Lower Thames Crossing

Transforming Infrastructure for a Sustainable Tomorrow

Perspective from a Megaproject

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Lower Thames Crossing

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Project team

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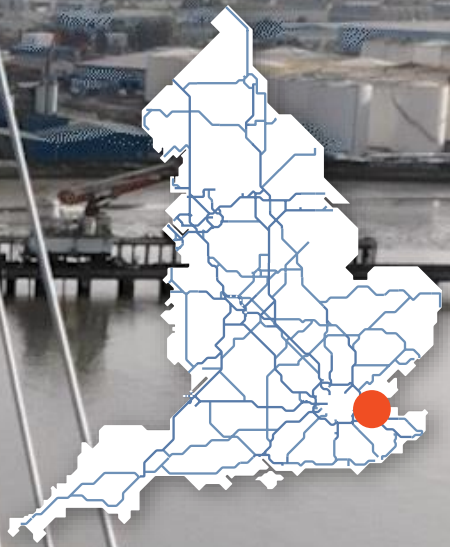
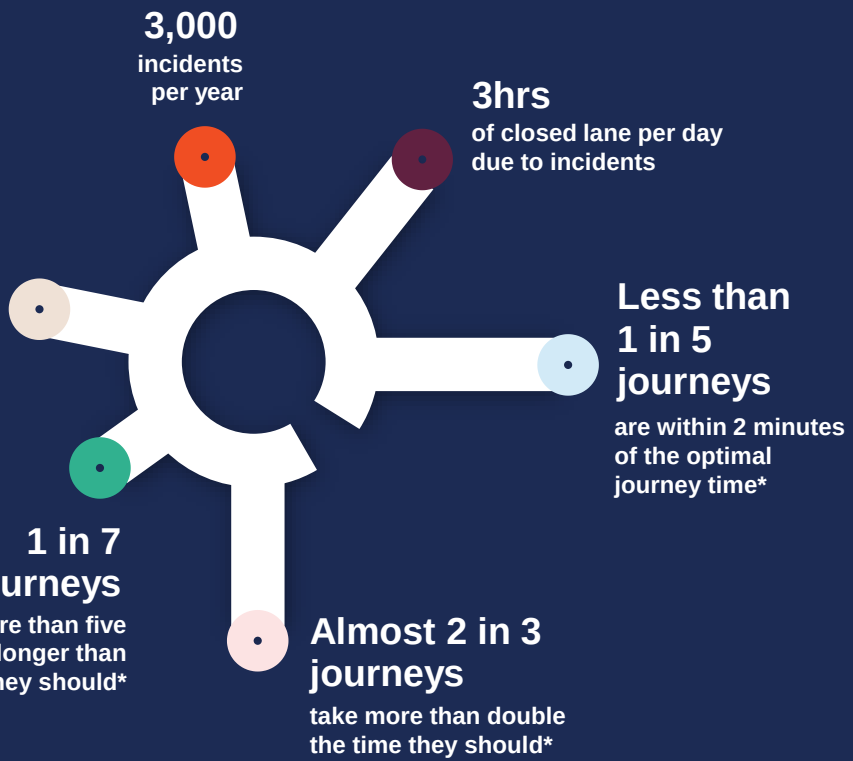
The Dartford Crossing



Dartford is the worst performing part of the UK motorway network

- It cannot cope with current traffic volumes
- Slow journeys
- Unpredictable journey times
- A huge daily operation to keep the crossing moving
- Hugely disruptive operational constraints



*data for Northbound weekdays 4-5pm, J3>Crossing, 2018 & 2019

The transport solution

1. **Biggest road project** since the M25 opened 30 years ago
2. Nearly **doubles cross river capacity**, reducing traffic at Dartford by 20%
3. **Direct freight connection** to Thames Freeport & between Channel ports, Midlands & North
4. **Two 2.6-mile tunnels -** longest road tunnels in UK and **third largest bored tunnels** globally
5. Approximately **14.5 miles (23km) of new road.** 70 mph, high quality, free flow crossing with no vehicle type restrictions
6. Traffic using Dartford cut by almost a quarter, while enabling new journeys
7. 30% more jobs within 30 minute commute of workers in Gravesham, Thurrock and Havering

The Lower Thames Crossing will provide a reliable new link in the strategic road network, taking Channel port freight traffic away from Dartford and connecting the regional economies of Kent and Essex

