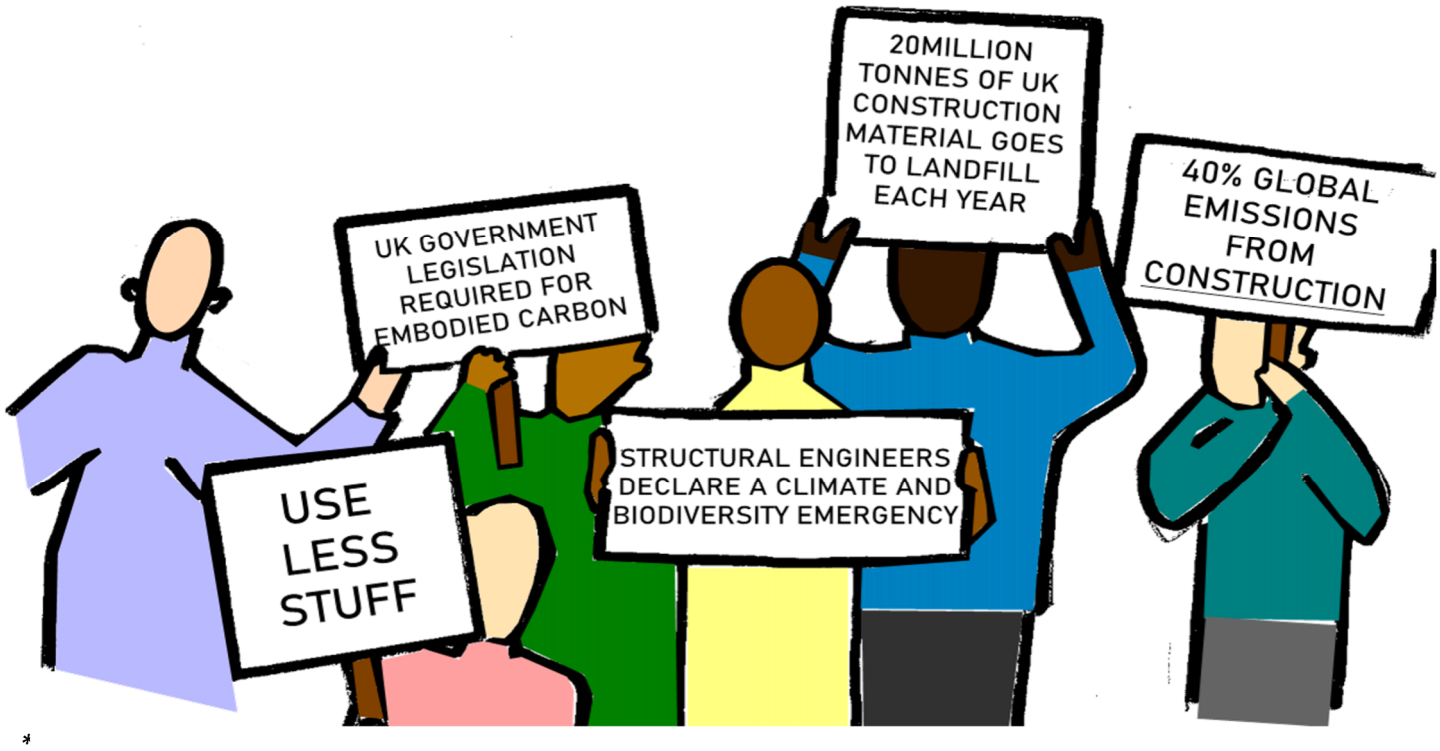
[redacted]



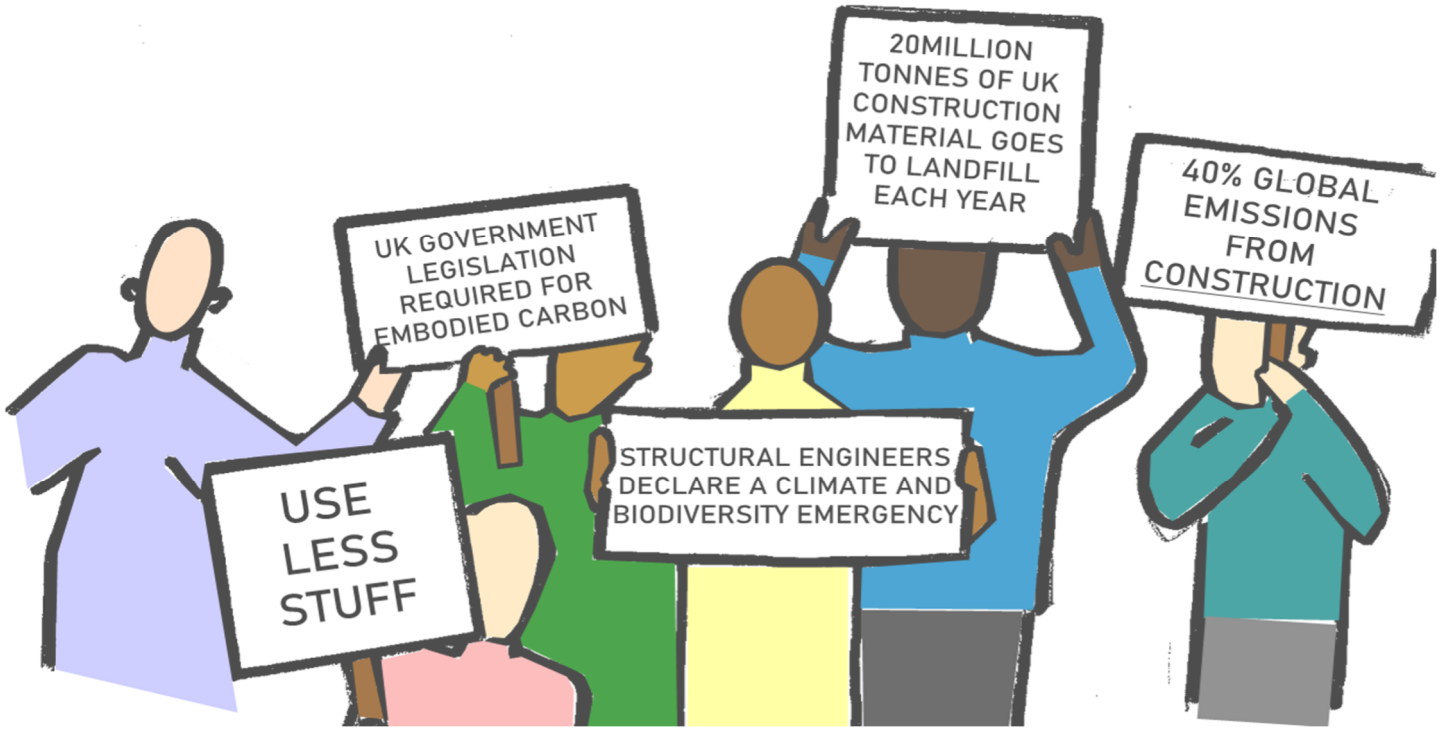
Society of the Environment Licensed Member Application

Institution of Structural Engineers Applicant

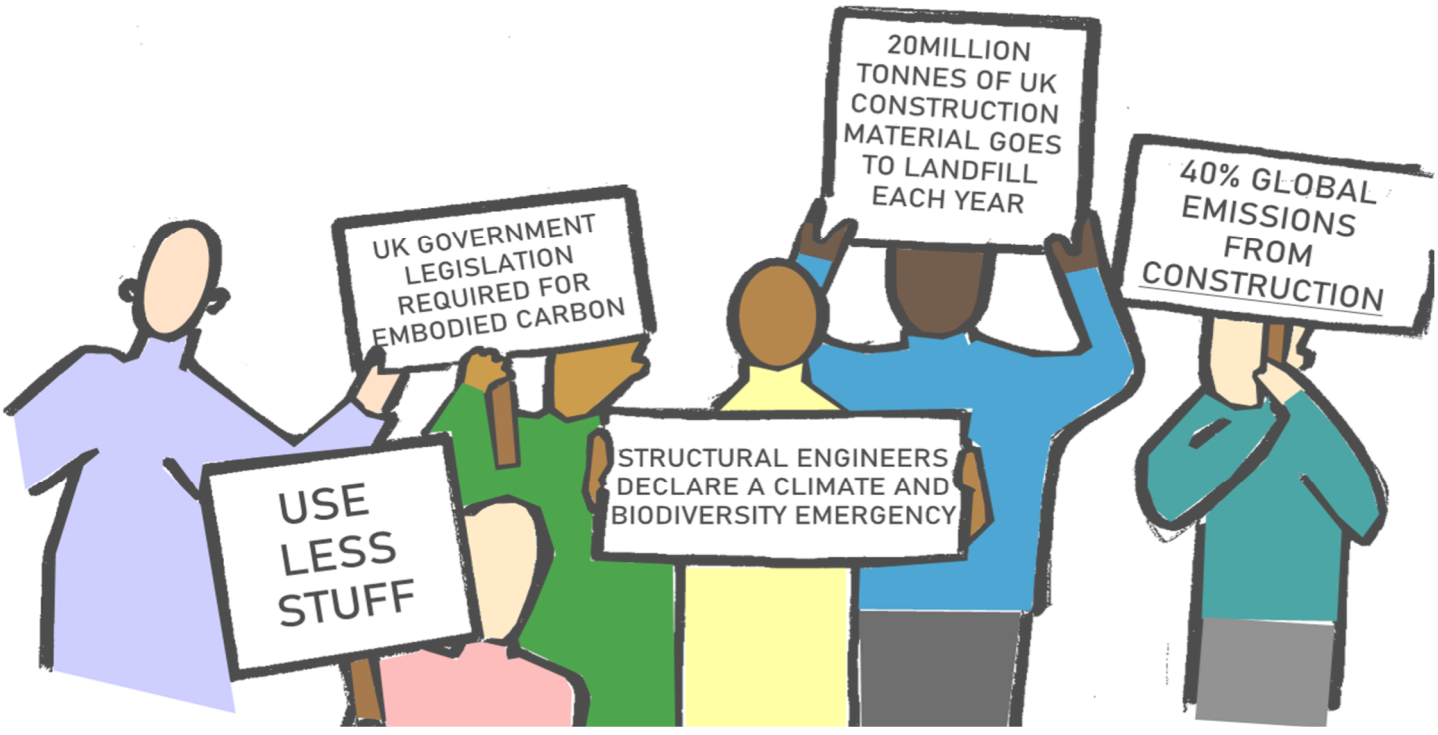
Please note this application has been made anonymous with details and names, including project names removed. Redactions can be seen as a black box. [redacted]

Contents of Portfolio:

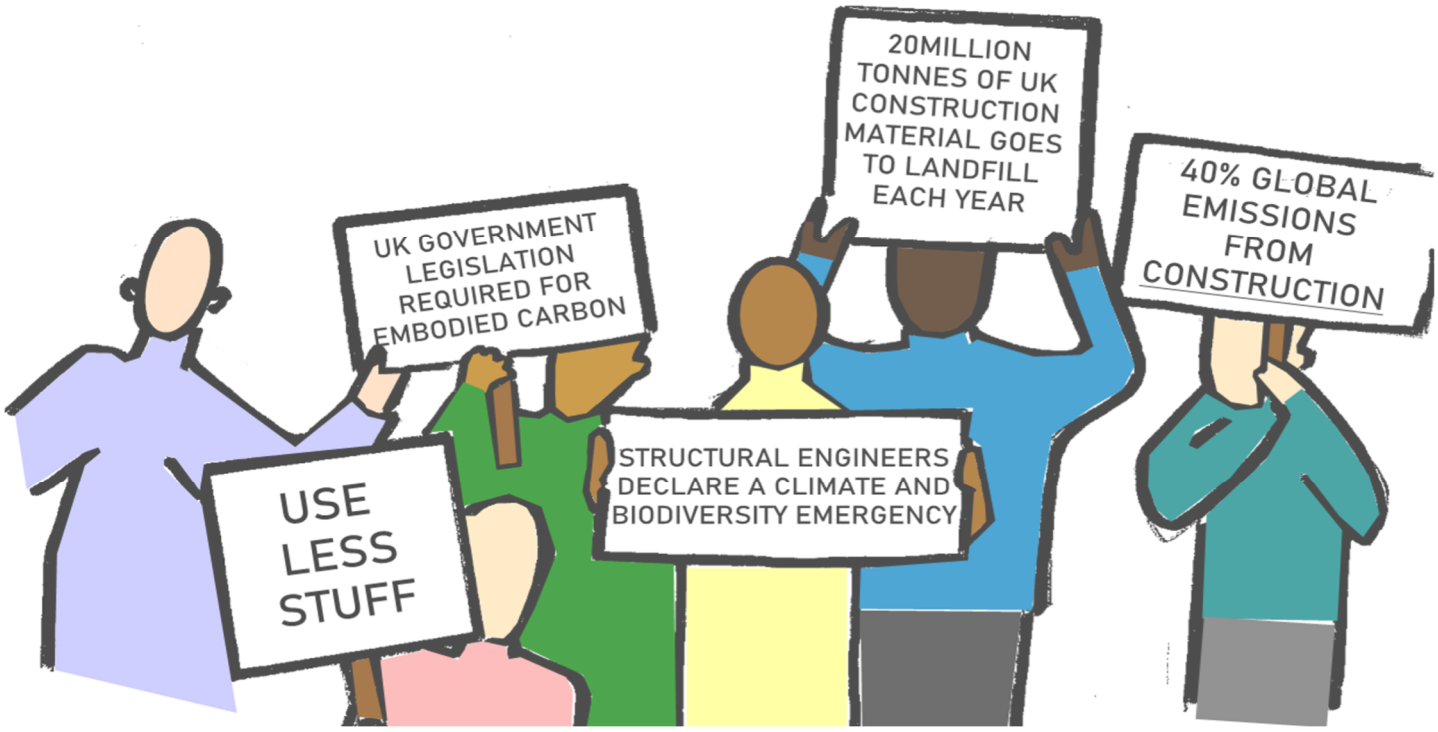
Section 1: Candidate CV



Section 2: Application Form and Commitments



Section 3: Competency Report



Competence A1 – Knowledge

My passion and job role has allowed me to establish a broad knowledge of sustainability principles beyond and within structural engineering; including that of carbon emissions associated from construction material manufacture and its contribution to the whole life cycle emissions of a building.

My knowledge has come from extensive personal research, peers, articles, lectures, and technical review of industry guidance such as, IStructE Circular Economy Design Guide and thought leadership piece on Regenerative design.

The construction industry is responsible for 40% of global emissions with 100million tonnes of material wasted annually in the UK. Structural Engineers commit to a code of professional ethics, which includes to 'take account of limited availability of natural resources' and *'protect, and improve, the quality of built and natural environments'.* (LETI, 2020). The cement and steel industry alone contribute 12% of global carbon emissions (UKGBC, 2021) as engineers specifying materials it is our professional duty to have the knowledge of where that material has come from and how this process effects people and the planet.

I understand within the broad issue of sustainability, carbon in structural engineering is just part of the global problem a brief look at the UNSDGS and link to our profession highlights the scale of this (Figure 1).

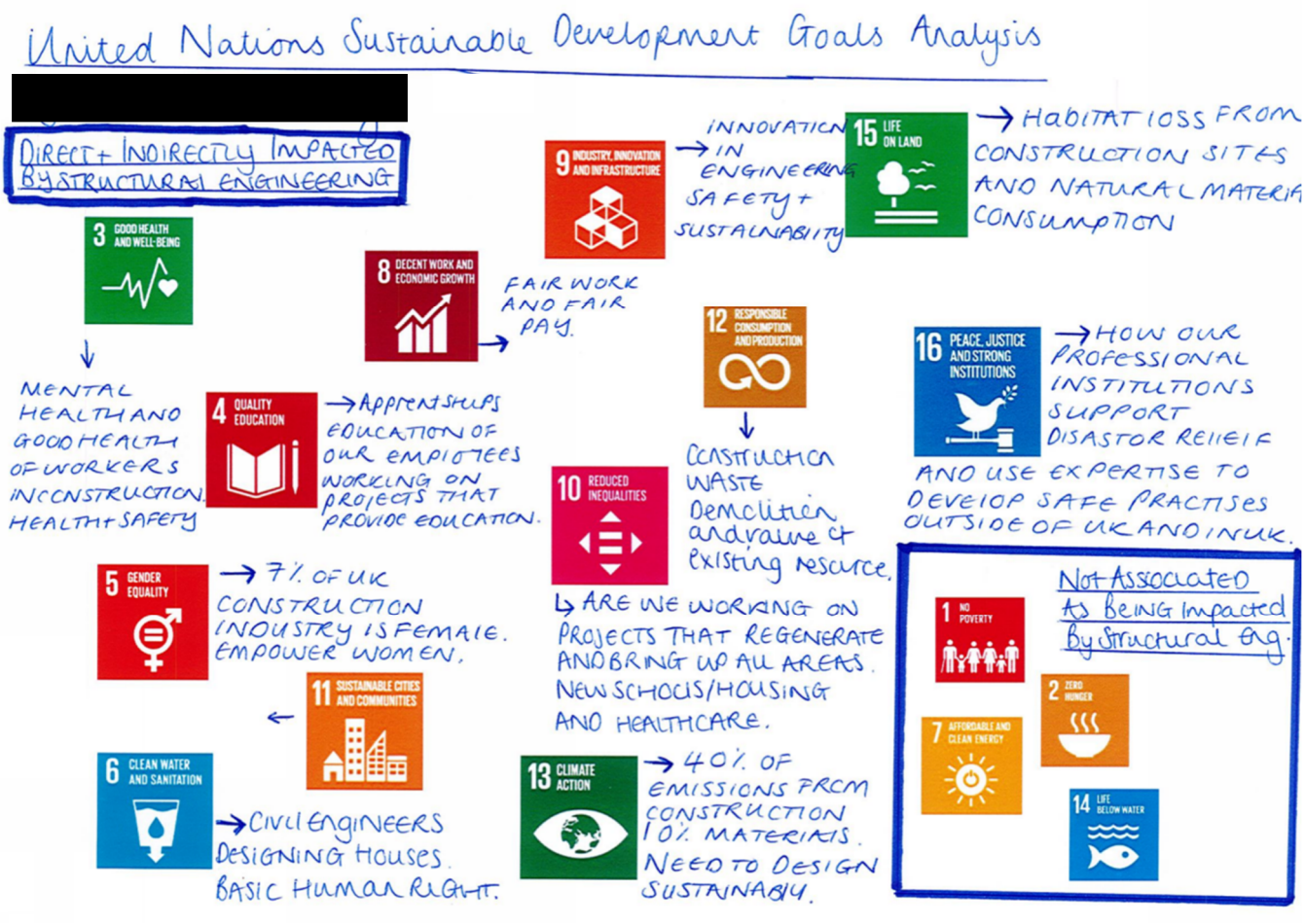


Figure 1- UNSDG's in Relation to Structural Engineering

Competence A2 – Application of Knowledge in Professional Practice

Within the competency 'application of environmental knowledge and principles in professional practice' my experience is within two key areas business strategy and within project delivery which is described below.

