

An aerial photograph of the Astoria-Megler Bridge in Oregon, showing the bridge's steel towers and suspension cables. The road below is lined with lush green trees and has a few cars driving. The sky is overcast. Two horizontal green bars are positioned above and below the text 'SE 2050'.

SE 2050

Embodied Carbon
Action Plan 2024

COWI



Table of Contents

1. Introduction	3
2. Commitment Letter	5
3. Education	6
4. Advocacy	9
5. Reduction	13

1. Introduction

In COWI in North America, our commitment to carbon management and reduction is at the heart of our values and culture.

COWI NA is proud to commit to the Structural Engineers 2050 (SE 2050) program, which aims to substantially reduce embodied carbon in structural systems through the cooperative efforts of the collective structural engineering profession.

The SE 2050 commitment program was developed by the Structural Engineering Institute (SEI) of the American Society of Civil Engineers (ASCE) in response to the SE 2050 Challenge issued in 2019 by the Carbon Leadership Forum (CLF), which stated:

All structural engineers shall understand, reduce, and ultimately eliminate embodied carbon in their projects by 2050.




COWI NA, along with other signatory structural engineering firms, commits to the following goals of the SE 2050 program:

- **Educating** the structural engineering industry on best practices.
- **Engaging** in an embodied carbon tracking program within the structural engineering profession to establish achievable embodied carbon reduction targets.
- **Reporting** on current embodied carbon impacts and trends of various structural systems for different regions.
- **Advocating** to clients, design community, and public to build a broader understanding about embodied carbon and impacts of the built environment.

COWI NA recognizes the urgency of the current climate crisis and our role in the building and construction industry. We are moving toward firm-wide implementation of our embodied carbon calculation tool and developing screening tools to identify socially and ecologically responsible solutions in our projects from start to finish. We look forward to joining this coalition of engineering firms to achieve the goals of the SE 2050 program. Our sustainability team in North America is growing rapidly, and it is open to new members who, in close collaboration with our colleagues and clients, will drive firmwide sustainability initiatives.



2. Commitment letter



June 15, 2023

To: Laura Champion, Director, Structural Engineering Institute

From: Thomas Dahlgren, President & CEO, COWI North America, Inc.

ADDRESS COWI North America, Inc.
88 Pine Street/
Wall Street Plaza
4th Floor
New York, NY 10005
USA
www.cowi.com

Letter of Commitment to the SE 2050 Program

Dear Laura,

COWI North America (COWI NA), a 400+ person firm with major offices across the United States and Canada, is hereby signing on to the SE 2050 Commitment Program. We support the vision that all structural engineers shall understand, reduce, and ultimately eliminate embodied carbon in their projects by 2050.

In 2021 COWI launched its new growth strategy, FUTURE-NOW which is based on the need for sustainable and livable solutions. FUTURE-NOW focuses on positioning COWI as a green market leader through initiatives such as committing to sourcing 100% of the company's revenue from projects that drive sustainability within the next 3-5 years.

COWI recognizes the urgency of the current climate crisis and our role in the building and construction industry, which accounts for around 37% of energy and process related CO₂ emissions globally.¹ We also recognize that this crisis will require collaboration across offices, customers, citizens, and partners. Joining the SE 2050 Commitment Program aligns with our strategy and core values, including our ambition of cutting our CO₂ emissions by 70% by 2030 (compared to 2008 levels). COWI NA is moving toward firm-wide implementation of our embodied carbon calculation tool and developing screening tools to identify socially and ecologically responsible solutions in our projects from start to finish.

We therefore commit COWI NA to take the following steps which are part of the SE 2050 Commitment Program:

¹ [2022 Global Status Report for Buildings and Construction | UNEP - UN Environment Programme](#)



PAGE 2/2

- > Within six (6) months and annually henceforth, we commit to reporting an Embodied Carbon Action Plan (ECAP) and permit the ECAP document or form be made public on the SE 2050 website.
- > Within one (1) year and annually henceforth, we commit to submit data to the SE 2050 project database in a collaborative effort to understand embodied carbon in structural engineering projects and to set attainable targets for future projects.

We look forward to joining this coalition and industry effort to achieve the goals of the SE 2050 program.

Sincerely,



Thomas Dahlgren, President & CEO
COWI North America, Inc.



3. Education

What we are doing in COWI in North America

As a global firm, COWI strives to create a culture of knowledge sharing and collaborative learning across all its offices worldwide.

COWI NA engages each of its regions (North, East, Southeast, and West) to implement sustainable practices across projects and workflows. With our commitment to the SE 2050 program, we will further develop our Sustainability Network and foster engagement through our Carbon Champions Network.

