

**Coldharbour Mill Trust Ltd:
Initial Sustainability Assessment**



**Written by
Fred Johnston**

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Executive Summary:

This report evaluates the current practices of Coldharbour Mill Trust Ltd and its efforts to reach its goal of being carbon neutral by 2030. Based off an initial sustainability assessment, conversations with senior members of staff and a variety of online tools, a clear focus on Scope 1 and 2 emissions was established via an emphasis on improving the energy performance of the mill. These initial actions highlighted a clear but not formalised culture of sustainability in senior staff that derives from a need to minimise costs and be as efficient as possible, in addition to a general sense of responsibility for their surroundings.

A review of the proposed Archimedes Screw is conducted and supported given the large impact it would have on the Trust's carbon footprint, with the source of hydropower paying for itself in 23 years (excluding interest rates and maintenance costs). Furthermore, alternatives to current heating and steam generation methods in the mill were explored, highlighting the environmental benefits both would provide through a move towards electrically powered equipment; however, the former is likely to involve higher running costs and more information on the steam generation rate was needed by suppliers before appropriate units could be identified. Comments on energy management at the mill also included lighting and insulation aspects.

The report then evaluates the waste management, products sold, and equipment used at Coldharbour, giving a generally positive review overall with some opportunities for improvement highlighted, before then underlining the importance of formalising the organisational culture of sustainability in order to establish it outside of senior staff and effectively spread it to volunteers and the local community. The report concludes by emphasising the good work that has been done so far within the financial constraints the Trust faces and underlines the fact that the most effective steps towards carbon neutrality (short of paying for offsetting) are the large energy performance projects highlighted in the 'Energy Production and Efficiencies' section.

Introduction:

Overview of Coldharbour Mill –

The Coldharbour Mill Trust Ltd is the registered charity (no. 1123386) that runs the leading industrial heritage site of Coldharbour Mill, located next to the River Culm in the rural village of Uffculme, Devon. The mill, which has been operating continuously since 1797, is one of the oldest woollen mills in the UK and was originally owned by the commercial giants the Fox Brothers, opening as a working museum in 1982 (Coldharbour Mill Trust Ltd, 2021). The site is *“a rare surviving example of Georgian architecture, industry and enterprise”* and as such is a Grade II* listed building (Historic England, 2021). In 2001, English Heritage described the site as *“probably one of the best-preserved textile mill complexes in the country”*, retaining much of the buildings, power systems and machinery that characterised the development of the 19th century textile mill and its operations into the 20th century (Coldharbour Mill Trust Ltd, 2021). This includes the steam engines installed in 1865 to power the factory's machines and keep up with production demands, usurping the use of the waterwheel.

The charity, which employs one part time and three full time members of staff, is supported by a team of over a hundred volunteers that are critical to the operation of the mill as a successful visitor attraction. With a mission of education and inspiration, Coldharbour Mill offers award-winning educational programmes for schools and higher education institutions across the South-West and further afield, utilising the *“unrivalled collection of heritage machinery, social and textile archives and wide-ranging power sources still in daily use”* (Coldharbour Mill Trust Ltd, 2021). Importantly, however, the long-term vision of the Trust is to develop and secure a relevant and sustainable future for the mill to ensure that it can continue to fulfil its mission, particularly in the wake of the COVID-19 pandemic which has made accessing resources increasingly difficult. As global warming occurs, it is likely directly impact the mill site in various ways, through structural issues associated with temperature fluctuations, flooding, fungal and plant growth and insect infestations (Historic England, 2021). Not only is this mission therefore integral to preserving a crucial part of the county's and nation's history, it is also significant for the local community, with the volunteering opportunities at the Trust representing an important tool for promoting social wellbeing and combating isolation. Encompassed in this, the environmental sustainability of the site and the support and involvement of all mill stakeholders is therefore integral.

Sustainability Review –

As part of this overarching aim of sustainability, the Coldharbour Mill Trust Ltd has targeted the goal of being carbon neutral by 2030. This is a challenging prospect for the organisation, given the difficulty of accessing funding and the fossil fuel dependent machinery the mill currently employs. Consequently, as the first steps towards this goal, a feasibility study was conducted concerning the potential for an Archimedes Screw to be installed between the upper and lower leat and the commissioning of this initial review of the site's operations.

The primary points of contact between the author and the Trust were Peter Holdway-Bradley (General Manager) and Martine Halse (Chief Executive Officer) and an initial sustainability assessment was conducted with the former at the beginning of this review alongside a tour of the complex. From this assessment, in addition to conversations throughout the meeting, it was evident that, despite the lack of any formalised sustainability framework or policies, the nature of the charitable work done at Coldharbour Mill means that many practices are unconsciously sustainable in an effort to be as

financially efficient as possible (Appendix A). This attitude within the Trust reflects wider trends, with 68% of SMEs not having a consistently documented and implemented energy policy yet a clear recognition that charities have an important role in tackling climate change and other sustainability related issues exists, not only for their own reputations but also because “charities exist for public benefit, and it is “entirely logical” that their investment decisions should also promote public benefit... Charities can and should lead by example” (Carbon Trust, 2021; Merrylees, 2019). Importantly, many funding sources now expect a minimum level of sustainability criteria to be met in order for the charity to be eligible for grants, including the Heritage Fund (Heritage Fund, 2021). There are barriers to this sustainability objective, with a lack of resources, time and money often the primary ones. These sit alongside other impediments like key individuals driving organisational sustainability leaving, conflicting organisational priorities and a lack of knowledge and information (Charity Commission, 2008). Nonetheless, the initial actions by the Coldharbour Mill Trust illustrate a positive desire to implement long-term changes to achieve sustainability that should be able to overcome these barriers.

Therefore, from this initial meeting the clear priorities for the Trust are Scope 1 (direct emissions from owned or controlled sources) and Scope 2 (indirect emissions from the generation of purchased electricity, steam, heating and cooling consumed by mill) emissions (Carbon Trust, 2021). Primarily this involved improved energy and carbon management, but also included developing and communicating a formalised culture of sustainability at Coldharbour Mill and in the local community. Consequently, the aim of this sustainability audit is to review the organisation’s current practices and provide a series of recommendations for improvements, which will form the basis for best practice at the mill.

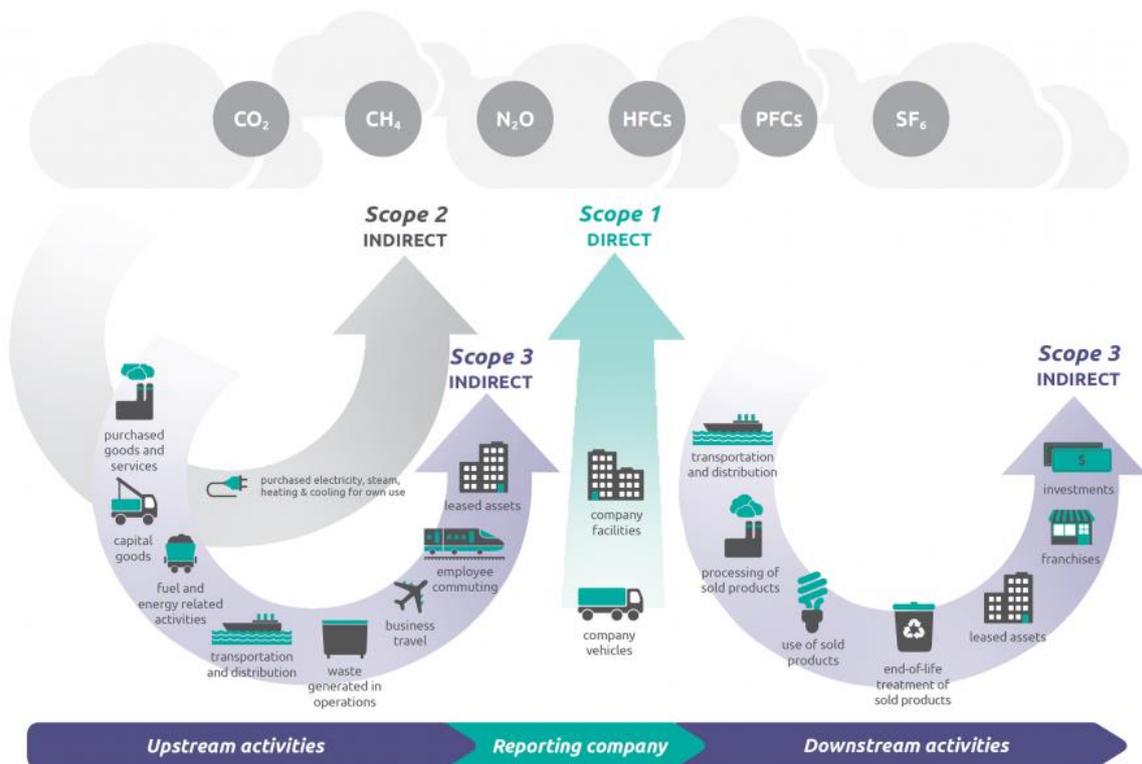


Figure 1: Diagram detailing the different types of emission scopes (EPA, 2020)

Tools Used and Results:

In order to evaluate the current state of energy and carbon management at Coldharbour, a series of online tools were utilised and, through various conversations with the aforementioned contacts at the Trust, an understanding of current practices was established. Within this section of the report the tools utilised are described and the results they produced discussed; these tools can be used in the future by the Trust to monitor progress on any changes implemented. Overall, the results from these tools underline the need for formalised policies and communications surrounding sustainable practices at Coldharbour Mill, as well as highlighting some other, more specific areas for improvements.