Business Strategy

Using the knowledge of our impact as a structural engineering firm I created "The Progression of Sustainable Design" [redacted]. A **long-term** carbon and social strategy relevant to our impact from our design work – noting where I have placed us as a business at now (Figure 2 & Appendix A2).

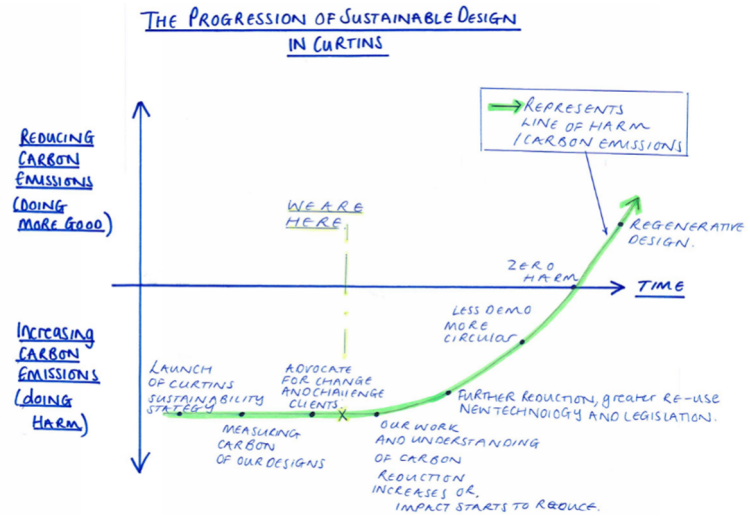


Figure 2 – Sketch of Progression of Sustainable Design

Within this sustainability strategy I created a resource library, Civil and Structural carbon calculator and structural carbon database. The database has around 160 data inputs. I am now able to use my knowledge to plot data trends in material types, structural framing systems and by sectors, enabling focused internal analysis, assessment, training and advising clients and engineers on the opportunities to reduce carbon (Figure 3). Learning from results to allow engineers to improve their approach to structural sustainability.

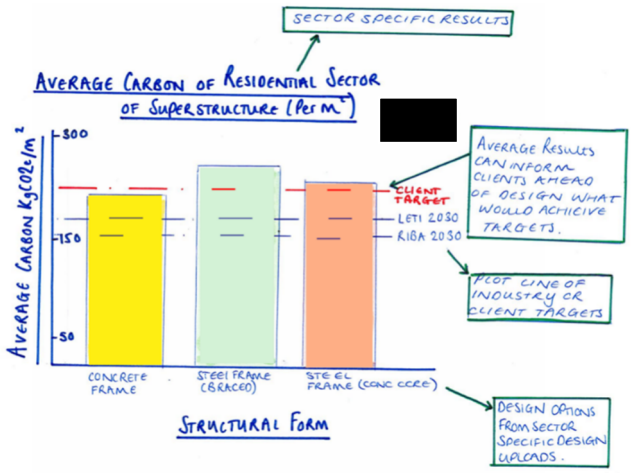


Figure 3 – Example Data Analysis and Reduction

Project Delivery

Applying this within project delivery my role has been challenging, guiding, and advising clients and engineers to make design decisions using knowledge on carbon reduction.
Although I am not currently involved with structural engineering project delivery, from 2016-2022 I delivered on several structural engineering projects in which I am proud of from a sustainability aspect. These included some refurbishment projects but many of these are of high social value.

Refurbishment Project Example

Existing steel frame office building with concrete cores and basement. Proposed complete demolition of top 2 light weight plant storeys including roof to replace with a glazed vertical extension with minimum structural intervention to the existing building structure. The project retained 5 storeys, a large concrete basement and 3 concrete stability cores. Reusing this existing structure saved 3000 tonnes of embodied carbon the solution also limited the amount of concrete demolition as it was not able to be reused like the steel by the demolition contractor (Figure 4).

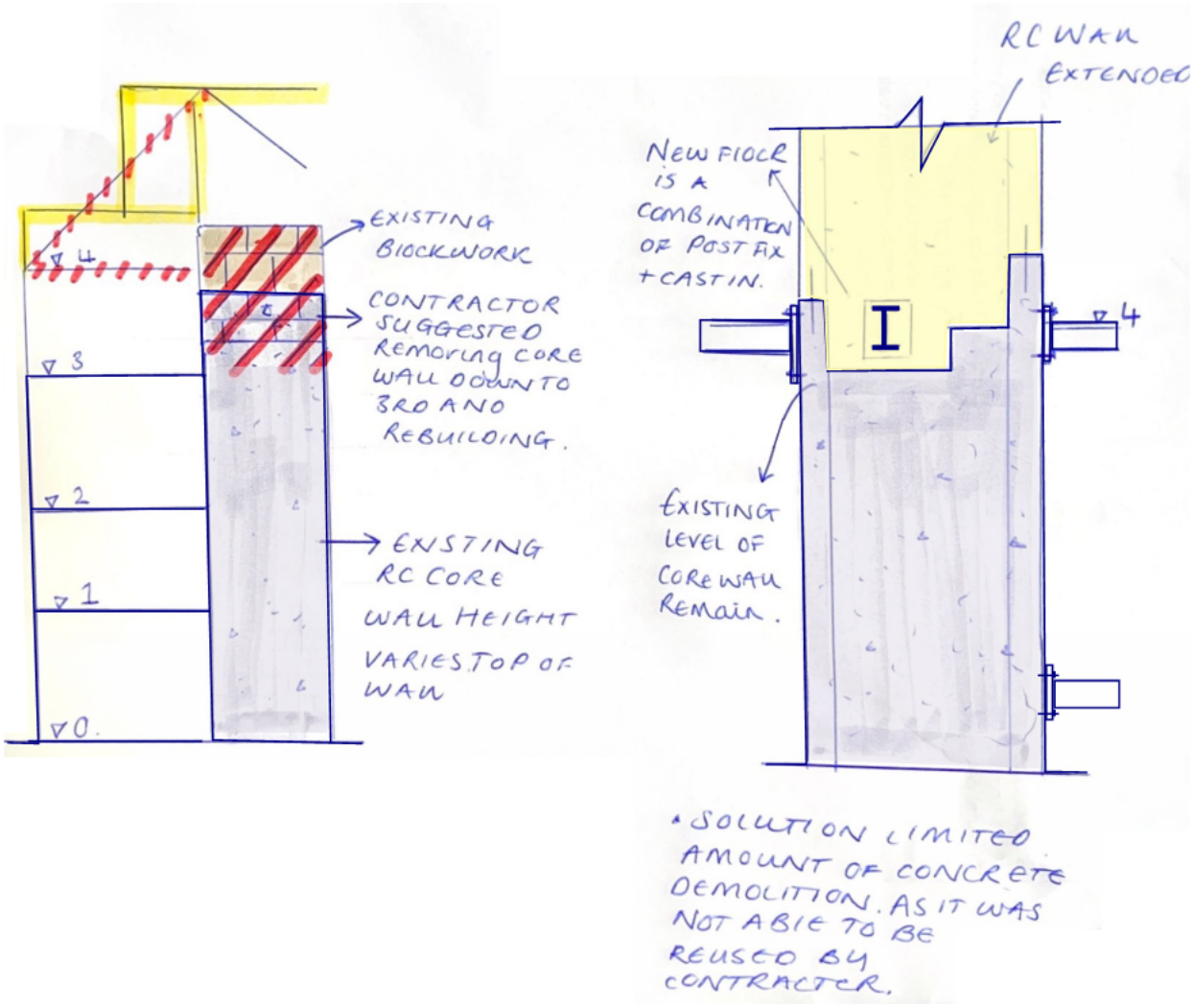


Figure 4 – [redacted] Proposal to Keep Maximum Amount of Existing Material

New Build School Example

Involved the design of a new primary school, a relatively simple structural design the most important part of this project for me was that this school was in an area which desperately needed a new school building to raise aspirations of the local school children.

Enabling Works Large Site Masterplan

Provided a comparison of embodied carbon of multiple buildings across their site- advising of impact of each with a view to latest development to aim to be reduced embodied carbon from those before Figure 5.

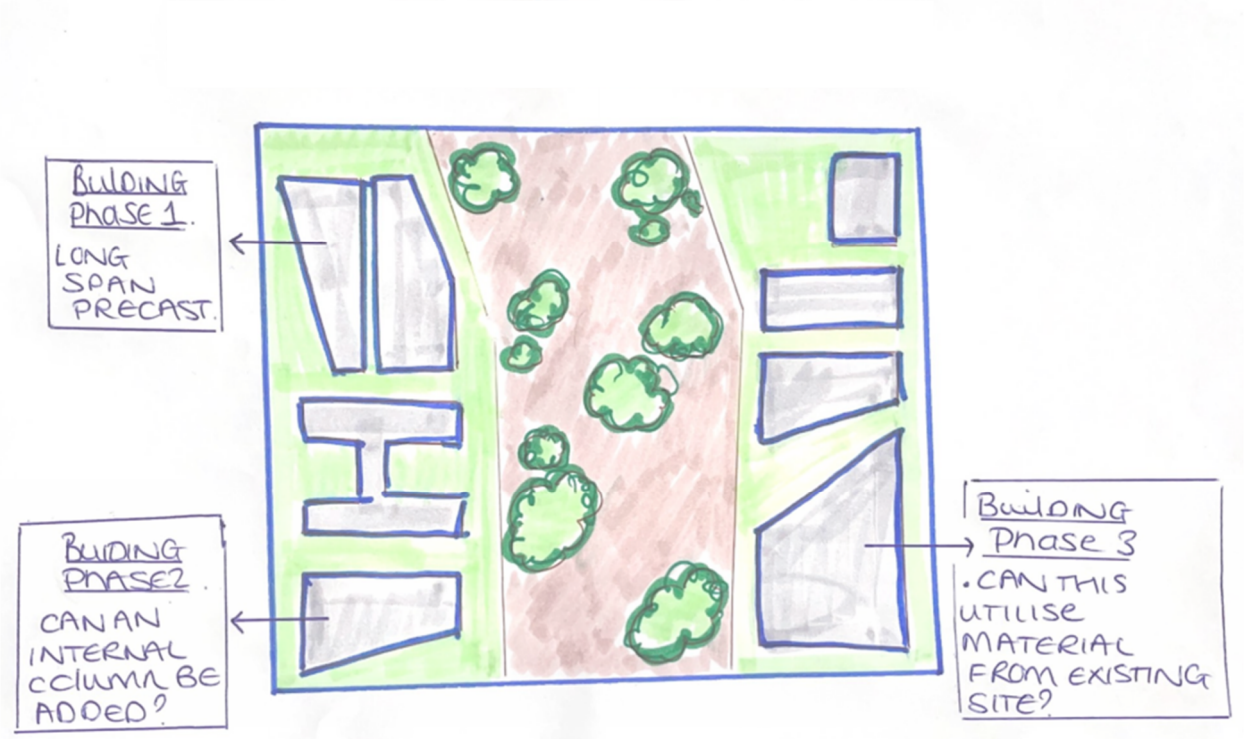


Figure 5 – [redacted] - Site Plan and Development Phases

Structural Fabric Embodied Carbon Working Group:

I reviewed standard 'bay studies' in early-stage design of embodied carbon values to inform framing options and share results with wider working group within [redacted](Figure 6).

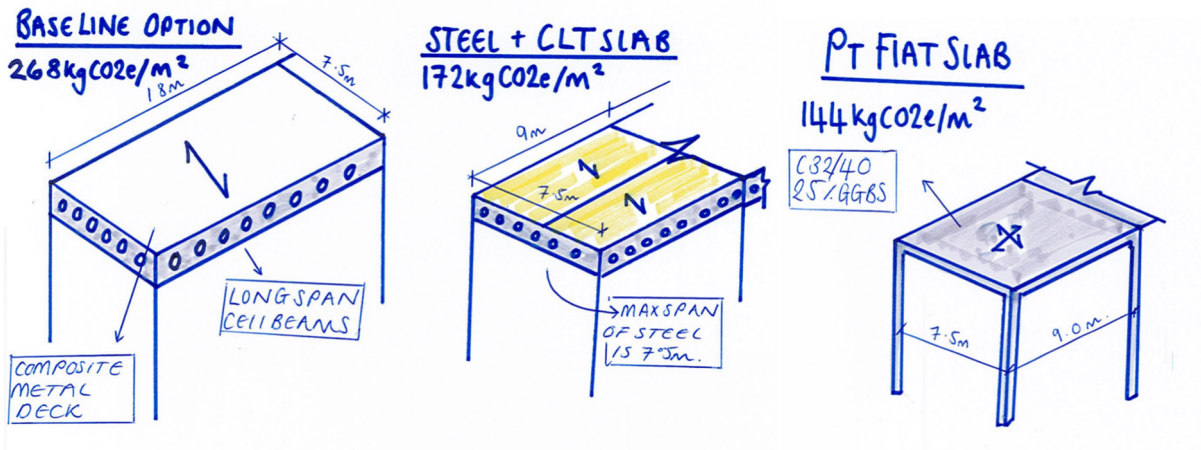


Figure 6– Example [redacted] Bay Study Review

Competence A3 – Analysis and Evaluation of Problems – Environmental Perspective

My ability to analyse environmental problems and sustainable solutions is within business strategy and project delivery:

Business Strategy – Data Analysis and Evaluation

In my initial evaluation of our database it highlighted where things were incomplete and that limited conclusions I could draw from our data. Key limitations that I identified are listed below and please see Figure 7 for an example of the solution developed.

- The variety of what was included in carbon values and what had not been included for example full pile depths or proprietary structural elements.
- Project definition by subsectors to allow comparison analysis of building type such as education or healthcare.
- Knowledge gap of engineers submitting data, to self-check and understand the scale of the number they are uploading to allow for self checking.

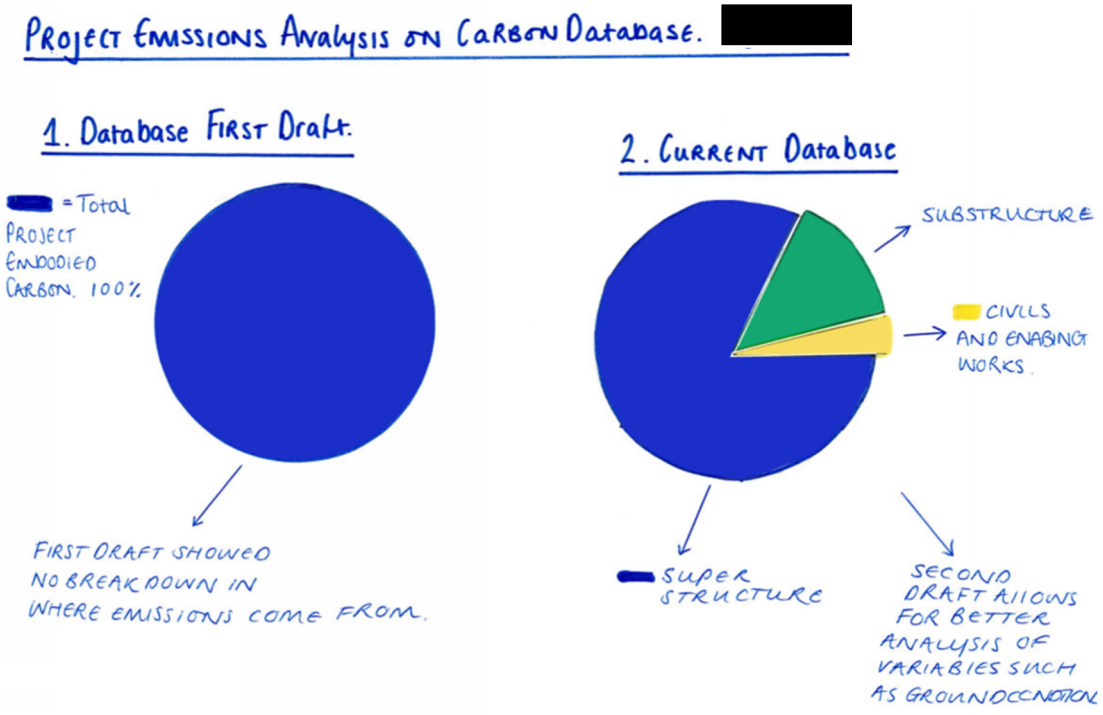


Figure 7– Carbon Database Project Emission Breakdown Solution to Limited Data

Solutions came from not only refining the data collection and carbon but in the form of delivering training across the business. Sharing database results allows engineers to review their carbon against others in the company to develop their own understanding.

Working with the Learning & Development team I have created and delivered a module to [redacted] graduate academy in Sustainability. Graduates who follow the [redacted] Academy process represent around 20% [redacted] employees who will understand their professional responsibilities to climate action, UNSDGs, carbon reduction and biodiversity in construction.

Project Delivery

- The [redacted] team approached me about achieving a low embodied carbon target within a project, as the site had a number of existing steel frame sheds, I suggested exploring the reuse of steel from onsite demolition to achieve low upfront embodied carbon Figure 8.
- Providing support to design teams with an goal to meet Net Zero Brief Guidance documents which provides measures to be considered by the design and construction team in relation to net zero construction, and achieving an upfront carbon target of 400kgc02e/m2. Through sharing material and grid options, which would enable this target. To be made clear to the client early if they want to achieve an embodied carbon target this is what they will need structurally.

