

Broadsword Carbon Footprint Calculation



Breakdown of Footprint

Activity	Unit	TCO2e
Scope 1 – Direct emissions	Total	2.39
<i>Gardner Industrial Estate Gas</i>		2.23
<i>Fuel Purchased</i>		0.16
Scope 2 – Emissions from electricity purchased	Total	4.71
<i>Gardner Industrial Estate Electricity</i>		4.71
Scope 3 – Indirect emissions	Total	203.52
<i>Equipment Rental</i>		39.42
<i>IT Equipment</i>		36.53
<i>Business Travel</i>		35.93
<i>Technical Consultant</i>		24.20
<i>Venue Hire</i>		11.47
<i>Employee Commuting</i>		11.09
<i>Software</i>		8.37
<i>Work from Home</i>		7.94
<i>Specialist Equipment</i>		6.08
<i>Deliveries</i>		5.58
<i>Food and Drink</i>		2.39
<i>Online Tools</i>		2.30
<i>Hotel Stays</i>		1.25
<i>Other</i>		10.97
Total Carbon Footprint	Tonnes	210.62

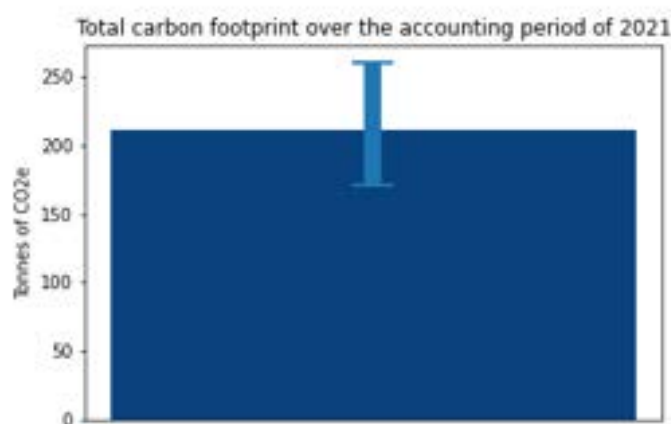


Table of Contents

Breakdown of Footprint	2
Introduction.....	4
Scope 1 Emissions	5
Scope 2 Emissions	7
Scope 3 Emissions	8
Transmission and Distribution	9
Deliveries	10
Logistics	10
Waste	11
Water	11
Purchased Items	12
Employee Commuting.....	13
Working from Home	14
Online Tools	16
Conclusion.....	17
Recommendations	19
Sources	20
Glossary of Terms	21
Bibliography	23

Introduction

The first step in an organisation carbon management strategy involves calculating the Greenhouse Gas emissions (GHGs) emitted over a given period. Once this has been undertaken, a reduction strategy can be set out for the future, and unavoidable emissions offset. These steps allow a company to go carbon neutral. This report is the first step in that journey and demonstrates the workings for Broadsword's carbon footprint calculation.

Broadsword is an events communications agency. The accounting period in question is the calendar year of 2021. This will give Broadsword a base year of emissions. During the period in question, the country went into a national lockdown due to the COVID-19 pandemic. As such the operations of Broadsword were affected by changing government restrictions limiting the size of events held.

Organisational Boundaries

When calculating an organisation's carbon footprint, it is important to set out boundaries to what degree the emissions will be calculated. The included activities, and therefore the boundaries of this calculation, are detailed throughout this document. For this base year and initial calculation, Broadsword will be calculating 100% of scope 1, 100% scope 2, and over 90% of their scope 3 emissions.

C Free has completed a carbon footprint calculation of the Broadsword's business. This is not an entire Lifecycle Assessment of emissions; it has been done to achieve carbon neutral business certification.

Scope 1 Emissions

Scope 1 pertains to all emissions from sources owned or controlled by the company/organisation (excluding those not covered by the Kyoto protocol) (World Resources Institute, 2015).

Gas

Broadsword's offices use gas burnt onsite for heating and hot water producing emissions. The gas is purchased from and supplied by Utilita.

