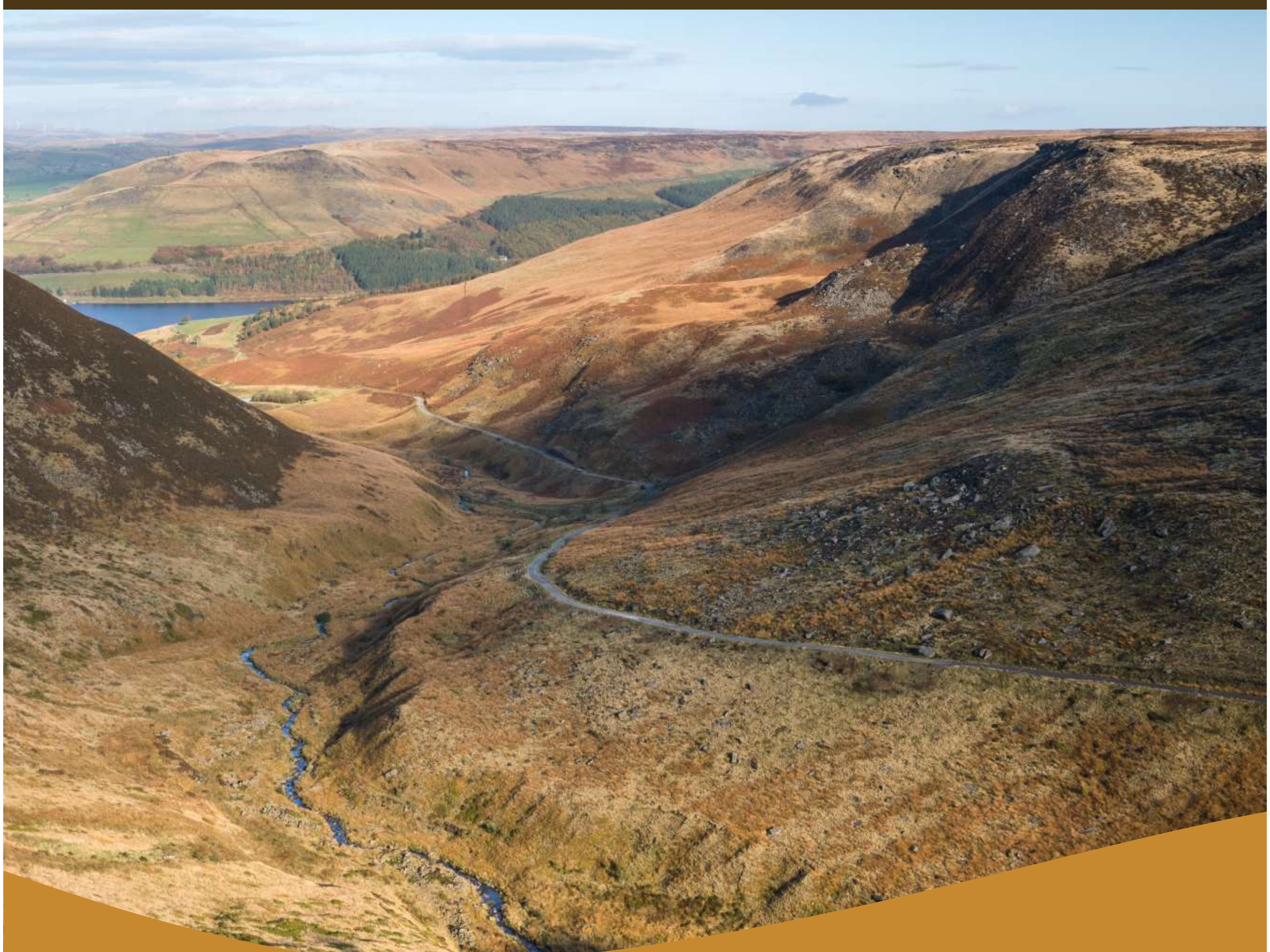
CARBON AUDIT FINAL REPORT 2022

MOORS FOR THE FUTURE PARTNERSHIP

MoorLIFE 2020



Prepared by:

Moors for the Future Partnership, (September 2022)

Suggested citation:

Titterton, P., Benson, J., Thorpe, K., Crouch, T., Pilkington, M. Justin, P. (2022) Carbon Audit Update Report 2022. Moors for the Future Partnership, Edale, UK.

MoorLIFE 2020 Project:

D5 Carbon Audit Update Report 2022

September 2022

(LIFE14 NAT/UK/000070)

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Suggested citation: Titterton, P., Benson, J., Thorpe, K., Crouch, T., Pilkington, M. Justin, P. (2022) Carbon Audit Update Report 2022. Moors for the Future Partnership, Edale.

Executive Summary

Moors for the Future Partnership monitored the carbon footprint of the MoorLIFE2020 project, with the aim of identifying where carbon savings can be made.

This carbon audit builds upon the original MoorLIFE project carbon audit, by including additional activities (e.g. office energy use) that are both directly controlled by Moors for the Future Partnership (scope 1 activities), and indirectly associated (scopes 2 and 3).

The activities associated with scope 1, 2 and 3 were assigned using the D5 Carbon audit guide produced by Benson et al. (2016).

In total the project's greenhouse gas emissions were over **988** tonnes CO_2e (Carbon dioxide equivalents) (or 288,239 Kg of CO_2e). This is the equivalent of the energy used by 124 USA homes in one year. The majority (56%) of the emissions were recorded in years 4 and 5, as the project activities varied between years.

Whilst these are one-off emissions, carbon modelling by Professor Fred Worrall at the University of Durham has shown that there was an immediate effect of restoration: an overall saving of 1,111 tonnes C/yr or 2629 tonnes CO_2e/yr and that the project areas are forecast to be in slower decline as a result of these carbon savings (Worrall, 2022).

The primary activities that contributed the most to total greenhouse gas emissions were:

- Helicopter Deliveries – 295,123 kg CO_2e.
- Employee Commute – 280,949 kg CO_2e.
- Contractor Travel – 93,331 kg CO_2e.

Analysis by action showed that the top three emitters of CO_2e were concrete conservation actions (C2, C1 and C5). This ranking changed however, when looking at the intensity ratios (total Moors for the Future Partnership spend per CO_2e emitted), the order changes to C2, D2 and C4. The reason that D2 is included becoming the action with the second most emitted kg CO_2e, due to the number of journeys associated with this action. Whereas C4 is included because there was a lot of travel for a relatively small amount of spend when compared to the other conservation actions.

Looking at kg CO_2e by site it is possible to determine that Alport, Arnfield and Derwent & Howden were the sites that incurred the most carbon emissions during delivery of the associated site activities. However outside of the top 3 results the ranking does change depending upon whether it is ranked by total Kg of CO_2e or the intensity ratio, with Castleshaw increasing 14 places from 21st to 7th if the ranking is changed to the intensity ratio.

Key recommendations:

As part of the MoorLIFE 2020 project, Moors for the Future Partnership and our associated beneficiaries are committed to reducing our carbon footprint. This could be done by looking to implementing measures to reduce emissions from those activates that emit the most carbon, this could include:

- Siting lift points as close to the working area as possible, where possible
- Specifying local helicopter take-off sites and the right helicopters for the job
- Accurately specifying areas using desk-based GIS and helicopter-mounted GPS
- Car sharing / use of public transport when and where logistically possible
- Purchase or lease of vehicles with the lowest CO_2/ km emissions (e.g. hybrid vehicles)

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1. Introduction

As part of the MoorLIFE 2020 (ML2020) project action D5, a carbon audit was undertaken for all greenhouse gas (GHG) emissions (carbon dioxide (CO_2), methane (CH_4) & nitrous oxide (N_2O)) to assess the carbon footprint of the project. The different GHG emissions were converted into carbon dioxide equivalents (CO_2e), allowing comparison between the different types of GHG emissions and a total emissions figure was calculated (OECD Statistics, 2013; Defra, 2017).

The aim of this document is to report the full kg CO_2e figures associated with delivering:

- Year 1: 1st October 2015 – 31st March 2016
- Year 2: 1st April 2016 – 31st March 2017
- Year 3: 1st April 2017 – 31st March 2018
- Year 4: 1st April 2018 – 31st March 2019
- Year 5: 1st April 2019 – 31st March 2020
- Year 6: 1st April 2020 – 31st August 2021
- Year 7: 1st September 2021 – 30th September2022

ML2020 was delivered in partnership with a number of organisations: National Trust (NT), Royal Society for the Protection of Birds (RSPB) and Pennine Prospects (PP). Emissions incurred by activities undertaken by the project's associated beneficiaries are reported on alongside those activities undertaken by Moors for the Future Partnership (MFFP) and any contractor travel associated with delivering the conservation works.