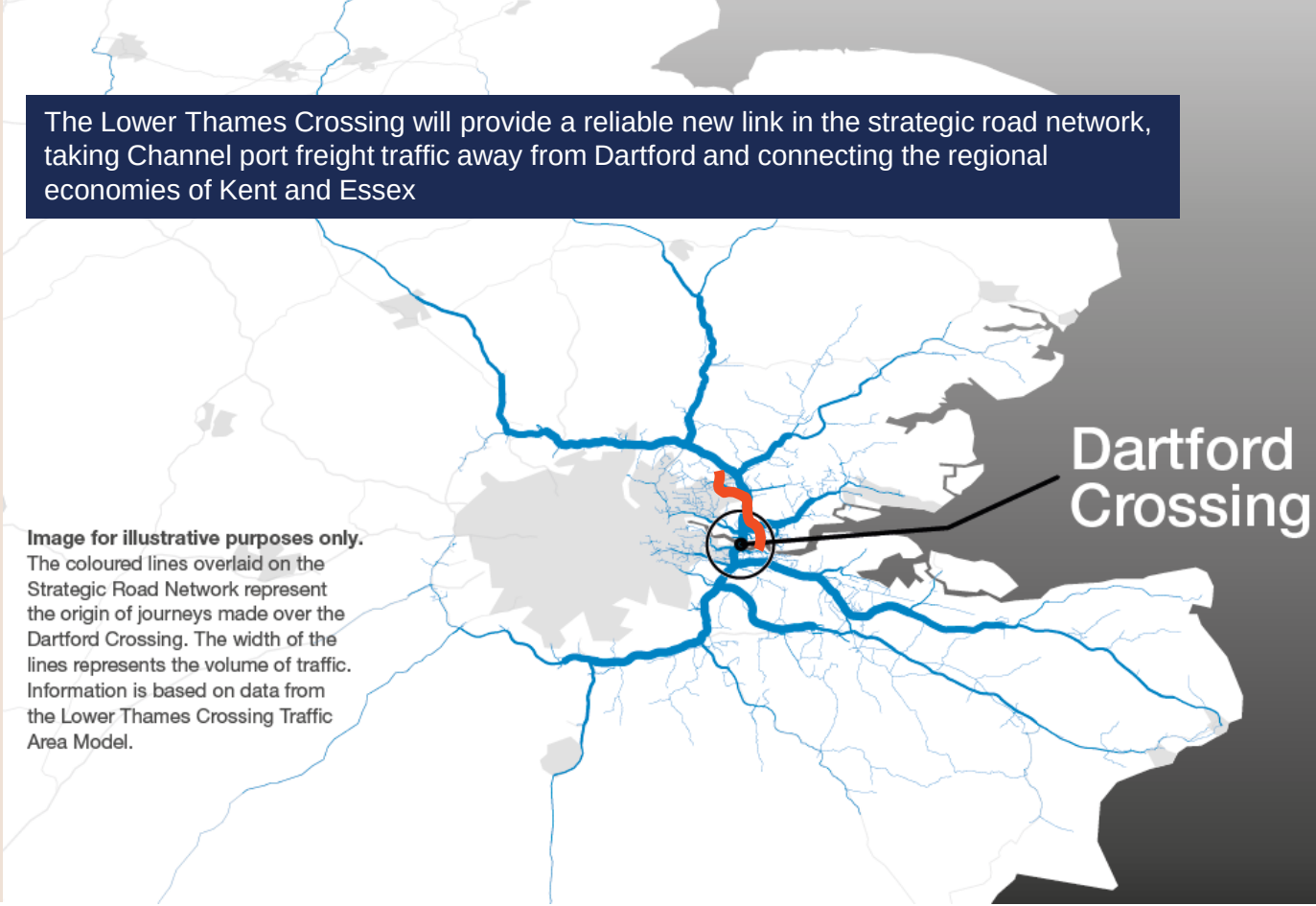


Image for illustrative purposes only. The coloured lines overlaid on the Strategic Road Network represent the origin of journeys made over the Dartford Crossing. The width of the lines represents the volume of traffic. Information is based on data from the Lower Thames Crossing Traffic Area Model.

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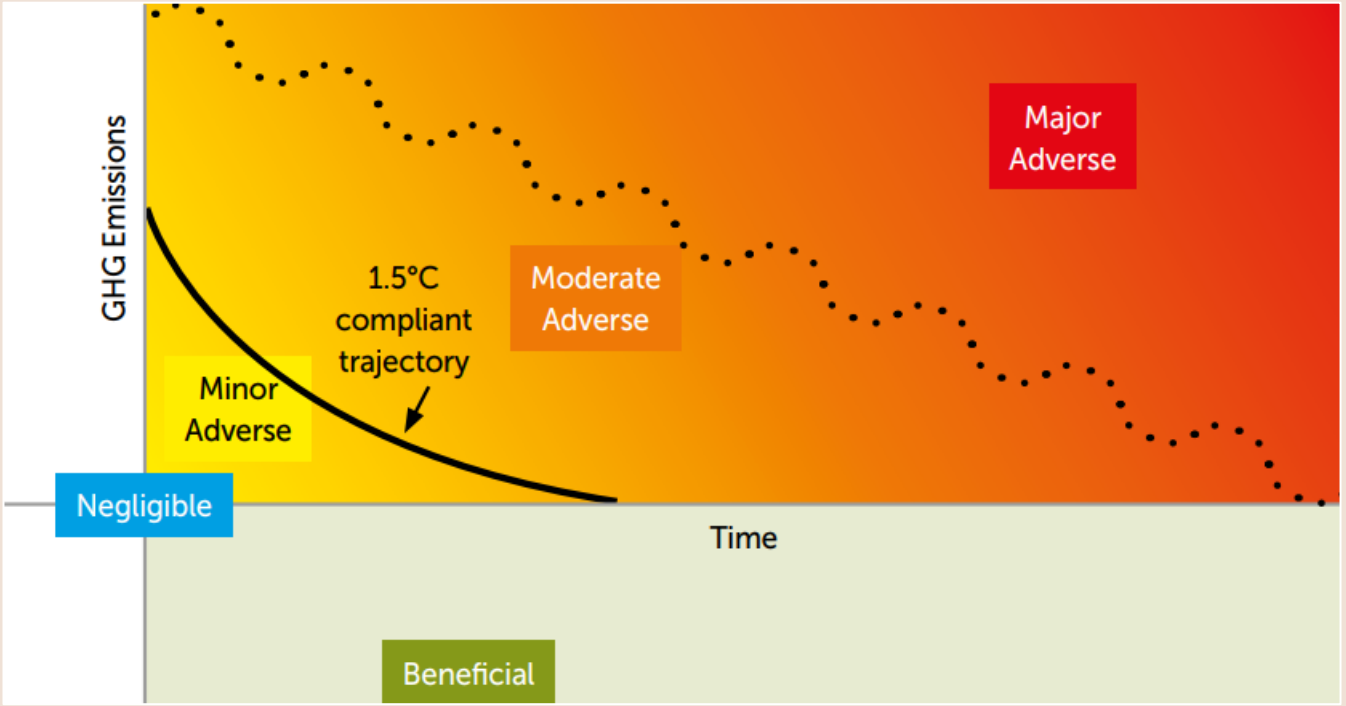
Why has LTC got a carbon challenge?

