SUPPLY CHAIN SUSTAINABILITY

Introduction to Climate Change & Carbon Footprinting

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House Rules

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Workshop Overview

- Overview of climate change
- What we can do: carbon reduction strategies
- Carbon footprinting 101
- Case studies
- Guidance on useful resources





Introductions



Let's check your name badge

• Who you are and how much do you know about climate change from 0 - 10?



-+-++++++++

Climate Change

Greenhouse Gas Effect





Greenhouse Gas Effect





Scene Setting: The last 800,000 years

Atmospheric CO₂ concentration Our World in Data Global average long-term atmospheric concentration of carbon dioxide (CO₂), measured in parts per million (ppm). Long-term trends in CO₂ concentrations can be measured at high-resolution using preserved air samples from ice cores. Homo Sapiens Agricultural World 400 ppm civilisation emerges 350 ppm 300 ppm 250 ppm 200 pp 150 ppm 100 ppm 50 ppm 0 ppm 600.000 BCE 400,000 BCE 200,000 BCE 800,922 BCE 2018 Source: EPICA Dome C CO2 record (2015) & NOAA (2018) OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY



Scene Setting: The last 200 years



Source: HadCRUT4, NOAA, NASA and Cowtan & Way datasets; IPCC (2018) *Chapter 1 - Framing and Context*. **Notes:** 'Observations' are the average of the four datasets above as in IPCC-SR1.5 including for the full year of data for 2018.



Sharp increase in CO₂ emissions by global region



Source: Our World in Data based on the Global Carbon Project OurWorldInData.org/co2-and-other-greenhouse-gas-emissions • CC BY Note: This measures CO₂ emissions from fossil fuels and cement production only – land use change is not included. 'Statistical differences' (included in the GCP dataset) are not included here.



Scene Setting: The last few years





Global Temperature Anomalies in 2019





Annual CO₂ emissions by country, 2019

Annual CO₂ emissions, 2019 Our World in Data Carbon dioxide (CO₂) emissions from the burning of fossil fuels for energy and cement production. Land use change is not included. World 500 million t <0 t 100 million t 2.5 billion t 7.5 billion t 50 million t 250 million t 1 billion t 5 billion t >10 billion t No data

Source: Global Carbon Project; Carbon Dioxide Information Analysis Centre (CDIAC) Note: CO₂ emissions are measured on a production basis, meaning they do not correct for emissions embedded in traded goods. OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY



- 1. China: 10.2 billion tCO₂
 - 28%
- **2. USA**: 5.3 billion tCO_2
 - 15%
- **3.** India: 2.6 billion tCO₂
 - 7%
- 4. Russia: 1.7 billion tCO₂
 5%
- **18. UK**: 370 million tCO₂
 - 1%
- **73.** Ireland: 37 million tCO₂
 - 0.1%

Per capita CO₂ emissions

Per capita CO₂ emissions, 2019 Carbon dioxide (CO₂) emissions from the burning of fossil fuels for energy and cement production. Land use change is not included. World 2.5 t 7.5 t 15 t >50 t <0t 5 t 10 t 20 t 1t No data

Source: Our World in Data based on the Global Carbon Project; Gapminder & UN Note: CO₂ emissions are measured on a production basis, meaning they do not correct for emissions embedded in traded goods. OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY



rld	•	USA:	16 tCO ₂ pp
a	•	Russia:	11.5 tCO ₂ pp
	•	Ireland:	7.6 t CO ₂ pp
	•	China:	7.1 tCO ₂ pp
	•	UK:	5.5 tCO ₂ pp

Our Wo in Dat

India: 1.9 tCO₂ pp
 But who's the highest?

• Qatar at 38.7 tCO₂ pp !!

Cumulative CO₂ emissions

Cumulative CO2 emissions

Cumulative carbon dioxide (CO_2) emissions represents the total sum of CO_2 emissions produced from fossil fuels and cement since 1750, and is measured in tonnes. This measures CO_2 emissions from fossil fuels and cement production only – land use change is not included.



