HIGH PEAK – AGRICULTURE & LAND USE ANALYSIS

Version 1.1

February 2022

Anthesis

DRAFT

CONTENTS

01 INTRODUCTION

INTRODUCTION
OVERVIEW

This report forms part of a larger piece of work commissioned by High Peak borough Council in response to their climate emergency declaration and net-zero target of 2030. This analysis will feed into High Peak's borough-wide action plan to determine the actions that High Peak Borough Council (HPBC) will need to take to meet its net zero ambition.

HPBC have undertaken several initial steps to support the borough's net zero ambition, conducting a review of the borough's baseline emissions, developing a Climate Change Strategy and Action Plan to tackle borough-wide emissions.

Objectives of this report

This report provides a deeper dive into the natural environment and agricultural sector, given the rural nature of the borough, and seeks to:

1. Provide an understanding of the current footprint of agricultural emissions in High Peak;
2. Explore how changing agriculture and land use practices can support emissions reductions; and
3. Define and explore the role of offsetting and insetting to support the borough in achieving its net-zero ambition.

The report focuses on two main areas of analysis: Chapter 2 focuses on agriculture and land use (ALU) emissions analysis while Chapter 3 looks at offsetting and its role in reaching net zero.

Agriculture and Land Use (ALU) Emissions Analysis

This section of the report discusses emissions from the natural environment and agriculture, namely:

- Emissions arising from agricultural activity within High Peak, including emissions from livestock, farming activities and fertiliser usage.
- An estimate using newly available data for peatlands and the importance of wetlands as a carbon sink.
- An estimate for the land use profile within the borough and discussion of how this relates to carbon sequestration potential in the case of soil carbon;
- Some high-level scenario analysis for land use change into the future, based on research from the Committee on Climate Change (CCC).

Carbon Offsetting

This section of the report looks at understanding Carbon Offsetting within a net-zero journey. This includes:

- An introduction into Carbon Offsetting and its key principles for local authorities.
- Highlighting some of the major challenges with offsetting as a local authority.
- An introduction to Authority Based Insetting (ABI) and they key principles around this new framework.
- Provision of some case study analysis of the above projects in practice.

02 AGRICULTURE AND LAND USE EMISSIONS

ALU EMISSIONS ANALYSIS
BACKGROUND & OVERVIEW

Rethinking land use

A 2018 report into reducing land use emissions published by the Committee on Climate Change (CCC) concludes that:

- The current approach to land use is not sustainable and past legislation has not been cohesive enough to deliver meaningful positive changes;
- A future land strategy that delivers the UK's climate goals whilst balancing other socio-economic pressures will require fundamental changes to how land is used;
- In a post-Brexit policy landscape, there is now an opportunity to define an improved land use strategy that responds to the challenge of climate change.

Some agricultural services bring direct financial value in a traditional market sense; growing crops for food or timber for construction and so on. Other vital services, such as nutrient cycling and carbon sequestration, are less well defined in terms of their conventional market value.

This means that activities that unintentionally disrupt or degrade the land can proceed without any obvious immediate consequence. Decisions around land use should therefore be based on a careful consideration of the full range of ecosystem services. This includes considering residents jobs, of which there just over 2,400 people employed in the farming sector on commercial holdings, according to DEFRA (2016).

The WWF's Land of Plenty: A Nature-Positive Pathway to Decarbonise UK Agriculture and Land Use identified local action to support communities as one of their 10 recommendations for all governments across the UK: "Governments must work with communities, local authorities and landowners to develop locally-driven land use frameworks and partnerships, allowing communities to shape the future of their landscapes."

In shaping the recovery from COVID-19, local stakeholders have the opportunity to capture the benefits of a low-carbon economy. Central to these benefits is increased resilience for local communities.

Methane and agriculture

During the 2021 COP26 summit in Glasgow, world leaders from 100 countries pledged to cut methane emission levels by 30% from 2020 levels by 2030 under The Global Methane Pledge. The European Commission estimates that achievement of the target would reduce global heating by at least 0.2 degrees Celsius by 2050.

The CCC's Sixth Carbon Budget outlines that methane from agricultural sectors alongside the energy sector have underpinned the recent rise in atmospheric methane concentrations. 56% of emissions from UK agriculture are methane, contributing approximately 5.5% of the UK's total carbon emissions.

ALU EMISSIONS ANALYSIS
BACKGROUND & OVERVIEW

Emissions in summary

Total net emissions from ALU across High Peak have been estimated at 90ktCO_2e according to the most recent datasets. Of these emissions, livestock is the dominant source, responsible for roughly 67ktCO_2e (74% of net ALU emissions overall). Emissions from land (fertilisers and nitrous oxide) are responsible for approximately 18ktCO_2e (20% of the net total). Land use, land use change & forestry acts as a carbon sink, contributing -17ktCO_2 to ALU emissions.

Fossil fuel emissions relates to the combustion of coal, various oils and petrol used across buildings, machinery and vehicles within the agricultural sector. Fertiliser emissions predominantly relate to the release of nitrous oxides from both natural fertilisers (manure) as well as other fertilisers used to promote crop growth. Livestock emissions includes methane produced from livestock within the authority as well as some manure-related emissions. Land Use, Land Use Change and Forestry (LULUCF) emissions relate to the sequestration of land and the natural environment, as well as emissions from decomposition and deforestation.

Differences with BEIS data

The significant disparity in the emissions reported by BEIS and analysis presented here stems from the different greenhouse gases assessed in each case. BEIS data considers only CO_2 emissions and neglects other greenhouse gases such as methane and nitrous oxide. These gases are emitted in significant volumes within the agricultural sector, chiefly through the rearing of livestock and use of fertilisers.