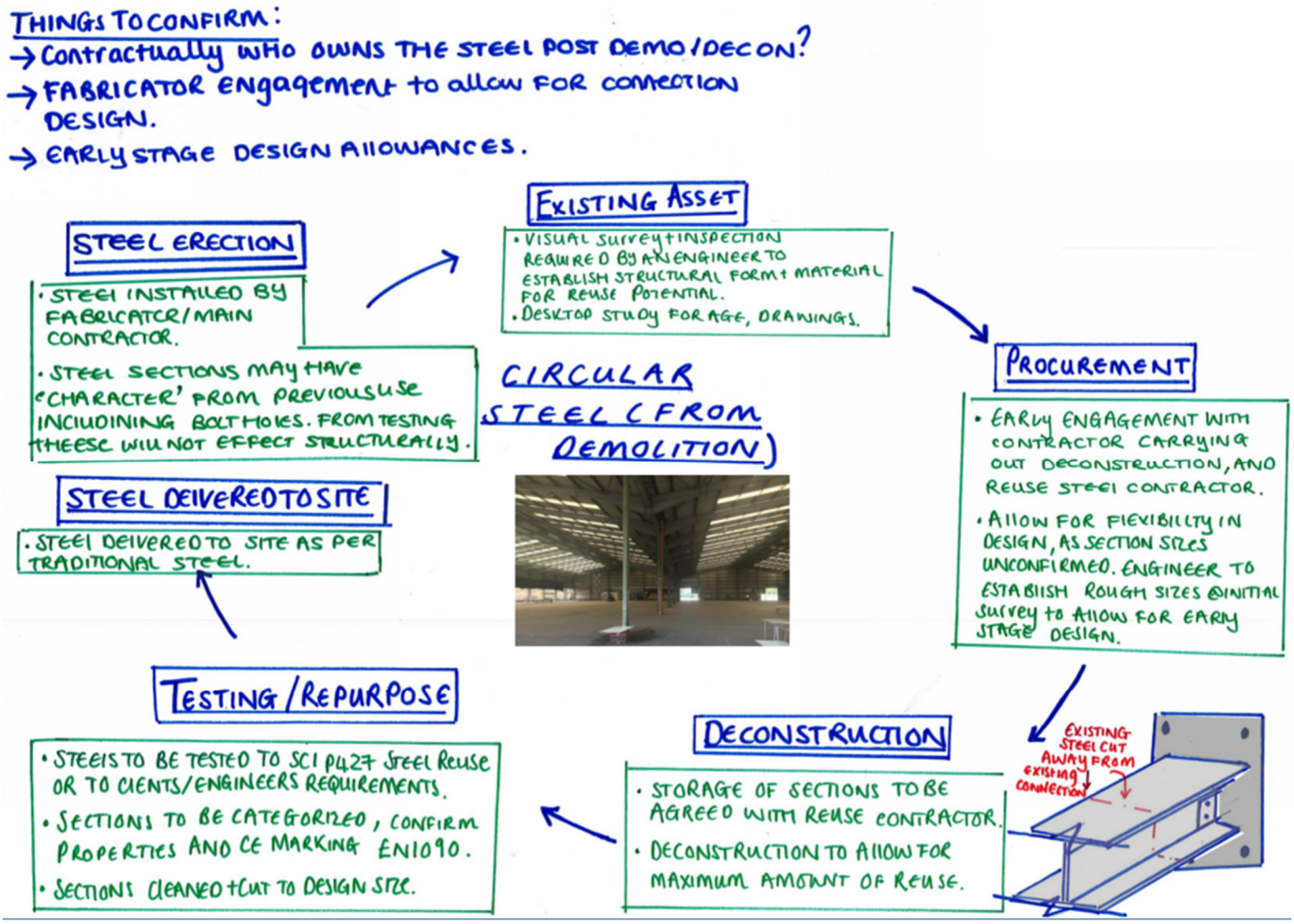


Figure 8 – Breakdown of process of reusing steel onsite.

Competence B1 - Influencing

As discussed in A3 my work has generated lessons learnt particularly around data collection, initiative engagement and opportunities for training. To promote continual improvement, I share my lessons learnt with relevant senior managers, discipline teams and the Board of Directors, within [redacted].

These updates are also reflected to engineers with internal communications on any updates made from users' feedback '*you asked - we listened'* style' and monthly updates to groups of 'Sustainability Champions' across the business.

Discussed in A3 I deliver a graduate academy module. I created this training using the core sustainability requirements from the key institutions for [redacted] graduate disciplines CIHT, Geological Society, ICE, IStructE and TPS and it includes workshops on UNSDGs, Carbon Calculations and Influencing the Brief.

Finally a large part of my role is working with volunteer groups and advocating for wider change.

I sit on the IStructE's Climate Emergency Task Group and the ACE Net Zero Advocacy Group and over the past year I have:

- Delivered 8 no. of Presentations on Sustainability in Construction to Universities.
- Delivered 3 no. to Institution of Structural Engineer Regional Groups
- Delivered 20 no. external presentations to industrial peers and stakeholders.
- [redacted]
- Written 2 articles on Biodiversity and Air Pollution for [redacted]
- Signed Yorkshire & Humber Climate Pledge
- Signed Proposed Part Z
- Provided data to UK Net Zero Building Design Standard.
- [redacted]
- Deliver quarterly CPDS internally too all staff within sustainability.

Competence B2 – Promote Strategic Environmental Approach

I produced [redacted] 2023 Sustainability Strategy and reduction commitments which can be seen in detail in Appendix B2.

Looking at our Carbon reduction commitments using industry research and data from our database, initially it raised questions for me.

- Where are we now?
- Will clients align with our reduction targets?
- Is it sensible setting targets ahead of industry guidance?
- Can we maintain a commercial business with large commitments to reduction?

These questions then resulted in a reduction target (Figure 9) that will be reviewed regularly and when 2023 industry guidance is released such as the Net Zero Carbon Building Design Standard.

I then created a strategy to implement monitoring this reduction which was presented to the board this included:

- Illustration of '40kgC02e/m2' in design materials, grid spacing etc. Allowing engineers to design for reduction.
- Monitoring of our data, allowing for the delay of projects uploaded within the next year that have already been designed prior to reduction commitments.
- Engaging feedback from internal/external teams.
- Effective data collection for measuring of target.

Producing reduction commitments and a sustainability strategy has been an opportunity to engage across business units internally, resulting in a strategy crossover created with digital delivery and communications teams. Externally I have had the opportunity to collaborate embodied carbon data alongside architects and deliver external presentations with construction lawyers, contractors, and funders such as the [redacted], this enables a full view of carbon of a project.

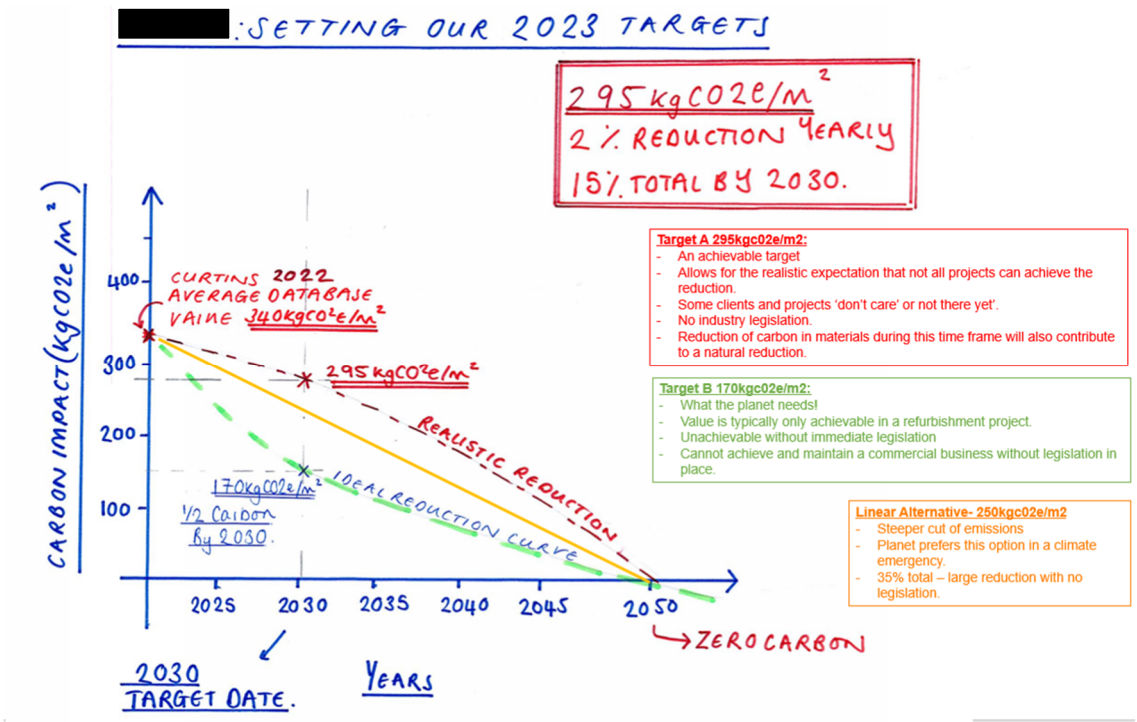


Figure 9 – Evaluation of Potential Carbon Reduction Commitments

Competence B3 – Demonstrate Leadership and Management

My role as Sustainability Coordinator at [redacted] has given me the opportunity to demonstrate leadership and management skills delivering on sustainable structural outcomes.

I am the day-to-day focal point and technical reference within the business working in sustainability, leading on our project sustainability and sustainability initiatives across the business. I have led the development of our carbon toolkit, development, implementation, and continuous improvement to the approach to carbon reduction internally and externally.

In the development of our 2023 Sustainability Strategy, I used my lessons learnt from the past year. For example creating resources that allow Engineers to improve their understanding of embodied carbon to allow for more consistent approach and data collection.

I have developed relationships with clients and other professionals with the aim of promoting [redacted] approach to sustainability – thus growing my network and influencing the debate on sustainability.

I Provide (and/or signpost) technical support, training, advice and mentoring to colleagues about sustainability, carbon reduction, etc. I keep up-to-date with latest research and practice literature, maintaining a critical review of papers in a fast-developing discipline.

I also champion carbon reduction in our offices: Providing support and advice to office managers and leaders regarding reducing the carbon footprint of our office and professional activities. Working with office directors to agree and set internal carbon targets.

Competence C1 – Communicate the Environmental Case

I have had many opportunities (as discussed in Section B1) to regularly present on sustainability to different types of audiences such as clients, solicitors, colleagues, contractors, or the public. Presenting and engaging with people is something I have a passion and love for, which I hope is reflected throughout this portfolio. This is important as to achieve carbon reduction in construction it relies on collaboration within the industry and respect for other disciplines impact.

I contribute to the work of sustainability volunteer groups in the built environment including:

- IStructE Climate Emergency Task Group
- ACE Climate Advocacy Group
- [redacted]

I also sit on the [redacted] As part of my role as [redacted] have created a regular agenda item which is usually in the form of a debate on something among young members within sustainability including:

- Proposed Part Z
- Regenerative Design
- Circular Economy

Sitting on these groups has given me the chance to communicate sustainability objectives in unique ways including recording a podcast episode [redacted] to discuss the need for a circular economy in Construction.

[redacted]

Competence C2 – Professional Advising, Influencing and Negotiating

My career requires me to demonstrate ability in professionally advising, influencing, and negotiating with others to achieve sustainable outcomes, to demonstrate this competency I have split these into two key areas Clients/Projects and Internal Stakeholders.

- Clients and Projects

  Encouraging developers and funders to prioritise structural embodied carbon as a project driver, through experience and sharing transparently our database results and deliver clarity in industry greenwashing.
  This includes presenting to clients such as [redacted]

  I have also created recourses for Engineers to provide carbon as a driver in early stage design and provide the most carbon efficient option for discussion with design team and client.
  Consistency in engagement has been challenging internally particularly with project embodied carbon (Figure 10), I have had to work internally to target strategy that will allow all offices to prioritise and uptake carbon initiatives.

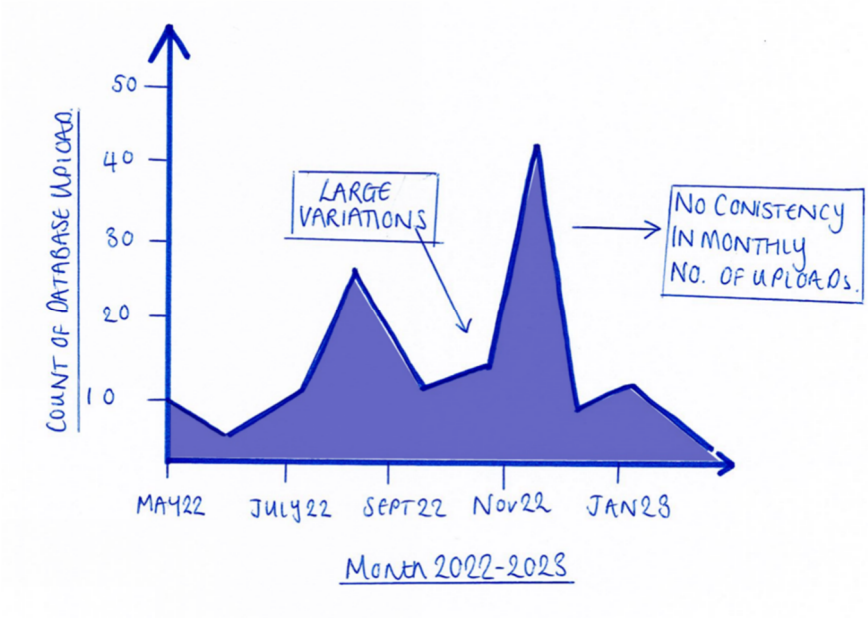


Figure 10 – Graph of Monthly Engagement with [redacted] Database

- Internal Stakeholders

  Recognising within my business my work is not just within 'Structural Engineering' to create a cultural change I have been working with different teams across [redacted] to achieve sustainable outcomes such as civil engineers.

Competence D2 – Ethical Dilemmas

Being a passionate environmentalist within construction has often left me feeling 'climate anxiety' and moral dilemmas and often coming across green washing. Often asking myself, does my role just continue developers to create carbon emissions? Promoting doing 'less harm' whilst creating a commercial incentive for more to be built just not built 'as bad'?

I would never choose to work on 'obvious unethical jobs'- however I still find myself debating what I should work on for example airport schemes or any project that has demolition.

My dilemmas also include when I am championing for more sustainable materials. Where I grew up a large percent of the local employment is from Tata Steel. As of March 2023 900 jobs are at risk due to closure of coking plant, closure not from sustainability pressure but operating costs with the facility moving out of the UK to somewhere cheaper *(Guardian, March 2023).*

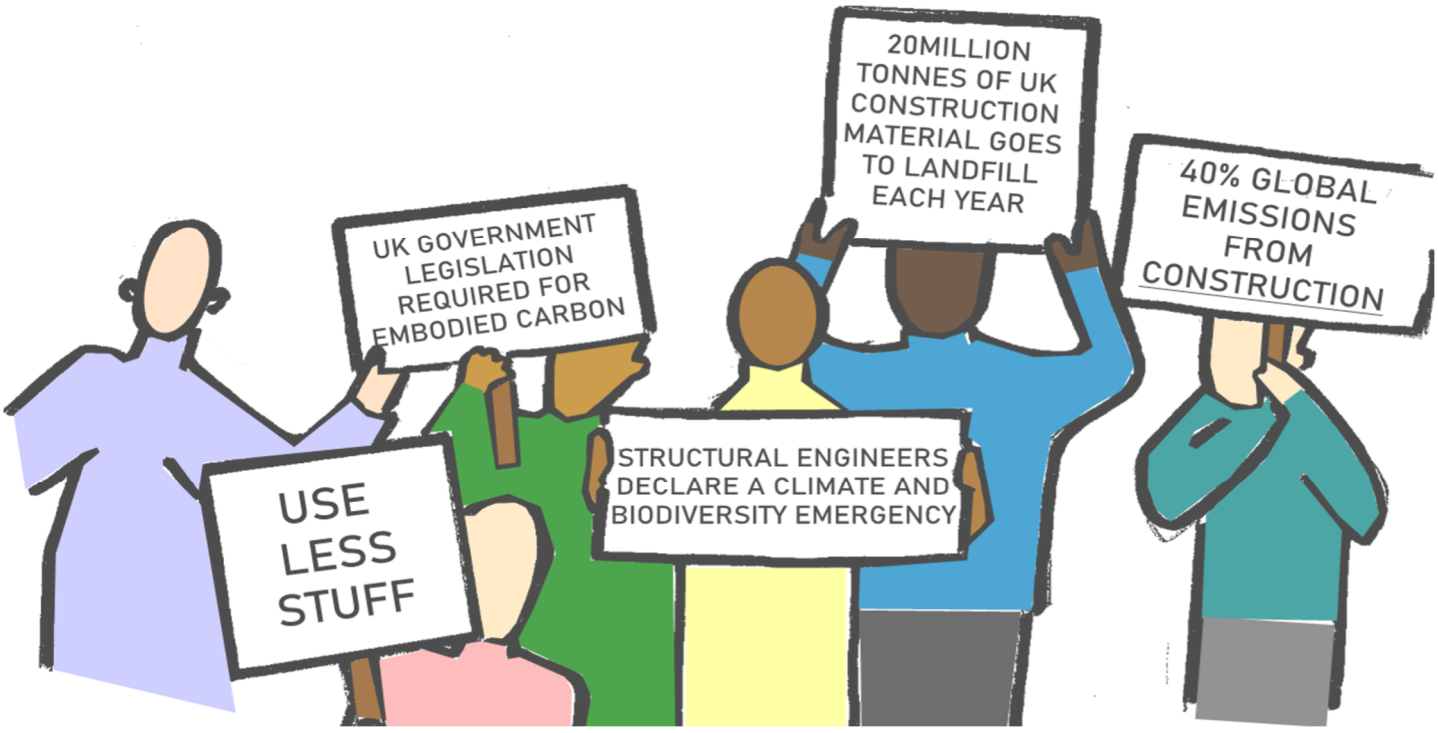
Although not directly due to sustainability it made me question how to keep people employed when steelworks or other climate damaging industries would rather close and locate to a cheaper location, over to upskill or upgrade to the sustainable alternative. Scunthorpe already has a much higher than average unemployment rate with nearly half of children living in poverty already (*ref gov*).

How do I advocate for fast transition to more sustainable and still enable a 'just transition'?