Methodology

The amount of gas used was supplied by Broadsword in kWh from their energy bills. This number, multiplied by the UK governments conversion factor for natural gas (Government, 2021) gives the emissions.

Formula:

$$kWh \times kgCO_2e/kWh = kgCO_2e$$

Results

2.23 Tonnes CO₂e



Fuel Purchased

Vehicles operated by Broadsword use fuel purchased by Broadsword, the emissions due to the combustion of this fuel is the responsibility of Broadsword.

Methodology

The litres and type of fuel used was supplied by Broadsword. This number, multiplied by the UK governments conversion factor for the specific type of fuel (Government, 2021) gives the emissions.

Formula:

$$L \text{ of fuel} \times \text{kgCO}_2\text{e/L} = \text{kgCO}_2\text{e}$$

Results

0.16 Tonnes CO₂e



Scope 2 Emissions

Scope 2 includes the organisation's carbon footprint that are emitted off-site through the purchased electricity generated elsewhere (World Resources Institute, 2015).

Electricity

The emissions for electricity production are produced offsite by a power station. This electricity is then purchased and distributed by Haven Power and Drax.

Methodology

Broadsword supplied the kWh used over the calculation period at their office from their energy bills. This can be used in conjunction with the government conversion factors (Government, 2021) to give the carbon footprint associated with electricity purchased.

Formula:

$$\text{kWh} \times \text{kgCO}_2\text{e/kWh} = \text{kgCO}_2\text{e}$$

Results

4.71 Tonnes CO₂e



Scope 3 Emissions

Scope 3 includes all indirect emission sources not included in scope 1 and scope 2. They occur as a result of the activity of the company, but not from sources owned or controlled by the company (World Resources Institute, 2015). Examples include the production of raw materials the company is reliant on, the transportation of materials, or the use of services such as online meeting platforms etc.

The vast majority of Broadsword's emissions come from Scope 3. Although it is not required, in cases where most emissions come from scope 3, it is highly recommended to include such emissions in the calculation.

As stated in the PAS:2060 (the internationally renowned carbon neutrality standard) any areas of scope 3 that fall under 1% of the total emissions of the organisation do not have to be factored into the carbon footprint calculation.

Some of the data needed for the calculation of scope 3 emissions was unreliable or unobtainable. In cases where the data was unreliable, the reason for its inclusion and our efforts to ensure accuracy have been made

clear in the methodology. In cases where the data was unobtainable, suitable proxies were used.

As stated in the GHG protocol, it is important to focus on the scope 3 areas that are expected to have the most significant GHGs, have the best opportunity to reduce those emissions, and are most relevant to Broadsword's business goals.

For these reasons, the following areas were analysed:

- Transmission and Distribution
- Logistics
- Deliveries
- Purchased Items
- Business Travel
- Hotel Stays
- Employee Commuting
- Work from Home
- Online Tools and Software
- Waste
- Water

In some cases, some emissions sources fall out of the scope of this document. This can be due to unreliable information, inadequate information, or lack of research pertaining to the source in question.

For Broadsword, the following areas were not analysed:

- Investments and Pensions

Transmission and Distribution

When electrical currents travel through a network like the national grid, a small percentage of energy is lost in the form of heat when getting the electricity from the power plant to the end user. These losses are known as Transmission and Distribution losses. It is important that we factor this in when calculating emissions for an organisation, as any electricity purchased does produce that small percentage extra of GHGs.

Methodology

In the UK the number for Transmission and Distribution is 0.00899 kgCO₂e/kWh (Government, 2021).

Formula:

$$kWh \times kgCO_2e/kWh = kgCO_2e$$

Results

0.20 Tonnes CO₂e



Deliveries

Broadsword only deliveries are internal shipment of goods within the company or for events. These deliveries are all carried out by third parties.