The different activities included within the carbon audit are identified in Table 1, along with the group or 'scopes' of emissions the activities relate to. Scope 1 and 2 activities relate to those actions which are controlled directly by MFFP (e.g. driving works vehicles), whereas scope 3 activities are activities which are indirectly controlled by MFFP (contractors' and partners' travel) (Carbon Trust, 2017).

Table 1 – Activity and scope reported on in the MoorLIFE 2020 carbon audit

Activity	Scope
Works vehicle use	1 and 3
Project staff commute	1 + Well To Tailpipe (WTT)
Contractor travel	3 + WTT
Volunteer travel	1 + WTT
Flying	3
Deliveries	3
Office energy use (Moorland Centre only)	2

Adapted from Benson *et al.* 2016

Since the original MoorLIFE carbon audit, the number of activities covered within the carbon audit was expanded to produce a more comprehensive audit. The original audit can be used as a guide for expected outcomes associated with the ML2020 carbon audit. Maskill *et al* (2015) identified that those activities involving helicopters and the delivery of materials produced the most carbon emissions.

An overview of the carbon released by partner is presented for our associated beneficiaries (see section 3.9 Associated beneficiaries CO2e contributions). This is not intended for direct comparison due to the different work areas and requirements of the sites that our associated beneficiaries work on. It has been included to allow our associated beneficiaries to put measures in place to reduce their carbon footprint, where applicable.

2. Methodology

The following methodology was taken from 'A guide to the project carbon audit processes and protocols' ML2020 report that was written for the ML2020 project by Benson et al. (2016).

2.1 Scope and boundaries of the MoorLIFE 2020 project carbon audit

The scope of the ML2020 carbon audit is defined as those activities carried out for, and invoiced to, the full suite of ML2020 project actions. In addition, where possible, supply chain emissions were included.

MFFP followed guidelines issued by the Department of Environment and Rural Affairs (Defra) for UK organisations and businesses complying with GHG reporting regulations where possible in order to produce a first order estimate of GHG emissions to a recognised national standard (Maskill *et al.* 2015).

The Defra guidelines (2009) state the importance of identifying the activities in an organisation (or in this case, the project) that are responsible for GHG emissions, and from which areas of an organisation (or project) information needs to be gathered.

There are three recognised groups of emissions-releasing activities, which are stated as follows:

"Scope 1 – Direct emissions: Activities owned or controlled by your organisation that release emissions straight into the atmosphere. They are direct emissions."

"Scope 2 – Energy indirect: Emissions being released into the atmosphere associated with consumption of purchased electricity, heat, steam and cooling. These are consequences of an organisation's activities, but occur at sources not owned or controlled by the organisation."

"Scope 3 – Other indirect: Emissions that are a consequence of your actions, which occur at sources which are not owned or controlled, and which are not classed as scope 2 emissions."

Scope 1 and scope 2 emissions are the recommended emissions types to audit, and scope 3 are discretionary. Scope 3 emissions can be especially important because there is a risk, should the organisation or business responsible for those emissions undertake a carbon audit, of double counting. However, it is acknowledged that it can be difficult to identify whether emissions fall into scope 1 or scope 3.

The ML2020 project contracted out most of the concrete conservation actions (C) hence the following activities often fell within scope 3: delivery by road, flying, contractor travel, material production (e.g. brash cutting).

The previous EU LIFE project MoorLIFE (MLFE) was the first MFFP project to have a carbon audit produced. The focus of the audit was restricted to the conservation works (C) actions that were controlled and supervised by MFFP.

In the previous MLFE carbon audit, helicopter travel to and from works site from helicopter company base were not reported on. These scope 3 emissions data are included in the present audit in recognition of helicopter "commute" distances. GHG emissions relating to Preparatory (A), Monitoring (D), Communications (E) and Project Management (F) actions were also not reported on in the MLFE carbon audit, whereas the present audit reports on the full range of project actions. Improvements were made to data recording systems in preparation for the ML2020 project delivery at MFFP, documenting recharges to individual ML2020 action codes, enabling reporting by action code, as well as by activity (Table 1).

Staff commute to the office (petrol/diesel) was also reported on the present project audit, which was omitted from the scope of the previous MLFE audit. Office energy use was another new addition to the scope of the audit since the original MLFE project audit (scope 2 emissions). Scope 2 emissions for staff working from home were difficult to incorporate into the audit and a decision was made to exclude these.

2.2 UK greenhouse gas conversion factors

GHG emissions figures were extracted annually from the Defra conversion factors spreadsheets, which are available to download online from Government conversion factors for company reporting of greenhouse gas emissions – GOV.UK www.gov.uk (Department for Business, Energy & Industrial Strategy, 2015)

2.3 Delivery by road

GHG emissions associated with the delivery by road of materials were audited for the full range of conservation works treatments, including:

- brash
- geotextile
- gully blocking
- lime, seed and fertiliser application
- plug planting
- *Sphagnum* application
- cutting
- bunding
- invasive species control

Identifying the type of vehicle involved in delivery of road by materials was key to assessing GHG emissions from this scope 3 activity as the different vehicle types use different conversion factors.

Fuel type was also important in assessing GHG emissions associated with road delivery. For example, an assumed fuel consumption of gas oil of 0.24 litres per km was used for GHG emissions calculations of tractor and tractor pulling trailer in the previous MLFE project audit when only distance data was available for the audit (Maskill *et al.* 2015).

Freighting goods conversion factors were used specifically for the shipment of goods over land, by sea or by air through a third party company. Factors are available for a whole vehicle's worth of goods or per tonne of good shipped via a specific transport mode (Defra, 2015).

2.4 Flying

GHG emissions associated with flying were audited for the full range of project conservation works treatments, listed under 2.3 Delivery by road.

Different treatment stages of the conservation works involving flying, a scope 3 activity, include:

- Application of material
- Delivery of material
- Stockpiling
- Distributing stockpile
- Removing empty bags
- Contractor travel

Defra conversion factors were extracted from the 'Fuels' tab. Additionally, well-to-tailpipe (WTT) fuels' conversion factors were used to account for the upstream scope 3 emissions associated with extraction, refining and transportation of the raw fuel sources to site, prior to combustion (Defra, 2015).

Different helicopter models assume different fuel consumption (litres per km); therefore identifying helicopter model was key to assessing GHG emissions associated with flying. Table 1 in "MoorLIFE: A carbon audit of the project: final report" by Maskill *et al.* 2015, listed the assumed fuel consumption for the different helicopter models flown in the previous MLFE project. These figures are also presented in Table 2 of this report for quick reference, alongside the latest assumptions that were used in the ML2020 project audit.

Table 2 – The assumed fuel consumption of helicopters used in GHG emissions calculations when only distance data was available for the MLFE project audit alongside new assumed fuel consumption figures for use in the ML2020 audit.

Helicopter model	Assumed fuel consumption (litres per km)	
	MoorLIFE (2011 – Sept 2015)	MoorLIFE 2020 (Oct 2015 – Aug 2022)
Bell 205	4.80	5.00
Single Squirrel	3.15	3.30
Bell 206	1.50	1.60
Long Ranger	1.25	1.50
Hughes 500	0.80	1.58

Fuel consumptions for the MLFE project audit were obtained through interviews with the helicopter companies and were derived from records of a specific job, rather than presenting an average consumption figure. The latest updates from the helicopter companies were provided to the data owner in August 2016 (Table 2). The figures represented average fuel consumption whilst lifting a load at capacity for a typical Peak District job of a 3 km carry.

It was assumed that on average the helicopters fly approximately 60 km per hour when load lifting and this is generally how the helicopter companies estimate jobs for MFFP. Several helicopter flight logs were used to calculate this average speed for the previous MLFE project audit. This assumption was also valid for the ML2020 project audit, since helicopter models did not change.

For each activity charged to the project involving flying, fuel consumption of the helicopter model (Table 2) was multiplied by km flown to give total litres of fuel used for the job. Total litres of fuel used was then multiplied by the aviation turbine fuel conversion factor (kg CO_2e per vehicle unit), for each GHG in turn: CO_2, CH_4, N_2O and Total Indirect GHG (upstream WTT emissions). The sum of these figures gave total kg CO_2e for the flight activity.

In preparation for ML2020 carbon audit data acquisition, a clause was incorporated into tenders with the expectation that contractors would be able to provide the number of litres of fuel used per job. Therefore the assumptions in Table 2 were only used in cases where this information was not able to be provided by the company.

2.5 Travel

GHG emissions associated with travel by project staff and contractors, by road and public transport, were audited for the full range of project actions.

Contractor travel

Records of information about contractor travel to works sites were used to audit GHG emissions arising from this scope 3 activity (Table 1).

Travel by contractor staff from base (or otherwise from a home address or local accommodation) to site occurred typically at the manual application stage of the conservation works treatments: geotextile (fixing), gully blocking, plug planting and *Sphagnum* works. Contractor travel for brash works was necessary at both the production and manual application (spreading) stages of treatment.