Section 4: Appendices: Supporting Evidence

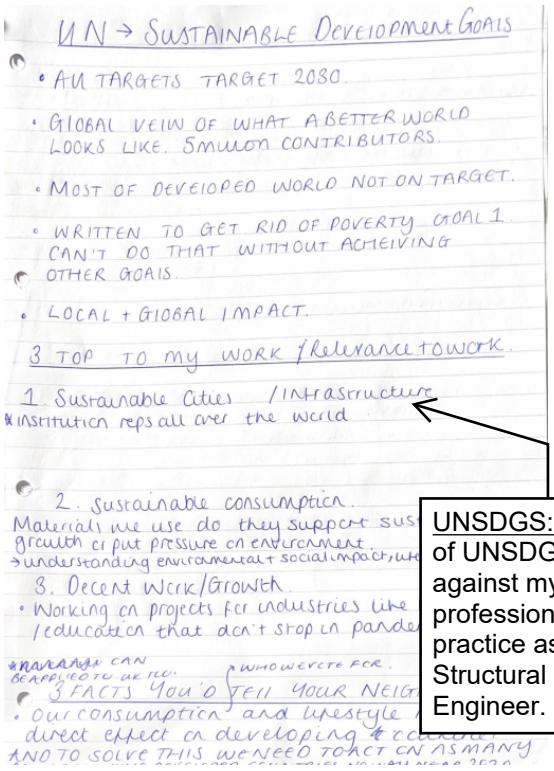
Please note that all evidence within Section 4 is work I have created and delivered.

I hope through the supporting evidence you can see my passion for climate action and many key competencies are seen throughout the portfolio such as knowledge and influence.



APPENDIX A1- KNOWLEDGE

Evidence of sustainability principles both those directly related to structural engineering and as well as wider sustainability issues shown through, my hand written notes from courses and seminars such as Net-Zero Structural Design Course and Embodied Carbon Basics.



UN → SUSTAINABLE DEVELOPMENT GOALS

- ALL TARGETS TARGET 2030.
- GLOBAL VEIW OF WHAT A BETTER WORLD LOOKS LIKE. SMALLON CONTRIBUTORS.
- MOST OF DEVELOPED WORLD NOT ON TARGET.
- WRITTEN TO GET RID OF POVERTY GOAL 1. CAN'T DO THAT WITHOUT ACHEIVING OTHER GOALS.
- LOCAL + GLOBAL IMPACT.

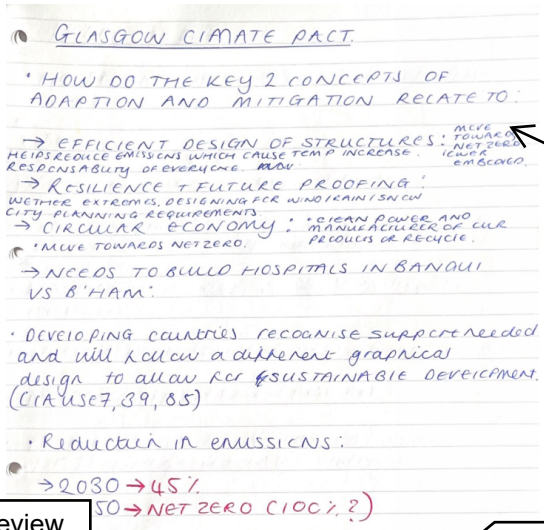
3 TOP TO MY WORK / RELEVANCE TO WORK.

1. Sustainable Cities / Infrastructure
* Institution reps all over the world

2. Sustainable consumption.
Materials we use do they support sus growth or put pressure on environment.
→ understanding environmental + social impact, us

3. Decent Work/Growth.
- Working on projects for industries like / education that don't stop in pande

* MANAGE CAN BE APPLIED TO UK TOO. / WHOEVER'S FOR.
3 FACTS YOU'D TELL YOUR NEIG
- our consumption and lifestyle
direct effect on developing
AND TO SOLVE THIS WE NEED TO ACT ON AS MANY



GLASGOW CLIMATE PACT

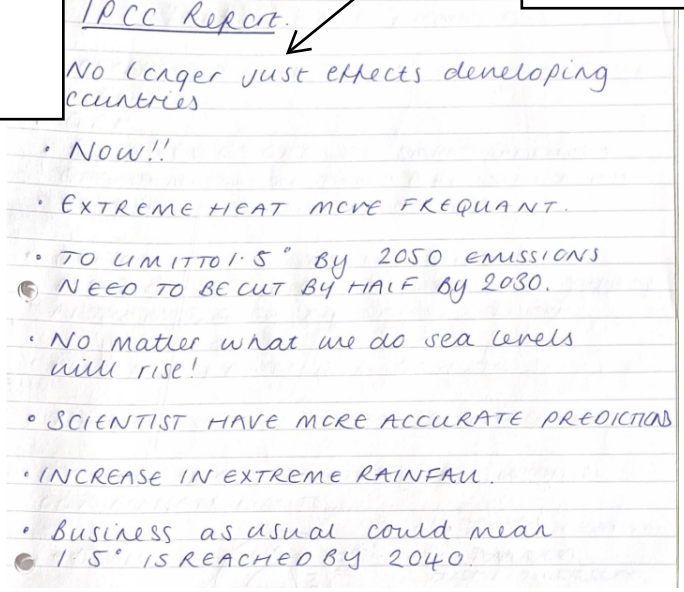
- HOW DO THE KEY 2 CONCEPTS OF ADAPTION AND MITIGATION RELATE TO:

→ EFFICIENT DESIGN OF STRUCTURES: MORE TOWARDS NET ZERO IGNOR EMBODIED. HELPS REDUCE EMISSIONS WHICH CAUSE TEMP INCREASE. RESPONSABILITY OF EVERYONE. MOV
→ RESILIENCE + FUTURE PROOFING: WETHER EXTREMES, DESIGNING FOR WIND/RAIN/SNOW CITY PLANNING REQUIREMENTS.
→ CIRCULAR ECONOMY: • REUSE POWER AND MANUFACTURER OF OUR PRODUCTS OR RECYCLE.
• MOVE TOWARDS NET ZERO.

→ NEEDS TO BUILD HOSPITALS IN BANGLI VS B'HAM.

- DEVELOPING COUNTRIES RECOGNISE SUPPORT NEEDED and will follow a different graphical design to allow for SUSTAINABLE DEVELOPMENT. (CLAUSE 7, 39, 85)
- Reduction in emissions:

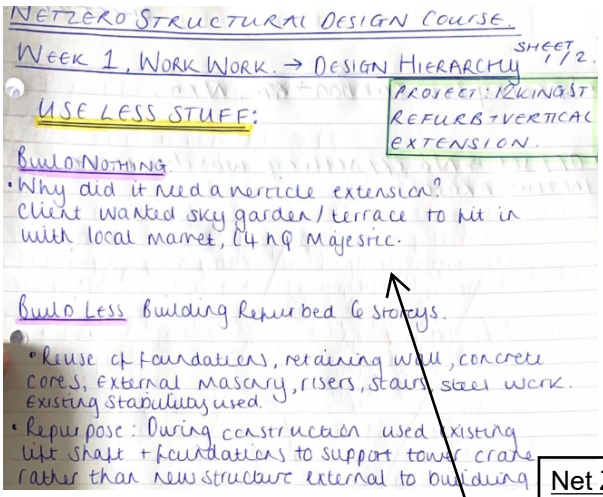
→ 2030 → 45%
50 → NET ZERO (100%, ?)



IPCC REPORT.

No longer just effects developing countries

- NOW!!
- EXTREME HEAT MORE FREQUANT.
- TO LIMIT TO 1.5° BY 2050 EMISSIONS NEED TO BE CUT BY HALF BY 2030.
- NO matter what we do sea levels will rise!
- SCIENTIST HAVE MORE ACCURATE PREDICTIONS
- INCREASE IN EXTREME RAINFALL.
- Business as usual could mean 1.5° IS REACHED BY 2040.



NET ZERO STRUCTURAL DESIGN COURSE.

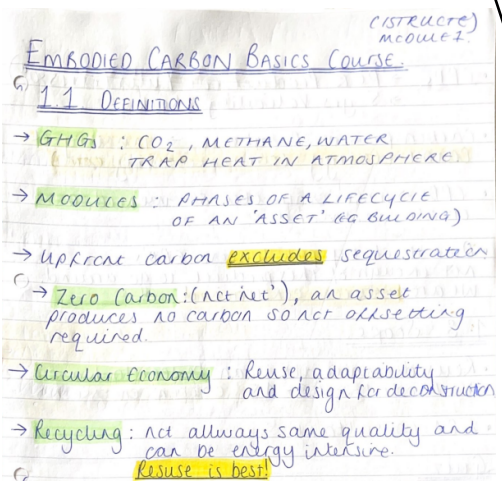
WEEK 1, WORK WORK. → DESIGN HIERARCHY SHEET 1/2.

USE LESS STUFF:

PROJECT: ISLINGST REFURB + VERTICAL EXTENSION.

BUILD NOTHING
- Why did it need a vertical extension? Client wanted sky garden / terrace to fit in with local market, C4 HQ Majestic.

Build Less Building Repurbed 6 storeys.
- Reuse of foundations, retaining wall, concrete cores, external masonry, risers, stairs, steel work. existing stability used.
- Repurpose: During construction used existing lift shaft + foundations to support tower crane rather than new structure external to building



EMBODIED CARBON BASICS COURSE. (STRUCTURE) MODULE 1.

1.1 DEFINITIONS

→ GHGs: CO_2, METHANE, WATER TRAP HEAT IN ATMOSPHERE

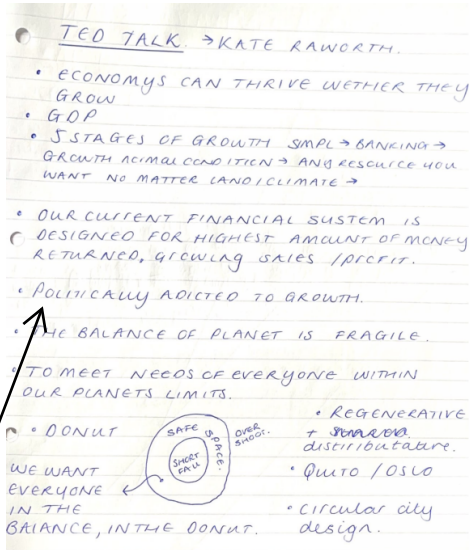
→ MODULES: PHASES OF A LIFECYCLE OF AN 'ASSET' (EG BUILDING)

→ UPFRONT carbon excludes sequestration

→ Zero Carbon: (net net'), an asset produces no carbon so net offsetting required

→ Circular Economy: Reuse, adaptability and design for deconstruction

→ Recycling: not always same quality and can be energy intensive. Reuse is best!



TED TALK → KATE RAWORTH.

- ECONOMYS CAN THRIVE WETHER THEY GROW
- GDP
- 5 STAGES OF GROWTH SMPL → BANKING → GROWTH NORMAL CONDITION → ANY RESOURCE YOU WANT NO MATTER LAND / CLIMATE →
- OUR CURRENT FINANCIAL SYSTEM IS DESIGNED FOR HIGHEST AMOUNT OF MONEY RETURNED, GROWING SALES / PROFIT.
- POLITICALLY ADICTED TO GROWTH.
- THE BALANCE OF PLANET IS FRAGILE.

TO MEET NEEDS OF EVERYONE WITHIN OUR PLANETS LIMITS.

- DONUT
- REGENERATIVE + SHARED distributature.
- QUITO / OSLO
- Circular city design.

WE WANT EVERYONE IN THE BALANCE, IN THE DONUT.

Glasgow Climate Pact: Critical analysis of Glasgow Climate Pact to relate back to construction

UNSDGS: Review of UNSDGs against my professional practice as a Structural Engineer.

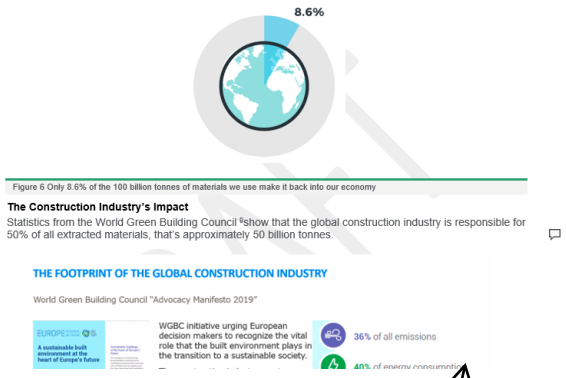
Notes on IPCC Report: broadening beyond direct construction industry impact- looking at consequences of climate change.

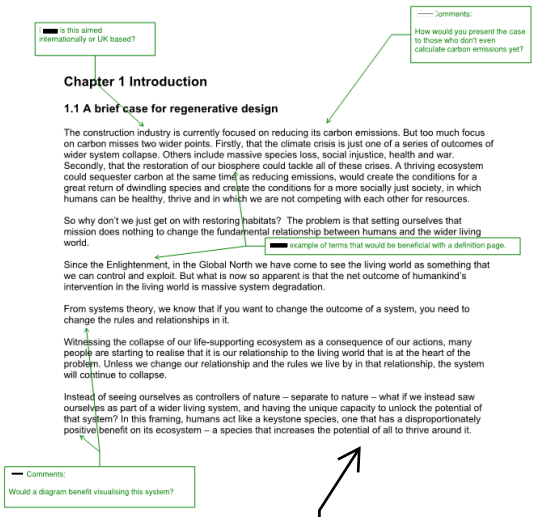
Net Zero Structural Design- Work Work: Notes on a targeted approach to the UN Sustainable Development Goals.

Net Zero Structural Design- Work Work: Notes from 'Ted Talk - Kate Raworth - Doughnut Economics' looking at the criticism of our current addiction to economic growth and profit.

APPENDIX A1- KNOWLEDGE

Regenerative Design & Circular Economy



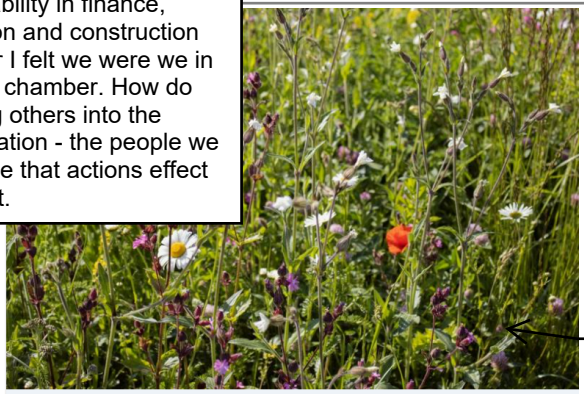


IStructE's Circular Economy & Reuse Design Guide: Reviewing the Draft linked the limitations of focusing on embodied carbon within structural engineering.
Looking at the larger impact of sourcing construction materials to the potential of material reuse and design.

'Regenerative Design' thought leadership piece: Reviewing showed to me a lack of knowledge in the industry of our impact on people and the planet and the concept that low carbon is only 'less harm'. However, it also showed me the gap in accessibility of these concepts from those in high level theory to those working in practice.

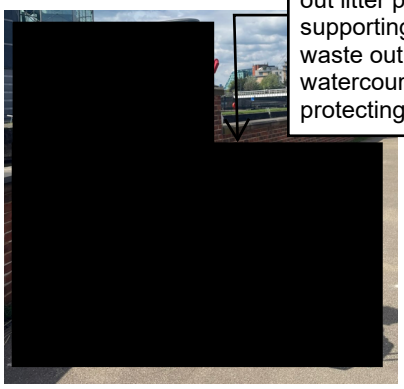
Beyond and Broadening

Chatham House: I attended Chatham House 'Un-conference' - I had thought provoking debates and conversations from sustainability in finance, education and construction however I felt we were we in an echo chamber. How do we bring others into the conversation - the people we reference that actions effect the most.

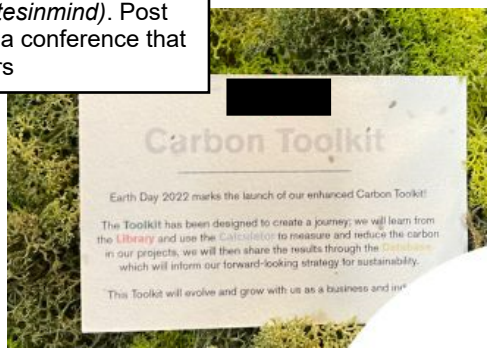

What sustainability means: Biodiversity

Biodiversity: I wrote an article for the Association of Consulting Engineers on Biodiversity in the construction industry. I also launched our Carbon Toolkit on seeded paper, which could be planted to grow UK native wild-flowers.

Volunteering: I support Litter Free Leeds with organising and carrying out litter picks, supporting keeping waste out of local watercourses and protecting local wildlife.



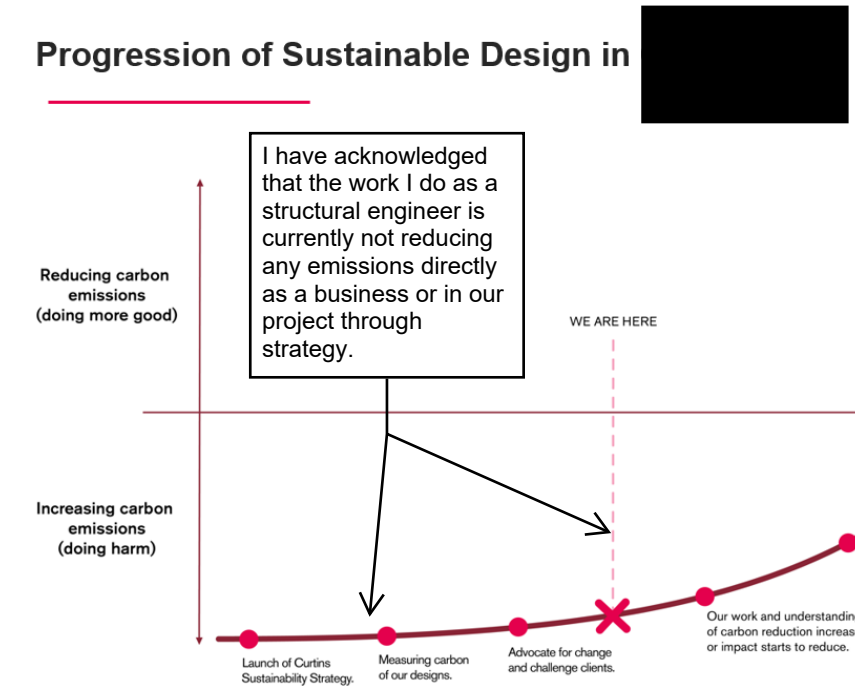
Mental Health: I working with mental health charity Mates in Mind on our Young Engineers Conference in 2021. Suicide rates amongst construction workers more than 3 times higher the national average (*ref: matesinmind)*. Post pandemic looking at creating a conference that supported for young engineers



APPENDIX A2- APPLICATION OF ENVIRONMENTAL KNOWLEDGE

Evidence of my application of environmental knowledge and principles in professional practice I have applied this within my role in the business strategy and within project delivery.

