ENVIRONMENT AND GREEN INVESTMENT

Thursday, 20 January 2022

Democratic and Members' Services
Fiona McMillan
Monitoring Officer

<u>10:00</u>

New Shire Hall
Alconbury Weald
Huntingdon
PE28 4YE

Multi-Function room New Shire Hall PE28 4YE [Venue Address]

AGENDA

Open to Public and Press by appointment only

CONSTITUTIONAL MATTERS

OTHER DECISIONS

Attending meetings and COVID-19

Meetings of the Council take place physically and are open to the public. Public access to meetings is managed in accordance with current COVID-19 regulations and therefore if you wish to attend a meeting of the Council, please contact the Committee Clerk who will be able to advise you further. Meetings are streamed to the Council's website: Council meetings Live Web Stream - Cambridgeshire County Council. If you wish to speak on an item, please contact the Committee Clerk to discuss as you may be able to contribute to the meeting remotely.

The Environment and Green Investment comprises the following members:

Councillor Lorna Dupre (Chair) Councillor Nick Gay (Vice-Chair) Councillor Anna Bradnam Councillor Steve Corney Councillor Piers Coutts Councillor Stephen Ferguson Councillor Ian Gardener Councillor Mark Goldsack Councillor John Gowing Councillor Ros Hathorn Councillor Jonas King Councillor Brian Milnes Councillor Catherine Rae Councillor Mandy Smith and Councillor Steve Tierney

Clerk Name:	Dawn Cave
Clerk Telephone:	01223699178
Clerk Email:	Dawn.cave@cambridgeshire.gov.uk

Environment and Green Investment Committee

Date: 16 December 2021

Time: 10.00am – 11.40am

Venue: New Shire Hall

Present: Councillors L Dupré (Chair), N Gay (Vice Chair), A Bradnam, S Corney, P Coutts, S Ferguson, I Gardener, M Goldsack, R Hathorn, A Hay (substituting for Cllr Gowing), J King, B Milnes, C Rae and M Smith

33. Apologies for Absence and Declarations of Interest

Apologies for absence were received from Councillors Tierney, Gowing (Councillor Hay substituting) and Goldsack.

Councillor Hay advised that she was asthmatic and would not be able to wear a face covering throughout the meeting.

There were no declarations of interest.

34. a) Minutes of the Environment & Green Investment Committee

The minutes of the meeting held on 16th November 2021 were agreed as a correct record.

b) Environment & Green Investment Committee Action Log

The Action Log was noted.

35. Petitions and Public Questions

No petitions or public questions were received.

36. Babraham Smart Energy Grid – Updated Investment Case

The Committee received a report detailing the updated investment case for the Babraham Smart Energy Grid.

Members were reminded that the investment case for this project had been approved by the Environment & Sustainability Committee in March 2021. At that meeting, Members had delegated the final decision on the works contract to the Executive Director and Chief Finance Officer, in consultation with the Committee Chair and the Green Investment Advisory Group, which was a Member group. More recently, the finalised costs had been received and capital costs substantially increased, so officers were presenting the revised investment case and increased borrowing requirement, for approval.

It was noted that the increase in costs had been caused by significant volatility in markets and supply chains. It was also noted that electricity costs had increased, which had a positive impact on business case, but it was unlikely that the current high prices would be sustained. The report set out progress made with this project to date and the timescales looking forward, including the PPA (Power Purchase Agreement) with Cambridge University Hospital Trust (CUHT). It was noted that the PPA was bi-directional, and enabled the smart energy grid to import electricity from the CUHT when there was insufficient generation, or when maintenance was required. This two-way supply of electricity was necessary as the smart energy grid would not be connected to the national grid. Whilst costs had increased significantly and there were risks, there were also opportunities, especially in the longer term e.g. from the battery storage and EV charging points.

In response to Member questions:

- It was noted that the prices quoted in the report were incorrect, and should read 5.5p/kWh and 20p/kWH respectively;

- With regard to the two-way supply arrangement set out in the PPA, it was confirmed that each organisation would bill the other separately. The mechanics of the modelling of costs between the two organisations were detailed;

- It was confirmed that Babraham and St Ives projects were both in the preconstruction phase, although the St Ives project was fractionally ahead in terms of contract development and procurement, and lessons learned from the St Ives project were being factored into the Babraham project e.g. further ground surveys of the car park had been commissioned in to the business case;

- A Member asked whether the EV chargers were fast chargers, and what actions could be taken to ensure EVs were not occupying the charging spaces when not charging. It was confirmed that this issue would be picked up as the project progressed, and that the software for EV chargers could factor in idling charges. It was confirmed that currently only slow chargers were planned in the short term, but the number was increasing;

- Speaking as a Local Member, Councillor Milnes welcomed the report, and whilst disappointed in the escalating costs, acknowledged that these were due to wider economic issues. He was pleased to note that the excavation works to bury the cable had been scheduled at the same time as the replacement of the gas main;

- It was noted that the additional prudential borrowing was dependent on approval by the Strategy & Resources Committee but could be included in the 2022/23 Business Planning cycle, as it would not be required in the 2021/22 financial year;

- The project costs could only be held to the end of December 2021 to allow the Committee approval process. It was confirmed that the contract would be monitored closely through the Green Investment Advisory Group.

It was resolved unanimously to:

a) Note progress with the project;

b) Approve the investment case for the Babraham Road Park and Ride Smart Energy Grid project as set out in section 3.4 of the report;

c) Recommend the additional prudential borrowing of £1.2M to Strategy & Resources Committee;

d) Approve a Letter of Intent to place orders for materials and equipment to secure the costs that have come through from the procurement process;

e) Approve entering into a construction contract with Bouygues Energies and Services for the delivery of the scheme.

37. Environment Fund – Resourcing Low Carbon Delivery

The Committee considered a report which sought approval of additional resources to reduce both the Council's and Cambridgeshire's carbon footprints, as set out in the Climate Change and Environment Strategy.

Members were reminded that the Council had approved a £16M capital Environment Fund at Full Council in February 2020, to reduce the Council's carbon footprint and that of the wider Cambridgeshire area. Approval was sought to draw down funding to resources additional capacity and skills which were needed in the energy services team to support the delivery of the pipeline of projects, including energy projects such as renewable schemes at schools and other Council sites. The team was looking to recruit officers with additional skills and capacities that would support these ambitions, including engineering and constructions skills, contract management skills, etc. The service generated income for the Council and had also successfully applied for grants, including the Public Sector Decarbonisation Fund.

The second proposal included in the report related to £15,000 gap funding required for the Cambridge EV Chargepoints project, which was a collaborative project with Cambridge City Council.

Arising from the report:

- A Member queried the 50% profit share with bpChargemaster for the EV charging project. It was noted that the City Council was providing the bulk of the match funding that was required to secure grant funding, and that bpChargemaster would be providing the rapid chargepoints across the two areas for free, and would also be undertaking all operational maintenance for the contract. The only income bpChargemaster would be receiving was the 50% profit share;

- Noting that the EV chargers were based in Cambridge, a Member asked if there was any intention of extending this to other places in county. Officers confirmed that the Cambridge project had been a valuable learning exercise on EV charging, especially on-street EV charging, and that whilst the team had aspirations to do projects across the county, there were no firm plans currently. More strategically, the Combined Authority would be bringing forward its Local Transport and Connectivity Plan next year, and the EV charging structure would be reviewed at that stage;

- In response to a Member question, it was confirmed that the £570K resource requirement was to ensure there were enough skilled officers available to deliver projects and maximise benefits to the Council. The Chair observed that the additional resource capacity would ensure that the team could continue to bring in significant income, as well as environmental benefits to the Council;

- A Member observed that "first connector costs" could be significant, and asked how this pressure was being managed. Examples of where progress was being made on this issue were outlined, but officers confirmed that grid connections continued to be a significant cost;

- A Member asked if there was any relationship between these proposals and the two additional substations being considered by the Greater Cambridge Partnership (GCP). Officers advised that a report had been commissioned three years ago regarding the additional capacity required to decarbonise new homes, electrify transport systems and retrofit older homes in Greater Cambridge. A tripling of electricity demand was forecast and this work was now being progressed by the GCP;

- A Member asked about the potential impact on bus charging in terms of the availability of the electricity supply at St Ives Park & Ride. Officers advised that modelling work was being undertaken currently with regard to the Babraham Park & Ride site, and that information could be shared with the St Ives project once available. A particular issue was whether there would be capacity for two 250KW chargers to be operational concurrently;

- A Member asked if anything could be done nationally, such as lobbying, with regard to the first connector issue, with a view to a more equitable division of costs. Officers explained that UKPN were currently going through a new business plan process with Ofgem. Members were also briefed on the "Plug and Play" innovation from UKPN, noting the issues with this approach - although big upfront connection costs were avoided, curtailment of the generation was likely and this could impact on the viability of projects.

The Chair concluded by saying that these were exciting proposals, especially the staffing proposal, as this would enable the Council to significantly increase activity and bring in further grant funding, to address climate change issues across the county.

It was resolved unanimously to approve drawdown of approved capital Environment Funding to support:

a) Additional staff resources totalling £570,000 over 4 years to deliver low carbon and energy capital projects as described in paragraphs 2.3-2.5 of the report;

b) Grid connection costs of up to £15,000 for the Cambridge EV chargepoint project as set out in paragraph 2.7 of the report.

38. Review of the Climate Change and Environment Strategy

The Committee considered a report detailing the Service Committee review of the Climate Change and Environment Strategy, for comment and recommendation to full Council so it gets adopted as corporate strategy.

Introducing Appendix 1, officers explained that this was the high level strategy document. In addition to the Climate Change team, colleagues from the Business Intelligence directorate had assisted in the development of the Strategy, using behavioural insights to ensure the document was sufficiently engaging for communities and businesses.

Appendix 2 provided a more technical approach, providing the detail behind the priorities, and colleagues across the Council had commented on the draft.

Appendix 3 was the live action plan, showing how objectives could be delivered, and what the Council needed to achieve. It was acknowledged that the action plan was a live document that would change as circumstances evolved, given the fast pace of the climate change debate.

Officers highlighted the following four key points relating to the Strategy:

- The importance of aligning actions in terms of both internal and external delivery, and across the organisation, recognising that some areas were more challenging than others;

- The Strategy needed to be enduring, adaptable and responsive, especially given the pace of change of policy and direction on a national basis;

- The importance of being open to ideas, i.e. open to learning from colleagues, Members, partners, residents and businesses, to accelerate the pace and scale of change, as everyone is working on addressing climate change challenges;

- The value of facilitating better choices – individuals and businesses make so many choices about everyday matters e.g. travel, energy, holidays – all of which potentially impact on climate change. The Council needs to support communities and businesses by providing the best information to support decision making.

The Strategy was supported by numerous documents including the Annual Carbon Footprint, and a communications and engagement plan would also be developed. Officers gave a specific example from the Adult Social Care team where colleagues had been looking to reduce car usage by contractors, and the implications of that in terms of how the Council does business.

A Member queried the statement in the Strategy around *"buildings owned and occupied by Council"*, and asked whether this included all schools? It was confirmed that it included Maintained schools but not Academies, which were not part of the County Council's carbon footprint. The Member suggested that the Strategy should make it clear what was included and what was not.

Noting that residents were encouraged to email Members and the Council to say what they were doing to reduce carbon emissions, a Member asked what would be done with those testimonies, commenting that it would be regrettable if someone writes a really thoughtful contribution, and this was ignored. Officers commented that they were keen to share information on what worked, and part of the website would be devoted to this type of best practice and information sharing. Carbon reductions managed by the community would be monitored through the Annual Carbon Footprint report, but those figures were aggregated and not available on the individual community level. In terms of ideas coming forward, it was important to help individuals feel empowered and manage that information, and this needed to be factored into the communications and engagement plan. It was unclear at this stage the level of feedback that would be received from communities, but officers were committed to capturing that information.

Welcoming the Strategy, a Member suggested that there should be greater emphasis on better standards of insulation on existing buildings, and supporting residents and businesses to do the same. This was a particular issue for older buildings, which were difficult to retrofit. Officers commented that the Council had set high energy standards for its new buildings through its Net Zero Energy Buildings policy approved in December 2019.. It was noted that the Cambridge Energy Retrofit Partnership, which comprised the County Council and all Districts, had recently been awarded £3.5M to support domestic energy retrofits for low income households. The Partnership also had aspirations to develop further offers for a wider range of households.

A Member asked that all non motorised users were included in the Strategy, including equestrian.

With regard to the transport hierarchy, a Member observed that there was little reference in the Strategy to creating cycleways in rural areas, where many residents were keen to use active travel modes, but did not feel safe doing so. Funding avenues such as the Local Highway Initiatives were not sufficient to bring forward schemes such as cycleways. Officers advised that an active transport strategy was being developed, and that the refresh of the Combined Authority's Local Transport and Connectivity Plan would be coming forward in March, which would be an important policy framework for active transport. It was further noted that this subject had been raised at a recent Highways & Transport Committee, and was a clear priority for Members.

Discussing the report:

- A number of Members indicated their support for the Strategy, but commented that it was a continuation of work started by the previous Conservative administration, including the £16M Environment Fund, which the opposition at that time had voted against. Those Members felt that the Strategy as proposed was not sufficiently ambitious, and specific examples given, including a target of only 50% of Scope 3 (supply chain) emissions by 2030;

- A Member commented that the Solar Together programme was an example of where procurement powers could be used, and suggested that a similar scheme could be established for cavity wall and loft insulation too, as those type of schemes had a high uptake by residents. The Member also observed that the government had withdrawn Green Grant Scheme after only six months;

- A number of Members welcomed the Strategy and looked forward to monitoring progress in coming years;

- A Member commented that this was a hugely ambitious but credible plan which was the result of tremendous hard work. Whilst acknowledging it built on the plan of the previous administration, he commented that it accelerated that plan and was very ambitious. The 2030 targets were ambitious but achievable, but the 2040 plan was largely reliant on matters outside the Council's control, specifically government policy on decarbonising housing, transport, etc. He encouraged Conservative Members to lobby their Ministers on these matters.

The Chair commented that this was an extremely ambitious new strategy for the Council, and she was grateful to all those involved, especially lead officers. She stressed the bold nature of the Strategy, which in addition to committing the Council to net zero carbon emissions, set a baseline for biodiversity and set targets in relation to peat, both which had been absent from the previous Strategy. There were some limiting factors owing to uncertainty at a national policy level, including waste, but there was a focus on closer partnership working, including the Combined Authority, businesses and communities. With regard to Scope 3 emissions, the Council was limited as these relied on other organisations, but there was commitment to working with those organisations through avenues such as procurement. The Strategy also aimed to spread understanding of decarbonisation across council's area of operation, especially internally, which was a significant task. She said she was extremely proud and privileged to be able to recommend the Strategy to full Council.

It was resolved unanimously to:

a) Note this report;

b) Comment on the revised draft Climate Change and Environment Strategy attached as Appendices 1-3 to the report;

c) Recommend the Draft Climate Change and Environment Strategy to Council for adoption as corporate policy.

39. Review of Draft Revenue and Capital Business Planning Proposals for 2022-27

The Committee considered a report detailing the current business and budgetary planning position estimates for 2022-2027, including the principal risks, contingencies and implications facing the Committee and the Council's resources. The report also set out the process and next steps for the Council in agreeing a business plan budget for future years.

Attention was drawn to the overarching themes of the business planning process, and both the permanent and temporary budget pressures/investments required.

It was resolved, by a majority, to:

a) Note the progress made to date and next steps required to develop the business plan for 2022-2027

b) Comment on the budget and savings proposals that are within the remit of the Committee as part of consideration of the Council's overall Business Plan

c) Note the updates to Fees and Charges for 2022-23

40. Finance Monitoring Report – October 2021

The Committee received the October 2021 Finance Monitoring Report. Introducing the report, the presenting officer highlighted:

- The predicted £31K Revenue underspend at year end;

- The proposed transfer from the 2021/22 to the 2022/23 financial year of the £850K planned emissions costs, as an earmarked reserve;

- that it had been identified that some of the street-sweeping waste and trade waste which passed through the waste transfer stations had been incorrectly attributed to the County Council. An adjustment had been made for previous years and there was also an impact on in-year expenditure to date (and hence also the forecast). The previous year's reconciliation amount of £460K and the in-year adjustment to the forecast was estimated to be £240K and it is proposed to also transfer these amounts to an earmarked reserve for the planned emission costs.

In discussion, it was confirmed that the costs of diversion works for Waterbeach, as well as the capital works, had all slipped to the 2022/2023 financial year. Councillor Bradnam, speaking as the Local Member for Waterbeach, commented that residents welcomed the EU Directive, and whilst appreciating that this may be difficult to manage, residents were constantly subject to odours across the village that were very unpleasant.

It was resolved by a majority to:

a) Review, note and comment upon the report;

b) Recommend to Strategy & Resources Committee that £1.55M of waste funding is transferred to an earmarked reserve towards the revenue costs associated with addressing the waste odour emissions work which has now slipped to next financial year.

41. Environment & Green Investment Committee Agenda Plan and Training Plan and Appointments to Outside Bodies and Internal Advisory Groups and Panels

The Committee noted the Agenda Plan.

Environment and Green Investment Committee Minutes - Action log
(includes outstanding actions from the Environment and Sustainability Committee)

This is the updated action log as at 12th January 2022 and captures the actions arising from the most recent Environment and Green Investment Committee meetings and updates Members on the progress on compliance in delivering the necessary actions.

Environment and Sustainability Committee minutes of 14th January 2021					
50.	Swaffham Prior Community Heat Project- Investment Case	Sheryl French	A suggestion was made by a Member, to instruct officers to engage in a discussion with the Secretary of State for Business, Energy and Industrial Strategy in order to broaden the Agricultural Grant Schemes to include incentives for landowners of suitable land for future energy projects. By including these landowners in the scheme would reduce the risks to potential future developments	Update to be provided at Committee meeting.	Ongoing
Environment and Green Investment Committee minutes of 1st July 2021					
7.	Low Carbon Lifecycle Heating Replacements at Maintained Schools	Chris Parkin	It was clarified that the £12.5M Environment Fund figures referred to in paragraph 2.6.4 was incorrect, it should read £13.5M, which was made up of £10M remaining Environment Fund, plus £3.5M Public Sector Decarbonisation Scheme. It was confirmed that there was a pipeline	Update 01.07.21: Cllr Dupré has requested a briefing on the pipeline and what would be required to decarbonise all maintained schools by 2030. This is awaiting a forward look of works from Education Capital's school Condition Surveys and will be provided for the Green Investment Advisory Group	Ongoing

			for some of the £10M and an estimate could be provided.	meeting in December. We expect to provide a briefing on the pipeline for Council Buildings for the same meeting.	

Agenda Item No: 4

Annual carbon footprint report 2020-21

To:	Environment and Green Investment Committee
Meeting Date:	20 January 2022
From:	Steve Cox, Executive Director, Place and Economy
Electoral division(s):	All
Key decision:	No
Forward Plan ref:	Not applicable
Outcome:	The outcome of this report is that the Committee have a good understanding of the sources of greenhouse gas emissions from Council activities during 2020-21, to enable monitoring of progress against our climate change targets and that this information is available to the public.
Recommendation:	a) To accept the annual carbon footprint report as a record of the Council's greenhouse gas emissions for the financial year April 2020 to March 2021 b) To publish the report on the Council's climate change pages on the website

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Member contacts:
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1. Background

1.1 In May 2020, Full Council approved the Council's Climate Change and Environment Strategy and associated Action Plan. The Strategy contains a commitment to a number of targets, including reducing our 'scope 1' (direct) emissions by 50% by 2023 (compared to 2018 levels), reducing our 'scope 3' (indirect) emissions by 50.4% by 2030, and to deliver Government's net zero carbon target for Cambridgeshire by 2050. In order to monitor progress against these targets, it is necessary to measure the Council's carbon footprint each year.

1.2 The Action Plan commits the Council to publishing annual carbon footprint calculations to demonstrate progress, and also includes additional agreed actions to identify ways to improve the data provision for carbon footprinting, in order to enable greater accuracy, fill gaps and further expand the scope of what we can report on in future.

1.3 Data has now been gathered on the Council's greenhouse gas (GHG) emissions for the financial year April 2020 to March 2021.

1.4 During the year 2020-21, the COVID-19 global pandemic changed ways of working for many people, in particular reducing travel. This has had a significant impact on the associated GHG emissions.

1.5 The full findings are presented in the attached report (Appendix A). As well as presenting the Council's own organisational carbon footprint, the report also looks, separately, at the carbon footprint of the whole county of Cambridgeshire.

2. Main Issues

2.1. County-wide emissions. Carbon dioxide (CO_2) emissions from the county of Cambridgeshire in 2019 (the most recent year of data available) were just under 6.1 million tonnes. This 6.1m tonnes does not include emissions of other, non-CO_2 GHGs such as methane (CH_4) or nitrous oxide (N_2O), which are not broken down by local authority area in the published statistics. Across the whole UK, CO_2 accounts for around 80% of all GHG emissions, after taking into account the Global Warming Potential (GWP) of different GHGs.

2.2. This dataset (of CO_2 emissions by local authority area) has been revised significantly since the previous year's publication, with the largest differences being from methodology improvements in the Land Use, Land Use Change and Forestry (LULUCF) sector. In Cambridgeshire, CO_2 emissions per capita and per km^2 area were considerably higher than the national average, with much of the excess due to the LULUCF sector. Excluding LULUCF, Cambridgeshire's CO_2 emissions were under 4.1 million tonnes. Aside from LULUCF, the trend in Cambridgeshire is reflective of the national trend: emissions slowly and steadily declining over the last few years, due mainly to the decarbonisation of the electricity grid.

2.3. Emissions of other (non-CO_2) GHGs from the county, such as methane or nitrous oxide, have been estimated based on combining UK emissions data with Cambridgeshire's land area, population and CO_2 emissions data for each sector. The results of these calculations put these emissions of other GHGs at 1.214m tonnes CO_2 equivalent (CO_2e) in 2019.

2.4. The non-CO_2 emissions are then added to the CO_2 emissions to give the total GHG emissions for the geographical area of Cambridgeshire as 7.3 tonnes CO_2e.

2.5. Council's own emissions. The total GHG emissions for the Council's own operations for 2020-21 is 113,477 tonnes CO_2e. This is 40% less than the previous year, with the majority of the difference due to a reduction in construction activity during the 20-21 year, and reduced activity due to the impacts of COVID-19. This will therefore not be a permanent reduction.

2.6. In gathering the data for this report, some gaps were identified. The biggest gaps are in our 'scope 3' (indirect) emissions, which accounts for the largest share, but is also where we have the least control, since much of the required data lies with other organisations.

2.7. Our Scope 1 (direct) emissions were 1,734 tonnes CO_2e. This is a 14% reduction compared to the previous year. Gas usage in our buildings and resulting emissions was reduced by 20% and oil reduced by 30%. Part of this reduction was due to the mild winter in 2020-21 meaning reduced need for heating.

2.8. Further reductions in scope 1 emissions were seen in our fleet transport, as people made fewer journeys during the COVID-19 pandemic, with an 82% reduction in mileage in our pool cars, 48% reduction in fuel used for our social and education transport fleet, 39% less fuel used in other fleet cars and vans, and a 19% reduction in fuel used for our highways maintenance and gritting fleet, which combined with a switch to HVO biofuel for some vehicles, reduced the resulting emissions from fleet transport by 40% compared to the previous year.

2.9. Emissions of fugitive F-gases (from air conditioning units) are also included in this total under scope 1. We have been unable to obtain the data for 2020-21, but have estimated the emissions based on previous years, at 24 tonnes CO_2e, which is a very tiny proportion of our emissions.

2.10. Scope 2 (purchased electricity) emissions were 4,388 tonnes CO_2e, a 23% reduction from the previous year. Emissions from electricity for street lighting were 20% lower this year, due to both a 12% reduction in the amount of electricity used, and the national grid getting greener with more electricity generated from renewable sources. Emissions from electricity for our buildings were also 8% lower, despite a 1% increase in electricity usage in buildings. The very small increase in usage could possibly be due to the increased requirement for ventilation during the COVID-19 pandemic.

2.11. Altogether, our scopes 1 and 2 emissions amounted to 6,122 tonnes CO_2e (gross, before any reductions or offsets). This is 20% lower than the previous year. Net GHG emissions for scopes 1 and 2, after taking into account purchasing of 100% renewable electricity, were reduced to 1,734 tonnes CO2e. The largest share of this remains from gas to heat our buildings.

2.12. Scope 3 (indirect) emissions remain by far the largest share, accounting for 107,355 tonnes CO_2e, which is 95% of the total known emissions.

2.13. Emissions from waste, primarily due to our role as the Waste Treatment Authority for household waste disposal, were the largest share of emissions in 2020-21, at 39,192 tonnes CO_2e. This is 35% of all CCC known emissions for that year. Most of this was from landfill.

2.14. Emissions from energy use in maintained schools was 7,449 tonnes CO_2e, a 14% reduction since the previous year.

2.15. Transport emissions (all scopes) were down by 62% to 4,218 tonnes CO_2e. Business travel emissions were down by 43%, and employee commuting emissions down by 78%, largely due to reduced travel during the COVID-19 restrictions. Highways transport emissions were also down by 27%.

2.16. Emissions of embodied carbon from construction projects (from the manufacture of materials used) were significantly reduced compared to the previous year, at only 4,979 tonnes CO_2e, which is a 95% reduction compared to the 95,603 tonnes in the previous year. Emissions are expected to be relatively low again in 2021-22 as few projects are on site. However, lots of projects are due to be starting in 2022-23 so associated carbon emissions levels will rise again in future. The temporary reduction this year is due to a smaller programme of works and less use of carbon-intensive products that year based on what type of works were happening at that time, as the majority of projects completed in summer 2020 for the period 2020-21, and few projects were on site for a substantial part of the financial year.

2.17. Highways materials for new roads, maintenance and resurfacing works accounted for 11,980 tonnes CO2e (which is 10% of the council’s total) – this is a 5% reduction from the previous year.

2.18. Emissions from agriculture were estimated at 14,511 tonnes CO2e, which is similar to the previous year.

2.19. Emissions from land use, land use change and forestry (LULUCF) from County Council owned land have been included this year for the first time. These were an estimated 24,490 tonnes CO2e (22% of all our emissions).

2.20. Some other scope 3 emissions are not included in this report as we do not have the data to calculate them. This is a problem common to many organisations, and for that reason it is common for organisations to report on scopes 1 and 2 only. However, for the purposes of greater transparency and accuracy, we have also reported all scope 3 emissions where known.

2.21. Outside of scopes – emissions from biological CO_2 - were 181 tonnes CO_2e. This is from HVO biofuel for some highways vehicles.

2.22. Further details of all these emissions are in our annual carbon footprint report – Appendix A (see separate document).

3. Alignment with corporate priorities

3.1 Communities at the heart of everything we do
There are no significant implications for this priority.

3.2 A good quality of life for everyone

There are no significant implications for this priority.

3.3 Helping our children learn, develop and live life to the full
There are no significant implications for this priority.

3.4 Cambridgeshire: a well-connected, safe, clean, green environment
Monitoring of greenhouse gas emissions enables the council to keep track of progress against targets of the Climate Change and Environment Strategy, helping to create a greener Council.

3.5 Protecting and caring for those who need us
There are no significant implications for this priority.

4. Significant Implications

4.1 Resource Implications
There are no significant implications within this category.

4.2 Procurement/Contractual/Council Contract Procedure Rules Implications
There are no significant implications within this category.

4.3 Statutory, Legal and Risk Implications
There are no significant implications within this category.

4.4 Equality and Diversity Implications
There are no significant implications within this category.

4.5 Engagement and Communications Implications
Publishing the Council's annual carbon footprint report on our website helps to communicate the Council's environmental impacts and be transparent with the public regarding our greenhouse gas emissions.

4.6 Localism and Local Member Involvement
There are no significant implications within this category.

4.7 Public Health Implications
There are no significant implications within this category.

4.8 Environment and Climate Change Implications on Priority Areas:

4.8.1 Implication 1: Energy efficient, low carbon buildings.
Positive/neutral/negative Status: Positive
Explanation: Monitoring and reporting GHG emissions helps to focus on target areas for emissions reductions.

4.8.2 Implication 2: Low carbon transport.
Positive/neutral/negative Status: Positive
Explanation: Monitoring and reporting GHG emissions helps to focus on target areas for emissions reductions.

4.8.3 Implication 3: Green spaces, peatland, afforestation, habitats and land management.
Positive/neutral/negative Status: Positive
Explanation: Monitoring and reporting GHG emissions helps to focus on target areas for emissions reductions.

4.8.4 Implication 4: Waste Management and Tackling Plastic Pollution.
Positive/neutral/negative Status: Positive
Explanation: Monitoring and reporting GHG emissions helps to focus on target areas for emissions reductions.

4.8.5 Implication 5: Water use, availability and management:
Positive/neutral/negative Status: neutral
Explanation: no impact

4.8.6 Implication 6: Air Pollution.
Positive/neutral/negative Status: neutral
Explanation: no direct impact, although reducing GHG emissions can, in some cases, also reduce air pollution.

4.8.7 Implication 7: Resilience of our services and infrastructure, and supporting vulnerable people to cope with climate change.
Positive/neutral/negative Status: neutral
Explanation: no direct impact

Have the resource implications been cleared by Finance? Yes
Name of Financial Officer: Sarah Heywood

Have the procurement/contractual/ Council Contract Procedure Rules implications been cleared by the Head of Procurement? Yes
Name of Officer: Henry Swan

Has the impact on statutory, legal and risk implications been cleared by the Council's Monitoring Officer or LGSS Law? Yes
Name of Legal Officer: Fiona McMillan

Have the equality and diversity implications been cleared by your Service Contact?
Yes
Name of Officer: Elsa Evans

Have any engagement and communication implications been cleared by Communications?
Yes
Name of Officer: Bethan Griffiths

Have any localism and Local Member involvement issues been cleared by your Service Contact? Yes
Name of Officer: Sheryl French

Have any Public Health implications been cleared by Public Health?
Yes
Name of Officer: Iain Green

If a Key decision, have any Environment and Climate Change implications been cleared by the Climate Change Officer?
Yes
Name of Officer: Emily Bolton

5. Source documents

5.1 Source documents

a) Cambridgeshire County Council Climate Change and Environment Strategy

b) UK greenhouse gas emissions national statistics

c) UK local authority carbon dioxide emissions national statistics

d) UK Government carbon conversion factors for company reporting

5.2 Location

a) https://www.cambridgeshire.gov.uk/residents/climate-change-energy-and-environment/climate-change-and-environment-strategy

b) https://www.gov.uk/government/collections/final-uk-greenhouse-gas-emissions-national-statistics

c) https://www.gov.uk/government/collections/uk-local-authority-and-regional-carbon-dioxide-emissions-national-statistics

d) https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting

Appendix A – Full Report

See separate document attached

Cambridgeshire County Council

Annual Carbon Footprint Report

2020 - 2021

Published January 2022

www.cambridgeshire.gov.uk/climate-change

Contents

1. Introduction

This is our annual carbon footprint report for the period April 2020 to March 2021. This report examines both the carbon footprint of Cambridgeshire County Council as an organisation, and that of the geographical area of Cambridgeshire as a whole.

The UK is already seeing the impact of climate change, with average annual temperatures 0.9°C higher in 2005-2014 compared with 1961-1990, more extreme weather events, and sea levels rising 1.4mm per year. In July 2019, Cambridge experienced the highest temperature ever officially recorded in the UK, at 38.7°C.

In 2019 the UK was the first nation to set a legally binding target to reduce GHG emissions to net zero by 2050. To achieve 'net zero' requires considerable changes including low-carbon power, extensive electrification of transport and heating, and behavioural changes to reduce demand.

Cambridgeshire County Council published our Climate Change and Environment Strategy in May 2020 and committed in our Action Plan to measure and report our greenhouse gas emissions.

We are delighted that we are starting to see reductions in emissions, but we recognise that there is much more to do. Many of the actions and projects now underway as a result of our Climate Change and Environment Strategy will lead to greater emissions reductions in future.

An unusual year

2020-21 was an exceptionally unusual year. The global COVID-19 pandemic led to nationwide lockdowns, reduced travel and changed ways of working for many people, combined with unprecedented demands on public health and social care services.

The associated carbon emissions have therefore also seen dramatic reductions. Across the UK, emissions also reduced significantly in 2020 compared to 2019, but are expected to rebound in 2021 as the nation returns to previous levels of industrial and commercial activity.

At Cambridgeshire County Council we have seen many reductions in emissions related to the impact of COVID-19, particularly from transport and construction projects. Some of these reductions will inevitably be temporary, whilst some such as reduced travel may see a longer-term reduction.

2. Cambridgeshire County Council's Carbon Footprint

The carbon footprint of Cambridgeshire County Council (as an organisation) comprises emissions that occur as a result of the Council's own operations. We have calculated the carbon footprint of the County Council's own operations for the financial year 1 April 2020 to 31 March 2021.

The Council's own carbon footprint has been calculated in line with the UK Government's Environmental Reporting Guidelines for Voluntary Greenhouse Gas Reporting (BEIS & DEFRA, 2019). For further details on the methodology, scope, boundary of reporting and exclusions, please see chapter 0.

2.1 Key findings

2.1.1 Scopes 1 and 2 emissions

We found that our scopes 1 (direct) and 2 (purchased electricity) emissions amounted to **6,122 tonnes CO_2e** (gross). This includes emissions from gas and oil for heating our buildings, electricity for our buildings and street lighting etc. and emissions from fleet vehicles. The breakdown of this is shown in

Scope 1 and 2 emissions

down 20%

from last year

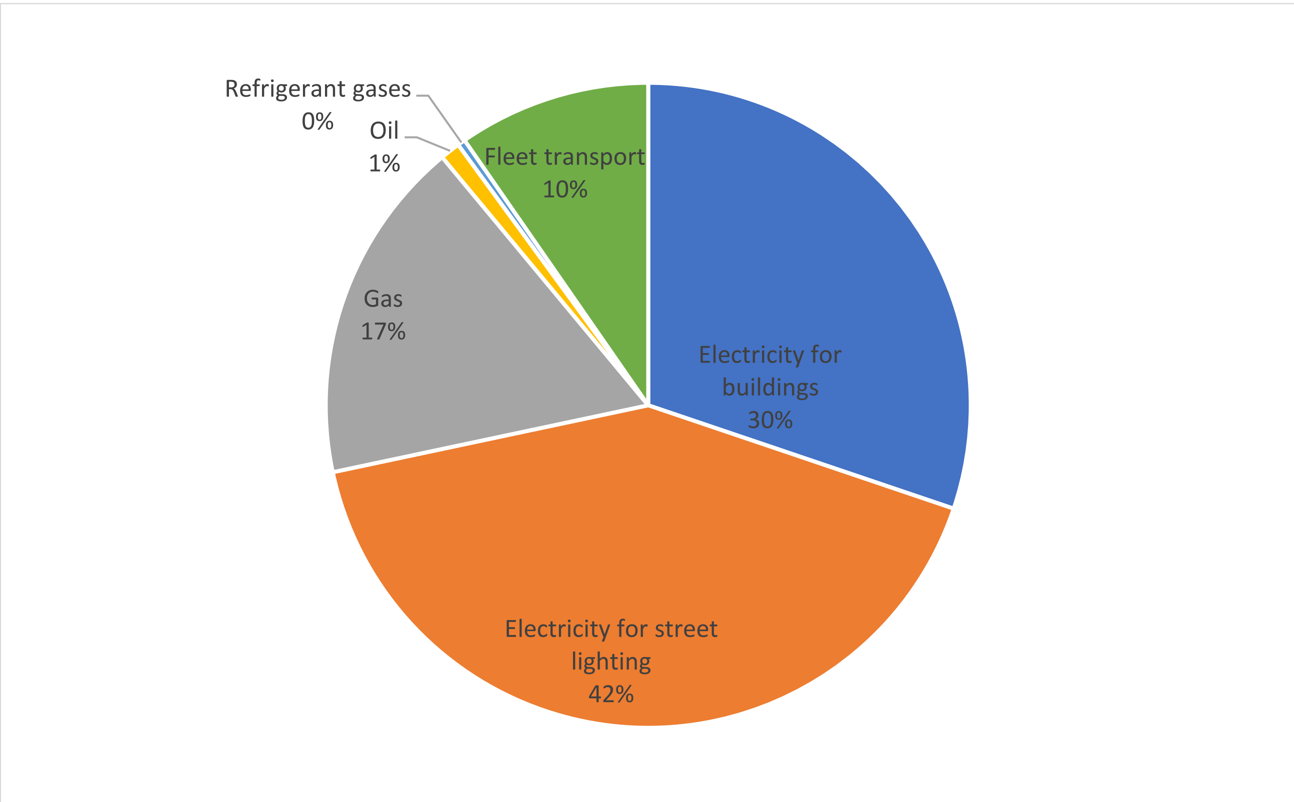


Figure 1. The largest share was for purchased electricity. This shows gross emissions, before any reductions or offsets.

Our scope 1 and 2 emissions together were 20% lower than the previous year. This is due to a combination of factors. Firstly, emissions from electricity for street lighting were 20% lower this year, due to both a 12% reduction in the amount of electricity used, and the national grid getting greener with more electricity generated from renewable sources. Emissions from electricity for our buildings were also 8% lower, despite a 1% increase in electricity usage in buildings. The very small increase in usage may be due to the increased requirement for ventilation during the COVID-19 pandemic. Gas usage in our buildings and resulting emissions was also reduced by 20% and oil reduced by 30%. Part of this reduction is due to the mild winter in 2020-21 meaning reduced need for heating.

Further reductions in emissions were seen in our fleet transport, as people made fewer journeys during the COVID-19 pandemic, with an 82% reduction in mileage in our pool cars, 48% reduction in fuel used for our social and education transport fleet, 39% less fuel used in other fleet cars and vans, and a 19% reduction in fuel used for our highways maintenance and gritting fleet, which combined with a switch to HVO biofuel for some vehicles, reduced the resulting emissions by 40% compared to the previous year.

Net GHG emissions for scopes 1 and 2, after taking into account purchasing of 100% renewable electricity, were reduced to 1,734 tonnes CO_2e. The breakdown of this is shown in

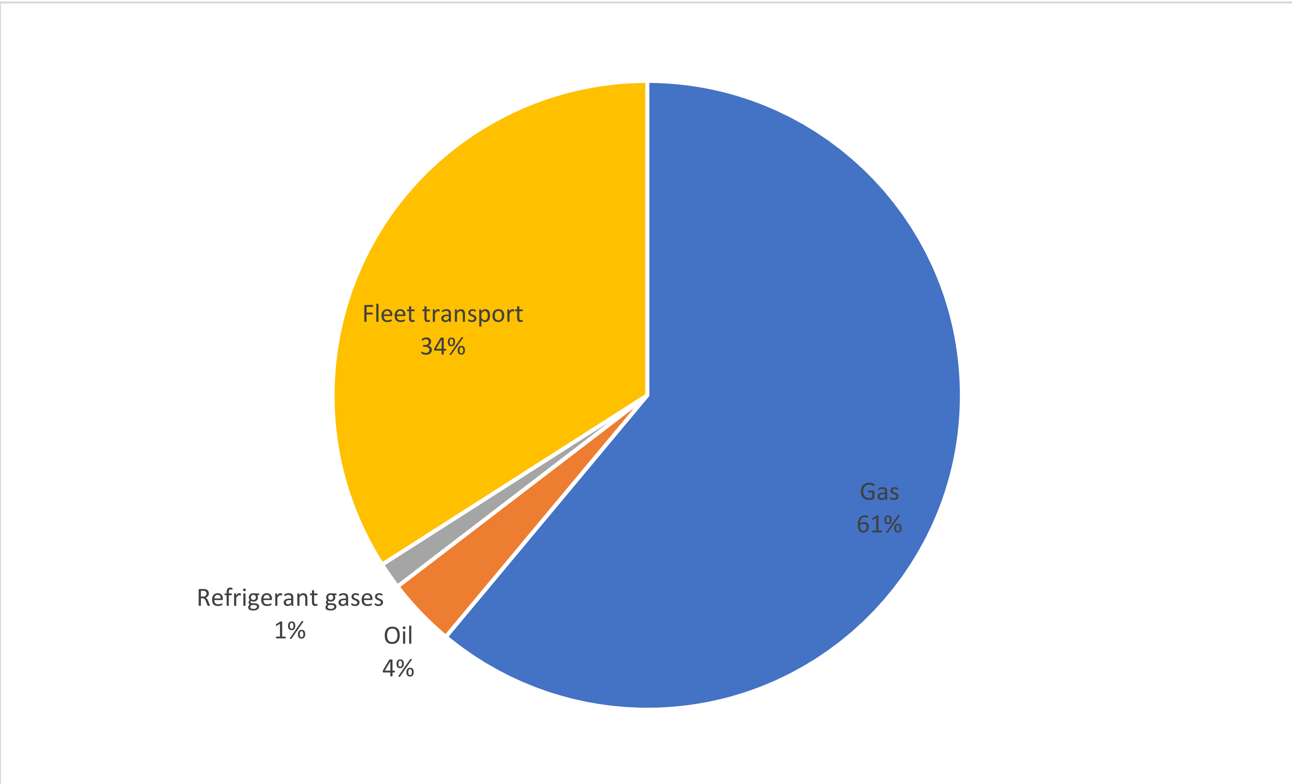


Figure *2* below, with the largest share coming from gas to heat our buildings.

We have started a programme of low carbon heating projects in order to further reduce gas and oil usage in future.

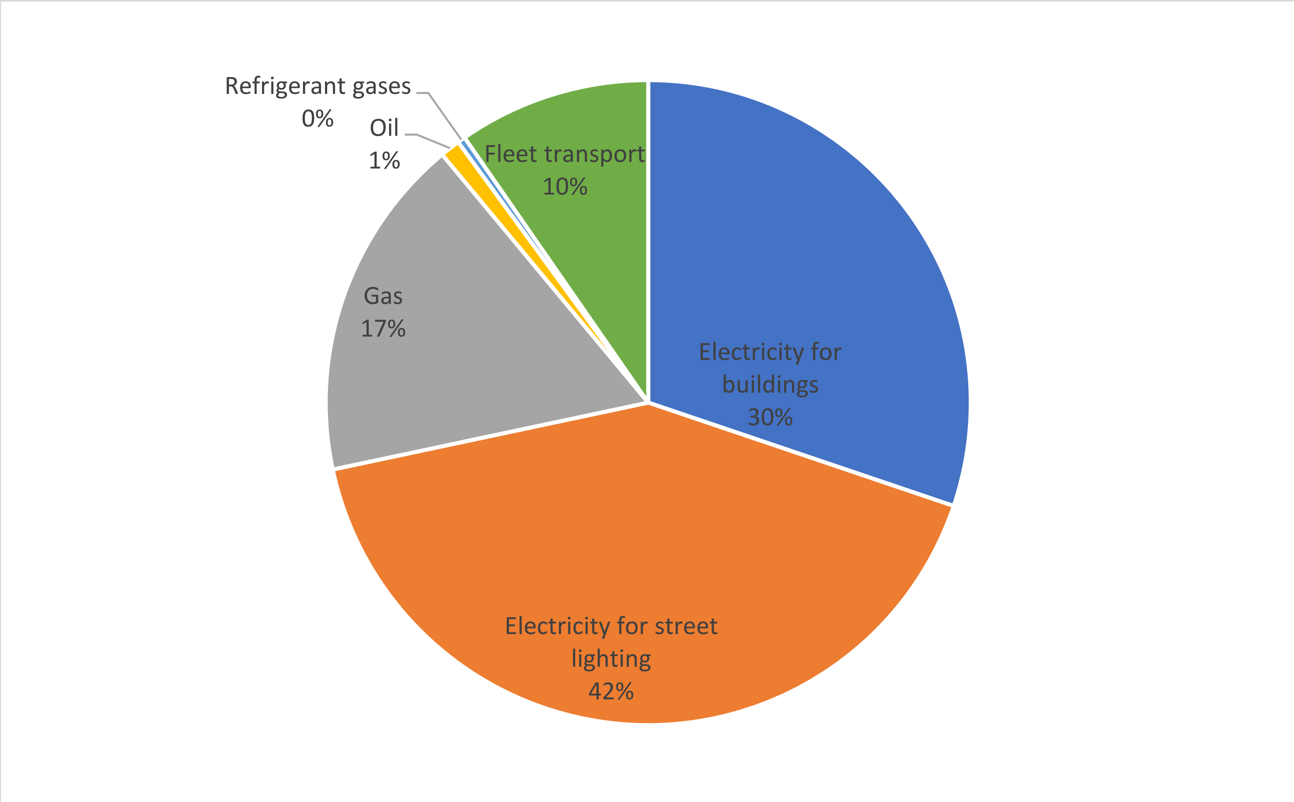


Figure 1: CCC Scopes 1 and 2 emissions sources, 2020-2021 (gross - before reductions)

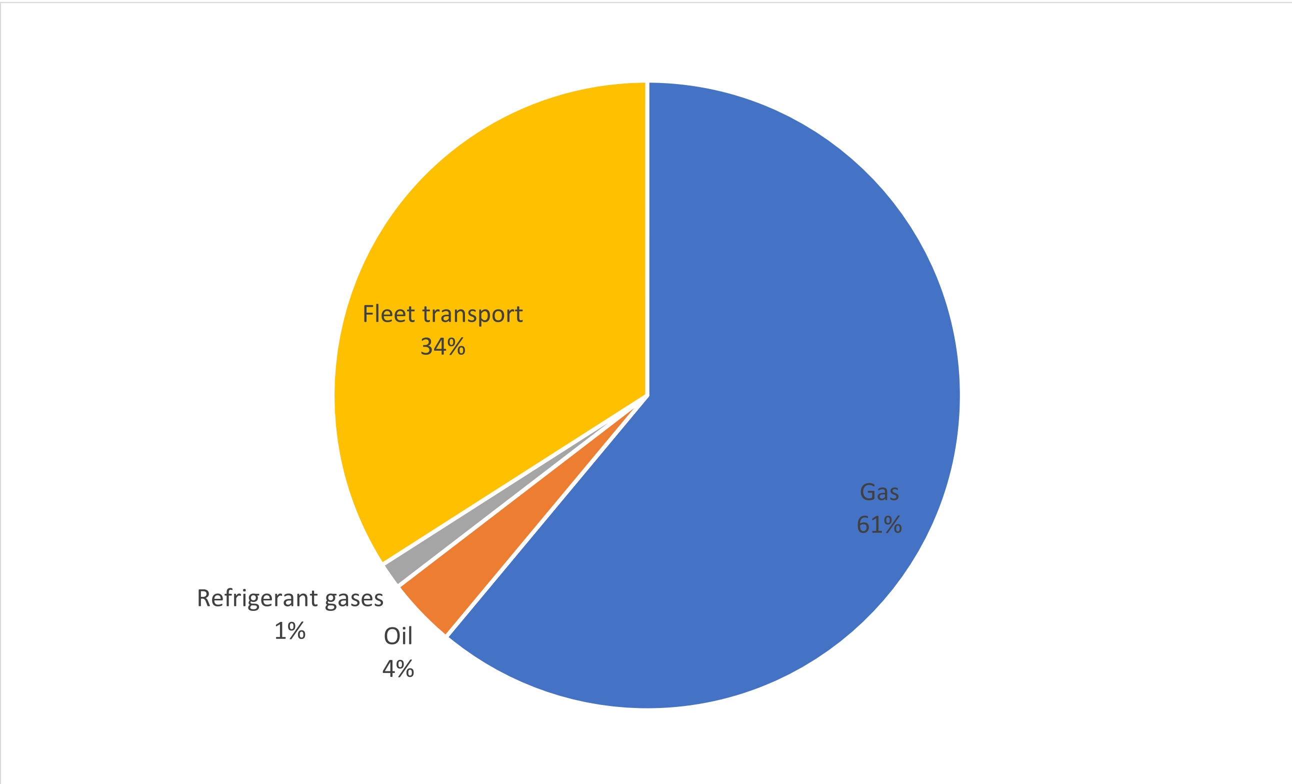


Figure 2: CCC Scopes 1 and 2 emissions sources, 2020 – 2021 (net – after reductions)

2.1.2 Scope 3 emissions

We have also calculated our scope 3 emissions where we can. This means emissions from assets outside of the Council's control, such as those of our contractors and suppliers.

The vast majority (95% or **107,355 tonnes CO_2e**) of all known emissions were scope 3 (indirect). This includes transport emissions from vehicles not under Council control (such as employee's own cars or contractors' vehicles), emissions from county waste disposal and treatment, emissions from Local Authority maintained schools' energy usage, agricultural emissions from the County Farms estate, and emissions associated with purchased goods and services delivered by third parties, such as capital construction works.

This year, for the first time, an estimate of emissions from land use, land use change and forestry (LULUCF), for land owned by the Council, is included in these figures. This is a significant change because it accounts for 24,490 tonnes CO_2e, largely due to the amount of cropland that the Council owns in its rural estate.

Some additional emissions associated with purchased goods and services are not included, because we do not have the relevant data to calculate these. However, this could potentially account for a significant quantity of additional unknown scope 3 emissions. Our action plan includes steps to identify more of this data in future.

2.1.3 All scopes

By also including those 'scope 3' (indirect) emissions sources for which we have data, the total amounted to **113,477 tonnes CO_2e** (gross). This is a 40% reduction compared to the previous year, which is mainly due to a reduction in construction activity during the 20-21 year, but also due to some changes in the available data.

The breakdown of all these known emissions sources is shown in **Error! Reference source not found.** and there is also a more detailed breakdown in Table 1 on page 8.

Net GHG emissions for all scopes, after deducting the emissions offset through our renewable electricity generation assets (saving 3,085 tonnes CO_2e) and for purchasing 100% renewable electricity (saving 4,388 tonnes), were **106,004 tonnes CO_2e**.

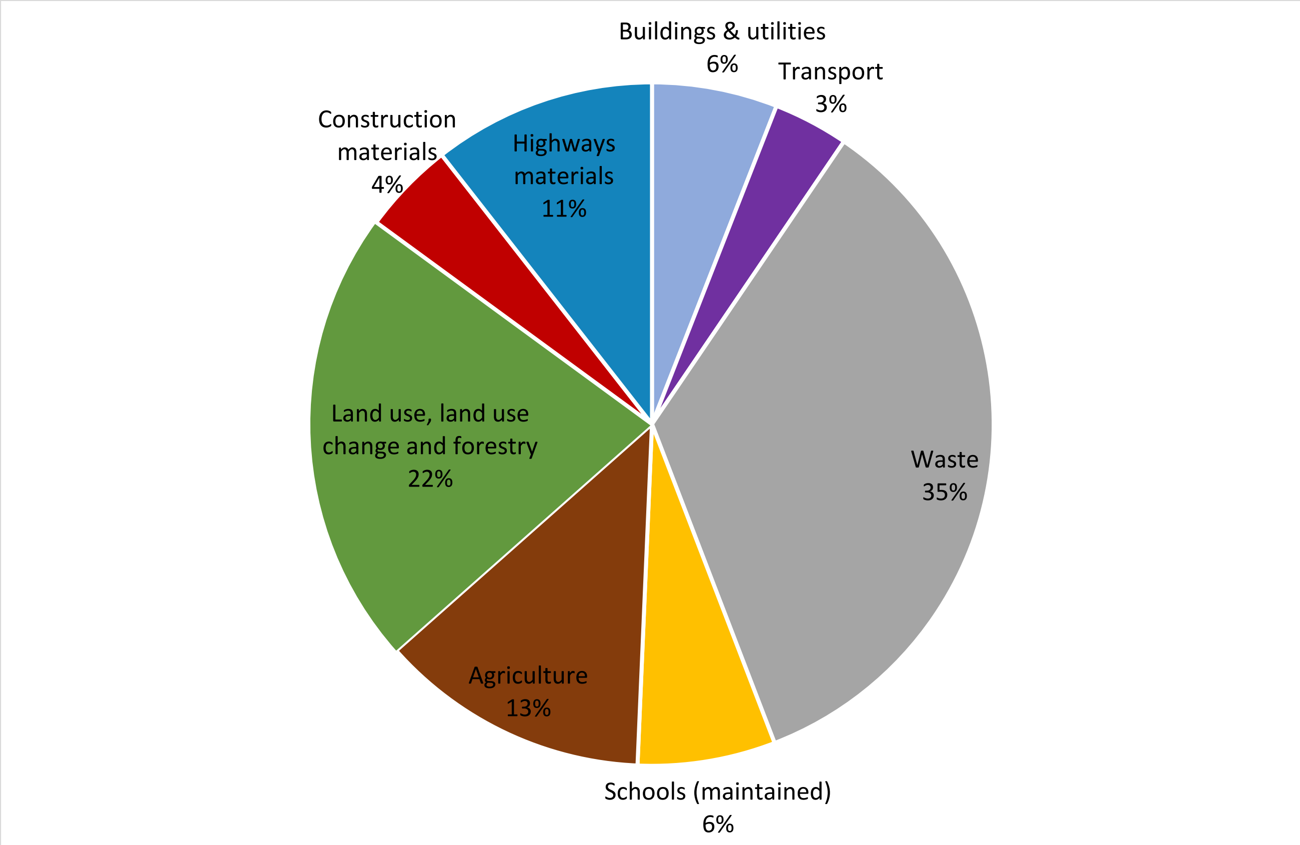


Figure 3: CCC GHG emissions, 2020-21, all 3 scopes

There were also 181 tonnes CO_2e emissions outside of scopes, from biofuels used in some of our highways vehicles.

A full list of what has been included and what is excluded, together with reasons for exclusions, is in section 0 below.

2.1.4 Trend over time

Figures 4 and 5 below show how the Council's GHG emissions for 2020-21 compare to previous years. The dramatic reductions, largely due to the impact of COVID-19, can clearly be seen.

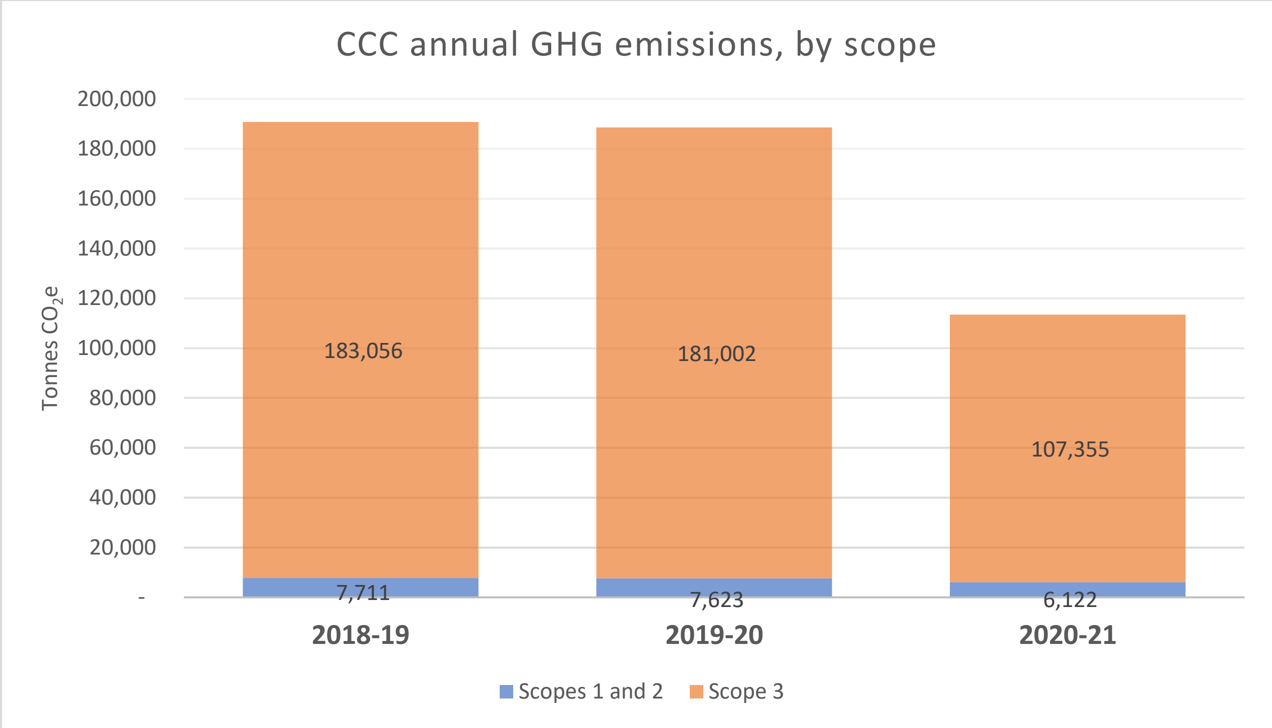


Figure 4. CCC annual GHG emissions trend over time

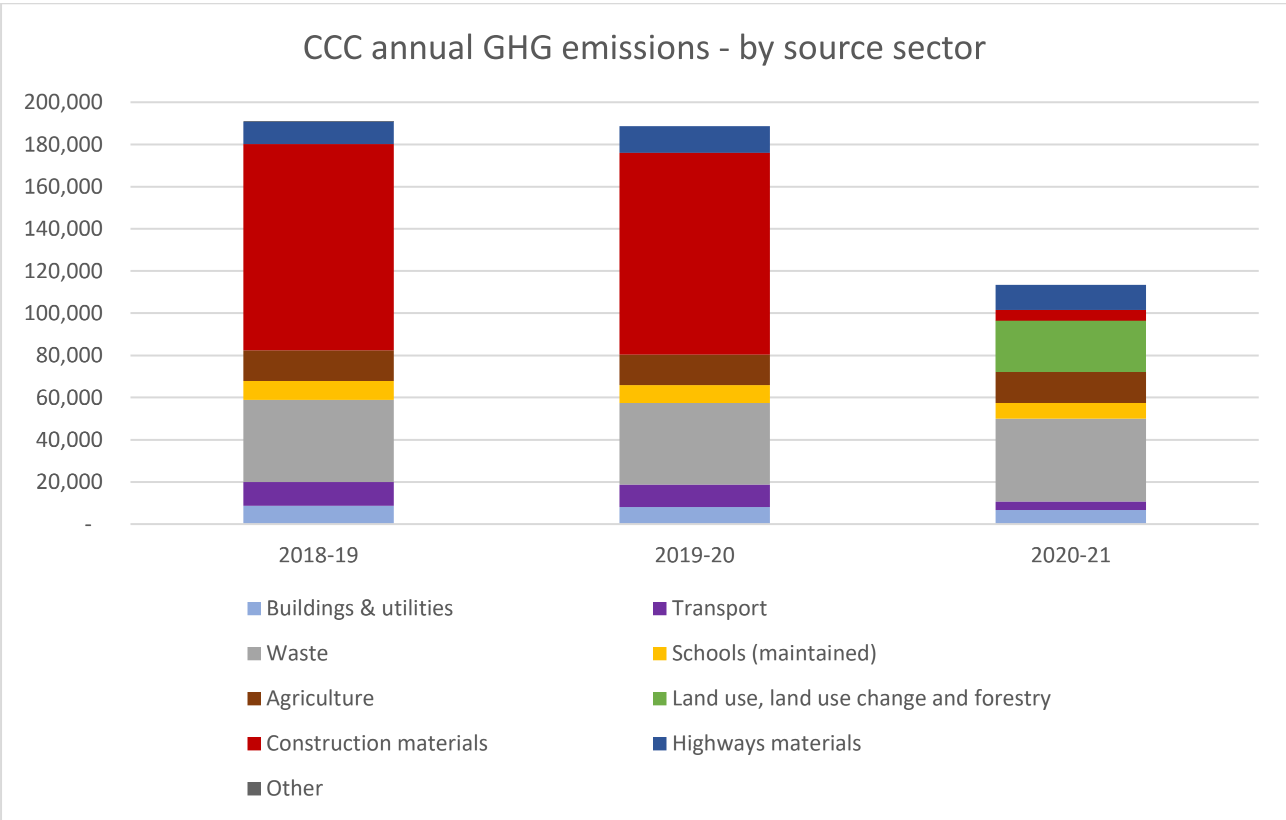


Figure 5. CCC annual GHG emissions by source sector

2.2 Full breakdown

Table 1: Cambridgeshire County Council Greenhouse Gas emissions 2020-21, breakdown by source and scope

	GHG emissions (Tonnes CO_2e)				
Category	**Scope 1**	**Scope 2**	**Scope 3**	**Total in scope**	**Outside of scopes**
Buildings & utilities	1,144	4,388	1,231	**6,763**	0
Gas	1,059		138	**1,197**	
Oil	61		13	**74**	
Refrigerant gases	24			**24**	
Water and sewerage			46	**46**	
Electricity for buildings		1,849	436	**2,285**	
Electricity for street lighting		2,539	599	**3,138**	
Transport	590		3,446	**4,037**	181
Business travel	121		1,083	**1,204**	
Employee commuting			1,139	**1,139**	
Highways	435		122	**557**	181
Public bus routes			868	**868**	
Social and education transport	34		8	**42**	
Construction transport			226	**226**	
Waste			39,320	**39,320**	0
Asbestos disposal			-	**-**	
CCC site waste			70	**70**	
Construction waste			32	**32**	
County waste disposal to landfill			31,989	**31,989**	
County waste disposal - recycling, composting and other			7,202	**7,202**	
Highways waste			26	**26**	
Schools (maintained)			7,397	**7,397**	0
Electricity			2,014	**2,014**	
Gas			4,464	**4,464**	
Oil			797	**797**	
Other heating fuels			122	**122**	
Construction materials			4,979	**4,979**	0
Highways materials			11,980	**11,980**	0
Agriculture			14,511	**14,511**	0
Livestock farming			324	**324**	
Arable farming			14,187	**14,187**	
Land use, land use change and forestry			24,490	**24,490**	0
CO_2 emissions from LULUCF			25,500	**25,500**	
CO_2 removals from LULUCF			-1,009	**-1,009**	
Total	**1,734**	**4,388**	**107,355**	**113,477**	**181**

2.3 Buildings and utilities

Buildings and utilities are responsible for 90% of all scope 1 and 2 emissions.

The biggest source of *gross* greenhouse gas emissions within the buildings and utilities category is electricity usage, using the location-based method, accounting for 4,388 tonnes CO_2e in scope 2 (including both buildings and street lighting). The Council purchased 18,821,129 kWh of electricity in 2020-21, 58% of which was for street lighting. This is 7% less than the amount purchased last year. However, the associated emissions from electricity are 15% lower than last year, due to the UK electricity grid being powered more by renewables and less by coal.

However, all of the gross CO_2e for scope 2 is reduced to zero in the *net* emissions, using the market-based method, by purchasing 100% renewable electricity through our supply contract. For transparency we are reporting both methods.

The next biggest source of GHG emissions related to buildings and utilities is gas, which accounts for 1,059 tonnes CO_2e in scope 1, plus 138 tonnes for 'well-to-tank' emissions in scope 3. Gas is currently used to heat many of our buildings. The Council purchased 5,759,521 kWh of mains gas in 2020-21. This is 20% less gas than last year, due to an reduced requirement for heating, likely to be because of milder weather in winter 20-21 compared to the previous year.

Oil, although more carbon intensive than gas, accounts for only 61 tonnes CO_2e, (plus 13 tonnes for WTT) because there were only four CCC sites that use oil. These used 248,635 kWh of heating oil in 2020-21. This is 30% lower than last year.

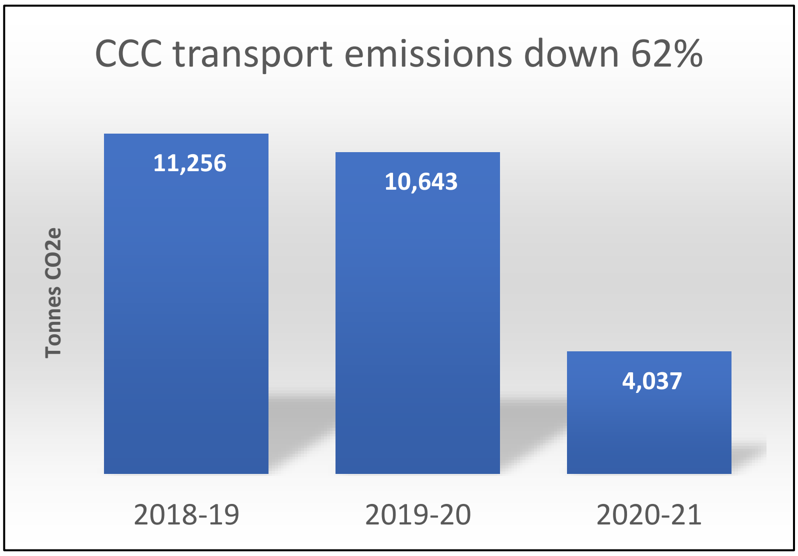
Finally, fugitive emissions of refrigerant gases from air conditioning units is estimated at 24 tonnes CO_2e, the same as last year.

This section does not include school buildings, which have been counted separately.

2.4 Transport

Transport accounts for 4,037 tonnes CO_2e, including 590 tonnes of scope 1 emissions. The majority of transport emissions are scope 3 because they are from vehicles not under the control of the Council.

Transport emissions have reduced by 62% compared to the previous year, likely to be largely due to the impact of the Covid-19 pandemic.



Of the scope 1 (direct) transport emissions, the largest share was from our Highways services, accounting for 435 tonnes CO_2e. This includes the road gritters pictured in Figure 6. Highways transport also accounted for 122 tonnes CO_2e in scope 3.

Figure 6: Some of CCC's Highways gritting fleet

Also in scope 1 transport is the social and education transport fleet, which produced an estimated 34 tonnes CO_2e emissions. Other social and education transport (including volunteers driving, some contracted out social care journeys and home to school transport by bus and taxi) are not currently included because we do not have the data to calculate these emissions.

Business travel (including pool cars, vans and other fleet vehicles) accounted for 121 tonnes CO2e in scope 1, and an additional 1,083 tonnes CO2e in scope 3, which includes emissions associated with business travel in employees' own vehicles and travel by public transport (trains, buses and taxis) and hotel stays. Journeys by public transport are estimated due to incomplete data.

