Environmental Product Declaration

EPD of multiple products, based on the average results of the product group in accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Recovered and refurbished used steel I-beams from

Cleveland Steel & Tubes Ltd.

Programme:	The International EPD® System, www.environdec.com
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An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

General information

Programme information

Programme:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	www.environdec.com
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Accountabilities for PCR, LCA and independent, third-party verification
Product Category Rules (PCR)
CEN standard EN 15804 serves as the Core Product Category Rules (PCR)
Product Category Rules (PCR): Construction Products. PCR 2019:14. Version 1.3.3 Valid Until: 2024-12-20.
PCR review was conducted by: The Technical Committee of the International EPD System. See www.environdec.com for a list of members. Review chair: Claudia A. Peña, University of Concepción, Chile. The review panel may be contacted via the Secretariat www.environdec.com/
Life Cycle Assessment (LCA)
LCA accountability: Mark Dowling and Robert Holdway Giraffe Innovation Ltd, Contact r.holdway@giraffeinnovation.com. +44(0)7788423399
Third-party verification
Independent third-party verification of the declaration and data, according to ISO 14025:2006, via: ☒ EPD verification by individual verifier Third-party verifier: Dr Matthew Fishwick, Fishwick Environmental Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025.

Company information

Owner of the EPD: Cleveland Steel and Tubes Ltd (CST).

Contact: Roy Fishwick, Managing Director. Dalton Industrial Estate, Thirsk, North Yorkshire, YO7 3JN, United Kingdom. sales@cleveland-steel.com.

Description of the organisation:
Established in 1973, Cleveland Steel and Tubes (CST) are one of the largest stockholders of steel tubes in Europe with 88,000 tonnes of material held at their 100-acre facility in North Yorkshire, UK.

CST are founder members of the multinational Bianco Group[1], with associate companies worldwide. This means customers have access to over 250,000 tonnes of material held in stock (steel tubulars and I-beams) within our group at any one time.

CST business is based on supplying customers with steel tubulars and I-beams that meet their requirements at highly competitive prices. Depending on the source and conditions of purchase, CST stock is divided into two broad categories: Uncertified/Non-Prime and Certified/Prime. CST stock profile includes 40% of certified material, complementing our more cost-effective uncertified material, which can always be issued with independent test reports based on your needs.

The I-beams are recovered from demolition sites and will be used in the construction sector such as building members. At end of life the life of the building the recovered and either refurbished or set for recycling as scrap metal.

The directors, management, and staff of CST remain committed to on-going environmental sustainability improvements. Our policies on these subjects can be found on our website: https://www.cleveland-steel.com/sustainability.

CST is a member of the British Constructional Steelwork Association. The manufacturing site is accredited to ISO 9000 and practices certified to BSEN1090-01, and BSEN1090-02.

Product certification – The products are certified to API 5L 2020 and then BSEN 10210 and BSEN 10219. This is followed by BS4360, EN10225, DIN2448, EN10224 and API 5CT.

Name and location of production site
Cleveland Steel & Tubes Ltd
Dalton Industrial Estate
Thirsk,
North Yorkshire,
YO7 3JN,
United Kingdom.

Product information

Product name and identification: Recovered and refurbished used steel I-beams from demolition sites.

Product description:
Recovered steel I beams come in a range of sizes. However, the most common sizes are given below.

Table 1: I-beam sizes

I beam size (mm)	Length (m)
152x152x37	6
203x133x25	6
762x267x173	6

[1] https://www.bianco-international.com/about-us-2/

The steel I-beams are recovered as waste from construction sites across the UK and in particular large cities such as London, Birmingham and Manchester. During refurbishment any attachments are grinded or torched off (Oxy Acetylene) and the surface shot blasted before the I-beam is cut to size.

Further technical information including range of specifications can be obtained on CST website https://cleveland-steel.com/.

UN CPC code: 4126
Geographical scope: The I-beams are recovered from within the UK and predominantly sold to the UK market.

EPD type: The EPD is based on the average results of the product group. Allocation of different sizes was carried out on a mass basis, so there is no difference in per tonne impact. The EPD covers (A1-A3) with modules C1-C4 and module D (A1-A3+C1-C4+D).

