangible and independently verified CO<sub>2</sub> reduction
- Easy to implement and manage for contracting authorities
  - Onus is on the contractor to obtain certification
  - Low cost for contractor
- Ready to used on tenders now!

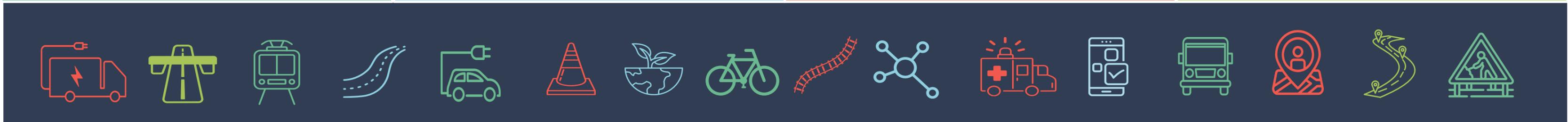


**michael.oconnor@tii.ie**  
**pj.hourigan@tii.ie**



# New Human Health and Population standard for the planning of national roads

*Jenny Dunwoody, Arup*





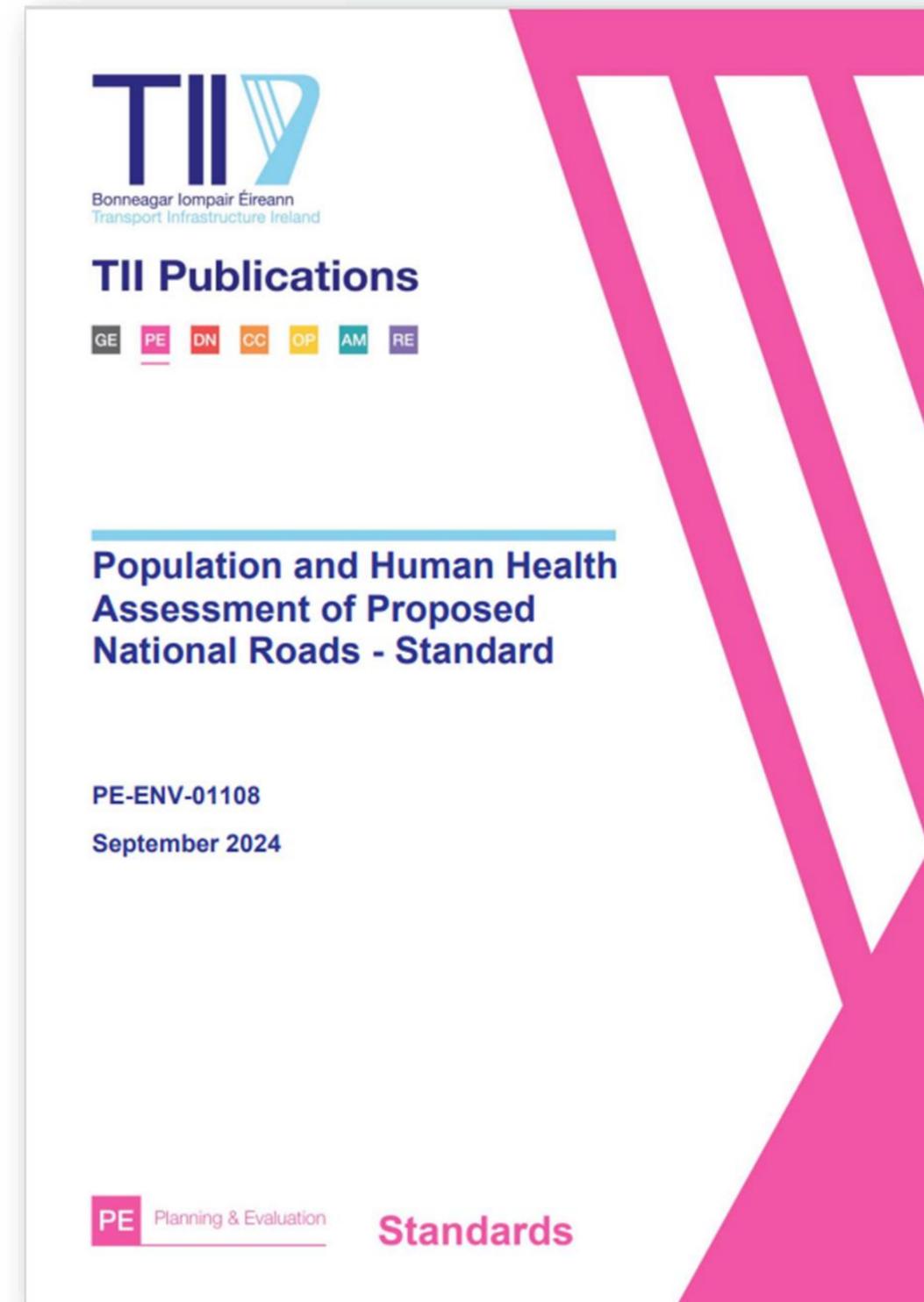
# Population & Human Health Assessment of Proposed National Roads - Standard

**PE-ENV-01108-01**

*Jenny Dunwoody, Arup*



- TII's first Standard covering the assessment of population and human health (PHH) effects
- Applies to national road projects
- Aligns with TII's Project Appraisal Guidelines (PAG)
- Provides an approach that is robust, proportionate and compliant
- Focused on improving outcomes for communities



# Need for a Population & Human Health Assessment Standard



- Supports TII's Vision, as set out in the Sustainability Implementation Plan (SIP), to:

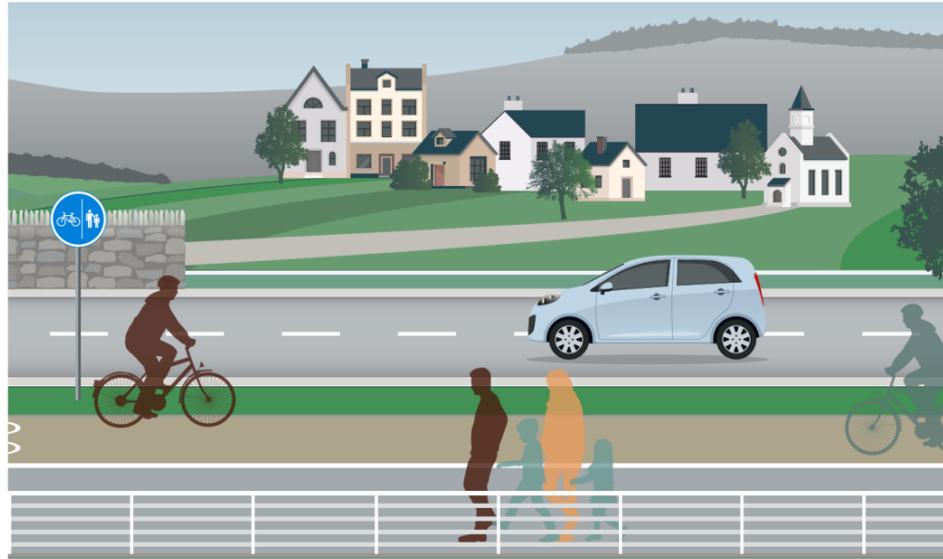
*'lead in the delivery and operation of sustainable transport, enabling our networks to drive inclusive growth, create job opportunities, enhance the well-being of all persons including vulnerable groups, strengthen our resilience to address climate change, maintain our commitment to the environment and continue to prioritise safety.'*

- Meets the legal requirements for Environmental Impact Assessment (EIA):

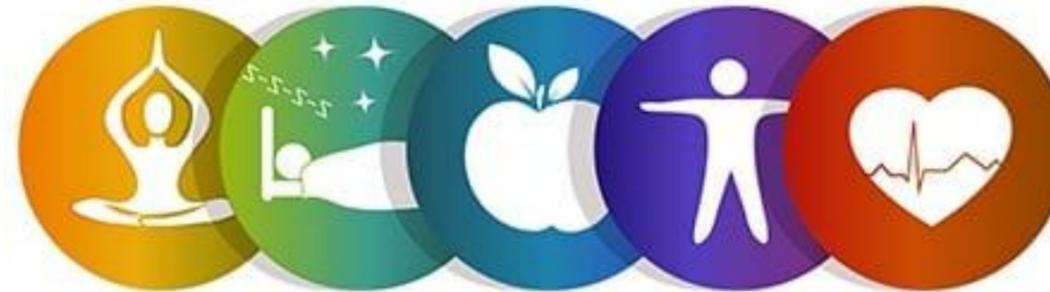
The EIA Directive 2011/92/EU, as amended by Directive 2014/52/EU, requires that development projects undertake an assessment to identify the likely significant effects of the project, including on *'population and human health'* (wording changed from 'human beings' in the 2011 Directive)

# Scope of the Standard

**Population** – effects on community resources and their users



**Human health** – effects on the health and wellbeing of the population



Why two topics in one Standard?

- Responds to the wording in the EIA Directive: *‘Population and Human Health’*
- Benefits the reader by describing effects on ‘people’ in one place
- A combined standard is shorter overall and avoids repetition
- The topics follow separate, established methodologies, closely linked, with extensive data sharing



# Informed by existing guidance

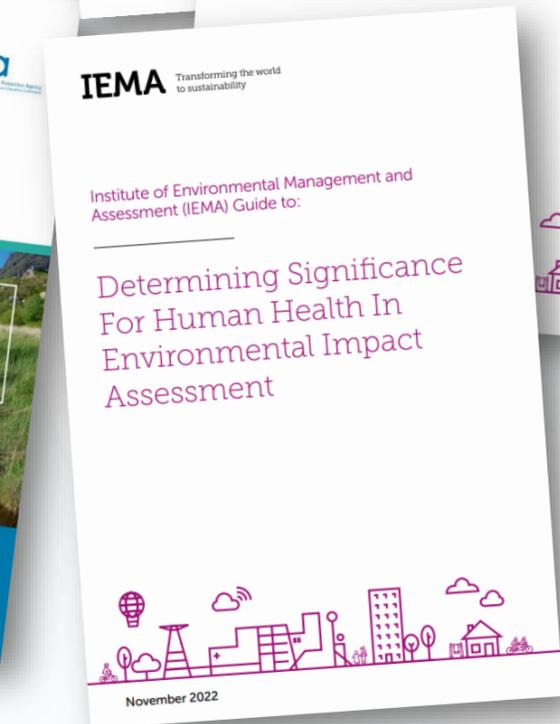
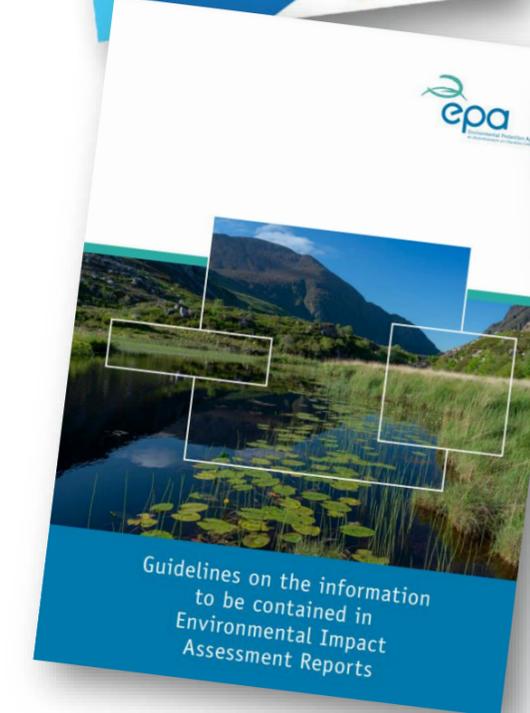
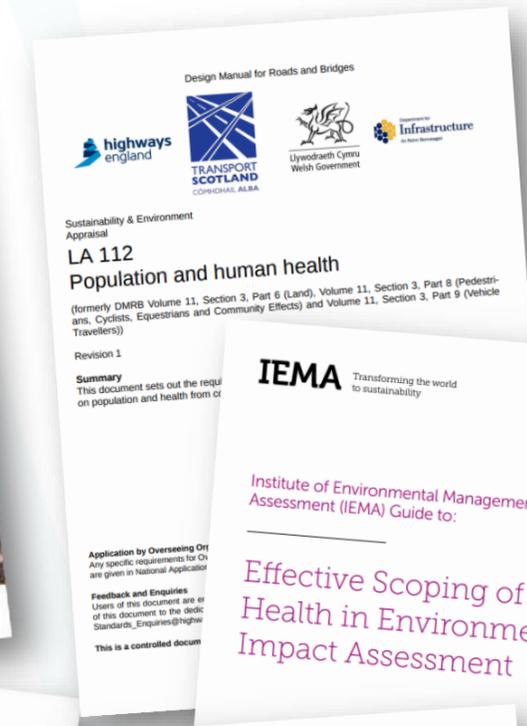
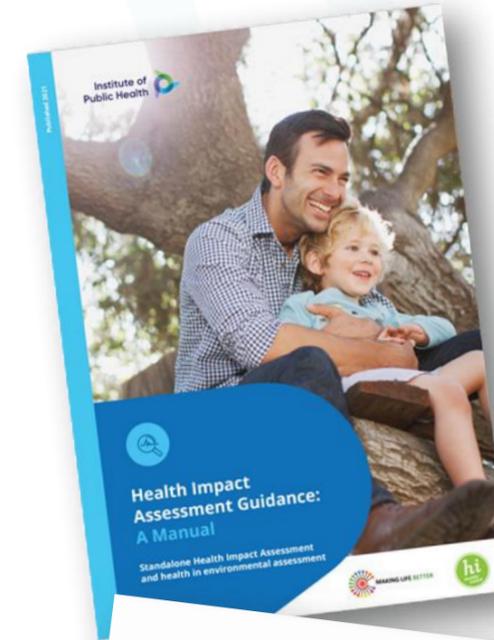
**Institute of Public Health (IPH)**, 2021. Health Impact Assessment Guidance: A Manual

**Environmental Protection Agency (EPA)**, 2022. Guidelines on the Information to be Contained in EIARs

**Institute of Environmental Management and Assessment (IEMA)** Guide to Effective Scoping of Human Health in Environmental impact Assessment, November 2022

