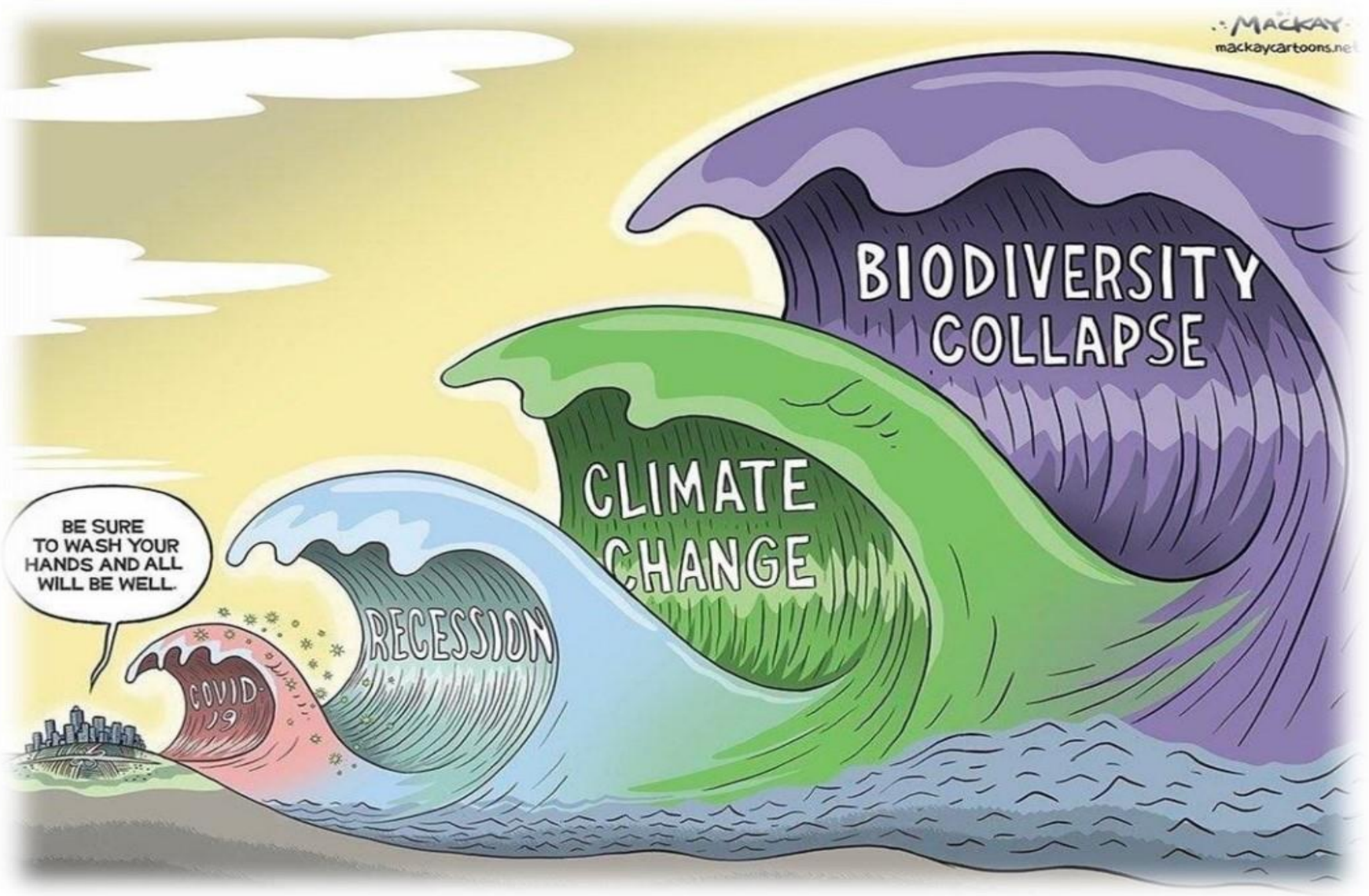
Bonneagar Iompair Éireann
Transport Infrastructure Ireland

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

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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

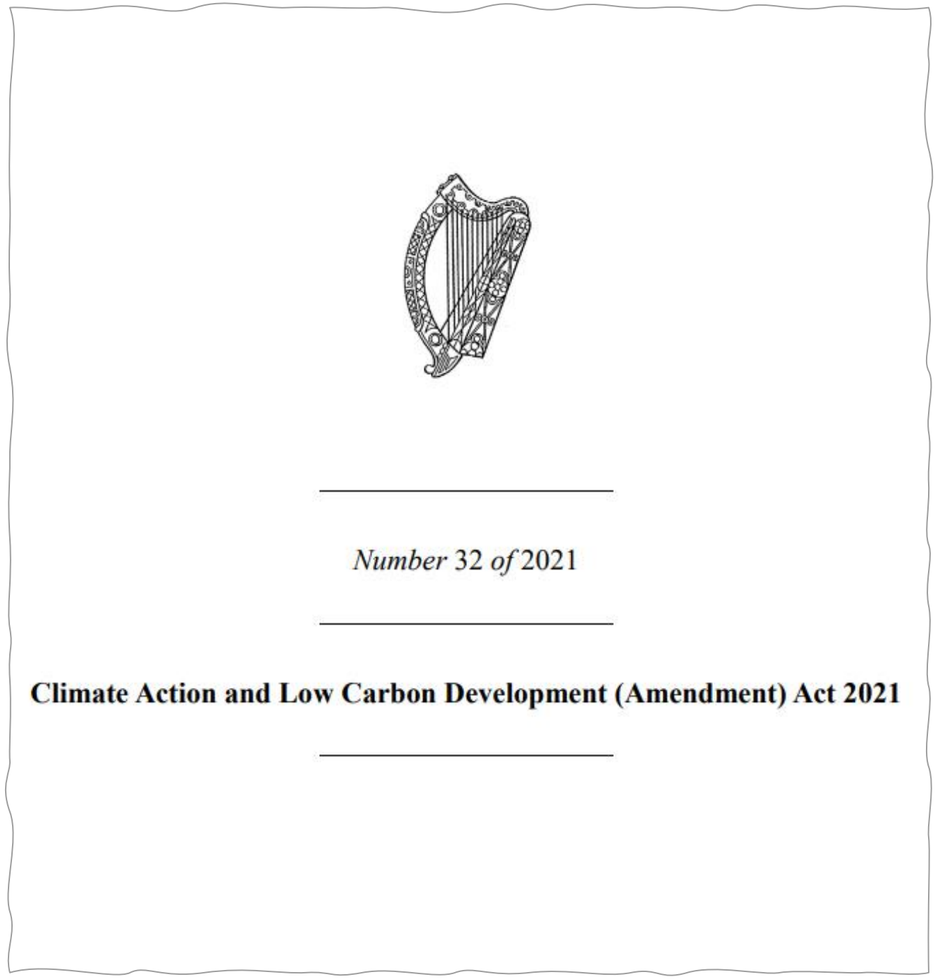
‘Decarbonising Ireland’s transport system and implications for transport infrastructure’

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)

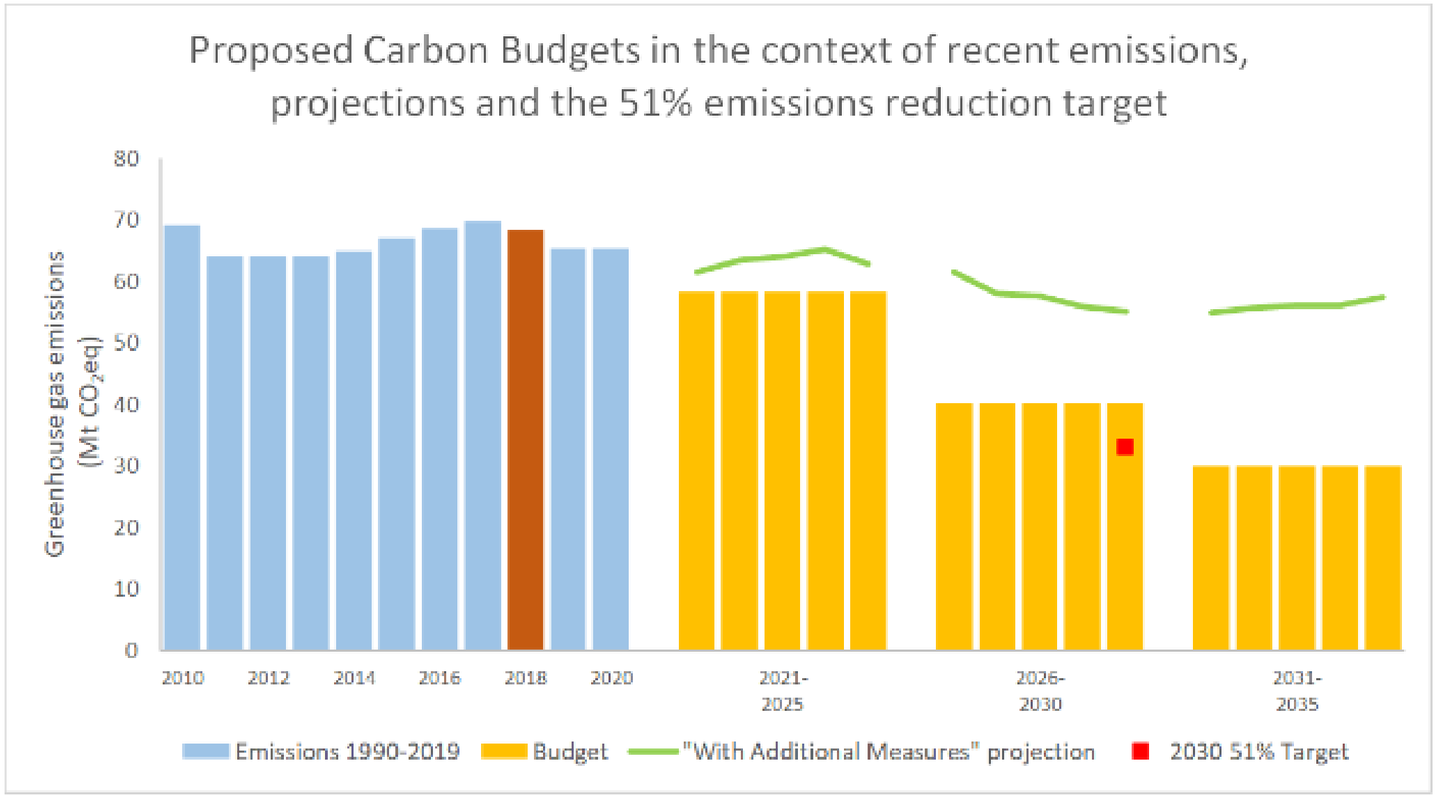


Number 32 *of* 2021

Climate Action and Low Carbon Development (Amendment) Act 2021

(1) Climate Action Plan Process - Background

- **2021-2025:** 295 Mt CO2 eq. an average of -4.8% for the first budget period.
- **2026-2030:** 200 Mt CO2 eq. an average of -8.3% for the second budget period.
- **2031-2035:** 151 Mt CO2 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 **45%** | residential **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.

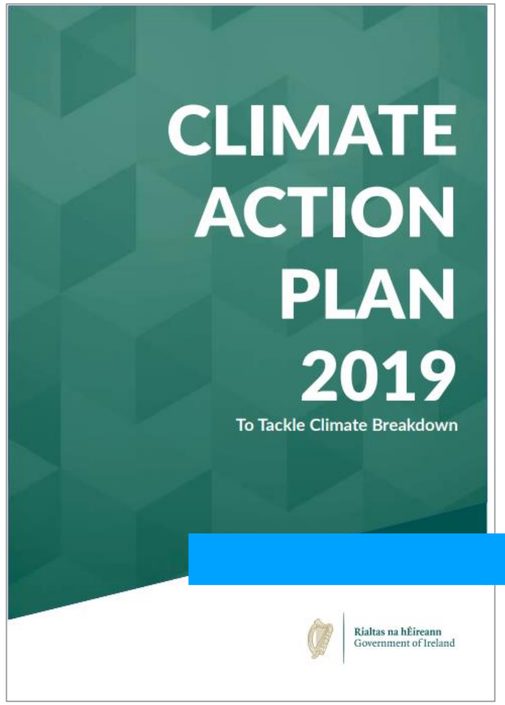
Table - Sectoral Emission Ceilings[3]

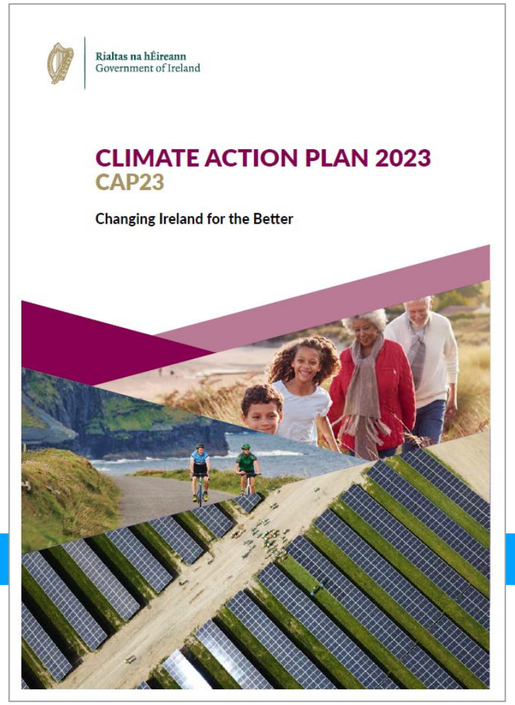
(Figures for $MtCO_2eq$ for 2018 and 2030 have been rounded. This may lead to some discrepancies)

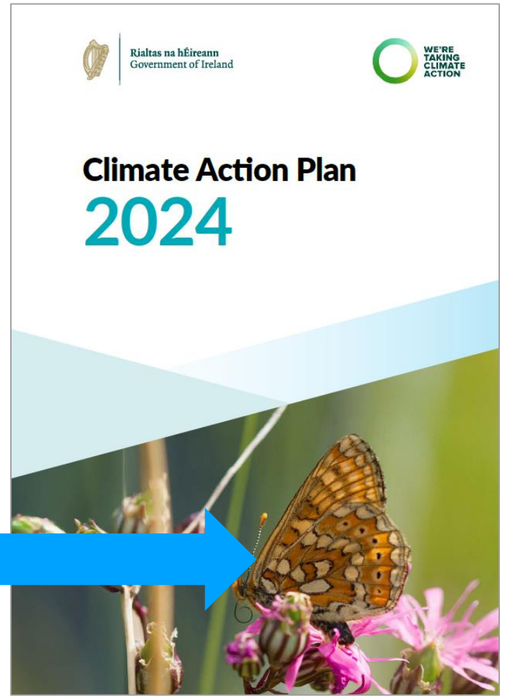
	2018 Baseline (MtCO2eq.)[4]	Sectoral Emission Ceilings for each 5-year carbon budget period (MtCO2eq.)		Indicative Emissions in Final Year of 2021-2025 carbon budget period (MtCO2eq)	Indicative Reduction in Emissions in Final Year of 2021-2025 budget period compared to 2018	Emissions in final year of 2026-20230 carbon budget period (MtCO2eq)	Reduction in Emissions final year of 2026-2030 carbon budget period compared to 2018	Agreed CAP21 Ranges
Sector	**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%[5]
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[6]	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[7]			*-26*			*-5.25*		
TOTAL[8]	*68*	*XXX*	*XXX*	*XXX*	*XXX*	*XXX*	*XXX*	*N/A*
Legally binding Carbon Budgets and 2030 Emission Reduction Targets[9]	-	**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

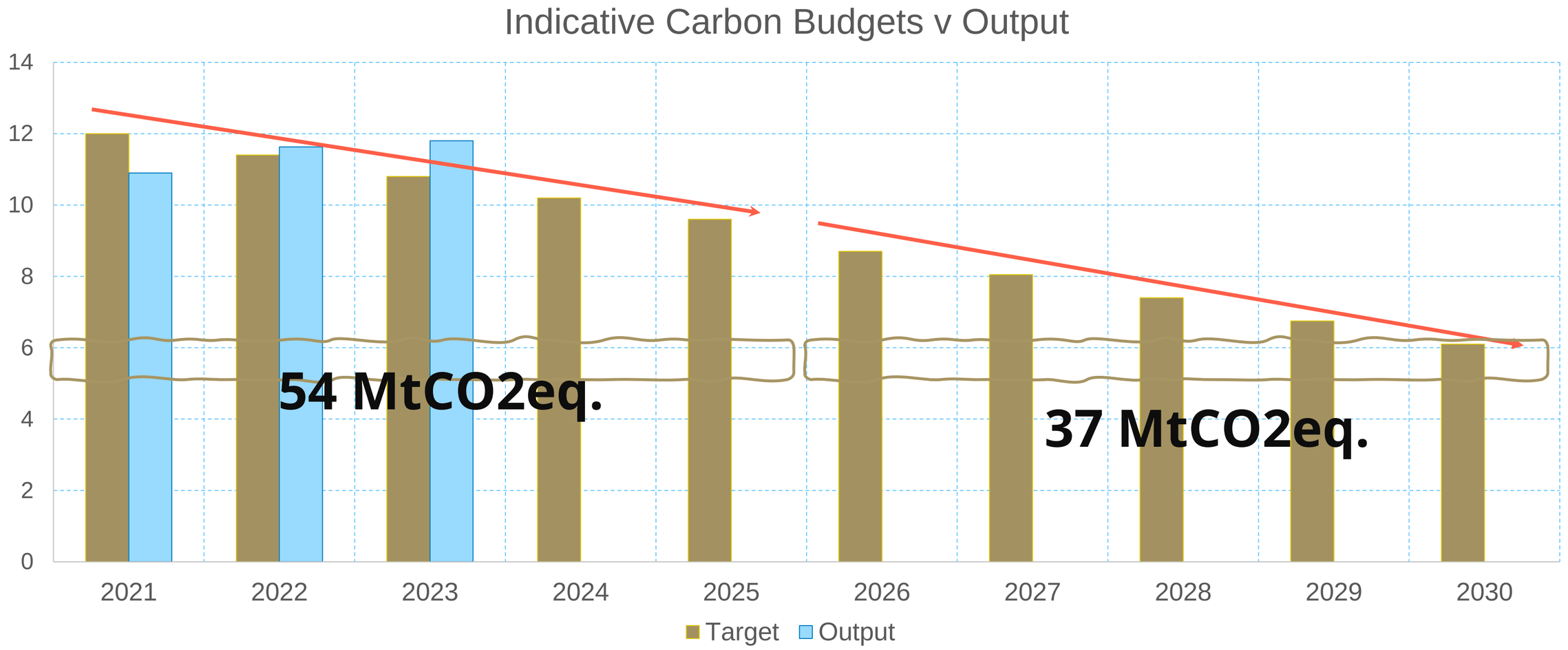
December 2022

First Statutory Plan under Carbon Budgets / Sectoral Emission Ceilings.

April 2024

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

(3) Transport Emissions – State-of-Play



(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%

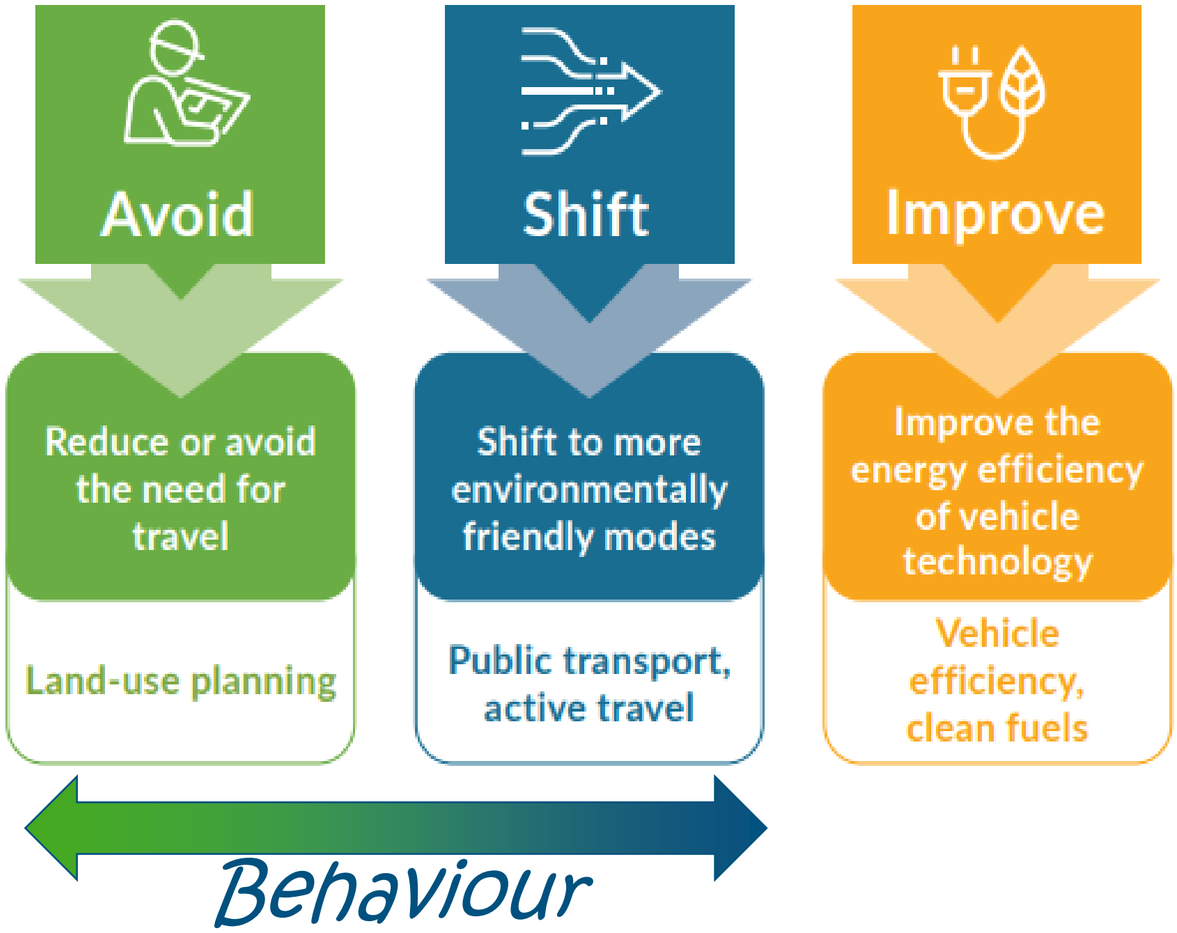
At the end of 2023, there were almost 110,000 electric vehicles in Ireland, approximately 56% of the Climate Action Plan target for 2025.

