Climate Change Evidence Documents

Document F – Offsetting and Sequestering Emissions

Huntingdonshire District Council

Draft report
Prepared by LUC
November 2024

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Climate Change Evidence Documents

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Glossary

- Net Zero – Net Zero refers to the point at which the amount of greenhouse gases being put into the atmosphere by human activity equals the amount of greenhouse gases being taken out of the atmosphere **[See reference** 1**]**.
- Carbon offsetting – Broadly refers to a reduction in GHG emissions or an increase in carbon storage that is used to compensate for emissions that occur elsewhere **[See reference** 2**]**.
- Nature based solutions – Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience **[See reference** 3**]** **[See reference** 4**]**.
- Biodiversity Net Gain – An approach to development, and/or land management, which aims to leave the natural environment in a measurably better state than it was beforehand **[See reference** 5**]**.
- Carbon sequestration – The practice of removing carbon dioxide (CO_2) from the atmosphere and storing it **[See reference** 6**]**.
- Natural capital – UK natural capital is comprised of all the ecosystem services that UK natural assets provide; natural assets include soil, air, water and all living things **[See reference** 7**]**.

Acronyms

- ABI – Authority Based Insetting
- BECCS – Bioenergy with Carbon Capture and Storage
- CCC – Climate Change Committee
- CCS – Carbon Capture and Storage
- CO_2e – Carbon Dioxide Equivalent
- CSR – Corporate Social Responsibility
- DACCS – Direct Air Capture and Carbon Storage
- DEFRA – Department for Environment Food and Rural Affairs
- GHG – Greenhouse Gas
- GLA – Greater London Authority
- GWP – Global Warming Potential
- LPA – Local Planning Authority
- S106 – Section 106
- UK GBC – UK Green Building Council
- TPT – Transition Plan Taskforce
- VCM – Voluntary Carbon Market

Executive Summary

Achieving 'net zero' greenhouse gas (GHG) emissions by 2050 is a statutory requirement for the UK and its local authorities. To aid in achieving this goal, carbon can be "locked up" via a variety of methods including by biological processes in a variety of land use types and habitats such as woodlands and peatlands, as presented with relevance to the Huntingdonshire context in Chapter 5 and Chapter 6 of this document, as well as from industry via methods of carbon capture and storage (CCS). Carbon offsetting can also be used to help compensate for Huntingdonshire's residual carbon emissions. These schemes include contributing, usually financially, towards measures to reduce emissions elsewhere.

Therefore, understanding and enhancing carbon storage and sequestration and storage as well as supporting carbon offsetting is crucial in reducing carbon emissions to achieve net zero. Though storing and sequestering carbon should be prioritised over carbon offsetting, which should be understood as a last resort after all direct mitigation options have been exhausted.

This report provides an assessment of the role of the Local Plan and policy recommendations to support Huntingdonshire in delivering sequestration of carbon emissions and their offsetting where necessary and appropriate.

First, a narrative of the fundamentals of offsetting within Local Plans is presented, as well as the key discussion points around the use of offsets and how this sit within the wider policy context. This provides an overview of the role and purpose of offsetting and its potential scope in planning policy. The document also outlines the importance of carbon sequestration in achieving net zero, along with the role of natural capital in supporting this.

Guidance on the range of offsetting options available is presented in this document, as well as on how an offsetting scheme could operate, including funding strategy approaches, drawing upon best practice and guidance from the industry.

Regarding the pricing of an offsetting scheme, it is recommended that HDC follow nationally recognised documents and guidance including the Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal publication **[See reference** 8**]** and the UK Green Building Council's (UK GBC) guidance on Renewable Energy Procurement & Carbon Offsetting **[See reference** 9**]**. However, HDC should also consider raising the price of their scheme above what is recommended in the above publications, as this would aid in ensuring net zero by 2050. Though, as with new policy the impacts of the proposed carbon price on development viability would need to be considered as part of the local plan viability assessment.

An overarching issue for HDC in relation to carbon offsetting is HDC's lack of internal technical expertise/resource to set up and run a carbon offsetting fund, including setting a carbon price, securing payments, selecting/designing suitable projects for funding, delivering projects and monitoring/reporting.

To establish and implement a carbon offsetting scheme, the key steps for HDC would include:

- Agreeing how to secure and fund the necessary expertise to establish and run a carbon offset fund (see key issue identified above);
- Developing a clear planning policy (and supplementary guidance as necessary) setting out when offsetting will be accepted (e.g. as a last resort after on-site measures have been maximised), how (and when) payment will be secured (i.e. via s106) and what types of projects it will be spent on;
- Setting up a carbon offset fund with appropriate governance and ring-fenced funding for carbon reduction projects;
- Setting a price for carbon (simplest approach would be to use nationally recognised approach as per GLA and Bristol);
- Identifying the types of projects to be funded and setting out clear eligibility and marking criteria to assess potential projects; and

- Establishing monitoring and reporting procedures (e.g. annual reporting on spend and delivery) to ensure that funds are being spent effectively and efficiently and that delivery of the projects is achieved.

This document also provides an assessment and recommendations on the categorisation and monitoring of any funded offsetting projects. This is informed by research on what current and future carbon storage and sequestration action/projects are being conducted in Huntingdonshire, as well as current methods of offsetting project categorisation. It is recommended that HDC generally follow the categorisation approach taken by GLA, which categorises projects under the headings of:

- Energy efficiency;
- Renewables;
- Behaviour change;
- Private sector housing grants;
- District heating;
- Business energy grants;
- Transport; and
- Greening/other.

Common offsetting projects within these categories include energy efficiency and afforestation, as these mitigation methods are well known, and solutions are readily available to implement immediately. Activities such as behaviour change and education, although beneficial, do not have immediate impact and the benefits are intangible, therefore HDC would be advised to treat such projects with caution.

To aid in deciding what types of projects should be funded, it is recommended that HDC follow the following framework:

- Main priority:

  - Reduce energy demand in existing buildings, including through energy efficiency measures and improving monitoring and operation.
- Secondary priorities:
  - Generate renewable electricity, e.g. solar PV;
  - Generate renewable or very low carbon and low emission heat e.g. solar thermal, heat pumps or fuel cells;
  - Replacing higher carbon systems that contribute to poor air quality such as gas-engine CHP Support low carbon heat networks; and
  - Undertaking whole building retrofit, e.g. improving energy and water efficiency, installing renewables and smart metering.

Furthermore, HDC should prioritise spending on ‘hard’ measures, i.e. those that deliver a tangible physical asset with transparent and predictable carbon savings. There is greater risk associated with the performance of softer measures and HDC would need to bear this in mind when selecting projects to fund, considering the latest research on specific measures where relevant.

Whilst the focus should be on projects that will deliver carbon reductions, HDC may also want to give some consideration to co-benefits of projects (e.g. reduced fuel poverty; supporting resilient businesses) when prioritising projects), taking into account strategic priorities identified in local plans and strategies. Any such consideration of co-benefits would need to be undertaken in a fully transparent way.

This document also provides an overview of the carbon balance (sequestration and storage) of the variety of habitats in the HDC administrative area along with an indication of what would need to be done to increase this.

The 91,245 hectares of land in Huntingdonshire currently sequesters approximately 19,176 tCO_2e/yr, resulting in a carbon sequestration rate of about 0.2 tCO_2e/ha/yr. This is the baseline level of sequestration and cannot be utilised to mitigate HDC’s residual emissions.

The broadleaved, mixed and yew woodland habitat type sequesters the most amount of carbon in Huntingdonshire at 25,714.5 tCO_2/yr, making up 71% of carbon sequestration of all positive carbon sequestering habitat types in Huntingdonshire. This habitat type also stores a large amount of carbon. The habitat type of acid and calcareous and neutral grassland also sequesters and stores some of the largest amounts of carbon out of the habitat types in Huntingdonshire. Therefore, for the transition to net zero, such habitats must be protected and enhanced. In addition, habitat types which sequester and store low amounts of carbon, such as those classified as bare ground and built-up areas and gardens should be prioritised for nature-based solutions to increase sequestration and storage such as conversion to habitat types which sequester high amounts of carbon, such as through afforestation. Newly established habitats, including woodland, require between 20-30 years to reach full establishment and achieve peak carbon sequestration. This would suggest that a majority of habitat conversion will need to take place in the coming 5-10 years.

The arable and horticultural habitat type covers the largest area out of the eleven habitat types covering 61.4% (56,018 ha) of Huntingdonshire. This habitat type stores the largest amount of carbon (3,585,178 tC) however it also sequesters by far the least amount of carbon at a rate of -16,806 tCO_2/yr, making the habitat an overall emitter of CO_2, the only habitat type in Huntingdonshire to do so. This highlights how important it is for Huntingdonshire’s transition to net zero for HDC to support climate-led and sustainable land management.

However, habitat conversions such as those outlined above should be taken with great consideration of the environmental and social context of each site. Therefore, when the Cambridgeshire and Peterborough Local Nature Recovery Strategy is completed, it is advised that this is used to inform future land use change.

Both woodlands and near natural and pristine peatland provide the greatest potential for ongoing carbon sequestration in Huntingdonshire. In addition, the most significant potential sources of carbon emissions from habitat/land use types include agricultural land and intensively managed grassland, heathland –

if impacted by management, grazing or burning (soil carbon loss) and peat soils.

To prioritise carbon sequestration activities in line with achieving wider policy aims, the following carbon mitigation and sequestration hierarchy is identified:

- Protecting carbon stores (high quality natural and semi-natural habitats including peatland, saltmarsh, and woodland);
- Identifying areas of carbon stores where management can be improved to reduce potential emissions;
- Reducing carbon emissions associated with management inputs through altering management practices, reflecting the biodiversity/social/economic value of the existing land use; and
- Changing habitat to higher sequestration value habitat on council owned land, reflecting the biodiversity/social/economic value of the existing land use.

Finally, the document provides a high-level indication of peatland extent and condition in Huntingdonshire, along with current habitat type that exists on organic soils such as peat. It also summarises any potential targeted measures that could be taken to reduce carbon emissions associated with degraded peatland.

18% (16,786 ha) of Huntingdonshire is covered by peatland (areas with deep peaty soils and soils with peaty pockets), this is concentrated in the north-east of the District. The vast majority of Huntingdonshire's peatland (75%) is situated on arable and horticultural land, much of which is intensively farmed for crop production. In arable areas, ploughing, tillage and fertiliser all exacerbate peatland degradation. Huntingdonshire's peatlands are also vulnerable to the impacts of climate change, which can also exacerbate degradation from agriculture.

It is therefore fair to assume that the majority of Huntingdonshire's peatland is in poor condition, due to degradation from agricultural practices. Degraded peat emits CO_2 rather than sequestering it. If we assume that all of the peatland on arable and horticultural land is degraded, this land would be emitting 411,048 tCO_2/yr. Peatland on arable and horticultural land is estimated to be the largest CO_2 emitter.

The majority of peatland on most of Huntingdonshire's habitat types are considered to be of poor or medium-level condition in relation to the extent of human influence and therefore degradation. However, any peatland subject to conservation projects may be on a trajectory towards good condition. The Great Fen project area intersects with a large proportion of Huntingdonshire's peatland.

The best option for improving the condition of Huntingdonshire's peat and therefore optimising carbon sequestration, is to increase the restoration and conservation of areas of peat, especially on habitat types with high CO_2 emissions such as arable and horticultural land. This could be done by increasing the area of and funding to the Great Fen project or similar restoration projects. However, farming is a large industry in Huntingdonshire so the Council should also support the transition to more sustainable forms of farming on peatland, such as paludiculture.

Introduction

This document provides context and policy recommendations to support Huntingdonshire in delivering local sequestration of carbon emissions and their offsetting where necessary and appropriate, with Chapter 5 and 6 presenting the carbon sequestration mapping and peatland assessment for Huntingdonshire.

In Chapter 1, the fundamentals of offsetting within Local Plans are discussed, how this sits within the wider policy context. It also provides an overview of the role and purpose of offsetting and its potential scope in planning policy.

In Chapter 2, guidance on the range of offsetting options available and previously implemented by other Local Planning Authorities, as well as advice on existing mechanisms that could be utilised is provided. It also presents guidance on how an offsetting scheme could operate, drawing upon best practice and guidance from the industry.

In Chapter 3, an assessment and recommendations on the categorisation and monitoring of any funded carbon offsetting projects in Huntingdonshire is presented.

In Chater 4, the importance of carbon sequestration in achieving net zero, along with the role of natural capital in supporting this is outlined.

In Chapter 5, an overview of the carbon balance (sequestration and storage) of the variety of habitats in the HDC administrative area is provided along with an indication of what would need to be done to increase this.

Chapter 1

Role of Carbon Offsetting and its use in Planning

1.1 This chapter gives a narrative presentation of the fundamentals of offsetting within Local Plans, the key discussion points around the use of offsets and how this sits within the wider policy context. It also provides an overview of the role and purpose of offsetting and its potential scope in planning policy.

Introduction to carbon offsetting

1.2 Carbon offsetting is the process of compensating for residual carbon emissions from a building by contributing, usually financially, towards measures to reduce emissions elsewhere.

1.3 Some LPAs operate carbon offsetting where a carbon target cannot be achieved on site. This involves developers making a payment into a carbon offset fund to pay for carbon reduction projects elsewhere in the LPA area (e.g. funding carbon emissions reductions from existing buildings by installing insulation, upgrading heating systems or solar PV panels).

1.4 Carbon offsetting is beneficial as it is easy to understand for developers and easily traded with other sectors. However, it does not account for grid decarbonisation. There is an alternative approach – ‘energy offsetting’ – offsetting energy use rather than carbon, using energy-use metrics. However, we’re not aware of any such adopted schemes in the UK.

1.5 Energy offsetting is a strategy to balance a building's energy use by sourcing an equivalent amount of renewable energy, helping to achieve net-zero operational emissions. This involves ensuring that any energy consumed by a development is offset by renewable energy production, either through on-site generation or contractual agreements for off-site renewable projects **[See reference** 10**]**.

1.6 Key principles for effective energy offsetting, as outlined by the UK Green Building Council (UKGBC), include ensuring additionality—that is, guaranteeing that the renewable energy used to offset consumption originates from new, additional projects that would not have been built without the investment in offsetting.

1.7 Furthermore, as the electrical grid continues to decarbonise, the need for additional energy offsetting is expected to decrease, as grid electricity itself will become nearly carbon-neutral, reducing the necessity for developments to invest in off-site renewable generation.

Different types of offsets available on the carbon market

1.8 There are two main types of offsets available on the UK carbon market, emissions reductions and carbon removals.

1.9 Emissions reductions are the most prolific type of offset available. They include avoided emissions, for example the deployment of renewable energy to replace planned fossil fuel power plants.

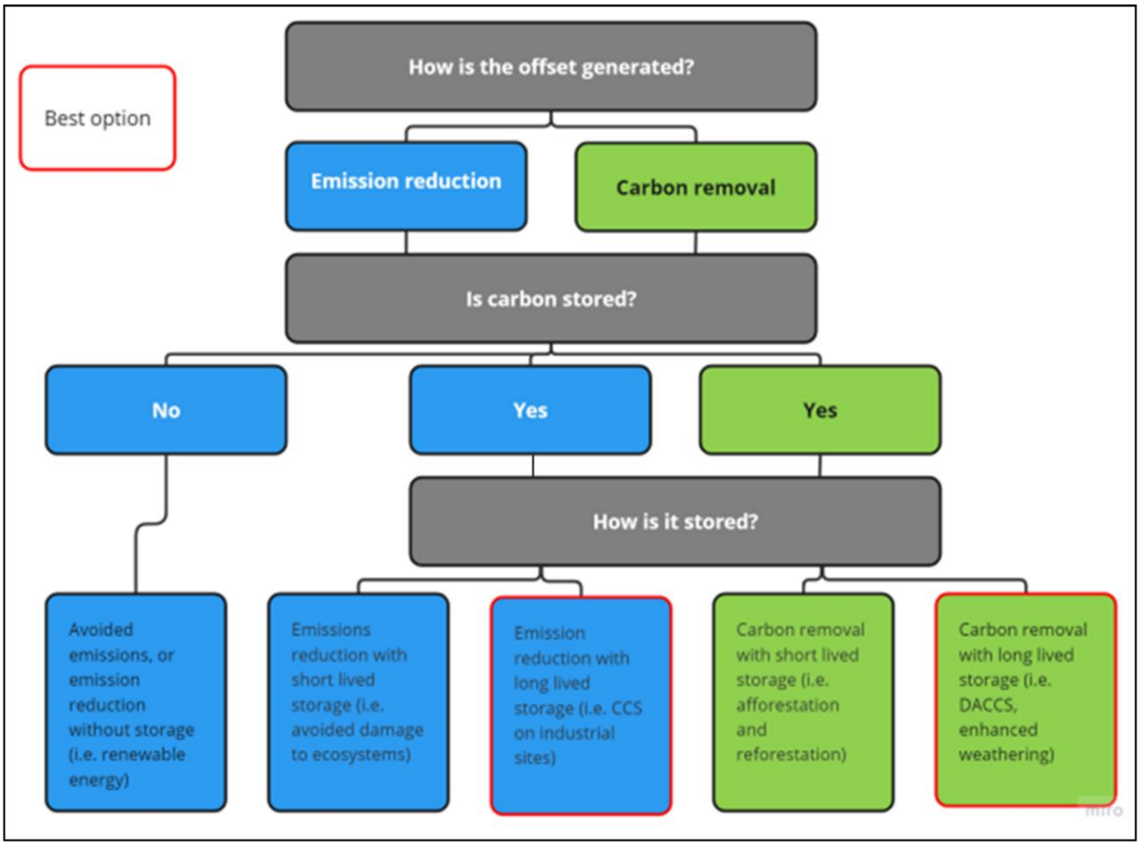
1.10 Emissions reductions can also involve physically storing the carbon whose emission was averted, for example, installing Carbon Capture and Storage (CCS) on industrial point sources or gas power stations; or restoring ecosystems (e.g. degraded peatlands) so that carbon emissions are reduced, and carbon stores are protected. It is important that the storage employed is sufficiently permanent whether in biological carbon reservoirs through restoration of natural and semi-natural ecosystems, or in geological reservoirs as with CCS **[See reference** 11**]**.

