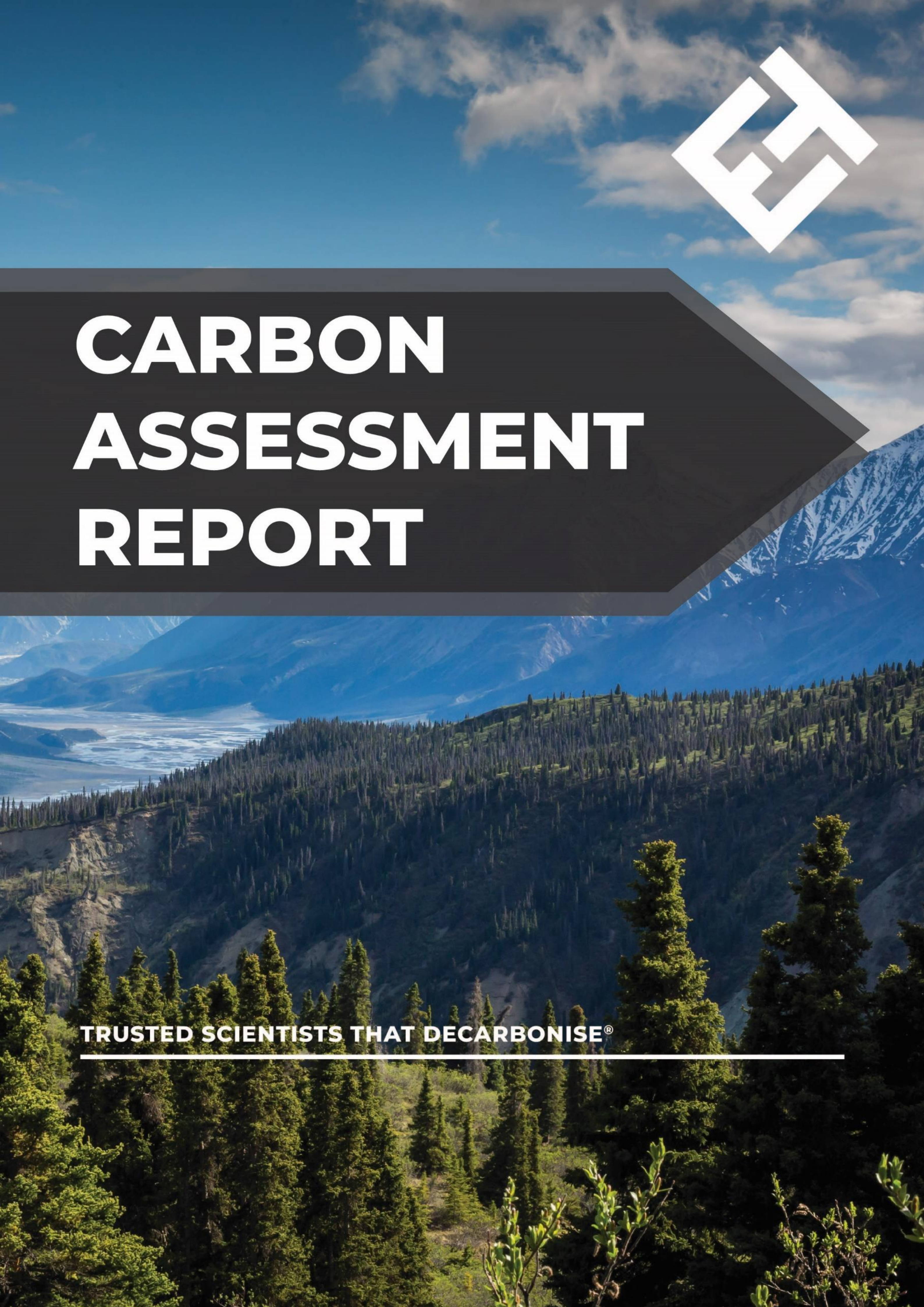

CARBON ASSESSMENT REPORT

TRUSTED SCIENTISTS THAT DECARBONISE®

CARBON ASSESSMENT REPORT

FOR

ANCHORBLOC

Contents

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Nomenclature

Nomenclature	Description
GHG	Greenhouse Gases, gases that trap heat in our atmosphere. GHG include Carbon dioxide, methane, nitrous oxides, and fluorinated gases.
Embodied Carbon / Partial Product Carbon Footprint	The total GHG emissions generated to produce a product; It includes those from extraction, manufacture, processing, transportation, and assembly of every component.
Carbon Equivalent	The effect on global warming of a greenhouse gas (GHG) relative to that of CO_2.
Zero Carbon	The absence of GHG emissions
Greenhouse Gas Protocol	The GHG Protocol Corporate Accounting and Reporting Standard which provides requirements and guidance to prepare a corporate-level GHG emissions inventory.
Net Zero Carbon (NZC)	The sum effect of combining actions to reduce GHG emissions with actions to off-set them.
Carbon Offsetting	A reduction in emissions of GHG to compensate for unavoidable emissions.
Global Warming Potential (GWP)	The heat adsorbed by any GHG as a multiple of the equivalent in carbon dioxide.
IPCC	The Intergovernmental Panel on Climate Change. It provides regular scientific assessment on climate change to policy makers.
AR6	The sixth assessment report of the IPCC. The most recent assessment report is 2021.
tCO_2e	Notation for tonnes of carbon dioxide equivalent emissions.
$kgCO_2e$	Notation for kilograms of carbon dioxide equivalent emissions.
ICE	The Inventory of Carbon and Energy.
Embodied Carbon Assessment (ECA)	Embodied carbon is the carbon footprint of a material. It considers how much greenhouse gas (GHGs) is released throughout the supply chain and is often measured from cradle to (factory) gate, or cradle to handover/site (of use).
Lifecycle Assessment (LCA)	A Lifecycle Assessment (LCA) is defined as the systematic analysis of the carbon emissions of products or services during their lifecycle.
Cradle-to-gate	A partial lifecycle of a product from raw materials through to the factory's gate.
Cradle-to-handover/site	A partial lifecycle of a product from raw materials through to delivery to the customer and does not include the end-of-life processes.
Cradle-to-grave	A full single lifecycle of a product from raw materials through to its end-of-life.
Cradle-to-cradle	A lifecycle assessment including consideration of reuse of the product or material in lieu of disposal at the end of a single life-time use. Pertains to the circular economy.

Introduction

Climate change, driven by an increase in greenhouse gases (GHGs), commonly referred to as carbon emissions, poses a significant challenge to the environment. Climate change impacts businesses, natural systems, and communities, necessitating mitigation measures at international, national, and local levels.

Tunley Environmental have conducted a cradle-to-gate life cycle assessment (Figure 1) to evaluate six AnchorBloc™ products cradle-to-gate carbon footprints, adhering to the standard BS EN ISO 14067:2018 in a manner consistent with the International Standards on Life Cycle Analysis (LCA) (ISO 14040 and ISO 14044). Tunley has also modelled a scenario, at AnchorBloc's request in which the products are transported to Paris (A4 stage) which can be found within the Appendix. The emissions have also been divided according to the Carbon Border Adjustment Mechanism (CBAM) designations. Tunley Environmental has used data provided by AnchorBloc for material types and quantities, supplier locations, and manufacturing process. Where data was limited, we made reasonable assumptions based on our expertise and information from secondary sources.

Figure 1. Life-cycle Carbon Assessment stages for consideration advised by BS EN ISO 14040 & 14044.

This report evaluates the single impact category of climate change for six AnchorBloc™ products, each with varying weights and components: 25 kg, 50 kg, 250 kg, 330 kg, 500 kg, and 1000 kg, all produced by AnchorBloc. The assessed products are block-shaped, composed of concrete, aggregate, steel rebar (for weights ≥ 250 kg), and various steel components. The concrete used within the manufacture of the AnchorBloc™ products is sourced as a waste product free of charge from local companies who manufacture other concrete products.

AnchorBloc specialises in producing concrete Kentledge blocks. Their products are designed to secure temporary hoardings, fencing, and structures, making them ideal for use in construction and events industries. The primary function of the AnchorBloc™ product class is to serve as a weight for securing temporary hoardings and fencing. AnchorBloc aim to make the production of their AnchorBloc™ products as sustainable as possible. They source otherwise waste concrete for manufacturing and utilise biofuels (HVO) in their production process.

In this report, two scenarios were modelled to assess the carbon footprint of the AnchorBloc™ products:

- **Scenario 1:** This model includes all embodied emissions associated with the raw material of concrete (A1). However, as the concrete used is considered waste and would be disposed of by the suppliers, a carbon credit has been added to account for the emissions avoided from transporting and disposing of the concrete.

- **Scenario 2**: This model excludes all embodied emissions associated with the raw material concrete (A1). Since the concrete is a waste product received for free, the economic allocation method dictates that the embodied emissions in the concrete should be considered a carbon credit. Additionally, as the concrete used is considered waste and would be disposed of by the suppliers, a carbon credit has been added to account for the emissions avoided from transporting and disposing of the concrete.

Appreciating the importance of determining major contributors to the emissions, Tunley Environmental also provides detailed analysis and discussion on the findings of the assessment; this will support AnchorBloc's customers with their decision-making processes to reduce their carbon emissions.

Executive Summary

AnchorBloc have engaged Tunley Environmental to conduct a cradle-to-gate life cycle assessment for six AnchorBloc™ products, each with varying weights and components: 25 kg, 50 kg, 250 kg, 330 kg, 500 kg, and 1000 kg. This assessment focuses on the single impact category of climate change (GHG emissions) which results from the manufacture and transportation of the raw materials, as well as the energy and utilities used in the production of the final products.

The assessment was performed in accordance with BS EN ISO 14067:2018 with a manner consistent with the International Standards on Life-Cycle Analysis (LCA) (ISO 14040 and ISO 14044).

Tunley Environmental has conducted an independent assessment to quantify carbon emissions for six AnchorBloc™ products based on the data provided by AnchorBloc. This assessment underscores AnchorBloc's dedication to reducing carbon emissions. It offers AnchorBloc and its customers a clear evaluation of the carbon footprint associated with their products, aligning with AnchorBloc's sustainability goals.