Methodology

As deliveries constitute such a small number of Broadsword's expenses the emissions associated with them were calculated using the spend based method. We used research done by Anne Owen at the University of Leeds,

in which Owen has assigned kgCO₂e per pound spent on various consumer goods. This data and the cost of deliveries were used to calculate. This method is inherently less accurate and so there is an added uncertainty.

Formula:

$$\text{£ spent} \times \text{kgCO}_2\text{e}/\text{£} = \text{kgCO}_2\text{e}$$

Results

5.58 Tonnes CO₂e



Logistics

Logistics is the delivery of items to Broadsword from all over the world. These supply chains cause emissions.

Methodology

For land travel, a similar methodology to that given delivery was applied (but with no need to order destinations). For sea travel distances between ports were taken from The CERDI sea distance dataset (Simone Bertoli, 2016) In conjunction with the weight of the product delivered, conversion factors were applied to attain a carbon footprint (Government, 2021).

Formula:

$$\text{kgCO}_2\text{e}/(\text{km} \times \text{tonnes}) \times \text{weight} \times \text{distance} = \text{kgCO}_2\text{e}$$

Results

0.15 Tonnes CO₂e

Waste

There are different types of waste, and each has a different carbon footprint associated with it. Recycling needs sorting and repurposing. This requires energy. When organic waste decomposes, carbon dioxide and methane are produced – both of which are GHGs.

Methodology

The number of binbags used was estimated by Broadword. The nature of the business means there was no additionally operational waste to consider. The added uncertainty due to this method of calculation has

been factored in. Estimating a binbag's weight we converted into tonnes of waste. Then, referencing the government conversion factors, we have a figure for kgCO₂e (Government, 2021).

Formula:

$\text{Tonnes of waste} \times \text{kgCO}_2\text{e/tonne} = \text{kgCO}_2\text{e}$

Results

Landfill:

0.67 Tonnes CO₂e



Water

Water requires treatment before and after use. It is also pumped and pressurised to get it to flow to our homes and businesses and treat it once used. All these activities require a large amount of energy and therefore produce GHGs. It is therefore important to calculate water usage and include it when accounting for the overall carbon footprint of an organisation.

Methodology

Broadword provided an estimate of their water usage based on their bills. One litre of water produces about 0.421 grams of CO₂e (Government, 2021).

Formula:

$\text{Litres} \times \text{kgCO}_2\text{e/Litre} = \text{kgCO}_2\text{e}$

Results

0.06 Tonnes CO₂e

Purchased Items

A company has a responsibility for the emissions produced by the production and distribution of the goods that are purchased in order to provide goods and services. Often this can be calculated by the amount spent in different areas using the spend-based method.

Methodology

In order to calculate the carbon footprint of items purchased by Broadsword, we used a combination of research done by Anne Owen at the University of Leeds and government conversion factors (Government, 2021). This research is available through the UK Government and is verified by WWF who used it for their calculations.

Owen has assigned kgCO₂e per pound spent on various consumer goods. Broadsword were able to share accounting information about the amount spent on such goods. These were categorised and multiplied by the relevant factor to give the total carbon footprint by using the spend-based method.

It can be argued that the carbon footprint associated with the production of various commodities should be spread across their lifetime. However, for the purpose of this calculation, we treat them as a point source at the time of purchase as, in practice, the lifetime of such goods is highly variable. Furthermore, consumption is typically quite regular (on an annual basis) and therefore, treating emissions as a point source will not skew the resultant footprint.

Formula:

$$\text{£ spent} \times \text{kgCO}_2\text{e/£} = \text{kgCO}_2\text{e}$$

Results

IT Equipment and Accessories:

36.53 Tonnes CO₂e

Equipment Hire:

39.42 Tonnes CO₂e

Software:

8.37 Tonnes CO₂e

Technical Consultancy:

24.20 Tonnes CO₂e

Venue Hire:

11.47 Tonnes CO₂e

Food and Drink:

2.39 Tonnes CO₂e

Electronics for Resale:

8.37 Tonnes CO₂e

Specialist Equipment:

6.08 Tonnes CO₂e

Other:

2.77 Tonnes CO₂e



Employee Commuting

When an individual would not usually travel if they were not working for a company, it is reasonable to put responsibility for the emissions produced from that travel on the company. Employee commuting is therefore a scope 3 emissions that should be included in the calculations of a company's carbon footprint.

