



CENTRE FOR RESEARCH INTO
ENERGY DEMAND SOLUTIONS



Capital carbon inventory seedcorn project

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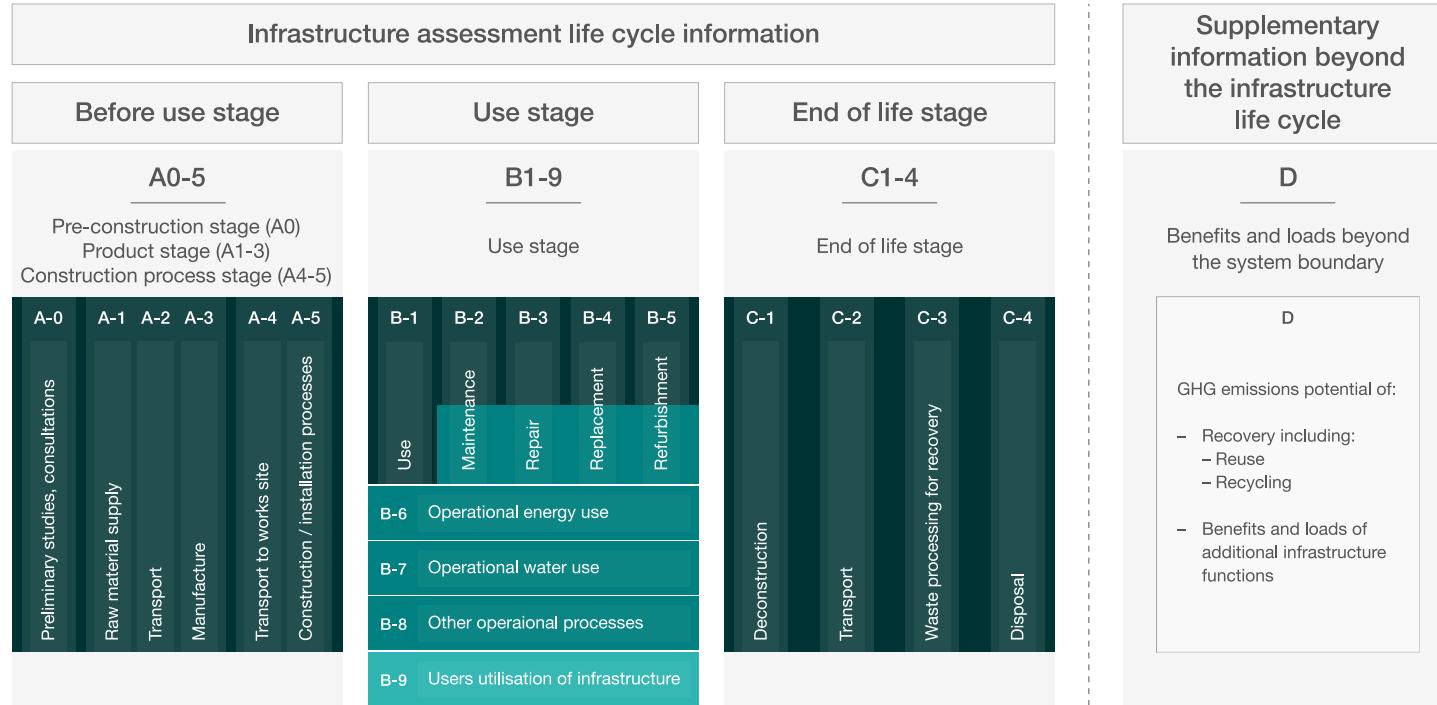