Identifying the type of vehicle used to transport contractor staff was key in assessing GHG emissions associated with contractor travel. Type of vehicle was identified in the annual Defra conversion factors spreadsheets, on the 'Passenger vehicles' tab.

We also reported on the upstream scope 3 emissions associated with extraction, refining and transportation of the raw fuels before they were used to power the transport mode. These indirect emissions factors were found on the '*WTT conversion factors for passenger vehicles and business travel on land*' tab (Defra, 2015).

Staff travel

MFFP: pool vehicles

The *"passenger vehicles"* conversion factors (scope 1) were used to report on GHG emissions associated with pool vehicles. Additionally, the "*WTT conversion factors for passenger vehicles and business travel on land*" were used to report the upstream scope 3 emissions associated with extraction, refining and transportation of the raw fuels before they were used to power the transport mode (Defra, 2015).

Beneficiary organisations: pool vehicles

The *"passenger vehicles"* conversion factors and "*WTT conversion factors for passenger vehicles and business travel on land"* were used to report on pool vehicles in the same way as for the MFFP pool vehicles.

MFFP: employee-owned vehicles

The "*business travel- land*" conversion factors were used to report on vehicles that were used by MFFP but weren't owned by the organisation. This included mileage for business purposes in cars owned by employees, public transport and hire cars (Defra, 2015).

Beneficiary organisations: employee-owned vehicles

GHG emissions arising from partner employee-owned vehicles were reported in the same way as detailed under MFFP employee-owned vehicles.

Project staff travel by public transport: road and rail

GHG emissions arising from travel by rail or bus by volunteers were reported by "passenger.km".

Project staff commute

GHG emissions arising from project staff commute were reported in the same way as detailed under MFFP employee-owned vehicles.

Volunteer travel

GHG emissions arising from travel by road by volunteers were reported in the same way as detailed under MFFP employee-owned vehicles.

GHG emissions arising from travel by rail by volunteers are reported by "passenger.km".

2.6 Office energy use

GHG emissions associated with water and electricity consumption were reported on for the primary MFFP staff base: Moorland Centre, Edale. Whilst the facility is shared by four accountable services: MFFP, Peak District National Park Authority (PDNPA) Visitor Centre, PDNPA Ranger Service and Fieldhead campsite, the campsite tenant billed the PDNPA for our contribution to the water supply (MFFP/ Visitor Centre/ Rangers). The campsite is therefore not accounted for in the PDNPA's Moorland Centre usage figures (see Table 3). However, this still leaves a situation where three accountable services are sharing one facility/ utility bill. The split across the three services was therefore estimated in order to determine MFFP's contribution. Further still, an estimation was made to isolate the contribution of the ML2020 project out of the full programme of MFFP projects Table 4. Similarly, the utility bill figures for electricity consumption were for the Moorland Centre as a collective: MFFP/ Visitor Centre/ Rangers, and did not include the campsite's contribution, so the same splits were used to estimate the contribution that the ML2020 project made to electricity consumption.

The amount of time which each accountable service used the building each year was also considered (Table 5). Whilst calculating the energy used in heating, the amount of floor space used by each accountable service was taken into account along with how this changed over the lifetime of the project (Table 3 and Table 4).

Moorland Centre electricity usage

Prior to February 2017, the electricity supply to the Moorland Centre and Fieldhead Campsite was supplied by two separate systems; meaning that the Fieldhead Campsite electricity usage was already excluded from the total energy usage figures. From February 2017, the Fieldhead Campsite's electricity usage **was** included within the Moorland Centres usage figures, due to a combined system being installed; this meant that for these subsequent years, the electricity used on the campsite was subtracted from the total energy figures. As both accountable services used electricity meters, it was simply a case of subtracting the campsite's usage figure from total electricity usage to calculate electricity used solely by the Moorland Centre. The data was provided per quarter for operations during the day and night. For the purposes of the carbon audit the nightly figures were excluded from the calculations as the Moorland Centre was not used at night.

With the Moorland Centre electricity usage separated from total electricity usage, the MFFP split was calculated using the inventory of energy using appliances spreadsheet. This spreadsheet identified the wattage of each appliance and which appliance each accountable service used at the Moorland Centre. The total wattage of each of these appliances was totalled up for each accountable service and a percentage split was calculated as in the example in Table 3 below.

Table 3 – Estimations for the percentage split of energy using appliances at the Moorland Centre by the three accountable services sharing the facility in year 1 and 2 of ML2020

Service	Percentage of total wattage (Year 1)	Percentage of total wattage (Year 2)
MFFP	35 %	37%
Visitor Centre	31 %	29%
Ranger Service	33 %	34%

Moorland Centre heating usage

Heating at the Moorland Centre was controlled by 2 separate heat pumps which utilised electricity to generate heat. The amount of heating used by each accountable service was dictated by the floor space used by each accountable service.

A record of the floor space associated with each room in the Moorland Centre was provided by PDNPA property services, and included those rooms previously used by the campsite. We identified which areas were used by MFFP; an example is provided in Table 4.

Table 4 – Estimation of floor space used by MFFP at the Moorland Centre to estimate heating usage for year 1 and 2 of ML2020

Area	**Floor Space (M^2) Year 1**	**Floor Space (M^2) Year 2**
Offices ground floor (including toilets and lobby)	41.8	41.8
Offices first floor	87.4	87.4
Lab and office above (was ranger briefing centre, workshop and stairwell)		
Stores including plant room	38.3	38.3
Campsite facilities		
Visitor centre		
Sedum room and meeting room		95.06
Total office space (M^2)	**167.5**	**262.56**
Percentage floor space used by MFFP	**30%**	**47%**

Calculating the GHG emissions used to heat the Moorland Centre involved subtracting the electricity used by both heat pumps from total electricity used by the Moorland Centre to obtain a total heating figure. The percentage floor space used by MFFP was calculated and then applied to the total heating figure, giving the total heat used by MFFP to heat the Moorland Centre. The electricity used by both heat pumps was provided by PDNPA property services.

Expansion of the office space for the Moorland Centre

To successfully deliver the ML2020 project the MFFP team expanded rapidly at the start of the project. To accommodate this rise in staff numbers, MFFP spread into additional areas of the Moorland Centre. This meant that both electrical appliances used by MFFP and floor space increased (Table 4). Table 5 identifies when each new room was first used by MFFP.

Table 5 – Date each area of the Moorland Centre building were first used by MFFP staff

Area	Date first used
Sedum office and meeting room	July 2016
Middle office	April 2017
Lichen office	February 2017
Sphagnum office	April 2016

Days per year that MFFP are operational vs the other PDNPA accountable services

In a typical year, the different accountable services that utilise the Moorland Centre work different hours (e.g. the MFFP team occupied the building all year round, the PDNPA visitor centre closed in winter). This split was not taken account of within the carbon audit calculations, as the heating was not controlled on a room-by-room basis, and as MFFP occupied the majority of the building, changing any of the heating settings would impact on a room used by MFFP.

Splitting electrical use by the hours each accountable service was operational was not applicable either, as any electricity used to operate appliances (e.g. computers) were taken account of by the electricity meters and the office energy use spreadsheet record.

Calculating staff working hours for ML2020

Multiple projects were delivered by MFFP staff members, meaning that not all energy used at the Moorland Centre was attributed to ML2020. To take account of this the proportion of time each staff member spent on ML2020 was calculated per annum from their timesheets and an average staff time figure calculated. This proportion was then applied to the overall energy usage. Staff time spent on the ML2020 project was calculated annually for the first 2 years of the project as additional staffing resource was added, thus increasing total staff hours on ML2020.

Calculating water usage for the Moorland Centre

The Moorland Centre and the Fieldhead Campsite were supplied by the same water pipe, with a sub-meter for the water used by the Fieldhead Campsite. In order to calculate the water usage by the Moorland Centre, the campsite metered figure was subtracted from the total water-metered figure. It was not possible to identify which water was used by which PDNPA accountable service. Therefore a total water usage figure for the whole building was used. Total water usage figures and sub-metered water figures were supplied quarterly.

2.7 Calculating intensity ratios by action code

In order to aid with the overarching monitoring of the project, all ML2020 works were attributed to an action code, meaning a split per action could be calculated. Where multiple actions were associated with a single journey it was possible to work out the split due to the way mileage was recorded. This meant that the carbon emitted could be attributed to a specific action. Intensity ratios for this were also calculated using total MFFP spend to give an intensity ratio for each action code expressed as kg CO_2e per £ spent. This was chosen because it was the only definitive business metric common for all action codes.

The per action mileage figure used in this calculation does not include the figures for office energy usage or employee commute. This is due to the diversity of actions that MFFP staff members work on, and the associated difficulty of attributing a proportion of the employee commute and office energy usage figure to that employee in order to split it down by action code. This does mean that some action codes which are purely desk-based actions (e.g. action D5) are not accurately reflected by the intensity rations, as these do not have any associated mileage. Where this is the case these have been excluded from the analysis.