The largest part of the transport section is the scope 3 (indirect) emissions from our employees commuting from home to work, which has been estimated at 1,139 tonnes CO_2e. This is a 78% reduction since the previous year. This estimate is based on 555 responses to the 2020 staff travel survey and has been extrapolated based on the total number of employees and assuming an average of 47 weeks worked per year. However, the relatively small sample size of the survey responses means that this is only a rough estimate.

Although the Cambridgeshire and Peterborough Combined Authority is the Transport Authority responsible for provision of public transport, they have delegated this responsibility back to Cambridgeshire County Council for 2020-21. We have therefore included the transport undertaken by passengers on those public bus routes which are subsidised by the Transport Authority, as a Scope 3 emissions source here, accounting for 868 tonnes CO_2e. Bus passenger numbers declined considerably in 2020-21 due to the COVID-19 pandemic, so for this year we have based our emissions estimate on the assumption that the distance travelled by the buses was the same, as the same routes were run. It is important to note that had these passenger journeys been made by car, total emissions would have been much higher (although outside of the Council's total).

Travel by contractors other than those mentioned above was not included due to not having access to this data.

2.5 Maintained schools

Schools emissions (which are all counted as scope 3) for all the Local Authority maintained schools in Cambridgeshire account for 7,449 tonnes CO_2e. This is 14% lower than the previous year, likely to be due to a combination of the greening of the UK electricity grid plus the impact of the 2020 lockdowns and partial school closures.

The largest share of this is 4,464 tonnes CO_2e from mains gas, followed by 2,066 tonnes CO_2e from electricity, and 797 tonnes CO_2e from heating oil.

This includes data for all Cambridgeshire maintained schools that either purchase their utilities through the ESPO contract or have provided their utilities data to us directly.

We do not currently have any data for schools' water and sewerage services or air conditioning gases in schools.

Academy schools are not included in these figures since these are not under the Council's control.

2.6 Waste

Waste accounts for the largest share (35%) of our known emissions in 2020-21, at 39,320 tonnes CO_2e.

The vast majority of this (estimated at 39,192 tonnes CO_2e) is due to the Council's statutory responsibility as the Waste Authority for treatment and disposal of waste from Cambridgeshire residents. In 2020-21 there were 303,598 tonnes of waste collected from both the household kerbside collections and the Council's nine Household Waste Recycling Centres. Of that, 48% went to landfill, mostly after initially going through a Mechanical-Biological Treatment (MBT) plant to reduce the volume, whilst 52% was either composted or recycled. Note that waste collection is the responsibility of the City and District Councils, therefore transport of waste is not included in these figures, whereas treatment and disposal is the responsibility of the County Council and is included.

The remainder of the waste category is from the waste generated at the Council's own sites, accounting for 70 tonnes CO_2e emissions, construction waste (32 tonnes) and highways waste (26 tonnes).

2.7 Agriculture

Agricultural emissions from the County Farms estate are estimated at 14,511 tonnes CO_2e, which is 13% of all known emissions in the Council's total carbon footprint for 2020-21. The vast majority of the County Farms estate is cropland, with a small area allocated to livestock.

2.8 Land use, land use change and forestry (LULUCF)

Emissions from land use, land use change and forestry (LULUCF) have been included this year for the first time. LULUCF can either be a source of GHG emissions (for example from soil erosion) or a sink where GHGs are removed (for example through tree growth).

This sector accounts for an estimated 24,490 tonnes CO_2e in the CCC carbon footprint, which is 22% of all our known emissions. This comprises an estimated 25,500 tonnes CO_2 from the 12,986 hectares of Council-owned cropland (arable farms) and 2,253 hectares of built-up land (buildings and highways) and deducting -1,009 tonnes CO_2 removed from the 270 hectares of Council-owned grassland (including livestock farms and parkland) and 163 hectares of forest / woodland.

2.9 Construction projects and highways

A share of our carbon footprint is from construction or building works. This comprises of emissions associated with extraction/mining, production/manufacture and transportation of materials to the point of purchase. These emissions are also known as ‘embodied carbon’.

The majority of construction works was building of new schools and major extensions to schools. In 2020-21, there was significantly reduced construction activity in our major capital projects compared to the previous year. This is the main reason for a very large reduction in associated emissions from construction materials, which in 2020-21 was 4,979 tonnes CO_2e – 95% less than the previous year.

This large reduction is in the context of a general slowdown in the construction industry in 2020-21 due to a combination of Covid-19 impacts and supply chain issues across the industry.

As for previous years, minor capital works such as renovations and maintenance of existing buildings, are not included in these figures because we do not have access to the relevant data on materials to be able to calculate the emissions.

Materials for Highways work, including resurfacing schemes and highways maintenance services and works, contributed an estimated 11,980 tonnes CO_2e. This is 5% less than the previous year. The largest share of this, by material, was from asphalt, followed by gas oil, concrete and steel. The associated activities included asphalt works, groundworks and surface treatment.

Major infrastructure projects other than those mentioned are not included in these figures because we do not have access to the relevant data on materials to be able to calculate the emissions.

2.10 Other purchased goods and services

Emissions from other purchased goods and services are unknown. This includes:

- Social care provision (other than our own buildings and staff travel);
- Legal, consultancy, insurance, pensions, investments, banking, telecommunications, post and other business services (other than our own buildings and staff travel);
- Education services (other than energy use in maintained schools);
- Office machinery, IT equipment, furniture and the like;
- Food and drink;
- Other goods and services not mentioned elsewhere.

Since the emissions data for these goods and services lies with other organisations it is more difficult to collect the relevant data. However, we are working to improve this.

2.11 Reducing our carbon footprint

There are two reasons for the difference between gross and net emissions; a reduction of 7,473 tonnes CO_2e.

Firstly, because we buy electricity generated from 100% renewable sources, although the gross emissions for electricity (based on grid-average carbon intensity – known as the location-based method) are 4,388 tonnes CO_2e, the net emissions (based on the supplier fuel mix for the tariff we purchase – the market-based method) are zero.

Secondly, our solar assets including the 12MW solar farm in Soham generated enough electricity to offset 3,084 tonnes CO_2e in 2020-21, which is enough to power more than 3000 homes.

Cambridgeshire County Council also already has several other key measures in place to reduce our gross carbon footprint and help mitigate against climate change. These include a range of energy efficiency projects across our property portfolio, such as on-site renewable generation assets (e.g. rooftop solar PV), Building Energy Management Systems (BEMS), and installation of LED lighting.

Our programme of low carbon heating works will see our scope 1 carbon footprint reduce further over the next few years, as we replace gas and oil heating with low carbon Air Source Heat Pumps at more sites.

Without these projects, the Council's carbon footprint would have been higher. However, we recognise that there is more work to do. This is set out in our Climate Change and Environment Strategy and Action Plan.

3. Methodology

A carbon footprint is a measure of the greenhouse gases (GHGs) emitted into the atmosphere from sources in a specified region or organisation. The most common GHG is carbon dioxide (CO_2). Emissions of other GHGs such as methane (CH_4) or nitrous oxide (N_2O), are measured in 'carbon dioxide equivalent' (CO_2e), which takes into account the different global warming potential (GWP) of different gases. Quantities of GHGs are multiplied by their GWP to give results in units of carbon dioxide equivalent (CO_2e).

Different activities emit different gases, for example, burning fossil fuels releases carbon dioxide, methane and nitrous oxide into the atmosphere.

Nationwide, emissions of CO_2 make up about 80% of GHG emissions, with the remainder from methane (12%), nitrous oxide (5%) and fluorinated gases (3%), when weighted by GWP, as shown in Figure 7.

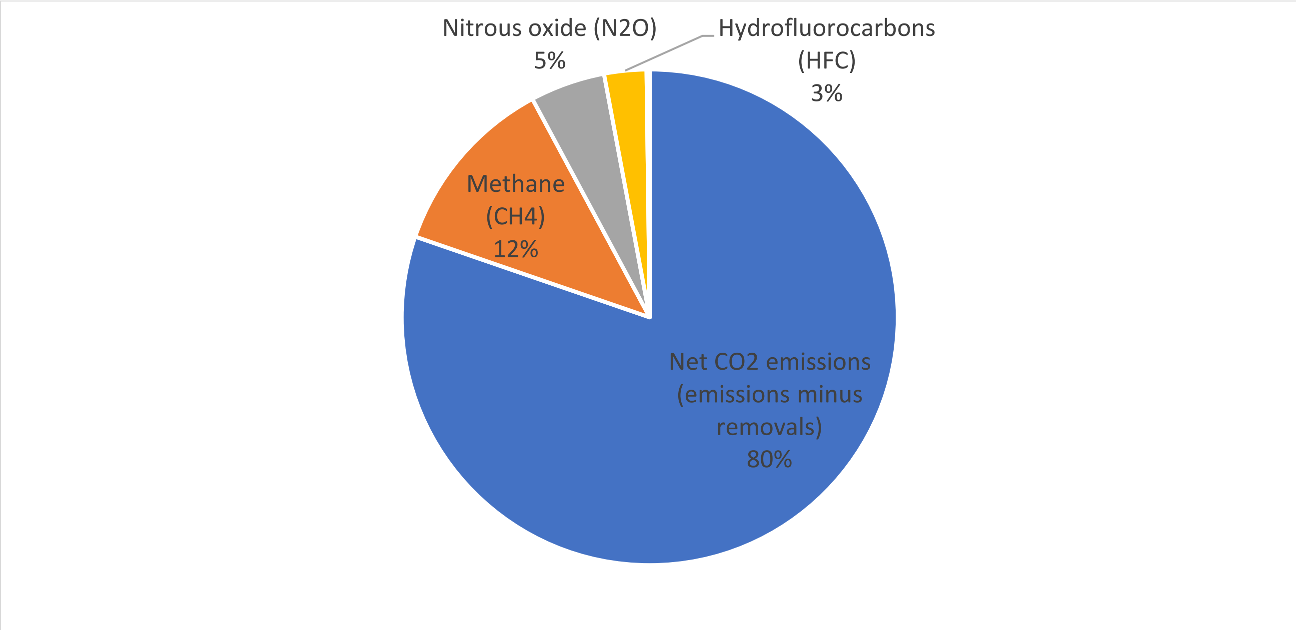


Figure 7: UK-wide Greenhouse Gas Emissions, 2019, by type of gas (tonnes CO_2e) (data from BEIS)

The Council's own carbon footprint has been calculated in line with the UK Government's Environmental Reporting Guidelines for Voluntary Greenhouse Gas Reporting[1], which is based on internationally-recognised standards from the World Resources Institute and World Business Council for Sustainable Development: the GHG Protocol Corporate Accounting and Reporting Standard, and the GHG Protocol Scope 3 standard.

Broadly, the methodology used was as follows:

1. Collect data on all activities under Cambridgeshire County Council control that emit GHGs (e.g. energy used, miles travelled, materials purchased). Actual data has been used wherever it is available.

[1] 2019 Environmental Reporting Guidelines, Chapter 3

2. Assumptions and estimates are only used where actual data was not available. Some activities have been excluded in cases where there was no data available and no basis upon which to estimate. Where this is the case, this is clearly stated below.
3. Convert data to metric tonnes of carbon dioxide equivalent (CO_2e), to calculate gross emissions using appropriate carbon conversion factors.
4. Note actions taken to reduce emissions (e.g. green energy tariff, solar generation), then also report net emissions.

The reporting period is the financial year 1 April 2020 to 31 March 2021.

The carbon conversion factors used for this reporting period are mostly the 2020 UK Government published carbon conversion factors, except where there is no appropriate emissions factor given, or a more accurate conversion factor is available. Where alternative methodologies have been used, these are explained in Table 3 in section 3.2 below.

3.1 Scopes

Emissions-releasing activities of organisations are classified into three groups known as scopes. These are defined in the GHG Protocol Corporate Standard and are described in Table 2 below.

Table 2: Scopes

Scope	Definition
Scope 1 (Direct)	Emissions that occur directly from sites or assets owned or controlled by the organisation (e.g. gas boilers at own premises, fleet vehicles).
Scope 2 (Energy indirect)	Emissions from purchased electricity, heat or steam.
Scope 3 (Other indirect)	Emissions that occur due to the organisation's activities / products / services, but at assets not owned or controlled by that organisation (e.g. travel in employee-owned vehicles or public transport, purchased goods and services).

Activities in all three scopes have been included in this report. However, Scope 3 emissions are more difficult to account for, because the required data often lies with other organisations. As a result, there is a higher degree of estimation in the scope 3 categories.

Carbon dioxide produced from biologically-sequestered carbon, e.g. from the combustion of biomass for electricity and / or heat generation, is not included in either scopes 1, 2, or 3. However, this is reported separately as 'outside of scopes'. This is because an equivalent amount of carbon dioxide would have been absorbed from the atmosphere during the plant growth phase. This carbon dioxide would have been emitted when the plants - from which the biomass is derived - decayed naturally at the end of their life. However, two other GHGs – nitrous oxide and methane – are commonly emitted when biomass is combusted. These would not be emitted during natural decay and any nitrous oxide or methane emissions from biomass / biofuel consumption is included in the emissions under the three scopes. This is the approach generally taken in international accounting standards.

3.2 Boundary of reporting, and data sources

All activities under the operational control of Cambridgeshire County Council are within the boundary of reporting, including those outsourced to third parties in cases where the overall control or responsibility still lies with the County Council.

A complete list of emissions sources included is shown below in Table 3.

Table 3: CCC Emissions Sources Included

Area	Activity	Methodology / Data source	Accuracy / Confidence level
Buildings and utilities	Gas burned for heating and hot water at CCC-controlled buildings	Usage data from utility bills	High
Buildings and utilities	Oil burned for heating and hot water at CCC-controlled buildings	Usage data from utility bills	High
Buildings and utilities	Electricity used at CCC-controlled buildings	Usage data from utility bills	High
Buildings and utilities	Electricity used for CCC street lighting, traffic signals and similar	Usage data from utility bills	High
Buildings and utilities	Refrigerant gases leakage from air conditioning units in CCC-controlled buildings	Estimated based on last year's data, which was based on leakage assumed from top-ups at servicing, applied to CCC list of A/C units, type of refrigerant gas and capacity.	Medium
Buildings and utilities	Water supply and wastewater collection and treatment	Usage data from utility bills. Some of this is estimated.	Medium
Buildings – maintained schools	Gas burned for heating and hot water at Cambridgeshire schools, where purchased through ESPO.	Gas usage data. (Some schools will not have gas data because they do not use any gas, for example those with oil heating. A small number of schools we do not have data for.)	Medium
Buildings – maintained schools	Electricity used at Cambridgeshire schools, where purchased through ESPO.	Electricity usage data.	High

Area	Activity	Methodology / Data source	Accuracy / Confidence level
Buildings – maintained schools	Oil and LPG used for heating at some Cambridgeshire schools.	Heating fuels usage data provided by the schools.	Medium
Transport	Travel in CCC pool cars. Travel in hire cars.	Data from mileage reports and invoices. Based on miles travelled and type of car where known.	High
Transport	Social and education transport in own fleet.	Data from a combination of fuel card reports for some vehicles and estimated mileage for others. Fuel consumption data and type of fuel is used where known. Actual mileage records used if no fuel usage data available. Estimated mileage used if neither fuel usage nor actual mileage available.	Medium
Transport	Highways maintenance vehicles and gritting fleet.	Data from fuel usage.	High
Transport	Employee travel on CCC business in own vehicles	Data from miles claimed on employee expenses system.	High
Transport	Travel by public transport incl flights, trains, buses and taxis, where known	Currently only have partial data on this. Some train and bus travel estimated from spend.	Low
Transport	Hotel stays on CCC business	Currently only have partial data on this. Estimated from spend.	Low
Transport	Subsidised public bus routes	Responsibility of the C&P Combined Authority, delegated back to CCC. Estimated based on route distances calculated from maps and assumed that average passenger travels 50% of total route distance. *Passenger numbers were significantly lower in 2020-21 but emissions assumed same as previous year as routes remained the same.*	Medium

Area	Activity	Methodology / Data source	Accuracy / Confidence level
Transport	Employee home to work commuting	Estimated based on annual staff travel survey in October. A sample of employees provided detailed information on their modes of travel and distance travelled for one week. Assumed this was representative of all employees and based on a typical week. Extrapolated to all employees and assumed working 47 weeks per year.	Low
Waste	Waste produced from CCC sites – general waste, recycling and confidential paper waste	Data from waste transfer notes / invoices.	High
Waste	Disposal / treatment of Cambridgeshire waste (as the statutory waste authority)	Based on waste volumes collected by all the City and District Councils in Cambridgeshire, and from all of the Household Waste Recycling Centres in Cambridgeshire, and proportions of waste recycled, composted and landfilled. Landfill gas emissions modelled using similar method to that of CUSPE report (Weber, et al., 2019), applied to updated data set. Composting emissions estimated based on Cambridgeshire share of UK population and national emissions data.	Medium
Agriculture	County farms / rural estates	Estimated based on area of land used for livestock, number of cattle, number of sheep, and area of land used for crops, with UK average GHG emissions rates for these uses (based on UK GHG inventory) applied.	Low
Land use, land use change and forestry (LULUCF)	Area of land used as cropland, grassland, wetlands, forestland and settlements	Estimated based on area of land owned by CCC of each type, and emissions factors calculated from the UK GHG Inventory.	Low

Area	Activity	Methodology / Data source	Accuracy / Confidence level
Purchased goods and services	Construction and buildings works – major capital projects	Inventory of each material used and quantity (tonnes) data from project information and/or capital works contractors (where available). Materials used multiplied by the relevant conversion factors for each material. This data was available for the majority of the total spend on major capital works, with the remaining spend assumed to have a similar composition of materials and emissions estimated on a pro rata basis.	High
Purchased goods and services	Highways works	Data provided by our highways contractor (Milestone) for the works they did on our behalf.	High

3.3 Exclusions

The following activities have been excluded from this carbon footprint calculation:

Table 4: Exclusions

Area	Activity	Reason for exclusion
Buildings and utilities	Diesel used for on-site generators	No data currently available. Unable to estimate. Expect this to be very low.
Buildings and utilities	Energy used at sites outside of CCC control e.g. space in a shared building, third party premises, and CCC-owned sites let to commercial or private tenants.	We do not have access to this data.
Buildings and utilities	Biomass	There are currently no biomass facilities at any CCC sites or maintained schools.
Schools	Gas used at those schools that do not purchase energy through ESPO.	We do not have access to this data.
Schools	Electricity used at those schools that do not purchase energy through ESPO	We do not have access to this data.
Schools	Oil and other heating fuel data for some schools	We only hold partial data for heating fuels used at schools.
Schools	All data for Academy schools.	These schools are outside of Council control.
Transport	Social and education transport by contractors (including home to school transport). Social and education transport by volunteer drivers.	We do not have access to this data.
Transport	Travel by public transport other than that included in scope above.	We do not have access to this data.
Transport	Other travel by third parties, contractors and suppliers (other than those mentioned in scope)	We do not have access to this data.
Waste	Other waste streams from CCC sites not mentioned in scope above e.g. batteries, WEEE, skip waste, green waste.	We do not have access to this data.
Waste	Collection and transport of Cambridgeshire waste	This is not CCC’s responsibility.
Waste	Transport, disposal and treatment of private / third party commercial waste	This is not CCC’s responsibility.

Area	Activity	Reason for exclusion
Purchased goods and services	All other goods and services purchased by CCC not accounted for elsewhere	Only spend data available. No accurate method available to convert spend to emissions.
All	All other activities not mentioned in scope above.	No known GHG emissions other than those already listed.

4. Cambridgeshire's Carbon Footprint

The carbon footprint of the geographical area of Cambridgeshire comprises GHG emissions from commercial and industrial sources, domestic homes, transport, agriculture, waste and land use. The vast majority of this is outside of the control of the Council.

We have used the following methodologies to identify the carbon footprint of the geographical area:

- CO_2 emissions by local authority area, data published by the UK Government (BEIS)
- Apportioning a share to Cambridgeshire of UK-wide non-CO_2 GHG emissions

4.1 CO_2 emissions data for Cambridgeshire

The Government Department for Business, Energy and Industrial Strategy (BEIS) currently publishes detailed data at a local authority (district) level, on emissions of carbon dioxide (Department for Business, Energy and Industrial Strategy, 2019), but does not provide data at a local authority level on emissions of other greenhouse gases. Carbon dioxide (CO_2) emissions account for around 80% of nationwide GHG emissions.

2019 is the most recent year of data currently available. Cambridgeshire has seen a 24% reduction in CO_2 emissions between 2005 and 2019. Most of the reductions are due to the decarbonisation of electricity generation for domestic, commercial and industrial usage.

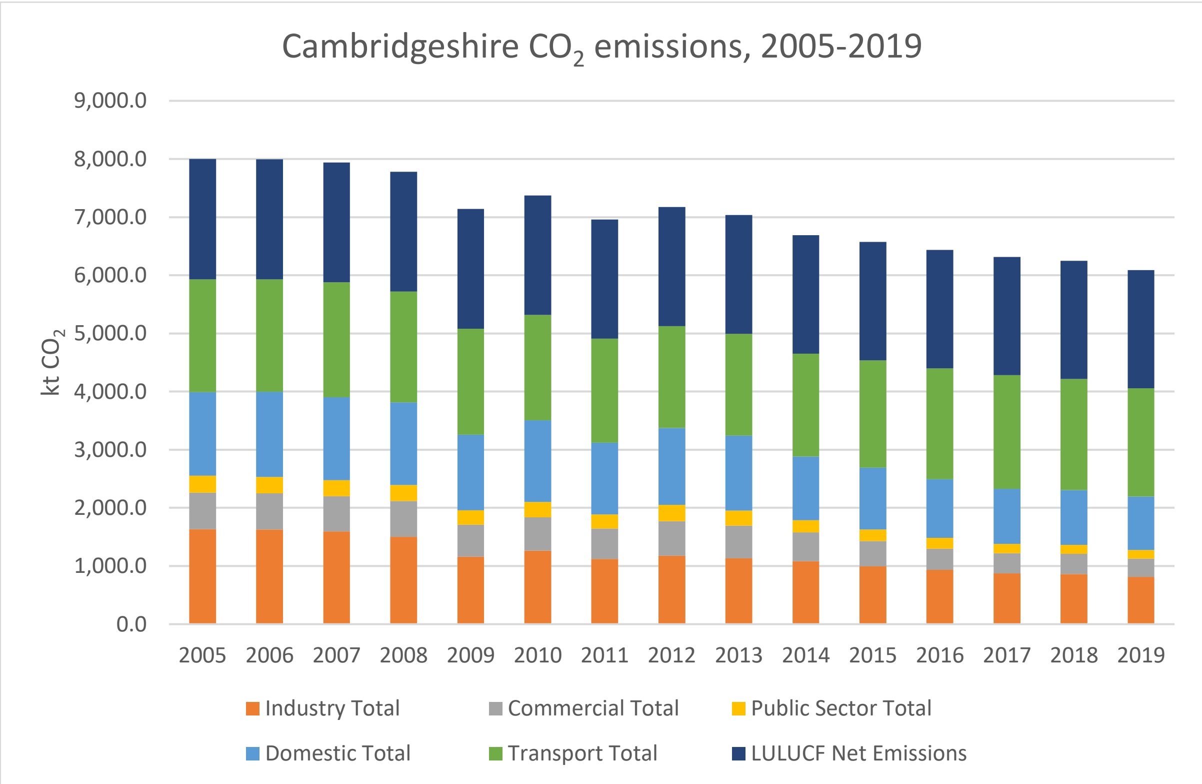


Figure 8 Cambridgeshire CO_2 emissions, 2005-2019 (data from BEIS)

The total CO_2 emissions from Cambridgeshire in 2019 was just under 6.1 million tonnes, and the largest share of that was from the Land Use, Land Use Change and Forestry (LULUCF) sector, followed by transport.

This data has been revised significantly since the previous year's publication, with the largest differences being from methodology improvements in the LULUCF sector. The LULUCF sector is now the largest source of emissions in Cambridgeshire. This is mostly due to the large areas of drained peatland in the region, where the wasted peat loses carbon from the soil as CO_2. However, LULUCF is a net sink in many other regions of the UK, where CO_2 is removed from the atmosphere through forest growth and conversion of cropland to grassland. This is illustrated in Figure 9 below. In Cambridgeshire, CO_2 emissions per capita and per km^2 area were considerably higher than the national average, with much of the excess due to the LULUCF sector. Excluding LULUCF, Cambridgeshire's CO_2 emissions were under 4.1 million tonnes.

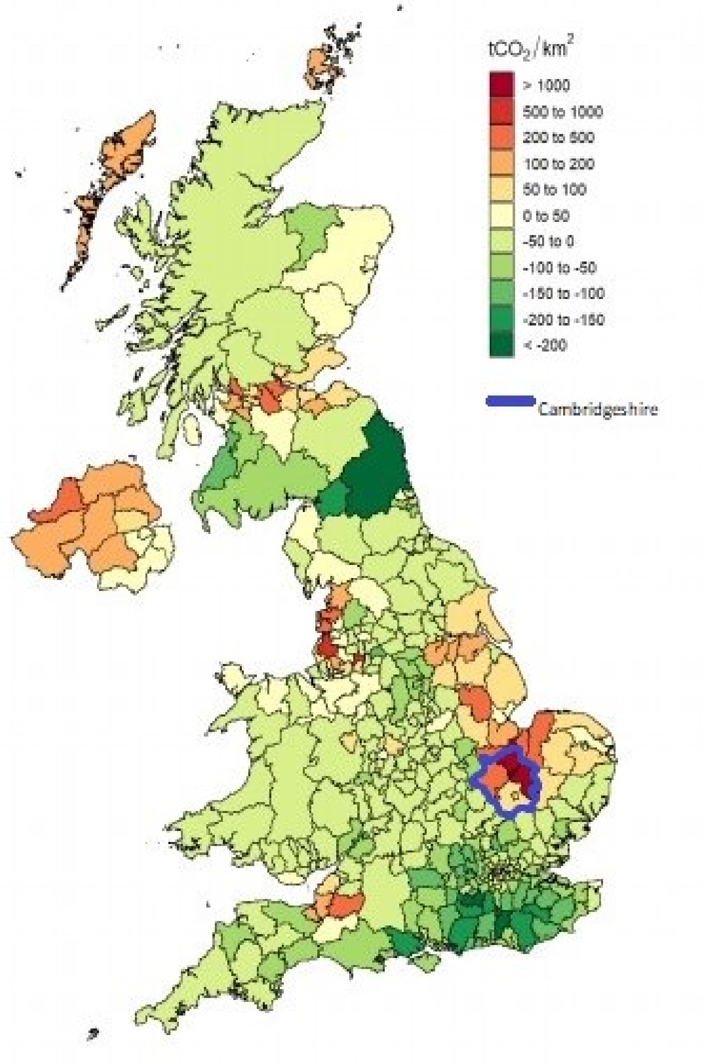


Figure 9 Emissions or removals of CO_2 from LULUCF by LA area in 2019 (data and image from BEIS)

Aside from LULUCF, the trend in Cambridgeshire is reflective of the national trend: emissions slowly and steadily declining over the last few years, due mainly to the decarbonisation of the electricity grid.

Emissions from agriculture (other than land use) and waste are not included in these figures because they primarily produce methane and this data is for CO_2 only.

The graph below shows a breakdown of the county's CO_2 emissions by sector and District.

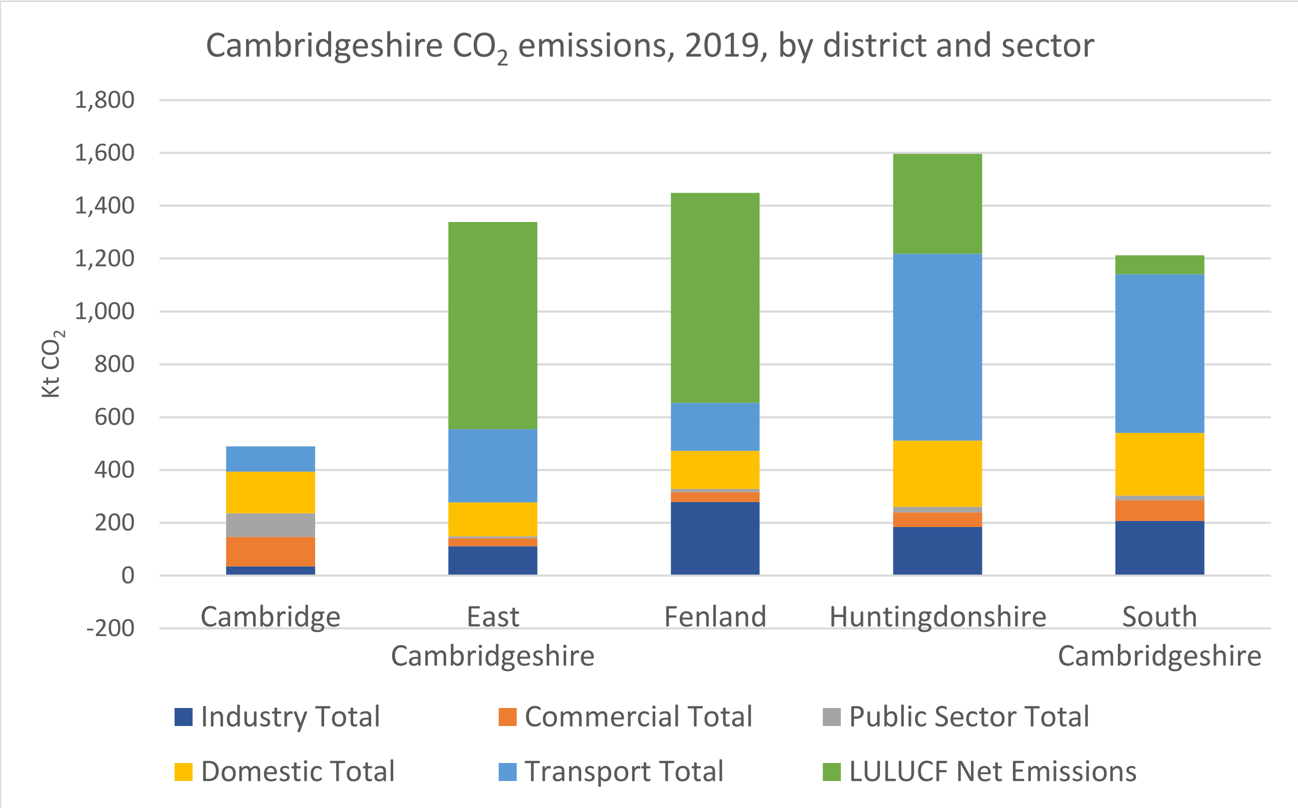


Figure 10

4.2 All GHGs in Cambridgeshire

Emissions of other (non-CO_2) GHGs from the county, such as methane or nitrous oxide, have been estimated based on combining UK emissions data with Cambridgeshire's land area, population and CO_2 emissions data for each sector.

The results of these calculations put these emissions of other GHGs at 1.214m tonnes CO2e in 2019.

The non-CO_2 emissions are then added to the CO_2 emissions to give the total GHG emissions for Cambridgeshire as **7.3m tonnes CO_2e**. A breakdown by sector is shown in Figure 11 and Figure 12.

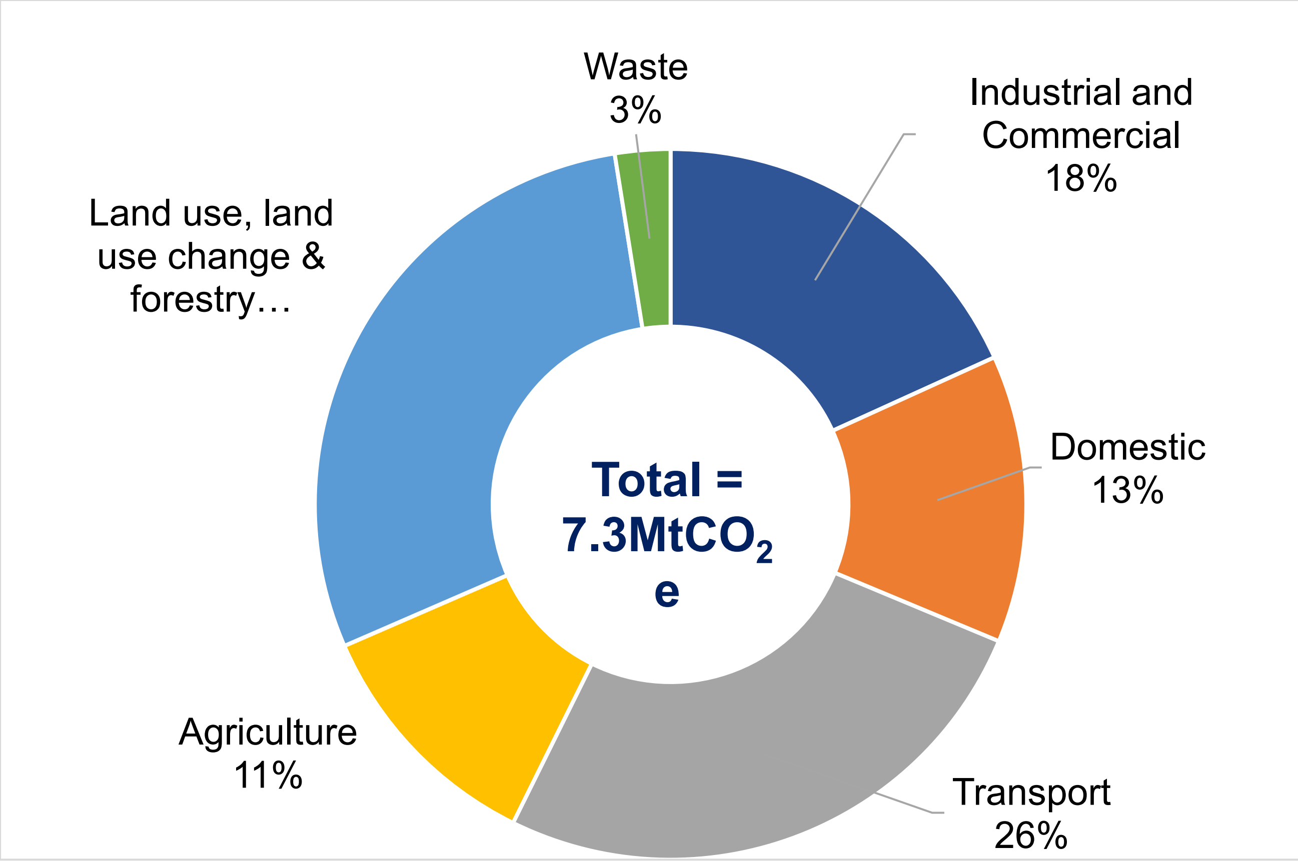


Figure 11 Cambridgeshire GHG emissions, 2019, by sector (combination of BEIS data and our calculations)

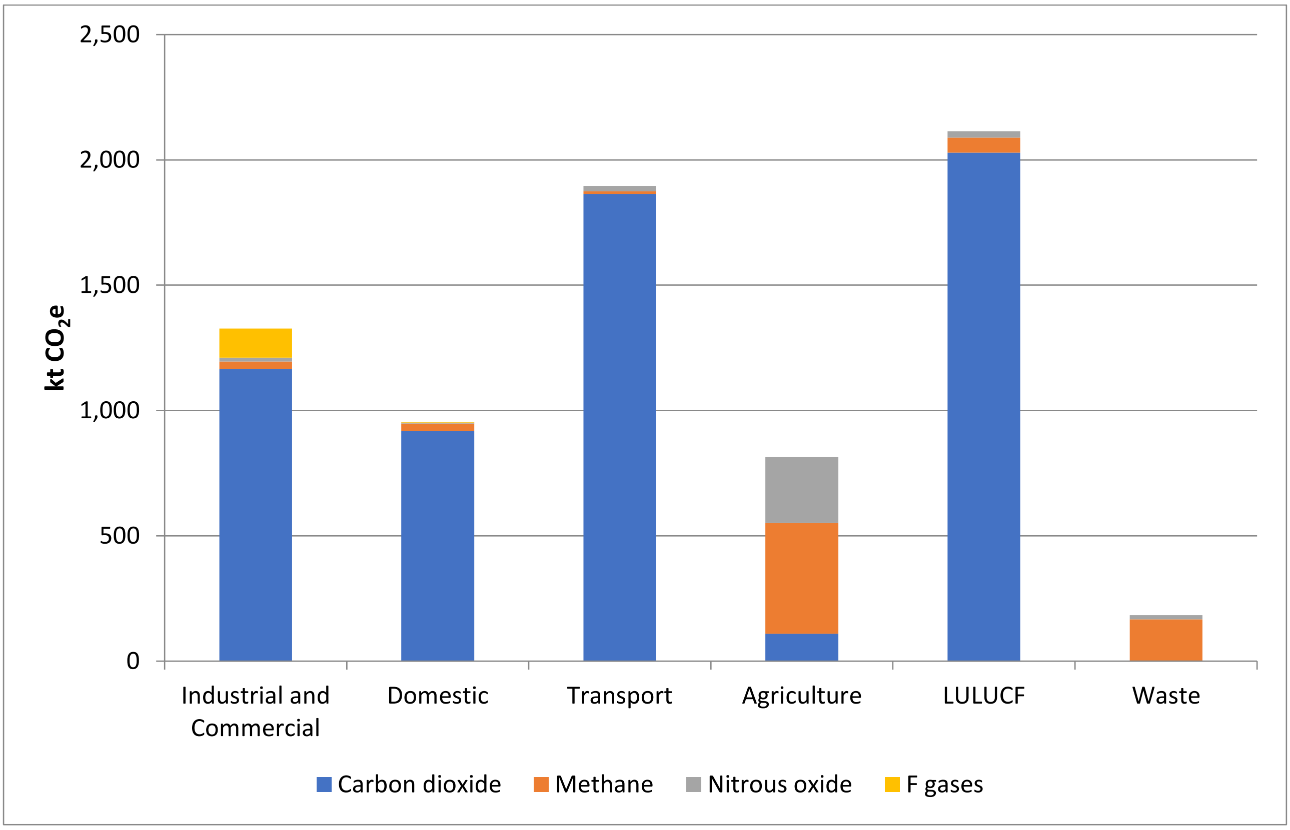


Figure 12 Cambridgeshire GHG emissions, 2019, by sector and gas (combination of BEIS data and our calculations)

5. Glossary

Expression	Meaning
Carbon	Used as abbreviation for carbon dioxide or carbon dioxide equivalent
Carbon Budget	An amount of carbon dioxide that a country, company, or organization has agreed is the largest it will produce in a particular period of time.
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent: A standard unit for measuring carbon footprints. It expresses the impact of each different greenhouse gas in terms of the amount of CO_2 that would create the same amount of warming, using GWPs.
GHG	Greenhouse gas: a gas that absorbs and emits radiant energy within the thermal infrared range. Greenhouse gases cause the greenhouse effect.
Greenhouse effect	The heating of the earth's surface caused by solar radiation trapped by atmospheric gases (rather like a greenhouse roof).
GWP	Global Warming Potential: this is a measure of how efficient a chemical is at trapping heat in the atmosphere relative to carbon dioxide. For example, methane has a GWP of 34 and nitrous oxide has a GWP of 298. (Intergovernmental Panel on Climate Change, 2014) By definition, CO_2 has a GWP value of 1. Quantities of GHGs are multiplied by their GWP to give results in units of carbon dioxide equivalent (CO_2e).
Kt	kilotonne = 1000 metric tonnes
LULUCF	Land Use, Land use change and forestry.
Mitigation	Methods to reduce or prevent greenhouse gases entering the atmosphere.
Net zero	Achieving an overall balance between emissions produced and emissions taken out of the atmosphere. This can take place on different scales and is often achieved through offsetting.
Offset	An action intended to compensate for GHG emissions by an equivalent quantity of reductions elsewhere or removals.
Sequestration	The long-term removal, capture or sequestration of carbon dioxide from the atmosphere to slow or reverse atmospheric CO_2 pollution and to mitigate or reverse global warming.
WTT – Well to tank	The emissions associated with extracting, refining and transporting fuels to the point of purchase.
Zero carbon	No emissions of GHGs at all

Cambridge University Science and Policy Exchange 2021: A Cambridgeshire Decarbonisation Fund (Part 2)

To:	Environment and Green Investment Committee
Meeting Date:	20 January 2022
From:	Steve Cox, Executive Director, Place and Economy
Electoral division(s):	All
Key decision:	No
Forward Plan ref:	N/A

Outcome: To speed up carbon emissions reductions in Cambridgeshire by (i) collaborating with public sector partners and businesses on a Decarbonisation Fund and Business Advisory Service for SMEs and (ii) accrediting Swaffham Prior Community Heat Project for carbon credits for businesses to purchase for 'hard to treat' carbon emissions.

Recommendation: Members are asked to:

a) Note the Cambridgeshire University Science and Policy Exchange (CUSPE) 2021 research report on a Cambridgeshire Decarbonisation Fund attached as Appendix A;

b) Agree next steps as set out in paragraph 2.8

Officer contact:
Name: Sheryl French
Post: Assistant Director Climate Change and Energy Services
Email: Sheryl.french@cambridgeshire.gov.uk
Tel: 01223 728552

Member contacts:
Names: Councillors Lorna Dupré and Nick Gay
Post: Chair/Vice-Chair
Email: lorna.dupre@cambridgeshire.gov.uk /nick.gay@cambridgeshire.gov.uk
Tel: 01223 706398

1. Background

1.1 In October 2016, Cambridgeshire County Council initiated an annual collaboration with the Cambridge University Science and Policy Exchange (CUSPE) society, which brings teams of researchers together to explore challenges faced by the County Council.

1.2 In 2020, CUSPE researchers identified the development of a Cambridgeshire Decarbonisation Fund as an opportunity to deliver carbon reductions more swiftly across Cambridgeshire. However, more detailed development work was needed to understand how the Decarbonisation Fund could work for businesses; how projects could 'sell' carbon credits and what the funding model looks like.

1.3 This year again, researchers have shown strong interest in projects relating to climate change. For 2021 two streams of research have been delivered, with the first focused on the Cambridgeshire Decarbonisation Fund and the second on Heat Zoning as part of Local Area Energy Planning and which is subject to a separate report.

1.4 During the last year, the local context for climate change and its ambitions for net-zero have changed. The Cambridgeshire and Peterborough Independent Commission published their Final Report highlighting that emissions in our area are almost 25% higher per person than the UK average. This decade is now critical for reducing carbon emissions and businesses need to step up and prioritise action towards achieving net zero.

1.5 The outcomes of this report are to speed up carbon emissions reductions by (i) collaborating with public sector partners and businesses on a Decarbonisation Fund and Carbon Advisory Service for SMEs and (ii) accrediting Swaffham Prior Community Heat Project for carbon credits sales for businesses for 'hard to treat' carbon emissions.

2 Main Issues

2.1 Supporting businesses.

The mission of the UK British Business Bank is to enable the transition to a net zero economy, by improving access to finance for smaller businesses. It has conducted an in-depth examination of the crucial role smaller businesses can play in driving changes, estimating that in aggregate, smaller businesses account for around half of industrial emissions in the UK, about the same as larger businesses. In 2021, approximately 5.58 million SME's existed in the UK and the East of England has the third highest SME numbers. While individual businesses have relatively small carbon footprints, their collective footprint is significant. Unlike larger businesses they rarely have an in-house sustainability advisor, lack capital to invest in decarbonisation measures, and are not obliged to report emissions under schemes like the Energy Savings Opportunity

Scheme (ESOS). There is a clear opportunity to achieve significant emissions reductions by helping local businesses decarbonise. However, SMEs have generally not taken steps to reduce their emissions with little evidence of decarbonisation strategies or measurement of carbon footprints. This is largely down to lack of knowledge and information and capital cost.

2.2 The research proposes setting up a Carbon Advisory Service to support SME's to develop decarbonisation plans to reduce carbon emissions and where 'hard to treat' emissions remain, direct SMEs to the Cambridgeshire Decarbonisation Fund to offset these 'hard to treat' emissions only. The benefits of this approach are emissions that can be reduced are reduced and for those which can't right now be reduced, carbon credits from local projects can be purchased. Please look at Appendix A, figures 2 and 3 on pages 16 and 17 of the report for how this can work. The research also proposes that SMEs could receive local accreditation as a carbon friendly business and this is an option for further discussion.

2.3 Carbon credits - Third party verification

The proposal for a Cambridgeshire Decarbonisation Fund assumes that businesses will contribute to this fund to offset their hard-to-reduce emissions in the short to medium term by purchasing carbon credits. For businesses to want to buy the carbon credits, they need to trust that the corresponding amount of carbon has actually been saved and they want visibility of their company's money going into local projects that benefit local communities. Otherwise, businesses could decide to buy potentially cheaper carbon credits elsewhere to offset their emissions.

2.4 High-quality carbon credits are generally considered to have the following six 'quality objectives' as set out below:

- Robust determination of the greenhouse gas emissions impact of the mitigation activity
- Avoiding double counting of emission reductions of removals
- Addressing the risk of non-permanent removal
- Facilitating the transition towards net zero emissions
- Transparency and oversight of the crediting process and project methodologies
- Social and environmental co-benefits and an absence of a negative impact

2.5 Project developers can have their projects validated and verified using a certification organisation. These organisations provide a framework for carrying out decarbonisation projects including methodologies for different types of projects and reviewing specified documents. Three certification organisations are Gold Standard, Plan Vivo, and Verified Carbon Standard. These provide accrediting validation/verification services and can issue carbon credits via a registry that is either owned by the organisation or is managed by an external company. To understand and test this process, the intention is to progress the Swaffham Prior Community Heat Project through validation and verification with an accrediting body to sell its carbon credits.

2.6 Fund Structure

A financial model was constructed by the researchers to estimate the financial and environmental return over a 40-year period. The largest fund modelled provides the most benefits to the environment and the local communities. It also has the potential to reduce 25% of Cambridgeshire's annual emissions within 25 years. This means that a Cambridgeshire Decarbonisation Fund could be an important tool for phasing out the county's 'hard to remove' emissions. However, more specialist inputs are needed on the fund model to verify if the level of emissions reductions could be achieved or not and to scope further options for upfront investment.

2.7 Initial funding will need to be sourced as there is a gap between projects being developed and constructed and the revenue from carbon credit sales. The research suggests this initial funding could come from public sector borrowing and government loans to leverage private sector contributions but other options such as green bonds are also considered. A proposal that was also interesting is potentially not just selling carbon credits from projects but developing projects that could also generate revenues from energy sales as an example.

2.8 Next Steps

- Undertake detailed discussions with public sector partners and businesses on the merits of setting up a Carbon Advisory Service for SME's and whether this should be for Cambridgeshire or linked into Norfolk and Suffolk, who already run these types of services. Consider the inclusion of the Carbon Advisory Service into the action plan currently being developed in response to the CPICC's final report.

- Progress Swaffham Prior Community Heat Project through the carbon credit validation process with an accredited company. This will provide knowledge of the costs and resources required to undertake validation to inform the Decarbonisation Fund and make carbon credits available for selling.

- Work with the CPCA and Local Authority partners on how the Decarbonisation Fund can fit within the CPCA's climate financing recommendations set out by the CPICC in their final report and include the Decarbonisation Fund in its action plan currently under development.

3 Alignment with corporate priorities

3.1 Communities at the heart of everything we do

Setting up a Carbon Advisory Service as set out in paragraph 2.1 will inform a local, community-centred energy transition by supporting small local businesses to decarbonise (with cost savings and potential uplift in business), and channelling carbon offsetting payments towards local schemes, which offer further co-benefits for the area.

3.2 A good quality of life for everyone

The CUSPE 2021 research report attached as Appendix A has no significant implications. If the Council agrees to collaborate with partners and businesses on the set up of a Carbon Advisory Service and a Decarbonisation Fund these could deliver quality of life benefits through cutting carbon emissions; improving air quality and investing in local projects that improve nature that help with health and wellbeing.

3.3 Helping our children learn, develop and live life to the full

No significant implications.

3.4 Cambridgeshire: a well-connected, safe, clean, green environment

If the Carbon Advisory Service is taken forward it will have a positive impact as it will support businesses to improve environmental quality, both locally (e.g., reducing car use in local area for business-related transport, or switching to electric vehicles) and on wider scale by reducing greenhouse gas emissions and associated global heating-related impacts for Cambridgeshire.

3.5 Protecting and caring for those who need us

No significant implications.

Significant Implications

4.1 Resource Implications

If the research is taken forward and a Carbon Advisory Service and Decarbonisation Fund set up, there are financing and staff resourcing implications. However, more specialist consultancy work is needed to inform next steps and wider discussion and collaboration with Local Authority partners, CPCA and the Business Board to identify who and how this work can be taken forward.

4.2 Procurement/Contractual/Council Contract Procedure Rules Implications

There are no significant implications at this stage.

4.3 Statutory, Legal and Risk Implications

There are no significant implications at this stage.

4.4 Equality and Diversity Implications

There are no significant implications at this stage.

4.5 Engagement and Communications Implications

To progress the report recommendations, businesses and partners must be engaged to identify how and if to take this forward.

4.6 Localism and Local Member Involvement

No significant implications.

4.7 Public Health Implications

No significant implications from the report but there are potential health benefits from setting up a Fund and its investment into carbon emissions reductions. The health benefits would include air quality improvements and improved access to nature.

4.8 Environment and Climate Change Implications on Priority Areas

These have been assessed on the basis of progressing and implementing a Fund.

4.8.1 Implication 1: Energy efficient, low carbon buildings.
Positive/neutral/negative Status:Positive
Explanation: Carbon emissions reductions through switching off fossil fuels and improved energy efficiency

4.8.2 Implication 2: Low carbon transport.
Positive/neutral/negative Status:Positive
Explanation: Investment into EV charging or walking and cycling projects

4.8.3 Implication 3: Green spaces, peatland, afforestation, habitats, and land management.
Positive/neutral/negative Status:Positive
Explanation: Investment into nature improvements and carbon sequestration

4.8.4 Implication 4: Waste Management and Tackling Plastic Pollution.
Positive/neutral/negative Status:Neutral
Explanation: N/A

4.8.5 Implication 5: Water use, availability, and management:
Positive/neutral/negative Status:Positive
Explanation: Investing into nature and trees can help manage rainfall and flood risk by slowing down water

4.8.6 Implication 6: Air Pollution.
Positive/neutral/negative Status: Positive
Explanation: Air quality improvements derived from investment and delivery of projects described in 4.81, 4.8.2 and 4.8.3.

4.8.7 Implication 7: Resilience of our services and infrastructure and supporting vulnerable people to cope with climate change.
Positive/neutral/negative Status:Positive
Explanation: The Fund could choose to invest in tree planting or other nature based solutions which can help manage flood risk.

Have the resource implications been cleared by Finance? Yes
Name of Financial Officer: Sarah Heywood

Have the procurement/contractual/ Council Contract Procedure Rules implications been cleared by the LGSS Head of Procurement? Yes
Name of Officer: Henry Swan

Has the impact on statutory, legal and risk implications been cleared by the Council's Monitoring Officer or LGSS Law? Yes
Name of Legal Officer: Fiona Macmillan

Have the equality and diversity implications been cleared by your Service Contact?
Yes
Name of Officer: Elsa Evans

Have any engagement and communication implications been cleared by Communications? Yes
Name of Officer: Amanda Rose

Have any localism and Local Member involvement issues been cleared by your Service Contact? Yes

Have any Public Health implications been cleared by Public Health?
Yes
Name of Officer: Iain Green

If a Key decision, have any Environment and Climate Change implications been cleared by the Climate Change Officer?
Yes
Name of Officer: Emily Bolton

5. Source documents and Location

- Smaller businesses and the transition to net zero (british-business-bank.co.uk)
- UK SME figures 2021 | Statista
- 2021 Business population estimates for the UK and the Regions: Statistical Release (publishing.service.gov.uk)
- CUSPE 2020: A Cambridgeshire Decarbonisation Fund

Proposal for a Cambridgeshire Carbon Advisory Service and Strategic Business Case for a Cambridgeshire Decarbonisation Fund

Maximilian Bloomfield, Buffy Eldridge-Thomas, Affan N. Iqbal,
Kirsty Mackinlay, Amoghavarsha Mahadevegowda, Isobel Ollard,
Robert Pearce-Higgins, Andrew Smith

December 2021

Contents

Executive Summary

The imperative and urgency to reach net-zero has never been clearer. Decarbonising our local environment and practises is a momentous task, however Cambridgeshire County Council and its various public sector partners and stakeholders together, are uniquely placed to collaborate positively and holistically towards tackling the climate crisis at a local level. Thus, the Cambridgeshire local system has an exciting and critical opportunity to drive the achievement of a net-zero Cambridgeshire by 2045 and serve as a model for other local areas across the country and elsewhere. This report recommends the establishment of a Carbon Advisory Service, which will support local businesses to decarbonise. In conjunction, this report sets out the strategic business case for a Cambridgeshire Decarbonisation Fund, which will offset residual 'hard to reduce' emissions and support investment in local community infrastructure and nature-based projects which will avoid, reduce, or sequester carbon.

There are two main principles which should guide decarbonisation efforts across Cambridgeshire. Firstly, carbon saving projects should be prioritised in the order 'avoid, reduce, sequester' to maximise long-term impact of interventions. Secondly, alongside providing a platform to offset current carbon emissions, there must be robust and verifiable plans to decarbonise all scopes of emissions in the long term. Towards this second principle, the establishment of a 'Carbon Advisory Service' to run alongside and in collaboration with the Cambridgeshire Decarbonisation Fund is proposed. The Carbon Advisory Service will provide businesses, particularly small and medium sized enterprises (SMEs), with assistance in calculating their emissions, and a tailored framework for reducing these emissions. Participating businesses will then be invited to offset any residual 'hard to reduce' emissions through the Decarbonisation Fund.

In the introduction, the motivation for the formation of a Carbon Advisory Service is shown, as well as context around what a Decarbonisation Fund is and the aims and essential components of such a fund, and how these two services could be highly complementary. The remainder of the report is divided into 2 main sections. The first provides a detailed justification for establishment of a Carbon Advisory Service, including how it will improve upon existing resources available to local businesses, using a case study of services available in Suffolk and Norfolk. The section concludes with some specific recommendations. The rest of the report is concerned with the Cambridgeshire Decarbonisation Fund, which covers i) the strategic business case for the establishment of the fund, ii) how decarbonisation projects will be verified and validated, including two case studies, and iii) the financial structure of the fund. The report concludes with a brief summary and a list of recommendations for the setting up of a Carbon Advisory Service and Decarbonisation Fund for Cambridgeshire, these recommendations are included below.

Recommendations:

1. The establishment of a local Carbon Advisory Service to support small and medium sized businesses in Cambridgeshire to decarbonise, through the provision of the following services:
   a. Free tailored advice, and signposting relevant external resources and services.
   b. Assistance with carbon accounting and the creation of action plans.
   c. Energy audits and business-specific recommendations.
   d. Assistance with the purchase of carbon credits from the Cambridgeshire Decarbonisation Fund, where appropriate.
   e. Assistance with procurement and accessing financial support for carbon-reduction projects.
   f. An accreditation service with tiered certification.
   g. Training and networking opportunities and regular updates on funding, technology and environmental legislation.
   h. Support with publicity and follow-up on businesses progression towards set targets.
2. The Carbon Advisory Service should act as a gateway to the Decarbonisation Fund, ensuring that businesses reduce their emissions as far as possible before offsetting any residual 'hard to reduce' emissions through the purchase of carbon credits.
3. The Decarbonisation Fund should support emissions-reduction projects that would otherwise not be financially viable (i.e., would not produce revenue or financial savings which outweigh the cost of the project). Projects which do not require the sale of carbon credits to be financially viable should be performed separately to the running of this Fund.
4. The Decarbonisation Fund should set a single carbon price through a portfolio approach, where more carbon expensive projects (with high social / environmental value) are supported by projects with a lower project cost per tonne of CO2.
5. The Decarbonisation Fund should organise and perform the necessary assessments, measurements and predictions required for validation and verification of the decarbonisation projects in the decarbonisation fund portfolio.
6. The Decarbonisation Fund should register projects with established certification organisations where relevant and cost-effective, and otherwise use/adapt relevant publicly available methodologies from such organisations for validation and verification.

7. The initial funding provided for the establishment of the Decarbonisation Fund should be maximised, as this will enable the biggest environmental impact and largest financial returns in the long-term.
8. A diverse portfolio of initial funding should be sought for the establishment of the Decarbonisation Fund, combining both public and private sources to ensure that the Fund is resilient.

Glossary

BEE Anglia - Business Energy Efficiency Anglia is a programme run by Suffolk County Council with funding from the European Regional Development Fund which provides advice and support to help businesses to become more energy efficient.

Carbon accounting - when a business estimates its carbon footprint, such as through the use of an online calculator.

Carbon Advisory Service (CAS) - the proposed service aimed at SMEs which will provide advice and support to assist businesses moving toward net zero emissions and act as the gateway of the Decarbonisation Fund.

Carbon audit - when a trained professional visits a business and identifies energy saving measures.

Carbon Charter - an accreditation awards scheme available in Suffolk and Norfolk which supports businesses to reduce their greenhouse gas emissions and provides locally-recognised certification.

Carbon credit - a token created by organisations who undertake carbon-reduction projects. These credits can be sold to others to "offset" some of their emissions. One credit is typically equivalent to removing one tonne of "CO_2 equivalent".

CCC - Cambridgeshire County Council

CO_2 equivalent (CO_2e) - a measure of greenhouse gas emissions which includes effects from all types of gases (like methane, nitrous oxides, HFCs) rather than just CO_2. CO_2e is the amount of only carbon dioxide required to cause the same level of warming.

Global heating - phrase used to refer to changes taking place to the world's climate due to human activity.

Net-zero - when there is no net addition of carbon to the atmosphere i.e., the amount of carbon added to the atmosphere is equivalent to the amount of carbon removed from the atmosphere.

Offset - a process in which an emitter can purchase carbon credits to counteract some or all of the emissions they are responsible for.

SMEs - small and medium sized enterprises, those companies which have fewer than 250 (full-time equivalent) employees and a turnover of ≤ € 50 m or balance sheet total ≤ € 43 m, as defined by the European Union.

WCC - Woodland Carbon Code

1. Introduction

In recent years, there have been increasing calls for global action towards net-zero, with major summits on global heating garnering significant attention and producing ambitious deals and targets. This was highlighted at the most recent COP26 summit in Glasgow, the first global summit to commit to reduce the use of coal, an activity which is responsible for 40% of global CO_2 emissions.[1] Other commitments were also made, ranging from increasing support to developing countries most affected by global heating, new green finance schemes, and methane removal targets.[2]

To avoid/mitigate the catastrophic effects of global heating, it is critical to reach global targets for curbing emissions. In the 2015 Paris agreement, nations committed to limiting temperature rises to 2 °C and pursuing efforts towards 1.5 °C, compared to pre-industrial levels.[3] In practical terms, this necessitates rapid emissions reductions now and reaching net-zero by 2050, i.e., no net addition of carbon into the atmosphere from 2050 onwards. There are also intermediate global targets of a 55% reduction of emissions by 2030 compared to 1990 levels.[4] The UK is on its way to achieving this by already managing to reduce emissions by 51% compared to 1990 levels, by some measures.[5]

The UK has its own targets for reducing global heating: UK emissions must be reduced by 78% compared to 1990 levels by 2035[6] - this is enshrined in law. The UK also released a Transport Decarbonisation plan in Spring 2021 which brings forward many previously set targets of decarbonising various aspects of the national transport infrastructure.[7] The UK government also has a £2bn Green Homes Grant scheme to help make UK homes more energy efficient.[8]

While government funding has financed projects achieving some significant carbon reductions, it is likely that given the high costs of truly decarbonising the economy, private funding will also be needed. Locally the Cambridgeshire public sector system has a critical role to play in achieving net-zero

[1] https://www.google.com/url?q=https://ukcop26.org/cop26-keeps-1-5c-alive-and-finalises-paris-agreement/&sa=D&source=docs&ust=1637797835733000&usg=AOvVaw3IB6j1pO3osXIbdp42au5R
[2] https://unfccc.int/documents
[3] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement
[4] https://ec.europa.eu/clima/eu-action/international-action-climate-change/climate-negotiations/paris-agreement_en
[5] https://www.gov.uk/government/statistics/provisional-uk-greenhouse-gas-emissions-national-statistics-2020
[6] https://www.gov.uk/government/news/uk-enshrines-new-target-in-law-to-slash-emissions-by-78-by-2035
[7] https://www.gov.uk/government/publications/transport-decarbonisation-plan
[8] https://www.gov.uk/guidance/apply-for-the-green-homes-grant-scheme

emissions, and an opportunity to be a leader in shaping public-private partnerships towards shared climate goals.

A 2020 CUSPE report[9] proposed a Cambridgeshire Decarbonisation Fund as a way of harnessing private funding to aid decarbonisation, allowing businesses a say in shaping their local environment; providing them with a range of co-benefits; and playing a positive role towards mitigating global heating. This report proposes that a Cambridgeshire Carbon Advisory Service is established alongside the Decarbonisation Fund, to assist SMEs in calculating and reducing their own emissions. Such an Advisory Service will fill a gap in the market to provide this advice and expertise to SMEs, who often do not have adequate resources in-house. The Carbon Advisory Service would act as a gateway to the Decarbonisation Fund, ensuring that businesses first decarbonise as much as possible, with remaining residual 'hard to reduce' emissions subsequently offset via the Fund. Carbon offsetting would be achieved through the sale of carbon credits generated by carbon mitigation projects, located in the Cambridgeshire region, supported by the Decarbonisation Fund. This report also builds upon last year's proposal of a Cambridge Decarbonisation Fund, detailing the strategic business case for such a Decarbonisation Fund. Methods for the verification and validation of carbon credits produced, and how such a fund would be managed, financed, and scaled are also investigated.

[9] https://data.cambridgeshireinsight.org.uk/dataset/cambridgeshire-policy-challenges-cambridge-university-science-and-policy-exchange-cuspe

2. Establishment of a Carbon Advisory Service

2.1. Justification

The Cambridgeshire Decarbonisation Fund is intended to provide a source of funding for projects that support the drive towards achieving net zero emissions in Cambridgeshire, while at the same time allowing local businesses to offset 'hard to reduce' carbon emissions and attain recognition for doing so. This raises two related questions:

1) How should the Fund determine which emissions are 'hard to reduce' and are eligible to offset through the Fund?
2) How can the Cambridgeshire public sector and its partners support and encourage businesses to identify and eliminate emissions that do not qualify as 'hard to reduce'?

An option to address these questions is the establishment of a Carbon Advisory Service (CAS), with five main functions:

1) Assist businesses in calculating their emissions
2) Recommend measures to reduce emissions
3) Enable the purchase of carbon offsets from the Cambridgeshire Decarbonisation Fund where appropriate
4) Support businesses to carry out these reductions
5) Assess and certify businesses progress in reducing net emissions

2.1.1. Opportunities, challenges and needs

While the Decarbonisation Fund will be important in offsetting 'hard to reduce' emissions, there is also a clear opportunity to achieve significant emissions reductions by helping local businesses decarbonise. This opportunity is particularly pertinent to SMEs: unlike larger businesses they rarely have an in-house sustainability advisor, lack capital to invest in decarbonisation measures, and are not obliged to report emissions under schemes like the Energy Savings Opportunity Scheme (ESOS).[10] 50% of emissions from UK businesses come from SMEs,[11] and a study commissioned by the Department of Energy and Climate Change found that *"the average SME could reduce its energy bill by 18-25% by installing energy efficiency measures with an average payback of less than 1.5 years. And it is estimated 40% of these savings would require zero capital cost."*[12]

[10] https://www.gov.uk/guidance/energy-savings-opportunity-scheme-esos
[11] https://www.british-business-bank.co.uk/wp-content/uploads/2021/10/J0026_Net_Zero_Report_AW.pdf
[12] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/417410/DECC_advice_guide.pdf

Despite these potential 'easy wins' for decarbonisation, SMEs have generally not taken steps to reduce their emissions. According to estimates from the British Business Bank, 76% have not yet implemented comprehensive decarbonisation strategies and just 3% of SMEs surveyed say they have measured their carbon footprint in the past five years and set an emissions reduction target.[13] This is largely down to two barriers:

- **Lack of expertise and information:** research by the Zero Carbon Business Partnership found that 70% of SMEs *"said that they could not find an online source of help for SME decarbonisation that was accessible and high-quality."*.[14] There is limited proactivity from businesses to improve their own knowledge and capability, with 56% surveyed saying they have taken no actions to change this.[13]
- **Cost:** 35% of businesses state cost as a barrier to reducing emissions,[13] often lacking the capital to make upfront investments despite the long-term savings.

Despite these barriers, SMEs that do take steps to reduce their emissions can experience multiple benefits, alongside the broader benefits to the area of decarbonisation:

- Long-term cost savings through efficiency improvements, including potential for an average reduction in energy bills of up to 25%.[12]
- Improved consumer perceptions, with associated potential uplift in business.
- Improved ability to attract high-quality employees, particularly among the younger generation.
- Ability to respond to procurement pressure from large businesses, which increasingly require emissions reporting and reductions from partners in their supply chain, as part of Scope 3 reporting.
- Stay ahead of the curve for potential future reporting requirements, including the possible extension of ESOS to medium-sized enterprises.[15]

A Carbon Advisory Service is well-placed to tackle these barriers, enabling businesses and the region to access the associated benefits of decarbonisation.

2.1.2. Links to Cambridgeshire County Council target outcomes

The proposed Carbon Advisory Service provides clear steps to meeting Cambridgeshire County Council's target outcomes:

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https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/392908/Barriers_to_Energy_Efficiency_FINAL_2014-12-10.pdf

[13] https://www.british-business-bank.co.uk/wp-content/uploads/2021/10/J0026_Net_Zero_Report_AW.pdf

[14] https://www.edie.net/news/6/New-coalition-to-help-UK-SMEs-align-with-net-zero-amid-Covid-19-recovery/

[15] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/999452/strengthening-energy-savings-opportunity-scheme-consultation.pdf

- *Cambridgeshire: A well-connected, safe, clean, green environment:* Supporting businesses to improve environmental quality, both locally (e.g., reducing car use in local area for business-related transport, or switching to electric vehicles) and on wider scale by reducing greenhouse gas emissions and associated global heating-related impacts for Cambridgeshire.
- *A good quality of life for everyone:* The evidence is clear that improved environmental quality supports both physical and mental wellbeing for local residents.
- *Communities at the heart of everything we do:* This scheme supports a local, community-centred energy transition by supporting small local businesses to decarbonise (with cost savings and potential uplift in business), and channelling carbon offsetting payments towards local schemes, which offer further co-benefits for the area.