The total cradle-to-gate carbon footprint for each product is illustrated in Figure 2, presented in kilogrammes of CO_2e per product. The stacked bar chart highlights the carbon credits applied in both scenarios, showcasing their contributions to the final footprint. Additional data for both scenarios is available in the Appendix.

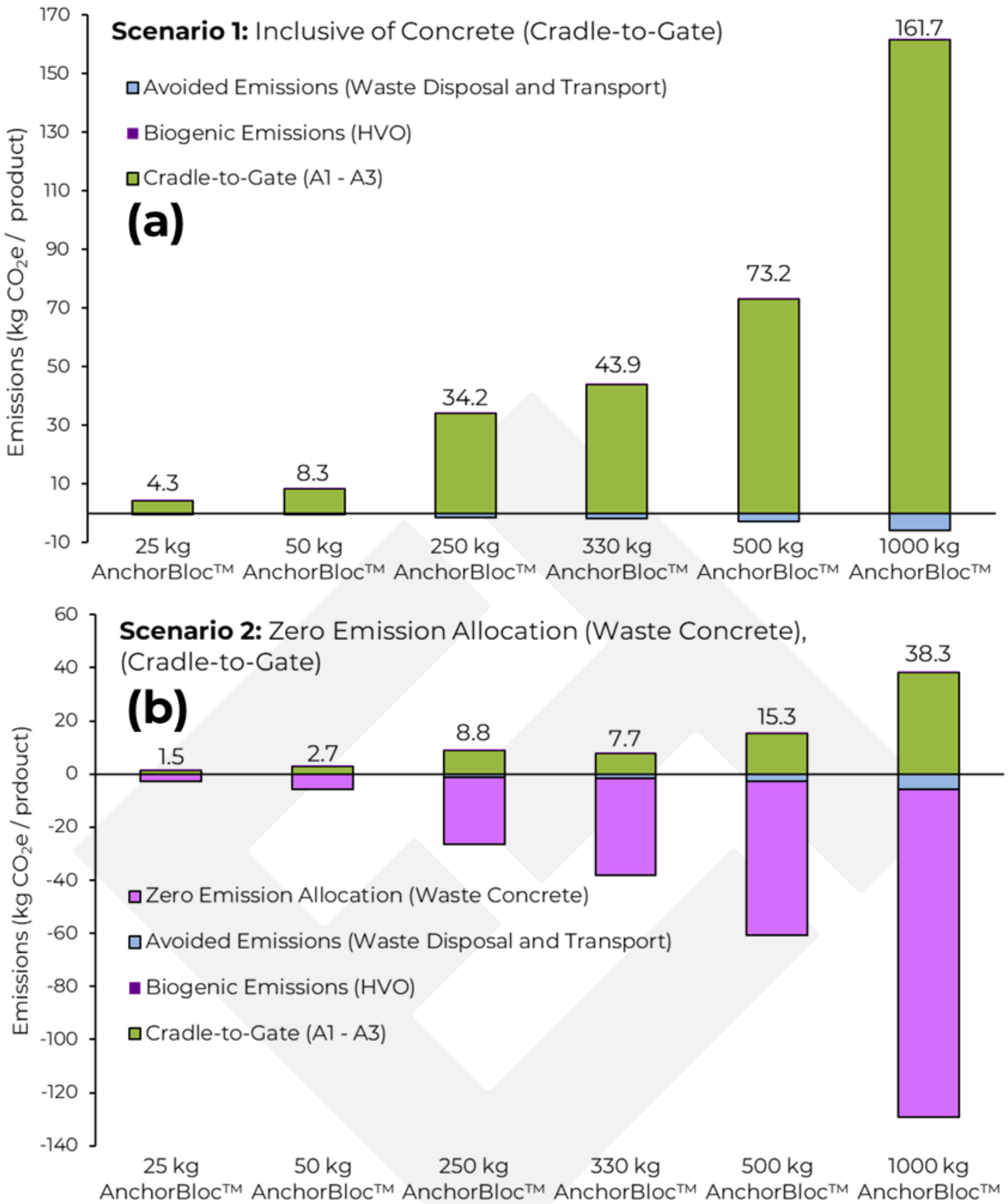

Figure 2. Stacked bar chart Showing the cradle-to-gate (A1 – A3) carbon emissions (kgCO_2e/product) for each AnchorBloc™ product. (a) represents scenario 1, (b) represents scenario 2.

Goals and Objectives

This report details the results of a carbon footprint assessment carried out by Tunley Environmental for AnchorBloc. The assessment evaluated the carbon footprints for six AnchorBloc™ products, each with varying weights and components: 25 kg, 50 kg, 250 kg, 330 kg, 500 kg, and 1000 kg manufactured by AnchorBloc, focusing exclusively on the impact category of climate change to quantify the carbon footprints of these products.

Two scenarios were modelled to assess the impact category of climate change of the products:

- Scenario 1: This model includes all embodied emissions associated with the raw material concrete (A1). However, as the concrete used is considered waste and would be disposed of by the suppliers, a carbon credit has been added to account for the emissions avoided from transporting and disposing of the concrete.
- Scenario 2: This model excludes all embodied emissions associated with the raw material concrete (A1). Since the concrete is a waste product received for free, the economic allocation method dictates that the embodied emissions in the concrete should be considered a carbon credit. Additionally, the model includes a carbon credit for the emissions avoided from transporting and disposing of the waste concrete.

A critical review of this assessment was carried out internally by impartial experts at Tunley Environmental to ensure conformance to ISO 14067:2018.

The goals of the assessment include four primary objectives:

1. To assess the cradle-to-gate carbon footprint for the six AnchorBloc™ products, including raw material extraction and processing, component production, upstream transportation, and product manufacturing.
2. Assess a modelled scenario whereby the products are transported to Paris.
3. Provide a comprehensive understanding of the product range's carbon footprint, including comparing it to a scenario where the concrete was purchased and splitting emissions into the Carbon Border Adjustment Mechanism (CBAM) designations, its hotspots, and discussion on GHG reduction opportunities.
4. Present findings in a clear and actionable manner to inform decision-making.

The intended application of this assessment is:

- The calculation of the carbon footprint of six different AnchorBloc™ products and their comparison to a scenario whereby the concrete was purchased and not received as a waste product using a 100-year time horizon and IPCC 2021 metrics.

The reasons for conducting this assessment are:

- To gain a comprehensive understanding of the GHG footprint produced by manufacturing the AnchorBloc™ products.
- Internal communication by AnchorBloc,
- Communication with AnchorBloc's relevant stakeholders and customers.

The intended audience of this assessment is internal communication within the AnchorBloc and communication with their external stakeholders and customers.

The carbon footprint is calculated using 100-year Global Warming Potentials (GWPs) as stated in the IPCC Sixth Assessment Report, 2021 (AR6) and are reported in kg CO_2e in line with the single impact category, as required by ISO 14067:2018.

Methodology and Quantification Standards

This report has been prepared using methodology consistent with the international standard BS EN ISO 14067:2018 in a manner consistent with the International Standards on Life Cycle Analysis (LCA) (ISO 14040 and ISO 14044)

To assess the carbon footprint of the products, two types of data are utilised: activity data and emission data. Specific activity data (primary data) was gathered by AnchorBloc where feasible. Where specific data was not available, reasonable assumptions were made using relevant databases and our expertise. AnchorBloc supplied data on the material composition of their products, including product weight and material content, as well as details on transportation and origin location. Transportation distances between various suppliers and AnchorBloc's location, were estimated using Google Maps.

To ensure that emissions data was reliable carbon equivalent data conversions were calculated in accordance with the emission factors for Greenhouse gas reporting: conversion factors published by DEFRA, the UK government Department for Business, Energy, and Industrial Strategy for 2023. Additionally, peer-reviewed academic papers and the ICE database have been used.

To analyse the emissions associated with the production of these products (A3), AnchorBloc provided comprehensive yearly data on production volumes. This included the number of products, their weights, and the annual consumption of electricity, water, HVO, argon, admixture, and release agent. The total production volume was used to calculate the percentage of each product by weight. This percentage was then applied to determine the usage of electricity, water, HVO, argon, admixture, and release agent for each product, which was subsequently used to calculate the emissions.

Scope and Function

The scope of this carbon assessment is "cradle-to-gate" assessment of six AnchorBloc™ products, which includes raw material extraction and processing, upstream transportation, manufacturing. Additionally, a modelled scenario is assessed whereby the products are transported to Paris (A4).

The products fall into the category of "Kentledge Blocks". The primary function of the AnchorBloc™ product class is to serve as a weight for securing temporary hoardings and fencing. Additional functions of this product have not been identified.

The declared unit used is one unit of product. The reference flow of the product is the sum of the product weight, highlighted within Table 1.

Table 1. Reference flows for each product.

Name of Product	Declared Unit	Total, Reference Flow (kg)
25 kg AnchorBloc™	1 product	25
50 kg AnchorBloc™	1 product	50
250 kg AnchorBloc™	1 product	225
330 kg AnchorBloc™	1 product	317
500 kg AnchorBloc™	1 product	507
1000 kg AnchorBloc™	1 product	1080

System Boundary & Allocation Procedure

The AnchorBloc™ product system assessed follows a cradle-to-gate approach (Table 2) and encompasses the following life cycle stages:

- Raw materials production
- Upstream Transportation of raw materials
- Manufacturing activities

Additionally, reported separately we downstream transportation (A4) is modelled to assess a scenario whereby the products are transported to Paris.

The system boundaries encompass all unit processes that contribute measurably to the category indicator results for the greenhouse gas indicators specified in ISO 14067:2018. In this study, except where otherwise noted, all required and known materials and processes were included in the life cycle inventory.

Table 2. Summary of the life cycle stages included in the LCA.

Life Cycle Stage	Life Cycle Stage Modules	Stage Description
Product Stage	A1-A3	The extraction, processing and manufacturing of materials required for the decals. This includes all the carbon emissions from manufacturing, including primary and secondary manufacturing stages as well as any transportation emissions between these.
Implementation Stage	A4	The emissions associated with the transport of the product to Paris *via* HGV and Ferry. This can be found within the Appendix.