Methodology

Using the survey sent to the Broadsword staff, the bulk of the information required to make an estimation of employee commuting was available. The questionnaire included information about the location of their homes and offices, the days worked per month, methods of transport used, and the frequency with which these methods were used. Therefore, the emissions were estimated by finding the distance travelled,

multiplying the total commuting distance by the relevant conversion factor for a given mode of transport, and then weight this by the frequency multiplier supplied (Government, 2021) and the number of days worked per month. Over two thirds of the employees answered the survey, so the previous calculation was used to find an average per person. This, along with the total number of employees was used to calculate the total emissions due to commuting.

Formula:

$2 \times \text{distance travelled km/day} \times \% \text{ mode} \times \text{kgCO}_2\text{e/km each mode} \times \text{days worked in office} = \text{kgCO}_2\text{e}$

Results

11.09 Tonnes CO₂e



Working from Home

During the accounting period, the country went into national lockdown due to the COVID-19 pandemic. Stay at home orders were issued (IEA, 2020). Therefore, much of the emissions associated with office life, (electricity consumption, heating, etc) were transferred to the respective homes of employees. It is important to include these resultant extra home emissions in the overall calculation of Broadsword's footprint.

Methodology

The Employees of Broadsword provided the days worked at home and their average monthly energy bills. This information and factors gathered from a paper regarding working from homes effect on utility usage (ecoact, 2020) was used to calculate the added gas and electricity used.

Then with conversion factors kWh per pound spent on utilities and kWh emissions factors from (Government, 2021) we calculated the carbon footprint.

Formula:

$Electricity \text{ £} \times kWh/\text{£} \times kgCO_2e/kWh \times \text{fraction of time spent working at home} = kgCO_2e$

$Gas \text{ £} \times kWh/\text{£} \times kgCO_2e/kWh \times \text{fraction of time spent working at home} = kgCO_2e$

Results

Electricity:

3.65 Tonnes CO₂e

Gas:

4.29 Tonnes CO₂e



Business Travel

In order to interact with clients and effectively satisfy their requirements, travel to and from client offices is necessary. However, this travel comes at an environmental cost. As with the previous section, COVID-19 restrictions played a large role in curtailing the business travel emissions of Broadsword. Again, movement restrictions and stay at home orders prevented usual activity.

Methodology

The spend based method was used to calculate the emissions due to business travel. Broadsword provided the expense records of travel with either location information or cost of travel along with mode of travel. The emissions factors per pound spent for each mode of transport from the Leeds report

Where specific location information was unavailable approximate values for average taxi, bus or train journeys was used from the governments Department of Transport reports.

Formula:

$$\text{Ticket } \pounds \times \text{kgCO}_2\text{e}/\pounds = \text{kgCO}_2\text{e}$$

$$\text{Fuel cost } \pounds \times \text{kgCO}_2\text{e}/\pounds = \text{kgCO}_2\text{e}$$

Results

35.93 Tonnes CO₂e



Online Tools

Online tools for communication like Zoom produce emissions associated with electricity consumption of the servers used for which we must account. Use of these tools has increased over the course of the accounting year as working from home has put greater dependency on these alternative methods of sharing information.

Methodology

Broadsword supplied the total user hours spent using Zoom. By modelling the total data transfer associated with such an activity, a calculation for video meeting was established.

Formula:

$Hours\ used \times kgCO_2e/hour = kgCO_2e$

Results

2.30 Tonnes CO₂e



Conclusion

In conclusion, we find that Broadword have emitted 210.62 tonnes of CO₂e over the accounting period of 2021. This is approximately 7 tonnes per employee.