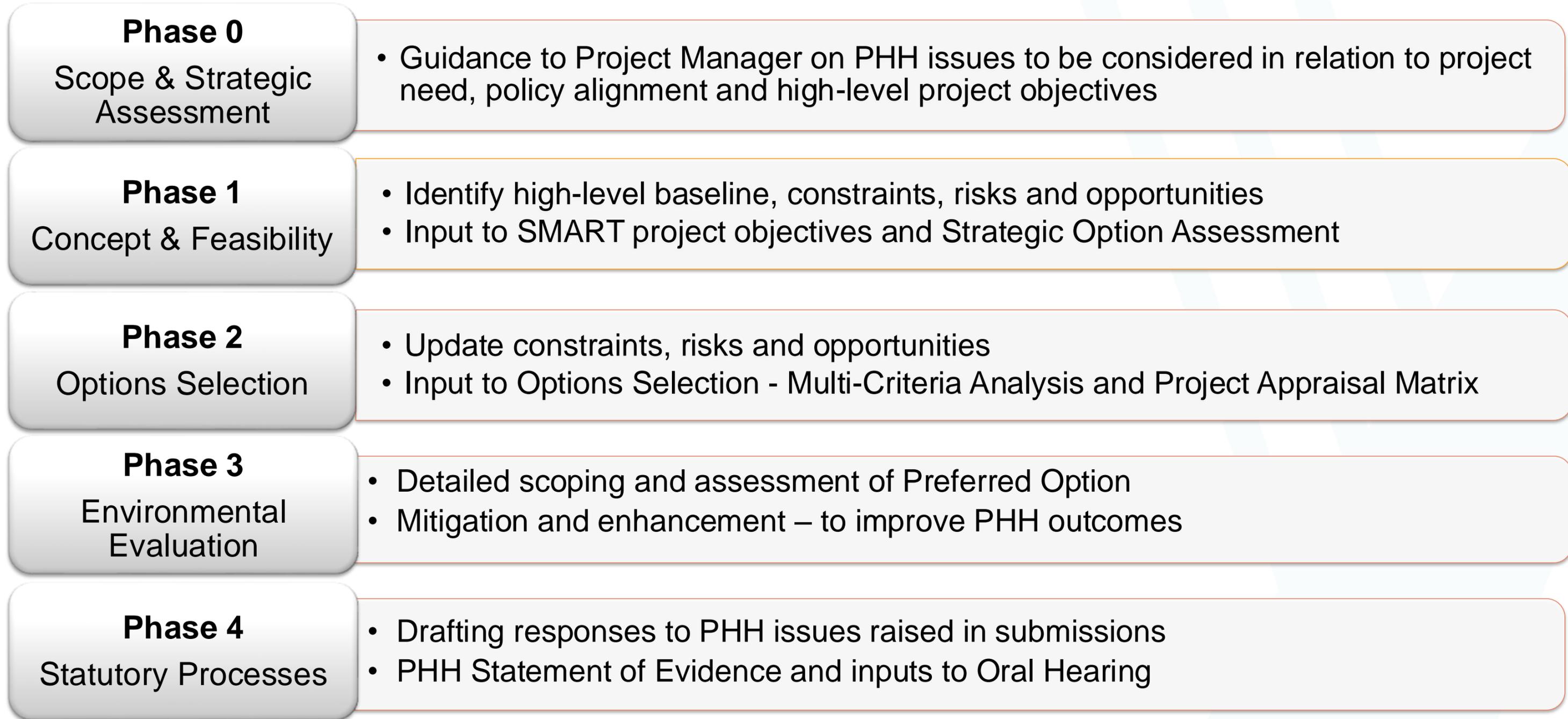
**IEMA** Guide to Determining Significance for Human Health in Environmental Impact Assessment, November 2022

**Design Manual for Roads and Bridges (DMRB) LA112 (UK)** – Population and human health, Revision 1, January 2020



# PAG Assessment Stages - Overview

The Standard applies to TII's Project Management Guidelines (PMG) Phases 0 – 4



# Practitioner competency

- Requirement for practitioners who undertake assessments to be expert, qualified and competent
- Standard provides guidance on meeting this requirement, including:



Academic qualifications



Professional associations



Professional experience

- Standard allows for separate or single practitioner, provided competency requirements are met

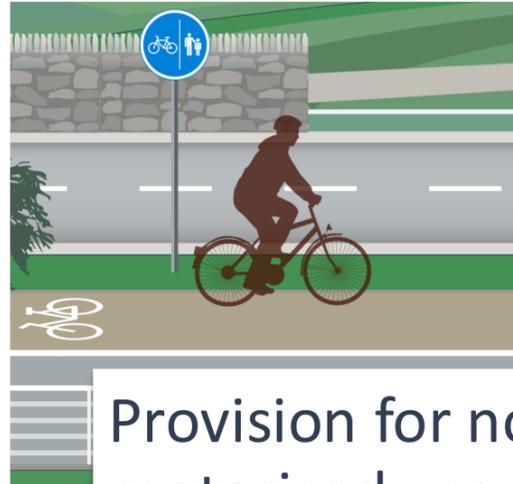


# Population impacts

## Resources and receptors (users)



Private property and housing



Provision for non-motorised users



Businesses and development land



Community land and assets



## Types of impact

Demolition and land take

Amenity value

Access and severance



# Health impacts

- Health is... *‘a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity’* (WHO, 1948)
- Assessment is based on the ‘Wider Determinants of Health’ model (social, economic and environmental factors)
- Effects on population health (rather than the health of individuals)
- Effects on health inequalities and vulnerable groups

## Wider Determinants of Health

- Transport and access
- Lifestyle & behaviours
- Social and community
- Economy & employment
- Environmental conditions
- Health and social infrastructure
- Climate

## Health Outcomes

- Illness & injury
- Mental wellbeing
- Physical wellbeing
- Quality of life
- Health equity



# Health determinants and outcomes

Evidence shows causal links between impacts on the wider determinants of health and health outcomes. This forms the basis of the assessment. For example:

Impacts on health determinants	Health outcomes (+/-)
<p><b>Transport and access</b></p> <ul style="list-style-type: none"> <li>• Safety</li> <li>• Access to educational facilities, health and social care services, green and blue spaces, etc</li> </ul>	<ul style="list-style-type: none"> <li>• Injury</li> <li>• Mental and physical wellbeing</li> <li>• Improved life chances and health outcomes</li> </ul>
<p><b>Economy and employment</b></p> <ul style="list-style-type: none"> <li>• Business benefits &amp; economic regeneration</li> <li>• Access to employment sites</li> </ul>	<ul style="list-style-type: none"> <li>• High quality, secure employment is linked to better mental health</li> <li>• Improved life chances through training and career development</li> <li>• Higher earnings – access to healthier lifestyle choices</li> </ul>
<p><b>Environmental conditions</b></p> <ul style="list-style-type: none"> <li>• Noise</li> <li>• Air quality</li> </ul>	<ul style="list-style-type: none"> <li>• Mortality rates</li> <li>• Respiratory health, chronic disease</li> <li>• Annoyance, sleep disturbance, quality of life and physiological effects</li> <li>• Participation in outdoor activities</li> </ul>
<p><b>Lifestyle and behaviours</b></p> <ul style="list-style-type: none"> <li>• Provision for pedestrians and cyclists</li> <li>• Improved junction design and road safety</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced injuries and fatalities</li> <li>• Participation in active travel – physical and mental health benefits</li> </ul>



# Scoping

- Principles of scoping: *robust and proportionate*
- Focus on the issues likely to give rise to material ('significant') effects on PHH
- No fixed PHH assessment scope. Scope is determined by practitioners on a project-by-project basis
- Depends on the nature and scale of the project, characteristics of the population, sensitive receptors in the study area, local issues and priorities
- Rationale must be clearly explained with reference to relevant data

## Source – Pathway – Receptor model

Source Project Element	Effect on Health Determinant(s)	Pathway Means of Transmission	Receptor Sensitive Population	
Provision of improved cycle routes and crossings	Improved opportunities for physical activity, safety and connectivity	Local community will experience improved cycling provision	New routes and crossings will be used by the local community	Scope in ←
Earthworks and construction of foundations	Ground contamination – potential mobilisation of contaminants	Contamination contained through required mitigation measures in Environmental Management Plan	Users of public footpath alongside construction site and residents of nearby housing	Scope Out →
Land take required to construct project	Green space and physical activity – loss of land from playing fields	Local community will experience reduced access to this resource	Playing fields are used by local community and sports clubs	Scope in ←



# Stakeholder engagement

- Led by Project Manager with inputs from PHH practitioners
- The Standard provides an indicative list of PHH stakeholders, including:

Prescribed Bodies & Public Authorities

Community Groups & Voluntary Organisations

Land / Business Owners & Local Community Representatives

- Purpose of engagement:
  - Agree scope of the assessment
  - Identify data sources and understand local context
  - Establish local issues, constraints and opportunities



# Population datasets

Baseline Information	Likely Data Sources
 <p><b>Private property and housing:</b></p> <ul style="list-style-type: none"> <li>The location and number of properties within the ZOI.</li> <li>The location of residential development land and number of units within the ZOI.</li> </ul>	<ul style="list-style-type: none"> <li>Geodirectory's GeoAddress Data</li> <li>Prime2.</li> <li>Aerial photograph.</li> <li>Local Authority Development Plans</li> <li>Project Ireland and National.</li> <li>Development Plans.</li> </ul>
 <p><b>Community land and assets:</b></p> <ul style="list-style-type: none"> <li>The location of community land (e.g., common land, village greens, open green space, allotments, sports pitches etc).</li> <li>The location of community assets (e.g., village halls, healthcare facilities, education facilities, religious facilities etc).</li> <li>The level of existing accessibility restrictions/severance to community land and assets within the ZOI.</li> <li>The frequency of use of community land and assets within the ZOI.</li> </ul>	<ul style="list-style-type: none"> <li>Geodirectory's GeoAddress Data</li> <li>Prime2.</li> <li>Aerial photography.</li> <li>Central Statistics Office.</li> <li>Local Authority Development Plans.</li> <li>Project Ireland and National</li> <li>Development Plans.</li> <li>Open Space and Land Use Condition Survey.</li> <li>Stakeholder engagement.</li> <li>Pobal mapping</li> <li>Economic &amp; Social Research Institute publications'</li> </ul>
 <p><b>Socio-economics, businesses and development land:</b></p> <ul style="list-style-type: none"> <li>The location and number of businesses within the ZOI.</li> <li>The location of tourism receptors within the ZOI.</li> <li>The location of land allocated for development by local authorities and the number of future jobs it should generate.</li> <li>The level of existing accessibility restrictions/severance to development land and businesses within the ZOI.</li> <li>Existing planning, economic and regeneration plans and strategies.</li> <li>Labour supply, employment levels and unemployment levels within the ZOI.</li> </ul>	<ul style="list-style-type: none"> <li>Geodirectory's GeoAddress Data.</li> <li>Prime2.</li> <li>Aerial photography.</li> <li>Central Statistics Office.</li> <li>Local Authority Development Plans.</li> <li>Project Ireland and National Development Plans.</li> <li>Stakeholder engagement.</li> <li>Economic &amp; Social Research Institute publications'</li> </ul>
 <p><b>Non-motorised road users:</b></p> <ul style="list-style-type: none"> <li>The type, location and extent of NMU provision (e.g., public rights of way, National Trails, canals, greenways, blueways etc) within the ZOI.</li> <li>The frequency of use of the NMU provision within the ZOI.</li> </ul>	<ul style="list-style-type: none"> <li>Sport Ireland Outdoors.</li> <li>Local authority data sets.</li> <li>Traffic and transport survey results (inclusive of NMU traffic counts and origin/destination of users where practicable).</li> </ul>

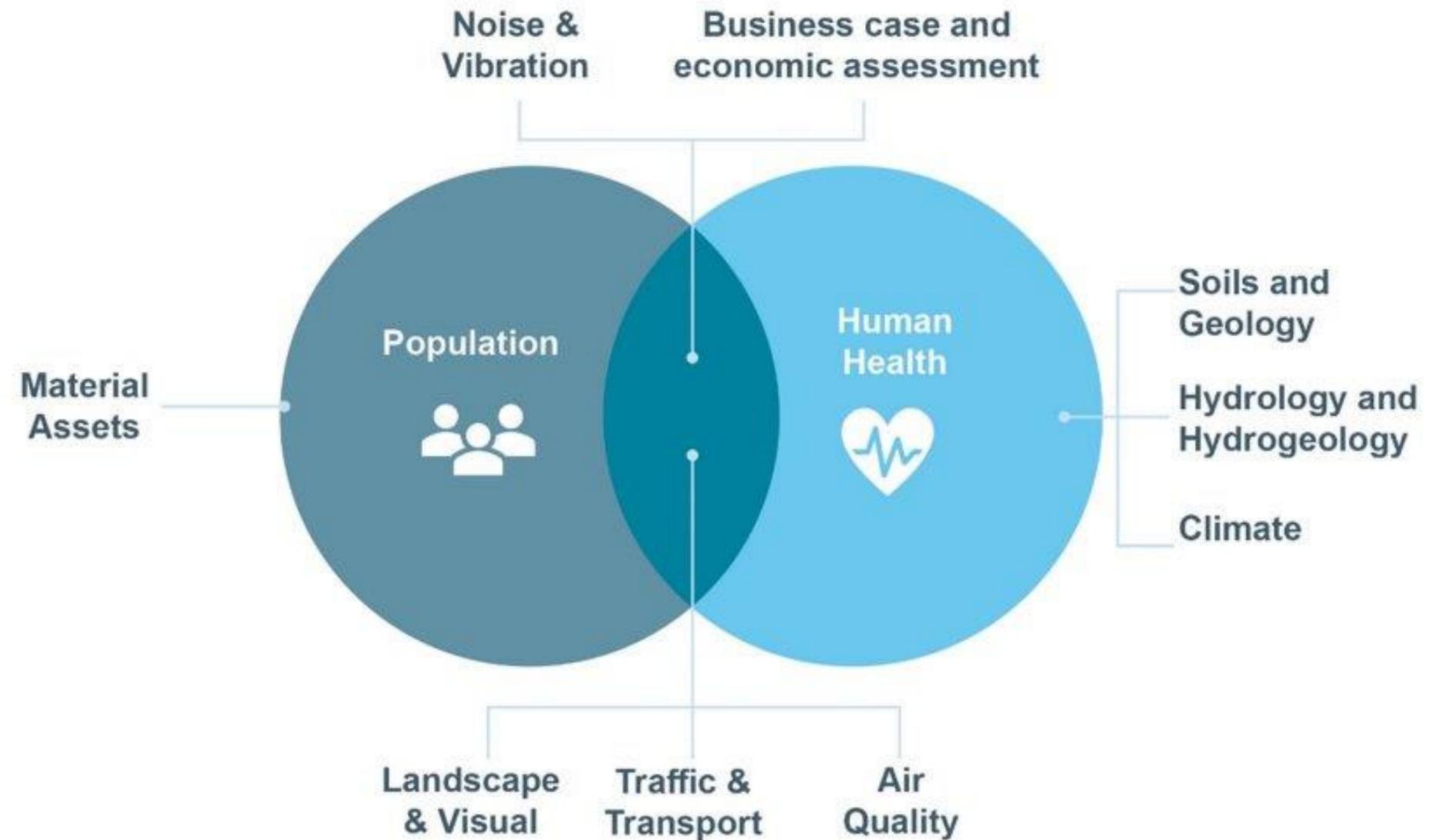
# Health datasets

Baseline information	Geographic area
<b>Demographic data</b>	
Total population	Local Electoral Area
Population density	Electoral Division
Population by age group	Electoral Division
Population by sex	Administrative County
Population by sex and age	Small Area
Resident population by ethnic or cultural background	Small Area
Family units with children by size and age of children	Small Area
<b>Social and economic data</b>	
Population by sex and social class	Small Area
Population aged 15 years and over by principal economic status and sex	Small Area
Housing tenure (owned, local authority rental, landlord rental)	Administrative County
Percentage of Housing Assistance Payment and Rent Supplement Properties	Local Authority
Population aged 15 years and over by age education ceased	Small Area
Population aged 15 years and over by sex and highest level of education completed	Small Area
Number of households with cars	Electoral Division / Small Area
Number of households with cars	Small Area
Persons at work or unemployed by occupation and sex	Small Area
Persons at work or unemployed by industry and sex	Small Area
<b>Health data</b>	
Deaths from respiratory disease	Area of Residence
Diseases and mortality rates attributed to cardiovascular disease, cancer, diabetes or chronic respiratory disease	Area of Residence
Persons with disability by sex	Small Area
Carers by sex	Small Area
Population by general (self-rated) health and sex	Small Area
Frequency of walking, cycling or using public transport instead of driving	NUTS3 Region