1.11 Emissions reductions are necessary but not sufficient to maintain net zero in the long run. Carbon removals are an alternative key type of carbon offset, which directly remove carbon from the atmosphere. Such offsets are thus critical in achieving net zero, and potentially even reducing emissions after net zero is achieved.

1.12 Examples of carbon removals include biological carbon sequestration (planting trees, soil carbon enhancement, etc.), bioenergy with carbon capture and storage (BECCS), direct air capture and carbon storage (DACCS), or converting atmospheric carbon back into rock through remineralisation **[See reference** 12**]**.

1.13 Figure 1.1 is a simplified classification scheme which shows five types of carbon offset based on whether carbon is stored, and the nature of that storage.

Figure 1.1: Carbon offset tree [See reference **13**]



How offsetting sits within national and local policy

National policy on carbon offsetting

1.14 Currently, the purchase and use of carbon credits from the voluntary carbon market (VCM) is permitted yet unregulated in the UK.

1.15 In 2023, the British Standards Institute (BSI) in partnership with the Department for Environment Food and Rural Affairs (Defra) published the high integrity standards framework for UK nature markets **[See reference** 14**]**. The framework presents overarching high integrity principles for all nature markets and specific standards for carbon.

1.16 The Government committed to consult by late 2023 on supporting the growth of high-integrity carbon and nature markets, including the role of regulation **[See reference** 15**]**.The Government consultation will consider the role of policy and regulation regarding the role of carbon credits in net zero claims **[See reference** 16**]**. This may produce relevant policy that relates to the use of carbon offsetting in land use activities. The consultation is yet to be announced. In September 2024, UK Climate Minister Kerry McCarthy stated that the government will "consult on steps we could take to raise integrity in these markets, so they realise more of their potential." However, the government has not confirmed the specific scope of the consultation or provided a timeline, only indicating that discussions would begin "soon" **[See reference** 17**]**.

1.17 In October 2023, the UK Transition Plan Taskforce (TPT) published its finalised Disclosure Framework **[See reference** 18**]**. This is intended to help companies develop, disclose, and deliver climate transition plans. The report includes disclosure recommendations for carbon credits purchased, such as the type (nature-based or technological, and reduction or removal), use (reliance towards achieving transition plan), third-party verifier/certifier and the methodologies used.

1.18 In July 2024, the CCC recommended that Government publish guidance for businesses on what activities it is appropriate to ‘offset’ and when. It underscores that businesses should only claim "Net Zero" status after substantially reducing their own emissions, using carbon credits only to offset any remaining emissions with high-quality, permanent removals **[See reference 19]**.

Local policy on carbon offsetting

1.19 Huntingdonshire District Council’s 2023 Climate Strategy **[See reference 20]** sets out six strategic objectives:

- “Achieving net zero for the council’s own operations by 2040;
- Designing Council policies that enable reduction of emissions and provide positive examples for businesses and residents;
- Demonstrating that we consider environmental impact in all policymaking and our stewardship of council assets and resources;
- Influencing our updated Local Plan to reflect the priorities outlined in our Climate Strategy;
- Maximising the opportunities to work with others collaboratively to address environmental issues; and
- Works to adapt our service delivery to a changing climate and build resilience in our community.”

1.20 Offsetting and sequestering emissions has a role to play in achieving a number of these objectives, particularly those which include emissions reduction and net zero goals. Regarding sequestering emissions, the Climate Strategy includes priority actions which will aid in increasing carbon sequestration in Huntingdonshire, particularly those under the Nature theme which encourage tree planting and increased biodiversity.

1.21 However, HDC's climate strategy sets out sequestration (undertaking activities to store emissions) and offsetting residual emissions as the least favoured options in the hierarchy of action.

> "Recognising the importance of carbon sequestration and the high value places on our natural and biodiverse environment, the Council will increase the natural capture of carbon through changed land management regimes and tree canopy enlargement. The council will only consider carbon offset as a very last resort as this does not address the need to reduce and adapt consumption that the Climate and Ecological Emergency require" **[See reference** 21**]**.

1.22 HDC's Climate Strategy and its accompanying Action Plan do not outline any specific sequestration projects, though it supports general tree planting and nature recovery and other projects such as restoration of the Great Fen will contribute to the sequestration of Huntingdonshire's carbon emissions. These documents also do not outline how HDC plans to offset its residual emissions, and it is not clear what is currently being done in the plan area by the Council or private entities/individuals.

1.23 Local Plans can support existing carbon stores and provide additional offsetting measures through having policies and site allocations that support the provision of green infrastructure, landscaping, habitat creation or restoration, new woodland and tree planting.

1.24 Huntingdonshire's Local Plan to 2036 does not have any policies that directly relate to carbon sequestration and offsetting but policies 'LP3 Green Infrastructure', 'LP30 Biodiversity and Geodiversity' and 'LP31 Trees, Woodland, Hedges and Hedgerows' recognise the importance of trees, woodlands, hedgerows, and areas of green infrastructure in storing carbon alongside their ecological, recreational and conservation value.

1.25 Cambridgeshire County Council is the upper-tier local authority providing services across Huntingdonshire. Its Climate Change and Environment Strategy **[See reference** 22**]** refers to carbon offsetting and its position on the Carbon Management Hierarchy, with its accompanying action plan including an action to “develop an offsetting strategy to enable the Council to consider options for dealing with its residual “hard to prevent” emissions through offsetting within the Council’s assets”.

1.26 Cambridgeshire County Council’s interim corporate tree and woodland strategy **[See reference** 23**]** aims to create local carbon offsets, where the offsetting activities can be more easily monitored and verified while also retaining those wider benefits, like air quality and wellbeing improvements, within Cambridgeshire. They outline that they are exploring how it can offer businesses the opportunity to invest in local carbon mitigation projects on council land, such as afforestation or renewable community heating, with the return in the form of carbon savings through a Cambridgeshire Decarbonisation Fund **[See reference** 24**]**. In addition, the council is developing a Corporate Carbon Offsetting Policy to ensure they are being forthcoming and transparent in their approach **[See reference** 25**]**.

1.27 There are multiple examples of Local Plans across the country that include policies supporting carbon offsetting. These are explored further below in Chapter 2.

The value of carbon offsetting as a tool for achieving net zero

1.28 Some critically important questions emerge for the users of offsets. How can offsetting be made a credible means of achieving net zero? What types of offsets should be used and when? How can actors purchasing offsets, and stakeholders holding them accountable, avoid the risk of greenwashing? How can users catalyse the cost-effective supply of the right kind of offsets at scale?

1.29 As a matter of best practice in carbon management, offsetting should be understood as a last resort after all direct mitigation options have been exhausted. There is evidence **[See reference** 26**]** that low or medium rise domestic developments can generally achieve net zero regulated emissions without offsetting but that it is more challenging for non-domestic or higher density developments **[See reference** 27**]**.

1.30 To achieve true net zero, eventually all sectors of the economy will need to make deep and expensive cuts and not just rely on offsetting. Considering the economy as a whole, the CCC recommends that it should be reserved for ‘hard to abate’ sectors, such as aviation and heavy industry **[See reference** 28**]**. Therefore, although offsetting may need to be considered for some types of developments at present, it is important to understand that it is not a long-term solution to the challenge of GHG mitigation and should not be encouraged in the first instance.

1.31 Offsetting has the potential to achieve net zero embodied carbon in new building developments, as well as net zero operational emissions; however, offsetting both sources of emissions would incur significant costs. Thus, offset policies adopted in local plans to date have focussed on offsetting only operational emissions.

Summary of offsetting options

Positives

- Although offsetting is not universally accepted as an appropriate way to achieve Net Zero, many organisations argue that offsets can play a critical role in the transition towards net zero, particularly in areas or activities where it is more difficult to reduce carbon profiles.

- High-quality schemes can generate additional value, such as enhancements to biodiversity, incomes and/or reduced energy bills for local people, improved climate-change resilience, and safeguarding community land rights.
- There is considerable flexibility available for HDC to take action on establishing an appropriate offset system and choosing appropriate offsetting projects that can benefit Huntingdonshire communities and take forward action on climate change.

Negatives

- Offsetting is contentious to some. Many argue that the availability of offsetting as an option reduces incentives to act to cut emissions. This can be addressed by ensuring there is a robust policy requiring onsite emissions to be reduced as far as possible first with offsetting only considered as a last resort.
- Requires in-house skills and expertise to establish and monitor an offset fund. Expansion of resource would be required in the Development Management team to draw up appropriate Section 106 agreements and monitor their implementation.
- Challenges in ensuring that offsetting projects adhere to best practice principles, such as making sure that emissions reductions are additional.
- Challenges in ensuring that funds are spent on appropriate projects. The GLA had to tackle significant underspending of funds in the early years of implementation of its offset fund.

Chapter 2

How an Offsetting Scheme Could Operate

2.1 This chapter provides guidance on the range of offsetting options available and already implemented by other Local Planning Authorities (LPAs), as well as advice on existing mechanisms that could be utilised.

2.2 It also presents guidance on how an offsetting scheme for Huntingdonshire could operate, drawing upon best practice and guidance from the industry, case studies of which can be found in Appendix A.

Current approaches for offsetting schemes

2.3 The most well-established carbon offsetting approach through planning is that used by the Greater London Authority (GLA), described in Appendix A. This has secured over £90 million for carbon offsetting since October 2016 **[See reference** 29**]**. Other examples include schemes used in Milton Keynes (which has helped over 8,000 households with energy efficiency measures), Bristol and Southampton.

Specific policy wording (GLA approach)

2.4 The London Plan includes a net zero-carbon target for major development. They have published detailed guidance on carbon offset funds for London Boroughs in July 2022 **[See reference** 30**]** including on how to calculate the amount of carbon that needs to be offset. The aim of the net zero-carbon standard is to achieve significant carbon reductions on site and to get as close to zero-carbon as possible. Only then should offsetting be considered i.e. as a last resort measure. LUC concurs with this approach and would recommend HDC take a similar position as it ensures on-site carbon savings – which are more certain – are locked in before resorting to offsetting.

2.5 The GLA's carbon offsetting involves a cash in-lieu contribution (via Section 106 agreement) to the relevant LPA's carbon offsetting fund. Alternatively, the development can make up the shortfall off-site by funding a carbon reduction project directly, provided the LPA has approved this approach.

2.6 Offsetting funds can then be used for other important projects such as:

- Energy efficiency measures in the local building stock;
- Projects that help to shift towards the use of sustainable transport;
- Local renewable energy projects; and
- Tree planting and other forms of land management to promote carbon sequestration.

2.7 The London Plan requires LPAs to:

- Set up a carbon offset fund to collect carbon offset payments from developers to meet any carbon shortfall from new development and ring fence these funds to secure delivery of carbon savings within the relevant LPA;
- Set a price for carbon, i.e. price per annual tonne of carbon, that developers pay to make up any shortfall in on-site carbon savings, securing contributions through Section 106 agreements;
- Identify a suitable range of projects that can be funded through the carbon offsetting fund; and
- Put in place suitable monitoring procedures to enable reporting to the GLA.

Further offsetting approaches

2.8 Although the GLA approach is the most comprehensive, in setting clear boundaries and conditions for offsetting, there are other policy examples that could influence any final policy decision for HDC, they are outlined in more detail in Appendix A.

- The City of Westminster has created guidance on a carbon offset fund to ensure funding is secured from any new developments which are unable to fully achieve the carbon savings required at the development site. The guidance sets out similar principles to the GLA guidance, however it sets out essential and desirable criteria as well as a list of priority projects. The priority projects are divided by theme: public sector buildings and assets, commercial buildings, sustainable travel and transport, knowledge and learning, low carbon energy and homes and communities.
- The Milton Keynes Council Carbon Offset Fund (administered by the National Energy Foundation) was launched by Milton Keynes Council back in 2008. It applies to all residential developments of 11 or more dwellings and non-residential developments with a floor space of 1,000 sqm or more. Requirements are set out in a Sustainable Construction SPD. The scheme has helped over 8,000 households in Milton Keynes to receive measures such as free energy efficient light bulbs, and subsidised loft and cavity wall insulation. In Milton Keynes viability issues have emerged where developers have paid an inflated value for the land which then impacts on developer profitability and ability to pay s106 contributions. In response to this, Milton Keynes adopts a flexible approach regarding offset contributions where developments are complex, such as in Conservation Areas or where Listed buildings are being upgraded.
- Bristol City Council has also set out an approach to carbon offsetting in their Bristol Local Plan (November 2023) **[See reference 31]**. Bristol City Council's adopted offsetting policy uses a carbon price of £95 per tonne of CO_{2e}, a rate that also helped inform the London Plan's offset pricing when it was established in 2017. However, the new Carbon Offsetting policy recommends updating this rate to £373 per tonne of CO_{2e} to align with the most recent government guidance, reflecting a more accurate valuation of

carbon impacts. This approach focuses specifically on upfront embodied carbon emissions, ensuring that offsets address emissions beyond target levels. In line with recommendations from the Centre for Sustainable Energy (CSE), the policy mandates that offset funds are directed toward carbon reduction projects other than renewable energy, supporting initiatives that contribute broadly to emissions reduction across the region.

- Southampton City Council has implemented carbon offsetting since 2012. In 2015 the approach was amended to apply only to new developments of over 10 dwellings or 1,000 sqm. The Southampton Carbon Offset Fund offsets one year of emissions rather than the lifetime of the development, at a cost of £210/tCO_2.

- Central Lincolnshire has a similar planning context to Huntingdonshire. It's approach to carbon offsetting, as outlined in its Local Plan **[See reference 32]**, focuses on achieving net zero emissions by encouraging development practices that reduce carbon footprints, particularly through building design, renewable energy sources, and improved energy efficiency. It emphasises integrating low-carbon technologies and enhancing green spaces to naturally offset emissions. Policies relating to carbon offsetting also encourage tree planting, habitat creation, and community-based projects to absorb emissions locally.

  - The Central Lincolnshire Local Plan evidence base report for carbon offsetting **[See reference 33]** set out regarding pricing, that there is feasibility challenge likely to be due to limited potential PV generation on-site. Therefore, rather than a price based on the non-traded cost of carbon, the offset price could be based on the cost of delivering PVs off-site. The cost could be related to carbon or just annual energy generation. They recommended a price, expressed as a renewable energy offset, of £1.5/kWh as the price would be independent from carbon factor changes. The report also recommends S106 as the mechanism of choice for a method of funds collection.

Suggested approach for a carbon offsetting scheme

2.9 The suggested offsetting scheme methodology for HDC, including pricing structure, below, is largely based on the GLA's **[See reference 34]**, in particular on pricing and viability considerations and price zones.

2.10 The GLA's scheme is one of the most robust and well-established carbon offsetting approaches. The full GLA approach to carbon offsetting is outlined in Appendix A.

Target offset ratio

2.11 HDC should aim for a 1-1 offset ratio, known as "carbon equivalence", where the carbon savings achieved through offsetting projects equals the residual emissions from development.

2.12 Developers can choose from three options to fulfil their carbon offset obligations:

1. Carbon Equivalence: Developers directly implement projects off-site that achieve carbon savings equal to the residual carbon emissions from their development. The developer aims to achieve carbon savings equivalent to the emissions produced by their project. The council would require evidence that the carbon savings achieved are equal to or greater than the emissions produced.

2. Financial Equivalence: Developers fund carbon-saving projects up to an amount equivalent to their contribution to the offset fund, based on the prevailing carbon price. Instead of implementing projects themselves, developers provide financial support to projects that achieve carbon savings. The council would need evidence that the amount spent by the developer on

carbon-saving projects matches or exceeds the contribution that would have been made to the offset fund.

3. Payment into the Offset Fund: Developers make a payment to the offset fund at the prevailing carbon price, allowing the council to secure carbon savings on their behalf. The aim is to achieve ‘carbon equivalence,’ meaning that the carbon savings achieved match the emissions produced by the development. However, the council has flexibility in accepting a range of offset ratios, potentially less than 1 to 1, based on the feasibility of available carbon-saving measures and projects.

2.13 This means that developers have the option to either directly implement carbon-saving measures off-site or contribute financially to an offset fund. If the cost of implementing off-site measures is equal to or less than the cost of contributing to the fund, developers may choose the most cost-effective option. This principle allows for flexibility in meeting carbon reduction targets while ensuring that the overall carbon dioxide savings remain consistent.

Allocating carbon savings between co-funders of projects

2.14 Co-funding of carbon saving projects can support delivery of more expensive and ambitious projects that may benefit from economies of scale. HDC could adopt the “Proportional shares by subsidy” approach, where carbon savings resulting from a co-funded offsetting project are distributed among all parties that have contributed funding. The distribution is based on the proportion of capital funding each party has provided. This is important as it ensures each funder (including the developer requiring carbon offsetting) gets their ‘fair share’ of the carbon savings they have funded and avoids any ‘double counting’ of carbon savings (i.e. multiple funders claiming to have delivered the same carbon savings).

Setting carbon pricing

2.15 As outlined in the examples above, the Greater London Authority (whose offsetting scheme is followed by all but two London LPAs) as well as other local authorities such as Bristol and Greater Manchester **[See reference** 35**]** **[See reference** 36**]** have opted to base carbon prices for offsetting on a nationally recognised carbon pricing mechanism rather than project-specific costs.

2.16 They have all based their pricing on HMG's Green Book supplementary guidance on valuation of energy use and greenhouse gas emissions for appraisal **[See reference** 37**]**. These are derived from non-traded carbon prices. The document includes a set of national carbon prices and sensitivities that are based on estimates of abatement costs to be incurred in order to meet the UK's emissions reduction targets in both the short and long term. This is reflected in the approach taken by the GLA in the London Plan.

2.17 In addition, the UK Green Building Council's (UK GBC) guidance on Renewable Energy Procurement & Carbon Offsetting **[See reference** 38**]**, also recommends that carbon pricing is linked to HMG's Green Book "to provide a credible, time-dependent valuation of carbon that is aligned to the Paris Agreement and specific to the UK context".

2.18 We recommend HDC follows a similar approach to ensure the robustness of its pricing structure. HDC may, though, need to consider small amendments, such as adding management costs (as Southampton have done **[See reference** 39**])** and policy wording that allow for regular reviews of pricing **[See reference** 40**]**.

2.19 It should be considered, however, that carbon savings via offsetting needs to occur at speed to satisfy 2050 net zero targets.

2.20 This is outlined in Greater Manchester's carbon offsetting study **[See reference** 41**]**, that shows that a very limited time frame exists by which carbon reductions need to be achieved for the UK's 2050 net zero target and its own targets and so more needs to be achieved, quickly, via carbon offsetting.