Due to the production method of the AnchorBloc™ products, they are part of a single product stream without any by-products or simultaneous production of other products. Consequently, the inputs and outputs of the lifecycle are allocated based on the assumption that they belong to a single product stream. The total allocated inputs and outputs for a process equal the sum of the inputs and outputs. Allocations are based on the mass approach. Additionally, certain assumptions have been made that might result in exclusions. All cut-offs and assumptions are clearly stated and described in the "Cut-offs, Exclusions & Assumptions" section.

Cut-offs, Exclusions & Assumptions

The procedure chosen for this assessment utilises the cut-off method. This method allows for the exclusion of processes that are assumed to contribute less than 1% to the environmental impact.

To our understanding, all input and output data for the processes are included, ensuring that no data is intentionally omitted. However, simplifications are made to facilitate the calculations. The assessments adopts these specific assumptions:

- Modes of transportation between material production sites and AnchorBloc's are assumed for the following: Rebar, Other Steel Components, Halfen Spherical Head, BS EN 39 Scaffold Tube, Galvanised Rectangular Hollow Sections, Argon, Release Agent, Chryso Premia 180, HVO and Aggregate.

- Distances transportation between material production sites and AnchorBloc's were assumed to be 100 km for the following: Other Steel Components, Halfen Spherical Head, Release Agent and Chryso Premia 180.To analyse the emissions associated with the production of these products (A3), AnchorBloc provided comprehensive yearly data on production volumes. This included the number of products, their weights, and the annual consumption of electricity, water, HVO, argon, admixture, and release agent. The total production volume was used to calculate the percentage of each product by weight. This percentage was then applied to determine the usage of electricity, water, HVO, argon, admixture, and release agent for each product, which was subsequently used to calculate the emissions.

- To analyse the downstream transportation (A4) whereby the products are transported to Paris, it was assumed that the product would be transported *via* HGV and Ferry.

Data and Data Quality Assessment

All datasets utilised are no more than six years old, thereby ensuring their relevance to the current processes they are intended to model. Each dataset is appropriate to the geographical region the products and raw materials are manufactured in; the data is either region-specific, or the selected generic dataset accurately reflects the intended area. The technical representativeness of the modelled processes is deemed adequate, as the data are representative both temporally and regionally, and only standard methods are employed.

The Data Quality Rating (DQR) for each material and process was determined. A cumulative, weighted DQR for each product was then derived based on the individual DQRs of each process and material, with Tunley Environmental ensuring that the total uncertainty of the product did not exceed 'Low Uncertainty (≤10 - 20%)'.

Impact Assessment

The result of the product carbon footprint calculations reveals the potential impact of each emitted greenhouse gas on climate change. This impact is expressed using the IPCC Global Warming Potential indicator, which utilises a 100-year time frame and presents the impact as kg CO_2e per declared unit.

Completeness Check

Overall, the carbon footprint of each product is deemed to be calculated with sufficient representativeness and accuracy concerning both system boundaries and data completeness, in alignment with the goal and scope of the assessment. The data used for calculating the carbon footprint comprises either AnchorBloc-specific primary data or generic data from databases that meet the set requirements for data quality, thus ensuring representativeness for the studied system.

Limitations

The methodology employed encompasses only one impact category, Climate Change, which assigns a single score to the product's impact. However, this approach overlooks other environmental aspects, leading to a rather narrow perspective. Furthermore, the assessment omits all lifecycle stages beyond A4. The use stage of the AnchorBloc™ products is passive and therefore will be negligible. Emissions from the end-of-life stage were considered out of scope due to AnchorBloc having little oversight on this process once the customer has received the product.

Results

Overview: Cradle-to-Gate (A1-A3) Emissions

This section evaluates the cradle-to-gate emissions for the single impact category of climate change across both modelled scenarios for six AnchorBloc™ products across two scenarios. The AnchorBloc™ products have varying components and weights: 25 kg, 50 kg, 250 kg, 330 kg, 500 kg, and 1000 kg.

The total cradle-to-gate GHG emissions for the six AnchorBloc™ products across both scenarios is provided in Table 3. These are assigned based on the modules outlined in BS EN ISO 14040 & 14044. This represents the GHG emissions associated with the raw materials, upstream transport, and manufacture of the products. The lifecycle stages use, and end-of-life stages have been excluded due to data obscurity. However, A4 is included in “Appendix B – Cradle-to-Gate and Transport”).

Table 3. Cradle-to-gate (A1 – A3) emissions of the AnchorBloc™ products per lifecycle module, reported in kilogrammes of carbon dioxide equivalents per product.

Product	A1, Raw Materials (kg CO_2e/ product)	A2, Transport (kg CO_2e/ product)	A3, Manufacturing (kg CO_2e/ product)	A1-A3, Cradle-to-Gate (kg CO_2e/ product)
Scenario 1: Inclusive of Concrete				
25 kg AnchorBloc™	4.1	7.5×10^{-2}	7.6×10^{-2}	4.3
50 kg AnchorBloc™	8.1	0.1	0.2	8.3
250 kg AnchorBloc™	33.1	0.4	0.7	34.2
330 kg AnchorBloc™	42.6	0.4	1.0	43.9
500 kg AnchorBloc™	71.1	0.6	1.5	73.2
1000 kg AnchorBloc™	157.2	1.2	3.3	161.7
Scenario 2: Zero Emission Allocation (Waste Concrete)				
25 kg AnchorBloc™	1.3	7.5×10^{-2}	7.6×10^{-2}	1.5
50 kg AnchorBloc™	2.4	0.1	0.2	2.7
250 kg AnchorBloc™	7.7	0.4	0.7	8.8
330 kg AnchorBloc™	6.3	0.4	1.0	7.7
500 kg AnchorBloc™	13.2	0.6	1.5	15.3
1000 kg AnchorBloc™	33.8	1.2	3.3	38.3

In the LCA modules A2 and A3, emissions are minimal compared to those from raw materials (A1) in both scenarios, as illustrated in Figure 3. This is due to the emissions generated during the transportation of precursors from suppliers and the relatively low-intensity manufacturing process, which utilises biofuels.

In Scenario 1, which includes emissions from concrete, the carbon footprint increases in line with the weight of the AnchorBloc™. For instance, the 25 kg product exhibits total cradle-to-gate emissions of 4.3 kg CO_2e, while the 1000 kg product has substantially higher emissions of 161.7 kg CO_2e. This trend is primarily driven by the raw materials module (A1), which accounts for most emissions across all product weights. The transportation (A2) and manufacturing (A3) modules contribute relatively minor portions of the total emissions. Transport emissions range from 0.075 kg CO_2e for the 25 kg product to 1.2 kg CO_2e for the 1000 kg product. Similarly, manufacturing emissions range from 0.076 kg CO_2e to 3.3 kg CO_2e across the same product weights.

Scenario 2, which assumes zero emission allocation for waste concrete, shows a different emissions profile. Here, the raw materials emissions are significantly lower compared to scenario 1, leading to lower overall cradle-to-gate emissions. Similar to what is observed in Scenario 1, transportation and manufacturing emissions remain relatively constant across product weights. However, the overall reduction in raw material emissions of concrete leads to a substantial decrease in total emissions, particularly for the heavier products. The 500 kg AnchorBloc™, for example, exhibits a reduction from 73.2 kg CO_2e in Scenario 1 to 15.3 kg CO_2e in Scenario 2.

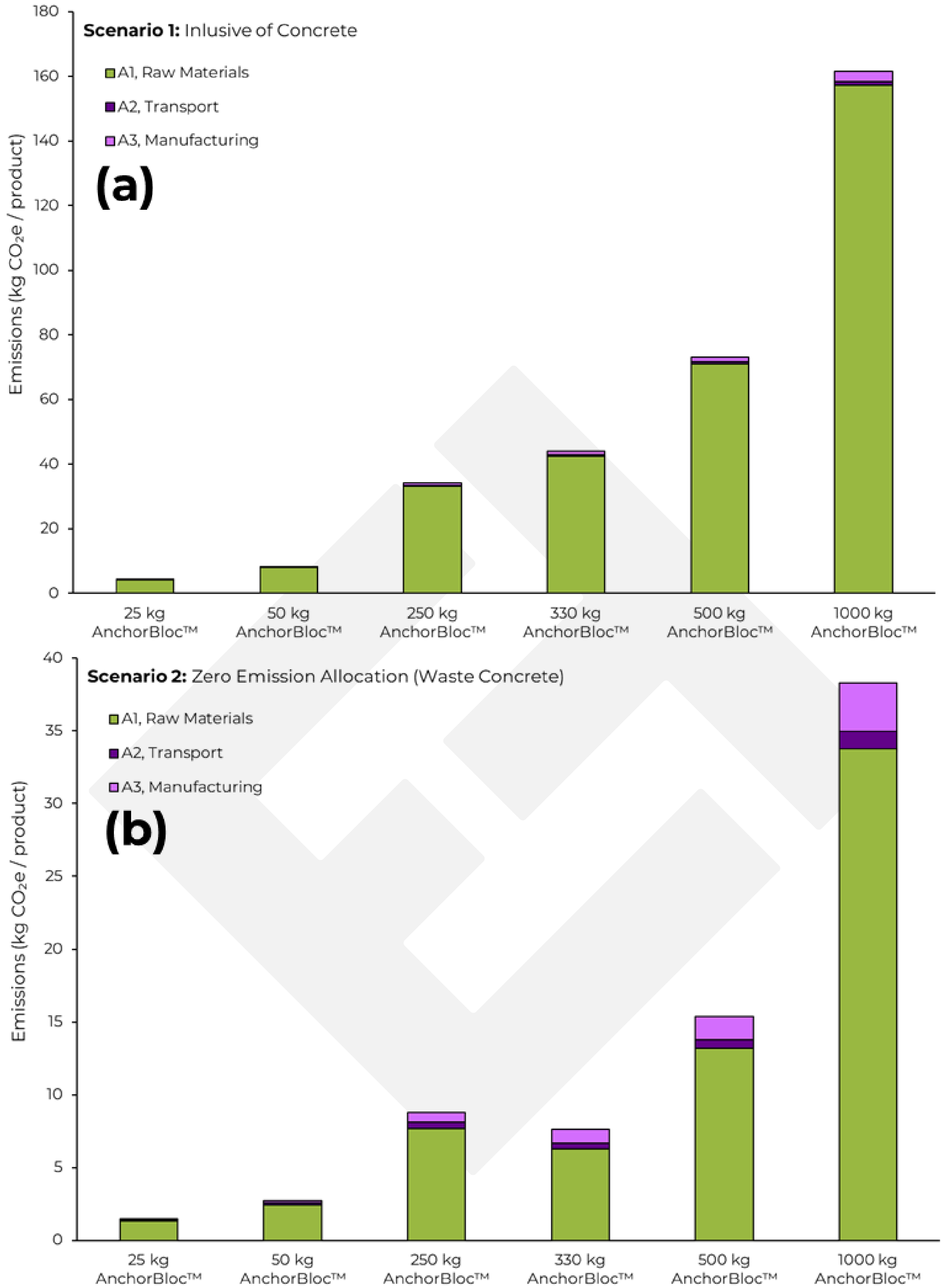

Figure 3. Stacked bar chart Showing the A1-A3 LCA module contribution (kgCO_2e/product) for each AnchorBloc™ product. (a) represents scenario 1, (b) represents scenario 2.