- UK has a legal commitment to net zero by 2050 – Climate Change Act, 2008
- In 2020, the UK construction industry was not on track for net zero
- UK projects frequently challenged in court over carbon emissions
- Project timing, size, complexity and location – roads seen as a polluter – 2mt CO_2e from construction, 4mt+ from operation
- Project set out to prove that construction can decarbonise and to develop a plan that others can adopt

Assessing the significance of emissions



From: Institute of Environmental Management & Assessment (IEMA) Guide: Assessing Greenhouse Gas Emissions and Evaluating their Significance

Project Timeline

2022
DCO Submission

June 2023
Examination Start

Dec 2023
Examination Finish

Tunnel and Roads contract award

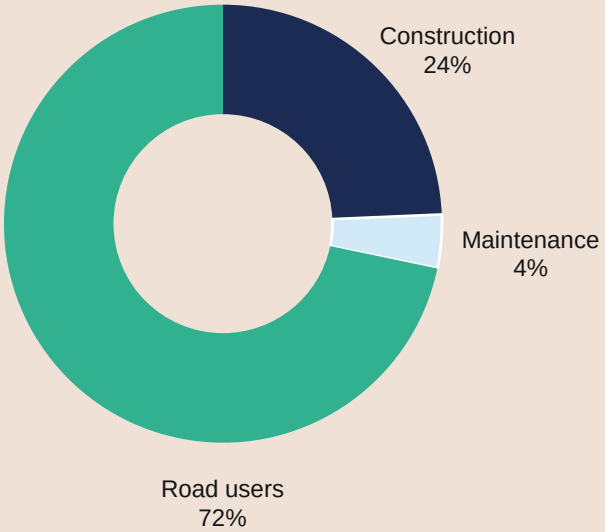
March 2024
PINS recommendation to government

June 2024
DCO Decision

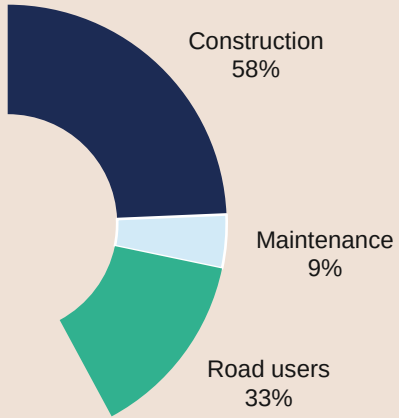
2030*
Opening* TBC

Lower Thames Crossing Carbon Challenge

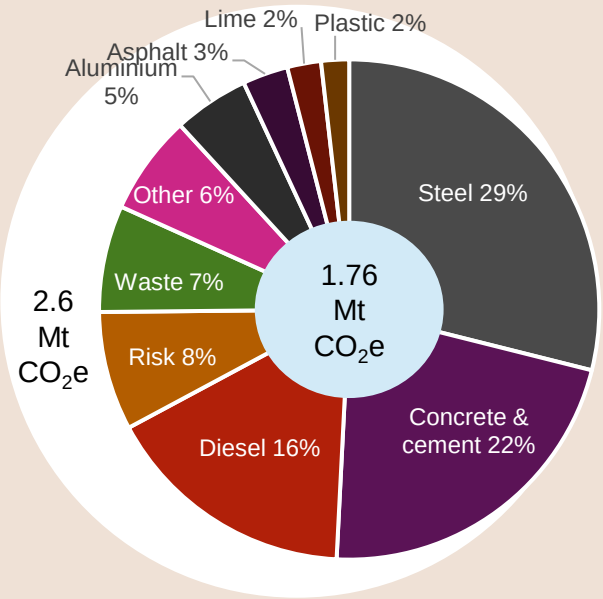
Initial Forecast



Decarbonised Transport Scenario



Construction



How LTC has approached carbon: Summary

Typical practice	Low carbon	Tendered position	Lowest carbon
• Carbon quantification • Highly detailed – embedded carbon, construction processes (diesel), risk and operation	• Carbon limit = best practice • Commercially available approaches • Set as a legal commitment	• Early contractor involvement key to innovation in processes • Carbon central to procurement • Tendered responses become contractual • Contractors contracted to a lower carbon limit	• Contract promotes further reduction • Financial incentive • Contractual mechanism to pay for low carbon innovation • Best practice carbon management – PAS 2080

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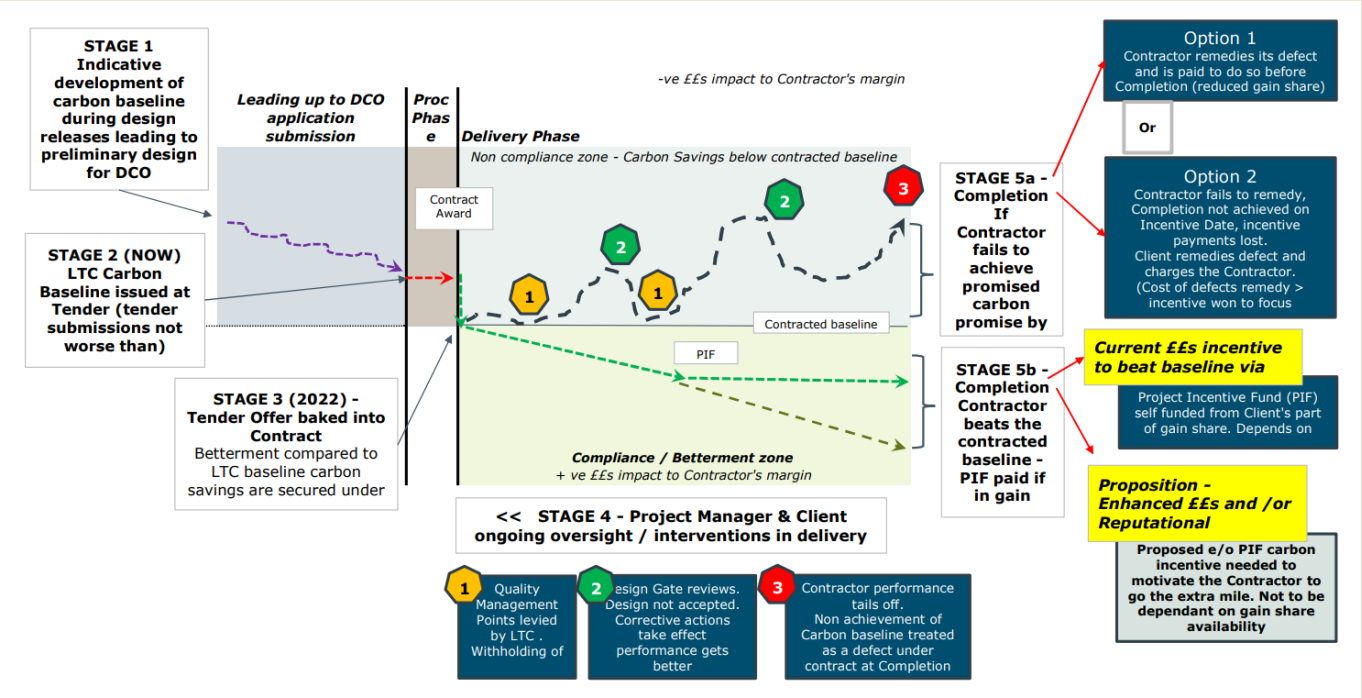
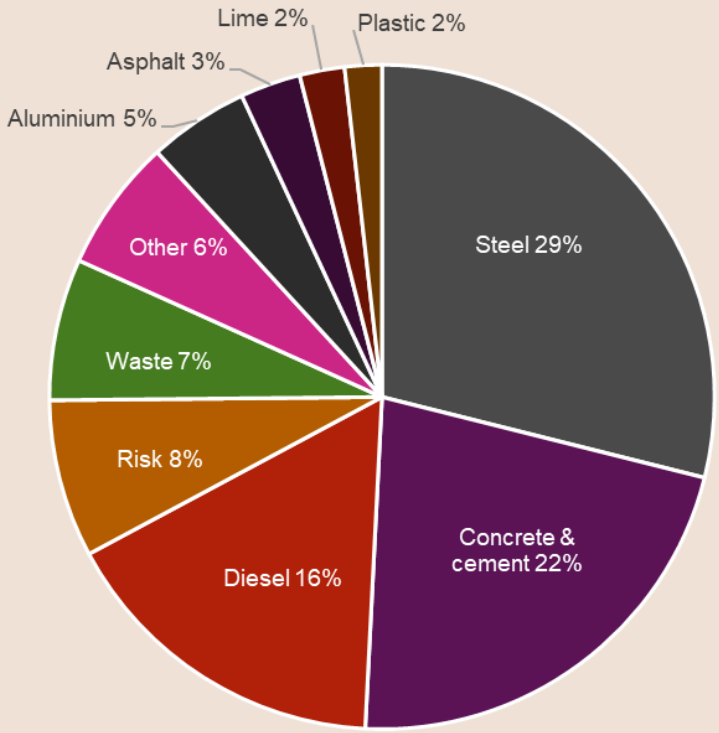
LTC carbon commercial life-cycle