Business Strategy

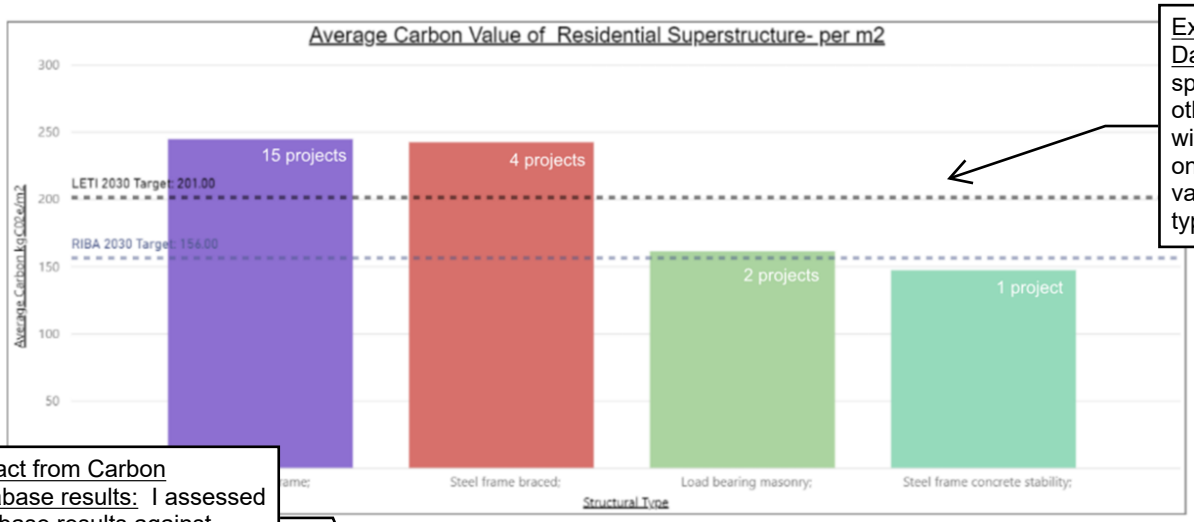


Progression of Sustainable Design Graph: I originally created in handwritten form but has been developed into a digital format.

I have acknowledged that the work I do as a structural engineer is currently not reducing any emissions directly as a business or in our project through strategy.

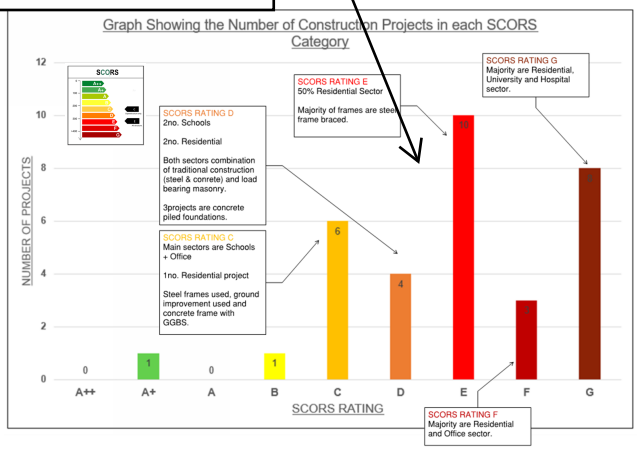
Note where regenerative design sits compared to where we currently are.

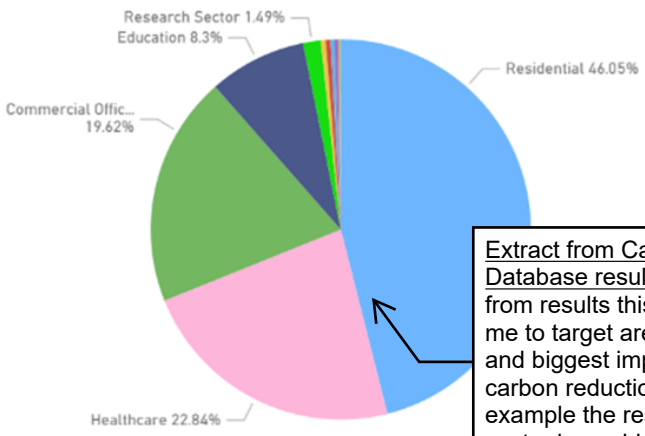
Recognising the limitations of legislation and scalable technology in the industry.



Extract from Carbon Database results: Sector specific results allowing others to make decisions within design teams based on average embodied carbon values for structural form type.

Extract from Carbon Database results: I assessed database results against SCORS criteria.

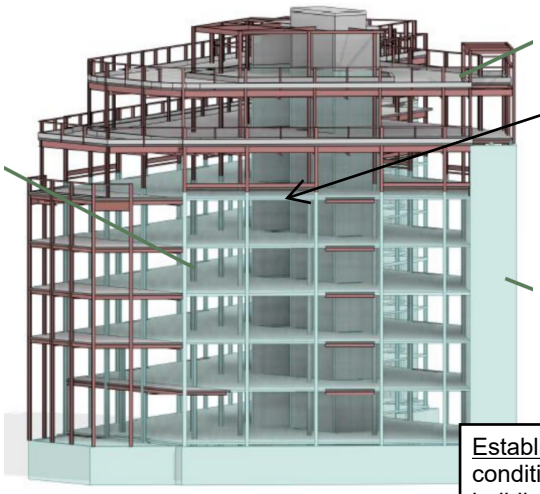


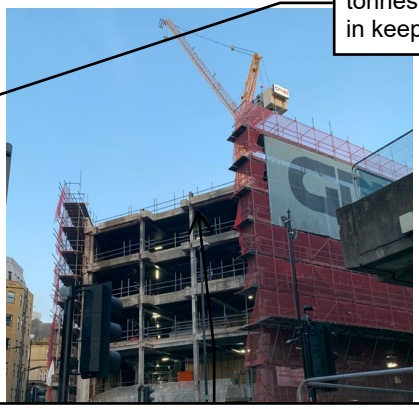


Extract from Carbon Database results: Learning from results this has allowed me to target areas for training and biggest impact for carbon reduction. For example the residential sector is our biggest source of emissions.

APPENDIX A2- APPLICATION OF ENVIRONMENTAL KNOWLEDGE

Project Delivery





Embodied Carbon Savings: 3000 tonnes in embodied carbon were saved in keeping the steelwork alone.

Establishing Reuse Potential: I worked on the condition survey and intrusive investigations of the building to ensure reuse potential and limit structural modifications. Design carried out using balancing of loads from IStructE guide and difference in factors, allowing for minimal strengthening and new materials.

Reusing Materials: Note photo shows level of demolition of steel work compared to concrete. Connections into existing core walls just needed to be thought about differently rather than simply taking the core down level.

KEY
Existing — New —

Where does the Embodied carbon come from – Material Manufacture

Typically around **90%** of embodied carbon emissions

Steel Manufacture- Electric or Blast Furnace

Cement Manufacture

Clay brick- firing

Emissions associated with precast manufacturing equipment

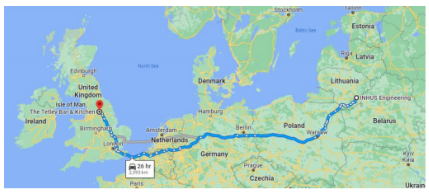
Embodied Carbon in Structural Design: Extract from presentation explaining to client where the embodied carbon emissions come from within their project. From this example the frame is a precast construction.

Where does the Embodied carbon come from – Transport & Construction

- Transport from [redacted] Lithuania- only accounts for approximately an additional **5%** of total embodied carbon emissions.
- Construction emissions and waste from site are relatively the smallest part of emissions **2-5%.** Accounts for plant use, electricity and fuel consumption

Note construction emissions may be a larger source of emissions for enabling works and infrastructure projects with less manufactured material product.*

- Waste is based on typical values from the source WRAP Net Waste- WRAP's Built Environment Programme | WRAP



Embodied Carbon in Transport: Unique to the project the precast has been supplied via Lithuania due to previous client relationships. In this extract from my presentation I explained to the client the impact of the material manufacture compared to the transport from Lithuania vs UK.

APPENDIX A2- APPLICATION OF ENVIRONMENTAL KNOWLEDGE

Project Delivery

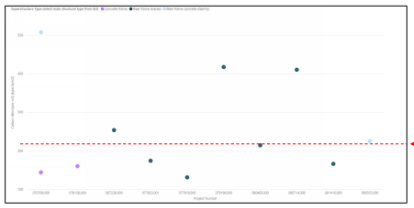
[redacted] Construction

- Total Embodied Carbon **213kgCO2e/m2**
- **83%** emissions from manufacture of materials
- **15%** From Transport (10% if from UK)

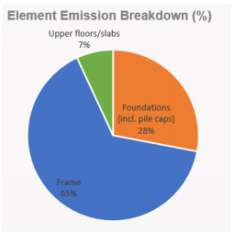
Sourcing hollow core planks from UK saved 3% within transport emissions and 0.1% in overall emissions.

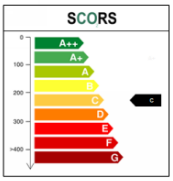
- **2%** from Construction

[redacted] *Carbon Database- Commercial Buildings* :



Construction stage is the emissions that will actually be put into atmosphere from the project.





Scheme Performance against 2030 targets:

SCORS	137 $kgCO_2e/m^2$	Scheme does not meet target
RIBA	156 $kgCO_2e/m^2$	Scheme does not meet target
LETI	228 $kgCO_2e/m^2$	Scheme meets target

Embodied Carbon in Structural Design: Extract of my presentation to the client showing a comparison and break down of 2no. buildings on their site - [redacted] and [redacted] to advise how we look to a lower carbon solution for the next phase of the site.

Example is that [redacted] saw a reduction in carbon emissions from planning stage to construction- due to large allowances and efficient design at construction of precast.

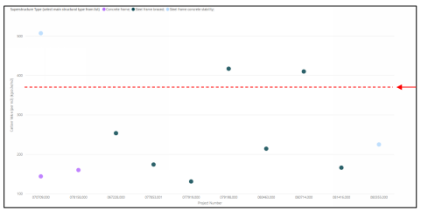
**note this evidence can be linked to B1 enabling a culture of learning.*

[redacted] Planning

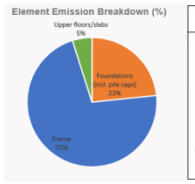
- Total Embodied Carbon- **368kgC02e/m2**
- **81%** emissions from manufacture of materials
- **17%** From Transport (**11%** if from UK)
- **2%** from Construction

**note does not include data for Deltabeams.*

[redacted] *Carbon Database- Commercial Buildings* :



No actual emissions created at this stage- estimate of what range of emissions to expect from this project



Scheme Performance against 2030 targets:

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RIBA	156 $kgCO_2e/m^2$	Scheme does not meet target
LETI	228 $kgCO_2e/m^2$	Scheme does not meet target

[redacted] – Structural Fabric Embodied Carbon Working Group:

Hi [redacted]

I have put a side by side comparison below. Numbers are very similar, and I do agree that PT flat slab is more carbon efficient than the CLT option. The provided tonnages mean that the steel frame supporting the timber slab is almost the same as the whole PT concrete option (including RC).

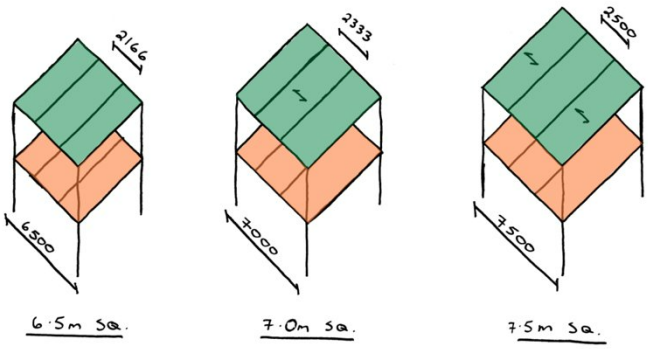
This is because at the time of calculation the embodied carbon factor for steel is 2.45 compared to concrete of 0.1. As of 31st March from BCSA steel recommended ECF has been reduced **to 1.74.**

[redacted]	[redacted]	[redacted] BCSA revised factors 31st March Steel
Baseline Scheme- 266 kgCO2e/m2	Baseline Scheme- 268 kgCO2e/m2	Baseline Scheme- 210 kgCO2e/m2
Downstand Cellform Timber CLT- 153 kgC02e/m2	Downstand Cellform Timber CLT- 172 kgC02e/m2	Downstand Cellform Timber CLT- 135 kgC02e/m2
PT Flat Slab- 138 kgC02e/m2	PT Flat Slab- 144 kgC02e/m2	

Assumptions:

- CLT did they include their 5% steelwork tonnage allowances in the calculation, may explain why [redacted] is higher in initial calc.
- Rounding numbers used.

Communicating Design Options: Extract of a review of feasibility bay studies for the client in regards to embodied carbon, stating my assumptions and comparing to current data.



APPENDIX A3- ANALYSIS AND EVALUATION OF PROBLEMS- ENVIRONMENTAL PERSPECTIVE

Evidence of my ability to analyse environmental problems and sustainable solutions is within business strategy, delivering teaching and project delivery:

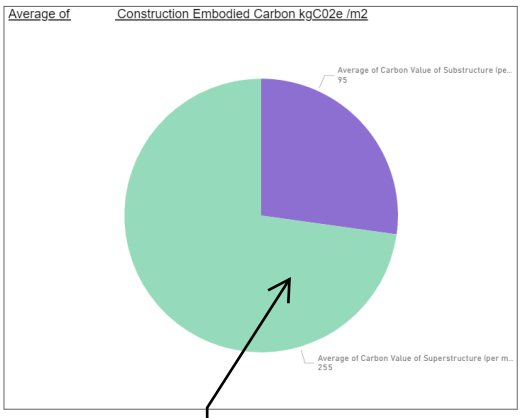
Business Strategy - Data Analysis and Evaluation

[redacted] Carbon Calculator Extract: Critical analysis of data required me to create a solution to ensure embodied carbon values were relevant to advise clients and design to allow for reduction. For example our initial data was not split between substructure, super structure and infrastructure allowing for misleading trends when comparing total carbon against structural form.

	328	14	18	360 tco2e

Total EC (kg CO2e)	360437	Total EC per m² (kg CO2e/ m2)	12
Super Structure EC (kg CO2e)	0	Super Structure EC per m² (kg CO2e/ m2)	0
Sub-Structure EC (kg CO2e)	360,437	Sub-Structure EC per m² (kg CO2e/ m2)	12
Civils, Infrastructure & External Works EC (kg CO2e)	0	Civils, Infrastructure & External Works EC per m² (kg CO2e/ m2)	0

*NOTE SUB STRUCTURE INCLUDES BASEMENTS AND GROUND FLOOR SLABS IF GROUND BEARING



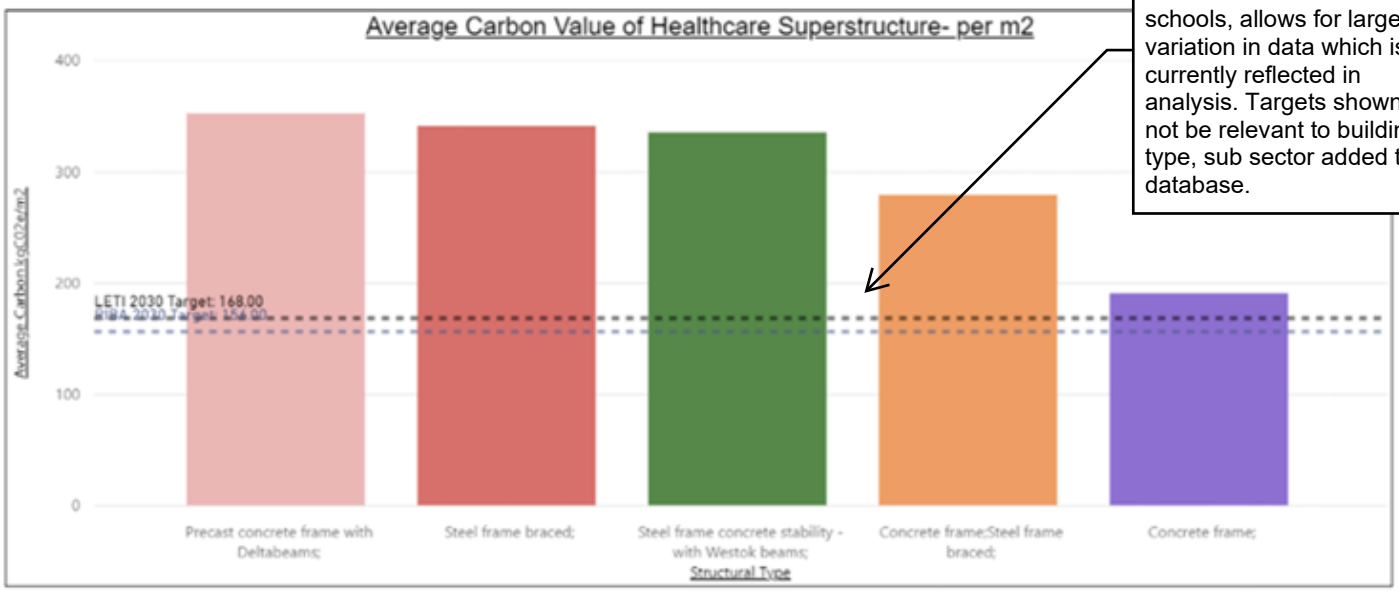
[redacted] Carbon Database Extract: Results from this analysis shows how splitting the calculator results as above allows for more accurate analysis of the embodied data collected. Example, some projects where substructure only with 50% GGBS

Select which elements have been **excluded** from your carbon value or **elements which have not been modelled in software as per real life** *e.g. pile depths or deltabeams.*

20. Note - Calculations from Revit models will include carbon value for piles if modelled - it is important if including this value that the pile depth modelled represents an accurate depth to ensure accurate carbon value.

- [ ] Piled Foundations (not including pile caps)
- [ ] Deltabeams
- [ ] Precast / Hollowcore Slabs
- [ ] Masonry Elements
- [ ] Cell Beams
- [ ] Mass fill concrete below foundations to correct depth
- [ ] Timber or CLT Elements
- [ ] Reinforcement
- [ ] Composite Metal Deck (not including concrete)

Extract from Database Submission form: The variety of what was included in carbon values and what had not been included for example full pile depths or proprietary structural elements. If not stated, this can mislead data when using averages and trends.