A1, Raw Materials – Granularity

The data for the AnchorBloc™ products under Scenario 1 (inclusive of concrete) and Scenario 2 (zero emission allocation for waste concrete) is presented in Figure 4. The data presented in Figure 4 represents the totals after subtracting the discussed carbon credits from the overall concrete emissions. There are several key hotspots highlighted within the A1 component, which relates to raw material extraction and processing. This discussion will focus on the significant contributors to the carbon footprint in both scenarios and the implications of these findings.

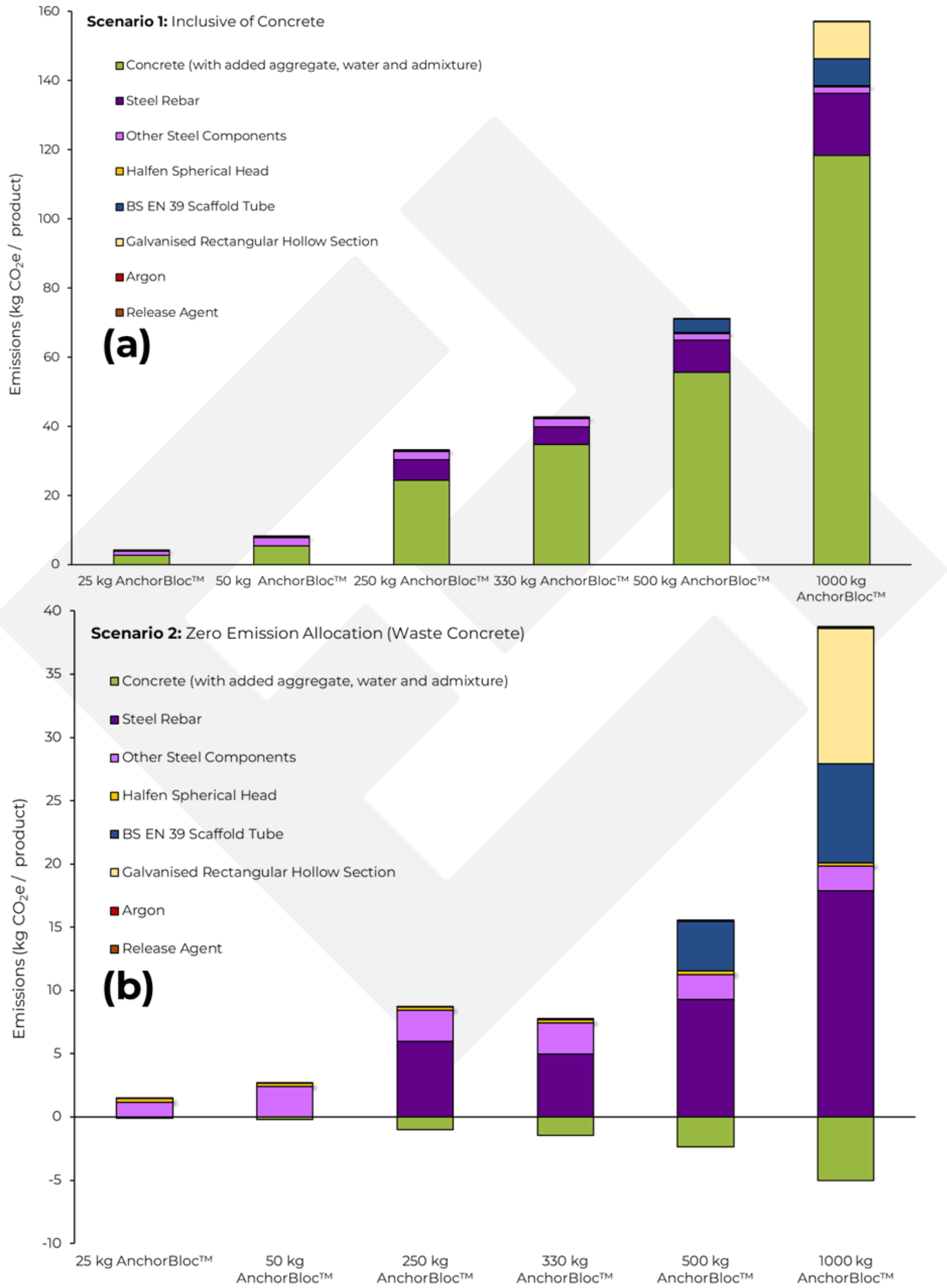

Figure 4. Stacked bar chart showing the A1 module contribution (kg CO_2e /product) by component for each AnchorBloc™ product. (a) represents scenario 1, (b) represents scenario 2. The data presented represents the totals after subtracting the carbon credits from the overall concrete emissions.

In Scenario 1, concrete emerges as the dominant contributor to the carbon footprint across all product weights. For instance, in the 1000 kg AnchorBloc™, concrete accounts for 118.4 kg CO_2e out of a total of 154.4 kg CO_2e. Steel components also contribute significantly to overall emissions, particularly in heavier products. In the 250 kg AnchorBloc™, steel rebar contributes 6.0 kg CO_2e, while other steel components add 2.4 kg CO_2e. The emissions from steel rebar increase with the weight of the product, reaching 17.9 kg CO_2e for the 1000 kg AnchorBloc™.

Emissions from other components such as the Halfen Spherical Head, BS EN 39 Scaffold Tube, and Galvanised Rectangular Hollow Section are relatively minor. However, for the 1000 kg product, the galvanised rectangular hollow section contributes an additional 10.7 kg CO_2e.

In Scenario 2, where waste concrete is allocated as a carbon credit, the carbon footprint from concrete is significantly reduced, resulting in negative values. For example, the 25 kg AnchorBloc™ has a carbon footprint of -0.11 kg CO_2e from concrete, while the 1000 kg product shows -5.01 kg CO_2e. Despite the reduction in concrete emissions, steel components remain significant contributors. The emissions from steel rebar are unchanged from Scenario 1. The emissions from components such as the Halfen Spherical Head, BS EN 39 Scaffold Tube, and Galvanised Rectangular Hollow Section remain minor.

The findings for the AnchorBloc™ products highlight the substantial impact of concrete and steel components on the overall carbon footprint. In Scenario 1, concrete is the primary contributor. However, steel components, particularly rebar, also play a significant role, especially in heavier products. In Scenario 2, the impact of steel components becomes the main hotspot. This indicates that to achieve further emissions reductions, a strategy to implement lower embodied carbon steel could be considered to further reduce the greenhouse gas impact of AnchorBloc™ products.

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A2, Transport – Granularity

The data for AnchorBloc™ products under both Scenario 1 and Scenario 2 is identical for the A2 module. Figure 5 illustrates the breakdown of emissions from the transport of each component within the AnchorBloc™ products. Although the contribution of transport to the total cradle-to-gate footprint is relatively minor, there are a few hotspots materials worthy of discussion.