- 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 to 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

Enhanced Spatial and Land-use Planning

Demand Management Strategy

Roadspace Reallocation

Strategic Transport Planning

SHIFT

Active Travel Infrastructure Programme

Major Public Transport Infrastructure Programme

Public Transport Services and Escort to Education Journeys

Smart, Shared and Integrated Mobility

IMPROVE

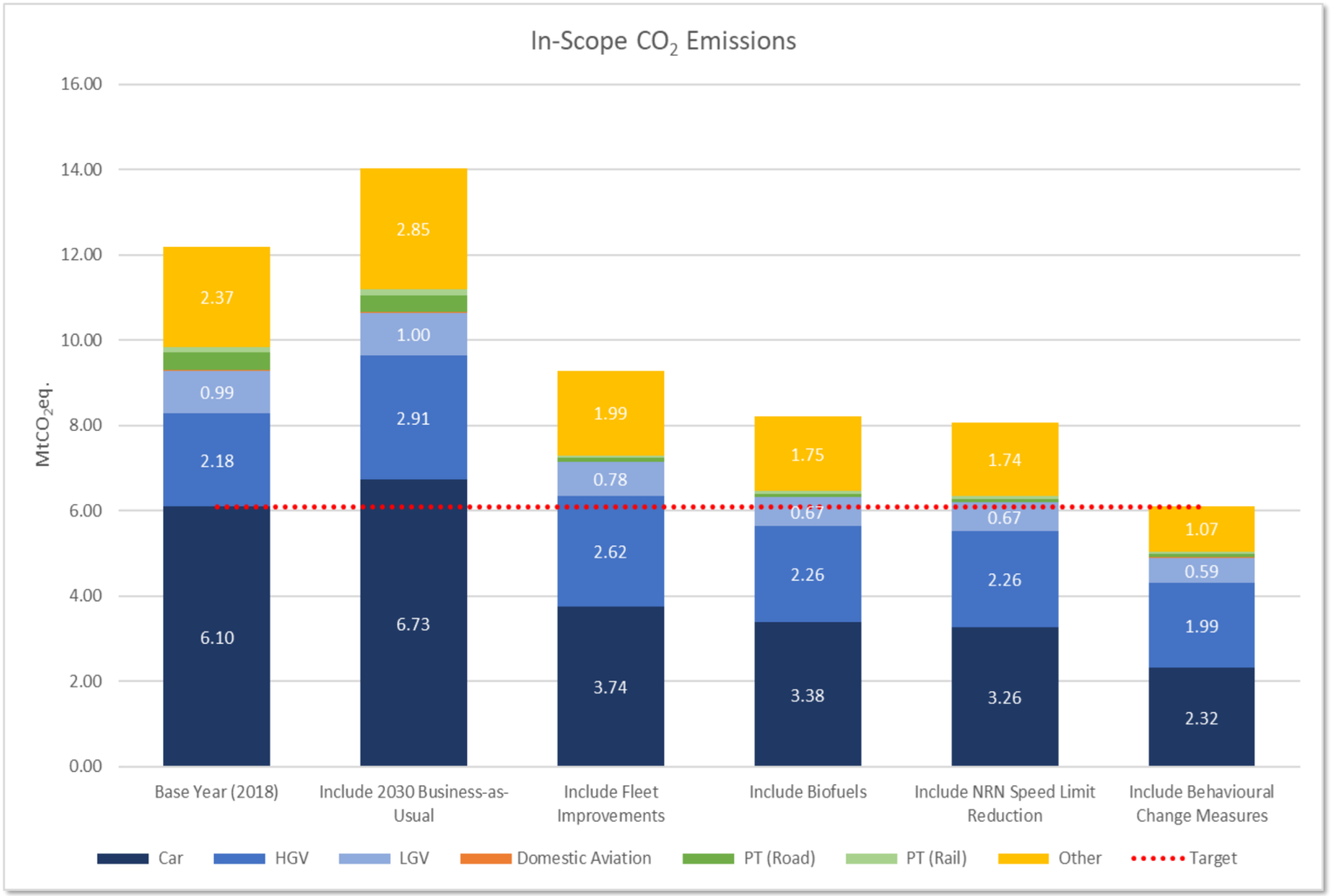
Decarbonising Public Transport & School Transport Services

EV Charging Infrastructure Strategy / ZEVI 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

(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

Metrices (by 2030)

Reduce total vehicle kilometres driven by 20%

50% reduction in fuel usage

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

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Metrices (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

Metrices (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

Metrices (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

Metrices (by 2030)

130% increase in daily Public Transport Journeys

Increase Public Transport Modal share from 8% to 19%

(4) CAP24 - Transport Chapter – ‘IMPROVE’ Actions

Metrices (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

Metrices (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

(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

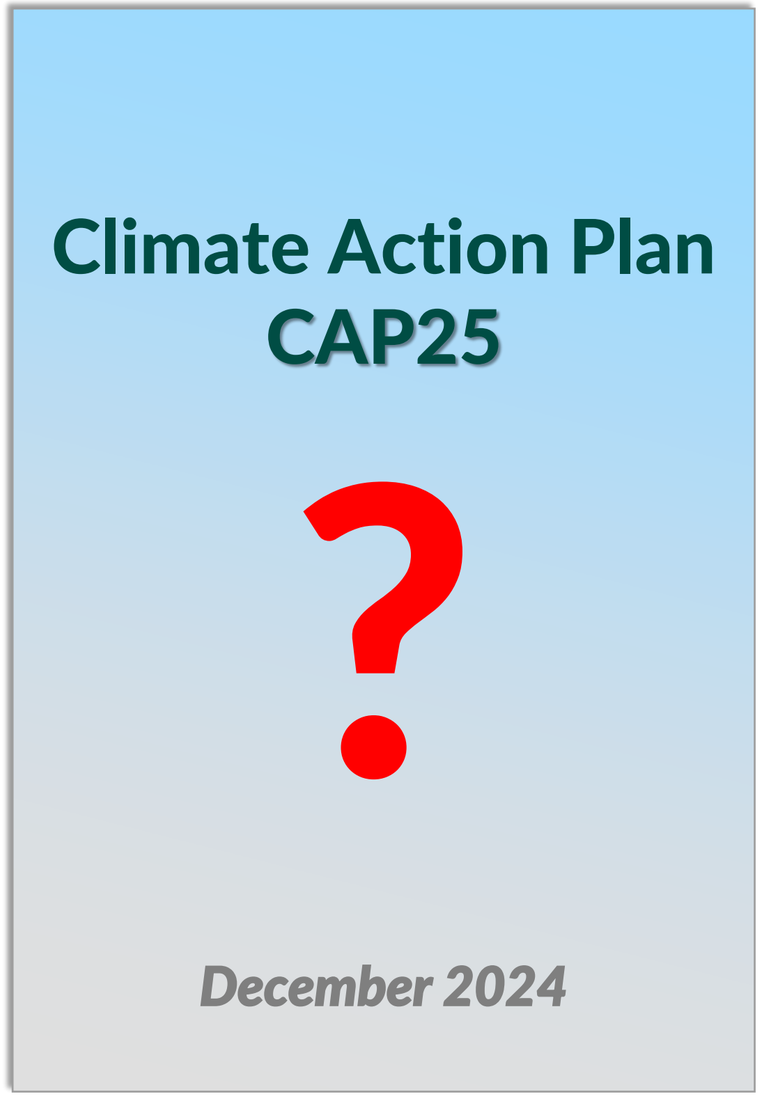
Public and Political Acceptance

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.



(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

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Transport Infrastructure Ireland

Challenges in rehabilitating peat bogs for biodiversity and carbon sequestration

Gerry Baker, Senior Hydrogeologist, Arup

ARUP

Challenges in rehabilitating peat bogs for biodiversity and carbon sequestration

TII National Roads and Greenways Conference 2024

Gerry Baker

4th Oct 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

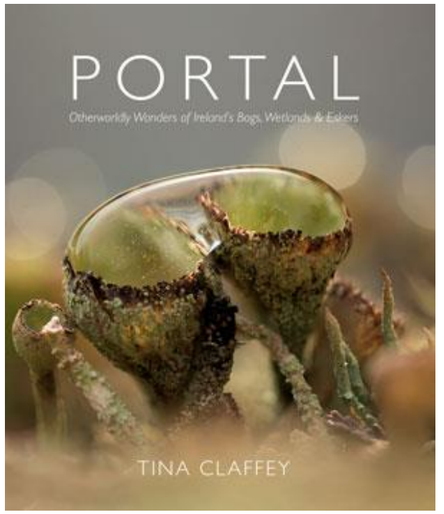
ARUP

Peatlands - Context

What are peatlands?

Sphagnum & Sundew

Pixie Lichen Cups



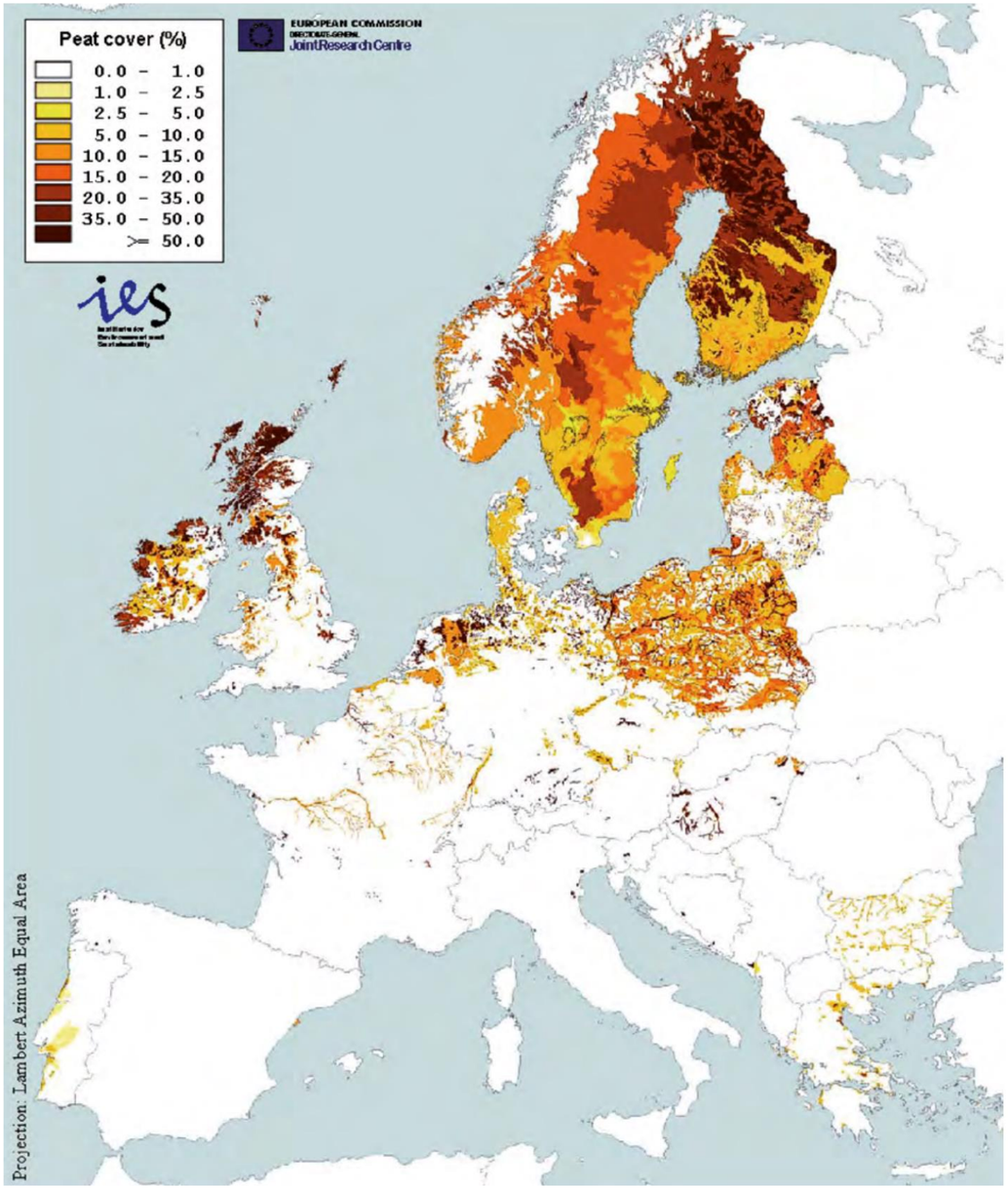
https://www.tinaclaffey.com/

Sphagnum moss

Why are peatlands important?

ARUP

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



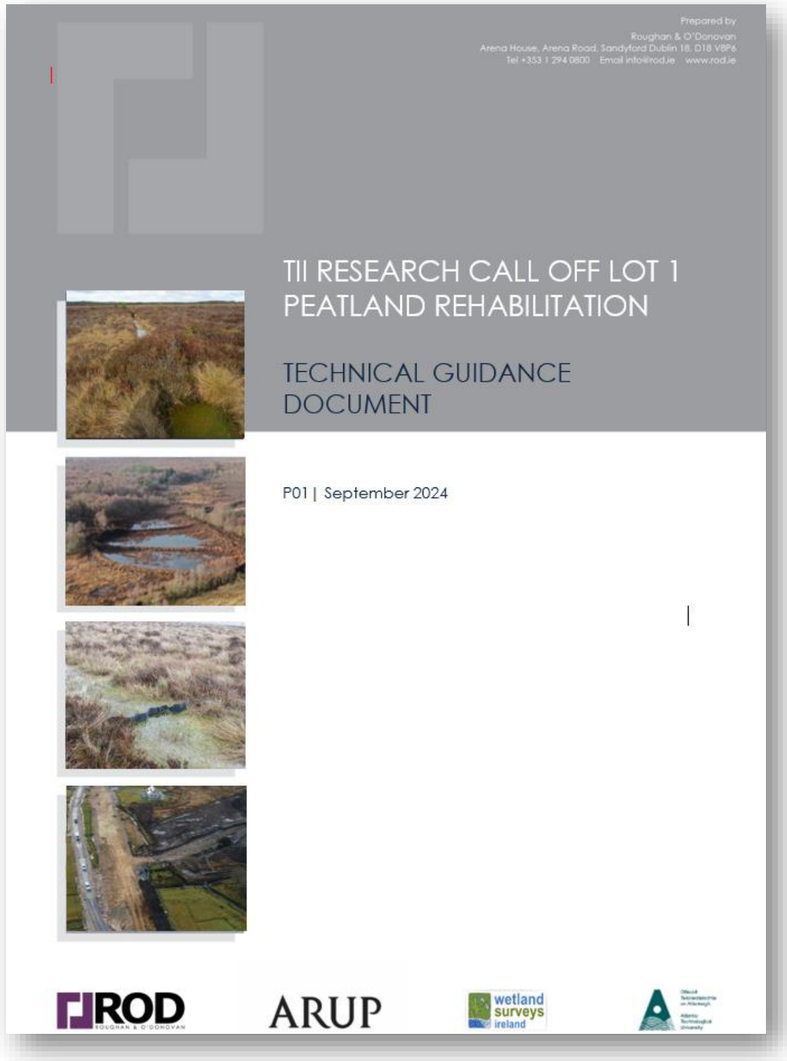
European Peatland Distribution

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

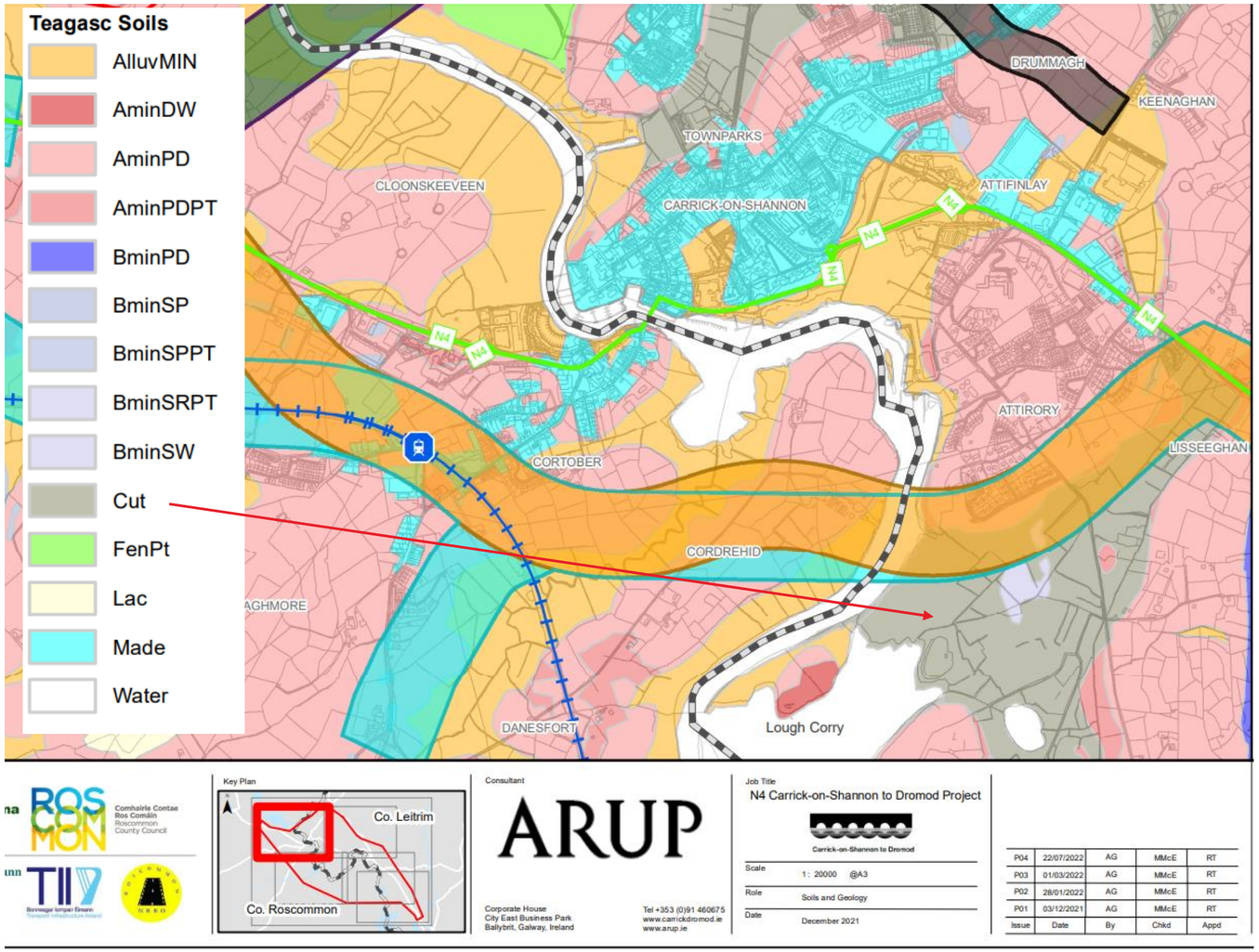


Peatlands in TII Projects

Where does peat become part of the conversation?

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

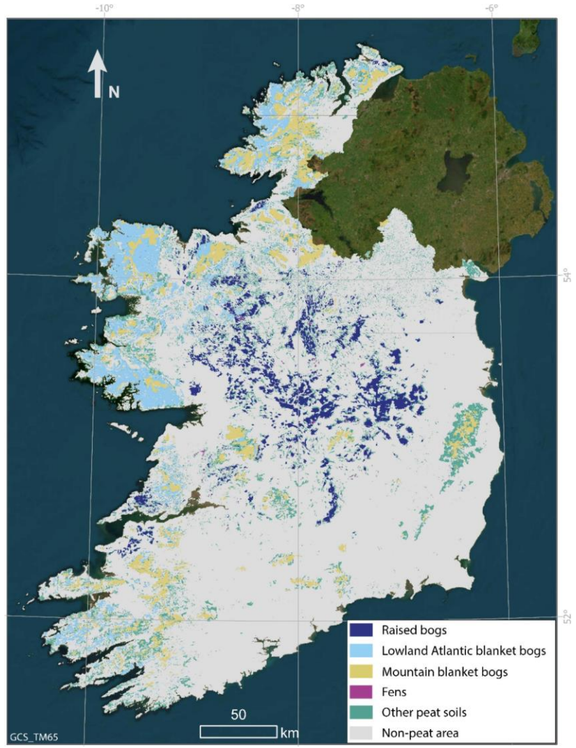
Planning and Design	Phase 0	Scope and Pre-Appraisal
	Phase 1	Concept and Feasibility
	Phase 2	Options Selection
	Phase 3	Design and Environmental Evaluation
	Phase 4	Statutory Processes
Construct / Implement	Phase 5	Enabling and Procurement
	Phase 6	Construction and Implementation
	Phase 7	Close out and Review

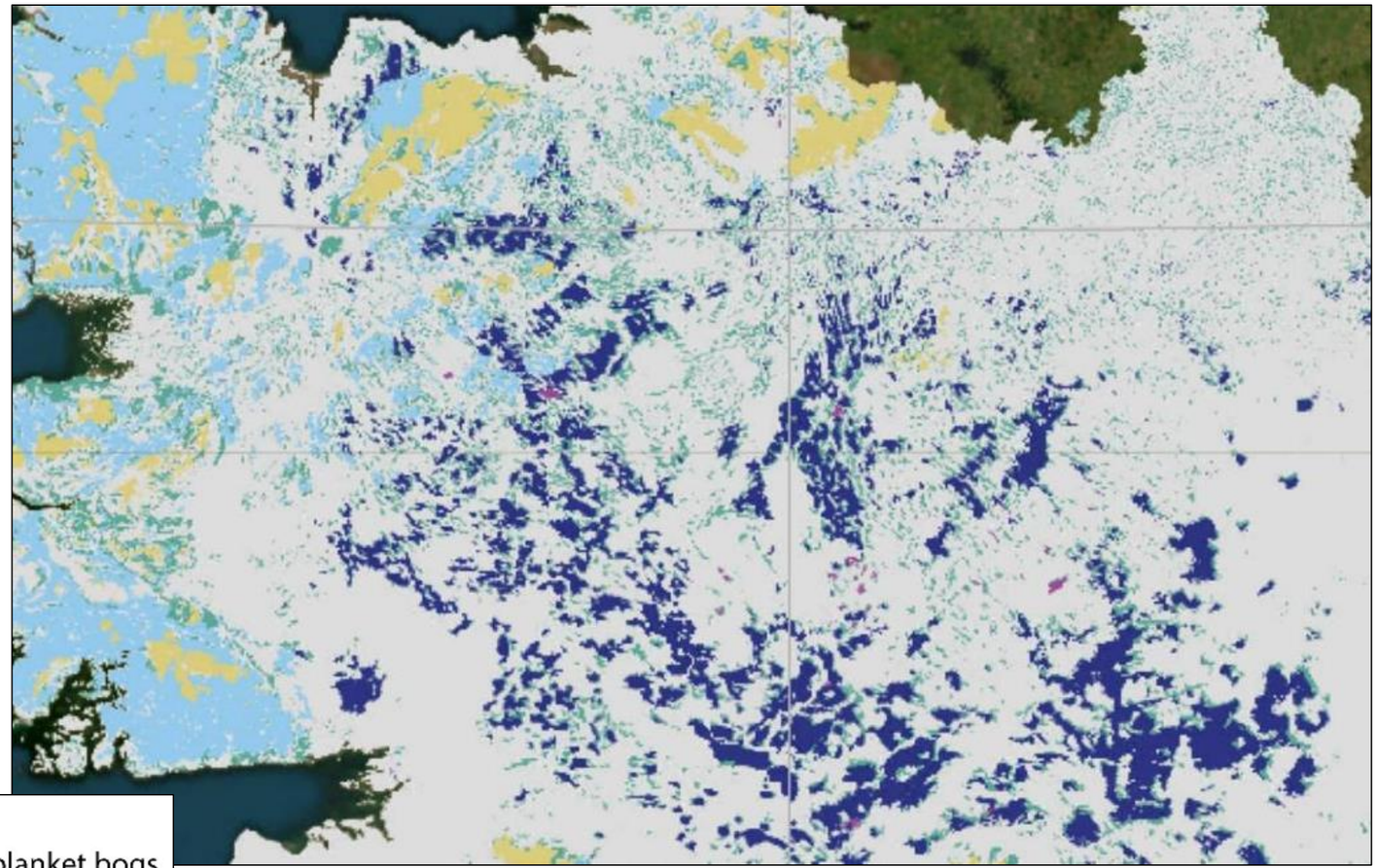


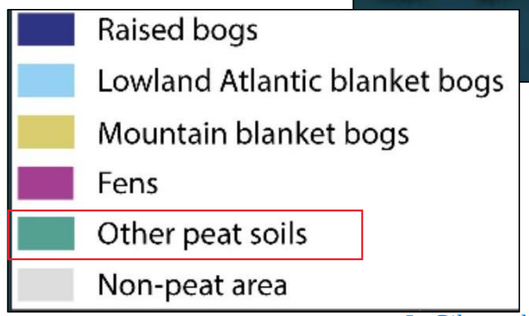
Peatland Coverage

New Mapping Implications

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





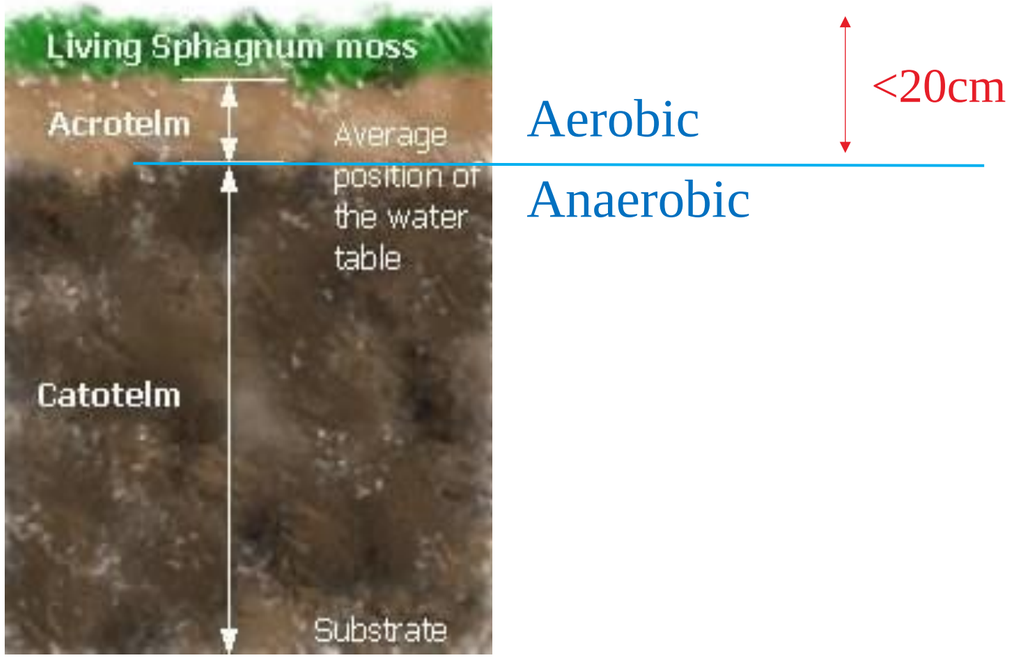


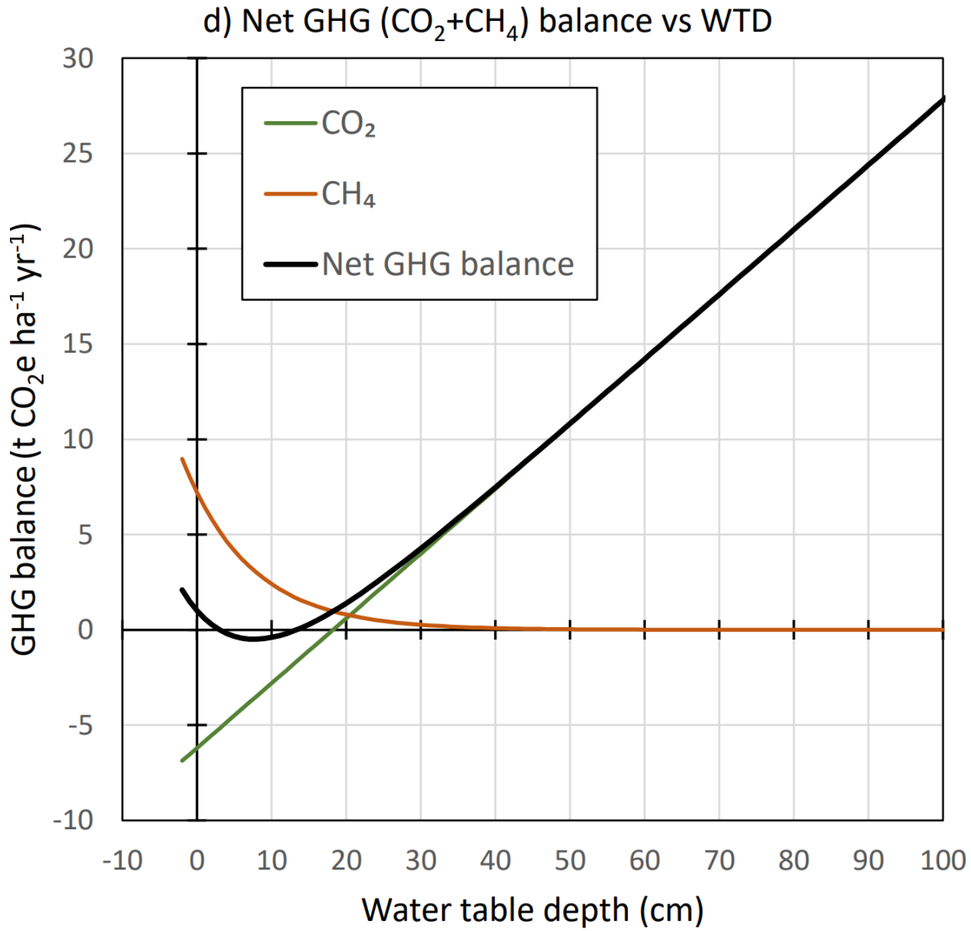
L. Gilet et al. (2024) An adaptive mapping framework for the management of peat soils: A new Irish peat soils map. Geoderma 447 (2024)