Extract from Database Submission Results: Variation in sector buildings such as lecture theatres to schools, allows for large variation in data which is not currently reflected in analysis. Targets shown may not be relevant to building type, sub sector added to database.

APPENDIX A3- ANALYSIS AND EVALUATION OF PROBLEMS- ENVIRONMENTAL PERSPECTIVE

[redacted] Academy:
The needs of the professionals with the industry and Curtins require training beyond embodied carbon.

Delivering Teaching - [redacted] Academy Sustainability Module

Sustainability- Influence the Brief

Influence the Brief and Early-Stage Design Decisions.

Pick one of the design briefs below and identify key design requirements where sustainability and embodied carbon can be implemented.

Design Brief 1.

Office refurbishment.

The client has an existing 1990s office building, they want to make the decision if they demolish the building or if they keep the existing building and build a vertical extension

Design Brief 3.

Large enabling work projects

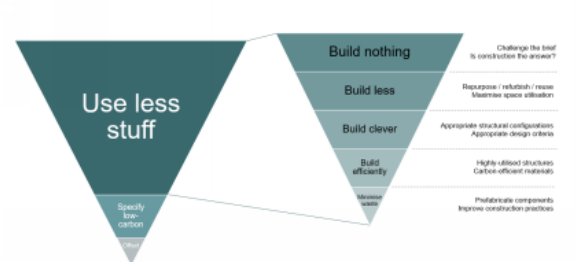
The client wants to build a new industrial factory on a constrained site.

- Early 1900's open cast coal mine.
- Backfilled with highly compacted made ground in 1990's over 4 years, previous as an airport with associated buildings in opencast footprint.
- Made ground ABP-100kNm/2
- Bedrock ABP- 500kN/m2
- Made ground 60m in depth with competent bedrock below.
- Proposed commercial buildings to be built within opencast footprint, supporting industrial manufacturing material.
- Low levels of contamination found in the upper 3m levels of made ground (pote asbestos from historic demolition).

Design Brief 4.

Housing estate

The client wants to build a large housing estate on the site of an old carpark, they want this site to be a leading site for sustainable houses including embodied carbon considerations above and below ground.



[redacted] Academy: I created an activity that requires early careers engineers to look at a construction brief and identify where the client has directly asked for sustainability requirements, but also where there is an opportunity to ask a question and reduce carbon.

UN SDGS DISCUSSION

- In breakout rooms, cuss which SDG's you k are most relevant to u and your work? scuss how you think rtins can support G's?

ction for the Sustainable Development Goals - Nations Sustainable Development

Sustainability- Quick Carbon Calculations

Design Brief 2.

Concrete- Substructure only

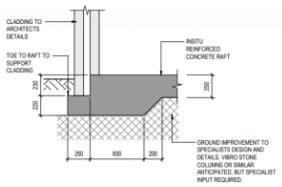
RC Raft- Concrete Grade UK 32/40 25% GGBS

2 Layers A393 Mesh- 6.16kg/m2

Floor Area-270m²

Groundworks below raft:

1. 600mm of 'general soil' to be removed and taken to landfill nationally (approx. 30 Soil density (18kg/m3)
2. 600mm of crushed stone to be brought in locally (approximately 50km) underneat Stone Density (21kg/m3)



TYPICAL RAFT FOUNDATION
SCALE 1:20

[redacted] Academy:
Activity I created to work through embodied carbon calculations beyond structural engineering, this was also an activity at the 2022 Young Engineers Conference.

[redacted] Academy:
Worksheet I created for Reflection on individual professional requirements for the module.

Sustainability
Chartership Development Planning

This document has been created to help you reflect on the areas of the Sustainability requirements from your chosen institution and after today where you are going to focus your development in this area and how you will do this against your self-defined timescales.

1. **On a scale of 1-10 how confident do you currently feel about having evidence for the Sustainability Chartership attribute/skill?**

2. **How could you improve your confidence and score?**

Use this Development Plan to think about the key areas of Sustainability covered today and what you can do to start gaining more understanding and experience. It may be something small around further knowledge and research all the way up to supporting a sustainable design concept for a client.

Remember to keep it SMARTI (Specific, Measurable, Achievable, Relevant and Timely).

3. **Sustainability Development Plan**

What area of Sustainability do I need to develop for my Chartership/ my role?	What will I do to achieve this?	What resources or support will I need?	How will I apply this learning and measure success?	Target date for review and completion

4. **What is your one key takeaway or learning from today that will help you with your Chartership development?**

[redacted] Academy:
Within handouts I provide, this include the IStructE's Climate Jargon Buster. Recognising key terms you are likely to encounter in sustainability but not everyone will have.

1.Get informed

Climate jargon buster

Grace Di Benedetto presents a short glossary of key sustainability terms that engineers are likely to encounter when reading climate guidance.

This article gives simple explanations of common sustainability terms that a structural engineer may come across. It has been developed with reference to existing industry definitions where possible. Where further explanation has been added, the definitions come from those used within Arup's Structural Engineering Sustainability Hub.

Concepts and systems

Lifecycle assessment (LCA)
A method to quantify the carbon emissions and other environmental impacts (such as acidification and air pollution) of assets or products over their whole lifecycle[1].

Lifecycle stages/modules
Each lifecycle module (A1, A2...) describes a distinct phase in the lifecycle of an asset, and modules are grouped into stages (e.g. product stage consists of Modules A1–A3). Refer to Figure 1 of BS EN 15804[2].

Environmental product declaration (EPD)
A third-party verified, standardised document that provides the environmental impact of a product, based on the data from an LCA.

Circular economy
A circular economy is based on the principles of designing out waste and pollution and keeping products and materials in use, e.g. refurbishment, reuse, design for adaptability/deconstruction[3].

Design for adaptability
Designing to support the continued use of an asset by allowing for and accommodating potential future adaptations[4].

Design for deconstruction (DfD)
Design decisions that increase the quality and

dioxide equivalent).

Embodied carbon (EC)
The GHG emissions associated with materials and construction processes throughout the whole lifecycle of an asset (Modules A1–A5, B1–B5 and C1–C4)[5].

Operational carbon (OC)
The GHG emissions arising from all energy and water consumed by an asset in use, over its lifecycle (Modules B6 and B7)[5].

Upfront carbon
GHG emissions up to practical completion, excluding sequestration (Modules A1–A5)[6].

Whole-life carbon (WLC)
The total of all GHG emissions and removals, both operational and embodied, over the lifecycle of an asset, including its disposal (Modules A–C). Potential benefits or loads from future energy recovery, reuse and recycling are reported separately (Module D)[5].

Sequestration
The removal and long-term storage of CO_2 from the atmosphere in biomaterials such as timber. The carbon stored in these materials is known as biogenic carbon[7].

Carbon capture and storage (CCS)

carbon emissions and therefore no offsetting is required. Also known as carbon zero, absolute zero, or gross zero.

Climate positive
An activity that goes beyond net zero by achieving an overall reduction in GHGs in the atmosphere. Also referred to as carbon negative.

Science-based target
A target that is consistent with the pace recommended by climate scientists to limit the worst impacts of climate change[8].

Scope 1, 2 and 3 emissions
To classify the boundaries of an organisation's GHG emissions, three scopes are differentiated. Scope 1 covers direct emissions from owned or controlled sources. Scope 2 covers indirect emissions from the generation of purchased electricity, steam, heating and cooling. Scope 3 includes all other indirect emissions that occur in a company's value chain, e.g. business travel and the embodied carbon of built assets[10].

Carbon offsetting
The use of GHG emission reductions or removals to compensate for CO_2 emissions.

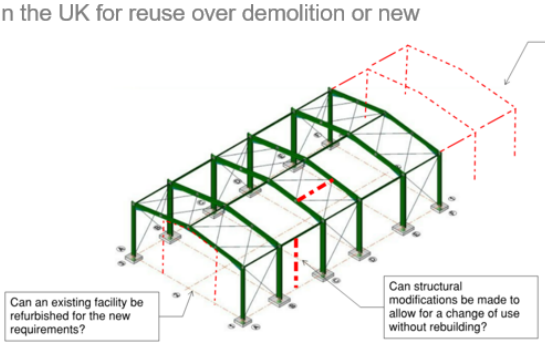
Materials
Recyclability
Indicates how easy a product is to separate into its material components and to convert into a new item. The term 'downcycling' is used where the resulting product is of a lower value than the original item. Conversely, 'upcycling'

APPENDIX A3- ANALYSIS AND EVALUATION OF PROBLEMS- ENVIRONMENTAL PERSPECTIVE

Project Delivery

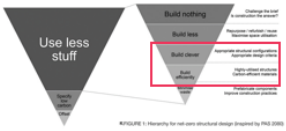
// Net Zero Structural Design- Build Nothing/Build Less

- Can an existing asset be used, refurbished or modified.
- A refurbishment can save up to 70% of embodied carbon compared with demolishing and reconstruction.
- Heavy loading requirements for this building type, often allow for modifications on slab such as additional mezzanine built off slab.
- Increased in planning requirements in the UK for reuse over demolition or new build.

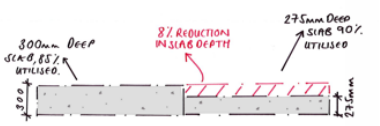


Reducing Environmental Impact of a Project:
From this extract of a presentation delivered to a logistics client and design team discussing high level concepts and solutions that can reduce environmental impact of potential projects.

// Net Zero Structural Design- Build Clever/Efficiently



- Slabs and External Yards
  - Thickness of slab refined for loading – 10% reduction in design 10% saving on material and carbon
  - Cement replacements



- Steel Frame
  - Review span of main structure, can this be reduced? Reducing grids
  - Internal fixtures can be reclaimed or sources from 'buy back schemes'
  - Consideration of how the structure can be used at the end of its life? – use of bolted connections etc.
  - Use of reclaimed steel – 95% saving in embodied carbon
- Ground Conditions
  - Explore option of ground improvement where possible – *may require higher upfront ground investigation cost*
  - Can material on site be reused – creates larger enabling work package on site than bringing in new material
- SUDs
  - How can the site incorporate natural features to create SUDs rather than manufactured proprietary products.

For example to compare the carbon saved by replacing plastic attenuation tanks with naturally formed detention basins:

Reducing Environmental Impact of a Project:
From this extract of a presentation delivered to a logistics client and design team discussing high level concepts and solutions that can reduce environmental impact of potential projects.

APPENDIX B1 - INFLUENCING

Evidence of how I promote behavioural and cultural change by influencing others and driver behavioural change in other engineers, colleagues and collaborators.

Influencing - Colleagues - Internal

// Carbon reduction targets – questions to ask when setting the values

Below are the questions the carbon reduction journey raises, which should be discussed while making our decisions

- **Will Clients align with our reduction targets?**

Suggested statement for our sustainability report as I think it needs addressing in case staff question it:

'Our proposed goal may not align with clients' obligations or wishes, however we will work with our clients to progress this matter together so that everybody achieves improvement - we can only reach our commitments in partnership with our clients.

- **Setting targets before industry guidance?**

Is this a risk when guidance could be issued in 2023 from UK Net Zero Building Design Standard?

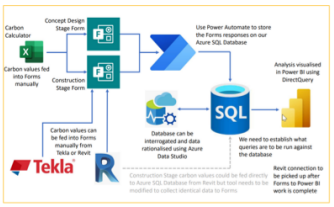
** NHS guidance released Friday Feb 24th- [redacted] review against our healthcare sector data.*

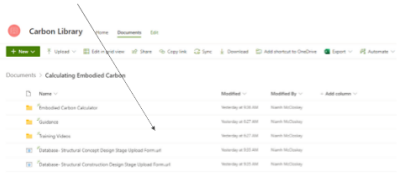
Internal Presentations and Training- Upskilling Senior Colleagues: Extract from Board Directors presentation on carbon reduction targets, challenging them to think of these questions whilst I present- how this promotes own thinking.

Internal Presentations and Training- Up skill Senior Colleagues: Presented my carbon toolkit and business KPIs to [redacted] Management Forum, who represent all discipline leads and office directors.

// Establish an Internal Carbon Database

- Using Microsoft forms to upload data to database, for STRUCTURAL projects only at this stage, for concept and construction stage.
- Link to forms is in Sustainability Library, embodied carbon calculator tab.





- We have created ou[redacted] for all our projects! [redacted] benchmarks and ana[redacted] from our projects.

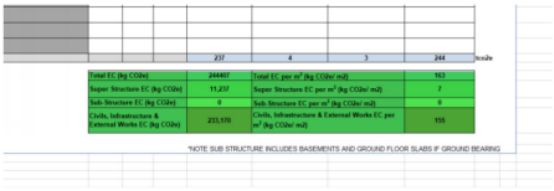
Promoting Continual Improvement:

Internal communications on lessons learnt, and how I promote a culture of learning and continuous improvement leading by example and sharing my own.

You asked - we listened!

Changes to the Carbon Calculator

1. **Total Embodied Carbon split** out into total, superstructure, sub structure and civils to align with database input. This also provides results in kg and tonnes.

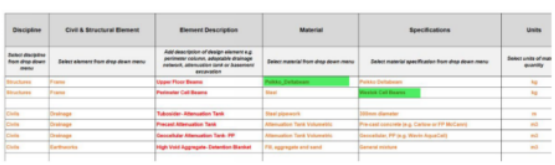


View the Carbon Calculator here.

2. **CLT and Glulam factors (A1-A3) updated** to Arup Review- Embodied Carbon Factors for A1-A3 - https://www.istructe.org/resources/blog/mass-timber-embodied-carbon-factors

3. **Westok Cell Beam selection added**-option within Steel Specification- additional 25kgC02e/t (0.025kgc02e/kg) to A1-A5 Carbon as advised by Westok

4. **Peikko Delta Beams material option added**- A1-A3 1.87kgC02e/kg as advised by Peikko EPD. See Carbon Library EPDs for more information.

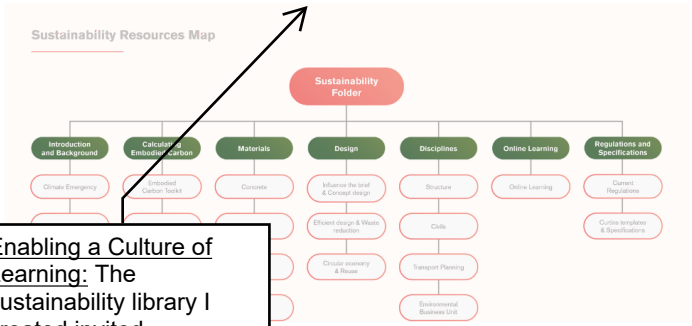


Sustainability Library

Welcome to [redacted] Sustainability Library- Please see Library 'Resources Map' below and access to documents by selecting here>> **Sustainability Resource Library**

If you have any recommendations for best practice and guidance which you think should be shared, particularly in relation to specific disciplines, please contact [redacted]

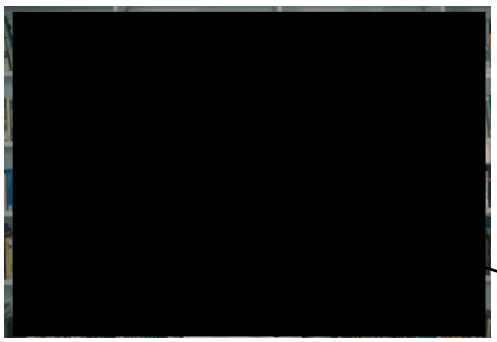
A forever growing resource, which will evolve with us as a business and industry.

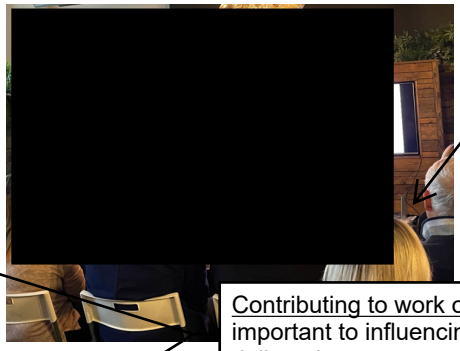


Enabling a Culture of Learning: The sustainability library I created invited collaborators for resources etc.

APPENDIX B1 - INFLUENCING

Influencing Collaborators- External



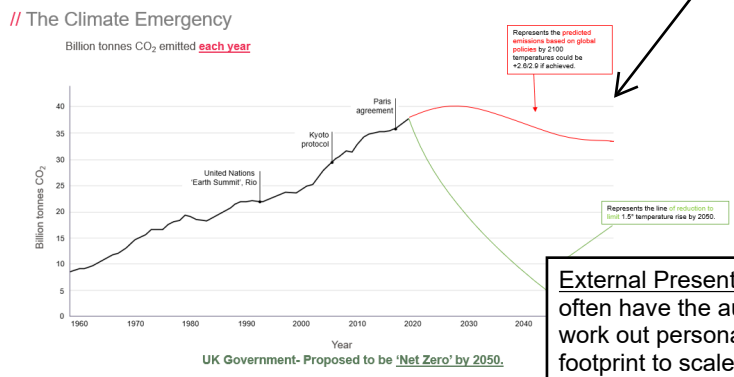


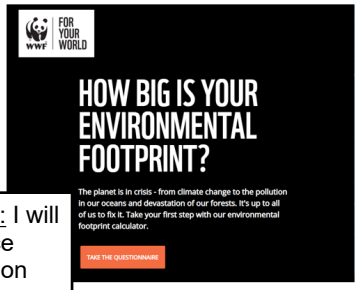
External Presentations: External presentations are a chance to inspire, teach wider industry on the opportunities they have within climate action. It is also an opportunity to challenge and be challenged.

Contributing to work of external groups across the industry: This is important to influencing as without volunteers these groups couldn't deliver the support and resources to the industry.

External Presentation- Helping Others With Knowledge

External Presentation: All presentations I deliver include a section on setting the scene with the climate emergency- before anything with construction.





External Presentations: I will often have the audience work out personal carbon footprint to scale the issue to embodied carbon. This is important for collaborators who traditionally may not have seen the impact of structure.

APPENDIX B2 + B3 - PROMOTE STRATEGIC ENVIRONMENTAL APPROACH AND MANAGE SUSTAINABLE STRUCTURAL OUTCOMES

Evidence of my experience in leading and managing to achieve sustainable outcomes and approaching structural sustainability strategically.