Source: Our World in Data based on the Global Carbon Project

OurWorldInData.org/co2-and-other-greenhouse-gas-emissions/ • CC BY

Our World in Data



- 1. USA: 400 GtCO₂ (25%)
- 2. EU-28: 370 GtCO₂ (22%)
- 3. China: 230 GtCO₂
- 4. Russia: 115 GtCO₂
- 5. Germany: 92 GtCO₂
- 6. United Kingdom: 78 GtCO₂

Where do GHG emissions come from?



- Industry 29.4%
- Agriculture & Forestry 21.1%
- Buildings 17.5%
- Transport 16.2%



What causes climate change?

- CO₂ (carbon dioxide)
- CH₄ (methane)
- N₂O (nitrous oxide)
- SF₆ (sulphur hexafluoride)
- HFCs (hydrofluorocarbons)
- PFCs (perfluorocarbons)
- (NF₃ nitrogen trifluoride)
- Kyoto Protocol 'Basket' of 6 GHGs
- Limit warming to 2°C above preindustrial levels, if not 1.5°C





Taking action: Governments

The Law!

- UK Climate Change Act target of 100% reduction by 2050 – 'net zero'
- Scotland has legislated to hit net-zero by 2045
- Wales' target to reduce by 95% by 2050 but aiming for net zero
- Ireland has legislated to hit net-zero by 2050
- New intermediate target for UK of 78% by 2035 vs 1990 baseline



Source: BEIS (2020) Provisional UK greenhouse gas emissions national statistics 2019; CCC analysis Notes: Emissions shown include emissions from international aviation and shipping (IAS) and on an AR5 basis, including peatlands. Adjustments for IAS emissions to carbon budgets 1-3 based on historical IAS emissions data; adjustments to carbon budgets 4-5 based on IAS emissions under the Balanced Net Zero Pathway.



UK Gov't PPN06/21: 5th June 2021 Carbon Reduction Plans

- Bidders for any contract over £5m ex VAT per year from Central Government, their Executive Agencies and NDPBs
- Contractors will have to provide a carbon reduction strategy confirming their commitment to achieving Net Zero by 2050 in the UK
- Covers Scope 1, 2 and certain Scope 3 (Upstream transportation & distribution, Waste generated in operations, Business travel, Employee commuting, Downstream transportation & distribution)
- From 30th September 2021
- Plans for an 'embodied carbon law': The Carbon Emissions (Buildings) Bill, and Part Z of Building Regulations

Cabinet Office

Procurement Policy Note – Taking Account of Carbon Reduction Plans in the procurement of major government contracts

Action Note PPN 06/21

05/06/2021

Issue

1. The UK Government amended the Climate Change Act 2008¹ in 2019 by introducing a target of at least a 100% reduction in the net UK carbon account (i.e. reduction of greenhouse gas emissions², compared to 1990 levels) by 2050. This is otherwise known as the 'Net Zero' target. This Procurement Policy Note (PPN) sets out how to take account of suppliers' Net Zero Carbon Reduction Plans in the procurement of major Government contracts.

Dissemination and Scope

2. This PPN applies to all Central Government Departments, their Executive Agencies and Non Departmental Public Bodies. These organisations are referred to in this PPN as 'In-Scope Organisations'. Please circulate this PPN within your organisation, drawing it to the attention of those with a commercial and procurement role.

3. In-Scope Organisations should take action to apply this PPN when procuring goods and/or services and/or works with an anticipated contract value above £5 million per annum³ (excluding VAT) which are subject to the Public Contracts Regulations 2015 save where it would not be related and proportionate to the contract.