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
Very High	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
High	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
Extremely High	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
Very High	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
High	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

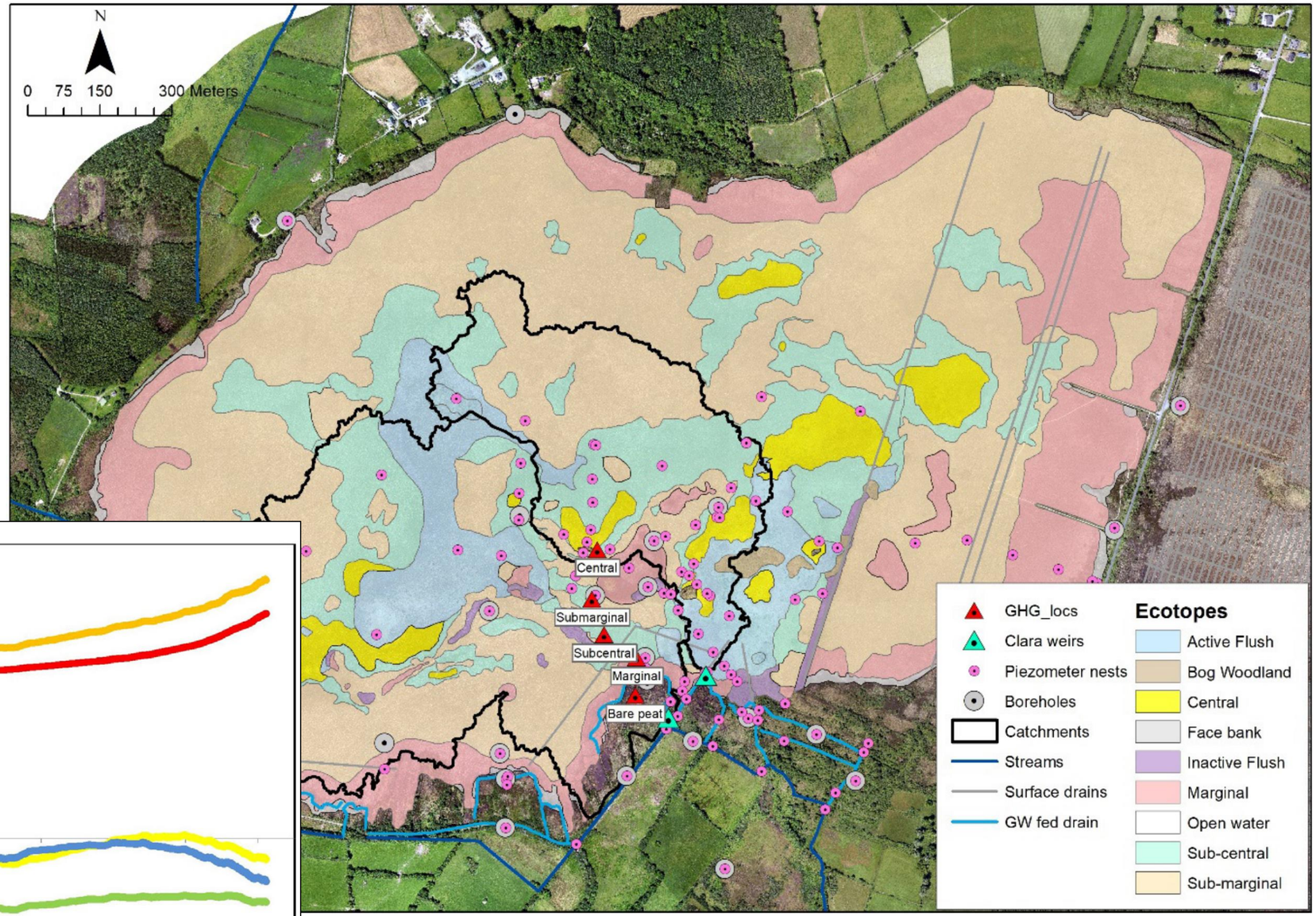
Controls on Biodiversity

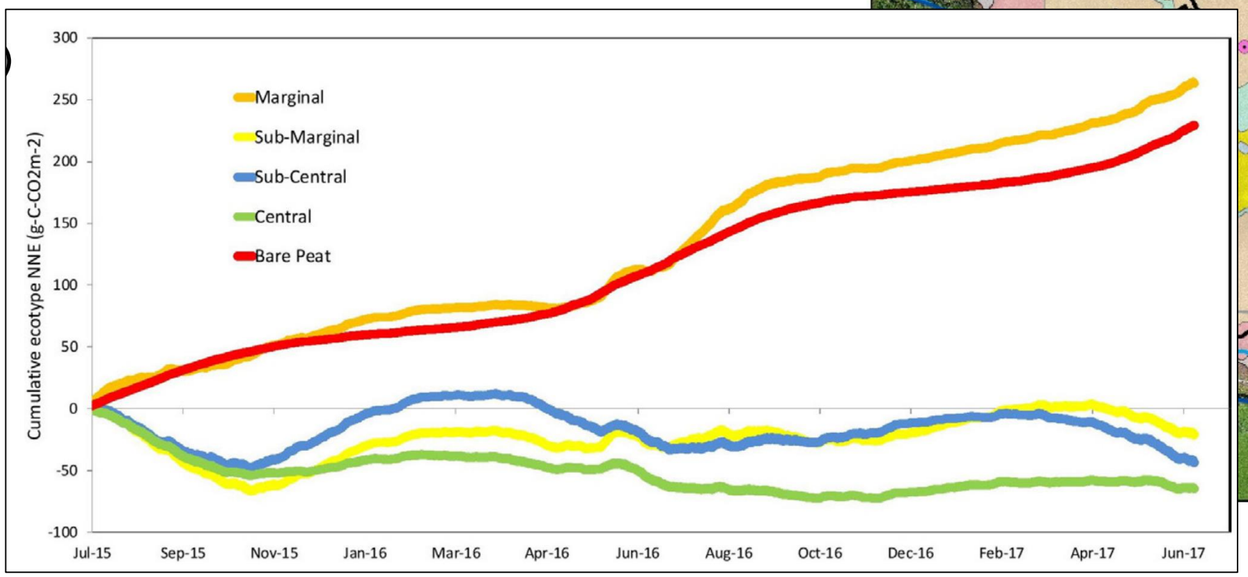
ARUP

Ecotope Distribution + Water

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

Clara Bog Ecotope Mapping (2017)





Regan et al (2014) Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report 2014-NC-MS-2

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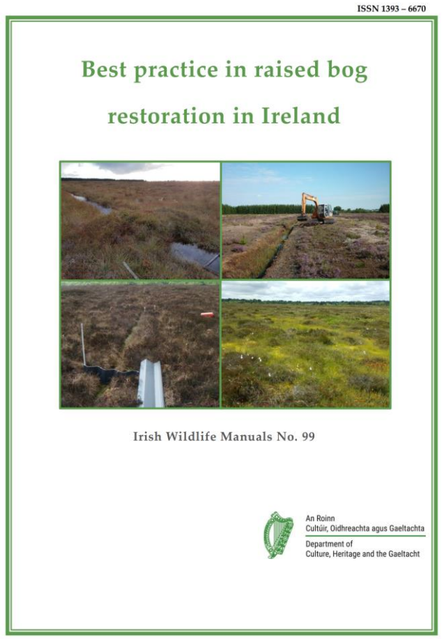
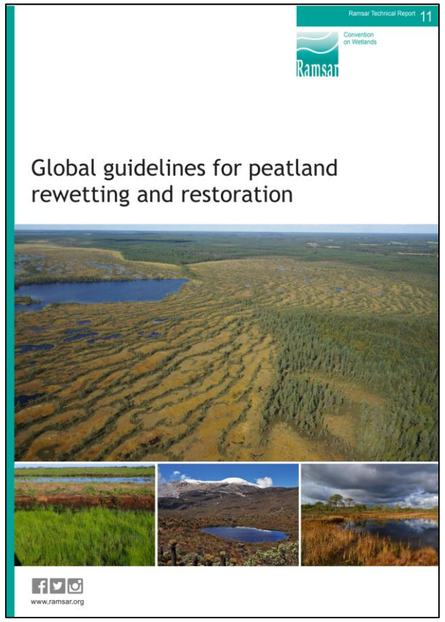
Peatland Restoration Strategies

- 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 Kellysgrove Bog June 2021.

Hydrological Criteria for Peatland Rehabilitation

ARUP

Raised Bog

- Objective based on ecotype

Ecotope	Water Level (mbgl) [1]	Slope/ Hydraulic Gradient[1]
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

1 Regan et. al. (2020) Ecohydrology, GHG Dynamics and Restoration guidelines for Degraded Raised Bogs. EPA Strive Report No. 342

Understanding the Water Balance

ARUP

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

Standpipe with geomembrane prior to installation

Peat Cores

Surface humidity

ARUP

TII Project Potential Impacts on Peat

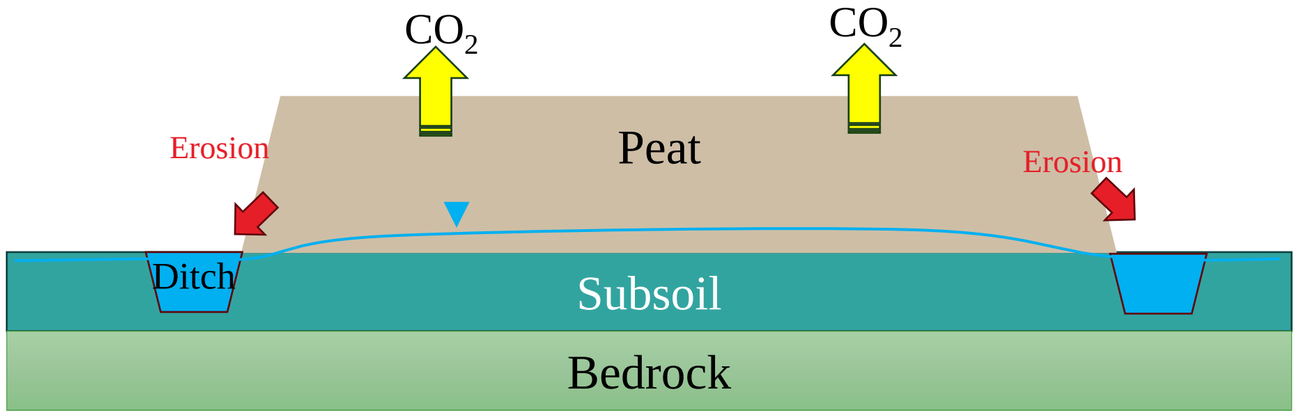
- Excavation
- Deposition
- Compaction
- Drainage

N6 Peat Infilled Borrow Pit

Peat Deposition Areas

N6 Pollboy Deposition, Ballinasloe[1]

- 115,000m^3 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 [2] as 11,670 tCO_2eq 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

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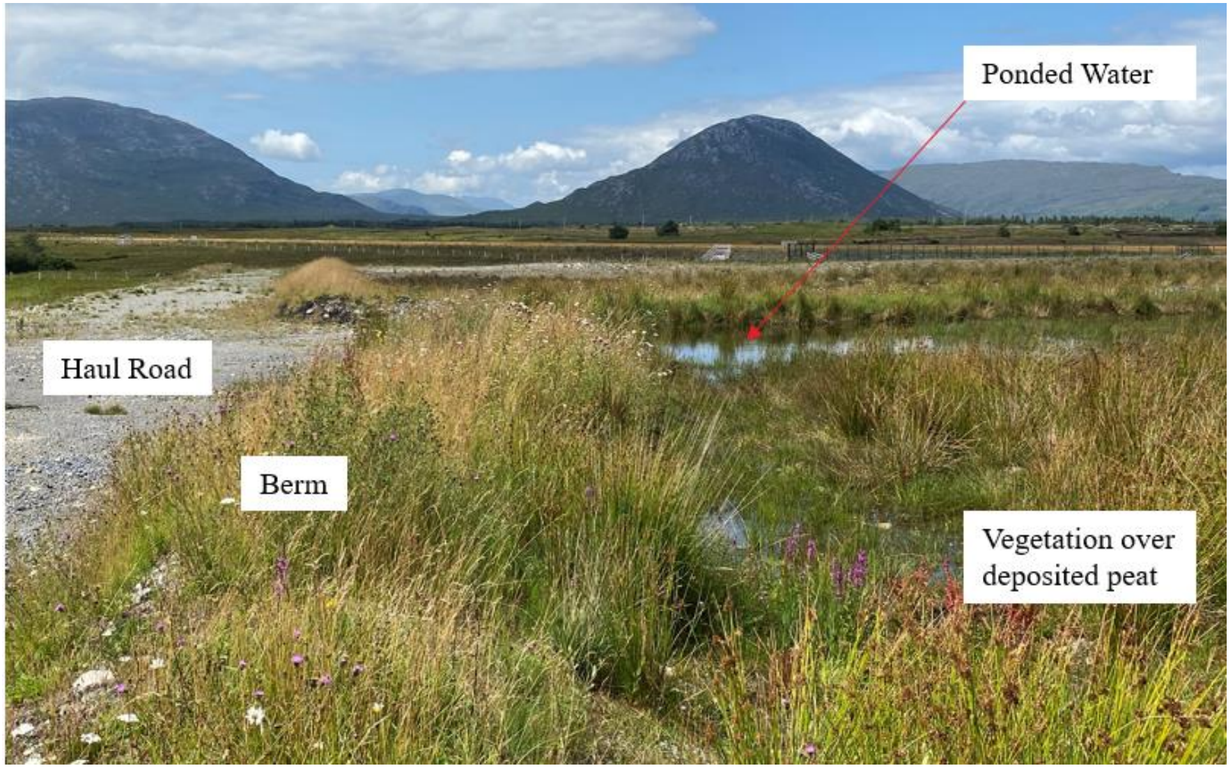
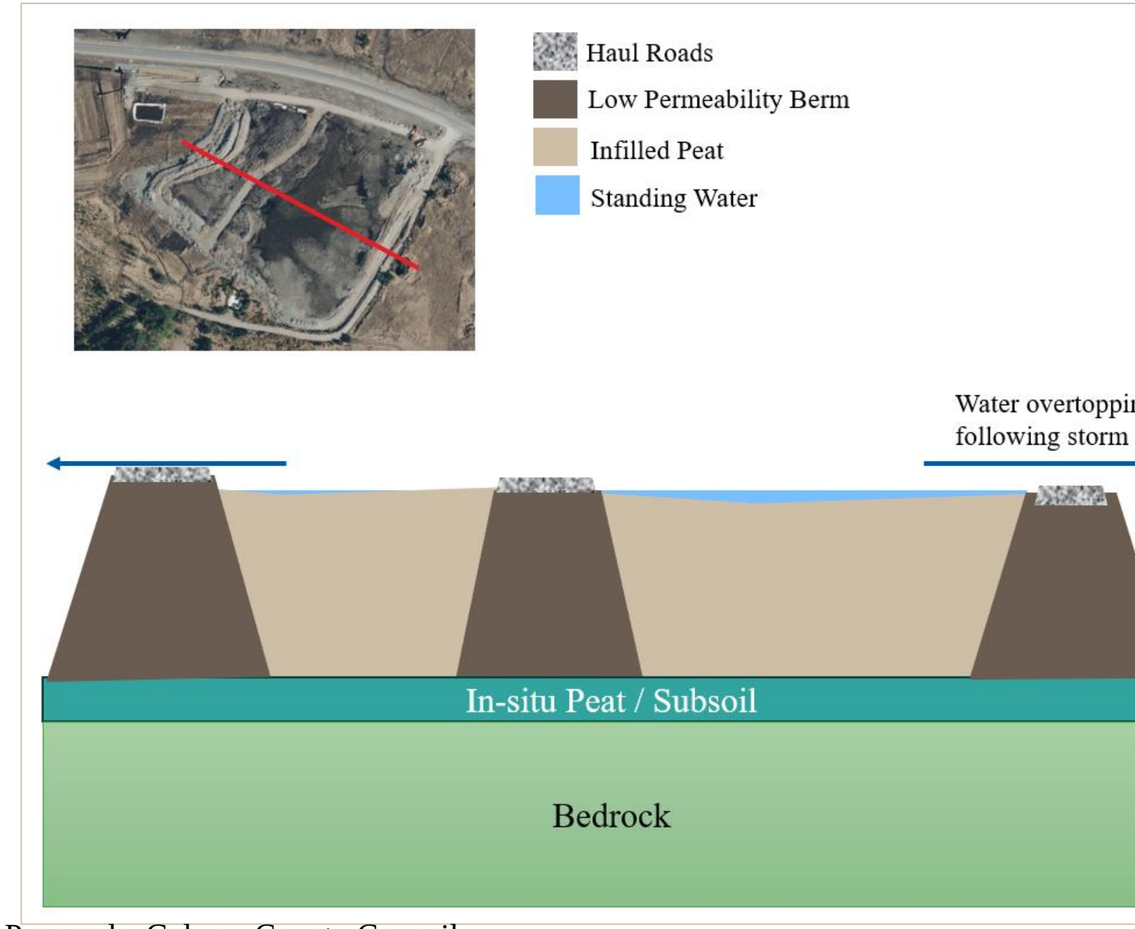
N59 Maam Cross[1]

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



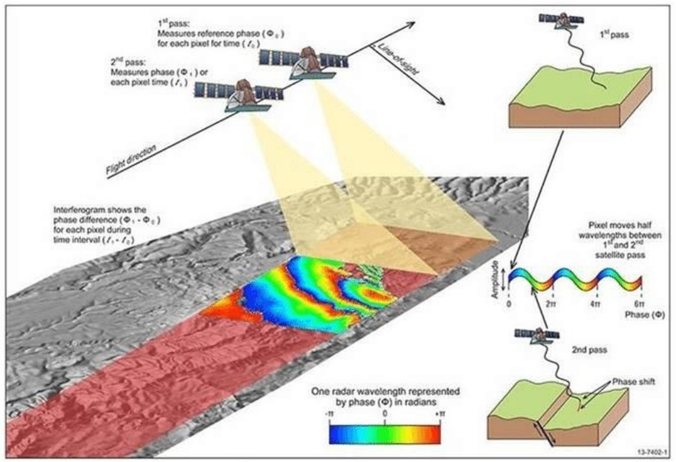


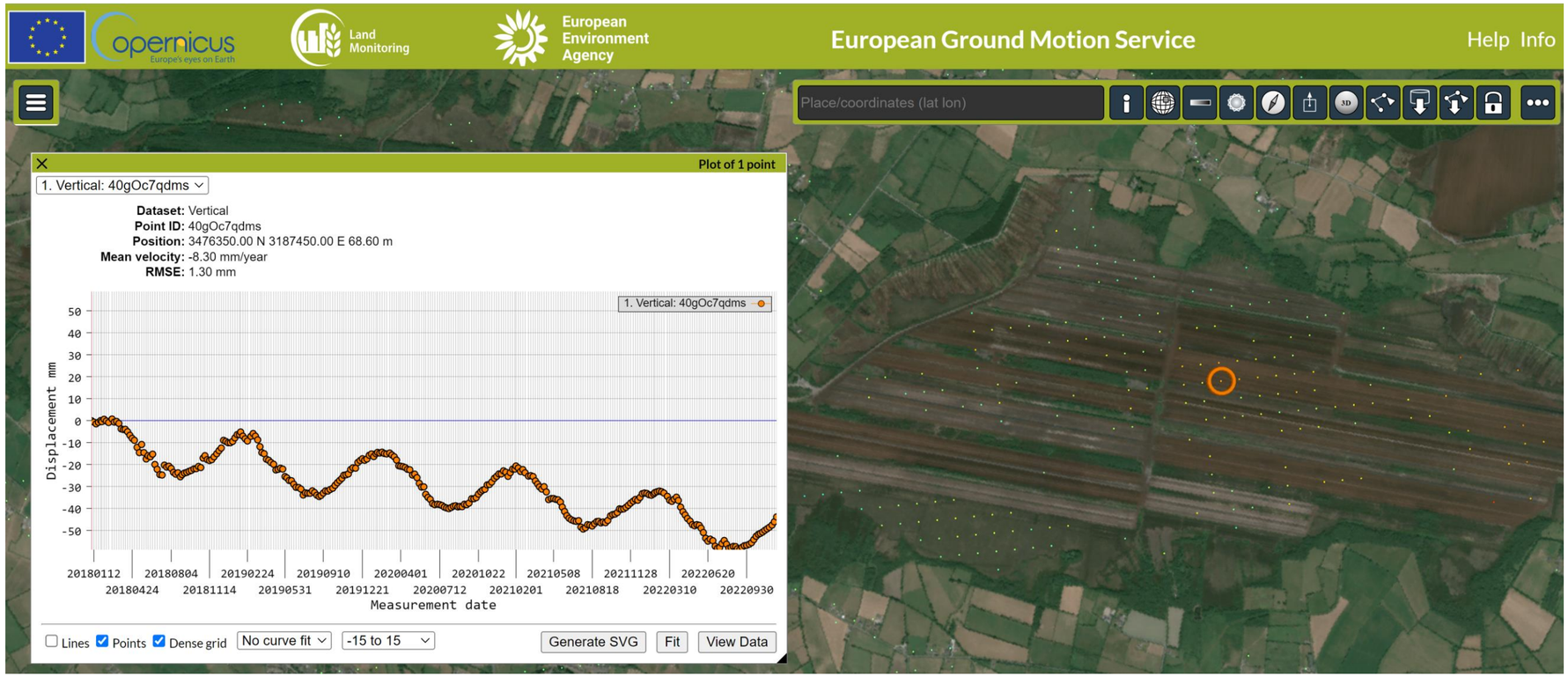
1: ROD, (2013). N59 Oughterard to Maam Cross – Technical Paper – Peat Restoration & Storage Proposals. Galway County Council.