UK Research
and Innovation

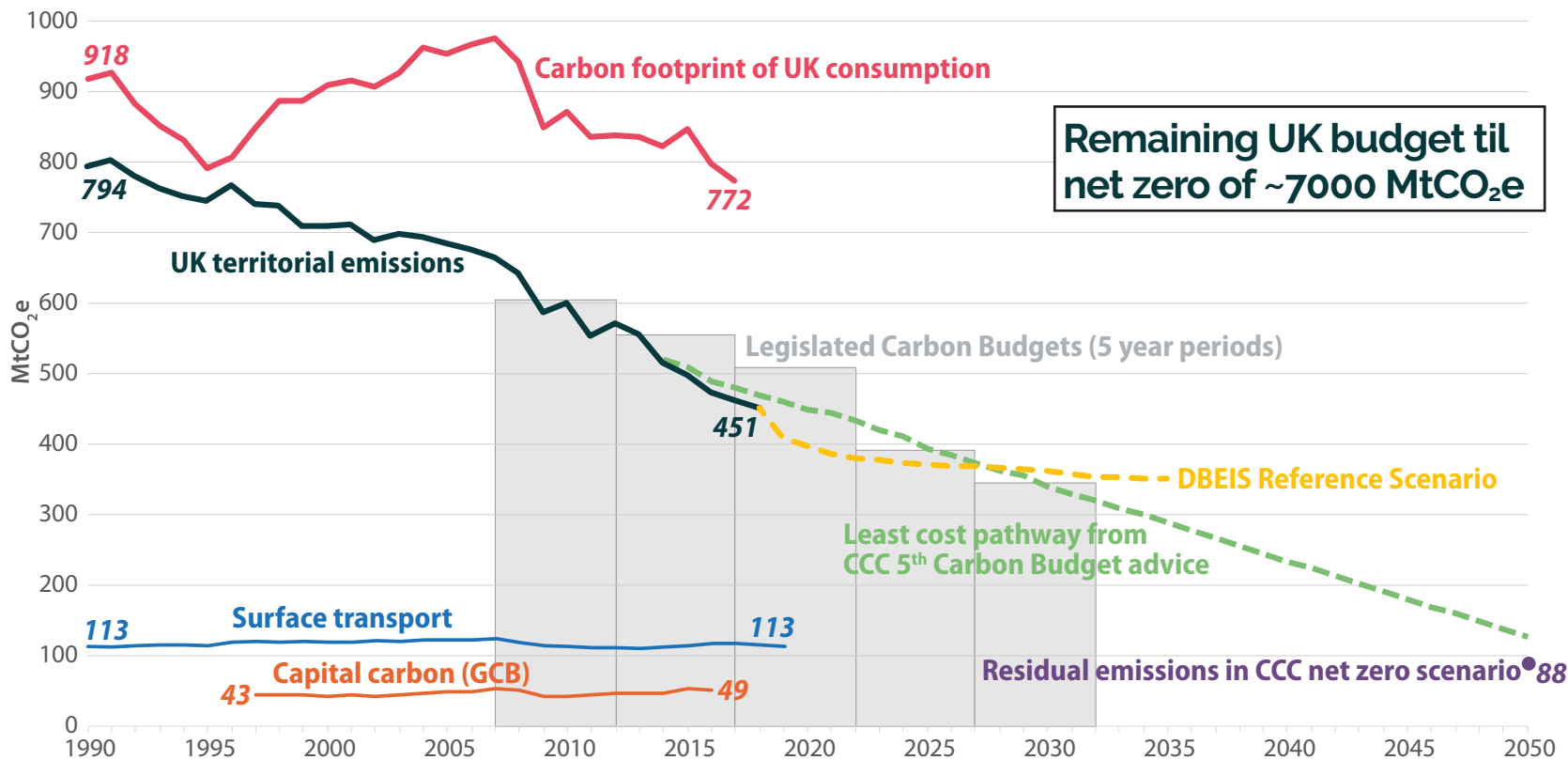
these slides are available at www.jannikgiesekam.co.uk

Emissions from an infrastructure asset

- Capital GHG emissions
- Operational GHG emissions
- User GHG emissions

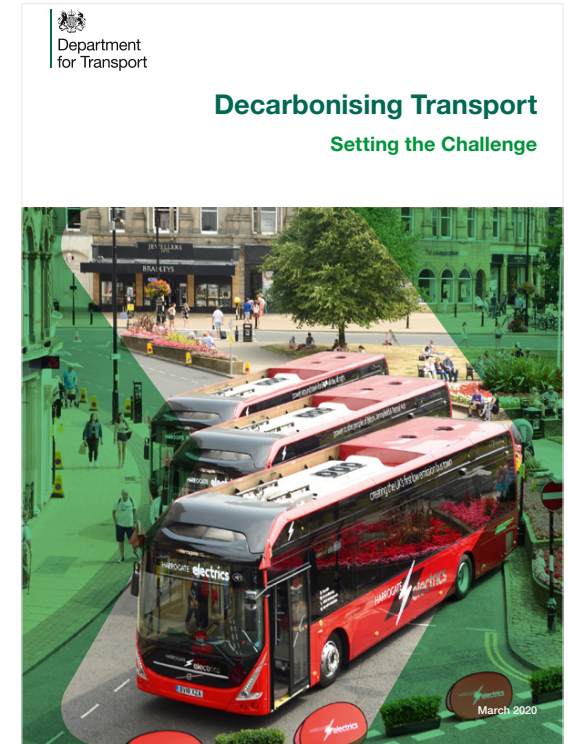


UK greenhouse gas emissions & targets



Transport challenge

*“outside of the scope of this plan are the GHG emissions associated with power generation and distribution for transport, and **construction of transport infrastructure**, noting their consideration in other policy areas”.*



Infrastructure transformation is essential for net zero

*“Reaching net-zero GHG emissions requires **extensive changes** across the economy, with complete switchovers of several parts of the UK capital stock...”*

*Achieving net-zero emissions will require **new infrastructure**...*

*Major infrastructure decisions need to be made in the near future and **quickly implemented**...*

*Just how much infrastructure will need to be developed in each sector will **depend on decisions on the pathway to achieving net-zero emissions**.”*



Long term scenarios, routemaps & investment pipelines

Required across all scales, e.g.