Declared unit: The declared unit is 1 tonne of recovered and refurbished steel I-beam. This is an aggregated data set based upon numbers of I-beams recovered and refurbished in 2023. It includes the different processes used e.g., to remove attachments and to cut the I-beams to size. There is limited other reuse market for these I-beams, aside from recycling as scrap steel.

Reference service life: A reference service life for the steel I-beams is not declared because they can be used in a variety of different forms of construction, and the final construction application is not defined. To determine the full service life, all factors would need to be included such as location and environment, corrosion protection, and fire protection.

Time representativeness: Covers one year for 1st January 2023 to 31st December 2023.

Database(s) and LCA software used: ecoinvent 3.9.1 (cut-off) and SimaPro 9.5.0.1

LCA methodology: EN 15804 reference package based on EF 3.0 was used.

Description of system boundaries: Cradle to gate (A1-A3) with modules C1-C4 and module D (A1-A3+C1-C4+D). The EPD includes the initial recovery and refurbishment of an I-beam that has been recovered as waste from a demolition site. Based upon the cut off rules the I-beam is burden free at this point.

Based upon the tonnage collected in 2023 and the distance travelled by road the following table shows the average distance and mode of transport.

Table 2: Transport to CST (A2)

Scenario information	Unit
Vehicle used	32t Euro 5 lorry
Fuel type	Diesel
Average distance to CST	276.75 km
Bulk density and capacity utilisation	Varies considerably so tkm from ecoinvent was used for each relevant mode of transport

The following electricity, gas, diesel and transport is used per tonne of I beam. This takes into account the additional weight of attachments to the I-beams.

Table 3: Materials and processes

Materials/assemblies	Amount	Units
Acetylene	0.026011	kg
Oxygen	0.017691	kg
Iron pellet	11.11	kg
Diesel	1	kg
Processes		
Electricity, medium voltage. GB, residual mix, from high to medium voltage	5.845	kWh
Transport, freight, lorry 16-32 metric ton	332.1	tkm
Transport, freight, lorry 16-32 metric ton	0.0043	tkm
Electricity, low voltage photovoltaic	8.7678	kWh

It was assumed that the I beams at end of life were removed from a demolition site and that 2.555 kg of diesel is used per tonne of extracted I beam. This is based upon Erlandsson, M., & Pettersson, D. (2015). Climate impact for buildings with different energy performance. May 2015. “Klimatpåverkan för byggnader med olika energiprestanda”. Stockholm: IVL - The Swedish environmental agency. This references 11 kWh of diesel for removal of 1 tonne of steel."

The residual grid mix for UK was used for electricity used and this equates to 0.477kgCO_2eq per kWh and the reference year was 2023.

System diagram:

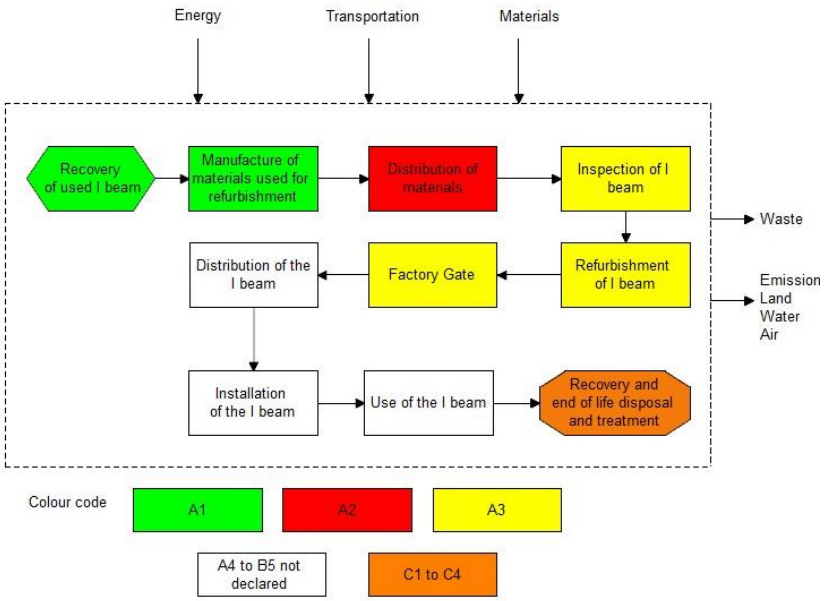

Figure 1:System boundary

Allocation

It is assumed that the I beam is burden free as it recovered as waste.