Sustainability Network

COWI NA's existing Sustainability Network supports the business for matters related to sustainability with the purpose of adding value to projects and to business development. The main goals of the Sustainability Network are:

- To formulate sustainability as an integrated element of COWI NA go-to-market value proposition, including project and client screening to identify clients' ambition levels and opportunities for sustainability;
- To manage implementation of global corporate sustainability initiatives within COWI NA;
- To develop, implement, and manage a COWI NA sustainability strategic (action) plan, which promotes a standardized understanding and way of working with sustainability within COWI NA;



- To engage NA employees through participation in the network and internal and external communication on sustainability;
- To develop a Carbon Champions Network to implement carbon management on all relevant COWI NA projects;
- To join and implement the SE 2050 Commitment;
- To attend conferences to connect with, share knowledge with, and learn from sustainability experts; and
- To include an introduction to sustainability and carbon calculation training as part of the new employee on-boarding procedure across COWI NA.

The Sustainability Network meets once a month to develop and progress the firm's sustainability goals and strategies across our NA offices, as well as update the wider network on progress of smaller task groups, who are focused on progressing specific goals.

Carbon Champions Network

The **Carbon Champions Network** will focus specifically on the embodied carbon in our projects. The network will engage at least one representative—or Champion—from each office, who is expected to share knowledge and insights with other Champions and lead the embodied carbon management efforts in their respective offices. The purpose of this network is to

incorporate carbon management on COWI NA's projects as a routine activity, following in the footsteps of our UK colleagues who have successfully rolled out such a network and developed an internal Carbon Tool to calculate and document the equivalent embodied carbon on all relevant projects. Each Champion will be trained in the use of the Carbon Tool and act as a sustainability resource for all projects. Many of the NA Carbon Champions are also Envision certified and can provide more holistic advice on projects, in addition to carbon management and reporting, to meet wider sustainability goals across COWI NA.

COWI at Large: Global Carbon Champions and philosophy, commitments and targets

Our Carbon Champions Network, led by the Global COWI Sustainability Director, is a diverse and enthusiastic group of individuals in COWI, responsible for monitoring the implementation, performance and relevance of the Carbon Policy. The Network is spread across COWI offices globally and meets regularly to share knowledge, best practice and project developments in terms of carbon management measures.

The Carbon Champions promote our carbon tools and processes, share information and resources and serve as go-to experts for individual project teams.

COWI Academy and Lunch & Learns

On a global scale, COWI continues knowledge sharing activities through **COWI Academy**. A new series known as Green Basics has been rolled out by our international colleagues with the goal of educating everyone within COWI on the importance of integrating sustainability into all our business practices. Such initiatives will continue to help all COWI staff become better stewards to the built and natural environment.

At a local level, COWI offices continue to provide Lunch & Learns as an opportunity for continuous education. Every year, a portion of these Lunch & Learns are focused on sustainability initiatives and topics, and, with our commitment to SE 2050, we will host more Lunch & Learns focused on carbon management and reporting.

As the Carbon Champions Network gains momentum in COWI NA, we will encourage all staff to become familiar with our Carbon Tool through our pre-recorded Carbon Canapes—a series of bite-sized educational videos on the use of the Carbon Tool—with our Carbon Champions acting as local resources in each office.

Sustainability SharePoint Site and Yammer Group

COWI's Sustainability Network is actively developing our internal digital resource wiki (SharePoint site) and our internal social media group (Microsoft Viva Engage) to further encourage knowledge sharing about sustainability and embodied carbon. These pages create spaces for casual and facilitated discussion on sustainability related topics and for sharing local webinars and Lunch & Learns of interest to wider COWI. The SharePoint Site, with a page dedicated to COWI's commitment to SE 2050, will also be a comprehensive resource for tools and information about carbon management, life-cycle analysis, and more.

4. Advocacy

COWI recognizes the urgency for the current climate crisis and our role in the building and construction industry. Minimizing carbon emissions from infrastructure is now a permanent challenge to the industry which cannot be postponed and will require collaboration amongst designers, contractors, and stakeholders. Joining the SE 2050 Commitment Program aligns with our strategy. COWI is advocating this commitment to other firms, with clients and with the architecture, engineering and construction industry as follows:

1. Describe the value of SE2050 and carbon reduction strategies to clients by:

- Encourage communication with our clients, and suppliers to develop collaborative relationships with the goal of reducing carbon emissions.
- Seeking the input of our clients, and suppliers to the process of continual improvement
- Capturing carbon emissions information and sharing this with our clients, and suppliers in order to facilitate benchmarking and continual improvement in future carbon management.
- Capturing carbon reduction solutions and approaches to implementation, and share learnings with our clients, and suppliers to inform future good practice.
- Documenting proposals for improvement along with anticipated benefits identified, recording the and sharing these with project partners.

2. Publicly declare firm as a member of SE2050

- As designers, we recognize the significance of our influence over the carbon footprint of the built environment and strive to set the example for future sustainable infrastructure. We proudly commit to this program and will continually share this commitment through external communication platforms.