4. This PPN applies to framework agreements and dynamic purchasing systems only where it is anticipated that the individual value of any contract to be awarded under the







-++++++ X-

Taking action: Industry

Construction Leadership Council – 9th March 2021

Transport

- 1. Zero emission vehicles and onsite plant
- 2. Modern methods of construction, improved logistics, reducing waste and transport
- 3. Connection with low carbon transport

Buildings

- 4. Retrofitting to improve energy efficiency of the existing housing stock
- 5. Low carbon heat solutions in buildings
- 6. Enhance the energy performance of new and existing buildings with monitoring

Construction activity

7. Carbon measurement to support quantifiable decisions to remove carbon

8. Become world leaders in designing out carbon, developing capability of designers and construction professionals to develop designs in line with circular economy – reducing embedded and operational carbon, shifting commercial models to incentivise and reward measurable carbon reductions.

9. Develop innovative low carbon materials (prioritising concrete and steel), as well as advancing low carbon solutions for manufacturing production processes and distribution.

theconstructionindex	0 V In Construction News Fri March 12 2021				
THE Construction Search Engine	Search 37,776 articles	News	GO		
onstruction News - Hot Topics -	 Contract News & Leads < Plant & Equipment News < Data News < Features Jobs 	TV Magazine App	s Podcast Media Pack		

Leadership council formulates carbon reduction strategy

© 3 days The Construction Leadership Council has published a plan to reduce carbon across the construction sector, from manufacturing and design to construction and operation of assets.



Construct Zero proposes a nine-point plan to reduce carbon and help the construction industry to play its part in delivering the UK government's objective of net zero for the whole economy by 2050.

The Construct Zero initiative – or CO2nstruct Zero as the organiser prefer to style it – does not set out to offers new solutions but instead brings together existing initiatives from various corners of the industry, consolidating it into collective action.

Overall UK emissions of CO_2 have been calculated at 537 million tonnes in 2018. There are three areas, collectively representing 43% of the total, that are relevant to the construction sector: transport, buildings and construction activity.

Based on these areas, the Construction Leadership Council (CLC) has used the Climate Change Committee's 6th Carbon Budget to determine nine

priorities:



Scale of the issue for Infrastructure



1.2 The impact of infrastructure is projected to increase from 53 per cent of UK emissions in 2010 to over 80 per cent of the carbon reduction target in 2025, and rising again to 90 per cent



Infrastructure Carbon Review

- This report makes clear **that reducing carbon reduces costs.** It is part and parcel of saving materials, reducing energy demand and delivering operational efficiencies
- 53% of UK emissions from infrastructure
- 1/3 of which we can control
- 2/3 we can influence
- CapCarb rising in relation to OpCarb

November 2013



Progress decarbonising the UK's Grid

- Significant progress to reduce carbon intensity of the UK's grid electric
- Reduced by 67% since 1990. Why?
- Two big reasons
- 'Dash for gas' in 1990's (less coal)
- Five-fold increase in renewable energy production since 2010: on- & offshore wind, solar PV, and biomass

GHG Emissions from UK Grid Electric, in kg CO2e / kWh





UKGBC Framework Definition of a Net Zero Carbon Building

Net zero carbon – construction: "When the amount of carbon emissions associated with a building's product and construction stages up to practical completion is zero or negative, through the use of offsets or the net export of on-site renewable energy."

Net zero carbon – operational energy: "When the amount of carbon emissions associated with the building's operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset."



Net Zero Carbon Buildings: A Framework Definition





But, still, why should we...?

- Reporting for compliance
- Reduced risk of energy security
- Stay ahead of regulation
- Identify hotspots to make carbon reductions and cost savings
- Improve reputation
- Meet stakeholder/client demands
- Win new work
- Become a market leader
- Which all means data accuracy...







Where does carbon come from and how can we reduce it...?with jargon explainer





Sources of Carbon Emissions from your Organisation

Your Suppliers	Your Business	Your Client
 Materials, goods and services, Capital goods 	• Fuel and energy in company facilities	 In-use emissions from running the building / asset;
 Delivery 	Vehicles and plant.	End-of-life treatment
 Utilities: electricity, waste and water 	 Chemical / biological processes, and 	Downstream distribution
Business travel	Fugitive emissions	
"Embodied" Carbon "Capital" Carbon - CapCarb	"Operational" Carbon - OpCarb	"End User" Carbon UseCarb
Upstream	Company	Downstream

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What can we do about it?

