Llywodraeth Cymru / Welsh Government

A487 New Dyfi Bridge

Environmental Statement - Volume 3: Appendix 11.2

Carbon Briefing Note

Final Issue | 11 January 2016

Technical File Note

Project title	Carbon Briefing Note for Design Team	900237-ARP-XX-XX-FN-YE-00001 Job no 244562
Prepared by	Jessica Postance	Date 11/01/2016
Subject	Carbon Accounting – A Technical Note for the Design Team	

Carbon Footprinting Specialist
Justice Sechele
justice.sechele@arup.com
Tel 0121 213 3275

1. Carbon Accounting - What it means for the A487 New Dyfi Bridge

- The Contractor shall be responsible for providing an indicative carbon footprint of the carbon emissions associated with delivery of the Project.
  - At Key Stage 3 this includes the construction carbon footprint, also known as “Project Carbon”.
  - At Key Stage 6 this includes the operational carbon footprint - the indicative annual carbon footprint of the energy consuming network assets.
- The Contractor shall actively manage, and reduce, the carbon footprint, wherever possible.
- The Contractor shall include carbon reduction planning in their design, assessment and appraisal work on the Project and provide records for carbon accounting as appropriate for Key Stage 3, Key Stage 4 and Key Stage 6.
- Carbon reduction planning covers the proposed changes to the road network, the design and implementation of the project, waste management and the provision of any offsetting measures, which may be off-site or associated with other projects.
- Further details of the contractual requirements found in the Works Information can be found in Appendix A.

2. Introduction to Carbon Accounting – Terminology

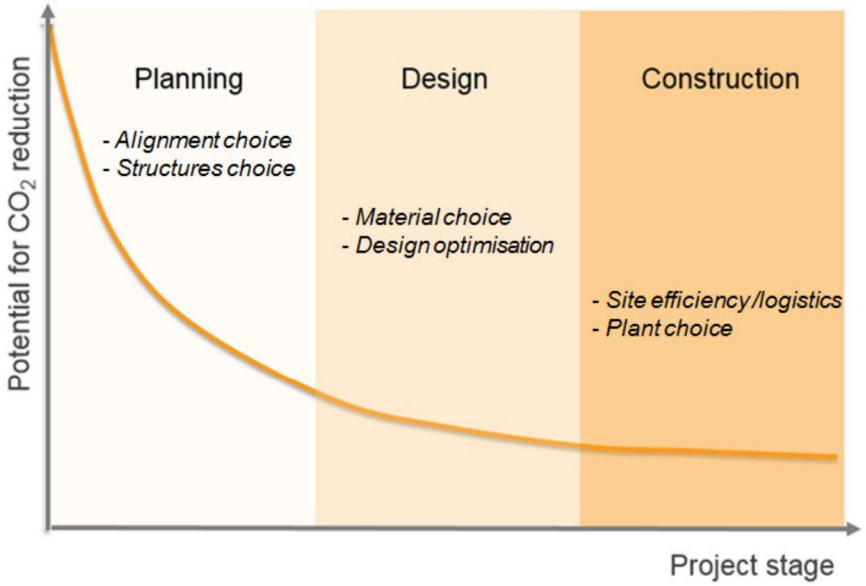
Below is a brief introduction to carbon accounting terminology to introduce and familiarise the design team with some commonly used terms.

- **Greenhouse gas** (or **GHG** for short) is any gas in the atmosphere which absorbs and re-emits heat, and thereby keeps the planet’s atmosphere warmer than it otherwise would be. There are six main greenhouse gases which cause global warming and are limited by the Kyoto protocol. Each gas has a different global warming potential. The six regulated gases are Carbon dioxide (CO_2), Methane (CH_4), Nitrous oxide (N_2O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF_6).
- **Carbon footprint** - The total set of greenhouse gas emissions caused directly and indirectly by an individual, organisation, event or product. Carbon footprints are typically calculated to include all greenhouse gases and are expressed in tonnes of CO_2 equivalent (tCO_2e)
- **Carbon dioxide** (**CO_2**) - the most common GHG emitted by human activities, in terms of the quantity released and the total impact on global warming.