2.1.3. Carbon Advisory Service in context: links to existing strategies and policies

The proposed Carbon Advisory Service is designed to align with existing policy around decarbonisation, from the international to organisational level:

- **International:** supports the UN Race to Zero strategy,[16] aiming for individual businesses to become carbon neutral by 2050, and supports businesses to meet the 'Starting Line' criteria for the strategy.
- **National:** supports businesses to make the SME Climate Commitment, included within the UK Business Climate Hub strategy for net zero by 2050.[17] This is aligned with the UN Race to Zero.
- **Regional:** supports Priority Areas (specifically within Mitigation and Natural Capital) within Cambridgeshire County Council's Climate Change and Environment Strategy.[18]
- **Organisational:** builds on the 2019 CUSPE report, establishing and discussing the target for net zero for Cambridgeshire by 2050.[19] Further builds on the 2020 CUSPE report on a Cambridgeshire Decarbonisation Fund, specifically recommendation 5 from the report: "Support businesses to reduce their emissions at source where possible but use the fund for the hard-to-treat residual emissions".[20] Supports the establishment of a Cambridgeshire Decarbonisation Fund as outlined in this report.

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[16] https://unfccc.int/climate-action/race-to-zero-campaign
[17] https://businessclimatehub.org/smes/
[18] https://www.cambridgeshire.gov.uk/residents/climate-change-energy-and-environment/climate-change-and-environment-strategy
[19] https://data.cambridgeshireinsight.org.uk/sites/default/files/2019%20CUSPE%20Policy%20Challenge%20-%20Net%20Zero%20Cambridgeshire.pdf
[20] https://data.cambridgeshireinsight.org.uk/sites/default/files/2020%20CUSPE%20Policy%20Challenge%20-%20Proposal%20for%20a%20Cambridgeshire%20Decarbonisation%20Fund%20to%20Support%20the%20Achievement%20of%20Net-Zero%20Cambridgeshire%20by%202050.pdf

2.1.4. Review and case study of existing resources

The following sections provide a review of energy efficiency and decarbonisation resources available to SMEs, and discuss the gap between the provision of information and the implementation of energy reduction measures. The services provided by neighbouring Suffolk and Norfolk County Councils to address this gap are outlined in a case study in Appendix B. Recommendations for the proposed Cambridgeshire Carbon Advisory Service are then provided.

2.2. Summary of existing carbon advisory tools and services

Research carried out for this report has identified tens of charities, non-for-profit organisations and businesses operating in the carbon advisory sector (Figure 1). These organisations act from the local/regional to international level, providing a plethora of free and paid-for tools and services to businesses.

Figure 1: Example charities, non-for-profit organisations and businesses operating in the carbon advisory sector. Organisations outlined in red provide tools/services locally/regionally and are not accessible to businesses in Cambridgeshire.

Each organisation has its own unique focus, from developing software for emissions calculations and performance tracking (Ecometrica, Greenstone and xtonnes), to supporting businesses in making carbon commitments (SME Climate Hub, Science Based Targets Initiative and Carbon Trust). Despite this variety, the tools/services offered by these organisations can be classified into five major themes:

- Calculating emissions
- Making recommendations

- Assistance with funding/procurement
- Taking sustained action
- Certification

Within each theme, there is a spectrum of specificity in the tool/service offered, ranging from generic to personalised (see appendix A).

2.2.1. Evaluation of existing carbon advisory tools and services

As this sector is dense with players, existing tools and services were evaluated to determine whether there is scope for a new service which addresses unmet needs of local businesses.

i. Impacts of existing carbon advisory tools and services

Collectively, existing tools and services have been accessed by thousands of businesses and have resulted in sizable carbon reduction. The differences in metrics and data analysis used by each carbon advisory organisation prevents us from providing overall figures, but examples include:

- The Carbon Literacy Project has certified 23,000 individuals, with a 5-15% carbon saving per person.[21]
- Through the B Corp Climate Collective, over 1600 businesses have committed to become net zero by 2030.[22]
- BEE Anglia has provided grant funding to support emissions reductions measures which save in excess of 3 kt CO2e per year.[23]
- The NUS Green Impact has worked with over 500 organisations.[24]

Thus, carbon advisory services have the potential to be wide-reaching and can appreciably contribute towards the uptake of low carbon practises.

ii. Opportunities for the provision of carbon advisory tools and services

- Recent international events have elevated the urgency to reach net zero in the national awareness, with a YouGov survey conducted in November 2021 indicating that 66% of UK adults believe that the UK should try as hard as possible to reduce its carbon emissions as much as possible, even if other industrialised nations do not.[25]

[21] https://carbonliteracy.com/about-us/
[22] https://www.bcorpclimatecollective.org
[23] Interview with Ned Harrison, BEE Anglia Project Manager.
[24] https://greenimpact.nus.org.uk
[25] https://docs.cdn.yougov.com/bcqrt8by0y/YouGov%20-

- COP26 has emphasised the role that businesses have to play in the transition to a low carbon future, and hundreds of UK SMEs have pledged to take part in the UN's Race to Zero campaign.[26]
- Consumers are increasingly placing value on a business' commitments to reducing their carbon footprint, with 66% of consumers stating they would feel more positive about companies that can demonstrate they are making efforts to reduce the carbon footprint of their products.[27]
- It is becoming increasingly clear that younger prospective employees are taking into account a business' carbon commitments when accepting job offers.[28]

Despite these striking motivations for SMEs to strive towards net zero, there are considerable barriers to SMEs taking action:

- Only 3% of SMEs have measured their carbon footprint in the past five years and subsequently set an emissions reduction target.[29]
- 40% of SMEs do not have a plan in place for becoming more sustainable, and 30% have no intention of forming one.[30]
- 35% of SMEs state cost as a barrier for reducing carbon emission.[29]
- 12% of SMEs state lack of information as a barrier to taking action.[29]

Carbon advisory services are well-placed to tackle all of these barriers. Furthermore, with growing pressure from employees, customers, other businesses (considering their scope 3 emissions), and potentially regulatory pressure for SMEs to reduce their carbon footprint, there is likely to be increasing demand for such services.

iii. Gaps in the provision of carbon advisory tools and services:

- The current carbon advisory sector is dense, complicated, and fragmented (see Appendix A) – there are myriad organisations offering a plethora of tools/services, but no 'one stop shop' where SMEs can receive the full spectrum of guidance: from initial carbon accounting through to follow-up on their certified decarbonisation strategy.

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[26] https://smeclimatehub.org/uk/
[27] https://www.carbontrust.com/news-and-events/news/research-reveals-consumer-demand-for-climate-change-labelling
[28] https://static1.squarespace.com/static/56b4a7472b8dde3df5b7013f/t/5819e8b303596e3016ca0d9c/1478092981243/2016+Cone+Communications+Millennial+Employee+Engagement+Study_Press+Release+and+Fact+Sheet.pdf
[29] https://www.british-business-bank.co.uk/research/smaller-businesses-and-the-transition-to-net-zero/
[30] https://www.forbes.com/sites/davidrvetter/2021/02/15/30-of-uk-small-firms-have-no-plans-to-become-sustainable-survey-finds/?sh=3c80fc984ae0

- Navigating this minefield of information is particularly challenging and time-consuming for SMEs who are unlikely to have the staff time or resource to invest in assimilating the barrage of information, nor the in-house expertise to independently construct their own carbon reduction strategies. Lack of knowledge and understanding is cited as a key barrier to small business owners in making the changes to build more sustainable businesses.[31]
- There are a range of logos/accreditation marks which businesses can display to demonstrate their commitment to sustainable action (NUS Green Impact, Carbon Charter, The Science Based Targets Initiative, SME Climate Hub). Unified, regional certification has the potential to be better recognised and respected by employees, consumers and the wider public, thus providing greater benefit to businesses.

From this assessment, it is clear there is an opportunity to offer a comprehensive, unifying service which, through a team of trained advisors and a dedicated website, can support Cambridgeshire businesses (with a specific focus on SMEs) towards low carbon operations. Such a service is already provided by other councils around the UK, including in Suffolk and Norfolk via the BEE Anglia advisory service and Carbon Charter accreditation scheme. These services work hand-in-hand to provide expert advice, conduct energy audits and provide locally-recognised accreditation for cutting emissions, and assist local businesses with accessing funding for the implementation of carbon reduction measures. A detailed case study covering i) the services available to businesses in Suffolk and Norfolk via BEE Anglia and the Carbon Charter, ii) how these programmes are structured and funded, and iii) some of the environmental outcomes and ways in which local businesses have benefited, is provided in Appendix B.

2.3. Recommendations

From the above assessment of the spectrum of existing carbon advisory tools and services available to businesses and a detailed case study of the services provided by Suffolk County Council (Appendix B), it was identified that Cambridgeshire SMEs lack support that is:

- Integrated - offers support throughout the decarbonisation process, from initial assessment to implementation and review.
- Personalised - offers support that is tailored to the requirements of the individual business.
- Local - operated and delivered at a Cambridgeshire level, enabling understanding of local business needs and building connections and community support within the county.

[31] https://realbusiness.co.uk/cop26-mean-uk-smes

As a result, there is an opportunity for Cambridgeshire County Council and its public sector partners to offer a unifying service which, through a team of trained advisors and a dedicated website, can meet these requirements. Broadly, it is proposed that the Carbon Advisory Service (CAS), centred on SMEs, would provide:

- Free tailored advice, and signposting relevant external resources and services.
- Assistance with carbon accounting.
- Conducting energy audits and business-specific recommendations.
- Assistance with the creation of action plans, including recommending the purchase of carbon credits from the Cambridgeshire Decarbonisation Fund where appropriate.
- Assistance with procurement and accessing financial support for carbon-reduction projects.
- A paid-for, tiered accreditation service to certify businesses' participation and progress.
- Training and networking opportunities and regular updates on funding, technology and environmental legislation.
- Support with publicity and follow-up on businesses progression towards set targets.

An overview of the proposed services offered by CAS is provided in Figure 2.

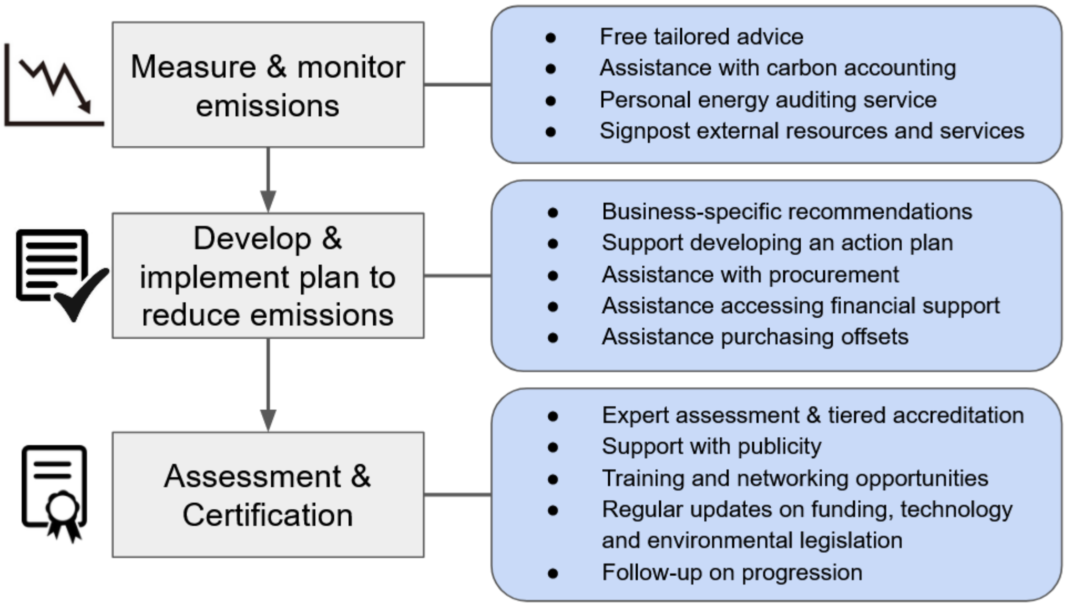

Figure 2: Outline of support offered to SMEs through the proposed Carbon Advisory Service.

We propose that these services are provided free of charge, excluding accreditation which businesses would pay for according to a sliding scale and which would provide an important funding stream to CAS (discussed below).

The CAS will also serve eligible large companies, which may wish to apply for accreditation or offset their emissions through the Cambridgeshire Decarbonisation Fund. The CAS will serve as a gateway to the Decarbonisation Fund by identifying ‘hard to reduce’ emissions and recommending the purchase of carbon credits where appropriate. The schematic diagram, shown in Figure 3, outlines how the CAS will serve SMEs and larger companies, and how it will link with the Decarbonisation Fund.

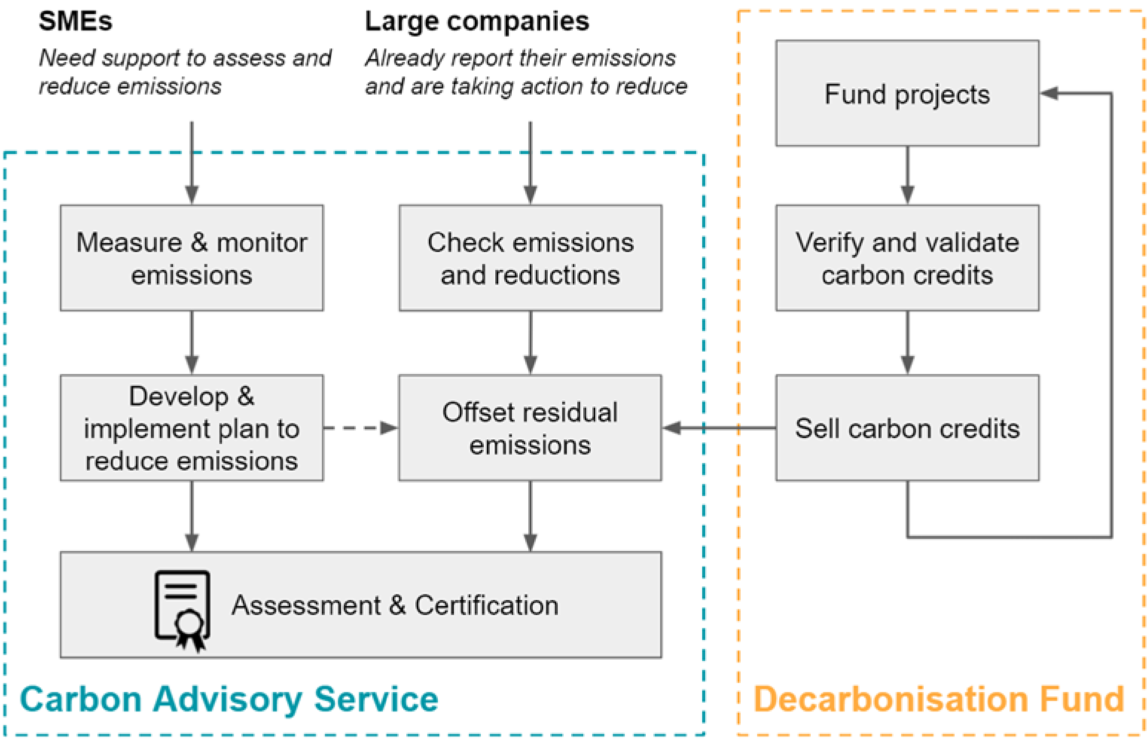

Figure 3: Proposed outline for Carbon Advisory Service and its role as a gateway to the Cambridgeshire Decarbonisation Fund

2.3.1 Links to the Cambridgeshire Decarbonisation Fund

The carbon auditing process offered by CAS will lead to an action plan for SMEs to reduce their emissions, focusing on easy wins that can achieve large reductions with minimal financial or opportunity cost. For emissions that are identified as being ‘hard to reduce’, such as those that form an unavoidable part of a business's operations, CAS would recommend that these emissions are offset through the purchase of carbon credits from the Decarbonisation Fund. Using CAS as a gateway to the Fund ensures that the Fund results in a genuine reduction in net emissions, rather than being used as a cover to avoid making easy reductions elsewhere. This operational model is summarised in Figure 3.

The purchase of carbon credits should be incentivised within the structure of CAS's accreditation scheme. This could be achieved through tiered certification, with the highest tier reserved for businesses which have achieved carbon neutrality. If the Carbon Charter award scheme is extended to Cambridgeshire, a fourth tier ('Platinum') could be added to recognise net-zero businesses. Moreover, there are clearly opportunities to discuss with Norfolk and Suffolk County Councils the merits of incorporating carbon offsetting into the Carbon Charter and allowing businesses across the region to offset their emission with the Decarbonisation Fund, greatly increasing market exposure.

2.3.2. Beyond SMEs

i. Links to large businesses

Large businesses are a substantial contributor to the county's emissions[32], and represent a significant opportunity to increase investment in the Decarbonisation Fund through the sale of carbon credits. It is therefore recommended that CAS includes a pathway for involving larger businesses as well as SMEs.

Large businesses are more likely to have an in-house sustainability advisor, have more capital to invest in decarbonisation measures, and are already held to standards of emissions auditing and reporting, including the Energy Savings Opportunity Scheme (ESOS)[33]. They therefore have little need of the carbon auditing and advice offered by CAS. However, evidence from the BEE Anglia case study suggests that these businesses do have an interest in engaging with local-scale sustainability initiatives, particularly to obtain locally-recognised accreditation. This can improve public perception of the business among potential employees and customers in the area.

As large businesses are likely to have already completed more stringent carbon auditing processes, it is recommended that CAS follows the example of BEE Anglia in adopting ISO14001 (or equivalent) compliance as a prerequisite for engaging with CAS and, by extension, the Decarbonisation Fund. This will avoid accreditation through the CAS becoming a 'soft option' for larger businesses, which may seek to avoid the rigours of achieving compliance with more robust and comprehensive standards.

[32] CUSPE 2019 Report
[33] https://www.gov.uk/guidance/energy-savings-opportunity-scheme-esos

Furthermore, for businesses which meet the eligibility requirements, only emissions which are 'hard to reduce' will be eligible for offsetting through the purchase of carbon credits.

ii. Social and micro enterprises

Recognition for the role of social and micro-enterprises in the region is growing, and strategic support from local government reflects this, with programmes including Care Together: Happy at Home[34] promoting opportunities for community micro-enterprises (CMEs) in the older adult care sector. These incubating or accelerating CMEs offer a unique opportunity to build a net zero strategy into operations right from the start. Existing CMEs should access CAS via the SME pathway (Fig. 3), while incubating CMEs or those looking to scale up operations could be supported with tailored advice to audit their plans prior to launch/expansion, followed up by later auditing and certification through the SME pathway.

2.3.3. Financing

Two financing questions need to be considered:

1) How will SMEs pay for the emissions reductions recommended to them by CAS?
2) How will CAS itself be funded?

i. Financing for SMEs

SMEs often lack capital to make large up-front investments in decarbonisation, so access to external financing is likely to be required. As many emissions saving measures will pay for themselves over the short-medium term, access to interest-free finance is often of equal benefit or even preferable to grant funding for helping businesses to cover upfront costs and this option is worth exploring. However, at present grants are generally more widely available.

CAS should offer assistance with accessing these grants, to remove as much of the burden from SMEs as possible in enacting recommendations. CAS should identify potential grants, provide information about these to SMEs, and possibly offer support in the grant application process. If taking a maximally in-house approach (see next section), CAS could also aim to obtain funding to provide its own grants

[34] https://www.cambridgeshire.gov.uk/residents/adults/connect-with-your-local-community/happy-at-home

or loans to participating SMEs. **A library of loans and grants offered in Suffolk and Norfolk has been collated by The Carbon Charter[35], and a similar local repository should be offered by CAS.**

ii. Financing CAS

The main costs for CAS are expected to be from developing a website and employing advisors (trained individuals who will carry out carbon auditing; provide tailored recommendations; support businesses in the creation of action plans; conduct certification; support with publicity and follow-up on progression), or contracting external organisations if an outsourcing approach is adopted (see next section). BEE Anglia operates with a skeleton staff of three advisors[36], it is envisaged that CAS will require a larger team, likely in the region of 5-10 full time staff, in order to provide the proposed support to Cambridgeshire businesses.

Payment for certification would provide a potential funding stream to cover some of these costs. However, the cost of accreditation must not become a barrier to participation for SMEs. Therefore, it is recommended that the accreditation fee should operate on a sliding scale according to business size, with larger businesses paying more to access the scheme. A similar pricing model is used by BEE Anglia.

Payment for certification is however unlikely to cover all the operational costs of CAS, therefore other funding streams should be sought. The running costs of BEE Anglia are largely covered by a European Union Regional Development Fund, which expires in mid-2022 and further funding from this fund is impossible due to Brexit. Nevertheless, Ned Harrison at BEE Anglia is hopeful that government grant funding will become available to sustain its activities, therefore this should be investigated, along with other local opportunities.

2.3.4. Options for in-house delivery, outsourcing and potential partnerships

We suggest two possible approaches to delivering proposed CAS.

1) In-house provision of all services
2) Outsourcing one or more stages of the process to contracted partner organisations

[35] https://carboncharter.org/resources-grants-and-funding/
[36] http://www.beeanglia.org/about-bee/team/

i. In-house delivery

All stages of the process could be delivered through the partnership of Cambridgeshire Local Authorities and the CPCA Business Board, with advisors employed directly. This would involve the creation of a new, Cambridgeshire and Peterborough-specific certification scheme. This has the advantage of offering complete oversight of the process, and potentially smoother integration with the Decarbonisation Fund. It also fully leverages the local appeal of the scheme and any trust local businesses may place in public bodies. However, it is also possible that, for some businesses, direct involvement will deter participation. The in-house approach would also place higher resource and operational demands on the above partnership and present higher upfront costs and financial risk.

ii. Outsourcing

Alternatively, one or more stages of the process, outlined in Figure 1, could be procured and contracted to organisations to offer an outsourced partnership-approved service. Examples include:

- **Groundwork** - charity which currently provides auditing and advice services for BEE Anglia and the Carbon Charter (see case study).
- **Carbon Charter** - accreditation scheme currently offered by Norfolk and Suffolk County Councils could be adopted and overseen by Cambridgeshire County Council, expanding the scheme across East Anglia. This would offer greater regional recognition and impact. It would also reduce setup costs.
- **University of Cambridge** - a similar scheme in Derbyshire (DE-Carbonise[37]) has successfully partnered with the University of Derby to provide expertise. Cambridge Universities offer a wealth of locally-available expertise in sustainability initiatives, including through the newly-established Cambridge Centre for Carbon Credits (4C)[38], the Cambridge Institute for Sustainability Leadership (CISL)[39], and the School of Environmental Sciences at the University of East Anglia. Within CISL, the Canopy program[40], launching in 2022, may offer opportunities to facilitate knowledge sharing among SMEs and access to further expertise and training.
- **Other charities, non-for-profit organisations and businesses** - a large number of organisations already operate in the carbon advisory sector (Figure 1), offering tools and services covering different stages of our recommendations (Appendix A). If it was felt that

[37] https://www.derby.ac.uk/business-services/funding/de-carbonise-project/
[38] https://4c.cst.cam.ac.uk/
[39] https://www.cisl.cam.ac.uk/
[40] https://www.cisl.cam.ac.uk/canopy

these organisations were best placed to offer a specific service, the relevant services could be encouraged to collaborate and work together to provide the advisory support.

2.3.5. Next steps

We recommend the following actions are taken to refine our proposals for the establishment of a Cambridgeshire Carbon Advisory Service:

- Consult with local businesses (both SMEs and large businesses) to assess local demand for CAS.
- Decide whether to adopt an in-house or outsourced approach, and identify partner organisations if necessary.
- Identify potential funding sources for CAS.
- Identify potential sources of grants or loans for SMEs.
- Design a bespoke accreditation scheme (liaising with Norfolk and Suffolk county councils on the merits of collaboration).
- Determine pricing structure for businesses applying for certification.
- Choose a methodology for identifying hard-to-reduce emissions which will be eligible for offsetting through the Decarbonisation Fund.

3. Establishment of a Cambridgeshire Decarbonisation Fund

3.1. Overview

The justification for the establishment of a Cambridgeshire Decarbonisation Fund is covered in detail in the CUSPE 2020 report[41]. This previous report highlights the scale of decarbonisation required within Cambridgeshire, which would not be achievable without support from all sectors. A Decarbonisation Fund is a potential solution to this: in which carbon credits are sold to local businesses to pay for decarbonisation projects. This is considered a mutually beneficial arrangement; by attracting organisations to offset their hard-to-reduce carbon as early as possible, their financial contribution into the scheme enables the Cambridgeshire public sector to place this investment into local projects.

Whilst the main focus of the Fund may be on the reduction of greenhouse gas emissions, decarbonisation projects also provide other co-benefits to the local communities. These can include a reduction of pollution-related health problems,[42] increased flood resilience[43] and lifting people out of fuel poverty. Large-scale investments in green infrastructure can also stimulate the local economy, making Cambridgeshire a leader in the execution of nature-based solutions for decarbonisation projects. This expertise could be exported to other local authorities, allowing the further growth of local companies.

Following on from the CUSPE 2020 report, two key areas of the Fund have been investigated: the validation and verification of carbon credits, and the financial management of the Fund. The validation of carbon credits is a key component, as this will be required by businesses wanting to buy credits and contribute to this fund to offset their own emissions. This section discusses how carbon reductions are calculated and monitored, and how these reductions can be used to make sellable carbon credits. The Woodland Carbon Code (WCC) is used as a case study of a validation body. The Swaffham Prior

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[41] https://data.cambridgeshireinsight.org.uk/dataset/cambridgeshire-policy-challenges-cambridge-university-science-and-policy-exchange-cuspe-20

[42] https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution#call-to-action-reducing-air-pollution

[43] https://www.forestresearch.gov.uk/tools-and-resources/fthr/urban-regeneration-and-greenspace-partnership/greenspace-in-practice/benefits-of-greenspace/flood-risk-alleviation/

Community Heat Network project[44] has been taken as a case study to investigate the best way to verify and validate carbon credits for this type of project, as retrofits of domestic housing are a key sector for carbon reductions. Based upon this research, it is concluded that:

- Projects within the Cambridgeshire Decarbonisation Fund should have their carbon credits verified and validated through approved bodies.
- If this is not possible, publicly available methodologies for carbon calculations should be used to determine carbon savings.
- In both cases, a third-party organisation will be required to confirm the number of carbon credits produced by a project.

The main aim of the financial research was to estimate how large a Fund would need to be to create a significant difference to the Cambridgeshire area. This culminated in a financial model, which simulates the financial and environmental impacts of a Fund over 40 years. With the largest Fund size modelled, this model predicts 19% of Cambridgeshire's annual emissions could be addressed by this Fund within 25 years, and would give a 125% return on investments above inflation over the 40 years.

The key assumption of the model is the availability of initial finance to start the Fund. Potential sources of initial capital were identified, these will need to be investigated further to assess a feasible size of Fund available to Cambridgeshire. From this research, it is concluded that:

- The size of the Fund should be maximised, to increase community benefits, environment impact and financial returns
- Initial funding should be sought from multiple sources, to increase the initial size of the Fund and increase resilience within the Fund.

3.2. Validation and verification

3.2.1. Outline

The proposal for a Cambridgeshire Decarbonisation Fund assumes that businesses will contribute to this fund to offset their hard-to-reduce emissions in the short to medium term by purchasing carbon credits. These credits will be generated by decarbonisation projects in the portfolio and will fund the maintenance of current projects and new projects. For businesses to want to buy the carbon credits,

[44] https://heatingswaffhamprior.co.uk/

they need to trust that the corresponding amount of carbon has actually been saved. Otherwise, businesses could decide to buy potentially cheaper carbon credits elsewhere to offset their emissions or not offset early enough to help meet net zero targets.

Validating and verifying decarbonisation projects enables businesses to trust that the projects have been carried out to the appropriate standards and that the stated carbon savings are correct. The Government's Environmental Reporting Guidelines set out DEFRA's good quality criteria for external decarbonisation projects that businesses can use to offset their emissions:[45]

- The carbon savings of a project must be additional to those that would have occurred otherwise.
- The project must not cause leakage by increasing emissions elsewhere.
- The carbon savings should be permanent, with a minimal risk of losing carbon.
- Validation and verification must be carried out by an accredited and recognised independent third party.
- Carbon credits can only be sold after the corresponding carbon savings have occurred.
- A registry must be used to prevent double counting of carbon credits and to make the information on the projects publicly available.

Based on these guidelines and the research performed, this report proposes the following recommendations for the validation and verification of projects within the Cambridgeshire Decarbonisation Fund:

- Organise and perform the necessary assessments, measurements and predictions required for validation and verification of the decarbonisation projects in the decarbonisation fund portfolio.
- Determine whether it would be cost-effective and practical to register decarbonisation projects with certification organisations.
- As an alternative, develop a standard for the validation and verification of the decarbonisation fund projects and employ suitable third-party bodies.
- Adapt relevant publicly available methodologies to develop ones that are specific to decarbonisation projects in the Fund for which no suitable methodologies currently exist.
- Use the Woodland Carbon Code for the validation and verification of afforestation and reforestation projects.

[45]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/850130/Env-reporting-guidance_inc_SECR_31March.pdf

3.2.2. Important Considerations Prior to the Start of Projects

The process of validation and verification involves checking different aspects of decarbonisation projects. This requires project developers to have made certain assessments, measurements, and calculations in advance of the validation/verification dates and these often cannot be done retroactively. When looking to develop a new carbon reduction or removal project for which carbon credits can be issued, it is important to make sure that credits that will be produced will be of high "quality". However, to develop a high-quality carbon credit, many criteria need to be considered, with the prioritisation of differing criteria depending both on the aims of the project developer and the predicted buyer of the credits. In general, six 'quality objectives' have been defined in recent literature and will be explored within this section[46]. These include:

1. Robust determination of the greenhouse gas emissions impact of the mitigation activity
2. Avoiding double counting of emission reductions of removals
3. Addressing the risk of non-permanent removal
4. Facilitating the transition towards net zero emissions
5. Transparency and oversight of the crediting process and project methodologies
6. Social and environmental co-benefits and an absence of a negative impacts

1. Robust determination of greenhouse gas emissions impact of the mitigation activity:

(a) Additionality:

A project developer needs to confirm that their decarbonisation projects display additionality.[47] This means that the projects could not have proceeded without the money gained from selling carbon credits[48]. It is not enough simply for a project to save carbon if the project would have been funded without selling carbon credits. In other words, a project lacking additionality is not able to sell any carbon credits, even if it has saved the corresponding amount of carbon. To understand whether a project is additional, the project developer must consider all financial, economic, legal, political or technological drivers of the project. For example, a political driver would be future introduction of

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[46] https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/54su0gjupo_What_Makes_a_High_quality_Carbon_Credit.pdf?_ga=2.133621070.1362238229.1637849475-1929427670.1586291417

[47] https://openknowledge.worldbank.org/bitstream/handle/10986/24295/K8835.pdf?sequence=2&isAllowed=y

[48] https://www.offsetguide.org/wp-content/uploads/2020/03/Carbon-Offset-Guide_3122020.pdf?utm_source=Securing%20Climate%20Benefit:%20A%20Guide%20to%20Using%20Carbon%20Offsets&utm_medium=tools-library&utm_campaign=SMECH

legislation in proposition of a specific emission-mitigating technology: if an offset project is developed around the use of this specific technology, the project would cease to be politically additional upon the enactment of such legislation, as the project activity *would have occurred anyway.* Similarly, if a project does not need to source funding from selling carbon credits in order to be financially viable then it would not be considered financially additional. Finally, if the project involves using an emission abatement technology that is also used within a similar, but not exactly the same, context in the surrounding area or in the same country, then it is probable that the project activity would likely have been adopted anyway in the near future: in this context technological additionality could not be ensured. A useful way to determine whether a specific project activity is likely to remain additional over the next 10-20 years is to look at the country's nationally determined contributions (NDCs): for example, emissions from flights and aviation are not covered within the UK's NDCs and, therefore, project activities that focussed on mitigating aviation emissions are likely to remain additional for the foreseeable future, as the government will not be putting in place legislation or financial incentives to promote the reductions of these emissions. However, the UKs NDCs do cover restoration and preservation of peatlands. Therefore, project activities related to peatland stewardship would likely not remain additional as the government may introduce incentives for the private sector to maintain and invest in peatland preservation.

(b) Robust quantification of emission reductions and removals:

One of the most important criteria for developing quality carbon offset credits is the use of robust quantifications outlining the emission reductions and removals of the project activity, over time. This is paramount, as over-estimation of emissions reductions or removals will lead to double emissions overall given the fact the credit buyer is purchasing a credit to 'offset' their own emissions. There are five key components of a project activity's emission calculations that need to be guaranteed:

- No ex-ante crediting is permitted: credits must only be given for emissions that have already been reduced or removed. Credits cannot be given for emission reductions or removals that have not happened yet.
- All emission sinks and sources are identified within a project activity and a way to robustly quantify them is identified.

- A conservative ‘baseline’ is set. The baseline scenario of a project is the level of emissions/sequestration that would occur in the absence of the project.[49,50] The carbon savings of a project are measured relative to the baseline scenario. As such, it is important that baseline emissions are not overestimated, as this will lead to an overestimation of the amount of carbon saved. Similarly, any baseline carbon sequestration needs to be accounted for; this is most relevant for forestry projects where a significant amount of existing vegetation could sequester carbon.[51]
- The emission reductions or sequestration is robustly monitored.
- Leakage is robustly incorporated into emission quantifications. Leakage describes any emissions that may be caused by the project but occur outside of the project boundary. For example, if a specific area of forest is protected from logging within a project activity. Logging activity may simply move to another area as a result of the project being implemented. The resulting ‘leaked’ emissions would need to be quantified for the logging in the alternate area and incorporated into emission reduction claims for the project.

2. Avoiding double counting of emission reductions or removals

(a) Avoiding double issuance:

Double issuance occurs when the sample carbon credit is issued to multiple buyers. To avoid double issuance, every carbon credit that is issued must be traceable and transparently ‘retired’, meaning that the credit is no longer available to be purchased. This is ensured by many mainstream credit issuers by applying a traceable reference code to every carbon credit that is produced under their scheme, with an open database of all past and present credits.

(b) Avoiding double claiming:

Double claiming occurs when multiple entities count the same carbon credit towards different climate targets or goals. This can occur within the same country or at the international level. At the international level, for example, an offset project’s activity could involve the establishment of a renewable energy-based mini-grid system for a community. The emission reductions achieved through this project will be sold as a carbon credit to an overseas buyer, therefore contributing to an

[49]https://openknowledge.worldbank.org/bitstream/handle/10986/24295/K8835.pdf?sequence=2&isAllowed=y

[50]https://www.offsetguide.org/wp-content/uploads/2020/03/Carbon-Offset-Guide_3122020.pdf?utm_source=Securing%20Climate%20Benefit:%20A%20Guide%20to%20Using%20Carbon%20Offsets&utm_medium=tools-library&utm_campaign=SMECH

[51]https://www.woodlandcarboncode.org.uk/images/PDFs/WCC_CarbonCalculation_Guidance_V2.4_March2021.pdf

offsetting of the overseas country's emissions calculations. However, the presence of the mini-grid within the domestic country means that the electricity usage of the main grid reduces, because the community is using their new renewable mini-grid instead. However, the power and energy planning ministry will observe the reduced electricity supply and incorporate it into its own emission reduction calculations. This means that two countries are claiming the same emissions reductions. To avoid this, it has been suggested that "(i) carbon crediting programs have procedures in place to identify and earmark in which calendar year and in which country the emission reductions occurred; (ii) procedures for host country authorizations are in place; and (iii) procedures for the application, reporting and reconciliation of corresponding adjustments are in place". [52]

3. Addressing the risk of non-permanent removal

(a) Degree of permanence of emission removal or reduction:

Many project activities, mostly those centred on emission sequestration, offer impermanent emission abatement. The permanence of emission removal depends on longevity of the emission storage process. For example, emission sequestration from tree planting only lasts as long as the integrity of the tree and surrounding soil is maintained. If a forest that has been planted within a carbon offset project is burnt down in a forest fire, or later chopped down owing to a change in government agenda, then all of the emission sequestration will be reversed. This will result in double emissions in the long run. Therefore, diligence should be taken when deciding on project types and activities in terms of whether a project that only ensures short-term emission sequestration should even be pursued in the first place. Contrastingly, some project activities will ensure long term or irreversible emission reductions, such as landfill methane destruction.

(b) Approaches to addressing non-permanence risks:

A level of impermanence of emission sequestration may be acceptable if the project addresses the associated risks sufficiently. For example, under many verification standards, projects are required to set aside a number of credits that cannot be sold as collateral in the event of a reversal of some of the emissions reductions. Similarly, there should be a robust way in which reversals are monitored and accounted for over time by, for example, reducing the number of credits sold in future.

[52] https://files.worldwildlife.org/wwfcmsprod/files/Publication/file/54su0gjupo_What_Makes_a_High_quality_Carbon_Credit.pdf?_ga=2.133621070.1362238229.1637849475-1929427670.1586291417

4. Facilitating transition towards net zero emissions:

(a) Enhancing adoption of low, zero or negative emissions technologies:

Carbon offset project development and financing should not be a permanent fixture within the net zero transition and they act as a deterrent for long term public policy implementation and financial investment. Instead, carbon financing should act as an enabler, to set in motion sustainable and endogenous future financing of net zero technologies. Projects should promote and facilitate the adoption of innovative technologies that go further than *common practises* within the project host country. Common practises are defined both with a temporal aspect (which methods are common at the time of the project implantation) and a spatial aspect (which methods are common in the host country specifically, not in another more developed country for example). With these in mind, project developers determine whether similar technology is already being used in the host country and, therefore, whether carbon financing is truly promoting innovation.

5. Transparency and oversight of the crediting process and project methodologies

(a) Third-party auditing:

As is covered in more detail later in this section, most certification organisations require that all calculations, assumptions and methodologies be first 'validated' to ensure that they are robust, and also that long-term monitoring of the process be carried out and 'verified' in order to ensure that everything outlined during the validation process has turned out to be demonstrably true. It is important that an unbiased, third-party auditor carry out auditing on all relevant documents at both of these stages to ensure that aspects of the project stand up to scrutiny.

(b) Transparency and stakeholder consultation:

Project developers should ensure that sufficiently detailed information on all aspects of their projects are publicly available at all times. Procedures should also be in place to ensure transparent decision-making processes, often with minutes from meetings being publicly available. Project developers should also carry out thorough stakeholder consultation prior and during project implementation and the findings from these consultations also made publicly available. Transparency and stakeholder consultation contribute to good governance which in turn contribute to buyer trust.

6. Social and environmental co-benefits and an absence of a negative impacts

(a) Assessment of environmental and social impacts:

The impact of a project will likely go beyond just the emissions that are reduced or removed. This means that all potential benefits and risks associated with a project should be comprehensively reported on within all project development documents (which should be publicly available). This will involve stakeholder consultations as stated above. This is particularly important within projects where land use changes. Land use changes can have far reaching effects: displacement of biodiversity should be assessed and the effect on both the livelihoods and living conditions of the surrounding communities should be taken into account. Any negative impacts will need to either be compensated for, or be recognised as reasons for the project to not go ahead if the negative impacts outweigh the benefits. This is important not only from an ethical standpoint but also to reduce future liability of the project developers. It is also important for ensuring economic 'value-for-money' of projects. Similarly, some projects may have positive co-benefits, such as reducing emissions, green job creation, and habitat creation. These co-benefits can potentially be quantified and monetised.

(b) Projects that support resilience and adaptation:

Given that the effects of global heating are already being felt within the UK in the form of floods and extreme weather, there is a need for climate resilience and adaptation. For example, projects relating to land management may also have co-benefits of managing the effect of flooding. Some buyers may prioritise projects that either directly or indirectly support climate resilience.

3.2.3. Performing Validation and Verification

After the project has begun, accredited and independent third-parties provide validation and verification at certain intervals. This involves checking relevant documents, as well as potential site visits.[53] Alongside the project design, the predicted carbon savings are assessed during validation, which normally must occur within 2-3 years of the start of the project.[54,55] If necessary, this validation body will outline the corrective action responses that are needed to address any issues.[56] Following successful validation, verification bodies perform validation 5 years after the start of the project, then typically every 5 years after that (or 10 years in the case of forestry projects[57]). These third-parties usually need to be contacted approximately 6 months in advance. Verification checks the progress of

[53] https://www.goldstandard.org/take-action/certify-project
[54] http://globalgoals.goldstandard.org/101-par-principles-requirements
[55] https://www.woodlandcarboncode.org.uk/landowners-apply/3-validation-initial-project-check
[56] https://www.planvivo.org/validation-verification
[57] https://www.woodlandcarboncode.org.uk/landowners-apply/4-verification-ongoing-check-of-project-sequestration

the project and confirms the amount of carbon saved. After any corrective action responses are completed, the project developer will receive verified carbon credits that are recorded and made publicly visible on a registry to provide transparency.[58] Double counting can occur if multiple entities claim the same carbon savings generated by a project; to avoid this, each carbon credit is assigned a unique serial number on the registry and is retired when sold.

Project developers can have their projects validated and verified using a certification organisation. These are well recognised organisations that provide a framework for carrying out decarbonisation projects.[59] This includes providing methodologies for different types of projects, reviewing specified documents, accrediting validation/verification bodies and issuing carbon credits via a registry that is either owned by the organisation[60] or is managed by an external company, such as IHS Markit. Projects certified using these organisations need to renew their crediting period (usually 7-10 years) to confirm that their project is still eligible to receive carbon credits.[61] Three certification organisations are Gold Standard,[62] Plan Vivo,[63] and Verified Carbon Standard.[64] As an example, the framework for Gold Standard is as follows:[65]

1. Project plan and stakeholder consultation
2. Review of preliminary design
3. Validation by accredited validation and verification body
4. Review of project design
5. Cycle of project monitoring, third party verification and performance review

The benefit of these certification organisations is that they are trusted as good standards for decarbonisation.[66] However, there are some disadvantages to projects from the Cambridgeshire Decarbonisation Fund being certified with these organisations. One of the main issues is cost, since these organisations charge fees for reviewing documentation and issuing credits, in addition to the fees from the validation and verification bodies themselves (see Appendix C). In the case of Plan Vivo,[67] the fees are typically larger and less dependent on the number of credits issued than those of Gold

[58] https://www.planvivo.org/markit-registry
[59] https://www.goldstandard.org/our-story/gold-standard-global-goals
[60] https://verra.org/project/vcs-program/registry-system/
[61] https://www.offsetguide.org/wp-content/uploads/2020/03/Carbon-Offset-Guide_3122020.pdf?utm_source=Securing%20Climate%20Benefit:%20A%20Guide%20to%20Using%20Carbon%20Offsets&utm_medium=tools-library&utm_campaign=SMECH
[62] https://www.goldstandard.org/
[63] https://www.planvivo.org/
[64] https://verra.org/project/vcs-program/
[65] https://www.goldstandard.org/take-action/certify-project
[66] https://www.goldstandard.org/our-story/gold-standard-global-goals
[67] https://www.planvivo.org/costs-fees

Standard,[68] and Verified Carbon Standard,[69] making them less effective for small projects. For example, for a project that sequestered 15,000 tonnes of CO_2 annually, the costs up to validation would be $4500-$7550 with Plan Vivo, compared to $1750 with Gold Standard and $2000 with Verified Carbon Standard. Furthermore, the costs of issuance would be $6000 for Plan Vivo, compared to $1500 with Gold Standard and $2100 with Verified Carbon Standard. (Note, these costs do not include the fees for the validation and verification bodies themselves.) For Gold Standard and Verified Carbon Standard, the greater influence of the number of credits issued on the fees means that their cost-effectiveness for use with the Decarbonisation Fund will depend on the size of the decarbonisation projects to be certified, as well the number to be certified together. Another issue with these certification organisations is that Plan Vivo and Verified Carbon Standard do not have any accredited validation and verification bodies in the UK;[70,71] while there is one such body accredited by Gold Standard in the UK, it cannot validate or verify certain types of decarbonisation projects.[72] As such, suitable third-parties would need to travel from outside the UK to perform site visits. Therefore, the sizes of the decarbonisation projects in the Fund may influence the benefit of being certified with one of these organisations versus the costs involved.

To illustrate the details involved in following a validation and verification framework from a certification organisation, the Woodland Carbon Code (WCC)[73] is described in Appendix D. The WCC is relatively cost-effective and provides detailed guidance on calculating carbon sequestration and performing validation and verification of woodland projects. It is therefore recommended that the WCC is used to validate and verify forestry projects within the Decarbonisation Fund.

One alternative strategy would be for the Decarbonisation Fund to develop its own standard for validation and verification and/or possibly linking with the Cambridge Centre for Carbon Credits to undertake this process. This is possible because methodologies for validation and verification, such as those from Verified Carbon Standard,[74] are publicly available, so relevant methodologies could be used for projects in the Decarbonisation Fund. Suitable independent third-party bodies could then be employed to perform the validations and verifications. Therefore, the same framework for validation and verification would still be followed as if the projects were certified with one of the aforementioned

[68] https://globalgoals.goldstandard.org/fees/
[69] https://verra.org/wp-content/uploads/2020/04/Program-Fee-Schedule_v4.1.pdf
[70] https://www.planvivo.org/validation-verification
[71] https://verra.org/project/vcs-program/validation-verification/
[72] https://globalgoals.goldstandard.org/approved-auditors
[73] https://www.woodlandcarboncode.org.uk/
[74] https://verra.org/methodologies/

organisations. For businesses to trust this approach, the methodologies used and the reviews involved will need to be made publicly available to provide the necessary transparency.

3.3. Financial structure of the Fund

In this section, three separate questions are addressed. In the first part, a financial model of the Fund is presented. This model estimates revenues and costs of the Fund over a 40-year timeline, as well as estimating the amount of carbon saved through projects. The model shows that significant financial and environmental gains can be made, and this scales well with the amount of initial investment acquired. It is therefore recommended that the Fund should acquire as much initial funding as possible, to maximise the financial return and environmental impact over the next 40 years.

The second part covers the different sources of funding available to start the Fund. Four main funding sources are highlighted: council borrowing, public loans/grants, issuing green bonds, and private investment. A portfolio of these funding sources is recommended, to increase the resilience and size of the Fund.

The final part investigates other revenue sources beyond the revenue from selling carbon credits. For example, through local plan policy a carbon levy could be applied to new developments. Where emissions cannot be mitigated cost effectively on-site, a contribution to the Fund is calculated. This incentivised low-carbon building practises and provides a revenue stream for the Fund if emissions aren't fully removed. In addition, for Local Authorities that have already invested in some low-carbon projects, the carbon savings from these could be sold as credits to provide an initial revenue stream.

Based on the research presented here the following recommendations are made:

- A diverse portfolio of initial funding should be sought, combining both public and private sources to ensure the Fund is resilient.
- The amount of initial funding should be maximised, as this will create the biggest environmental impact and largest financial returns in the long-term.
- Projects in the Fund should be those which require the selling of carbon credits to be financially viable. Projects which are financially viable without selling carbon credits should be performed in addition to the running of this Fund.
- Setting up a separate company might be useful, as this can detach any initial revenue costs associated with the Fund from the Council's finances. This may allow a larger Fund to be viable than what would be possible from within the Council.

3.3.1. Financial models

To determine the financial viability and climate impact of this Fund, a financial model was constructed to estimate the financial and environmental return over a 40-year period. A range of parameters were estimated (for full information see Appendix E), and created a worst-case, best-case, and expected scenario for three different Fund sizes. This model demonstrates the feasibility and scalability of the Fund and shows that the size of the Fund should be maximised. A larger fund will provide ever more benefits to the environment, the local communities, and the council's finances.

The initial funding is assumed to mainly come from project-specific funding (30-50%) and project-independent funding (30-60%), with a smaller amount provided through green bonds (10-15%). Projects are assumed to produce carbon credits for sale for 20 years, after which they may still remove CO_2 but would not produce credits to sell. This distinction is important, as this provides actual carbon reductions from projects which last longer than 20 years, rather than solely providing carbon credits to offset other emissions. Projects were modelled to start in 6 waves over a 20-year period,[75] with each wave incorporating a blend of "avoid", "reduce" and "sequester" projects to create a portfolio with an averaged carbon credit price. Fund sizes have been described by the size of local authority borrowing required at the start of the Fund (either through PWLB, other local authority or private sources), and key figures for the expected scenario of the Fund sizes are shown below (Table 1).[76]

Expected scenario	Max carbon saved/year ($MtCO_2$)	Max carbon saved/year, % of current emissions	% Financial return on investments	Net financial gain after 40 years (£m)
£50m fund	0.538	4.6%	125%	100
£100m fund	0.930	8.0%	125%	174
£250m fund	2.183	18.8%	123%	382

Table 1: Predicted figures for the three modelled Fund sizes, taken from the "expected" scenario. Current emissions are taken to be 11.6 $MtCO_2$ (incl. peatland emissions). % Financial return is calculated as 100% + (end balance/total loans taken) after all loans are repaid. Net financial gain values are after all outstanding loans are paid, and do not account for inflation.

As seen in the first two columns of Table 1, annual emissions can be reduced significantly with this Fund, with the carbon saved per year increasing with the size of the Fund. The maximum carbon saved value is reached 25 years after starting the Fund (2048 if the Cambridgeshire Decarbonisation Fund

[75] Whilst projects were modelled to begin in 6 waves, this was predominately to simplify the model. A more realistic scenario would be for a continuous stream of projects starting when they are ready. However, this should not detract from this model giving a rough insight into the scale of the benefits from a Fund.

[76] See Appendix E for values of the worst and best case scenarios

begins in 2023). With the largest Fund modelled, about 19% of Cambridgeshire's annual emissions could be removed per year, with that reduction delivered by 2050.[77]

The Fund would also be financially viable, with positive returns projected over the course of 40 years (Table 1, columns 3 and 4). The return on investments is 105-125% for each fund size, meaning larger funds (which take out more loans) give larger financial yields. The Fund's net balance (when the Fund's balance is greater than outstanding loans) becomes positive within 30 years (Figure 4). In the first 20 years, the revenue produced by projects is reinvested into future projects (as well as covering annual running costs), which enables the Fund to support projects worth 1.8-2.3 times more than the total loans received. The Fund's balance decreases in the final five years, as the model assumes a constant level of indirect staffing costs, however in practice this is unlikely to be necessary once no new projects are being developed.

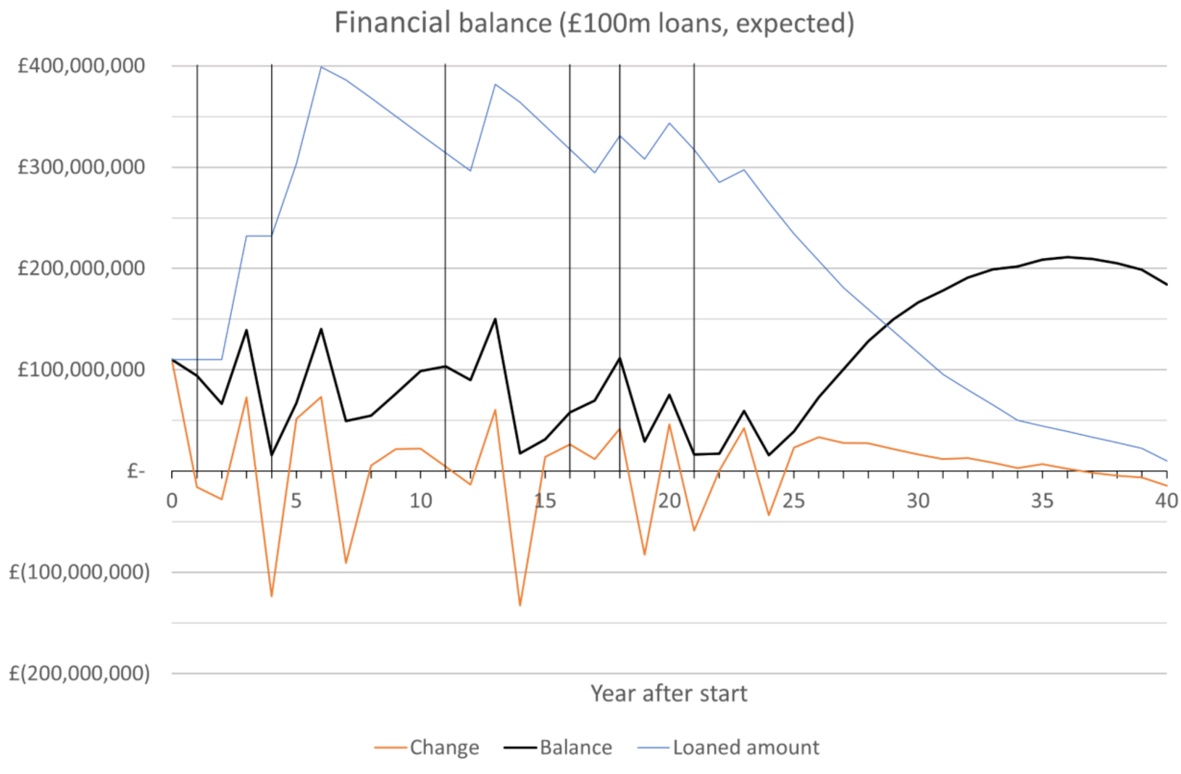

Figure 4: Graph of finances for the fund, showing end of year balance (black), annual change (orange) and outstanding debts (blue). This chart was taken for the £100 million fund under the expected scenario. Vertical lines indicate years in which project waves are started.

[77] Annual emissions taken to be 11.6 $MtCO_2$ (including peat emissions), as presented in the CUSPE 2019 report (https://data.cambridgeshireinsight.org.uk/dataset/cambridgeshire-policy-challenges-cambridge-university-science-and-policy-exchange-cuspe-8)

While successive waves of projects allow the recycling of funds to multiply the impact of initial loans, each portfolio of projects in a wave will be independently financially viable. This is illustrated in Figure 5, showing a 104% return on investment of a single project portfolio over its 20-year life.

Figure 5: Financial status of a single wave of projects. £240m in loans taken out to fund £325m worth of decarbonisation, giving a return of £9.1m after 20 years.

The number of carbon credits produced and sold per year is shown in Figure 6. The number of carbon credits produced increases as more projects become functional, peaking between years 15 and 25, then decreasing as projects are retired. These values are important, as it has been assumed that all the carbon credits created will get sold. If there is insufficient demand locally, these could potentially be sold in other markets at a national level. The potential local demand for carbon credits should be investigated further, to ensure that a large Fund will be viable. Global modelling of carbon credit markets and companies' net-zero commitments suggests demand could be up to 15 times higher than 2020 levels in 2030, and up to 100 times higher in 2050.[78] [79]

[78]https://www.mckinsey.com/business-functions/sustainability/our-insights/a-blueprint-for-scaling-voluntary-carbon-markets-to-meet-the-climate-challenge
[79]https://trove-research.com/wp-content/uploads/2021/06/Trove-Research-Carbon-Credit-Demand-Supply-and-Prices-1-June-2021.pdf

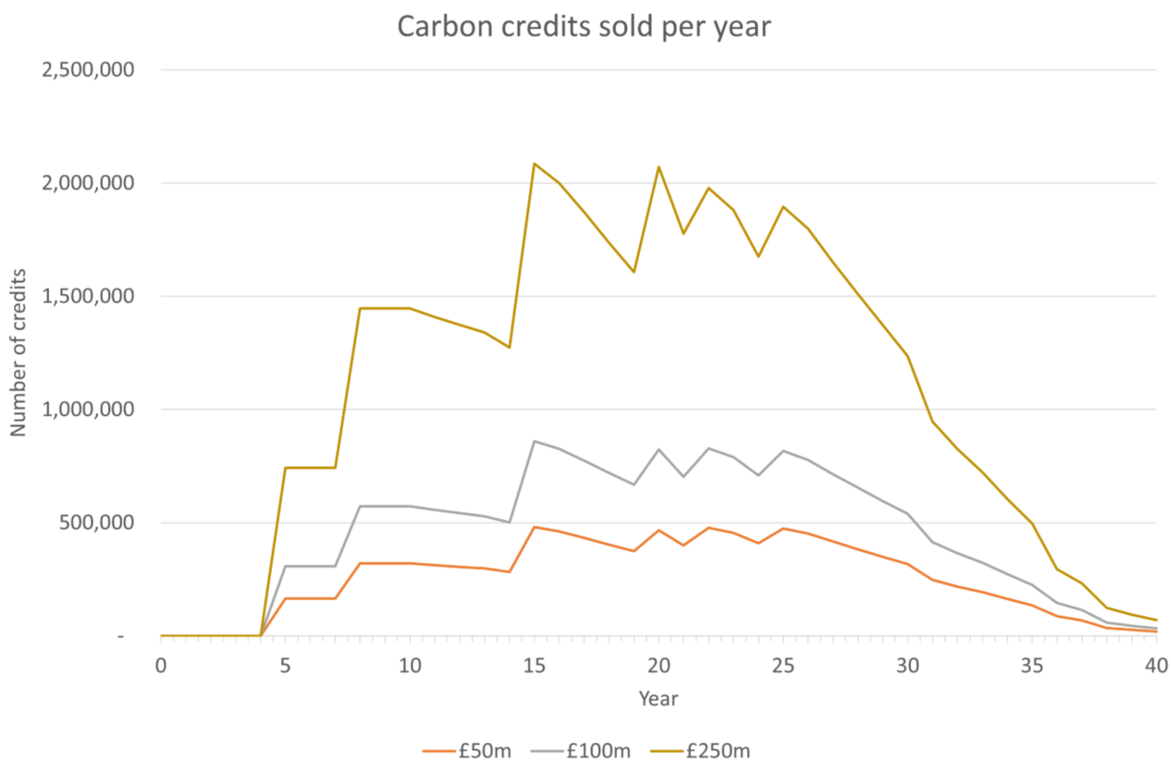

Figure 6: Number of carbon credits produced and sold each year, given for the three sizes of fund modelled. These figures are taken from the "expected scenario" for each.

The model presented here provides a simplified outline of what the Fund may look like, however, it clearly demonstrates two takeaways for the Fund. First, the Fund should be financially viable regardless of size and length of duration. Second, the financial and environmental returns from the Fund scale roughly linearly with size. Combined, these two features imply that the size of the Fund should be maximised, and only limited by current capabilities. A larger Fund will provide ever more benefits to the environment, the local communities, and the council's finances.

3.3.2. Initial funding

Projects undertaken as part of this Fund will incur most of their costs before any revenue is produced through carbon credits. Most projects will either require significant infrastructure construction before any credits are produced (e.g., renewable energy production, renewable heat networks), or require multiple years to achieve their full carbon reducing potential (e.g., afforestation or peatland projects). This necessitates sourcing finance through means other than selling carbon credits at the outset. Potential sources of funding have been identified, which have been separated into three categories: project-specific funding (e.g., government loans and business collaboration), project-independent funding (e.g., council borrowing and private investment), and issuing green bonds.

We found that project-independent loans were only required in the first 10 years, after which project revenue and project-specific funding was sufficient to sustain project development over the next 10 years and beyond. Further details on these three funding categories are provided below.

Project-specific funding

Project-specific funding encompasses any loans or funding which is linked to a specific project. Financing is separated into three sources: government loans, collaboration with local businesses, and private investment. In the financial models presented above, between 30% (worst scenario) and 50% (best scenario) of project costs are assumed to be provided by project-specific loans, through a combination of the above sources. It was found that the availability of the funding was *the* key differentiator between the worst-case and best-case scenarios: better access to project-specific funding allows for a significantly larger Fund, leading to greatly increased financial and environmental benefits.

The largest source of project-specific funds are government grants or loans to incentivise particular categories of projects.[80] A wide range of funding sources is available from the government for individual projects; in particular projects which focus on energy or heat decarbonisation. The scope of projects funded through these loans may increase over time, so should be monitored regularly in order to maximise the level of funding received through these incentives.

Another funding option may be to collaborate with local businesses who would benefit from particular projects. This could be a direct benefit (e.g., the provision of reliable renewable power to the business), or an indirect benefit (e.g., upgrading the energy efficiency of local housing, encouraging employees to the area). All projects proposed should be assessed for benefits to local businesses, and if one is identified, the Council should investigate whether the financing of the project could be shared by the Fund and the relevant businesses.

Private investment may also be an option for flagship projects, as demonstrated by the company Abundance Investments.[81] This company provides a platform for individuals to invest in a variety of environmental projects. Their ability to support large infrastructure projects is highlighted by the financing of two solar farms in collaboration with Swindon Council. In total, £4.2m was raised through Abundance Investment within 5 months, allowing the building of these solar farms providing up to 10 MW of renewable power.[82]

[80] See "Greater South East Energy Hub" for financing options for energy-based projects: https://www.energyhub.org.uk

[81] Abundance Investments: https://www.abundanceinvestment.com

[82] https://issuers.abundanceinvestment.com/case-studies/swindon-common-farm-chapel-farm

Project-independent funding

Project-independent funding encompasses all loans and funding which the Fund could attract which are not linked to specific projects within the Fund. The main options for this funding are council borrowing and private investment.

Council borrowing is likely to be the most reliable and largest project-independent funding source available to the fund at the start. Preferably, borrowing would come from the Public Works Loan Board (PWLB), who are able to issue large, long-term loans to local authorities for infrastructural projects.[83]

In the financial models described above, it is projected that an initial loan of 30-60% of the first project portfolio would be required, followed by a smaller 20-year loan taken out in year 5 to coincide with the development of the second wave of projects. No further local authority borrowing would be required after this once revenue from the selling of carbon credits of previous projects starts.

Private investment may also be possible as a project-independent source of funding. If the Fund can be seen as a reliable long-term investment, this may attract green/ethical pension funds.[84] This may become an option as the Fund develops and proves its viability.

Green bonds

Green bonds (or community municipal investments, CMIs) are a method for local businesses and residents to invest in local decarbonisation projects, allowing local projects to be performed and providing a financial return to investors. In the financial models, it is assumed that 20-year bonds totalling £10 m will be issued in year 0, reissued in year 20, and repaid in full year 40.

The management of green bonds has been pioneered by Abundance Investment, who have recently overseen the issuance of green bonds by two local councils (West Berkshire and Warrington Borough) for a total of £2m.[85] They are in the process of issuing further green bonds for Islington Council worth £1m. Given the ambition of the Cambridgeshire Decarbonisation Fund compared to these previous schemes, issuing a larger amount of green bonds should be investigated.

3.3.3. Alternate revenue sources

While most of the income for the Fund will come from the selling of carbon credits, there are some opportunities to supplement this cash flow. To ensure the consistency with the Fund's objectives, these alternative revenue sources should be climate positive.

Working with the Local Planning Authorities, two options could be considered:

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[83] https://www.dmo.gov.uk/responsibilities/local-authority-lending/about-pwlb-lending

[84] For an example of a green pension fund, see "Path Financial": https://thepath.co.uk/our-services/pensions

[85] https://issuers.abundanceinvestment.com/council-climate-bonds

- Developers contribute to the fund to offset operational emissions which are difficult to remove through on-site measures.
- Emissions associated with the construction of new building developments are subjected to a carbon levy within Cambridgeshire.

A developer carbon levy has been successfully implemented by Milton Keynes County Council, as well as a selection of London Boroughs. In Milton Keynes, developers are required to reduce the emissions from construction and running of the building (minimum 45%) and offset the remaining emissions by paying £200/tCO_2 into a fund to finance local decarbonisation projects.[86] Not only does this levy encourage developers to adopt low carbon construction methods and increase the energy efficiency of the buildings, but it also allows decarbonisation projects to be performed at no direct costs to the council or residents. This scheme could be incorporated into the Cambridgeshire Decarbonisation Fund by obliging developers to buy carbon credits from the Fund, ensuring that future developments within Cambridgeshire are carbon neutral. Alternatively, a carbon levy could be set at the price of the more expensive “avoid” projects (£200-250/tonne) to encourage further emissions reductions during construction and supply additional income for the Fund.

Previous council decarbonisation projects external to the Fund could provide another source of revenue.[87] These previous projects are mostly renewable energy generation and will be fully paid through the electricity they provide. Since these projects will also reduce carbon emissions, part of this reduction could be sold as carbon credits and provide an initial revenue for the Fund before the first projects are functional. However, there may be issues with the validity of these carbon credits, as they will not satisfy the additionality requirement described above (Section 3.2.2).

[86] https://www.milton-keynes.gov.uk/planning-policy/documents/Sustainable_Construction_SPD.pdf

[87] Of interest are Triangle and North Angle solar farms and renewable energy at park & ride sites: https://www.cambridgeshire.gov.uk/residents/climate-change-energy-and-environment/climate-change-action/low-carbon-energy/large-scale-renewable-energy-and-storage

4. Summary and Recommendations

In order to maximise the effectiveness of the Cambridgeshire Decarbonisation Fund, the establishment of a separate Carbon Advisory Service (CAS) is recommended. This Service will complement the Fund by assisting businesses in the estimation and reduction of their carbon footprints, as well as recommending offsetting through the Fund, if applicable. The primary target for CAS is expected to be SMEs, but pathways both for larger businesses and for social- and micro-enterprises are also recommended. Establishing this service will ensure that offsetting through the Fund is limited to genuinely hard-to-reduce emissions and that the Fund operates alongside, rather than instead of, other decarbonisation measures essential to meeting net zero targets. Furthermore, the CAS will enable a holistic approach to emissions reduction within participating businesses. It will also offer key co-benefits for both businesses and communities, including improved efficiency, increased attractiveness to consumers and supply chain partners, readiness for future regulatory change, and improved environmental quality.