Mitigation

- Sustainable transportation
- Energy conservation
- Thermal mass / sinks for temperature regulation
- Insulation and heat recovery systems
- Renewable energy
- Energy & carbon efficient materials and products
- Improve vehicle fuel efficiency
- Capture and use landfill & digester gas

Adaptation

- Geothermal
- Green roofs
- Solar thermal
- District heating
- Building design for natural light & ventilation
- Tree planting & care
- Water harvesting & conservation
- Local food production

- Infrastructure upgrades: SUDS, sewers & culverts
- Residential programs: sewer backflow & downspout disconnection
- Health programs and help for vulnerable people
- Emergency & business continuity planning
- Coastal and river bank protection and flood plain maintenance









Mitigation: the globally responsible thing to do

Actions that reduce the emissions that contribute to climate change.

Adaptation: the locally responsible thing to do

Actions that minimize or prevent the negative impacts of climate change.



Carbon Reduction Actions

Avoid energy and carbon where possible, e.g.

- Teleworking and conferencing
- Passive design to reduce energy demand

Use more efficient equipment and transport, e.g.

- Invest in energy-efficient equipment, e.g. lighting, plant & equipment, HVAC, IT
- Upgrade fleet to Euro 6 and plant to NRMM Stage V. Go further to electric / hybrid. Air quality benefits

Consider the materials you are using, e.g.

- Take an eco-design approach to enable easier maintenance, repair and upgrade
- Use less material in absolute terms work with design and procurement teams
- Switch to alternative materials with lower embodied carbon impacts: innovation
- Increase reusable items and the recycled content of materials engage suppliers

Improve behaviours and systems , e.g.

- Energy Management Systems and automatic switches & sensors
- Offsite and lean construction
- Train colleagues and suppliers in how to use equipment efficiently:
 - Choose the right equipment for the job don't overspec ٠
 - Use correct power modes including in low / eco power modes
 - Turn off equipment that's not being used. Avoid machine idling

Switch to low and zero energy sources

- Make use of renewable power sources, such as GSHP/ ASHP, solar
- Low and zero carbon fuels: HVO, electric for vehicles



























Use the Carbon & Energy Hierarchy





REDUCE: use less by smart design, more efficient equipment, less materials, and better behaviours

SWITCH to low carbon and renewable sources of energy and materials

COMPENSATE/ REMOVE the residual remaining emissions when all other actions have been taken



Get a Carbon Reduction Strategy



Goal and Scope

Agree the aim and set boundaries, base year and targets



Measure

Measure your footprint, identify hotspots and agree action plan



Reduce

Implement reduction actions, on hotspots first and then other aspects, using carbon hierarchy, and measure the reductions





Remove residual GHG emissions, but only after other actions have been taken



Report

Disclose your emissions and reduction actions. Follow up with revising and continual improvement



Case Study – The Forge (105 Sumner St): Landsec

- 139,000 sq ft office development in Southwark
 - Aims to be first commercial building constructed and operated in line with UKGBC's net zero carbon buildings framework
 - Work on both supply chain scope 3 emissions, and operational use
 - Using a platform-led approach to design & construction: P-DfMA, consists of a set of components that can be combined to produce highly customised structures



- The trial had positive results compared to a traditional construction site and techniques:
 - Construction productivity improved by 55%; Installation time 30% less; the final build achieved 33% cost savings
 - Final structure uses less material and less waste, and has an almost 20% reduction in embodied carbon
 - Further savings made in specifications, including high levels of recycled content and cement replacement in the main building materials.
 - Passive design techniques to reduce the energy demand, air source heat pumps for heating and cooling, and solar PV for electricity. Once in operation, these will be run on a 100% renewable electricity tariff.

https://www.futureoflondon.org.uk/2020/11/23/achieving-net-zero-case-study-zero-carbon-commercial-development/ https://www.youtube.com/watch?v=NQjcvSFU8Wk



How do you compare?...