Mire Breathing

ARUP

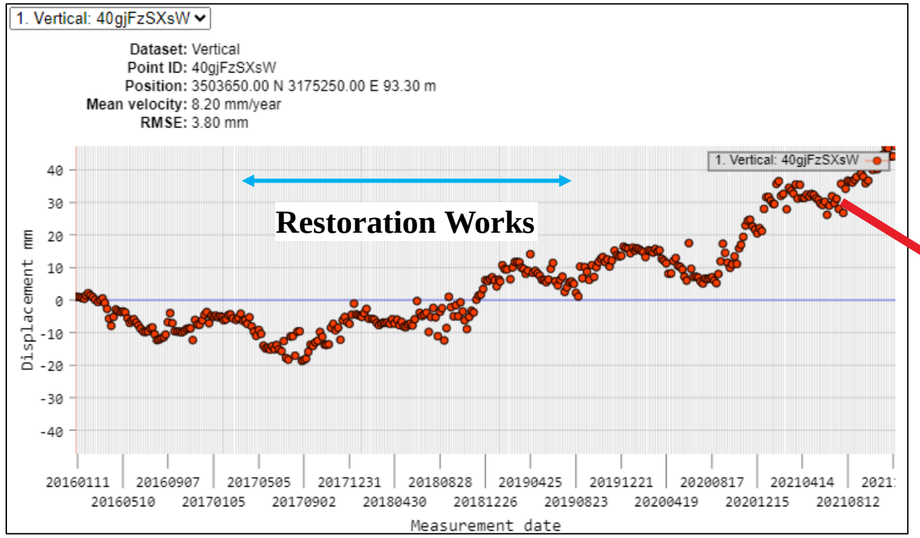
- Raised bogs swell in winter with rainfall and recede in summer
- EGMS provides open source InSAR data monitoring ground movements at millimetre accuracy
- Significant subsidence in some drained bogs >60mm

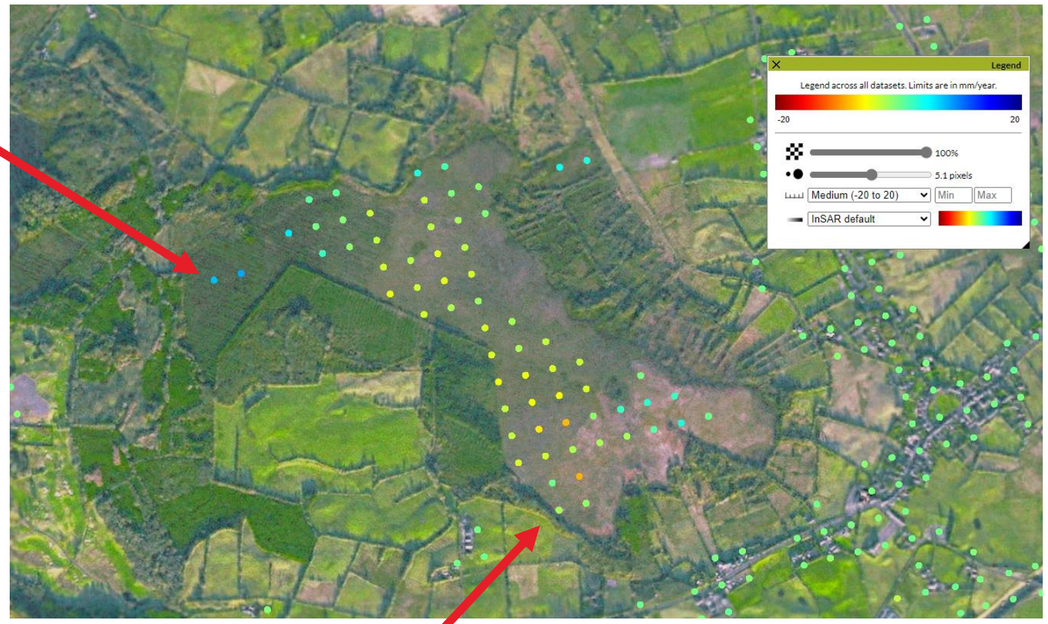


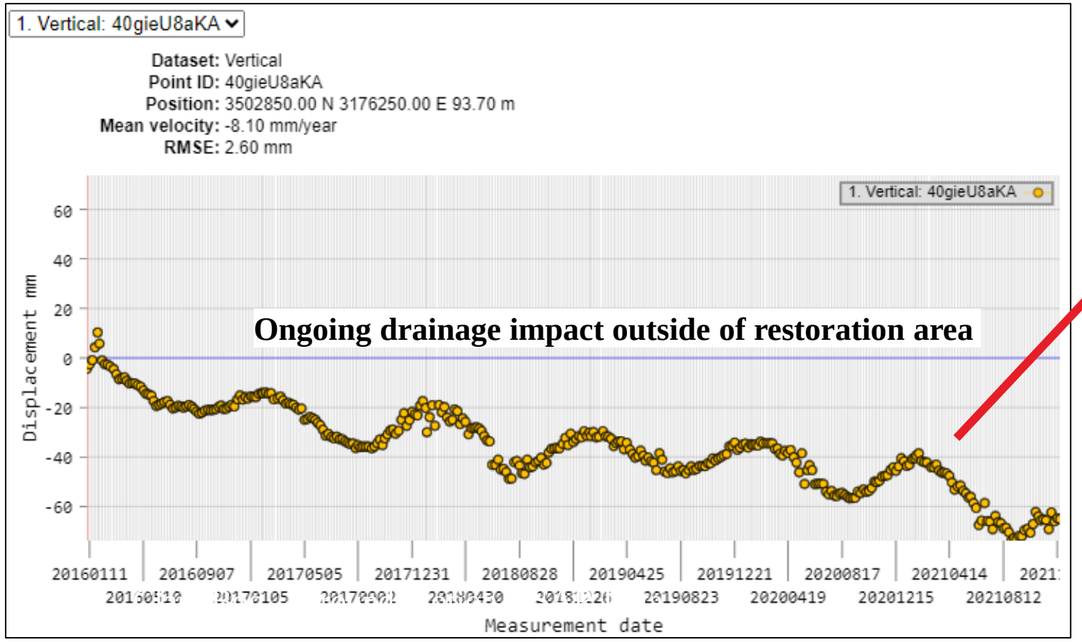


Cloncrow Bog

ARUP







Drain blocking for peatland restoration

Peatland Health Diagnostics

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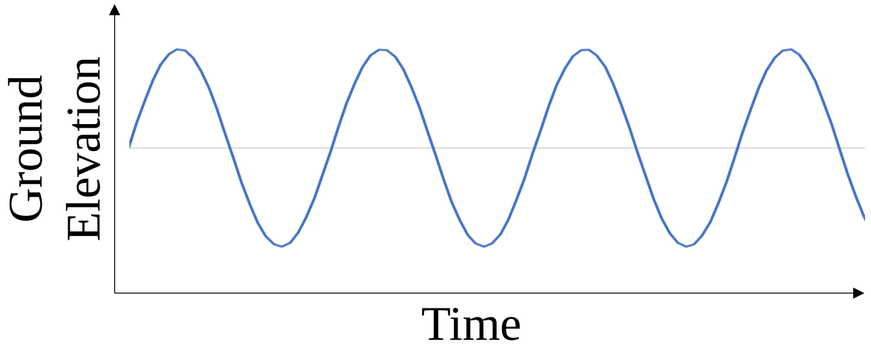
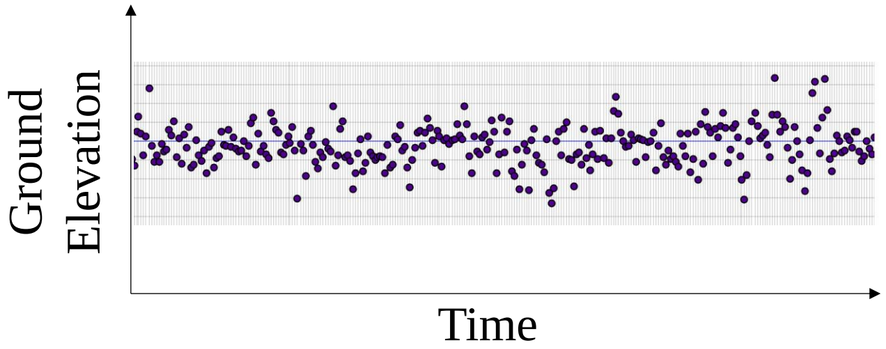
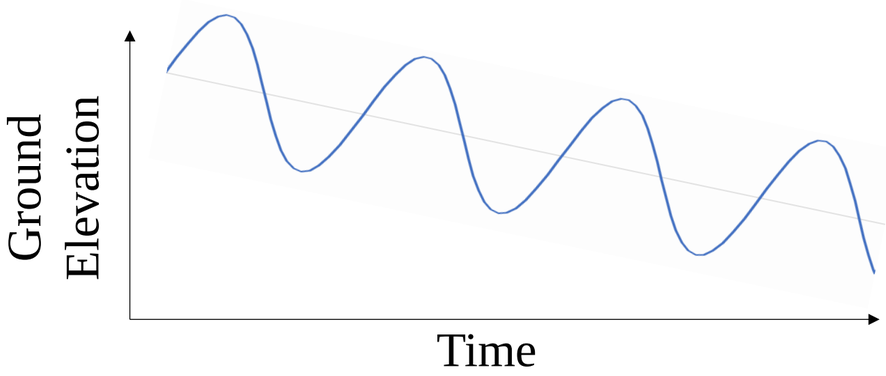


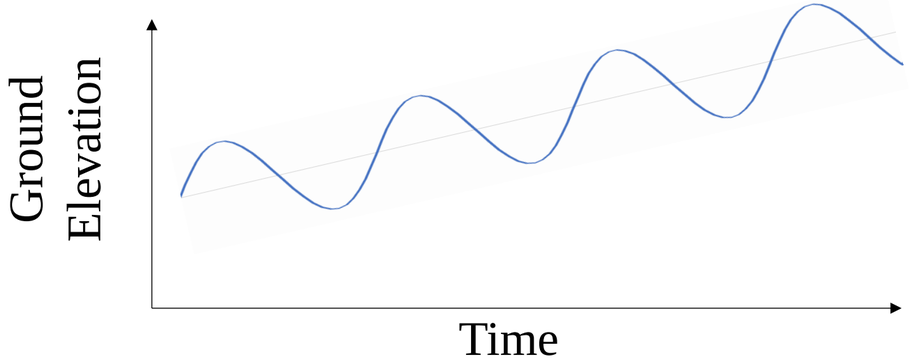
Well Balanced
"Healthy"



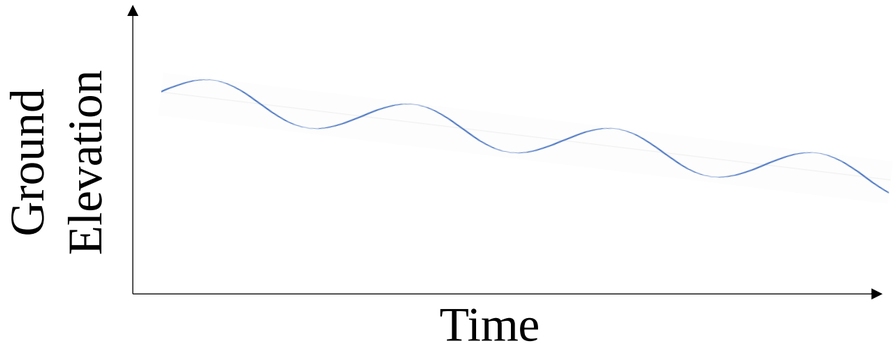
No seasonality = mineral soil
"Dead!"



Depleting
"Getting Sick"



Increasing
"Improving"



Seasonality reduced as peat thickness depleted "Sick"

EGMS Analysis at scale

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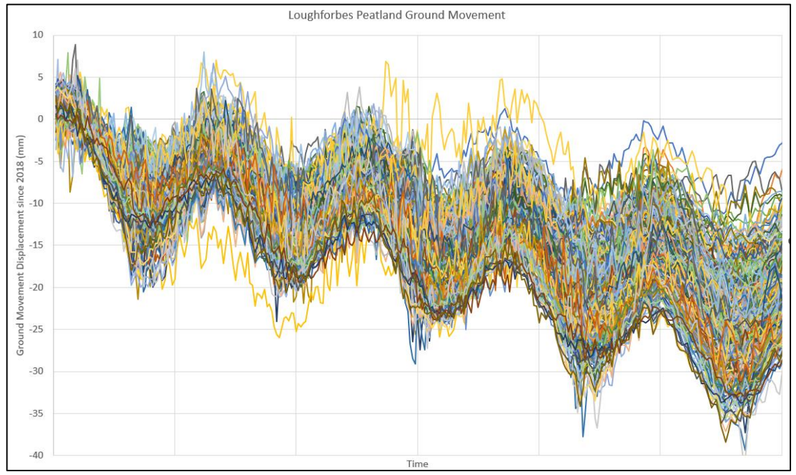
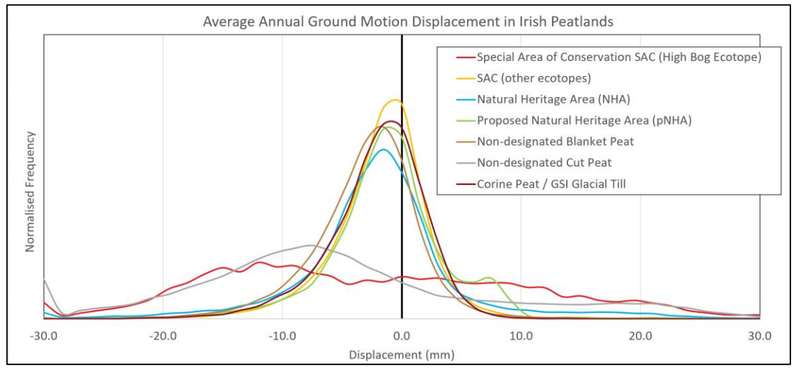
Analysis of all peatlands in Ireland

- 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	- 2,756,561	- 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	- 24,849,989	- 22,364,990
Carrowbehy/Caher Bog SAC	-17	-3271	194	- 6,346,431	- 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
Carrownagappul 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 B	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
Curraghlehanagh Bog SAC	-3	-397	132	- 523,876	- 471,488
Tullaghanrock Bog SAC	-18	-1056	60	- 633,886	- 570,497

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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

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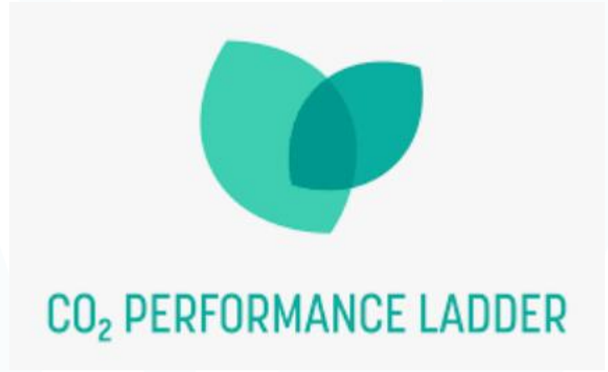
Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Green Procurement and Carbon Ladder

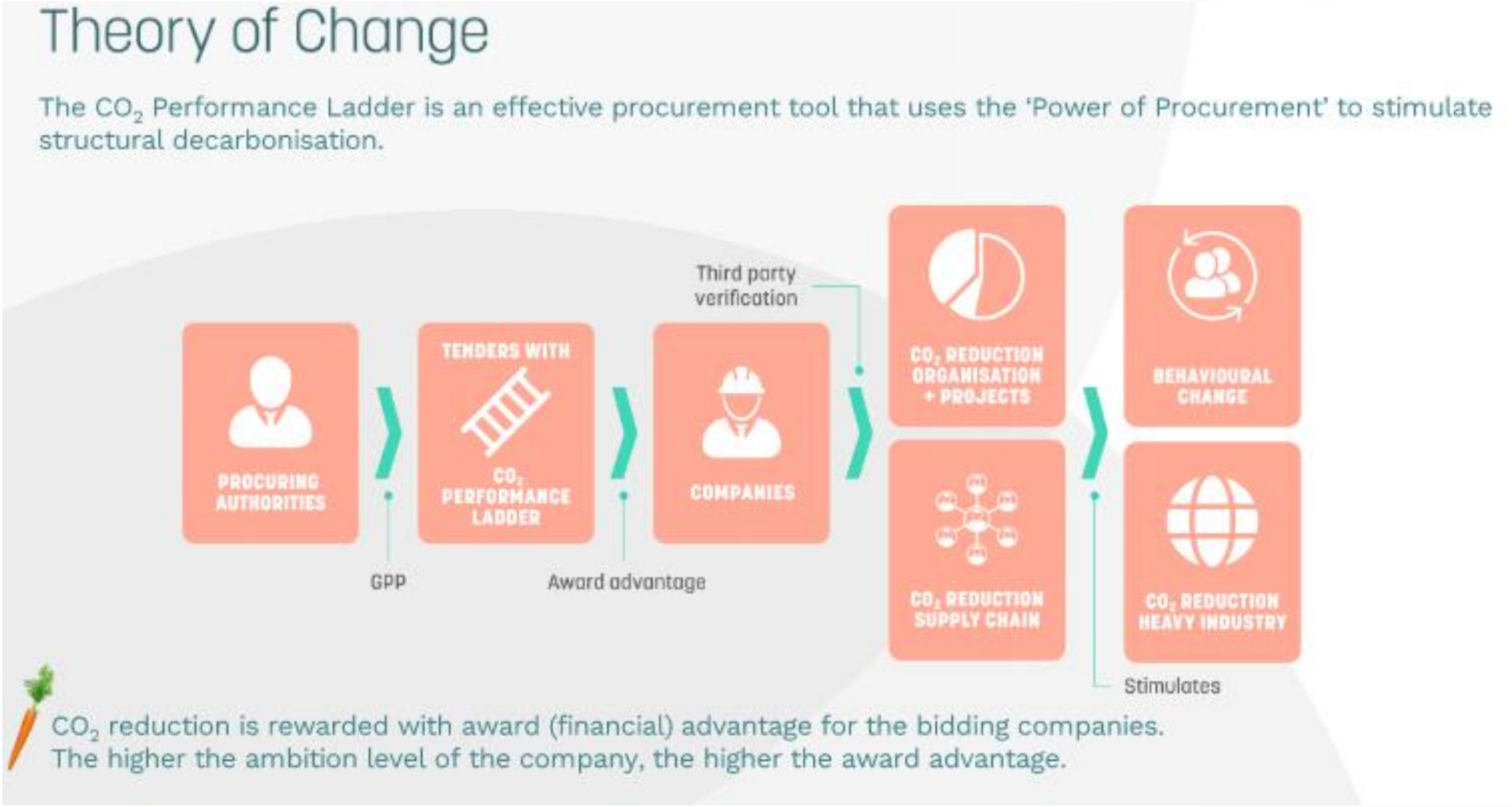
Micheál O'Connor, TII
PJ Hourigan, TII

Summary of Presentation

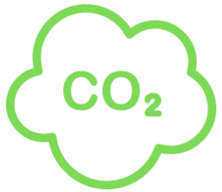
- What is the CO2 Performance Ladder
- CO2 Performance Ladder as a green procurement tool and as a management system.
- TII Pilot Project implementation.
- Update on TII's Pilot Project post contract award, including the 21% carbon reduction achieved.
- Feedback from Contractor on Pilot Project



What is the CO2 Performance Ladder



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 CO2 Performance Ladder

15 years CO_2 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

1506

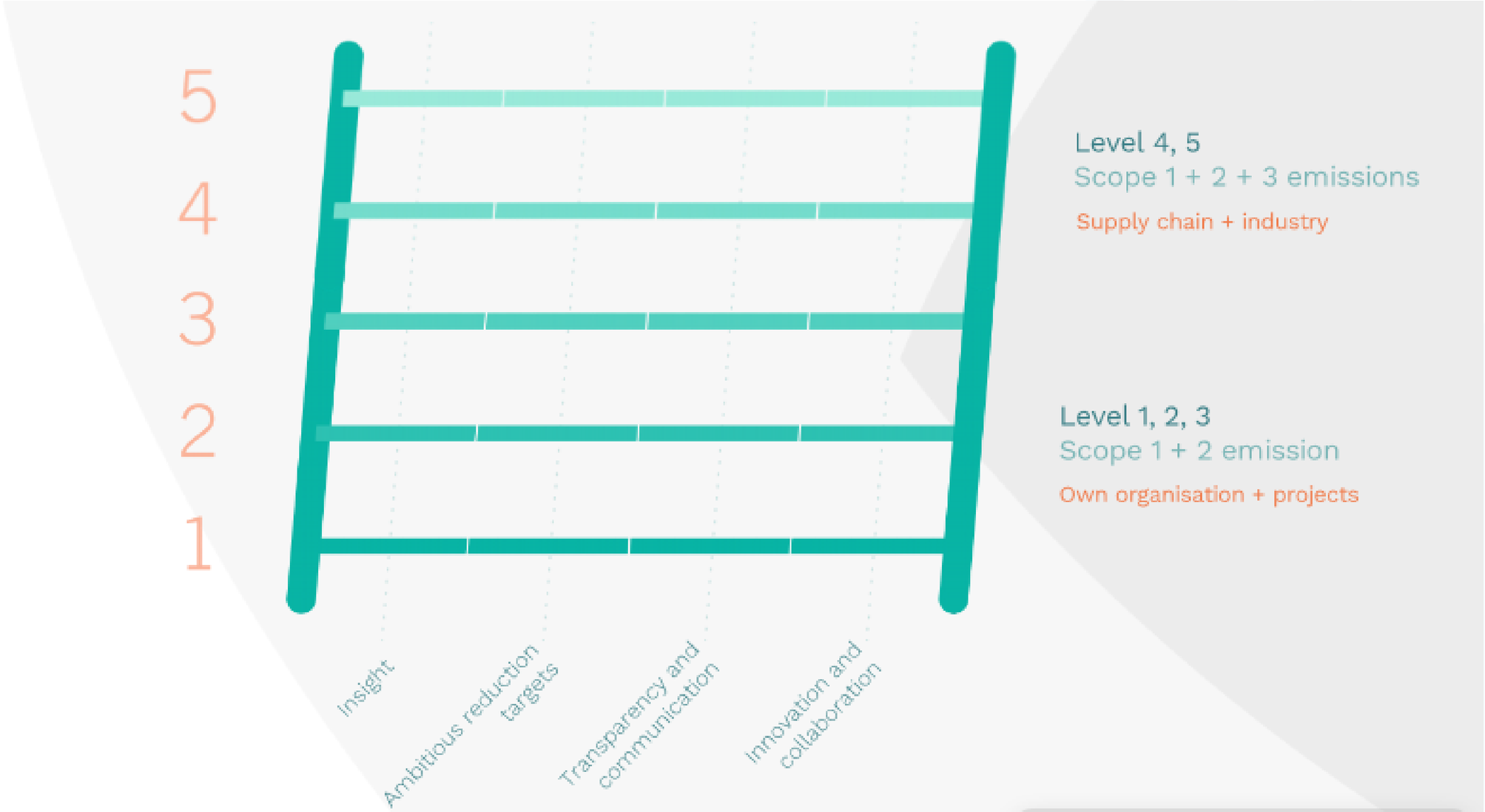
2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024

CO2 Performance Ladder as a green procurement tool

Green (public) procurement tool

CO_2 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_2 Performance Ladder Requirements for this Tender

Revisions Required to Tender Documents

- Minor text additions to include the provisions of the CO_2 Performance Ladder process
- ITT: Updated Appendix 5 Comparative Cost of Tender table to include notional discount
- ITT: Included Appendix 6 which details the CO_2 Performance Ladder process
  - Options for achieving Implementation Levels
    - Certified Project Statement or CO_2 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_2 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%