2.21 Greater Manchester's net zero targets are to be achieved earlier than 2050, partly explaining their stated urgency. However, the timing and rate at which emission reductions are achieved is, indeed, critical. If Huntingdonshire is to reach net zero by 2050 the residual emissions from new development also need to be offset by the 2050 deadline. This logic supports higher charges being levied on developers to achieve carbon savings within the 2050 timeframe, with charges increasing further as 2050 nears (and the time for carbon savings to accrue reduces), so that carbon residual emissions from new development are offset by 2050, rather than over the lifespan of the measure funded (which has been typically used in the past). However, as with any new policy, the impacts of proposed carbon pricing on development viability will need to be considered as part of the local plan viability assessment.

Offsetting project principles

2.22 HDC should aspire to incorporate the principles and recommendations outlined in the UK GBC's guidance on Renewable Energy Procurement and Carbon Offsetting **[See reference 42]** to ensure the environmental integrity and quality of carbon offset credits. To achieve this, HDC should ensure that carbon offset credits adhere to key principles, including additionality (projects must not have been able to occur without the carbon finance), permanence (credits must represent permanent carbon reductions), and environmental integrity (projects should not contribute to social or environmental harm). Projects must demonstrate quantifiable emission reductions, be independently verified by accredited third parties, avoid leakage (ensuring emissions reductions in one area do not lead to increases elsewhere), and prevent double-counting by using a transparent registry system. By integrating UK GBC's Renewable Energy Procurement and Carbon Offsetting guidance into the recommendations, HDC can enhance the credibility, effectiveness, and sustainability of its offsetting scheme's pricing structure, contributing to its overall success in promoting carbon neutrality and environmental stewardship.

Summary and recommendations

Pricing structure

2.23 In the creation of an offsetting pricing structure, Huntingdonshire District Council should evaluate the costs associated with implementing offsetting projects such as the development, monitoring, verification, and administration and also conduct a market analysis that identifies potential buyers to understand the demand for carbon offsets within the HDC’s jurisdiction. The Council should ensure they consider the environmental co-benefits provided by offset projects and determine how factors such as biodiversity conservation, air quality improvement, and community engagement contribute to the value proposition of offsets. These co-benefits could be incorporated into the pricing structure to reflect their additional value. HDC should also engage stakeholders, including local communities, environmental organisations, and businesses, in the pricing process.

2.24 HDC should also ensure that the pricing structure aligns with the Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal publication as well as the principles and recommendations outlined in UK GBC’s guidance on Renewable Energy Procurement and Carbon Offsetting. This includes considering factors such as additionality, transparency, and environmental integrity in the design of the pricing mechanism. However, HDC should also consider raising the price of their scheme above what is recommended in the above publications, as this would aid in ensuring net zero by 2050 **[See reference** 43**]**. Though, as with new policy the impacts of the proposed carbon price on development viability would need to be considered as part of the local plan viability assessment.

Spatial scale of the funding strategy

2.25 A funding strategy for a potential public planning offset scheme in Huntingdonshire could operate at a range of different scales, from the Local Authority level to larger scales such as regional or county level, as part of a Cambridgeshire wide scheme. Operating at each scale has its advantages and drawbacks.

2.26 A **locally run scheme** may allow for greater alignment with local needs and offer the flexibility to address environmental and social goals previously set by the council. It could also be utilised to enhance community engagement, fostering a stronger connection between residents and the initiative, which in turn can lead to higher public support. Local projects should be more transparent and accountable to the community given existing council and local civil society connections. They can be utilised to stimulate local economic co-benefits as projects could be selected that employ local businesses and contractors.

2.27 However, due to economies of scale, locally managed schemes have a limited scale and may have higher associated costs, which may restrict its overall carbon impact. Additionally, funding can be inconsistent, posing a risk to long-term project viability.

2.28 In contrast, a scheme at a larger scale, such as **county or regional**, such as that considered by the Greater Manchester Combined Authority **[See reference** 44**]** may benefit from economies of scale, which can reduce per-project costs and make larger initiatives more feasible. This approach would allow administrative savings and enable the authorities to benefit from one another's strengths and provides access to specialist expertise and resources that smaller authorities might lack, and it can lead to a greater carbon reduction impact through broader initiatives like reforestation or renewable energy projects. Funding can be more stable and predictable in larger schemes, allowing for long-term projects. The main drawbacks are reduced local control over project selection, which may limit alignment with specific community needs, a weaker connection with local residents, and the added governance and administrative complexity of working with multiple stakeholders, which would need careful resolution.

2.29 The London Carbon Offset Price study **[See reference 45]** which informed GLA's Carbon Offset Funds guidance, suggested a strategy of zoning carbon offset prices as an alternative to assuming that a single carbon price is recommended for the whole of London. The option of zonal carbon prices arises from the potential effect of carbon prices on development viability. This may be a good option for a larger scale funding scheme to ensure that a carbon offset price is appropriate for local areas.

2.30 For a balanced approach, a hybrid model can be effective—combining locally relevant projects with larger-scale initiatives, allowing the authority to address community needs while contributing to wider carbon reduction efforts. In this model, a county-wide scheme could handle the administrative load and create economies of scale, reducing costs and centralising expertise, while still allowing individual districts or boroughs to set carbon prices and choose specific projects for their areas, potentially supported by community engagement. This structure means local councils retain project selection control and can ensure alignment with community needs, maximising both impact and local support.

2.31 However, a hybrid scheme would likely involve added complexities with the need to coordinate between local authorities and the involvement of a larger administrative body. This may lead to bureaucratic challenges, especially if each district sets its own carbon prices or selects unique project types. Balancing both local autonomy and regional efficiency could create conflicts over project priorities and fund allocation, potentially slowing down decision-making and project implementation. There isn't significant precedence for this approach and HDC would, therefore, need to conduct further research to understand how this approach would best be implemented.

Set up of operations

2.32 Offsetting has the potential to achieve net zero embodied carbon in new building developments, as well as net zero operational emissions, however offsetting both sources of emissions would incur significant costs. Thus, offset policies adopted in local plans to date focus on offsetting only operational emissions.

2.33 The Community Infrastructure Levy is not an appropriate mechanism for collecting carbon offset payments, in that CIL is a fixed charge per m2 and does not account for the varying performance of developments in terms of carbon emissions. Thus Carbon offset funding must be secured through Section 106 (S106) legal agreements on planning consents, and every planning obligation must pass three legal tests, that it is *necessary to make the development acceptable in planning terms; directly related to the development; and fairly and reasonably related in scale and kind to the development*.

2.34 Administration processes (i.e. how decisions are taken to distribute funding and how projects are then subsequently monitored for the resultant carbon saving) should be specifically designed to ensure that the S106 tests can be met in every legal agreement entered into and every project funded. For this reason, every project or programme of projects funded (including Council projects) should go through an application process and be assessed against published criteria derived from the legal tests.

2.35 The most appropriate administration mechanism will depend on the range and type of projects that are deemed to be eligible for funding and on the scale of the fund. If a large number of applications are expected from the community for relatively small projects, for instance for energy retrofitting or community energy projects, there may be benefits to outsourcing the day to day administration of the fund, with the provider reporting to a panel of representatives from authorities **[See reference** 46**]**.

2.36 The overarching issue for HDC in relation to carbon offsetting is HDC's lack of internal technical expertise/resource to set up and run a carbon offsetting fund, including setting a carbon price, securing payments, selecting/designing suitable projects for funding, delivering projects and monitoring/reporting.

2.37 Islington Council has been operating carbon offsetting since 2012, but they benefit from having an in-house Energy Services Team who review energy strategies submitted with planning applications (as part of the development management process), identify projects to receive carbon offset funding and prioritise and deliver them. However, some London boroughs have reported that limited staff resource has constrained their ability to spend offset funds. According to the GLA's 2020 survey on carbon offset funds, 75% of collected funds remain unspent.

2.38 An offsetting study commissioned by the GLA in 2016 **[See reference** 47**]** discussed how viability has been impacted in Local Authorities outside London that have adopted offsetting policies. It noted that these councils assess the viability of major development applications in line with the NPPF, and the developer must appoint a viability consultant and pay for the Council to appoint its own viability consultancy service.

2.39 If viability is a primary concern for HDC, following the approach of Ashford Council could mitigate these concerns. Ashford adopt best practice guidelines for assessing viability by using an independently assessed appraisal method. Affordable housing is the key priority for payment; the use of contributions is then prioritised for each application.

2.40 HDC currently lacks such in-house expertise so would need to either buy this in (e.g. note example above of Milton Keynes working with the charity, National Energy Foundation) or take a decision to build this expertise in the council. The council could also consider the opportunity to invest in a shared expert resource with other LPAs, with might improve cost efficiency.

Key points to consider

2.41 In summary, to establish and implement a carbon offsetting scheme, the key steps would include:

- Agreeing how to secure and fund the necessary expertise to establish and run a carbon offset fund (see key issue identified above);
- Developing a clear planning policy (and supplementary guidance as necessary) setting out when offsetting will be accepted (e.g. as a last resort after on-site measures have been maximised), how (and when) payment will be secured (i.e. via s106) and what types of projects it will be spent on;
- Setting up a carbon offset fund with appropriate governance and ring-fenced funding for carbon reduction projects;
- Setting a price for carbon (simplest approach would be to use nationally recognised approach as per GLA and Bristol);
- Identifying the types of projects to be funded and setting out clear eligibility and marking criteria to assess potential projects; and
- Establishing monitoring and reporting procedures (e.g. annual reporting on spend and delivery) to ensure that funds are being spent effectively and efficiently and that delivery of the projects is achieved.

Chapter 3

Categorisation and Monitoring of Offsetting Projects

3.1 This chapter discusses best practice for the categorisation and monitoring of any funded carbon offsetting projects in Huntingdonshire.

Categorisation of projects

3.2 The GLA's Plan includes requirements for LPAs to monitor and guidance instructing LPAs to set out the categories that an offsetting project falls in to and confirm this publicly.

3.3 The GLA categorises carbon offsetting projects under the following headings **[See reference** 48**]**:

- Energy efficiency;
- Renewables;
- Behaviour change;
- Private sector housing grants;
- District heating;
- Business energy grants;
- Transport; and
- Greening/other.

3.4 It is recommended that HDC take a similar approach to the GLA's. However, a recent offsetting monitoring report from the City of London found that there were a wide range of projects being funded by its offsetting fund, some of which did not directly relate towards emission reductions in the area. Therefore, appropriate and effective categorisation and monitoring of offsetting projects is imperative for effective emissions reduction.

3.5 The primary purpose of a project funded by carbon offset fund should be to deliver carbon savings. To demonstrate that a project meets this primary purpose, GLA's guidance indicated that projects applying for CO_2 offset funding should provide an estimate of the carbon cost-effectiveness of the proposed measure, i.e. the capital cost per tonne of CO_2 saved over its lifetime (£capex/tCO_2 lifetime).

3.6 Within this broad framework (of delivering carbon savings), the guidance recommends prioritising projects using the following categories:

- Main priority:
  - Reduce energy demand in existing buildings, including through energy efficiency measures and improving monitoring and operation.
- Secondary priorities:
  - Generate renewable electricity, e.g. solar PV;
  - Generate renewable or very low carbon and low emission heat e.g. solar thermal, heat pumps or fuel cells;
  - Replacing higher carbon systems that contribute to poor air quality such as gas-engine CHP Support low carbon heat networks; and
  - Undertaking whole building retrofit, e.g. improving energy and water efficiency, installing renewables and smart metering.

3.7 Reducing energy demand is the first, best and often most cost-effective approach to decarbonising buildings, which is why the GLA recommends that LPAs prioritise measures such as energy efficiency improvements. Lower-cost projects that target energy efficiency, such as insulation programmes, should be a priority for offset funds.

3.8 The primary focus for offset funds is to achieve carbon savings but, where possible, projects should maximise co-benefits, i.e. wider environmental, social and economic benefits that align with Huntingdonshire's strategic priorities identified in its Climate Strategy.

Hard vs soft measures

3.9 In addition to these categories, the GLA encourages LPAs to prioritise spending on 'hard' measures, i.e. those that deliver a tangible physical asset with transparent and predictable carbon savings.

3.10 However, LPAs can also spend offset fund payments on 'softer' measures such as behaviour change campaigns. LPAs are advised to set stricter information and performance requirements for softer measures. For example, the GLA recommends that LPAs make it a requirement that all behaviour change projects set out an engagement strategy and monitoring plan in advance of receiving funding; and suggest that carbon savings should be adjusted to reflect the uncertainty over what outcomes will actually be delivered.

3.11 There is greater risk associated with the performance of softer measures and HDC would need to bear this in mind when selecting projects to fund, considering the latest research on specific measures where relevant.

Assessing a project's eligibility

3.12 When selecting offsetting projects to fund, LPAs should also consider defining eligibility and marking criteria including in relation to the deliverability of the project, over what timescales and with what monitoring procedures (a proportionate approach is recommended to establishing monitoring requirements, with larger and more expensive projects required to provide more detailed reporting).

Additionality and monitoring

3.13 All projects financed by the offset fund must be able to demonstrate that they will save carbon once they are funded. GLA guidance advises that offset payments must be spent on projects that "would not have occurred without the offset funding, would not have occurred under a business-as-usual scenario, and are not required in order to meet national legislation." Therefore, determining whether a project offers this additionality is a key component of the effective governance of the project. These tests may be time-consuming but are necessary to ensure that funded projects deliver tangible carbon reduction benefits beyond what would have happened without the carbon offset funding.

Examples of monitoring approaches

3.14 LPAs have various approaches to monitoring carbon offsetting schemes. Most LPAs in London use their existing Section 106 (S106) monitoring processes, while some rely on local plan annual monitoring reports or have dedicated teams, such as in Havering **[See reference** 49**]**. A few have not set up processes due to limited funding **[See reference** 50**]**. Some London LPAs reported contract requirements are used to confirm carbon savings **[See reference** 51**]**.

3.15 The Greater London Authority (GLA) monitors carbon offset funds by conducting annual surveys with boroughs and using their feedback to create detailed monitoring reports **[See reference** 52**]**. This process captures data on how funds are spent across various projects, helping to track progress on emissions reduction goals and assess project effectiveness. The GLA provides guidance and a standard reporting format to ensure consistent data collection across London. Additionally, it encourages transparency by publicly sharing insights into fund allocation and project impacts, supporting accountability in climate action.

3.16 The data the GLA collects from LPAs for monitoring includes:

- Total funds received and spent on offsetting projects
- Types of projects funded, such as energy efficiency or renewable energy initiatives
- Estimated carbon savings achieved by each project
- Remaining balance of funds and plans for future projects
- Challenges faced in collecting and spending offset funds
- Progress regarding governance and administrative processes.

3.17 Brent Council's approach to monitoring its carbon offsetting scheme emphasises accountability and community impact **[See reference** 53**]**. Successful applicants to the carbon offset fund are required to monitor their projects and submit evidence of community benefits. This includes photos or videos with permissions, receipts or invoices proving expenditure, records of community reach, and a summary of project outcomes for potential use in Council promotions. Funds must be used strictly for approved purposes, and recipients must maintain thorough financial records, such as income and expenditure sheets, receipts, and invoices.

3.18 Assessing post-construction/operational emissions are an important component of offset scheme monitoring (ensuring that the original offset agreement matches the realised carbon profile of the development). Camden takes a comprehensive approach, maintaining a detailed audit trail for each project, including a database to track installations, grants, and estimated carbon savings. Waltham Forest requires applicants to submit a project plan outlining the expected emissions reductions and plans to request follow-up reports for up to five years, though this has not been fully implemented. The London Legacy Development Corporation similarly asks applicants how they will measure the effectiveness of their projects **[See reference** 54**]**.

3.19 Some authorities, such as Merton, emphasise that monitoring regarding carbon emissions savings resulting from funded projects should be proportionate to the carbon savings, with Merton cautioning against overly stringent monitoring requirements that could hinder schemes. Merton also highlights the discrepancy between predicted and actual energy performance in new developments and opposes requiring a 1:1 carbon equivalence for offset projects **[See reference** 55**]**.

3.20 Hertsmere Borough Council states that for post construction monitoring of carbon offsetting, the in-depth monitoring of carbon savings from projects could take up a large proportion of time and resources. The Council therefore also advocates a proportionate approach to be adopted according to the scale of the project, where projects above the carbon scheme threshold report actual carbon savings whereas standard assumptions are applied to smaller projects **[See reference** 56**]**. For larger projects exceeding the carbon scheme threshold, applicants must provide post-construction carbon assessments to verify actual carbon savings against initial projections. This is achieved through conditions or S106 agreements that may require further assessments at completion, comparing "as built" carbon data with pre-construction estimates. Any discrepancies must be explained, and additional contributions may be required if targets are unmet. Smaller projects rely on standard assumptions rather than detailed post-construction data.

Monitoring recommendations

3.21 To effectively monitor the success of carbon offsetting projects, Huntingdonshire District Council should adopt a balanced and proportionate approach that aligns monitoring efforts with the scale of each project and funding available. A monitoring plan with measurement and verification should be part of each project’s evaluation, with project owners required to confirm the carbon savings achieved post-installation.

3.22 A 1:1 offset ratio serves as a useful performance benchmark, ensuring that the council's offset fund achieves meaningful impact. Wherever possible, existing administrative structures, such as Section 106 processes, should be used to manage and track funds, reducing the need for new processes and conserving resources for direct project delivery. Where additional resources are necessary for staff or administration, up to 10 per cent of the offset fund may be allocated to support these functions, though it is essential to document this clearly within agreements to maintain transparency.

3.23 Requirements should be tailored to the project type and size. Large-scale retrofitting projects, for instance, managed by the council or trusted partners, should track the number and location of properties retrofitted and apply standard assumptions for quarterly reporting of carbon savings. While post-installation monitoring may be unnecessary for most large retrofits, larger council building retrofit projects should report actual carbon savings based on in-situ performance data to enhance accountability. For smaller retrofitting projects, such as those undertaken by third parties (e.g., community building upgrades), confirmation of completed works should be provided, alongside the application of standard assumptions to calculate carbon savings. Large and medium renewable energy initiatives, like community solar or wind projects, should include real-world carbon savings in their monitoring data. For carbon sequestration projects, such as tree planting and wetland restoration, the council should track the area restored or planted, alongside carbon sequestration predictions, and align progress reporting with the Woodland and Peatland Carbon Codes.