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Which is better for carbon, travelling by train or plane for the same distance?



But how much better is the train, in percentage terms? → Menti!



Train vs Plane

Train lower impact per passenger.km

Comparison	Rail: Oxford to Glasgow 497km	Air: Brum to Glasgow, 418km			
Cost for return ticket	£153	£215			
Time	5h 30	4h estimated: 1h15 train Oxford to Brum Intl, 1h check in & wait time in airport, 1h15 flight, 0h30 to leave airport			
Carbon emitted (per passenger)	22 kgCO2e \rightarrow 80% less than by air	132 kgCO2e			
Saving for Rail	103 kgCO2e, or 82% less impact than flying; £60 or 29% cheaper	Approx. 1h30. But, you can work more effectively on a long distance train than in airport and on plane			



Which is better for carbon, the plastic bag or the cotton bag, for the same volume?



But how often do you need to use the cotton bag for a lower footprint than a plastic bag? → Menti!



Plastic vs Paper vs Cotton

Type of bag	HDPE bag (No secondary reuse)	HDPE bag (40.3% reused as bin liners)	HDPE bag (100% reused as bin liners	HDPE bag (Used 3 times)
Paper	3	4	7	9
LDPE 'bag for life'	4	5	9	12
Non-woven PP	11	14	26	33
Cotton	131	173	327	393



Break for Tea – back in 10 mins





What is Carbon Footprinting?

"Commonly used to describe the total amount of CO_2 and other greenhouse gas (GHG) emissions attributable to an organisation, project or product."



The Footprinting Process: Data Collection & Analysis





The GHG Protocol

Accounting and Reporting of 6 greenhouse gases (Kyoto Protocol)

GHG inventory using standardised approaches and principles

Develop an effective strategy to manage and reduce GHG emissions

Consistency and transparency in GHG Accounting and Reporting

Construction-specific GHG Protocol - Encord



The Greenhouse Gas Protocol

A Corporate Accounting and Reporting Standard REVISED EDITION



WORLD RESOURCES



Organizational Boundaries: Consolidation approaches

- Equity share approach
- Control approach
 - Financial control
 - Operational control





A Corporate Accounting and Reporting Standard REVISED EDITION



WORLD RESOURCES



• Equity share

- Under the equity share approach, a company accounts for GHG emissions from operations according to its share of equity in the operation.
- The equity share reflects economic interest, which is the extent of rights a company has to the risks and rewards flowing from an operation.







• Financial control

- Under the financial control approach, a company accounts for 100% of the GHG emissions over which it has financial control.
- It does not account for GHG emissions from operations in which it owns an interest but does not have financial control.







Operational control

- Under the operational control approach, a company accounts for 100% of the GHG emissions over which it has operational control.
- It does not account for GHG emissions from operations in which it owns an interest but does not have operational control.







Example



Biz Units	Structure	Equity	Control
Construct UK	Incorporated Company	100%	OC 100% FC 100%
Aufbau GmbH	Incorporated Company	80%	OC 100% FC 100%
HausBau	Subsidiary of Aufbau GmbH 75% owned	60%	OC 100% FC 100%
Construire SrL	Non-incorporated Joint Venture	33%	OC 0% FC 33%



Operational Boundaries – Scopes



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- Direct emissions are emissions from sources that are owned or controlled by the reporting company
- Indirect emissions are emissions that are a consequence of the activities of the company but occur at sources owned or controlled by another company