Carbon Footprint Small Business Calculator –

Carbon Footprint provide a free carbon calculator for SMEs that assesses buildings, energy use and transport and calculates CO₂e for each aspect and summarises by category and in total (Carbon Footprint, 2021). Given that travel was not a major focus of this project, this tool was used purely to estimate the carbon footprint of running the site based on data provided by the Trust; however, it is worth noting that this only represents the carbon footprint of energy used on the site, and thus does not account for Scope 3 emissions (all other indirect emissions that occur in a company's value chain; Carbon Trust, 2021). These results were automatically calculated using DEFRA and other internationally recognised metrics and thus are open to error should the data be wrong (Carbon Footprint, 2021). The results of the tool are displayed in Table 1 below:

Energy/Fuel Type	Amount Used Annually	Annual Carbon Footprint (tonnes of CO₂e)
Electricity	48,720 kWh*	12.34
Natural Gas	93,874 kWh	17.26
Heating Oil	0 litres	0
Coal	12 tonnes	34.60
LPG	0 litres	0
Propane	100 litres	0.16
Wood	1 ton	0.07
Diesel	200 litres	0.51

Table 1: Estimated carbon footprint of the energy inputs for the site (= at a factor of 0.2532 kgCO₂e/kWh)*

The total carbon footprint of the site is therefore 64.93 tonnes of CO₂e, which equates to 21.64 tonnes per employee (using the 3 full time employees). Compared to other manufacturing and high energy enterprises the footprint per employee is slightly above average (see Figure 2); however, this figure fails to account for the part time staff member and the series of volunteers working onsite that would bring this figure down.

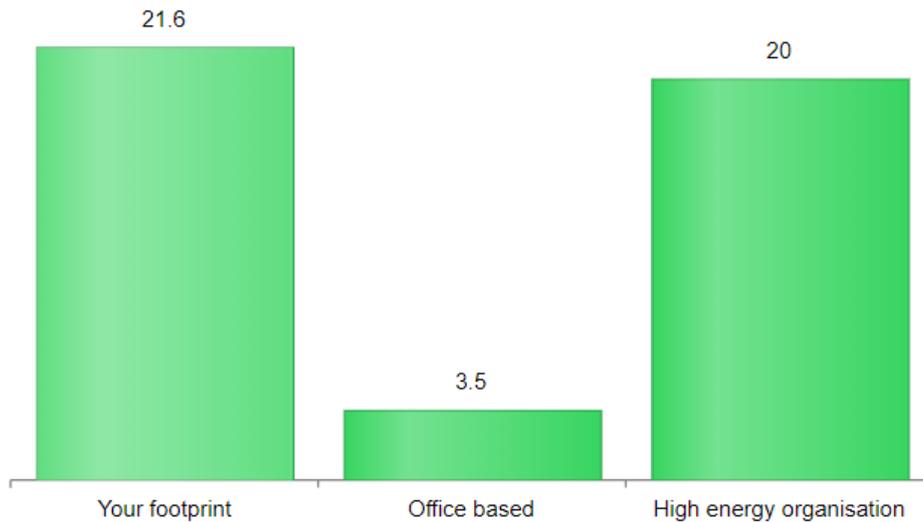


Figure 2: Comparison of carbon footprint per employee between Coldharbour Mill and the averages of different types of enterprises (in CO₂e tonnes); office-based organisations tend to have a carbon footprint of between 2 and 5 tonnes per employee whereas high energy organisations have a much higher footprint at around 10-30 tonnes per employee (Carbon Footprint, 2021)

Carbon Trust Energy Management Assessment –

The Carbon Trust provide a free Microsoft Excel spreadsheet that can be used to (self-)assess an organisation’s energy management (Carbon Trust, 2021), comprised of an energy management matrix which gives a quick assessment of strengths and weaknesses across six areas of energy management, as well as a more thorough Energy Management Assessment (EMA). The latter, more detailed version of the tool was completed with the Trust’s General Manager, providing a series of scores for each energy management characteristic that can be seen in Table 2 and Figure 3 below. It is important to note that the scoring for this tool is dependent on the best judgement of the user and as such is subjective and may not fully represent the overall situation.

Characteristic	Score		% score
	Actual	Max	
Management Commitment	5	32	16%
<i>Energy policy</i>	0	10	0%
<i>Energy strategy</i>	0	10	0%
<i>Organisational structure</i>	5	12	42%
Regulatory Compliance	5	10	50%
<i>Regulatory compliance</i>	5	10	50%
Procurement and Investment	4	22	18%
<i>Procurement policy</i>	2	10	20%
<i>Investment procedures</i>	2	12	17%
Energy Information Systems & Identifying Opportunities	5	34	15%
<i>Monitoring and analysing energy use</i>	5	14	36%
<i>Target setting</i>	0	10	0%
<i>Opportunities identification</i>	0	10	0%
Culture & Communications	2	30	7%
<i>Staff engagement and training</i>	2	10	20%
<i>Operational procedures</i>	0	10	0%
<i>Communications</i>	0	10	0%
GRAND TOTAL	21	128	16%

Table 2: Detailed appraisal of Coldharbour Mill's energy management performance across twelve key areas

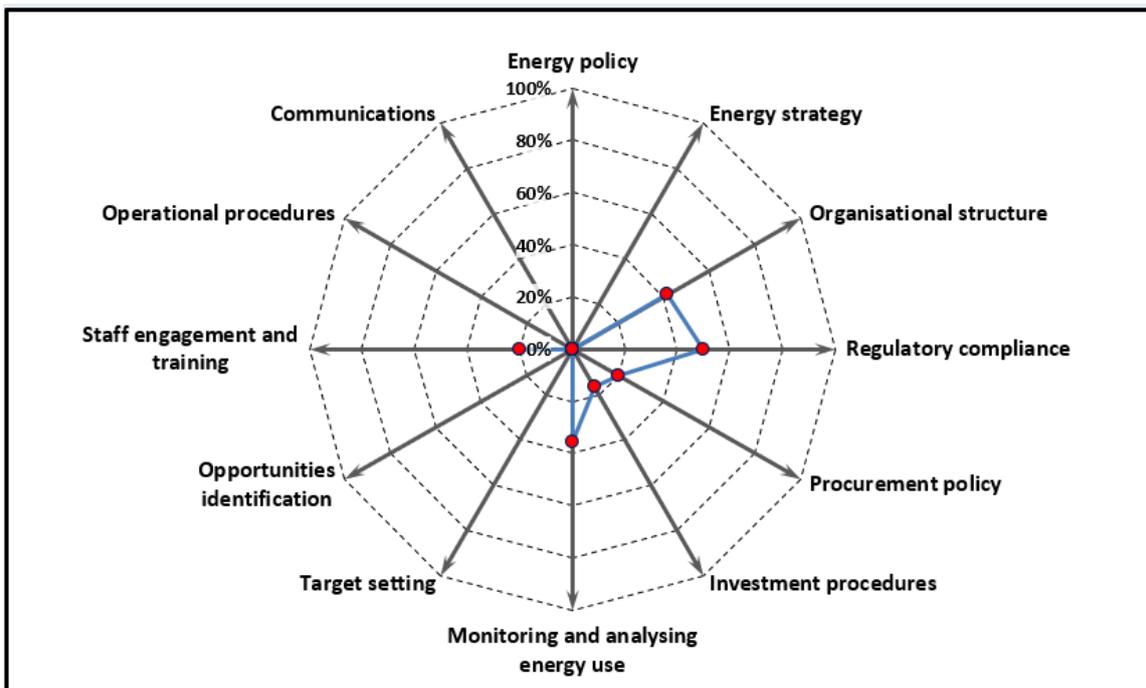
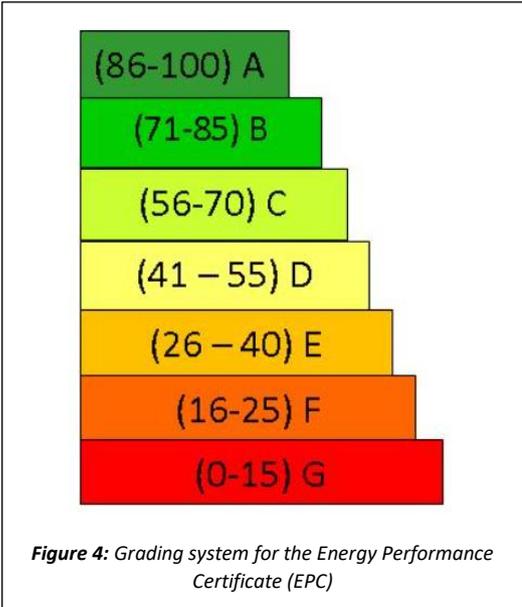