Anthesis' analysis considers these gases and provides a figure for the equivalent weight of CO_2 after accounting for methane and nitrous oxide emissions that are common in the agricultural sector.

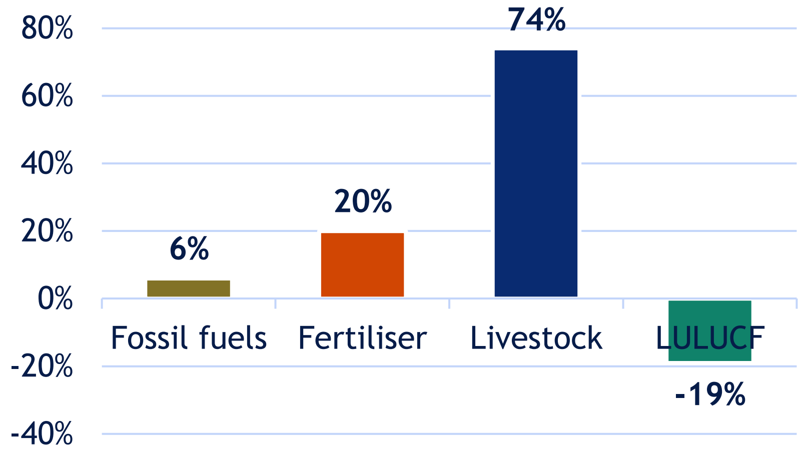


Figure 1: A breakdown of High Peak's agricultural emissions sources and sinks, shown as a percentage of the gross total (2018).

Emission Type	ktCO_2e	Description
Fossil fuels	5	CO_2 emissions from agricultural fossil-fuel use
Fertiliser	18	Nitrous oxide from manure and fertiliser emissions
Livestock	67	Methane and direct emissions from manure management
LULUCF	-17	Net CO_2 storage from LULUCF
Net Emissions	**90**	

Table 1: A breakdown of High Peak's ALU emissions and activities (2018).

ALU EMISSIONS ANALYSIS
LAND PROFILING

The map and chart opposite break down the various land use types across High Peak. The single largest land use is permanent grassland, which forms about 26,000 hectares (48.1% of the total). The next major land-type is arable land of 11,100ha (20.6%) followed by woodland at 5,900ha (10.9%) and legumes/nitrogen fixing at 5,700ha (10.5%). The smaller land use types are non-agricultural, fallow, heathland and water, contributing 2,200ha (4.1%), 1,900ha (3.5%), 700ha (1.3%) and 600ha (1%) respectively.

The land use map is taken from the Crop Map of England (CROME), which mainly uses satellite data to identify land-uses and crop types. The data for this profile was taken in 2020 is intended to provide a spatial understanding of land types rather than a fully definitive current picture.

Figure 2: Map showing the different land use types across High Peak borough.

Land Types across High Peak

	Land Type	Area covered (hectares)	% of total area
	Permanent Grassland	26,000	48%
	Cereals	9,600	18%
	Woodland	5,900	11%
	Leguminous & nitrogen-fixing	5,700	11%
	Non-agricultural	2,200	4%
	Fallow	1,900	4%
	Vegetables	1,100	2%
	Bracken, Heather and Heathland	700	1%
	Water	600	1%
	Oilseed	400	<1%

Table 2: A key and breakdown of land use across High Peak showing hectares of each land use type in Figure 2.

ALU EMISSIONS ANALYSIS
LAND USE EMISSIONS

Land-use, land-use change & forestry (LULUCF)

Using the breakdown of different land use types shown on the previous page, alongside emissions factors for these land types, we can now build a picture of land use emissions across High Peak. Land use change can release carbon dioxide into the atmosphere and act as a carbon source, through processes such as the decomposition of organic matter and deforestation. Forests and woodlands act in the opposite way, absorbing carbon dioxide through the growth of trees and plants.

Land type	tCO_2e
Grassland	-7,400
Forestland	-24,200
Settlements	6,800
Cropland	8,100
Net Total	**-16,700**

Table 3: Estimated soil and biomass gains and losses for High Peak (2018).

Table 3 (above) shows that grass and forestland act as carbon "sinks", storing a combined total of around 31.6ktCO_2e in High Peak. These sinks are balanced against emissions arising from settlements and cropland changes, showing that overall land use, land use change and forestry are a net carbon sink of around 16.7ktCO_2e. It should be noted that the data used here from BEIS is from 2018 while the CROME data is from 2020. See Appendix 1 for definitions.

The impact of different greenhouse gases

Results in this chapter are shown as *(kilo)tonnes of carbon dioxide equivalent* (written as *(k)tCO_2e*). This unit of measurement allows us to express different greenhouse gas emissions in common terms in order to directly compare their impact.

Methane is a very potent greenhouse gas, which in the short term (~20 years) has 84 times the warming effect of carbon dioxide and, in the long term (~100 years) has 28 times the effect. Nitrous oxide has 265 times the warming impact of carbon dioxide.

While carbon dioxide emissions are the primary cause of climate change, cuts to the emissions of other greenhouse gases such as methane and nitrous oxides have a much more immediate climate impact, helping to limit short- and long-term temperature increases.

The importance of peatland

Peatland plays a crucial role as the largest natural capital carbon sink, as well as providing a range of co-benefits which are listed on the right. According to Carbon Store UK, up to 80% of peatland is degraded or damaged, meaning that one hectare of heavily degraded peatland can actually emit 25tCO_2e every year, rather than acting as a carbon sink. The IUCN estimates that 1 hectare of peatland can store at least 1000tCO_2e of carbon, emphasising the benefits of peatland as a carbon sink.