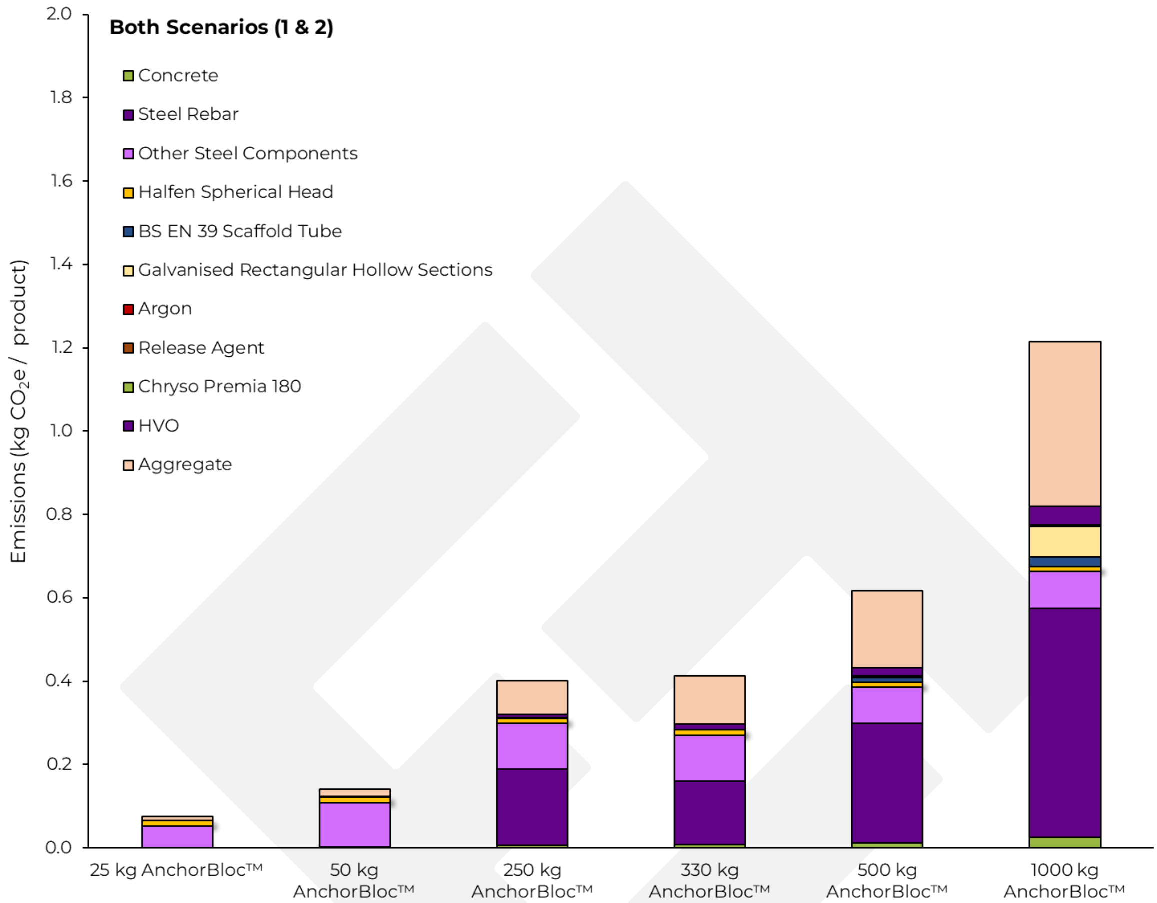

Figure 5. Stacked bar chart Showing the A2 module contribution (kgCO_2e/product) by component for each AnchorBloc™ product. (a) represents scenario 1, (b) represents scenario 2.

The analysis of transportation related emissions (A2) emissions reveals that steel rebar and aggregates are the primary contributors to the carbon footprint during the transportation of raw materials to AnchorBloc, especially as the product weight increases. To achieve further emissions reductions, strategies should focus on optimising the transport logistics of these materials and considering alternative materials or suppliers with lower associated transportation emissions.

A3, Manufacturing – Granularity

The data for AnchorBloc™ products under both Scenario 1 and Scenario 2 is also identical for the A3 module, as the manufacturing procedure remains unchanged. Figure 6 illustrates the emissions from the manufacturing of each AnchorBloc™ product.

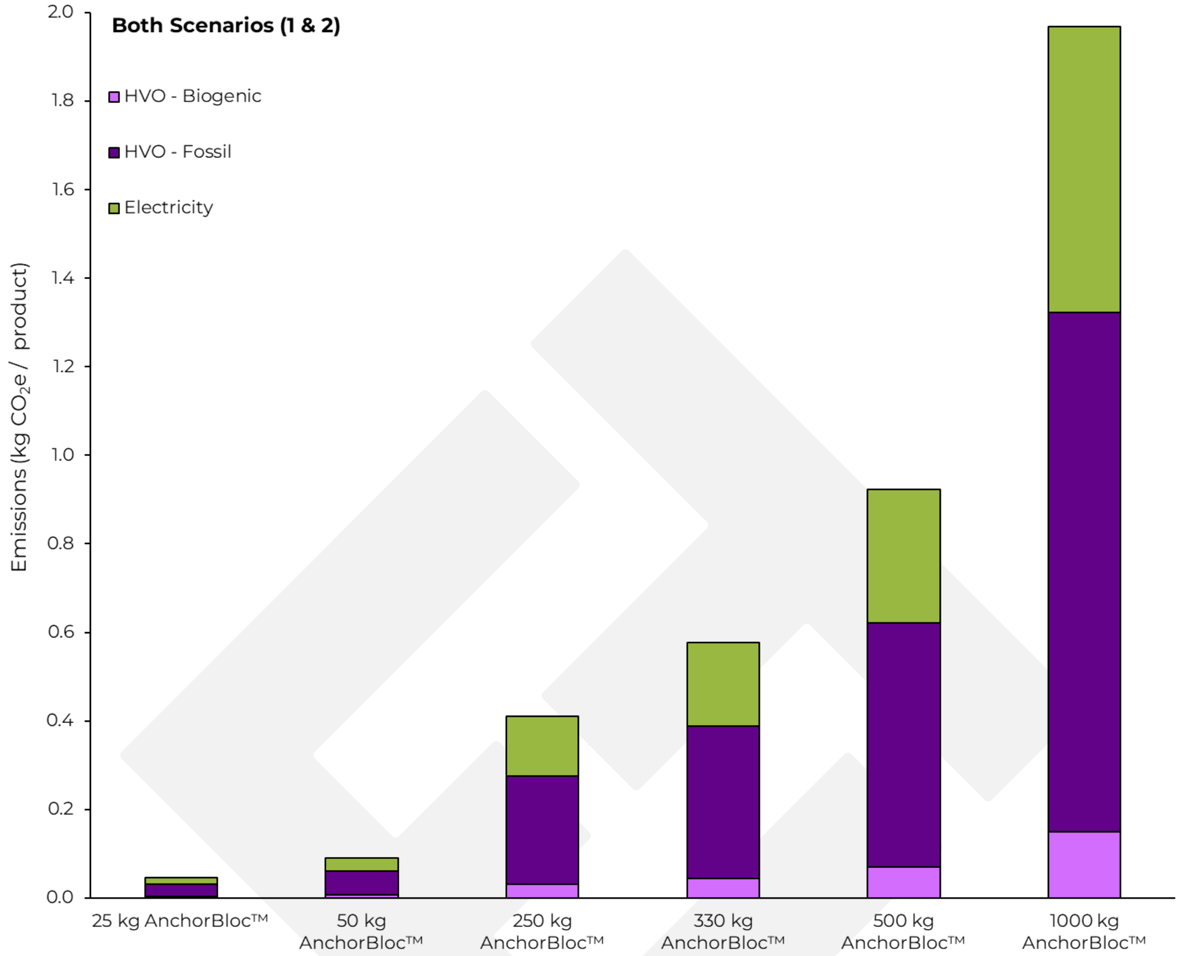

Figure 6. Stacked bar chart Showing the A2 module contribution (kgCO_2e/product) by component for each AnchorBloc™ product. (a) represents scenario 1, (b) represents scenario 2.

The analysis of manufacturing-related emissions (A3) reveals key hotspots in the carbon footprint of AnchorBloc™ products. HVO emissions are divided into biogenic, from burning, and fossil, from the well-to-tank (WTT) emissions of HVO. Fossil HVO emissions increase significantly with product weight, making it a major contributor, particularly in heavier products. Additionally, electricity consumption during manufacturing is a notable hotspot.

To further reduce emissions, the strategies should focus on minimising the emission associated with electricity use. Although currently, 50% of electricity is procured from on-site wind turbines, to further reduce emissions an effective strategy is to procure a Renewable Energy Guarantees of Origin (REGO) tariff for grid supplied electricity. By switching to a REGO tariff, which certifies that the electricity is sourced from 100% renewable energy, the carbon footprint from electricity consumption can be effectively eliminated. This would reduce the overall A3 emissions, complementing HVO use and enhancing the sustainability of the manufacturing process for the AnchorBloc™ products.

Carbon Border Adjustment Mechanism (CBAM)

The Carbon Border Adjustment Mechanism (CBAM) is a policy tool implemented by the European Union to equalise the carbon cost of imports with those produced within the EU. It aims to prevent carbon leakage, where companies might move production to countries with less strict carbon regulations, thus undermining global climate efforts.

Direct Specific Embedded Emissions:

- Direct Specific Embedded Emissions are directly generated emissions which occur during the production/manufacturing process of a CBAM regulated product, such as emissions from the combustion of fossil fuels.

Indirect Specific Embedded Emissions:

- Indirect Specific Embedded Emissions are emissions resulting from the production of electricity that is consumed during the production of CBAM goods.

The direct and indirect emissions described above are accounted for throughout the supply chain to encompass all emissions generated during the production processes of CBAM-covered goods. This includes all direct emissions, such as those from on-site fossil fuel combustion and off-site generation of heating and cooling necessary for production, as well as indirect emissions from electricity use. Therefore, when these emissions occur further up the supply chain, they are still considered direct or indirect emissions accordingly.

The AnchorBloc™ products are not currently subject to CBAM regulations, as they fall under the Combined Nomenclature (CN) code "6810 1110 00," which pertains to "articles of cement, of concrete, or of artificial stone, whether or not reinforced." However, Tunley has performed the necessary calculations in anticipation of potential future requirements.

For any tariffs, the responsibility lies with the importer to pay and input the required information into the CBAM registry. Currently, the EU CBAM is in its "transitional phase," which means that until January 2026, no financial payments are required for imports. Components originally produced in the EU are subject to the European Union Emissions Trading System (EU ETS). Therefore, any carbon price already paid under the EU ETS can logically be deducted from the CBAM liability.

The calculations discussed in this section only consider the components of the AnchorBloc™ products that currently fall under CBAM regulations, which includes all steel products. The concrete is not considered, as only cement precursors are regulated by CBAM currently.

Figure 7 shows the split of emissions between both CBAM emission categories for each AnchorBloc™ product per product. The import fee payable is fixed to the market trading price of the EU Emissions Trading System (EU ETS) and thus is volatile, as of 23rd May 2024, this is set as €77.12 per tonne of CO_2e emitted (£65.72 GBP). The reporting of CBAM requires the numbers to be standardised to per tonne of product imported, therefore Tunley have provided Table 4. Please note, no financial payments are required for imports until January 2026.

Table 4. Emissions per tonne of AnchorBloc™ product and related cost to import each AnchorBloc™ product based on May 2024 prices. Please note, no financial payments are required.