Figure 3: Spider diagram of Coldharbour Mill's energy management performance across twelve key areas

The results from this self-assessment (see Appendix B) confirm what was said in the initial sustainability assessment with the Trust; there is no specific, formalised energy policy or strategy in place and, given the small nature of the charity, there is no widespread organisational effort to promote energy efficiency. Compliance efforts are not so pronounced as would be expected in larger organisations and must be balanced against maintaining the tradition and heritage of the site. Procurement and investment give some thought to energy efficiencies, but this is where financial constraints allow in most cases. Although there exists a regular monitoring of energy use, little analysis is done with this information and targets subsequently set, outside of the renewal of energy contracts; this consequently limits the opportunities for increasing energy efficiencies. Finally, there is little to no formal communication and culture of energy management at Coldharbour in terms of training and operational procedures, although as previously underlined this often happens in an informal manner.

Carbon Footprint Energy Efficiency Test –

Another tool from Carbon Footprint, the Energy Efficiency Test, was also utilised to assess the energy efficiency of the Mill for Scope 1 and 2 (Carbon Footprint, 2021). The multiple-choice questionnaire explored areas primarily relating to lighting and heating but also enquired about insulation and any associated ISO standards. A score out of one hundred and what grade that score would get in an Energy Performance Certificate (EPC) is produced once the questionnaire is completed. With an overall score of 40.00 out of 100.00, the Mill has an energy efficiency rating of 'E', a relatively poor rating yet one which may underestimate the efficiency of the building, given that the thermal performance of older, listed buildings often are (a qualified architect/surveyor will be required to give a more accurate result; Historic England, 2015). Positive aspects identified in the survey included the predominant lighting type, the lack of air conditioning use and the monitoring of energy consumption. However, the lack of adjustable lighting (both in brightness and control), inter-staff communication and sufficient temperature control mechanisms do represent areas for improvements. Overall, however, the lack of formalised policies and communications combined with the difficulty of improving a listed building's energy efficiency is reinforced in this result. The full set of results can be seen in Appendix C.



Energy Production and Efficiencies:

Renewable Hydropower Proposal –

Coldharbour Mill Trust Ltd have proposed the construction of a single-turbined Archimedes (Hydrodynamic) Screw between the upper and lower leats in the immediate vicinity of the Mill and have already conducted a basic feasibility study for the project. Although opposed by some local residents due to noise concerns, the scheme has the potential to reduce the mill's energy (carbon) footprint by 19.01% (12.34 tonnes) through providing for all its electrical needs. The proposed hydropower project is predicted to produce 68,900 kWh (12kW) annually, which would comfortably satisfy the current electricity demands of the Mill, leaving ~20,180 kWh per year to be used for other purposes or sold back to the National Grid. This level of energy generation is dependent on rainfall, maintenance and abstraction levels permitted by the Environment Agency.

According to early-stage documents provided by the Trust, the project is predicted to cost in the region of £196,000 from point of planning permission, which includes a 5% contingency on the overall budget. This cost does not account for the following: insurance, interest on any loans, installation of an export meter, debris/silt clearance every 3-5 years and other operating expenses (for which a annual budget of £1,250 has been assumed beginning in year 1). Significantly, there are methods that can be utilised to reduce the noise produced by Archimedes Screws, which increases at higher rotational speeds (dbx Acoustics Ltd, 2015; YoosefDoost & Lubitz, 2020). Although such methods would increase the overall cost of the project, they could help encourage support for it from the as yet unsupportive local residents. Furthermore, the carbon footprint of a similar proposed Archimedes Screw project, that was actually much larger in terms of the number of turbines and their size, was 80 tonnes (AMEC, 2014); consequently, it is suggested that after a maximum of 6.5 years of operation (likely much less) the Archimedes Screw project will have become carbon neutral. However, it is important to note that this is very much an assumption and that without a thorough assessment by qualified professionals this cannot be said with any significant certainty.

Importantly, income will be produced in two ways from the project, firstly through electricity purchase savings (£7503.49 based on 2019 figures) and secondly through the Smart Export Guarantee (SEG), the successor to the government's Feed-in Tariff scheme which ended in 2019 (the SEG does not include deemed export payments; Ingrams, 2021). Provided the installation meets the requirements of having a capacity of <5MW, having a meter that can provide half-hourly readings for electricity export and is MCS-certified (all of which Coldharbour should be eligible for), the mill will be able to receive payments for electricity exported to the National Grid via energy suppliers (Ingrams, 2021). Smart meters will make this process easier by sending half hourly measurements to the SEG licensee (Folk, 2021). Although payment rates vary substantially between energy suppliers, SEG licensees must always offer a tariff that remains above zero, even if wholesale electricity prices fall below zero (Ofgem, 2020). SEGs can be taken out at the more common fixed rate method (pay a set amount per kilowatt hour of electricity you export to the grid, regardless of when you export it) or at a flexible rate (which pays varying amounts depending on how valuable the electricity is to the system at different times); some companies also offer multi-rate SEGs where there are different set rates for electricity exported at different times (Ingrams, 2021).

Based on a search of various comparison websites, the lowest payment rate found was 0.5p per kWh but most prices sat between 3-5.5p per kWh. This means that annual profits using all of the excess ~20,180 kWh produced per year will be a minimum of £100.90, but could higher than £1,000.00 if rates are higher than 5p per kWh. Importantly, companies with over 150,000 customers must offer a minimum of one SEG tariff that is export-only, which means they have to offer it to all eligible

installations, not just those of their customers (Ingrams, 2021). Furthermore, some companies will pay into your account for your exports if you are a customer with them, whilst some may offer a better tariff rate if you buy your energy from the same company (Ingrams, 2021). Consequently, annual income from this project could be up to £8,500 even without improvements in energy efficiency. As such, the Archimedes Screw could pay for itself in just over 23 years (excluding interest rates, etc). Importantly, an Archimedes Screw turbine typically has a design life of 30 years, and this can be extended with major overhauls (Renewables First, 2021); however, many will require significant maintenance after 20-30 years anyway (YoosefDoost & Lubitz, 2020). Additional benefits of an Archimedes Screw are that they tend to be far more 'fish friendly' and less disruptive than other forms of hydropower and thus this option will ensure a reduced impact on the local waterway and its ecology (Renewables First, 2021). A further hydropower project has been suggested by the Trust at the weir just upriver of the mill, but a feasibility study will have to be conducted before the benefits of such a project can be properly assessed. Importantly, if these projects prove to be unfeasible, then efforts should be made by the Trust to switch its electricity supply from fossil fuel based to renewables based (given other forms of renewable energy installations are not compatible with the Coldharbour Mill site), with various energy companies now offering such options at competitive prices.

Alternative Steam Generation Methods –

One of the biggest attractions of the museum is certainly the steam events that power the textile machines in the mill ten times per year, events that generate 80% of the Trust's visitor income. However, the use of the coal-powered 1910 Galloway boiler to fuel the engines produces 34.60 tonnes of CO₂e annually, 53.29% of the total carbon footprint of all the energy used on the site. As such, the Trust is looking to install an electric steam generating boiler to run the mill's engines so as to not only save money and run the steam events more regularly, but also to meet the goal of carbon neutrality by 2030.

Based on the fact that one tonne of coal produces the equivalent energy as 2,460 kWh of electricity (McGinley Support Services, 2017), to produce the same amount of energy as the 12 tonnes of coal currently used annually, the electricity needed to power the new electric steam boiler would be 29,520 kWh. Consequently, switching to an electric boiler would reduce the carbon footprint of running the 'steam days' by 27.13 tonnes (34.60 tonnes minus 7.47 tonnes), or 78.41%, reducing the overall carbon footprint of the site by 41.78% (based purely on energy consumption). Given that £5,000 to £6,000 is spent annually on coal, this would reduce the cost of running the steam days by up to £4,428 (at £0.15 per kWh). If this electricity was produced renewably onsite via the proposed hydroelectric projects, the site's carbon footprint (purely in terms of energy use) of the Mill would fall by 53.29% and the cost of the energy would be limited to the construction costs of the hydropower technology. Nonetheless, it must be emphasised that this is a very rough and likely inaccurate set of figures given the age of the Galloway boiler and the inefficiencies associated with it.