ALU EMISSIONS ANALYSIS
PEATLAND EMISSIONS

How peatland emissions are categorised

The IPCC (2006) guidance for inventories does accommodate for differences in land-use classifications. Within the UK, bogs, marshes and fens are included in the grassland category under the IPCC 2016 guidance. It is assumed that peatland and peat bog are used for grazing within the 2017 LULUCF data. The 'Wetland' category, only considers peat workings and inland waters. More information on the data set used, and the methodology behind the data can be seen here.

The recently released 2019 LULUCF data set does include emissions related to the rewetting of peatland, based on the 2013 IPCC Wetlands Supplement report. Data from the report can be seen in table 5, and further methodology notes can be seen here.

Table 4 shows an additional 10ktCO_2e of carbon sequestration through wetlands which has not been accounted for in the methodology used throughout the report. The data also shows 0.2ktCO_2e lost through peat extraction, negating the positive impacts of the wetlands. It should be noted that carbon lost due to damaged or heavily degraded wetland is not accounted for in this methodology.

Case Study

The Moors for the Future partnership is a collective of key stakeholder in the conservation and restoration of the natural environment across the Peak District and other regions. The MoorLIFE 2020 project aimed to protect over 9,500 hectares of active blanket bog over the past 7 years and have seen project milestones far exceeded.

Land Use Category (New)	2018 Data (New Methodology)
Wetlands (near-natural organic soil)	-10,037
Wetlands (rewetted organic soil)	0
Wetlands (peat extraction)	226
Total (tCO_2e)	-9,810

Table 4: Estimating emissions sequestration from wetlands in High Peak. Data taken from 2019 NAEI Inventories.

Co-benefits of peatland restoration

A valuation methodology, provided by the Integrated Catchment Solutions Programme (iCASP), contains a detailed breakdown of co-benefits for peatland restoration, which have been listed below.

Natural co-benefits

- Water quality ecological benefits
- Flooding risk mitigation benefits
- Reduced fire risk

Socio-economic co-benefits

- Low-cost emissions savings
- Drinking water quality benefits
- Recreational & cultural benefits

ALU EMISSIONS ANALYSIS
CARBON STOCKS

Carbon is stored in several "pools" – systems that can absorb carbon for long periods of time. The key carbon pools on land are soil and above-ground biomass (trees, crops and other plants). The balance of total carbon between these pools depends on the type of land – woodland stores more carbon in above-ground biomass (trees) than cropland or grassland, for example.

Quantifying carbon stocks

We can estimate the proportion of carbon stored within the natural environment across High Peak based on the land use analysis shown on pages 6 and 7. Understanding existing carbon stocks can be crucial information when informing priority areas for action. Maintaining soil and carbon vegetation health can ensure that carbon is stored in these stocks, rather than being released into the atmosphere.

Carbon sequestration in woodlands

UK woodlands act as a whole as a net carbon sink, storing an average of 5.5 tCO_2 per hectare per year for existing woodland. Of this, about 1.3 tonnes are stored in the soil, 2.9 tonnes in trees, and 1.3 tonnes in dead wood and leaf litter. We can apply this average to the total area of forestry High Peak to give a rough estimate for the sequestration within woodland; giving net storage of around 24,000tCO_2 per year. Additional data on the age and type of trees and natural features within High Peak is needed to better estimate the contribution of current forestry to net emissions, though these figures do indicate the scale of the sequestration potential of current tree stocks.

Table 5 describes the different quantities of carbon that are stored in various habitats and natural features, including soil to a depth of 15cm and 100cm. These are measured in units of *tonnes of carbon per hectare* (tC/ha). Habitats with more trees and vegetation lend themselves to having larger carbon stock potential, as can be seen in the woodland habitats. The final column describes the equivalent *carbon dioxide* held within the natural environment, which is also heavily weighted towards woodland.

Habitat	Carbon stored (tC/ha)				tCO_2/ha
	Soils (15cm)	Vegetation	Soils (100 cm)	Vegetation & Soils (100 cm)	Vegetation & Soils (100 cm)
Coniferous woodland	90	70	185	255	935
Broad leaf, mixed woodland	73	70	150	220	808
Neutral grassland	69	1	170	171	628
Improved grasslands	67	1	116	117	431
Arable & horticulture	47	1	95	96	351

Table 5: Average Carbon stocks by land-use type across the UK. Adapted from Natural England, 2012 and Open University 2018. Carbon in soils to 100cm is extrapolated from 15cm using ratios calculated from Natural England 2012.

ALU EMISSIONS ANALYSIS
SOIL CARBON

Carbon vs carbon dioxide

When captured in biomass or soils, carbon is stored as organic compounds. When this organic matter decomposes or is removed, carbon is released into the atmosphere as a gas – carbon dioxide. A specified quantity of solid carbon matter is interchangeable with a specific quantity of CO_2 gas.

Carbon stocks above ground

Using the values for vegetation in Table 1.4 and applying them to the broad land-types within the Crop Map of England gives an estimated 9,030 kilotonnes of carbon (33,109 ktCO_2) stored in vegetation and natural features above ground across High Peak. The majority of this stored carbon falls on improved grasslands (33%). Woodland is responsible for a further 6%, with the remaining contribution coming from grasslands.

Carbon stocks within soil

Figure 3 (opposite) visualises estimates for stored carbon within soils to a depth of 15cm, comparing 1978 and 2007 dataset. Areas with larger carbon stocks typically correspond with areas designated within the Countryside Surveys as improved grassland (as carbon stocks are estimated using this designation).

A total of 4,232 kilotonnes of carbon is estimated to be held within High Peak's soils to a depth of 15cm. This is equivalent to 15,516ktCO_2 stored within High Peak's soils. Extrapolating these data to a depth of 100cm suggests that stored carbon grows to 9,180 kilotonnes of carbon, equivalent to 33,660ktCO_2. As can be seen in figure 3, there has been significant change in carbon stocks has occurred across High Peak, with some areas in the North East decreasing in carbon stocks, while the south has increased its carbon stocks when comparing 1978 to 2007. Total emissions stored have increased by 310ktCO_2 when comparing 1978 to 2007 at a depth of 15cm.