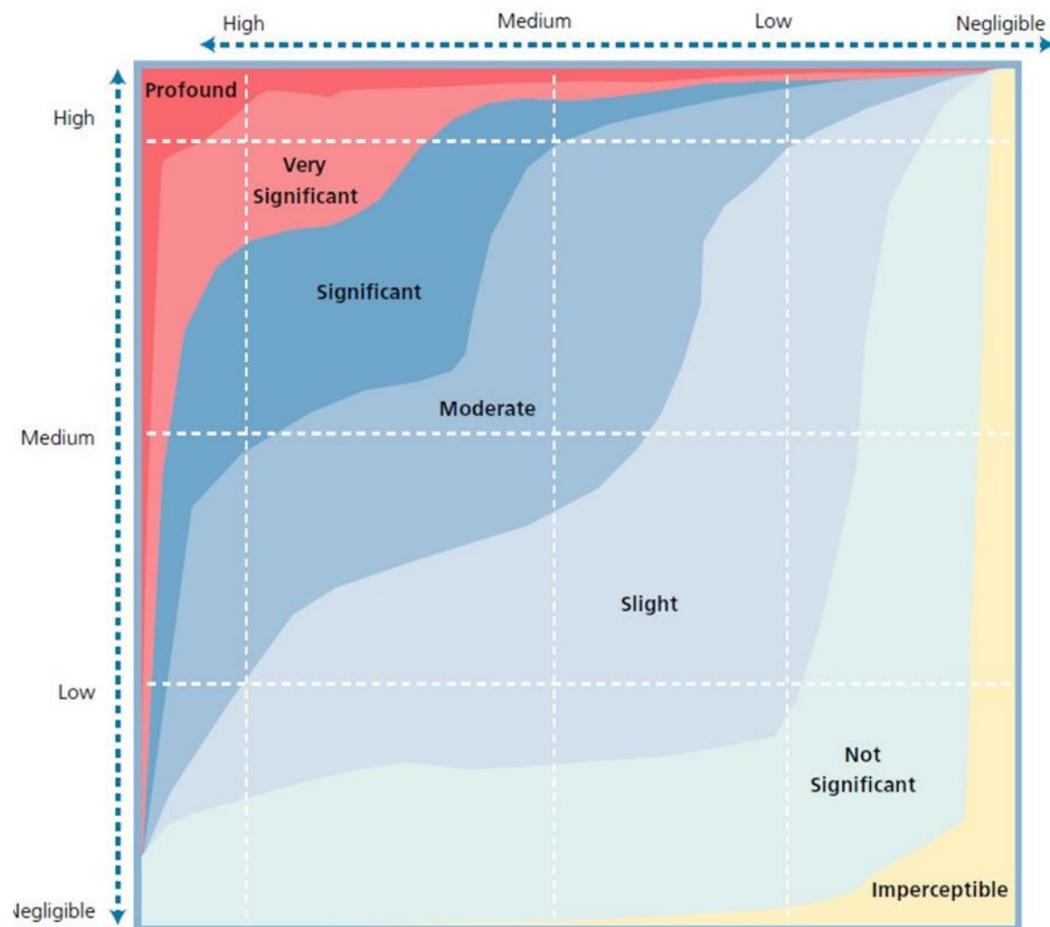
# Interactions with other disciplines

- PHH is a broad topic, encompassing a wide range of potential impacts
- Many impacts are also included within other Multi-Criteria Analysis (MCA) and EIA topic assessments
- Assessment of PHH effects is informed by outputs from other topics
- PHH assessment adds value – does not duplicate other topics
- Gap analysis applied at options selection stage to avoid double counting in MCA
- Close working with other topics and disciplines



# Assessment of significant effects

- Largely qualitative assessment using professional judgement, based on evidence
- Rationale for judgements must be described, with reference to evidence and data
- Assessment of significance based on:
  - Magnitude of impacts on population resources / health determinants
  - Sensitivity of receptors (users of resources / study area population) } Low / Medium / High



Standard provides guidance on assigning ratings, e.g.

## Magnitude

- Scale of impact, exposure, duration, reversibility
- Type of outcomes associated with exposure

## Sensitivity

- Population resources – how well used are they, who are they used by, are there alternatives available?
- Health – health status, social deprivation, health and social inequalities, capacity to adapt, public concerns and perceptions

Specific focus on vulnerable groups (e.g. people on low-incomes, children, older people, people with mobility or health issues)



# Vulnerable Groups (examples)

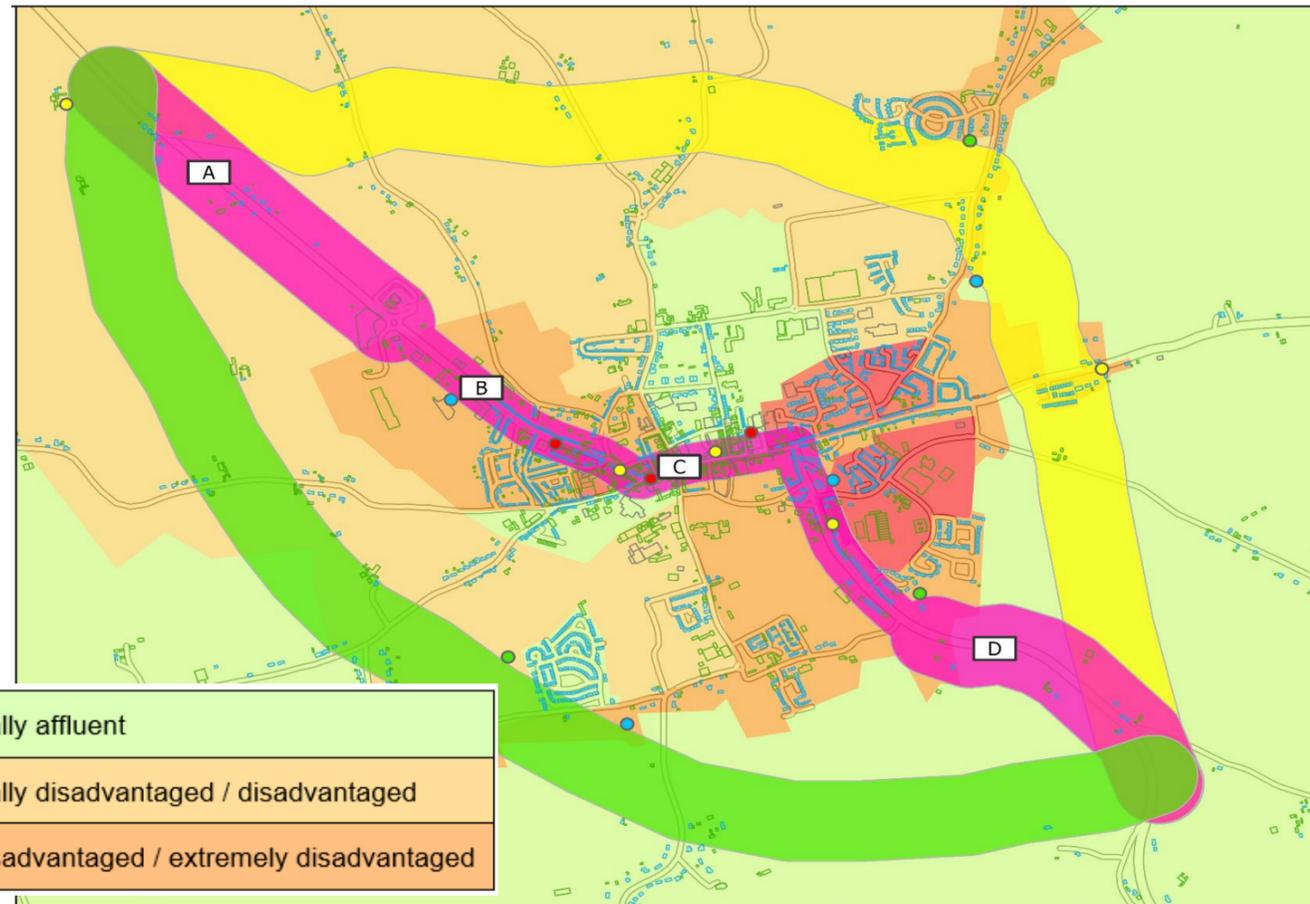
Population Groups	Sensitivities (not exhaustive)
<p>Social deprivation and low income</p> 	<ul style="list-style-type: none"> <li>• People in more deprived areas live on average shorter lives and have poorer health. This is linked to a range of factors including personal finances, environmental conditions, crime rates, education and housing.</li> <li>• People on a low incomes are more likely to experience poor health because of increased stress and have a lack of resources to stay healthy.</li> </ul>
<p>Age</p> 	<ul style="list-style-type: none"> <li>• As people age, movement and reactions become slower and hearing loss is more likely. Older people are more risk from injury and more anxious about navigating roads.</li> <li>• Young people are more sensitive to air pollution and are more at risk from road traffic accidents.</li> </ul>
<p>Access to a car</p> 	<ul style="list-style-type: none"> <li>• People without access to a private vehicle are more dependent on local facilities and are more likely to be users of public transport.</li> </ul>
<p>Poor health or disability</p> 	<ul style="list-style-type: none"> <li>• People with physical health problems or disabilities may be more vulnerable to environmental changes (e.g. air quality and noise).</li> <li>• People with impaired vision or mobility face barriers to access and movement.</li> <li>• Mental health conditions may be exacerbated by environmental, social or economic impacts.</li> <li>• People with existing health conditions or disability are likely to be more reliant on access to health and social care services.</li> </ul>



# Health equity

*‘The principle of equity aims to minimise avoidable disparities in health, as well as the social determinants of health, between groups of people who have varying levels of social advantage. Equity provides all persons with a fair opportunity to attain their full health potential, to the greatest extent possible’. DoH, 2013*

- Distributional analysis:
  - Identify variations in social deprivation and health status across the study area population
  - Identify resources used by vulnerable groups



Option Corridor	Negative impacts					
	Population – community assets				Air quality (receptors within 50m)	Noise receptors >60dBden (change)
	Community facilities	Medical facilities	Schools	Nursing homes		
Do Minimum	-	-	-	-	45	88
	-	-	-	-	48	115
	-	-	-	-	89	195
Yellow (northern bypass)	1				(+11)	(+5)
	1			1	(+44)	(+22)
			2		(+18)	(+6)
Green (southern bypass)					(+19)	(+5)
	2		1	1	(+16)	(+7)
					(+3)	(0)



# Contributors

## Expert peer review

- Dr Craig Bullock, Optimize Economic Consultancy
- Dr Martin Hogan, Director, Corporate Health Ireland
- Dr Andrew Buroni, Director of Health and Social Impact Assessment, Savills
- Ben Cave, Ben Cave Associates

## Stakeholders

- Institute of Public Health (IPH)
  - Dr. Joanna Purdy, Public Health Development Officer
  - Dr. Helen McAvoy, Director of Policy
- Health Service Executive (HSE)
  - Dr. Ina Kelly, Consultant in Public Health Medicine & Health Protection, HSE Public Health
  - Prof Diarmuid O'Donovan, Director of National Health Improvement, HSE Public Health
  - Dr Éamonn O'Moore, Director of National Health Protection, Health Protection Surveillance Centre (HPSC)



# Discussion



# Noise Mitigation and Standards

*Dr Eoin King, Lecturer, Mechanical Engineering, University of Galway*





OLLSCOIL NA GAILLIMHE  
UNIVERSITY OF GALWAY



# NATIONAL ROADS AND GREENWAYS CONFERENCE 2024

## Noise Mitigation and Standards

Eoin A. King

The Galway Sound Lab | University of Galway



University  
ofGalway.ie

# ANITA Project



OLLSCOIL NA GAILLIMHÉ  
UNIVERSITY OF GALWAY

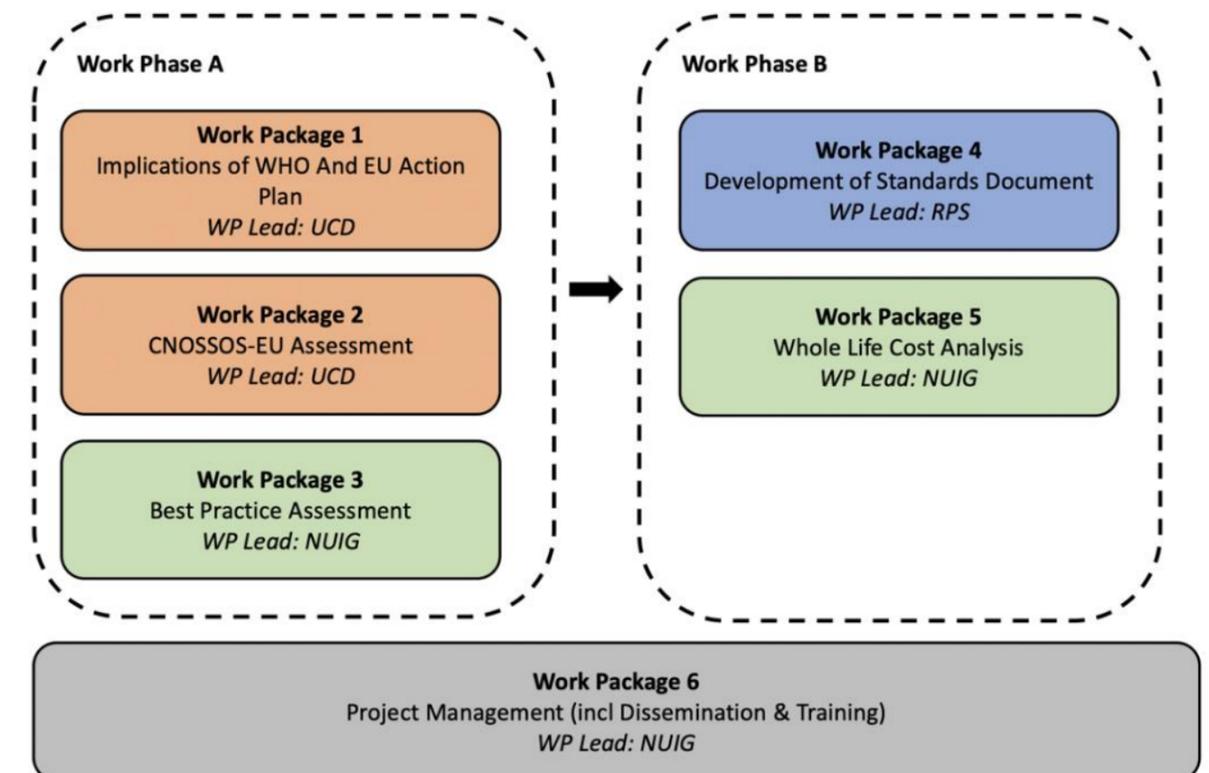
- Transport Infrastructure Ireland provides sustainable transport infrastructure and services in Ireland.
  - As part of this purpose, noise and its well-established interconnected links to adverse economic, environmental and social impacts, is an issue that TII has identified
- **The ANITA Project**
  - *“Assessment of Noise Impacts from National Roads Projects considering the World Health Organization Environmental Noise Guidelines for the European Region”*
  - Objective: Develop a Standards Document regulating the noise impact assessment of Proposed National Roads.