Any waste steel generated in production (A3) is dealt with as waste steel for sorting and recycling.

Cut off rules.

When building a life cycle inventory (LCI), it is typical to exclude items considered to have a negligible contribution to results. To do this in a robust manner there must be confidence that the exclusion is fair and reasonable. Therefore, cut-off criteria are defined, which allow items to be neglected if they meet the criteria. In this study exclusions could be made if they were expected to be within the below criteria:

- The LCI data shall be a minimum of 95% of total inflows (mass and energy) per module (e.g. A1-A3, A4-A5, B1-B5, B6-B7, C1-C4 and module D)
- This EPD applies the expanded cut-off rule of ISO 21930, which says that at least 95% of the environmental impact per module shall be included as well. Plausibility assessments and expert judgement can be used to demonstrate compliance with these criteria.

Swarf from the cutting and grinding and the grinding wheels and the saws are less than 1% of the mass and environmental significance. The straps and wooded blocks used in transportation are used repeatably and therefore also fall under the 1% for mass and environmental significance.

The energy use in the offices at the production site and any consumables have been excluded as this will be considerably less than 1% of the key impact categories.

Data quality indicators (DQIs)

To ensure data quality, checks were completed on key data parameters using data quality indicators (DQIs) which are applied to key data parameters to ensure fit for purpose. Key data parameters are assessed against a data quality matrix. The data quality matrix used in this study is shown below and the scoring for the data is highlighted in grey.

Table 4: Data quality indicators

Score	Very good	Good	Fair	Poor	Very poor
Reliability of the source	Verified data based on measurements	Verified data partly based on assumptions or unverified data based on measurements	Non-verified data partly based on assumptions	Qualified estimate (e.g., by industrial expert)	Non-qualified estimate
Representative	Representative data from sufficient sample of sites over an adequate period to even out normal fluctuations	Representative data from a smaller number of sites but for adequate periods	Representative data from an adequate number of sites but from shorter periods	Representative data but from a smaller number of sites and shorter periods or incomplete data from an adequate number of sites and periods	Representativeness unknown or incomplete data from a smaller number of sites and/or from shorter periods
Temporal correlation	Less than three years of difference to year of study	Less than six years of difference	Less than 10 years of difference	Less than 15 years of difference	Age of data unknown or more than 15 years of difference
Geographical correlation	Data from area under study	Average data from larger area in which the area under study is included	Data from area with similar production conditions	Data from area with slightly similar production conditions	Data from unknown area or area with very different production conditions
Technological correlation	Data from enterprises, processes and materials under study	Data from processes and materials under study but from different enterprises	Data from processes and materials under study but from different technology	Data on related processes or materials but same technology	Data on related processes or materials but different technology

Life cycle stages that have been omitted from the scope of the study include the following:

- Human energy inputs to processes;
- Infrastructure and capital goods; and
- Transport of employees to and from their normal place of work.

The estimated impact results are only relative statements which do not indicate the end points of the impact categories, exceeding threshold values, safety margins or risks.

Modules declared, geographical scope, share of specific data (in GWP-GHG results) and data variation (in GWP-GHG results):

Table 5: Modules declared

	Product stage			Construction process stage		Use stage							End of life stage				Resource recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse-Recovery-Recycling-potential
Module	**A1**	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
Modules declared	X	X	X	ND	ND	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	GB	GB	GB	ND	ND	ND	ND	ND	ND	ND	ND	ND	GB	GB	GB	GB	GB
Specific data used	10%			ND	ND	ND	ND	ND	ND	ND	ND	ND	-		-	-	-
Variation – products	<10%			ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-
Variation – sites	0%			ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-	-	-	-

X included in LCA - ND: module not declared - NR: module not relevant

Product and packaging information

Table 6: Product and packaging information

Product components	Weight, kg	Post-consumer material, weight-%	Biogenic material, weight-% and kg C/kg
Hot rolled steel	1000	100%	0

The product does not contain any substances from the Candidate List of Substances of Very High Concern (SVHC) for authorisation in amounts greater than 0.1%.