Following on from the CUSPE 2020 report on the establishment of a Cambridgeshire Decarbonisation Fund, two aspects of this Fund were investigated in detail: validation and verification of carbon credits, and the financial viability of the Fund. The importance of validating and verifying decarbonisation projects within the Decarbonisation Fund has been investigated. This will be a significant part of the management of the Fund and will require substantial organisation to ensure that the relevant information is gathered for each project for the different stages of the validation and verification process. There is an additional benefit for the Fund in terms of credibility by registering projects with a certification organisation; however, the cost-effectiveness of this may vary by project and by the certification organisation used. A possible alternative is to create a standard for the Decarbonisation Fund based on publicly available methodologies and that employs suitable third-party validation and verification bodies. How such methodologies could be adapted to validate and verify the Swaffham Prior Heat Network project has been explored, as an example of how this approach could be applied to future projects. Finally, the report has considered how the UK-based Woodland Carbon Code can be used to generate carbon units from forestry projects and the level of detail and preparation that is required.

With the largest Fund size modelled, 25% of Cambridgeshire's annual emissions could be mitigated within 25 years. This means that a Cambridgeshire Decarbonisation Fund will be an important tool for phasing out the county's 'hard to remove' emissions. In order to achieve this reduction in emissions, the Council should maximise the amount of initial funding acquired to increase the size and efficacy of the Fund. This initial funding should be sought from a variety of sources, with Local Authority borrowing and government loans likely to be the most significant sources.

Beyond a Cambridge Decarbonisation Fund, much more will need to be done across the county to achieve net-zero. The council can facilitate this by encouraging local businesses to decarbonise through the proposed Carbon Advisory Service, and by exerting pressure upon their supply chain to encourage action across the board. There are also many projects that can be performed that are economically viable (e.g., renewable energy, increasing energy efficiency), which should be undertaken in addition to this Fund, either directly by the Council or through partnerships with local businesses.

The report's recommendations for the Carbon Advisory Service and Decarbonisation Fund are summarised below:

1. The establishment of a local Carbon Advisory Service to support small and medium sized businesses in Cambridgeshire to decarbonise, through the provision of the following services:
    a. Free tailored advice, and signposting relevant external resources and services.
    b. Assistance with carbon accounting and the creation of action plans.
    c. Energy audits and business-specific recommendations.
    d. Assistance with the purchase of carbon credits from the Cambridgeshire Decarbonisation Fund, where appropriate.
    e. Assistance with procurement and accessing financial support for carbon-reduction projects.
    f. An accreditation service with tiered certification.
    g. Training and networking opportunities and regular updates on funding, technology and environmental legislation.
    h. Support with publicity and follow-up on businesses progression towards set targets.
2. The Carbon Advisory Service should act as a gateway to the Decarbonisation Fund, ensuring that businesses reduce their emissions as far as possible before offsetting any residual 'hard to reduce' emissions through the purchase of carbon credits.
3. The Decarbonisation Fund should support emissions-reduction projects that would otherwise not be financially viable (i.e. would not produce revenue or financial savings which outweigh the cost of the project). Projects which do not require the sale of carbon credits to be financially viable should be performed separately to the running of this Fund.

4. The Decarbonisation Fund should set a single carbon price through a portfolio approach, where more carbon expensive projects (with high social / environmental value) are supported by projects with a lower project cost per tonne of CO_2.
5. The Decarbonisation Fund should organise and perform the necessary assessments, measurements and predictions required for validation and verification of the decarbonisation projects in the decarbonisation fund portfolio.
6. The Decarbonisation Fund should register projects with established certification organisations where relevant and cost-effective, and otherwise use/adapt relevant publicly available methodologies from such organisations for validation and verification.
7. The initial funding provided for the establishment of the Decarbonisation Fund should be maximised, as this will enable the biggest environmental impact and largest financial returns in the long-term.
8. A diverse portfolio of initial funding should be sought for the establishment of the Decarbonisation Fund, combining both public and private sources to ensure that the Fund is resilient.

Appendix A - Services offered by existing carbon advisory organisations

The table below provides a summary of the tools/services offered by existing carbon advisory organisations. Columns on the left represent the most generic tools/services, becoming progressively more specific and tailored moving across columns to the right. Organisations in black offer that specific tool/service free of charge. Organisations in grey charge for that specific tool/service.

Calculating emissions		
Auditing advice and literature	**Online calculator**	**Personal auditing service**
SME Climate Hub Greenhouse Gas Protocol B Corp Climate Collective Avieco	SME Climate Hub Greenhouse Gas Protocol Carbon Footprint	Carbon Footprint Ricardo PLC Greenstone Ecometrica Anthesis Loreus xtonnes

Making recommendations			
General literature	**Sector-specific literature**	**Training/e-learning**	**Tailored business-specific recommendations**
The Carbon Charter NetRegs SME Climate Hub B Corp Climate Collective Green Growth	The Carbon Charter Carbon Literacy Project NetRegs Wrap B Corp Climate Collective	Carbon Literacy Project NetRegs START2ACT Greenhouse Gas Protocol Ricardo PLC CDP Loreus IMEA Carbon Footprint	BEE Anglia The Science Based Targets Initiative Green Growth Eastern New Energy Energy Saving Trust Carbon Trust START2ACT Carbon Footprint Avieco Ricardo PLC Ecometrica Anthesis Verco Loreus xtonnes

Assistance with funding/procurement			
Information on available funding	Funding application support	Procurement assistance	Funding provision
The Carbon Charter Energy Saving Trust Eastern New Energy B Corp Climate Collective	BEE Anglia Eastern New Energy Wrap	BEE Anglia Energy Saving Trust	BEE Anglia Wrap

Taking sustained action		
Support creating action plans		Follow-up and progression
BEE Anglia	Carbon Footprint	BEE Anglia
NUS Green Impact	Avieco	SME Climate Hub
Eastern New Energy	Ricardo PLC	Energy Saving Trust
SME Climate Hub	Anthesis	Ricardo PLC
B Corp Climate Collective	Verco	Greenstone
Energy Saving Trust	Loreus	
Carbon Trust	xtonnes	

Certification		
Badge/logo	(Tiered) certification	Publicity support
NUS Green Impact **SME Climate Hub**	NUS Green Impact The Carbon Charter Carbon Literacy Project The Science Based Targets Initiative Carbon Trust Carbon Footprint CDP	BEE Anglia The Science Based Targets Initiative Eastern New Energy SME Climate Hub Green Growth Energy Saving Trust

Table 2: Summary of the tools/services offered by existing carbon advisory organisations. Columns on the left represent the most generic tools/services, becoming progressively more specific and tailored moving across columns to the right. Organisations in black offer that specific tool/service free of charge. Organisations in grey charge for that specific tool/service.

Appendix B - Case Study of BEE Anglia and the Carbon Charter

i. Introduction

Suffolk County Council has been helping businesses to implement environmental measures for over 15 years. An energy efficiency advisory service was originally set up in response to pressure from district councils to help local businesses save energy and protect the environment. The council currently provides business advice and grant funding for SMEs through Business Energy Efficiency (BEE) Anglia,[88] which is co-financed by Suffolk County Council and the European Regional Development Fund (ERDF). Local businesses can also receive advice and recognition for taking steps to reduce their carbon emissions through the Carbon Charter award scheme,[89] which is supported by The Suffolk Climate Change Partnership between Suffolk's local authorities and the Environment Agency.[90] Both BEE Anglia and the Carbon Charter services are now also available to businesses in Norfolk, where the programmes are overseen by Norfolk County Council. This case study will provide an overview of the services available to businesses in Suffolk and Norfolk, how these programmes are structured and funded, and outline the environmental outcomes and how local businesses have benefited. Insights into the implementation of the programmes were also obtained from an interview with the BEE Anglia Project Manager at Suffolk County Council, Ned Harrison.

ii. Services to Businesses

Through the complementary services provided by BEE Anglia and the Carbon Charter, local small SMEs are able to access: expert energy saving and emissions reduction advice, grant funding for emissions reduction initiatives and locally-recognised accreditation for implementing emissions saving measures. The programmes work closely with the Chambers of Commerce and local business organisations to link with local businesses. They also promote their services through regular press releases, providing details of successful projects undertaken with local businesses.

"After working with a local printing business and putting out a press release, we had a flurry of interest from other print firms, the same thing happened when we worked with our first law firm" - Ned Harrison, BEE Anglia Project Manager

Advice

Both BEE Anglia and Carbon Charter provide access to trained expert advisors who can help businesses identify energy and emissions savings. The advisory services are delivered by the charity Groundwork

[88] http://www.beeanglia.org/
[89] https://carboncharter.org/
[90] https://www.greensuffolk.org/about/suffolk-climate-change-partnership/

East, which acts as a point of contact for businesses. Advice is provided through a hybrid approach of remote support and site visits. The advisors typically produce an energy audit in which they rank recommended measures according to upfront cost, potential energy and emissions reduction, and pay-back time. They also help businesses to find suitable local suppliers or installers of low carbon technologies.

Groundwork Carbon Management process:[91]

1. **Establishing a baseline** – by measuring your current carbon footprint our consultant will be able to identify areas for improvement for your business to focus on.
2. **Set targets** – our consultants understand SMART carbon management objectives. Their experience will help your business to understand what targets are achievable based on the resources you have available.
3. **Monitor** – record keeping is essential when managing your carbon to track progress. Our industry leading tools will ensure all the data you need is at hand.
4. **Adapt** – carbon management is a continual improvement process; recommendations can continue to be made. Our consultants can even help you go beyond net zero, looking to a climate positive future where your business seeks to remove additional carbon dioxide from the atmosphere.

Grant funding

BEE Anglia and the Carbon Charter also help businesses to access grant funding to reduce the upfront cost of emissions reduction projects. BEE Anglia provides grants of up to £20,000 at an intervention rate of between 20% to 40% of project costs.[92] The Carbon Charter does not provide any funding directly but helps businesses to apply to a range of different grant funds,[93] many of which are exclusive to Suffolk.

Accreditation

The Carbon Charter has supported approximately 600 businesses to achieve accreditation through tackling their carbon emissions. Though less robust and comprehensive than other national / international standards for measuring environmental performance, the Carbon Charter provides an effective incentive for businesses to take action.

[91] https://groundworksbs.org.uk/carbon-management/
[92] http://www.beeanglia.org/grant-funding/
[93] https://carboncharter.org/resources-grants-and-funding/

"The Carbon Charter has helped incentivise businesses to implement the recommendations of their energy audit" - Ned Harrison, BEE Anglia Project Manager

The Charter is targeted specifically at SMEs and is designed to be "attainable for companies which do not employ a full-time energy manager, and can't afford a rigorous environmental management system".[94] According to Ned Harrison, Project Manager at BEE Anglia, "SMEs are often overwhelmed by the structural and legal implications of achieving compliance with standards such as ISO14001[95] and The Carbon Trust Standard,[96] the Charter offers something which is both meaningful and attainable for them". The Carbon Charter process encourages businesses to implement quick and effective measures to put them on a path of emissions reduction. Through taking action and making tangible progress towards decarbonisation, businesses are encouraged to go further, as they start to capitalise on the benefits and begin to view themselves as part of the solution.

There are three levels of Carbon Charter Accreditation, which are outlined in Figure 7. Put simply, the Bronze level charter recognises businesses which 'take [their] carbon impact seriously', and is intended to be within reach of any business. A Silver level business has 'significantly reduced its carbon emissions', and a Gold level business is 'an exemplar of low carbon management'.

[94] http://www.beeanglia.org/about-bee/carbon-charter/carbon-charter-quick-q-and-a/
[95] https://www.iso.org/standard/60857.html
[96] https://www.carbontrust.com/what-we-do/assurance-and-certification/the-carbon-trust-standard

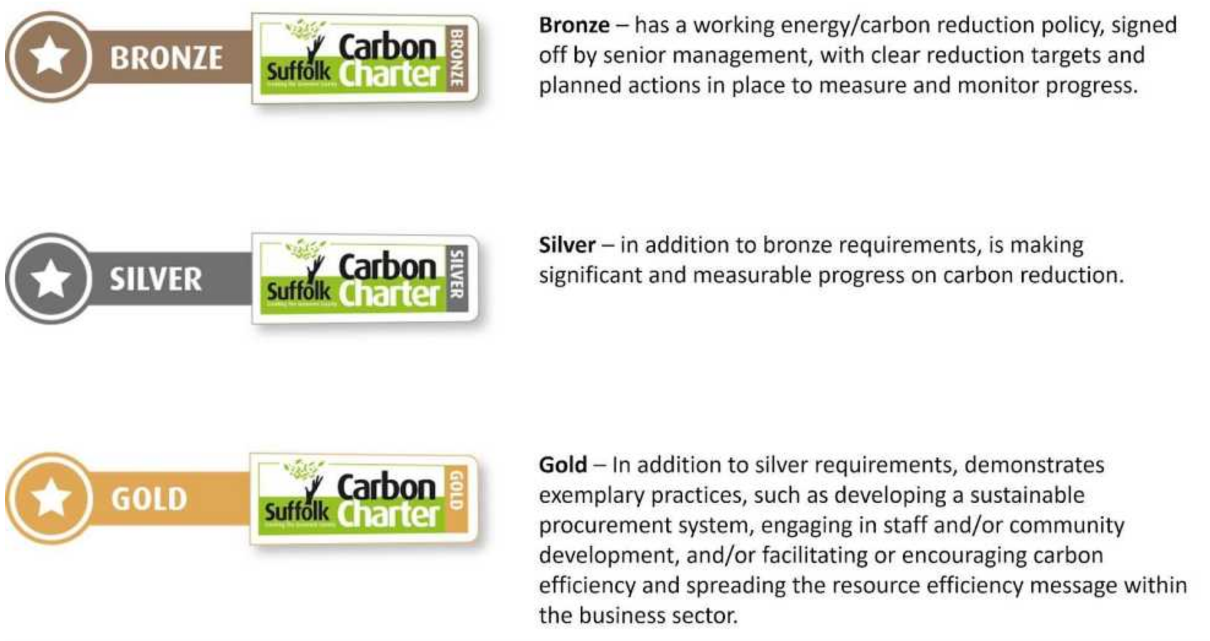

Figure 7: Logo and requirements for the three levels of accreditation awarded by the Carbon Charter in Suffolk and Norfolk.[97]

Eligibility

While historically only available to SMEs, the Carbon Charter has recently started granting accreditation to larger companies in response to increasing interest. These larger companies were often already compliant with other more comprehensive standards such as ISO14001 but wanted to have local recognition of their environmental credentials. In order to avoid larger companies using the charter as a cheap and easy alternative to more robust and demanding schemes, larger companies are required to be ISO14001 (or equivalent) compliant as a prerequisite.

Application process

Charter accreditation is awarded based on an independent assessment by a qualified auditor who carries out a site visit and submits a report to the Carbon Charter Panel. The assessment considers the major environmental aspects of the business and how it is addressing its environmental impacts. The auditor will also calculate a carbon footprint for the business. The Carbon Charter Panel, which is made up of qualified and experienced environmental professionals from a range of local organisations including the Environment Agency, Suffolk County Council, local authorities and the water companies, will then determine the level of award that the company receives. The business is then informed of the outcome, together with practical suggestions for further progress. The accreditation process typically takes 6-12 months to complete, though timescales can vary considerably. Businesses are

[97] https://carboncharter.org/about-the-carbon-charter/

encouraged to renew their Charter accreditation every two years, through a simplified renewal process.

iii. Structure and Funding

The organisational structure of BEE Anglia and the Carbon Charter is outlined in the diagram shown in Figure 8. BEE Anglia is currently co-funded by Suffolk County Council and the European Regional Development Fund (ERDF). However, grant funding from the ERDF is due to expire mid-2022 and the council is seeking future support from the UK Government. The Carbon Charter, which charges for its advice and accreditation services, does not rely on any external revenue streams, giving greater financial stability and ensuring continuity of service. Suffolk County Council is the lead partner and handles project finances and grant payments for BEE Anglia and the Carbon Charter, while Norfolk County Council oversees delivery of the programmes in Norfolk. Advice and auditing services are provided to businesses via the charity partner Groundwork East in Suffolk and Norfolk. The processing of grant applications is undertaken by Nwes, a not-for-profit enterprise agency supported by the ERDF.

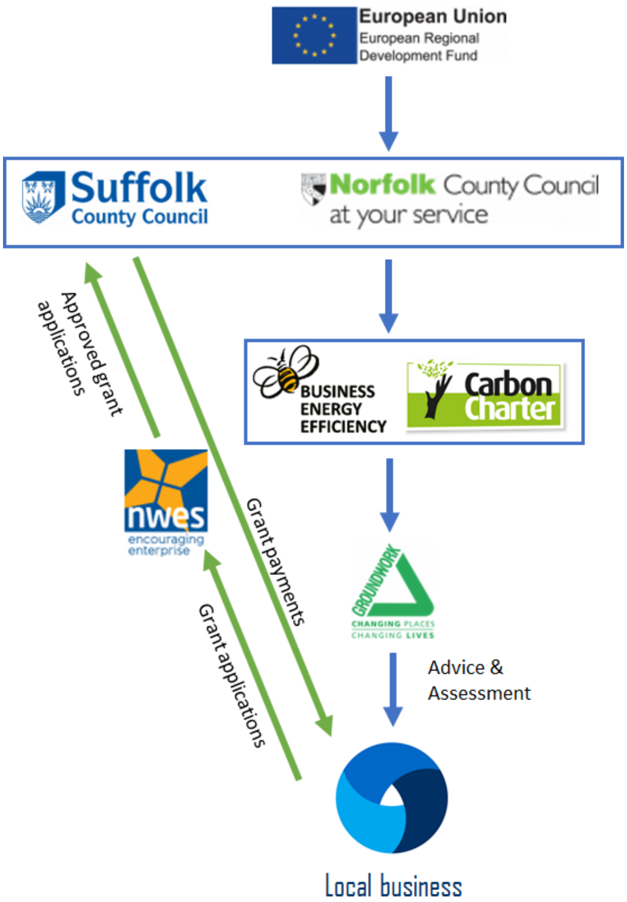

Figure 8: Schematic diagram showing the organisational structure of the services offered by BEE Anglia and the Carbon Charter on behalf of Suffolk and Norfolk County Councils

The cost of Carbon Charter accreditation depends on the size of the business:

- £750 for microbusiness (0-9 employees)
- £850 for small business (10-49 employees)
- £950 for medium-sized business (50-250 employees)
- Prices start at £1,250 for organisations with over 250 employees.

The fee may be covered by BEE Anglia or paid by businesses themselves and covers the costs of an onsite audit and review and provides the business with two years of accreditation and network membership. The fee covers the Groundwork advisor's time, which is charged at £50 per hour, with a small margin included to cover other non-chargeable costs. There is also the opportunity for larger organisations to support the programme as 'Pathfinder Partners'. One such example is the East of England Co-operative, which supports local businesses and producers to apply for the award and covers the accreditation fee for its suppliers.

iv. Implementation and Outcomes

During 6 years of operation, BEE Anglia has helped 874 businesses to cut energy usage. This work has realised annual savings of 3,000 tonnes CO2e through the measures implemented with grant funding alone, with further carbon reductions from measures implemented without grants. In addition, since its establishment in 2010, the Carbon Charter has accredited 600 businesses and carried out over 800 energy audits across businesses as varied as cleaning services, groceries delivery, food and beverage producers & suppliers, financial & legal services, engineering, construction materials, schools, printing services and marketing services. The Carbon Charter is also now recognised in council procurement and businesses are required to meet at least some of the criteria of the charter to supply goods / services to the council.

Businesses which approach the BEE Anglia or the Carbon Charter do so for several reasons:

- Motivated owner(s) / employee(s)
- Cost reduction / efficiency savings
- Perceived pressure from peers, competitors and customers
- Competitive advantage
- Compliance with current and future environmental legislation
- Pressure from customers / meeting procurement requirements
- Pressure from staff and attracting new employees

"Businesses often say that cost is their main concern but in my experience time and confidence often present greater barriers" - Ned Harrison, BEE Anglia Project Manager, Suffolk County Council

Ned Harrison believes that good quality advice can give SMEs the confidence they need to implement energy saving measures. He explained that “businesses which get in touch often have a pretty good idea of what they want to do to reduce carbon emissions but lack the confidence to follow through on those plans”. In this sense, the advisor's role is to use their experience and relevant case studies to provide businesses with the reassurance they need that their proposed measures will deliver the expected benefits. Furthermore, Ned’s experience has taught him that, while businesses are often very keen to have an advisor visit and produce an energy audit, they often fail to implement any of the recommendations, even those which are low cost and have short pay-back times. However, the Carbon Charter accreditation programme has been highly effective at incentivising more companies to implement the recommendations of their energy audits. It has also attracted many more businesses who want local recognition of their environmental efforts.

The Carbon Charter lists the following benefits of Certification and Membership:

- Use of the Carbon Charter logo – communicate your commitment to carbon reduction to all your stakeholders
- Listing in Carbon Charter’s Member Directory
- Access to Member Login Area
- Free support from our sustainable business services team
- Priority invitations to a range of training and networking events
- Introductions to other like-minded businesses working locally
- Regular updates on funding, new technologies and environmental legislation

Appendix C - Validation and verification fees

i. Gold Standard Certified Emissions Reductions Fees

Fee Type	Cost
Annual Registry Account Fee	$1000 per account
Preliminary Review Fee	$900 per project
Project Design Review Fee	$0.05 per credit minus Preliminary Review Fee
Performance Review Fee	$1000 per project
First Year of Issuance	$0.05 per credit minus Performance Review Fee
Subsequent Issuances	$0.1 per credit minus Performance Review Fee OR $0.02 per credit minus Performance Review Fee plus 1.5% of credits given to Gold Standard

ii. Gold Standard Microscale Carbon Fees

Fee Type	Cost
Annual Registry Account Fee	$1000 per account
Preliminary Review Fee	$500 per project
Performance Review Fee	$650 per project
Standalone Project – Validation Fee	$5000 per project
Standalone Project – Annual Verification Fee	$2500 per project per year
Programme of Projects – Validation Fee	$20000 per programme
Programme of Projects – First Voluntary Project Activity Validation Fee	$2500
Programme of Projects – Inclusion/Validation Fee	$2500 per additional Voluntary Project Activity
Programme of Projects – Annual Verification Fee	$1500 per Voluntary Project Activity

iii. Plan Vivo Fees

Fee Type	Cost
Project Idea Note Review Fee	$750
Project Design Document Review Fee	$1800
Validation Coordination and Report Review Fee	$1000
Registration Fee	$1000-$4000 per project
Issuance Fees	<50000 Plan Vivo Certificates per year = $0.4 per Plan Vivo Certificate >50000 Plan Vivo Certificates per year = $0.35 per Plan Vivo Certificate

iv. Verified Carbon Standard Fees

Fee Type	Cost
Account Opening Fee	$500 per account
Registration Fee (credited towards future issuance levies)	Estimated volume of annual emissions reductions × $0.1; capped at $10000
Validation/Verification Body Annual Fee	$2500 per year
Verified Carbon Unit (VCU) Issuance Levy	1-10000 VCU = $0.05 per VCU 10001-1000000 VCU = $0.14 1000001-2000000 VCU = $0.12 2000001-4000000 VCU = $0.105 4000001-6000000 VCU = $0.085 6000001-8000000 VCU = $0.06 8000001-10000000 VCU = $0.04 >10000000 VCU = $0.025

Table 3: Adapted tables of the main costs associated with certifying a project with Gold Standard (i. and ii.), Plan Vivo (iii.) and Verified Carbon Standard (iv.). For a project to be classified as a Gold Standard Microscale Carbon project (ii.), there are certain requirements, such as the maximum number of carbon reductions per year is 10,000 tonnes CO_2 equivalents.

Appendix D - Case Study of Validation and Verification with the Woodland Carbon Code

Afforestation and reforestation projects are important for sequestering carbon, particularly from emissions that are difficult to reduce. The carbon sequestered can then be sold as carbon credits. However, it is important that these projects have been validated and verified, so that businesses that want to buy the credits can trust that they correspond to an accurate amount of sequestered carbon. As such, forestry projects involve more procedures than simply planting the required number of trees.

One standard that provides the guidelines for carrying out certified forestry projects is the Woodland Carbon Code, a UK-based Government-supported voluntary code that is managed by Scottish Forestry.[98,99] It provides a framework for the validation and verification of tree planting projects, including predicting and confirming the amount of carbon sequestered by the project, as well as checking that the projects conform to UK Forestry Standard.[100,101] Predicted Issuance Units (PIUs) are given based on predicted carbon sequestration, while Woodland Carbon Units (WCUs) are given after verification of the actual carbon sequestered.[102] Only the WCUs can be used by businesses to report against UK-based emissions. It is worth noting that WCUs are technically not carbon credits, as they do not meet all additionality requirements.[103] This is because of the UK government's policy on woodland creation as part of the United Nations Framework Convention on Climate Change (UNFCCC) agreements.[104]. In practice, this means that WCUs cannot be used by UK businesses to compensate for overseas emissions or those from international flights or shipping.

Costs involved

Aside from the validation/verification performed by third-parties, the costs involved with using the Woodland Carbon Code are based on the number of carbon units sequestered by projects.[105] There is a £0.06 charge per unit for adding the PIUs to the registry, followed by a £0.03 charge for each PIU

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[98] https://www.woodlandcarboncode.org.uk/
[99] https://www.woodlandcarboncode.org.uk/about/governance
[100] https://www.woodlandcarboncode.org.uk/landowners-apply/3-validation-initial-project-check
[101] https://www.woodlandcarboncode.org.uk/landowners-apply/4-verification-ongoing-check-of-project-sequestration
[102] https://www.woodlandcarboncode.org.uk/buy-carbon/what-are-woodland-carbon-units
[103]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/850130/Env-reporting-guidance_inc_SECR_31March.pdf
[104] https://www.woodlandcarboncode.org.uk/standard-and-guidance/1-eligibility/1-6-additionality
[105] https://www.woodlandcarboncode.org.uk/images/PDFs/WCC_CarbonUnitRegistry_Fees_July2016.pdf

verified as a WCU. The rest of the costs are paid to the bodies that perform the validation and verification. For example, the cost of a single validation/verification with OF&G (including the application fee and VAT) is £1382.40.[106] There is no fee for reviewing documentation, unlike the other certification organisations mentioned above, and the issuance charges per unit are less than those aforementioned organisations (Appendix C, pages 60-61), making using the Woodland Carbon Code cost-effective for certifying forestry projects within the Cambridgeshire Decarbonisation Fund.

Before validation and verification

For potential projects within the portfolio of the Decarbonisation Fund, the first step is to register with the Woodland Carbon Code, which can only be done before any planting begins – projects cannot be registered retroactively.[107] This involves creating an account for each project on the UK Land Carbon Registry, which is maintained by the third-party company IHS Markit. The UK Land Carbon Registry provides a publicly available record of the predicted and verified carbon units for each project, providing transparency for potential buyers.[108] The following steps for projects involve completing the detailed methodology provided by the Woodland Carbon Code that is used for predicting the carbon sequestration of the project over its lifetime, as well as providing the information needed by third-party bodies to perform validation and verifications.[109]

Prior to the validation of projects, the predicted carbon sequestration is calculated. The Woodland Carbon Code provides spreadsheets that use various planting details to perform the calculations, including the tree species used, the seedling area and spacing, and the management type.[110] In addition, the baseline sequestration of any current vegetation needs to be measured before it is cleared prior to tree planting, as well as any leakage if emissions are caused outside of the project area, as the calculations account for any sequestration/emissions that are over 5% of that predicted for the forest. However, the UK legislation that protects semi-natural habitats and existing woodlands reduces the likelihood of leakage due to intensified land use outside of the project area.[111] Therefore,

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[106] https://assets.ofgorganic.org/rd316-woodland-carbon-code-charges.59tbab.pdf
[107] https://www.woodlandcarboncode.org.uk/landowners-apply/2-register-your-project
[108] https://www.woodlandcarboncode.org.uk/standard-and-guidance/2-project-governance/2-7-carbon-statements-and-reporting
[109] https://www.woodlandcarboncode.org.uk/landowners-apply/template-documents
[110]https://www.woodlandcarboncode.org.uk/images/PDFs/WCC_CarbonCalculation_Guidance_V2.4_March2021.pdf
[111] https://www.woodlandcarboncode.org.uk/standard-and-guidance/3-carbon-sequestration/3-2-carbon-leakage

the project developers need to know these details of the current land area and the design of the forest at the start of the project.

Performing validation and verification

The validation and verification of the projects are performed by bodies accredited by the UK Accreditation Service.[112,113] Currently, these are Organic Farmers and Growers (OF&G) and Soil Association. For validation, these bodies check that the carbon sequestration predictions are correct. Validation must be carried out within 3 years of the project start date and the process can take 4-6 months from contracting one of the accredited bodies to receiving PIUs after validating the predicted carbon sequestration. If any corrective actions are specified by the body, these need to be completed within 1 month. Once PIUs are received, they are recorded on the registry. 20% of these are kept as a buffer in case of reversal (such as from fires) or lower sequestration than predicted.[114] As such, not all carbon units generated will be available to sell. Another spreadsheet from the Woodland Carbon Code uses the number of PIUs, along with the carbon price and the costs involved with validation and verification, to calculate the costs and income involved with following the Code.[115] This can help demonstrate the financial additionality of the project. Forestry Commission grants and funding can be used with Woodland Carbon Code projects;[116] the requirement for financial additionality is that at least 15% of the project's planting and establishment costs up to year 10 come from selling WCUs.[117]

Verification is performed at regular intervals to assess the progress of the project and confirm the actual carbon sequestration that has occurred. This is first carried out 5 years after the start of the project, then every 10 years subsequently.[118] Progress and monitoring reports need to be submitted in advance of the verification due date – between 9 and 12 months before. Additionally, the project developers need to conduct a survey of the area, which is also sent to the verification body.[119] For the first verification, the aim of the survey is to check the stocking density and health of the saplings, while subsequent verifications confirm the amount of carbon that has been sequestered compared to that

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[112] https://www.woodlandcarboncode.org.uk/landowners-apply/3-validation-initial-project-check
[113] https://www.woodlandcarboncode.org.uk/landowners-apply/4-verification-ongoing-check-of-project-sequestration
[114] https://www.woodlandcarboncode.org.uk/standard-and-guidance/2-project-governance/2-3-management-of-risks-and-permanence?highlight=WyJidWZmZXIiLCInYnVmZmVyJyIsImJ1ZmZlciciXQ==
[115]https://www.woodlandcarboncode.org.uk/images/PDFs/WCC_Cashflow_Spreadsheet_Guidance_V2.1_March_2021.pdf
[116] https://www.gov.uk/guidance/the-woodland-carbon-code-scheme-for-buyers-and-landowners
[117] https://www.woodlandcarboncode.org.uk/standard-and-guidance/1-eligibility/1-6-additionality
[118] https://www.woodlandcarboncode.org.uk/landowners-apply/4-verification-ongoing-check-of-project-sequestration
[119] https://www.woodlandcarboncode.org.uk/images/PDFs/WCC_SurveyProtocol_Version2.1_March2021.pdf

predicted. The surveys involve dividing the area into subsets based on planting density and then taking measurements of the trees at randomly assigned plots. Therefore, substantial planning and coordination is required prior to each verification, and is an important part of the management of the projects.

Once the carbon sequestration has been verified, the corresponding number of PIUs are converted to WCUs.[120] These are recorded on the registry and can be sold to businesses to be used to compensate for emissions in the UK. The WCUs can be grouped with the carbon credits generated by other projects in the decarbonisation fund portfolio and sold in combination to businesses. Upon being sold, the WCUs are retired on the registry, so that there can be no double counting.

Example project: Forest of Marston Vale

An example of a group of forestry projects that have been registered with the Woodland Carbon Code in a neighbouring authority is the Forest of Marston Vale.[121] It is located in 61 square miles between Bedford and Milton Keynes and the area was designated as one of 12 Community Forests by the Government in 1991.[122] The Forest of Marston Vale Trust oversees the 10 different projects involved, which total 98.24 ha planted between 2001 and 2013 and which have increased tree cover from 3.6% in 1995 to 15.4% in 2015. Over its 100-year project lifespan, it is predicted to sequester 52,987 tonnes of CO_2 equivalents.[123] Therefore, this is a large scale set of forestry projects that are successfully following the Woodland Carbon Code.

In addition to the carbon saved, the Forest of Marston Vale has produced many co-benefits. To quantify these, the Forest of Marston Vale Trust commissioned an academic study, which found that, for every £1 invested in the Forest up to 2015, there were £11 of social, economic and environmental benefits.[124] These benefits included £4.95 million of physical health benefits per year; a boost to the local economy of £22.05 million per year from local spending for goods, services and contractors; and £1.49 million per year of air quality benefits and reduced social damage costs. Therefore, the creation

[120] https://www.woodlandcarboncode.org.uk/standard-and-guidance/2-project-governance/2-6-registry-and-avoidance-of-double-counting
[121] https://www.woodlandcarboncode.org.uk/case-studies/woodland-carbon-projects/forest-of-marston-vale-group
[122] https://www.marstonvale.org/Handlers/Download.ashx?IDMF=c9d14c67-2ba3-402f-b3dd-fd124495bdd1
[123] https://www.woodlandcarboncode.org.uk/case-studies/woodland-carbon-projects/forest-of-marston-vale-group
[124] https://www.marstonvale.org/Handlers/Download.ashx?IDMF=c9d14c67-2ba3-402f-b3dd-fd124495bdd1

of the Forest of Marston Vale has provided significant benefits to the community in addition to sequestering carbon.

Other credit types

It is possible to generate other types of credits, with different co-benefits, from a forestry project registered with the Woodland Carbon Code.[125] However, the predicted income from these needs to be stated during validation, because the income from these types of credits could mean the project is no longer additional. Alternatively, instead of stacking different types of credits, different trees could be designated for different credit types. It is worth noting that there will be different market demands for different types of credits. Therefore, careful assessment is needed prior to stacking credit types on any forestry projects using the Woodland Carbon Code.

[125] https://www.woodlandcarboncode.org.uk/standard-and-guidance/1-eligibility/1-6-additionality

Appendix E - Financial structure

i. Model parameters

The model was first set up for the "50 million, expected" scenario with the following parameters:

Indirect running costs:

This cost was predominately made up from the employment of people within the council to oversee the fund, and the associated costs for these employees (such as office space etc). 10-12 employees were estimated to be required, with a total annual cost of £670,000.

Validation/verification:

This cost was estimated at £400,000 annually. This is likely to be an overestimate, and these costs can be better estimated with knowledge of the amount and types of projects performed.

Business margin:

The annual cost of running projects was averaged over the first 20 years, and compared to the annual validation, indirect costs, and loan repayments (0.6*average over the first 20 years). This suggested a minimum business margin of 26%, on top of which 3% was added to give 29% as the business margin used.

Project costs and revenue:

The majority of costs were estimated to be incurred in the first 5 years (70% of total), with a constant "running cost" of 2% of the total (Figure 9). Revenue was estimated to start in year 5 and be consistent until year 10. After year 10, revenue decreases year upon year, to account for a reduction in additionality of the projects which is likely to occur. Reductions used are 5% from previous year in years 11-14, 10% in years 15-16, 20% in years 17-18 and 25% in years 19-20.

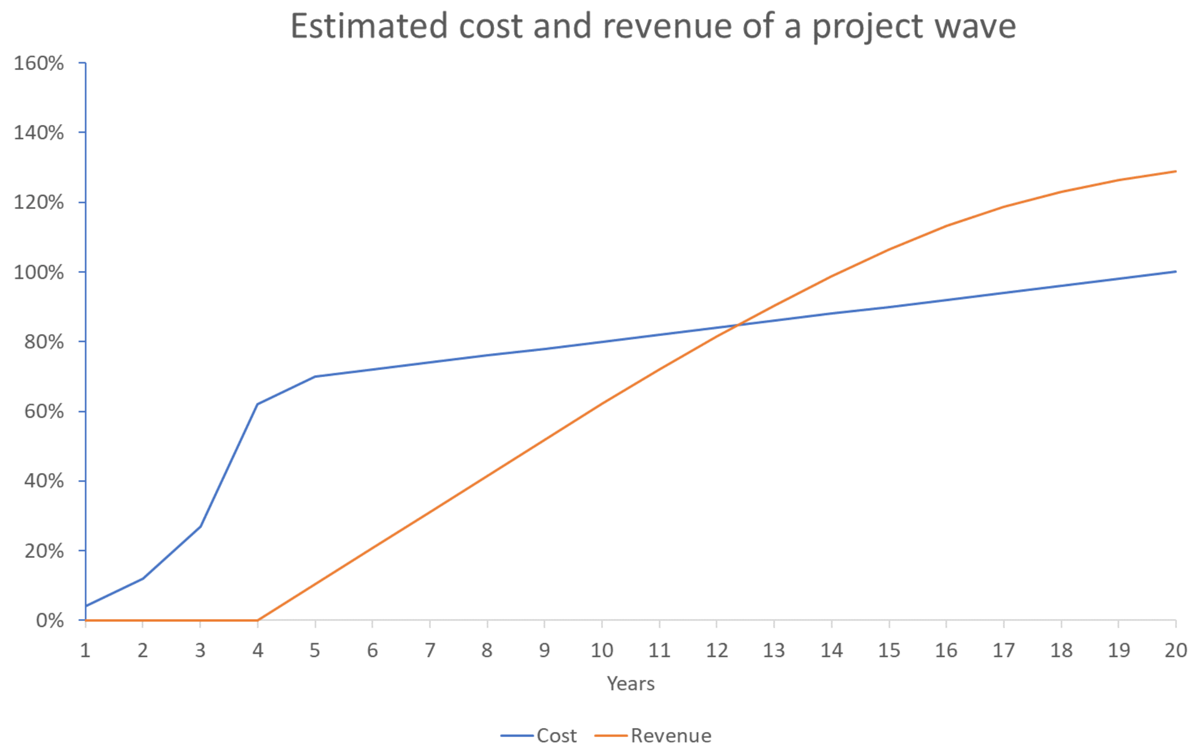

Figure 9: Estimated cost and revenue for projects over their 20-year life. This was used for the expected scenarios.

Cost of carbon

The cost of carbon was calculated from the estimated cost of decarbonisation in three types of project: “avoid”, “reduce” and “sequester”. “Avoid” was estimated to cost £220/tCO_2, based on the Swaffham Prior Heat Network. “Reduce” was estimated at £140/tCO_2 based on the CUSPE 2020 report. “Sequester” was estimated at £15/tCO_2, based on estimates from woodland carbon code of £7-20/tCO_2 (which includes a buffer for reversal/insurance of credits). A blend of projects from each of these categories was produced to give the desired cost of a carbon credit (Figure 10): starting around £105 and rising to £140 (Figure 11).

Portfolio size	**£164,000,000**		
Group 1			
Breakdown	**Cost/tCO2**	tCO2 offset	Project price
"Avoid"	£220.00	454,280	£ 99,941,600.00
"Reduce"	£140.00	319,800	£ 44,772,000.00
"Sequester"	£15.00	1,287,400	£ 19,311,000.00
Total		2,061,480	£ 164,024,600.00
	Average cost per tCO2		£ 79.67
	Average credit (with markup)		**£ 102.67**

Figure 10: Calculations performed for the first portfolio of projects in the "£50 million, expected" scenario.

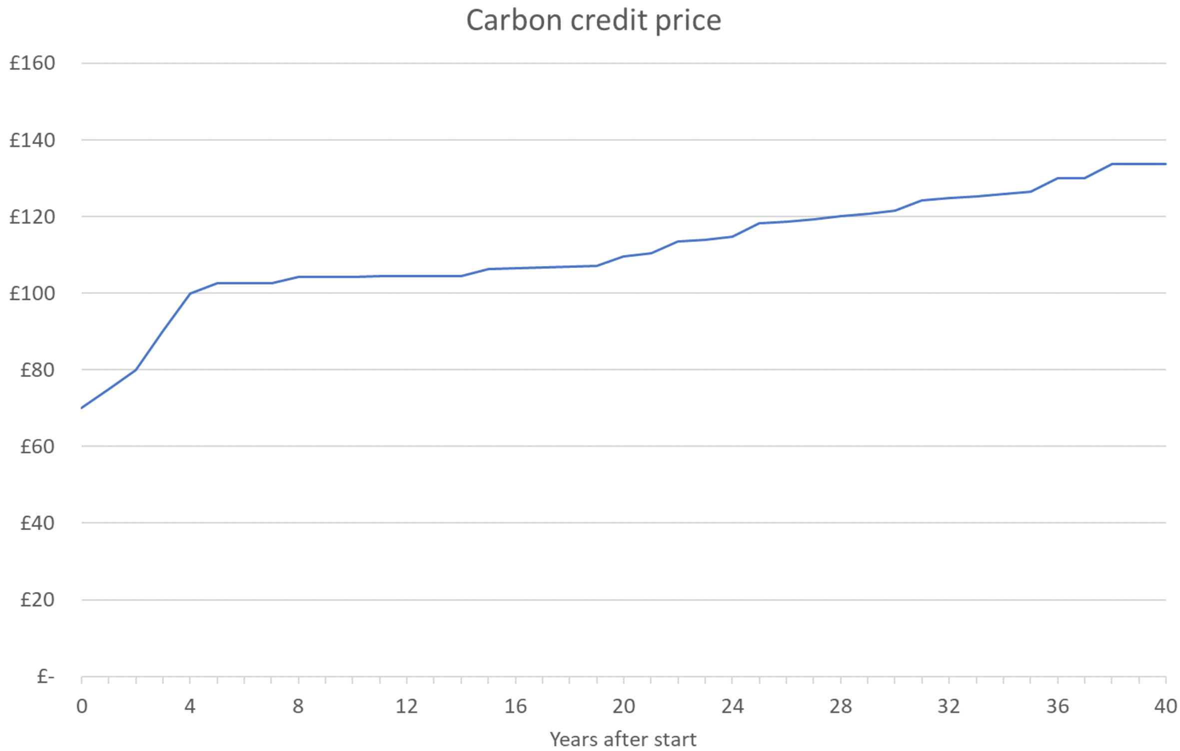

Figure 11: The price of a carbon credit sold by the decarbonisation fund over 40 years. Graph taken for the "£50 million, expected" scenario

Loans and repayments

General loans were taken out in the years 0 and 5 of the fund, allocated to council borrowing from the Public works loans board, though this may come from private sources if identified. Green bonds were also issued through Abundance Investments for 20 years in year 0 and 20. Project specific loans, from a mix of public and private sources, were taken out in the third year of that project wave (before the major costs incurred in the fourth year). Project specific loans were estimated at 40% of the project's value, and last for 20 years. Project loans were paid off as done by the council: with the minimum revenue repayment above interest only being paid once revenue is being received. Below is a summary of the loans taken out for this scenario (Figure 6).

Number	Source	Amount	Year start	Interest rate	Years of bon	Total repaid
1	PWLB	50,000,000	0	2.10%	40	74,675,000
2	Green bonds (Abundanc	10,000,000	0	2.50%	20	15,000,000
3	Project loans 1	65,600,000	3	2.20%	20	80,753,600
4	Project loans 2	63,600,000	6	2.30%	20	78,959,400
5	PWLB	40,000,000	5	2.30%	20	48,740,000
6	Project loans 3	57,500,000	13	4.00%	20	81,650,000
7	Green bonds (Abundanc	10,000,000	20	8.00%	20	26,000,000
8	Project loans 4	35,000,000	18	5.50%	20	55,212,500
9	Project loans 5	37,500,000	20	5.50%	10	48,843,750
10	Project loans 6	26,750,000	23	6.00%	10	35,577,500
	Total	395,950,000				545,411,750

Figure 10: A summary of the loans taken out during the "50 million, expected" scenario.

Projects performed

Projects were modelled to be performed in six waves over twenty years, with different cumulative values for each wave. The values of each wave were optimised to maximise carbon savings without becoming insolvent. The value of each project for each scenario is shown below on page 67. Project waves were started in the following years: 1, 4, 11, 16, 18, 21. This system of 6 waves was adopted to simplify the modelling process, however a continuous process of project initiation may be preferable.

Other financial sources

Extra funding has been taken from the selling of carbon credits from existing Council projects (Triangle solar farm, North Angle farm and Park & Ride energy projects). These were estimated to save 11,000tCO_2/year and sold for 25 years at the price of carbon credits produced by the fund.

Fund scale-up

The larger fund sizes were based upon the £50m fund, but with some changes to simulate the effects of scaling up.

For £100 m fund:

- Indirect costs and Validation/verification costs were 75% higher

For £250 m fund:

- Indirect costs and Validation/verification costs were 300% higher

Best and worst-case scenarios

The best and worst-case scenarios portrayed were derived from the corresponding expected scenario with the following modifiers.

For the worst-case scenario:

- Projects come online a year later (year 6). The cost schedule stays the same
- Indirect costs are 25% higher
- Validation costs are 50% higher
- Interest rates start 0.2% higher, rising to 1.5% higher at year 25
- Only 50% of credits from past projects are sold (Triangle farm etc)
- Project-specific loans are 30% of project value (down from 40%)
- Cost to remove carbon is 10% higher. This reduces the amount of carbon saved per project.

For the best-case scenario:

- Indirect costs 10% lower
- Validation costs are the same (but more projects are run)
- Interest rates start 0.1 % lower, up to 0.5% at year 25
- Project-specific loans are 50% of project value (up from 40%)
- Carbon credits are 10% cheaper to produce. This increases the amount of carbon saved per project

ii. Project portfolio size

The following tables describe the value of each project wave used in these models.

Project portfolio sizes for £50 million Fund (£m)	**Worst**	**Expected**	**Best**
Group 1	112	164	259
Group 2	83	159	265
Group 3	123	230	450
Group 4	70	140	260
Group 5	42	125	220
Group 6	39	107	199
Total	**469**	**925**	**1653**

Project portfolio sizes for £100 million Fund (£m)	**Worst**	**Expected**	**Best**
Group 1	210	305	480
Group 2	155	270	480
Group 3	200	415	800
Group 4	120	240	450
Group 5	76.5	205	390
Group 6	75	180	375
Total	**836.5**	**1615**	**2975**

Project portfolio sizes for £250 million Fund (£m)	**Worst**	**Expected**	**Best**
Group 1	510	735	1180
Group 2	400	720	1100
Group 3	540	950	2120
Group 4	290	690	1000
Group 5	180	380	950
Group 6	170	380	850
Total	**2090**	**3855**	**7200**

iii. Other calculated values

Max carbon saved/year ($MtCO_2$) (year in brackets after)	£50m fund	£100m fund	£250m fund
Worst	0.293 (16)	0.517 (16)	1.335 (16)
Expected	0.538 (25)	0.930 (25)	2.183 (25)
Best	0.979 (25)	1.750 (25)	4.234 (25)

Max carbon saved/year as a percentage of current emissions (11.6 $MtCO_2$, incl. peatland)	£50m fund	£100m fund	£250m fund
Worst	2.5%	4.5%	11.5%
Expected	4.6%	8.0%	18.8%
Best	8.4%	15.1%	36.5%

% Financial return on investments after 40 years	£50m fund	£100m fund	£250m fund
Worst	102%	105%	106%
Expected	125%	125%	123%
Best	124%	125%	124%

Net financial gain of fund after year 40 (£m)	£50m fund	£100m fund	£250m fund
Worst	6.1	24.5	63.8
Expected	100.2	174.2	381.9
Best	176.9	325.3	768.6

Total carbon mitigated by projects over 40 years ($MtCO_2$)	£50m fund	£100m fund	£250m fund
Worst	6.6	11.8	29.5
Expected	12.1	21.2	51.0
Best	21.2	38.2	92.7

Value of projects:loans taken out	£50m fund	£100m fund	£250m fund
Worst	1.89	1.87	1.92
Expected	2.34	2.31	2.31
Best	2.25	2.25	2.26

Maximum carbon credits sold (thousands/year) (year in brackets after)	£50m fund	£100m fund	£250m fund
Worst	293 (16)	517 (16)	1335 (16)
Expected	481 (15)	860 (15)	2086 (15)

Best	877 (22)	1562 (25)	3814 (22)

Total credits sold over the 40-year period (millions)	**£50m fund**	**£100m fund**	**£250m fund**
Worst	5.7	10.1	25.3
Expected	10.6	18.6	44.6
Best	18.7	33.6	81.6

Acknowledgements

We would like to thank Cambridgeshire County Council and CUSPE for the opportunity to take part in such an interesting and important project. We have all learned a lot through the process, and very much hope that our work will lead to appreciable benefit for Cambridgeshire residents, businesses and the climate more generally.

Over the course of this project, we have received assistance from a wide range of people who we would like to thank.

Very many thanks to Sheryl French, Chloe Rickard and Emily Boulton for your input and expertise at our regular meetings - you have been enormously helpful and supportive.

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Thanks to Ellie Todd and Matthew Rathbone for their insight into how the council's finances are run, and the implications of this upon the proposed Fund.

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Thanks to Ned Harrison at Suffolk County Council for sharing his wealth of experience of how businesses can be supported in implementing emissions reductions measures and his helpful insights into how BEE Anglia and the Carbon Charter are run.

Thanks to William Moody from the University of Cambridge for insights into The Carbon Literacy Project.

Thanks to David Lowe from the Warwickshire County Council for insight on how the Woodland Carbon Code (WCC) can be applied to local decarbonisation and biodiversity projects.

Cambridge University Science and Policy Exchange 2021: Local Area Energy Planning: Evidence base for heat zoning

To:	Environment and Green Investment Committee
Meeting Date:	20th January 2022
From:	Steve Cox, Executive Director, Place and Economy
Electoral division(s):	All
Key decision:	No
Forward Plan ref:	N/A
Outcome:	To start to build the skills, knowledge and evidence bases to inform the development of heat zones and low carbon heat networks for Cambridgeshire market towns.
Recommendation:	Members are asked to:

a) Note the Cambridgeshire University Science and Policy Exchange (CUSPE) 2021 research report on Local Area Energy Planning: Evidence base for heat zoning, attached as Appendix A;

b) Agree next steps as set out in paragraph 2.7

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1. Background

1.1 In October 2016, Cambridgeshire County Council initiated an annual collaboration with the Cambridge University Science and Policy Exchange (CUSPE), which brings teams of researchers together to explore challenges faced by the County Council and wider public sector.

1.2 This year again, researchers have shown strong interest in projects relating to climate change. For 2021 two streams of research have been delivered, with the first focused on the Cambridgeshire Decarbonisation Fund and the second, the focus of this report, on Heat Zoning as part of Local Area Energy Planning.

1.3 In October 2021, Government published its Heat and Buildings Strategy (HBS) which sets out how the UK will decarbonise its homes, commercial, industrial, and public sector buildings. To meet net zero by 2050 virtually all heating and hot water for buildings will need to be decarbonised and during the 2020s markets will be developed along with supply chains, skills, and delivery. Decarbonisation will be delivered through improving energy efficiency of buildings, heat pumps (both individual and via heat networks) and establishing where, and how hydrogen could be used for heating buildings.

1.4 Building the market for heat pumps and heat networks is a key element of the HBS. They are proven scale-able options for decarbonisation of buildings and will play a substantial role shifting reliance off fossil fuels and managing energy bills. However, significant effort is required to build the market including ensuring heat pumps are no more expensive to heat and run than gas boilers and to incentivise investment into heat networks. Government has committed £338million investment during 2022/23 to 2024/25 into a Heat Network Transformation Programme to enable local areas to deploy heat network zoning and scale up delivery of heat networks and building the UK market.

1.5 On 29th December 2021 BEIS announced it had appointed Ofgem to become the heat networks regulator to give consumers, investors, and developers confidence in heat networks. Ofgem will help facilitate the growth of the new 'Heat Networks Market Framework' to encourage capital investment into local projects to reduce bills, tackle fuel poverty and support local regeneration. The aim is for heat networks to meet approximately a fifth of all heat demand for buildings in the UK.

1.6 The Final Report of the Cambridgeshire and Peterborough Independent Commission for Climate Change (October 2021) identified the following recommendation:

- The Cambridgeshire and Peterborough Combined Authority (CPCA) and constituent authorities should support local area energy planning that identifies heat zones for buildings (e.g., suitability for district heating or community networks) and retrofit priorities.
- Develop local energy plans, working with stakeholders, to have a key role in preparing for the decarbonisation of heat in buildings: identify which heat and energy efficiency options and national policies apply; consider zoning areas for specific heating solutions; engage with communities to build community understanding and willingness to take action.

1.7 The outcome of this report and the CUSPE research is to start to build the skills and knowledge to inform the development of heat zones and heat networks for Cambridgeshire market towns.

2. Main Issues

2.1 What is Heat Zoning?

BEIS has been working with Local Authorities during 2020/21 to develop its heat zoning methodologies. Heat zoning is the **identification and designation of areas within which heat networks are the lowest cost, low carbon solution for decarbonising heating for homes and non-domestic buildings.**

In October 2021 Government consulted on the first steps towards developing the necessary legislation and processes for heat zoning including:

- the methodology to be used for identifying and designating heat network zones
- roles and responsibilities of different parties involved in the zoning process
- requiring certain buildings within zones to connect to a heat network
- requirements on certain parties to provide information to identify and designate heat network zones
- whether heat networks in zones should meet a low carbon requirement
- approaches for how heat networks are deployed in zones
- proposals to ensure that consumers within zones are not adversely affected
- the enforcement, monitoring, and reporting regimes under zoning

The results of the consultation are due in February 2022. This will build on Government's Heat and Buildings Strategy which identified heat network and heat zoning as one of the key points in its ten-point plan.

2.2 What is the aim of the CUSPE research attached as Appendix A?

For Cambridgeshire to decarbonise, it will need to undertake Local Area Energy Planning (LAEP) to identify the most cost-effective low carbon solutions for heating and powering buildings, and to electrify transport. However, LAEP is complex. Establishing the evidence bases will be challenging. For example, identifying energy demand must account for changes over a 24-hour period and also seasonally. This will also need to include future growth demand and how improved energy efficiency will impact energy demand.

2.3 The idea behind this CUSPE research project was to start to break down Local Area Energy Planning into manageable bite sized chunks. By focussing on one aspect, in this case heat networks and heat zones, a better understanding of what evidence is needed and how easy it is to get the data would inform resource and skills planning for Local Authorities ahead of Government's heat zoning legislation coming forward. It will also, along with many other data sets and energy plans already underway e.g. for new housing developments; form the building blocks towards a robust long term investment and delivery programme for decarbonisation of Cambridgeshire buildings. District Council Local Plan and policy development will be key to this process as will UK Power Networks Business Planning and Economic Development incentives.

2.4 The objective of the CUSPE research was to review the proposed BEIS heat zoning methodologies and the Energy Systems Catapult methodology for Local Area Energy Planning, to identify heat demand in the market towns of Huntingdon, Ely and March to inform potential opportunities for starting heat networks and heat zones. Please note, the research is not fully comprehensive. It provides initial analysis on heat demand, recognising that not all data was available to the researchers or how partners and stakeholders would prioritise different influences such as fuel poverty, deprivation or new developments. However, this initial data analysis can sit alongside other data to inform a more detailed technical and commercial assessment of where heat zoning will provide the greatest benefits. The heat zones suggested in this report are therefore indicative only and subject to further development.

2.5 In summary, the researchers brought together available data relating to low- and zero-carbon space heating and hot water and their analysis covered:

- mapping current Electricity and Gas demand using BEIS Consumption Statistics for Domestic and Non-Domestic electricity and gas consumption from 2010 to 2019.
- Research into a range of low-carbon technologies and heat sources which can be used as part of a heat network
- Compared the carbon intensity of current heat supply with the expected carbon intensity of each technology over time, incorporating gradual decarbonisation of the electricity grid into those calculations.
- Compared projections with National Grid's four Future Energy Scenarios: Steady Progression, Consumer Change, Systems Change, and Leading the Way.

2.6 Why choose Huntingdon, March and Ely as case studies for testing heat zoning methodologies?

Government's focus for decarbonisation of heat has largely focussed on cities and large urban areas. More recently it has started to focus on 'off-gas' communities dependent on oil. The Council is already collaborating with Government on Swaffham Prior, a rural off-gas community to deliver a heat network to decarbonise heating and hot water in a rural community with 'hard to treat' homes.

The gap is market towns or smaller urban areas with less dense housing and commercial energy demand. It is estimated that a quarter of the population of Cambridgeshire (and Peterborough) live in market towns. Market towns are an important feature of the economic geography of Cambridgeshire and remain a central destination for work, retail and leisure supporting rural communities (CPIER 2018). Focussing on the market towns for this research will provide insights relevant to Cambridgeshire and its towns to aid discussions with government on the market frameworks and incentives that may be required for the decarbonisation of smaller towns.

2.7 Next steps

- With Local Authority partners, review how the CUSPE research can inform the development of heat zones and heat networks in Cambridgeshire including additional work that would need to be commissioned.

- With partners and stakeholders, include Local Area Energy Planning into the CPCA Climate Action Plan (currently under development) and scope what and how a LAEP can be developed for Cambridgeshire. The end goal of the LAEP is to develop a long-term energy infrastructure investment and delivery programme for decarbonising and retrofitting Cambridgeshire buildings and transport.

3. Alignment with corporate priorities

3.1 Communities at the heart of everything we do

Engaging communities in energy planning will help deliver the switch from fossil fuels and support communities to manage the costs of their energy bills. Cambridgeshire must look to plan how it is retrofitting buildings for greater energy efficiency, switch from fossil fuels to low carbon alternatives and plan for local energy generation where possible. One part of this energy planning will be collaborating on heat zoning to identify the lowest cost options for decarbonising heat for buildings and communities.

3.2 A good quality of life for everyone

The CUSPE 2021 research report attached as Appendix A has no significant implications. If the Council agrees to collaborate with partners and businesses on the set up of a Carbon Advisory Service and a Decarbonisation Fund these could deliver quality of life benefits through cutting carbon emissions; improving air quality and investing in local projects that improve nature that help with health and wellbeing.

3.3 Helping our children learn, develop and live life to the full

No significant implications.

3.4 Cambridgeshire: a well-connected, safe, clean, green environment

21.6% of all carbon emissions in Cambridgeshire are from homes. This includes heating and hot water and electricity for appliances. There are also emissions from the commercial, industrial, and public sector buildings but the exact volume of carbon emissions associated with heating and hot water is not yet clear. By undertaking Local Area Energy Planning and heat zoning this will identify the lowest carbon and least cost heating solutions to decarbonise Cambridgeshire buildings.

3.5 Protecting and caring for those who need us

Fuel poverty is a key concern. Planning for greater energy efficiency and increased local energy supplies will offer better opportunity to manage energy bills in the long term.

4. Significant Implications

4.1 Resource Implications

If the research is taken forward, there are financing and staff resourcing implications. More specialist consultancy work is needed to inform Local Area Energy Planning and heat zoning. However, there are potential benefits to the Council including:

- Identifying the most cost-effective low carbon solutions for decarbonising the Council's buildings
- Opportunities for the Council to identify land for energy schemes that benefit the community and provide commercial returns
- Support the Council's role in place making by identifying how and what 'infrastructure' places need to live low carbon lifestyles

4.2 Procurement/Contractual/Council Contract Procedure Rules Implications

There are no significant implications at this stage.

4.3 Statutory, Legal and Risk Implications

There are no significant implications at this stage.

4.4 Equality and Diversity Implications

There are no significant implications at this stage but as plans are developed, they will be subject to an equality impact assessment.

4.5 Engagement and Communications Implications

To progress Local Area Energy Planning and heat zoning, partners, businesses, and communities must be engaged to understand what and why energy planning is needed.

4.6 Localism and Local Member Involvement

No significant implications.

4.7 Public Health Implications

No significant implications from the report but there are potential health benefits from Local Area Energy Planning and heat zoning as these will cut carbon emissions resulting in air quality improvements.

4.8 Environment and Climate Change Implications on Priority Areas

These have been assessed based on progressing Local Area Energy Planning and heat zoning.

4.8.1 Implication 1: Energy efficient, low carbon buildings.
Positive/neutral/negative Status: Positive
Explanation: Carbon emissions reductions through switching off fossil fuels and improved energy efficiency

4.8.2 Implication 2: Low carbon transport.
Positive/neutral/negative Status: Positive
Explanation: Identifying the energy infrastructure and investment to support EV charging.

4.8.3 Implication 3: Green spaces, peatland, afforestation, habitats, and land management.
Positive/neutral/negative Status: Neutral
Explanation: Energy infrastructure and generation will require land. Where possible this will look to brownfield land, but this may not always be the case. In which case, the energy project would be subject to planning policies and conditions including Biodiversity Net Gain.

4.8.4 Implication 4: Waste Management and Tackling Plastic Pollution.
Positive/neutral/negative Status: Positive
Explanation: Air quality improvements through reducing emissions.

4.8.5 Implication 5: Water use, availability, and management:
Positive/neutral/negative Status: Neutral
Explanation: No impact.

4.8.6 Implication 6: Air Pollution.
Positive/neutral/negative Status: Positive
Explanation: Air quality improvements through reductions of greenhouse gas emissions.

4.8.7 Implication 7: Resilience of our services and infrastructure and supporting vulnerable people to cope with climate change.
Positive/neutral/negative Status: Positive
Explanation: Increasing local energy supplies and security.

Have the resource implications been cleared by Finance? Yes
Name of Financial Officer: Sarah Heywood

Have the procurement/contractual/ Council Contract Procedure Rules implications been cleared by the LGSS Head of Procurement? Yes
Name of Officer: Henry Swan

Has the impact on statutory, legal and risk implications been cleared by the Council's Monitoring Officer or LGSS Law? Yes
Name of Legal Officer: Fiona Macmillan

Have the equality and diversity implications been cleared by your Service Contact? Yes
Name of Officer: Elsa Evans

Have any engagement and communication implications been cleared by Communications? Yes
Name of Officer: Amanda Rose

Have any localism and Local Member involvement issues been cleared by your Service Contact? Yes

Have any Public Health implications been cleared by Public Health? Yes
Name of Officer: Iain Green

If a Key decision, have any Environment and Climate Change implications been cleared by the Climate Change Officer?
Yes
Name of Officer: Emily Bolton

5. Source documents

- The Final Report, Cambridgeshire and Peterborough Independent Commission for Climate Change, October 2021
- Cambridgeshire and Peterborough Independent Economic Review (2018)
- Government proposal for heat network zoning, October 2021
- Government's Heat and Buildings Strategy, October 2021
- Local Area Energy Planning

6. Source documents - Location

Final Report, Cambridgeshire and Peterborough Independent Commission for Climate Change, October 2021
Cambridgeshire and Peterborough Independent Economic Review (2018)
Proposals for heat network zoning - GOV.UK (www.gov.uk)
Heat and buildings strategy - GOV.UK (www.gov.uk)
Local Area Energy Planning: The Method - Energy Systems Catapult

CAMBRIDGESHIRE LOCAL AREA ENERGY PLANNING

AN EVIDENCE BASE FOR HEAT ZONING AND NETWORKS IN HUNTINGDON, ELY AND MARCH

January 2022

Ana Paula Seraphim, Lizzie Knight, Grace Field, Hannah Galbraith-Olive, Gah-Kai Leung and Roberto Hofmann

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Glossary

Air Source Heat Pumps (ASHPs): Heat pump that uses the outside air as a heat source when in heating mode, or as a heat sink when in cooling mode using the same vapour-compression refrigeration process and same external heat exchanger with a fan as used by air conditioners.

Anchor loads: Places with high heat demand which have little variation in the amount of heat they use throughout the day, e.g. heated swimming pools.

Carbon intensity: A measure of how much CO2 is produced per unit of energy generated.

Decarbonisation: The act of removing or reducing the carbon dioxide (CO2) output of a process.

District Heating and Cooling (DHC): District heating and cooling systems move heat in urban areas. Heat and cold are generated in central supply units by heat or cold recycling, renewables, or by direct heat or cold generation. The heat and cold demands should be concentrated in order to keep low distribution costs. District heating and cooling systems substitute ordinary primary energy supply for heating and cooling. Therefore, district heating and cooling increase both energy efficiency and decarbonisation in the energy system.

Display Energy Certificate (DEC): Similar to an EPC (see below), but for public buildings. DECs are more accurate as they are based on actual energy consumption data, whereas EPCs are approximations based on building characteristics from a standard model. DECs last for one year if the floor area of the building is more than 1,000 m^2, or 10 years if the floor area is between 250-1,000 m^2.

District heating: A distribution system of insulated pipes that takes heat from a central source and delivers it to a number of domestic and/or non-domestic buildings. The term is often used interchangeably with “heat network”.

Energy centre: A centralised energy source which provides energy to a heat network.

Energy Efficiency (EE): This term has two possible meanings. Generically, it means the amount of energy required as an input to produce some desired output. In the context of the heat hierarchy, it refers to the building fabric efficiency (i.e. how well insulated a building is, or how quickly it loses heat). Energy efficiency comes first in the heat hierarchy.

Energy Performance Certificate (EPC): A certificate which describes the energy efficiency rating of buildings. EPCs have been required for all buildings (domestic and non-domestic) constructed, sold or rented since 2007. EPCs are valid for 10 years.

Gas Distribution Network (GDN): An infrastructure network that delivers natural gas to customers.

Geographic Information System (GIS): is a spatial system that creates, manages, analyzes, and maps all types of data. GIS connects data to a map, integrating location data (where things are) with all types of descriptive information (what things are like there).

Heat hierarchy: The heat hierarchy describes the steps that should be followed to reduce the cost to consumers of the heating energy transition.[1] Energy efficiency is prioritised, followed by wasted heat (heat that already exists but would otherwise be unused), followed by heat upgrading (e.g. low temperature sources of heat used for heat pumps). Direct heat, by which energy is directly input for the purpose of creating heat, comes last in the heat hierarchy: it should be avoided where possible.

Heat Interface Unit (HIU): A box that looks like a boiler. It transfers heat from a community heat network into the central heating system of a building.

Heat network: A collection of buildings or dwellings connected to a centralised heat source. The term is often used interchangeably with "district heating".

Heat pump: A technology that transfers thermal energy, typically from a warmer reservoir to a cooler reservoir, using electricity.

Heat zone: An area of land for which specific policies regarding heating are considered and/or implemented.

Heavy Duty Vehicles (HDV): Freight vehicles of more than 3.5 tonnes (trucks) or passenger transport vehicles of more than 8 seats (buses and coaches). The HDV fleet is extremely heterogeneous, including vehicles with various uses and drive cycles.

Internal Combustion Engine (ICE): An engine that generates motive power by burning petrol, oil, or other fuel.