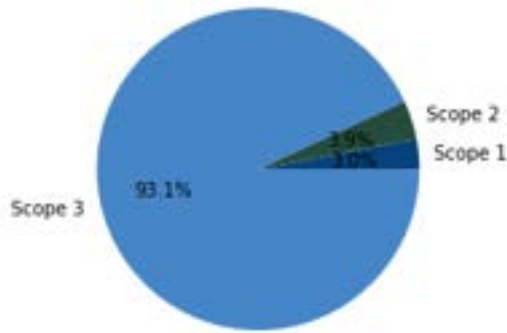


Figure 1: The total emissions broken down by scope.

Figure 1 shows the total emissions by Broadword broken down into scope. Scope 3 make up most of the emissions.



Figure 2: All emissions that contribute over 2% each broken down by source.

Figure 2 shows the total emissions of Broadword's activities broken down by source. Equipment Hire make up the largest percentage of emissions followed by Travel and IT equipment. "Resale" here denotes the equipment labelled as purchased for resale in expenses.

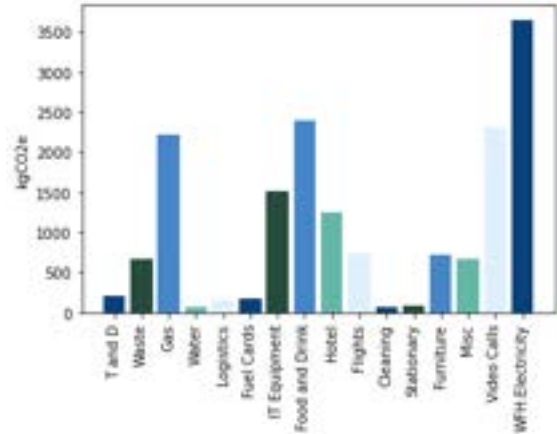


Figure 3: All emissions contained with the 'other' label of Fig 2.

Figure 3 shows the emissions encompassed by 'Other' in Figure 2. Work from home electricity emissions, Food and Drink, and Video Calls (Zoom) contribute the most, 'Misc' here contains other office spending that doesn't fit into another category such as key cutting.

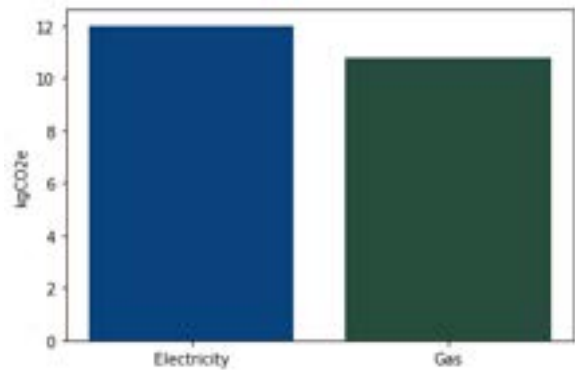


Figure 4: Utilities emissions comparison.

Figure 4 shows the emissions due to utilities in the office of Broadword. Electricity is about double that off gas, this is as expected as gas would only be used when needed for heating and occasionally hot water whereas electricity would be constantly during operating hours.

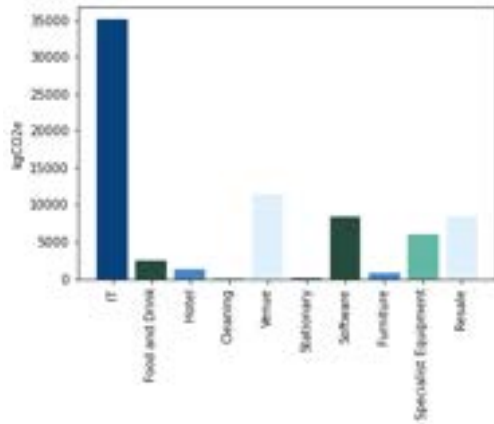


Figure 5: Emissions from expenses.