3.24 Croydon Council recommends that to optimise future monitoring, early projects should be treated as pilots, collecting comprehensive feedback and data to refine processes. Governance structures should be scaled to match available funds and only expanded when the fund size justifies this. In the interim, existing boards, like those used for Section 106 management, can oversee initial offset funds, maximising efficiency **[See reference** 57**]**. By adopting this proportionate monitoring approach, the council can ensure that carbon offsetting efforts remain both resource-efficient and effective in achieving real carbon savings across varied projects.

Recommendations of offsetting projects to be funded

3.25 There are various types of offsetting projects which can be implemented in Huntingdonshire, these are discussed in the preceding sections of this chapter.

3.26 Common offsetting projects within these categories include energy efficiency and afforestation, as these mitigation methods are well known, and solutions are readily available to implement immediately. Activities such as behaviour change and education, although beneficial, do not have immediate impact and the benefits are intangible, therefore HDC would be advised to treat such projects with caution. Peatland restoration projects may be supported by carbon offset schemes and are of particular relevance to Huntingdonshire. The potential benefits of restoring Huntingdonshire peatland are discussed in detail in Chapter 6 of this report.

3.27 Overall, it is recommended that HDC take a similar approach to the GLA's prioritisation framework outlined in this chapter, where projects which reduce energy demand in existing buildings, including through energy efficiency measures and improving monitoring and operation are prioritised over others.

3.28 Whilst the focus should be on projects that will deliver carbon reductions, HDC may also want to give some consideration to co-benefits of projects (e.g. reduced fuel poverty; supporting resilient businesses) when prioritising projects), taking into account strategic priorities identified in local plans and strategies. Any such consideration of co-benefits would need to be undertaken in a fully transparent way.

Chapter 4

Role of Sequestration and Natural Capital in Net Zero

4.1 This chapter outlines the importance of carbon sequestration in achieving net zero, how to go about increasing local sequestration and the role of natural capital in supporting this.

What is carbon sequestration and how does it contribute to net zero

4.2 Carbon sequestration is the amount of carbon captured or absorbed from the atmosphere by a particular habitat type. This is typically expressed as tonnes of carbon dioxide per hectare per annum. It can also be expressed as tonnes of carbon dioxide equivalent (CO_2e), which includes other greenhouse gases. CO_2e allows other greenhouse gas emissions to be expressed in terms of CO_2 based on their relative global warming potential (GWP).

4.3 Carbon storage relates to the quantity of carbon stored in soil and vegetation, which is affected by changes in land use. For example, woodland stores carbon in the woody material, leaf litter and soil. Other habitats may hold limited carbon in the vegetation and a more significant proportion within the soil.

4.4 Alongside increasing sequestration, it is important to protect carbon stores such as soil, peatland and existing woodland from damage, as this can lead to further carbon emissions.

4.5 Carbon is stored within soils and vegetation, and sequestration is the capture and secure storage of carbon that would otherwise be emitted or remain in the atmosphere.

4.6 The existing carbon value of soil stock is relevant to land use change, as management interventions or development may release carbon from the soil. Different levels of carbon storage in soils are important when considering land use change, but less for considering carbon flow. For example, woodland cover can significantly increase the carbon stock within soils, compared to a previous arable land use. Therefore, to achieve net zero, alongside increasing sequestration, it is important to protect carbon stores such as soil, peatland and existing woodland from damage, as this can lead to further carbon emissions.

4.7 Huntingdonshire District Council has committed to a net zero carbon emissions pathway for council operations by 2040 and to support residents and businesses to be net zero by 2040. Planned reductions in emissions from HDC's corporate activities will not, on their own, see the area meet aspirations for net zero by 2040 **[See reference** 58**]**. It is therefore likely that some emissions will need to be addressed through alternative means. Carbon offsetting, including through sequestration, could play a role in helping the Council achieve its own net zero targets or wider net zero aspirations for Huntingdonshire at large.

How carbon sequestration and storage is delivered

4.8 Carbon sequestration and storage can be delivered via many means.

4.9 Chief among them is tree planting. It is important to encourage woody growth as trees sequester carbon at a faster rate as they are growing (the Natural England average figure is 14.5 tCO_2e/ha/yr for a 30-year-old mixed woodland and 7 tCO_2e/ha/yr for a 100 year old mixed woodland) than when they have reached maturity **[See reference** 59**]**. Therefore, tree planting, allowing natural regeneration of woodland, coppicing, pollarding and thinning of existing woodland, woodland-pasture restoration/ creation, replacing single species conifer blocks with native woodland and hedgerow creation will aid this.

4.10 In addition, disturbing ground through cultivation or removal of surface vegetation can release carbon stored in the soil or the roots of vegetation within that soil. Therefore, reducing soil disturbance and increasing soil restoration will increase sequestration, such as through:

- Rewetting woodlands;
- Rewetting peatland/bog;
- Soil compaction alleviation and remediation; and
- Creation and incorporation of biochar.

4.11 Peat soils can be managed by tree removal, managing recreational impacts, limiting disturbance from tillage/livestock, limiting burning and raising water levels.

4.12 Other management techniques that require low intervention and carbon emissions should be encouraged. These could include; grazing expansion/reintroduction, restoration of wetland and open water habitats/creation of ponds, creation of reedbeds, rewilding and expansion of degraded bogs and mires, rewilding areas of low biodiversity, such as amenity grassland (relaxed mowing), arable reversion to lowland meadow/wood-pasture/parkland.

4.13 There is also potential to sequester carbon through the creation of green roofs and walls on buildings.

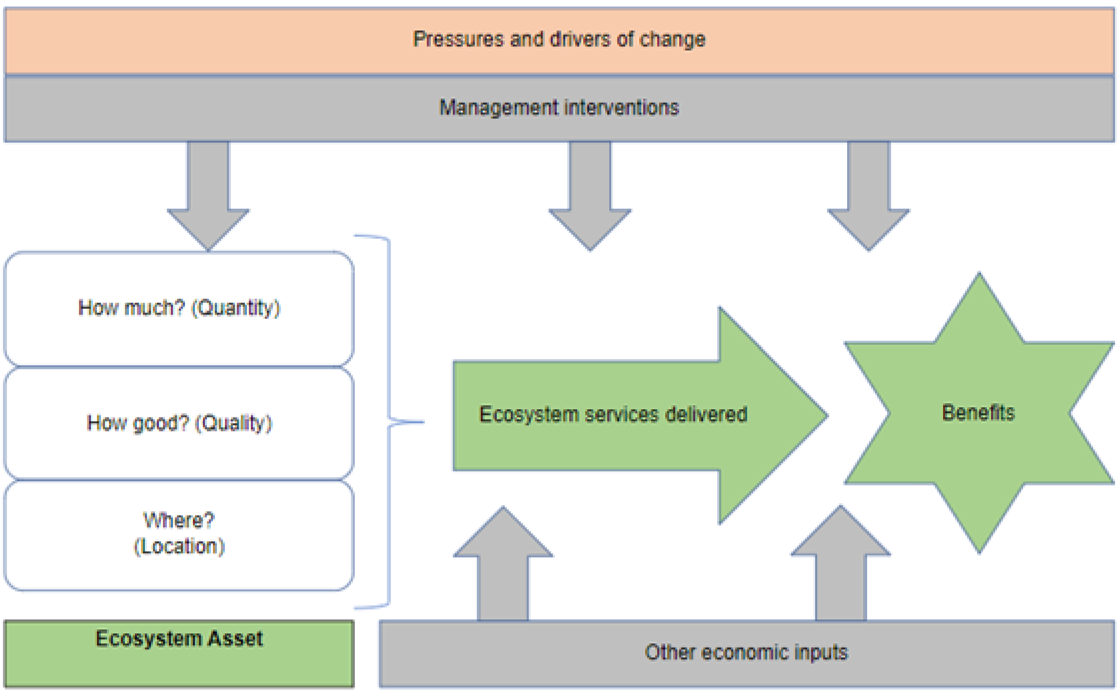
Overview of natural capital and how this could be harnessed by Local Authorities

4.14 Natural Capital can be defined as the stock of natural assets which include geology, soil, air, water and all living things. It is from this natural capital that we derive a wide range of benefits or services, supporting human life and wellbeing as well as the economy.

4.15 Positive management of natural capital can increase the flow and quality of the benefits we derive from it. Equally, actions that damage natural capital are likely to diminish the flow or reduce the quality of those benefits. Investing in the quality and expansion of natural capital assets can thus realise significant benefits for humans and help to tackle the twin crises for climate and nature.

4.16 Figure 4.1 shows how the quantity, quality and location of natural assets deliver ecosystem services which, combined with other economic inputs, provide benefits to people and society. At each stage of this chain there are pressures and drivers for change, and also potential management interventions.

Figure 4.1: The Natural Capital Framework [See reference **60**]



4.17 Natural capital has become a standard analytical approach to thinking about nature. It also develops our traditional understanding of how the economy works as pressures on nature result in costs to the economy. Understanding nature as a set of assets that benefit people and society in all kinds of ways can also support better decision-making as it reduces the risk of the value of the natural environment being ignored. This helps to give the best public value given that there are scarce resources and trade-offs between objectives. Natural capital also enables different disciplines to adopt a shared framework and understanding in both research and practical initiatives. However, it is recognised that natural capital as a conceptual approach and language may not resonate with all groups or be relevant for all purposes.

4.18 To reach net zero, understanding how nature supports the functioning of society, as well as its links with climate change, is vital. Stocks of natural capital continue to be exploited and negatively impacted, without allowing them to recover.

4.19 Nature based solutions are an answer to this in Huntingdonshire, these involve actions to protect, sustainably manage, and restore natural or modified ecosystems to address challenges. Ecosystem restoration is a key example of such nature-based solutions, as ecosystems help regulate climate, cycle nutrients and produce biomass in the form of food, fuel and fibre. They also play a vital role in carbon capture which will support Huntingdonshire’s transition to net zero. Modest conservation efforts offer a cost-effective way to mitigate climate risk and protect against significant losses.

4.20 Strategic natural capital opportunities in Huntingdonshire could include:

- Peatland restoration;
- River flood risk and water quality management;
- Woodland enhancement; and
- Agricultural land enhancement.

Chapter 5

Carbon Sequestration Mapping

Current carbon balance of habitats in Huntingdonshire

5.1 This chapter provides an overview of the carbon balance (sequestration and storage) of the variety of habitats in the HDC administrative area along with suggestions of how to increase sequestration and storage.

5.2 Please see Chapter 4 for an explanation of carbon sequestration and carbon storage.

5.3 A full explanation of the methodology for this exercise is contained in Appendix E.

Overview

5.4 Figure 5.1 shows the distribution of habitat types in Huntingdonshire. Figure 5.3 presents an illustration of the estimated current carbon sequestration potential in the Huntingdonshire district based on these habitat types and typical carbon sequestration rates derived from existing literature (Appendix B). Within Figure 5.3 (A), negative numbers represent carbon removal from the atmosphere (sequestration), while positive numbers represent carbon emissions.

5.5 Overall, the Huntingdonshire's administrative area, consisting of about 91,245 hectares of land, is estimated to sequester approximately 19,200 tCO_2e/yr, resulting in a carbon sequestration rate of about

0.2 tCO_2e/ha/yr (this is a LUC calculation, further details can be found in Appendix C). This is the baseline level of sequestration and cannot be utilised to mitigate HDC's residual emissions.

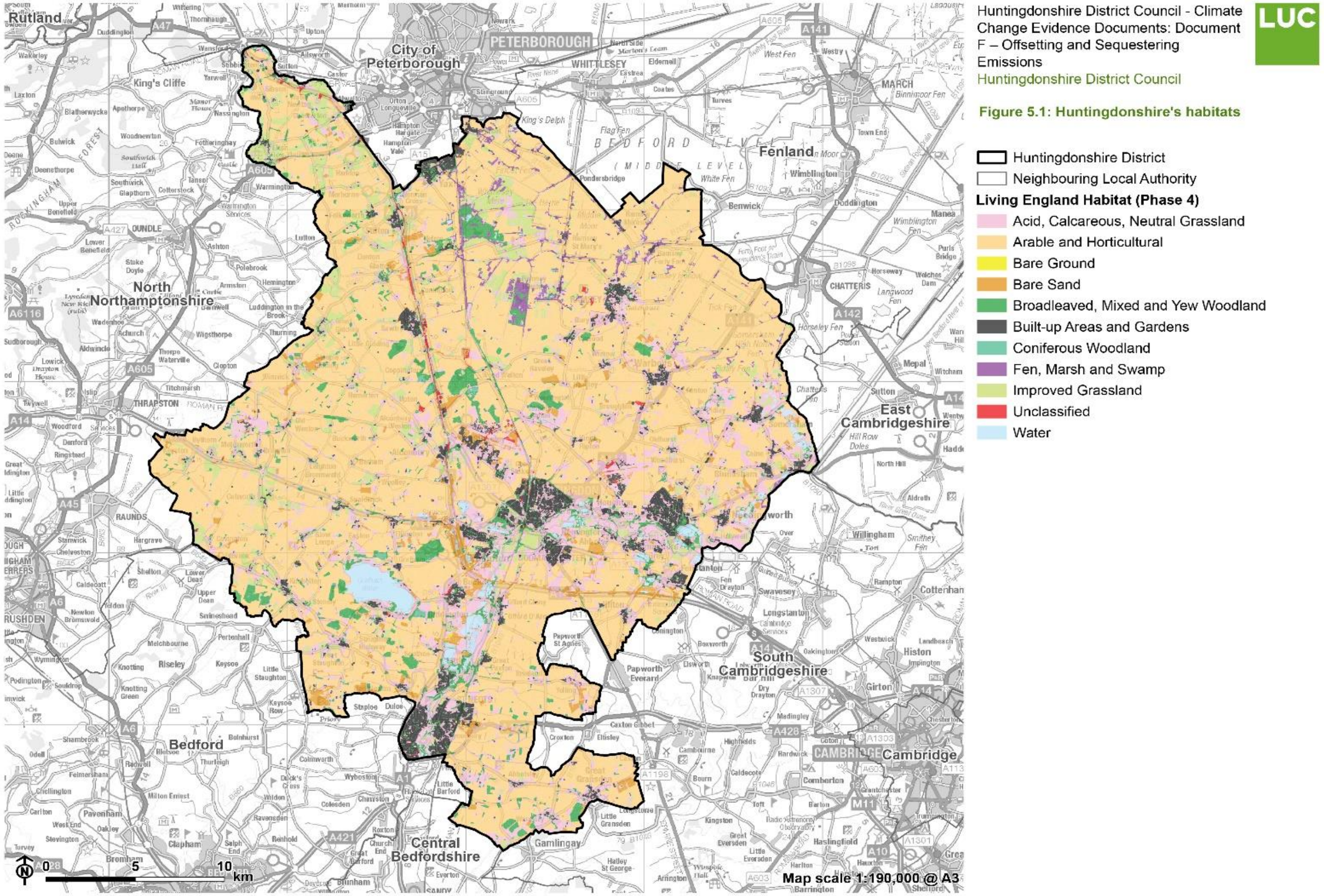
5.6 Our baseline assessment shows that arable and horticultural land is the most prolific habitat type in Huntingdonshire, covering 61.4% (56,018 ha) of the administrative area. This is followed by the habitat type of acid, calcareous and neutral grassland at 16.8% (15,305 ha), improved grassland at 6.2% (5,698 ha) and broadleaved, mixed and yew woodland at 4.9% (4,511 ha).

5.7 Bare ground is the least prolific habitat type, covering 0.02% (16 ha) of Huntingdonshire, followed by coniferous woodland at 0.2% (206 ha). Fen, marsh and swamp covers the 4^{th} smallest area out of the eleven habitat types at 1.3% (1,188 ha).

5.8 Our assessment, illustrated in Figure 5.3 (A), shows that the broadleaved, mixed and yew woodland habitat type sequesters the most amount of carbon in Huntingdonshire at 25,714.5 tCO_2/yr, making up 71% of carbon sequestration of all positive carbon sequestering habitat types in Huntingdonshire. The habitat type sequestering the second largest amount of carbon in Huntingdonshire is estimated to be acid, calcareous and neutral grassland at 6,076 tCO_2/yr. The arable and horticultural habitat type sequesters by far the least amount of carbon at a rate of -16,806 tCO_2/yr, making the habitat an overall emitter of CO_2, the only habitat type in Huntingdonshire to do so.

5.9 As shown in Figure 5.3 (B), (carbon stored in vegetation plus carbon stored in soils), the arable and horticultural habitat type stores the most carbon at 47% of the total in Huntingdonshire (3,585,178 tC). This is followed by broadleaved, mixed and yew woodland at 21% (1,597,004 tC) and acid, calcareous and neutral grassland at 18% (1,377,404 tC). Fen, Marsh, and Swamp, is the fifth most significant out of the eleven habitat types at 2% of the total (179,364 tC).