Levelised Cost of Energy (LCOE): The levelised cost of energy, or levelised cost of electricity, is a measure of the average net present cost of electricity generation for a generating plant over its lifetime. It is used for investment planning and to compare different methods of electricity generation on a consistent basis.

Lower Layer Super Output Area (LSOA): A geographic region that contains between 1,000 and 3,000 residents comprising 400 to 1,200 households.

Middle Layer Super Output Area (MSOA): A geographic region built from groups of contiguous Lower Layer Super Output Areas. They contain a minimum of 5,000 residents.

Plug-in Hybrid Electric Vehicles (PHEVs): Vehicles run by the combined power of an electric motor and an internal combustion engine (ICE). PHEV batteries can be charged using a wall outlet or charging equipment, by the ICE, or through regenerative braking.

Social Net Present Value (SNPV): The present value of a stream of future costs and benefits to UK society (that are already in real prices) and that have been discounted over the life of a proposal by the appropriate social time preference rate.

[1] https://www.theade.co.uk/assets/docs/resources/Heat_and_Energy_Efficiency_Zoning_A_framework_for_netzero_for_new_and_exisiting_buildings-min.pdf.

Waste heat: Heat produced as a byproduct of existing processes, including industry and commercial activities. Waste heat can also be collected from water sources like rivers and sewer systems.

1. Introduction

In 2016, the generation and supply of heat produced 37% of the UK's total greenhouse gas emissions[2]. Heating is therefore responsible for a larger proportion of emissions than transport, agriculture or power generation. As laid out by the government's recent Heat and Buildings Strategy[3], in order to reach net zero carbon goals by 2050 across the UK, virtually all heat supply will need to become carbon neutral.

The objective of this project is to consolidate currently available data and provide updated strategic evidence to inform the development of low and zero-carbon space heating and hot water policies in Cambridgeshire, using Huntingdon, March and Ely as demonstrator examples. Cambridgeshire aims to reach net zero well before its official 2045 target. Reaching that objective will depend on:

- Understanding the current energy demand and supply for space heating and hot water;
- Understanding how low carbon and renewable energy will be integrated into the UK's existing energy infrastructure in various future scenarios;
- Assessing the potential for further deployment of low carbon space heating and hot water technologies.

Heat networks connect multiple buildings or dwellings to a central energy source. Their benefits are wide-ranging: they can provide far more energy efficiency than individual heat supply, they can take advantage of renewable and low-carbon sources, and they can reduce heating bills for consumers.

There are already over 14,000 heat networks in the UK — however, many of these networks are small-scale and rely on combined heat and power (CHP) generators. Although CHP generators are more efficient than individual gas boilers, they tend to be natural gas fired[4]. In this report, we investigate the evidence base for installing heat networks in Huntingdon, Ely and March, focusing on technologies that would instead be supplied by a low-carbon or zero-carbon source.

To do this we:

1. Investigate two methodologies. The first, Local Area Energy Planning (LAEP), is a broad methodology in which heat zoning can feature as one of many components. The second, the BEIS heat zoning methodology, is specific to heat zoning.
2. Summarise the different technologies which can be used in the energy centre of a heat network.
3. Use the National Grid's Future Energy Scenarios to assess the future energy landscape across the UK.
4. Review a range of case studies from across the UK which plan to install or have installed a heat network.
5. Identify priority zones for the development of heat networks in Huntingdon, Ely and March, based on the distribution of current heat demand.

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[2]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/766109/decarbonising-heating.pdf

[3] https://www.gov.uk/government/publications/heat-and-buildings-strategy

[4] https://post.parliament.uk/research-briefings/post-pn-0523/

Cambridgeshire has the potential to become a leader in low-carbon heating[5]. It should capitalize on the promise offered by heat networks and become part of the growing landscape of low-carbon energy solutions in the UK.

2. Heat Zoning Methodologies

The Cambridgeshire County Council identified Local Area Energy Planning and the BEIS heat zoning methodology as frameworks that could be used to facilitate the planning of heat networks and/or the decarbonisation of heating. This Section will outline the key components of these methods and explain how they relate to our research.

Local Area Energy Planning

"All places are different – the people, housing stock, energy networks and opportunities for change are all unique to an individual local area – there will be no 'one size fits all' solution."[6]

At present, there is no formally structured planning process to help local governments transition to low-carbon energy systems. Current planning processes for infrastructure in the UK are not delivering the scale of intervention necessary to meet the UK's legally binding carbon goals. Local Area Energy Planning is a system which has been designed to provide a long-term framework to decarbonise energy systems in the UK, and to provide an opportunity for dialogue between local governments, energy network operators, consumers, and other stakeholders.

What is LAEP?

The Local Area Energy Planning (LAEP) process, developed by Energy Systems Catapult (ESC) and the Energy Technologies Institute[7], uses a whole-system analysis to identify cost-effective and low-regret solutions to aid the decarbonisation of buildings. LAEP explores a range of possible future energy scenarios and investigates options for heat networks in the local area, while incorporating an inclusive and comprehensive stakeholder engagement process which reflects the unique nature of each region. One of the main underlying premises of LAEP is that the decarbonisation of buildings cannot be a "one size fits all" solution; different places will require tailored, individual plans to reach the best possible low-carbon outcome.

LAEP can facilitate the local decarbonisation of buildings by:

- Identifying cost-effective options for heat decarbonisation in a whole-system context;
- Identifying clear pathways to reach local and national decarbonisation objectives;

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[5] CUSPE report 2019: Net Zero by 2050 in Cambridgeshire, https://data.cambridgeshireinsight.org.uk/sites/default/files/2019%20CUSPE%20Policy%20Challenge%20-%20Net%20Zero%20Cambridgeshire.pdf

[6] https://es.catapult.org.uk/case-study/local-area-energy-planning/

[7]https://esc-non-prod.s3.eu-west-2.amazonaws.com/2018/12/Local-Area-Energy-Planning-Guidance-for-local-authorities-and-energy-providers.pdf

- Supporting dialogue among members of the community and increasing awareness of the energy transition;
- Providing an evidence base to increase investment in energy networks;
- Generating local plans which can aid accountability, governance, and performance management of the system against climate goals;
- Addressing fuel poverty and air quality, and supporting local job creation.

LAEP implements a whole-system approach in its analysis. This means that different aspects of the energy system will be considered together; for example, the role of electricity in aiding the decarbonisation of heat will be considered alongside its role in powering electric vehicles. The effects of improving the energy efficiency of buildings and the effects of implementing local heat networks will be considered side-by-side.

The aims of LAEP

As described by ESC[8], Local Area Energy Planning has three goals:

1. To create a clear plan for local energy systems in line with local decarbonisation targets;
2. To inform an optimum investment strategy for network operators, large-scale heat producers, and heat consumers, which will align the consumers' interests with those of the network companies;
3. To enable resources to be deployed where they will have the greatest impact and value for money — for example, where they can make a lasting impact in tackling fuel poverty.

Key elements of LAEP

As laid out by Energy Systems Catapult and the Centre for Sustainable Energy[9], Local Area Energy Planning should be guided by four principles:

1. Robust technical evidence should consider the whole energy system and make use of all accessible data;
2. Wider non-technical factors, such as the social impact on residents, should be comprehensively assessed;
3. A well-designed and inclusive social process should engage all appropriate stakeholders and manage all vested interests, ensuring that plans represents local intent;
4. All plans should be delivered through a sustained and well-planned set of governance structures.

These four elements are shown in Figure 1.

[8] https://es.catapult.org.uk/report/local-area-energy-planning/

[9] https://es.catapult.org.uk/report/local-area-energy-planning-the-method/

Element 1: Technical Analysis

The purpose of this element of Local Area Energy Planning is to gain a detailed understanding of the changes to local energy systems — and the associated investment — that would be required to achieve certain decarbonisation goals. The question guiding this aspect of LAEP is:

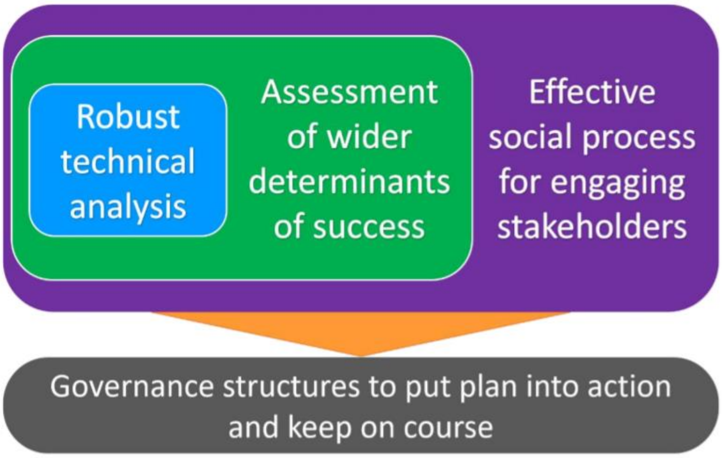

Figure 1: The four key elements of Local Area Energy Planning, as taken from Local Area Energy Planning: The Method (CSE & ESC).

"What is the preferred combination of technological and system changes we can make to the local energy system to decarbonise heat and local transport and realise opportunities for local renewable energy production?"

Various factors inform the answer to this question — including, for example, how much of the area's heat demand could be provided by district heat networks, how many existing buildings could be retrofitted with carbon-friendly technologies, and what standards should be imposed on new buildings. The costs and benefits of possible changes, across all levels of society and throughout time, should be considered as part of the analysis.

Element 2: Wider Determinants of Success

A successful Local Area Energy Plan should assess a range of non-technical factors that will determine whether the options suggested by the technical analysis can be realised in practice. Two methodological tools are well-placed to support this assessment: PESTLE analysis and Participatory Systems Mapping. PESTLE analysis considers the political, economic, social, technological, legal and environmental context of a system. Participatory Systems Mapping identifies, maps, and analyses the range of factors that can influence a system and lead to different outcomes.

This element of the LAEP process is critical for determining the timescale needed to realise the options laid out in the technical analysis. It should support the production of a timetable which includes targets for actions required from non-local stakeholders (like national government or energy regulators), local stakeholders, and the interactions between the two.

Element 3: Social Process

The LAEP process should involve a wide range of stakeholders to ensure that the plan it prescribes has been shaped by local perspectives. In particular any suggested plan needs to be adopted by the relevant local council and endorsed by a wide range of local stakeholders.

First, the stakeholders need to be identified and mapped. Discussions with critical stakeholders should then help to determine existing or emerging local priorities. Once a plan has been identified, further discussions should ensure that stakeholders are committed to implementing the agreed upon steps.

Element 4: Deliverability and Ongoing Governance

The plan established by a LEAP process must have ongoing governance arrangements and realistic delivery commitments from all stakeholders. It must be grounded and realistic in its assessment of the current and future agency of the stakeholders to deliver at the pace necessary to reach local decarbonisation goals. It should also be a "living plan", which can adapt according to changes in local or national guidance.

These four elements can be captured by a 7-step LAEP process, as illustrated in Figure 2.

The Local Area Energy Planning Process

Figure 2: The 7 stages of LAEP, from Local Area Energy Planning: Guidance for local authorities and energy providers[10].

[10] https://es.catapult.org.uk/brochure/local-area-energy-planning-guidance-for-local-authorities-and-energy-providers/

Step 1: Identify and engage stakeholders
Stakeholder engagement should begin early in the LAEP process and continue throughout the development of the plan. The process and outputs should be led by a single organisation (the Local Lead Organisation).

Step 2: Set area vision, targets and objectives
The overall aim of the LAEP process should be to build a compelling, aspirational and realistic vision for decarbonisation in light of local goals. Additional objectives could involve the creation of jobs, alleviation of fuel poverty, or improving other social aspects related to energy systems. The specific goals of the LAEP process, as it applies to the local area under consideration, should be established in this second step.

Step 3: Create and understand the local energy system
Understanding the local area's current and future energy demand is crucial. The data gathered in this step will provide the evidence base for the analysis and investigation of future local energy scenarios.

Step 4: Investigate future local energy scenarios
This step should be based on modelling various future scenarios. A whole-system analysis should be used to explore and test a full range of potential changes and their impact across the whole energy system, with the goals set out in Step 2 as the desired objectives, before identifying preferred options. A baseline scenario should be used as a reference point from which to compare alternative low-carbon solutions.

Step 5: Produce a Local Area Energy Strategy
This is the output of the LAEP process, which will provide a long-term framework for decarbonising the energy system. The Strategy will consolidate the findings of Steps 3 and 4.

Step 6: Lead and implement
An effective LAEP strategy requires consistent leadership and support from all stakeholders. The Local Lead Organisation will need to continuously assess the plan and develop the strategy according to local or national guidance, and consider the long and short term implementation.

Step 7: Monitor and review
Successful delivery of the LAEP Strategy will require management and review over time. Elements of the Strategy may be affected by major political change, market forces, tech developments, or national emission targets.

BEIS Heat Network Zoning Methodology

Local Area Energy Planning is a broad methodology that considers the possible impacts of various decarbonisation strategies — including, but not limited to, heat network zoning. The BEIS Heat Network Zoning Methodology, in contrast, was designed specifically to support the planning and implementation of heat networks. Developed by BEIS in collaboration with Ramboll[11], it presents various possible scenarios which could be used to identify heat zone boundaries which deliver the lowest cost low-carbon solutions for the consumer. While the detailed scope of the methodologies has not yet been set, these scenarios are designed to initiate early-stage discussions among stakeholders.

Of the 6 scenarios presented, Cambridge County Council has identified Scenario 5 as the most appropriate for identifying heat zones in Huntingdon, Ely and March. Scenario 5 is the most comprehensive of the scenarios and resonates well with the Local Area Energy Planning method because it uses a whole-system analysis to inform its zoning procedure — but, unlike LAEP, it does this specifically with heating in mind. An outline of the methodology of Scenario 5 is shown in Figure 3.

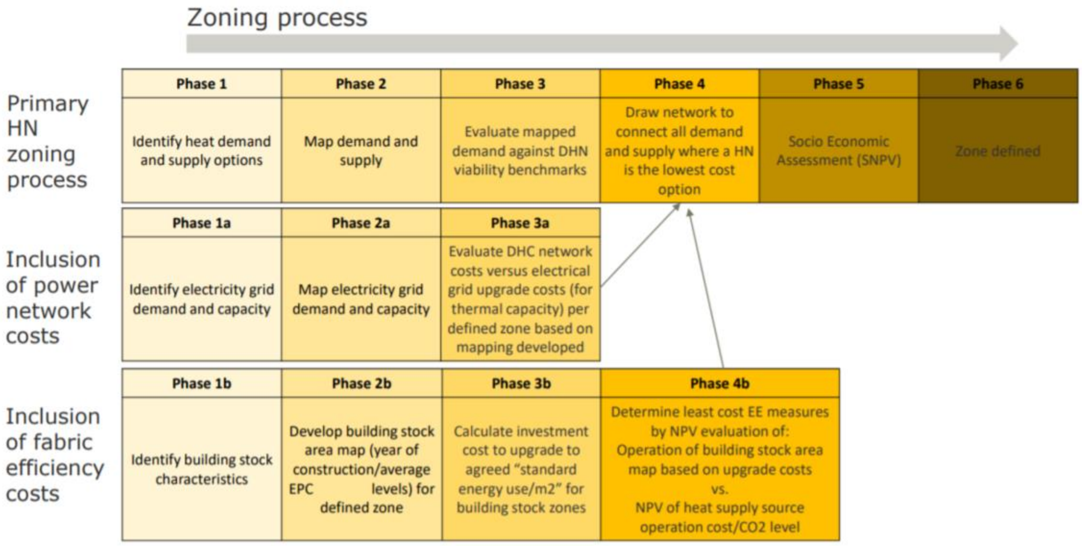

Figure 3: An outline of Scenario 5 from the BEIS Heat Zoning Methodology.

Phase 1:

The first phase involves identifying energy demand and capacity (including heating and electricity), identifying the characteristics of the current building stock, and identifying potential heat supply sources.

Phase 2:

In this phase, energy demand and supply are mapped in GIS (Geographic Information System Mapping) alongside building stock characteristics.

Phase 3:

The third phase identifies a first cluster of buildings that would perform well on a heat network — e.g. buildings with similar characteristics and heating demand. The cost of that potential heat network is then compared to the cost of upgrading the electricity grid to provide electrically-sourced heating in that area.

Phase 4:

[11] Ramboll (2021). Heat Network Zoning Methodology: Scenarios To Explore Methodology Approaches (Presentation given to CCC)

At this stage, a heat network is drawn up and priced using benchmarked values. Suitable heat sources for the network are determined and priced. The LCOE (Levelised Cost of Energy) is defined as the average net present cost of energy in £ per kWh. The LCOE of the proposed network is assessed for various possible heat network technologies, and compared with the current cost of heat generation in the region. If the heat network is revealed to be more economically viable than the current energy infrastructure, it is extended to include more buildings. These steps are repeated until the point where adding more buildings would render the network economically unviable.

Phase 5:
A full socio-economic analysis of the heat network is conducted in Phase 5. The goal is to consider the wider benefits (or disadvantages) of installing the proposed network.

Phase 6:
The heat network is officially defined in this final phase. But it only reaches this stage if it has passed the socio-economic viability assessment in Phase 5.

Heat Zoning Methodologies in Our Research

Our report links to Stages 3 and 4 of the LAEP process and Phases 1-3 of Scenario 5 of the BEIS heat zoning methodology. By mapping out the current heat demand in Huntingdon, Ely, and March, we will develop an understanding of their local energy systems. We will then be able to identify priority areas for the implementation of heat networks, based on where heat demand is highest. At the same time, these assessments will help to inform the strategies and stakeholder engagement that could be used to help Cambridgeshire reach its net zero objectives.

We do, however, use a simplified approach to heat zoning methodology — given the project time constraints and our limited access to data. We outline this methodology in Sections 6 and 7 of our report. If Cambridgeshire County Council were to conduct a larger-scale study on both the technical viability and the cost-benefit analysis of heat zoning, either the LAEP or the BEIS methodology could be used in full, building on the initial analysis presented in this report.

3. Heat Network Technologies

Overview

Heat networks, also known as district heating, deliver heat from a central heat source to multiple buildings and dwellings. They help to reduce overall carbon emissions by reducing the heat and/or electricity losses associated with energy transportation. They can also utilise renewable or low-carbon heat sources like geothermal energy, waste heat, and biofuels, reducing emissions even further.

Heat networks are comprised of[12]:

1. One or more energy centres, which collect or generate energy from a centralised heat source;
2. Pipes connecting the buildings within the network (typically hot water pipes);
3. Heat exchangers which transfer heat from the pipe network to a secondary network of pipes within each building.

Networks can also include Heat Interface Units (HIU), which regulate heat flow into dwellings or buildings, and heat pumps, which upgrade the temperature of the heat provided by the network for use in domestic heating.

Energy Sources

Here we discuss the energy sources which may be feasible for heat networks in Cambridgeshire: boilers and combined heat and power (CHP), geothermal heat, waste heat, and hydrogen.

Boilers and Combined Heat and Power (CHP)

Large-scale gas boilers have been used as a centralised heat source for heat networks. A combined heat and power (CHP) plant burns fuel to generate electrical energy, but also captures the waste heat from the combustion process (which can be up to half of the total energy produced) to be distributed through the network. CHP plants traditionally burn fossil fuels; they emit less CO2 than individual gas boilers but ultimately they are not a zero (or near zero) carbon technology. Some CHP plants use lower-carbon biomass fuels like wood pellets or food waste, but issues relating to availability of sustainable biomass, air pollution and transportation have prevented biofuels from replacing the prevalence of gas-powered plants. Currently CHP plants are often combined with back-up gas boilers for use in periods of high heat demand. More than half of the existing UK heat networks are powered by gas boilers (52%), and nearly a third by gas-fired combined heat and power (32%)[13]. As the carbon intensity of the UK electricity grid decreases, CHP plants provide less and less CO2 savings compared to grid electricity. Those savings will continue to decline into the

[12] https://www.theade.co.uk/assets/docs/about/ADE_Shared_Warmth_Report_Jan2018.pdf

[13]https://www.theade.co.uk/assets/docs/resources/Heat%20Networks%20in%20the%20UK_v5%20web%20single%20pages.pdf

future. Gas-powered CHP plants therefore should not be Cambridgeshire's first choice as a heat network energy source[14].

Geothermal heat

Heat generated within the Earth can provide a renewable, low-carbon heat source. Shallow geothermal heat, collected from boreholes up to 100m deep, can supply water between 10-40°C. Deeper geothermal heat, from boreholes several kilometres deep, can bring water to the surface at 70°C or more. To provide viable low-carbon heat for a heat network, the geothermal source (and associated boreholes) must be located close to the built-up target area of the network — thereby minimising transportation needs and increasing efficiency.

Waste heat

Surplus heat is generated by many natural or industrial processes. This waste heat is of increasing interest to heat network developers. Waste heat can be gathered from industrial plants, water sources (rivers, canals, sewage treatment plants), data centres, or large commercial areas (supermarkets or shopping centres). Waste heat is typically obtained at a low temperature and must be upgraded by a heat pump for use in domestic settings.

Hydrogen

The combustion of hydrogen generates heat and results in no direct greenhouse gas emissions. However, the real carbon footprint of hydrogen heating technologies can vary greatly depending upon how the hydrogen is sourced — for example, whether it is produced from natural gas or coal[15]. In addition, hydrogen combustion provides very low end to end efficiency compared to heat pumps. Very crudely, one unit of low carbon electricity produces half a unit of green hydrogen by electrolysis and almost half a unit of heat in a boiler, but one unit of low carbon electricity supplies three to five units of heat from a heat pump.

High vs. Low Temperature Networks

One of the main decisions to make when designing a heat network is whether to supply heat at a low or high temperature. Heat networks have traditionally supplied heat at high temperatures, but recent studies have shown that low-temperature networks are more efficient and come along with lower carbon emissions[16].

High temperature

A high temperature network (also known as a 2nd- or 3rd-generation heat network) circulates pressurised hot water at a temperature between 70-100°C. After circulating through the network, the water returns to the energy centre at a temperature between 40-60°C. In such systems, buildings are connected only to the pipe network, not to each other — there is no exchange of heat between buildings or dwellings. High-temperature

[14] https://researchbriefings.files.parliament.uk/documents/POST-PN-0632/POST-PN-0632.pdf
[15] https://researchbriefings.files.parliament.uk/documents/POST-PN-0523/POST-PN-0523.pdf
[16] https://www.plymouth.gov.uk/sites/default/files/HeatNetNWEPlymouthTransitionRoadmap.pdf

networks are typically powered by boilers or CHP plants, but can alternatively use ground or air source heat pumps. One advantage of high-temperature networks is that they can operate at a temperature sufficient for domestic heating; the heat they provide does not always need to be upgraded for use in domestic settings. However, high-temperature networks suffer from especially severe inefficiency and heat loss[17].

Low temperature

Low temperature heat networks (also known as 4th- or 5th-generation heat networks) can make use of lower temperature heat sources such as geothermal heat. A 4th-generation network circulates water at a temperature between 40-60°C, which results in less heat wasted from the pipes and thus greater efficiency and lower overall carbon emissions. 5th-generation networks are currently under development and are being designed to carry water at temperatures closer to ambient ground temperatures. This will minimise heat loss and perhaps even eliminate the need for pipe insulation. Heat pumps installed in each property will then upgrade the heat from the network for hot water or space heating. 5th-generation networks will be able to take advantage of even lower temperature heat sources, including, for example, waste heat from industry and sewage treatment plants. Low-temperature networks are also being designed to facilitate heat exchange between buildings; this will optimise efficiency even further.

Individual Heat Pumps vs. Heat Networks

It is important to compare the pros and cons of installing a heat network with the pros and cons of installing individual heat pumps for buildings in the same region. Heat pumps can be incorporated into the operation of a heat network — either as the central energy source itself or to upgrade heat from a low-temperature source — but can also be used as an individual heat supply in domestic settings.

Heat pumps work like reverse refrigerators or air conditioners: they take some external source like air or water, use electricity to increase its temperature, and then pump that higher-temperature output through buildings and homes to provide space heating or hot water. More precisely, heat pumps use an external heat source, combined with electricity, to heat a refrigerant and convert it to a gas. That gas enters a compressor, where, due to the increased pressure, it condenses to a liquid. It releases heat as it condenses, and that heat is released into the building. The liquid refrigerant then enters an expansion valve, where it becomes a gas once again, and the cycle continues.

Heat pumps produce less carbon emissions than gas boilers because they run on electricity — and, when working efficiently, they can even use up to 4 times less electricity than electric heaters. This is because, unlike electric heaters, they only have to *upgrade* the temperature of a source that already holds significant thermal energy. The precise carbon emissions associated with a heat pump will depend on the carbon intensity of the electricity that it uses to run.

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[17] https://www.bre.co.uk/filelibrary/SAP/2016/CONSP-04---Distribution-loss-factors-for-heat-networks---V1_0.pdf

Heat pumps can use the thermal energy in ambient air, water, or the ground as their source. These different types of heat pump are known as air source, water source, and ground source, respectively; they will be discussed in more detail below.

Air Source Heat Pumps

Air Source Heat Pumps (ASHPs) are the most common type of heat pump in domestic settings. They absorb heat from air external to the property and transfer it to the internal heating system. They can be retrofitted to existing properties and consist of an external ground or wall-mounted unit, requiring only a small land footprint. ASHPs can either be "air-to-water" systems, in which heat is transferred to a standard hot water heating system, or "air-to-air", in which heat is transferred directly to air that will be distributed around the home. A drawback of air-to-air heat pumps is that they do not provide hot water.

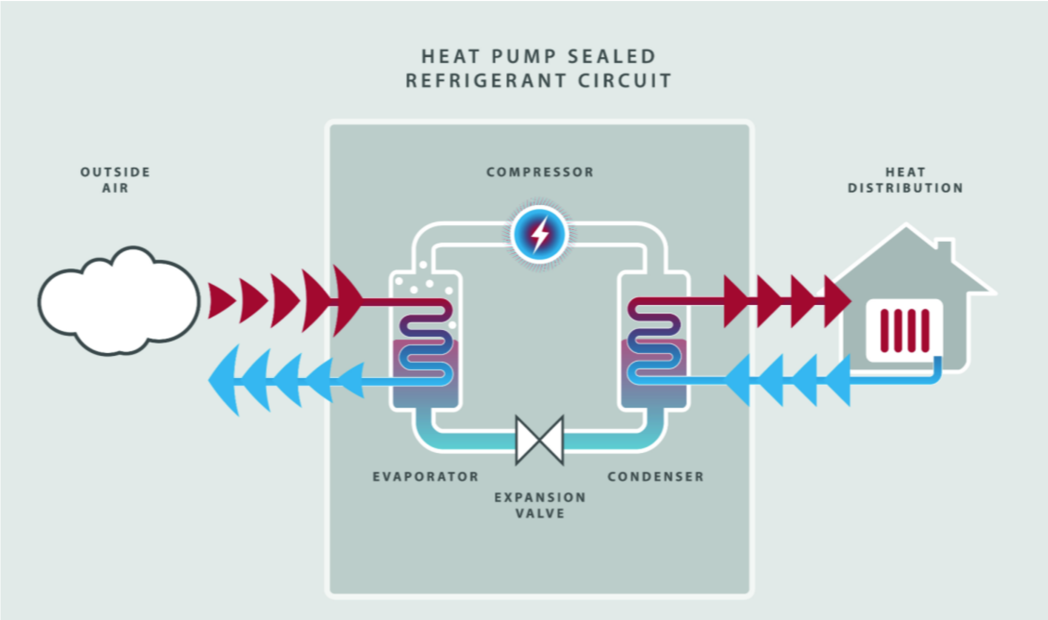

Figure 4: Diagram of an air source heat pump, showing how the refrigerant is cycled through the system[18].

The total cost to purchase and install an ASHP typically falls between £7,000-13,000 in the UK.[19] However, this excludes the cost of installing new radiators, pipework and insulation that might be needed to provide comfort from low temperature heat. ASHPs are most efficient when the external ambient temperatures are closer to the temperatures required for domestic heating.

Ground Source Heat Pumps

Ground Source Heat Pumps (GSHPs) use copper or plastic tubes buried underground as an external heat exchanger. An open-loop system draws water from, and returns it back into, a river or another groundwater resource — for example, an aquifer or spring. Closed-loop systems are more common; they use a sealed loop

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[18] https://www.refrigeration-mitton.co.uk/renewable-energy/air-source-heat-pump/

[19] https://energysavingtrust.org.uk/advice/air-to-water-heat-pumps/

to extract heat from the surrounding soil or rock. Ground heat sources are more stable and reliable than air heat sources, but installation of GSHPs is more costly and disruptive than installation of ASHPs. The heat output of a GSHP is directly related to the size of its underground heat collector.

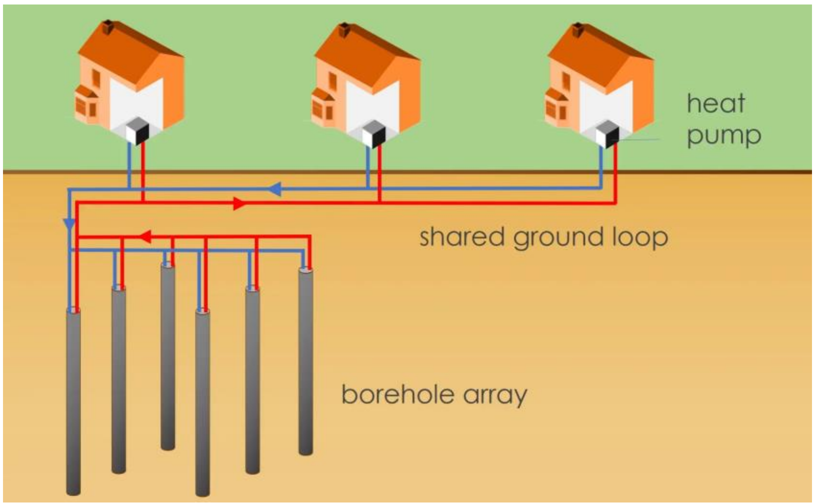

Figure 5: Diagram of a ground source heat pump distribution network[20]. Individual heat pumps are used to "upgrade" the temperature for use in domestic settings.

Installation costs for GSHPs are high: as much as £3,000 per kW of heating capacity[21]. But they do not require much maintenance. More boreholes might be needed to maintain the temperature of the network over long periods of time. But otherwise, a GSHP, once installed, is fairly stable. In a closed-loop system, the ground loops should last up to 100 years. The heat pumps themselves have a ~20-25 year life cycle.

A GSHP can only be installed after a geological survey has been performed to assess the viability of the heat source and the suitability of the site for borehole and piping infrastructure.

Water Source Heat Pump

Water Source Heat Pumps (WSHPs) use a series of submerged pipes containing a working fluid (e.g. antifreeze) to absorb the heat from a river, lake, large pond or borehole. WSHPs are often more efficient than ground and air source heat pumps, because water has a high specific heat capacity — it holds and transfers heat well. Furthermore, water temperatures tend to be relatively constant and predictable throughout the year (between 7-12 degrees), providing a more stable and higher temperature heat source than the air during winter.

Any large body of water can be used as a source for heat pumps, but urban areas near fast-flowing rivers have been identified as the most promising type of site for the technology, according to the DECC's water source

[20] https://bhesco.co.uk/rural-heat-networks-sussex-kent

[21] https://www.gshp.org.uk/ground_source_heat_pumps_Domestic.html

heat map[22]. Fast-flowing rivers provide access to a large volume of water and will not change much in temperature throughout the year.

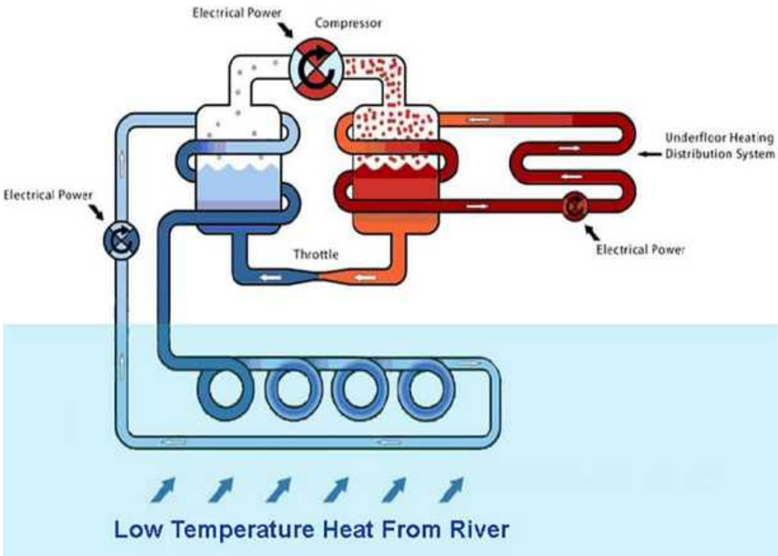

Figure 6: Design of a water source heat pump, in which heat is extracted from a river or other water source[23].

A water source heat pump will soon be installed at Robinson College, Cambridge, to offset approximately half of the main building's gas heating demand[24]. The heat exchange will be with Bin Brook, a tributary of the Cam which runs through college grounds. A weir has been constructed across the brook, and water will be circulated from the weir to the heat pump and back to the brook. The heat pump will provide heating and hot water delivered at temperatures similar to those issued by the original gas boilers. The existing gas boilers will be retained as a back-up to supplement the water source heat pump on cold days. By moving from gas to this new sustainable heat source, it is estimated that the College will save over 5,000 tonnes of CO2 emissions over the next twenty years.

Carbon Emissions

If multiple energy sources are found to be viable for a proposed heat network, the carbon emissions of the different sources should be compared to find the lowest-carbon solution. In reality, this situation might be rare — factors like land availability and local policy will often only allow for one option.

While the precise carbon emissions of a heat network will depend on the details of its location, building stock, and size, many studies have sought to estimate the amount of carbon emitted by networks powered using different heat sources. Some of these estimates, compiled by the Parliamentary Office for Science and

[22]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/416660/water_source_heat_map.PDF
[23]https://www.renewablesfirst.co.uk/water-source-heat-pumps/free-heat-pump-initial-assessment/attachment/heat-pump/
[24] https://www.icax.co.uk/Robinson_College.html

Technology in a 2016 report[25], are shown in Table 1. The Table provides a carbon footprint range for various heat sources in grams of carbon dioxide equivalent per kilowatt-hour of heat. The number of estimates column refers to the number of studies used to estimate each carbon footprint range.

The carbon emissions of electric technologies depend almost entirely on the carbon footprint of the electricity grid, and as the UK's electricity grid moves further towards decarbonisation, carbon emissions of electric technologies will continue to fall. In Table 1, the carbon footprints of electric technologies are listed under three scenarios, which we have labelled CIG 181, CIG 100 and CIG 14[26]: where the carbon intensity is assumed to be at its 2020 level (181 gCO2eq/kWh)[27], its projected 2022 level (100 gCO2eq/kWh)[28], and its projected 2050 level (14 gCO2eq/kWh)[29]. Values for the 100 gCO2eq/kWh scenario are taken directly from the estimates compiled by the Parliamentary Office for Science and Technology; values for the 181 gCO2eq/kWh and 14 gCO2eq/kWh scenarios have been extrapolated from the 100 gCO2/kWh scenario by us, rounded to the nearest 5 gCO2eq/kWh for values over 10 gCO2eq/kWh, and rounded to the nearest 1 gCO2eq/kWh for values less than 10 gCO2eq/kWh.

Direct carbon emissions from the combustion of natural gas or biomass could, in future, be captured and stored underground using carbon capture and storage (CCS). However, CCS is currently expensive; cost reductions would be necessary to deploy CCS widely in the UK on a cost effective basis.[30] Teesside, Merseyside and Grangemouth are currently hosting ongoing initiatives to test the potential for CCS development in the UK, but significant deployment of CCS is not expected to take place for at least a decade.

The carbon emissions of hydrogen technologies depend greatly on the associated hydrogen generation and combustion processes. Use of hydrogen should sit within the wider context of a local energy system. For example, green hydrogen is most easily produced in areas with significant solar or wind capacity. In future, demand for hydrogen will likely be concentrated in industrial areas that require intense heat — for example, in areas that produce steel. The scenarios listed in Table 1 include estimates of the carbon footprint of hydrogen when produced from natural gas without CCS, from natural gas with CCS, and from electricity under the CIG 100 scenario.

Technology	**Carbon footprint range (gCO2eq/kWh)**	**Number of estimates**
Gas boilers	210-380	6
CHP (natural gas)	220-650	4

[25] https://researchbriefings.files.parliament.uk/documents/POST-PN-0523/POST-PN-0523.pdf

[26] We use "CIG" as an abbreviation for Carbon Intensity of the Grid.

[27] https://www.nationalgrideso.com/news/record-breaking-2020-becomes-greenest-year-britains-electricity

[28] According to the Steady Progression National Grid ESO Future Energy Scenario.

[29] According to the Steady Progression National Grid ESO Future Energy Scenario.

[30] https://www.gov.uk/guidance/uk-carbon-capture-and-storage-government-funding-and-support#the-governments-approach-to-ccus

Geothermal	10	1
Biomass boilers	5-200	9
Bio-sourced gases	20-100	2
Ground-source heat pumps (CIG 181)	35-90	Extrapolated from below
Ground-source heat pumps (CIG 100)	20-50	15
Ground-source heat pumps (CIG 14)	3-7	Extrapolated from above
Air-source heat pumps (CIG 181)	55-125	Extrapolated from below
Air-source heat pumps (CIG 100)	30-70	11
Air-source heat pumps (CIG 14)	4-10	Extrapolated from above
Hydrogen (produced from gas, no CCS)	220-545	8
Hydrogen (produced from gas, with CCS)	30-90	3
Hydrogen (produced using electricity, CIG 100)	125-250	4

Table 1: Carbon footprint associated with different heat sources for heat networks.

For an electricity grid with a carbon intensity (CIG) of 181 gCO2eq/kWh (2020 level), ground-source heat pumps have the lowest carbon emissions, with air source heat pumps close behind. This still holds true for an electricity grid with a carbon intensity (CIG) of 14 gCO2eq/kWh (2050 level). However, the Table does not consider all possible technologies — for example, it does not provide carbon footprint estimates for water-source heat pumps.

Government Investment

Grants and funding available from the Government or third-party investors may affect decisions regarding the design of local heat networks. Currently there are several schemes available to local councils or heat networks developers, including the Heat Network Investment Project[31] and the Green Heat Network Fund[32]. These have been developed to contribute to low-carbon heating technologies in domestic settings, and they include grants to support the installation of individual heat pumps in private homes.

The Government's Domestic Renewable Heat Incentive (RHI) provides financial compensation per kWh of renewable heat supplied, but it ends in March 2022. The Boiler Upgrade Scheme, announced as part of the Government's Heat and Buildings Strategy, will provide up to £5,000 per home towards the installation of an air source heat pump — or £6,000 for a ground source heat pump — from April 2022[33]. However, the

[31] https://www.gov.uk/government/collections/heat-networks-investment-project-hnip-overview-and-how-to-apply
[32] https://www.gov.uk/government/publications/green-heat-network-fund-ghnf-transition-scheme
[33]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1032119/heat-buildings-strategy.pdf

£450m scheme translates into funding for only 90,000 homes, a small fraction of the ~30 million homes across the UK[34].

Insulation and Other Factors

Other factors to consider when planning a heat network include the details of the local building stock and the availability of possible sites for an energy centre.

In particular, the age, EPC ratings, and internal infrastructure of the building stock should be considered. The cost of installing a heat network should be weighed against the cost of upgrading the energy efficiency of buildings in the same region, through double glazing and/or wall or roof insulation. Different technologies should be weighed according to how well they fit with the existing infrastructure of the buildings. A high temperature heat network, for example, can act as a direct substitute for existing gas boilers, feeding straight into homes' existing hot water and radiator infrastructure. The majority of existing buildings would, in contrast, require significant upgrade insulation and a supplementary heat pump to connect to a low temperature heat network.

At the same time, there is no use in planning a heat network unless the local area under consideration includes an area (or areas) that could reasonably be used to house an energy centre. Various factors should come into play in assessing the viability of possible energy centre locations — including local plans and restrictions, citizens' views, possible visual obstruction and possible interference with the natural landscape. Each energy source will require an energy centre with different features.

[34] https://www.theccc.org.uk/wp-content/uploads/2019/02/UK-housing-Fit-for-the-future-CCC-2019.pdf

4. Future Energy Scenarios

To assess future heating and electricity demand, we refer to the modelling presented in the 2021 National Grid ESO Future Energy Scenarios (FES) report[35,36]. The report details four different future energy scenarios.

Today, around 76% of domestic energy demand can be traced back to heating[37]. Current residential demand for heating in the UK is 480 TWh. The FES report predicts that by 2050, total residential demand will be as low as 172 TWh, with air and ground source heat pumps in widespread use and district heat networks installed in some areas.

Some features are common to all four future scenarios. In each, insulation and retrofitting efforts will be combined with a push towards low carbon heat sources. The sale of natural gas boilers for existing homes will be banned from 2035, and all new homes will have heat pumps installed from 2025. Thermostats will be turned down by 0.5-1C to reduce overall demand and reduce the electricity system peak — and that peak will also be reduced through the installation of thermal storage devices. Overall energy efficiency will increase due to widespread use of LED lighting and smart appliances.

The scenarios differ in the low carbon heating technologies that they adopt, in what ratios, and in whether changes are driven by policy or by the consumer.

The Four Scenarios

Scenario 1: Steady Progression

The Steady Progression world sees the least amount of societal change and corresponds to the slowest rate of decarbonisation. Significant progress can be made towards net zero in this scenario — but ultimately, it results in a failure to meet the government's net zero target by 2050. It includes widespread uptake of electric vehicles for personal use, but much slower decarbonisation of Heavy Duty Vehicles (HDVs). Natural gas continues to act as the primary fuel for heating, although heat pumps are successfully rolled out in some areas — especially in new builds where gas and oil boilers will be banned from 2025. The electricity generation capacity of the UK increases significantly, with growth in both small- and large-scale solar photovoltaic installations and an increase in distributed generation from waste, biomass and energy crops. However, this increase in renewable electricity capacity is not enough to compensate for the increase in demand, and a significant number of new gas fired power plants are installed. The public shows limited appetite for participating in the energy market via smart mechanisms like demand side response and time of use tariffs.

[35] https://www.nationalgrideso.com/document/202851/download

[36] For more details on the different scenarios, see https://innovation.ukpowernetworks.co.uk/2021/01/11/distribution-future-energy-scenarios-2021/.

[37] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1020152/2020_Energy_Consumption_in_the_UK__ECUK_.pdf

Scenario 2: System Transformation

In a System Transformation world, the UK reaches its net zero target in 2050 by relying on hydrogen to decarbonise heat and heavy transport — two sectors that are especially difficult to decarbonise. Sales of electric vehicles, especially cars and vans, ramp up, resulting in greater demand for rapid public electric chargers. Global production of hydrogen fuel cells increases at the same time, enabling large-scale supply of zero emission HDVs, including buses, coaches and heavy goods vehicles, to be available from the mid-2030s. The Government chooses to install electric heat pumps in new-builds. For existing buildings, the natural gas grid is repurposed to distribute low-carbon hydrogen — but the cost of carbon capture and storage associated with hydrogen generation presents a major issue. Development in renewable electricity generation is steady, as is development in battery storage. A moderate level of grid flexibility is brought about by demand side response and electric vehicle smart charging.

Scenario 3: Consumer Transformation

The Consumer Transformation world also sees the UK reach net zero by 2050, this time thanks to widespread electrification, decarbonisation of the electricity supply, and consumer behaviour change. Decarbonisation efforts are aided by innovative new revenue streams designed to encourage and reward consumers to adopt new routines — including, for example, Time-of-Use Tariffs (ToUT), which offer cheaper electricity to consumers at off-peak times. Uptake of electric vehicles, especially cars and vans, is widespread. The decarbonisation of larger vehicles progresses more slowly, but by the mid 2030s, a wide range of zero emissions Heavy Duty Vehicles are available. A nationwide refuelling network is completed by 2045. The Government decides to decarbonise heat through electrification. New-build homes are forbidden from installing gas boilers from 2023 onwards, and gas boilers are banned outright by 2035. A nationwide programme for improving building energy efficiency is established and implemented, reducing the amount of electricity needed for heating. Various subsidies for the installation and operation of heat pumps are put in place and kept in operation until the late 2020s. Electrification of heating and transport significantly increases demand on the electricity grid. This increase in demand is met predominantly through the expansion of solar and wind farms, which become ever more affordable to install and maintain. As renewable generation expands, so does grid capacity and domestic battery storage.

Scenario 4: Leading the Way

This scenario requires the highest level of societal change, but results in the fastest change. In a Leading the Way world, we reach net zero well before 2050. All ICE and PHEV vehicle sales are banned from 2030, boosting adoption of electric vehicles and engagement with vehicle-to-grid network flexibility. At the same time, consumers are more willing to take public transport and opt for active transport like cycling and walking, resulting in a significant reduction in demand for passenger cars and a lower growth of van stock compared to other scenarios. For HDVs, both batteries and hydrogen fuel cells are developed at scale, and diesel ICE vehicles are completely phased out by the 2040s. Decarbonisation of heat is achieved via a hybrid approach, through widespread deployment of heat pumps combined with distribution of hydrogen through the existing gas infrastructure. This provides a platform for the installation of hybrid heat pump systems, which combine electric heat pumps with hydrogen boilers. The electricity capacity required to support the many electric vehicles and heat pumps deployed in this scenario is high, and must be met with a more centralised approach than in the Consumer Transformation scenario. Large solar PV is more popular than in the other scenarios, and corresponds to a high uptake of co-located battery storage. Consumers are willing to participate in flexibility programmes, with over 40% of those with EV charging at home taking part in some form of smart charging.

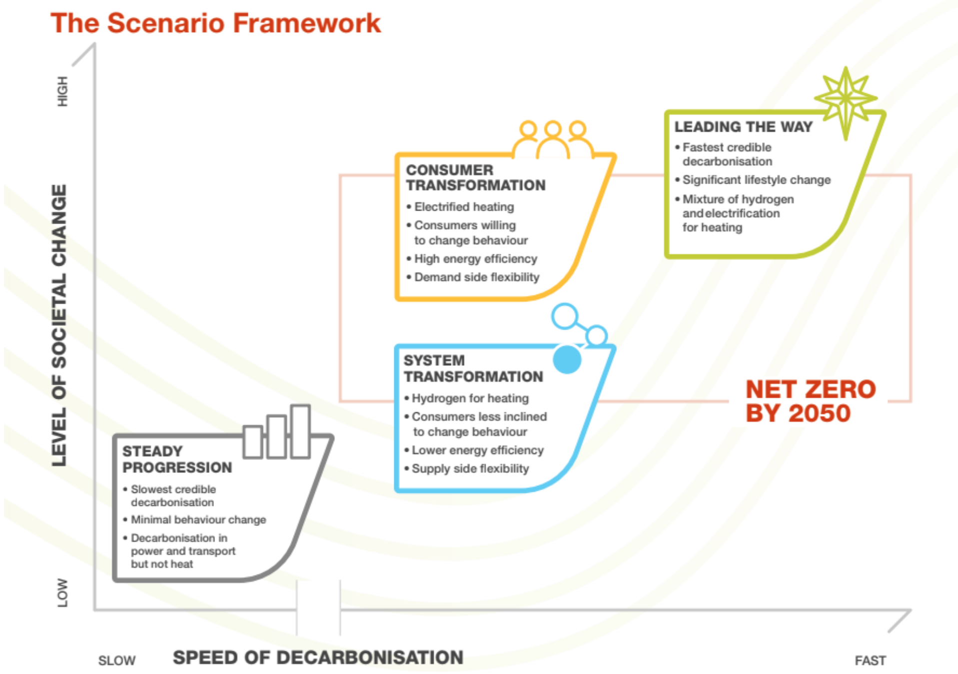

Figure 7: An overview of the four future energy scenarios proposed by UK Power Networks.

Energy Demand for Domestic Heating

80% of domestic heat demand is currently met by gas boilers[38]. In all four future energy scenarios, the energy required to meet domestic heat demand is predicted to significantly decrease (Figure 8). This decrease corresponds to the adoption of more efficient methods for heat generation. Today, and in the Steady Progression scenario, gas boilers dominate (Figure 9). In Consumer Transformation and Leading the Way, air-source, ground-source and hybrid heat pumps dominate. In System Transformation, the whole energy supply is transformed such that hydrogen boilers dominate. All future energy scenarios require a substantial change in heat generation and infrastructure, and Local Authorities will need to play a key role in supporting that change — by, for example, installing heat networks and encouraging individuals to switch to low-carbon heating technologies.

[38] https://www.sciencedirect.com/science/article/pii/S0301421518307249

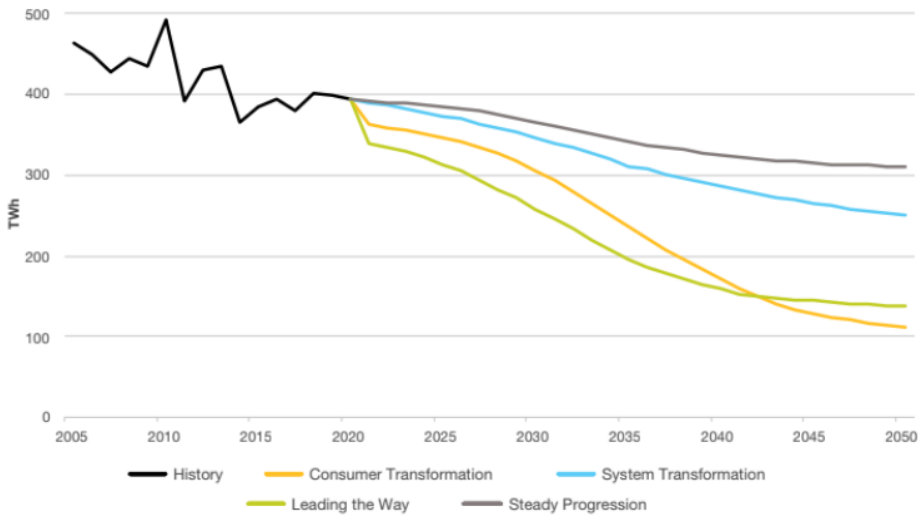

Figure 8: Total annual energy demand for heating homes in each future energy scenario.

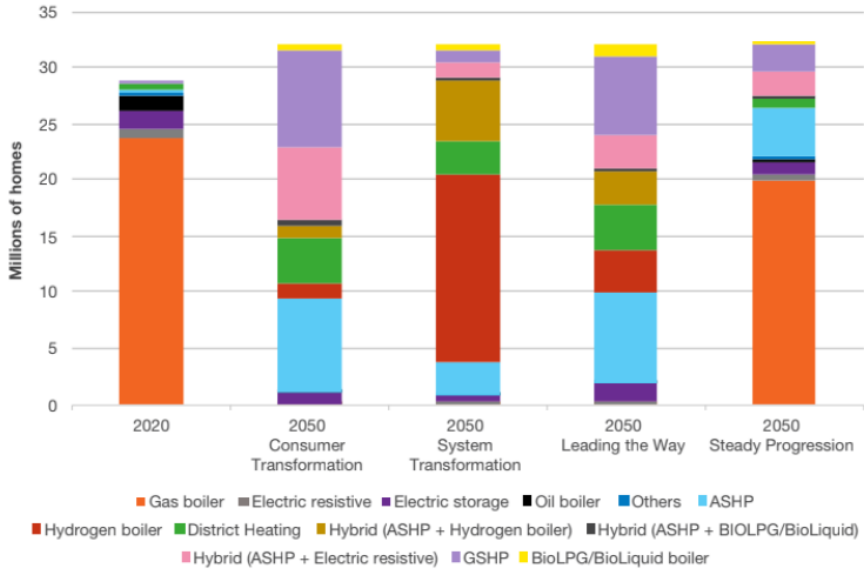

Figure 9: The predicted mix of domestic heating technologies in each future energy scenario.

Electricity Demand for Domestic Heating

The FES report models future electricity demand for domestic heating in each of the four scenarios. As traditional gas boilers are phased out and heat pumps begin to dominate, the electricity required to provide space and hot water heating in homes will increase by up to four times compared to current levels (see Figure 10). This will require a complete overhaul of the current electricity distribution system, in order to avoid power cuts and blackouts. However, a fourfold increase in electricity demand will not necessarily require a fourfold increase in electricity generation capacity if smart technologies are used to spread electricity demand throughout the day.

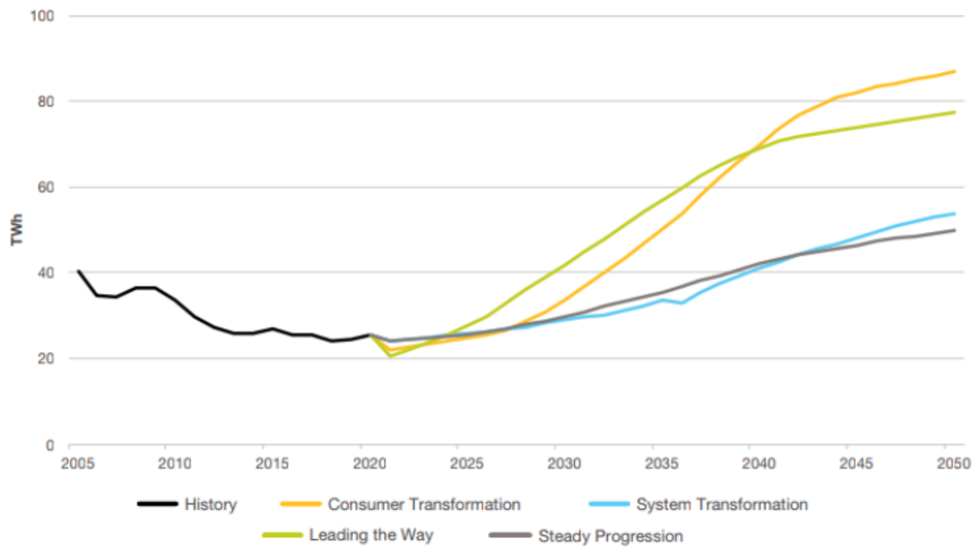

Figure 10: Electricity demand for heating homes for each future energy scenario.

Currently, the non-domestic sector uses the majority (~63%) of the UK's electricity consumption[39]. An increase in domestic heat demand is therefore not the only factor that will put pressure on the electricity grid over the next few decades. It will be important to consider electricity demand trends in other sectors, including industry and transportation, when upgrading the electricity grid in Cambridgeshire.

Carbon Intensity of the Electricity Grid

The FES report models the carbon intensity of the power grid in each of the four scenarios outlined above: Steady Progression, Consumer Transformation, System Transformation and Leading the Way.

National Grid ESO aims to make the UK's electricity system carbon neutral by 2025.[40] Under the Steady progression scenario, "Emissions from the power sector fall below 42 gCO2/kWh by 2030, and decline gradually after this point driven by the shift away from unabated gas".[41] This will be combined with an increase in supply, with a 1.5 times increase in total electricity output by 2050.[42] 79 TWh of that total will, according to projections, be exported.[43] By 2050, even in this least ambitious scenario, the carbon intensity of electricity generation will have fallen by over 90% to 14 gCO2/kWh.

The three more ambitious scenarios take negative emissions from Bioenergy with Carbon Capture and Storage (BECCS) into account, bringing overall emissions from the power sector to below zero from between 2030 and 2035. But, according to their 2021 report, even "[e]xcluding BECCS, emissions in the power sector

[39]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/853760/sub-national-electricity-and-gas-consumption-summary-report-2018.pdf

[40] National Grid ESO Future Energy Scenarios Report 2021, pg. 114.

[41] National Grid ESO Future Energy Scenarios Report 2021, pg. 118.

[42] Ibid.

[43] Ibid.

fall below 10gCO2/kWh by 2043 in all net zero scenarios".[44] Electrified heating will therefore become zero carbon, or very low carbon, by 2050.

The Carbon Intensity API[45] gives short-term projections of regional carbon intensity and generation mix for the power grid, available 96+ hours in advance for each region of the UK.

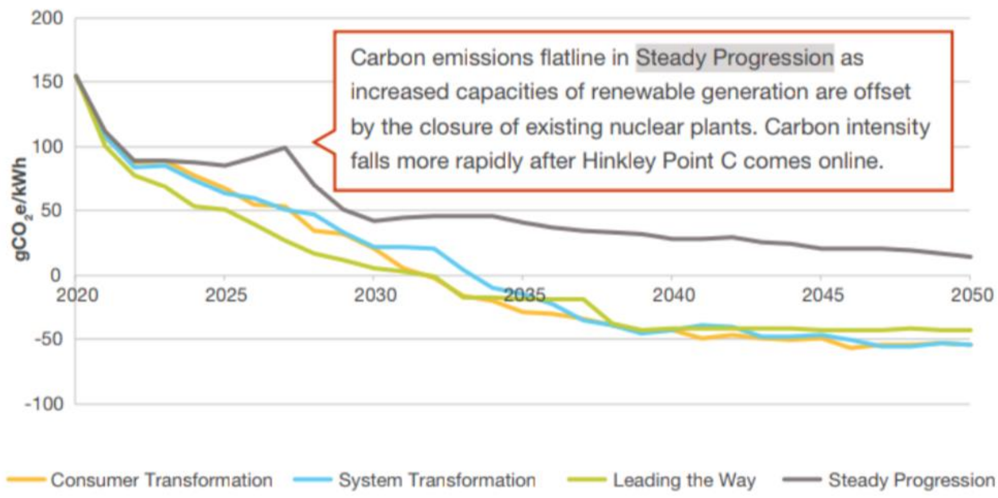

Figure 11: Power sector carbon intensity for each future energy scenario.

[44] National Grid ESO Future Energy Scenarios Report 2021, pg. 120.

[45] https://carbonintensity.org.uk

5. Case Studies

Here we review the Greater Manchester Spatial Energy Plan and five existing heat network projects in the UK to inform our recommendations for Huntingdon, Ely, and March.

Greater Manchester Spatial Energy Planning

The Greater Manchester Spatial Energy Plan[46] provides an assessment of the technical potential for installing low carbon energy solutions in Greater Manchester (GM) to support the city's climate goals. The plan was compiled before the emergence of the LAEP and BEIS methodologies discussed in Section 2. Therefore it uses its own methodology, composed of 5 steps presented below.

1. **Identification of energy and heat demand.** Energy and heat demand data for all sectors was obtained using BEIS and the CSE National Heat Map data[47]. Space heating and hot water were estimated to account for 77% of domestic energy demand, with gas as the heating fuel for 96% of homes.
2. **Assessment of electricity and gas network capacity.** The existing electricity and gas distribution networks in GM were assessed. This assessment found that major shifts in heating technology would require a significant increase in electricity network capacity in some areas to accommodate new demand.
3. **Evaluation of building stock.** The energy efficiency ratings of domestic and public buildings were assessed using EPC and DEC data. Non-domestic buildings were not considered due to a lack of EPC data. Arround 60% of domestic buildings and 80% of public buildings in GM were found to have low thermal efficiency.
4. **Analysis of existing energy trends.** Carbon emissions trends in GM between 2005 and 2014 were analysed and assessed in the context of targets laid out in The Climate Change Act (2008).
5. **Development of future energy scenarios.** Using the background information collected in steps 1-4, two future energy scenarios were developed for GM. The first, 'Business-as-Usual', assumes a continuation of current trends. The second, 'Green Aspiration', includes widespread implementation of low carbon heating and transport. Models of these scenarios revealed that buildings would have to change almost entirely to different sources of energy for space heating and hot water to reach Greater Manchester's carbon emissions targets. The Business-as-Usual scenario would miss GM's 2050 target by 4 MtCO2.

We use the methodology and results of this study, together with the LAEP and BEIS methodologies reviewed in Section 2, to guide our identification of priority areas for district heating in Huntingdon, Ely and March.

Our report links mainly with the first and fifth steps outlined above: we will estimate the gas and energy demand on our three demonstrator sites to identify priority areas for the installation of heating districts, and then assess how much their installation could save in carbon emissions.

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[46] https://www.greatermanchester-ca.gov.uk/media/1277/spatial-energy-plan-nov-2016.pdf

[47] https://www.cse.org.uk/projects/view/1183

More details on the GM Spatial Energy Plan can be found in Appendix 1.

Heat Networks in the UK

We reviewed 5 existing heat network projects in the UK — projects in Swaffham Prior[48], Gateshead, Leeds, Islington[49], and Solihull[50] — before conducting our own analysis on the viability of heat networks in Cambridgeshire. The similarities among these existing projects provide important background information for the selection of priority areas for district heating in Huntingdon, Ely and March.

Most of these five existing (or planned) sites use a combination of air and ground source heat pumps as their main heat source. Leeds and Islington instead use waste heat already produced by other uses: heat from Leeds' recycling and energy recovery facility and the Northern tube line, respectively.

All five cases include a contingency plan to deal with higher-than-usual peak demand on colder days. To provide that buffer, most include back-up energy or gas boilers.

The energy centre is usually built on government land. And in all cases, the carbon impact of the network depends on the carbon intensity of the electricity grid and on climate variations.

Each of the five heat networks will be able to provide space heating at around 23 degrees Celsius for homes, businesses, and government buildings. Usually they begin by connecting to a small portion of properties and gradually increase their coverage.

Most homes are able to connect to the new networks without upgrading their central heating systems, but electrically heated homes present an exception — they need to install a wet system of radiators and pipes.

More detailed information about each of the five projects can be found in Appendix 2.

48 http://www.swaffham-prior.co.uk/pc/CLT/study.pdf
49 https://www.dezeen.com/2020/03/11/bunhill-2-energy-centre-london-underground-uk-architecture/
50 https://www.birminghammail.co.uk/news/midlands-news/new-details-designs-revealed-energy-19973178

6. Gas and Electricity Demand in Huntingdon, Ely and March

Methodology

We have investigated the evidence base for installing heat networks in three areas of Cambridgeshire: Huntingdon, Ely, and March. Huntington is a market town in the Huntingdonshire district with a population of ~26,000[51]. Ely, the second smallest city in England, lies in the East Cambridgeshire district with a population of almost 18,000[52]. It has undergone rapid growth in recent years, with a significant amount of new housing development on its north-western edge. March is a market town in the Fenland district with a population of ~23,000[53,54].

We began our analysis by identifying the spatial distribution of the current gas and electricity demand in those three areas, using data from the Department for Business, Energy & Industrial Strategy (BEIS) Subnational Electricity and Gas Consumption Statistics[55]. The data is based on an aggregation of Meter Point Administration Number (MPAN) readings throughout Great Britain, which are obtained directly from electricity and gas suppliers.

The data is aggregated in 5 different geographic levels: regional level, local authority level, Middle Super Output Area (MSOA) level, Lower Super Output Area (LSOA) level, and postcode level. The regional level, local authority level, and MSOA level did not provide sufficient detail to map the spatial distribution of gas and electricity demand in the urban areas of Huntingdon, Ely, and March. Therefore we used the LSOA and postcode level data to map energy demand.

Furthermore, we limited our analysis to domestic meters, since LSOA- and postcode-level electricity and gas data is only available for domestic meters. It is important to note, however, that an industry standard consumption threshold of 73,200 GWh per annum of gas is used to categorise meters into domestic and non-domestic, which may result in misclassification of some smaller commercial properties as domestic.

We extrapolated heating demand directly from the gas demand. In the domestic sector this extrapolation is appropriate, since gas consumption is predominantly used for heating purposes. It would not be appropriate in the non-domestic sector, where gas is used to fuel a variety of activities.

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51 https://www.huntingdonshire.gov.uk/council-democracy/council-open-data-and-information/statistics/

52 https://www.eastcambs.gov.uk/sites/default/files/agendas/061112%20Ely%20Vision_0.pdf

53 https://en.wikipedia.org/wiki/March,_Cambridgeshire

54 https://www.fenland.gov.uk/media/16583/Fenland-Monitoring-Report-2018-2019/pdf/Fenland_Monitoring_Report_2018-2019.pdf?m=637261848570770000

55 https://www.gov.uk/government/collections/sub-national-electricity-consumption-data

Consumption Trends

Electricity

In 2019, a total of 272,541 GWh of electricity was consumed across the UK via 31.3 million meters, 1.5% less than in 2018. Total domestic electricity consumption hit 102,737 GWh, accounting for 38% of total consumption. This was 0.3% lower than in 2018 (103,050 GWh), and 14% per cent lower than in 2005 (119,425 GWh).

Comparatively, Fenland (where March is based) saw a reduction of 12% in the domestic electricity demand between 2019 (181 GWh) and 2005 (205 GWh). Huntingdonshire (where Huntingdon is based) saw a reduction of 12% between 2019 (302 GWh) and 2005 (345 GWh). Finally, East Cambridgeshire (where Ely is based) saw a reduction of 11% between 2019 (179 GWh) and 2005 (160 GWh).

All three districts fell short of the UK-wide reduction trend. However, with the exemption of East Cambridgeshire, which had a mean domestic electricity consumption of 5,671 kWh, both Fenland (5,001 kWh) and Huntingdonshire (4,834 kWh) fell below the UK-wide mean domestic consumption of 5,046 kWh.