- **Carbon dioxide equivalent** or "**CO_2e**" is a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2e signifies the amount of CO_2 which would have the equivalent global warming impact.
- **Embodied carbon** – the amount of carbon released from material extraction, transport, manufacturing, and related activities. This may be calculated from cradle to (factory) gate, cradle to (installation) site, or (ideally) from cradle to grave.
- **Carbon Emission Factor** – a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.

3. Carbon Reduction during the Project Life Cycle

Opportunities for greater carbon reduction are present at the early stages of a project as shown by the graph below. As we are now in the design phase, it is critical the design is optimised to reduce the carbon footprint.



4. Carbon Reduction Plan at Key Stage 3

- The design team must work with the carbon accounting specialist to identify **the most significant cost-effective opportunities** to reduce the embodied carbon emissions associated with the Scheme.
- Reductions (or increases!) in **plant, materials, labour and transport** resulting from changes to the tender design will be estimated to quantify the carbon in terms of CO_2e.
- The carbon accounting specialist will report actions and outcomes as part of the Carbon Report.

5. Generic Carbon Calculation Approach

- To calculate the carbon footprint, measures of plant, materials, labour and transport are converted into CO_2e by using standard emissions factors.
- For example:

Measure of activity	**X**	**Emission Factor**	**=**	**Tonnes CO_2e**
1000 litres of petrol	X	2.315kg CO_2/litre	=	2.315 Tonnes CO_2e

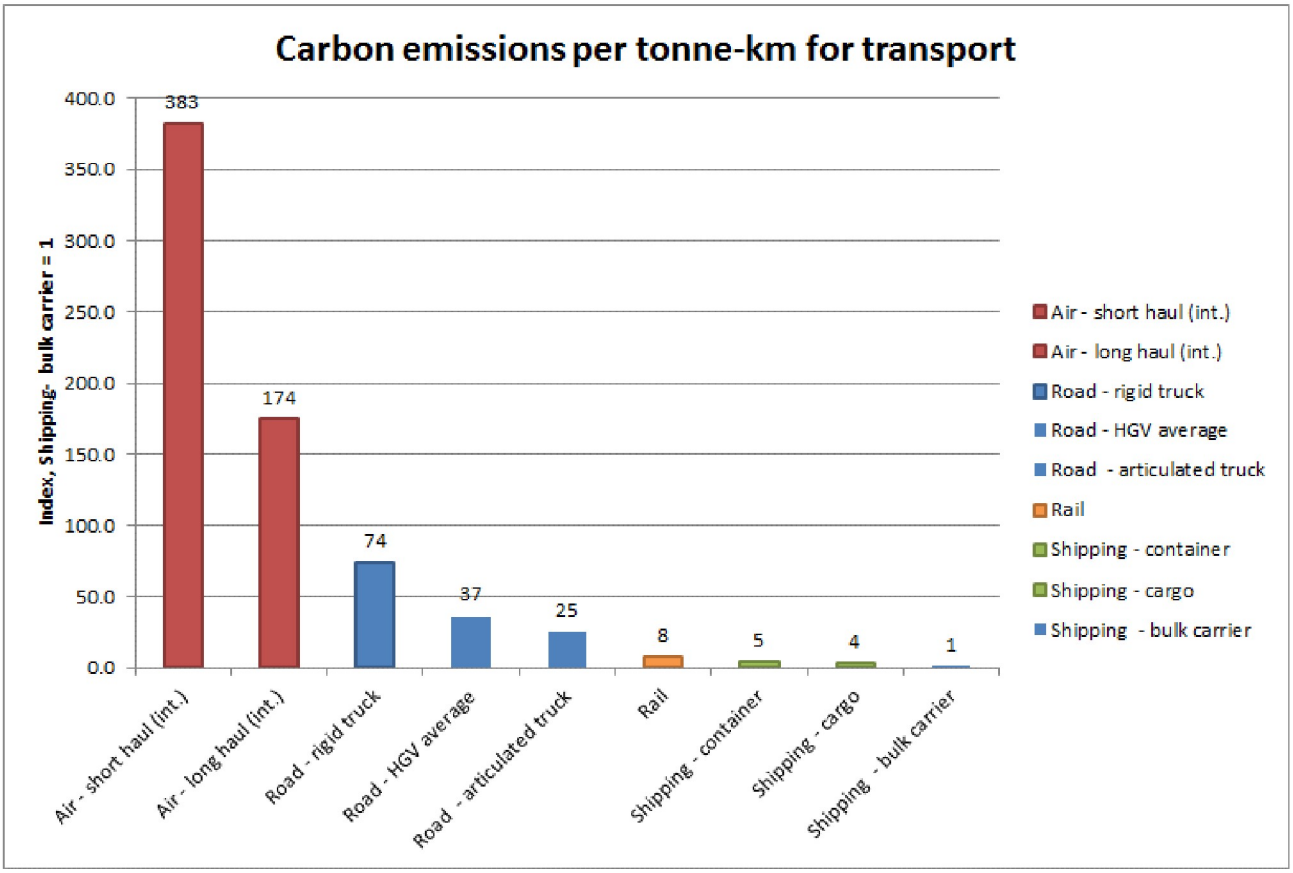
6. Types of action the design team should consider and record