Research was done into suppliers of such a boiler, with a draft funding application written by the Trust estimating the cost of such equipment to be around £70,000. However, after spending time speaking to representatives from various companies, including Clayton Industries and Certuss (UK) Ltd (suppliers of gas and electrically powered steam boilers respectively), it was established that further advice on appropriate boiler models would need data on the peak flow of steam/steam generation produced during the steam events – information that was not available at the time of this report's writing. To find this information both companies suggested utilising a steam meter (which can be hired rather than outright buying them) or hiring a qualified consultant to establish the needs of the mill. If

practicable however, this report advises the purchase of electric over gas boilers as, not only are they better for the environment, but could also reduce costs more if combined with the proposed plans for the Archimedes Screw installation.

Heating Methods –

Due to its age Coldharbour Mill is a very energy inefficient building, and as such the choice of heating methods is very important both financially and environmentally. This is particularly important in the areas visitors are permitted in, with three of the floors in the main building currently heated by a gas heater on each floor. This costs the Trust ~£3,600 annually to run and produces 17.26 tonnes of CO₂e, roughly 26.58% of the energy (carbon) footprint of the mill, which is cheaper per kWh than it would cost to produce the same using electricity. However, provided that the electricity is sourced from renewable sources (whether they be onsite or not), upgrading to electricity-based heating will help the Trust move towards its 2030 carbon neutrality goal, although it may be more expensive to run (21st Century Heating, 2019; Yucatan Times, 2019). Having spoken to various suppliers of such electrical heaters, the replacement of the gas heaters with electrical ones will also be an expensive process, with the lowest price quoted being at least £2,300 for the three floors.

Importantly, measures such as agreed temperature thresholds where heating is switched on and the installation of a Building Management System (BMS)/Building Energy Management System (BEMS) can also dramatically increase energy efficiencies, with an increase of one degree Celsius on the thermostat potentially increasing costs by up to 8% (Carbon Footprint, 2021). The Trust will have to decide whether this heating upgrade is financially possible in the short-term, although this report suggests that other environmental upgrade projects may be better to prioritise for now.

Lighting –

The predominant lighting type at Coldharbour Mill is LED lamps, the best choice in terms of energy performance and environmental impact. However, this report recommends replacing any remaining non-LED bulbs with similar looking LED bulbs, which could provide energy savings of 50-70% (The Climate Group, 2021). Dimmable LED lights would be even more efficient, however, not all circuits allow this and they are unlikely to be appropriate for the industrial setting of parts of the site due to health and safety reasons (Hoey, 2018).

Importantly, LED bulbs enable significant long-term savings to be achieved despite high initial costs; normal LED bulbs can cost as much as £10 to £20 per bulb (a tube may be between £20 and £50) which means replacing 30 plus bulbs can cost more than £400 (dimmable bulbs would be more expensive and disruptive to install; The Renewable Energy Hub, 2018). However, the running of these bulbs is considerably lower, which means a 6-watt LED bulb that lasts for 60,000 hours and costs around £80-90 to run during that time is considerably cheaper than standard 60-watt incandescent and 14-watt CFL bulbs costing around £1 to £2 and £3 each but will only last 1,200 hours and 10,000 hours respectively (The Renewable Energy Hub, 2018). Furthermore, as well as needing to be replaced more often, incandescent and CFL bulbs cost more to run, costing £700 and £180 respectively over the 60,000 hours. Consequently, the 6-watt LED bulb that lasts 60,000 hours will cost £2,600 overall, producing savings of £20,400 and £3,000 compared with the incandescent and CFL bulbs (The Renewable Energy Hub, 2018).

Nonetheless, natural light should be used wherever appropriate across the site, although obviously given the industrial nature of certain parts areas it should be supplemented with artificial light where necessary for health and safety reasons. Although the installation of lighting or motion sensors of some kind could potentially reduce energy use, the small-scale nature of the site and number of employees means it is likely that a culture of energy reduction is likely to be just as effective, and as such such installations are not recommended.

Insulation –

Given the poor energy performance rating Coldharbour Mill was given by the assessment tools utilised, it is crucial that the building's energy efficiency is improved. However, due to the listed nature of the building these improvements can not follow more common methods that tend to significantly impact the character or risk the deterioration of such buildings (Historic England, 2015).

Given the large number of single-glazed windows present on the building, through which 18% of heat loss occurs (UK Government, 2016), secondary glazing represents a lower impact means of improving the energy performance of the site. A non-intrusive way to reduce draughts and heat loss through windows, secondary glazing involves adding supplementary glazing to the inside of the existing window and is often done in listed buildings where replacing the windows is not possible (Centre for Sustainable Glazing, 2013; The Green Age, 2017). By investing in secondary glazing, heating bills could be cut by up to 10% by increasing the thermal efficiency of the windows by around 60-70% (Clearview Secondary Glazing, 2017). Importantly, there are numerous versions of secondary glazing of varying quality, ranging from more temporary DIY measures, including thin films or acrylic sheets, to more professional secondary glazing that involves custom built frames and glazing (Energy Saving Trust, 2021).

The cost of secondary glazing is dependent on the structure of the building, the size of the windowsill, the materials for the window frames, and the extent of the project, although it generally remains a cheaper and more appropriate option than double glazing (Green Match, 2021). However, given the specialised nature of secondary glazing there is no central body that certifies installations unlike with double glazing, so it is important to get multiple quotes to ensure best value for money (Energy Saving Trust, 2021). It is significant to note, however, that traditional glass secondary glazing often also involves redecorating costs and plastic frames are not always compatible with listed buildings (Glaze and Save, 2017). Consequently, it is important when installing secondary glazing to evaluate which materials to use in order to ensure the best result for the building, both in terms of energy efficiency but also building aesthetics; if this is done carefully, secondary glazing could significantly improve the energy performance of Coldharbour Mill.

Other ways to improve the energy performance of the mill include installing draught-proofing strips around the seals of external and internal doors (Energy Saving Trust, 2021) as well as insulating exposed heating pipes/hot water cylinders which represents a quick and cheap way of reducing heat loss by around 70% (Carbon Footprint, 2021). Finally, simple actions such as using filler on any small gaps between windows, etc can also help reduce heat loss at low expense. All these suggestions are appropriate for listed buildings and could help significantly reduce heat loss from Coldharbour Mill and thus improve its energy efficiency.

Retail and Office Activities:

Although not the primary source of emissions at Coldharbour Mill, the administrative and retail activities of the Trust have an important impact on its progress towards becoming carbon neutral. As such, it is important to review current practices to ensure that they are as sustainable as possible and in order to identify any potential improvements. Based on discussions with staff and from explorations of suppliers/contractors' websites, it is clear that sustainability is (as previously highlighted) emphasised in decision making, yet not in a formalised way and as a secondary consideration to financial constraints. Nonetheless, the charity's actions are deemed by this report to be a solid baseline to ensuring long-term financial and environmental sustainability and reducing greenhouse gas emissions across all three scopes.

Waste Management –

Effective waste management is integral not only for the smooth running of any enterprise, but also for the purposes of reducing an organisation's environmental impact. As highlighted continuously throughout this report, the strong ethos of sustainability within the Trust means that every effort is made to keep wastage to a minimum. Waste from retail and office activities is consequently disposed of by using the company Devon Contract Waste, which guarantees 'Zero to Landfill' by sorting and recycling all waste produced by the mill or, if aspects of the waste cannot be recycled, sent to an energy from waste plant for incineration (Devon Contract Waste, 2021). Furthermore, conscious efforts are made to reduce waste by reusing as much as possible instead of using single-use products; for example, buying washable towels and cloths to be used in the café as opposed to single-use wipes or using proper cutlery as opposed to single-use plastic ones. Importantly, this ethos extends to plans to introduce a repair café to the mill and work done with the local 'Green Team' in the village, where efforts were successfully made to remove all single-use plastic from the mill. Use of paper is also restricted by encouraging visitors to pre-book their entrance to the museum online and this should be further extended to the shop and café area by offering (ideally exclusively) electronic receipts for purchases there as a replacement to traditional paper ones; this is important as many receipts cannot be recycled (O'Connor, 2019). Table 3 highlights the environmental impact of the roughly 0.068 metric tonnes of paper used annually at Coldharbour Mill, utilising an online tool from the Environmental Paper Network (2021) and assuming different recycling rates of the paper disposed of by Devon Contract Waste. The table highlights that even assuming 100% recycling rates, there is still a significant environmental impact and as such waste reduction should remain a high priority for the trust.