Figure 5.1: Huntingdonshire's habitats



12713_Doc_F_Nov2024/12713_Doc_F_r1_Fig5_1_Habitats 06/11/2024 EB:bournazel_j

Figure 5.2: Area covered by habitat types in Huntingdonshire

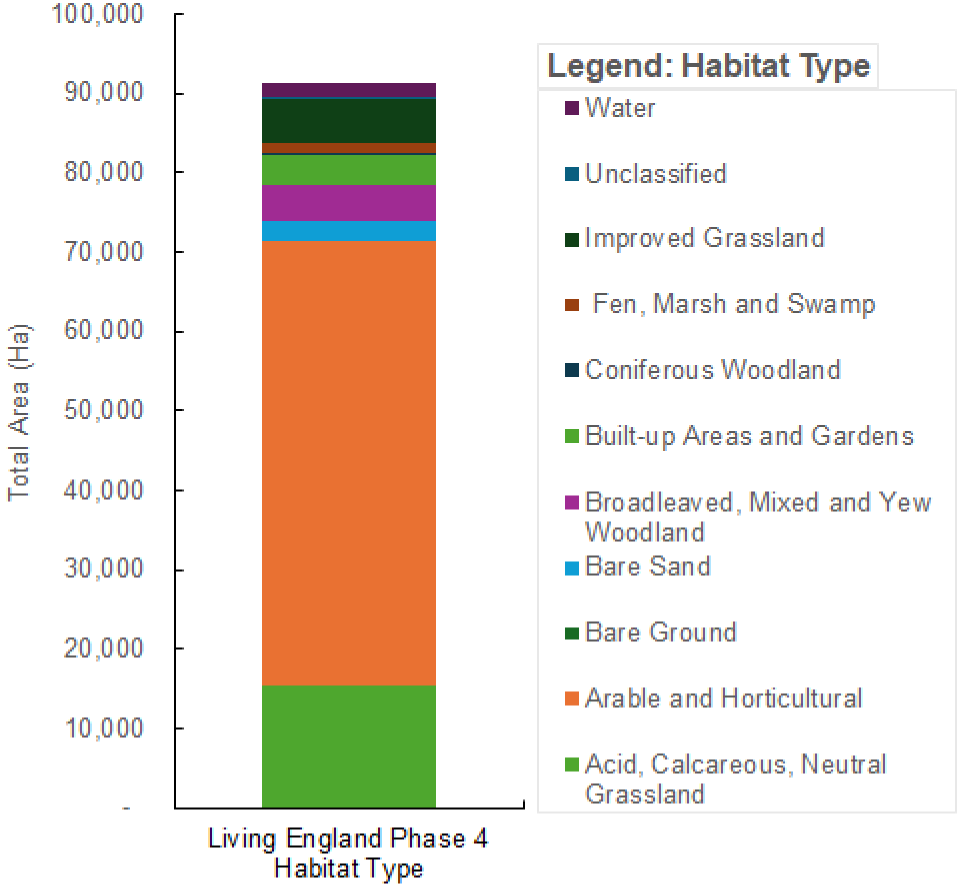
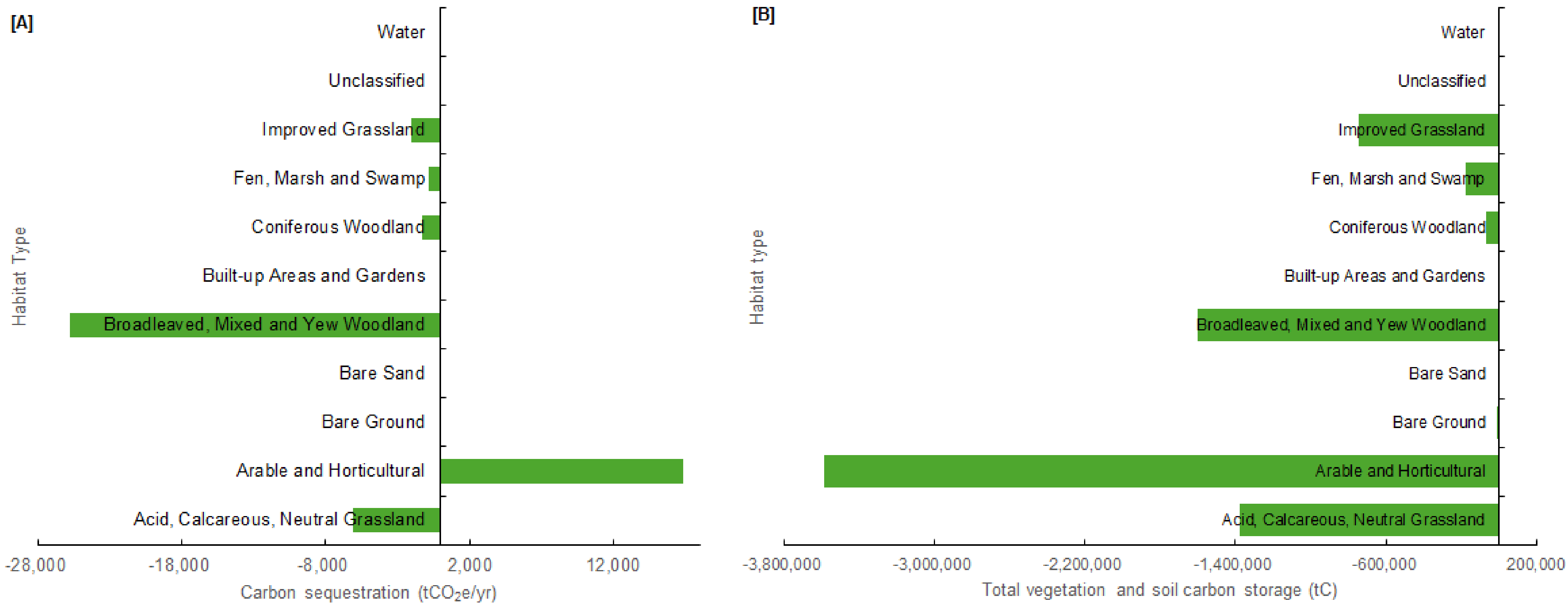


Figure 5.3: [A] Carbon sequestration and [B] carbon storage of habitat types in Huntingdonshire



Note that negative (-) values represent the removal of carbon from the atmosphere (storage and sequestration) while postive (+) values indicate emissions

Analysis

5.10 Arable and horticultural habitats cover the largest amount of land in Huntingdonshire of all habitat types and stores the largest amount of carbon of any habitat type. However, it emits a large amount of carbon over time and is the only habitat type in Huntingdonshire to do so.

5.11 Agricultural land and intensively managed grasslands are some of the greatest potential emission sources in Huntingdonshire, as well as heathland and peat soils, especially if impacted by management, including managed or unmanaged grazing or burning (soil carbon loss) and clearing of forests. In particular, agriculture contributes to CO_2 emissions when uncultivated land or pasture is converted to arable land, as disturbing soil – e.g. by ploughing – stimulates soil bacteria which release both CO_2 and nitrous oxide through respiration. The breakdown of liming materials in the soil also releases fossilised CO_2. This highlights how important it is for Huntingdonshire's transition to net zero for HDC to support climate-led and sustainable land management.

5.12 The habitat types of broadleaved, mixed and yew woodland and acid and calcareous and neutral grassland both sequester and store some of the largest amounts of carbon out of the habitat types in Huntingdonshire.

5.13 Therefore, for the transition to net zero, such habitats must be protected and enhanced. In addition, habitat types which sequester and store low amounts of carbon, such as those classified as bare ground and built-up areas and gardens should be prioritised for nature-based solutions to increase sequestration and storage, where feasible, such as conversion to habitat types which sequester high amounts of carbon, such as through afforestation. Newly established habitats, including woodland, require between 20-30 years to reach full establishment and achieve peak carbon sequestration. This would suggest that a majority of habitat conversion will need to take place in the coming 5-10 years.

Scenarios for increasing carbon sequestration and storage in Huntingdonshire

5.14 This study assessed the potential for increasing the carbon sequestration potential through land use changes to woodlands, having the highest potential for carbon sequestration as described above. However, it is recognised that there could be site-specific constraints, as well as a potential for a mix of new habitats to be delivered such as grassland and wetlands limiting the range of scenarios presented.

5.15 The assessment considered two ranges of potential land use change to reflect the ranges of potential constraints and impacts for current land use:

- a high-range estimation converting 10% of area of habitat types to a mix of woodlands, to reflect an ambitious scenario of conversion, with limited constraints and limited potential to disrupt agricultural and grazing opportunities; and
- a low-range estimation converting 5% of area of habitat types to a mix of woodlands, to reflect more site constraints and potential to impact existing agricultural and grazing opportunities.

5.16 The assessment found that under a high-range scenario, converting viable areas of acid, calcareous, neutral grasslands, and improved grasslands, to a LUC-derived broadleaf mix (including 75% broadleaf, 15% conifer, and 10% open space), can result in an increase of carbon sequestration by up to 5.5%, from the baseline estimate, and a LUC derived conifer mix (including 75% conifer, 15% broadleaved, and 10% open ground), can result in a 4.5% increase in carbon sequestration.

5.17 Similarly, under a low-range scenario, converting viable areas of acid, calcareous, neutral grasslands, and improved grasslands, to a LUC-derived broadleaf mix (including 75% broadleaf, 15% conifer, and 10% open space), can result in an increase of carbon sequestration by up to 3.7%, from the baseline estimate, and an LUC derived conifer mix (including 75% conifer, 15% broadleaved, and 10% open ground), can result in a 3.3% increase in carbon sequestration.

5.18 Appendix D presents a detailed description of the habitat conversion calculations.

5.19 However, habitat conversions such as those outlined above should be taken with great consideration of the environmental and social context of each site. For example, a site may be a vital link in a green corridor, contain rare and important habitats or be key for local and community amenity. Therefore, when the Cambridgeshire and Peterborough Local Nature Recovery Strategy is completed, it is advised that this is used to inform future land use change. Site specific surveys would be required before developing any proposals in further detail.

Recommendations for increasing carbon sequestration and storage in Huntingdonshire

5.20 To enhance carbon sequestration and storage in Huntingdonshire, it is recommended that HDC prioritise protecting its high carbon sequestering habitat types. In particular, its high quality natural and semi-natural habitat types such as broadleaved, mixed and yew woodland and acid and calcareous, neutral grassland and peatland.

5.21 HDC should also aim to improve the management of carbon stores where possible to reduce potential emissions, as well as reduce carbon emissions associated with management inputs through altering management practices, though they should reflect the biodiversity/social/economic value of the existing land use.

5.22 The potential most significant sources of carbon emissions from habitat/land use types to include **[See reference** lxi**]**:

- Agricultural land and intensively managed grassland;
- Heathland – if impacted by management, grazing or burning (soil carbon loss); and
- Peat soils.

5.23 Such management changes include altering management practices in arable and intensive grassland systems, for example by increasing the use of farming methods which result in fewer carbon emissions, such as paludiculture on peat soils. Further discussion of how HDC can increase sequestration via management practices can be found in Chapter 4.

5.24 Finally, HDC should also aim to convert low carbon sequestering habitat types, such as grassland and arable and horticultural land to high carbon sequestering habitat types such as woodland, again making sure to reflect the biodiversity/social/economic value of the existing land use.

5.25 The following habitat types are identified as having very limited opportunity for land use change:

- Built-up areas and gardens, including buildings, roads, play areas, etc, assuming no significant change is envisaged due to functionality associated with vegetation cover and management e.g. play areas. It should be noted that there is a potential for land use change in some built-up areas, however, further analysis is required on the land cover and use of built areas
- Bare ground and sand;
- Existing broadleaved, Mixed and Yew Woodland, Coniferous Woodland, to maintain existing carbon stores, assuming no significant change is envisaged due to current high-quality habitat.; and
- Water.

5.26 Areas which may have scope for investigation of potential include:

- Acid, calcareous, and neutral grassland, with consideration for grazing and farming activities.
- Improved grasslands, with consideration for grazing and farming activities
- Arable and Horticultural, with consideration for the impacts on food production; and
- Fen, Marsh and Swamp, however more information is needed on the current work to improve existing habitats

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Chapter 6

Peatland Assessment

6.1 This chapter presents a high-level indication of peatland extent and condition in Huntingdonshire, along with current habitat types that exist on organic soils such as peat. It also summarises potential targeted measures that could be taken to reduce carbon emissions associated with degraded peatland.

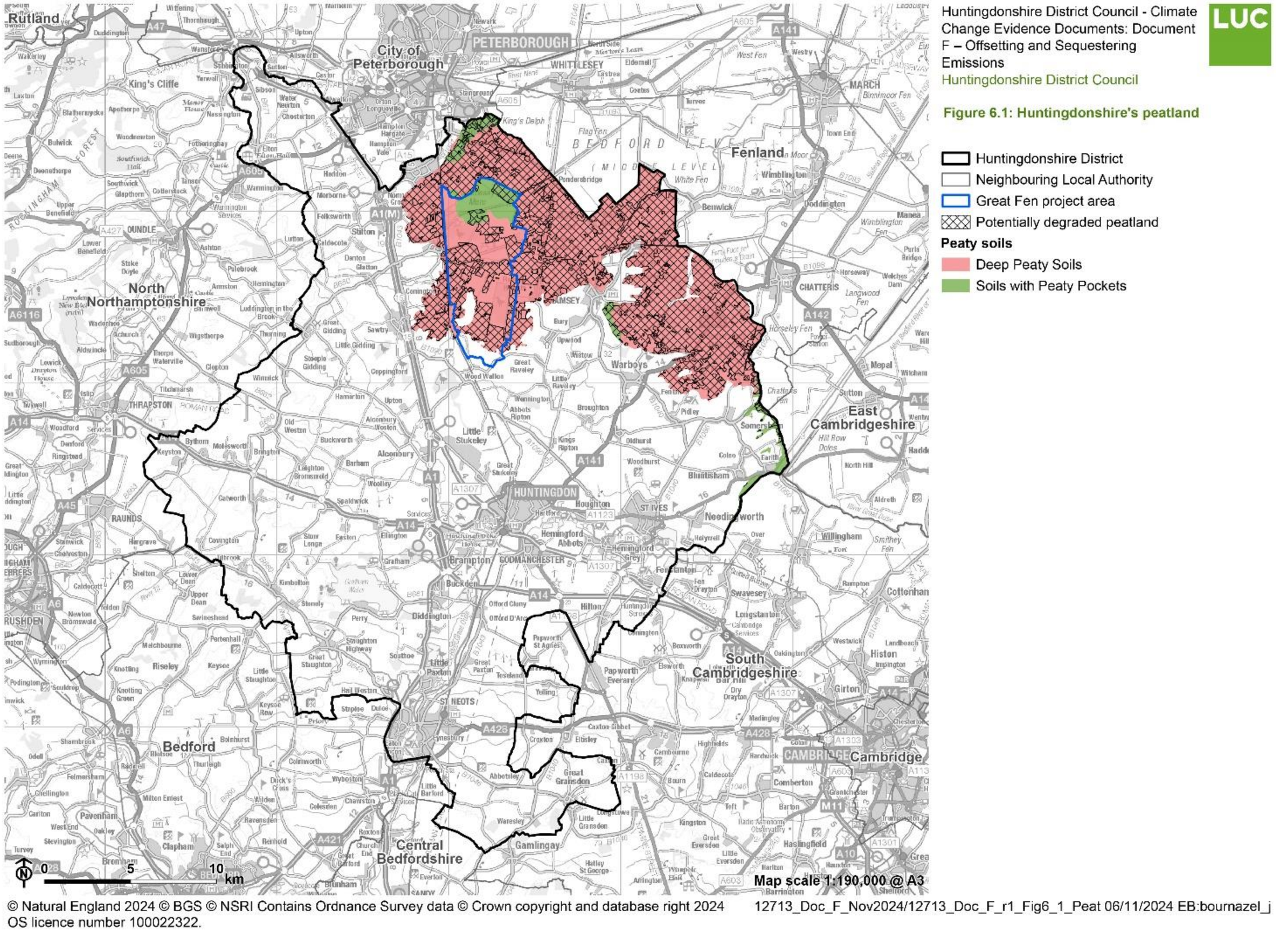
Overview

6.2 As shown in Figure 6.1, in total, 18% (16,786 ha) of Huntingdonshire is covered by peatland (areas with deep peaty soils and soils with peaty pockets) (this is a LUC calculation, further details can be found below and in Appendix G). This is concentrated in the north-east of the District.

6.3 The vast majority of Huntingdonshire's peatland (75%) is situated on arable and horticultural land, this is followed by improved grassland (9%) and then fen, marsh and swamp (7%) habitat types. As such, this assessment focuses mainly on arable and horticultural land as this represents three-quarters of Huntingdonshire's peatland.

6.4 In arable areas, ploughing, tillage and fertiliser all exacerbate peatland degradation. Subsidence and erosion and, in parts, the complete loss of peatland habitats and even peat soils are well recorded **[See reference** lxii**]**. Much of Huntingdonshire's arable land is intensively farmed for crop production, such as The Fens which are part of a larger area responsible for around a third of England's vegetable production, of which changing agricultural practices are a key determinant of the area's future character **[See reference** lxiii**]**. Huntingdonshire's peatlands are also vulnerable to the impacts of climate change through potential heating enhancing the drying processes but also from increased variability in water levels ranging from impacts of flash floods and potential sea level rises. These processes can exacerbate degradation from agriculture.

Figure 6.1: Huntingdonshire's peatland



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Analysis

6.5 This section presents a high-level assessment of peatland in Huntingdonshire. A number of assumptions were used to inform the assessment of peatland based on available literature and the carbon sequestration mapping detailed in Chapter 5 of this document.

6.6 This assessment assumes that the majority of Huntingdonshire's peatland is in poor condition, due to degradation from agricultural practices (three-quarters of peatland is on arable and horticultural land). Data sources used for estimated peatland values applied in this study are as follows:

- Natural England, 2021. Carbon Storage and Sequestration by Habitat: A review of the evidence (second edition) (NERR094) **[See reference** 64**]**.
- Thom and Doar, 2022. Quantifying the potential impact of nature-based solutions on greenhouse gas emissions from UK habitats. The Wildlife Trust. **[See reference** 65**]**

6.7 The assessment also assumes peatland depth between 75-200 cm. It should also be noted that emissions factors for agricultural land use on peat represent carbon only emissions, excluding other GHG such as nitrous oxide.

6.8 As degraded peat emits CO_2 rather than sequestering it, and under the assumption that all of the peatland on arable and horticultural land is degraded, emissions from peatland in Huntingdonshire are estimated to be about 411,000 tCO_2e/yr. This amounts to approximately 9.5 tCO_2e/ha/yr.

6.9 This represents a high level, worst-case estimate, informed by the outlined assumptions, and further evidence is needed to assess the site-specific condition of peatland. In addition, there are some projects in Huntingdonshire which have introduced forms of agricultural management of Huntingdonshire's peatlands which will reduce the amount of CO_2 emitted. A fen in near natural state (undrained) should not be emitting CO_2 but rather providing carbon sequestration benefits.

6.10 The Great Fen project involves such restoration initiatives. It is an ambitious 50–100-year habitat restoration project, which aims to restore 3,700 ha of land to wild fen, creating a large nature recovery network **[See reference** 66**] [See reference** 67**]**. Work has been ongoing within the large area of the fens in Huntingdonshire since 2002, however quantification of the percentage of the area of the Great Fen project that has been significantly restored was beyond the scope of this work. As shown in Figure 6.1, the peatland assessment indicated that about 20% (about 3400 ha) of Huntingdonshire's peatlands are within areas covered by the Great Fen project, as such it can be assumed that restoration activities are either underway or under consideration for restoration.