- The table provides examples of carbon saving actions which could be considered for the Scheme.

Carbon saving action	Example
Using less materials	
More efficient design	Make the most of in-situ materials
Change the specification of elements	Reducing the thickness of carbon-intensive asphalt layers by using hydraulically bound mixtures in the bases and sub-bases
Design for less waste on site	Cut wastage rates on the top 10 materials from baseline to good practice
Design for off-site construction to benefit from lower wastage and efficient fabrication	
Using alternative materials	
Select materials with lower carbon intensities	Buy less energy-intensive materials e.g. cold-mix asphalts, cement substitutes or sustainably-sourced materials such as timber
Select reused or higher recycled content products and materials offering lower carbon intensities	e.g. reclaimed bricks, higher recycled content blocks, locally recycled aggregates
Select materials with lower transport-related carbon emissions	Locally-sourced aggregates
Select materials with high levels of durability and low through-life maintenance	
Designing and implementing energy efficient equipment	
Select most energy efficient and economically viable equipment available	e.g. LED lighting

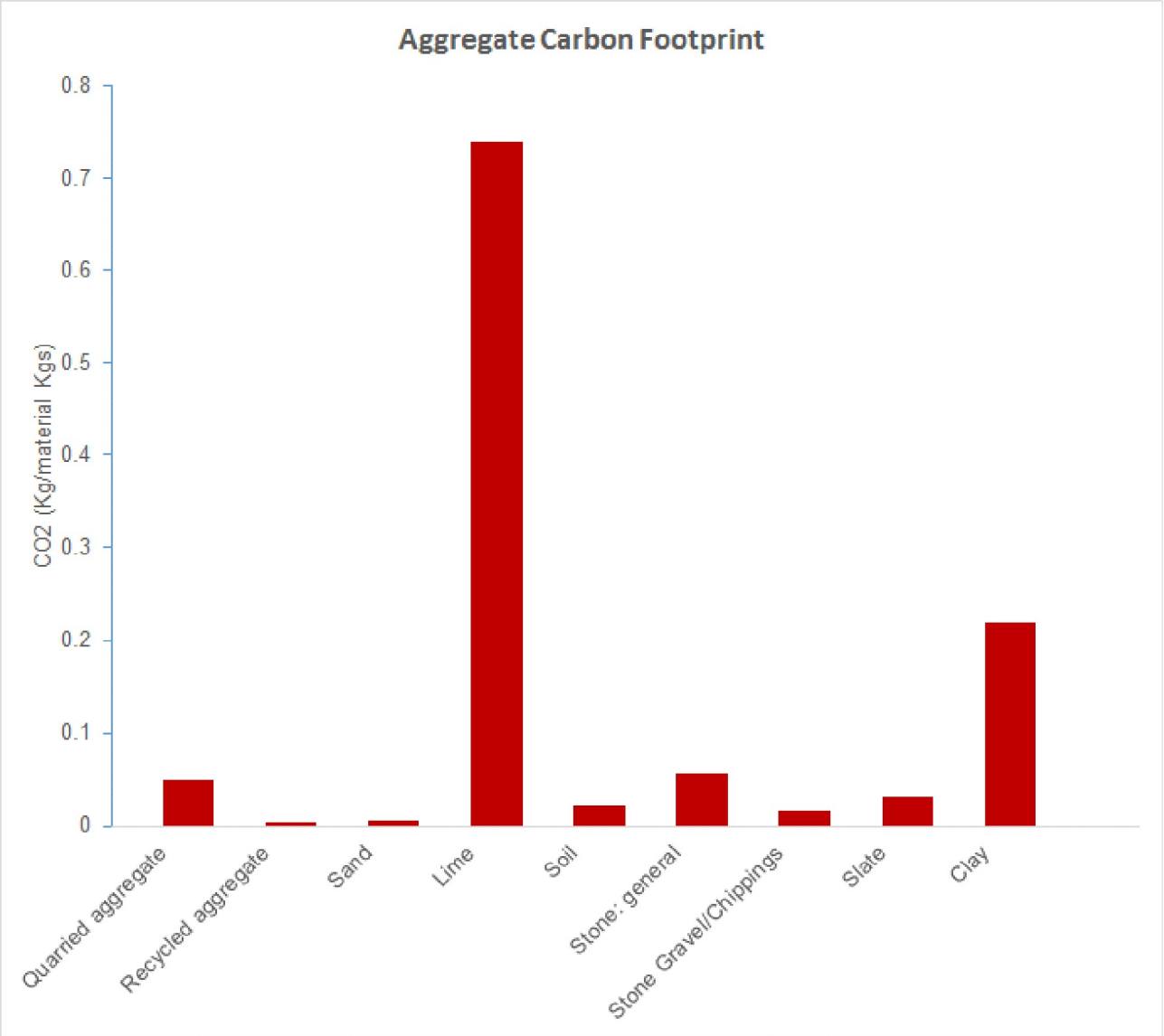
7. Transport Consideration - Comparison of Transport Options based on 1 tonne travelling 1km