2.8 Calculating intensity ratios by site

Carbon emitted by site was calculated. The mileage logs of all journeys recorded the destination(s), making it possible to split down each journey by destination and calculate the carbon emitted in the same way as identified in the travel section. A number of assumptions were made as not all starting points were recorded. Therefore, where a journey had multiple destinations but only one start location the total mileage was split evenly between the different destinations.

In order to calculate the intensity ratios per site, the total mileage attributed to that site was divided by the area of the site in hectares to give an intensity ratio for each site expressed as kg CO_2e emitted during commuting to the site per area of the site in hectares (ha).

2.9 Assumptions

A number of assumptions were made when calculating the GHG emissions figures. A full list of the assumptions made is presented in Appendix 1 Assumptions made of this report.

3. Results

3.1. Total carbon emission in year seven

In total, 66,735 kg CO_2e was emitted during year 7 of the project (Table 6). These were considerably less than the other years because the project was winding down and didn't include any conservation works activity.

3.2 Total carbon emissions

Total GHG emissions for entire project were over 988 tonnes CO_2e to date, which is the equivalent of the energy used by 124 US homes in one year (EPA, 2022). The majority (56%) of those emissions were associated with years 4 and 5. This coincides with when MFFP had the two biggest delivery seasons in the partnership's history.

Figure 1 shows the kg CO_2e across project years. As the scope of activities varies each year there is no comparison available to make between project years. To note, year 1 was a preparatory year, which meant that not all members of staff were working on the project and not all activities (e.g. travel, deliveries, road) were undertaken in this year. In addition to this, the number of employees increased since the project began. Additionally, year 7 represents the final year of the project and the winding down of activities with no conservation activities taking place.

Table 6 – Total kg CO_2e for all partners by activity per project year

Activity	Scope	Year 1***	Year 2	Year 3	Year 4	Year 5	Year 6 *****	Year 7****	Total
		kg CO_2e	kg CO_2e	kg CO_2e	kg CO_2e	kg CO_2e	kg CO_2e	kg CO_2e	kg CO2e
Contractor Travel – Helicopter	3	0.0	3,378.7	30,604.7	30,014.3	228.9	1,914.0	0.0	66,140.7
Contractor Travel – Road	3	0.0	14,14.5	5,679.3	24,599.0	41,957.3	19,681.9	0.0	93,331.9
Delivery – Flying	3	0.0	18,483.3	21,944.3	92,362.5	138,414.5	23,917.9	0.0	295,122.6
Delivery – Road	3	0.0	4,452.0	5,067.0	8,816.1	5,654.1	7,688.4	0.0	31,677.6
Employee Commute	1 + WTT*	7,979.6	5,6843.3	72,342.5	75,899.3	67,280.0	604.5	53,942.0	334,891.2
Pool Car Travel	1 + WTT*	222.4	2,590.7	8,707.6	8,830.5	7,892.5	1,726.8	1014.0	30,984.5
Project / Casual Staff Travel	1 + WTT*	998.5	4,499.8	4,408.2	8,882.0	10,248.6	11,305.1	2331.2	56,312.8
Volunteer Travel	1 + WTT*	0.0	715.0	1,612.7	4,224.6	2,848.8	2,510.9	329.2	12,241.3
Cutting	3	0.0	732.5	6162.8	4,509.1	5,186.2	7,557.1	0.0	24,147.7
Office Energy Use	2	3,106.2	7,808.7	7,450.6	8,436.0	7,069.2	0.0**	9118.4	42,989.1
Bogtastic Van Generator	2	0.0	0.0	53.3	113.1	165.0	68.9	0.0	400.3
Total CO_2e		12,435.4	101,898.1	165,970.6	270,161.4	289,211.9	81,827.4	66,735.0	988,239.8

WTT conversion factors were used to report the upstream Scope 3 emissions associated with extraction, refining and transportation of the raw fuels before they are used to power the transport mode' (UK Government GHG Conversion Factors for Company Reporting, Defra); ** Not included within the Total CO_2e figure as the office was closed for significant portions of the year due to Covid 19; ***year 1 was a 6 month period; ****year 7 figure is 11 month period ** year 6 is a 17-month period.**

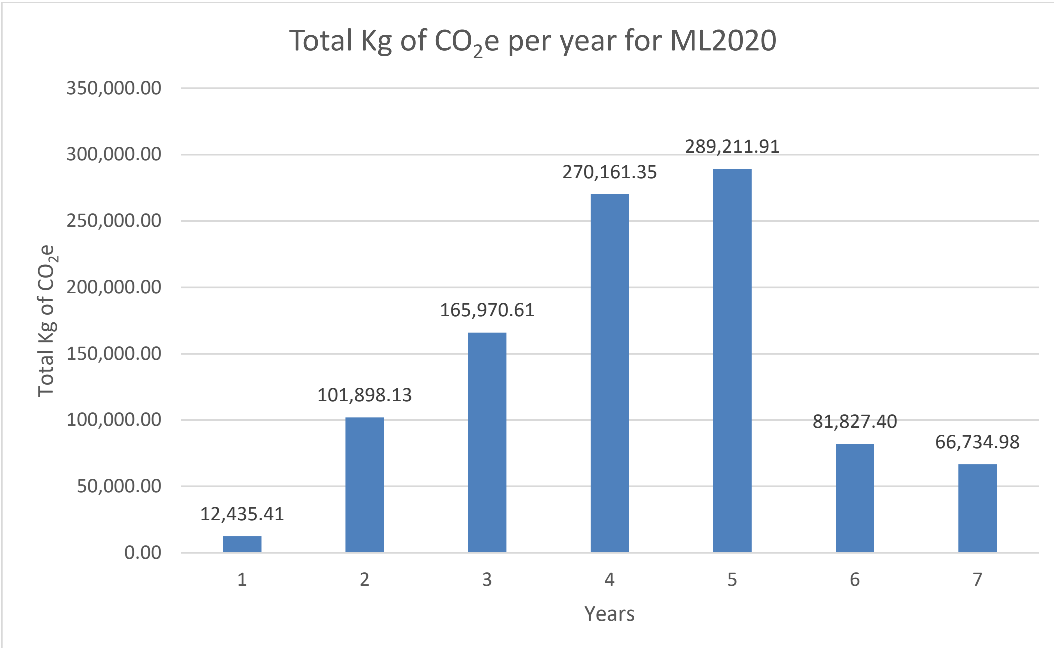


Figure 1 – Total kg CO_2e expenditure per project year* by the MoorLIFE2020 project to date (Project years 1–7)

***year 1 was a 6-month period; **year 6 is a 17-month period ***year 7 is a 11-month period**

3.3. Travel

Travel figures are presented below by project year, split by travel activity (Table 7). Whilst the amount of work requiring travel undertaken for the project varied over the life of the project, years 5 and 6 saw some additional effects of the COVID-19 pandemic: notably significantly less office commute emissions were reported in year 6. Additionally, March 2020 saw the project team move to a home working arrangement for the first lockdown and homeworking largely continued throughout years 6 and 7. The largest total contribution to staff travel emissions was the employee commute, despite there being overwhelmingly reduced office commute taking place in year 6 and 7 of the project Figure 2.

Table 7. Travel emissions by activity and project year associated with the ML2020 project to date.

	Y1 kg CO_2e (1st October 2015 – 31st March 2016)	Y2 kg CO_2e (1st April 2016 – 31st March 2017)	Y3 kg CO_2e (1st April 2017 – 31st March 2018)	Y4 kg CO_2e (1st April 2018 – 31st March 2019)	Y5 kg CO_2e (1st April 2019 – 31st March 2020)	Y6 kg CO_2e (1st April 2020- 31st Aug 2021)	Y7 kg CO_2e (1st April 2020- 31st Aug 2022)	Total kg CO_2e
Employee Commute	7,980	56,843	72,343	75,899	67,280	605	53,942	334,891
Pool Car Travel	222	2,591	8,708	8,830	7,892	1,727	1,014	30,985
Volunteer Travel	0	715	1,613	4,225	2,849	2,511	329	12,241
Project Staff Travel	1,127	5,479	6,346	12,357	12,515	16,157	2,331	56,312.8
Total	9,329	65,628	89,010	101,311	90,536	21,000	57,616	420,262

Year 1 was a 6-month period, **year 6 is a 17-month period, ***year 7 figure is 11-month period. N.B. All figures are rounded to the nearest whole number; therefore the figures in the "Total" column are correct but do not necessarily reflect the sums of the figures provided in the Y1 to Y6 columns.