Product	Direct Specific Embedded Emissions, per Tonne of Product (tCO_2e/ tonne)	CBAM Import Cost, per Tonne of Product, May 2024 (Euro, €)
25 kg AnchorBloc™	0.05	3.60
50 kg AnchorBloc™	0.04	3.34
250 kg AnchorBloc™	0.03	2.51
330 kg AnchorBloc™	0.02	1.58
500 kg AnchorBloc™	0.03	1.97
1000 kg AnchorBloc™	0.03	2.28

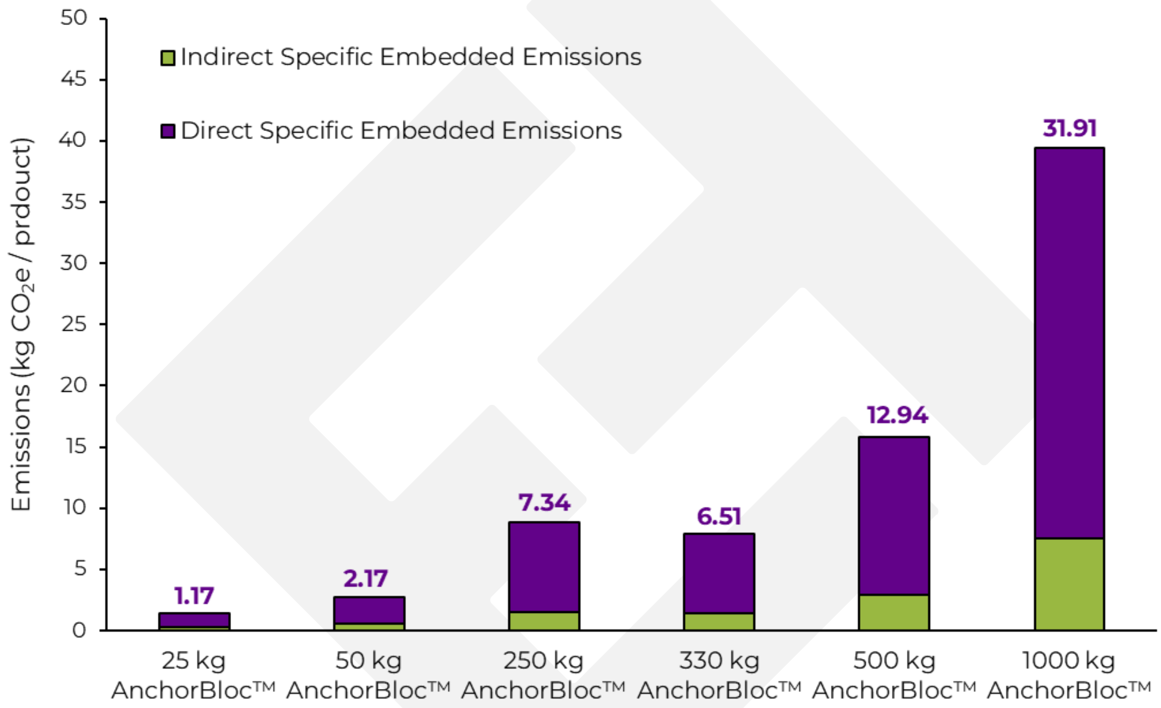

Figure 7. Stacked bar chart Showing the CBAM emission categories and total "Direct Specific Embedded Emissions" (reported in $kgCO_2e$/product) for each AnchorBloc™ product.

Offsetting

Whilst reducing emissions is the ideal end goal in decarbonisation this is not always feasible with every source of emissions. In these instances, offsetting against the embodied carbon can be implemented to achieve a fully carbon neutral product (cradle-to-grave), *e.g.*, after reduction strategies are implemented to reduce the embodied carbon as much as possible. Therefore, the remaining carbon emissions will have to be offset with bona fide suppliers. Consequently, Tunley recommends all offsets be purchased from One Tribe (https://onetribeglobal.com/).

The cost of carbon credits typically operates between a range of £12 to £18 per tCO_2e. One Tribe's carbon credits are typically procured through one or more of the following regulatory bodies: Verra, Gold Standard, American Carbon Registry and Delta. OneTribe use their purchasing power to facilitate the very best pricing for their clients, however, it's important to note that these prices are subject to change based on market demand and other factors.

To offset the calculated cradle-to-gate emissions for AnchorBloc™ products, a minimum of 1 tCO_2e offsets must be purchased, as this is the smallest volume available. These offsets can be aggregated to cover multiple products. At a cost of £18 per tCO2e, the total cost would be £18. This offsetting would render the product carbon neutral; however, it is recommended to offset twice the measured amount to ensure a net positive effect.

Conclusion

Tunley Environmental have conducted a cradle-to-gate life cycle assessment to evaluate the partial carbon footprints of six AnchorBloc™ products, adhering to the BS EN ISO 14067:2018 standard. This assessment considered the production and transportation of materials, particularly focusing on the emissions associated with raw materials, upstream transportation, and manufacturing activities. The analysis also included a scenario where the products are transported to Paris (as found in "Appendix B – Cradle-to-Gate and Transport") and discussion the Carbon Border Adjustment Mechanism (CBAM) designations.

Two scenarios were modelled to assess the carbon footprint: Scenario 1 included all emissions associated with the raw material concrete, with a carbon credit for avoided emissions from transportation and disposal. Scenario 2 excluded these emissions, treating the waste concrete as a carbon credit, significantly lowering the overall emissions, especially for heavier products.

The results indicated that concrete and steel components are the primary contributors to the carbon footprint. In Scenario 1, concrete accounted for most emissions, while in Scenario 2, the impact of steel components became more pronounced. Transportation and manufacturing emissions remained relatively minor in both scenarios, but steel rebar and aggregates were identified as key contributors during the transportation phase.

To further reduce emissions, AnchorBloc™ can consider strategies such as sourcing lower embodied carbon steel, optimising transport logistics, and procuring 100% renewable electricity from the grid for manufacturing. Please note that 50% of the electricity supplied to AnchorBloc™ is generated by on-site wind turbines, with the remainder supplemented by electricity from the national grid.

AnchorBloc™ products are currently not subject to CBAM regulations, but the necessary calculations have been performed in anticipation of potential future requirements. The findings from this assessment provide a detailed understanding of the carbon footprint of AnchorBloc™ products and offer actionable insights for reducing emissions and enhancing sustainability in production processes.

Tunley Environmental Report Emission Statement

Tunley Environmental GHG emissions from completing this assessment were 1.23 $kgCO_2e$.

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Appendix A - Assumptions and Data Sources

Assumptions, and life cycle indicators applied to and/or used to inform this ECA are listed in the table below. These common assumptions have been previously agreed with AnchorBloc.

Table A1. Assumptions, and life cycle indicators applied to and / or used to inform the calculations.

Data point	Unit	Description	Life Cycle Stage	Why used?	Source/Justification	Data Quality Rating
Aggregates and Sand	kg CO_2e / kg	Aggregates and Sand	A1	To account for material use	ICE	2.0
CEM I, Ordinary Portland Cement (OPC)	kg CO_2e / kg	Cement	A1	To account for material use	ICE	1.8
GGBS	kg CO_2e / kg	GGBS	A1	To account for material use	ICE	1.8
Water	kg CO_2e / m^3	Water	A1	To account for water use	DEFRA 23	2.0
Admixture	kg CO_2e / kg	Admixture, Chryso Premia 180	A1	To account for material use	ICE	2.0
Limestone	kg CO_2e / kg	Aggregates	A1	To account for material use	ICE	2.0
98% post-consumer content - Steel, Rebar	kg CO_2e/ kg	Other Steel Components, Halfen Spherical Head	A1	To account for material use	ICE	2.0
Engineering Steel	kg CO_2e/ kg	Steel Rebar	A1	To account for material use	ICE	2.3
Electrogalvanized Steel	kg CO_2e/ kg	Scaffold Tubes, Galvanised Rectangular Hollow Sections	A1	To account for material use	ICE	2.3
Soybean Oil Analogue	kg CO_2e/ kg	Release Agent	A1	To account for material use	Ecoinvent 3	2.8
Argon	kg CO_2e/ kg	Argon	A1	To account for material use	Ecoinvent 3	2.3
HVO	kg CO_2e/ L	HVO	A3	To account for process	DEFRA 23	1.0
Electricity	kg CO_2e/ kWh	Electricity	A3	To account for process	DEFRA 23	1.0
Avg. Laden, Rigid HGV	kg CO_2e/ t.km	Avg. Laden, Rigid HGV	A2	To account for transport of materials	DEFRA 23	2.0
Diesel Van - Average (up to 3.5 tonnes)	kg CO_2e/ t.km	Diesel Van - Average (up to 3.5 tonnes)	A2	To account for transport of materials	DEFRA 23	2.0

Data point	Unit	Description	Life Cycle Stage	Why used?	Source/Justification	Data Quality Rating
Avg. Laden, All HGVs	kg CO_2e/ t.km	Avg. Laden, Rigid HGV	A2	To account for transport of materials	DEFRA 23	2.0