- The bar chart shows how the consideration of transport for materials can impact upon the Schemes carbon footprint.
- For example, the carbon footprint of rail transport is 8 times that of shipping by bulk carrier.
- For road transport, an articulated truck is nearly a third that of a rigid truck.

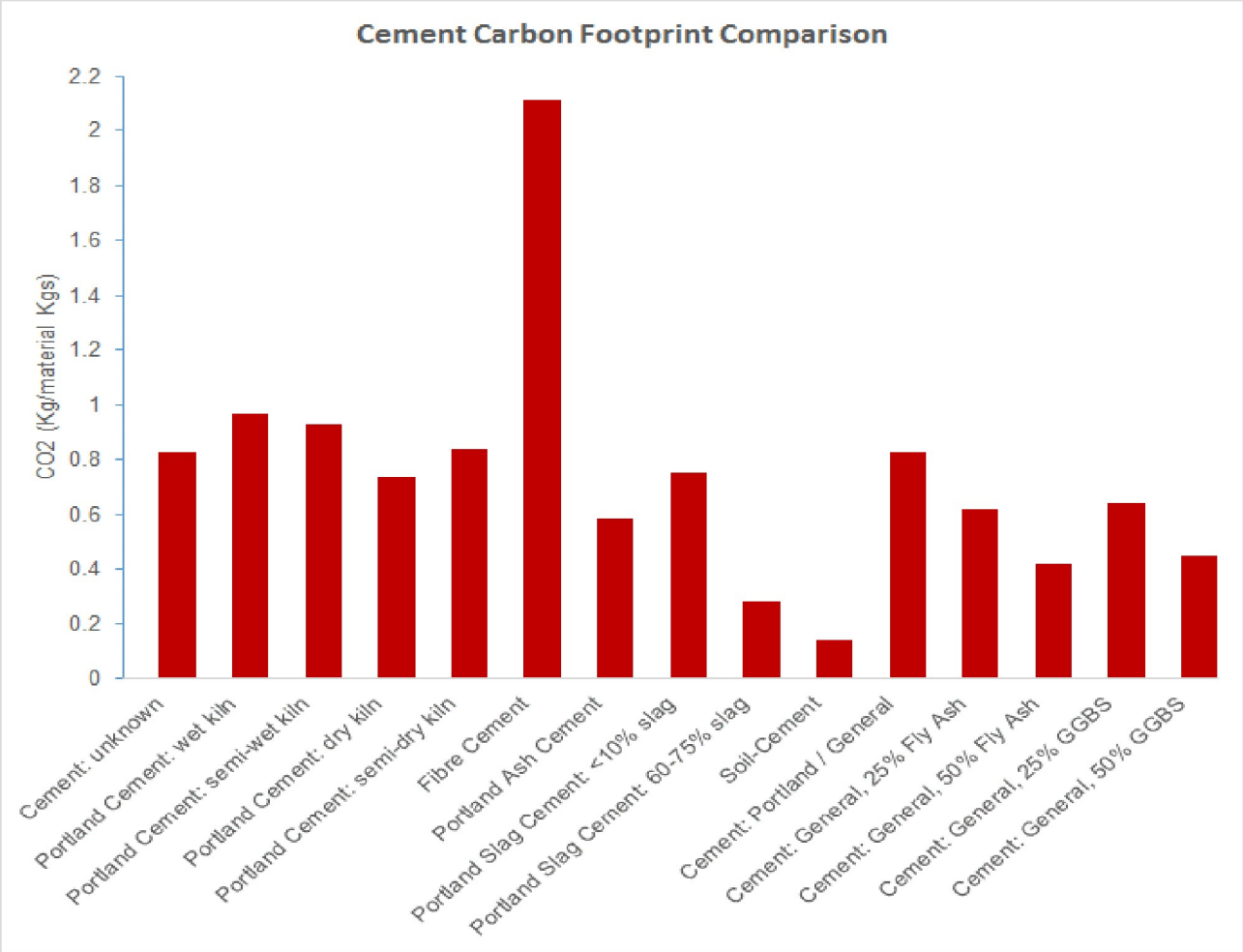


8. Material Considerations - Comparison of Different Materials Options in terms of their Carbon Footprint