% Paper Recycled	Wood Used (metric tonnes)	Total Energy (BTUs)	CO₂e (metric tonnes)	Water Usage (gallons)	Solid Waste (metric tonnes)
100	0	1.2 million	0.26	1,460	0.037
95	0.018	1.2 million	0.28	1,470	0.037
90	0.027	1.2 million	0.29	1,480	0.038
75	0.06	1.4 million	0.35	1,500	0.038
50	0.09	1.5 million	0.43	1,530	0.039

Table 3: Illustration of the environmental impact of differing rates of paper recycling from the 0.068 tonnes used annually by Coldharbour Mill (Environmental Paper Network, 2021)

Importantly, Devon Contract Waste asks that food and glass waste be sorted separately from the rest of the waste they collect (Devon Contract Waste, 2021). Given that waste that cannot be recycled is incinerated for energy, which still produces carbon emissions, Coldharbour should instead start

composting any excess food waste alongside any garden waste produced through the site's upkeep and using this on the grounds or else, provided enough is produced, selling it on. The village 'Green Team' have suggested the installation of a communal compost bin for use by the local community and businesses, which could be a cost-effective way of dealing with organic waste without incinerating it, as well as building further bridges with the community. Furthermore, efforts should be made to eliminate the use of any materials that cannot be recycled easily, such as sticky notes and hand soap pumps (O'Connor, 2019; Monaghan, 2018) as well as going completely paperless, a term that denotes a work environment which uses minimal physical paper and instead primarily uses digital documents. Not only could this reduce the environmental impact of office activities, but it can have a series of benefits ranging from increased security, reduced costs, and easier transfer of information (Laserfiche, 2021). Ideally plastic would be completely removed from the site, yet until more environmentally friendly alternatives are found to plastic bobbins, etc, the current policy of reusing them for as long as possible is sufficient. This waste reduction process is an important next step to carbon neutrality as, despite using Devon Contract Waste's 'Zero to Landfill' service, more emissions are still produced by the incineration and recycling of waste than if the waste was not created in the first place.

Products –

The procurement of products for sale at the Trust's café and shop is an important aspect to consider in regard to the carbon neutral by 2030 target as they play a large role in the scope 3 emissions of an organisation. The majority of products sold in Coldharbour's café come from within the county of Devon, with the remainder sourced from its immediate vicinity. Importantly, many of these suppliers explicitly mention their use of local ingredients, and often have a strong emphasis on these being natural and organic (Chunks of Devon, 2021; Tideford Organics, 2021). Given that the Trust has only recently resumed direct running of the café area and, in the wake of the pandemic, footfall is as yet uncertain, the choices of suppliers such as Cater Devon are appropriate given the fact that orders can be placed at late notice, consequently helping to minimise waste by reducing over-ordering (Caterfood, 2021). Given that these suppliers have not yet been used, the amount of waste from packaging cannot be properly assessed yet; however, suppliers like Voyager Coffee emphasise that their packaging is 100% compostable, made from plants and thus being far more sustainable than alternatives on the market (Voyager Coffee, 2021). However, the café does use compostable Vegware cups for takeaway drinks and this report advises using the similar products for takeaway food if it is deemed necessary. Furthermore, in addition to current suppliers being compatible with the uncertainty of the current situation, the fact that many of the products sold by organisations such as Cater Devon and Chunks of Devon are longer-lasting than those that would be produced by a more locally based baker for example, means emissions associated with the transport of these products are likely to be lower than closer but more regular delivery options. Nonetheless, this should not stop the Trust exploring alternative options that are more environmentally friendly and financially beneficial during review meetings.

Comparatively, the products sold at the Trust's shop have a larger range of origin. The majority of products sold are made onsite at Coldharbour; however, a significant proportion of current and proposed new products come from far beyond Devon, including the likes of Siddons Industrial Heritage (Warrington) and Ulster Weavers (Ulster, Northern Ireland). Nonetheless, although efforts should be made to find similar suppliers closer to Uffculme to reduce the products' carbon footprints, those currently in use or proposed to be introduced generally show a dedication to sustainability through plastic-free commitments and recycling old industrial equipment into new products (House

of Marbles, 2021; Seddons Industrial Heritage, 2021). Importantly, most of the products sold in the shop are made from natural materials such as wool and wood, reducing the environmental impact associated with their production. Furthermore, all products sold are placed in brown paper bags, reducing the environmental impact from sales further compared to more commonly used plastic ones.

Reviewing the products sold within the Trust's shop and café, the selection seems to be appropriate for the demands required of them, with footfall before COVID-19 and the Trust's takeover of the café's operations suggested to be relatively low. Furthermore, the suppliers generally explicitly state their concern for sustainability in one form or another and thus represent appropriate choices when attempting to limit scope 3 emissions. Potential avenues for improvements include selling reusable cups and other products that can be used in the café, whilst also rewarding patrons for bringing their own (eg: through small discounts on coffee's etc) and asking whether customers need a bag when making purchases as these will help reduce waste further. Furthermore, switching to vegetarian/vegan only food (either permanently or for certain parts of the week) will also lower the scope 3 emissions associated with Coldharbour Mill. Importantly, regular reviews of the products sold in these premises should take place, to assess both their financial and environmental performance against similar or new products as this will ensure their environmental impacts are as low as possible.

Equipment –

The use of electrical equipment, both office and retail based, can be a significant source of energy consumption. An average desktop computer uses an average of 200 W/hr when it is being used (including use of loudspeakers and printer) which, if it is on for eight hours a day, uses almost 600 kWh and emits 175kg of CO₂ per year (Energuid, 2021). If the PC is in stand-by mode, this power consumption falls to about a third. Consequently, this underlines the importance of monitoring equipment use closely. Within the office and kitchen all the equipment used has an energy efficiency rating and are switched off at the end of the day (aside from the fridge and freezer); however, improvements could be made by fully implementing timers to turn office equipment off when not in use or, if this is not possible, turning them off manually once they have been used. For example, printers or microwaves should only be turned on at the plug when needed, especially given the latter is not likely to be needed often throughout the day due to the low foot traffic predicted for the café.

The Carbon Trust states that simply establishing simple 'opening/start-up' and 'closing/shut-down' procedures can save thousands of pounds each year (Carbon Trust, 2019); this can involve colour coding equipment to indicate whether they need to be left on or not and in what situations (eg: fridges will remain on overnight whereas desktop computers should be turned off at the end of usage). Importantly, any future equipment purchases should include evaluations of their energy performance as this will not only reduce energy use (and thus the mill's carbon footprint) but also save the Trust money in the long-term; this is particularly pertinent for major equipment like toilets and refrigerators the latter of which are likely to account for a significant proportion of energy consumption due to their constant use (Carbon Trust, 2019). This should be encapsulated within a policy of procuring key assets based on a 'life cycle cost assessment' that takes energy usage and cost into account over the expected lifetime of the product or system and should be accompanied by a registry of the mill's key energy using assets and their specifications that can be used to plan future investments in energy efficient assets and achieve step change improvements (Carbon Trust, 2019). Nonetheless, the equipment currently in use should also be regularly assessed to ensure optimum efficiency; for example a faulty door seal on a refrigeration unit can increase its power usage by 11% (British Gas, 2021).

The importance of eco-friendly cleaning equipment can also not be underestimated in improving an organisation's sustainability, especially one like Coldharbour that is located so close to a river into which damaging chemicals can leak. Consequently, it is advised that the Trust switches to eco-friendly cleaning products as this will not only help to reduce the environmental impact of maintaining cleanliness, but also reduce costs and produce a safer environment for young children, an important point given the strong emphasis on educational trips for the museum (Harrington, 2018).

Travel and Transport –

Given the low number of regular staff and that travel for the organisation is rare, in addition to the primary focus of this report being on scope 1 and 2 rather than scope 3 emissions, this report will not delve deeply into travel and transport. However, it is important to underline the importance of encouraging use of car shares, electric vehicles, cycling, walking or public transport for both staff, volunteers and visitors in order to reduce emissions associated with the Trust. This should be done through a variety of communication channels, including emails and website notices that provide details on public transport, bike routes, etc to the mill from various locations. Although introducing electric car charging points could be a way of encouraging this further, this report does not recommend such an action given the cost it would involve and the relatively low number of electric vehicles operating in the UK (representing only 6.6% of cars sold in 2020; Attwood, 2021), particularly in rural areas. However, plans to introduce bike storage at the mill is an effective step toward encouraging sustainable transport and should be undertaken.