COWI has been an active advocate through the past years and will continue to advocate about embodied carbon within the wider industry through committee participation, and publications.



COWI in North America joins SE 2050 Commitment to Reduce Embodied Carbon in Structural Systems

 **Anna Socha**
Communication Specialist
Published 14/07/2023



COWI North America is pleased to share its commitment to the Structural Engineers 2050 (SE 2050) program, which aims to substantially reduce embodied carbon in structural systems through the cooperative efforts of the collective structural engineering profession. COWI's dedication to the SE 2050 program aligns with the FUTURE-NOW strategy, supporting the need for sustainable and livable infrastructure solutions.

Net Zero Bridges Group -
one year on



Brian Duguid
Chair
Net Zero Bridges Group



Cameron Archer-Jones
Principal Engineer
COWI

Wed 8 March 12:20-12:45

Book tickets

#Bridges23



LIVE

IABSE WEBINAR

Date: 7 July 2023
Time: 14:00 - 15:30 (CET)

Carbon management in bridges
How low we can go?

Speaker
Cameron Archer-Jones, UK

Moderator
David Knight, UK

Brought to you by:





SERIES

LEAN
CONSTRUCTION
IN EUROPE

WITH WILLIAM POWER



FEATURING

RANDI M. CHRISTENSEN

SUSTAINABILITY DIRECTOR



4. Advocacy

CO₂ 2.Low carbon

Carbon targets for bridges: a proposed SCORS-style rating scheme

Cameron Archer-Jones and Daniel Green propose a version of the IStructE's 'SCORS' rating scheme for bridges and encourage engineers to adopt carbon targets for their projects.

Introduction

In October 2020, the Institution of Structural Engineers Climate Emergency Task Group published a detailed proposal for a Structural Carbon Rating Scheme (SCORS) for buildings.

In this article, the authors adapt the same methodology for application to bridge projects – a Structural Carbon Rating Scheme for Bridges (or SCORBS). The rating scheme has been informed by analysis of COWI project carbon data and can be used to communicate the carbon performance of a bridge project or a set of design options.

As per the original SCORS proposal, the authors also reinforce 'the need to adopt (and hold ourselves to) low targets that are periodically updated and that tend towards zero, starting immediately'.

SCORS for bridges Using SCORBS

Figure 1 shows the SCORBS rating 'sticker' suggested for use by bridge engineers in communicating the carbon performance of the designs we produce to those we work with and for.

The SCORBS rating of a design, an asset, or a company's portfolio of work is based on the estimated A1-A5 emissions of the primary structure (superstructure plus substructure, including foundations) and the superimposed dead load, calculated in accordance with *How to calculate embodied carbon* (HCEC). The carbon footprint is normalised in line with PAS 2080 cl. 7.1.2 using the functional area (FA) of the bridge deck (Figure 2).

Bridge assets are assigned a letter and a colour between A++ and G depending on the normalised carbon footprint. This rating can be conducted at any stage in design or construction, with the underlying calculation updated to an appropriate level of detail at each stage, as described by Arnold *et al.*

GLOSSARY

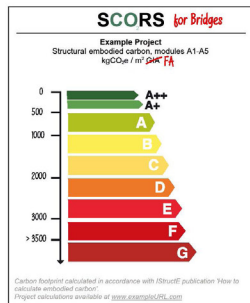
Carbon = Carbon dioxide equivalent emissions – a unit of global warming potential corresponding to 1kg of carbon dioxide (kgCO₂e).

CapCarb = Capital carbon associated with construction of the asset, the equivalent to upfront carbon for buildings (corresponding to lifecycle modules A1-A5)

UseCarb = In-use carbon associated with use of the asset by the public (corresponding to lifecycle module B9)

OpCarb = Operational carbon associated with ongoing energy use, maintenance, refurbishment or replacement works (corresponding to lifecycle modules B1-B7)

FIGURE 1: Proposed Structural Carbon Rating Scheme for Bridges (SCORBS)



A final carbon count should be uploaded to a shared database, such as the Built Environment Carbon Database (www.becc.co.uk – in development), to drive progress around industry understanding of carbon.

Infrastructure vs buildings

HCEC outlines extensive guidance for this calculation which is not repeated here. However, it is primarily buildings orientated and some aspects of the guidance should be adapted for application to transport infrastructure projects. For example, superimposed loads, such as surfacing and parapets, should be included for a bridge.

In addition, for A5a emissions, i.e. those due to site activities, explicit calculations should be made rather than relying on a capital cost multiplier. For instance, activities that require significant temporary works or consume large quantities of sacrificial material should receive close attention, as should double-handling of bulk materials over a large site.