[redacted] Sustainability Toolkit - Carbon Calculator

[redacted]alculator

General Information		Project Information	
Curtins Office	Leeds	Project Sector	Education
Project Number	069519	Design Stage	Stage 5- Manufacturing and Construction
Engineer	Niamh McCloskey	Project Value	10000000
Project Title	TERC- NZCBS	Gross Internal Floor Area (m²)	25974
Date Created	13/12/2022	Scheme Reference	TERC
Doc Ref.	CUR-XX-XX-T-S-XX-0000X-X01		
Sheet No.	1 of 1		

Notes: 'EC' = Embodied Carbon. Read red triangle cell notes for assistance
Red cells must be entered by engineer manually
Amber cells are defaults but can be adjusted by engineer to suit from drop down menu
Blue cells contain fixed data or outputs - no action required

Total EC per m² (kg CO2e/ m2)	12
Rating:	A++

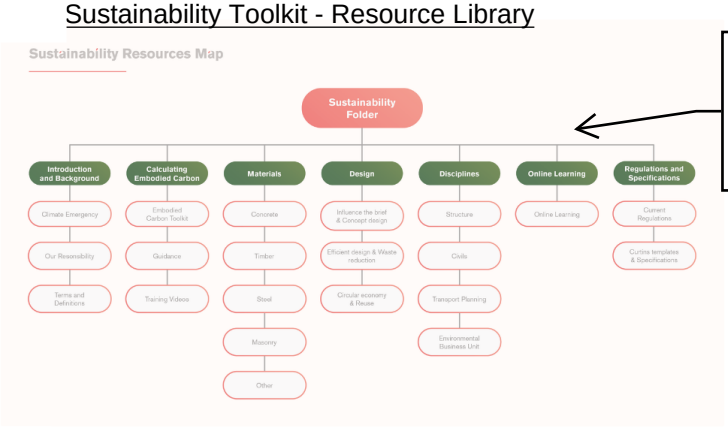
Discipline	Civil & Structural Element	Element Description	Material	Specifications	Units	Material Quantity	Reinforcement [kg_m3]	Embodied Carbon Factor (kgCO2e/kg) A1-3	A4	A5	Embodied Carbon (tcoe2e) A1-3	A4 (Transport)	A5 (Waste)	Element Embodied Carbon
Select discipline from drop down menu	*Select element from drop down menu*	*Add description of design element e.g. perimeter column, adoptable drainage network, attenuation tank or basement excavation*	*Select material from drop down menu*	*Select material specification from drop down menu*	*Select units of material quantity*	*Enter total amount of material based on units selected*	*Select UK average reinforcement quantity from drop down menu (reinforcement allowance shown in brackets)*				*Product Stage- Material Quantity x embodied carbon factor for Module A1-A3 (tco2e)*	*Product Stage- Material Quantity x embodied carbon factor for Module A4 (tco2e)*	*Construction Stage- Material Quantity x embodied carbon factor for Module A4 (tco2e)*	*Total Upfront Carbon (A1-15) tco2e*
Structures	Foundations (incl. pile caps)	Reinforcement	Steel	Rebar - UK: UK CARES avg EPD	kg	430,000	Rebar Mild (90)	0.76	0.03	0.05	328.47	13.83	18.14	360.44
Civils							Mass Concrete (0)							
							Mass Concrete (0)							
							Mass Concrete (0)							
TOTALS											328	14	18	360 tco2e

Total EC (kg CO2e)	360437	Total EC per m² (kg CO2e/ m2)	12
Super Structure EC (kg CO2e)	0	Super Structure EC per m² (kg CO2e/ m2)	0
Sub-Structure EC (kg CO2e)	360,437	Sub-Structure EC per m² (kg CO2e/ m2)	12
Civils, Infrastructure & External Works EC (kg CO2e)	0	Civils, Infrastructure & External Works EC per m² (kg CO2e/ m2)	0

*NOTE SUB STRUCTURE INCLUDES BASEMENTS AND GROUND FLOOR SLABS IF GROUND BEARING

Carbon Calculator: I created a multidisciplinary carbon calculator including structures, infrastructure and enabling works. This incorporates elements from IStructE How to Calculate Embodied Carbon V2.0, National Highways and Inventory of Carbon and Energy.

Sustainability Toolkit - Resource Library



Resource Library: I created the resource library to allow others to improve their sustainability knowledge and their own work. This includes webinars, technical guidance and blank templates for many aspects of sustainability in construction. Including material and discipline specific.

Sustainability Toolkit - Database- Dashboard

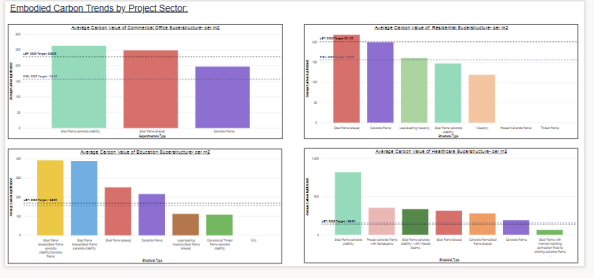
Dashboard under construction

We have created our Carbon database to record the carbon for all our projects. Giving us the data to set carbon targets, benchmarks and analyse the carbon we create as a business from our projects. The dashboard below displays our current carbon data in the database.

Our dashboard currently updates every Friday- up to date as of 30/01/2023

Embodied Carbon Summary Dashboard

Embodied Carbon Trends by Sector Type



Carbon Database:
I created a dashboard of our carbon database allowing engineers to see live results of the embodied carbon emissions they upload into the database.

This is also part of my strategy to help others validate their own data and understand carbon emissions using averages and material types. It also gives engineers motivation to upload as they can see their results and is a learning platform.

APPENDIX B2 + B3 - PROMOTE STRATEGIC ENVIRONMENTAL APPROACH AND MANAGE SUSTAINABLE STRUCTURAL OUTCOMES

[redacted] Sustainability Strategy

// 2023 Sustainability Strategy

- **Continue to measure and upload carbon & publish our Data & Carbon Reduction Commitments-**
- [redacted] KPI's for 2023 for carbon measurement and upload of new projects:
  - 50% Q1
  - 75% Q2
  - 100% Q3
- Continue and increase progress of our database, with a view to increase sector specific data and trends from 2022 lessons learnt.
- Publish data internally and externally to our industry partners with impact report.
- Set project carbon reduction targets
- **Project Guidance** - Develop guidance documents that will promote a consistent approach to sustainable design across the company.
- **Circular Economy -** Embed the principles into our design, develop reuse specifications and templates for reports and drawings.
- **Business Emission Reductions** - Achieve PPN accreditation & set a reduction plan and lead by example with our business culture and sustainability initiatives.

Sustainability Strategy: High level details of my 2023 Sustainability Strategy. Based on what we need as a business and what the industry needs.

Delivery of Strategy: This is an example of how I set out to deliver on the 2023 strategy.

[redacted]

Delivery of Strategy: Identifying the groups I need to engage with internally and externally to deliver- who does it effect?

Delivery of Strategy: Identifying decisions needed to be made and first actions.

[redacted]

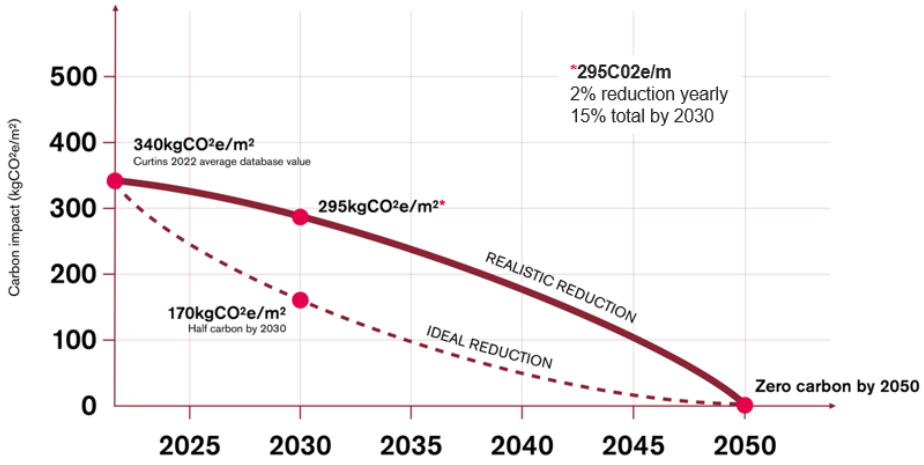
Delivery of Strategy: Example of engaging with stakeholders, addressing challenges such as knowledge gap, H&S or uncertainty.

APPENDIX B2 + B3 - PROMOTE STRATEGIC ENVIRONMENTAL APPROACH AND MANAGE SUSTAINABLE STRUCTURAL OUTCOMES

[redacted] Commitments to Reduction

[redacted] Embodied Carbon Reduction Commitment

Embodied Carbon Reduction Commitments: Overview of main reduction commitment to average project embodied carbon emissions with no offsetting.
**graph originally hand-drawn by*



Target A 295kgc02e/m2:
- An achievable target
- Allows for the realistic expectation that not all projects can achieve the reduction.
- Some clients and projects 'don't care' or not there yet'.
- No industry legislation.
- Reduction of carbon in materials during this time frame will also contribute to a natural reduction.

Target B 170kgc02e/m2:
- What the planet needs!
- Value is typically only achievable in a refurbishment project.
- Unachievable without immediate legislation
- Cannot achieve and maintain a commercial business without legislation in place.

Embodied Carbon Reduction Commitments: Target A & Target B show the judgment I used on one of many iterations of data and reduction plans against industry consensus.

Approach to Reduction Commitment

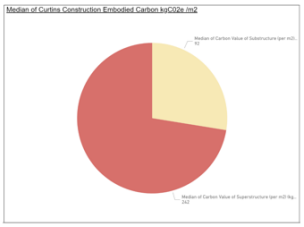
Approach to Reduction Commitments: The below section looks at how I approached making decisions relating to embodied carbon reduction commitments.

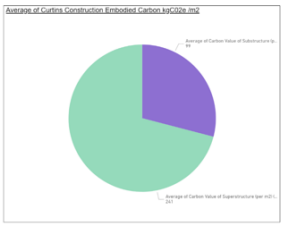
1. Where are we now?

// Where we are now- database results (10/12/2022)

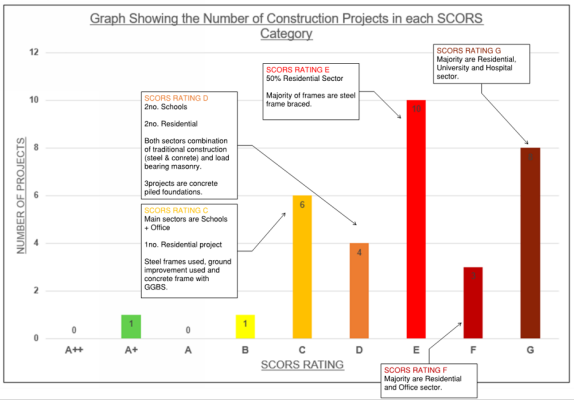
- **Current average 340kgc02e/m2** for superstructure and substructure @ construction- **SCORS Rating E**
- **Current median 333kgc02e/m2** for superstructure and substructure @ construction- **SCORS Rating E**
- Total number on database: 119 Uploads over 84 Projects with 33 at construction stage.
- At Construction smallest value is 98kgC02e/m2 note this project is **Substructure only project with 50% GGBS.**
- At Construction largest value is 635kgC02e/m2
- **70% Projects sit between 200-400kgc02e/m2**
- Total Carbon at Construction- 132,868 tonnes C02e -33 projects- 4000t average – median value 1365t
- Superstructure Carbon at Construction- 83,000 tonnes C02e -33 projects – 2515t average

Approach to Reduction Commitments: First I looked at where we are now, our current data in which will be the point we need to reduce from.





*Graphs to be shown larger on Power BI on [redacted] Screen****



// Where we are now- Structural Carbon Rating Scheme- Sector Analysis

Sub-Sector	% of Sector on Database in Each SCORS Rating				
	C	D	E	F	G
Commercial Office	50%	-	25%	25%	-
Residential	14%	14%	54%	14%	14%
School (Education)	28%	28%	14%	-	-

APPENDIX B2 + B3 - PROMOTE STRATEGIC ENVIRONMENTAL APPROACH AND MANAGE SUSTAINABLE STRUCTURAL OUTCOMES

[redacted] Commitments to Reduction
2. Where are Others?

// Where are we now- [redacted]

[redacted]

// Where we are now- Sector Specific- Commercial Office

- What is the industry doing?

2022 BCO Proposed Updates:

			office usage rather than extreme levels.
Grids			
Structural grid	9, 10.5, 12 and 15 m	6, 7.5, 9, 10.5, 12 and 15 m	6 m and 7.5 m structural grid dimensions added.

	Band	Office	Residential	Education	Retail
	A++	<100	<100	<100	<100
	A+	<225	<200	<200	<200
LETI 2030 decision target	A	<350	<300	<300	<300
	B	<475	<400	<400	<425
LETI 2030 decision target	C	<600	<500	<500	<550
	D	<775	<675	<625	<700
	E	<950	<850	<750	<850
	F	<1,100	<1,000	<875	<1,000
	G	<1,300	<1,200	<1,100	<1,200

Table 5
Target upfront embodied carbon for RIBA stages A1–A5 (excluding sequestration)
Source: LETI, RIBA, WLCN and IStructE, Embodied Carbon Target Alignment[16]

Approach to Reduction Commitments:
To understand our approach I looked at what others in the industry where doing.

[redacted] Commitments to Reduction
3. Risks and Challenges to Commitments

Approach to Reduction Commitments:
Looking at the limits to the data I am using to form the reduction commitments such as where I have misleading or in-conclusive data.

// Where we are now- Sector Specific- Education

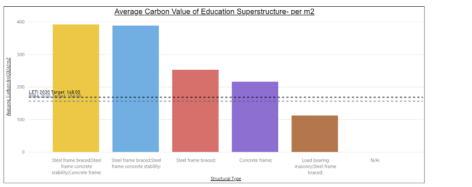
- Which sectors are least likely to achieve reduction under industry targets?

8% of [redacted] emissions come from Education Sector.

- **Additional data needed- sector too wide to compare projects-**

Worst case would need a reduction of almost 57% to be under the LETI 2030 targets for embodied carbon emissions for superstructure.

I Don't believe this data enables us to create a target of reduction at this moment.



// Questions to think about during discussion.

Below are the questions the reduction journey raises, which I think should be discussed throughout our decisions.

- **Data from Projects in 2023 that go to construction** – will they already be designed now in 2022? Prior to reduction commitments?

- **Will Clients align with our reduction targets?**
  Do we need to think of them in a different way for example we always provide a reduction option of 25%?

Suggested statement for our sustainability report as I think it needs addressing in case staff question it.
'Our proposed goal may not align to clients obligations or wishes, however we will work with our clients to progress this matter together so that everybody achieves improvement- we can only reach our commitments in partner ship with our clients.

- **Setting targets before industry guidance?** Is this a risk when guidance could be issued in 2023 from UK Net Zero Building Design Standard.

** NHS guidance released Friday Feb 24th- [redacted] against our healthcare sector data.*

// 2023 Sustainability Strategy - Discussion of challenges to overcome

- Change management – it's everyone's responsibility to champion sustainability, not just sustainability coordinator and local office champions
- Uptake of new process and guidance documents such as project specs.
- Availability of resource to undertake reviews and test where required.
- Support from office leads and offices prioritising measuring and uploading carbon.
- Do we have any knowledge/experience gaps within areas of our strategy? e.g. circular economy.

Approach to Reduction Commitments:
What are the risks to making commitments - when no legislation and not all clients are aligned with carbon reduction.

[redacted] Commitments to Reduction
4. Achieving Commitments

Approach to Reduction Commitments:
Once commitments are made, how do we achieve them. Looking at how engineers deliver the reduction and then how I monitor it.

// Carbon reduction targets – implementation – technical

How to achieve the reduction:

- Illustrate what reduction of 40kgCO_2e/m^2 looks like in design materials, grid spacing etc. to allow engineers to design for reduction and discuss with clients and design teams.
- Plot reduction graph and measure progress.
- Discuss where we require more effective data collection methods such as in Vantagepoint to allow for effective measuring of this target and to streamline compilation and extraction of accurate data.

- **Reduction targets to be reviewed annually and when legislation/guidance becomes available!**

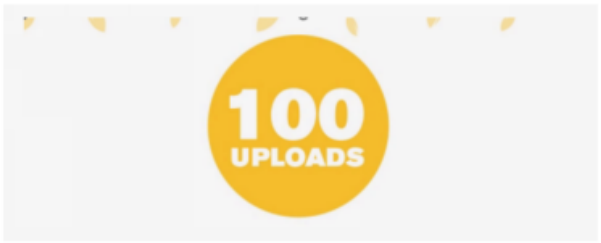
- **Comments welcome on this approach – and the adoption of targets**

APPENDIX C1 - COMMUNICATE THE ENVIRONMENTAL CASE

Evidence of how I confidently, clearly and competently communicate environmental issues to others.

Internal Communications

[redacted]



A huge milestone has been achieved in our Sustainability journey; as of last week, we officially surpassed 100 uploads to our Carbon Database. Well done to everyone who contributed to this fantastic achievement!

We created the Carbon Database with the aim of recording the carbon for all [redacted] projects. Gathering this information gives us the data to set meaningful and informed carbon reduction targets and it allows us to benchmark against our industry, as we strive for positive impact.

Thank you to everyone for contributing to this milestone. Please keep it up and keep those uploads coming!