Figure 5 shows the emissions from expenses broken down by category. IT is the largest emitter followed by Venue Hire and Software. IT includes the purchase of laptops, PCs, Monitors, and things like keyboards and replacement parts. Software emissions come from the use of third-party servers as well as the users own compute.

Recommendations

- We, as a society, will only make progress towards net zero if everyone gets involved. Ask companies you do direct business with how they are reducing their emissions. This could lead them to take action and may give you new ideas. Try having a conversation about reducing environment impact with each of your supplies at least once in the next three months.
- Look into reduction strategies for electricity in the office, switch to LED lightbulbs, purchase energy efficient equipment, turn off lights and coffee machines when not in use, buy second-hand, insulate the building to reduce energy consumption and bills
- Install solar panels for your own renewable electricity.
- Reduce, Reuse and Recycle in the office and minimise waste as much as possible.
- Switching to green energy providers is a great way to lower the impact of your business's activities.

Sources

Factor	Unit	Source	Date	Comment
Average distances travelled	miles	Department for Transport UK Government	2018	The average distances travelled by various modes of transport in the UK
Fuel	£	University of Leeds consumption of emissions	2018	The emissions of fuel per pound spent
Train	£	University of Leeds consumption of emissions	2018	The emissions of a train per pound spent
Taxi	£	University of Leeds consumption of emissions	2021	The emissions of a taxi or other hire car per pound spent
Water	litre	UK Government Conversion factors	2021	Water purchased and treated
Gas	kWh	UK Government Conversion factors	2021	Natural gas supplied through a utility company
Electricity	kWh	UK Government Conversion factors	2021	National grid Electricity supplied and associated transport and distribution
Furniture	£	University of Leeds consumption emissions	2018	Average emissions due to purchased furniture by the pound spent
Food and Drink	£	University of Leeds consumption of emissions	2018	Average emissions due to purchased foods and drinks
Software	£	University of Leeds consumption of emissions	2018	Average emissions due to the subscription and licensing of software
Equipment Rentals	£	University of Leeds consumption of emissions	2018	Emissions from renting electrical equipment per pound spent

Glossary of Terms

Accessories	For the purpose of report "Accessories" refers to purchasing of office equipment excluding otherwise stated like computers, furniture, etc.
Base year	A year of accounting GHG emissions against which of organisation emissions can be tracked.
Carbon Sequestration	The uptake of Carbon Dioxide. In context, the removal of greenhouse gases from the atmosphere.
CO₂e	Carbon Dioxide and Equivalent Greenhouse gases.
Conversion factor	A factor also known as an emissions factors which allows GHG emissions to be estimated from a unit of available activity data (e.g. tonnes of fuel consumed, tonnes of product produced) and GHG emissions.
Direct GHG Emissions	Emissions that are from sources controlled or owned by the organisation.
Double counting	Accounting for emissions or reductions more than once. This can be done either through two separate reporting companies accounting for the same emissions/reductions, or one company including emissions/reductions related to one activity more than once.
Emission Factor	A factor allowing GHG emissions to be estimated from a unit of available activity data (e.g. tonnes of fuel consumed, tonnes of product produced) and GHG emissions.
Emissions GHG Protocol	The release of Greenhouse Gases into the atmosphere. The Greenhouse Gas protocol is a comprehensive, global, standardized framework for measuring and managing GHGs from private and public sector operations, value chains, products, cities, and policies.
Greenhouse Gasses (GHGs)	GHGs are the sic gases listed in the Kyoto Protocol: carbon dioxide (CO ₂); methane (CH ₄); nitrous oxide (N ₂ O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulphur hexafluoride (SF ₆).
Indirect GHG emissions	Emissions that are a consequence of the operations of an organisation but occur at sources owned or controlled by another organisation.
IT Equipment	Throughout this report IT equipment refers to computers.
Kyoto Protocol	A protocol to the United Nations Framework Convention on Climate Change (UNFCCC). It requires countries listed to meet reduction targets of GHG emissions relative to their 1990 levels during the period of 2008-12.
PAS:2060	PAS:2060 is an internationally renowned standard detailing how to demonstrate carbon neutrality produced and published by the British Standards Institution.