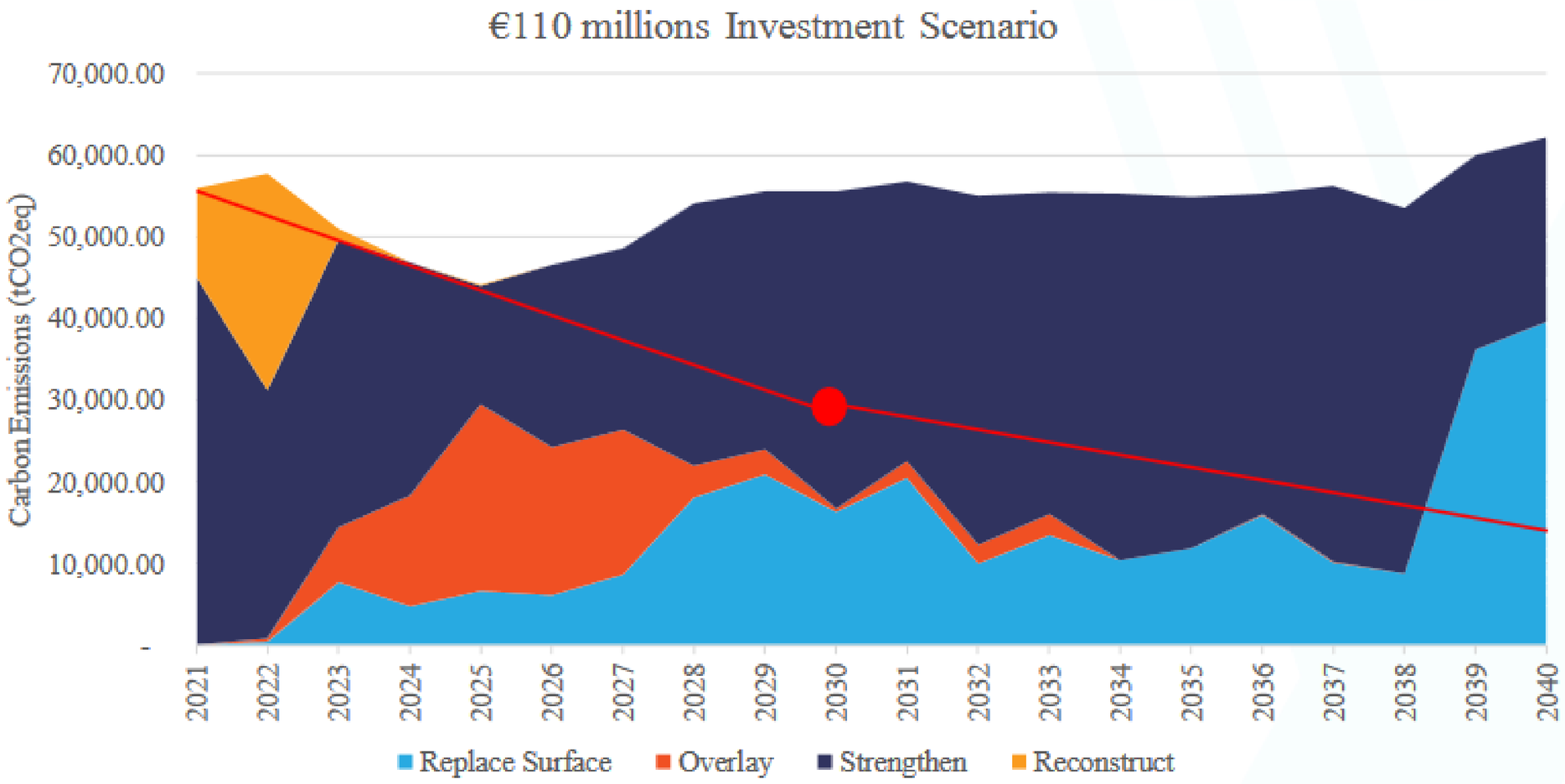
Tender Return & Winning bidder

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 CO_2 Performance Ladder Trial



https://www.tii.ie/media/isepuzak/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_2 Performance Ladder
- Capital Works Management Framework
  - PW-CF5 contract documents

CO2 Performance Ladder as a Project Management Tool

- Forecast baseline CO_2 emissions
- Identify CO_2 reduction measures

- Agree CO_2 reduction measures that impact the design/contract

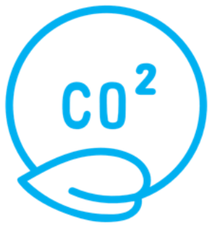
- Verification of the implementation of site measures

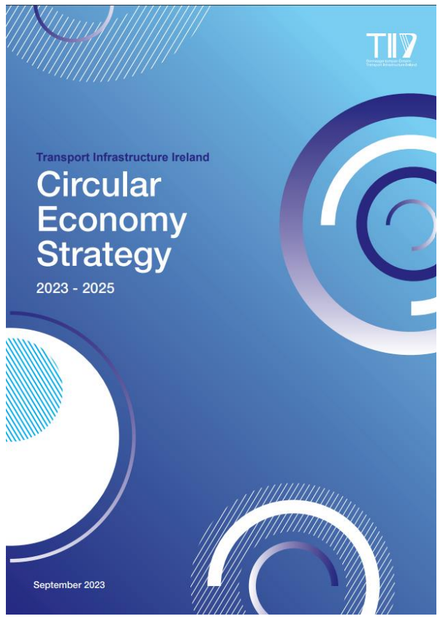
- Calculation of expended CO_2 emissions
- Award of Implementation Level
- Compile Project File

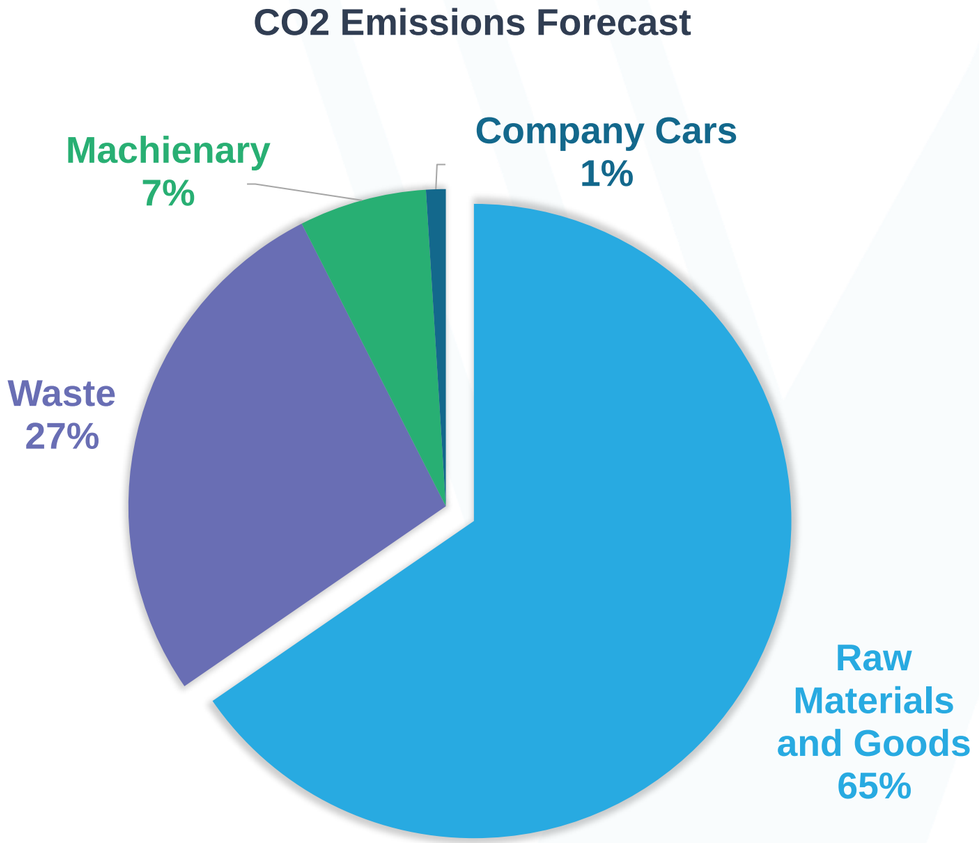
CO_2 Reduction Dialog

Potential CO_2 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







Materials Innovation

HRA RAP Trial

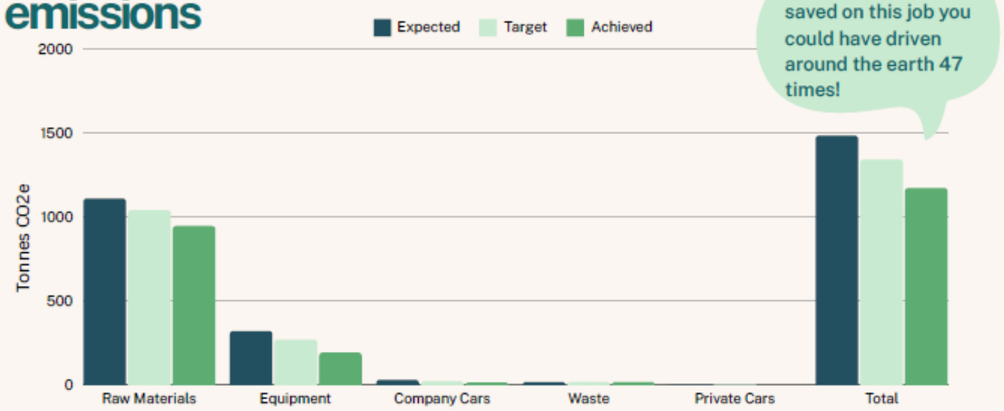
- Reuse of asphalt planings to reduce waste
- Site won planings reused in the new trial surface course materials:
  - 15% RAP HRA
  - 35% RAP HRA
- 500m of “standard” HRA constructed as a control section, to be used as a baseline for future evaluation of the trial materials.

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_2 eq.	71.6kg CO_2 eq.	67.4kg CO_2 eq.
Difference to “standard” material	-	-6.4%	-11.9%

M7 Kildare Bypass Pavement Scheme

CO2 Performance Ladder Update August 2024

We achieved a 21% reduction in carbon emissions



With the carbon saved on this job you could have driven around the earth 47 times!

Carbon Reduction Success

Scope 1 ↓ 84.5%

Scope 3 ↓ 20.3%

Material and Travel Reduction

Total Reduction in CO2e = 311T

126T **from Equipment**

165T **from Material**

20T **from Cars and Travel**

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.

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_2 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.

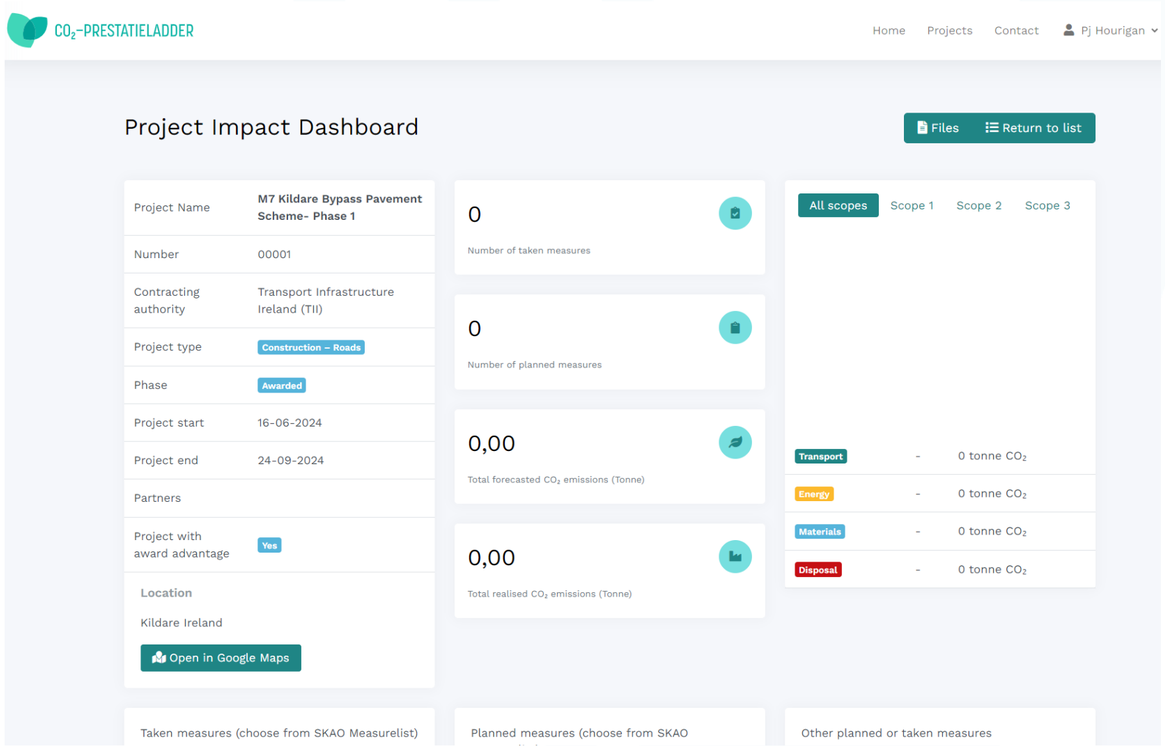
Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Network Management

Deliverables

What Do we get as a Client?

- Certified Project Statement or CO_2 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



Contractor Feedback

It is good that our current decarbonization efforts are being rocoginised 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 CO_2 emissions and evaluating protentional CO_2 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 Scope1 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_2 reduction achieved!

- Positive buy-in from all Tenderers
- Tenderers preference for CO_2 Awareness Certificate (company wide certification) for Implementation Level
- Opportunity to acknowledge and reward Tenderers who are working towards decarbonisation

CO_2 Performance Ladder

- Proven green procurement and project management tool
- Tangible and independently verified CO_2 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

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

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

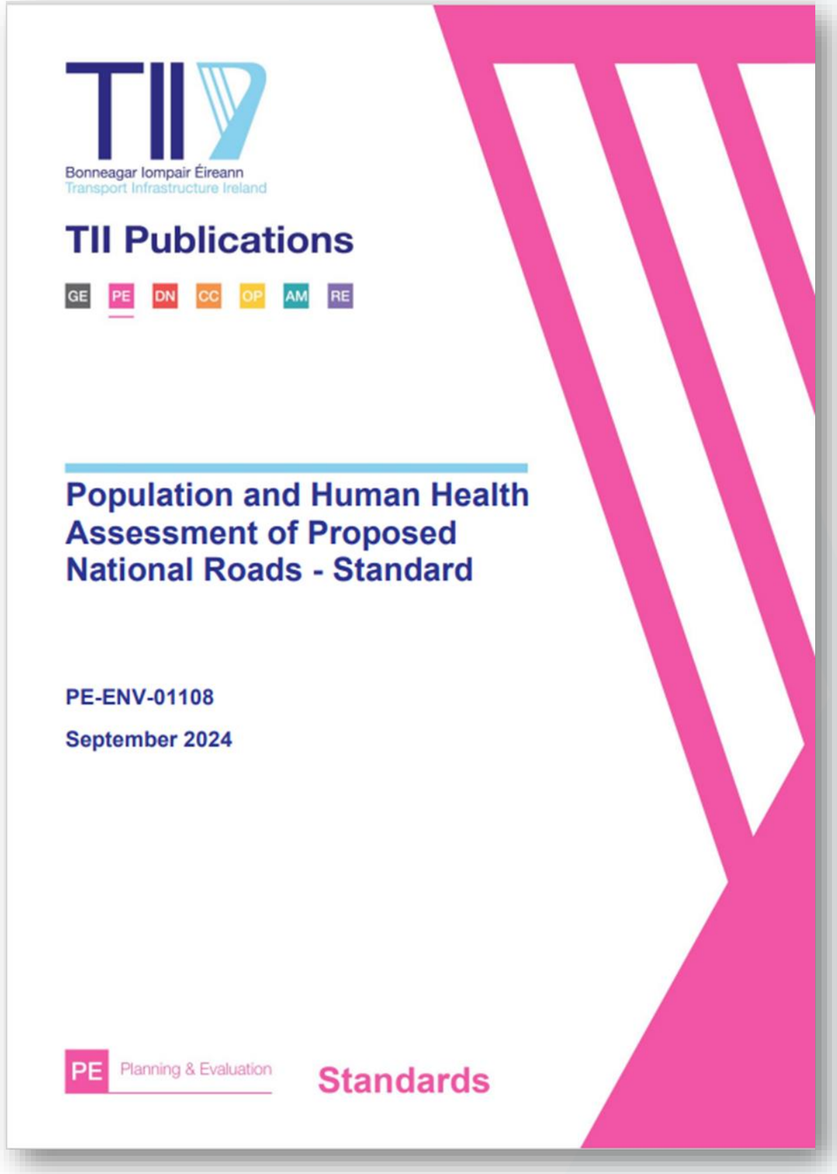
Jenny Dunwoody, Arup

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:

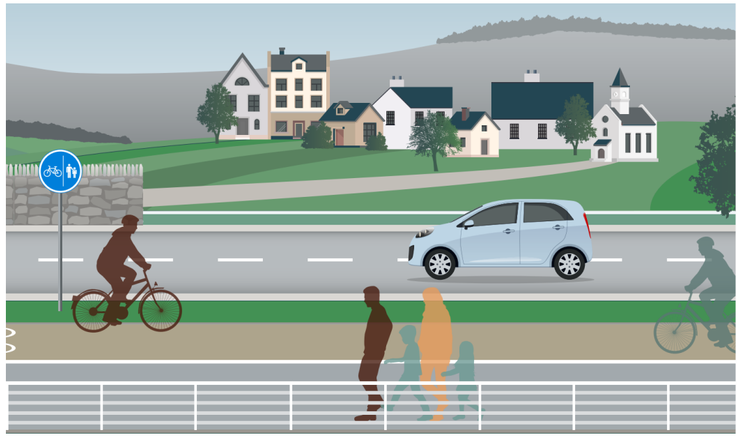
  'lead in the delivery and operation of sustainable transport, enabling our networks to drive inclusive growth, create job opportunities, enhance the well-being of all persons including vulnerable groups, strengthen our resilience to address climate change, maintain our commitment to the environment and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

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

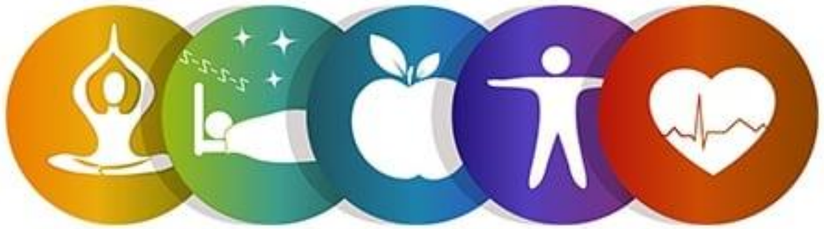
  The EIA Directive 2011/92/EU, as amended by Directive 2014/52/EU, requires that development projects undertake an assessment to identify the likely significant effects of the project, including on *'population and human health'* (wording changed from 'human beings' in the 2011 Directive)

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

Phase 0 Scope & Strategic Assessment	• Guidance to Project Manager on PHH issues to be considered in relation to project need, policy alignment and high-level project objectives
Phase 1 Concept & Feasibility	• Identify high-level baseline, constraints, risks and opportunities • Input to SMART project objectives and Strategic Option Assessment
Phase 2 Options Selection	• Update constraints, risks and opportunities • Input to Options Selection - Multi-Criteria Analysis and Project Appraisal Matrix
Phase 3 Environmental Evaluation	• Detailed scoping and assessment of Preferred Option • Mitigation and enhancement – to improve PHH outcomes
Phase 4 Statutory Processes	• Drafting responses to PHH issues raised in submissions • PHH Statement of Evidence and inputs to Oral Hearing

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

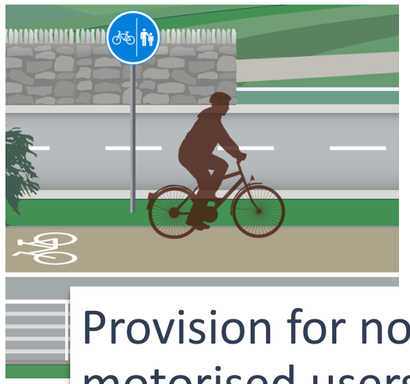
Professional experience

- 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

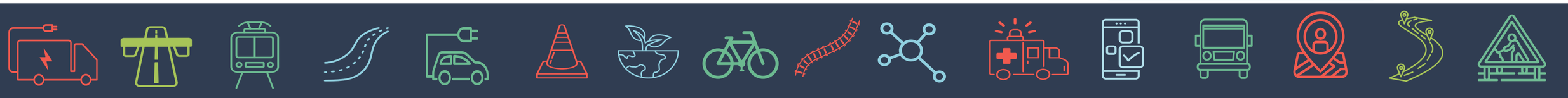
- Health is… *‘a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity’* (WHO, 1948)
- Assessment is based on the ‘Wider Determinants of Health’ model (social, economic and environmental factors)
- Effects on population health (rather than the health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

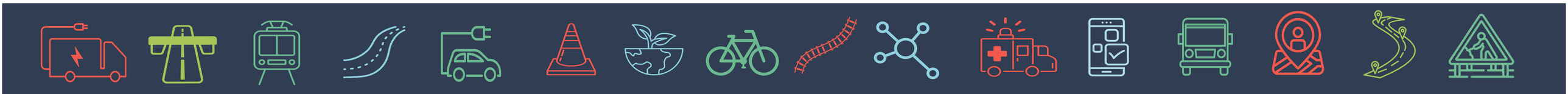
- Illness & injury
- Mental wellbeing
- Physical wellbeing
- Quality of life
- Health equity



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 (+/-)
Transport and access • Safety • Access to educational facilities, health and social care services, green and blue spaces, etc	• Injury • Mental and physical wellbeing • Improved life chances and health outcomes
Economy and employment • Business benefits & economic regeneration • Access to employment sites	• High quality, secure employment is linked to better mental health • Improved life chances through training and career development • Higher earnings – access to healthier lifestyle choices
Environmental conditions • Noise • Air quality	• Mortality rates • Respiratory health, chronic disease • Annoyance, sleep disturbance, quality of life and physiological effects • Participation in outdoor activities
Lifestyle and behaviours • Provision for pedestrians and cyclists • Improved junction design and road safety	• Reduced injuries and fatalities • Participation in active travel – physical and mental health benefits



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	**Source** 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

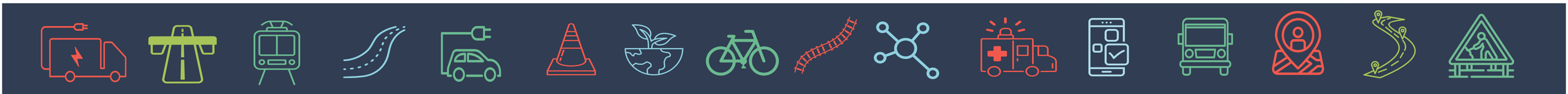
- Purpose of engagement:
  - Agree scope of the assessment
  - Identify data sources and understand local context
  - Establish local issues, constraints and opportunities

Population datasets

Baseline Information	Likely Data Sources
Private property and housing: • The location and number of properties within the ZOI. • The location of residential development land and number of units within the ZOI.	• Geodirectory's GeoAddress Data • Prime2. • Aerial photograph. • Local Authority Development Plans • Project Ireland and National. • Development Plans.
Community land and assets: • The location of community land (e.g., common land, village greens, open green space, allotments, sports pitches etc). • The location of community assets (e.g., village halls, healthcare facilities, education facilities, religious facilities etc). • The level of existing accessibility restrictions/ severance to community land and assets within the ZOI. • The frequency of use of community land and assets within the ZOI.	• Geodirectory's GeoAddress Data • Prime2. • Aerial photography. • Central Statistics Office. • Local Authority Development Plans. • Project Ireland and National • Development Plans. • Open Space and Land Use Condition Survey. • Stakeholder engagement. • Pobal mapping • Economic & Social Research Institute publications'
Socio-economics, businesses and development land: • The location and number of businesses within the ZOI. • The location of tourism receptors within the ZOI. • The location of land allocated for development by local authorities and the number of future jobs it should generate. • The level of existing accessibility restrictions/ severance to development land and businesses within the ZOI. • Existing planning, economic and regeneration plans and strategies. • Labour supply, employment levels and unemployment levels within the ZOI.	• Geodirectory's GeoAddress Data. • Prime2. • Aerial photography. • Central Statistics Office. • Local Authority Development Plans. • Project Ireland and National Development Plans. • Stakeholder engagement. • Economic & Social Research Institute publications'
Non-motorised road users: • The type, location and extent of NMU provision (e.g., public rights of way, National Trails, canals, greenways, blueways etc) within the ZOI. • The frequency of use of the NMU provision within the ZOI.	• Sport Ireland Outdoors. • Local authority data sets. • Traffic and transport survey results (inclusive of NMU traffic counts and origin/destination of users where practicable).