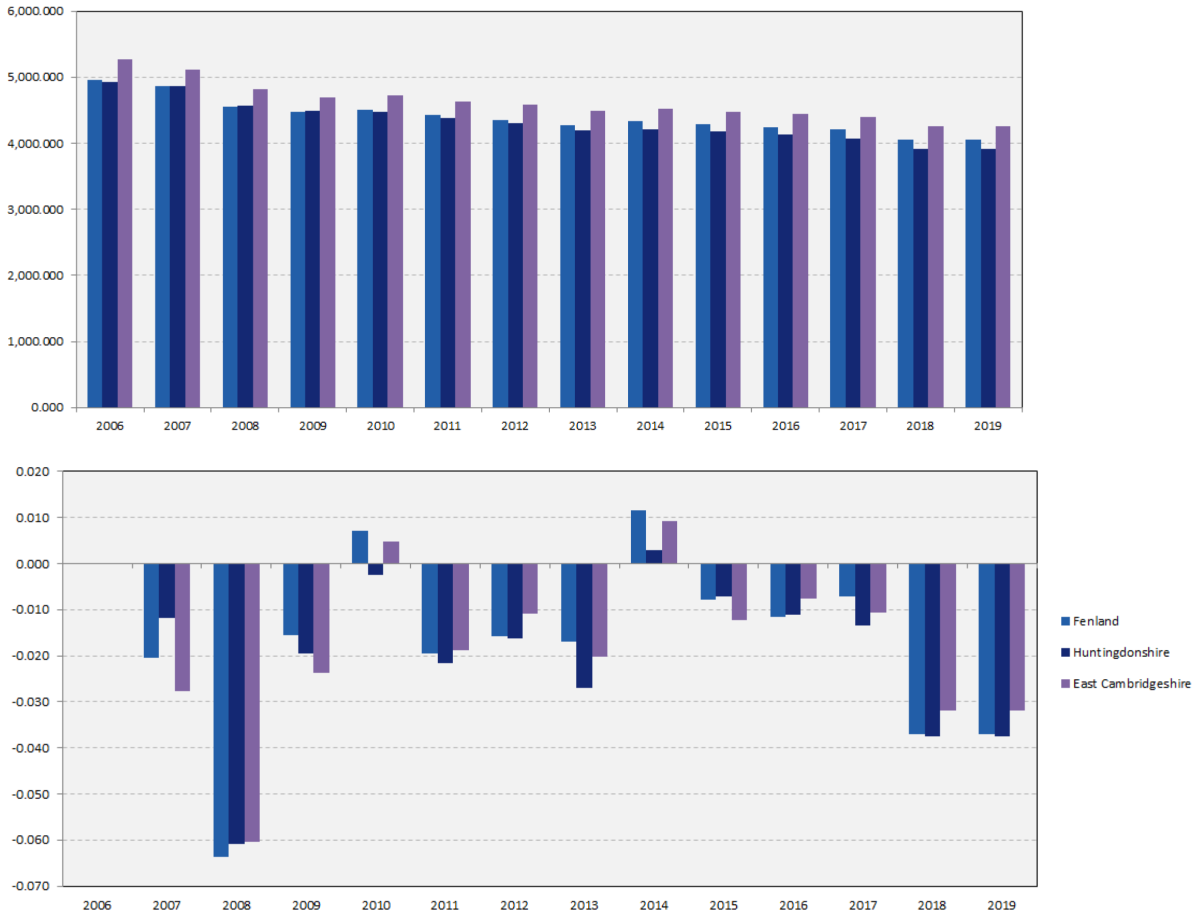

Figure 12: Total domestic electricity sales changes in kWh and percentage points between 2006 and 2019 in Fenland, Huntingdonshire, and East Cambridgeshire.

Gas

The electricity year aligns with the calendar year, but the gas consumption year runs from mid-May to mid-May. During 2019/20, total annual gas consumption in Great Britain was 505,499 GWh (via around 24.4 million meters), 0.7% lower than in 2018/19. UK-wide mean domestic gas consumption decreased by 29.0% between 2005 (19,020 kWh) and 2019/20 (13,495 kWh). The long-term downward trend in gas consumption is explained by energy efficiency improvements in buildings, installation of new boilers and energy efficient appliances, and increased gas prices[56]. However, this trend has flattened somewhat since 2015.

In addition, total and mean domestic gas consumption increased slightly (by 0.9 %) between 2018/19 and 2019/20. This small increase stems from the impact of COVID-19 restrictions put in place between March and May 2020, which required most non-essential workers to stay at home. During this period, when many business operations were put on hold, a significant portion of non-domestic sites consumed less than the 73,200 kWh threshold required for non-domestic classification. Around 5% of non-domestic meters were reclassified as domestic in 2019/20.

Domestic gas consumption in Fenland, Huntingdonshire, and East Cambridgeshire follows these UK-wide trends, showing long-term downward movement that has flattened since 2015, and a small increase in mean consumption between 2018/19 and 2019/20.

[56]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/946968/sub-national-electricity-and-gas-consumption-summary-report-2019.pdf

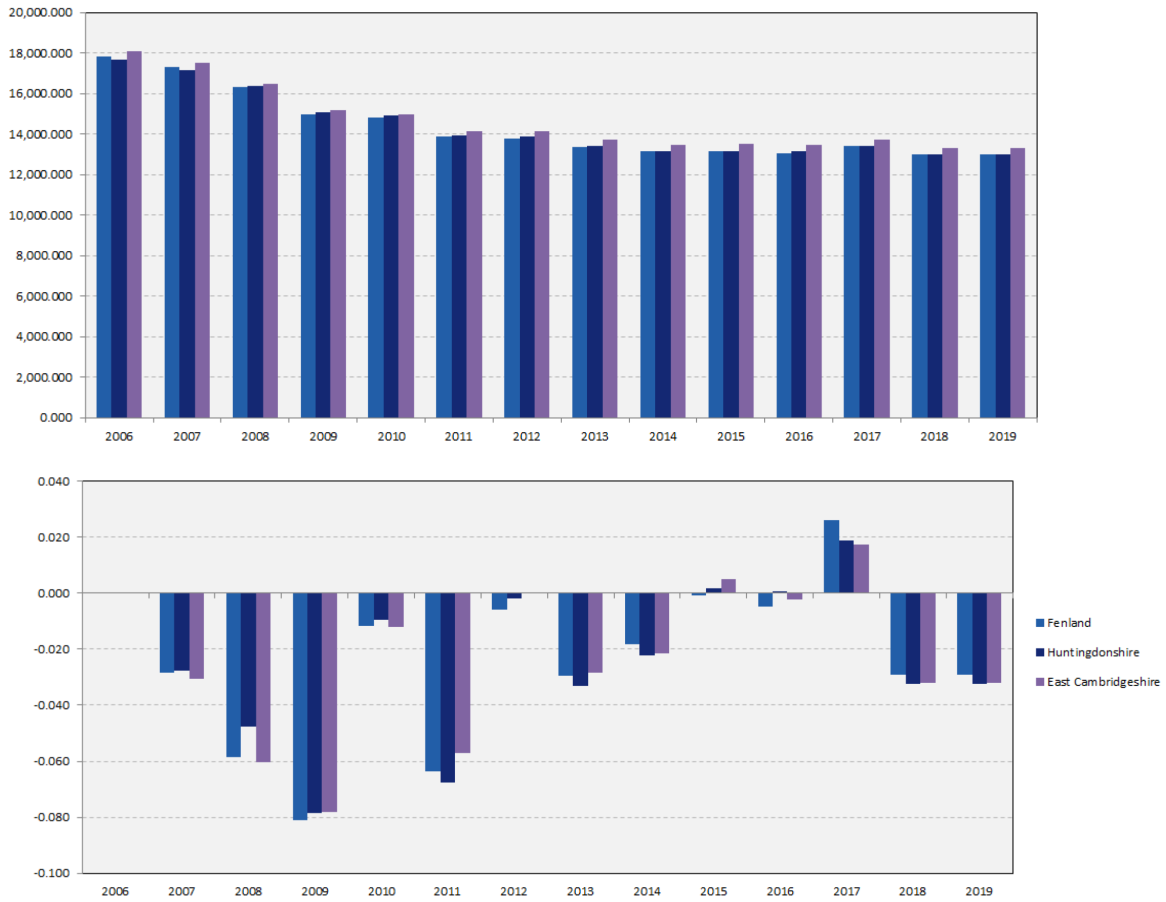

Figure 13: Total domestic gas sales changes in kWh and percentage points between 2006 and 2019 in Fenland, Huntingdonshire, and East Cambridgeshire.

Mapped demand

To map current electricity and gas demand in Huntingdon, Ely, and March, we began by defining an area of analysis for each city. We considered only the built-up urban areas of each site, defined according to the 2011 Office for National Statistics (ONS) data on Built-up Areas. This was the most up-to-date data available; Built-Up Areas are defined by the Census every 10 years. According to ONS[57], Built-Up Areas are areas which are 'irreversibly urban in character'. They are defined using an automated approach based on 50m grid squares, where settlements within 200m of each other are linked.

As mentioned earlier, we used electricity and gas data from the BEIS Subnational Consumption Statistics at the LSOA level and postcode level to map demand. Postcode-level data was not available everywhere — it is not provided for postcodes that include less than 5 meters, or for postcodes where a single meter consumes more than 90% of total consumption.

[57]https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/characteristicsofbuiltupareas/2013-06-28

Alongside the Built-up Areas and BEIS Subnational Electricity and Gas Consumption Statistics data, we used the following resources to map demand: High Resolution (25cm) Vertical Aerial Imagery (2020)[58] from Digimap Getmapping Plc, postcode boundaries from digimap Ordnance Survey Limited (OS Data) Code-Point® with Polygons, and the LSOA boundaries from ONS geography information[59].

Gas

The following maps show the spatial distribution of the domestic mean gas consumption in 2019 for Huntingdon (Figure 14), March (Figure 15), and Ely (Figure 16). The consumption data is divided into 5 classes. Class 1 (less than 12,000 kWh) and Class 2 (between 12,000 and 13,000 kWh) fall below the national and regional average of consumption. Class 3 (between 13,000 and 14,000 kWh) is in the national and regional average consumption range. And Class 4 (between 14,000 and 15,000 kWh) and Class 5 (greater than 15,000 kWh) are above the national and regional average.

Figure 14 shows that in Huntingdon the highest mean gas consumption rates are concentrated mainly in the northeast, northwest and south, while consumption rates in some central regions are below average.

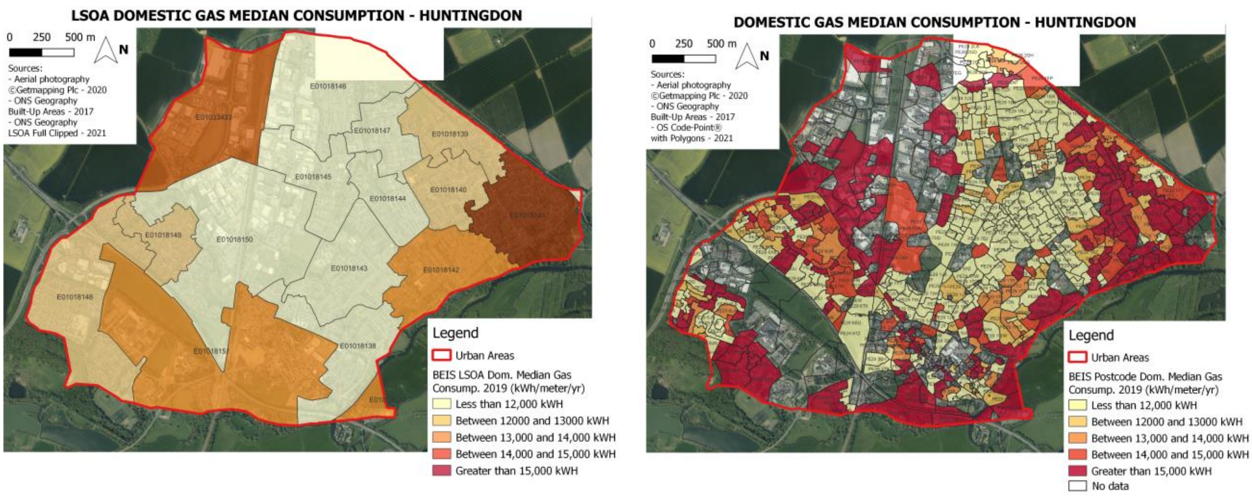

Figure 14: Huntingdon domestic mean gas consumption in 2019 at LSOA and Postcode levels.

[58] https://digimap.edina.ac.uk/help/copyright-and-licensing/aerial_eula/

[59] https://geoportal.statistics.gov.uk/

Figure 15 shows that in March the highest mean gas consumption rates are concentrated in the centre and south, while the east and west have lower than average consumption rates.

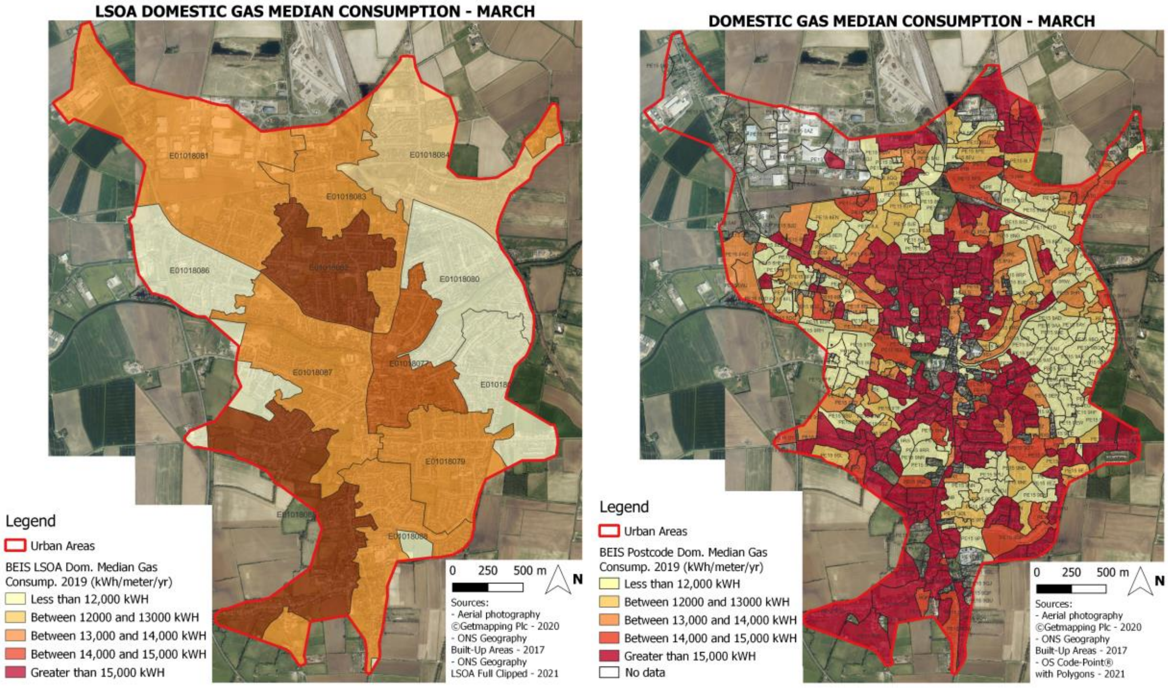

Figure 15: March domestic mean gas consumption in 2019 at LSOA and Postcode levels.

Finally, Figure 16 shows that in Ely the highest mean gas consumption rates are concentrated mainly in the central, southeast and west of the city, while the northeast has lower average consumption rates.

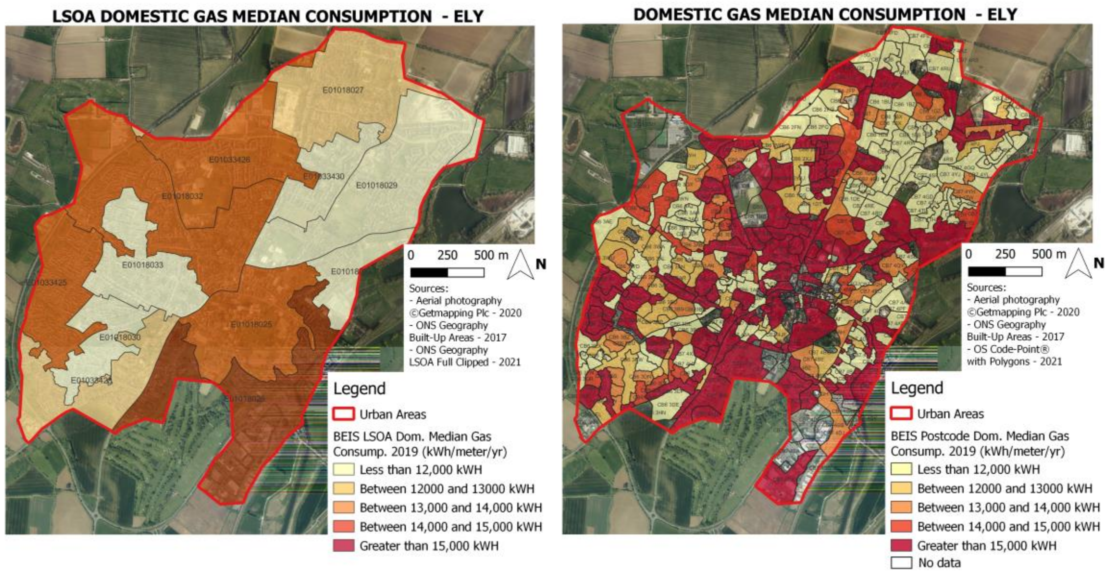

Figure 16: Ely domestic mean gas consumption in 2019 in the LSOA and Postcode levels.

Electricity

The following maps show the spatial distribution of domestic mean electricity consumption in 2019 for Huntingdon (Figure 27), March (Figure 28), and Ely (Figure 29). The data is again divided into 5 classes.

Class 1 (less than 3,400 kWh) and Class 2 (between 3,400 and 3,800 kWh) fall below the national and regional average. Class 3 (between 3,800 and 4,200 kWh) is in the national and regional average consumption range, and Class 4 (between 4,200 and 4,600 kWh) and Class 5 (greater than 4,600 kWh) are above the national and regional average.

Overall, we see in Figures 17, 18 and 19 below that in all three areas, the spatial distribution of electricity consumption is very similar to the spatial distribution of gas consumption.

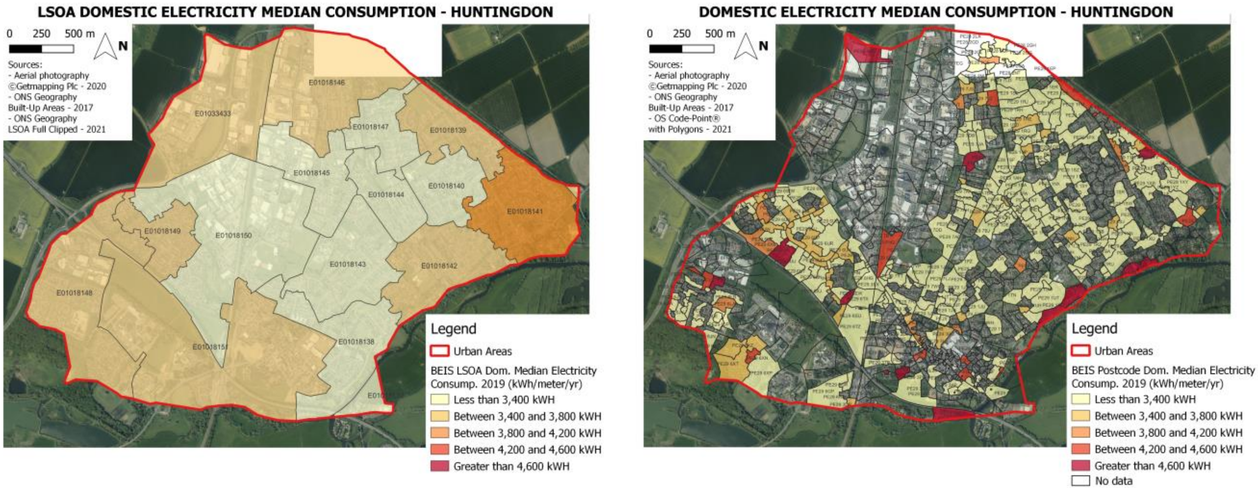

Figure 17: Huntingdon domestic mean electricity consumption in 2019 in the LSOA and Postcode levels

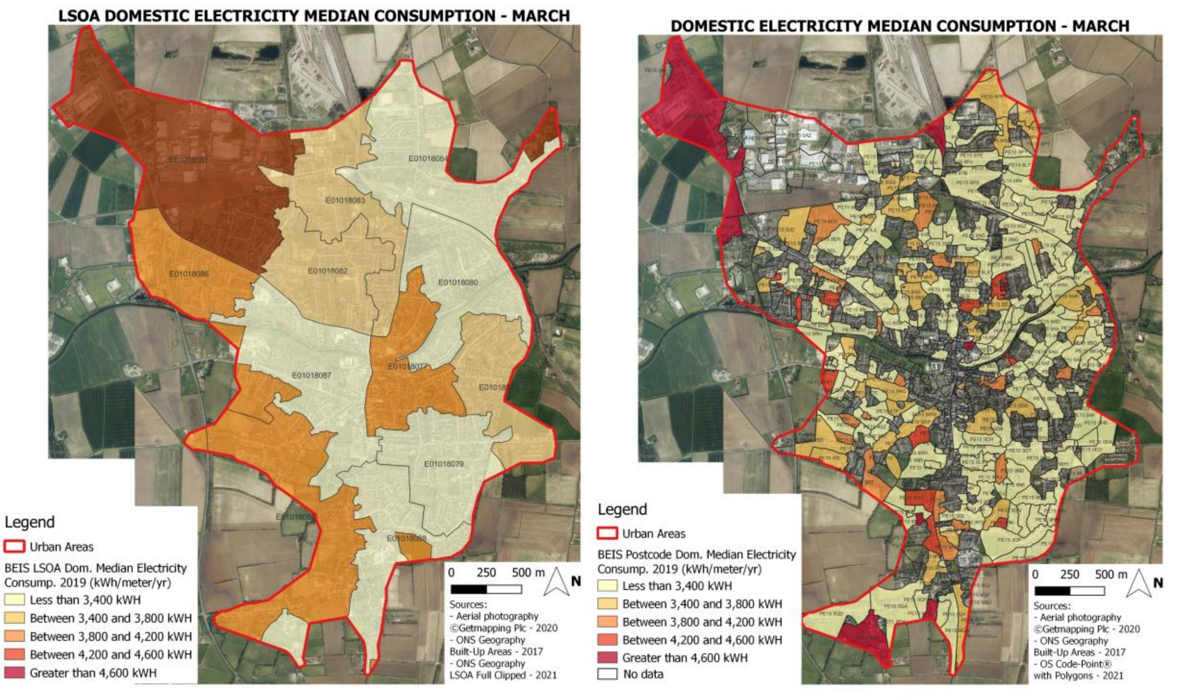

Figure 18: March domestic mean electricity consumption in 2019 in the LSOA and Postcode levels.

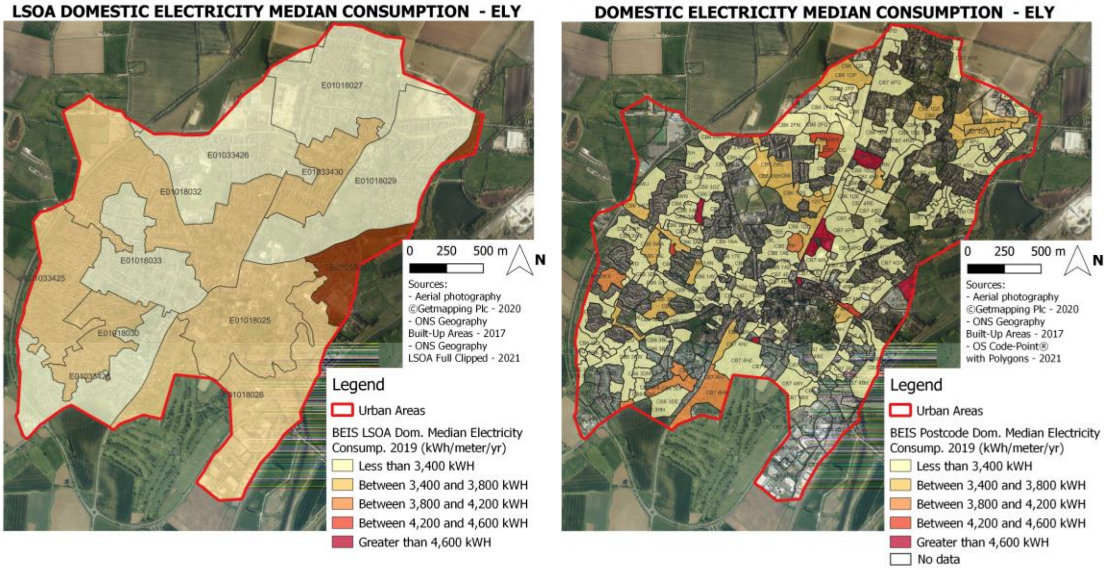

Figure 19: Ely domestic mean electricity consumption in 2019 in the LSOA and Postcode levels.

7. Heat Network Zoning in Huntingdon, Ely and March

PLEASE NOTE: ALL HEAT ZONES IDENTIFIED IN THIS CHAPTER ARE INDICATIVE ONLY AND SUBJECT TO FURTHER WORK.

Using the energy consumption data mapped in Section 6, we moved on to define regions in Huntingdon, Ely and March that should be prioritised for heat network development. We began this stage by briefly assessing the major council-owned assets and public buildings in each of the three demonstrator sites, as shown in Figure 20. Data was provided by Cambridgeshire County Council.[60]

The urban area of Huntingdon contains numerous schools, council office buildings, and a hospital. Ely is home to a number of schools and administrative council buildings, and March includes several schools and community buildings, including the offices of the Fenland District Council. Both Huntingdon and March contain areas of council-owned land that could act as sites for a potential energy centre.

[60] https://my.cambridgeshire.gov.uk/myCambridgeshire-beta.aspx?mapsource=CCC/Energy_Investment&BaseMapSource=CCC/base_ADS_OSPremiumBW

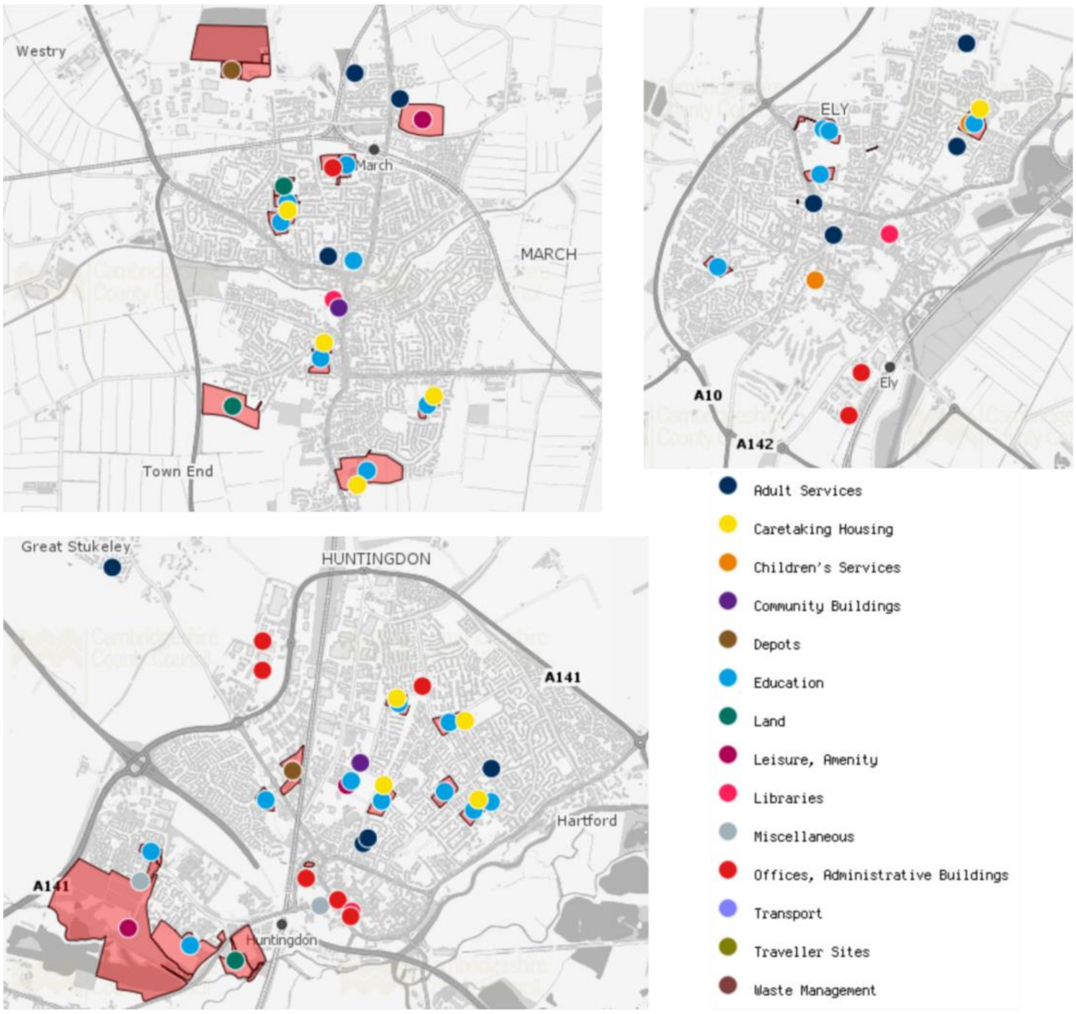

Figure 20: Maps of council-owned properties and land in Huntingdon, Ely and March.

Methodology

To define priority sites for heat networks in Huntingdon, Ely and March, we adopted a simple approach, informed by LAEP methodology (see Section 2), the BEIS heat network zoning methodology (see Section 2), and the BEIS report "Opportunity areas for district heating networks in the UK"[61].

First, we used the data from Section 6 to identify concentrated areas with high heat demand: these, if possible, should become high priority areas for heat network development. Then we assessed the availability of possible heat sources near those areas.

Step-by-step

In more detail, our methodology is captured by these seven steps:

[61] https://www.gov.uk/government/publications/opportunity-areas-for-district-heating-networks-in-the-uk-second-national-comprehensive-assessment

1. Within the urban areas of each demonstrator site, generate a gas consumption map at postcode level, with data plotted as annual gas consumption per postcode (from 2019). Obtain gas consumption data from the BEIS Sub-national electricity consumption data reports[62].
2. For each postcode, divide total gas consumption by the number of gas meters to estimate gas consumption per building. Take these values as a proxy for annual heat demand.
3. Create a map to show postcodes where annual heat demand per building exceeds 13.5 MWh/yr (13.5 MWH/yr is the average gas consumption for domestic properties in the East of England).
4. Mark each of those postcodes as a high priority site for heat network planning.
5. Identify clusters of such high priority postcodes which are adjacent to each other to define the boundaries of a potential heat network (heat zone). Where possible, avoid defining a heat zone which crosses major roads or geographical boundaries.
6. Using OS maps and Cambridgeshire County Council's asset maps, consider the following factors:
    a. Does the zone contain any council assets, e.g. council buildings, council-owned land or council housing?
    b. Does the zone contain buildings of similar physical characteristics?
    c. Does the zone contain any large "anchor loads" like schools, hospitals or leisure centres?
7. If the answer to any of 6a, b or c is yes, proceed by considering potential heat sources for the heat network:
    a. Are there any existing heat sources within or geographically adjacent to the zone? (E.g. power plants, waste heat sources, significant bodies of water)
    b. Is land available for the construction of an energy centre (using a location-agnostic heat source such as CHP or biomass boilers)?

A wide variety of considerations informed the development of this step-by-step process, including but not limited to the following:

- Large buildings with high and relatively constant heat demand throughout the year (e.g. leisure centres, hospitals, schools, care homes), also known as anchor loads, can help to balance heating load and make a heat network more efficient[63].
- Networks that include a mix of residential, public and commercial customers tend to be more efficient, as heat demand from the various building types averages out to produce more stable demand overall[64].
- Heat networks are most efficient in dense areas where separation between buildings is low, so that the length of the pipe network and heat loss are both minimised[65].
- Units with similar characteristics often require similar upgrades to connect to a new heat network, and by connecting such clusters all at once, overall infrastructure and installation costs can be reduced (similarly, connecting many-unit buildings, like blocks of flats, is often cheaper than connecting separate buildings).

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62 https://www.gov.uk/government/collections/sub-national-electricity-consumption-data
63 https://www.sciencedirect.com/science/article/pii/S0301421516304281?via%3Dihub
64 https://researchbriefings.files.parliament.uk/documents/POST-PN-0632/POST-PN-0632.pdf
65 https://www.bre.co.uk/filelibrary/SAP/2016/CONSP-04---Distribution-loss-factors-for-heat-networks---V1_0.pdf

- Heat networks should be designed to minimise destruction or disruption of existing infrastructure and geographical features (e.g. roads or rivers), to reduce capital costs and minimise environmental damage.

Assumptions and limitations

One limitation to the approach outlined above is that it uses gas consumption as a proxy for heat demand — which is an approximation, albeit a relatively reliable one. However, this does mean that we do not account for properties that are disconnected from the gas grid. Further studies should include non-gas properties to provide a more accurate and fine-grained view.

We have also assumed that each building connected to the gas grid has only one gas meter. This assumption is unlikely to significantly affect our results, since less than one percent of properties in the UK had more than one gas meter in 2013, and that statistic is unlikely to have significantly changed since[66].

A more serious limitation of our study is that it prioritizes areas with high heat demand without undertaking a detailed study of building energy efficiency. Insulation upgrades should be implemented in combination with low-carbon technologies like heat networks to help Cambridgeshire achieve its emissions targets, and future studies should consider energy efficiency data alongside the heat demand data we have presented here.

Huntingdon

Using the heat demand maps in Section 6, we identified three potential heat zones in Huntingdon. These are marked in Figure 21 as zones 1, 2 and 3.

Zone 1

Zone 1 is in southwest Huntingdon. It contains residential properties, Hinchingbrooke Hospital, Hinchingbrooke School, Hinchingbrooke House, and the Cambridgeshire Constabulary HQ. Metered gas data was not available for the postcodes containing the hospital, school, Hinchingbrooke House and constabulary, but estimates of the heat demand of these buildings can be obtained from Energy Performance Certificates and Display Energy Certificates[67]. These public buildings would act as large anchor loads for the proposed heat network, ensuring a high and relatively constant heat demand.

Zone 1 does not include any existing heat sources — however, it is located next to Hinchingbrooke Country Park, a council asset. Options for installing a heat network in or near the park could be explored, but any plan would need to preserve the natural surroundings as best as possible.

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[66]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1021891/Sub-national_methodology_and_guidance_booklet_2021.pdf

[67] https://epc.opendatacommunities.org/

Zone 2

Zone 2 is in the Stukeley Meadows region of Huntingdon. It contains primarily residential properties, in addition to Stukeley Meadows Primary School and a large supermarket.

It might be possible to recover some of the waste heat from the supermarket for use in a low-temperature heat network — however, a survey would be required to determine the amount of waste heat produced and the technical feasibility of installing a heat recovery unit. Otherwise, Zone 2 includes council-owned land both on the site of Stukeley Meadows School and north of the A141. Either one of those areas could be developed to house an energy centre.

Zone 3

Zone 3 is in the Hartford region of northeast Huntingdon. This zone is similar to Zone 2 in that it contains primarily residential properties with high heat demand. Zone 3 is surrounded by several major roads, but includes some council-owned land along the edge of the A141 and the B1514..

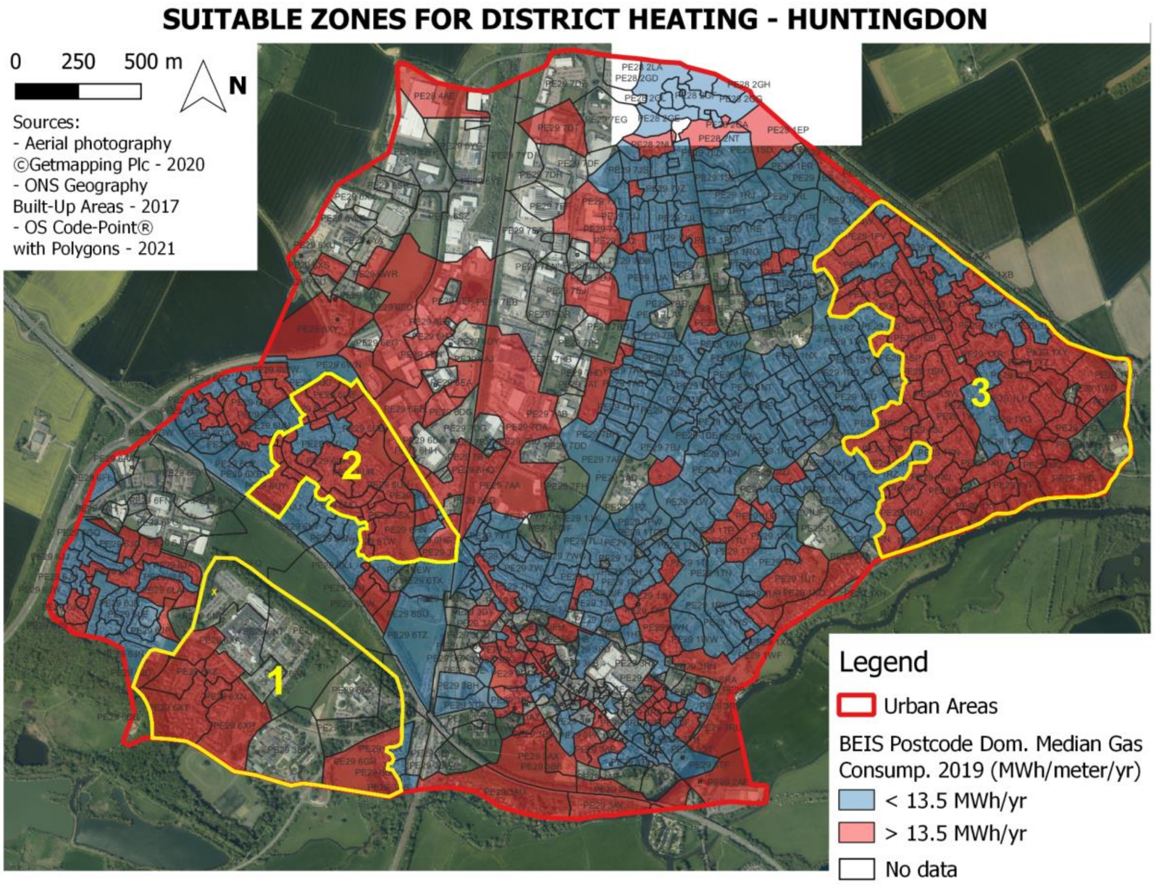

Figure 21: Potential heat zones in Huntingdon (each is outlined in yellow).

Ely

In Ely, we identified one indicative potential heat zone near the centre of the urban area (Figure 22). This zone comprises residential properties, Highfield Ely Academy, Bishop Laney Sixth Form, Ely College and The Lantern Primary School. It does not contain existing heat sources, but land on the school sites could be used to house an energy centre. We decided not to extend the zone east of Lynn Road to avoid disrupting major infrastructure.

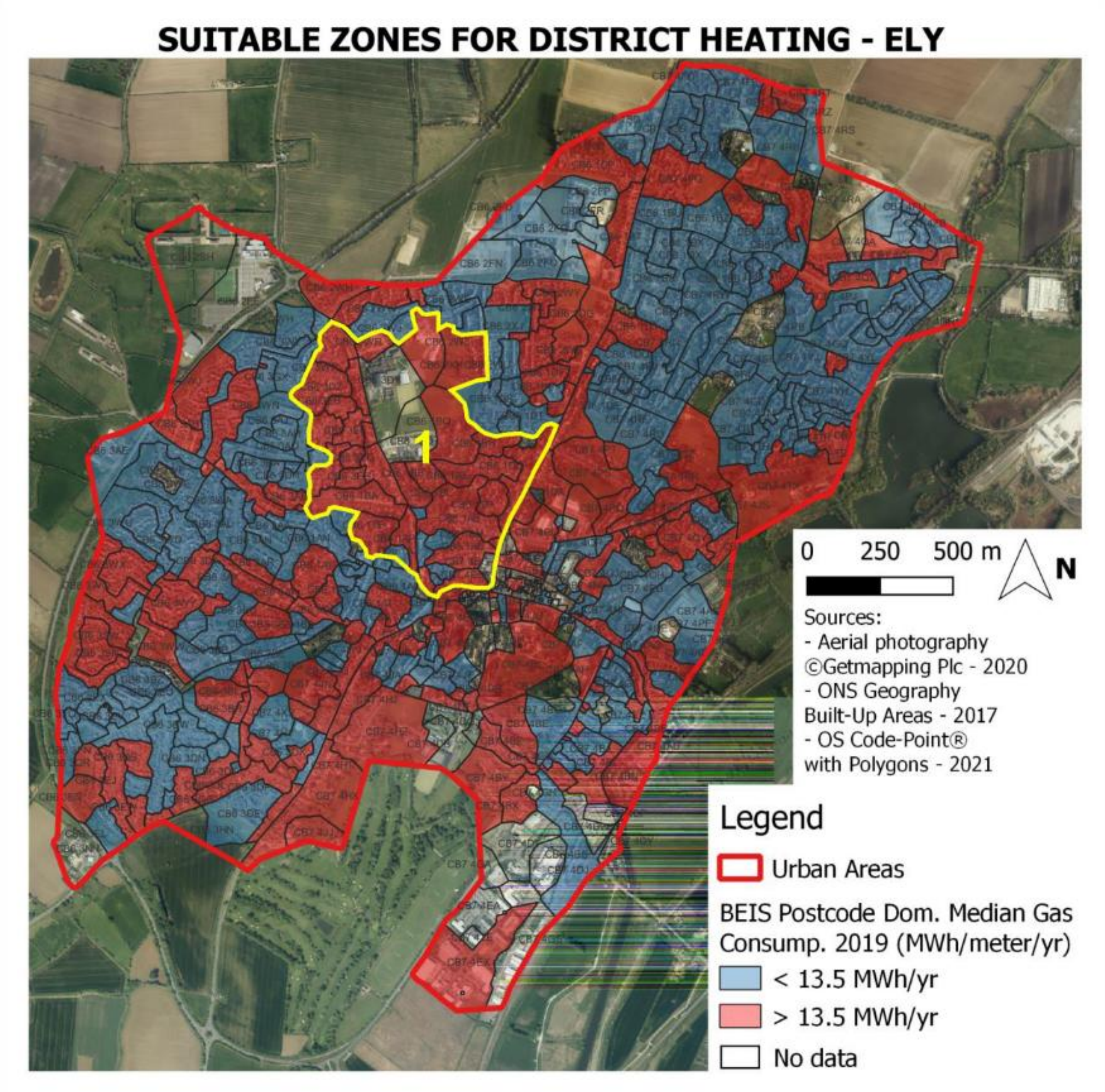

Figure 22: A potential heat zone in Ely.

March

We identified two indicative potential heat zones in March (see Figure 23).

Zone 1

Zone 1 is located in the centre of the urban area. It includes a variety of building types, from residential properties to bigger sites like March Town United Football Stadium, Westwood Primary School, March Fire Station and the Fenland District Council building. It does not include existing heat sources, but land is available near March Train Station in the postcode PE15 8NE.

Zone 2

Zone 2 is in the south of the urban area. It contains a mix of building types, including a care home, the Neale-Wade Academy and residential properties. We have designated Zone 2 as a potential heat zone because of its proximity to a large plot of council-owned land (in the postcodes PE15 9SL, PE15 9SB and PE15 9SD). That plot could be an ideal location for an energy centre.

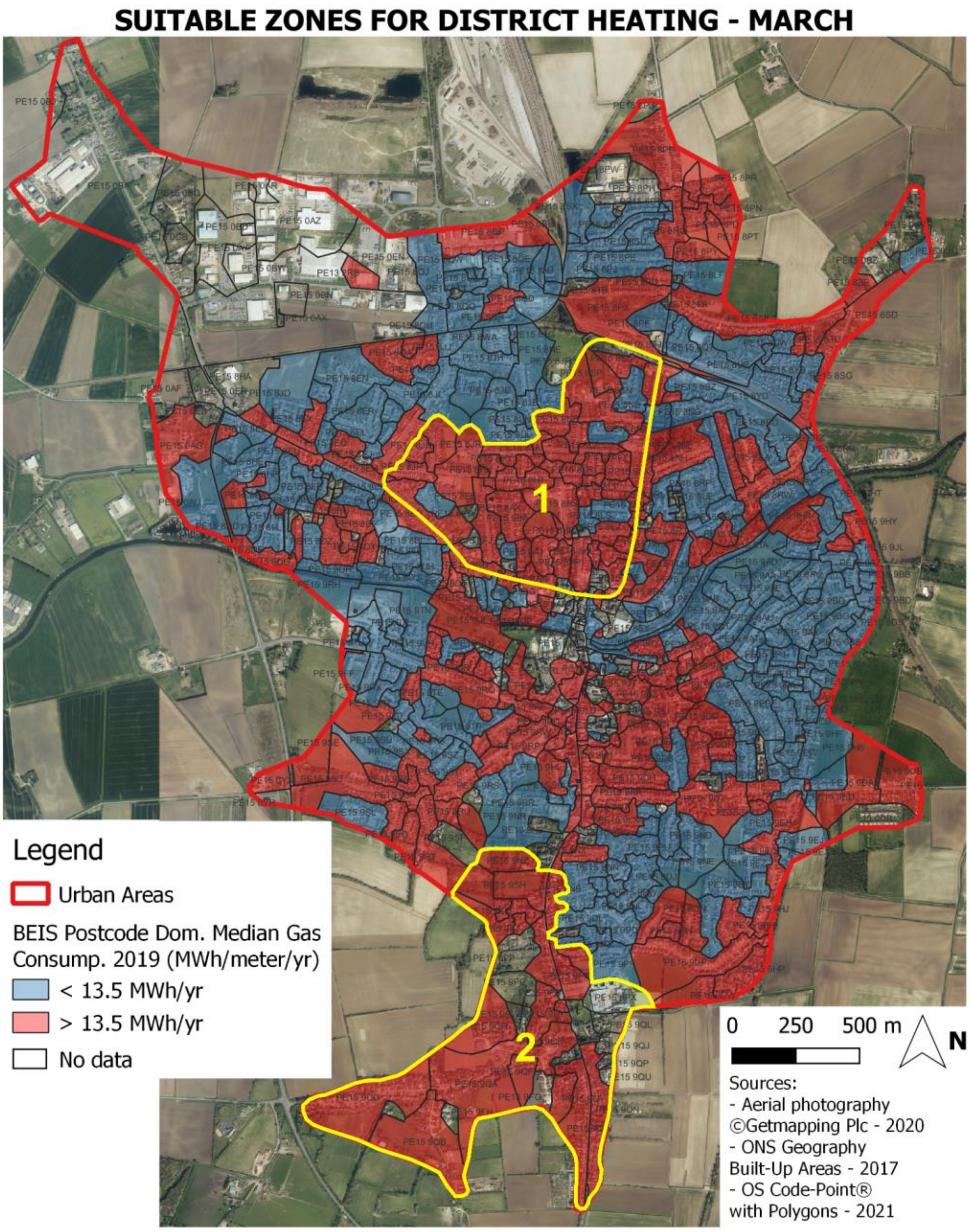

Figure 23: Potential heat zones in March.

Recommendations

In Huntingdon, we recommend prioritizing Zone 1 for heat network planning. This zone contains a mixture of building types and several large anchor loads which would guarantee high future heat demand, minimising the risk associated with heat network development. Several of its buildings are county council assets, and could therefore be connected to a network at the council's discretion, without the need to convince private owners. Zone 1 includes several suitable locations for an energy centre, including the land attached to Hinchingbrooke School, Hinchingbrooke Country Park, and the council-owned land in the postcode PE29 6GP. Waste heat recovery from the hospital might also be possible, although a full technical study would be required to assess the viability of that option.

In Ely, we identified only one potential heat zone; this zone should become the highest priority site for heat network development in the city. It contains several schools and colleges, which could be connected as anchor loads. Land available on the school sites could be used to house an energy centre — or an energy centre could be located just north of the urban area. The zone is surrounded by several major roads, but it could be extended to include the leisure centres in postcode CB6 2FE. A full cost-benefit analysis would be required to determine whether the construction costs of extending the network outweigh the benefits of connecting those extra anchor loads.

In March, Zone 1 should be prioritized, as it contains council-owned assets and the Fenland District Council building. These properties would serve as excellent anchor loads. Zone 2 is also a promising option, and could even be implemented later on as an extension to Zone 1. It includes a good mix of building types and several anchor loads.

Carbon Savings

To estimate the carbon savings associated with installing heat networks in Huntingdon, Ely and March, we used data on the carbon intensity of different heat sources to compare the carbon intensity of the current heating infrastructure in those areas (currently dominated by gas boilers) with the carbon intensity of running heat networks powered by various sources.

The results of this analysis are displayed in Tables 2, 3 and 4 respectively. For the options that include heat pumps, we have used the predicted 2050 value for carbon intensity of the electricity grid (CIG): 14 gCO_2eq/kWh.

In Huntingdon and Ely, all buildings included in the calculation of total heat demand which we assessed using EPCs and DECs are heated using natural gas. For March, we only used BEIS gas consumption data; there were no additional buildings within the proposed heat zone which had publicly available EPCs or DECs.

Huntingdon heat zone

Total current heat demand of heat zone	24,323 MWh/yr
Current heat source for heat zone	100% natural gas
Estimated current carbon emissions (natural gas)	5100–9230 tonnes CO2/yr
Equivalent carbon emissions from alternative heat sources	
CHP (natural gas)	5350–15800 tonnes CO2/yr
Geothermal	240 tonnes CO2/yr
Ground source heat pumps (CIG 14)	70–170 tonnes CO2/yr
Air-source heat pumps (CIG 14)	100–240 tonnes CO2/yr

Table 2: Total current heat demand and estimated current carbon emissions in the proposed heat zone in Huntingdon. We estimate the equivalent carbon emissions from alternative heat sources using the data in Table 1.

Ely heat zone	
Total current heat demand of heat zone	10,650 MWh/yr
Current heat source for heat zone	100% natural gas
Estimated current carbon emissions (natural gas)	2240–4050 tonnes CO2/yr
Equivalent carbon emissions from alternative heat sources	
CHP (natural gas)	2340–6920 tonnes CO2/yr
Geothermal	110 tonnes CO2/yr
Ground source heat pumps (CIG 14)	30–75 tonnes CO2/yr
Air-source heat pumps (CIG 14)	40–110 tonnes CO2/yr

Table 3: Total current heat demand and estimated current carbon emissions in the proposed heat zone in Ely. We estimate the equivalent carbon emissions from alternative heat sources using the data in Table 1.

March heat zone	
Total current heat demand of heat zone	15970 MWh/yr

Current heat source for heat zone	100% natural gas
Estimated current carbon emissions (natural gas)	3350–6070 tonnes CO2/yr
Equivalent carbon emissions from alternative heat sources	
CHP (natural gas)	3510–10380 tonnes CO2/yr
Geothermal	160 tonnes CO2/yr
Ground source heat pumps (CIG 14)	50–110 tonnes CO2/yr
Air-source heat pumps (CIG 14)	60–160 tonnes CO2/yr

Table 4: Total current heat demand and estimated current carbon emissions in the proposed heat zone in March. We estimate the equivalent carbon emissions from alternative heat sources using the data in Table 1.

Within the designated heat zones, a switch from natural gas to geothermal energy or heat pumps could therefore dramatically lower annual carbon emissions — by up to 96% at present, and up to 99% by 2050 (if decarbonisation of the electricity grid meets its predicted targets).

Although CHP plants are the most common heat source for existing heat networks, they do not provide significant enough savings compared to individual gas boilers. Geothermal energy, heat pumps, and waste heat recovery are lower-carbon technologies that will help the CCC to achieve its net-zero goals; these are the technologies that should be considered for powering heat networks in Huntingdon, Ely and March.

Land Use Planning

Since 2011, all heat pumps (air, ground and water) in England have been considered a permitted development, and in general they can be installed without planning permission. Some exceptions could apply, however — for example, the installation of a ground source heat pump within an area of conservation would only be able to proceed given permission from the relevant authorities and stakeholders.

Both national and local policies on land use and planning permission should be taken into account before progressing with the proposed heat zones. We summarise some key considerations below.

National

At a national level, relevant policy considerations include the planning regulations set out in the *National Planning Policy Framework*. In particular:

Chapter 2: Achieving sustainable development highlights that any planning interventions should contribute towards a sustainable pattern of development, and that there is a "general presumption in favour of sustainable development"[68].

Chapter 11: Making effective use of land concerns the importance of encouraging multiple benefits from both urban and rural land, recognizing that undeveloped land can itself be of great value, prioritizing previously-developed or 'brownfield' land where possible for development, prioritizing under-utilised land, accounting for changes in demand for land, and achieving appropriate density on land such as that it promotes equitable living standards[69].

Chapter 13: Protecting Green Belt land addresses the need to prevent urban sprawl by keeping some areas permanently open and unaffected by development. If a Green Belt site is proposed for a heat network, it will "comprise inappropriate development" unless the planning authority can demonstrate "very special circumstances," such as the positive externalities from increased renewable energy production.[70]

Chapter 14: Meeting the challenge of climate change, flooding and coastal change encourages authorities to become proactive in implementing measures to adapt to and mitigate against climate change. It stresses that development should avoid increasing vulnerability to climate change impacts while also reducing greenhouse gas emissions.

Local

Relevant literature on local policy includes: *Huntingdonshire's Local Plan to 2036* (henceforth HLP, which covers Huntingdon), the *Fenland Local Plan 2014* (henceforth FLP, which covers March), and the *East Cambridgeshire Local Plan 2015* (henceforth ECLP, which covers Ely).

The HLP notes that Huntingdonshire is vulnerable to the impacts of drier summers resulting from climate change: it is situated in the driest part of the UK and consequently only experiences two-thirds of the average annual rainfall for England and Wales. The area encompasses a flat landscape with little cloud cover, which provides opportunities for solar and wind renewable energy generation. There are former Ministry of Defence sites which may give rise to development opportunities that do not impinge on the countryside and historic rural settlements.[71] The area has an increasing number of older people[72], who may not be immediately obvious target consumers for a heat network, but should nevertheless be considered as potential users. The HLP sets out a strategic vision to "support the health and wellbeing of all its residents" by, among other things, "providing sufficient infrastructure to support healthy communities," "meeting the needs of a changing

[68] *National Planning Policy Framework* (NPPF) (London: Ministry of Housing, Communities and Local Government, 2021), p. 6.
[69] Ibid., pp. 35-37.
[70] Ibid., pp. 41-44.
[71] *Huntingdonshire's Local Plan to 2036* (Huntingdon: Huntingdonshire District Council, 2019), p. 22.
[72] Ibid., p. 20.

population" and "working with our climate, landscape and heritage." [73] As part of this, it identifies green infrastructure as a core part of its development strategy.[74].

The FLP presents a similar commitment to promoting sustainable development and reducing impacts from climate change, presumably informed by the NPPF's messages in this direction. It identifies March as a priority site for growth and development, given its status as one of the four market towns in the area.[75] Local Plan 14 (LP14) considers the imperative of switching to renewable or low carbon energy sources, within the context of chronic fuel poverty in parts of the district, a desire to shift to a 'green economy' and create jobs in Fenland, the need to upgrade the energy performance of existing buildings and avoid capacity overload on the power infrastructure network, and the need to combat climate change. According to the FLP, renewable energy projects will be considered subject to their impact on the surrounding landscape, visual and residential amenity, noise pollution, highway safety, biodiversity, aircraft activity and high quality agricultural land. [76]

Aside from the analogous commitments to sustainable development, the ECLP mentions the possibility of establishing a Community Energy Fund as a way to finance renewable energy initiatives that benefit the local community.[77] The plan maintains that renewable energy projects should be sensitive to other considerations, such as: not disturbing key views (particularly of Ely Cathedral), maintaining biodiversity, avoiding areas earmarked for airfields, and protecting heritage assets.[78] It includes a particular Ely-focused remit to promote the historic "distinctiveness" of the city and have this reflected in new development applications, in tandem with ensuring the city's climate resilience. Developments should enhance the rural setting and the city's cultural heritage, while also contributing to sustainable growth of the local economy.[79]

Future Work

We have used a simple approach to map potential heat zones. In future, a full cost-benefit and socio-economic analysis should be conducted to determine whether these zones are truly viable, in line with the methodologies of LAEP or BEIS (Section 2).

By working with heat network providers and third-parties, the Council should conduct a technical analysis of the proposed zones to determine the approximate infrastructure costs associated with each. The installation and maintenance costs of the various possible heat sources should be weighed against their carbon emissions. But, as outlined above, we highly recommend that the Council only considers low- or zero-carbon heat sources.

In addition, it would be worth conducting a detailed and area-specific analysis to compare the pros and cons of installing a heat network with the pros and cons of installing other types of low-carbon heating

[73] Ibid., p. 25.
[74] Ibid., p. 37ff.
[75] *Fenland Local Plan 2014* (Fenland District Council, 2014), p. 16.
[76] Ibid., pp. 64-65.
[77] *East Cambridgeshire Local Plan 2015* (East Cambridgeshire District Council, 2015), p. 73.
[78] Ibid., p. 74.
[79] Ibid., p. 155.

infrastructure — including, for example, heat pumps in individual homes. As noted previously, buildings with high heat demand may only have high heat demand because they suffer from poor insulation. The emissions of such buildings could be dramatically decreased by insulation retrofitting even without the help of a heat network. At the same time, however, almost all properties in the UK must ultimately transition to low-carbon heat sources in order to reach UK-wide emissions goals. So there should be no harm in installing heat networks in these areas regardless — they will be required to connect to a heat network or alternative low-carbon heat solution eventually.

We emphasize that we have estimated heat demand using only BEIS gas consumption data and EPCs/DECs, and we are therefore missing data from buildings without reported EPCs or a connection to the gas grid. Future analysis should include data for these buildings to map current heat demand even more accurately. Even for buildings with reported EPCs, updated data should be obtained for those whose certificates are more than a few years old.

We also note that we have only considered the current heat demand of the three demonstrator sites. In a follow-up study, the future energy demand of these areas could be modelled using the projections discussed in Section 4 (Future Energy Scenarios) and other growth scenarios. Relatedly, the possibility of installing heat networks for planned housing developments should be assessed. It is much cheaper and less disruptive to install heat network infrastructure for properties that are still being planned and built.

In addition, our analysis has been based primarily on gas consumption data. A whole-system analysis, incorporating current and future projections of electricity demand, would allow the Council to better model future demand on its electricity grid. This will become increasingly important as heat pumps and other electric heating technologie become more widespread across the UK.

Finally, future studies should engage with a range of stakeholders, including Local Authorities, businesses, UKPN, and residents. Consumers will need to be reassured that the cost of connecting to a heat network will not exceed the cost of installing alternative technologies like individual ASHPs.

8. Conclusions and future research

This report has identified potential priority zones for heat network development in three areas of Cambridgeshire: Huntingdon, Ely and March. By mapping current energy consumption data, we outlined three promising potential heat zones in Huntingdon and the first priority area. We outlined one zone in Ely. And we outlined two in March, again identifying the first as higher priority.

We have suggested that only low-carbon technologies like geothermal energy, heat pumps, and recovery of waste heat should be considered as heat sources for these heat networks. When powered by low-carbon sources, heat networks in Huntingdon, Ely and March could reduce heating-related carbon emissions in those areas by up to 99% by 2050.

As we progress towards 2050, Cambridgeshire must decide if it wants to lead the way towards UK-wide emissions reduction goals. Decarbonisation of its heat supply is one of the most important and decisive actions that it could take in that direction.

The research presented here is only a first step: future studies should expand on our results and conduct a full cost-benefit and socio-economic analysis of the proposed heat zones.

Appendix 1

Great Manchester Spatial Energy Planning

The Greater Manchester Spatial Energy Plan[80] is a study that provides an assessment of the existing energy demand and supply in Greater Manchester (GM); an analysis of the impact of planned future growth to 2035; and the technical potential for decentralised, low carbon and renewable energy in supporting GM energy and climate change goals.

GM is a metropolitan county in North West England, with a population of 2.7 million people and approximately 1.1 million homes. Almost all of GM is classified as a major urban conurbation, with some fringe areas classified as urban city or town and a small number of areas as rural town or village.

Energy and Heat Demand

GM uses 51.6 TWh/year of energy. Homes in GM account for 37% of this demand, while the non-domestic sector accounts for 35% and Road Transport for 28%. The heat demand for the GM region is identified to be 21.7 TWh/yr, which accounts for 42% of the total energy demand[81]. This is split between residential (67%), non-domestic (27%) and transport (6%) (Figure 12).

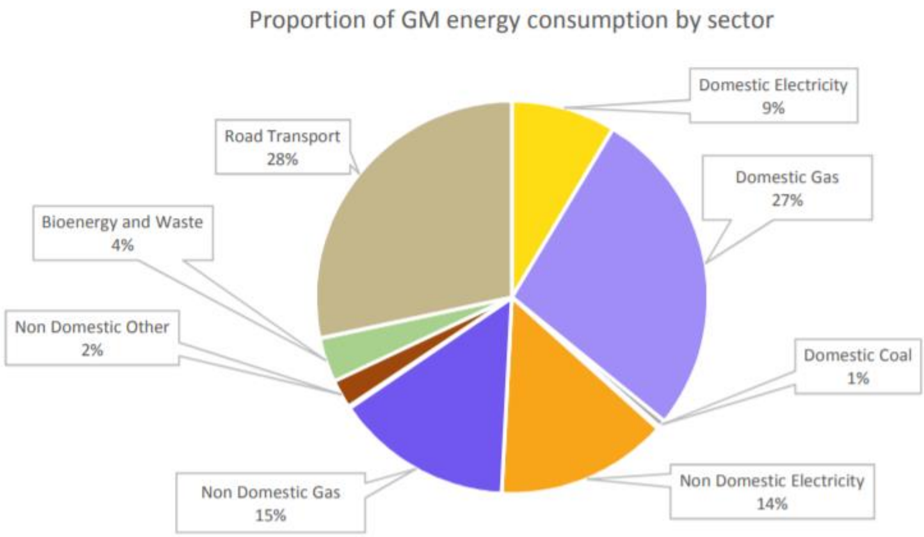

Figure 1: Proportion of Greater Manchester's energy demand.

Space heating and hot water are estimated to account for 77% of domestic energy demand. For domestic use, gas is the primary heating fuel for homes (96%), with electricity accounting for 2%, and coal and oil for 2%, particularly concentrated in Wigan. The areas that use coal and oil often have domestic buildings with poor thermal efficiency and high levels of fuel poverty. Around 35,000 properties (3%) have never had a gas

[80] https://www.greatermanchester-ca.gov.uk/media/1277/spatial-energy-plan-nov-2016.pdf

[81] https://www.cse.org.uk/projects/view/1183

connection and can be considered off-grid. In the non-domestic sector, industry and retail accounts for the largest proportion of the demand, 20% each, while government buildings and education accounts for 10%.

Cooling demand, on the other hand, is difficult to estimate as the available benchmarks do not cover cooling, so it is included in the general electrical usage demand. However, the introduction of cooling demand methodologies into the building regulation energy requirements will be more important as temperatures increase and city centre densities get higher. Greater London has developed a methodology to benchmark new build residential buildings for cooling demand[82].

Electricity and gas distribution network

Greater Manchester has 137 33kV substations feeding 11,205 distribution substations. The capacity of a substation is an indication of how much development and increased load could be handled without infrastructure upgrade. All new developments and upgrades to existing buildings have to be assessed for network capacity and major shifts in technology can cause some issues. The capacity of GM's electricity network to accommodate increased demand is considered generally robust. However, there are a number of areas with limited capacity to accommodate new demand .

The network distribution of gas in the study area is carried out by National Grid Gas Networks. The UK gas pipeline network is extensive and just 5% of all postcode units in the GM region have been identified as having never had a gas connection.

Building Energy Performance

GM has a wide range of building ages and types which influences energy consumption across the region. The housing stock is predominately pre 1980s. Older buildings are likely to be more energy intensive due to lower levels of insulation and less efficient heating systems. While, newer buildings are typically more energy efficient. Two thirds (67%) of domestic properties have an Energy Performance Certificate (EPC), and 60% of the domestic buildings in GM have low thermal efficiency. And it is expected that as many as 90% of these buildings will still be in use in 2050.

Total energy usage in non-domestic buildings is complex to estimate due to sparse and inconsistent data, the wide variety of construction methods, multiple uses and constant change of use. Less than 1% of non-domestic floor area in GM has an associated EPC. Since 2015, public buildings with a floor area of over 250m^2 must display a Display Energy Certificate (DEC). These DECs show that more than 80% of public buildings are classified from D to G in GM. With around 10% in the worst category, G. Identifying cost effective pathways for the retrofit of energy efficiency, as part of a coherent whole systems approach, is essential to support GM's long term decarbonisation targets.

[82] https://www.london.gov.uk/sites/default/files/gla_cooling_benchmarking_study_final2.pdf

Carbon Emissions

Greater Manchester's total annual carbon emissions are 13.5 $MtCO_2$ (2014), equivalent to 5 tonnes of CO_2 per capita. The UK national average is 6.3 tonnes CO_2 per capita. This lower value is due to much lower carbon emissions from heavy industry in the GM region, in comparison to the UK average.

GM's carbon targets are aligned with The Climate Change Act (2008), which established a target for the UK to reduce its greenhouse gas emissions by at least 80% from 1990 levels by 2050. However, sub-national data on energy use and emissions has only been collected since 2005, so the GM's environmental strategy team undertook its own analysis to produce a 1990 baseline for GM.

Carbon Emissions between 2005 and 2014 have reduced 26% (Figure 13). The industrial and commercial and domestic sectors had a greater reduction since 2005 (31%) than transport (14%). Furthermore, the transport sector is much less variable as it doesn't respond to factors like cold winters whereas the other sectors do. The emissions from change of land use are insignificant in comparison to the other sectors. To put local actions in context, the national electricity grid has reduced carbon emission associated with power generation by around 33% since 2005. In order to meet these long-term carbon targets near-full decarbonisation of both buildings and surface transport is required.