The carbon intensity of the I beam per tonne is 0 kgCO2 eq as it is 100% post-consumer scrap product.

Results of the environmental performance indicators

The environmental performance of one tonne of steel I-beam is declared and reported using the parameters and units as specified in PCR 2019:14 v1.3.3. These life cycle impact assessment results and other environmental results are presented in the tables below per declared unit, broken down by module.

As specified in EN 15804:2012+A2:2019 and the PCR 2019:14 v1.3.3, the environmental impacts are declared and reported using the baseline characterisation factors from the EC-JRC.

Mandatory impact category indicators according to EN 15804

Table 7: Mandatory imapct results

Results per tonne of I-beam							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-fossil	kg CO_2 eq	6.94E+01	2.40E+00	9.48E+00	8.55E-01	4.31E-01	4.39E+02
GWP-biogenic	kg CO_2 eq	3.04E-01	5.77E-03	2.45E-02	5.42E-02	9.28E-04	2.97E-02
GWP-luluc	kg CO_2 eq	3.45E-02	5.84E-04	4.60E-03	1.87E-03	2.53E-04	1.31E-01
GWP-total	kg CO_2 eq	6.98E+01	2.40E+00	9.51E+00	9.11E-01	4.32E-01	4.40E+02
ODP	kg CFC11 eq	1.71E-06	2.16E-07	2.01E-07	1.60E-08	1.20E-08	8.98E-13
AP	mol H+ eq	1.66E-01	9.67E-03	2.02E-02	5.05E-03	3.11E-03	1.07E+00
EP-freshwater	kg P eq	6.06E-03	1.29E-04	6.57E-04	7.15E-04	3.44E-05	2.05E-04
EP-marine	kg N eq	4.10E-02	1.95E-03	5.09E-03	1.02E-03	1.20E-03	2.10E-01
EP-terrestrial	mol N eq	4.21E-01	1.70E-02	5.18E-02	9.88E-03	1.28E-02	2.10E+00
POCP	kg NMVOC eq	2.41E-01	1.99E-02	3.13E-02	3.15E-03	4.46E-03	8.11E-01
ADP minerals & metals*	kg Sb eq	2.62E-04	1.53E-06	3.02E-05	9.39E-06	5.74E-07	3.08E-04
ADP-fossil*	MJ	1.06E+03	1.33E+02	1.31E+02	1.79E+01	1.03E+01	4.35E+03
WDP*	m^3 depriv.	5.10E+00	1.69E-01	5.48E-01	1.97E-01	4.55E-01	2.87E+02

Acronyms
GWP-fossil = Global Warming Potential fossil fuels; GWP-biogenic = Global Warming Potential biogenic; GWP-luluc = Global Warming Potential land use and land use change; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential, Accumulated Exceedance; EP-freshwater = Eutrophication potential, fraction of nutrients reaching freshwater end compartment; EP-marine = Eutrophication potential, fraction of nutrients reaching marine end compartment; EP-terrestrial = Eutrophication potential, Accumulated Exceedance; POCP = Formation potential of tropospheric ozone; ADP-minerals&metals = Abiotic depletion potential for non-fossil resources; ADP-fossil = Abiotic depletion for fossil resources potential; WDP = Water (user) deprivation potential, deprivation-weighted water consumption

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of these results are high or as there is limited experience with the indicator.*

The use of the results of modules A1-A3 without considering the results of module C is discouraged as end of life may vary for other reuse applications.

Additional mandatory and voluntary impact category indicators

Table 8: Additional results

Results per tonne of I-beam							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
GWP-GHG[2]	kg CO_2 eq.	6.95E+01	5.86E-02	1.78E-01	4.68E-01	6.52E-03	3.29E+03
Ionising radiation*	kBq U-235 eq	3.28E+00	7.62E-08	5.46E-07	3.49E-08	6.63E-08	1.59E-05
Particulate matter	disease inc.	4.08E-06	2.38E-08	1.19E-07	1.64E-08	4.99E-09	7.01E-06
Human toxicity, non-cancer**	CTUh	8.97E-07	7.90E-10	4.21E-09	7.94E-10	1.76E-10	1.32E-07
Human toxicity, cancer**	CTUh	3.08E-08	6.04E+01	6.95E+01	2.25E+00	5.05E+00	5.13E+02
Ecotoxicity, freshwater**	CTUe	5.20E+02	7.38E+00	7.92E+01	1.73E+01	2.04E+01	1.54E+02
Land use	Pt	5.50E+02	5.86E-02	1.78E-01	4.68E-01	6.52E-03	3.29E+03