Organisational Culture –

Based on the tools' results and conversations with staff, it is clear that there is a strong emphasis on sustainable actions, if only for the purpose of encouraging efficiencies that ensure financial sustainability. Nonetheless, the lack of clear energy targets and their sufficient communication to staff (as an example) represents a major limitation for environmental sustainability within the organisation, particularly if drivers of such initiatives are replaced by those less inclined to include this into cost-benefit analyses for decision making processes. This is important as, although paid employees of the Trust are likely to remain conscious to the sustainability needs of the mill and how these impact the charity financially, the hundred-odd volunteers may not be as aware and connected to this aspect and are thus less likely to be as vigilant as paid staff, even for actions as simple as turning lights off when leaving a room. This is because, despite induction training and policy agreements that volunteer's sign covering basic health and safety, safeguarding and site history, training as yet fails to detail the sustainability/environmental goals of the Trust. Consequently, promoting a formalised organisational culture that encompasses these volunteers through various written policies, initiatives and communications to all stakeholders of the mill is integral to the 2030 carbon neutral goal. Therefore, this report recommends implementing the following actions:

- Introduce a regularly reviewed written energy policy and strategy that is agreed by the board and senior management and communicated to all employees (paid and volunteers), with a live action plan for implementation accompanying it
- Regularly collect energy consumption and cost data and analyse this to identify and create targets and benchmarks to aim for
 - This could involve use of metering, monitoring and targeting systems and regular energy saving surveys to identify these savings opportunities

- Ensure that there is a designated person with responsibility for energy that has a clear job description and is assigned adequate resources
 - This person should lead regular management meetings to review energy use and regulatory compliance (although this should be done whilst balancing the heritage demands of the mill)
 - This person should also be directly involved in setting the targets detailed above
- Introduce energy performance policies to inform any future procurements and projects
- Account for any energy saving repairs in maintenance budgets
- Introduce appropriate training for all staff (paid and volunteers) both at induction and throughout their tenure, and involve them in all initiatives and campaigns
 - This includes creating active reporting systems for energy waste and suggestions alongside job/priority sheets for reducing energy waste

These actions utilise energy management as an example given the Trust's focus toward it but should be applied across a range of sustainability areas either independently or as part of a wider environmental/sustainability project or policy (see Appendix D for an example environmental policy), with waste management being one of the more important ones. By following these suggested actions, it is predicted that a more tangible culture of sustainability can be created that is resilient to personnel and financial changes. The key changes to the current practices at Coldharbour Mill therefore centre around formalising them into written policy with specified and achievable targets shaped by designated persons with responsibility for such sustainable actions. Importantly however, this process should involve all Coldharbour Mill stakeholders, ranging from both paid and volunteer staff to the public, and enacted with a strong focus on the communication of policies and the reasoning behind them. For example, signs should be placed around the shop and café area that explain the Trust's lack of separate recycling bins due to their relationship with Devon Contract Waste in a visually appealing way, or staff training that actively encourages energy conservation. Significantly, the Trust's sustainability goals and actions to achieve them should be actively communicated with visitors and the local community, particularly in site tours, etc as the performance of tour guides has been directly linked to the sustainable behaviour of visitors (Alazaizeh, et al., 2019). It is the opinion of this report that this formalisation of the existing culture is, outside of the major energy projects referred to earlier, the best avenue for increasing the Trust's sustainability.

Concluding Remarks:

This report has used a range of tools and conversations with senior members of staff at Coldharbour Mill Trust Ltd to evaluate its current practices with regards to its goal of carbon neutrality by 2030. The Trust's informal focus on energy performance and management as the primary avenue for reducing its carbon footprint is appropriate, with the installation of an alternative steam generation unit and a form of hydropower ideal prospects to reduce the carbon footprint associated with energy use at the mill by 53.29% if combined. Given the financial and heritage constraints the Trust is working within, the efforts to date outside of these major projects have been effective, particularly the use of Devon Contract Waste to deal with the waste produced onsite. Consequently, aside from a few additional steps, the foremost steps for the mill to take in the immediate future is that of formalising its sustainable culture through regularly reviewed written policies containing targets and benchmarks to meet that are widely communicated so that it spreads to volunteers and visitors. Doing so will lay the foundations for future projects to improve the mill's environmental impact and as such is integral to the goal of carbon neutrality by 2030. If this is combined with a transition to clean energy for all onsite processes, with the work of 'Project Splash' at the mill utilised as a way to offset the remaining emissions, it is the opinion of the report that the Trust's targets can be reached.

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Appendix:

Appendix A – Initial Sustainability Assessment

Green Consultants Initial Sustainability Assessment

This tool will enable Green Consultants interns to conduct an initial sustainability assessment,

Attached To	FREDERICK JAMES JOHNSTON (660032673)
Began	19 Apr 2021, 9:59 am
Finished	19 Apr 2021, 10:24 am
Updated	19 Apr 2021, 2:35 pm
Status	Approved
Actions	Print submission

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Green Consultants Initial Sustainability Assessment

This is a preliminary assessment tool, to be completed with a client on the first day of a Green Consultants internship. It covers five broad areas of sustainability and is designed to give an overview of the business' current performance so that you can identify areas to focus on during the week.

*** Date**

Date of assessment

19-Apr-2021

*** Name of Green Consultant**

Fred Johnston

*** Name of interviewee and role in business**

Peter Holdway-Bradley, General Manager

*** Company Name**

Coldharbour Mill Trust Ltd

*** Address**

Address

Coldharbour Mill Museum, Uffculme

City / Town

Cullompton

Region

Devon

Country

United Kingdom

Postcode

EX15 3EE

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Energy and Carbon Management

Does the organisation have an Energy Policy in place?

Yes - An informal/ verbal policy is in place

Key areas of the organisation using energy.

- ICT
- Lighting and Heating
- Machinery

What is the organisation's primary energy source?

National Grid

How does the organisation currently encourage energy efficiency?

Devices on timers, etc and turn off when finished using, etc

Notes/ Additional Information

IT is office based, but mainly machinery as this includes steam, etc
Old buildings take a lot to heat and light due to poor energy efficiency

Procurement

Does the organisation have a sustainable procurement policy in place?

Yes- An informal/ verbal policy is in place

Are materials bought based on a whole Life-Cycle analysis (LCA) basis?

Sometimes (add details in notes section)

Does the organisation use local food suppliers?

As much as possible

Notes/ Additional Information

Case by case basis, based on necessity
Some areas only; customer facing (shop, cafe, etc) efforts are made to be as sustainable as possible, worked with Uffculme Green Team to be as green as possible in these areas with plastic free policies, etc within the bounds of expenses
For other areas such as steam complex area less so

Waste and Resource Management

Does the organisation have a waste and resource management policy in place?

No policy is in place

Signage encouraging waste prevention

False

Minimal single use plastics available for use

True

Information discouraging water wastage

False

Double sided printing

True

Reusable mugs and cutlery in kitchen areas

True

Water reuse strategies

False

Segregated recycling bins

True

Clear informative signage indicating what can and cannot be recycled

False

Non-recyclable waste sent to an energy recovery facility

False

Non-recyclable waste sent to an energy recovery facility**Take-back scheme in place****Food waste separated and composted****Notes/ Additional Information**

Any additional information about this section, or examples of current practice.

No one holding them accountable outside of the staff themselves, not necessarily a concerted effort to produce a culture of waste and resource management but based on individuals (however, many here are conscious of their efforts, etc)
Importantly, as a charity its very much in the mind to be as efficient as possible with resources, etc however
Most of these efforts come about from Peter and Martin doing things off their own back based on previous working experiences, etc rather than actual policies formal or informal being in place - no conversations have specifically focused on this

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Travel

If the organisation has multiple sites, select one.

Does the organisation have a sustainable travel policy in place?**Number of staff****Part A - Commuting**

How employees travel to their main place of work and home again.

Number of bike racks**Number of lockers for helmets/change of clothes storage****Number of car parking spaces****Distance from nearest train station**

Approximate

Distance to nearest bus stop

Approximate

Does the organisation have a car share policy?

Does the organisation have a car share policy?

No

Does the organisation provide electric vehicle charging points?

No

Does the organisation have a cycle to work scheme?

No

Part B - Business Travel

Any other travel that employees do as part of their work activities.

Beyond travelling to and from work, do employees have to travel for their job?

Sometimes

What vehicles are used for work-based travel?

- Car
- Public Transport

For what purpose do employees travel for their job?

Travel and tourism events, shows and conferences, etc - tend to be very few and far between

Notes

Any additional information about this section, or examples of current practice.