## Project Partners:



OLLSCOIL NA GAILLIMHÉ  
UNIVERSITY OF GALWAY

- Work Package 1
  - Implications of WHO Guidelines & EU Action Plan
- Work Package 2
  - Assessment of CNOSSOS-EU
- Work Package 3
  - International Best Practice Assessment
- Work Package 4:
  - Development of Standard
- Work Package 5:
  - Whole Life Cost Analysis

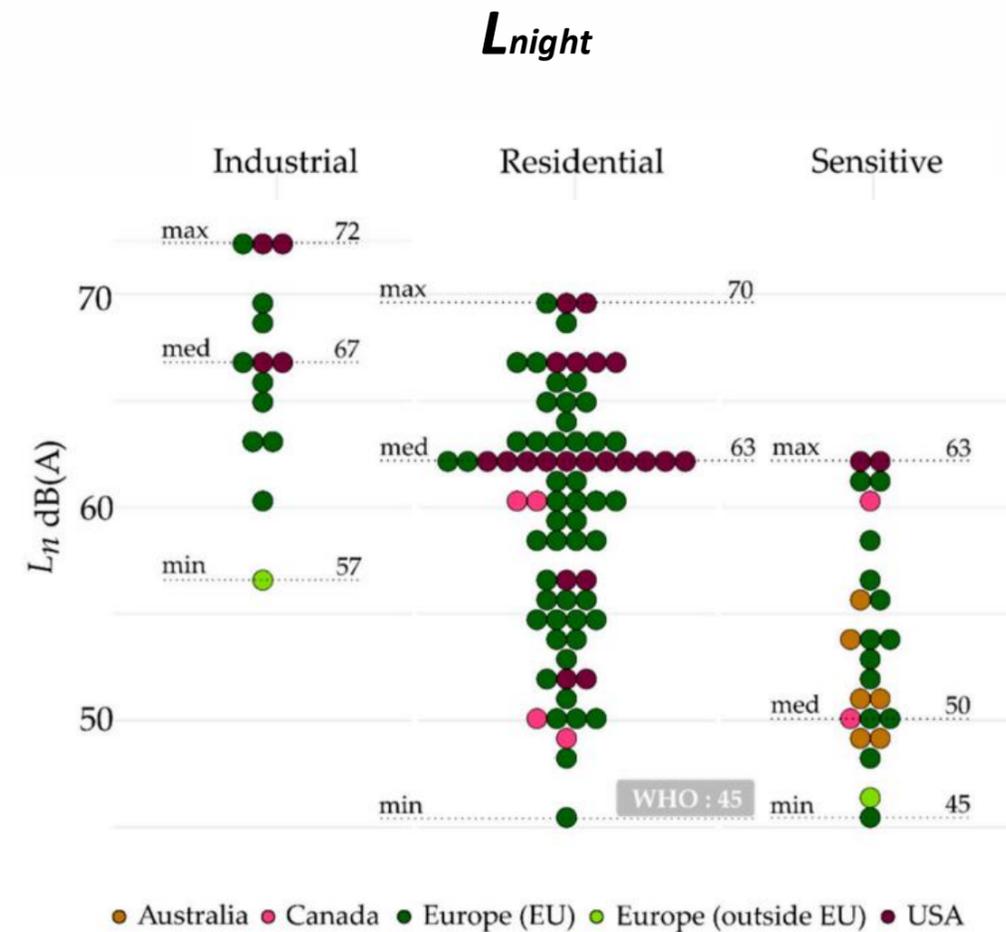
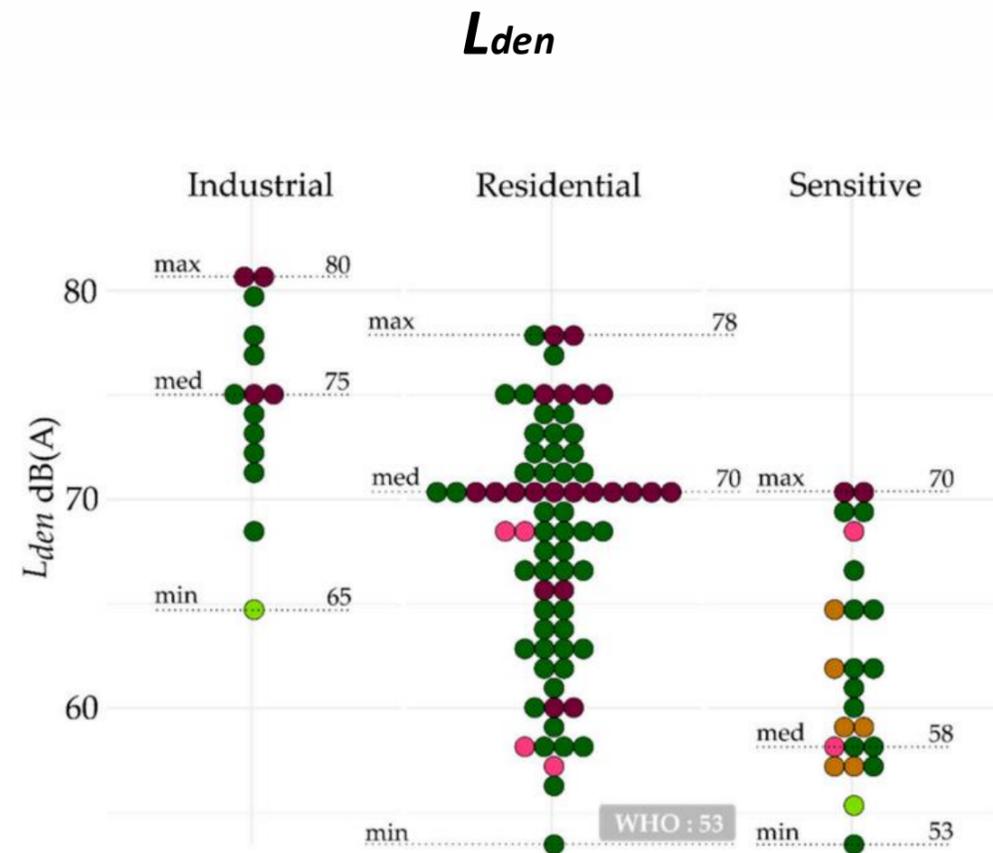


# ANITA Project Findings/Updates

- Phase A assessed best international practice for noise impact assessment
  - Included a consideration of the implications of the 2018 WHO Noise Guidelines, as well as the EU's Pathway to a Healthy Planet
- Compared two noise calculation methods:
  - UK's Calculation of Road Traffic Noise (CRTN) and the new European CNOSSOS-EU method
  - Identified most appropriate method for noise assessment in Ireland
- Conducted a review of the costs of noise mitigation measures, along with an assessment of the socio-economic costs of road traffic noise in Ireland
- Current Design Goals were assessed, and recommendations for updates are currently under consideration

# Scoping Considerations

- Design Goal:

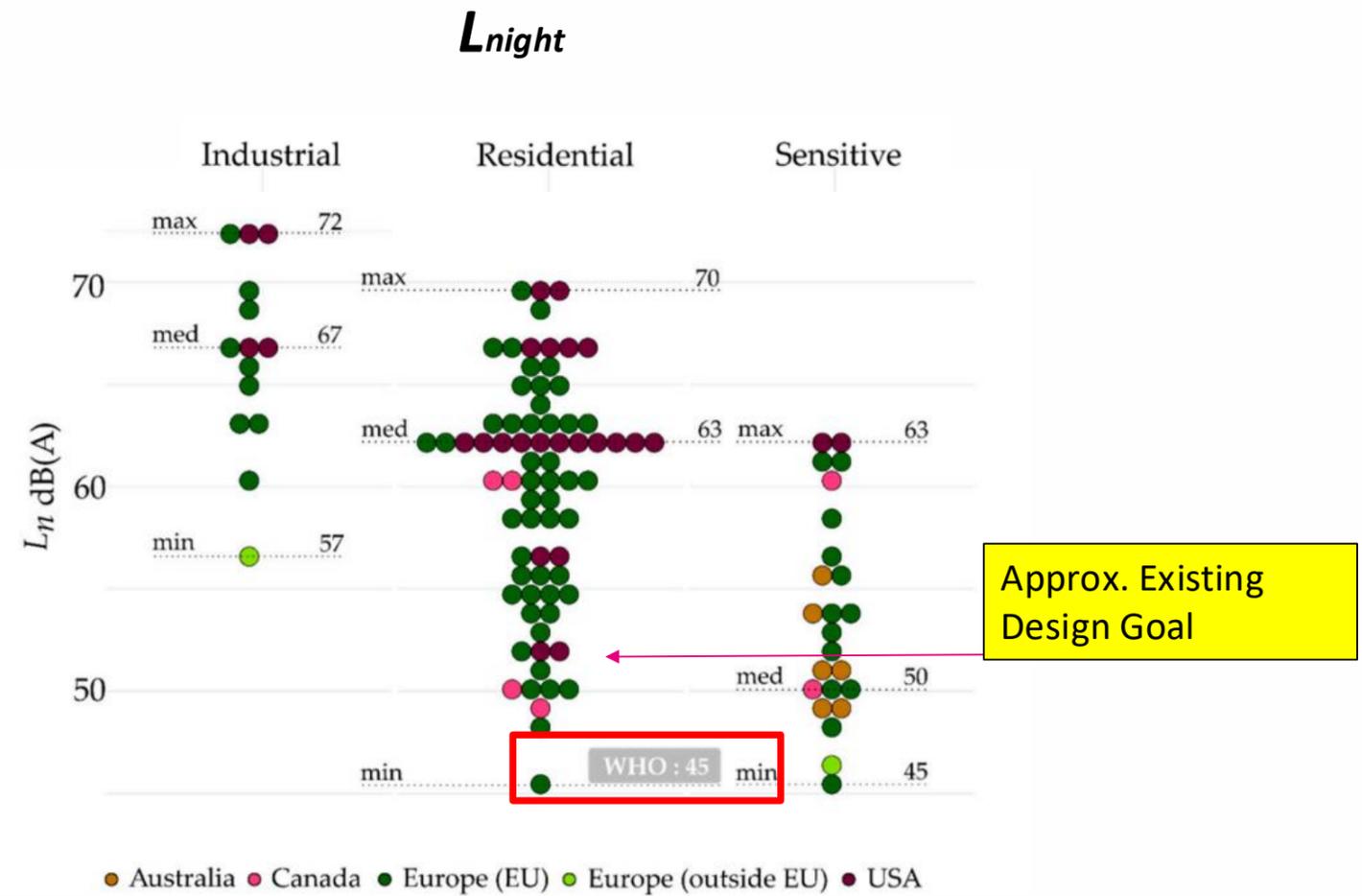


**Note:** (37 Administrations) - All data converted to  $L_{den}$

**Source:** Perna, M.; Padois, T.; Trudeau, C.; Bild, E.; Laplace, J.; Dupont, T.; Guastavino, C. Comparison of Road Noise Policies across Australia, Europe, and North America. *Int. J. Environ. Res. Public Health* 2022, 19, 173. <https://doi.org/10.3390/ijerph19010173>

# Scoping Considerations

- Design Goal:



**Note:** (37 Administrations) - All data converted to  $L_{den}$

**Source:** Perna, M.; Padois, T.; Trudeau, C.; Bild, E.; Laplace, J.; Dupont, T.; Guastavino, C. Comparison of Road Noise Policies across Australia, Europe, and North America. *Int. J. Environ. Res. Public Health* 2022, 19, 173. <https://doi.org/10.3390/ijerph19010173>

# Noise Mitigation

- Noise Mitigation remains a key consideration in design of major road schemes
- Noise Mitigation may be achieved in a variety of ways:
  - Low Noise Road Surfaces
  - Traffic Management Strategies
  - Route Selection in Design Stage
  - Noise Barriers
  - Novel Noise Mitigation Strategies



# Noise Mitigation

- Noise Mitigation remains a key consideration in design of major road schemes
- Noise Mitigation may be achieved in a variety of ways:
  - Low Noise Road Surfaces
  - Traffic Management Strategies
  - Route Selection in Design Stage
  - Noise Barriers
  - Novel Noise Mitigation Strategies





OLLSCOIL NA GAILLIMHE  
UNIVERSITY OF GALWAY

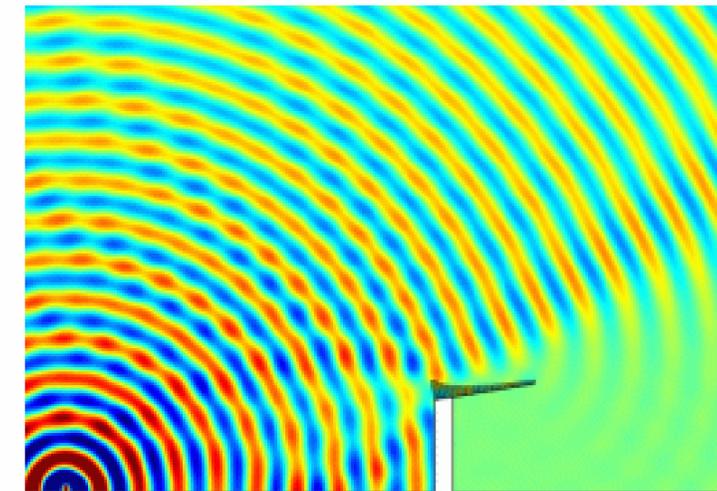
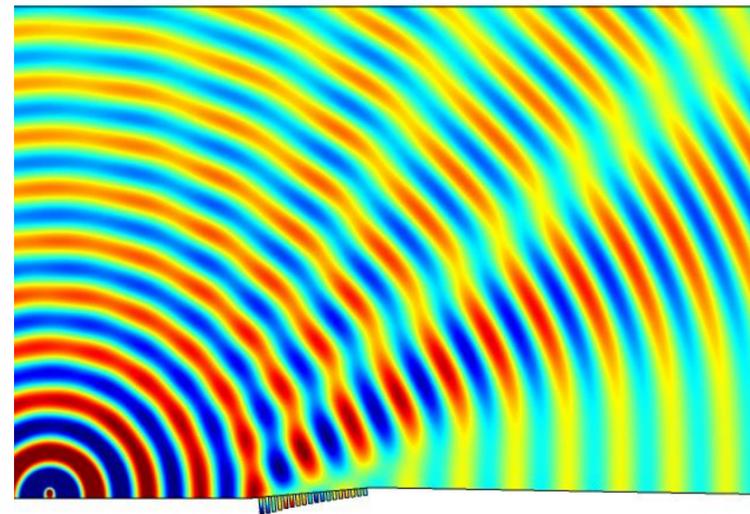
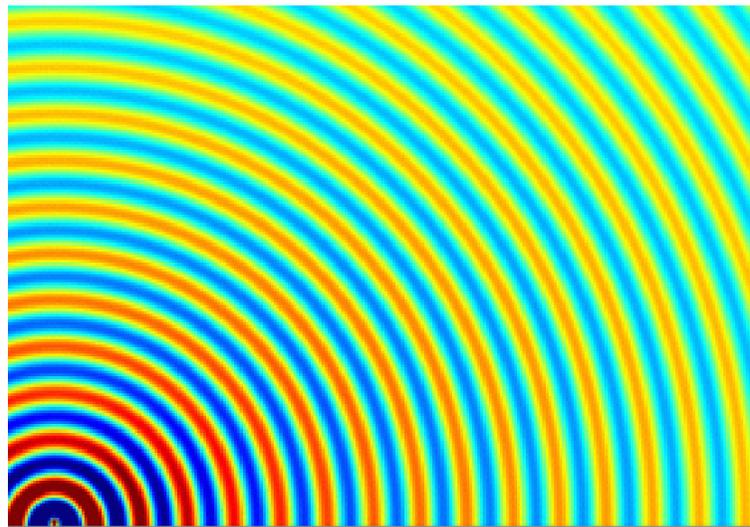
# Novel Noise Mitigation