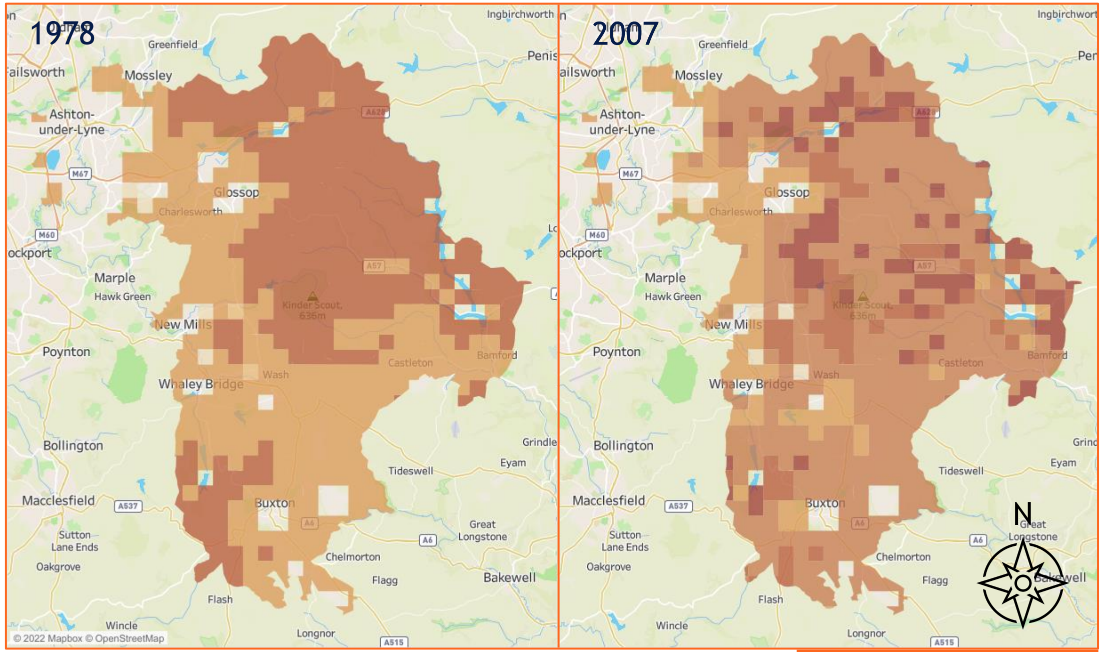


Figure 3: Estimated soil carbon stocks across High Peak to 15cm based on land-cover type (land-use) and soil characteristics. Comparing carbon stocks from 1978 to 2007. Source: Countryside Surveys 2007 and 1978.

Tonnes of soil carbon per hectare (tC/ha).

- 40 - 49
- 50 - 59
- 60 - 69
- 70 - 79
- 80 - 89

ALU EMISSIONS ANALYSIS
AGRICULTURE EMISSIONS

The main source of emissions across agriculture and land use in High Peak relate to agriculture. Some of these are the direct result of fossil fuel consumption, in things like agricultural machinery, whilst others come from livestock. Emissions from agriculture fall into three main groups:

1. Fossil fuel usage

Agricultural vehicles, machinery and buildings consume fuel which generate emissions. In High Peak, a total of 24.2ktCO_2 of emissions were estimated in the 2018 BEIS data. This includes; Burning oil, Coal, Fuel oil, Gas oil and Petrol.

2. Livestock

Livestock generates emissions from enteric fermentation (i.e. eructation and flatulence) as well as some nitrous oxide emissions from direct manure management. A total of 66.6ktCO_2e was emitted by the borough's livestock, totalling over 180,000 livestock, according to the most recently available data from DEFRA (2016). Naturally, it is worth noting that significant proportions of livestock reared in High Peak will be consumed outside of the borough.

Methane is a greenhouse gas that contributes to global warming alongside carbon dioxide, nitrous oxide and F-gases. Over a 20-year period, methane is 80 times more potent at heating the atmosphere than carbon dioxide. This is demonstrated in table 6, with Dairy Cattle having a significantly higher emissions per head factor due to their higher methane production.

It is worth noting that the emissions factors used in these calculations are generic and do not account for different farming practices and feed types that could influence the emissions intensity of livestock. The NFU explores this in their 'Doing Our Bit For Net Zero' work.

Livestock type	Number	Total tCO_2e	Emissions per head (tCO_2e)
Dairy cattle	4,140	19,172	4.63
Other cattle	13,928	27,004	1.94
Sheep	131,405	17,271	0.13
Pigs	7,533	3,061	0.41
Poultry	23,009	48	<0.01
Total	180,015	66,555	

Table 6: Livestock numbers for High Peak taken from DEFRA statistics. Emissions factors for livestock taken from NAEI Inventory.

ALU EMISSIONS ANALYSIS
AGRICULTURE EMISSIONS

Despite the significant numbers of poultry and sheep in High Peak, their carbon impact is much lower relative to other types of livestock, such as dairy cattle. A breakdown of the emissions from livestock is shown in Figure 5, detailing the contribution from each livestock type.

The dominant contributions towards the 27ktCO_2e figure come from cattle, which are responsible for 70% of all livestock emissions. The contribution from sheep is much smaller – just over a quarter of the total – with the remainder made up by a small contribution from pigs and poultry.

Despite much lower numbers of dairy cattle than other livestock, their per-head emissions intensity means that their contribution remains significant.