Additional is very rare
3 FT, 1 PT, 100 volunteers (PT) - Number of staff
0 (4/5 planned to be purchased) - Number of bike racks
50-60 cars - car parking spaces

Business, Culture and Communications

Does the organisation have a sustainability policy in place?

Yes- An informal/ verbal policy is in place

Are there regular staff communications regarding energy, waste, procurement and travel sustainability?

No

Is a sustainability framework used in decision making?

Yes/No/Sometimes and give examples

No formal framework - but working for a charity means you try to be as efficient as possible so efforts based on efficiencies rather than for sustainability in and of itself, its certainly isn't conscious

Does the organisation have a sustainability manager or leader?

No

How are staff actively encouraged to make sustainable choices?

They're not, but again its part of an unconscious thing as part of being a charity worker to help keep costs low

Notes

Any additional information about this section, or examples of current practice.

Discussion with Client

What does the organisation feel its sustainability priorities are?

- Energy
- Carbon
- Procurement
- Business, Culture and Communications

Notes/ Additional Information

B, C and C - better themselves (more formal) but also to encourage others outside to do so as well
Procurement - start with customer facing, offices and then to the machinery (start small and build)
Energy and Carbon - to either offset coal use or to replace old boilers with more efficient ones (whilst keeping the old ones for show), then also would like to introduce hydropower to offset electrical costs, etc and become greener (whether this would involve a new source of income by selling back to the grid remains to be seen)

Green Consultants, please thank your employer for taking the time to assist you in completing this form. Using the information produced from this initial assessment, please now refer to the sustainability assessment tools flowchart to plan the next steps of your internship project.

Appendix B – Energy Management Assessment (EMA)



Energy Management Assessment (EMA)

Management Commitment

This section identifies whether there is a clear statement of policy that shows the commitment of management to the efficient use of energy, an associated written strategy and whether there are suitable allocations of responsibility for energy management with adequate resources assigned.

Energy policy

Characteristic	Score		Notes
	Actual	Max	
A written energy policy (may be part of an environmental or sustainability policy)	0	2	
Agreed by senior management	0	2	
Communicated to all employees	0	1	
Recently written, or reviewed and revised (within 3 years)	0	1	
Contains a commitment to the development / deployment of quantitative improvement targets	0	2	
Contains a commitment to annual reporting (public or to all employees)	0	1	
Includes a date for review/revision	0	1	
Total Score	0	of 10 maximum	

Energy strategy

Characteristic	Score		Notes
	Actual	Max	
A written strategy document consistent with the energy policy	0	4	
Agreed by senior management	0	2	
Includes a live Action Plan for implementation	0	3	
Includes a date for review/revision	0	1	
Total Score	0	of 10 maximum	

Organisational structure

Characteristic	Score		Notes
	Actual	Max	
A manager at board (or equivalent) level has responsibility for energy	0	3	
Appointment of person with designated responsibility for energy	2	3	<i>Not necessarily written specifically within any policies</i>
Clear job description and assigned adequate resources for designated person	3	3	<i>Martin's role includes this</i>
Regular management meetings to review energy use	0	2	
Local energy 'managers' or champions appointed	0	1	
Total Score	5	of 12 maximum	

Regulatory Compliance

This section identifies whether there is a clear understanding of the organisation's legal obligations in respect of energy and carbon emissions, and that these obligations are being managed effectively.

Regulatory compliance

Characteristic	Score		Notes
	Actual	Max	
Formal review completed to determine which regulations are applicable and which are not.	1	2	<i>Some would be reviewed, annual basis</i>
Senior management have reviewed and understand the organisation's legal obligations.	1	2	
A compliance plan is in place, including identified responsible staff.	1	2	<i>Small organisation so easy to do</i>
Processes are in place to ensure the organisation keeps up to date with relevant developments.	1	2	<i>Reviewed regularly</i>
The organisation is compliant	1	2	<i>Places like the factory; balancing tradition with modern regulation</i>
Total Score	5	of 10 maximum	

Procurement and Investment

This section identifies whether the organisation's procurement and investment policies and procedures provide active support for improvements to energy efficiency.

Procurement policy

Characteristic	Score		Notes
	Actual	Max	
General policy is to include consideration of energy consumption in all procurement.	2	4	<i>In some but not all</i>
Energy performance is specified in new buildings, IT projects, process plant etc	0	3	
Specific procurement policies used for particular products, e.g. lighting, motors etc.	0	3	
Total Score	2	of 10 maximum	

Investment procedures

Characteristic	Score		Notes
	Actual	Max	
Capital investment procedure exists to obtain funding for energy efficiency	1	4	<i>No traditional procedure route but funding can be available on an ad hoc basis</i>
Clear payback (or other) investment threshold for energy efficiency*	0	3	
All capital funding requests assessed for energy impact by person with responsibility for energy	1	3	<i>Come into it but not the primary thought process</i>
Do maintenance budgets include repairs to save energy	0	2	
Total Score	2	of 12 maximum	

*if criteria are too restricting , acting as a major barrier for energy efficiency investment, mark down.

Energy Information Systems & Identifying Opportunities

This section identifies whether there are systematic procedures for monitoring and understanding energy consumption, setting suitable improvement targets, and identifying savings opportunities.

Monitoring and analysing energy use

Characteristic	Score		Notes
	Actual	Max	
Regular collection of energy consumption and cost data	3	4	
Analysis of consumption against energy drivers (production, temperature, etc.) and time	1	4	
Regular and appropriate reporting	0	3	
Comparison of energy data with utility bills	1	2	<i>Based on renewal of energy contracts</i>
CO ₂ emissions calculated/analysed	0	1	
Total Score	5	of 14 maximum	

Target setting

Characteristic	Score		Notes
	Actual	Max	
Energy saving targets based on analysis	0	3	
Targets challenging, but achievable	0	4	
Performance compared with appropriate benchmarks (internal or external)	0	3	
Total Score	0	of 10 maximum	

Opportunities identification

Characteristic	Score		Notes
	Actual	Max	
Metering, Monitoring and Targeting (MM&T) system actively used to identify savings opportunities	0	4	
Site energy surveys undertaken regularly	0	4	
Other information used; e.g. energy certificates, asset registers, etc.	0	2	
Total Score	0	of 10 maximum	

Culture & Communications

This section identifies whether the opportunities afforded through involving staff in energy efficiency, and in communicating progress both internally and externally are being taken advantage of.

Staff engagement and training

Characteristic	Score		Notes
	Actual	Max	
Appropriate training for staff key to energy management, e.g. maintenance, boiler-house, caretakers, security, etc.	1	4	<i>No fixed training, more of an ethos</i>
Awareness campaigns held regularly	0	3	
Wider active staff involvement initiatives (e.g. via 'green' programmes, quality improvement, etc)	1	2	<i>Involved with local initiatives</i>
Energy included in staff induction training	0	1	
Total Score	2	of 10 maximum	

Operational procedures

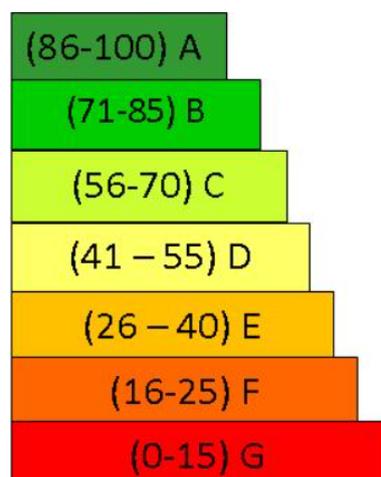
Characteristic	Score		Notes
	Actual	Max	
Active reporting systems for energy waste and suggestions (lights on, doors open, steam leaks etc.)	0	3	
Job/Priority sheets for reducing energy waste (e.g. repair compressed air leak)	0	2	
Maintenance schedules include reducing energy wastage	0	2	
Operating instructions include energy use issues (e.g. shut down procedures)	0	3	
Total Score	0	of 10 maximum	

Communications

Characteristic	Score		Notes
	Actual	Max	
Regular communications to all employees on initiatives and progress against the strategy and targets.	0	4	
Performance against strategy and targets published publicly in organisation's annual reports or similar.	0	3	
Energy/carbon included in regular communications to wider stakeholders (local community, etc.)	0	3	
Total Score	0	of 10 maximum	

Appendix C – Carbon Footprint Energy Efficiency Test Results

Thank you for completing the Energy Efficiency in the Workplace Tool. Your workplace scored 40 out of 100.0. Match your score with the colour coding system below to determine how energy efficient your workplace is.



Recommendations for improving the energy efficiency in your workplace are outlined in the table below.