Carbon quantification

- Compliant with PAS 2080, Carbon Management in Buildings and Infrastructure
- Highly detailed model including
  - embodied carbon
  - construction processes (including diesel)
  - utility work
  - maintenance and replacements
  - allowance for risk
- **Low carbon** construction emissions of 1.76mtCO_2e – current best practice
  - Lower carbon cement (65% GGBS in concrete, 50% GGBS in cement for ground improvement)
  - Renewable electricity
  - Optimisation of concrete grade
  - Use of steel fibre reinforced concrete
  - Reduced disposal of material offsite
  - Design efficiency
- None of this specified – up to contractors to decide how to reduce emissions
- Commitment to 1.76mtCO2e as an upper limit for LTC



PAS 2080 compliant Carbon & Energy Management Plan

- **Produced a Carbon and Energy Management Plan which was a legally secured document within our Development Consent Order submission**
- **The Plan set out project's carbon ambitions:**
  - Quantify carbon impact
  - Set minimum standards
  - Reward carbon reduction – incentivisation
  - Adopt best practice carbon management
    - Verification
    - Transparency
    - Ownership/responsibility
  - Operational phase

Contractors' versions must be signed off by Secretary of State

Carbon in procurement

- **Tender scoring was 70% quality, 30% cost**
- **10 of the quality points were for carbon performance – 14% of the quality total**
- **30-page submissions to be written in contractual language**
- **Questions covered:**
  - Short and long-term actions to reduce emissions
  - How wider corporation delivering carbon reduction
  - Plans for working with supply chain and PAS 2080
  - How performance will be continually improved
  - Delivery of Lowest Carbon Strategy
  - Commitment to baseline

Lowest Carbon Strategy

Our ambition is to construct the Lower Thames Crossing for the lowest practicable carbon emissions

Materials

1 Concrete & Cement

Where we cannot eliminate or substitute cement, we will use the lowest carbon product available, in the most carbon efficient design

2 Steel

We will reuse and recycle steel for temporary & permanent structural applications & substitute with basalt/fibre in reinforced concrete

3 Diesel

Green hydrogen & battery electric will be the fuels of choice for our plant and vehicle fleet and all our people will have green travel plans

4 Asphalt

We will stimulate the market for a zero carbon road surfacing product

Materials

Market

5 Supply Chain

All major suppliers will have a Net Zero plan and carbon will be part of the selection criteria throughout our supply chain

6 Skills

We will establish a zero carbon construction skills hub in the region and provide carbon literacy training for the whole workforce

Market

Management

7 Design & standards

We will work with the industry to revise standards that constrain innovation on carbon

8 Assured reporting

We will apply three lines:

1. Integrated Project Controls
2. Carbon audit
3. Independent review

9 Carbon Management

PAS2080 will be mandated throughout our supply chain and we will support our supply chain in obtaining accreditation

Management

We will collaborate to leverage economies of scale: across our business; in the region; with peer infrastructure programmes

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Lowest carbon: contract mechanisms

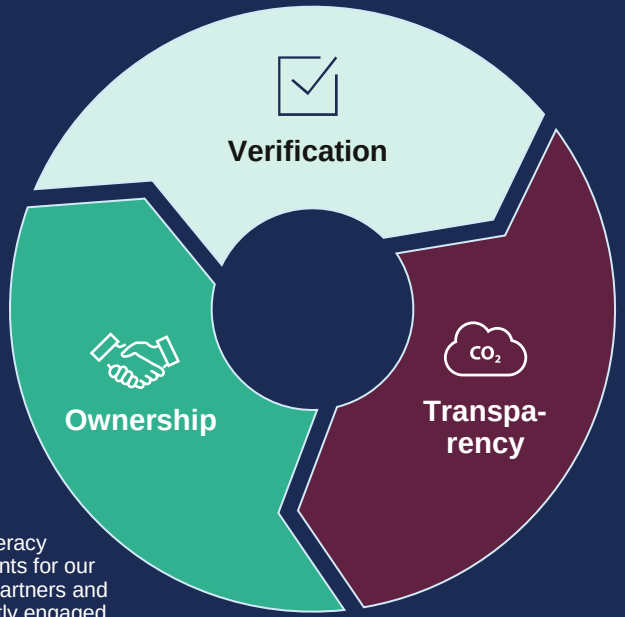
Designed the procurement process to select contractors who are committed to net zero and ready to work with us to deliver our carbon ambitions