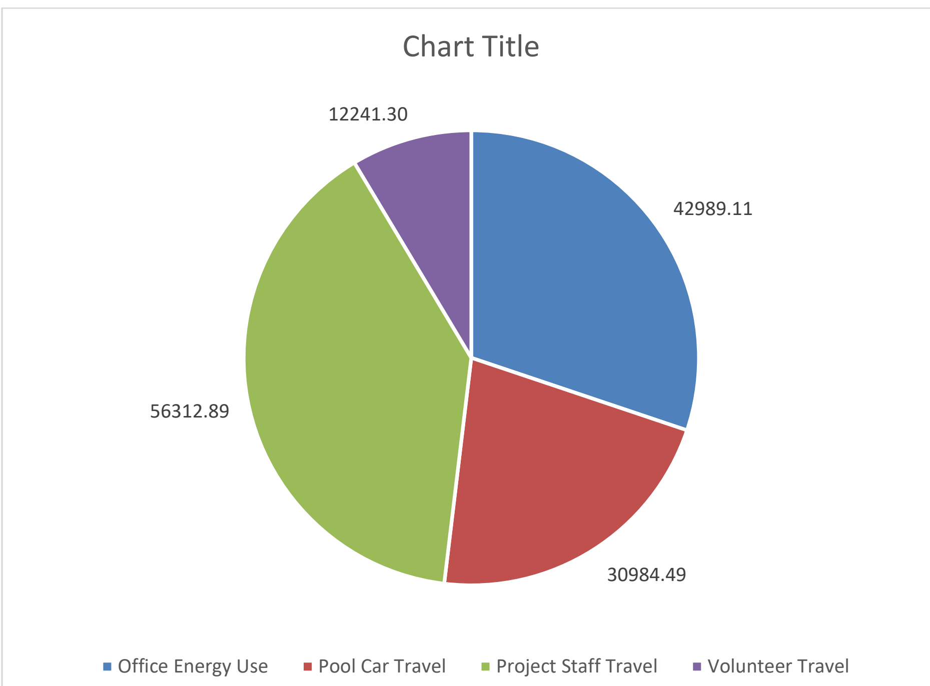
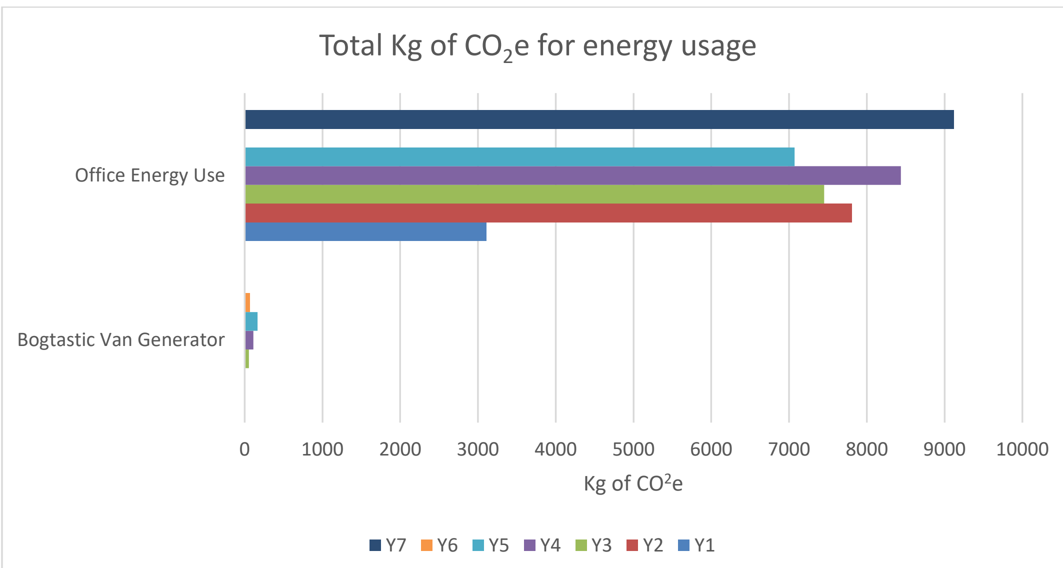


Figure 2. Total staff travel emissions in kg CO_2e for all travel activities.

3.4 Energy usage

The two main sources of scope 2 activities were office energy usage and the generator in the Bogtastic van (Figure 3). These were classed as source 2 emissions because it involved the production of energy using electricity, water, gas, etc. For the last month of year 5 and all of year 6 the office energy usage decreases due to COVID-19 pandemic preventing employees working from the office. This meant that year 6 figures had to be removed from the total CO_2e figure. Furthermore, we did not include any energy use from employees own homes due to the difficulty involved in ascertaining the additionally energy used by working from home. Overall, the kg CO_2e generated remained consistent at approximately 7000 kg CO_2e generated each year, except year 1, which reported half a year.



***year 1 was a 6-month period**

****year 6 is a 17-month period**

*****year 7 figure is 11-month period**

Figure 3 – Kg CO_2e produced by different energy sources for all project year to date (Year 1 to 7)

In accordance with government guidelines for reporting GHG emissions produced from fuels (Defra, 2017), the petrol used in the Bogtastic van generator was not included within the final carbon audit figures presented in Table 8, as they are classed as outside the scope of the carbon audit. This is because it uses petrol purchased from the forecourt which is blended with biofuels (Defra, 2017), and if a fuel source includes biofuels then it is counted as net 0 since the fuel source absorbs some carbon during its production (Defra, 2014). The reason the emissions in year 3 are significantly lower than subsequent years is because we received the Bogtastic van partway through year 3 and engagement visits varied throughout the project by nature of the events calendar. Year 6 saw the Bogtastic van usage decline because of the Covid-19 pandemic. The generator wasn't used in year 7 as the project was coming to an end.

Table 8 – Outside scope electricity generated from the BogTastic Van generator

Year	Emissions (kg CO_2e)
1	No van
2	No van
3	1.65
4	5.23
5	4.04
6	1.67
7	0

Year 1 was a 6-month period, **year 6 is a 17 month period, ***year 7 figure is 11 month period

3.5 Contractor travel

Figure 4 below identifies that for contractor travel by road the total kg CO_2e increased from 0 in year 1 to 41,957 kg CO_2e in year 5, which is when it peaked. Contractor travel by helicopter also increased from 0 in year 1 to 30,604 kg CO_2e in year three, which is when usage peaks. The reason there was 0 kg CO_2e in year 1 for both attributes, is that this was a preparatory year and no conservation activities were undertaken. In Year 7 no contractors undertook conservation work as the project was finishing.

Generally, the emissions from contractor travel by helicopter are always higher than contractor travel by road because of the amount of carbon used in aviation fuel when compared to motor vehicle fuel. However, in year 5 and 6, there was limited contractor travel journey undertaken by helicopter, due to the type of conservation works undertaken in those years. This explained why the trend was reversed in those years.

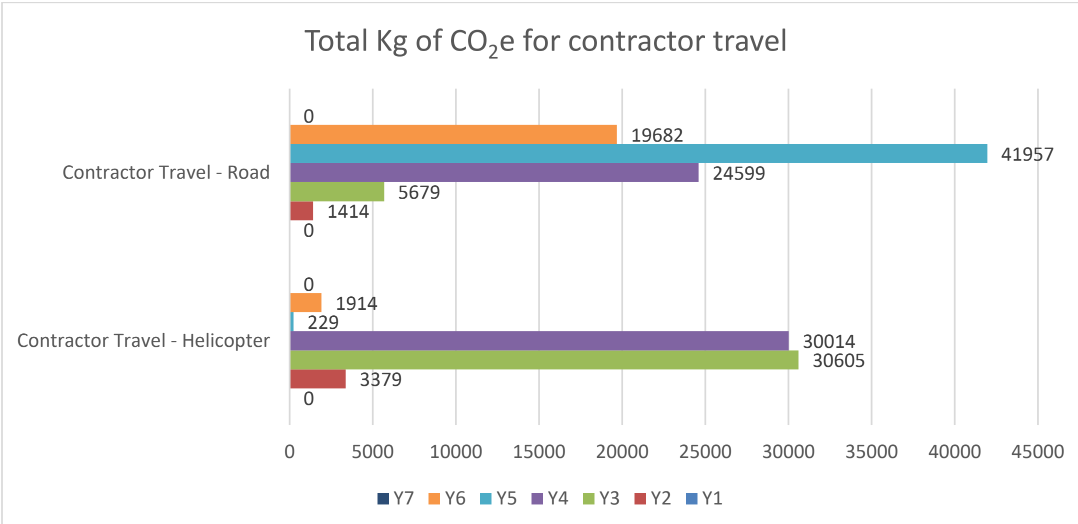


Figure 4 – Total kg CO_2e for all contractor travel

***year 1 was a 6-month period; **year 6 is a 17-month period, year 7 figure is 11-month period**

3.6 Delivery of materials

The amount of material delivered by road peaked in year 4 with 8,816 kg CO_2e with the other years staying constant around the 5000 kg CO_2e (Figure 5). This corresponded to a peak in high-emission types of activity and the materials used to deliver them in year four, (e.g. three times as much brash was delivered compared to year 5). The materials delivered by helicopter increased year-on-year up until year 6 when it started to decrease as the works were slowing down. This is a direct result of the amount/ type of works delivered as part of the project (e.g. three times as many stone dams were installed in year 5 compared to year 4).