It can be difficult to obtain emissions data related to construction site activities, even at a late stage in the project. In the absence of primary data from an active site, a first-principles approach should be adopted, focusing on the most energy-intensive processes.

Communicating with SCORBS

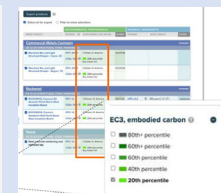
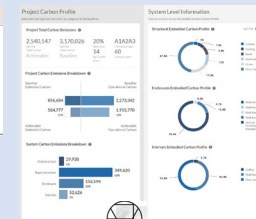
The SCORBS sticker is presented as a communication tool around which stakeholders in a project can have a conversation, regardless of their level of carbon literacy. An A rating in green or an F rating in red gives context through instantly understandable cues. The normalisation of the results and transparency of the rating



Material and Technology Initiatives in Sustainability

Monday, July 10th at 5pm
Cameron Archer-Jones CEng, Edith Coco PE, Terry Swack, Nilesh Bansal

COWI Approach – Carbon Management



COST
ASCE Met Section Members – FREE
Students – FREE
ASCE Members – \$10.00
All Others – \$20.00



All attendees (excluding students that register at no cost) will receive 1.5 PDH (professional development hour), pending approval.

As sustainability is a top priority in the AEC industry, the process of selecting materials and material constituents as well as applying relevant technological tools is important. Appropriate materials and digital technologies are critically needed to reach sustainability targets. As the AEC industry changes, so do the initiatives we undertake to ensure we leave an enduring legacy of protecting the planet we all inhabit.

The learning objectives of this presentation include (1) conceptual understanding of climate change, sustainability, and resilience as it relates to structural engineering (2) understanding EPDs, the creation of EPDs, and accessing the EPDs through various databases (3) understanding LCA and how technological tools can be used for building and bridge designs (4) a panel discussion on how technology and material selection can be helpful to reach sustainable goals as well as an understanding of how it can also unintentionally harm progress.

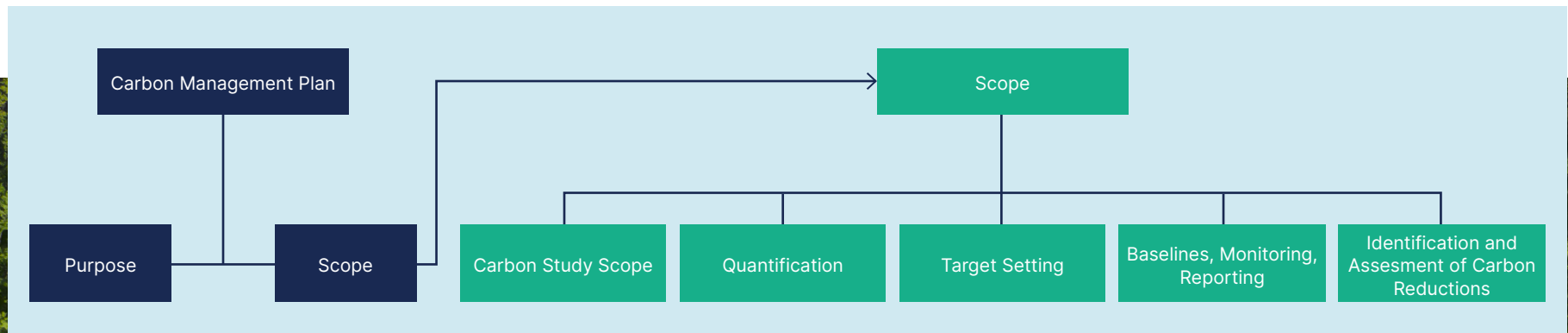
The panelists are Cameron Archer-Jones CEng, Edith Coco PE, Terry Swack, and Nilesh Bansal. Cameron is an Associate for COWI and has experience in design delivery for new bridges in the UK and internationally as well as assessment of existing bridges. Edith Coco PE is the Sustainability Lead and Associate Technical Director for COWI in the US and her experience is in bridge and transportation structures. Terry, founder and CEO of Sustainable Minds, is an internet and environmental entrepreneur and a leader in the product sustainability software industry. Nilesh is the Director of Sustainability at cove.tool and his primary focus is on product development and supporting research efforts and guiding the AEC industry in defining their strategy for adopting sustainability

For more information about the ASCE Met Section Sustainability Group, visit our website at www.ascemetsection.org/sustainability or contact us at sustainability@ascemetsection.org or radhi@majmudar.org

5. Reduction

Carbon Reduction through Design

As engineers, we recognize the significance of our influence over the carbon footprint of the built environment and strive to set the example for future sustainable infrastructure. Carbon calculation is a natural extension of the structural engineer's role in the era of climate change and should be viewed as inseparable from everyday design work. We deliver design optimization from an early stage, and, as part of the D&B process, advocate for carbon reduction and its consideration in decision-making.