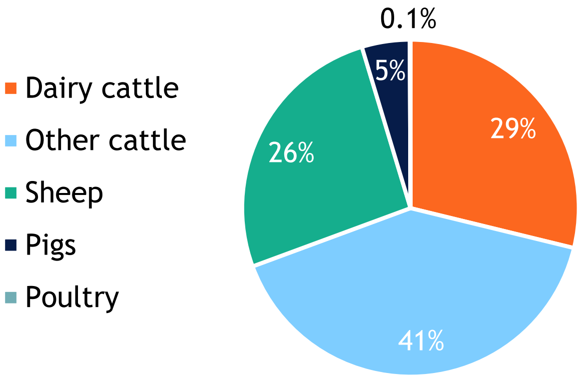


Figure 4: Estimated emissions generated from livestock across High Peak broken down by livestock type.

3. Fertiliser

This use of agricultural fertiliser on land releases nitrous oxide emissions. Across High Peak this is estimated at around 18ktCO_2e (2016). Fertiliser releases nitrous oxides into the atmosphere when microbes break down synthetic fertilisers (such as anhydrous ammonia) or organic fertilisers (such as animal manure).

Nitrous oxides remains in the atmosphere for a long time (>100 years) and are significantly more effective than carbon dioxide at trapping heat in the atmosphere. This means that even a small concentration of nitrous oxide emissions can impact the climate significantly.

In High Peak, nitrous oxides are released from fertiliser used in grassland (which has low fertiliser applications but a large total area) and wheat production (which has higher fertiliser applications and a large area). Emissions from fertiliser are heavily dependent on crop rotations and will vary each year that crops are rotated.

ALU EMISSIONS ANALYSIS
EMISSIONS REDUCTION SCENARIOS

The UK Committee on Climate Change (CCC) provides several scenarios for how changes in land-use and agriculture can contribute towards the UK's emissions reductions targets. These represent business-as-usual (low ambition), adoption of currently-available measures (medium), and more radical and novel measures (high) respectively. Here we have considered what the medium- and high-ambition measures might mean for High Peak. The CCC's report on land use provides further details on suggested policies for a net-zero UK.

Dietary change

This scenario includes a reduction in the national consumption of dairy, beef and lamb of 20% (medium) and 50% (high) by 2050 which will have impacts on livestock across the country. The reduced consumption of these products is offset mainly with increased consumption of plant-based/alternative proteins. This scenario is modelled as a reduction in cattle numbers: 20% reduction in the medium ambition case, 50% in the high ambition case. Pig and chicken numbers increase by 10% under both ambition levels, a transition which also contributes to the reduced consumption of the most carbon-intensive livestock. The National Diet and Nutrition survey shows declining trends in red and processed meat consumption over the past decade, most likely for environmental and health reasons and a higher vegetable diet has been proven to have a lower emissions impact. In order to reflect this change in livestock numbers, the overall coverage of grassland is modelled to fall around 5,900ha in the medium- and 14,700ha in the high-ambition scenario.

Transitioning from grassland to woodland

The second aspect of the CCC emissions reduction scenario considers changes to this grassland, specifically the transition from grasslands to woodlands over the period to 2100.

Grassland vacated under the dietary change scenario is assumed to be replaced by woodland to provide a simple scenario for the purposes of these calculations. In practice, carbon storage potential is variable on many factors, including the underlying soil type and that the accounting methodology includes wetlands within grassland, including grazing land. This means that this modelling expects the transition of peatland to woodland, which is something that is not recommended, but, is done for modelling purposes as a result of the data limitations explored in the peatland section. A mixture of native broadleaved and conifer woodlands is modelled in line with the CCC's forest management plan.

Grassland is assumed to be planted with trees at a constant rate to the year 2050, equivalent to 199 hectares per year (medium ambition case) and 498 hectares per year (high ambition case). This transition from grassland to woodland would more than double the existing area of woodland within High Peak under even the medium scenario.

Impact on GHG emissions

Table 8 (overleaf) shows the impact on emissions contributions as a result of successful implementation of the changes described under the dietary change and woodland transition modelling. The reduction in carbon-intensive livestock numbers indicates changes to livestock emissions – a 23% reduction by 2050 under the high ambition scenario. This is largely down to the current livestock profile already being biased towards high-carbon livestock produce. The associated reduction in grassland coverage provides only marginal savings.

ALU EMISSIONS ANALYSIS
EMISSIONS REDUCTION SCENARIOS

Of much greater significance are the savings made by the transition towards greater woodland coverage. Under the medium ambition scenario, the equivalent of 37% of current livestock & fertiliser emissions would be sequestered into new woodlands. This rises to 66% under the high ambition scenario, which when combined with the livestock changes yields overall reductions of around 88%.

Scenario	Net emissions reductions per year (tCO2e)		Proportion of current emissions*	
	Medium	High	Medium	High
Dietary change (grassland)	-517	-1,292	-0.6%	-1.5%
Dietary change (livestock)	-6,713	-17,026	-8%	-20%
Dietary change (subtotal)	-7,230	-18,319	-9%	-22%
Transitioning from grassland to woodland	-30,902	-55,390	-37%	-66%
Total	**-38,132**	**-73,708**	**-45%**	**-88%**

Table 7: Emissions reductions according to CCC scenarios for dietary change and afforestation. The first & second rows describe the average annual savings from the reductions in cattle and sheep and associated grassland use by 2050. The fourth row is the average annual net carbon sequestration over the period to 2100 in biomass and soil.

** "Current emissions" here relates to livestock and land fertiliser emissions only, as the impact on sequestration, land use changes and agricultural practices is not modelled.*

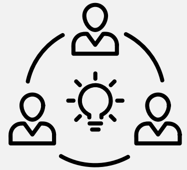
The Impact of Co-Benefits

Reducing carbon emissions to avoid the worst impacts of climate change is complementary to many other objectives, with a number of co-benefits associated with reducing emissions in the natural environment specifically. High Peak has high potential to drive change with a transition to low-carbon farming & land use practices.