Case Study: WHIStop



# Background & Objective

- WHIStop is a lightweight aluminium diffractor that can be mounted on a noise barrier to deflect sound upwards (developed by 4Silence).
- Implemented in the Netherlands – Trials ongoing in Germany and Ireland





# Background & Objective

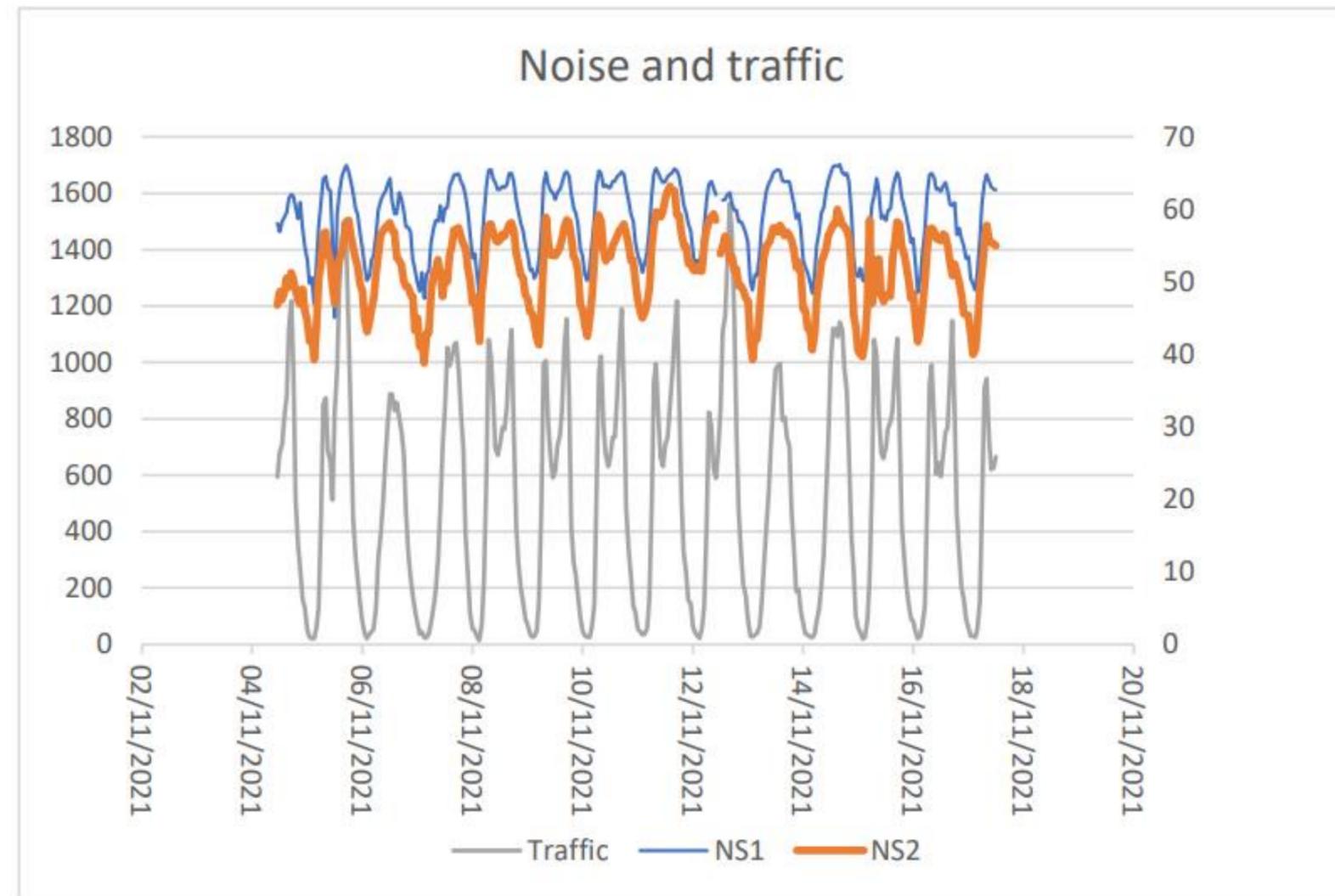
- To assess the performance of the WHIStop diffractor, TII commissioned the installation of a test section in West of Ireland
  - Study consisted of installation of noise barrier (timber) followed by WHIStop diffractor - mounted on top of this new barrier
- Several Tranches of Noise Measurements were taken:
  - 2021 - Baseline Condition (with No mitigation)
  - Tranche 1: After Noise Barrier Installation (No WHIStop)
  - Tranche 2: After WHIStop Installation (Noise Barrier & WHIStop)
  - Additional Acoustic Camera Measurements

# Site Description



# Baseline with No Mitigation

- Average  $L_{den}$  Loc1: 63 dB(A)
- Average  $L_{den}$  Loc2: 57 dB(A)
- The average difference between Loc 1 and Loc 2 was 6 dB(A).
- Measurement Period:
  - November 2021



# Tranche 1 – Noise Barrier Installed

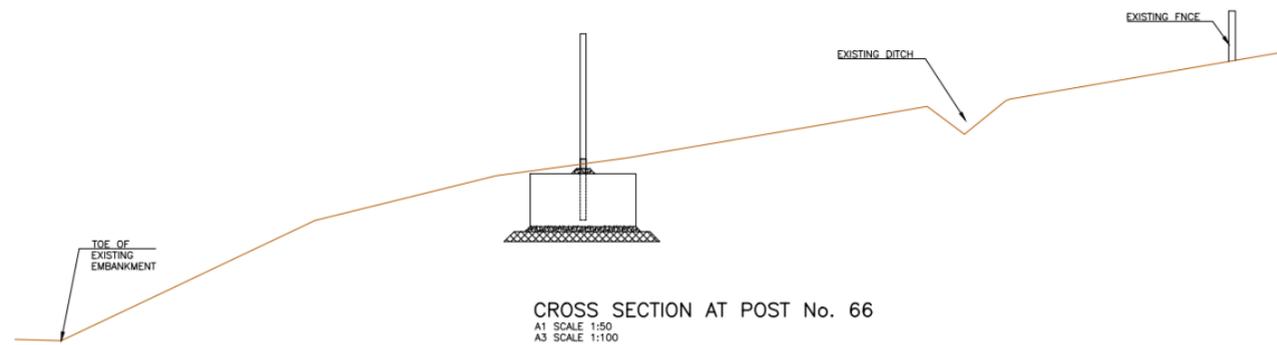
- December 2023: Noise Barrier installed
  - Height above Ground: 3m
  - Post Spacing : 3m
  - Approx Length: 250m



OLLSCOIL NA GAILLIMHE  
UNIVERSITY OF GALWAY

**SOUND**  
The Galway Sound Lab

# Tranche 1 – Noise Barrier Installed

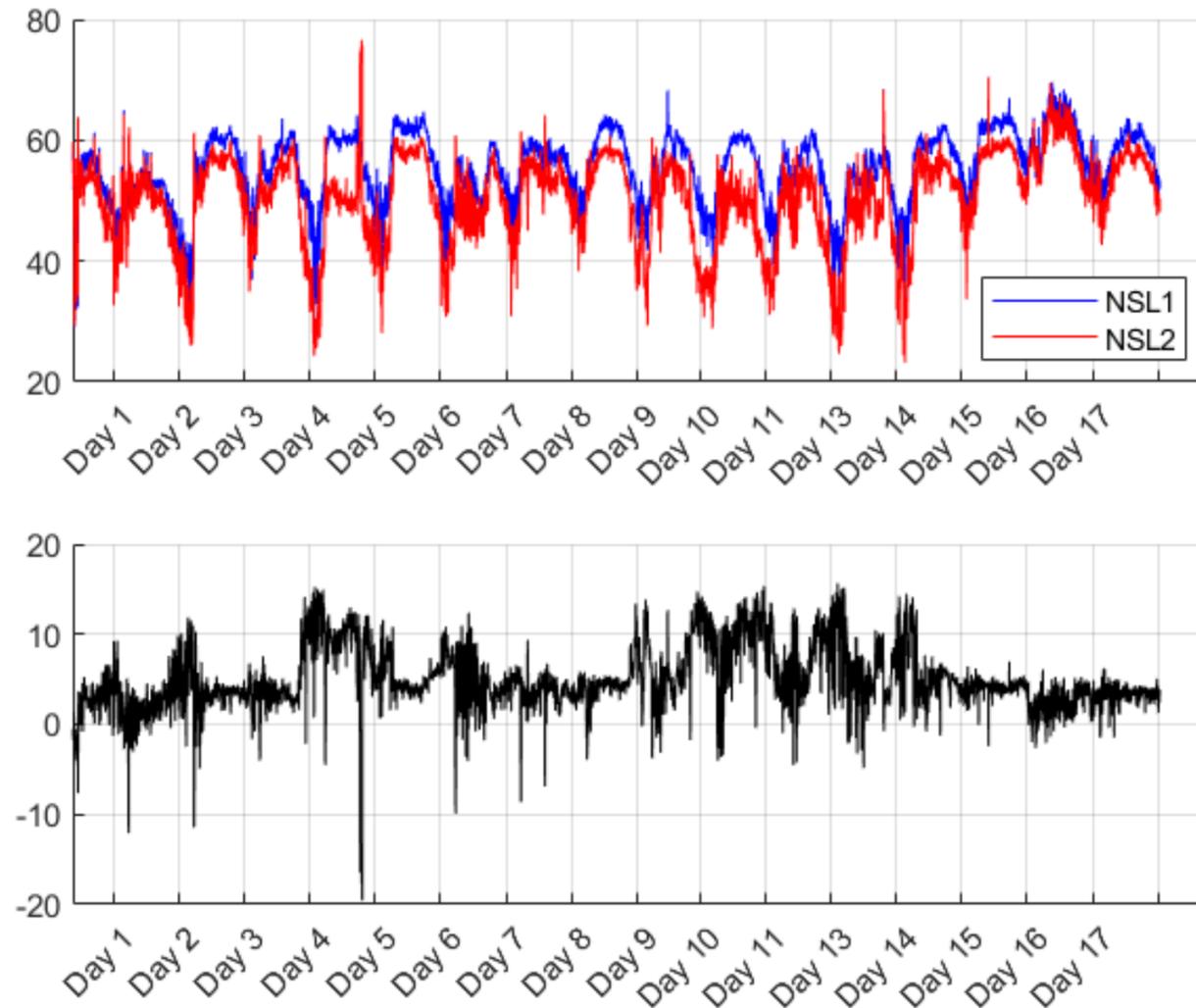


OLLSCOIL NA GAILLIMHE  
UNIVERSITY OF GALWAY

**SOUND**  
The Galway Sound Lab

# Results – Tranche 1 (Noise Barrier Only)

- Average  $L_{den}$  Loc1: 60.4 dB(A)
- Average  $L_{den}$  Loc2: 58.2 dB(A)
- The average difference between Loc 1 and Loc 2 was 2-3 dB(A).
- Measurement Period:
  - March 2024

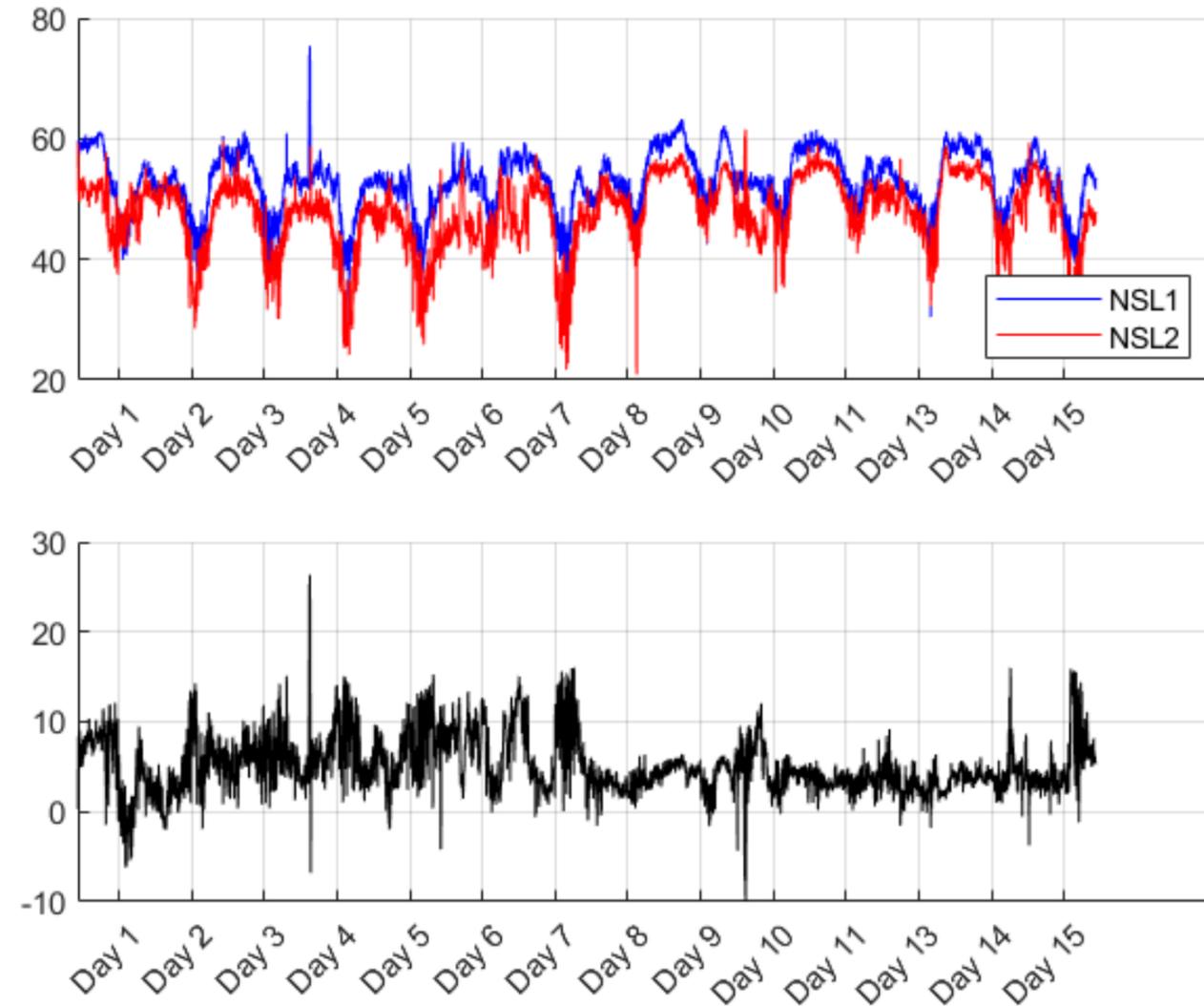


# Tranche 2 – WHIStop Installed



# Results – Tranche 2 (with WHIStop)

- Average  $L_{den}$  Loc1: 58.9 dB(A)
- Average  $L_{den}$  Loc2: 54.5 dB(A)
- The average difference between Loc 1 and Loc 2 was 4-5 dB(A).
- Measurement Period:
  - July 2024