Carbon Management Plan

Carbon Study Scope:

- Clearly define the scope and boundaries of your carbon study, specifying the projects or elements of infrastructure that will be included.
- Identify the life cycle stages that will be considered, such as raw material extraction, manufacturing, transportation, construction, use, and end of life.

Quantification:

- Determine the methodology you will use to quantify embodied carbon emissions, such as using Life Cycle Assessment (LCA) tools or environmental product declarations (EPDs).
- Identify the key materials and processes with the highest carbon impact and prioritize them for reduction efforts.
- Set up a system for collecting relevant data, such as material quantities, energy usage, and transportation distances.

Target Setting:

- Establish ambitious yet achievable reduction targets for embodied carbon emissions. This can be done through benchmarking against industry standards or setting percentage reductions per project.
- Make sure to consider the expected growth and scale of your infrastructure projects when setting targets.

Baselines, Monitoring, and Reporting:

- Determine a baseline inventory of embodied carbon emissions for your projects, serving as a reference point for measuring progress.
- Develop a monitoring and reporting system to track and evaluate the performance of each project against the established reduction targets.
- Integrate this monitoring into regular project reporting or create a separate carbon-focused reporting mechanism.

Identification and Assessment of Carbon Reductions:

- Identify and assess different strategies, technologies, and practices for reducing embodied carbon throughout the project life cycle.
- Evaluate the feasibility, cost-effectiveness, and potential environmental benefits of each reduction option.
- Select the most practical and impactful carbon reduction measures to implement, considering factors such as stakeholder engagement, project budget, and timeline.

Carbon Reduction Hierarchy

Our **Carbon Management Process** follows the carbon reduction hierarchy displayed in Figure 1. All supporting plans, tools and templates incorporate the aspiration to minimize the whole life carbon directly linked to our projects, before offsetting is considered.

Carbon Opportunities Toolkit

To achieve genuine carbon reductions, our projects are supported by our **Carbon Opportunities Toolkit**. This Toolkit is a live and growing database of carbon reductions that can be adopted on projects and are linked with the project stage and PAS 2080 reduction hierarchy stages.

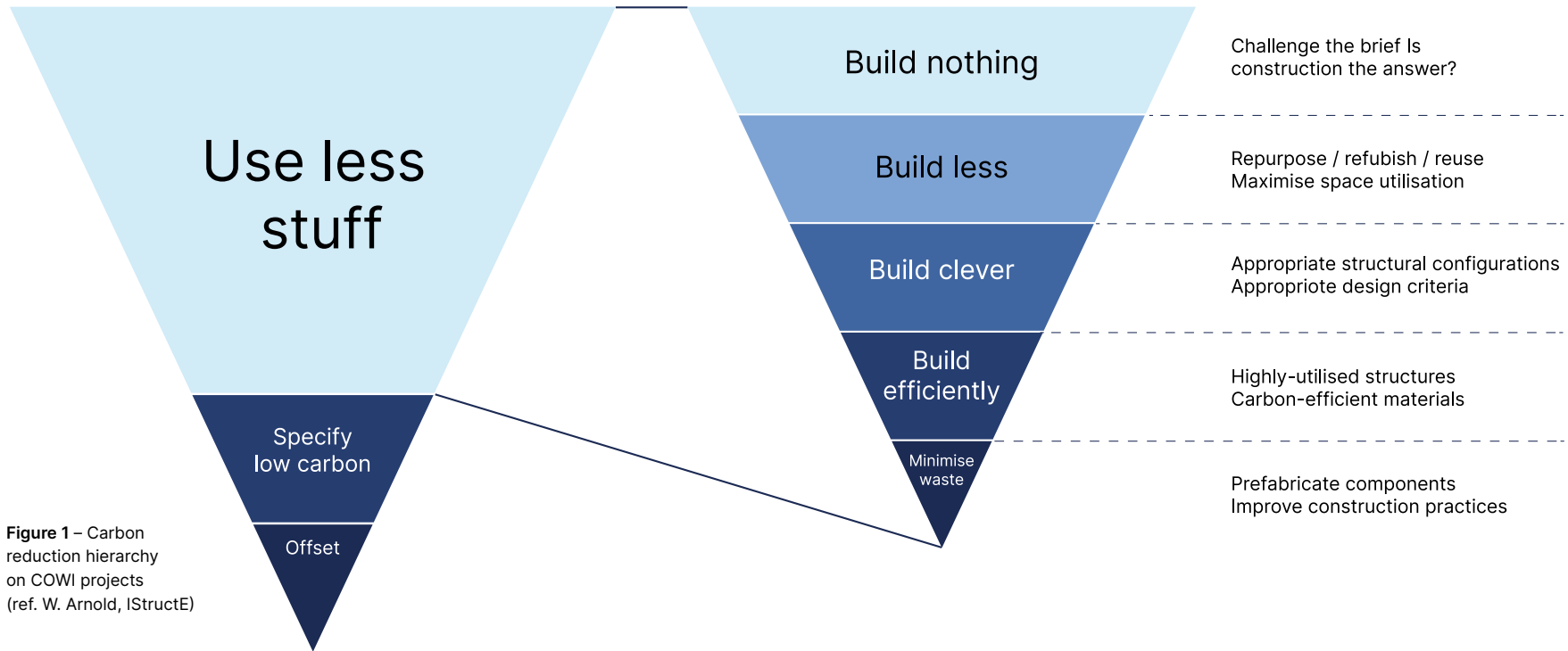
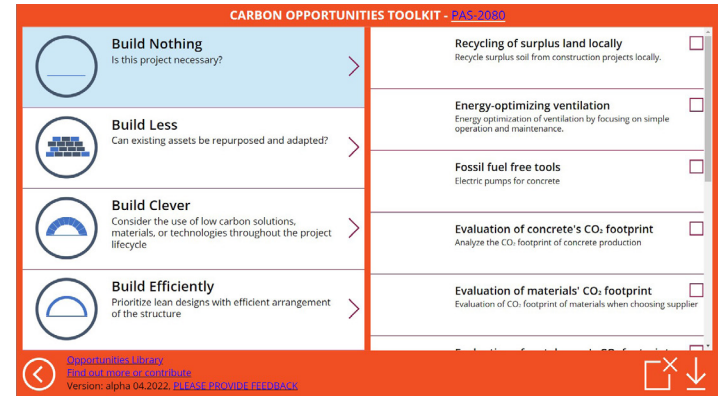