Renewable Energy	Energy taken from sources that are not limited, e.g. wind, water, solar, geothermal energy, and biofuels.
Scope 1	All direct GHG emissions under an organisation control.
Scope 2	An organisation's emissions associated with the generation of electricity, heating/cooling, or steam purchasing for own consumption.
Scope 3	All organisation's indirect GHG emissions not covered in Scope 2.
Spend-based Method	This is a way of estimating emissions for goods and services by collecting data on the value of goods and services purchased and multiplying it by relevant emission factors.

Bibliography

- Bernard, K. L. R. M. S. D. N., 2013. *Carbon Footprint Across the Coffee Supply Chain: The Case of Costa Rican Coffee*, s.l.: s.n.
- Berners-Lee, M., 2010. *How Bad are Bananas?: The Carbon Footprint of Everything*. s.l.:s.n.
- Clark, D., 2013. *Information Paper - 6 CO2e emissions due to office waste*, s.l.: CUNDALL.
- Commision, E., 2013. *Building Consumption by Energy*, s.l.: s.n.
- Currie, P. J. & A., 2020. *The State of Data Center Energy Use in 2018 (Updated 2020)*. s.l.:s.n.
- Dell, 2019. *PowerEdge R640 Data sheet*. s.l.:s.n.
- ecoact, 2020. *Homeworking emissions Whitesheet*, s.l.: s.n.
- EcolInvent, 2021. *Various*, s.l.: s.n.
- Environmental Agency, 2020. *Greenhouse gas emissions of water supply and demand management options*, s.l.: s.n.
- Executive, H. a. S., 2013. *Workplace health, safety and walfare*, s.l.: s.n.
- Genevieve Doublet, N. J., 2010. *Life Cycle Assessment of drinking Darjeeling Tea*, s.l.: ESU-services Ltd.
- Government, U., 2021. *Conversion Factors*, s.l.: s.n.
- Government, U., 2021. *Uk Government Conversion Factors 2019*, s.l.: s.n.
- Greenwood, T., 2020. *Has the lockdown reduced our CO2 emissions?*, s.l.: s.n.
- Harrison, T., 2020. *Millions can expect 'shock' energy bill this autumn*, s.l.: s.n.
- IEA, 2020. *Global Energy Review 2020*. s.l.:s.n.
- Ntiamoah, A, A. G., 2008. *Environmental impacts of cocoa production and processing in Ghana: life cycle assessment approach*, s.l.: Journal of Cleaner Production.
- Owen, R. J., 1988. *Decision Theory: An Introduction to the Mathematics of Rationality*, s.l.: s.n.
- SEAI, 2020. *Energy Emissions Report 2020*, s.l.: s.n.
- Simone Bertoli, M. G. O. S., 2016. *The CERDI-seadistance database*, s.l.: s.n.
- Transport, D. f., 2018. *National Travel Survey: England 2017*, s.l.: s.n.
- Trust, C., 2019. *Warehousing and Logisitics*, s.l.: s.n.
- Trust, E. S., 2017. *at home with water*, s.l.: s.n.
- University, L., 2018. *Consumption Emissions*.
- waterwise, 2019. *Water consumption*, s.l.: s.n.
- World Resources Institute, 2013. *Technical Guidance for Calculating Scope 3 Emissions*, s.l.: s.n.

World Resources Institute, 2015. *GHG Protocol Scope 2 Guidance*, s.l.: s.n.

World Resources Institute, 2015. *The GHG Protocol Corporate Accounting and Reporting Standard Revised*, s.l.: s.n.

WWF, Cranfield University, 2009. *How long can we go?*

Leeds Sustainability Institute, 2013. *LCA of Shea Butter*

McGill University, 2021. *Liquid or Bar? Soapy Tales*