# Summary

- **Result Summary**

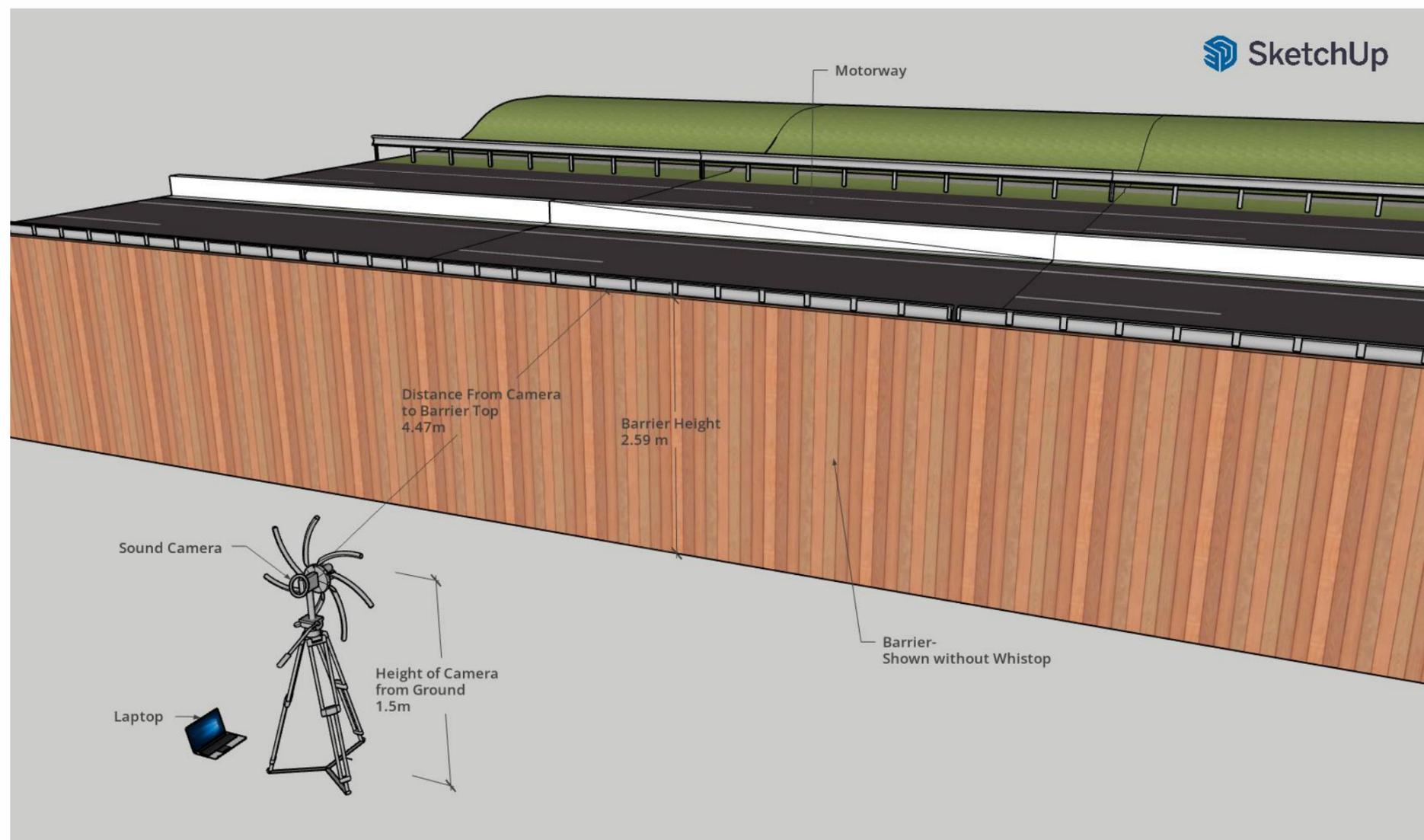
	Loc 1	Loc 2	Difference
Baseline No Barrier	63*	57*	6
With Barrier	60.4	58.2	2.2
Barrier and WHIStop	58.9	54.5	4.4

- **Conclusions**

- Initial results suggest a  $\sim 2\text{dB(A)}$  reduction at Loc 1
- Effect of WHIStop needs to be supported with modelling to be better quantified (ongoing)