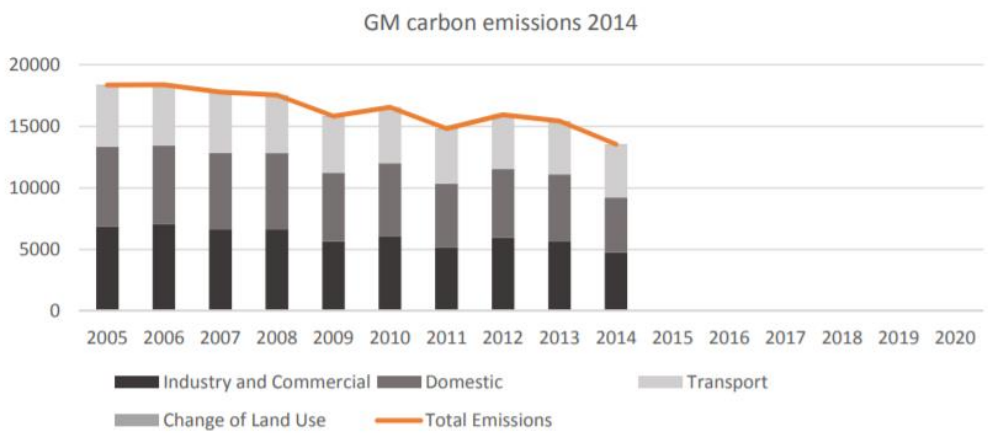

Figure 2: Carbon emissions in Greater Manchester 2005-2014.

Future Scenarios

Two future energy scenarios for Greater Manchester have been developed. These models are based on the National Grid Future energy scenarios methodology - more specifically in the Gone Green and No Progression figures - but recalculated using the regional projections for households and floor space. Buildings are dealt with on a domestic, commercial and industrial basis with new build and existing buildings modelled separately. Transport projections from DECC have been used alongside the FES assumptions. The two scenarios are the following:

- **Business-as-Usual** - this scenario is focused on achieving security of supply at the lowest possible cost. With low economic growth, traditional sources of gas and electricity dominate, with little innovation affecting how we use energy. There is low take up of low carbon heating technologies and efficiency of building stock is not prioritised

- **Green Aspiration** - this represents the scenario where government policy is strongly supportive of renewables and low carbon technologies while meeting carbon reduction targets. Low carbon heating and transport are widely implemented. The electricity grid is completely decarbonised and building efficiency is strongly pushed.

Household and non-domestic growth projections have been taken from the Greater Manchester Forecasting Model (GMFM). By 2035 GM is forecast to have 233,000 new homes (an increase of 17%) and 6.6 million m^2 of additional commercial and industrial floor space (an increase of 22%). Forecast growth of new homes and non-domestic buildings in GM could increase energy demand by around 3% by 2035. The current and projected future changes in floor area and households have been used to calculate future energy demand. For the Green Aspiration scenario, new stock is assumed to have better energy performance benchmarks and existing stock is upgraded through retrofit measures.

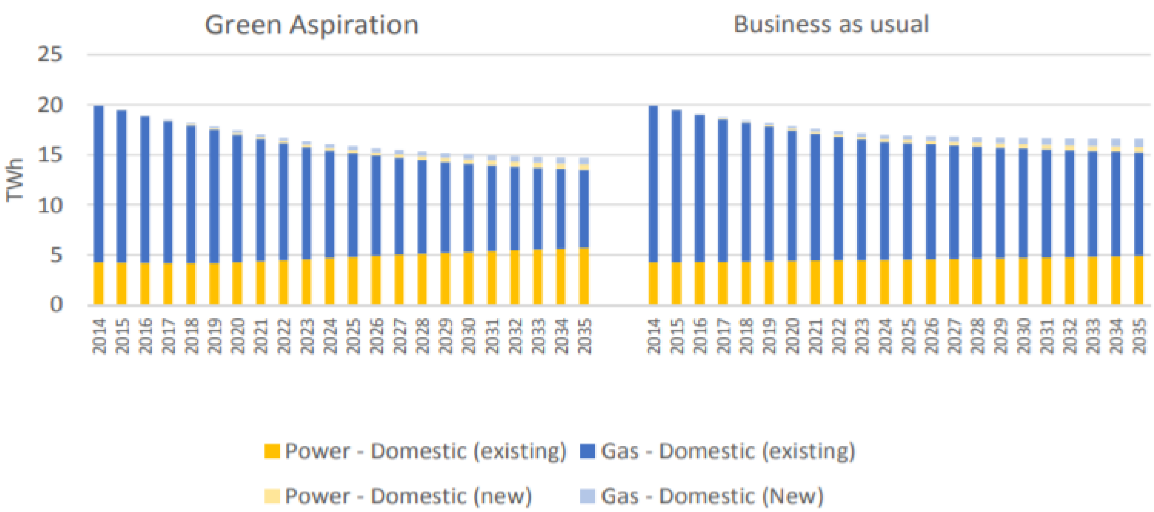

Figure 3: Domestic energy consumption projection for Greater Manchester.

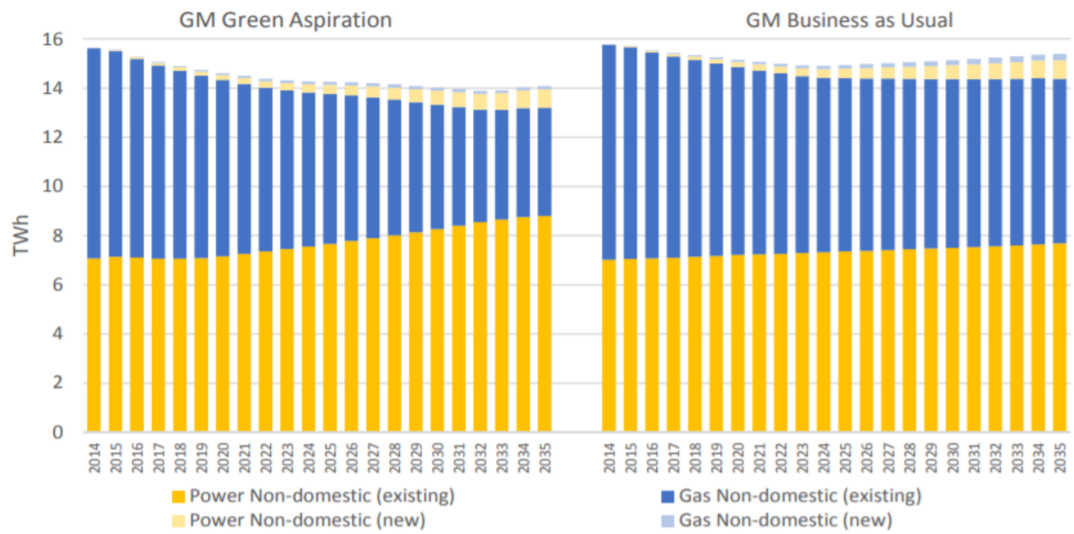

Figure 4: Non-domestic energy consumption projection for Greater Manchester.

To achieve the GM carbon emission target, buildings will have to change almost entirely to different sources of energy for heat and hot water. According to the study, the technologies with the highest technical potential to contribute to a low carbon energy system include district heating, individual electric heat pumps, and bio-fuels and solar technologies for both hot water and electricity.

According to the study, up to 68% of existing gas demand could technically be replaced with renewable heat from heat pumps, solar thermal and bioenergy within the GM region. Ground Source and Air Source Heat Pumps have the technical potential to contribute to 12,400 GWh/yr (50%) of current GM domestic and non-domestic heat consumption. Heat pumps could play a significant role in the decarbonisation of existing homes, particularly in the less built up areas.

District Heating has the technical potential to expand significantly in GM. District Heating can utilise a range of low carbon and renewable technologies and the technical potential for gas CHP led high efficiency District Heating in the North West has been estimated as 37,000 GWh/yr with a cost-effective potential of 4,000 GWh/yr21 under current market and regulatory arrangements.

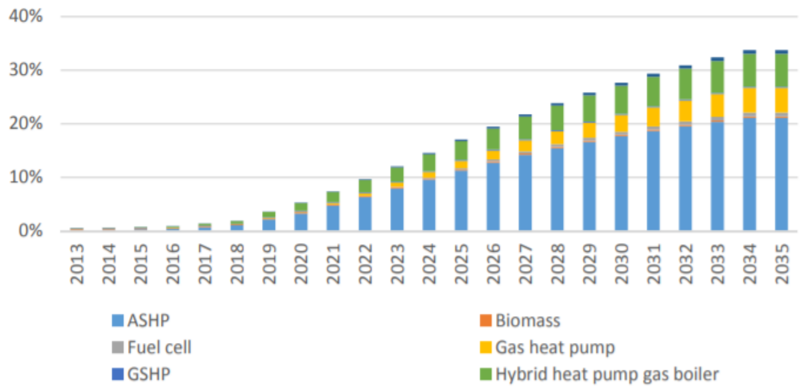

Figure 5: Installed low carbon technologies in the Green Aspiration scenario for Greater Manchester..

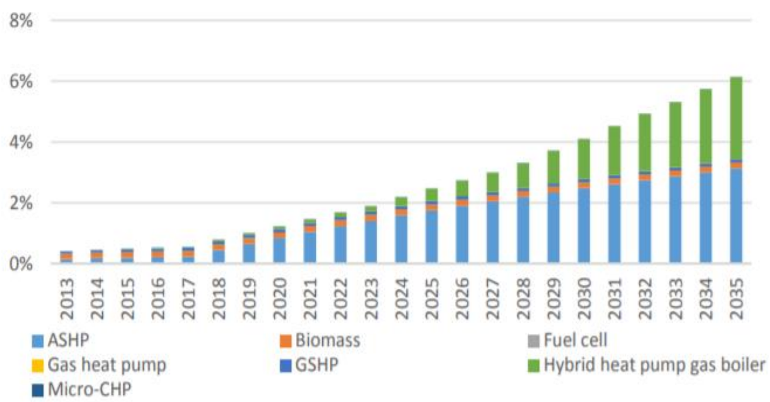

Figure 6: Installed low carbon technologies in the Business As Usual scenario for Greater Manchester.

In the Green Aspiration scenario, the 2050 target is reached (3.4 MtCO2 in 2050 compared to the 4.2 MtCO2 target), with the grid completely decarbonising and the residual gas demand reducing enough that the emissions remain close to the 2050 target despite significant emissions from the transport sector which make up 58% of all emission in 2050. In the Business-as-Usual scenario, the 2050 target is missed by 4 MtCO2, which shows that "Business as Usual" is not an option if targets are to be achieved. An aggressive decarbonisation of the grid alongside improved efficiency of existing stock, through retrofitting fabric and heating system measures, is necessary to achieve the carbon targets.

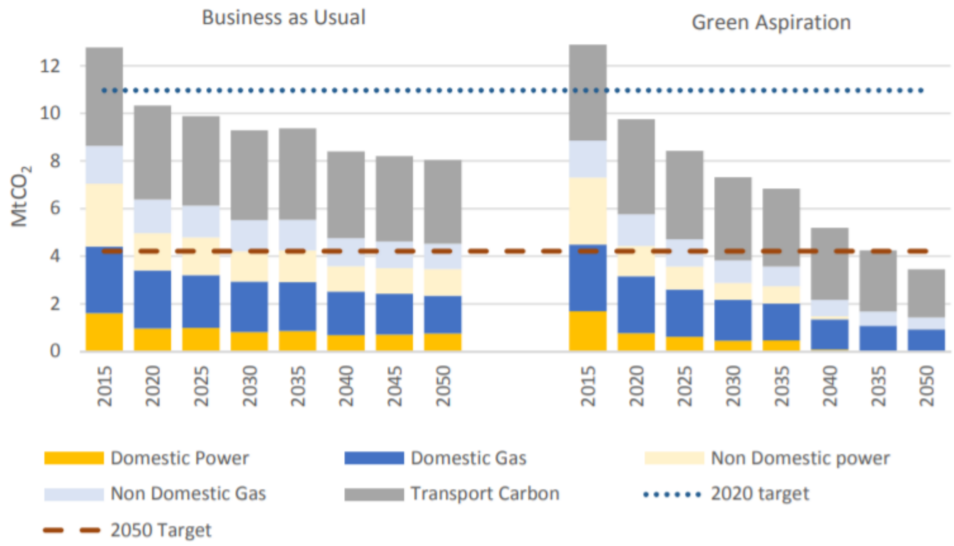

Figure 7: Comparison between Business as Usual and Green Aspiration scenarios carbon targets.

Appendix 2

Swaffham Prior[83]

One location in Cambridgeshire which has already begun transitioning to a low carbon heating supply is Swaffham Prior. Swaffham Prior is a rural village in Cambridgeshire (East Cambs) with 300 homes (>800 residents). One third of these homes are affordable housing and there are also two churches, a pub and a school. It is unconnected to the gas network, meaning oil is currently the main source of fuel. 75% of houses are heated with oil or LPG and 25% with electricity.

The district heating network needs to supply maximum (peak) demands. Therefore knowledge of typical annual and daily demands was needed to estimate the daily demand profile and peak heat demands. The data came from the National Heat Map[84] and the EPC (Energy Performance Certificate) database[85] (for 167/229 houses). The housing stock is predominantly detached and semi-detached houses with about 15% bungalows. Swaffham Prior Primary School's heat demand is based on the DEC (Display Energy Certificate) information and the demand profile based on monitored data for a primary school of similar construction. Raw data collection was also conducted by households in Swaffham Prior agreeing to the installation of a heat metre in their homes. These heat metres gave an indication of how much energy the village uses currently. Maximum (peak) demands are therefore estimated to be 8 kW for space heating and 33 kW for hot water.

Swaffham Prior's energy centre is a combination of an 1.5 MW ground source heat pump and a 500 kW air source heat pump with 200 m^3 of thermal storage. There will be a connection to the council's 29 MW North Angle Solar Farm via a private wire network. A 1,500 kW electrode boiler will be used as back-up, delivering 100% renewable energy. This combination will supply a minimum of 72°C to customers. A water source heat pump was dismissed because the nearest water source (Gutter Bridge ditch) was too far away to be effective. A straw biomass boiler which uses agricultural waste (abundant in Swaffham Prior) needed an operator, a year round supply of fuel and management of air pollution. Therefore, a straw boiler has a lower capital cost and cost of heat than a ground source open loop borehole heat pump, which is the chosen technology, but the boiler would have required more intervention and maintenance and local residents discounted this option.

The energy centre is located on council land with a network of pipes connected to individual homes. It is away from most houses but close to the main road, under which pipes can be laid. The Council has powers from the 1976 Local Government Act, that allows it to generate, distribute and sell heat. This allowed it to install services along the road network so there are no negotiations required to allow pipes to run through third parties' properties. With every increase in nominal pipe size the heat losses increase by 10% and the capital costs by 15%. A plastic twin pipe (two pipes wrapped in the same insulated outer pipe) is used with flow temperatures of 65-75°C. Return temperatures should be between 40 and 55°C. Copper pipes are used to service each house and traditional boilers are replaced with a heat interface unit (HIU), to supply hot water instantaneously or via a hot water cylinder, with a heat metre for billing. Therefore, most homes can connect without upgrading their central heating system. Electrically heated homes would need to install a wet system of radiators and pipes in order to be able to connect. The district heat network operator takes on the responsibility to maintain and replace the HIUs. The heat interface unit installed is property of the Council

[83] http://www.swaffham-prior.co.uk/pc/CLT/study.pdf
[84] http://nationalheatmap.cse.org.uk/
[85] www.epcregister.com

and will replace existing boilers and be maintained by trained contractors. The installation of a heat network requires no upfront capital investment by the homeowner which might dissuade uptake of low carbon technologies. Customer satisfaction is paramount so the heat supply needs to be cost-effective and reliable.

Figure 1: A map of the heat network at Swaffham Prior, with hot water pipes (red) extending from the energy centre (white) underneath the roads to all the houses in the village

The financial assessment assumed that 50% of buildings would initially connect to the heat network, increasing to 90% over a five year period. The pricing for consumers was calculated based on the cost of oil heating. The assumed income from heat sales is equal to the current costs of provision of oil based heating in each house (EPC data used to estimate current heating costs). District heating does not have fixed costs associated with oil (e.g. boiler and oil tank servicing, replacement, repair) but these are spread over time as part of a standing charge. Importantly, the SPHN network needed to be equivalent to or cheaper than oil to attract customers and make it worthwhile to connect.

The total capital cost of the project is £11.9 million, to include £3.2 million of grant funding from the Heat Network Investment Project[86]. HNIP has £320 million to spend supporting the development of heat networks in the next 4 years, given out in grants or loans (although grants are mostly available to the public

86 https://cambridgeshire.cmis.uk.com/CCC_live/Document.ashx?czJKcaeAi5tUFL1DTL2UE4zNRBcoShgo=vKlVqcFqafxGke7QLsnMyI4IfKrXo1iz%2b8obHEKn%2fB8D%2blDfxN9gCw%3d%3d&rUzwRPf%2bZ3zd4E7Ikn8Lyw%3d%3d=pwRE6AGJFLDNlh225F5QMaQWCtPHwdhUfCZ%2fLUQzgA2uL5jNRG4jdQ%3d%3d&mCTIbCubSFfXsDGW9IXnlg%3d%3d=hFflUdN3100%3d&kCx1AnS9%2fpWZQ40DXFvdEw%3d%3d=hFflUdN3100%3d&uJovDxwdjMPoYv%2bAJvYtyA%3d%3d=ctNJFf55vVA%3d&FgPlIEJYlotS%2bYGoBi5olA%3d%3d=NHdURQburHA%3d&d9Qjj0ag1Pd993jsyOJqFvmyB7X0CSQK=ctNJFf55vVA%3d&WGewmoAfeNR9xqBux0r1Q8Za60lavYmz=ctNJFf55vVA%3d&WGewmoAfeNQ16B2MHuCpMRKZMwaG1PaO=ctNJFf55vVA%3d

sector). However, the HNIP funding is unlikely to exceed 50% of required investment. The feasibility of the project mainly depends on the connection rate; if there are fewer connections, only a small decrease in initial investment and operating costs is expected.

The Swaffham Prior heat network is installing a commercial-sized heat pump so planning permission was needed. To apply for planning permission, engaging with the community was key to understanding their concerns – these include visual landscape impact; heritage assets; biodiversity and geology; residential amenity; access and transport impacts.

The heat network in Swaffham Prior should save 70,975 tonnes of carbon over a 60 year period. However, the actual savings are very sensitive to carbon intensity of the electricity grid and the chosen period to average it over.

Gateshead

The heat network established in Gateshead is funded and owned by Gateshead Council via a grant from the European Regional Development fund. All customers receive a 5% discount compared to market energy prices.

Heat is provided through 5 km of pipes and high-voltage electricity to the domestic, commercial and public sectors. There is a mixture of battery storage and combined heat and power (4 MW engine) with heat storage. The energy centre provides customers with heat. When heat is provided by gas CHP engines, electricity is also generated and supplied through private wires at a lower cost to customers. Conventional gas boilers are used as a backup during periods of high heat demand.

Initially the project only supplied public buildings Gateshead Civic Centre, the Sage Gateshead, BALTIC and Gateshead College and homes managed by Gateshead Council. With time, the network has grown to connect other Council buildings and depots, leisure centre, Shipley Art Gallery and Talmudical College and new-build office building. It will be extended towards Gateshead Stadium, a 300-home new housing development, Gateshead Quays and 5 high rise social housing blocks.

The project aims to be zero carbon by 2030 by using a 6 MW mine water (from abandoned mine workings) heat pump energy centre to supplement the network. 0.5 MW is currently connected to the network, with increasing capacity by 2025. The mine water can also be used as a cooling network.

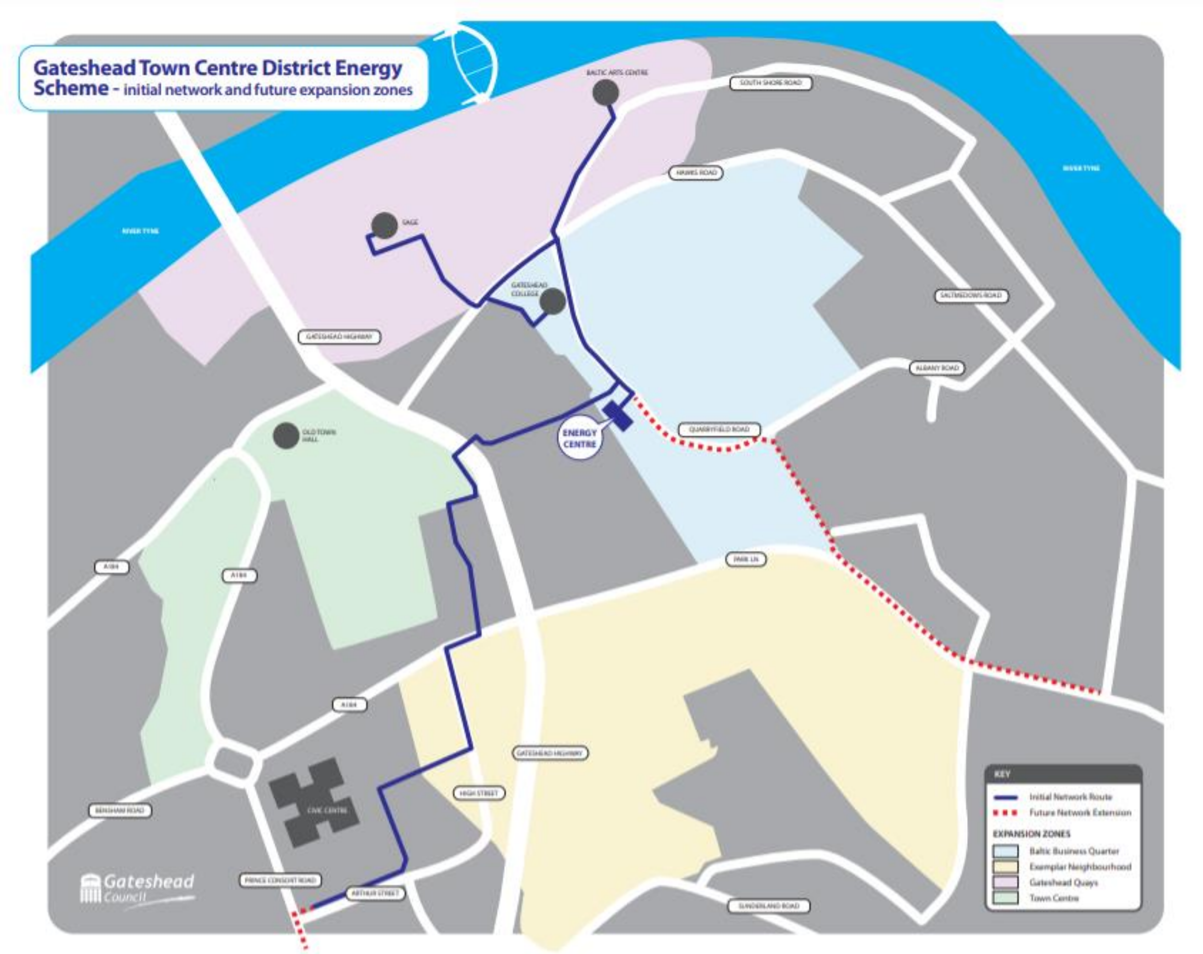

Figure 2: A map of the initial heat network (blue) and proposed future expansion zones (red dashed) extending from the energy centre (blue) in Gateshead.

Leeds

In Leeds, 1,983 council homes and numerous businesses will be connected to a low carbon heat and hot water network (19 km of pipes). The network is reusing heat (waste heat) that is already produced at Leeds' recycling and energy recovery facility. Steam generated from black bin waste is converted into hot water. Gas-fired boilers used as backup. Carbon emissions are predicted to be reduced by 11,000 tonnes per year for the city. The project will cost £36 million with £4 million of funding coming from the government's Heat Networks Investment programme.

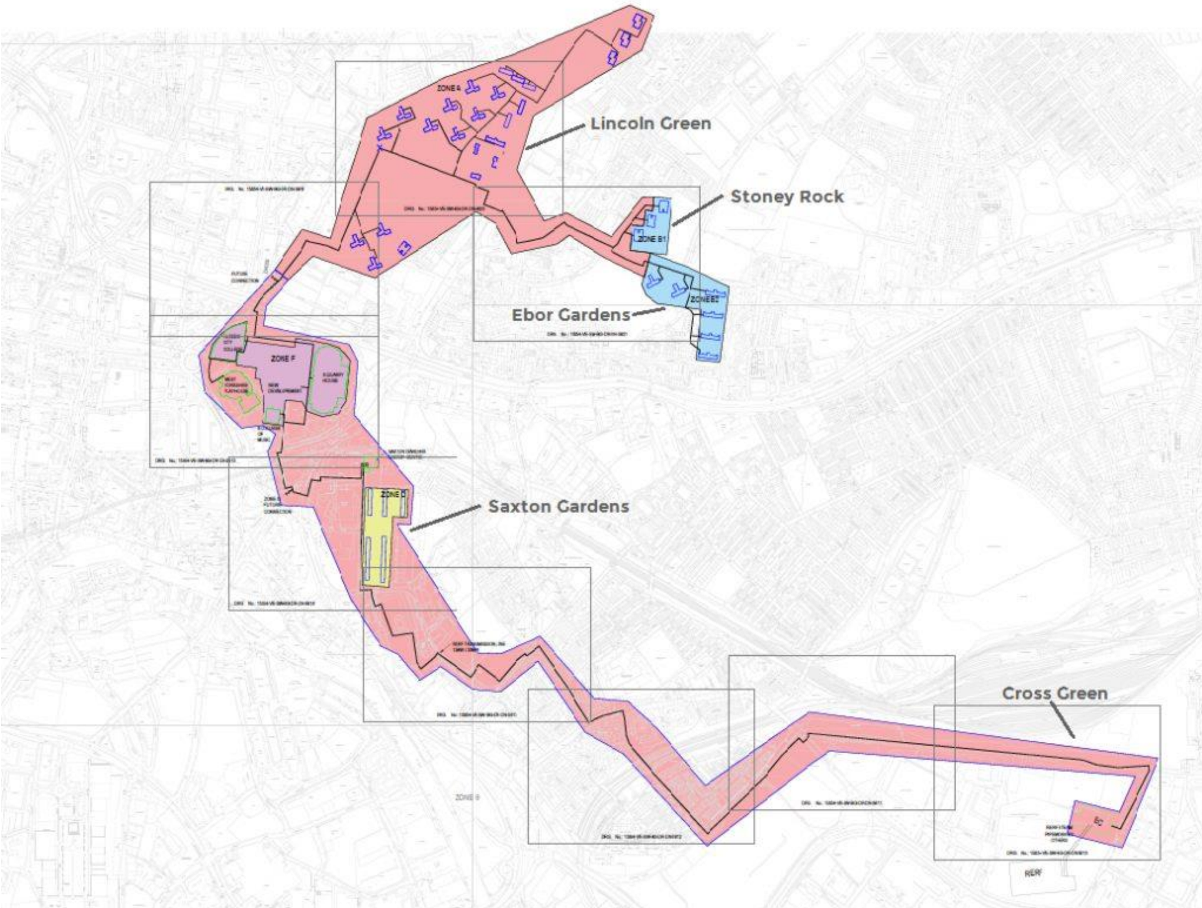

Figure 3: A map of the proposed heat network in Leeds city centre, connecting council homes and businesses to waste heat produced from the recycling plant

Islington, London (Bunhill 2)

Bunhill 2 is the second phase of Islington Council's Bunhill Heat and Power scheme – a heat network in Islington that was established in 2012 to warm approximately 800 homes and two leisure centres[87]. Islington had already built the first phase of the Bunhill heat network, delivering efficient heating to 850 homes through a gas combined heat and power (CHP) scheme at Bunhill Energy Centre 1. Ramboll[88] was commissioned by Islington Council in London to design and deliver the district-wide heating network to provide cheaper and greener heat by using unwanted heat from the London Underground.

[87] https://www.dezeen.com/2020/03/11/bunhill-2-energy-centre-london-underground-uk-architecture/

[88] https://uk.ramboll.com/projects/ruk/heating-up-london

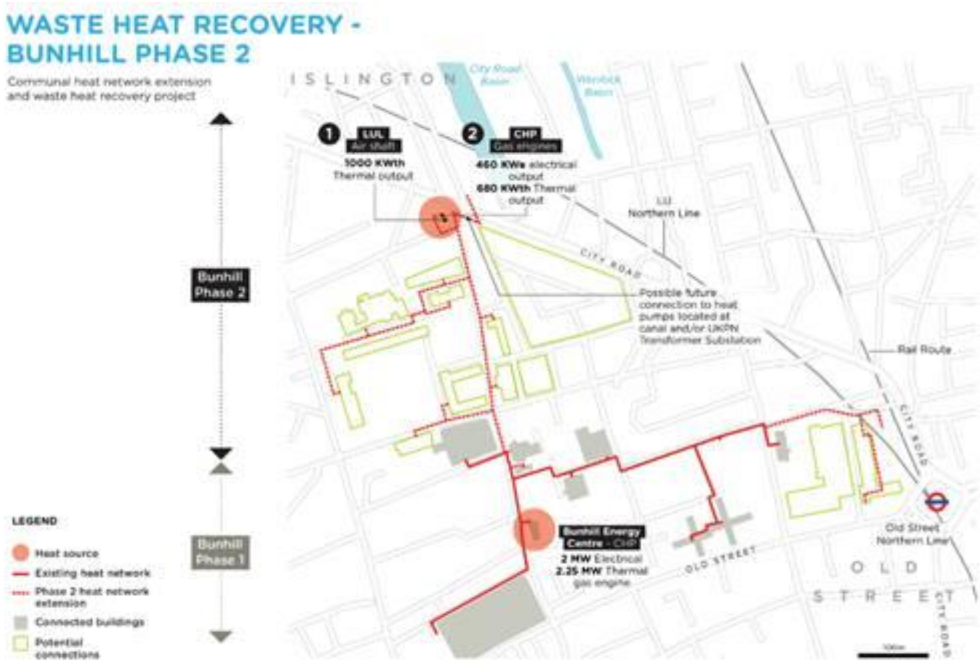

Figure 4: A map of the Bunhill district heating network

The Northern Line is used as waste energy to provide a low carbon, low cost heat source for local homes and businesses, which is largely council housing and leisure centres. A London Underground ventilation shaft is used as the heat source, where 18-28 degrees Celsius air is exhausted to the atmosphere from a long abandoned tube station (City Road, between Old Street and Angel), now part of the Northern Line tunnel ventilation system. This source of waste heat is exploited by heat pumps, which capture the waste heat and upgrade it to approximately 80 degrees Celsius. Northern Line passengers also benefit from cooler tunnels, while London residents as a whole benefit from lower carbon emissions and improved air quality as gas combustion is displaced. Ramboll investigated the impact of lower temperatures for the connected buildings' heating and domestic hot water loads to ensure demands could be met and end user comfort wasn't compromised. Ramboll's investigations proved the lower temperatures for the connected buildings' heating and domestic hot water loads met demands and end user comfort wasn't compromised. Another design innovation was to incorporate two smaller gas-fired CHP engines which, as well as providing heat, also supply electricity directly to the heat pump when the power from the grid is most expensive, helping reduce the cost of the heat. Funding for this innovative feature was supplemented by a grant from the GLA. A second thermal store also enhances system technical and economic performance.

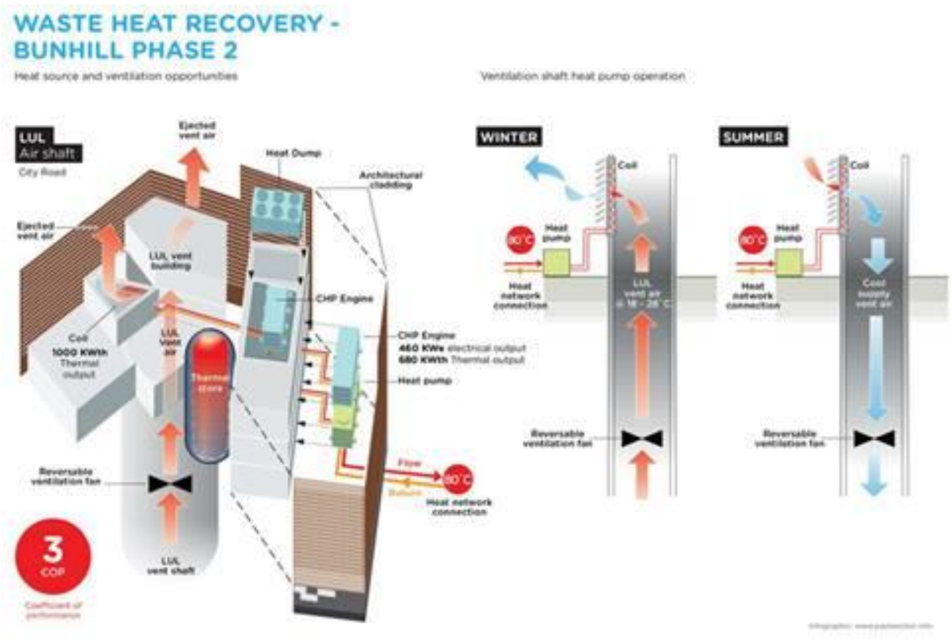

Figure 5: How waste heat is extracted from a London Underground air shaft and upgraded using heat pumps.

As well as being financed by the London Borough of Islington, the award-winning Bunhill Heat and Power Network was partly funded by the EU CELSIUS Project[89], and is supported by other London project partners including the Greater London Authority, TfL and UK Power Networks.

Figure 6: The design of the Bunhill 2 Energy Centre.

[89] https://celsiuscity.eu/

Solihull[90]

Figure 7: Where the energy centre will be located in Solihull, in relation to the Tudor Grange Leisure Centre and other local landmarks.

In Solihull, a planned district heating network intends to provide low carbon heating and electricity to council buildings, offices and school/college sites in the vicinity.

The district heating network will mostly be powered by air source heat pumps although gas boilers will provide back-up on cold days. The heat pumps rely on evaporator units on the roof. This starts the process which allows for pressurised hot water to be carried via underground pipes to the various buildings which form part of the network.

The proposals also involve the removal of some vegetation, although the council has said that "the majority" of trees on-site would be retained. They have committed to planting new greenery as part of the scheme to ensure a "net gain" in wildlife habitat.

The striking structure of the energy centre, to be erected next to Tudor Grange Leisure Centre, is intended to serve as the "beating heart" of a district heat network which will plumb into buildings across the wider area. The two storey building will be built next to the car parking area at Tudor Grange Leisure Centre, in Blossomfield Road as it needs to be close to the various buildings that the system will serve in the vicinity of the town centre, while being large enough to house all the necessary equipment. The colour of the energy

[90] https://www.birminghammail.co.uk/news/midlands-news/new-details-designs-revealed-energy-19973178

centre is intended to blend in with the surrounding parkland, while the perforated cladding is intended to resemble the tree canopy.

Figure 8: An artist's concept for the energy centre that will power the district heat network in Solihull town centre. The design is designed to blend in with local parkland although there is likely to be concern about the impact on trees.

Agenda Item No: 7

Greater Cambridge Local Plan: First Proposals (Regulation 18) Consultation Response

To:	Environment and Green Investment Committee
Meeting Date:	20 January 2022
From:	Steve Cox - Executive Director, Place and Economy
Electoral division(s):	All divisions within South Cambridgeshire and Cambridge City
Key decision:	No
Forward Plan ref:	N/A
Outcome:	The Committee will consider and endorse the County Council's response to the Greater Cambridge Local Plan
Recommendation:	The Committee is requested to:

a) Endorse the consultation response to the Greater Cambridge Local Plan (First Proposals) as set out in Appendix 1; and

b) Delegate to the Executive Director (Place and Economy) in consultation with the Chair and Vice Chair of the Committee the authority to make minor changes to the response.

Officer contact:
Name: Emma Fitch
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1. Background

1.1 Cambridge City Council and South Cambridgeshire District Council are working together to create a joint Local Plan for the two areas, collectively referred to as Greater Cambridge. This will ensure that there is a consistent approach to planning with the same planning policies where appropriate across both areas being used for decision making. The Plan is being prepared by Greater Cambridge Shared Planning (GCSP) on behalf of the two local planning authorities.

1.2 Local Plan preparation follows a process set out in national legislation and guidance and is independently tested at a public examination to check it is 'sound' – this means that it is realistic, deliverable and based on good evidence – before it can be formally adopted.

1.3 The new Local Plan is being prepared within a wider regional context, including the Oxford-Cambridge Arc and within the legal duty to cooperate with key stakeholders, including the County Council, and surrounding areas on strategic cross boundary issues.

1.4 The First Proposals stage sets out the preferred approach to the level of growth that should be planned for, and where it should be planned. It also highlights uncertainty about the delivery of water infrastructure needed to support new growth, and how this could impact on the timing of developments proposed. It describes the planning policies that will be prepared that will shape development and guide planning decisions.

1.5 The current consultation is seeking responses to these proposals before they develop into detailed planning policies at the next stage.

1.6 Feedback is sought particularly on:

- The emerging development strategy
- The direction of travel for policies
- Issues we should be considering as policies are prepared

1.7 The deadline for making responses to this consultation was 13th December 2021. Consequently, internal consultations have been conducted with other County Council service areas and a formal officer response has been submitted to GCSP in advance of this Committee. GCSP are aware these comments are subject to the Committee's agreement.

1.8 The consultation documents can be viewed on the GCSP website at the following link: [Greater Cambridge Planning hyperlink](#).

2. Main Issues

2.1 The consultation seeks comments on the extent to which the proposed strategy and policies in the Local Plan will deliver the vison and aims for the Plan and whether there are other policies that need to be included.

2.2 The key issues for the County Council to consider are:

- What are the implications for County Council services and infrastructure from the scale and location of proposed development? Are there policies in place to help mitigate any adverse impacts and support the delivery of services?

- Is the strategy and the proposed policies consistent with the corporate objectives of the County Council?

- Has the plan making authority adequately consulted and engaged with the County Council in formulating the strategy and policies? The consultation and engagement points will be covered in the separate Statement of Common Ground and Duty to Cooperate Statement.

2.3 The table below lists the key themes and policies proposed in the Local Plan that directly relate to the County Council's areas of responsibility.

Theme	Policy
How much development, and where?	S/JH: New jobs and homes
	S/DS: Development strategy
Climate change	CC/NZ: Net zero carbon new buildings
	CC/FM: Flooding and integrated water management
	CC/CE: Reducing waste and supporting the circular economy
	CC/RE: Renewable energy projects and infrastructure
	CC/CS: Supporting land-based carbon sequestration
Biodiversity and greenspace	BG/BG: Biodiversity and geodiversity - '20% net gain'
	BG/RC: River corridors
	BG/PO: Protecting open spaces
Wellbeing and social inclusion	WS/HD: Creating healthy new developments
	WS/CF: Community, sports, and leisure facilities
Great Places	GP/QP: Establishing high quality landscape and public realm
	GP/HA: Conservation and enhancement of heritage assets
	Policy GP/CC: Adapting heritage assets to climate change
Jobs	J/RE: Supporting the rural economy
	J/AL: Protecting the best agricultural land
Homes	H/SS: Residential space standards and accessible homes
	H/SH: Specialist housing and homes for older people
Infrastructure	I/ST: Sustainable transport and connectivity
	I/EV: Parking and electric vehicles
	I/SI: Safeguarding important infrastructure
	I/EI: Energy infrastructure masterplanning
	I/ID: Infrastructure and delivery
	I/DI: Digital infrastructure

2.4 An internal consultation has been undertaken within the County Council and responses have been received from Education, Floods and Water, Mineral and Waste and Transport Strategy. These responses have been included in Appendix 1, which has formed the basis for the Council's response to GCSP.

Duty to Cooperate and Statement of Common Ground

2.5 A statement of common ground is a written record of the progress made by strategic policy making authorities during the process of planning for strategic cross-boundary matters, demonstrating effective co-operation throughout the plan-making process. It is also part of the evidence required for local planning authorities to demonstrate that they have complied with the duty to cooperate.

2.6 Cambridgeshire County Council in its capacity as Local Highways Authority, Minerals and Waste Planning Authority, and with responsible for a range of infrastructure and services including education and social care is a signatory to the Statement of Common Ground.

2.7 For the transport modelling of the Preferred Option the local authorities and relevant partners have confirmed via the Transport subgroup a shared understanding of the certainty and timing of strategic transport infrastructure and schemes impacting on Greater Cambridge. These were included as baseline schemes within transport modelling supporting the First Proposals consultation. Also, the Councils have agreed with neighbouring authorities the development assumptions in the modelling for those districts. This engagement will continue to inform the full draft local plan. There are no areas of disagreement on this strategic matter.

3. Alignment with corporate priorities

3.1 Communities at the heart of everything we do

There are no significant implications for this priority.

3.2 A good quality of life for everyone

There are no significant implications for this priority.

3.3 Helping our children learn, develop and live life to the full

There are no significant implications for this priority.

3.4 Cambridgeshire: a well-connected, safe, clean, green environment

There are no significant implications for this priority.

3.5 Protecting and caring for those who need us

There are no significant implications for this priority.

4. Significant Implications

4.1 Resource Implications

There are no significant implications within this category.

4.2 Procurement/Contractual/Council Contract Procedure Rules Implications

There are no significant implications within this category.

4.3 Statutory, Legal and Risk Implications

There are no significant implications within this category.

4.4 Equality and Diversity Implications

The GCSP has prepared an Equalities Impact Assessment as part of the Local Plan Sustainability Assessment. This has indicated that there are only positive and neutral impacts on the relevant protected characteristics. Under the public sector equality duty any County Council projects related to the implementation of the local plan will be subject their own Equalities Impact Assessment.

4.5 Engagement and Communications Implications

There are no significant implications within this category.

4.6 Localism and Local Member Involvement

The public consultation carried out by GCSP has followed the statutory procedures. A briefing note on this matter has been provided to Spokes and asked to share it with their respective groups. All members whose division falls within the plan area have been notified.

There are no significant implications within this category.

4.7 Public Health Implications

There are no significant implications within this category.

4.8 Environment and Climate Change Implications on Priority Areas

4.8.1 Implication 1: Energy efficient, low carbon buildings.

Positive/~~neutral/negative~~ Status:

Explanation: The Local Plan will contain policies that will seek to carbon within new buildings

4.8.2 Implication 2: Low carbon transport.

Positive/~~neutral/negative~~ Status:

Explanation: The Local Plan promotes a development strategy and policies that will support low carbon transport

4.8.3 Implication 3: Green spaces, peatland, afforestation, habitats and land management.

Positive/~~neutral/negative~~ Status:

Explanation: The Local Plan will contain policies to support biodiversity, green space and carbon sequestration.

4.8.4 Implication 4: Waste Management and Tackling Plastic Pollution.

~~Positive~~/neutral/negative Status:

Explanation: The Local Plan will contain a policy to support waste reduction and the circular economy.

4.8.5 Implication 5: Water use, availability and management:

Positive/neutral/negative Status:

Explanation: The Local Plan will contain policies to promote water efficiency in new developments and integrated water management.

4.8.6 Implication 6: Air Pollution.

Positive/neutral/negative Status:

Explanation:

4.8.7 Implication 7: Resilience of our services and infrastructure, and supporting vulnerable people to cope with climate change.

Positive/~~neutral/negative~~ Status:

Explanation: the Local Plan will contain a policy that will set out how development should take account of sources of pollution.

Have the resource implications been cleared by Finance? Yes or No Name of Financial Officer: Sarah Heywood

Have the procurement/contractual/ Council Contract Procedure Rules implications been cleared by the LGSS Head of Procurement? Yes or No Name of Officer: Henry Swan

Has the impact on statutory, legal and risk implications been cleared by the Council's Monitoring Officer or LGSS Law? Yes ~~or No~~ Name of Legal Officer: Fiona McMillan

Have the equality and diversity implications been cleared by your Service Contact? Yes ~~or No~~ Name of Officer: Elsa Evans

Have any engagement and communication implications been cleared by Communications? Yes or No Name of Officer:

Have any localism and Local Member involvement issues been cleared by your Service Contact? Yes ~~or No~~ Name of Officer: Emma Fitch

Have any Public Health implications been cleared by Public Health? Yes or No Name of Officer: Kate Parker

If a Key decision, have any Environment and Climate Change implications been cleared by the Climate Change Officer? Not applicable as this is not a key decision.

5. Source documents

5.1 Source documents

Greater Cambridge Local Plan consultation documents.

5.2 Location

Greater Cambridge Planning hyperlink

Appendix 1: Cambridgeshire County Council Response to the Greater Cambridge Local Plan (First Proposals) Consultation

1. Education

Vision and development strategy

Section / Policy	Your comments
S/DS: Development strategy	The plan proposes that sites are developed at densities with recognition that 'using less land for development reduces carbon emissions and allows more space for nature and wildlife'. Whilst the Council accepts these principles, sufficient land would need to be made available for educational purposes. Cambridgeshire County Council's Children and Young People Committee have previously approved the site sizes which would be required to deliver a new school. These ensure that there is sufficient flexibility for sites to be developed in line with space per pupil/area guidelines provided by the Department for Education (DfE) (DfE Building Bulletins 103 and 104 for mainstream and special provision respectively), and allows for on-site early years and childcare provision, in line with Council policy. Whilst the Council will endeavour to explore different options for delivery or education provision, and in keeping with the surrounding area, there would need to be clear reasoning for any request to deviate from its policy and published national DfE's Building Bulletins' guidance for full consideration by members of the relevant committees. The proposed strategy is heavily informed by the location of existing and committed public transport schemes. The Council is fully supportive of this but would also insist that footpaths and cycle routes are taken into consideration, to ensure that schools are centrally located and easily accessible to families living within the catchment area and to fulfil the objective that 'developing sites can be well-integrated with existing communities'. This ensures that children and their families can attend them by either walking or cycling rather than through local authority provided transport or car and fulfil health and well-being expectations for children, e.g., around 'healthy schools'
S/SH: Settlement hierarchy	The Council appreciates the wish to raise Babraham to a 'Group Village' as it has a primary school consistent with infrastructure in other Group Villages. The school is currently full to its capacity of 0.5FE/84 places and operates with four classes (it operates a Published Admission Number (PAN) of 12). The school's site and context mean that it has previously been determined that there is no scope for significant expansion beyond its current size.

Section / Policy	Your comments
	Some children currently attend from within Sawston catchment, so displacement of places back to Sawston should be borne in mind with development at Babraham.

Cambridge urban area

Policy	Your comments
S/NEC: North East Cambridge	Based on the housing mix that has informed the North East Cambridge Area Action Plan, the development is expected to generate approximately 1,362 early years' children, 790 primary-aged pupils (3.8FE) and 205 secondary-aged children (1.4FE). This would require delivery of up to two primary schools on site, both with early years' provision. Additional sites would also need to be allocated and marketed for full day care provision. This is partly to ensure sufficient EY places, which could not be provided on the school sites alone, but also to promote choice of type of EY provision for families who are not entitled to funded childcare but still wish to access provision. At this stage, it is for illustrative purposes only. The Council will not be able to confirm its education requirements, land and contributions until later in the planning process when the housing mix is finalised. The Council remains committed to working in collaboration with South Cambridgeshire District Council and Cambridge City Council during the Area Action Plan making process and is supportive of the view that the detailed planning framework containing site specific policies will be of equal status to those in the Local Plan once adopted. The policy states that formal sports facilities will be largely delivered off-site. Whilst the Council does not object to this approach, it would insist that school playing fields are located on-site to ensure that high-quality PE curriculum can be delivered without the requirement to travel.
S/AMC: Areas of Major Change	Continuation of AMCs noted.
S/OA: Opportunity Areas in Cambridge	The Council is supportive of the objective for the Opportunity Areas in Cambridge. The new Opportunity Areas, S/OA/NR (Newmarket Rd Retail Park) and S/OA/BC (Beehive Centre) both fall within the St. Matthew's Primary School catchment. St. Matthew's is a restricted site. Whilst the existing school cannot expand any further to mitigate any potential children from potential housing in the OAs, the intention to 'improve…infrastructure delivery' in the OAs could enable longer-term solutions for the school's needs, e.g., new-build and relocation as part of the holistic approach outlined.
S/LAC: Land allocations in Cambridge	The Council notes the intended use for S/C/SCL Land South of Coldham's Lane as for commercial purposes, which will not

Policy	Your comments
	impact on existing Land North of Cherry Hinton/Cambridge East education plans.

Edge of Cambridge

Policy	Your comments
Edge of Cambridge - general comments	The Council will continue to work closely with both Cambridge City Council and South Cambridgeshire District Council in the development of area action plans and policies. One key aspect for education place planning is always around timing of a development and as clear an understanding of housing mix as possible, so as not to destabilise existing provision and to ensure the curriculum effectiveness and long-term financial viability of schools, for example. A second is around connectivity and transport issues for early years and school access with the integration of provision within a community. There are possibly quite complicated scenarios arising in Cambridge East where the Council will be interested to support policy development.
S/CE: Cambridge East	The Council notes the further development of this area subsequent to it being ‘safeguarded’ under the 2018 Local Plans and the existing permission granted to Land North of Cherry Hinton (LNCH) within the site. The Council is already working on proposals for the delivery of a primary and secondary school in the context of the outline permission for 1,200 homes at this location. The Council notes a further 2,900 dwellings are anticipated at Cambridge East to 2041, with a total of 7,000 once the site is completely developed. The Council would find it valuable, in the context of the existing schools’ proposals, to understand at the earliest possible opportunity where the 2,900 dwellings are planned within the site; whether adjacent to the current LNCH site south of the airport/green corridor or to the north along Newmarket Road and adjacent to Marleigh, etc., or both. Based on the Council’s approved general multipliers, the level of additional development proposed to 2041 (2,900 dwellings), would generate approximately 580-870 early years’ children, 870-1,160 primary-aged pupils (4.1FE-5.5FE) and 520-725 secondary-aged pupils (3.5FE-4.8FE). In theory, Cambridge East could require the equivalent of three 2FE/two 3FE schools to accommodate site development until 2041, with a further possible 3FE school required (630 places) to cater for the 640 places (max multiplier) for the residual 1,600 dwellings post 2041. Further, assuming the landowner/developer(s) may wish to bring forward smaller land parcels across the site for development at

Policy	Your comments
	different stages, the Council recommends adoption of an up-to-date area action plan for the holistic development of both the remaining site and integration with existing communities at Cherry Hinton, LNCH and Marleigh. One reason for this is around timing. LNCH currently includes provision for a 2FE Primary School (420 places i.e. 60 places in each of the 7-year groups of the primary phase) and a 2FE Wave 12 free primary school is in build, in conjunction with DfE, for Marleigh. The current expectation, given housing mixes understood at the time of writing, is that Marleigh Primary will open in September 2022 with a published admission number of 15 for entry in year Reception. It will accept in-year applications for all year groups and will build gradually to 1FE (30 places in each year group) and eventually 2FE (6 places in each year group) to meet the needs of the development as it grows. Timing is also important to avoid surplus places at existing primary schools within the local area, factoring in demographic basic need, which could have implications for effective curriculum delivery and financial sustainability. Timing of primary place provision is going to be critical for school sustainability both within Cambridge East and for schools in communities surrounding it. For Early Years, additional sites would also need to be allocated and marketed for full day care provision. This is partly to ensure sufficient places which would not be met by the schools alone, but also to promote choice and for families who are not entitled to funded childcare but still wish to access provision. Regarding secondary provision, a Wave 12 free secondary school is currently being planned in consultation with DfE, the Multi-Academy Trust (MAT) which will run the school and the developers (Bellway) at LNCH. The secondary school is to be located at the eastern gateway to LNCH, off Airport Way and will be south of the ‘green corridor’ DfE is proposing it will be a 4FE capacity (600 place) secondary to begin with. The Council has proposed that this should be built with the ability to expand on the same site to 6FE (900 places). The permitted development at LNCH, on current housing mix proposals, will see a demand of approximately 1FE, Marleigh potentially 2.5FE. Bearing in mind the 2,900 additional dwellings to 2041 of approximately 520-725 secondary-aged pupils, 3.5FE-4.8FE, this school, as currently envisaged, could potentially absorb much, but not all possible demand, with a possible deficit in places of 1-2.3FE by 2041, unviable for a second 11-16 school. However, the residual post-2041 build-out implies a further 1,600 dwellings still to come at Cambridge East. This would not yield a sufficient number of secondary age children for another viable secondary school, however the

Policy	Your comments
	allocation of land for a second campus prior to 2041 would enable necessary expansion beyond the current 6FE envisaged to cover a 1-2.3FE deficit by 2041 and the additional need requirements beyond 2041, which could stretch that deficit to as much as 3-5FE. In the immediate to short-term, the situation of other existing local secondary schools needs to be borne in mind, particularly in circumstances where basic need has dropped in the past few years. Therefore, the Council recommends a further site for secondary provision should be identified at Cambridge East to accommodate capacity closer to 2041 and the post 2041 residual build-out. Again, for school effectiveness and financial sustainability purposes, timing of both this first secondary and further 11-16 provision are critical. Assuming the LNCH secondary school remains the main local secondary school for the majority of the period to 2041, consideration needs to be given to student, family and wider community access to it across the ‘green corridor’ from the northern part of the site and Marleigh. Public transport as well as walking and cycling routes will need to bear this in mind. At this stage, all figures provided here are for illustrative purposes only. The Council will not be able to confirm its education requirements, land and contributions until later in the planning process when the housing mix is finalised
S/NWC: North West Cambridge	The intensification of the site, already identified for development, will place additional demands on infrastructure, and on the associated contributions to deliver it. Based on the Council’s approved general multipliers, this level of additional development (1,500 dwellings), would generate approximately 300-450 early years’ children, 450-600 primary-aged pupils and 270-375 secondary-aged pupils. It may therefore be necessary for a 2-3 form entry primary school, with on-site early years provision. In addition to early years and childcare provision on site at the new primary schools, it will be necessary to allocate and market additional sites suitable for full day care provision. This is partly to ensure sufficient places which would not be met by EY provision on the school sites alone, but also to promote choice and for families who are not entitled to funded childcare but still wish to access provision. Where possible, the Council would encourage the co-location of establishments to promote partnership working. The Council would also actively encourage developers to provide free plots of serviced land or purpose-built buildings.

Policy	Your comments
S/WC: West Cambridge	The Council notes the intention 'to add flexibility to the [existing] policy, to allow an element of residential, focused on affordable housing and key workers' on a site primarily focused on science and technological research. The Council would recommend a plan to incorporate likely dwelling numbers and density at an early date and would support the approach to consider 'the potential for a single policy that looks at this site together with the University's North West Cambridge site, to ensure the benefits of this significant area of innovation are maximised, will be considered as part of preparing the draft plan.' This would help ensure social and community infrastructure assets, including early years and education provision, are included as necessary and shared across sites of a similar community character.
S/EOC: Other existing allocations on the edge of Cambridge	Proposals noted.

New settlements

Policy	Your comments
S/CB: Cambourne	Cambourne is currently served by one secondary school, Cambourne Village College, which is part of The Cam Academy Trust. The Trust applied to the Department for Education (DfE) to open a 6-form entry/900 place Free school as part of Wave 12 of the Free Schools Programme, in recognition of the significant level of planned on adjacent land to the west of Cambourne village (2,350 dwellings). However, this was unsuccessful. Since this decision, the Council have been working collaboratively with the Trust on plans to expand the existing school to ensure that there is sufficient capacity to accommodate both the existing community and families moving into new developments within the town. Once complete, Cambourne Village College will have capacity for 11FE/1,650 places, as well as a 350 place sixth form for young people aged 16-19. The increase of 1,950 dwellings within the town could therefore pose an issue with regards to appropriate mitigation. There is limited scope for further expansion on the school's current site, however, the additional housing will not create enough demand to make a new secondary school viable. The Council would therefore be supportive of the view that additional development should not simply be about delivering more housing, but instead, focus should be upon how this area including Cambourne and

Policy	Your comments
	Bourn Airfield and nearby villages will function as a place, and its relationship with Cambridge, to enhance its sustainability.

Climate change

Policy	Your comments
Climate change - general comments	In May 2019, Cambridgeshire County Council declared a Climate and Environment Emergency, and recognises that this is a priority with both local and central government. The Council is therefore supportive of the inclusion of this as one of the overarching themes.
CC/NZ: Net zero carbon new buildings	A change to the Building Regulations which came into force on 1 January 2019 means that all new buildings owned and occupied by public authorities must be 'Nearly Zero Energy Buildings', and policies and specifications of all buildings reflect this. To achieve compliance, the Council's preferred policy is a combination of different mechanisms including achieving at least 6 BREEAM energy performance "Ene01" credits, designing buildings to achieve an EPC rating of A or better and/or installing on-site renewable energy generation sized to meet a significant proportion (>80%) of the building's expected energy use. Policy CC/NZ is less flexible with specific targets set for non-domestic buildings, including schools. Delivering schools which are 'Nearly Zero Carbon' buildings has increased the capital cost of construction by 10%. With further, and more specific targets, such as those above, and notwithstanding advances in technology, additional cost is likely to be incurred. The Council would therefore require associated policies to make clear the expectation on developers meeting such costs through section 106 agreements.
CC/WE: Water efficiency in new developments	See CC/FM comments below.
CC/FM: Flooding and integrated water management	Policy CC/FM includes the expectation that developments will be required to provide integrated water management, including sustainable drainage systems (SuDS). The Council would be supportive of this being incorporated into the design of new schools. However, it should be acknowledged that this is likely to increase the size of the site required for a school. Currently, it is Council Policy to request the minimum site size required to enable delivery of a school which meets the standards set by the Department for Education (DfE), including suitable outdoor space to enable physical education in accordance with the school curriculum and to enable pupils to play outside. As this is a statutory requirement and delivered through the planning

Policy	Your comments
	process via Sport England, there would be a statutory planning objection if not incorporated into the design. Including SuDS within the design would require an additional land allocation. Costs and space would also need to be incorporated into s106 agreements to ensure children's safeguarding if, for example, SuDS ponds were to be on site rather than using attenuation tanks. The Council therefore feels it would be most appropriate for any targets to be incorporated in policy to be the subject of a technical assessment on their achievability and cost, before being formally adopted.
CC/RE: Renewable energy projects and infrastructure	See response to CC/NZ above.

Wellbeing and inclusion

Policy	Your comments
WS/CF: Community, sports, and leisure facilities	Where facilities are to be used by the school and the wider community, there are a number of associated safeguarding concerns. For this reason, the Council would strongly suggest that separate access arrangements are planned and these would be expected to be fully funded by the developer to mitigate the level of risk. There will also need to be early engagement from all parties to ensure that there is a mutually agreed basis on which access to the facilities will be managed.

Infrastructure policies

Policy	Your comments
I/ID: Infrastructure and delivery	The County Council has a strong preference for contributions towards educational facilities to be sought through section 106, as opposed to seeking through the Community Infrastructure Levy (CIL). This allows for a cost per place to be calculated meaning that contributions are both appropriate and proportionate.

2. Floods and Water

Climate change

Policy	Your comments
CC/DC: Designing for a changing climate	Support the mention of SuDS in this policy. It would be good to ensure that drainage and SuDS are included in this. We are receiving more and more queries on whether surface water

Policy	Your comments
	proposals are going to include consideration for climate change, so having this written in policy would be useful.
CC/FM: Flooding and integrated water management	The direction of the policy is going in a good direction, taking inspiration of the Cambridge City Local Plan 2018, as this holds good practice for the design of SuDS systems. There should be an emphasis on managing surface water close to the source, on the surface and within open SuDS where practicable. I note it is included, but this should be the basis of all surface water schemes. There is no mention of water quality in the proposed policy direction section. This should be included within the local plan as a standalone point within the flood management policy. This could include the use of terms such as the SuDS Management Train, focussing on providing multi stages of treatment through cascading structures. This is the way that developments should be going in managing their surface water. While climate change is covered in Policy CC/DC, it would be worth including the surface water systems should be designed with an allowance of climate change included The document is very much setting out the policy directions, it would be good to know the general set out of the proposed policy, as the listed versions of these policies are useful in interpreting, signposting and referring stakeholders to for information or as part of a scheme. Reference should ideally be made to the Cambridgeshire Flood and Water Supplementary Planning Document (SPD), or any subsequent version of this, which is adopted South Cambs and Cambridge City individually. It is noted that the policy will not need to repeat items covered by the NPPF, however, reference should be made to this within the document.

3. Mineral and Waste

Vision and development strategy

Section / Policy	Your comments
S/SB: Settlement boundaries	Has implications for Cambridgeshire and Peterborough Minerals and Waste Local Plan (July 2021) (MWLP) Policy 5. Consultation with the mineral planning authority (MPA) is not needed for development proposals within a settlement boundary or where they are consistent with an allocation in the development plan for the area.

Cambridge urban area

Policy	Your comments
S/NEC: North East Cambridge	No comments – covered in Area Action Plan Statement of Common Ground.
S/LAC: Land allocations in Cambridge	Site S/C/SCL – within a Mineral Safeguarding Area (MSA) for chalk. Former landfill so it is assumed that mineral has already been extracted. Within the settlement boundary.

Edge of Cambridge

Policy	Your comments
S/CE: Cambridge East	All of the site is within a MSA for chalk; part within a MSA for sand & gravel. MWLP Policy 5.
S/NWC: North West Cambridge	Most of the site is within a MSA for sand & gravel. Policy 5. Southeast section of the site nearly all within a MSA for chalk and is within the settlement boundary.
S/CBC: Cambridge Biomedical Campus	Most of Consultation Area (CA) for Addenbrooke's energy from waste Management Area (WMA) is within the Proposed Area of Major Change. S/CBC/E/2 is partly within the CA. All of the PAMC is within a MSA for chalk and parts are within a MSA for sand & gravel.
S/WC: West Cambridge	Small part of site is within a MSA for chalk. Within settlement boundary.

Rural southern cluster

Policy	Your comments
S/GC: Genome Campus, Hinxton	All within a MSA for chalk; a very small part of the site at south is within a MSA for sand & gravel. MWLP Policy 5 applies.
S/BRC: Babraham Research Campus	All within a MSA for chalk; nearly all is within a MSA for sand & gravel. MWLP Policy 5 applies.
S/RSC: Village allocations in the rural southern cluster	S/RSC/HW - All within MSAs for chalk and sand & gravel. MWLP Policy 5 applies. Site is adjacent to residential properties; amenity buffer likely to sterilise most of the mineral. S/RSC/MF – All within a MSA for chalk. MWLP Policy 5 applies. Site is adjacent to residential properties and too small to contain a workable quantity of mineral. S/RSC/CC - All within MSAs for chalk and sand & gravel. MWLP Policy 5 applies. Site is too small to contain a workable quantity of mineral.
S/SCP: Policy areas in the rural southern cluster	S/SCP/WHD – All within a MSA for sand & gravel; part within a MSA for chalk. Most of the site is within the settlement boundary. Railway, A505 and existing residential and other

Policy	Your comments
	sensitive properties would be a constraint to working the minerals.

Rest of the rural area

Policy	Your comments
S/RRA: Allocations in the rest of the rural area	S/RRA/ML – All within a MSA for chalk. The site is adjacent to residential properties and too small to contain a workable quantity of mineral. S/RRA/MF – All within a MSA for sand & gravel. WWLP Site is adjacent to residential properties and too small to contain a workable quantity of mineral. S/RRA/CR – All within a MSA for chalk. Situated between Melbourn Science Park and residential properties and too small to contain a workable quantity of mineral. S/RRA/BBP – Within CA for Uttons Drove Water Recycling Area (WRA). MWLP Policy 16 applies.
S/RRP: Policy areas in the rest of the rural area	S/RRP/L – Only very small part at east of site within a MSA for sand & gravel.

Climate change

Policy	Your comments
CC/RE: Renewable energy projects and infrastructure	This policy may interact with the Cambridgeshire and Peterborough Minerals and Waste Local Plan, in respect of energy from waste and district heating. Early consultation about the wording of this policy would be appreciated.
CC/CE: Reducing waste and supporting the circular economy	Inclusion of this policy is supported, however it is suggested that the Circular Economy is given priority over Reducing Waste in the title, as it has a much wider scope. It is also suggested that the Councils may wish to consider explicitly linking this policy with Policy CC/NZ: Net zero carbon new buildings; as these two policies interact with each other. The waste hierarchy proposed by the Draft Plan reads “Refuse, Reduce, Reuse, Repurpose, Recycle”. It is appreciated that this is based on the “5 r’s”, but to avoid confusion the Councils may wish to either clarify in the policy or supporting text that ‘refuse’ is seeking to minimise avoidable resource use and not the refusal of planning permissions or development outright. The waste hierarchy as set out in Appendix A of the National Planning Policy for Waste (October 2014) is: Prevention, Preparing for Re-use, Recycling, Other recovery, Disposal. Reference to the requirement for the RECAP guide is welcomed and accords with Policy 14 of the Cambridgeshire and Peterborough Minerals and Waste Local Plan (MWLP).

Policy	Your comments
	The mineral and waste planning authority (MWPA) has noted that Policy CC/6: Construction Methods which embedded consideration of waste management within the South Cambridgeshire Plan appears, by being embedded in that Plan to have been particularly effective, and inclusion of this policy is welcomed. When referring to resources to be considered, the MWPA wishes that aggregate and other minerals are included and highlighted for consideration by applicants. The MWPA would welcome further discussion on this topic, potentially as part of a SoCG.

Supporting documents on which we are consulting

Policy	Your comments
Sustainability Appraisal (incorporating the requirements of the Strategic Environmental Assessment)	The MWPA welcomes the inclusion of minerals as an objective, albeit noting the negative and uncertain result for most options considered. The MWPA would encourage the consideration of "Sustainable resource use" or "Waste minimisation" when considering objectives for future local plans.

4. Transport

Vision and development strategy

Section / Policy	Your comments
Vision and aims	On Page 18 the definition of sustainable development is very welcome but given the importance of sustainability in the document we feel that this section should have greater prominence. There is also a significant infrastructure requirement to deliver the proposed Local Plan, so it is going to be a challenge to deliver this in a sustainable way. Welcome the emphasis on active and public transport, and planning development at sites where public transport is the natural choice. We would recommend clear reference to ensuring new future development meets LTN 1/20 and other appropriate policies and measures.
S/DS: Development strategy	From the evidence of the options tested at the time S01 performed best in transport terms. It should be noted that not all transport mitigation had been tested. Transport however is not the only consideration when developing a Local Plan and there are numerous other factors that require consideration. Therefore we are happy to support S09 Preferred Option growth level Preferred Option spatial strategy for the Emerging Local Plan. S09 emerged from including sites that performed well in transport terms in earlier testing. Section 15 of the Greater

Section / Policy	Your comments
	Cambridge Local Plan: Transport Evidence Report October 2021 provides a good summary of the transport impacts. It is noted that North East Cambridge and Cambridge Airport, Waterbeach and existing new town development lead to better performance in transport terms and greater internalisation of trips. Generally, the larger the development the greater the chance of trips being internalised, and the settlement is likely to have a greater chance at being able to provide key services and facilities. Cambourne was the best performing in transport terms of the free-standing new settlements of those tested at stage one- with the Cambourne to Cambridge public transport scheme and East West Rail included. Any development in the Cambourne / Bourne Airfield area needs to have good links to the existing community to enable greater access to services and to reduce the potential transport impacts of any new development.