Figure 1 – Carbon reduction hierarchy on COWI projects (ref. W. Arnold, IStructE)

Carbon Calculator Tool and Database

Our **Carbon Calculator Tool** has been designed to be flexible and quick to use on a wide range of projects. The data from carbon calculations will be fundamental to ensuring that a project’s carbon footprint can be minimized, not only in terms of embodied carbon, but also operational carbon, as applicable. These tools enable robust conversations with clients and stakeholders about the implications of design and procurement decisions and help to support engagement with our clients and our supply chains. As part of this process we also estimate construction fuel usage, to identify potentially wasteful construction processes. Once you can see embedded emissions, you can start to do something about them.

Our methodology follows industry best practice methods from the “How to Calculate Embodied Carbon Guide” published by the Institute of Structural Engineers (IStructE). COWI’s carbon tool can be used for target setting as the data held within can be filtered to present useful comparisons to previous COWI projects of a similar nature.



Dukes Meadows Footbridge, London

Examples of carbon calculation

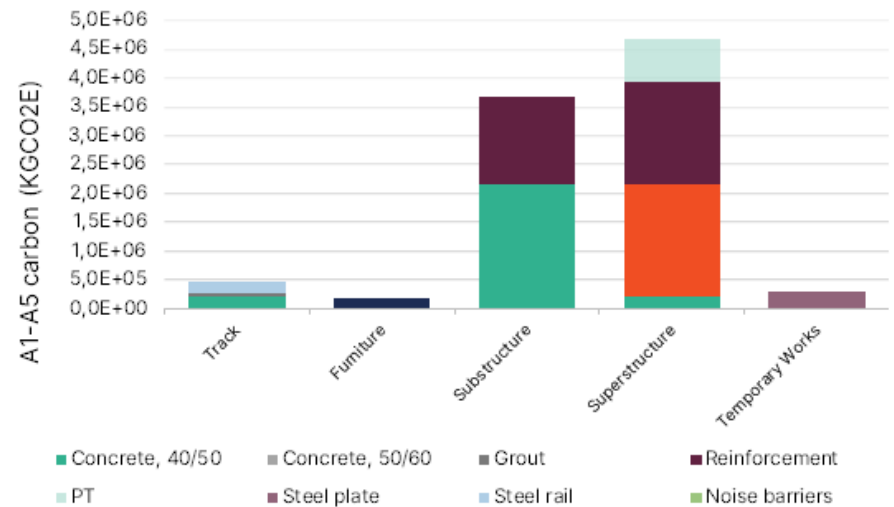


Figure 2 – Example of upfront carbon (A1-A5) for a rail bridge used to identify hotspots. Compiling the carbon calculation results within our database, set up by our engineers delivering projects, provides us with a portfolio level view of carbon for different asset types, structural systems and key criteria (e.g. height, span, diameter, etc.). This database then allows engineers to underpin their decisions at the very early stages of projects.

R&D

Alongside our Carbon Management process, within the wider COWI Group we have multiple R&D exercises in progress, investigating the potential of low-carbon materials such as geopolymers/calced clay cements. Innovative new options such as these will also feed into our database as it expands in scope and complexity, presenting more engineering solutions.