We have established mechanisms to achieve lowest carbon:

1. Rewarding carbon reduction by paying a financial incentive for every tonne of carbon reduced below the contractual carbon limit
2. Enhancement clauses to promote innovation – guaranteed profit. For example, hydrogen procurement
3. Adopting a best practice approach to carbon management

All these mechanisms are commitments in the Carbon and Energy Management Plan: Appendix

- PAS 2080 requirements for LTC, our Delivery Partners and their directly engaged subcontractors
- Independent verification of our carbon data



- Carbon literacy requirements for our Delivery Partners and their directly engaged subcontractors
- Carbon Director in each Delivery Partner

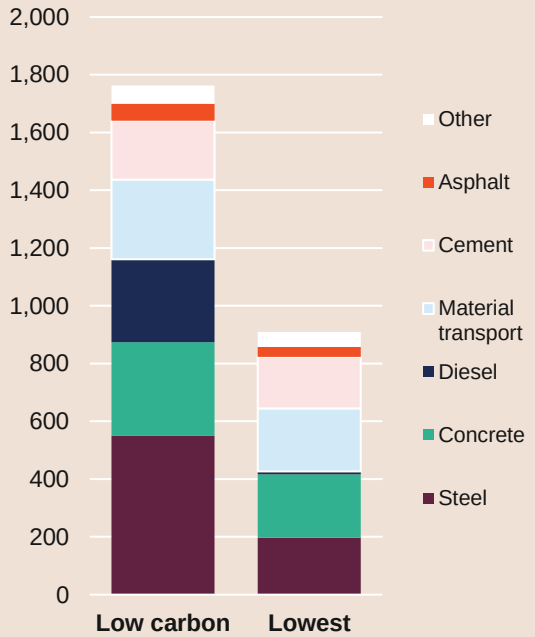
- Annual carbon performance report
- Further iterations of the Carbon and Energy Management Plan
- Second iteration requires Secretary of State approval before construction commences
- Annual updates
- Quarterly carbon reports from Delivery Partners
- Quantification of carbon impact using lifecycle analysis

Lowest carbon: what might be achieved

Quantified what lowest carbon looks like

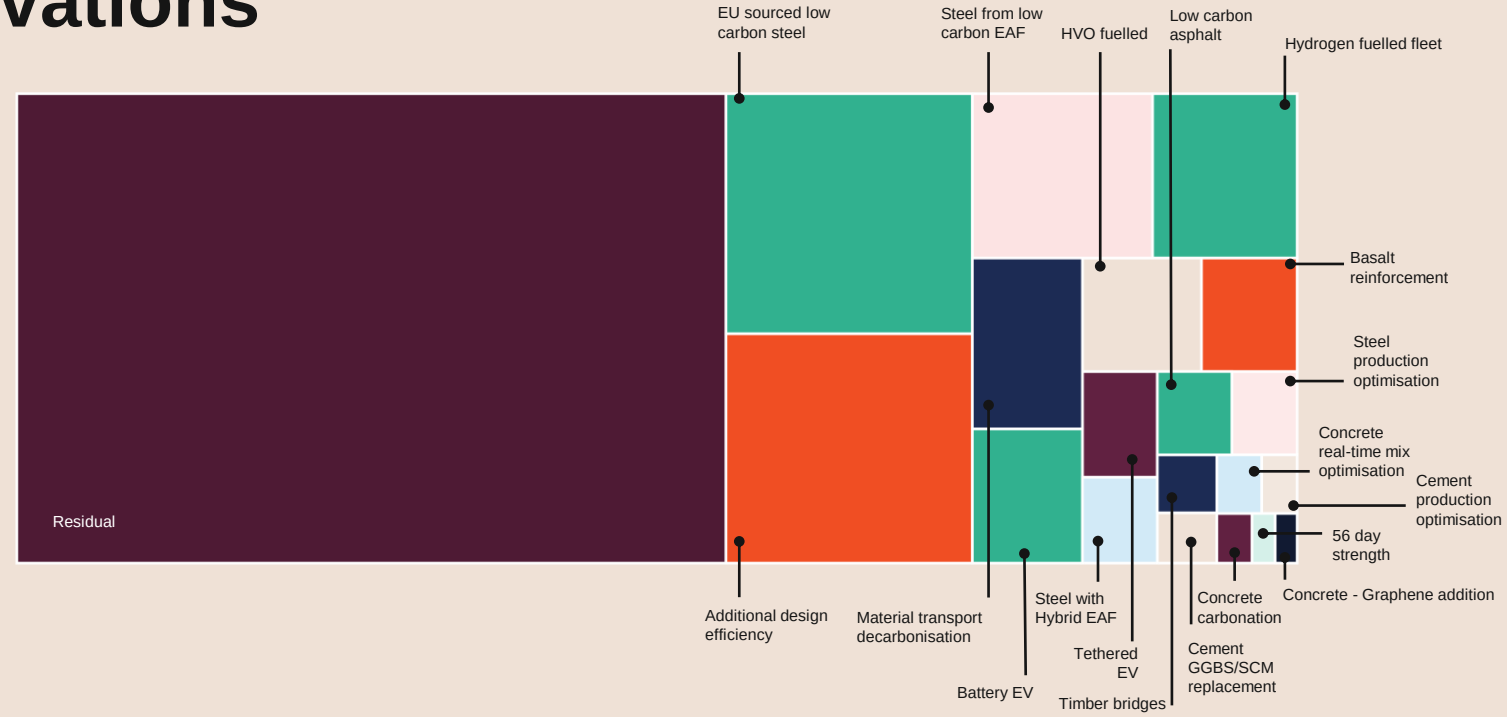
- Identified carbon saving technologies
- Consulted the market
  - For diesel, with Original Equipment Manufacturers
- Examined alignment between timelines for technology development & LTC's construction period
- Assessed potential emissions reduction
- Identified priority technologies