National

National Infrastructure Assessment, associated models & recommendations

National Infrastructure & Construction Pipeline from Infrastructure & Projects Authority

Green Construction Board Low Carbon Routemap for the Built Environment

Regional

Strategic Transport Plan & Long Term Investment Pipeline from Transport for the North

London Infrastructure Plan & Mayor's Transport Strategy for London

Sectoral

Road Investment Strategies 1 & 2

What are the associated emissions?

Corporate

Highways England Strategic Business Plan & Delivery Plans

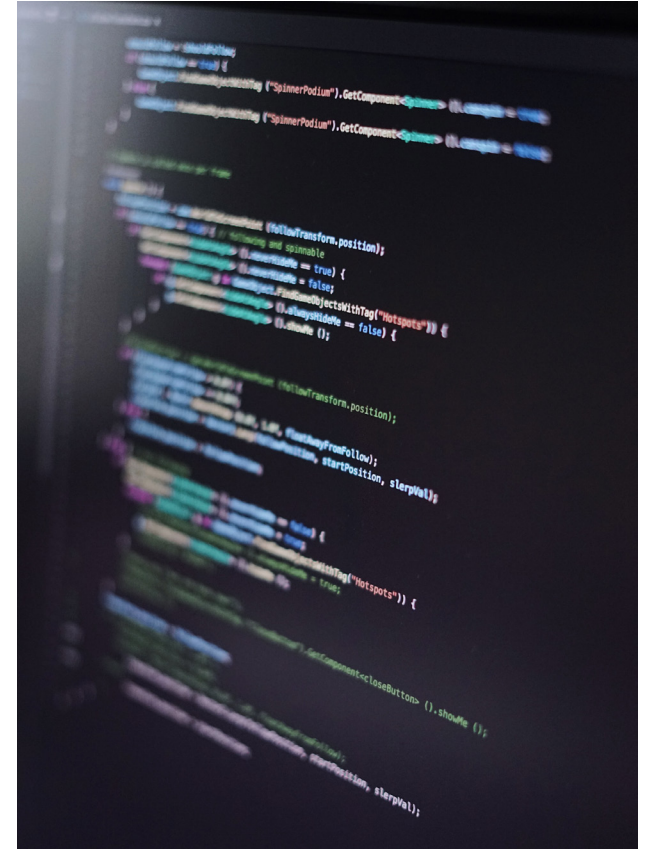
Where our project fits

Already routinely evaluated
 Increasingly commonplace
 Rarely evaluated

	Materials, products & components	Assets & projects	Asset portfolios	Investment plans, pipelines & scenarios
CapCarb				
OpCarb				
UseCarb				
Recent trends	Rapidly expanding range of Environmental Product Declarations (>8000); new and recently updated databases (e.g. ICE v3); suppliers increasingly able to provide information on request	Carbon assessment increasingly embedded into regulations (e.g. 2014/52/EU); organisational requirements and standards (e.g. Network Rail Environmental and Social Minimum Requirements)	Carbon management commonplace; many organisations with carbon KPIs (e.g. Highways England supply chain emissions); some benchmarking (though often only for OpCarb & UseCarb)	Increasingly detailed and integrated system models evaluating futures but CapCarb largely absent from models and rarely assessed for investment pipelines

Proposed solution

Creation of a transparent open source resource facilitating estimation of capital carbon of future projects and pipelines



Key data sources for amalgamation

Materials, products & components:
EPD (Environmental Product Declaration) directories
Carbon factor databases (e.g. ICE database)
Bespoke tools

Assets & projects:
Independent LCA studies
Environmental Statements produced as part of EIA
Information from stakeholder databases
Resource also includes links to guidance and tools

- treatment of wastes;
- transportation of waste and material;
- operational electricity consumption; and
- emissions associated with maintenance activities.

2.12 Footway quantities are not included in the pavement/sub base materials in Table 1, but are modelled and the impacts included in the results below. Footway construction depth is assumed to be 220mm, comprising Type 1 unbound mixture sub-base 150mm thick, dense macadam binder course with 20mm aggregate 50mm thick, close graded macadam surface course with 6mm aggregate 20mm thick = 5,245m³ (including 10% worst-case scenario contingency).