Average Carbon Intensity Structural Type

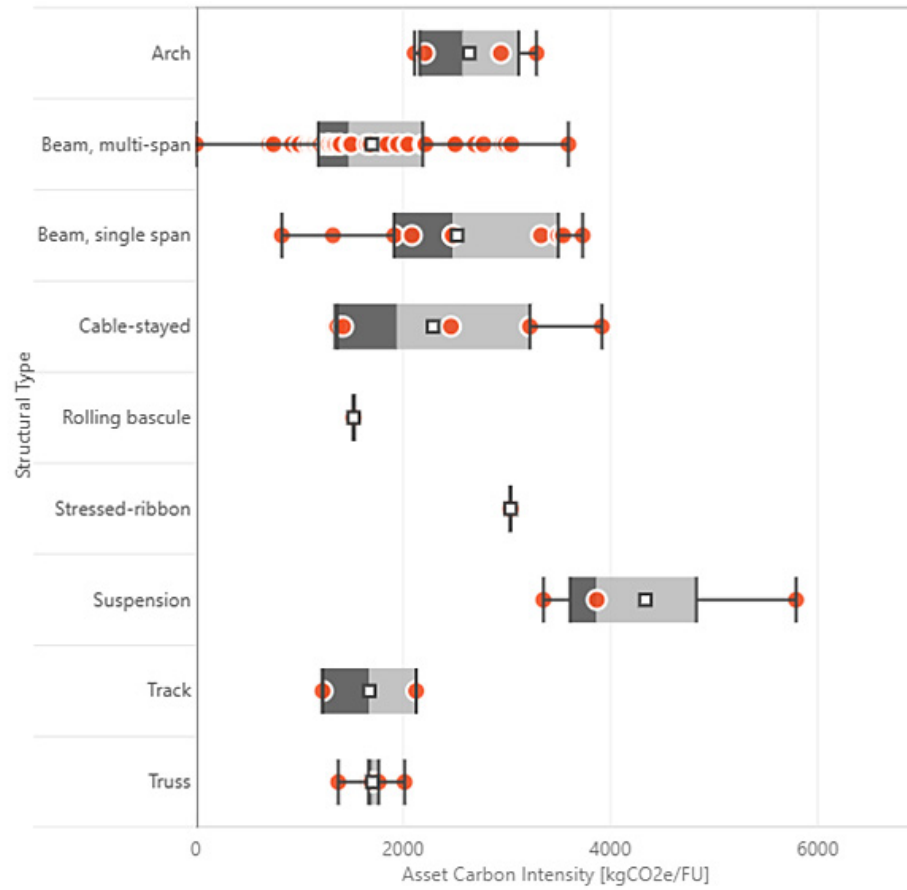


Figure 3 – Carbon database output for over 100 bridges logged in COWI's carbon database broken down by structure type.

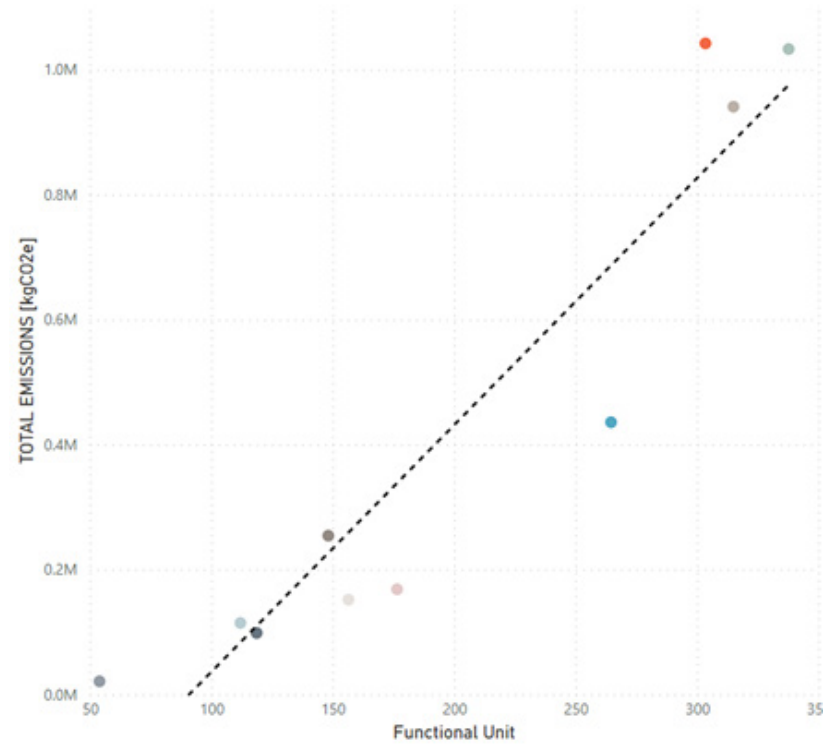


Figure 4 – Snapshot of the towers/masts included within COWI's database comparing total carbon with mast height.