Appendix B – Cradle-to-Gate and Transport

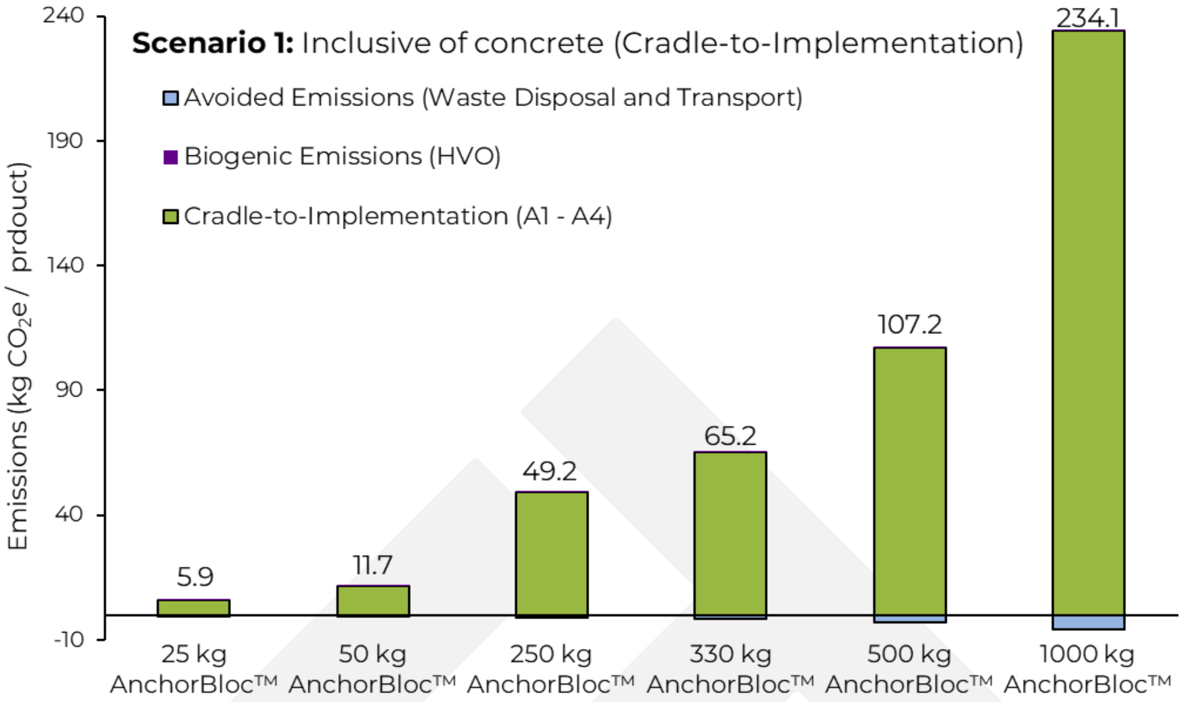

Figure A1. Stacked bar chart for Scenario 1 showing the showing the cradle-to-implementation (A1 – A4) carbon emissions (kgCO_2e/product) for each AnchorBloc™ product.

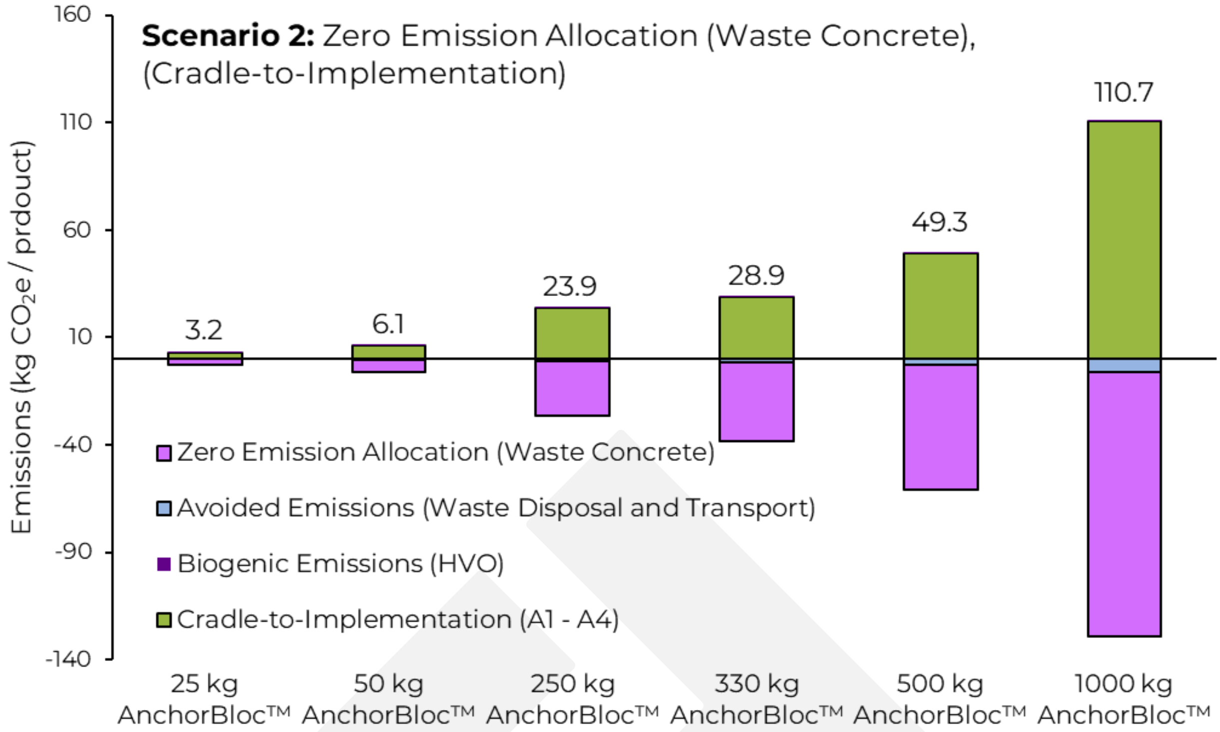

Figure A2. Stacked bar chart for Scenario 2 showing the cradle-to-implementation (A1 – A4) carbon emissions (kgCO_2e/product) for each AnchorBloc™ product.

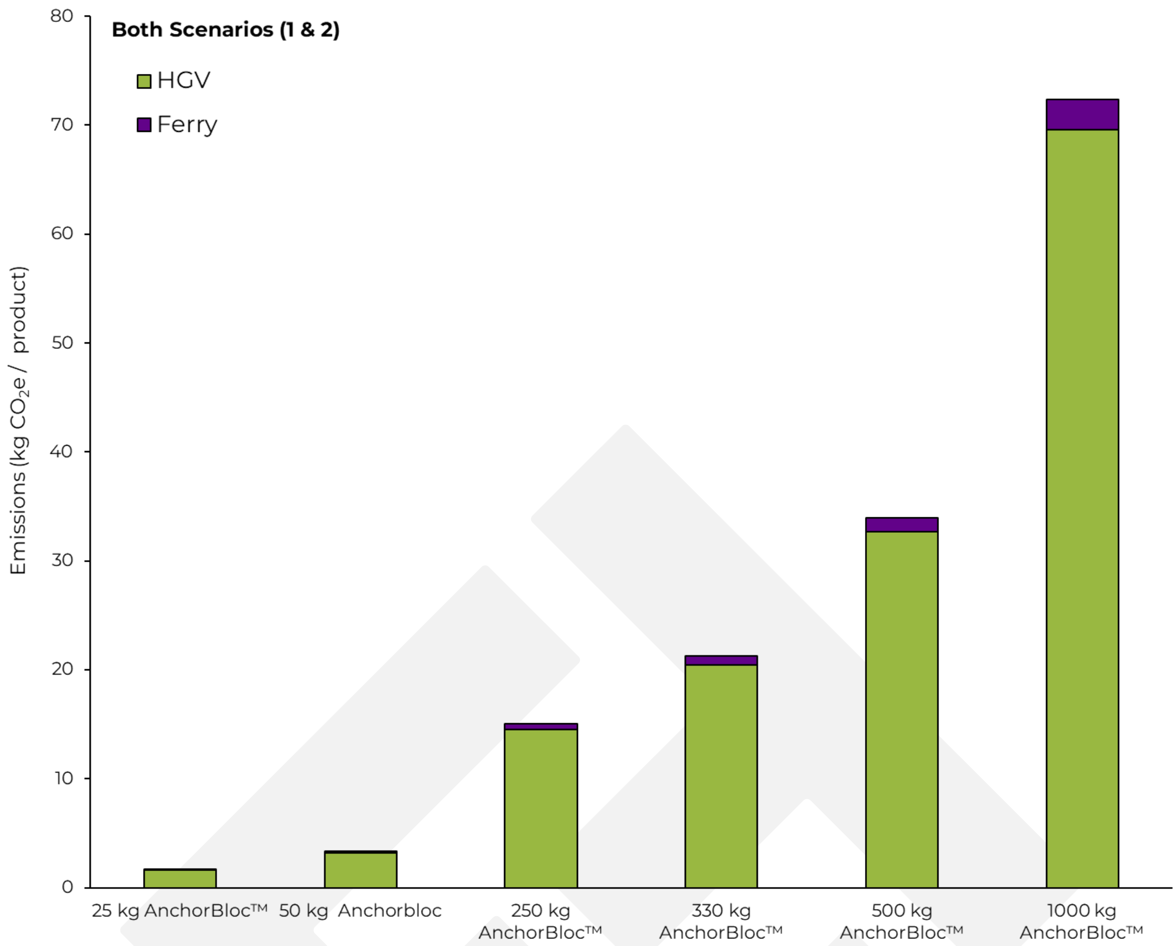

Figure A3. Stacked bar chart for both scenarios showing the transport (A4) related carbon emissions ($kgCO_2e$/product) for each AnchorBloc™ product split by transport method.