6.11 The majority of peatland on most of Huntingdonshire's habitat types is considered to be of poor or medium-level condition, and in poor condition for arable and horticultural land as shown in Figure 6.1. However, any peatland subject to conservation projects may be on a trajectory towards good condition. Lowland peats under intensive arable agriculture in England are probably the UK's largest land-use derived source of carbon dioxide emissions, whereas conservation managed lowland fens appear to be among the most effective carbon sinks per unit area in England and Wales. The Great Fen project area intersects with a large proportion of Huntingdonshire's peatland.

6.12 The best option for improving the condition of Huntingdonshire's peat and therefore optimising carbon sequestration and reducing losses from carbon stored in existing peatlands, is to increase the restoration and conservation of areas of peat, especially on habitat types/land uses with high CO_2 emissions such as arable and horticultural land. This could be done by increasing the area of and funding to the Great Fen project or similar restoration projects. However, farming is a large industry in Huntingdonshire, and the opportunity cost from impacts to food production on this highly productive land would need to be carefully considered (albeit it should be noted that this production is unstainable with the Climate Change Committee estimating that there is only enough peat soil left to continue farming as we do for another 20 to 50 years). Opportunities to support transitions to more sustainable forms of farming on peatland, such as paludiculture, should be explored.

6.13 A report by Natural England **[See reference** 68**]** presents a range of potential options for reducing emissions from peatlands including through:

- Raising water tables, as water is the most important factor determining the existence of peatlands, rewetting is most often the solution for restoration **[See reference** 69**]**. The importance of water level management was also highlighted by the Lowland Agricultural Peat Task Force.
- Stopping burning, as evidence indicates that burning practices result in damage to peat soils, peatland species, and wider peatland habitats and ecosystem functions **[See reference** 70**]**; and
- Preventing planting on peatlands as new forest planting on peatland is not supported **[See reference** 71**]**.
- Removing commercially planted trees from peatland areas
- Integrating nature-based solutions (NbS) for climate into landscapes which are primarily devoted to agriculture or production forestry, taking land out of agriculture, particularly for peatland restoration **[See reference** 72**]**.

6.14 The feasibility of these options in Huntingdonshire would need to be explored further with landowners and land managers. Defra’s lowland agricultural peat policy team have several ongoing partnership projects exploring paludiculture, socioeconomics and wider research and development including in Cambridgeshire and Lincolnshire; HDC might consider exploring opportunities for pilot projects in Huntingdonshire with Defra.

Chapter 7

Conclusion

7.1 Huntingdonshire faces significant challenges from climate change. Its people, built environment, natural assets and wildlife already feel the effects and more dramatic changes are likely to come. In 2023, councillors formally recognised a Climate Crisis and Ecological emergency in Huntingdonshire, with a commitment of net zero carbon council by 2040 **[See reference 73]**.

7.2 To aid in achieving this goal, carbon can be “locked up” via a variety of methods including by biological processes in a variety of land use types and habitats such as woodlands and peatlands. Carbon offsetting can also be used to help compensate for Huntingdonshire’s residual carbon emissions.

7.3 This document has provided both recommendations on a potential offsetting strategy in the local plan and beyond and methods of further carbon sequestration in the borough and peatland condition. The key conclusions of this report are presented below.

Operation of an offsetting scheme in Huntingdonshire

7.4 It is advised that HDC should set a carbon offset pricing structure that accounts for project costs and market demand while incorporating the environmental and social co-benefits of projects, such as biodiversity and community engagement. Stakeholder input and alignment with guidance from the Green Book and UK GBC are crucial, though raising prices above the Green Book’s standard pricing recommendations may help achieve net-zero goals by 2050. A hybrid funding strategy is advised, combining local and regional initiatives to balance community engagement with larger carbon reduction impacts.

7.5 Partnering with other authorities or bringing in external expertise could help address gaps in HDC’s in-house resources needed to manage a carbon offset fund, which includes setting carbon prices, selecting projects, and monitoring their effectiveness.

7.6 HDC should develop a clear planning policy that specifies when offsetting will be allowed, how payments will be secured, and which projects will receive funding. Establishing a carbon offset fund with proper governance and ring-fenced funding for carbon reduction projects is essential, as is setting an appropriate carbon price, ideally based on nationally recognised standards. The council should also identify eligible projects, define selection criteria, and set up robust monitoring and reporting processes to ensure effective use of funds and successful project delivery.

7.7 HDC is advised to prioritise offsetting projects that provide immediate, measurable carbon reductions, particularly energy efficiency improvements and afforestation, as these are proven, readily implementable methods. Projects delivering behaviour change and education programmes, while beneficial, lack immediate and tangible impact, so HDC should approach these cautiously. Peatland restoration, relevant to the local landscape, could also be supported as an offset project. Following the GLA's framework, HDC should focus on projects that reduce energy demand in existing buildings as a primary priority. Additionally, while carbon reduction remains the main objective, co-benefits may also be considered in project selection, aligning with local strategic priorities. Any co-benefit consideration should be transparent.

Carbon sequestration and natural capital in Huntingdonshire

7.8 Huntingdonshire District Council can utilise natural capital to aid in reaching net zero by recognising the essential role nature plays in supporting society and mitigating climate change. Nature-based solutions in Huntingdonshire, such as those which protect, manage, and restore natural ecosystems, provide effective responses to these challenges. Cost-effective conservation can also mitigate climate risks and prevent larger losses. Strategic natural capital initiatives in the area could include peatland restoration, managing river flood risks and water quality, enhancing woodlands, and improving agricultural land.

7.9 Arable and horticultural habitats cover the most land in Huntingdonshire covering 61.4% (56,018 ha) of the administrative area and store the highest amount of carbon. However, they are also significant carbon emitters, with a sequestration rate of 16,806 tCO2/yr, primarily due to agricultural activities that disturb the soil. Sustainable land management is therefore critical for Huntingdonshire’s net zero goals.

7.10 In contrast, habitats like broadleaved, mixed woodlands, and various grasslands both sequester and store substantial carbon, at 25,714.5 tCO2/yr, making up 71% of carbon sequestration of all positive carbon sequestering habitat types in Huntingdonshire, highlighting the need to protect and enhance them. Low carbon-sequestering areas, such as bare ground and urban spaces, should be prioritised for nature-based solutions to boost carbon capture, including potential conversion to high-carbon habitats like woodlands.

7.11 This study also assessed carbon sequestration potential through land use changes, focusing on converting grasslands to mixed woodlands, as this has the highest potential for carbon sequestration. In a high-range scenario (10% land conversion), converting grasslands to a broadleaf woodland mix could increase sequestration by 5.5%, or 4.5% with a conifer-dominant mix. A lower range (5% conversion) would result in increases of 3.7% and 3.3% for broadleaf and conifer mixes, respectively. However, habitat conversions such as those outlined above should be taken with great consideration of the environmental and social context of each site.

7.12 To increase carbon sequestration and storage in Huntingdonshire, HDC should focus on protecting habitats with high carbon capture potential, particularly high-quality natural areas like broadleaved and mixed woodlands, various grasslands, and peatlands. Improving management practices to reduce emissions from carbon stores is also recommended, with an emphasis on sustainable methods that respect the biodiversity, social, and economic value of the land.

7.13 The most significant sources of emissions are agricultural land, intensively managed grassland, heathland, and peat soils. Management changes, such as adopting low-emission farming practices like paludiculture on peat soils, can help. Converting low-carbon habitats, such as certain grasslands and agricultural areas, to high-carbon habitats like woodlands could further enhance sequestration, provided existing land use values are considered. Areas with potential for sequestration improvement include certain grasslands, arable land, and marsh habitats, though further analysis may be required to assess viability and impact.

Huntingdonshire's peatland

7.14 Peatlands cover 18% of Huntingdonshire, with 75% of these areas on arable and horticultural land, which are typically degraded due to intensive agriculture and emit an estimated 411,000 tCO2e annually. Restoration efforts, such as the Great Fen project, which covers around 20% of Huntingdonshire's peatlands, aim to reverse these emissions by returning peat to a healthier, carbon-sequestering state. Conservation-managed peatlands, particularly undrained fens, serve as highly effective carbon sinks, while agricultural peatlands are major emission sources.

7.15 The best option for improving the condition of Huntingdonshire's peat and therefore optimising carbon sequestration and reducing losses from carbon stored in existing peatlands, is to increase the restoration and conservation of areas of peat, especially on habitat types/land uses with high CO_2 emissions such as arable and horticultural land. This could be done by increasing the area of and funding to the Great Fen project or similar restoration projects. However, farming is a large industry in Huntingdonshire, and the opportunity cost from impacts to food production on this highly productive land would need to be carefully considered (albeit it should be noted that this production is unstainable with the Climate Change Committee estimating that there is only enough peat soil left to continue farming as we do for another 20 to 50 years). Opportunities to support transitions to more sustainable forms of farming on peatland, such as paludiculture, should be explored. The feasibility of specific peatland conservation and restoration actions options in Huntingdonshire would need to be explored further with landowners and land managers. Defra's lowland agricultural peat policy team have several ongoing partnership projects exploring paludiculture, socioeconomics and wider research and development including in Cambridgeshire and Lincolnshire; HDC might consider exploring opportunities for pilot projects in Huntingdonshire with Defra.

Appendix A

Examples of Offsetting Schemes

A.1 Below are some examples of how different Local Planning Authorities have conducted their own offsetting schemes.

Greater London Authority (GLA)

A.2 The most well-established carbon offsetting approach through planning is that used by the GLA in London. This has secured over £90 million for carbon offsetting since October 2016.

A.3 The London Plan requires LPAs to:

1. Set up a carbon offset fund to collect carbon offset payments from developers to meet any carbon shortfall from new development and ring fence these funds to secure delivery of carbon savings within the relevant LPA;

2. Set a price for carbon, i.e. price per annual tonne of carbon, that developers pay to make up any shortfall in on-site carbon savings, securing contributions through Section 106 agreements;

3. Identify a suitable range of projects that can be funded through the carbon offsetting fund; and

4. Put in place suitable monitoring procedures to enable reporting to the GLA.

Identifying projects to fund

A.4 Offsetting projects should deliver tangible carbon savings. The GLA's 2020 offsetting report indicates that projects on LPAs' corporate estates and in schools were the most popular and mainly included energy efficiency improvements and renewable energy installations e.g. solar PV panels.

A.5 Typical types of projects funded through carbon offsetting include:

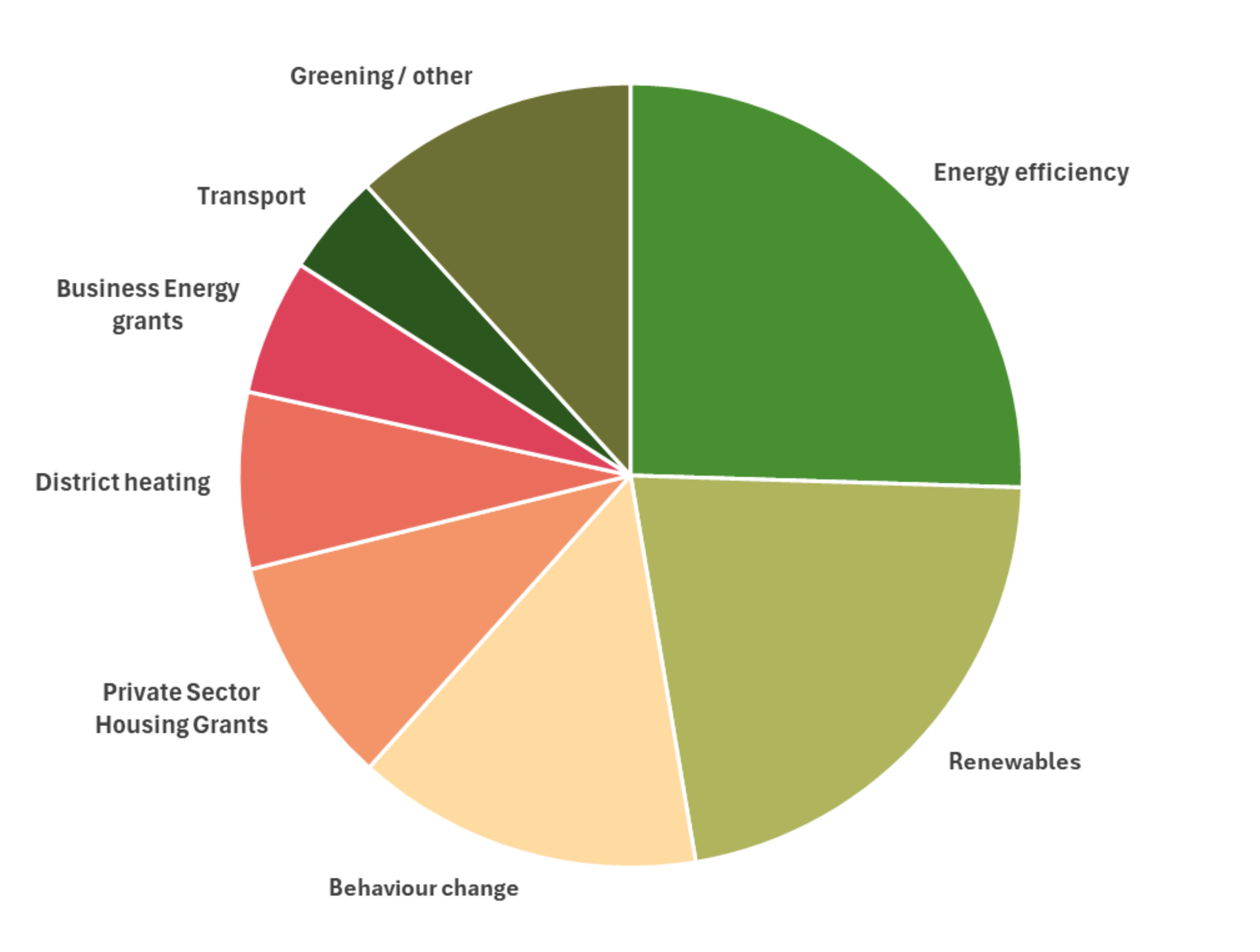
- Energy efficiency retrofitting projects and fuel poverty alleviation projects;
- Renewable energy projects;
- Heat decarbonisation projects and district heating; and
- Vehicle electrification.

A.6 In line with the widely used energy hierarchy, the GLA states that reducing energy demand is the first and often most cost-effective approach to decarbonise buildings, which is why they recommend that LPAs prioritise energy efficiency measures such as improvements to building fabric and upgrading to more energy efficient services. To maximise the impacts of these types of projects, particularly for more costly measures, LPAs are encouraged to combine offset funds with other sources of funding.

A.7 The primary focus for offset funds is to achieve carbon savings but, where possible, projects should maximise co-benefits, i.e. wider environmental, social and economic benefits that align with an LPA's strategic priorities identified in climate change plans/strategies and Local Plans (e.g. reducing energy bills of deprived communities).

A.8 The chart below shows the main project types targeted for offset projects in London (as of 2022).

Figure A.1: Main offset project types funded in London (as of 2022) [See reference **74**]



Hard versus soft measures

A.9 The GLA encourages LPAs to prioritise spending on ‘hard’ measures, i.e. those that deliver a tangible physical asset with transparent and predictable carbon savings.

A.10 However, LPAs can also spend offset fund payments on ‘softer’ measures such as behaviour change campaigns. LPAs are advised to set stricter information and performance requirements for softer measures. For example, the GLA recommends that LPAs make it a requirement that all behaviour change projects set out an engagement strategy and monitoring plan in advance of receiving funding; and suggest that carbon savings should be adjusted to reflect the uncertainty over what outcomes will actually be delivered.

A.11 Clearly there is greater risk associated with the performance of softer measures and HDC would need to bear this in mind when selecting projects to fund, considering the latest research on specific measures where relevant.

Setting up the fund including setting the price

A.12 The GLA guidance states that LPAs should either establish a dedicated carbon offset fund or administer the funds through their Section 106 processes. In either case the funds should be ring-fenced for the sole purpose of delivering carbon reduction projects.

A.13 LPAs are directed to develop and publish a price for offsetting carbon based on either: a nationally recognised carbon pricing mechanism, or the cost of offsetting carbon emissions across the LPA (based on an assessment of feasible carbon offsetting measures, their anticipated carbon savings and costs). The price set should not put an unreasonable burden on development and should be tested through a viability study.

A.14 In the latest guidance, the GLA's recommended price for offsetting carbon is £95 per tonne (previous to the new London Plan it was £60 per tonne). Bristol also uses the same carbon offset price. This price was tested as part of the viability assessment of the London Plan 2020 and was informed by a GLA commissioned study undertaken by AECOM **[See reference 75]**. Many London boroughs use this price, but some have commissioned their own research to set a bespoke price (e.g. Lewisham charges £104 per tonne) and Islington takes a different approach that factors in unregulated emissions as well as regulated emissions. The AECOM report outlines that the price's origin is the government's central non-traded price of carbon in 2013. The projections from which the £60 per tonne is drawn consist of low, central and high annual carbon prices up to the year 2100. AECOM also reviewed the carbon prices set by

Boroughs who had adopted a price independent of the £60/tCO_2 guidance, as a guide for their own recommendations.

A.15 The GLA indicates that the overall funding contribution should be calculated over 30 years (the assumed lifetime of the development's services). For example, using the GLA's recommended price equates to £95 x 30 years = £2,850 per tonne of carbon to be offset.

Assessing a project's eligibility

A.16 The core purpose of a project funded by carbon offset funds should be to deliver carbon savings. LPAs tend to require that projects be delivered within their administrative area. When selecting offsetting projects to fund, LPAs should also consider defining eligibility and marking criteria including in relation to:

- The carbon cost effectiveness of the project (i.e. £ per tonne of carbon saved). There are a range of existing methods/tools for estimating how much carbon different projects will save **[See reference 76]**. LPAs may want to set an upper limited on the cost per tonne of carbon saved.
- Whether the project offers additionality i.e. will it result in carbon savings that would not have been delivered without the offset funding? As the GLA admits, this can be challenging! For example, would a domestic insultation project have happened anyway without the offset funding. HDC would need to decide how they would determine this and how strict they wished to be.
- What co-benefits the project offers.
- The deliverability of the project, over what timescales and with what monitoring (a proportionate approach is recommended to establishing monitoring requirements, with larger and more expensive projects required to provide more detailed reporting).