When deciding where and how to make emissions reductions there are a number of other considerations which bring positive impact. Deciding where and how to make emissions reductions is a challenging process. Action which cuts emissions from the agricultural sector and the natural environment can deliver significant co-benefits locally within the borough.

Natural co-benefits

- Flood management
- Improved animal welfare
- Protection for the natural environment against irreversible decline
- Enhanced biodiversity



Socio-economic co-benefits

- Future land stewardship offers by government
- Better collaboration as a community across the borough
- Insulation against rising costs of climate adaptation

03 CARBON OFFSETTING

OFFSETTING
NET-ZERO CONTEXT

Considering Offsets to reach Net-Zero

Carbon offsetting refers to the purchase of a tradeable unit, representing emissions rights or emissions reductions, to balance the climate impact of an organisation, activity or individual by reducing greenhouse gas emissions.

Carbon offsetting offers a means through which the council can address any "Gap to Target" (i.e. residual emissions) given the difficult nature of reaching net-zero carbon by 2030 due to the scale of change, technology deployment and investment required. The tradeable offsetting units which are purchased, however, are often likely to relate to projects outside of the council boundary (usually in developing countries). Carbon offsetting should only be considered to tackle hard to remove emissions and, where possible, carbon reduction measures should be prioritised. This is shown in the HPBC's draft action plan in the'Carbon Management hierarchy'.

Carbon Offsetting and Local Authorities

UK Certifiable schemes are available to councils seeking to offset their emissions, such as the Peatland Code, and Woodland Carbon Code. Offsetting schemes should align with neutrality standards such as PAS 2060. In addition, emerging Science Based Targets Institute guidance may be set to stipulate that only offsets acquired through neutralisation, rather than compensation, are eligible in achieving net zero.

Key Offsetting Challenges for UK Local Authorities

We have observed some common challenges and concerns that the public sector face when using 'traditional offsets'. These include:

- **Increasing public scrutiny:** The public is becoming better educated on climate change matters, partly due to the 'mainstreaming' of the climate emergency via school strikes and increased media coverage. This means that issues around quality (including additionality, permanence, and verification) of offsets still exist and are receiving greater scrutiny by the general public than ever before. Councils' offsetting activity is, therefore, likely to attract significant public attention.
- **Difficulty in retaining co-benefits locally:** Local authorities need to demonstrate a social return on money invested, such as an increase in jobs and improved health, within the borough that they serve. This is difficult to achieve using existing certified offsetting schemes, as they commonly relate to projects outside of the local authority and/or outside of the UK.
- **Limited options available in the UK:** Limitations in scope of Carbon Neutrality Standards - Existing carbon neutrality standards such as PAS 2060 require 'certified' offsets to be used. However, the range of UK options is currently limited (i.e., the Peatland Code and Woodland Carbon Code). Also, with an increase in demand for UK projects, these schemes are becoming more expensive.

As a result, many local authorities are now seeking to focus their investments inwardly through "carbon insetting".

OFFSETTING
AUTHORITY BASED INSETTING

Authority Based Insetting

An Authority Based Insetting mechanism is currently being piloted by Anthesis, with 12 UK local authorities (shown in the graphic on the right), to better equip them to identify and engage in insetting partnerships.

Authority Based Insetting (ABI) builds on selected elements of ‘traditional’ offsetting and insetting. It shifts the focus of the carbon saving project into the geographic boundary to a local authority. The authority boundary could be set at an individual borough or unitary borough, along with counties and combined authority boroughs.

- **Meeting net zero**
  - ABI can support councils in meeting net zero targets by reducing local emissions.
- **Drive action locally**
  - ABI ensures there are local benefits by driving projects within the authority boundary.
- **Financial incentives**
  - ABI provides a new financial incentive and model to finance projects that may have been challenging to finance.
- **Increase collaboration**
  - ABI provides routes to collaboration with stakeholders across the authority.

Blackburn with Darwen Council
Cheshire East Council
Leicester City Council
Oxford City Council
London Borough of Richmond upon Thames
Trafford Council
Wandsworth
Brighton & Hove City Council
Horsham District Council
Leicestershire County Council
Shropshire Council
Solihull Metropolitan Borough Council
West Sussex County Council

OFFSETTING
CASE STUDIES

WESTMINSTER CARBON OFFSET FUND

Westminster's Carbon Offset Fund awards funding to groups and organisations within Westminster that deliver projects with clear, quantifiable carbon savings that would otherwise not be possible. Westminster Council provide a list of Priority Projects including low carbon energy and sustainable travel.

CHESHIRE EAST COUNCIL

As part of their plan to be a carbon neutral council by 2025, Cheshire East Council have ambitious plans to plant trees around the borough, which will help to offset some of the local emissions they are not able to reduce. They will also be restoring peatlands and have undertaken a study to help guide future offsetting plans.

CUMBRIA COUNTY COUNCIL

As part of its Carbon Management Strategy 2020-2025, Cumbria County Council is installing 1.5 MW of solar PV and a 2.5 MW wind turbine to offset emissions from its corporate estate. 623tCO_2e could be offset by the offsite renewable energy installations.

ABI PILOT PROJECTS

Each local authority that was a part of the pilot phase presented a project to enable the testing and enhancement of the ABI guidance. These projects are intended to act as potential alternatives to traditional offsetting. An extracted list of these projects can be seen below and the full report can be accessed here.

Blackburn with Darwen are looking to re-wet Darwen Moor and re-establish blanket bog and heath vegetation across 2 different areas, totalling 45 hectares and estimated carbon reductions of around 6.6ktCO_2e over the first 10 years.