Emissions source	Priority technologies
Concrete	• Design efficiency • Production optimisation • Basalt reinforcement
Steel	• Procure steel produced in electric arc furnaces using renewable electricity and recycled steel
Diesel	• Hydrogenated vegetable oil • Hydrogen • Battery electric and tethered electric plant
Asphalt	• Biogenic materials • Fuel switching/production optimisation • Recycled asphalt



Future savings and innovations

- Further design efficiency/value engineering
- Low emissions steel
- Cement replacements
- Alternative fuels – HVO and hydrogen
- Electric plant
- Decarbonising transport
- Innovative concrete additives

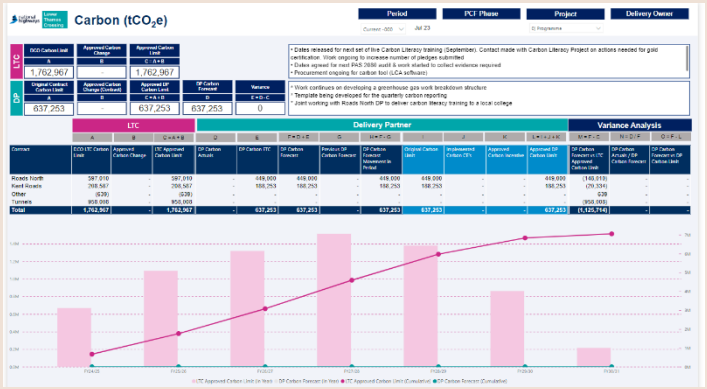


Lowest carbon: managing performance

- Setting annual targets & measuring performance is key to our carbon management
- Quarterly report includes approved carbon incentives

Delivery Partner annual target =
carbon limit – savings from approved carbon incentives

- Monthly monitoring
- Annual reconciliation



If performing better than target
May be eligible for further incentive payments

If performing better than target
May be eligible for further incentive payments

Lowest carbon: carbon literacy

Carbon important for promoting carbon reduction across the supply chain

Aiming for Gold accreditation for carbon literacy for the project

Components of our carbon literacy training

NH Net Zero & Sustainability e-learning module

- Over 250 people completed

Live carbon training

- Over 140 people completed
- Over 65 people fully certified as Carbon Literate Individuals

LTC as a Carbon Pathfinder e-learning module

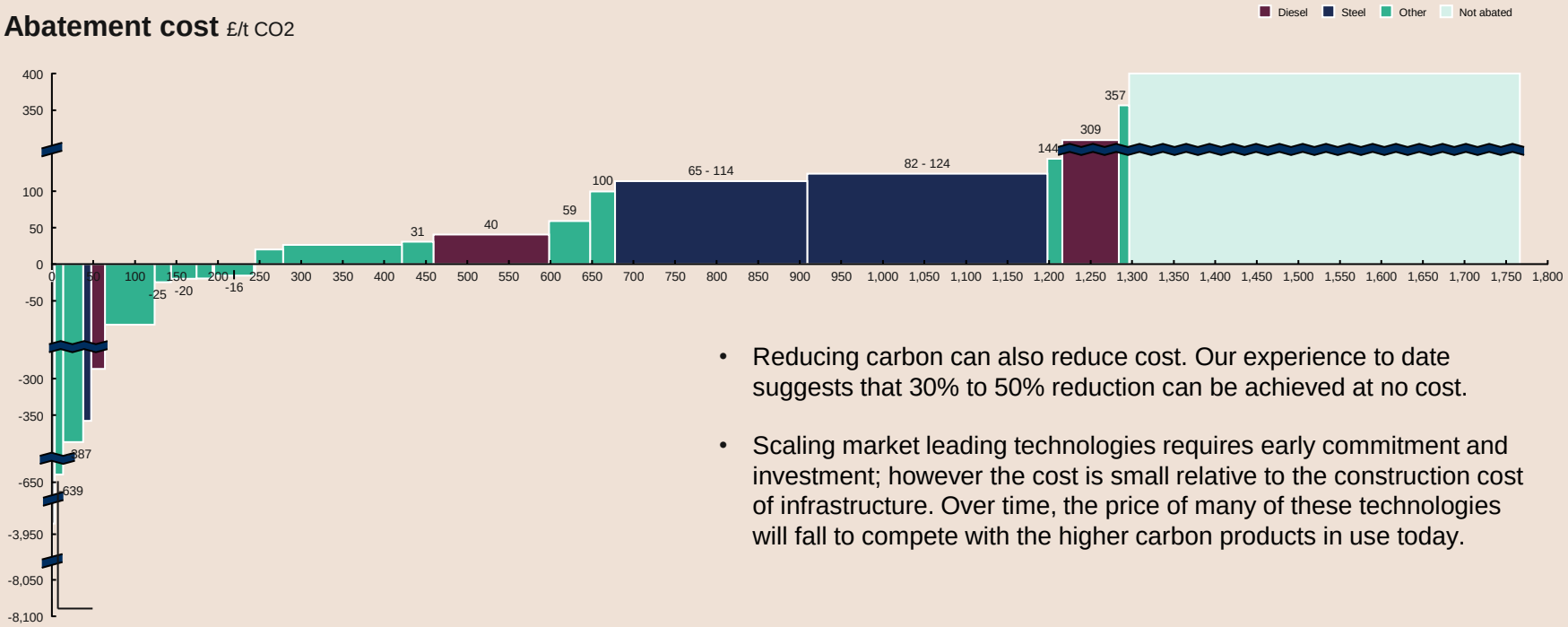
- To be released later this year
- For contractors future LTC staff

Requirements for gold

- 50% of the workforce certified as Carbon Literate Individuals
- Integrate carbon literacy in performance management & assessment systems
- Visually promote carbon literacy
- Publish a case study on carbon literacy
- Deliver carbon literacy training to another organisation
- Actively advocate for carbon literacy