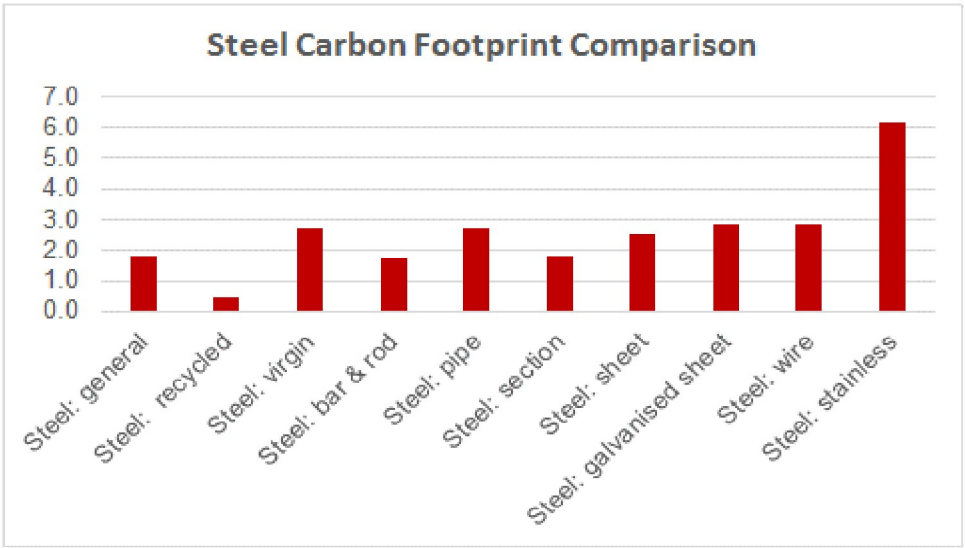
- The bar chart shows how the consideration of aggregate materials can impact upon the Schemes carbon footprint.



- The bar chart shows how the consideration of type of cement can impact upon the Schemes carbon footprint.



- The bar chart shows how the consideration of type of steel can impact upon the Schemes carbon footprint.