3 Results

3.1 Transport Scotland's Projects Carbon Tool was used to estimate the carbon emissions associated with the proposed scheme. The results are set out in Table 2, Table 3 and Table 4. The calculations are based on a worst-case scenario, including a 10% contingency to cover unknown items.

3.2 Table 2 shows the total carbon emissions anticipated from the proposed scheme throughout its lifetime, during construction and maintenance. It should be noted that that due to rounding of data outputs there are slight discrepancies between the totals presented in Tables 3 and 4, when compared to Table 2. It is confirmed that the information provided in these tables is correct as an output of the Carbon Tool.

Table 2: Proposed Scheme Emissions Summary (Worst Case Scenario Including 10% Contingency)

Carbon source	ICO ₂ e
Construction: Materials embodied	15,050
Maintenance: Materials embodied	13,975

3.3 Table 3 and Table 4 provide more detailed information on the carbon emissions for each of the 3 stages by splitting the figures into individual project elements and the carbon emissions for construction materials by type. All volumes shown are based on the worst-case scenario figures that include a 10% contingency.

Table 3: Summary by Project Elements (Worst-case scenario including a 10% contingency)

Project elements	Materials embodied (ICO ₂ e)	Maintenance (materials embodied) (ICO ₂ e)
Drainage	60	615
Earthworks	8,290	0
Fencing	120	470
Road Pavement	3,085	12,230
Safety Barriers	125	490
Signs	35	165
Structures (civils & buildings)	3,345	0

Timeliness of project

1. Stock distribution implies impending spike in maintenance, refurbishment & new construction
e.g. wave of 70s roads requiring remedial work
2. Stimulus spending
will we 'build back better' or 'build build build'?
3. Legal challenges questioning compatibility with Paris Agreement
e.g. Heathrow ANPS ruling & RIS2 legal challenge
4. Numerous ongoing 'net zero' initiatives that could be informed by the proposed resource
e.g. Net Zero Infrastructure Coalition Embodied Carbon Working Group



Project objectives

1. Compile an open and extendable **prototype resource** detailing CapCarb emissions factors for products, components, projects and asset types; coupled with a set of representative material inventories for common model elements.
2. Generate **CapCarb benchmarks** for physical assets, capital investments, and units of service provision. These high-level benchmarks will be suitable for use in long term scenario modelling where detailed asset designs are not yet available.
3. **Demonstrate application** of these benchmarks within the designated corridor
4. Further **develop understanding of stakeholder needs** through engagement and prototype testing, with the intention of developing a final product through a future funding bid.

Project timeline

Work packages

1. Rapid review of CapCarb integration in current models

2. Compilation of CapCarb data

3. Benchmark generation

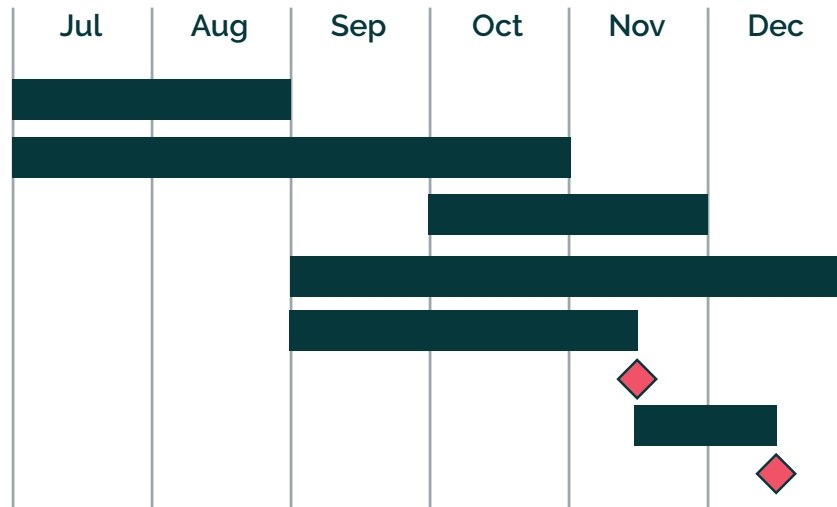
4. Development of prototype online resource

Development of alpha version

Stakeholder workshop

Development of beta version

Delivery of beta version



Focus of activities to date:

Engaging stakeholders

Compiling directory of links to standards, guidance, learning resources etc.

Compiling material, product, component and asset data

How to get involved

1. Submit user needs
2. Contribute data
3. Connect relevant stakeholders & projects
4. Participate in development workshops
5. Offer feedback or develop resultant resource

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Thank you

Please get in touch with any queries
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