Internal Communications:
I hope it is demonstrated throughout this portfolio I deliver a range of presentations regularly internally and externally. However internally I communicate environmental issues in a number of ways:

// [redacted]lemy- Overview

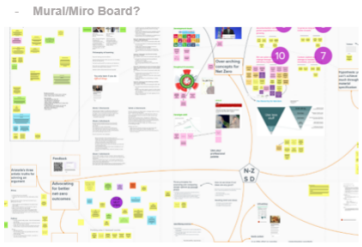
- Introduction & Background
- Calculating Carbon (All Disciplines)

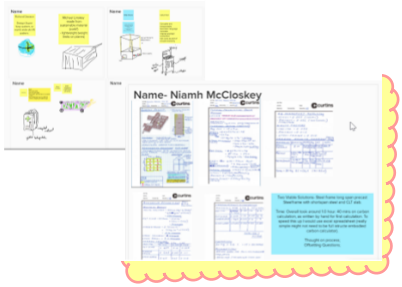
BREAK

- Materials
- Disciplines

BREAK

- Design Principles
- Influence the brief & Concept Design
- Efficient Design and Waste Reduction
- Circular Economy and Reuse

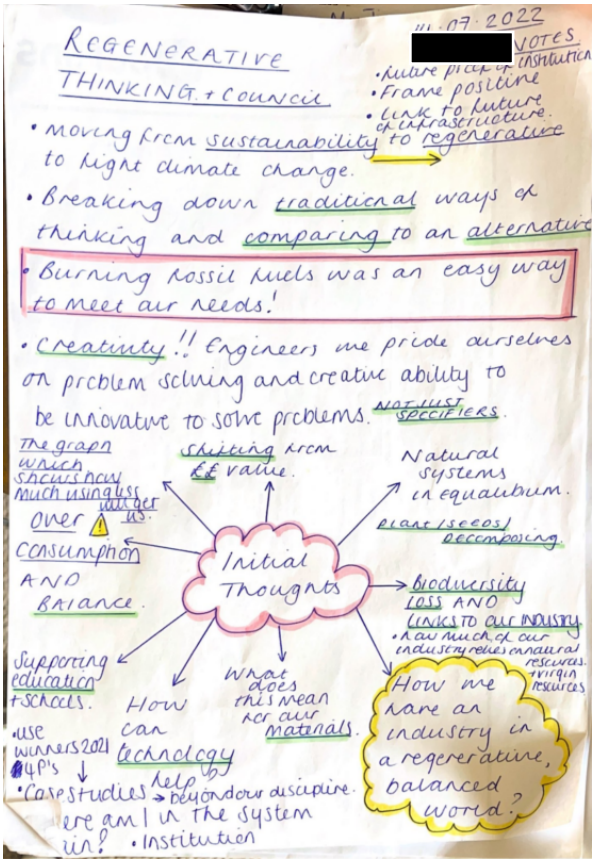




Internal Communications:
Delivering an internal training academy online utilising alternative miroboards.

External Communications

[redacted]



External Communications:
Contributing to the work of sustainability volunteer groups in the built environment.

APPENDIX C1 - COMMUNICATE THE ENVIRONMENTAL CASE

External Communications:
IStructE Council Presentation

External Communications:
Contributing to the work of sustainability volunteer groups in the built environment- Circular Economy Podcast for ACE Emerging Professionals.

6000 TONNES OF CO2e

Setting the scene – Embodied Carbon

6,000t of C02e =
360,000m Plastic drainage
30,000m³ Bitumen or road surfacing
10,000 Precast manholes



Setting the scene – Embodied Carbon

6000t = **17,000**
of C02e = family cars running for one year

Annual family car running for one year = 4.7t of C02e

External Communications:
I deliver different presentation approaches to different stakeholders e.g. what is embodied carbon? and setting scale of structural embodied carbon.

APPENDIX C2 - PROFESSIONALLY ADVISING, INFLUENCING & NEGOTIATING

Evidence of my ability to liaise, negotiate, handle conflict and advise others to achieve sustainable outcomes.

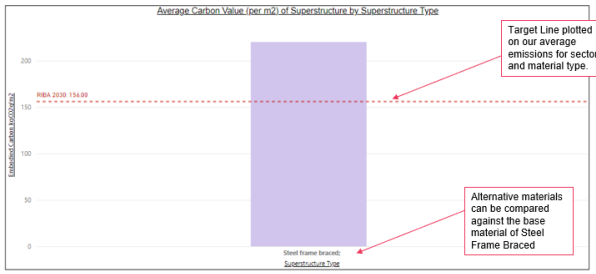
Clients and Projects

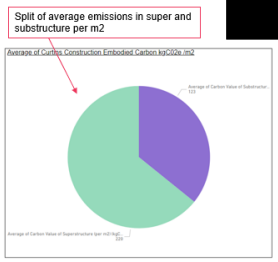
// Measuring Carbo[redacted] Embodied Carbon Database

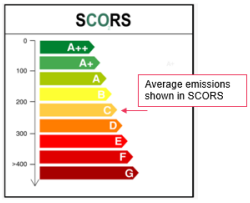
TABLE 1: Targets in RIBA 2030 Climate Challenge[4]

	RIBA targets, modules A–C (excl. B6–7), whole building		A1–A5 as % of A–C[5]	Assumed structural carbon as % of whole-building carbon	A1–A5 structures 2030 target (and SCORS rating)
	2020 target	2030 target			
Domestic	600	300	74%	65%	144 (A)
Non-domestic	800	500	52%	60%	156 (B)

NB All figures are given in kgCO$_2$e/m^2 GIA





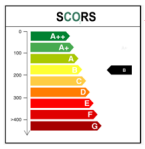


Advising Clients: This is an extract of two presentations where I have shown clients of different sectors and different outcomes examples of carbon targets they may want to achieve against structural materials from my database results.

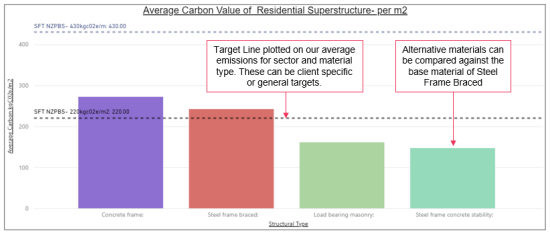
[redacted] Carbon Database

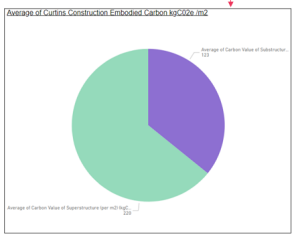
SFT Benchmark Data Residential Sector:

Sector	EC Min kgc02e/m2	Median kgc02e/m2	Max kgc02e/m2
Residential	220	430	1330



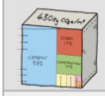
Split of average emissions in super and substructure per m2





Advising Clients: This is an extract of a table I produced for a client advising on potential alternative materials and their implications on cost or design. This includes challenging the use of GGBS to help bring clarity to clients and design teams or 'mythbusting'

// Net Zero Structural Design- Low Carbon

Material Option	Carbon Savings and Benefits	Cost & Design Implications
Concrete Cement Replacement – GGBS Waste Product of Blast Furnace Steel 	**86%** saving in embodied carbon compared to cem 1 (*ref concrete centre specifying sustainable concrete)*	- Effects strength gain of concrete and would require this to be considered in construction programme. - Supply chain issue in UK and requires importing. - Product of carbon intensive blast furnace.
Timber 	Timber **absorbs carbon** in its original form which is stored in the material	- Cost and procurement of timber including insurances for fire and building control limitations. - CLT has carbon intensive manufacturing process. - Timber can typically only be 'downcycled at the end of its life' - May require additional concrete for certain use to limit vibration and increase structural capacity/
Reclaimed Steel	**95% saving in embodied carbon**	- Limited supply of reclaimed steel compared to demand. - Price of reclaimed steel expected to overtake standard steel due to demand.
Electric Arc Furnace Steel	**Circa 50% reduction in embodied carbon**	- Supply chain as limited supply in UK due to infrastructure of steel industry

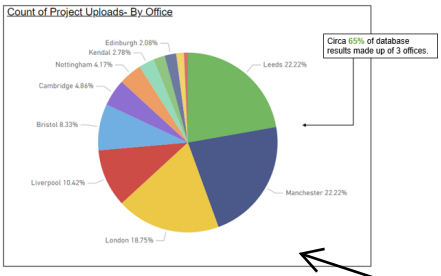
APPENDIX C2 - PROFESSIONALLY ADVISING, INFLUENCING & NEGOTIATING

Internal Stakeholders

// Lessons Learnt from **2022**- Engagement with Sustainability Initiatives

- **Signposting to ways we can calculate carbon in Curtins required**.
- Offices with **support from office lead have better engagement** with carbon database.
- Offices **will delegate the job of calculating carbon to apprentices and technicians only.**
- **Offices have made this routine in projects**, which has allowed for the increase in projects the database, **others haven't uploaded in 6months+ or at all.**

Opportunity for a discussion on engagement and any feedback



// Establish an Internal Carbon Database- Civils

Testing Material output for input into carbon calculator

Testing the simple upload form with carbon data of a civils project

Testing material export from digital software, to populate the carbon calculator.

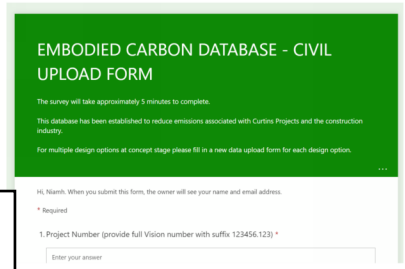
Commenting on the database upload form questions, are we missing anything?

CPD to civils teams once database set up.

Check Units, currently kgC02e/m2 so is relevant to our projects should we explore other units?

omment Deadline Friday 20th Jan 2023.

ps://forms.office.com/Pages/ResponseP
e.aspx?id=fkoMK3HuJ027wbCp0ylyr8Zd
wiyatOnG-
i6sn6MZUQ1pKVDRXU09RVkxTSkoyUDB
10UySUM3QS4u



Identifying Challenges: Extract of challenges I have recognised in the past year delivering as Sustainability Coordinator.

Carbon Calculator- Updates- For Review

[redacted]

Thu 20/10/2022 15:39

We have been doing some updates to the carbon calculator following comments received during my office visits and presentations, I would be grateful if you could have ago at testing the updates. What has changed below (official coms to be sent).

Hoping we can have comms out next week and have the carbon calculator revised onto the carbon library.

For review:

- Prepopulated examples quantities **(civils)**
- Inputting Westok beams and Peikko Delta beams. **(structures)**
- Super and substructure inputs to check split at bottom of page. **(structures)**
- Attenuation tank function and calculations **(civils)**

Changes:

Engaging with Stakeholders: Extract of my communications with engineers in internally who to ensure I am working to deliver for those who will be using what I create. Coordinator.

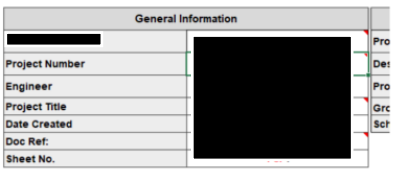
2023 Sustainability and Digital Strategy

Policy Ref Sustainability/Digital	Notes from Strategy Documents	Digital/Sustainability Crossover
1. Sustainability- Continue to measure and upload project carbon.	Promoting, encouraging, and chasing staff / offices to measure carbon and upload project data.	Dashboard to be interactive and automatically refresh to encourage upload from seeing results. - View the dashboard page on Carbon Library without going on Power BI app- we require a premium licence so that we can create a premium workspace and permission and the staff view it- screenshot below - Live update of Power BI with the uploads from database- currently needs manually inputting with spreadsheet due to publicly known security access point of database -
2. Sustainability- Publish our Data and defined carbon commitments.	Publish Sustainability Policy, carbon results, exemplar case studies, etc, internally to [redacted] /ebsite and externally to our industry partners – target end of Jan 2023 for a report that will summarise our progress, future targets, and latest thinking. This information will also be useful for bids in collaboration with the BD and marketing team.	- Power BI training [redacted] to understand in detail what we can create from software. - Development of filters and graphs of projects for reduction.
3. Project Guidance	Develop guidance documents that will	- Templates - Revit tool guidance and

Engaging with Stakeholders: Engaging with a feedback and commenting process on my work from stakeholders.

Minor comments on the Embodied Carbon Calculator

Recommend that you set the Project number field to text format so the first '0' doesn't disappear. We had this problem on the



The RIBA Design Stages don't match RIBA. Recommend either matching the list to RIBA or calling it 'Design Stage'.

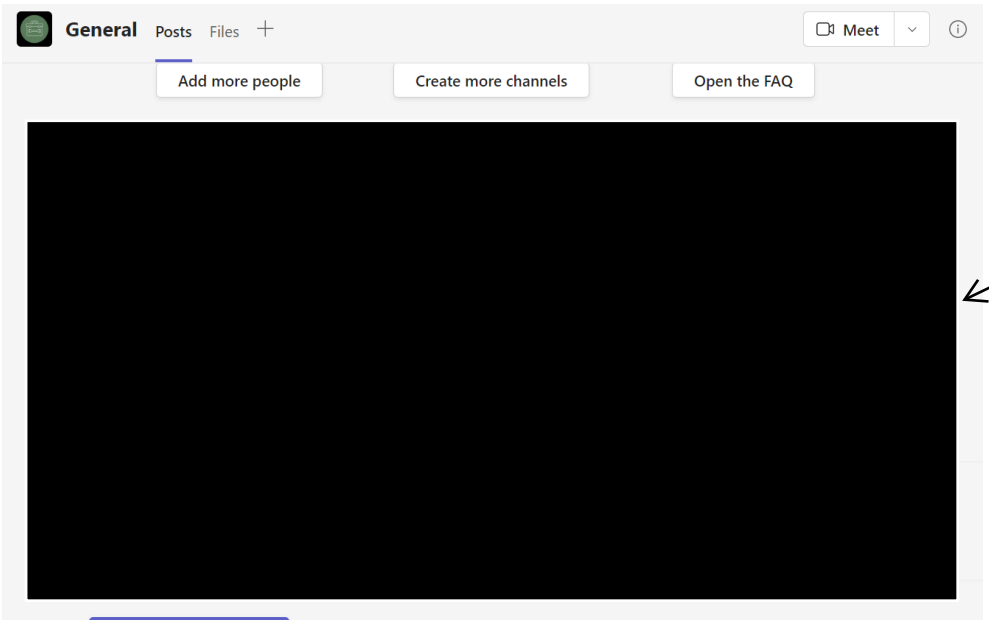
Stage	In tool	RIBA
1	(not used)	Preparation and Briefing
2	Concept	Concept Design
3	Costing	Spatial Coordination
4	Detailed	Technical Design
5	Construction	Manufacturing and Construction

The standard index character for metres is a lower case 'm'. Upper case 'M' stands for Mega.
Grammar. Sometimes 'too' has been used instead of 'to'.

APPENDIX D1 - ENCOURAGE OTHERS

Evidence of how I demonstrate experience in helping others to understand their own potential for working toward a more sustainable future.

Internal Sustainability Champions



Creating Sustainability Champions:
I have created an internal network of sustainability champions, these represent multiple offices across the UK and multiple disciplines including administrative staff and technical staff.

How can they support me deliver my strategy, but also how can I help them deliver what is important to them in sustainability.

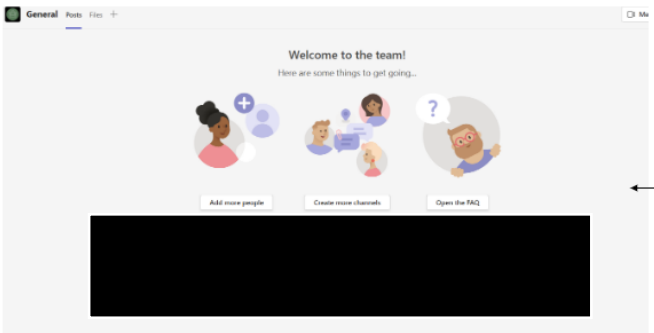
// What does it mean to be a Sustainability Champion?

This group should help to promote and get involved with company initiatives across their offices such as:

- Carbon database
- CPDs and Knowledge Sharing
- Office carbon reduction events , initiatives
- Reduction targets as a business
- Best practice and innovation in Sustainability
- Updating their offices where appropriate such as monthly office meetings.

The group should represent not only technical C&S staff, but anyone who has a passion for sustainability!

- *Suggestion of bi-monthly meetings to be scheduled in my [redacted] with the view to have time to bring meaningful updates*
- ***Opportunity for discussion* what does it mean to you and why you joined the champions group?***
- ***Comms to be shared on who are our champions.***
- ***How can I support you in what you want to achieve as a champion?***



Teams channels for questions, group discussion and access to shared files.

APPENDIX D2 - UNDERSTANDING OF ENVIRONMENTAL ETHICAL DILEMMAS

Understanding of Ethical Dilemmas: Extract from Guardian article I read in March 2023.

British Steel announces 260 job losses at Scunthorpe works

Firm's owner says closure of coking ovens is down to global economic challenges and rising energy bills

Jasper Jolly
@jjpjolly
Wed 22 Feb 2023 11.51 GMT

British Steel's Scunthorpe plant in north Lincolnshire. The company was bought by China's Jingye Group in 2020. Photograph: Lindsey Parnaby/AFP/Getty

British Steel is closing the coking ovens at its Scunthorpe works with the loss of 260 jobs, as the UK steel industry struggles amid high energy prices and the need to invest heavily in lower-carbon technologies.

The company's owner, China's Jingye Group, said the move was partly "to overcome global economic challenges" and also due to £190m in extra costs last year from higher energy bills and carbon credits.

British Steel's chief executive, Xifeng Han, said: "Jingye is committed to our long-term future but decarbonisation is a major challenge for our business and, like most companies, we're facing significant challenges because of the economic slowdown, rising inflation and exceptionally high energy prices."

Understanding of Ethical Dilemmas:Extract of an email chain looking for support on my dilemma.

Tata Steel Scunthorpe-260- 900 Job Losses

[redacted]

Hi All,

Interested on your thoughts on this, not far from where I grew up a lot of the local employment is from Tata Steel in Scunthorpe (including one of my mums first jobs when she moved to Grimsby). A school trip to the steel works also inspired me to want to be in construction when I wanted to understand everything they were making!

It says up to **900 more jobs could be at risk**- they aren't closing due to pressure from sustainability reasons but operating costs.

Not one for the IStructE necessarily but wondering how government or unions keep people employed when steelworks or other industries would rather close and locate to a cheaper location, than upskill or upgrade to the sustainable alternative.

Scunthorpe already has a much higher than average unemployment rate with nearly half of children living in poverty already.

Just wondering if this is something we ever think about on the flip side? I know in Grimsby a lot of those who work in offshore oil, are moving to Orested offshore wind farm and they have now become a big employer in the region.

Article here - British Steel announces 260 job losses in Scunthorpe works | British Steel | The Guardian

Thanks,

APPENDIX D3 - UNDERSTANDING OF ENVIRONMENTAL ETHICAL DILEMMAS

[redacted]

[redacted]

Understanding of Ethical Dilemmas:

Alternative example of where I challenged a developer, who spoke about how a £1,000 a month build-to-rent scheme would benefit a low income area in Leeds (Holbeck).