The links between Scope 1, 2 and 3 carbon emissions in the Supply Chain



Scope 1 – Direct Emissions from owned or controlled sources

Scope 2 – Indirect emissions from generation of purchased energy

Scope 3 – All other indirect emissions that occur in a company's value chain



Set your Boundaries for your Organisation

Your Suppliers

- Materials, goods and services,
- Capital goods,
- Delivery
- Utilities: electricity, waste and water
- Business travel

"Embodied" Carbon "Capital" Carbon - CapCarb

"Upstream Scopes 2 & 3 (Indirect)







Your Business

- Fuel and energy in company facilities
- Vehicles and plant.
- Chemical / biological processes, and
- Fugitive emissions

"Operational" Carbon - OpCarb

Company's Scope 1 (Direct)



Your Client

- In-use emissions from running the building / asset;
- End-of-life treatment
- Downstream distribution

"End User" Carbon UseCarb

Downstream Scope 3 (Indirect)







Product Boundaries





Where does Activity Data come from





Where does Activity Data come from



Kinds of Data

- Litres of fuel (diesel, LPG...)
- Litres of refrigerant
- kWh of electricity
- Mileage travelled
- Tonnes, m³ of materials

Where the Data is

- Fleet
- Estates
- HR / Travel agent
- Procurement
- Suppliers



How to calculate a carbon footprint



- KgCO₂e ("equivalent") takes into account all the main GHGs emitted: CO₂, CH₄ and N₂O, etc.
- Think about units of measurement and converting between them: factors of a thousand



Some Fundamentals- Emissions Factors Comparing Power Sources and Modes of Travel





Some Fundamentals- Emissions Factors Comparing Materials





Some fundamentals – Global Warming Potentials: GWP

- It's all relative...
 - CO₂:1
 - CH₄:28
 - N₂O: 265
 - SF₆: 23,500
 - HFCs: 4 12,400
 - PFCs: 6,630 11,100
 - NF₃: 16,100
 - Expressed as "tonnes of CO₂ equivalent"; tCO₂e







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Open Mentimeter – a test on scopes

- 1. Go to <u>www.menti.com</u> in a new browser or tab on your phone or computer, *ideally Chrome or Firefox rather than Edge, or download the app.*
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Primary Activity Data Sources

Sources of Data – Quantities (tonnes, m³, etc.)





Challenges in Carbon Footprinting





Exercise 1: Calculate the carbon footprint for your organisation or site

Use the data provided to calculate the carbon footprint of your site's activities:

- Fork lift trucks
- Electricity for your offices / site welfare
- Diesel for outsourced delivery logistics
- List it as scopes 1, 2 and 3 and the overall total
- Time: 10 mins
- Nominate a spokesperson









And the answers are...

- Scope 1 389 kg CO2e
- Scope 2 1,168 kg CO2e
- Scope 3 2,512 kg CO2e
- Total 4,069 kg CO2e





Resources Guidance – Free Carbon Data and Tools

- **Defra/BEIS 2021 Greenhouse gas reporting conversion factors :** the UK Government's database of carbon factors for fuel, energy, transport, and materials, updated annually. <u>https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021</u>
- Bath Inventory of Carbon and Energy (ICE) database: a well-established database of embodied carbon factors for a variety of materials, updated periodically. <u>http://www.circularecology.com/embodied-energy-and-carbon-footprint-database.html</u>
- Supply Chain School Carbon Calculator: a free tool from the School to measure scope 1, 2 and 3 emissions in your supply chain. https://carbon.sustainabilitytool.com/
- The Embodied Carbon in Construction Calculator (EC3) Tool: a database of EPDs for construction products <u>https://buildingtransparency.org/ec3</u>
- Carbon Trust Carbon Calculator for SMEs: The Carbon Footprint Calculator has been designed to help UK based SMEs measure their corporate emission footprint following GHG Protocol Guidance, including direct emissions from fuel and processes (Scope 1 emissions) and those emissions from purchased electricity (or Scope 2 emissions) for the assets they operate https://www.carbontrust.com/resources/tools/carbon-footprint-calculator
- Highways England Carbon Tool: a free-to-download Excel tool to calculate carbon emissions for operational, construction and maintenance activities undertaken on behalf of Highways England that draws on Defra and Bath ICE datasets www.gov.uk/government/publications/carbon-tool
- The RSSB Rail Carbon Tool is a web-based tool that allows you to calculate, assess, analyse, report and reduce your rail project carbon footprint by evaluating low-carbon options using verified, centrally-available carbon factor data that draws on Defra and Bath ICE datasets <u>https://www.railindustrycarbon.com/</u>
- Environment Agency Carbon Calculator: a free-to-download tool to calculate the carbon impact of different material and transport options in your project www.ice.org.uk/knowledge-and-resources/best-practice/environment-agency-carbon-calculator-tool
- Hawkins\Brown: Emission Reduction Tool \. An open source Revit-based tool that enables design teams to quickly analyse and clearly
 visualise the embodied carbon emissions of different building components and construction material options at any time during the design
 process. https://www.hawkinsbrown.com/services/hbert