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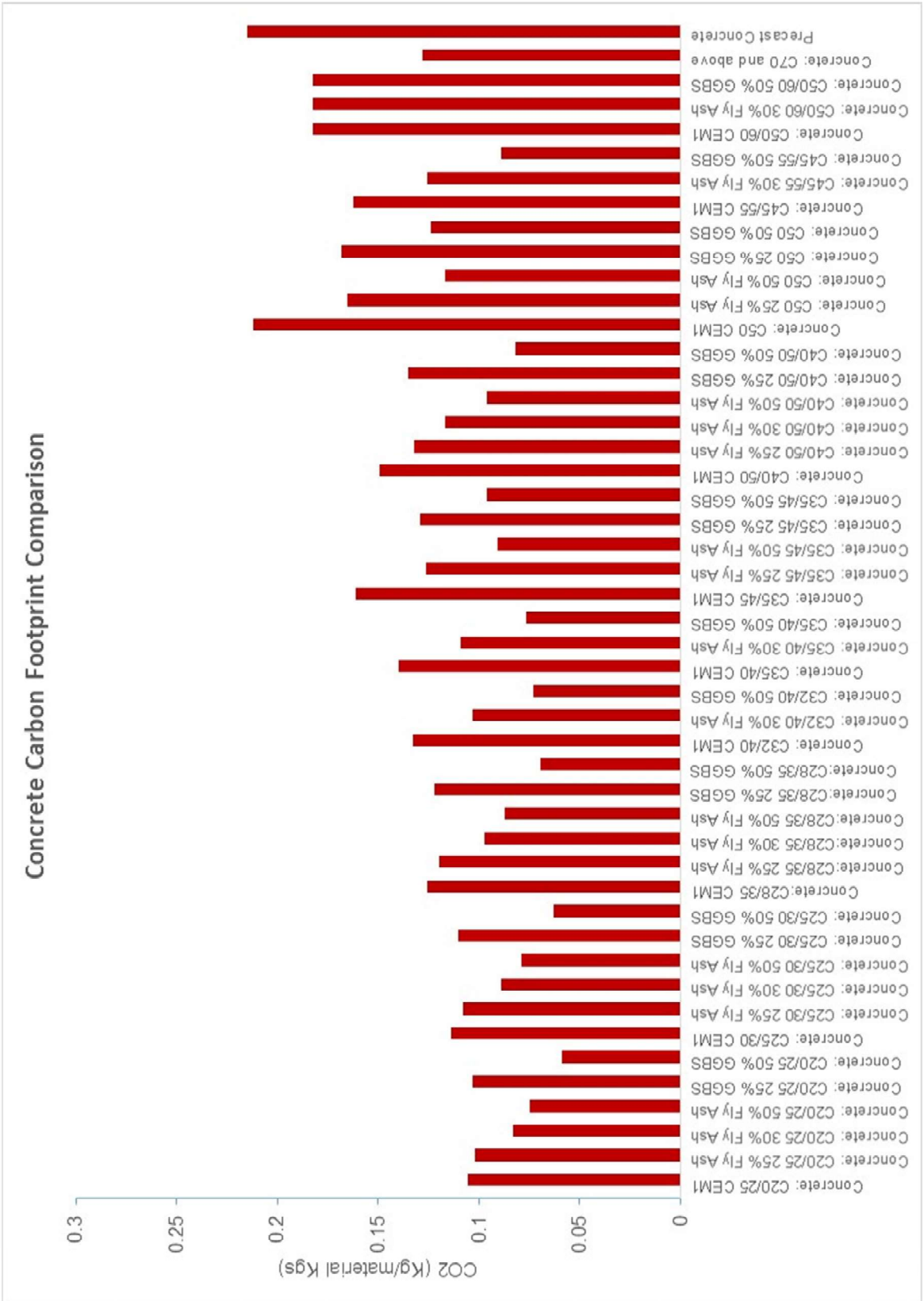
- The bar chart shows how the consideration of types of concrete can impact upon the Schemes carbon footprint.



Appendix A Carbon Accounting in the Works Information Contract

Carbon Accounting (Calculation) and Reporting

1.32.33 Project Carbon - The *Contractor* shall be responsible for providing an indicative carbon footprint to the *Employer* of the carbon emissions associated with delivery of the Project.

1.32.34 Operational Carbon - The *Contractor* shall be responsible for providing an indicative carbon footprint to the *Employer* of the carbon emissions associated with annual operations, activities & services associated with the length of network associated with the Project, once the Project is completed.