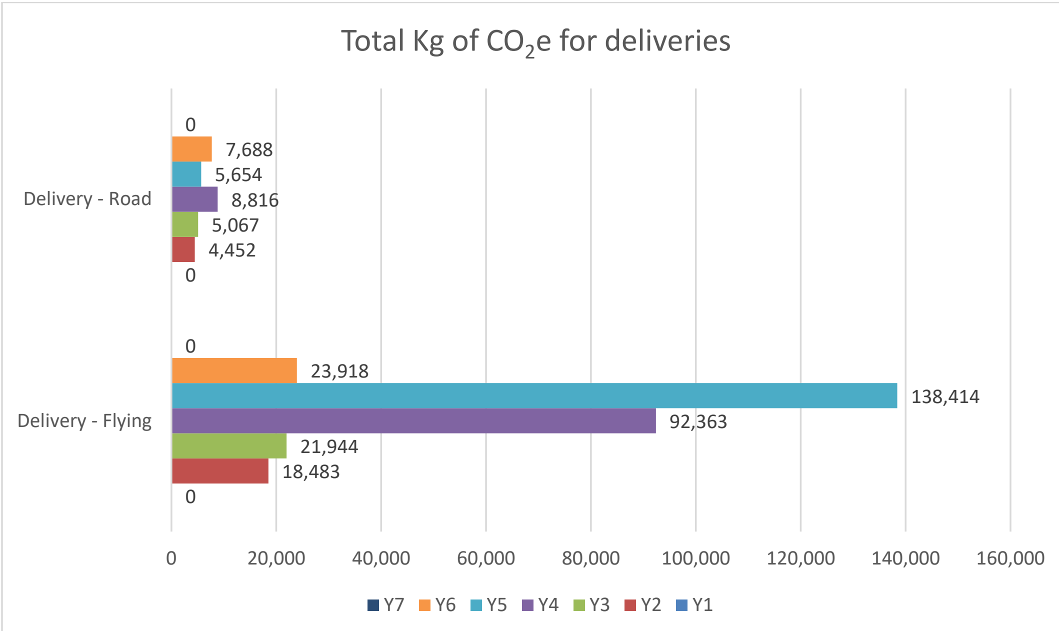


Figure 5 – Total kg CO_2e for all deliveries for all years of the project

***year 1 was a 6-month period; **year 6 is a 17-month period, year 7 figure is 11-month period**

3.7. Cutting

Cutting (e.g. *Molinia Caerulea, Calluna Vulgaris and Rhododendron Spp*) was variable over project years, as per the project plan. Emissions associated with cutting are presented in Table 9.

Table 9 – Total kg CO_2e for cutting of all habitats for all project years

	Year 1*	Year 2	Year 3	Year 4	Year 5	Year 6**	Year 7
Cutting	0	732	6,162	4,509	5,186	7,557	0

***year 1 was a 6 month period; **year 6 figure is 17 month period, 888 year 7 is an 11 month period**

3.8. Intensity ratios

Intensity ratio by action code

The results in Table 10 indicate the key ML2020 actions that emitted the largest total amount of kg CO_2e and the intensity ratio. Action C2 emitting the largest total amount (205,490 tonnes of kg CO_2e) across the whole project and had the largest carbon emitted per total spent on it. The top 3 actions (C2, C1, C5) all involve concrete conservation actions when ranked by total carbon emitted for the whole project.

However, when changing the ranking to intensity ratio, we see a change in the order with action D2 becoming the second largest emitter of CO_2e for the whole project. This is primarily because of the large number of journeys that were undertaken to deliver it. The third largest action split is C4, because there was a lot of travel for a relatively small amount of spend when compared to the other conservation actions this is due to the labour intensive nature of invasive species removal combined with the extensive use of volunteers.

The least amount of CO_2e attributed to an action is D3 with 4,977 kg CO_2e across the whole project. Comparing this to the intensity ratios for the different action codes, we see that this is slightly different with actions D1 and E7 having the least amount of carbon emitted by total amount spent on it.

Table 10, shows the intensity ratio for the key ML2020 actions. A full list is available in Appendix 2 Total CO2e and associated intensity ratio for all action codes. The key actions are those actions where travel included a large part of the works. This is because it is impossible to determine the proportion of office energy and employee commute was used to deliver desk based actions. These have been excluded from the analysis above because of this.

Table 10 – Total CO_2e emitted by action code for MFFP as part of the ML2020 project and associated intensity ratios for selected actions

Action	Title	Total GHG emissions (kg CO_2e)	TOTAL spend by action*	Intensity ratio (kg CO_2e per pound (£) spent)
C1	Protecting active blanket bog by stabilising bare peat	173,948	£1,523,442.30	0.11
C2	Restoring hydrology	205,490	£1,147,953.81	0.18
C3	Increasing heterogeneity	30,719	£602,144.03	0.05
C4	Controlling invasive species	4,012	£34,527.30	0.12
C5	Increasing sphagnum	36,019	£1,823,478.24	0.02
D1	Monitoring of concrete conservation actions using earth observation	8,057	£208,726.13	0.04
D2	Monitoring the biodiversity and ecosystem service impacts at demonstration sites and against blanket bog restoration trajectories at other project sites	26,804	£177,748.94	0.15
D3	Monitor peat pipe blocking effectiveness and efficiency and produce best practice guidance	5,858	£66,432.80	0.09
E7	Bogtastic & fire aware	7073	£146,398.89	0.04

*** The total spend figures are from July 2022**

Intensity ratio by site

When comparing the kg CO_2e emitted by site it is possible to determine that Alport had the largest carbon expenditure and intensity ratio across the whole project with 138,696.58 kg CO_2e emitted to deliver the works, providing an intensity ratio of 119.33 kg CO_2e per ha, see Table 11.

The three sites that had highest CO_2e emissions and intensity ratios were those sites which involved both Conservation team works and monitoring by the Science team. This is because there were regular journeys to undertake the required monitoring, and on top of this the delivery of work led to a relatively high level of emissions from helicopter works and contractor travel.

The least amount of kg CO_2e emitted was for Bobus, with just 4.57 kg CO_2e emitted to deliver the ML2020 works, excluding the 22 sites that had no works associated with them. When looking at the intensity ratio, we see that the lowest intensity ratio is for Mossy Lea, with an intensity ratio of 0.005 CO_2e. This is because no conservation work was undertaken on site, and only one journey to the site was recorded. Comparing the total amount of kg CO_2e to the intensity ratios a number of changes in the ranking occur, with one of the biggest changes being East Crowden, jumping from 25th in the CO_2e list to 5th in the intensity ratio list.

Appendix 3 Total CO2e and associated intensity ratio for all sites provides a full list of the total kg CO_2e and intensity ratios for all sites identified as part of the ML2020.

Table 11 – Total CO_2e emitted by site as part of the ML2020 project and associated intensity ratio

Site	Size of site (Ha)	Total carbon (kg CO_2e)	Intensity ratio (kg CO_2e per ha)
Alport	1,162	138,696.58	119.33
Ashop	1,641	25,628.00	15.61
Ashway	970	25,867.00	26.68
Birchinlee	1,473	30208.64	20.51
Bobus	151	4.57	0.03
Castleshaw	223	5,640.71	25.24
Close Moss	992	5,064.54	5.11
Crowden	2,286	10,537.29	4.61
Derwent & Howden	2,300	78,715.32	34.23
Ilkley Moor	769	331.72	0.43
Mossy Lea	892	4.73	0.01
Pikenaze	957	8,477.38	8.86
Readycon Dean	183	2,827.26	15.45

3.9 Associated beneficiaries CO_2e contributions

Table 12 identifies the split by partners to allow our associated beneficiaries to identify where they can reduce the amount of carbon emitting activities.

Table 12 – Total CO_2e contributions (kg) by associated beneficiaries for all years associated with the ML2020 project and the highest contributing activities

Partner	All project total kg CO_2e	Highest contributing activities towards the total
MFFP	724,668	Deliveries – flying and contractor travel – road
NT	159,670	Deliveries – flying and employee commute
PP	2,724	Employee commute and project staff travel
RSPB	34,505	Deliveries – flying and pool car travel

3.10 Modelling the carbon benefits of ML2020

Whilst the audited emissions are one-off emissions, carbon modelling by Professor Fred Worrall at the University of Durham has shown that there was an immediate effect of restoration: an overall saving of 1,111 tonnes C/yr or 2629 tonnes CO_2e/yr. Furthermore, when compared to the counterfactual scenario, i.e. what would have happened had no restoration taken place, the GHG benefit of restoration accelerated over time (Worrall, 2022).