Introduction to relevant standards

PAS 2080: 2016

0 0 Ň AS2080:

Management of carbon reduction across infrastructure value chain

Determining baselines, establishing metrics and setting targets

Selecting carbon emissions quantification methodologies

Reporting at appropriate stages & visibility of performance

Continual improvement of management and performance

PAS 2080:2016

Carbon Management in Infrastructure



Leadenthip The Green Construction Board

bsi.



Environmental Product Declarations: EPDs

A summary of the costs and environmental impacts from the manufacture and expected use of a product





ENVIRONMENTAL PRODUCT DECLARATION



Magnitude is up to 40% more efficient than standard centrifucal chiller and can save up to \$4 million over the life of the chiller. Facility managera can count on their chillers running at peak efficiency year after year with a dezign that wipee out the risk of contamination from efficiency-robbing oil buildup on to heat-transfer surfaces.





DAIKIN

Daikin Applied, a member of

manufactures technologically

advanced commercial HVAC

with confidence that they will

Magnitude magnetic bearing

VA, define industry leading

the right thing to do for our customers, our community, the

a difference in sustainable initatives. For more information visit www.DaikinApplied.com

of Daikin technology Daikin Applied is committed to

experience outstanding

effciency.

world. Customers turn to Daikin



EPD for Oriented Strand Board

1 of 14



ISO 13709 (API 610) type BB3 axially split, opposed impeller, dual volute, horizontal multistage pump Rated pow 2,500 kW Manufacturer: Sulzer Pumps USA

MSD Process Pump The pump characterised in this EPD is inherently

configurable. Configuration and efficiency depends on customer specification. The data given below are illustrative and only valid for the defined parameters (see chapter *Life cycle - coverage, assumptions, and exclusions") Oil & Gas, Hydrocarbon Processing, Power Generatio

and Waste Water Industries. The fluids pumped includ hydrocarbons, crude charge, boiler feed, water feed an

CPC classificat

waste water

Pump including casing, baseplate, shaft, impeller, bearings Gearbox Motor Frequency inverter Piping syste Electricity mix considered for usage: USA

SULZER

Key economic and environmental advantage

- High availability of more than 98% (Customers typically buy two pumps for each service one is standby)
- Design life of the pump is 20 years in accordance with API 610.
- High efficiency and improved seal technology means lower energy consumption and hence lower emission

Environmental Product Declaration - EPD

Environmental and economic life cycle performance including climate-related data

- · Variable frequency drives allow flexible performance and improved energy-efficiency
- · Comprehensive training and professional service enable customers to operate the pump more reliably · Retrofit service to re-establish the best efficiency point if operating conditions change
- Common API 610 materials are well suited for recycling.