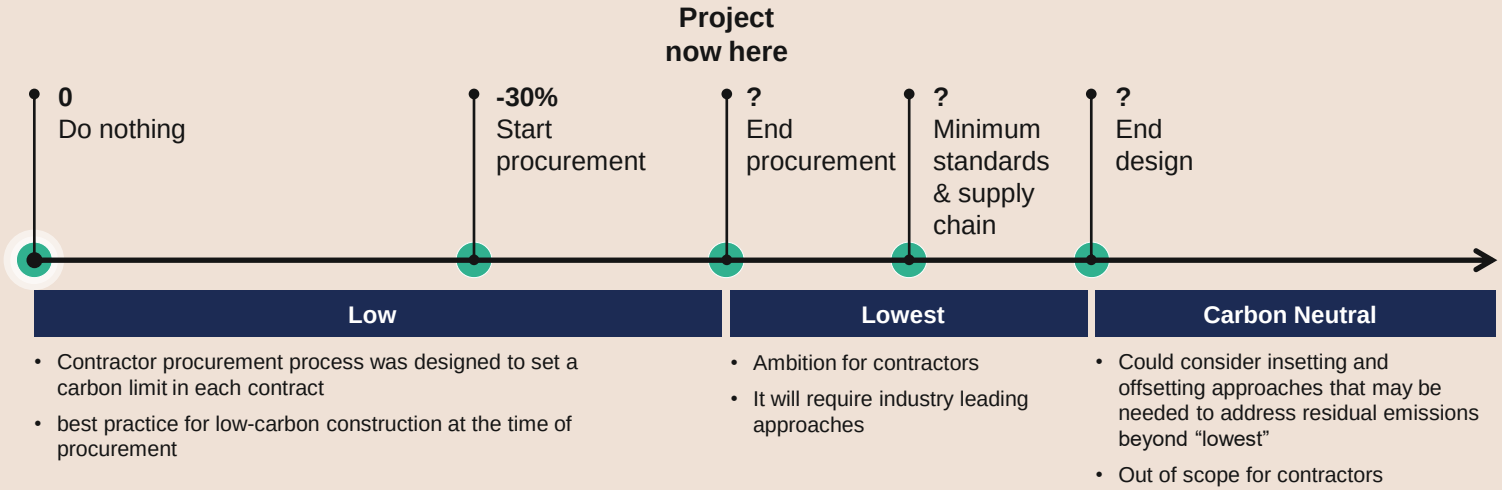
The cost of low carbon

Abatement cost £/t CO2

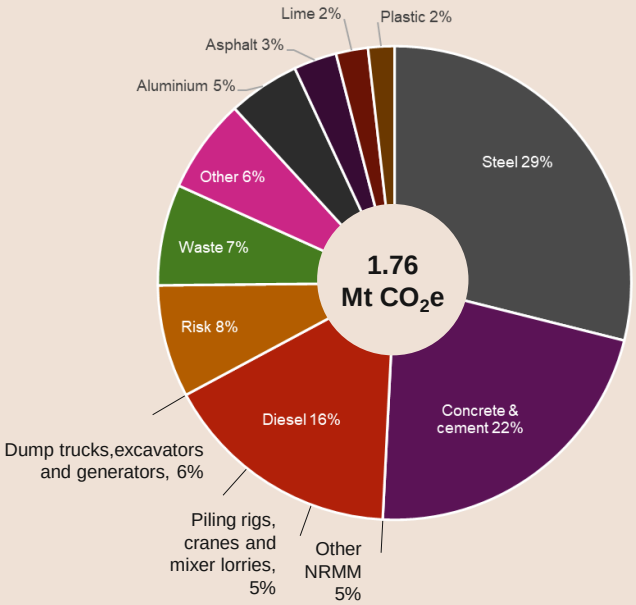


- Reducing carbon can also reduce cost. Our experience to date suggests that 30% to 50% reduction can be achieved at no cost.
- Scaling market leading technologies requires early commitment and investment; however the cost is small relative to the construction cost of infrastructure. Over time, the price of many of these technologies will fall to compete with the higher carbon products in use today.

Lower Thames Crossing – progress to date



Use of diesel is a significant proportion of construction emissions

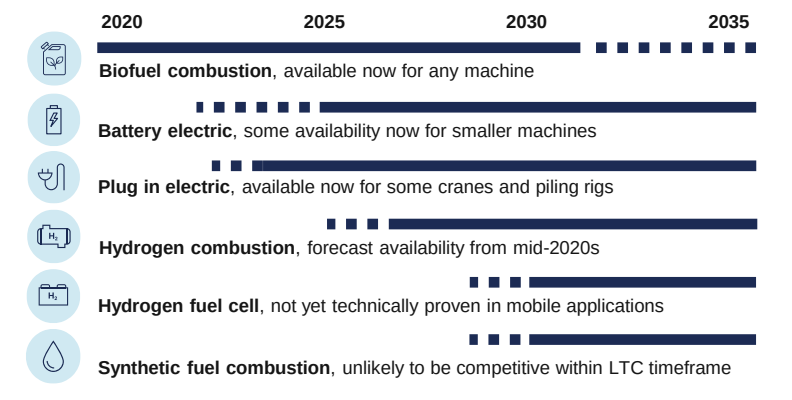


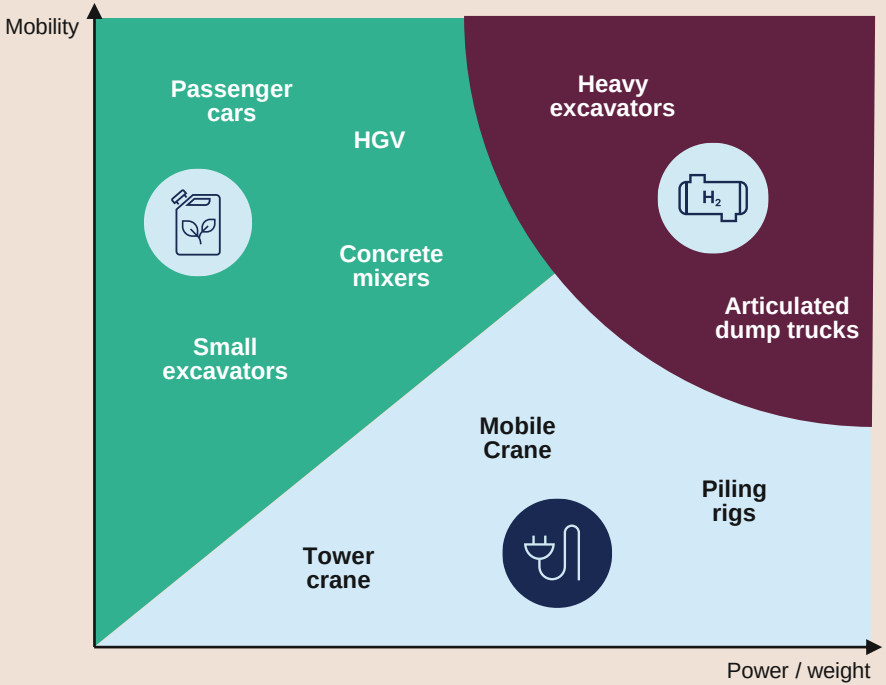
Low / zero carbon technology

Likely availability / applicability

The technologies most applicable to Non-Road Mobile Machinery (NRMM) on Lower Thames Crossing are:

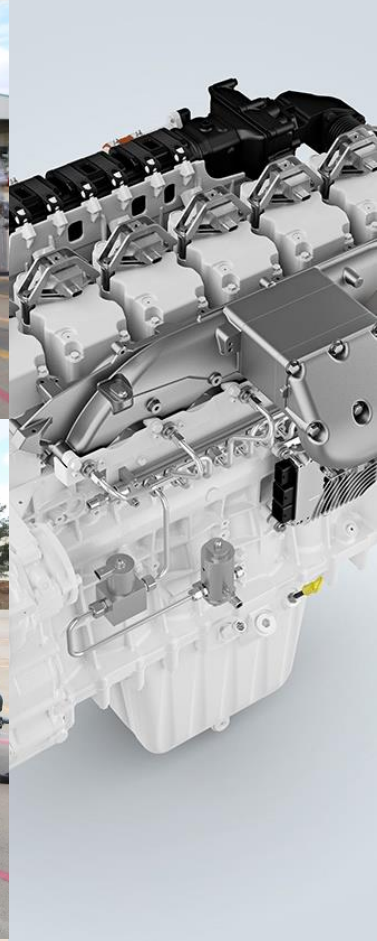
- battery electric,
- plug in electric and hydrogen combustion.
- Biofuels will be used where the other technologies are not yet available.
- Different technologies are suited to different applications. Hydrogen is likely to be preferred for heavy, mobile applications. This also tends to be where the greatest carbon emissions are, c30% of emissions from NRMM on Lower Thames Crossing will be eliminated by switching to hydrogen fuelled excavators and dump trucks.





National Highways undertaking UK's largest ever purchase of low carbon hydrogen for transport

- Tender issued for **over six million kilograms of low carbon hydrogen** in July 2023
- **First major infrastructure project** to propose low carbon hydrogen at scale to power heavy machinery
- Purchase aligns with UK **government's drive towards Net Zero** and Construction Leadership Council's plan to **eliminate diesel** from most construction sites by 2035
- The scale of procurement in this location will leave a **legacy for the Thames Estuary** and **UK construction sector** by:
  - Reducing the scheme's **carbon footprint** through removal of an estimated 20 million litres of diesel
  - Giving major firms / suppliers the **confidence to invest** in hydrogen skills and technologies
  - Establishing a **hydrogen ecosystem** in the Thames Estuary



Five key points

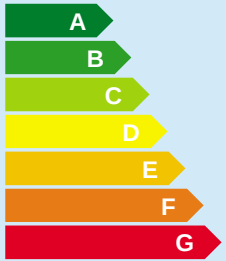
Take-away points for low carbon infrastructure projects

The five asks of construction clients – the market is ready for this

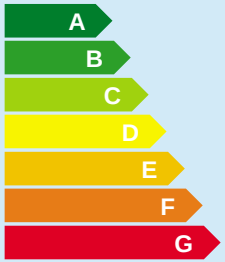
Know your numbers (PAS 2080)

Contract for low carbon

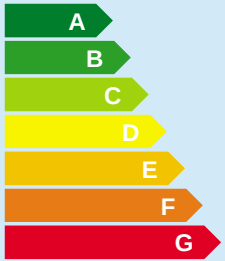
Diesel free sites



Low carbon cement



Green steel

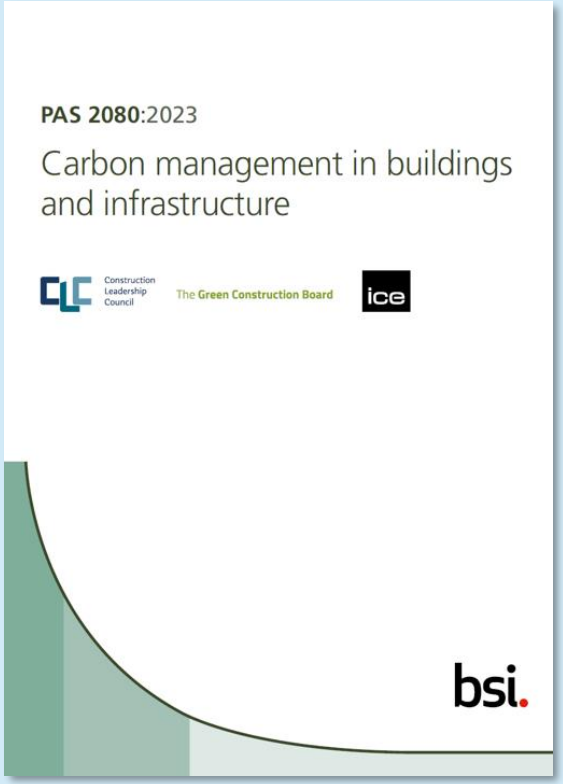


Know your numbers (PAS 2080)

- PAS 2080:2023 specifies requirements for the management of whole-life carbon in buildings and infrastructure.
- It has been sponsored by the Construction Leadership Council, Institution of Civil Engineers and the Green Construction Board.
- It is available free of charge and there are a number of independent bodies that can verify your management system against the standard.

Adoption will:

- Evidence your commitment to carbon reduction
- Increase confidence and trust in a verified carbon management approach
- Promote collaboration through the supply chain
- Applying it to every project will produce benefits in cost reduction and carbon efficiency



Contract for low carbon

- The market is ready to be challenge on low carbon emissions
- Tender selection processes and contracts should allow for:
- Requiring PAS2080 and your standards for steel concrete and diesel to your requirements
- Experience shows you can get significant savings at no extra cost,
- Likely to get cost efficiency and innovation too
- Incentivise further carbon reduction in contract
- Beware of setting arbitrary targets

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Questions?