Asall peatlands, restored or not, suffer under ongoing climate change,the modelling predicts that restored areas are in slower decline that if they had not been restored (Fred Worrall personal comms, 16/09/22). Thus, Worrall (2022) makes a recommendation for the Partnership to explore techniques above and beyond sphagnum planting for carbon benefits such as methane suppression.

4. Impacts

MFFP and our associated beneficiaries are committed to reducing the carbon footprint associated with the project through a number of key areas.

The outcomes of the project carbon audit indicate that the greatest saving could be achieved in areas relating to staff travel / employee commute, which contributed the most to total GHG emissions in 3 out of the 5 project years, excluding year 6 which was affected by COVID-19 pandemic. Some recommendations are:

- Car sharing/ use of public transport when and where logistically possible.
- Purchase or lease of vehicles with the lowest CO_2/ km emissions (e.g. hybrid vehicles).
- Optimise/ reduce the number of physical meetings – use of remote meeting facilities/ telephone and video conferences.
- Work-from-home days.

Additionally, the greatest individual carbon emissions are in relation to helicopter journeys, therefore undertaking the following actions, which have been implemented where possible, will also help to reduce our carbon footprint:

- Specifying local helicopter take-off sites and the right helicopters for the job
- Accurately specifying areas using desk-based GIS and helicopter-mounted GPS.
- Siting lift points as close to the working area as possible.

The reason that these measures are not implemented each time, is primarily because of external factors such as access agreements, our procurement system and contractor availability. This means that it can be difficult to get lifts sites (e.g. landowners won't allow it on their land) and we might not get the right helicopter for the work because that company doesn't win the tender.

5. Lessons learnt

In future, to make data processing more efficient it is suggested that when employees record their destination on a travel claim the ML2020 site is also recorded. Road names (e.g. A57) or local/ colloquial names (e.g. Snake Summit) caused a number of issues including:

1. There can be more than one ML2020 site along a road making it difficult to ascertain which site was visited without significant investigation.
2. It can be difficult to ascertain which location the employee visited as there can be more than one place with the same name, or the place is not shown on a map. This again meant that each one had to be investigated before a site could be assigned to the journey.

Not only is this inefficient but it also adds a degree of error into the calculations, as journeys could be assigned to the wrong site especially where employees have left the organisation and can't be contacted to verify the location of the journey.

6. Conclusion

In total the project has emitted 988,240 kg CO_2e (over **988**tonnesCO_2e) to date, which is the equivalent of running 124 USA homes for 1 year. The majority (56%) of the emissions were recorded in year 4 (270,161 kg CO_2e) and year 5 (289,211 kg CO_2e) due to the type and amount of restoration activities that was undertaken in those years.

Whilst these are one-off emissions, carbon modelling by Professor Fred Worrall at the University of Durham has shown that there was an immediate effect of restoration: an overall saving of 1,111 tonnes C/yr or 2629 tonnes CO_2e/yr and that the project areas are forecast to be in slower decline as a result of these carbon savings (Worrall, 2022).

Analysis of the data indicates that the three activities that contributed the largest amount to total kg CO_2e throughout the project were:

- Helicopter Deliveries – **295,123 kg CO_2e.**
- Employee Commute – **334,891 kg CO_2e.**
- Contractor Travel Road – **93,331 kg of CO_2e**

Whilst operations involving flying were expected to contribute a significant amount of kg CO_2e, based upon the findings of the original MoorLIFE carbon audit, employee commute was not expected to be such a significant contribution. This could be due to a number of factors, including a significant increase in the number of staff delivering the project compared to the original MoorLIFE project.

Analysis of the data identified that the top three sites (Alport, Arnfield and Derwent & Howden) that emitted the largest amount of kg CO_2e and had the largest intensity ratios, were those sites where both conservation works and regular monitoring visits were undertaken. Outside the top three sites the ranking changed depending on whether they were ranked by total emissions or by the intensity ratio, with Castleshaw exhibiting one of the largest changes in ranking.

Total carbon emitted by action code figures revealed that the three top-ranking total emissions were associated with the concrete conservation actions (C2, C1, C5 respectively). However, the top three changed when examined by intensity ratio, with action D2 being the second most intensive action that we carried out and C4 being the third most intense action. This was due to the large number of journeys that were undertaken as part of the works. The site that recorded the least amount of CO_2e emitted was Bobus with just 4.57 kg CO_2e.

With employee commute contributing a significant share to the total kg CO_2e emitted for each year of the project, recommendations for implementing/ encouraging staff to undertake the following measures would have the greatest impact in reducing the carbon footprint of future peatland restoration projects:

- Car sharing/ use of public transport when and where logistically possible.

- Optimise/ reduce the number of physical meetings – use of remote meeting facilities/ telephone and video conferences.
- Purchase or lease of vehicles with the lowest CO_2/ km emissions (e.g. hybrid vehicles).

Whilst the largest individual GHG emissions are produced from helicopter use, other ways to reduce the emissions would be to:

- Specify local helicopter take-off sites and the right helicopters for the job.
- Accurately specify areas using desk-based GIS and helicopter-mounted GPS.
- Site lift points as close to the working area as possible.

7. References

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Worral, F. (2022) MoorLIFE 2020 Carbon modelling – Phase 3 Report

Worrall, F. (2022) Personal Communications (email) to Jemma Benson on 16/09/22.

Appendix 1 Assumptions made

Conservation works

1. For helicopter flights from base to site it is assumed that a straight line is flown. Fuel consumption multiplied by km flown.
2. Stone wagons are 100% laden if delivering 20 tonnes.
3. Tractor and trailer uses 0.24 litres of diesel per km.
4. Heather cutting – Cutting tractor travels 12.5 m per bag / bale and collecting vehicles travel 50m per bag on average. Assume one cutting tractor and one collecting tractor per job.

Helicopter works

1. Helicopter base to site flights – Assumed that a straight line is flown from base to site. Fuel consumption multiplied by km flown.
2. Helicopter Fuel is calculated as Aviation Turbine Fuel – Scope 1 as there is no option on Scope 3
3. MoorLIFE carbon audit did not include flights from base to site eg. AH flying from Devon to Glossop. ML2020 audit includes these journeys and also the ground crew journeys.

Travel

1. All notes for individual entries are noted on the relevant spreadsheet using the comments function.

Commute

1. A commute is defined either as a person's journey from home to base or home to a meeting point (where there may be an onward journey to site).
2. The estimation does not take account of holidays.
3. If an employee walks/ cycles /car shares to work then the total number of days worked on ML2020 is reduced to take account of this change.
4. If an employee only undertakes, on average 0.25 days or less than this on ML2020 then the figure is rounded down to 0 and they are excluded from the calculation.
5. The number of weeks worked on ML2020 is dependent on when the employee started, and only includes full weeks, if an employee started mid-week, this week is discounted, to take account of any inductions they would be required to take.
6. Only full weeks are taken account of, therefore if a person started part-way through a week, this is not included within the calculation.
7. If an employee commutes to two bases regularly, the commute to the second base (e.g. Aldern house) is included as a separate entry.

Pool Cars

1. We are only interested in number of miles, not the number of people within the car.

Working from home

1. It is better to use an accurate figure is included within the calculations, but if this isn't possible then an estimate is fine, because days spent working from home can be ad hoc.

Volunteer Travel

1. Only those volunteers that submit a travel claims are captured within the data, if they do not submit a travel claim we cannot prove the journey for audit purposes.

Office Energy Use

1. We are not expecting co-beneficiaries to report on office energy use.
2. As it is difficult to calculate the weekly energy usage for ML2020, the campsite electricity figure for February 2017 has not been separated out from total energy usage.

Split by Site

1. Where a journey had multiple destinations but only 1 starting location. The mileage was split equally between those destinations.