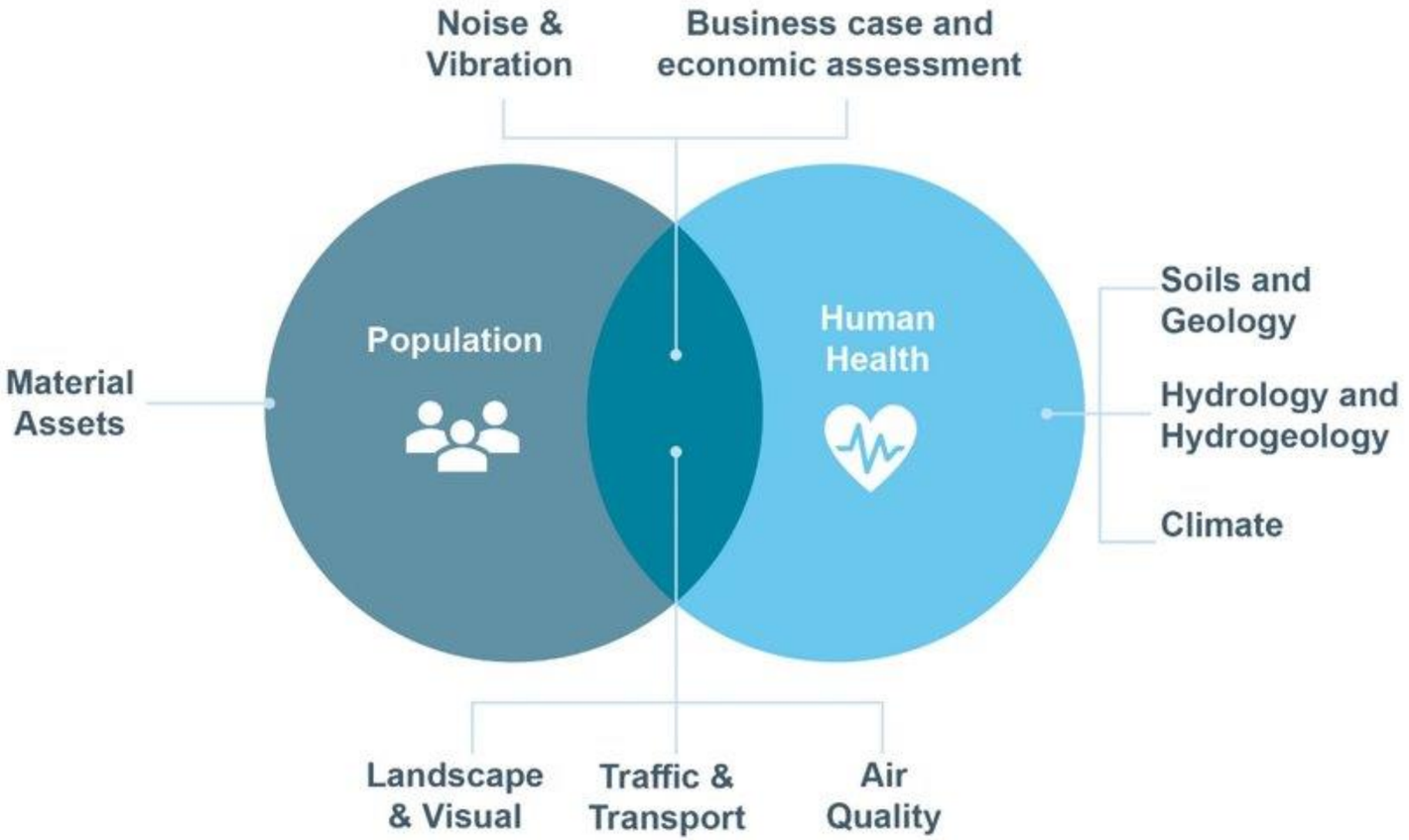
Health datasets

Baseline information	Geographic area
Demographic data	
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
Social and economic data	
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
Health data	
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

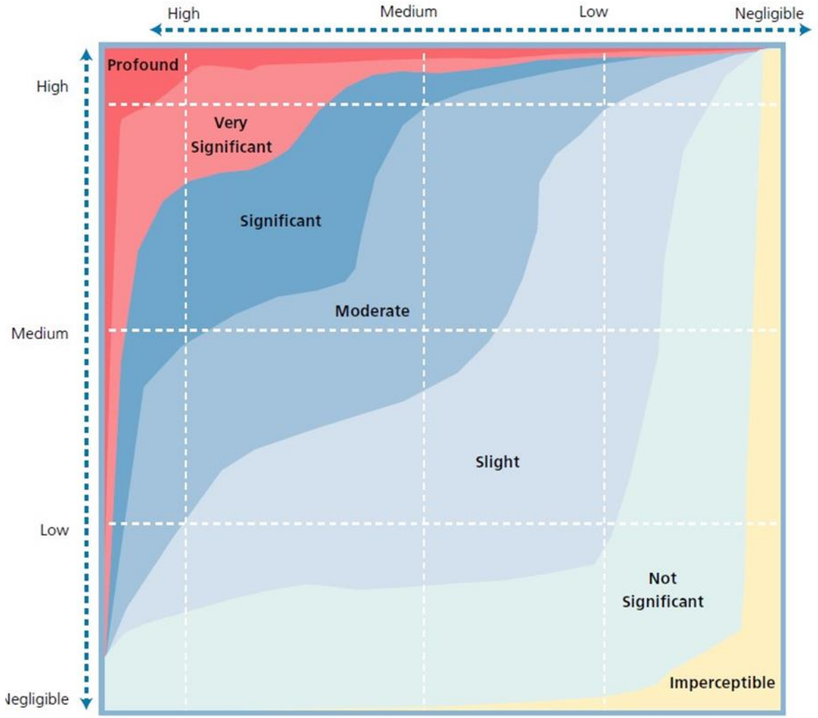
- PHH is a broad topic, encompassing a wide range of potential impacts
- Many impacts are also included within other Multi-Criteria Analysis (MCA) and EIA topic assessments
- Assessment of PHH effects is informed by outputs from other topics
- PHH assessment adds value – does not duplicate other topics
- 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)

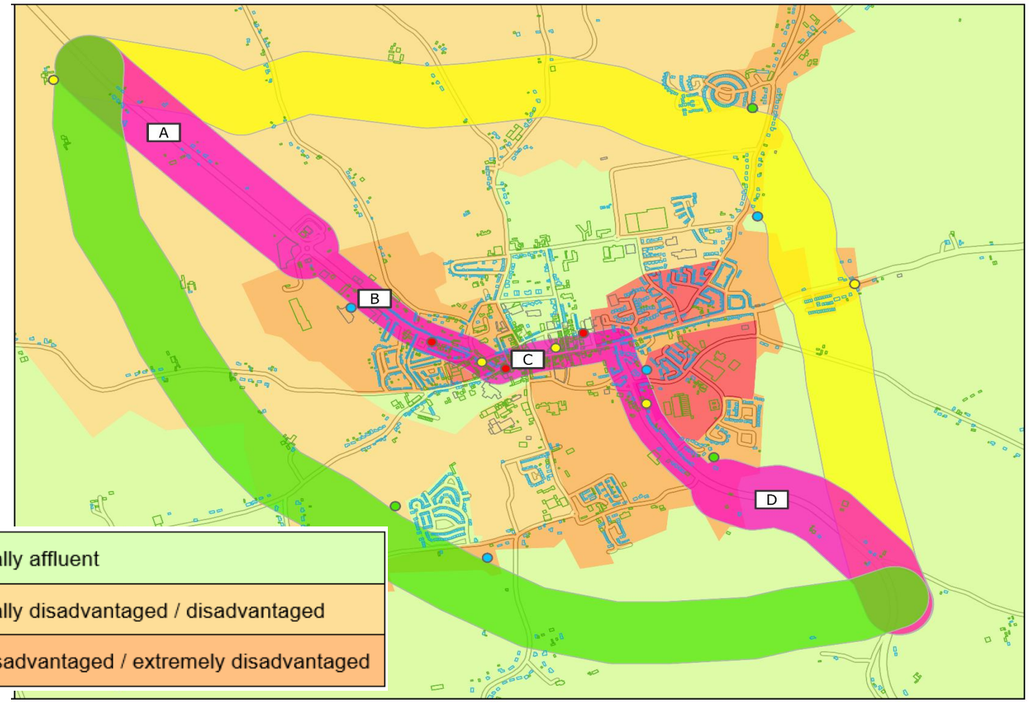
Vulnerable Groups (examples)

Population Groups	Sensitivities (not exhaustive)
Social deprivation and low income 	• 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. • 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.
Age 	• 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. • Young people are more sensitive to air pollution and are more at risk from road traffic accidents.
Access to a car 	• People without access to a private vehicle are more dependent on local facilities and are more likely to be users of public transport.
Poor health or disability 	• People with physical health problems or disabilities may be more vulnerable to environmental changes (e.g. air quality and noise). • People with impaired vision or mobility face barriers to access and movement. • Mental health conditions may be exacerbated by environmental, social or economic impacts. • People with existing health conditions or disability are likely to be more reliant on access to health and social care services.

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 >60dBLden (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)

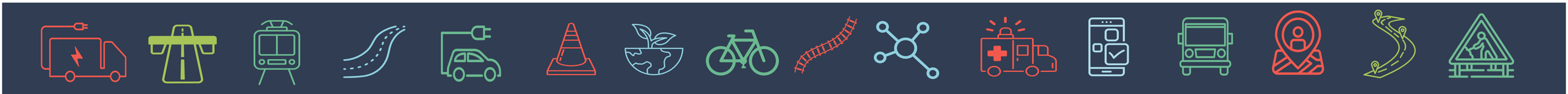
Contributors

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

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

Noise Mitigation and Standards

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

Ollscoil na Gaillimhe
University of Galway

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

NATIONAL ROADS AND GREENWAYS CONFERENCE 2024

Noise Mitigation and Standards

Eoin A. King

The Galway Sound Lab | University of Galway

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The Galway Sound Lab

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ANITA Project

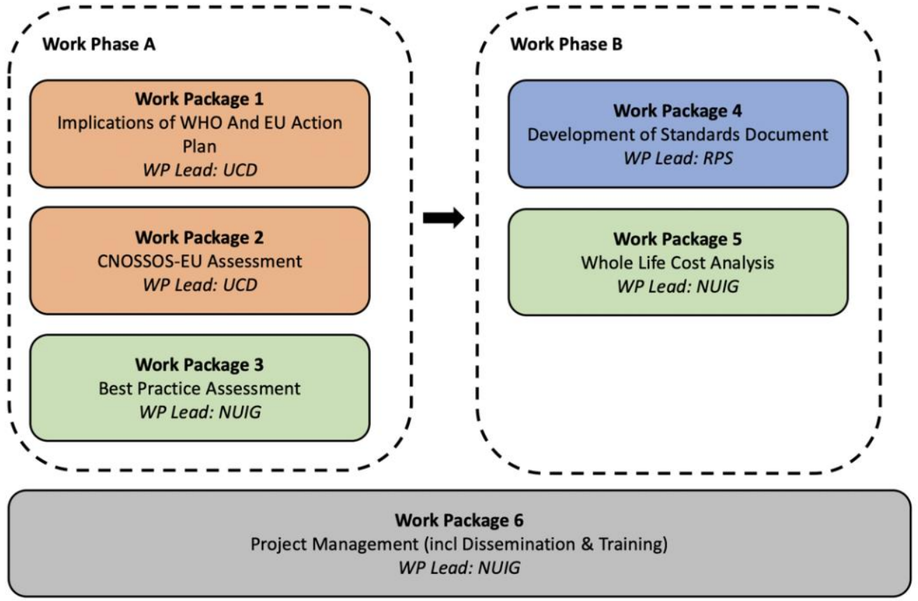
- Transport Infrastructure Ireland provides sustainable transport infrastructure and services in Ireland.
  - As part of this purpose, noise and its well-established interconnected links to adverse economic, environmental and social impacts, is an issue that TII has identified

- **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:

ANITA

- 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

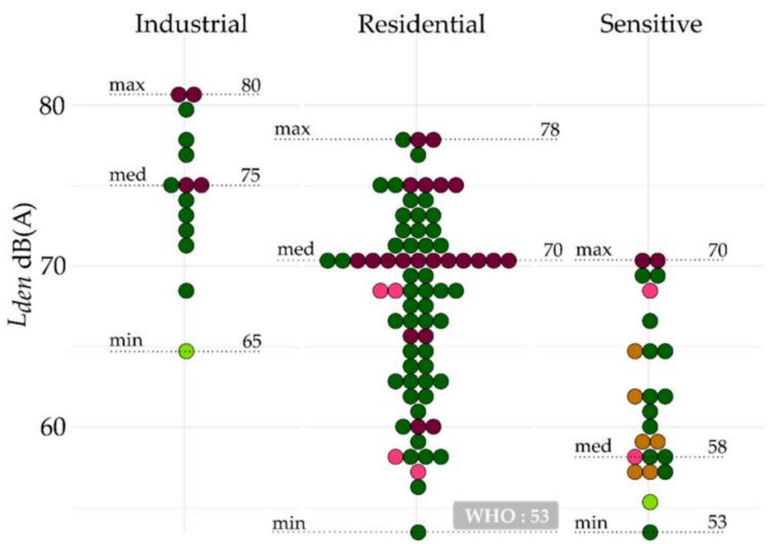
- Conducted a review of the costs of noise mitigation measures, along with an assessment of the socio-economic costs of road traffic noise in Ireland

- Current Design Goals were assessed, and recommendations for updates are currently under consideration

Scoping Considerations

- **Design Goal:**

Lden



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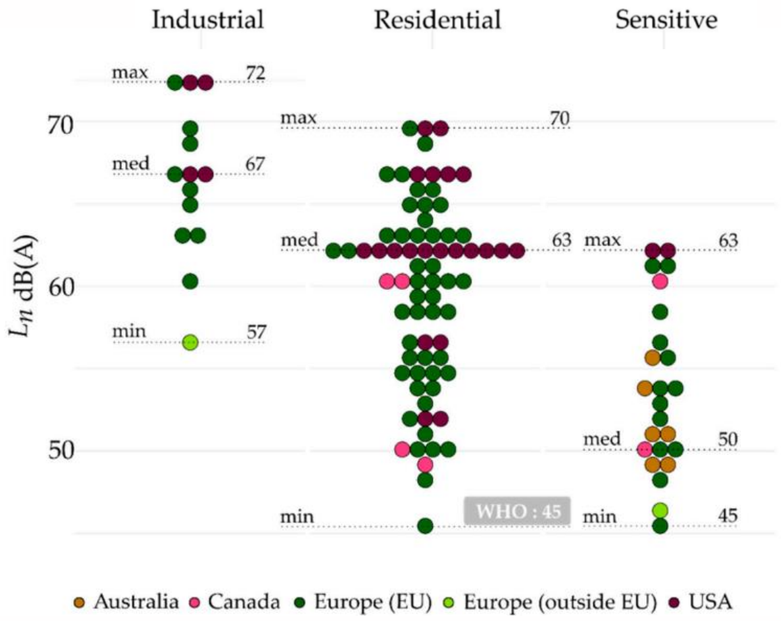

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University of Galway

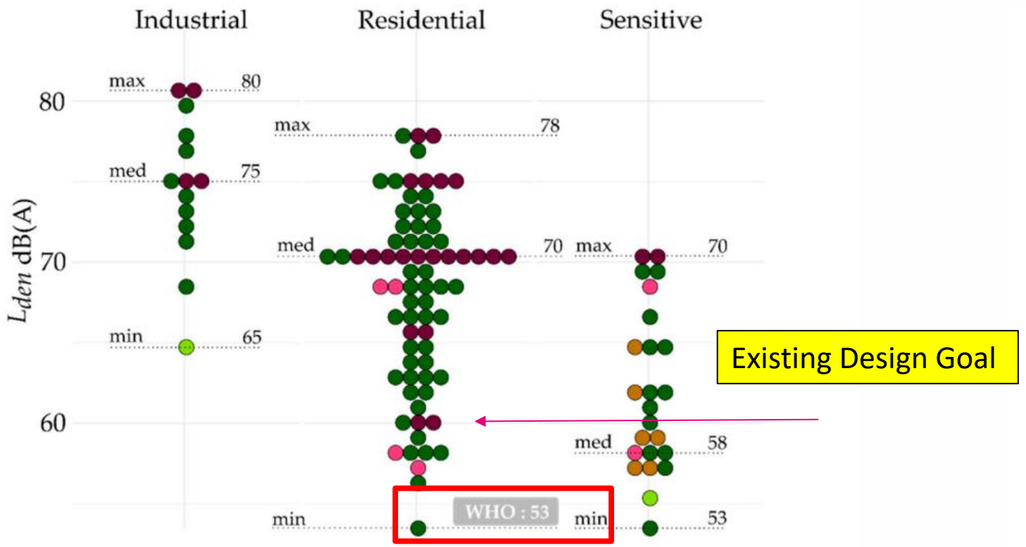
Note: *(37 Administrations) - All data converted to Lden*

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

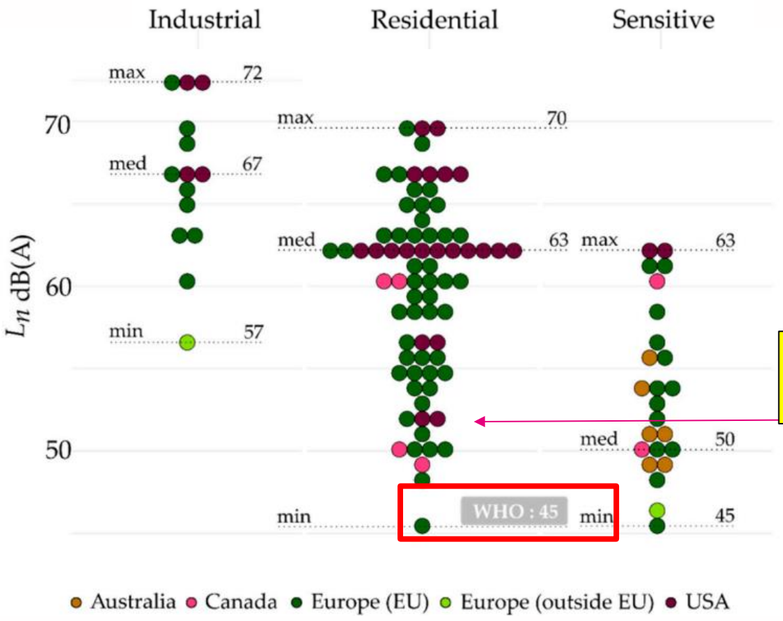
- **Design Goal:**

Lden



Existing Design Goal

Lnight



Approx. Existing Design Goal

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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

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Noise Mitigation

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Novel Noise Mitigation

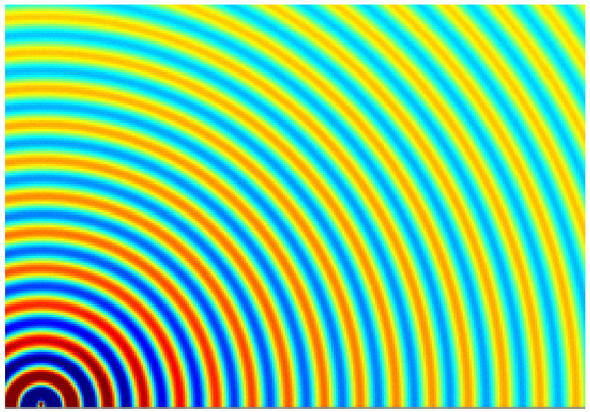
Case Study: WHIStop

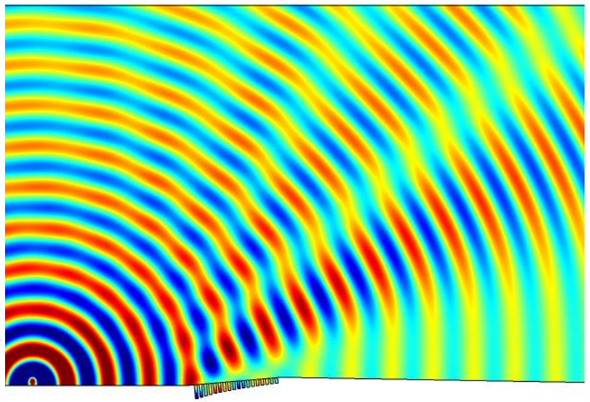
University
*of*Galway.ie

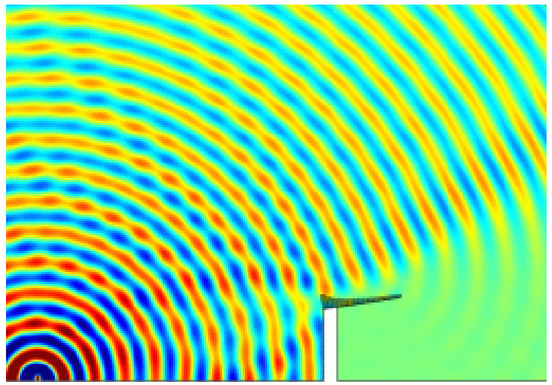
Background & Objective

- 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







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Source: *https://www.openaccessgovernment.org/noise-reduction-solution/84996/*

Noise reduction solution bends sound waves upwards: Less impact on environment"

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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

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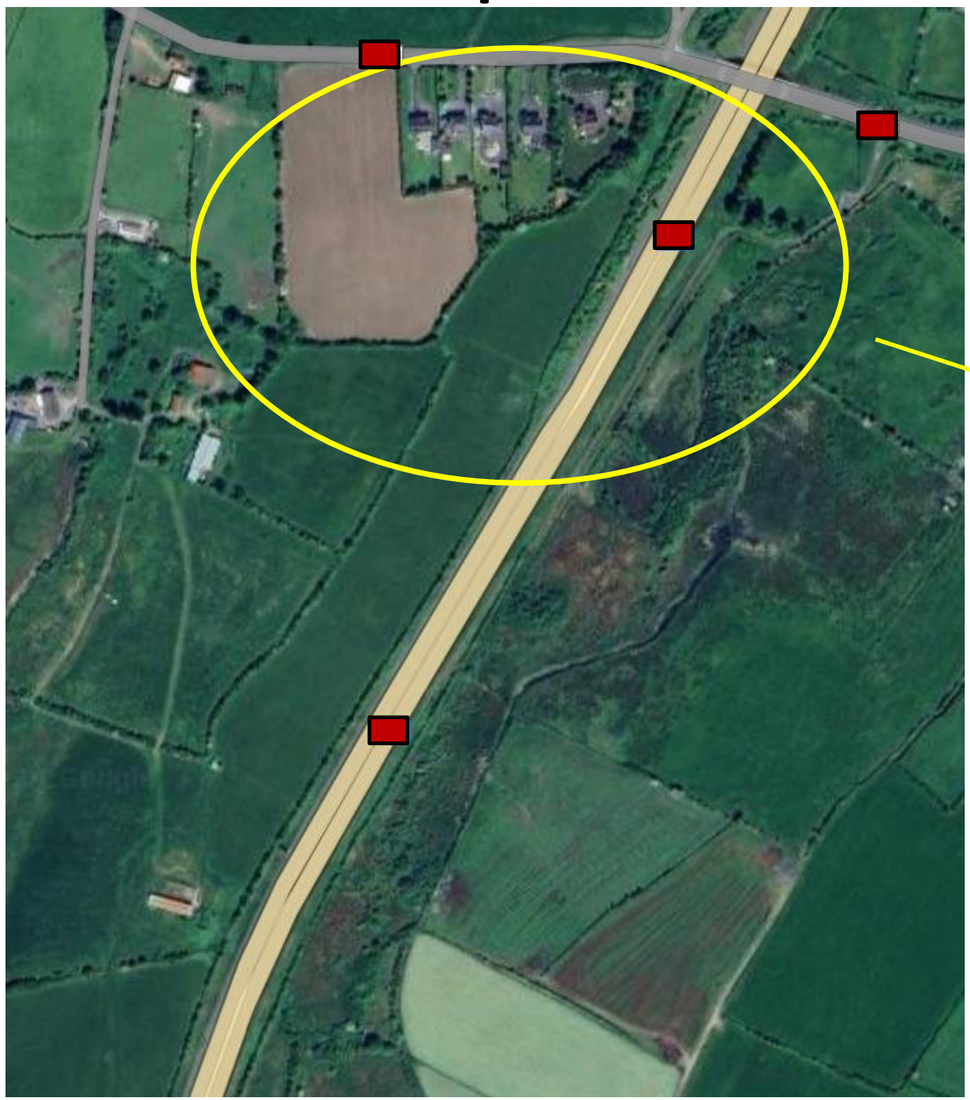
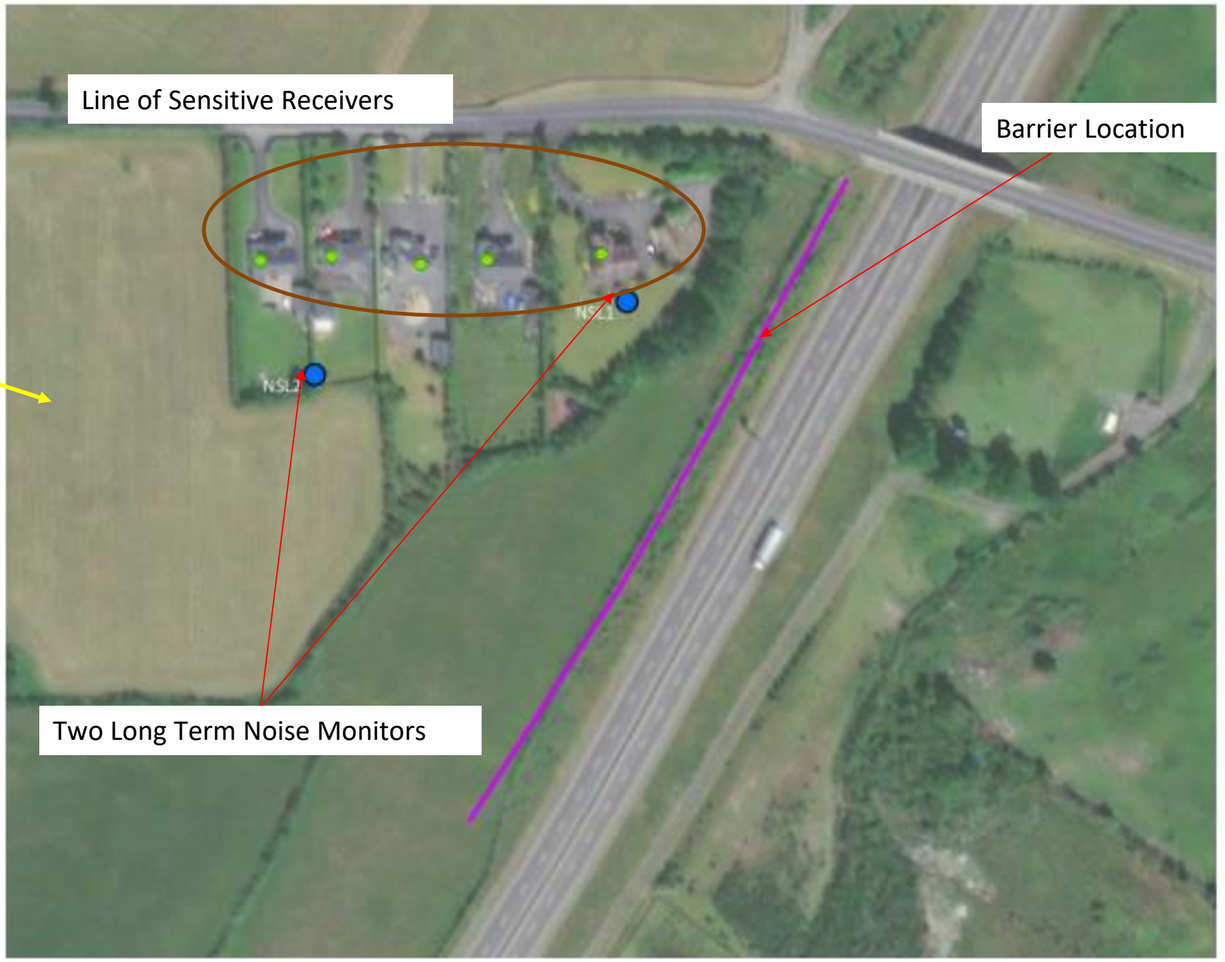
Site Description