Appendix C – Further Data and Data Summary

Further Data - Comparison of Scenarios

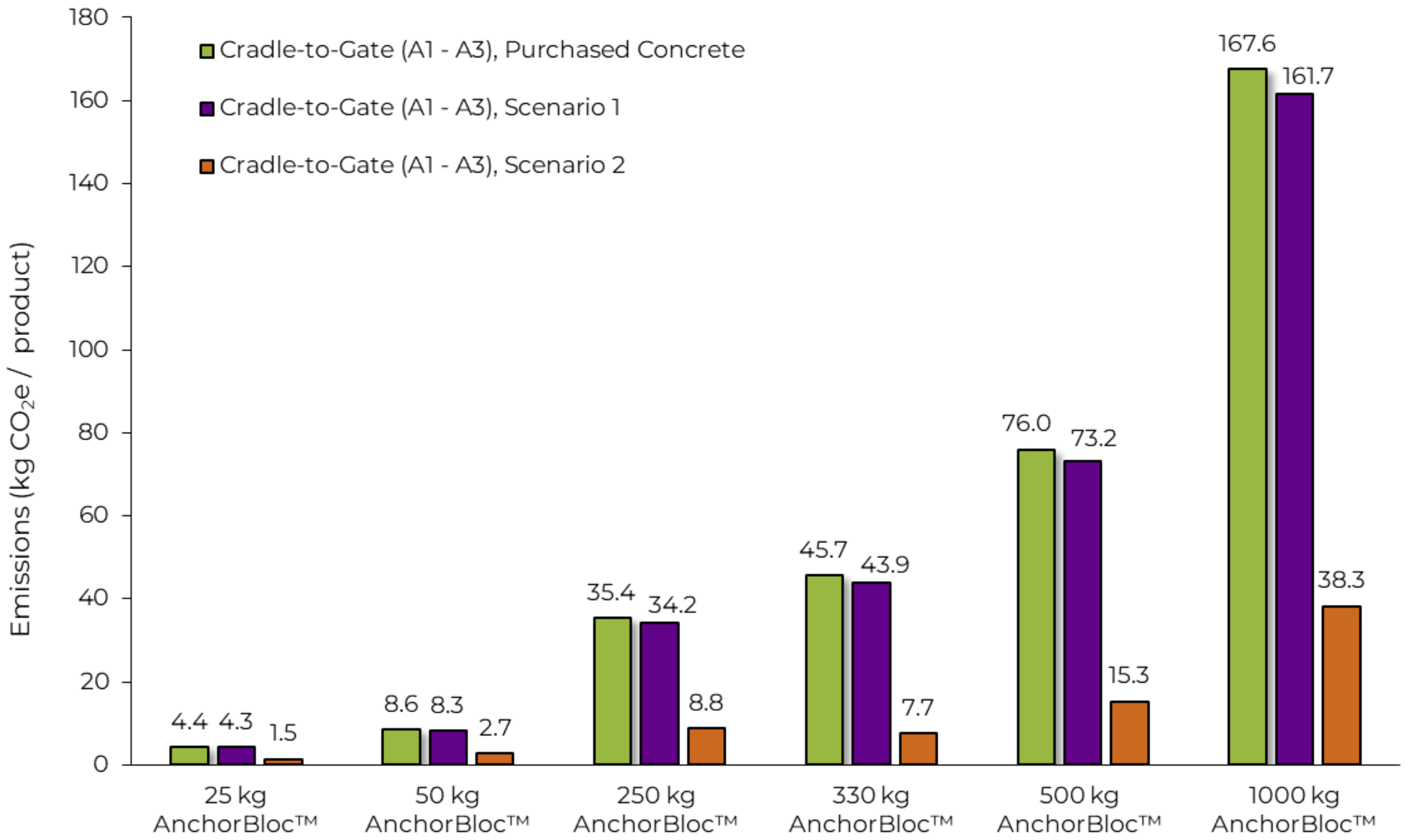

Figure A4. Bar chart showing the carbon emissions for each scenario for all products compared to purchased concrete (A1-A3)

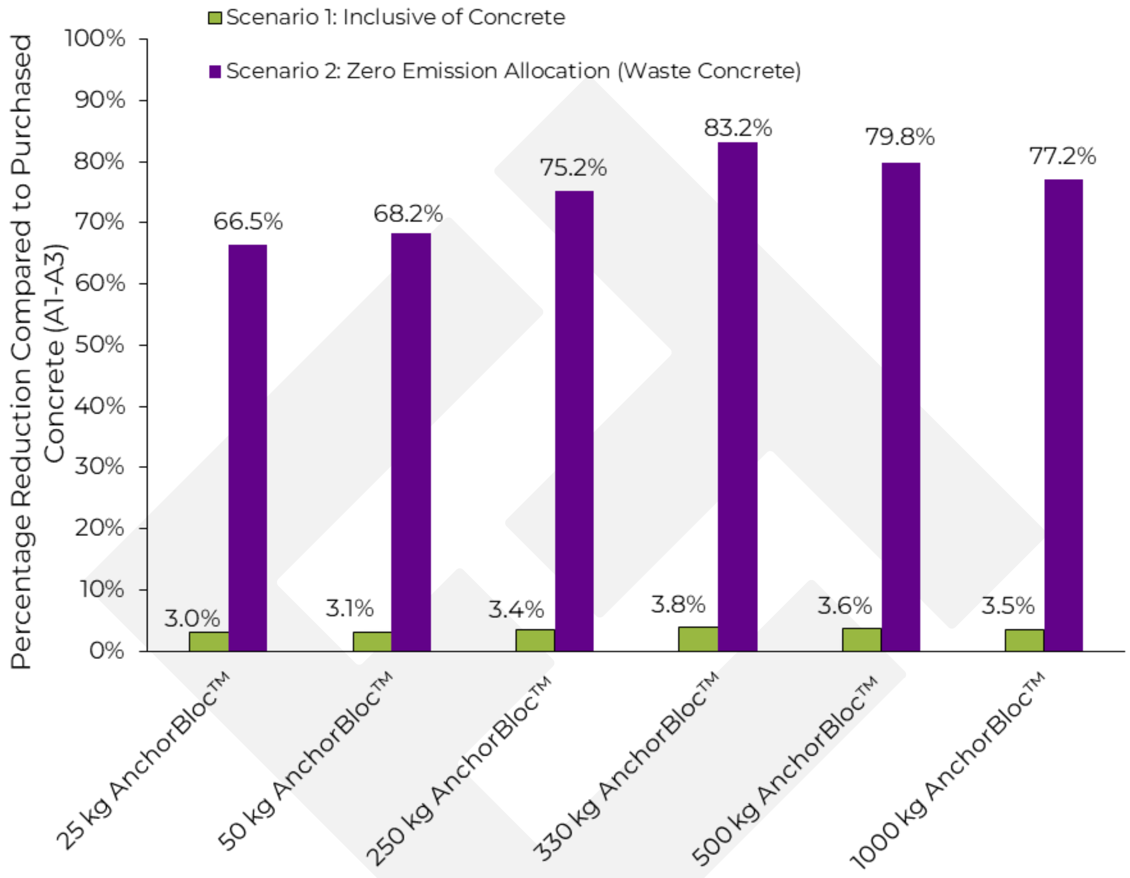

Figure A5. Bar chart for both scenarios showing the percentage reduction of emissions for each product compared to purchased concrete (A1-A3)

Data Summary - Scenario 1: Inclusive of concrete

Scenario 1: Inclusive of concrete		Emissions (kg CO2e / Product)					
Life Cycle Stage		25 kg AnchorBloc™	50 kg AnchorBloc™	250 kg AnchorBloc™	330 kg AnchorBloc™	500 kg AnchorBloc™	1000 kg AnchorBloc™
A1	Materials Extraction	4.1	8.1	33.1	42.6	71.1	157.2
A2	Upstream Transportation	0.1	0.1	0.4	0.4	0.6	1.2
A3	Manufacturing	0.1	0.2	0.7	1.0	1.5	3.3
Cradle-to-Gate (A1 - A3)		4.3	8.3	34.2	43.9	73.2	161.7
A4	Downstream Transportation	1.7	3.4	15.1	21.2	34.0	72.4
Cradle-to-Implementation (A1 - A4)		5.9	11.7	49.2	65.2	107.2	234.1
Emission Categories							
Biogenic Emissions (HVO)		3.5E-03	6.9E-03	3.1E-02	4.4E-02	7.0E-02	0.15
Avoided Emissions (Waste Disposal and Transport)		0.1	0.3	1.2	1.7	2.8	5.9
Zero Emission Allocation (Waste Concrete)		N/A	N/A	N/A	N/A	N/A	N/A

CBAM						
Indirect Specific Embedded Emissions	0.3	0.5	1.5	1.4	2.9	7.5
Direct Specific Embedded Emissions	1.2	2.2	7.3	6.5	12.9	31.9
Data Quality						
Data Quality Rating (DQR)	1.95	1.95	1.96	1.96	1.99	1.99
Uncertainity	Low Uncertainty (≤10 - 20%)	Low Uncertainty (≤10 - 20%)	Low Uncertainty (≤10 - 20%)	Low Uncertainty (≤10 - 20%)	Low Uncertainty (≤10 - 20%)	Low Uncertainty (≤10 - 20%)

Data Summary – Scenario 2: Zero Emission Allocation (Waste Concrete)

Scenario 2: Zero Emission Allocation (Waste Concrete)		Emissions (kg CO2e / Product)					
Life Cycle Stage		25 kg AnchorBloc™	50 kg AnchorBloc™	250 kg AnchorBloc™	330 kg AnchorBloc™	500 kg AnchorBloc™	1000 kg AnchorBloc™
A1	Materials Extraction	1.3	2.4	7.7	6.3	13.2	33.8
A2	Upstream Transportation	0.1	0.1	0.4	0.4	0.6	1.2
A3	Manufacturing	0.1	0.2	0.7	1.0	1.5	3.3
Cradle-to-Gate (A1 - A3)		1.5	2.7	8.8	7.7	15.3	38.3
A4	Downstream Transportation	1.7	3.4	15.1	21.2	34.0	72.4
Cradle-to-Implementation (A1 - A4)		3.2	6.1	23.9	28.9	49.3	110.7
Emission Categories							
Biogenic Emissions (HVO)		3.5E-03	6.9E-03	3.1E-02	4.4E-02	7.0E-02	1.5E-01
Avoided Emissions (Waste Disposal and Transport)		0.1	0.3	1.2	1.7	2.8	5.9
Zero Emission Allocation (Waste Concrete)		2.8	5.6	25.4	36.3	57.9	123.4

CBAM						
Indirect Specific Embedded Emissions	0.3	0.5	1.5	1.4	2.9	7.5
Direct Specific Embedded Emissions	1.2	2.2	7.3	6.5	12.9	31.9
Data Quality						
Data Quality Rating (DQR)	1.95	1.95	1.96	1.96	1.99	1.99
Uncertainity	Low Uncertainty (≤10 - 20%)	Low Uncertainty (≤10 - 20%)	Low Uncertainty (≤10 - 20%)	Low Uncertainty (≤10 - 20%)	Low Uncertainty (≤10 - 20%)	Low Uncertainty (≤10 - 20%)

Approval

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Approval date:	24th May 2024
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Revision:	A

Revision History:	Change Description:	Changed by:	Date:	Approved by:	Date:
B	Altered wording to reflect 50% renewable supply	NW	15th July 2024	LH	15th July 2024
C					
D					
E					
F					

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