Scoring Summary –

Item	Score	Max	Explanation
What is the predominant lighting in your workplace?	10	10	Switching from lower efficiency T12 and T8 lamps to higher efficiency T5 or even better, LED lamps will reduce energy consumption and can lead to economic savings.
Are motion sensors and/or lighting sensors installed to control lighting?	0	5	Using motion and daylight sensors will reduce energy consumption by automatically turning lights off when they are not needed. Motion sensors are especially effective in less commonly used areas such as corridors or store cupboards.
Are lights able to be dimmed?	0	5	Having dimmable lights gives more control over the lighting levels of the workplace. They can be incorporated with daylight sensors meaning that light levels dim automatically when there is sufficient natural light which reduces energy consumption.
Are lighting levels able to be controlled on a zonal basis?	5	5	Splitting lighting into zones allows more control over lighting levels and means only necessary lighting is turned on.
Is natural light utilised whenever possible?	3	5	Maximising natural light by cleaning windows and skylights regularly, moving objects that block windows and opening window blinds will reduce the need for artificial lighting.

Is there an awareness campaign to encourage staff to turn off unnecessary lighting?	0	2.5	Engaging staff with the importance of turning off unnecessary lighting is important in reducing energy consumption. Creating a rule such as 'last one out turns the lights off' and putting notices by light switches can help in reminding colleagues to save energy.
Are there any measures in place to reduce heat loss through windows?	0	5	Heat can easily be lost through poorly insulated windows. Double glazing can reduce heat loss by 50% compared to single glazing with Low E Glass double glazing and triple glazing reducing this loss further. When replacing windows consider those with the lowest U-values as these will reduce heat loss the greatest.
Are there any measures in place to reduce heat loss through walls?	0	5	Cavity wall or solid wall insulation reduces heat loss through walls by approximately a third. If cavity wall insulation or solid wall insulation is not possible in your building, external and internal insulation methods are available.
Are exposed heating pipes and hot water cylinders insulated?	2	5	Insulating boiler equipment and pipes is a quick and cheap way of reducing heat loss by around 70%. The insulation around your hot water tank should be at least 75mm thick to provide adequate insulation.
How is temperature controlled in the building?	0	5	A Building Management System (BMS) or Building Energy Management System (BEMS) can be used to control heating, lighting and ventilation to the optimum conditions. Having a BMS/BEMS that can be controlled internally gives greater control over energy usage. Identifying a member of staff who is in control of the thermostat avoids frequent changes in temperature. Increasing the thermostat by 1 degree Celsius can increase costs by 8%.
Are additional thermostats installed in problem areas where temperatures levels are harder to maintain?	0	5	Installing additional thermostats in areas that are harder to maintain at comfortable temperature levels allows more control. These areas can then be heated separately meaning that energy is not wasted on unnecessary heating for the whole area.
How frequently is air conditioning used?	5	5	Air conditioning can double an energy bill so only make sure it is operating when necessary. Make sure air conditioning is turned off in meeting rooms when empty and never have air conditioning on at the same time as the heating.

Is there an agreed temperature threshold where neither heating nor air conditioning is required?	0	10	Having an agreed dead band temperature where neither heating nor air conditioning is on stops energy being wasted unnecessarily. Typical ranges for this are between 18 - 24 degrees celsius
Are timers used to turn office equipment off when not in use?	3	5	46% of electricity used in businesses is consumed outside of working hours. Setting timers to turn off equipment at the end of each day will reduce energy consumption. Infrequently used equipment should only be turned on when required and not left on all the time.
Is there an awareness campaign to encourage staff to turn off office equipment when not in use?	0	2.5	Engaging staff in the importance of turning off equipment when it is not needed is vital in reducing energy consumption. Having reminder notices to turn off equipment when not in use should be on display.
Does the current office and kitchen equipment have energy efficient ratings?	5	5	Choosing energy efficient appliances for the most commonly used items such as kettles and fridges will reduce energy consumption. When choosing new appliances look for the EU energy efficiency label for guidance.
How do you monitor energy consumption?	5	5	Monitoring your energy usage is a very useful tool in reducing your energy consumption. Automatic meter readings will show where and when energy is being used and will allow you to understand where energy is being wasted. These monitoring techniques also allow you to track your progress easily to see whether your energy efficient procedures are working.
Are the energy consumption figures/targets communicated to all staff?	0	5	All staff should be aware of energy reduction targets and the benefits that these give to the organisation. Displaying targets and results on a notice board or updating staff by email are ideas for ways of communicating the results.
Is your workplace ISO14001 (Environmental Management) certified?	2	5	ISO14001:2015 is a standard which supports organisations in growing sustainably while reducing the environmental impact of this growth. Having this standard can help your organisation meet legal requirements, create better environmental management, improve efficiency and reduce costs.
Total Score	40	100.	0

Answers to questions –

What is the predominant lighting in your workplace?	LED Lamps
Are motion sensors and/or lighting sensors installed to control lighting?	No
Are lights able to be dimmed?	No
Are lighting levels able to be controlled on a zonal basis?	Yes
Is natural light utilised whenever possible?	Sometimes
Is there an awareness campaign to encourage staff to turn off unnecessary lighting?	No
Are there any measures in place to reduce heat loss through windows?	Single glazing
Are there any measures in place to reduce heat loss through walls?	No
Are exposed heating pipes and hot water cylinders insulated?	Partially
How is temperature controlled in the building?	Other (please specify) (not applicable)
Are additional thermostats installed in problem areas where temperatures levels are harder to maintain?	No
How frequently is air conditioning used?	Never
Is there an agreed temperature threshold where neither heating nor air conditioning is required?	Not Applicable
Are timers used to turn office equipment off when not in use?	Partially

Is there an awareness campaign to encourage staff to turn off office equipment when not in use?	No
Does the current office and kitchen equipment have energy efficient ratings?	All
How do you monitor energy consumption?	Half hourly metering
Are the energy consumption figures/targets communicated to all staff?	No
Is your workplace ISO14001 (Environmental Management) certified?	Interested in gaining certification
Is your workplace ISO50001 (Energy Management) certified?	Interested in gaining certification
Please select the sections that you would like further information on:	<ul style="list-style-type: none"> • Energy Audits • Carbon Reporting and Management Software • ISO50001 • ISO14001 • Carbon Footprinting • Carbon Offsetting
Please select the size of the workplace	Small (<50 employees)
Please provide your email address where the results can be sent.	fjj203@exeter.ac.uk

Appendix D – Example Environmental Policy for Coldharbour Mill Trust Ltd

Coldharbour Mill Trust Ltd has the long-term vision of developing and securing a relevant and sustainable future for the mill to ensure that it can continue to fulfil its mission of education and inspiration. An integral part of achieving this vision is supporting our employees and local community in tackling climatic changes which threaten both them and the heritage the Trust protects. In order to achieve this, the following policy has been established:

The Trust will manage our activities to minimise, wherever practical, their impact on the environment. We are dedicated to this goal at all levels and functions of the organisation, including those taken on in a voluntary basis, and commit to continual improvement. We recognise that the regular monitoring of our environmental performance against objectives set and informed by the latest research and guidance is critical to achieving this goal.

Our Environmental Policy commits the organisation at all levels to ensure that we:

1. Identify any risk of pollution arising from any of our activities, products and services, which shall then either be eliminated or effectively controlled and minimised as much as practical and in line with legal criteria.
2. Reduce unnecessary use of materials, resources and energy to a minimum.
3. In liaison with all Coldharbour Mill stakeholders, consider and reduce to a minimum the environmental effect of all future developments and purchases by ensuring that they have as minimal an impact on both the environment and our health and safety as possible.
4. Reduce waste to the lowest practicable level, ensuring responsible disposal of waste created and received.
5. Advocate employee (paid and volunteer) involvement in all environmental matters, providing suitable training and support to all employees with regard to this Environmental Policy.
6. Ensure that any persons working on our behalf are made aware of, and agree to comply with, this Policy and that they understand that not conforming to it can cause implications when adhering to our compliance obligations as well as the detrimental impact/s upon our environment.
7. Place ultimate responsibility for our Environmental Performance with our Chief Executive Officer but ensure that our environment remains the responsibility of everyone within or who can have an effect on Coldharbour Mill.
8. Undertake a review of this Policy and its associated objectives and targets annually, especially in the light of any changes to our context, new knowledge, changing legislation or public concerns, and to ensure that it remains appropriate to the purpose, scale, nature and impact of the Trust's activities.

This Policy has been defined by the board of Coldharbour Mill Trust Ltd and has been communicated, understood and implemented throughout the organisation as well as publicised to the local community and visitors as per the documented procedure/s set down in the Trust's business plan.

Signed _____

Martin Halse – Chief Executive Officer

On (date) _____