A.17 It is important to note that the GLA does NOT require a strict 1:1 ratio (i.e. the cost of the offset measure to save one tonne of carbon compared to the offset price per one tonne of carbon). Such a ratio would, they suggest, only allow simple retrofitting measures to be implemented and would leave more complex and costly measures without funding. Thus, they support a more flexible approach, including setting a carbon cost effectiveness cap (i.e. max price per tonne of carbon) as much as 3-5 times higher than the carbon offset price to give maximum flexibility.

A.18 Some LPAs have set up panels to review bids for funding and advise which projects are proposed to receive funding based on defined project criteria.

How to find suitable projects

A.19 Most LPAs in London have tended to focus on identifying projects within their own estate, including social housing (presumably using a combination of in-house expertise and external advice).

A.20 The GLA reports that setting up an application process for individuals, community groups and businesses to apply for offset funding has worked well in multiple LPAs, making projects more visible whilst reducing the demands on LPAs to source projects. For example, Camden Council set up the Camden Climate Fund which is financed from carbon offset payments. There are three separate grants available for households, businesses and community groups to install renewable energy systems and make energy efficiency improvements. The application process should be made as simple as possible for residents, communities and businesses, with clear assessment criteria.

Reporting/transparency

A.21 The GLA reports annually on the overall progress of London’s carbon offset funds and we would suggest that HDC do similar to ensure transparency.

Following the GLA model, this could be done by providing information on the following:

- Amount of carbon offset fund payments committed;
- Amount of carbon offset fund payments collected;
- Amount of carbon offset fund payments spent;
- The type of projects being funded, associated co-benefits and cost per tCO_2 saved; and
- The carbon offset price being used.

A.22 The specific questions asked in the GLA's annual survey are included in an appendix to their Carbon Offset Funds report **[See reference 77]**.

Westminster

A.23 The City of Westminster has created guidance on a carbon offset fund to ensure funding is secured from any new developments which are unable to fully achieve the carbon savings required at the development site. The guidance sets out similar principles to the GLA guidance, however it sets out essential and desirable criteria as well as a list of priority projects. The priority projects are divided by theme: public sector buildings and assets, commercial buildings, sustainable travel and transport, knowledge and learning, low carbon energy and homes and communities. HDC could utilise a similar approach as a guide for those that would like to apply for funding.

A.24 Local assessment carried out in 2013/14. Price derived from an assessment of the cost of delivering a range of carbon saving measures in the Borough which are costly due to large number of heritage buildings and designations making energy efficiency measures more expensive.

A.25 Cash in lieu payments for carbon offset are only accepted in Westminster where developments have clearly demonstrated to the City Council, with submitted evidence, that it is not technically or financially possible to achieve the necessary emissions reductions on site.

A.26 Where a carbon offset payment has been agreed, the level of financial contribution is calculated at the planning determination stage, in accordance with the below formula. All carbon offset payments are secured by legal agreement and collected upon commencement of the development scheme, unless otherwise agreed in writing.

A.27 Carbon offset formula use by Westminster City Council – Carbon offset contribution = carbon gap (residual tonnes of carbon) x price of carbon (£) x 30 years.

A.28 Westminster City Council's current carbon offset price is £2,850 per tonne of carbon. This is calculated at a rate of £95 per tonne of carbon over a 30-year period (the assumed lifetime of the development's services), in accordance with current GLA guidance.

A.29 Westminster reserves the right to review and update the local cost of carbon where evidence indicates that an alternative price will better reflect the local cost of offsetting **[See reference** 78**]**.

Milton Keynes

A.30 The Milton Keynes Carbon Offset Fund (administered by the National Energy Foundation) was launched by Milton Keynes Council back in 2008. It applies to all residential developments of 11 or more dwellings and non-residential developments with a floor space of 1,000 sqm or more. Requirements are set out in a Sustainable Construction SPD **[See reference** 79**]**. The scheme has helped over 8,000 households in Milton Keynes to receive measures such as free energy efficient light bulbs, and subsidised loft and cavity wall insulation.

Bristol

A.31 Bristol has also set out an approach to carbon offsetting in their Local Plan Review Draft Policies and Development Allocations (2019). The approach is broadly in line with the GLA's, focusing on reducing carbon emissions on site first and then allowing offsetting of residual emissions via a payment (same carbon cost of £95 per tonne of CO_2 calculated over 30 years) towards "renewable energy, low-carbon energy and energy efficiency schemes elsewhere in the Bristol area" or via agreeing "acceptable directly linked or near-site provision".

Southampton

A.32 Southampton City Council has implemented carbon offsetting since 2012. In 2015 the approach was amended to apply only to new developments of over 10 dwellings or 1,000 sqm. The Southampton Carbon Offset Fund offsets one year of emissions rather than the lifetime of the development, at a cost of £210/tCO_2.

Greater Manchester

A.33 Greater Manchester is also considering establishing carbon offsetting. A detailed evidence base report was produced for the Greater Manchester Combined Authority in 2020. It proposed setting a carbon price of £113 or £118 per tonne but questions whether a higher price might be needed to achieve Greater Manchester's target of net zero emissions by 2038.

Central Lincolnshire

A.34 Central Lincolnshire has a similar planning context to Huntingdonshire. It's approach to carbon offsetting, as outlined in its Local Plan **[See reference** 80**]**, focuses on achieving net zero emissions by encouraging development practices that reduce carbon footprints, particularly through building design, renewable energy sources, and improved energy efficiency. It emphasises integrating low-carbon technologies and enhancing green spaces to naturally offset emissions. Policies relating to carbon offsetting also encourage tree planting, habitat creation, and community-based projects to absorb emissions locally.

A.35 The Central Lincolnshire Local Plan evidence base report for carbon offsetting **[See reference** 81**]** set out regarding pricing, that there is feasibility challenge likely to be due to limited potential PV generation on-site. Therefore, rather than a price based on the non-traded cost of carbon, the offset price could be based on the cost of delivering PVs off-site. The cost could be related to carbon or just annual energy generation. They recommended a price, expressed as a renewable energy offset, of £1.5/kWh as the price would be independent from carbon factor changes. The report also recommends S106 as the mechanism of choice for a method of funds collection.

7.16 Expanding projects like the Great Fen could improve peatland condition and enhance carbon storage, though this needs to be balanced against the impacts on local agriculture, which is currently unsustainable according to climate experts. Options to support carbon-friendly farming practices, such as paludiculture, should be considered. Other recommended measures include rewetting peatlands, stopping burning practices, removing commercial forestry, and incorporating nature-based solutions within agricultural areas. Further feasibility analysis and stakeholder engagement would be necessary to implement these measures effectively in Huntingdonshire, potentially with support from ongoing Defra pilot projects.

Appendix B

Carbon Values for Different Habitats

B.1 The list below summarises the values used for carbon storage, sequestration and operational emissions for different types of habitats. It also includes notes on how all factors were derived, including key references.

B.2 In this list, vegetation carbon storage refers to the amount of carbon stored in the vegetation of a habitat, expressed in tonnes of carbon (tC/ha), whereas soil carbon storage is the amount of carbon stored in the soils of a habitat, both are measured in tonnes of carbon per hectare, expressed in tonnes of carbon per hectare (tC/ha).

B.3 '-' symbols represent carbon emission storage/sequestration, while '+' represents emissions. Therefore, greater sequestration/storage rates will have negative values per habitat. This is to align with existing literature.

Table B.1: Carbon values for habitat types in Huntingdonshire

Living England Phase 4 Habitat Type	Habitats	Carbon Sequestration (tCO_2e/ha/yr)	Vegetation Carbon Storage (tC/ha)	Soil Carbon Storage (tC/ha)	Notes
Acid, Calcareous, Neutral Grassland	Acid grassland (undegraded)	-0.397	-3.1	-87	Carbon Sequestration value as reported in Christie et al (2011) **[See reference** 82**]**; Vegetation Carbon value from Cantarello et al (2011) **[See reference** 83**]**; Soil Carbon value as reported in Natural England (2021)**[See reference** 84**]** (Emmett et al (2010) **[See reference** 85**]**
Arable and Horticultural	Cereal crops	0.3	0	-64	Carbon Sequestration value as reported in Muhamed and others (2018) as reported in Gregg et al (2021) **[See reference** 86**]**
Bare Ground	Ruderal/ephemeral	-2	-2	-77	Carbon Sequestration value as reported in LUC Derived Value; Vegetation and Soil Carbon: Reported in Natural England (2021); (Hagon et al (2013) **[See reference** 87**]**
Bare Sand	Bare ground	0	0	0	Values assumed to be negligible

Appendix B Carbon Values for Different Habitats

Living England Phase 4 Habitat Type	Habitats	Carbon Sequestration ($tCO_2e/ha/yr$)	Vegetation Carbon Storage (tC/ha)	Soil Carbon Storage (tC/ha)	Notes
Broadleaved, Mixed and Yew Woodland	Broadleaves light management	-5.7	-203	-151	Forest Research (2022) (2012) and Natural England (2021) Soil depth 100 cm
Built-up Areas and Gardens	Developed land, sealed surface	0	0	0	Values assumed to be negligible
Coniferous Woodland	Production pine	-6.2	-100	-234	Forest Research (2022) (2012) **[See reference** 88**]** and Natural England (2021) Soil depth 100 cm
Fen, Marsh and Swamp	Mire and swamp	-0.7	-8	-143	Carbon Sequestration value as reported in Christie et al (2011); Vegetation Carbon: Cantarello et al (2011); Soil Carbon: Cantarello et al (2011)
Improved Grassland	Improved grassland	-0.36	0	-130	As reported in Natural England (2021) Carbon storage and sequestration by habitat: a review of the evidence
Unclassified	Unclassified	0	0	0	Values assumed to be negligible
Water	Standing/running water (unspecified)	0	0	0	Values assumed to be negligible

Appendix C

Baseline Carbon Calculations

C.1 The methodology for the carbon sequestration mapping consisted of two main stages, the identification of baseline carbon sequestration potential in Huntingdonshire, and the potential habitat change for carbon sequestration purposes. The potential for habitat change for carbon sequestration is considered in the subsequent appendix. The methodology for deriving the potential baseline carbon sequestration in the district is described below:

- Literature review to identify carbon sequestration values of different habitats;
- GIS data cleaning and organisation;
- Assigning carbon sequestration values to habitats; and
- Baseline carbon sequestration potential calculations.

Literature review

C.2 Research indicates that carbon sequestration and storage differ between habitat types, reflecting characteristics such as soil conditions climate, latitude, and altitude. Habitat age and condition also have a significant effect on the rate of carbon sequestration and storage. It is critical, therefore, to adopt sequestration rates that are appropriate to Huntingdonshire and its existing habitats.

C.3 A range of literature formed the bases of the review to identify sequestration values applied to habitat types.

C.4 Technical advice published by SNH (now NatureScot) **[See reference** 89**]** provides a useful starting point and references a 2011 UK-based literature review **[See reference** 90**]** which compared measurements of carbon storage within eleven different habitat types recorded in the scientific literature. The study also referred to work in Wales which ranked habitats by their importance for carbon storage in soils, vegetation and combined, and research at city scale which confirmed that urban habitats and soils can store significant amounts of carbon.

C.5 Natural England **[See reference** 91**]** has also published research drawing together data on carbon storage by habitat type and, where relevant, soil type. The Natural England research also highlights some useful management considerations, including the suggestion that the transition from one habitat to another (e.g. to improve sequestration) should be undertaken steadily rather than suddenly, and soil disturbance should be kept to a minimum.

C.6 A second edition of the Natural England study **[See reference** 92**]** has also been published which collated more information on sequestration and storage values from a wide range of relevant literature, providing further guidance for the UK context.

C.7 The initial review of existing literature resulted in the selection of a hybrid approach based on a number of literature sources and bringing together habitat types and carbon sequestration value. There is some variation in the evidence on the rates on sequestration, especially from urban spaces, which can be attributed to the lack of information from the carbon inputs from mowing and management which are typically not taken into account in the calculations.

GIS data cleaning and organisation

C.8 The study is a data led study involving the Natural England's Living England Phase 4 Habitat Type data, which delivers satellite-derived national habitat layers using a machine learning approach to image classification, to provide an overview of the habitat classification in Huntingdonshire.

C.9 An overview of the habitat types is presented in Appendix B, above.

Assigning carbon sequestration values

C.10 Appendix B presents the Phase 4 Habitat Types in Huntingdonshire along with the assigned carbon sequestration and storage values as well as the sources of values assigned.

C.11 Values were assigned reflecting literature source variations in value from negative to positive values, and minimal positive contribution where this was indicated. Note that carbon sequestration value does not include inputs to maintenance through mowing, etc.

C.12 Some of the assumptions made include:

- For water habitat types it was assumed there is no vegetation cover
- For bare ground and bare sand, it was assumed there is no vegetation cover

Baseline carbon calculations

C.13 The assigned sequestration and storage values were multiplied by the total unit areas for each habitat type to derive the sequestration and storage values.

C.14 The baseline assessment was used in the later stages of the study to identify opportunities to increase carbon sequestration by highlighting those habitats that currently have a low carbon sequestration rate and low carbon storage.

C.15 The tables below summarise the results of the baseline carbon calculations at a high level by category of habitat site.

C.16 In these tables, vegetation carbon storage refers to the amount of carbon stored in the vegetation of a habitat, whereas soil carbon storage is the amount of carbon stored in the soils of a habitat, both are measured in tonnes of carbon per hectare.

C.17 It is important to note that negative '-' values represent the removal of carbon from the atmosphere (carbon sequestration and storage), while '+' represents emissions. Therefore, greater sequestration/storage rates will have negative values per habitat. This is to align with existing literature.

Table C.1: Carbon baseline by habitat type

Living England Phase 4 Habitat Type	Total Area (ha)	Carbon Sequestration ($t/CO_2e/yr$)	Vegetation Carbon Storage (tC)	Soil Carbon Storage (tC)	Vegetation + Soil Carbon Storage (tC)
Acid, Calcareous, Neutral Grassland	15,304.5	-6,075.89	-47,443.95	-1,331,491.5	-1,378,935.45
Arable and Horticultural	56,018.4	16,805.52	0	-3,585,177.6	-3,585,177.6
Bare Ground	15.53	-31.06	-31.06	-1,195.81	-1,226.87
Bare Sand	2,631.06	0	0	0	0
Broadleaved, Mixed and Yew Woodland	4,511.31	-25,714.47	-915,795.93	-681,207.81	-1,597,003.74
Built-up Areas and Gardens	3,789.66	0	0	0	0
Coniferous Woodland	206.10	-1,277.81	-20,609.9	-48,227.17	-68,837.07
Fen, Marsh and Swamp	1,187.84	-831.488	-9,502.72	-169,861.12	-179,363.84
Improved Grassland	5,697.61	-2,051.14	0	-740,689.3	-740,689.3
Unclassified	277.93	0	0	0	0
Water	1,605.19	0	0	0	0

Appendix D

Habitat Conversion Calculations

D.1 Of all the natural habitats trees and woodlands offer the highest rates for sequestering carbon dioxide from the atmosphere. For this reason, woodland creation has been the key focus. An assessment of peatlands in Huntingdonshire is considered separately in the peatland assessment in Chapter 6.

D.2 The methodology for deriving the options for increasing carbon sequestration in the district is described below, following the baseline calculations described above:

- Assigning carbon sequestration values to habitats from the literature review in Appendix C
- Identifying habitats suitable for land use change with higher carbon sequestration values, while recognising potential constraints.
- Identifying options for change.

7.17 This is described further in Appendix E.

Options for land use change

D.3 Options for potential carbon sequestration were based key land use change options against two scenarios – scenario 1 (high range for habitats most suitable for change) and scenario 2 (low range for habitats most suitable for change).

D.4 The options considered for scenario 1 include:

- Option 1.1 – Land use change to conifer mix woodland (75% broadleaf, 15% conifer, 10% open space); and
- Option 1.2 – Land use change to broadleaf mix woodland (75% conifer,15% broadleaved, 10% open ground).

D.5 While the options considered for scenario 2 include:

- Option 2.1 – Land use change to conifer mix woodland (75% broadleaf, 15% conifer, 10% open space); and
- Option 2.2 – Land use change to broadleaf mix woodland (75% conifer,15% broadleaved, 10% open ground).

D.6 '-' symbols represent carbon emission storage/sequestration, while '+' represents emissions. Therefore, greater sequestration/storage rates will have negative values per habitat. This is to align with existing literature.

Table D.1: Habitat conversion calculations – Scenario 1 (conversion of 10% of non-peaty improved and acid grassland)

Calculations	Scenario 1.1 (conversion of 10% of non-peat grassland to conifer mix)	Scenario 1.2 (conversion of 10% of non-peat grassland to broadleaved mix)
Area covered in Scenario 1 (ha) (area equivalent to 10% of non-peaty acid and improved grassland in Huntingdonshire)	1,852.19	1,852.19
Total carbon sequestration rate of the area after habitat conversion (t/CO_2e/yr)	14,641.57	10,529.70
Difference in carbon sequestration of the converted habitat area compared to baseline grassland cover (t/CO_2e/yr)	22,768.59	18,656.73

Calculations	Scenario 1.1 (conversion of 10% of non-peat grassland to conifer mix)	Scenario 1.2 (conversion of 10% of non-peat grassland to broadleaved mix)
Percentage change in carbon sequestration of the converted habitat area compared to baseline grassland cover	-5.48%	-4.50%

Table D.2: Habitat conversion calculations - Scenario 2 (conversion of 5% of non-peaty improved and acid grassland)

Calculations	Scenario 2.1 (conversion of 5% of non-peat grassland to conifer mix)	Scenario 2.2 (conversion of 5% of non-peat grassland to broadleaved mix)
Area covered in Scenario 2 (ha) (area equivalent to 5% of non-peaty acid and improved grassland in Huntingdonshire)	926.10	926.10
Total carbon sequestration rate of the area after habitat conversion (t/CO_2e/yr)	7,320.78	5,264.85
Difference in carbon sequestration of the converted habitats area compared to baseline grassland cover (t/CO_2e/yr)	15,447.81	13,391.88
Percentage change in carbon sequestration of the converted habitat area compared to baseline grassland cover	-3.74%	-3.25%

Appendix E

Methodology for Carbon Sequestration Mapping

Data and information gathering

E.1 To provide estimates for the baseline and the potential carbon storage and sequestration potential for Huntingdonshire, a complete habitat dataset for all relevant sites was needed. It was concluded that the habitat dataset should be based upon the Natural England's Living England Phase 4 Habitat Type data, which delivers satellite-derived national habitat layers using a machine learning approach to image classification.