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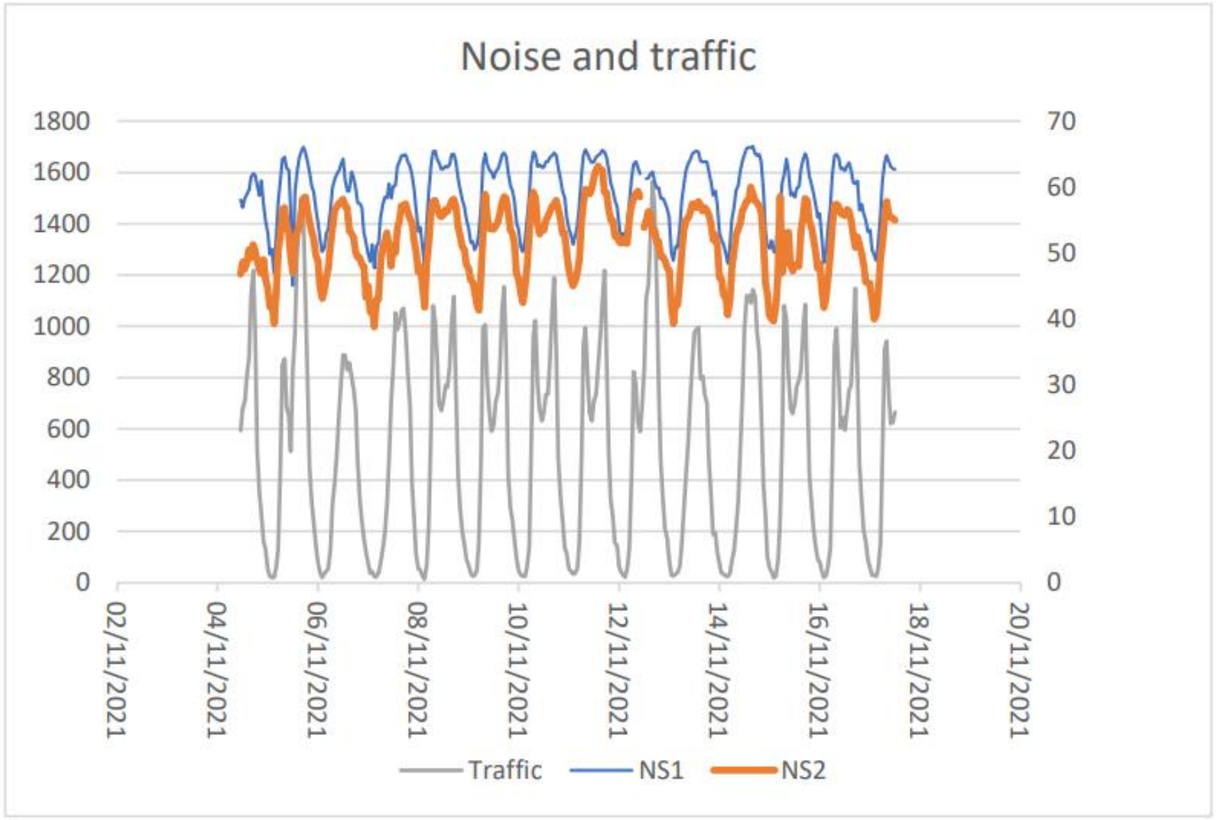
Baseline with No Mitigation

- 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



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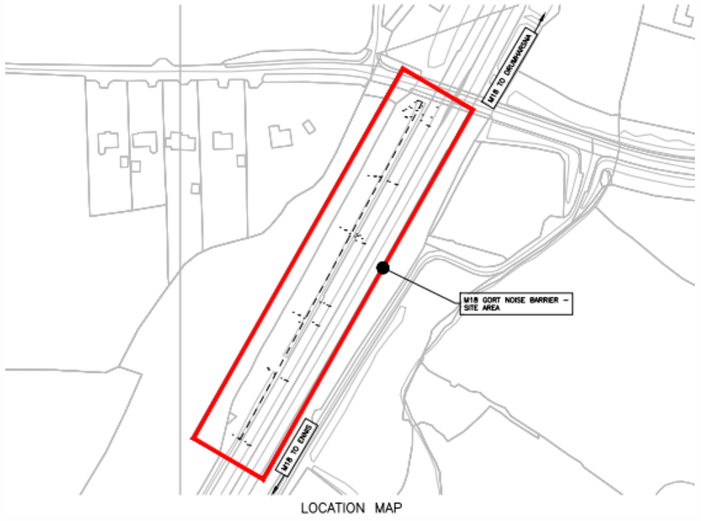
Tranche 1 – Noise Barrier Installed

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



LOCATION MAP

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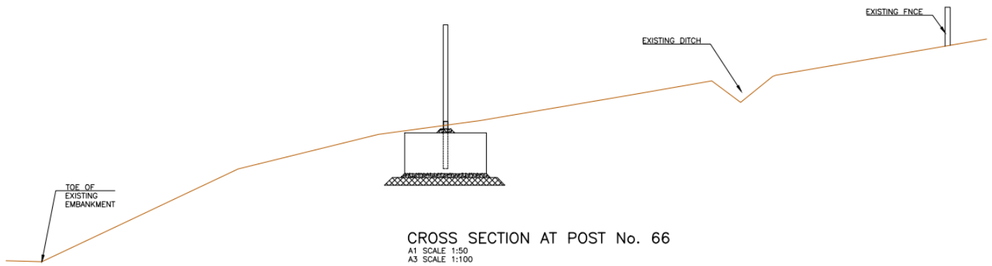
Tranche 1 – Noise Barrier Installed



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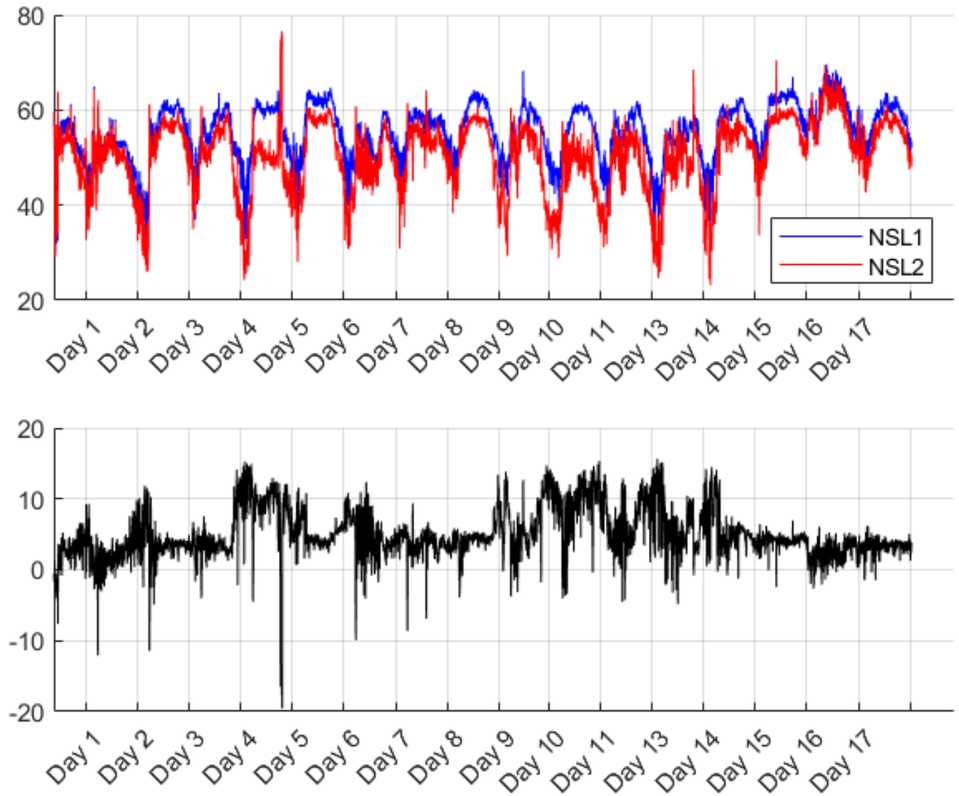
Results – Tranche 1 (Noise Barrier Only)

- 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



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Tranche 2 – WHIStop Installed

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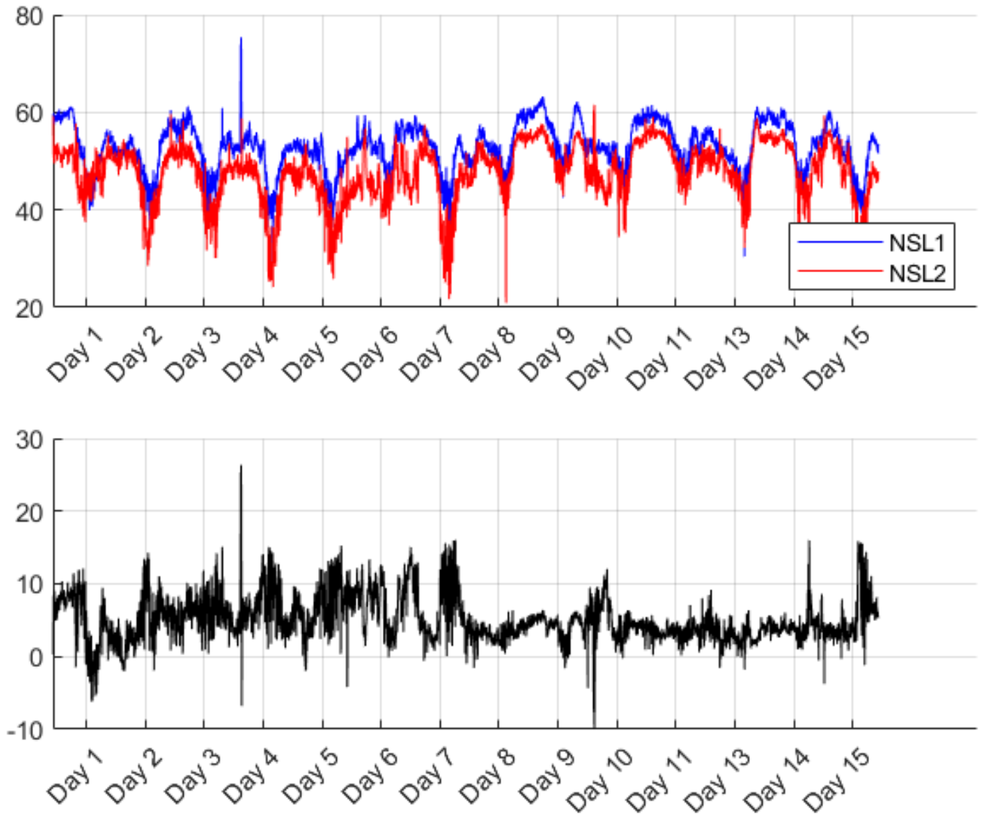
Results – Tranche 2 (with WHIStop)

- 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



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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 ~2dB(A) reduction at Loc 1

- Effect of WHIStop needs to be supported with modelling to be better quantified (ongoing)

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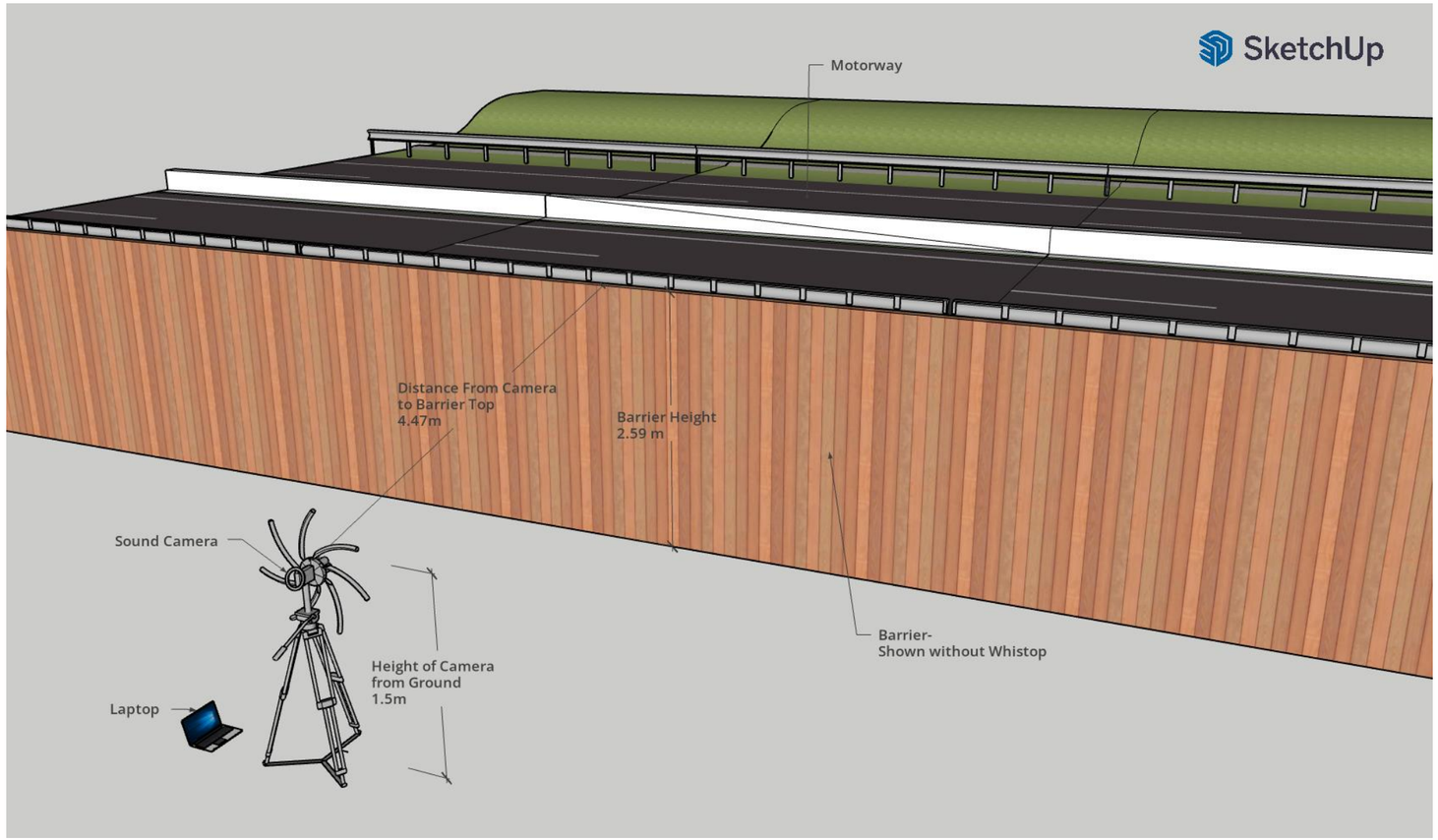
Supplementary Tests – Acoustic Camera



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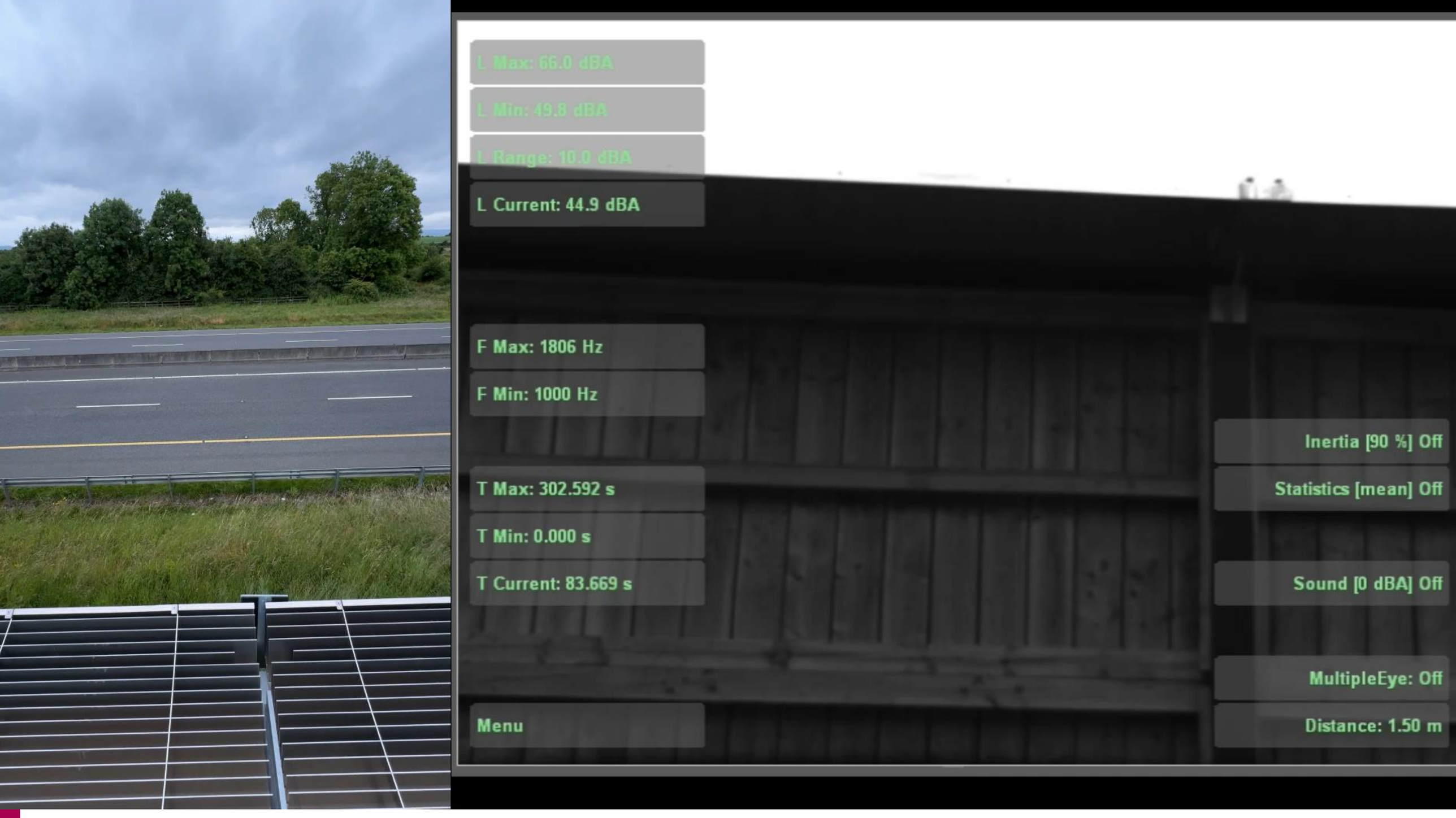
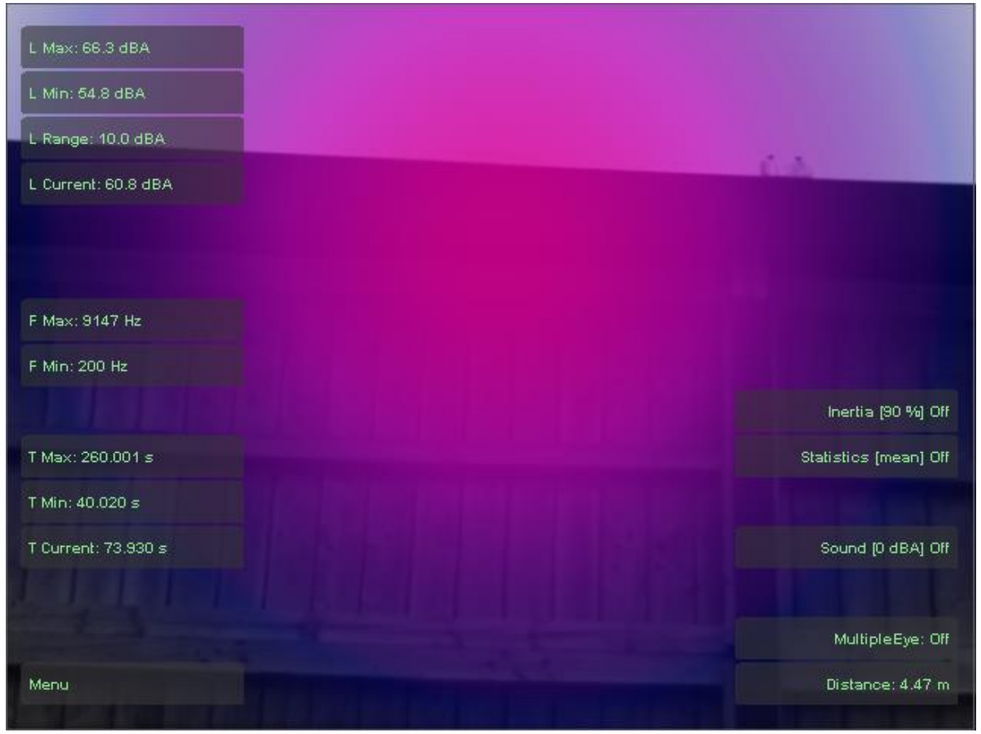

L Max: 66.0 dBA
L Min: 49.8 dBA
L Range: 10.0 dBA
L Current: 44.9 dBA
F Max: 1806 Hz
F Min: 1000 Hz
T Max: 302.592 s
T Min: 0.000 s
T Current: 83.669 s
Menu
Inertia [90 %] Off
Statistics [mean] Off
Sound [0 dBA] Off
MultipleEye: Off
Distance: 1.50 m

Summary of Results

NO WHIStop:

With WHIStop:



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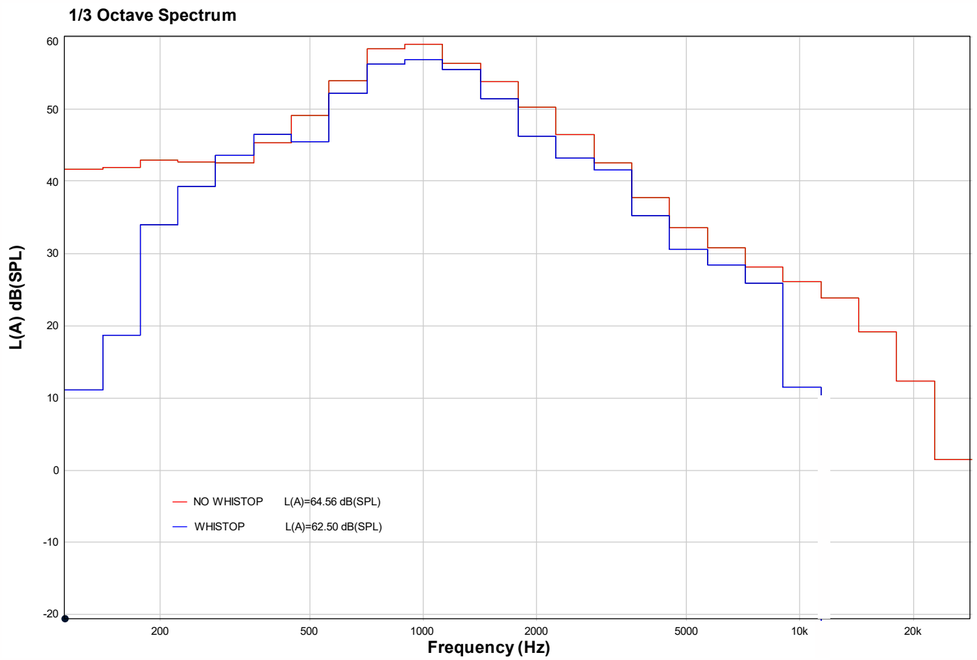
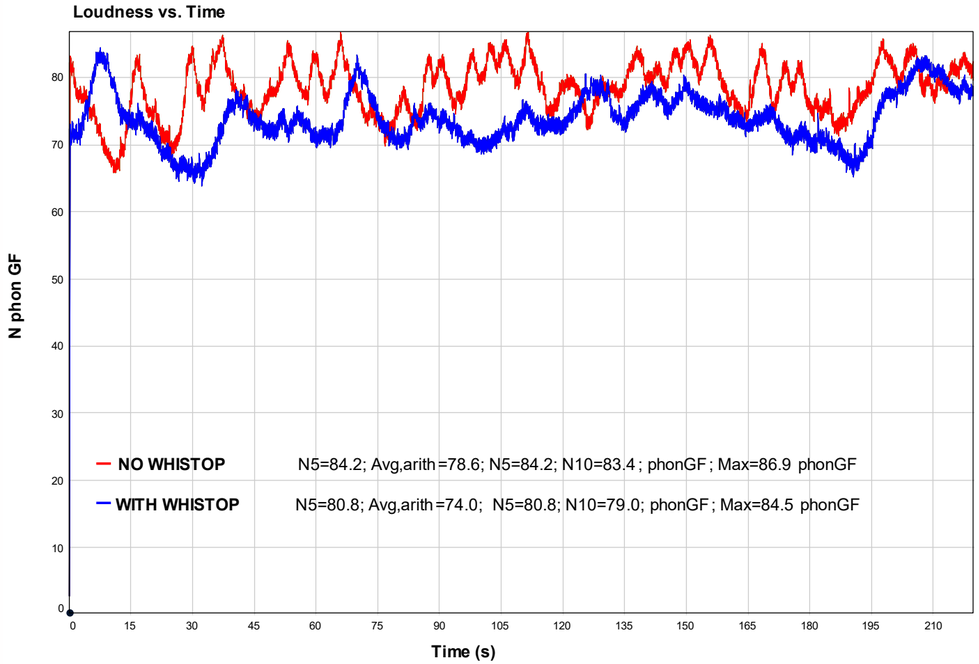
Summary of Results – 1/3 Octaves & Loudness





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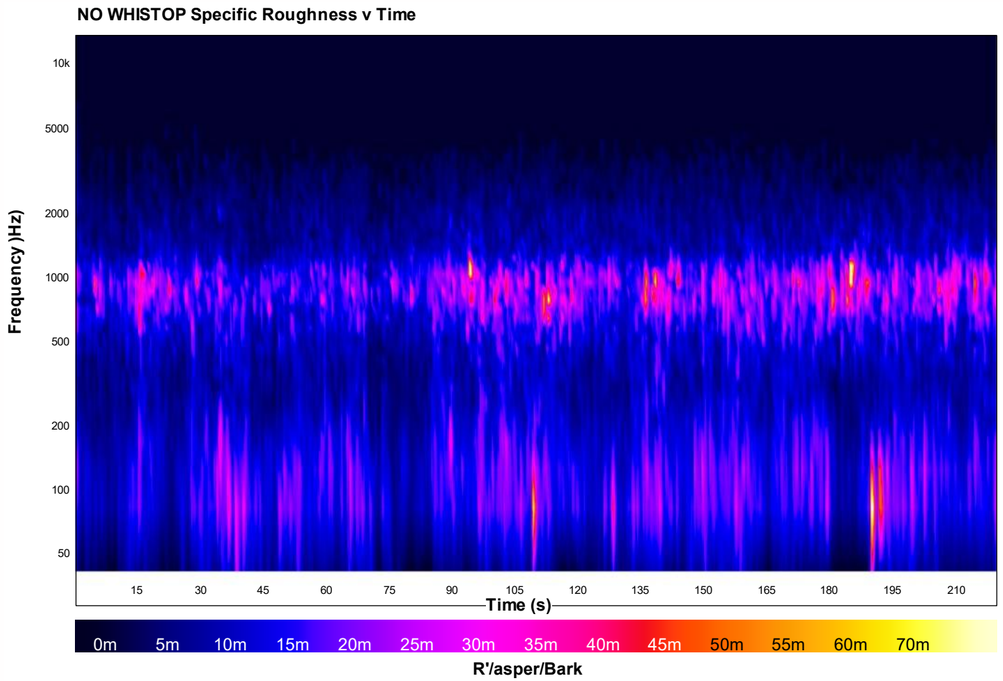
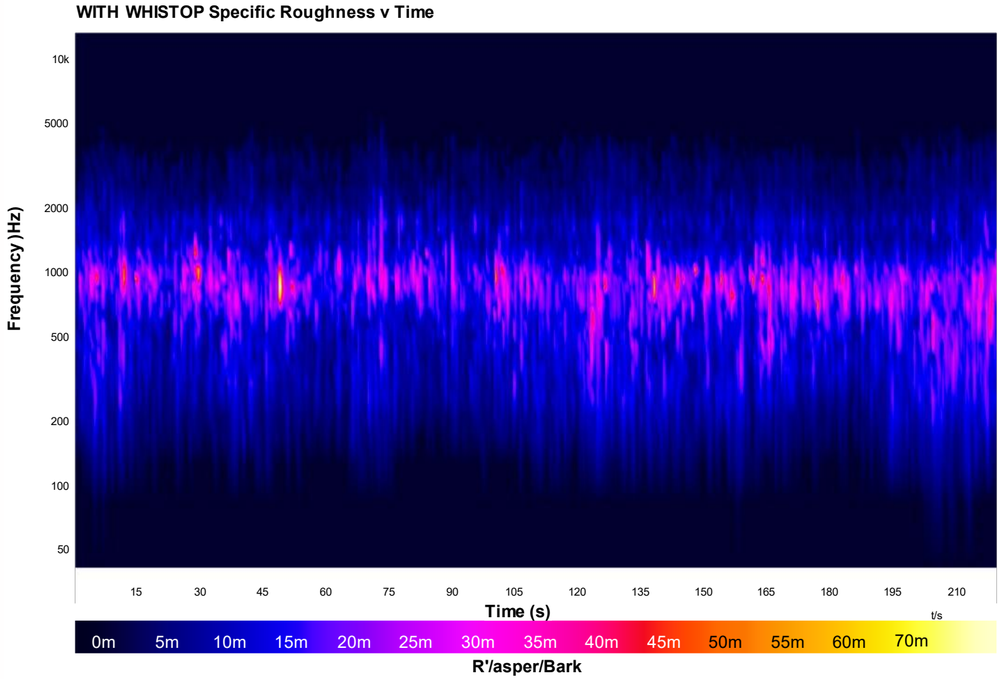
Summary of Results - Roughness

NO WHIStop:



With WHIStop:



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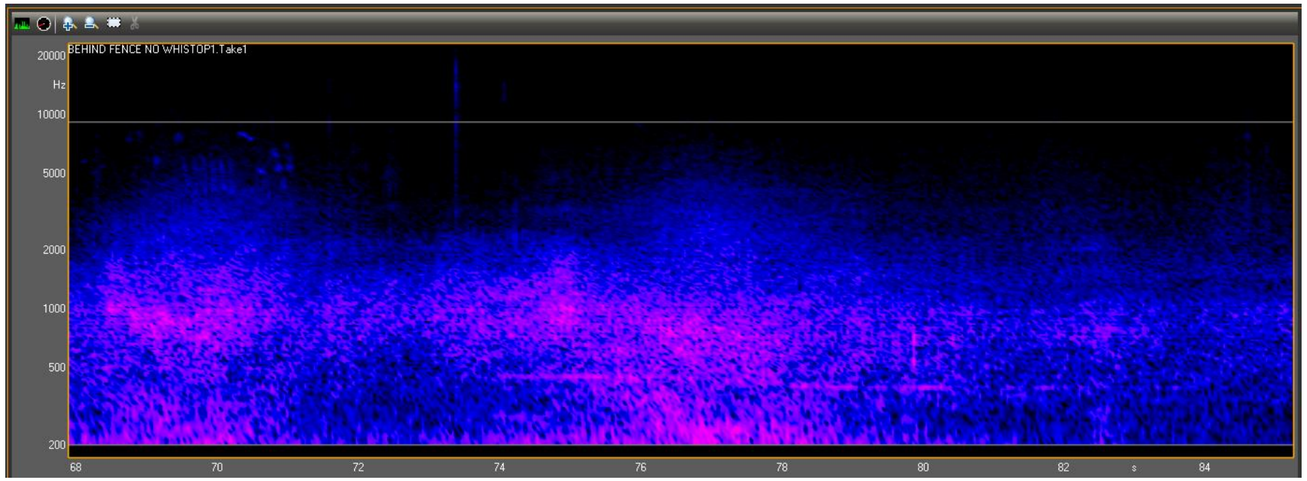
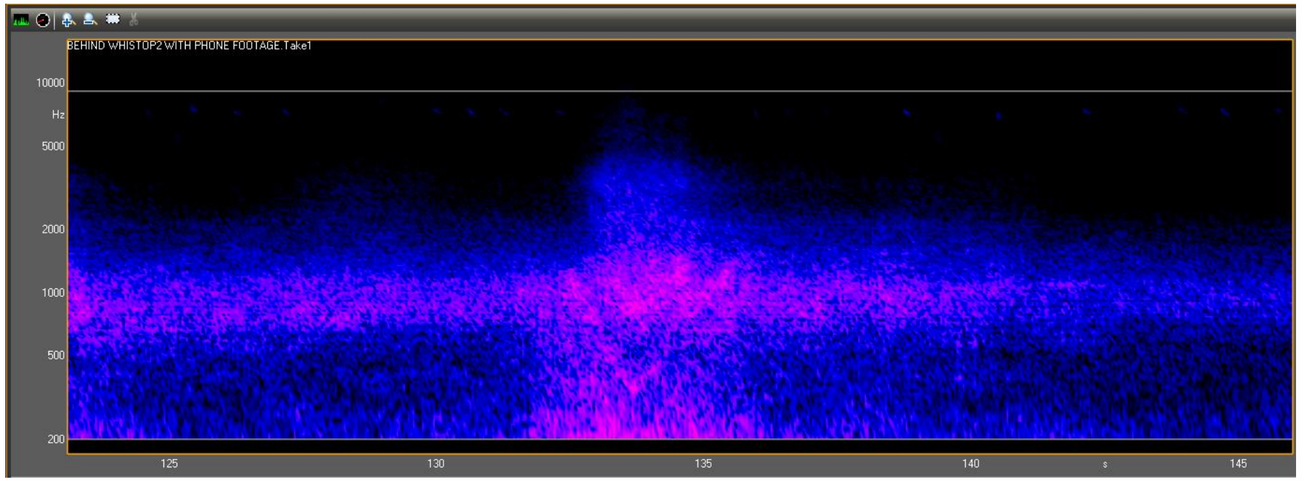
**Roughness quantifies the subjective perception of rapid (15-300 Hz) amplitude modulation of a sound.*

Summary of Results – Doppler & Flanging



NO WHIStop



With WHIStop

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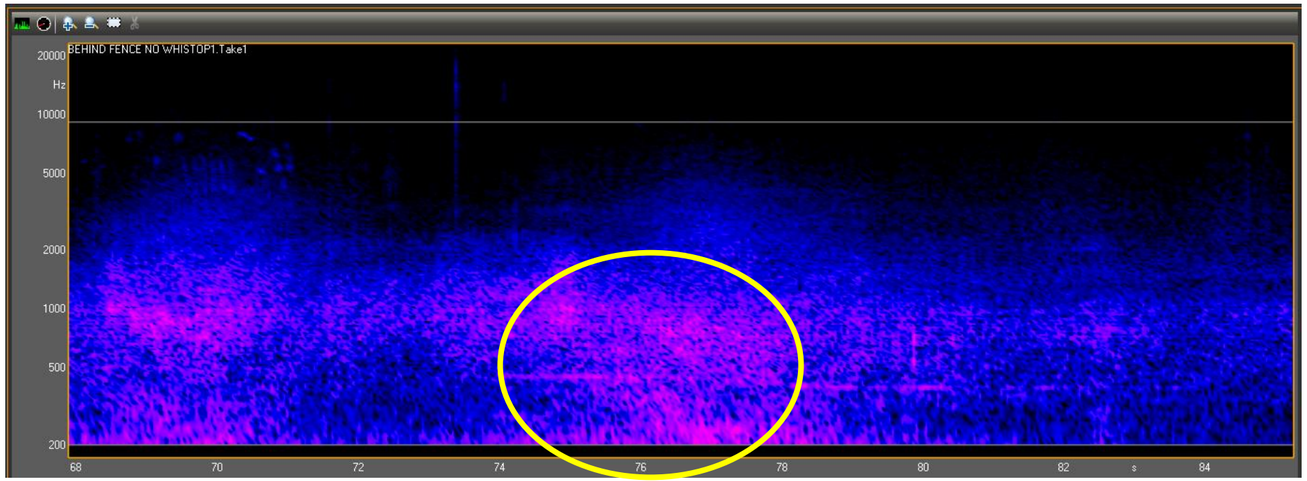
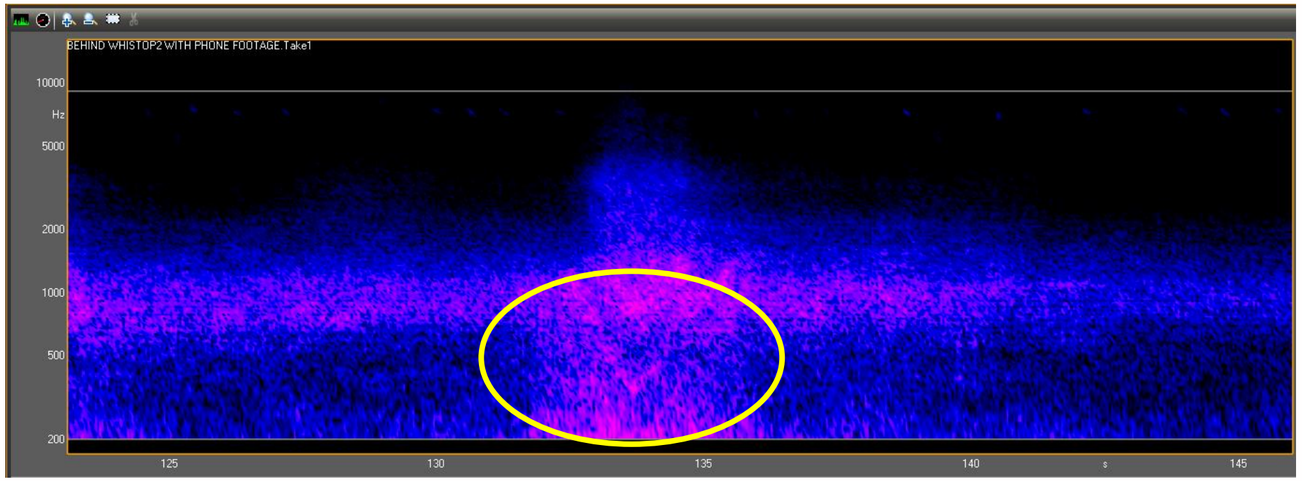
Summary of Results – Doppler & Flanging



NO WHIStop



With WHIStop

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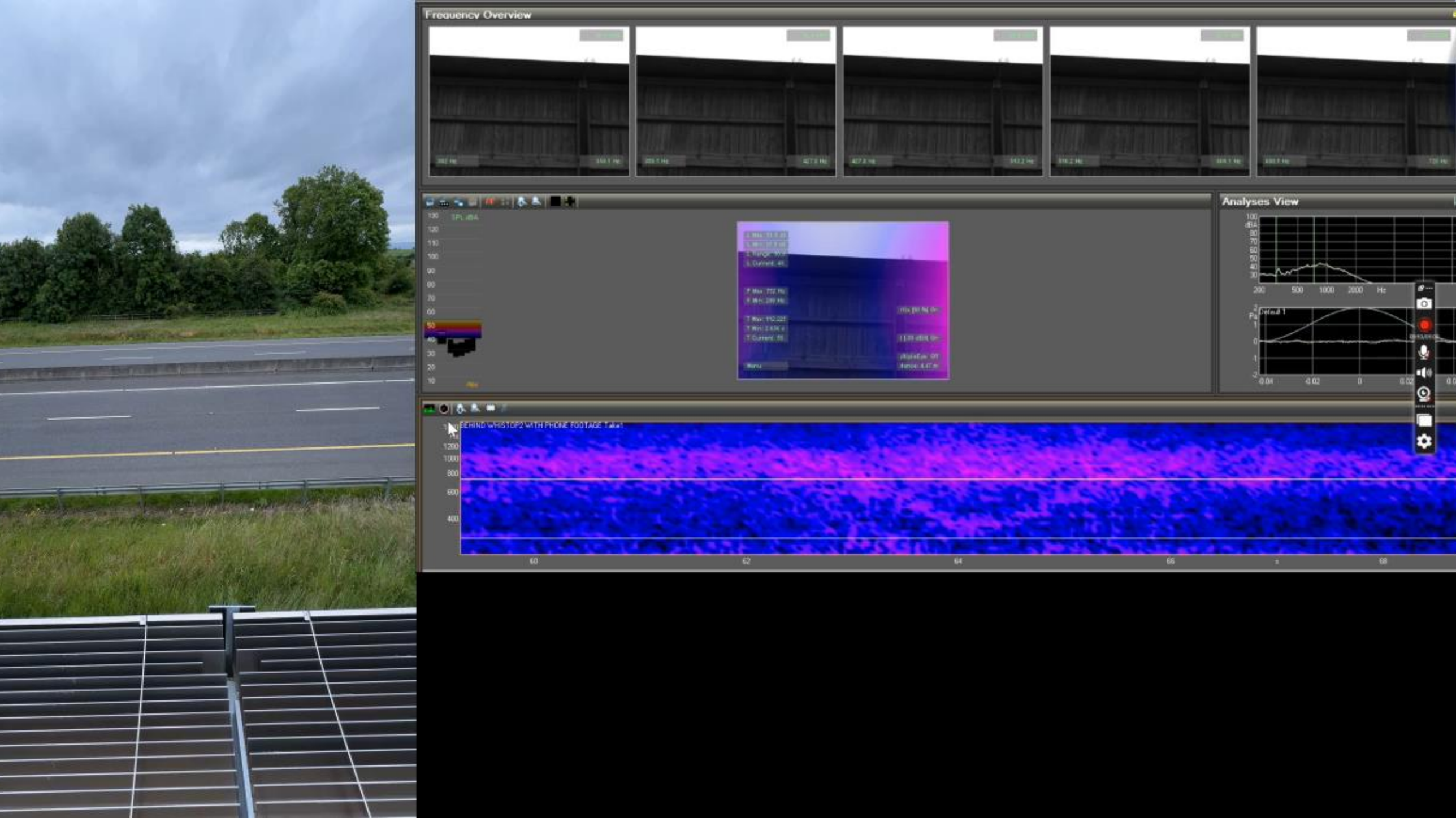
Frequency Overview
Analyses View
Hz
60
62
64
66
68

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	*62 in total*
NO WHISTOP NORTHBOUND	21	6	2	1	30	
WHISTOP SOUTHBOUND	30	2	4	0	36	*62 in total*
WHISTOP NORTHBOUND	24	1	1	0	26	

- 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

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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).

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Thank You - Questions?

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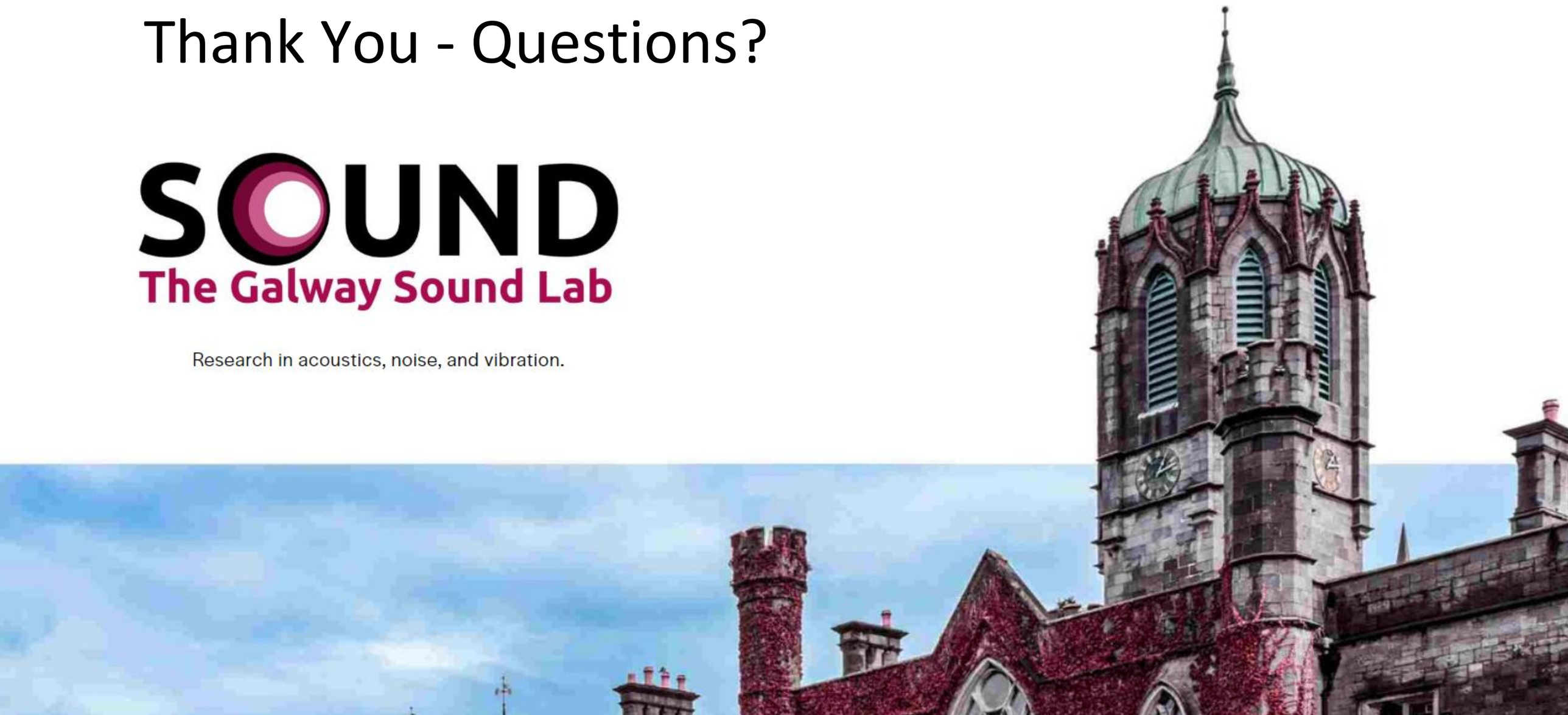
Research in acoustics, noise, and vibration.



Questions: Session 6 Panel

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

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*

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Thank you for attending the 2024 National Roads and Greenways Conference