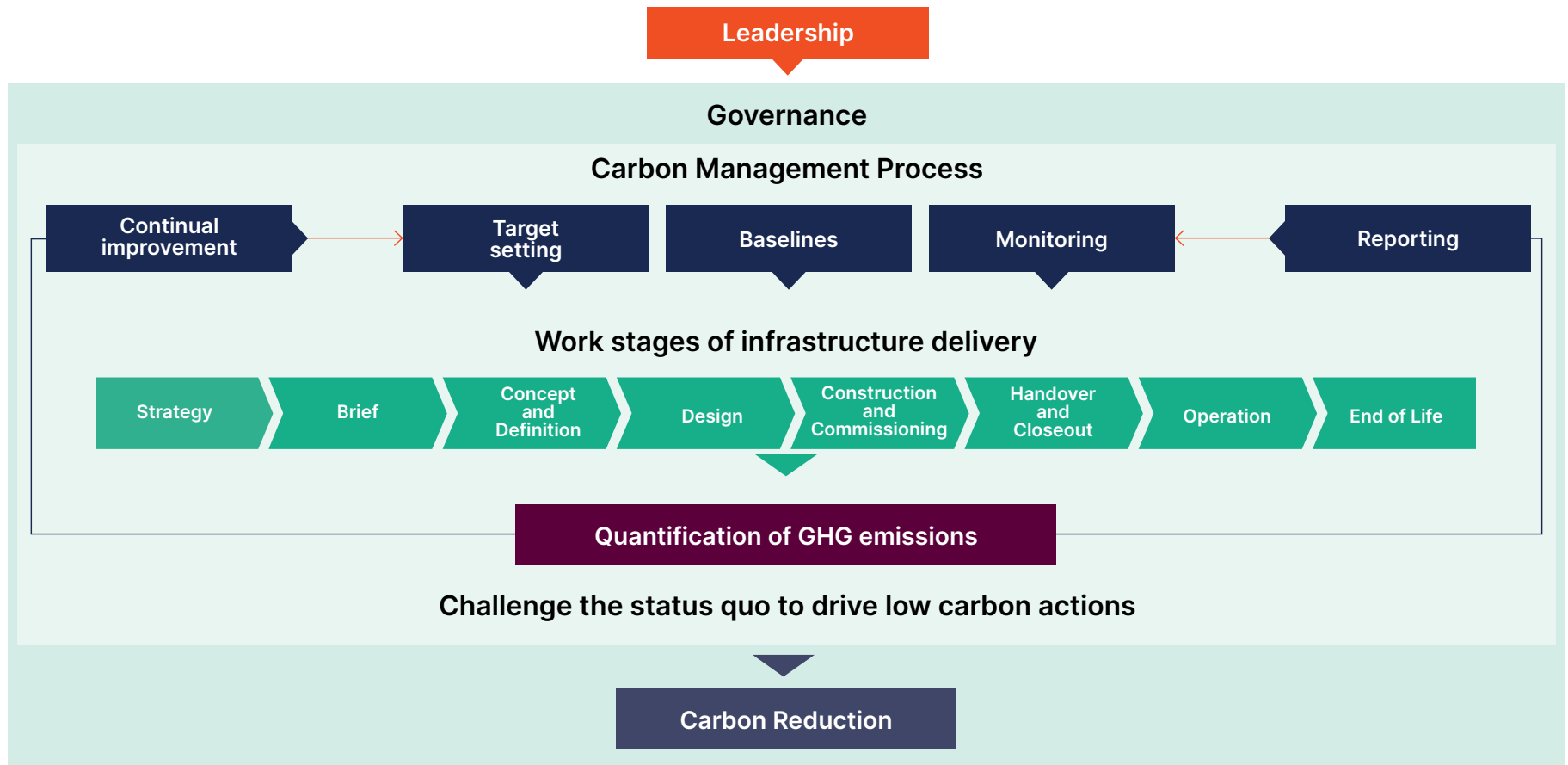


Figure 5 – The Carbon Management Process

Email

pkkr@cowi.com

mljg@cowi.com

etcc@cowi.com

www.cowi.com

Together with customers, partners and colleagues, we shape a future where people and societies grow and flourish. We do that by co-creating sustainable and beautiful solutions that improve the quality of life for people today and many generations ahead.

Our starting point is gaining a deep understanding of our customers, their aspirations and concerns. This is what sets us apart and how we deliver long-term value.

Primarily located in Scandinavia, the UK, North America and India, we are currently 7,500 people, who offer our expertise in engineering, architecture, energy and environment.