Disclaimers
**This impact category deals mainly with the eventual impact of low dosing ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure, nor due to radiative waste in underground facilities. Potential ionizing radiation from soil, from radon and from some materials is also not measured by this indicator.*
*** The results of these environmental impact indicators should be used with care as the uncertainties of these results are high or as there are limited experiences with the indicators.*

[2] This indicator accounts for all greenhouse gases except biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. As such, the indicator is identical to GWP-total except that the CF for biogenic CO_2 is set to zero.

Resource use indicators

Table 9: Resource use indicators

Results per tonne of I-beam							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
PERE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PERM	MJ	5.35E+01	4.76E-01	2.06E+00	3.67E+00	8.72E-02	2.99E+01
PERT	**MJ**	**5.35E+01**	**4.76E-01**	**2.06E+00**	**3.67E+00**	**8.72E-02**	**2.99E+01**
PENRE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRM	MJ	1.12E+03	1.42E+02	1.39E+02	1.88E+01	1.10E+01	4.58E+03
PENRT	**MJ**	**1.12E+03**	**1.42E+02**	**1.39E+02**	**1.88E+01**	**1.10E+01**	**4.58E+03**
SM	kg	1.20E+03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	1.82E-01	6.65E-03	1.89E-02	1.34E-02	1.09E-02	1.06E+00

Acronyms
PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

Waste indicators

Table 10: Waste indicators

Results per tonne of I-beam							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed	kg	2.00E+02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.80E+01
Radioactive waste disposed	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Output flow indicators

Table 11: Output flows indicators

Results per tonne of I-beam							
Indicator	**Unit**	**A1-A3**	**C1**	**C2**	**C3**	**C4**	**D**
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.66E+02
Material for recycling	kg	2.00E+02	0.00E+00	0.00E+00	0.00E+00	8.50E+02	4.66E+02
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported energy, thermal	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Additional environmental information

The I-beams covered in this EPD have been recovered as waste from demolition sites across the UK as a used construction product. As evidence of this they are purchased at near scrap value and handled as waste and therefore come burden free part from the shipping to CST and treatment. There is minimal other reuse market for these tubulars, aside from recycling as scrap steel. This is an aggregated data set based upon numbers of I-beams recovered in 2023.

The transportation impacts in A2 are based upon 2023 data on weights of I-beams recovered. When recovered from use (C1) if they are in good condition the beams will be refurbished again and reused in structural application (members).

The analysis is given for tubulars used in structural applications (above ground) such as members in buildings where reuse and recycling are much more likely at end of life. For this scenario Reuse-Recovery-Recycling Potential (D) has been modelled to identify the potential benefits of recovering, and recycling tubulars.

The values (C3) are based upon a recovery rate of 93.2% of which 466 kg (46.6%) are reused, 466 kg (46.6%) are recycled and 68 kg (6.8%) is landfilled (C4). This is based upon Defra UK statistics on for the recovery of steel by the construction industry waste[3].

The transportation impacts in C2 are based upon shipping the I-beams 50km. All transportation is by 16-32t articulated lorry.

References

General Programme Instructions of the International EPD® System. Version 4.0.

Construction Products. PCR 2019:14. Version 1.3.3. Valid Until: 2024-12-20

Defra (2020) UK statistics on waste - GOV.UK (www.gov.uk)

EN 15804+A2. Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

Erlandsson, M., & Pettersson, D. (2015). Klimatpåverkan för byggnader med olika energiprestanda. ”Climate impact for buildings with different energy performance”. Stockholm: IVL - The Swedish environmental agency.

ISO 14025, 2006 Environmental labels and declarations. Type III environmental declarations. Principles and procedures

ISO14044, 2006 Environmental management, Life cycle assessment Requirements and guidelines

ISO 14040, 2006 Environmental management, Life cycle assessment Principles and framework

[3] https://www.gov.uk/government/statistics/uk-waste-data/uk-statistics-on-waste