Key economic and environmental indicators over life-cycle of 20 years



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Environmental Product Declarations: EPDs

A summary of the costs and environmental impacts from the manufacture and expected use of a product



Magnitude is up to 40% more efficient than and can save up to \$4 million over the life o managers can count on their chillers runnin after year with a design that wipes out the n efficiency-robbing of buildup on to heal-trar

bre

LCA Results

The results for the declared unit of 1 tonne of BDA average UK brick can be found below. As the average brick is assumed by the BDA to have a mass of 2.13 kg, results can be calculated per average brick by dividing individual values in results tables by a factor of (1000 / 2.13).

(MND = module not declared; MNR = module not relevant; INA = indicator not assessed; AGG = aggregated)

arameters describing environmental impacts									
	(GWP	ODP	AP	EP	POCP	ADPE	ADPF
			kg CO ₂ equiv.	g CFC 11 equiv.	kg SO ₂ equiv.	kg (PO ₄) ³⁻ equiv.	kg C₂H₄ equiv.	kg Sb equiv.	MJ, net calorific value.
oduct stage	Raw material supply	A1	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Transport	A2	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Manufacturing	A3	AGG	AGG	AGG	AGG	AGG	AGG	AGG
	Total (of product stage)	A1-3	213	1.85e-5	3.49	0.107	0.177	1.24e-4	2370
onstruction ocess stage	Transport	A4	8.026	1.48E-06	0.027	7.08E-03	4.68E-03	2.11E-05	121.2
	Construction	A5	11.466	1.08E-06	0.177	6.07E-03	9.31E-03	8.41E-06	130.9
	Use	B1	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Maintenance	B2	MNR	MNR	MNR	MNR	MNR	MNR	MNR
	Repair	B3	MNR	MNR	MNR	MNR	MNR	MNR	MNR

xe including climate-related data

SULZER



ing casing, baseplate, shaft, impeller, bearings
Motor Frequency inverter Piping syste
sidered for usage: USA

th service - one is standby) In and hence lower emission lency the pump more reliably thance





Business Reality

National Grid

"One idea that's really worked is the start of a 5% carbon weighting on our new construction projects.

We're saying to our suppliers that if you can design a lowercarbon solution you stand a better chance of winning our business."







National Grid Example



New electricity substation at Wimbledon



Smarter thinking on design and use of materials



Calculated carbon savings of 20% across the asset's life, equivalent to about 39,000 tCO2



Saved £3 million in costs compared with the original design

"By having clear data on carbon emissions, we can use energy and resources more efficiently. We've been able to prove the business case that lower carbon can equal lower cost"



Exercise 2: Calculate the carbon footprint of concrete

Use the data in the hand-out

Look at the conversion factors:

- Aggregates
- Cement

Calculate answers Time: 10 mins




And the answers are...

• 67.7 kg CO2 per tonne

or

• 148.8 kg CO2 / m3





Carbon Reduction Actions – at Home

At home

- Keep an eye on the thermostat wear a jumper in winter!
- Insulate your house: attic, walls, windows and doors
- Switch to a provider of renewable energy such as SSE Airtricity, OVO, Good Energy or Ecotricity
- Use your equipment as efficiently as possible eco modes

Diet

- Eat less meat and dairy; try other options
- Reduce food waste only buy and cook what you need
- If you can, compost any food waste you do make

Travel

- Work from home, if you can, even if only part of the week
- Get public transport as much as you can
- Use a more efficient car better mpg, or hybrid or even EV!
- Drive more smoothly and maintain your car
- Fly less often get the train where you can: New network of sleeper trains planned: <u>https://www.theguardian.com/travel/2021/jun/22/new-network-of-european-sleeper-overnight-trains-planned</u>

At the shops

- Buy efficient equipment that can be maintained for a long lifetime, e.g. washing machine
- Don't always buy the latest model think of the materials and waste as well as carbon
- Resist fast fashion put it in the wardrobe and the fashion will come around again in 25 years!
- Avoid unnecessary packaging wherever you can, and recycle as much as you can











The end of the training... for now...



...but the beginning of your carbon reduction plans!....





Questions, Answers and Feedback





Thank you!

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