Brighton & Hove City Council are looking to plant a total of 8,000 trees over a 3-year period, with aims to grow a naturally regenerative woodland on their 1 acre site.

Horsham borough Council are looking to retrofit a listed building that was once used as HDCs office. The potential savings were estimated using different levels of retrofit.

04 RECOMMENDATIONS & NEXT STEPS

RECOMMENDATIONS & NEXT STEPS

Conclusions

This analysis has provided an estimate for the scale and nature of emissions from agricultural activities and the natural landscape within High Peak. The analysis in this report shows that:

- Emissions from agricultural activity are significant, totalling 109ktCO_2e.
- Livestock contribute the most significant agricultural emissions source and while sheep dominate headcount, cattle account for the largest emissions source.
- Just under half of the borough is covered by permanent grassland, whilst arable crops make up around 20% of land in High Peak. This includes grazing land, covering wetlands and peatland.
- Peatland play a significant role in ALU balancing emissions, acting as a carbon sink.
- The emissions reductions scenarios conclude that, under a high ambition scenario, the national transition of diets away from livestock (18ktCO_2e) as well as the local transition from grassland to woodland (55ktCO_2e) could reduce up to 88% of emissions form ALU sources.

Next steps

Following this research, High Peak Borough Council is encouraged to consider the following next steps:

- **Maintain continued engagement with farmers and landowners on this agenda.** Local stakeholders will be crucial to any positive changes in reducing emissions from land use and agricultural practices. Engaging with the diverse group of actors who support the agri-food sector in High Peak is therefore essential if HPBC intends to deliver sustainable improvements to the borough. Early engagement between the Council, landowners and other key stakeholders such as the NFU enables collaborative development of new modes of working and provides a base of support for a key industry. This may take the form of education on sustainable land use and agricultural practices, providing guidance on financial incentives and support and/or amplifying local best practice and case studies.
- **Prioritise woodland coverage.** High Peak's livestock population is heavily weighted towards livestock that carry a low emissions intensity relative to cattle. This means that changes to the livestock population are not likely to yield as significant emissions savings compared with woodland. Instead, focus on harnessing land use types with high sequestration potential, such as woodland, which yields much more significant emissions savings. There is also a large potential for afforestation within High Peak. Considerations will need to be made for implications on the Peak District National Park and restrictions that may occur from naturally occurring wetlands.

RECOMMENDATIONS & NEXT STEPS

- **Conduct more specific analysis of potential sites for afforestation.** This will allow for a more accurate estimate for the carbon sequestration potential of the borough.

- **Collect more accurate data on local farming practices and landowner carbon emissions.** Agricultural carbon footprinting software such as the Cool Farm Tool provides further guidance on this.

- **Build understanding of the importance of soils in mitigating carbon emissions (see suggestions from the Soil Association in this area).** Support key stakeholders such as landowners and farmers in accessing this information through industry bodies. Lead by example and work with the National Park to communicate the importance of soil health on land owned by the council and the park.

- **Define and communicate suitable finance options for farmers and landowners.** High-level guidance on financially attractive project design is available from the UN's Food & Agriculture Organisation whilst the World Bank Group have published papers on mobilizing private finance for nature. The UK government also plans to launch the pilot of its Sustainable Farming Incentive, one of three projects along with the Local Nature Recovery and Landscape Recovery schemes which will pay for sustainable farming practices and improve environmental outcomes.

Carbon offsetting conclusions

This analysis introduced carbon offsetting and its role in achieving net zero:

- Carbon offsetting is often considered to address residual emissions or the councils ‘gap to target’ when analysing reduction scenarios.

- Offsetting for local authorities falls under strong public scrutiny, due to its inability to retain benefits locally.

- Authority Based Insetting can offer an alternative solution to typical offsetting practices.

Carbon offsetting next steps

Following this research, High Peak are encouraged to consider the following next steps:

- **Establish the council’s stance on Carbon offsetting within their net-zero ambition.** Setting a clear and outlined perspective on the role of offsetting is important to allow for any issues to be clearly explained and thought through.

- **Explore opportunities for insetting.** Explore the potential for insetting projects within the borough’s boundaries, as it continues its development, to act as a replacement for offsetting plans.

More detailed actions will be recommended to the council in the High Peak Climate Action Plan.

05

APPENDICES

APPENDIX 1: GLOSSARY OF KEY TERMS

- **ABI -** Authority Based Insetting.
- **ALU -** Agriculture and land use.
- **BEIS -** Department for Business, Energy & Industrial Strategy. Climate strategy has fallen under the remit of BEIS since the dissolution of the Department for Energy & Climate Change (DECC) in 2016.
- **Biomass -** the total weight of all organic material in a given system.
- **Carbon dioxide equivalent -** An emissions unit which expresses the global warming potential of different gases in common units. Methane and nitrous oxide emissions are measured as "carbon dioxide equivalent in order to allow a direct comparison between different activities.
- **Carbon budget -** A fixed limit of cumulative emissions that are allowed over a given time in order to keep global temperatures within a certain threshold.
- **Carbon sink -** A natural feature that accumulates and stores carbon for an indefinite period, lowering the concentration of atmospheric greenhouse gases e.g. a woodland.
- **Carbon source -** Any activity or natural feature which emits carbon (or carbon equivalent) emissions.
- **CCC -** Committee on Climate Change.
- **Co-benefit -** Any secondary positive effect that is garnered from an action with a different primary intention e.g. reducing transport emissions by removing cars from a town centre will garner a co-benefit of improved air quality.
- **DEFRA -** Department for Environment, Food & Rural Affairs.
- **Gross emissions -** Gross emissions refer to all emissions from activities that generate emissions, excluding any sequestration or 'negative' emissions.
- **IPCC -** Intergovernmental Panel on Climate Change.
- **$ktCO_2(e)$** – One kiloton of carbon dioxide (equivalent). A unit of emissions generated.
- **LULUCF -** Land use, land use change & forestry.
- **Net emissions -** Net emissions refers to gross emissions minus any sequestration within carbon sinks such as forestry and agricultural soils.
- **HPBC -** High Peak borough Council.
- **Scope -** Different classifications of emissions based on the nature of their activity. Scope 1 refers to direct emissions from within the NK boundary; Scope 2 refers to emissions associated with grid electricity; Scope 3 refers to other emissions that occur out of boundary as a result of in-boundary activity.
- **Sequestration -** Removal of greenhouse gases from the atmosphere, usually by organic means.
- **WWF -** The World Wildlife Fund for Nature.