Appendix 2 Total CO_2e and associated intensity ratio for all action codes

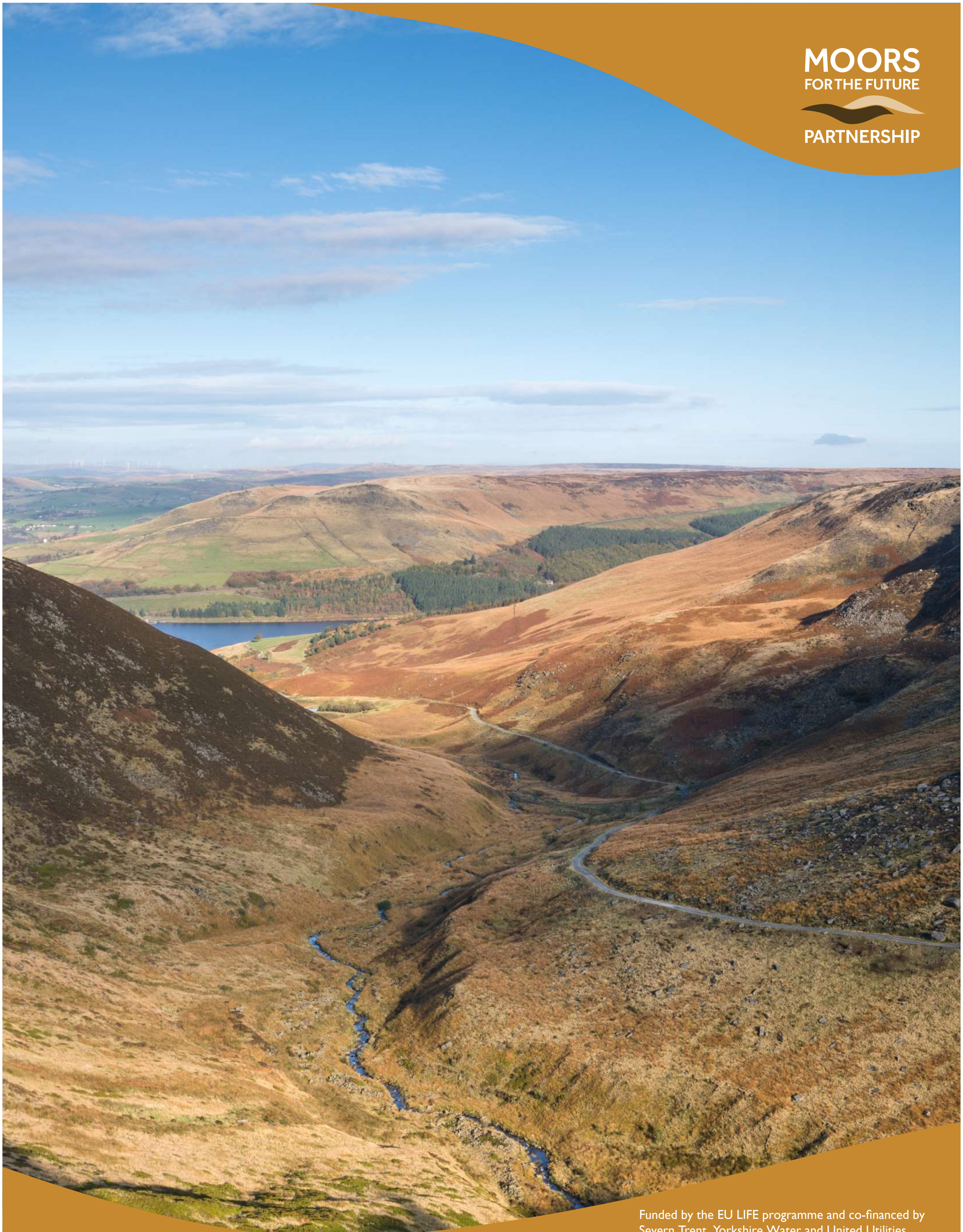
Group	Action	Total GHG y1-7	Rank by total GHG	Intensity Ratio	Rank by IR
A	1	113.77	21	0.02	24
A	2	82.56	22	0.09	14
A	3	406.56	19	0.66	2
A	4	3026.18	10	0.56	3
A	5	494.19	18	0.02	22
A	6	74.20	23	0.01	26
A	7	2070.98	12	0.06	16
C	1	173948.33	2	0.11	12
C	2	205490.28	1	0.18	8
C	3	30719.22	4	0.05	17
C	4	4012.07	9	0.12	11
C	5	36018.78	3	0.02	21
C	6	2137.45	11	0.33	6
D	1	8056.52	6	0.04	20
D	2	26804.24	5	0.15	9
D	3	5858.03	8	0.09	13
D	4	638.95	16	0.42	5
D	5	234.58	20	0.02	23
D	6	59.30	24	0.00	27
E	1	1400.52	13	0.05	19
E	2	24.44	26	0.07	15
E	3	6.17	27	0.47	4
E	4	615.09	17	0.01	25
E	5	52.69	25	2.20	1
E	6	978.72	14	0.14	10
E	7	7073.43	7	0.05	18
F	1	863.55	15	0.26	7

Appendix 3 Total CO_2e and associated intensity ratio for all sites

Site	Total Carbon Emitted Yr 1 to Yr 7	Rank by total CO2e	Intensity Ratio	Rank by intensity ratio
Alport	138,696.58	1	119.33	1
Arnfield	72,833.12	3	74.65	2
Ashop	25,628.00	6	15.61	12
Ashway	25,867.00	5	26.68	6
Big Moor and Leash Fen	184.93	44	0.08	59
Birchinlee	30,208.64	4	20.51	8
Blackstone Edge North	369.27	37	0.83	36
Blackstone Edge South	0.00	72	0.00	72
Bobus	4.57	71	0.03	64
Bodkin Farm	0.00	72	0.00	72
Bradfield	661.22	34	0.46	42
Broomhead	13.83	65	0.01	69
Brown Edge	36.99	57	0.28	49
Burbage	43.49	54	0.05	61
Butterly	1,472.35	29	13.92	19
Butterworth	8.85	68	0.01	68
Castleshaw	5,640.71	21	25.25	7
Close Moss	5,064.54	22	5.11	28
Combs Moss	145.99	48	0.28	48
Crag Estate	11.75	67	0.01	67
Crompton Moor	8.46	69	0.32	47
Crowden	10,537.29	12	4.61	29
Cupwith Hill	26.92	61	0.24	51
Deanhead	6,617.91	20	18.94	11
Deer Hill Moss	72.30	51	0.22	52
Derwent and Howden	78,715.32	2	34.23	3
East Crowden	4,370.72	24	29.68	4
Edgworth Enclosure	0.00	72	0.00	72
Emmott Moor	0.00	72	0.00	72
Grindsbrook	0.00	72	0.00	72
Harden Moor	38.86	56	0.41	44
Haworth Moor	0.00	72	0.00	72
Heptonstall	15,947.97	8	19.88	9
High Brown Hill	740.43	33	0.83	37
Higher Moor	0.00	72	0.00	72
Holcombe	168.60	45	0.37	46
Ilkley Moor	331.72	38	0.43	43

Keighley Moor	2,391.58	28	5.41	27
Langfield	7,678.05	17	13.27	21
Langsett	113.56	50	0.09	57
Midhope	36.71	58	0.04	62
Morridge	148.37	47	0.48	41
Moscar Flats	0.00	72	0.00	72
Moscar North	137.23	49	0.18	53
Moscar South	35.70	59	0.02	66
Mossy Lea	4.73	70	0.01	70
Musden Head Moor	0.00	72	0.00	72
Nab Water	0.00	72	0.00	72
Nether Moor	595.95	35	0.91	34
Noe Stool	62.51	52	0.99	32
North Lees	21.68	62	0.06	60
Oakworth Moor	0.00	72	0.00	72
Ovenden	6,752.04	19	14.88	15
Oxenhope Moor	2,820.92	27	14.32	18
Peaknaze	3,768.37	25	3.06	30
Pikenaze	8,477.38	13	8.86	22
Pule	15.31	63	0.09	58
Readycon Dean	2,827.26	26	15.45	13
Rishworth North	7,100.03	18	6.11	26
Rishworth South	7,834.99	16	15.01	14
Roaches	532.71	36	1.46	31
Ronksley	8,016.23	14	7.00	23
Roych	296.73	41	0.63	40
Saddleworth	1,332.25	30	0.84	35
Scout Moor	46.65	53	0.04	63
Snailsden	772.27	32	0.94	33
Soyland	15,854.77	9	19.75	10
Stalybridge	14,633.35	10	13.47	20
Stanbury Moor	41.90	55	0.09	56
Stott Hill Moor	0.00	72	0.00	72
Sutton Moor	0.00	72	0.00	72
Thornton Moor	1,133.79	31	6.99	24
Thurlstone	12.12	66	0.02	65
Thurrish Rough	0.00	72	0.00	72
Trawden	302.87	40	0.75	39
Turley Holes	11,657.15	11	14.69	16
Turncliffe Common	0.00	72	0.00	72
Twizlehead	155.19	46	0.40	45

Ughill Moors	196.63	43	0.82	38
Walsden	31.21	60	0.13	55
Walshaw Moor	14.86	64	0.00	71
Warley Moor	7,845.26	15	14.35	17
Wessenden	4,755.09	23	6.14	25
Wessenden Head	304.74	39	0.27	50
West Crowden	0.00	72	0.00	72
Widdop	17,522.56	7	29.32	5
Winterhill	0.00	72	0.00	72
Woodhead	213.12	42	0.15	54
Yeoman Hill	0.00	72	0.00	72



Funded by the EU LIFE programme and co-financed by Severn Trent, Yorkshire Water and United Utilities. With advice and regulation from Natural England and the Environment Agency, and local advice from landowners.

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