E.2 The next task involved collating carbon sequestration and storage values from relevant and up to date literature to support baseline and potential carbon calculations, these are set out in Appendix B.

Carbon sequestration and storage values

E.3 Carbon sequestration and storage values vary considerably within given habitat types, reflecting characteristics such as soil conditions, climate, habitat age and condition. It was therefore important to adopt values that were appropriate to Huntingdonshire's habitats based on the best available data.

E.4 We reviewed the latest literature on carbon sequestration and storage values to assemble a set of values relevant to habitats in Huntingdonshire, as discussed in Appendix C. Where data was not available or habitats were specific to Huntingdonshire, we derived our own values using a combination of professional judgement and reference values sourced from the academic literature. Fully referenced carbon sequestration values can be found in Appendix B.

E.5 The sources used in this process were chosen based on two important criteria:

- Are they the latest values and knowledge from the scientific and grey literature?
- Are they values that are most relevant to the habitats found in Huntingdonshire?

E.6 We constantly undertook horizon scanning throughout the duration of the study, ensuring that any new values were integrated into our analysis.

E.7 Appendix B sets out a fully referenced suite of carbon sequestration and storage factors. These factors informed our baseline analysis and calculations, alongside the habitat conversion opportunities that will allow HDC to offset its residual carbon footprint.

E.8 Due to the inherent differences in estimated habitats compared to real habitats, together with the uncertainties in estimating carbon dynamics for a wide range of habitats, the values given in Appendix B are indicative only and offer the best representation of the likely carbon dynamics of the habitats found in Huntingdonshire.

Data processing

E.9 Each Living England Phase 4 Habitat Type was matched with the most relevant carbon sequestration and storage values that had been found. This enabled the calculation of the amount of carbon sequestered and stored in each of Huntingdonshire's habitat types. A full table of the baseline carbon sequestration and storage of different habitat types in Huntingdonshire can be found in Appendix C. The Living England Phase 4 Habitat Types in Huntingdonshire and the matched habitats with carbon sequestration/storage values are set out below:

- Acid grassland (undegraded): Assigned to areas classed as Acid, Calcareous, Neutral Grassland, under the assumption that areas have not been significantly damaged or altered by human activities such as overgrazing, and development, therefore maintaining its ecological integrity.
- Cereal crops: Assigned only to areas classed as ‘Arable and Horticultural’. Due to lack of information on farm types, it was assumed all arable and horticultural areas were active agricultural land. Bare Ground – Ruderal/ephemeral.
- Bare ground: Assigned to ‘Bare Sand’ areas due to the geographical location of Huntingdonshire making the context and characteristic different from coastal sand dunes.
- Broadleaves light management: Assigned to areas classed as ‘Broadleaved, Mixed and Yew Woodland’ due to lack of information on the mix, age, and management practices of these areas.
- Developed land, sealed surface: Assigned to ‘Built-up Areas and Gardens’ assuming a significant portion of the areas are covered by non-permeable materials, such as concrete or asphalt, due to lack of information. This includes including most of manmade surfaces (e.g. buildings, structures, roads, railway, hardstanding, steps, masonry, weir, manmade tracks and paths, etc).
- Production pine: Assigned to areas classed as ‘Coniferous Woodland’, assumed due to lack of information on the age/type/management of the different coniferous woodlands.
- Mire and swamp: Assigned as ‘Fen, Marsh and Swamp’ areas as a general classification for wetlands due to a lack of information on the habitat breakdown.
- Improved Grassland: Assigned to areas classed as ‘Improved grassland’ as a direct comparison, assuming surfaces will be managed to an extent.

- Unclassified: Assigned as ‘Unclassified’ due to lack of information on sites and their characteristics.
- Standing/running water (unspecified): Assigned to areas classed as ‘Water’ due to lack of information on the properties and nature of the habitat.

Suitable habitats for land use change for increasing carbon sequestration

E.10 This assessment applied a high-level criteria-based approach to identifying suitable habitats for land use change for increasing carbon sequestration in the district. The criteria considered include:

- Is the habitat a woodland or woodland component? Where no additional woodland creation activities would be performed on existing woodlands to increase sequestration rates in the district.
- Is the habitat an area of wetland or peatland? Where planting on peatland is not supported.
- Will land use change result in significant change to functionality including functionality associated with vegetation cover and management such as with built up areas?
- Is the habitat a designated area? Under the assumption that designated areas should be retained and enhanced for their qualifying features
- Is the habitat a low carbon sequestering habitat using the information in the baseline assessment?

E.11 Following the criteria, it was determined that the following habitat types had very limited opportunity for land use change:

- Built-up areas and gardens, including buildings, roads, play areas, etc, assuming no significant change is envisaged due to functionality associated with vegetation cover and management e.g. play areas. It should be noted that there is a potential for land use change in some built-up areas, however, further analysis is required on the land cover and use of built areas

- Bare ground and sand;
- Existing broadleaved, Mixed and Yew Woodland, Coniferous Woodland, to maintain existing carbon stores, assuming no significant change is envisaged due to current high-quality habitat;
- Water.
- Arable and Horticultural, with consideration for the impacts on food production; and
- Fen, Marsh and Swamp, however more information is needed on the current work to improve existing habitats

E.12 Areas which may have scope for investigation of potential include:

- Acid, calcareous, and neutral grassland, with consideration for grazing and farming activities.
- Improved grasslands, with consideration for grazing and farming activities

Habitat conversion for Net Zero

E.13 Of all the natural habitats trees and woodlands offer the highest rates for sequestering carbon dioxide from the atmosphere. For this reason, woodland creation has been the key focus. Planting new trees on land that is sequestering carbon at a lower rate than trees is the most effective way of increasing carbon sequestration and storage.

E.14 Feasible high-carbon-sequestration land use change options for habitat types within Huntingdonshire were then explored. LUC derived options for increasing carbon sequestration were considered including:

- A broadleaf mix, including 75% broadleaf, 15% conifer, and 10% open space; and
- a conifer mix, including 75% conifer, 15% broadleaved, and 10% open ground

E.15 The assessment considered two ranges of potential land use change to reflect the ranges of potential constraints and impacts for current land use:

- a high-range estimation converting 10% of area of habitat types to a mix of woodlands, to reflect an ambitious scenario of conversion, with limited constraints and limited potential to disrupt agricultural and grazing opportunities; and
- a low range estimation converting 5% of area of habitat types to a mix of woodlands, to reflect more site constraints and potential to impact existing agricultural and grazing opportunities.

E.16 The range applied for the development of scenarios considered were based on conservative estimates for the benefits of woodland creation around grazing sites **[See reference** 93**],** and the potential impacts on grazing activities, noting that there could be a positive impact on soil health, as well as professional judgement on the opportunities for woodland creation.

E.17 Considerations for these scenarios also include the fact that the impact of human-induced alterations, such as grazing and fire regime changes typical of modern grasslands (heavy livestock grazing), can be improved by the replacement of grasses by woody vegetation **[See reference** 94**]**. In addition, potential effects of land use change for woodland creation include that:

- Soil organic carbon mass would have decreased significantly without woody plant encroachment;
- Studies show that soil and plant carbon stocks in woodlands exceed those of the pristine grasslands they replaced; and
- Replacement of grasslands by woodlands will lead to increases in carbon sequestration and ongoing increases in ecosystem carbon stocks over a relatively short period.

Limitations

E.18 The baseline habitats assessment includes assessment of existing land cover only.

E.19 The habitats dataset contained certain limitations, including:

- Via our spot check review, Natural England's Habitats Network provided doubts over the accuracy of its data for particular parts of the District. We therefore adapted our methodology to only use part of the dataset for the baseline habitats assessment when assigning CS habitats.
- There was no information on soil type, therefore carbon storage in soil was assigned based on habitat type only using values from literature, where available.
- There was no information on tree type and age within wooded areas, therefore baseline habitats assessment was based on generic habitat types only (e.g. conifer, broadleaved). Individual trees or smaller groups of trees outside wooded areas were not included in the assessment.
- The extent of developed land and manmade sealed surface was determined as bult-up areas and gardens. No CS values have been assigned to these areas in the calculation.
- No CS values were assigned to the water or unclassified habitat types.
- While CS rates are available for some habitat types (e.g. Degraded acid grassland, Modified bog, Rewetted bog, Fast growing conifer thinned), due to unavailability of suitable habitats dataset and management information, it was not possible to include these CS rates in the assessment.
- Sliver and smaller overlapping areas under $2m^2$ have been excluded from the assessment. Due to this approach, the total area of the baseline habitats dataset does not exactly match the total area of the assessed site. This difference is negligible for the purpose of this project.
- Existing site habitats were identified using aerial imagery and therefore may not represent an up-to-date or accurate assessment.

- Calculations for broadleaf mix did not consider orchard species or wet woodland habitats.
- The calculations for carbon sequestration through woodland planting are for the entire area outside of any Priority Habitat Inventory (PHI) boundary, however, there may be wet/marshy grassland which may be of ecological value and should be protected and enhanced. Therefore, carbon sequestration calculations may represent an over-estimation.
- Due to data limitations, we were not able to baseline the impacts of arable land on organic soils such as peat. More research should be conducted into potential locations where this exists, and careful consideration should be taken in choosing the appropriate land use. Arable on deep peat soil is estimated to emit 32.89 tCO_2/ha/yr-1. Therefore, addressing this land use has the potential to provide significant carbon savings where appropriate.

Appendix F

Peatland Assessment Calculations

F.1 The below table outlines the peatland assessment calculations conducted in this study.

F.2 The table includes the area of each habitat type in Huntingdonshire which is covered by soils with peaty pockets (SPP) and with deep peaty soils (DPS). Soils with peaty pockets is an area with mostly non-peat soils that contains smaller pockets of deep peat. Deep peaty soils are where most of the soil is peat that is more than 40 centimetres deep. The respective areas of SPP and DPS are then combined to show the total area in each habitat covered by both SPP and DPS (total area with peaty soil/ pockets). These are all measured in hectares.

F.3 In addition, in the table 'vegetation carbon storage' refers to the amount of carbon stored in plant biomass, including trees, shrubs, and grasses, within each habitat. This is expressed in tonnes of carbon (tC).

F.4 'Soil carbon storage' is the amount of carbon stored in the soils of a habitat, typically from decomposed organic matter. This is expressed in tonnes of carbon (tC).

Table F.1: Peatland assessment calculations

Living England Phase 4 Habitat Type	Total Area (ha)	Area of Soils with Peaty Pockets (SPP)	Area with Deep Peaty Soils (DPS)	Total Area with Peaty Soil/ Pockets (ha)	Total Carbon Sequestration/ Emission (t/CO2e/yr)	Vegetation Carbon Storage/ Emissions (tC)	Soil Carbon Storage/ Emissions (tC)	Total Storage/ Emissions (tC)
Acid, Calcareous, Neutral Grassland	15,304.5	208.85	761.46	970.32	24.26	0	0	0
Arable and Horticultural	56,018.4	565.52	11,959.5	12,525.02	411,948.01	0	48,597,089.24	48,597,089.24
Bare Ground	15.53	0	0	0	0	0	0	0
Bare Sand	2,631.06	8.96	44.58	0	0	0	0	0
Broadleaved, Mixed and Yew Woodland	4,511.31	13.40	379.18	0	0	0	0	0
Built-up Areas and Gardens	3,789.66	7.79	98.91	0	0	0	0	0
Coniferous Woodland	206.10	1.44	30.83	0	0	0	0	0
Fen, Marsh and Swamp	1,187.84	135.15	965.23	1,100.38	-671.23	0	-2,168,843.07	-2,168,843.07
Improved Grassland	5,697.61	438.18	1,071.71	1,509.89	-599.43	-131,511.33	-126,830.68	-258,342.01
Unclassified	277.93		8.82	0	0	0	0	0
Water	1,605.19	29.42	54.64	0	0	0	0	0

Appendix G

Peat Soils in Huntingdonshire

G.1 The tables below outline the area of each habitat type in Huntingdonshire which are covered by soils with peaty pockets (SPP) and with deep peaty soils (DPS). Soils with peaty pockets is an area with mostly non-peat soils that contains smaller pockets of deep peat. Deep peaty soils are where most of the soil is peat that is more than 40 centimetres deep.

Table G.1: Extent of Deep Peaty Soils (DPS) in habitat types in Huntingdonshire

Living England Phase 4 Habitat Type	Area (ha)	Percentage of DPS
Acid, Calcareous, Neutral Grassland	761.46	4.95
Arable and Horticultural	11,959.5	77.77
Bare Ground	2.85	0.02
Bare Sand	44.58	0.29
Broadleaved, Mixed and Yew Woodland	379.18	2.47
Built-up Areas and Gardens	98.91	0.64
Coniferous Woodland	30.83	0.20
Fen, Marsh and Swamp	965.23	6.28
Improved Grassland	1,071.71	6.97
Unclassified	8.82	0.06
Water	54.64	0.36

Living England Phase 4 Habitat Type	Area (ha)	Percentage of DPS
Total	15,477.71	100.00

Table G.2: Extent of Soils with Peaty Pockets (SPP) in habitat types in Huntingdonshire

Living England Phase 4 Habitat Type	Area (ha)	Percentage of SPP
Acid, Calcareous, Neutral Grassland	208.85	14.79
Arable and Horticultural	565.52	40.05
Bare Sand	8.96	0.63
Broadleaved, Mixed and Yew Woodland	13.40	0.95
Built-up Areas and Gardens	7.79	0.55
Coniferous Woodland	1.44	0.10
Fen, Marsh and Swamp	135.15	9.57
Improved Grassland	438.18	31.03
Unclassified	3.35	0.24
Water	29.42	2.08
Total	1,508.47	100.00

Appendix H

Methodology for Peatland Assessment

H.1 The methodology used for the Huntingdonshire peatland assessment discussed in Chapter 6 is explained below.

Important Data Sources

H.2 As with the carbon sequestration mapping exercise of Chapter 5, the peatland assessment has also utilised the Living England Phase 4 Habitat Type data as well as the emission factors acquired via a literature review. The sources for estimated peatland emission and sequestration factors applied in this study are as follows:

- Natural England, 2021. Carbon Storage and Sequestration by Habitat: A review of the evidence (second edition) (NERR094)
- Thom and Doar, 2022. Quantifying the potential impact of nature-based solutions on greenhouse gas emissions from UK habitats. The Wildlife Trust.

H.3 The peatland assessment also used the Peaty Soils Location (England) dataset from BGS and NSRI to locate both deep and shallow peaty soils as well as soils with peaty pockets in Huntingdonshire.

Method

H.4 The methodology for the peatland emission factor and assessment is based on the following steps:

- GIS data cleaning and organisation

- A literature review to identify emission and sequestration factors for different habitats;
- Assigning emissions factors to habitat types
- Assessment of peatlands in Huntingdonshire
- Providing recommendations for emission reduction-based assessment of peatlands in Huntingdonshire

GIS data cleaning and organisation

H.5 The Peaty Soils Location data was first overlapped with the Living England Phase 4 Habitat Type data to provide information on the different types of habitats that currently exist on organic soils in Huntingdonshire, including the total area of each habitat type on peaty soils in Huntingdonshire. This data can be found in Appendix G.

Literature review

H.6 A literature review was conducted to derive emission factors for different habitats, reflecting high-level characteristics able to have a significant bearing on the rate of emissions or sequestration from peatlands, such as soil conditions, habitat, age, and conditions. A range of literature (see important data sources section) formed the bases of the review to identify suitable emission factors resulting in a hybrid process of data selection from literature, bringing together habitat types and emission factors.

H.7 It is important to note that there is some variation in evidence on the emission rates from peatlands, attributed to sample sizes and methodology within sources.

Assigning emissions factors to habitat types

H.8 The review of emission factors in existing literature review, applicable factors were applied to matching habitat types based on the relevance of each habitat type within literature presented in Appendix F. Where emission factors could not be derived from literature, consideration was made for the total area of affected habitat types and the impact this would have on the overall assessment. Where unassigned habitat types represented less than 10% of the overall area with peatland, such areas were considered not significant to the overall assignment.

H.9 The following assumptions were made to assign emission factors to habitat types:

- All peatland soil depth of 75-200cm
- The influence of nitrous oxide is not considered as such carbon gain/loss for each habitat is adjusted to represent carbon emissions only
- Unassigned habitats represent a negligible amount of peatlands in the district

Assessment of peatlands

H.10 The GIS data cleaning and preparation revealed that Arable and Horticultural and improved grasslands were the habitats with the greatest peatlands in the district, with Arable and Horticultural the greatest at 78%, presented in Appendix G.

H.11 Due to a lack of information on the condition of peatlands, It was assumed that a significant portion of the peatland in poor condition, due to degradation from agricultural practices associated with arable and horticultural land. Similarly, peat on any protected site was assessed as higher quality. This gives an indication of peatland quality in Huntingdonshire, largely based on a high-level indication of the level of human influence in each habitat type.

H.12 The following assumptions were made for the assessment of peatland in the district:

- Due to a lack of further information on the progress of restoration and management projects, this assessment does not account for on-going restoration projects or agricultural management projects in the district which could result in medium to high quality peatland, reducing the amount of CO_2 emitted. The Great Fen project includes such initiatives, being an ambitious 50–100-year habitat restoration project, with aims to restore 3,700 ha of land to wild fen, creating a large nature recovery network. This assessment therefore presents a worst-case scenario, and further evidence is needed to assess the site-specific condition of peatland.
- Due to limited data on the average peat depth across Huntingdonshire, the assessment assumes the same peatland depth for all peatland within the district. Further surveys would need to be undertaken to provide estimates of peat depth for the district. Estimates from Natural England's report on Carbon Storage and Sequestration by Habitat (75-200cm depth of peatland) have been used to inform the assessment instead **[See reference** 95**]**. This has the potential to either overestimate or underestimate the carbon storage and emission potential of peatland in the district as the carbon storage capacity is influenced by the depth of the peat. Deeper peat layers generally hold more carbon.
- The assessment focuses on arable and horticultural land as this represents three-quarter of peatlands areas in the district

H.13 The peatland area calculations for each habitat type were then combined with their respective emission factors to produce values of total carbon loss/gain for the area of peaty soils within each habitat type. A full table of these calculations can be found in Appendix F.

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