APPENDIX 2: DATA REFERENCES

Definitions of different emissions for this section

- **Gross emissions:** In this context, gross emissions refers to emissions from agricultural fossil fuel usage, emissions from fertiliser and emissions from livestock. It does **not** include emissions from LULUCF sources as these sequester carbon in High Peak.
- **Net emissions:** This term refers to the gross emissions minus any negative emissions from LULUCF sources.

Note on reporting years

- Statistics for livestock numbers at the local authority level were last published by DEFRA in 2016.
- BEIS sources for data are published two years in arrears, though these have been year-matched to the livestock data in order to provide a single baseline figure across emissions sectors.

Note on CCC emissions reduction scenarios

- Medium scenario is defined as a 20% reduction in red meat and dairy consumption, replaced by pork, chicken & human-edible crops (50% under high scenario). The production of beef, lamb and milk was reduced by 20% (by 2050) from BAU. All grassland areas were reduced in proportion with the reduction in total cattle & sheep numbers - i.e. 20% by 2050.
- This assumes no specific changes to practices i.e. the same proportion of livestock is reared in uplands/lowlands as under BAU.
- Total arable area is changed by the net difference in reduction due to less ruminant cereal-based feed required and the increase due to more pig & poultry cereal feed and human-edible crops.
- Cropping area requirements for animal feed and relative replacement values of red meat with white meat were taken from Audsley et al.

Data	Source	Year published
Fossil fuel, LULUCF emissions	BEIS	2018
Wetland emissions	NAEI Inventory	2019
Livestock numbers	DEFRA	2016
Emissions factors	Livestock: NAEI Inventory	2017
	Fertiliser: British Survey of Fertiliser Practice	2017
Land use map	Crop Map of England	2020
Carbon stocks by habitat	Natural England, Open University	2012 (Natural England) 2018 (Open University)
Soil carbon map	Countryside Surveys	2007
Emissions reduction scenarios	CCC	2015

Table 8: A list of data references used throughout the report and within the carbon analysis

APPENDIX 3: BREAKDOWN BY WARD

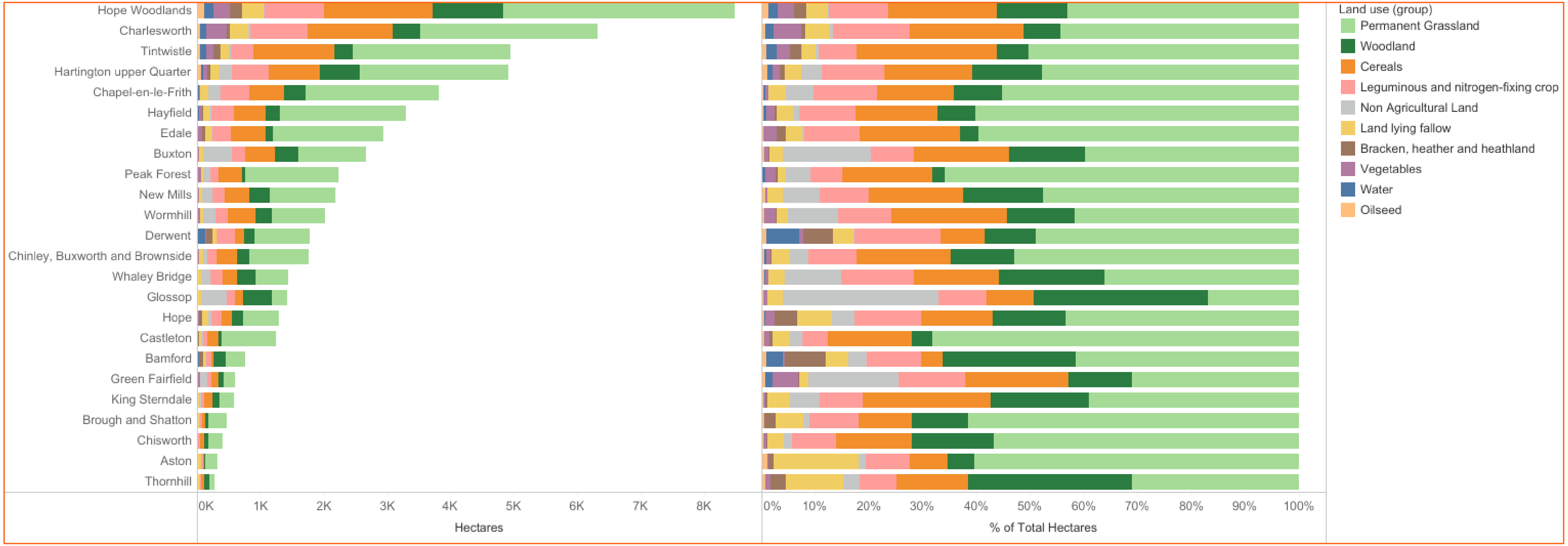


Figure 5: A breakdown of land use types across High Peak wards in total hectares (left) and as a percentage of overall land (right).

Disclaimer