# Supplementary Tests – Acoustic Camera





L Max: 66.0 dBA

L Min: 49.8 dBA

L Range: 10.0 dBA

L Current: 44.9 dBA

F Max: 1806 Hz

F Min: 1000 Hz

T Max: 302.592 s

T Min: 0.000 s

T Current: 83.669 s

Menu

Inertia [90 %] Off

Statistics [mean] Off

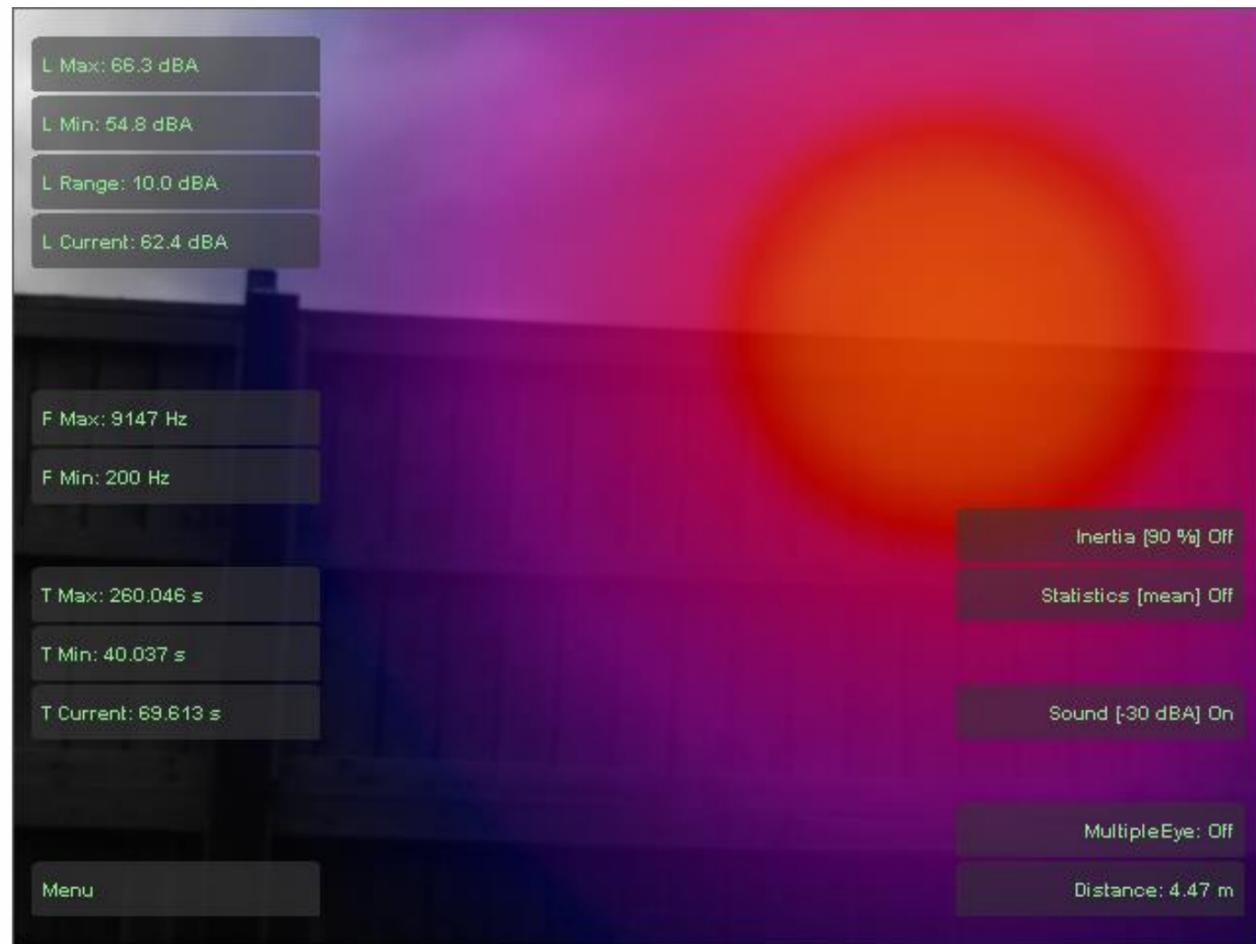
Sound [0 dBA] Off

MultipleEye: Off

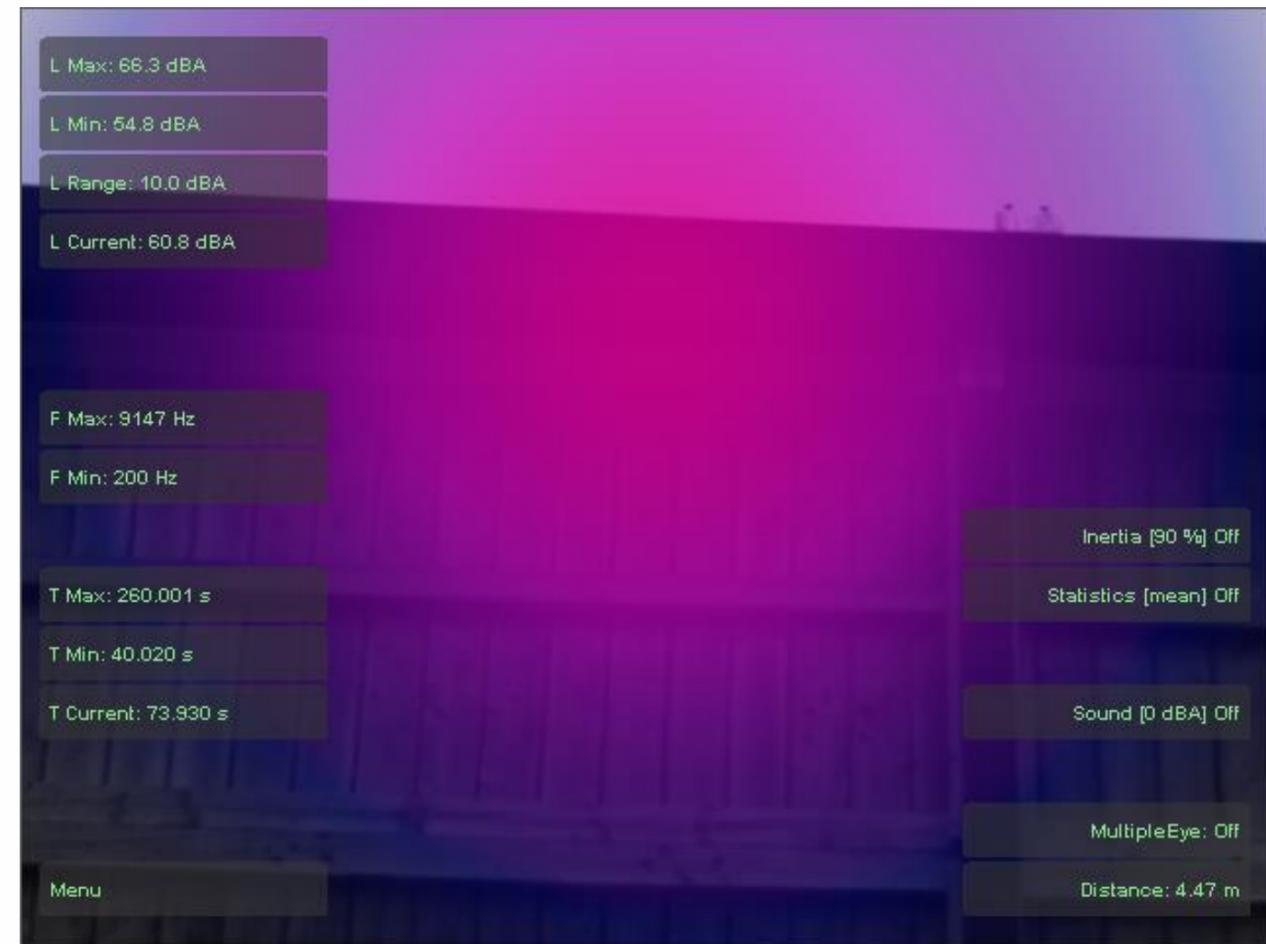
Distance: 1.50 m

# Summary of Results

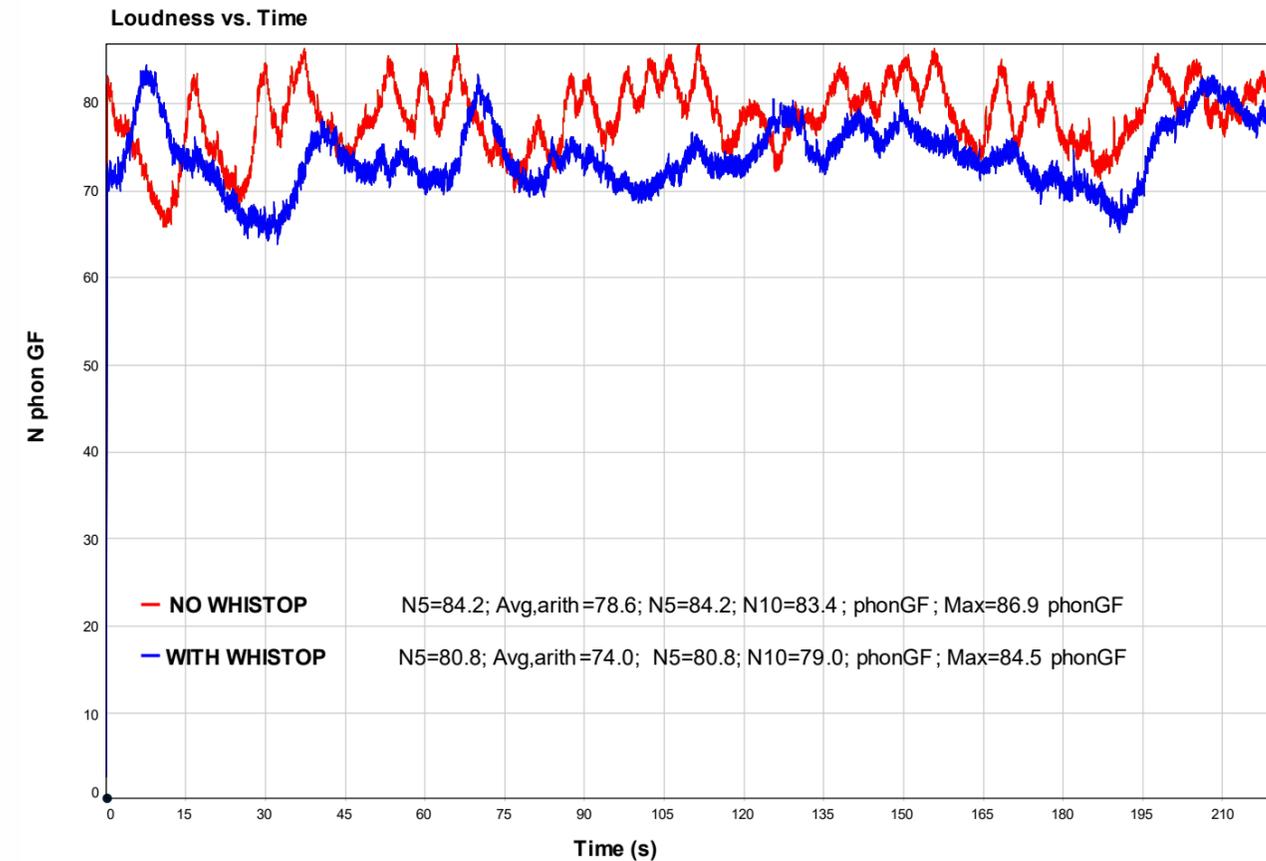
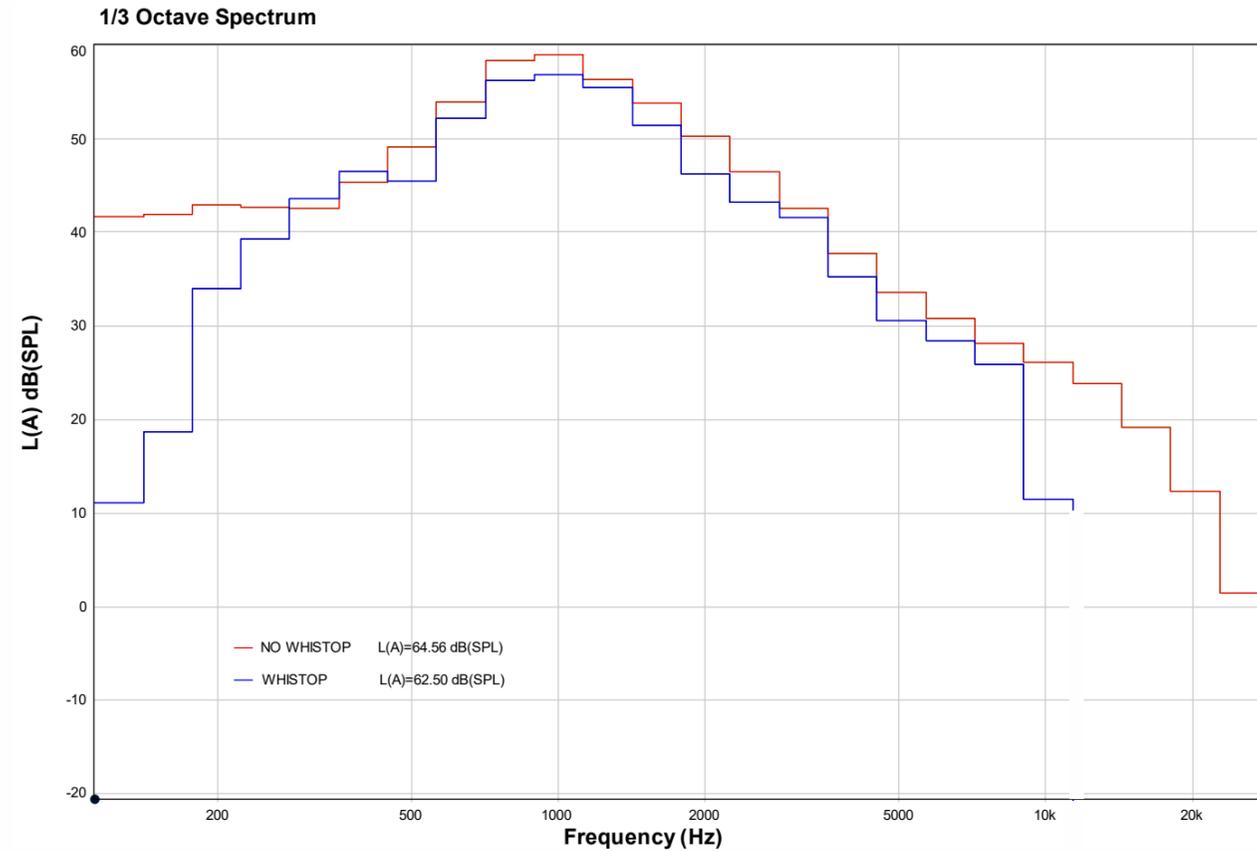
NO WHIStop:



With WHIStop:



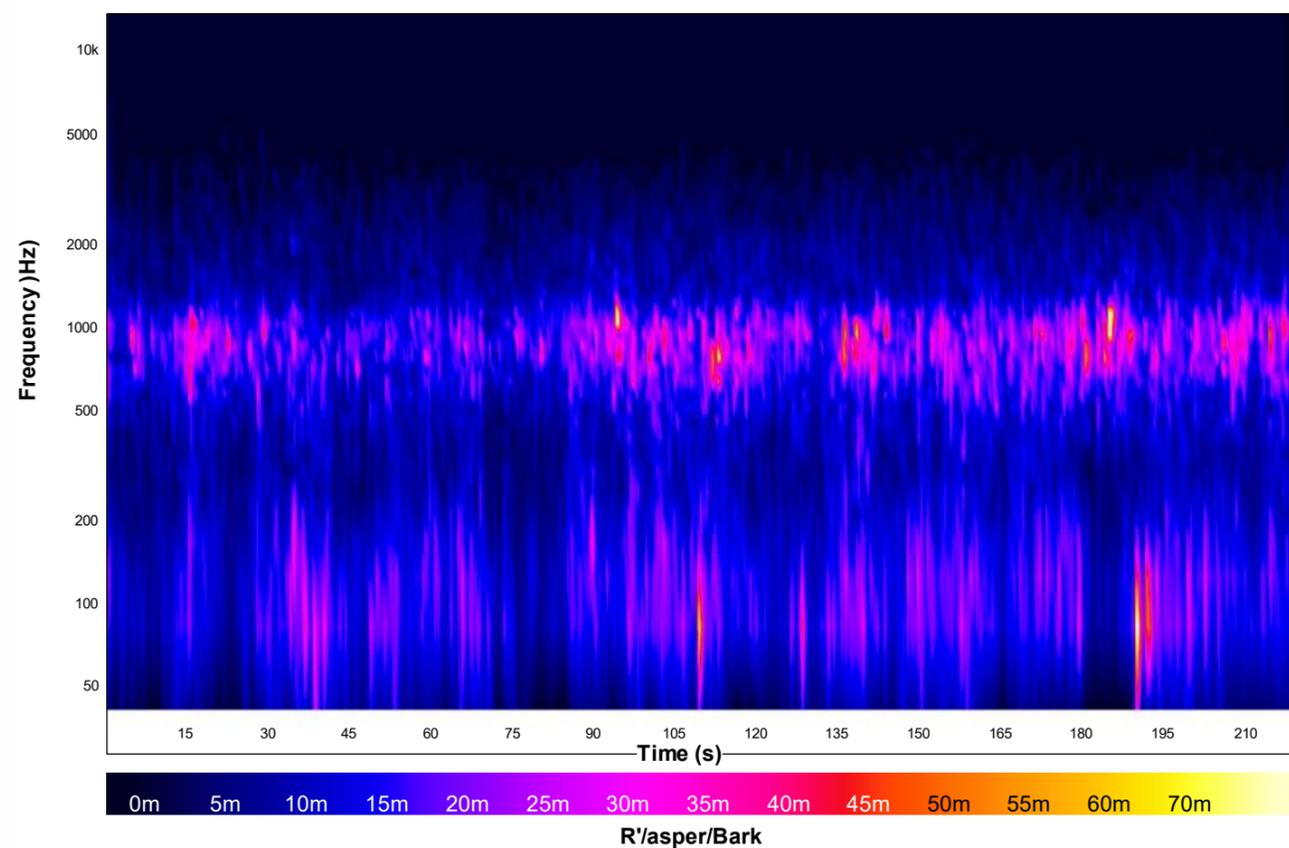
# Summary of Results – 1/3 Octaves & Loudness



# Summary of Results - Roughness

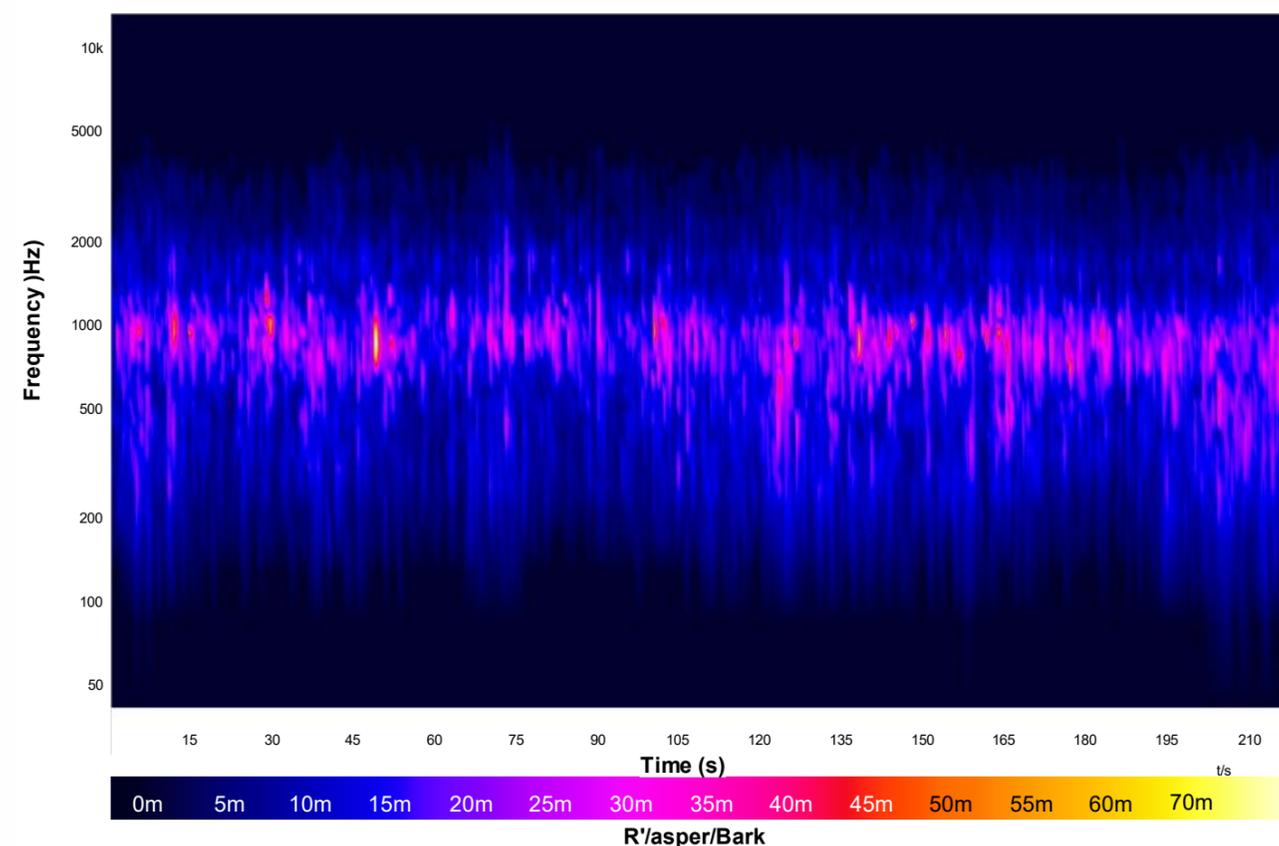
## NO WHIStop:

NO WHISTOP Specific Roughness v Time



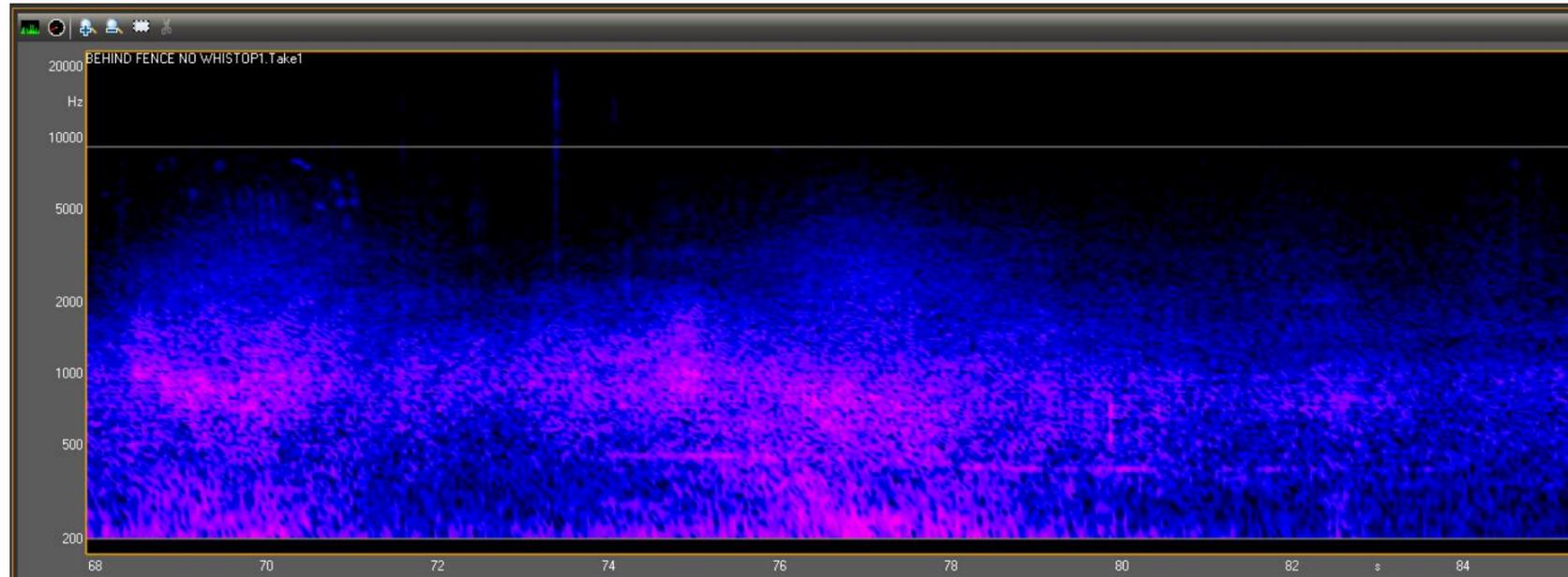
## With WHIStop:

WITH WHISTOP Specific Roughness v Time

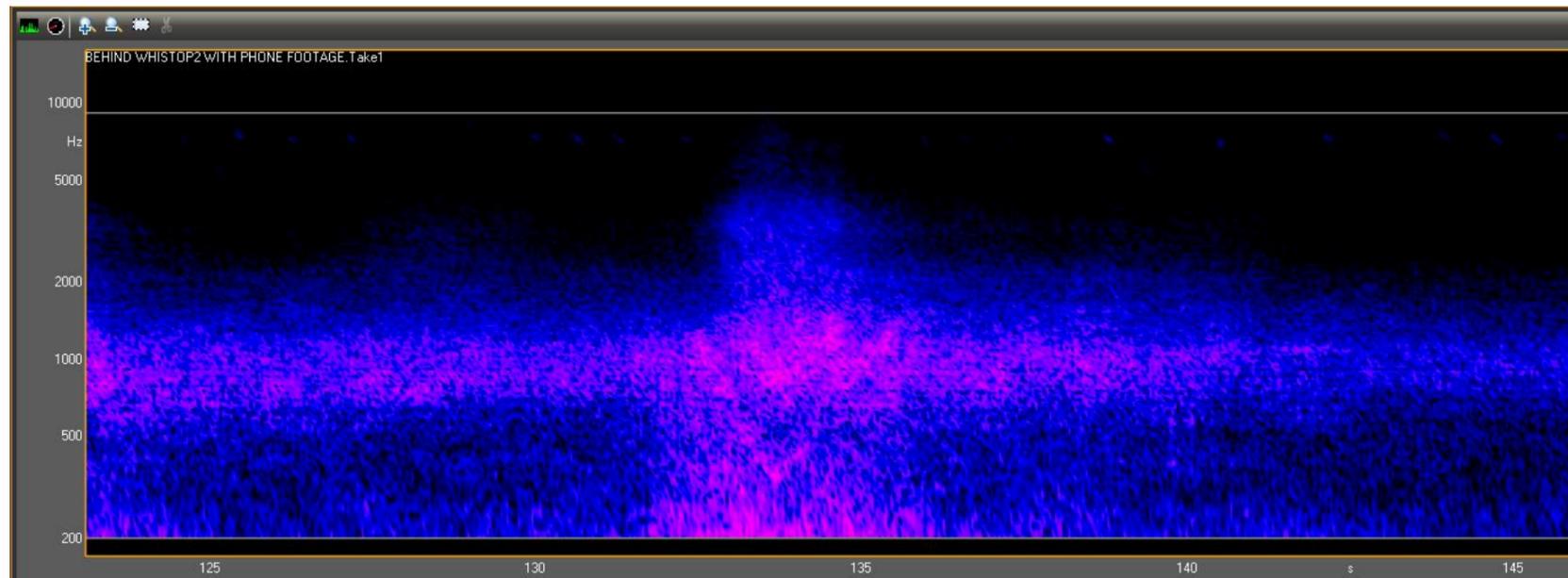


*\*Roughness quantifies the subjective perception of rapid (15-300 Hz) amplitude modulation of a sound.*

# Summary of Results – Doppler & Flanging

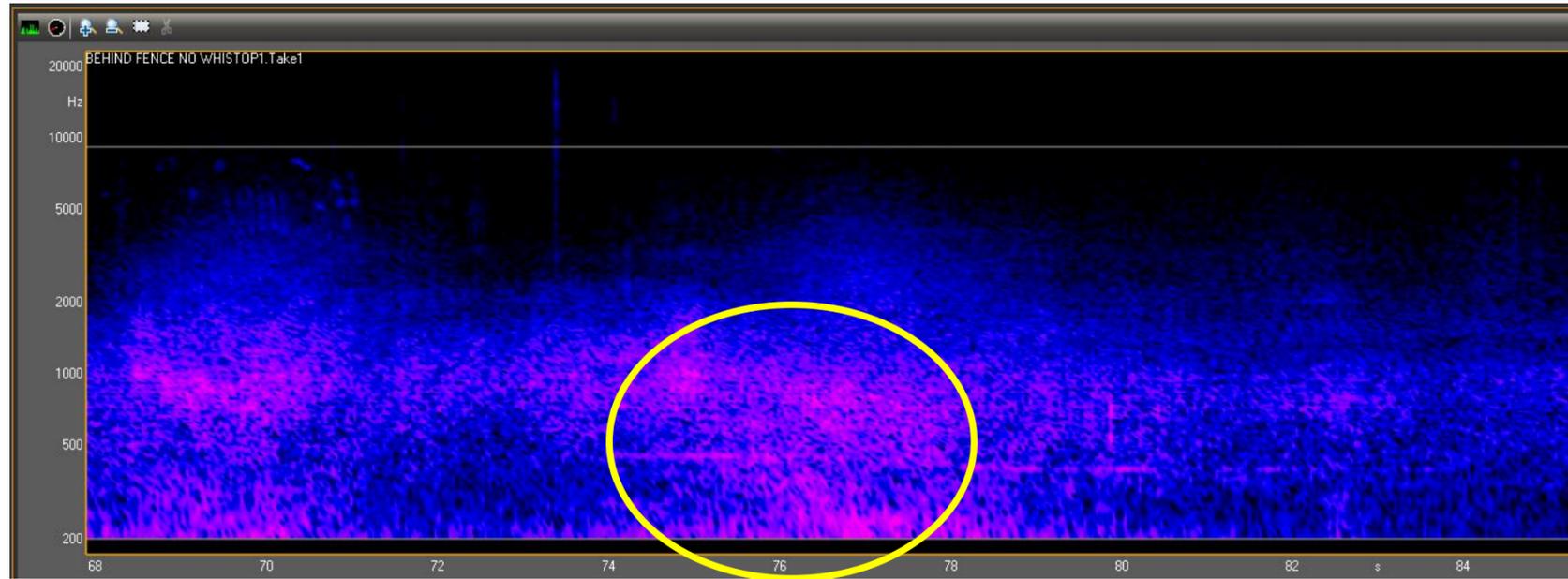


NO WHIStop

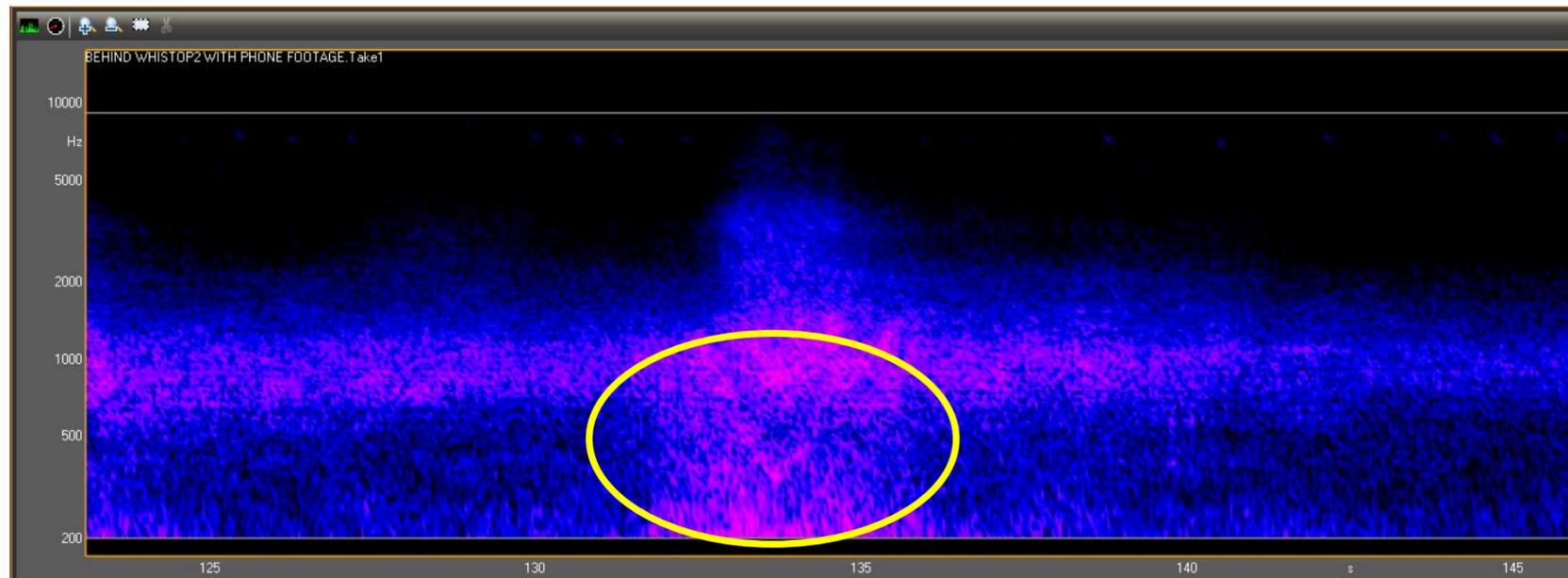


With WHIStop

# Summary of Results – Doppler & Flanging



NO WHIStop



With WHIStop



# Summary of Results

- Spot Measurements were taken at different points with & without WHIStop
- 3 minutes in duration with following traffic counts:

VEHICLE TYPE	CAR	VAN	TRUCK	BUS	Total
NO WHISTOP SOUTHBOUND	30	0	2	0	32
NO WHISTOP NORTHBOUND	21	6	2	1	30
WHISTOP SOUTHBOUND	30	2	4	0	36
WHISTOP NORTHBOUND	24	1	1	0	26

} *62 in total*  
} *62 in total*

- Measurement Results:

	$L_{eq}$ dB (SPL)	Max dB(A)	L5 dB(A)	L10 dB(A)
NO WHISTOP	64.6	69.2	68.0	67.5
WITH WHISTOP	62.5	69.1	67.1	65.7

# Initial Conclusions

- Initial results indicate introduction of WHIStop had a moderate effect on overall noise levels but needs to be further investigated with modelling.
- Site layout may impact on performance – in this case receivers are on top of embankment.
- The diffractor changes the sound characteristics of pass-by noise:
  - Significant change in perceived roughness
  - Flanging effects observed
- This study will conclude with noise model of site to estimate impact of barrier vs WHIStop



# Acknowledgements

- Vincent O'Malley & Stephen Byrne, Environment Unit, TII
- Martin Bourke, Regional Operations Manager, Region West
- This research was funded by Transport Infrastructure Ireland as part of the ANITA project funded under the TII309 Open Research Call (2022).



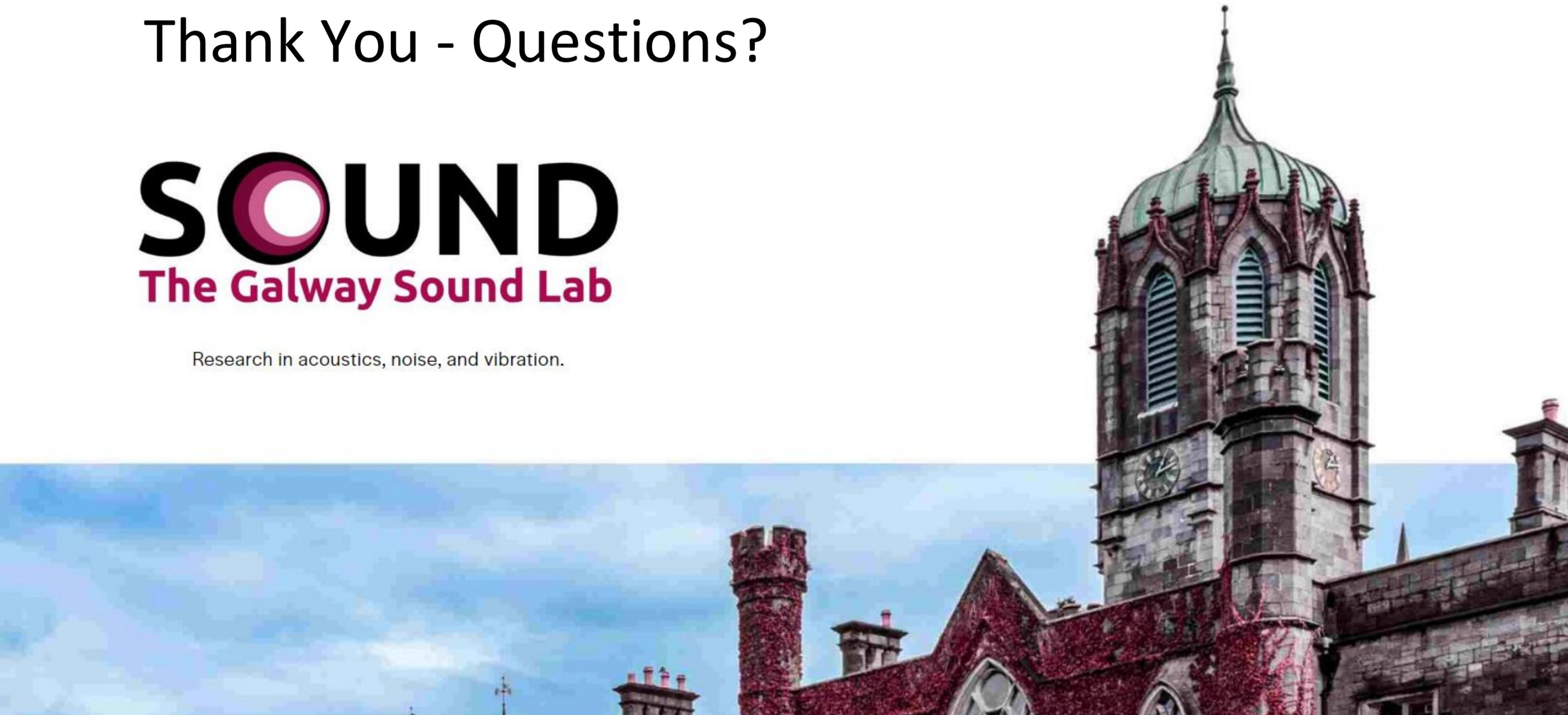
OLLSCOIL NA GAILLIMHÉ  
UNIVERSITY OF GALWAY

**SOUND**  
The Galway Sound Lab

Thank You - Questions?

**SOUND**  
The Galway Sound Lab

Research in acoustics, noise, and vibration.



# Questions: Session 6 Panel

## Session 6: Decarbonisation

*Chair: Dr Vincent O'Malley, Head of Environment, TII*

**Climate Action Plans; implications for road authorities**

*John Martin, Head of Climate Engagement /Governance, Department of Transport*

**Challenges in rehabilitating peat bogs for biodiversity and carbon sequestration**

*Gerry Baker, Senior Hydrogeologist, Arup*

**Green Procurement and Carbon Ladder**

*Micheál O'Connor and PJ Hourigan, TII*

**New Human Health and Population standard for the planning of national roads**

*Jenny Dunwoody, Arup*

**Noise Mitigation and Standards**

*Dr Eoin King, Lecturer, Mechanical Engineering, University of Galway*



# Thank you for attending the 2024 National Roads and Greenways Conference