1.32.35 The *Contractor* shall actively manage, and reduce the carbon footprint, wherever possible.

4 REQUIREMENTS FOR KEY STAGE 3

4.19 Carbon Accounting (Calculation) and Reporting

Project Carbon

4.19.1 The *Contractor* shall include carbon reduction planning in their design, assessment and appraisal work on the Project and provide calculations during and/or records for carbon accounting as appropriate for Key Stage 3, Key Stage 4 and Key Stage 6. Carbon reduction planning covers the proposed changes to the road network, the design and implementation of the project, waste management and the provision of any offsetting measures, which may be off-site or associated with other projects.

4.19.2 The *Contractor* shall be required to gather information relating specifically to the main sources of CO_2 emissions produced by the Project. In broad terms, these sources include the following categories: Energy & Utilities, Materials, Transport and Waste Removal. The carbon calculation methodology for the capture of carbon emissions information shall be in a format agreed with the *Employer*.

4.19.3 The *Contractor* shall use an excel based system that calculates tonnes of CO_2 based on standard conversion factors.

4.19.4 The *Contractor* shall report the carbon emissions associated with the work they carry out on behalf of the Welsh Government. The *Contractor* shall present the data as tonnes of CO_2. The data shall be reported in a transparent manner.

In support of carbon reduction, the *Contractor* shall:

- identify methods to reduce the carbon footprint of the Project, starting at the commencement of service, and during the course of the service report to the *Employer* at the end of each key stage the practical implications of implementing the recommended actions – using the tool agreed with the *Employer* to forecast the carbon footprint and quantify potential reductions in carbon;
- work with the project team to ensure that design actions to reduce the carbon footprint are implemented;
- agree with the *Employer* the level of carbon reduction to pursue; and
- develop the carbon reduction options from an early design stage and include the carbon footprint forecasts and data on carbon reduction targets and actions.

6 REQUIREMENTS FOR KEY STAGE 6

6.5.7 **Project Carbon** - During construction, the *Contractor* shall provide quarterly returns on the carbon emissions associated with the work they carry out on behalf of the Welsh Government. The *Contractor* shall present the data as tonnes of CO2 to establish the annual and total carbon footprint of the Project. The data shall be reported in a transparent manner.

6.5.8 **Operational Carbon** - The *Contractor* shall be responsible for providing an indicative annual carbon footprint of the energy consuming network assets to the *Employer*, to enable ongoing compliance with the Carbon Reduction Commitment Energy Efficiency Scheme. The *Contractor* shall present the data in kWh and/or tonnes of CO_2.

D/1 ENVIRONMENTAL REQUIREMENTS

1.9 Carbon Management and Accounting

1.9.1 The *Contractor* shall include carbon reduction planning in their design, assessment and appraisal work on the Project, and provide calculations and/or records for carbon accounting as appropriate for Key Stage 3, Key Stage 4 and Key Stage 6. Carbon reduction planning shall cover the proposed changes to the road network, the design and implementation of the project, waste management and the provision of any offsetting measures, which may be off-site or associated with other projects.

1.9.2 The *Contractor* shall provide to the *Employer* an up-to-date inventory of all energy consuming network assets to enable an estimate of energy consumption through electrical, gas and bulk supplies during operation to be calculated. This shall include items such as street lights, lit signs, electronic signing, Intelligent Transport Systems (ITS), traffic lights, illuminated bollards and generators.

1.9.3 The inventory shall include an indicative annual operational carbon footprint to the Employer of all energy consuming network assets. The annual energy estimated consumption shall be provided in kWh and the associated carbon footprint calculated in CO_2e.

1.9.4 New lighting schemes and Intelligent Transport Systems shall only be installed where they are proven to be beneficial and required. Equipment used shall be the most energy efficient and economically viable available and shall have reduced ongoing maintenance requirements.

1.9.5 In support of carbon reduction, the Contractor shall:

- identify methods to reduce the carbon footprint of the Project, starting at the commencement of service, and report to the *Employer* at the end of Key Stage 3, Key Stage 4 and Key Stage 6 the practical implications of implementing the recommended actions;
- work with the project team to ensure that design actions to reduce the carbon footprint are implemented;
- agree with the *Employer* the level of carbon reduction to pursue – for example, new lighting schemes and ITS shall only be installed where they are proven to be beneficial and required;
- use equipment that is the most energy-efficient and economically-viable available, and that has reduced ongoing operational cost and maintenance requirements; and
- develop the carbon reduction options from an early design stage and include the carbon footprint forecasts and data on carbon reduction targets and actions.