Cambridge urban area

Policy	Your comments
Cambridge urban area - general comments	Section 2.2 - the term unnecessary private car use is very subjective would recommend something with a clearer definition is used. Link to Cambourne and East West Rail (EWR) need to maximum the benefits of this. Consider setting our policy specific to EWR with the LPA's vision, objectives, and requirements (e.g. for stations, connectivity etc) should this project come forward. Welcome Greater Cambridge Planning to fully engage with Network Rail to ensure that Cambridge South station maximises use of Active Travel and that provision of drop off and collection points are suitable, and do not cause a negative impact on the surrounding area.

Infrastructure policies

Policy	Your comments
I/ST: Sustainable transport and connectivity	Maybe provide reference to the CCC Transport Assessment Teams guidelines as to what development sizes need to do would be helpful. https://www.cambridgeshire.gov.uk/business/planning-and-development/developing-new-communities
I/EV: Parking and electric vehicles	There needs to be clearer and more specific guidance regarding cycle and mobility parking with clear minimum standards. Given the phasing out of fossil fuelled cars by 2030 and the lifespan of this Local Plan to 2041 we believe that high provision

Policy	Your comments
	of electric car charging points should be provided. Whilst electric cars are not the answer to all transportation problems, they do have benefits and insuring infrastructure is in place will assist with their adoption. No reference could be found to electric car charging points in public car parks or on streets. A policy is required on this as otherwise issues will arise with on street parking and charging provision. This section will require an update following recent announcements: https://www.bbc.co.uk/news/business-59369715
I/AD: Aviation development	"would not have a significant adverse impact on the environment". It is unclear how any airport/aviation development could not have a significant adverse impact on the environment, given aviation's massive carbon emissions, although this may change in the future.

Comments on Evidence Base Documents

Policy	Your comments
Greater Cambridge Local Plan Transport Evidence Report November 2020	**P22** clearly shows which scenarios performs best in terms of public transport, S01 Densification being best. **4.3** clearly shows the predict highway impacts of the development options, S01 Densification being best this is also true of delay figure 8. **5** Is helpful and shows option 1 or option 7 are the best performing options The report seems to be cut short and ends at page 35?
Spatial Options Review Supplement minor corrected 12 Sept 21	Layout of the document as landscape made it difficult to read on screen. **2.1** could have been more clearly shown on a map, highlighting the location and volume of the growth figures. **P2** transport infrastructure *Limited opportunity to improve highway infrastructure within the existing urban area.* Unclear by what is meant by this. It might be undesirable for a range of reasons to improve highway infrastructure for private car use, but it is desirable to improve it for public transport, and active travel. Unsure what is meant by *sustainable transport infrastructure* (which supports all modes of travel). **P4** welcome that broadband and mobile phone signal are highlights as being critical. Unclear what is mean by improvements will still be required to reduce congestion - is this separate from facilitate mode shift

Policy	Your comments
	from car or different. It is very hard to reduce congestion without inducing demand. **P6** Agree with the principal that locating housing close to jobs and service will reduce the need to travel. Also need to ensure this includes high quality telecoms for home working.
Greater Cambridge Local Plan Transport Evidence Report Preferred Option Update October 2021	Glossary at the front very helpful. Useful summary clearly setting out the work that has been carried out and the key findings. **3.2.4 table 8 Figure 4** shows how car trips dominate mode share of all the options tested. However, it is noted that these predictions are based on no mitigation being in place and include existing trips and therefore any additional trips cause by Local Plan development would not be expected to create a significant mode shift given the small percentage. **Table 11 and Figure 5** detail the mode share of additional trips generated by development in each spatial option compared to the mode share of the 2015 base year and the additional trips in the 2041 baseline. SO1 densification creates both the lowest number of new trips and has the highest non-car mode share. S02, S03 and S08 all performed similarly in both number of new trips and non-car mode share. **Table 14** again shows that significant PCU-km and hrs are added to the road network under all development options. SO1 densification has the lowest impact. Agree with the statement that **5.2.1** that SO 1 Densification is the best performing against all metrics analysed in Chapter 3. **5.3.1** states that SO1 densification is the most sustainable of the eight options- however it should be note that it relies on significant investment see **2.2.12** and it still adds car trips from the 2015 base. Significant mitigation measure in addition to the ones already included in the model are going to be required, if the Local Plan is going to achieve its objective of delivering sustainability, and there is clearly potential for the mitigation measures themselves to not be sustainable. **11.1.3** it is noted that the proposed mitigation ‘trip budget’ policy approach which has identified as required for North East Cambridge, Cambridge East and Cambridge Biomedical Campus was not included in the assessment and mode share of car use for the larger sites within the Preferred Option are therefore likely to be over-estimated trips at this point. The use of ‘trip budgets’ is welcomed as a mitigation measure at other larger sites in the draft Local Plan such as the expansion of Cambourne. **15.1.13** Provides a useful summary of the impacts of the Preferred Option for the emerging Local Plan, in transport terms, and provides reassurance from a transport perspective.

Policy	Your comments
Infrastructure Topic Paper	**P6** It is clear that the public want to reduce the need to travel and ensure that sustainable travel options are available. Secondly it is clear that there is a desire for new developments to be supported with appropriate infrastructure. Highlights that all spatial options show an increase in the number of trips, time taken and delays on the highway network. Highlights that there is a need for further mitigation. **4.5** Proposed Policy Direction This section is in line with CCC aims and goals. Welcome the requirement for a Low Emissions Strategy, as well as a focus on Active Travel which has numerous known benefits. In terms of transport related challenges, developments which are further away from existing transport links and with poor active travel links are likely to be the hardest to cater for. Welcome the report highlight that further work is required and that a policy needs to be put in place in addition to policy and plans that are already in place such as LTP. **Chapter 5** will need updated following the recent announcements regarding the provision of EV charging points. https://www.bbc.co.uk/news/business-59369715 **5.5** welcome the cycle parking provision requirements and the need to accommodate non-standard cycles. **6.2** A10 there is a fine balance between schemes that reduce congestion and those that create capacity and thus induce more traffic to use the road network. **7.** Potentially there is a requirement to safeguard land for East West Rail and ensure that enough land is safeguarded for aspects such as active travel provision and key transport improvements. **8**. Welcome that only development that is sustainable will be considered at Cambridge Airport. It is unclear how any airport/aviation development cannot have a significant adverse impact on the environment, given aviation's massive carbon emissions although it is noted that this may change in the future. **9**. Due to the likely uptake of electric vehicles it is likely that the power grid is going to require significant upgrades to support this. **11.** High speed broadband is an essential service. Broadband and high-quality mobile phone connections have a role to pay in reducing the need to travel by supporting home working.
Greater Cambridge Local Plan Strategic Spatial Options Assessment: Carbon Emissions Supplement.	Figure 4 highlights the annual carbon dioxide emissions per home in the mid-plan year 2030, with the medium growth options 1-8 and preferred growth options 9 and 10 with zero carbon policies.

Policy	Your comments
	In all growth scenarios transport emissions dominate carbon dioxide emission and are the only ones that change significantly as building energy use and building embodies carbon remain similar for all options.

Agenda Item No: 8

Finance Monitoring Report – November 2021

To:	Environment and Green Investment Committee
Meeting Date:	20th January 2022
From:	Steve Cox – Executive Director, Place & Economy Tom Kelly – Chief Finance Officer
Electoral division(s):	All
Key decision:	No
Forward Plan ref:	N/A
Outcome:	The report is presented to provide Committee with an opportunity to note and comment on the forecast position for 2021/2022.
Recommendation:	The Committee is asked to review, note and comment upon the report.

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Member contacts:
Names: Councillors Lorna Dupré and Nick Gay
Post: Chair/Vice-Chair
Email: lorna.dupre@cambridgeshire.gov.uk /nick.gay@cambridgeshire.gov.uk
Tel: 01223 706398

1. Background

1.1 The appendix attached provides the financial position for the whole of Place & Economy Services, and as such, not all of the budgets contained within it are the responsibility of this Committee. To aid Member reading of the finance monitoring report, budget lines that relate to the Highways and Transport Committee are unshaded and those that relate to the Environment and Green Investment Committee are shaded. Members are requested to restrict their questions to the lines for which this Committee is responsible.

2. Main Issues

2.1 Revenue: The report attached as Appendix A is the Place & Economy Finance Monitoring Report as at the end of November 2021. Place and Economy is currently forecasting a £52K overspend for year end. There are no significant issues to update Committee on.

2.4 Capital: The capital position is detailed in Appendix 6 and the significant changes are described below:-

- Swaffham Prior Community Heat Scheme – Covid 19 has impacted the construction industry through delays to materials and build programmes. The energy centre build has been delayed due to difficulty getting hold of cladding materials. This has meant that £2.4m of expenditure has been reprofiled into next year.

- Environment Fund: This is the £16million capital fund supporting the implementation of the Climate change and Environment Strategy (May 2020) priorities including:
    - Decarbonisation of heat for Council and maintained school buildings
    - EV charging for Council assets
    - Supporting Oil Dependent communities
    - Climate Action Fund

  Progress implementing projects is underway with the key focus on the decarbonisation of Council and maintained school buildings. Government published the Public Sector Decarbonisation Scheme for Council's to apply for grant towards decarbonisation of buildings and maximising the draw down of grant to match fund projects has been a priority. However, Government has recently published its Heat and Building Strategy and is now consulting on measures to shift oil dependent communities onto low carbon solutions. This means a greater focus on developing actions to support oil dependent communities can now come forward. In addition, the Environment Bill has also been approved and projects to support nature based climate action can start progressing. It is also important to note that the Climate Change and Environment Strategy has been reviewed during August-December 2021 and is being considered by Full Council in February 2022. The revised strategy will direct how the remaining funding will be spent.

- School Ground Source Heat Pump Projects – Confirmation of the Public Sector Decarbonisation grant funding came forward in May 2021 and the priority is to spend the grant by the end of the financial year. The remainder of the budget will be spent next financial year.

- The Connecting Cambridgeshire spend for this year has been reprofiled and some spend will now be in next year, as the SFBB Phase 4, Contract 2 is now not expected to be completed until mid-2022. There will be a total scheme underspend of £900k from saving from the Openreach SFBB contract 1, Phases 1-3, reducing the original £20m (£16.515m from prudential borrowing, £3.485m from LPSA grant) to £19.1m.

3. Alignment with corporate priorities

3.1 Communities at the heart of everything we do

There are no significant implications for this priority.

3.2 A good quality of life for everyone

There are no significant implications for this priority.

3.3 Helping our children learn, develop and live life to the full

There are no significant implications for this priority.

3.4 Cambridgeshire: a well-connected, safe, clean, green environment

There are no significant implications for this priority.

3.5 Protecting and caring for those who need us

There are no significant implications for this priority.

5. Source documents guidance

5.1 Source documents

None

Place & Economy Services

Finance Monitoring Report – November 2021

1. Summary

1.1 Finance

Previous Status	Category	Target	Current Status	Section Ref.
Amber	Income and Expenditure	Balanced year end position	**Green**	2
Green	Capital Programme	Remain within overall resources	**Green**	3

2. Income and Expenditure

2.1 Overall Position

Forecast Variance – Outturn (Previous Month) £000	Directorate	Budget 2021/22 £000	Actual £000	Forecast Variance - Outturn (November) £000	Forecast Variance - Outturn (November) %
-2,694	Executive Director	3,304	594	-2,694	-82
+2,085	Highways & Transport	25,680	11,693	+2,214	+9
+534	Planning, Growth & Environment	41,880	24,446	+533	+1
0	Climate Change and Energy	147	-466	0	0
0	External Grants	-6,754	-3,253	0	0
-31	**Total**	**64,257**	**33,014**	**+52**	**0**

The service level budgetary control report for November 2021 can be found in appendix 1.

Further analysis of the results can be found in appendix 2.

2.1.2 Covid Pressures

Budgeted Pressure £000	Pressure	Revised forecast £000
638	Waste additional costs / loss of income	50
1,500	Parking Operations loss of income	639
300	Park & Ride loss of Income	22
603	Traffic Management loss of income	60
310	Planning Fee loss of Income including archaeological income	137
400	Guided Busway – operator income	155
3,751	**Total Expenditure**	**1,063**

2.2 Significant Issues

Covid-19

Table 2.1.2 details the budget (as allocated in Business Planning) and forecasts within the service relating to the Covid-19 virus. The funding to reflect the additional costs (for waste) is allocated to the respective budget but the funding to reflect the loss of income is held on the Executive Director line with the actual shortfall shown on the respective policy lines. The budget to offset the loss of income arising from the financial impact of covid is £3.1m, and currently it is estimated that £0.8m is actually required and £0.3m is being used to offset the waste pressure, plus £0.4m is being used to offset the short term central costs arising from the Directorate restructuring and the interim staffing costs. It was previously assumed that any of the covid funding not required would be vired back to the corporate centre but instead now it will be retained within P&E to partly offset the Guided Busway litigation costs at the bottom line.

Guided Busway Litigation

Litigation costs relating to the Guided Busway, which are expected to be £3.2m this financial year compared to the £1.3m budget allocated. It is proposed that this pressure is covered by the funding set aside for Covid pressures which are no longer required. Costs of litigation remain in line with expectations overall, this variance represents progress of the case and alongside a case management conference scheduled this financial year.

Waste Private Finance Initiative (PFI) Contract

The waste budget is a large and complex budget and there are various potential pressures and underspends within it. Last financial year there were underspends due to an overall reduction in tonnage of waste being collected and overspends due to increased recycling credits and reduced trade waste income, and volumes are being closely monitored to see if and when they return to pre-Covid levels.

In Business Planning the waste service was allocated £638K to reflect the estimated impact of Covid but the majority of this will not be required for this specific purpose. However, this funding will instead be directed to help address the pressure created by the works required to address the Industrial Emissions Directive (IED) which requires the reduction of odour emissions from the Waterbeach facilities. This pressure was previously estimated to be £850K in this financial year, however the requirement to obtain planning consent will delay implementation of the works and move the majority of this budget pressure into next financial year.

As part of the annual post-year reconciliation of volumes and payments it has been identified that some of the street-sweeping waste and trade waste which passed through the waste transfer stations were incorrectly attributed to the Council and an adjustment needs to be made for previous years and there is also an impact on in-year expenditure to date (and hence also the forecast). The previous year's reconciliation amount of £460K and the in-year adjustment to the forecast, estimated to be £240K, has been transferred to waste reserves to contribute towards the revenue costs of the IED in 2022/23 and on this basis these adjustments are not shown in the forecast. This has been combined with the £850K identified above so that waste now has a £1.55M reserve to partially offset the revenue impacts of delivering the IED amendments to the Waterbeach facilities now largely expected to be in 2022/23.

3. Balance Sheet

3.1 Reserves

A schedule of the Service's reserves can be found in appendix 5.

3.2 Capital Expenditure and Funding

Expenditure

No significant issues to report this month.

Funding

All other schemes are funded as presented in the 2021/22 Business Plan.

A detailed explanation of the position can be found in appendix 6.

Appendix 1 – Service Level Budgetary Control Report

Previous Forecast Outturn Variance £000's	Service	Budget 2021/22 £000's	Actual October 2021 £000's	Forecast Outturn Variance £000's	Forecast Outturn Variance %
	Executive Director				
420	Executive Director	190	594	420	220%
-3,114	Lost Sales, Fees & Charges Compensation	3,114	0	-3,114	-100%
-2,694	**Executive Director Total**	**3,304**	**594**	**-2,694**	**-82%**
	Highways & Transport				
	Highways Maintenance				
0	Asst Dir - Highways Maintenance	165	133	0	0%
2	Highway Maintenance	10,064	2,831	-5	0%
-66	Highways Asset Management	443	81	-85	-19%
0	Winter Maintenance	2,744	1,221	0	0%
34	Highways - Other	-613	205	34	5%
	Project Delivery				
0	Asst Dir - Project Delivery	200	133	0	0%
1,945	Project Delivery	1,513	1,975	1,945	129%
-196	Street Lighting	10,594	5,408	-301	-3%
	Transport, Strategy & Development				
0	Asst Director - Transport, Strategy & Development	206	155	0	0%
24	Traffic Management	-184	-261	60	32%
25	Road Safety	528	497	27	5%
2	Transport Strategy and Policy	19	216	290	1562%
-268	Highways Development Management	0	-737	-559	0%
176	Park & Ride	0	394	169	0%
452	Parking Enforcement	0	-557	639	0%
2,130	**Highways & Transport Total**	**25,680**	**11,693**	**1,926**	**9%**
	Planning, Growth & Environment				
0	Asst Dir - Planning, Growth & Environment	90	50	0	0%
103	County Planning, Minerals & Waste	321	187	103	32%
49	Historic Environment	54	122	34	63%
61	Flood Risk Management	1,103	103	68	6%
21	Growth & Development	555	322	21	4%
300	Waste Management	39,757	23,661	306	1%
534	**Planning, Growth & Environment Total**	**41,880**	**24,446**	**533**	**1%**
	Climate Change & Energy Service				
0	Energy Projects Director	32	-423	0	0%
0	Energy Programme Manager	115	-43	0	0%
0	**Climate Change & Energy Service Total**	**147**	**-466**	**0**	**0%**
-31	**Total**	**71,012**	**36,267**	**52**	**0%**

Appendix 2 – Commentary on Forecast Outturn Position

Number of budgets measured at service level that have an adverse/positive variance greater than 2% of annual budget or £100,000 whichever is greater.

Executive Director

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
190	594	420	220%

The forecast overspend is due to the short term central costs arising from the Directorate restructuring and the interim staffing costs. This pressure will be covered by the funding set aside for Covid pressures, which are less than originally projected.

Lost Sales, Fees & Charges Compensation

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
3,114	0	-3,114	-100

Budget has been set aside to cover expected shortfalls in income due to COVID. The budget has been built on assumptions on the level of income and these a closre being closely monitored during the year. The level of income is currently greater than the initial assumptions and the surplus is being used to cover the costs of the Busway litigation and costs relating to the Directorate restructure.

Project Delivery

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
1,513	1,975	+1,945	+129

This forecast pressure relates to the Busway litigation costs, which are expected to be £3.2m this financial year compared to the £1.3m budget allocated. It is proposed that this pressure is covered by the funding set aside for Covid pressures which are no longer required. Costs of litigation remain in line with expectations overall, this variance represents progress of the case and alongside a case management conference scheduled this financial year.

Traffic Management

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
-184	-261	+60	+32

Income from permitting is projected to be lower than the budget set due to COVID. This is currently projected on certain assumptions and these assumptions is being closely monitored during the year. Income to date is higher than expected and this is shown in the reduction in the outturn forecast. Budget to cover this shortfall is held within 'Lost Sales, Fees & Charges Compensation' line.

Street Lighting

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
10,594	5,408	-301	-3

This budget is currently predicted to underspend due to savings from the PFI contract and vacancy savings in the Commissioning team. Energy inflation costs are increasing but are less than expected, resulting in a further underspend.

Transport Strategy and Policy

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
19	216	290	1562

The Strategy & Scheme development capital budget is under pressure this year. There has not been much work forthcoming from the Combined Authority due to the change of Mayor revisiting their priorities and about what work they want CCC to do to assist the delivery of their programme.

There are also a number of areas of CCC work which the team are expected to deliver for which there is insufficient funding, this includes A428 Black Cat to Caxton Gibbet Examination which has to be delivered as it is part of CCC's statutory duty.

Use of revenue funding is now being used to cover this pressure.

Highways Development Management

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
0	-737	-559	0

There is an expectation that section 106 fees will come in higher than budgeted for new developments which will lead to an overachievement of income. However, this is an unpredictable income stream and the forecast outturn is updated regularly.

Parking Enforcement

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
0	-557	+639	0

Income is projected to be lower than the budget set due to COVID. This is projected on certain assumptions and these assumptions are being closely monitored during the year. Currently income is ahead of the initial assumptions but not yet at pre-Covid levels. Budget to cover this shortfall is held within 'Lost Sales, Fees & Charges Compensation' line.

Park & Ride

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
0	394	+169	0

Income is projected to be lower than the budget set due to COVID. This is currently projected on certain assumptions and these assumptions are being closely monitored during the year.Currently income is ahead of the initial assumptions but not yet at pre-Covid levels. Budget to cover this shortfall is held within 'Lost Sales, Fees & Charges Compensation' line.

County Planning, Minerals & Waste

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
321	187	+103	+32

Income is projected to be lower than the budget set due to COVID. This is currently projected on certain assumptions and these assumptions are being closely monitored during the year. Currently we do not have enough data to change the assumptions when the budget was set. Budget to cover this shortfall is held within 'Lost Sales, Fees & Charges Compensation' line.

Historic Environment

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
54	122	+34	+63

Income is projected to be lower than the budget set due to COVID. This is currently projected on certain assumptions and these assumptions are being closely monitored during the year. Currently we do not have enough data to change the assumptions when the budget was set. Budget to cover this shortfall is held within 'Lost Sales, Fees & Charges Compensation' line.

Waste Management

Current Budget for 2021/22 £'000	Actual £'000	Outturn Forecast £'000	Outturn Forecast %
39,757	23,661	+306	+1

The waste budget is a large and complex budget and there are various potential pressures and underspends within it. Last financial year there were underspends due to an overall reduction in tonnage of waste being collected and overspends due to increased recycling credits and reduced trade waste income, and volumes are being closely monitored to see if and when they return to pre-Covid levels.

In Business Planning the waste service was allocated £638K to reflect the estimated impact of Covid but the majority of this will not be required for this specific purpose. However, this funding will instead be directed to help address the pressure created by the works required to address the Industrial Emissions Directive (IED) which requires the reduction of odour emissions from the Waterbeach facilities. This pressure was previously estimated to be £850K in this financial year, however the requirement to obtain planning consent will delay implementation of the works and move the majority of this budget pressure into next financial year.

As part of the annual post-year reconciliation of volumes and payments it has been identified that some of the street-sweeping waste and trade waste which passed through the waste transfer stations were incorrectly attributed to the Council and an adjustment needs to be made for previous years and there is also an impact on in-year expenditure to date (and hence also the forecast). The previous year's reconciliation amount of £460K and the in-year adjustment to the forecast, estimated to be £240K, has been transferred to waste reserves to contribute towards the revenue costs of the IED in 2022/23 and on this basis these adjustments are not shown in the forecast. This has been combined with the £850K identified above so that waste now has a £1.55M reserve to partially offset the revenue impacts of delivering the IED amendments to the Waterbeach facilities now largely expected to be in 2022/23.

Appendix 3 – Grant Income Analysis

The table below outlines the additional grant income, which is not built into base budgets.

Grant	Awarding Body	Expected Amount £'000
Grants as per Business Plan	Various	6,712
Adjustment to Waste PFI grant		+42
Non-material grants (+/- £30k)	N/A	0
Total Grants 2021/22		**6,754**

Appendix 4 – Virements and Budget Reconciliation

Budgets and movements	£'000	Notes
Budget as per Business Plan	64,313	
Centralisation of postage budgets	-40	
Non-material virements (+/- £30k)	-16	
Current Budget 2020/21	**64,257**	

Appendix 5 – Reserve Schedule

Fund Description	Balance at 31st March 2021 £'000	Movement within Year £'000	Balance at 30th November 2021 £'000	Yearend Forecast Balance £'000	Notes
Other Earmarked Funds					
Deflectograph Consortium	31	0	31	30	Partnership accounts, not solely CCC
Highways Searches	175	0	175	0	
On Street Parking	1,876	0	1,876	1,300	
Streetworks Permit scheme	44	0	44	0	
Highways Commutted Sums	1,376	(3)	1,373	900	
Streetlighting - LED replacement	48	(32)	16	0	
Flood Risk funding	20	0	20	0	
Real Time Passenger Information (RTPI)	216	0	216	150	
Waste - Recycle for Cambridge & Peterborough (RECAP)	61	0	61	30	Partnership accounts, not solely CCC
Travel to Work	197	0	197	180	Partnership accounts, not solely CCC
Steer- Travel Plan+	66	0	66	52	
Waste reserve	984	1,550	2,534	2,534	
Other earmarked reserves under £30k	89	18	107	0	
Sub total	**5,184**	**1,533**	**6,717**	**5,176**	
Capital Reserves					
Government Grants - Local Transport Plan	0	0	0	0	Account used for all of P&E
Other Government Grants	3,905	(396)	3,508	0	
Other Capital Funding	3,410	(237)	3,173	0	
Sub total	**7,315**	**(634)**	**6,681**	**0**	
TOTAL	**12,499**	**899**	**13,398**	**5,176**	

Appendix 6 – Capital Expenditure and Funding

Capital Expenditure 2021/22

Total Scheme Revised Budget £'000	Original 2021/22 Budget as per BP £'000	Scheme	Revised Budget for 2021/22 £'000	Actual Spend (November) £'000	Forecast Spend – Outturn (November) £'000	Forecast Variance – Outturn (November) £'000
		Integrated Transport				
0	200	Major Scheme Development & Delivery	0	2	0	0
318	0	- S106 Northstowe Bus Only Link	318	6	7	-311
208	0	- Stuntney Cycleway	177	16	177	0
1,085	882	Local Infrastructure Improvements	1,128	506	678	-450
101	0	- Minor improvements for accessibility and Rights of Way	97	29	101	4
		Safety Schemes				
1,000	500	- A1303 Swaffham Heath Road Crossroads	980	9	80	-900
344	94	- Safety schemes under £500K	344	310	344	0
907	345	Strategy and Scheme Development work	908	554	908	0
		Delivering the Transport Strategy Aims				
2,808	901	- Highway schemes	2,846	156	1,474	-1,372
		- Cycling schemes				
0	550	- Boxworth to A14 Cycle Route	0	0	0	0
0	500	- Hilton to Fenstanton Cycle Route	0	0	0	0
0	780	- Buckden to Hinchingbrooke Cycle Route	0	0	0	0
0	272	- Dry Drayton to NMU	0	6	6	6
400	285	- Hardwick Path Widening	305	283	283	-22
982	760	- Bar Hill to Longstanton	30	18	30	0
1,000	800	- Girton to Oakington	704	378	589	-115
16	0	- Arbury Road	12	0	12	0
1,562	0	- Papworth to Cambourne	1,335	46	1,335	0
0	0	- Wood Green to Godmanchester	0	1	1	1
150	132	- Busway to Science Park	148	0	148	0
200	0	- Fenstanton to Busway	14	29	29	15
60	0	- NMU Cycling scheme - Washpit Road	57	59	59	2
0	0	- NMU Cycling scheme - Girton Upgrades	0	0	0	0
348	0	- NMU Cycling scheme - Longstanton Bridleway	316	308	316	0
355	445	- Other Cycling schemes	475	24	68	-407
23	23	Air Quality Monitoring	23	1	23	0
25,000	1,000	A14	1,000	-1,000	1,000	0
		Operating the Network				
		Carriageway & Footway Maintenance incl Cycle Paths				
1,115	400	- Countywide Safety Fencing renewals	1,115	9	195	-920
1,249	1,142	- Countywide Retread programme	1,249	469	1,249	0
481	481	- Countywide F'Way Slurry Seal programme	481	267	481	0
989	989	- Countywide Surface Dressing programme	989	0	154	-835
956	690	- Countywide Prep patching for Surface Dressing prog	956	104	956	0
709	357	- Whittlesey, Ramsey Road Nr Pondersbridge Cway	709	672	729	20
4,182	4,182	- Additional Surface Treatments	4,182	950	4,182	0
3,839	2,431	- Carriageway & Footway Maintenance schemes under £500k	3,850	1,715	3,360	-490
140	140	Rights of Way	140	88	175	35

Total Scheme Revised Budget £'000	Original 2021/22 Budget as per BP £'000	Scheme	Revised Budget for 2021/22 £'000	Actual Spend (November) £'000	Forecast Spend – Outturn (November) £'000	Forecast Variance – Outturn (November) £'000
		Bridge Strengthening				
900	568	- St Ives Flood Arches	900	48	294	-606
2,226	1,996	- Other	2,226	814	2,702	476
1,407	850	Traffic Signal Replacement	1,407	663	1,460	53
200	200	Smarter Travel Management - Int Highways Man Centre	200	72	200	0
165	165	Smarter Travel Management - Real Time Bus Information	165	26	165	0
		Highways & Transport				
		Highways Maintenance				
		£90m Highways Maintenance schemes				
839	0	- B1050 Willingham, Shelford Rd Prov.	0	-2	-2	-2
500	0	- B660 Holme, Long Drove C/way resurface/strengthen	638	745	745	107
900	0	- B1382 Prickwillow Pudney Hill Road Carriageway	900	771	845	-55
550	0	- B198 Wisbech, Cromwell Road Carriageway	625	8	625	0
80,627	2,723	- Other	4,403	166	3,544	-859
		Pothole grant funding	0	0	0	0
3,074	0	- Additional Surface Treatments	3,074	2,574	2,574	-500
3,770	0	- Other	3,767	909	3,644	-123
4,000	4,000	Footways	4,000	67	4,000	0
0	0	Safer Roads Fund	10	2	10	0
		Project Delivery				
49,000	18	- Ely Crossing	58	-1,469	58	0
149,791	4,179	- Guided Busway	100	2	100	0
0	0	- Cambridge Cycling Infrastructure	0	0	0	0
1,975	0	- Fendon Road Roundabout	275	13	40	-235
350	0	- Ring Fort Path	308	15	40	-268
330	0	- Cherry Hinton Road	330	29	245	-85
1,200	0	- St Neots Northern Footway and Cycle Bridge	0	5	5	5
6,950	2,063	- Chesterton - Abbey Bridge	0	0	0	0
33,500	10,900	- King's Dyke	12,700	5,733	12,700	0
1,098	0	- Emergency Active Fund	785	217	610	-175
2,589	0	- Lancaster Way	792	426	642	-150
150	0	- A14	0	116	0	0
3,971	4,877	- Wisbech Town Centre Access Study	1,883	1,628	1,883	0
158	0	- Spencer Drove, Soham	158	29	170	12
6,023	0	- March Future High St Fund	336	0	192	-144
8,522	0	- St Neots Future High St Fund	349	13	154	-195
		Transport Strategy and Network Development				
1,000	0	- Scheme Development for Highways Initiatives	437	10	13	-424
2,083	0	- Combined Authority Schemes	2,083	811	1,964	-119
280	0	- A505	143	2	143	0
6,795	0	- Wheatsheaf Crossroads	200	0	75	-125
		Planning, Growth & Environment				
6,634	3,188	- Waste Infrastructure	294	131	290	-4
12,000	0	- Waterbeach Waste Treatment Facilities	4,500	0	0	-4,500
680	0	- Northstowe Heritage Centre	519	69	519	0
		Climate Change & Energy Services				
1,000	0	- Energy Efficiency Fund	306	127	252	-54

Total Scheme Revised Budget £'000	Original 2021/22 Budget as per BP £'000	Scheme	Revised Budget for 2021/22 £'000	Actual Spend (November) £'000	Forecast Spend – Outturn (November) £'000	Forecast Variance – Outturn (November) £'000
8,998	8,835	- Swaffham Prior Community Heat Scheme	8,998	2,212	6,598	-2,400
928	0	- Alconbury Civic Hub Solar Car Ports	583	532	583	0
4,814	3,134	- St Ives Smart Energy Grid Demonstrator scheme	967	0	967	0
6,849	2,161	- Babraham Smart Energy Grid	1,409	496	1,409	0
6,970	-	- Trumpington Smart Energy Grid	0	0	0	0
8,266	127	- Stanground Closed Landfill Energy Project	236	-10	0	-236
2,526	-	- Woodston Closed Landfill Energy Project	0	-8	0	0
24,444	22,781	- North Angle Solar Farm, Soham	21,150	4,509	21,150	0
635	550	- Fordham Renewable Energy Network Demonstrator	635	18	635	0
15,000	862	- Decarbonisation Fund	4,074	2,246	4,795	721
200	200	- Electric Vehicle chargers	200	0	200	0
500	500	- Oil Dependency Fund	500	0	65	-435
300	300	- Climate Action Fund	300	0	0	-300
157	0	- Cambridge Electric Vehicle Chargepoints	157	0	173	16
3,145	0	- School Ground Source Heat Pump Projects	3,224	72	1,943	-1,281
45,890	14,937	**Connecting Cambridgeshire**	14,937	1,758	6,198	-8,739
	483	Capitalisation of Interest	483	0	483	0
575,099	**109,878**		**131,612**	**32,610**	**105,249**	**-26,363**
	-25,237	Capital Programme variations	-25,237	0	0	25,237
	84,641	**Total including Capital Programme variations**	**106,375**	**32,610**	**105,249**	**-1,126**

The increase between the original and revised budget is partly due to the carry forward of funding from 2020/21, this is due to the re-phasing of schemes, which were reported as underspending at the end of the 2020/21 financial year. The phasing of a number of schemes have been reviewed since the published business plan and are now incorporated in the table above

The Capital Programme Board have recommended that services include a variation budget to account for likely slippage in the capital programme, as it is sometimes difficult to allocate this to individual schemes in advance. As forecast underspends start to be reported, these are offset with a forecast outturn for the variation budget, leading to a balanced outturn overall up to the point when slippage exceeds this budget. The allocations for these negative budget adjustments have been calculated and shown against the slippage forecast to date.

Appendix 7 – Commentary on Capital expenditure

- S106 Northstowe Bus Only Link

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
318	7	-311	-311	0	0	-311

Delays in seeking alternative construction procurement following high cost of original target price.

- Stuntney Cycleway

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £’000	Forecast Variance (November) £’000	Variance Last Month (October) £’000	Movement £’000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
177	177	0	0	0	0	0

Target Cost for Southern alignment is circa £86,000, currently forecasting to be spent Jan/March 22, pending start of works date. Proposal is to allocate the remaining budget to scheme development, linking the new footway construction to both Ely to the West and Stuntney to the East.

- Local Infrastructure Improvements

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £’000	Forecast Variance (November) £’000	Variance Last Month (October) £’000	Movement £’000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
1,128	678	-450	-449	-1	0	-450

There are no projects which are individually material (over £100k), but there are a 46 LHI schemes which are to be delayed and carried forward to 22/23 (amounting to £449,842). Some of the project delays are on schemes which need to be safety audited, currently the turnaround is around 10-12 weeks, (usually 6-8weeks), prior to proceeding to formal consultation or target costing. Other delays to date have been due to approval times from parish councils. The delays have also been exacerbated by project team resources. For further information on specific schemes please refer to the LHI report appended to this document.

- A1303 Swaffham Heath Road Crossroads

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £’000	Forecast Variance (November) £’000	Variance Last Month (October) £’000	Movement £’000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
980	80	-900	-400	-500	0	-900

Construction isn’t expected to begin until early 22/23 and is subject to ongoing land negotiation.

- Strategy and Scheme Development work

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £’000	Forecast Variance (November) £’000	Variance Last Month (October) £’000	Movement £’000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
908	908	0	+287	-287	0	0

The Strategy & Scheme development budget is under pressure this year. There has not been much work forthcoming from the Combined Authority due to the change of Mayor revisiting their priorities and about what work they want CCC to do to assist the delivery of their programme.

There are also a number of areas of CCC work which the team are expected to deliver for which there is insufficient funding, this includes A428 Black Cat to Caxton Gibbet Examination which has to be delivered as it is part of CCC’s statutory duty.
Use of revenue funding is now being used to cover this pressure.

- Delivering the Transport Strategy Aims – Highway Schemes

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
2,846	1,474	-1,372	-1,334	-38	0	-1,372

Slippage of £1.3m on Delivering the Strategy Transport Aims- Highway Schemes is due the funding allocation and programme not being agreed until September 2021, and together with the required involvement of the various district councils and the complexity of the projects this will mean that just under half the of expenditure will slip into next financial year. It is anticipated that agreement to next year's allocation and programme will be made earlier, so that this year's slipped schemes plus next year's full programme will be delivered and spent within year.

- Hardwick Path Widening

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
305	283	-22	-22	0	-22	0

Project delivered under budget and as per programme of construction. Efficiencies brought about by an amended design and widening the footpath within the Highway Boundary instead of re-aligning the carriageway.

- Girton to Oakington Cycleway

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
704	589	-115	-122	+7	0	-115

Construction on Phase 1 constrution complete expended HE monies, currently undertaking design of phase 2 (S106 monies) construction to commence in next financial year.

- Other Cycling Schemes

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
475	68	-407	-287	-120	0	-407

Schemes that are to be funded by the Integrated transport block were agreed in September 21 and as a consequence those schemes with significant detail design and longer lead in times are now expected to be delivered in 2022/23.

- Countywide Safety Fencing renewals

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £’000	Forecast Variance (November) £’000	Variance Last Month (October) £’000	Movement £’000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
1,115	195	-920	-920	0	0	-920

The construction phase of the A505/ M11 Duxford safety fencing renewals have been delayed due to design complexities and coordination with National Highways. The scheme is now expected to be delivered in 22/23.

- Countywide Surface Dressing programme

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £’000	Forecast Variance (November) £’000	Variance Last Month (October) £’000	Movement £’000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
989	154	-835	-675	-160	0	-835

As detailed within the ‘Carriageway & Footway Maintenance’ section, 3 schemes are being brought forward as they are the most deliverable schemes that can be accommodated at this stage in the financial year.

- Carriageway & Footway Maintenance schemes

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £’000	Forecast Variance (November) £’000	Variance Last Month (October) £’000	Movement £’000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
3,850	3,360	-490	-488	-2	0	-490

With the current levels of predicted underspend and unallocated funding, the following three schemes are being bought forward from the published Capital Maintenance Programme

- Brockly Road, Elsworth £180,000
- Church Street, Guilden Morden £132,000
- Balsham Road, Linton £168,000

These schemes are the most deliverable schemes that can be accommodated at this stage in the financial year.

It is proposed to fund the delivery of two highway drainage flood alleviation schemes, where highway water is significantly contributing to the flooding of a number of properties. The two drainage schemes are High Street, Buckden, (£312,000) and Ermine Street, Arrington (£280,000). It is proposed that the additional funding required to deliver these schemes is taken from the previously identified Vehicle Restraint System upgrade at the A505/M11 interchange, where funding has previously been approved to be carried forward to 2022/23. The A505 scheme will continue in 2022/23 unaffected however this amendment will ensure the highway drainage improvements can be delivered without undue delay.

- Bridge Strengthening

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
3,126	2,998	-128	-128	0	0	-128

Reactive Capital works Bridge repairs needs an extra £475k for minor repairs, so funding this year will be moved from the St Ives Flood Arches/ Town Bridge and North of Girton Bridge, both which have been delayed.

- £90m Highways Maintenance schemes

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
6,566	5,757	-809	-372	-437	0	-809

A net underspend is forecast this year mainly due to slippage of 2 main schemes:-
Littleport – Road space issues with Highways England / Suffolk network, 50% of the scheme will be carried out when the diversion route falls within Cambridgeshire (predicted at £452k spend in 2021/22 - £450k spend 2022/23).
Parson Drove/Murrow Bank (£390k) – Works to be programmed in 2022/23 to realise efficiencies by working alongside a 2022/23 Gull Road scheme.

- Pothole grant funding

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
6,841	6,218	-623	-566	-57	0	-623

Due to delays in the surface treatment programme and the a reduced window for delivery during the winter months, leading to an underspend. Time taken to produce target costs may mean that some schemes may not be achievable this year, which may lead to some schemes in this programme being delivered in the next financial year attributing to this variance.

- Fendon Road Roundabout

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
275	40	-235	-235	0	-235	0

Expenditure has been lower than anticipated during 21/22 as remedial work costs to the roundabout were lower than expected. The remaining monies will go back to the original South Area Corridor S106 pot.

- Ring Fort Path

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £’000	Forecast Variance (November) £’000	Variance Last Month (October) £’000	Movement £’000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
308	40	-268	-268	0	0	-268

Due to ongoing land acquisition negotiations the scheme is not likely to be in a position to start on-site during 21/22. The expected expenditure for the remainder of 21/22 is a reflection of land purchase costs and legal fees.

- Emergency Active Fund

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £’000	Forecast Variance (November) £’000	Variance Last Month (October) £’000	Movement £’000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
785	610	-175	-175	0	0	-175

Following preliminary development of the original 53 schemes, an extended consultation period during Autumn 2021, analysis of the data by Business Intelligence Unit (currently underway), scheme detailed design, road safety audit and traffic management complexities, plus engagement with the Greater Cambridge Partnership over schemes that formed part of the City Access strategy now being taken forward by the GCP, only some simple and cycle parking projects are programmed to be delivered by end March 2022, with the more complex schemes programmed for delivery from April to August 2022.

- Lancaster Way

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £’000	Forecast Variance (November) £’000	Variance Last Month (October) £’000	Movement £’000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
792	642	-150	-150	0	-150	0

There is an expectation that scheme will now underspend against the allocation funding. This scheme is funded by the Combined Authority, so will mean a reduction in the reimbursement claimed.

- March Future High Street Fund

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £’000	Forecast Variance (November) £’000	Variance Last Month (October) £’000	Movement £’000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
336	192	-144	-144	0	0	-144

Design costs which were factored into this year’s budget are being picked up directly by Fenland District Council, so has reduced the forecast expenditure for this year.

- St Neots Future High Street Fund

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
349	154	-195	-195	0	0	-195

Design costs which were factored into this year's budget are being picked up directly by Huntingdonshire District Council, so has reduced the forecast expenditure for this year.

- Scheme Development for Highway Initiatives

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
437	13	-424	-424	0	0	-424

Funding was allocated to enable scheme development for new schemes, however this year no new schemes have been identified that require scheme development work. It is therefore expected that this funding would roll forward into next year.

- Waterbeach Waste Treatment Facilities

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
4,500	0	-4,500	-4,500	0	0	-4,500

A new scheme has been placed into the capital programme to take account of amendments to the Waterbeach waste treatment facilities following changes to the Industrial Emissions Directive to reduce emissions to levels which are able to meet the sector specific Best Available Technique conclusions (BATc) and comply with new Environmental Permit conditions issued by the Environment Agency (subject to determining whether a Qualifying Change in Law applies). This work is not now expected to begin until 2022/23.

- Energy Efficiency Fund

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
306	252	-54	-61	+7	0	-54

8 LED lighting projects completed so far and 6 more currently in progress or being planned. 5 more projects are in doubt due to potential asbestos, awaiting survey results and costs to remove asbestos. This means actual spend could increase compared to forecast (due to asbestos removal) or decrease (if we decide not to proceed because costs are too high).

- Swaffham Prior Community Heat Scheme

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
8,998	6,598	-2,400	0	-2,400	0	-2,400

Rephasing of scheme and more costs will fall into 22/23. The priority during 21/22 has been to spend the grant from the Heat Network Investment Project (HNIP) by the end of March 2022. Delays on the delivery of the energy centre have occurred as a result of site asbestos contamination which need to be cleared and the difficulty getting hold of cladding materials. This has meant that some spend is being reprofiled into 2022/23.

- Stanground Closed Landfill Energy Project

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
236	0	-236	0	-236	0	-236

This scheme has been delayed by a year due to capacity constraints, so costs will now be incurred in 22/23.

- Decarbonisation Fund

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
4,074	4,795	+721	+533	+188	0	+721

20 low carbon heating projects currently underway,one of which is now completed. Government grant from the Public Sector Decarbonisation Scheme partly funds the investment into the heating programme. Covid-19 has had some impact on delivery, in particular material delays and cost.

- Oil Dependency Fund

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
500	65	-435	0	-435	0	-435

Funding was agreed at Environment and Green Investment Committee in December 2021 but government policy to support off-gas communities to decarbonise has only just started coming through. Now we understand Government's direction of travel in the Heat and Building Strategy we have reprofiled the spend.

- Climate Action Fund

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
300	0	-300	0	-300	0	-300

The Climate Change and Environment Strategy has been reviewed August-December 2021 and is being considered by Full Council in February 2022. The revised strategy will direct how the funding will be spent.

- School Ground Source Heat Pump Projects

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
3,224	1,943	-1,281	0	-1,281	0	-1,281

Confirmation of the Public Sector Decarbonisation grant funding came forward in May 2021 and the priority is to spend the grant by the end of the financial year. The remainder of the budget will be spent next financial year.

- Connecting Cambridgeshire

Revised Budget for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Variance (November) £'000	Variance Last Month (October) £'000	Movement £'000	Breakdown of Variance: Underspend/ pressure £'000	Breakdown of Variance : Rephasing £'000
14,937	6,198	-8,739	-116	-8,623	0	-8,739

The Connecting Cambridgeshire spend for this year has been reprofiled and some spend will now be in next year, as the SFBB Phase 4,Contract 2 is now not expected to be completed until mid-2022. There will be a total scheme underspend of £900k from saving from the Openreach SFBB contract 1, Phases 1-3, reducing the original £20m (£16.515m from prudential borrowing, £3.485m from LPSA grant) to £19.1m.

Capital Funding

Original 2021/22 Funding Allocation as per BP £'000	Source of Funding	Revised Funding for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Funding Variance - Outturn (November) £'000
13,873	Local Transport Plan	13,599	13,099	-500
4,182	Other DfT Grant funding	11,808	11,567	-241
16,426	Other Grants	18,313	12,737	-5,576
8,437	Developer Contributions	3,929	2,415	-1,514

Original 2021/22 Funding Allocation as per BP £'000	Source of Funding	Revised Funding for 2021/22 £'000	Forecast Spend - Outturn (November) £'000	Forecast Funding Variance - Outturn (November) £'000
48,447	Prudential Borrowing	59,773	43,916	-15,857
18,030	Other Contributions	23,707	21,032	-2,675
109,395		**131,129**	**104,766**	**-26,363**
-12,254	Capital Programme variations	-24,300	2,063	26,363
97,141	**Total including Capital Programme variations**	**106,829**	**106,829**	**0**

The increase between the original and revised budget is partly due to the carry forward of funding from 2020/21, this is due to the re-phasing of schemes, which were reported as underspending at the end of the 2020/21 financial year. The phasing of a number of schemes have been reviewed since the published business plan.

Funding	Amount (£m)	Reason for Change
New funding/Rephasing (DfT Grants)	3.48	Roll forward of unused pothole grant (£2.695m). Roll forward of Emergency Active travel fund grant (£0.785m)
New funding/Rephasing (Specific Grants)	3.13	Roll forward of Highways England funding for A14 cycling schemes (£0.991m). Roll forward of grant for Northstowe Heritage centre (£0.519m). Roll forward of grant for School Ground Source Heat Pump Projects (£1.88m) Roll forward of CPCA funding for Lancaster Way (£0.642m) Roll forward and rephasing Wisbech Town Centre Access scheme (-£1.055m) CPCA funding for A505 scheme (£0.143m).
Additional Funding / Revised Phasing (Section 106 & CIL)	-4.79	Developer contributions to be used for a number of schemes. Northstowe Bus link (£0.128m) Highway development work (£0.508m). Rephasing Bar Hill to Longstanton cycleway (-£0.730m). Rephasing Girton to Oakington cycleway (-£0.102m). Rephasing of Signals work (£0.557m). Rephasing of Waste scheme (-£0.117m). Rephasing of Guided Busway (-£4.079m). Rephasing of Fendon Road Roundabout (£0.275m). Rephasing of Ring Fort path (£0.308m). Rephasing of Cherry Hinton Road cycleway (£0.330m). Rephasing Chesterton Abbey Bridge (-£2.063m). Repahsing Lancaster Way (£0.150m).
Additional funding / Revised Phasing (Other Contributions)	5.59	Strategy & scheme development work (£0.149m). Deletion of A14 cycling schemes which are part of phase 2 bid (-£1.830m). Carriageway & Footway Maintenance

Funding	Amount (£m)	Reason for Change
		(£0.420m).Pothole funding (£4.000m). Rephasing King's Dyke (£0.611m). Combined Authority funding (£2.072m) Spencer Drove, Soham (£0.158m)
Additional Funding / Revised Phasing (Prudential borrowing)	14.01	Deletion of A14 cycling schemes which are part of phase 2 bid (-£0.125m). Rephasing of Highways Maintenance funding (£8.056m). Rephasing of Waste schemes (-£2.777m). Rephasing of Energy schemes (£7.19m). Rephasing King's Dyke (£1.189m). Rephasing Scheme development for Highway Initiatives.

Key to RAG ratings

RAG status	Description
RED	Not delivered within the target completion date (financial year)
AMBER	Highlighted concerns regarding delivery by completion date
GREEN	On target to be delivered by completion date

Update as at 01.12.2021

Cambridge City Works Programme

Carried Forward from 2018/19

Total Local Highway Improvement (LHI)_Schemes 27
Total Completed 26
Total Outstanding 1

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/19 completion date)	Project Update and any Issues or Variance Explanation
Cllr Richard Howitt 30CPX02296	Petersfield	Great Northern Road	**Civils** - Zebra crossing	RED	Road now adopted. NOI consultation starts 03/08. A number of objections received which are currently being discussed and worked through with the local member. Some pressure to relocate the zebra from proposed location despite this being the only available option. This is further delaying the scheme as members now wish to revisit this, although ruled out via safety audit already.

Carried Forward from 2020/21

Total LHI Schemes 24
Total Completed 23
Total Outstanding 1

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/21 completion date)	Project Update and any Issues or Variance Explanation
Cllr Beckett	Queen Edith	Cavendish Avenue	**Raised Features** - Installation of speed cushions along Cavendish Avenue to reduce vehicle speeds.	RED	Scheme now with Policy & Regulation team for formal TRO.

Current Schemes Forward for 2021/22

Total LHI Schemes 20
Total Completed 2
Total Outstanding 18

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/22 completion date)	Project Update and any Issues or Variance Explanation
Richard Howitt	Petersfield	Cambridge Place	Parking restrictions - Extend loading restriction into Cambridge Place though the narrow section. Add Diag 816 No Through Road sign.	GREEN	Informal consultation complete. Next stage formal consultation for TRO. This will be undertaken during September. This has now been delayed by P+R team and will run to 19/11.
Alex Bulat	Abbey	Occupation Road	Parking restrictions - Yellow lining to only allow parking on one side of the road to allow access for emergency vehicles.	GREEN	Informal consultation complete. Next stage formal consultation for TRO. This will be undertaken during September. This has now been delayed by P+R team and will run to 19/11.

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/22 completion date)	Project Update and any Issues or Variance Explanation
Richard Howitt	Petersfield	Union road	Signs / Lines - Replace existing DYL waiting restriction with "School Keep Clear" marking with associated amendment to existing traffic order to run the length of school accesses. Refresh existing DYL markings on approaches, add 20 roundels and SLOW markings.	GREEN	Work Complete
Alex Bulat	Abbey	The Homing's	Street lights - Exact amount of lights to be determined upon review and consultation, current allowance for 6 no.	GREEN	Design approved. Now with street lighting team to progress.
Elisa Meschini	Kings Hedges	Cameron Road	Raised features - Installation of cushions to help reduce vehicle speeds in the vicinity of the Ship Pub.	AMBER	Scheme currently submitted and awaiting Road Safety Audit. Next stage once RSA received is formal consultation. Amber due to outstanding activities including formal consultation and pricing before the scheme can be installed on site.
Alex Beckett	Queen Edith's	Hills Road	Parking Restrictions - Double yellow lines for length of Hills Road access road - from 321 - 355	GREEN	Informal consultation complete. Next stage formal consultation for TRO. This will be undertaken during September. This has now been delayed by P+R team and will run to 19/11.
Catherine Rae	Castle	Street Lights - Various	Street Lights - 2 no locations around the ward (Garden Walk / Sherlock Road) which currently have significant areas of unlit path.	GREEN	Design approved. Now with street lighting team to progress.
Catherine Rae	Castle	Huntingdon Road	Signs / MVAS - Warning signs in advance of zebra crossing and MVAS unit.	GREEN	Order raised. Currently waiting on start date from contractor.
Neil Shailer	Romsey	Coldhams Ln	MVAS unit.	GREEN	To be tied in with countywide MVAS procurement package.
Gerri Bird	Chesterton	Fallowfield / May Way / Orchard Avenue	Street lights - Various locations around Chesterton ward to improve lighting in existing dark spots.	GREEN	Design approved. Now with street lighting team to progress.
Richard Howitt	Petersfield	Saxon Street	Access restriction - Provide diagram 619 with sub plate "Except for Access" with relevant legal order. Signs are not legally required to be lit as within a 20mph zone but should be considered as the signs might be very hard to distinguish in the dark.	GREEN	Informal consultation with residents complete. TRO to follow on once ETRO schemes in area have been decided on later this financial year (Nov committee).
Catherine Rae	Castle	Albert St	Civils - New surface water drainage system, and improvements to the entrance of Albert St off Chesterton Road including imprint paving, new signs and new lining.	GREEN	Design complete. Submitted for pricing WC 01/11
Elisa Meschini	Kings Hedges	Green End Road	Parking restrictions - yellow lining to both sides of the road to allow access for vehicles and increase visibility.	GREEN	Informal consultation complete. Next stage formal consultation for TRO. This will be undertaken during September. This has now been delayed by P+R team and will run to 19/11.
Bryony Goodliffe	Romsey	Birdwood Rd	Raised Features - Speed cushions	AMBER	Next stage is formal consultation. Amber due to outstanding activities including formal consultation and pricing before the scheme can be installed on site.
Alex Bulat	Abbey	Riverside Bridge	Civils - Relocation of existing bollards and signs/lines to make it a clearer route for cyclists and pedestrians.	GREEN	Work Complete
Nick Gay	Market	Green Street	Signs / lines - change to NMU route between certain hours of the day to create a pedestrian zone for majority of hours during day	GREEN	Consulting with GCP, City Council, Policy and Regulation and Parking services regarding proposal and enforcement. Awaiting responses to queries before proceeding with informal consultation.
Gerri Bird	Chesterton	Chestnut Grove	Parking restrictions - DYL waiting restriction at junction	GREEN	Informal consultation complete. Next stage formal consultation for TRO. This will be undertaken during September. This has now been delayed by P+R team and will run to 19/11.
Neil Shailer	Romsey	Coldhams Ln 256 - 258	Civils - Installation of footpath gullies and resurfacing of footpath to remove standing water.	GREEN	Design work complete. Needs reviewing internally before being sent to local member for comment.
Bryony Goodliffe	Cherry Hinton	Fishers Lane	Parking restrictions - Double Yellow Lines.	GREEN	Informal consultation complete. Next stage formal consultation for TRO. This will be undertaken during September. This has now been delayed by P+R team and will run to 19/11.
Elisa Meschini	Kings Hedges	Nuffield Road	MVAS / Signs / Lines - 20mph repeater and road markings as needed	GREEN	Signing and lining work complete. MVAS to be tied into countywide package.

Huntingdonshire Works Programme

Carried Forward from 2019/20

Total Local Highway Improvement (LHI) Schemes 21
Total Completed 19
Total Outstanding 2

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/20 completion date)	Project Update and any Issues or Variance Explanation
Cllr Bywater	Folkesworth & Washingley	Village Area	7.5t Weight Limit	RED	Project's proposal got altered. Weight limit + village gateways to be implemented. Request to advertise N.O.I sent to P&R on 22/09/2021. TC request to be sent w/c 1st November.
Cllr Gardener	Winwick	B660	30mph speed limit	RED	Awaiting confirmation from Parish/ Community on their increased contribution prior to raising works order. Application for CIL funding sent. Decision expected in October/ November 2021.

Carried Forward from 2020/21

Total LHI Schemes 25
Total Completed 18
Total Outstanding 7

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/21 completion date)	Project Update and any Issues or Variance Explanation
Cllr Criswell	Woodhurst	Wheatsheaf Rd & Church Street	Provision of 40mph buffer zones	RED	Works completed except centre line marking. Hydroblasting to be used to remove existing centre line. Once done new centre line marking to be painted.
Cllr Bywater	Sawtry	Gidding Road	Installation of pedestrian crossing	RED	Awaiting BBLP's street lighting design. Expected by end of October. Once received, RSA 1&2 to be requested.
Cllr West	Great Paxton	High Street	Priority narrowing's	RED	Initial scope turned out to be unfeasible. PC agreed to provision of a solar powered MVAS unit. Works Order for MVAS unit has been raised on 19/10/21. Posts locations to be agreed on with PC.
Cllr Gardener	Catworth	Church Road	New footway leading up to the bus stop	RED	Reduced scope agreed with PC due to budget constraints. Works Order raised. Works to be carried out from 6th December
Cllr Rogers	Abbots Ripton	The main roads through and into the village	Heavy Commercial Vehicles (HCV) survey	GREEN	Work Complete
Cllr Gardener	Winwick	B660, Old Weston Road	Provision of a Mobile Vehicle Activated Sign (MVAS)	RED	Tied in with 19/20 bid. Awaiting PC's confirmation regarding their contribution.
Cllr Downes	Brampton	The Green, Brampton	Installation of pedestrian crossing	RED	CCC Officers met with PC to agree on the crossing's location. Officer to send request for RS comments. Street lighting design to be requested before end of October.
Cllr Fuller	St Ives	Footpath crossing Erica Road	Provision of crossing point and installation of knee-rail fence	RED	Request for street lighting design sent to BB. RSA 1&2 and TC requested on 17.08.21. Still awaiting HDC's approval regarding land take and adoption. Unable to proceed without approval. Chasing correspondence sent. Still no approval. TRO process to follow.

Current Schemes Forward for 2021/22

Total LHI Schemes 29
Total Completed 0
Total Outstanding 29

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/22 completion date)	Project Update and any Issues or Variance Explanation
Ian Gardener	Upton and Coppingford PC	Upton Village, Upton	Reduction in the speed limit from 30mph to 20mph with 30mph buffer limits.	GREEN	Notice of Intent (NOI) advertised on 01/09/21. TC requested w/c 25th October.
Simon Bywater	Glatton	B660 (Infield Road) Sawtry Road	Install 1 no. MVAS unit to assist in encouraging greater compliance with the speed limit.	GREEN	Quotation request for power supply disconnection to VAS post sent to UKPN on 21/09/21. Post and NAL socket installation could not be completed due to site constraints (concrete pad at chosen location) and so alternative location to be found and agreed on.
Douglas Dew	MD Community Roadwatch	Sawtry Way (B1090) Mere Way	Reduce speeds (implement changes to the current speed limit) as per feasibility study.	AMBER	Ongoing discussions with Applicant regarding CCC's stance. Agreement reached on 15/10/2021. Detailed design to follow. Applicant has requested extra work on Mere Way
Steve Criswell	Woodhurst	Woodhusrt, South Street & Church Street	Supply 1 no. MVAS unit and install two new posts. Lighting columns to be utilised as additional mounting locations.	GREEN	Revised plans sent to PC for their final approval. Comments received on 17/09/21. As final approval received, Works Order to be raised w/c 1st November 2021.
Steve Corney	Upwood and the Raveleys PC	Upwood and the Raveleys Parish	Supply 1 MVAS unit and agree on 5 mounting locations (new posts and lighting columns).	GREEN	PC approved plans. Works Order raised. Programme dates to be confirmed.
Jonas King	Huntingdon Town Council	B1514 / Hartford Main Street	Install an informal pedestrian crossing within the vicinity of the bus stop positioned along B1514, Hartford.	RED	Speed survey results received. In detailed design. RED as road safety audit and consultation still required. Likely to be difficult to deliver on site before year end.
Ian Gardener	Kimbolton and Stonely	B645 / Tillbrook Road	**Supply 2 no. MVAS units and install mounting posts to reduce speed on B645 through the village. The above to be implemented on the proviso that PC's contribution is min. 20% of the total cost (not 10%).**	GREEN	Preliminary plans sent to PC for review and approval. Officer met with PC on site. PC's approval received on 21st September. TC request sent and received. Works order to be raised w/c 25th October.
Adela Costello	Ramsey	Wood Lane, Ramsey (B1096)	Construct a new footway from the village to the 1940's Camp to aid in pedestrian safety along a busy road.	RED	In pre-lim design. RED as Road Safety Audit still required. Likely to be difficult to deliver on site before year end.
Simon Bywater	Stilton PC	North street, Stilton (North end) B1043 Junction	Install 40mph buffer zone as per feasibility study.	GREEN	Detailed design completed. To be sent for PC's approval w/c 1st November.
Ian Gardener	Tilbrook PC	Station Road, Tilbrook	Supply 1 no. MVAS unit and install two posts to reduce speeds in this narrow roadand improve pedestrian safety.	GREEN	Works Order raised. Awaiting programme dates.
Douglas Dew	Houghton and Wyton	Mill St	Install additional information signs. Level and harden verge used for parking with planings.	AMBER	In preliminary design.
Stephen Ferguson	Great Gransden	Ladies Hill, Meadow Road Middle Street	Priority give way features on Ladies Hill and Middle Street to aid in speed reduction and increase pedestrians' safety.	RED	In detailed design. Highlighted RED due to lead in times for safety audits. May be difficult to complete on the ground before year end.
Ian Gardener	Old Weston	B660 / Main Street (Old Weston)	Install village gateways and 40mph buffer zones at the entrances to the village. Red coloured surfacing along B660 at the existing 30mph speed limit.	GREEN	Detailed design completed and sent for PC's approval. Awaiting response.
Simon Bywater	Sawtry PC	The Old Great North Road, Sawtry (Opp Straight Drove)	Install "Pedestrian Crossing" warning signs, SLOW markings and cut back vegetation.	GREEN	Site visited in early August. Design to be completed by mid-November.
Simon Bywater	Sibson-cum-Stibbington PC	Old Great North Road, Stibbington	Introduce parking restrictions in a form of double yellow lines.	GREEN	Proposed plans sent for PC's approval. Next stage TRO for parking restrictions.
Stephen Ferguson	Abbotsley	B1046, Abbotsley	Install 1 no. MVAS unit and mounting posts to reduce speed on B1046 through the village.	GREEN	Prelim plans completed. Plans sent to PC for approval. Site meeting request sent. Awaiting confirmation.
Ian Gardener	Bythorn & Keyston	Thrapston Road	Install MVAS and gateways on Thrapston Road to calm traffic and reduce speeds through Bythorn Village.	GREEN	Prelim plans completed. Plans sent to PC for approval. Site meeting took place. Revised TC requested following on from PC's amendments.
Graham Wilson	Godmachester	East side of London Eoad, Godmanchester	Install parking restrictions in a form of double yellow lines in pre-agreed locations along London Rd.	GREEN	Site visited in early August. Detailed design completed. To be sent for PC approval w/c 1st November.
Ian Gardener	Great & Little Gidding	Mill Road (between Gt Gidding and Little Gidding)	Install 40mph buffer zones on roads leading to Great Gidding village. This will aim to	GREEN	Detailed design completed. To be sent for PC's approval w/c 1st November.

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/22 completion date)	Project Update and any Issues or Variance Explanation
		Luddington Road (towards Luddington Village)	reduce traffic speeds at approaches to the village.		
Ian Gardener	Perry	Chichester Way, Perry	Amend the TRO to change the current waiting time to a max 30min.	GREEN	In preliminary design. Existing restrictions (TRO) to be confirmed by the end of September. Detailed design to follow and to be completed by end of November.
Douglas Dew	Hemingford Grey	Hemingford Grey Centre	Proposed 20mph spped limit along various roads across the village.	AMBER	In the process of collecting speed data. Speed data reviewed. Further comments from Road Safety Team required. Highlighted issues with CCC's 20mph policy compliance to parish.
Keith Prentice	Little Paxton	Great North Road from A1 South (In front of co-op foodstore)	Install parking restrictions in a form of double yellow lines to tackle inconsiderate parking issues.	GREEN	Detailed design to be completed by end of November.
Steve Criswell	Bluntisham	Colne Road, Bluntisham	Improve existing pedestrian Zebra crossing at Colne Road by making it more conspicuous.	GREEN	Zebrite unit installed. PC want to proceed with guardrail installation and footway widening. TC requested on 24/09/21. TC received and to be reviewed w/c 25th October.
Stephen Ferguson	Great Paxton	B1043 from Harley Ind Estate, Paxton Hill to High St, Great Paxton	Install 40mph buffer zones on the approach to village from Harley Industrial Estate, Paxton Hill to High Street to lower speeds before entry to the current 30mph speed restriction.	GREEN	Site visit complete. Detailed design to follow and to be completed by end of November.
Douglas Dew	Fenstanton	8 - 30 Chequer Street, Fenstanton	To install new hard surface (to act as parking bays) and knee high fence segregating the latter from the footpath. **PC's contribution insufficient. Clarification on increased contribution received.**	RED	Site meeting took place with PC on 2nd August. Ongoing discussion regarding scheme's proposed design. Further site visit and meeting with PC, discussed outcome of prelim design and costs implications. RED as road safety audit still outstanding.
Ian Gardener	Leighton Bromswold	Sheep St / Staunch Hill	Supply 1 no. MVAS unit and install mounting posts to reduce speed on Sheep St and Staunch Hill entry point to reduce speads and improve pedestrians' safety.	GREEN	Preliminary plans sent to PC for review and approval. Officer met with PC on site. Still awaiting PC's approval. PC to meet on 03/11/21 and advise CCC Officers accordingly.
Steve Corney	Abbots Ripton	B1090 and C115	Existing verge widening (to be used in abcence of footpath) to link Home Farm Close with school, shop and church.	AMBER	Liaison with structures team with regard to proposed design. An application for Watercourse Consent via Flood and Water Team to be sent.
Simon Bywater	Elton	B671 "Overend" Elton	Initial proposal was for a pedestrian crossing point between Black Horse PH car park and the centre of the village. Installation of a table top. Two of the Local Members scored the proposal based on table top only. **PC's contribution insufficient. PC confirmed their increased contribution at £6507 instead of £5299.67. This will not resolve the issue.**	RED	Revised scheme agreed with PC in principal on 10/09/21. Detailed design to be carried out end of October/ once agreement reached on scope. The revised scheme also needs to be recosted. PC will then be required to approve the revised cost.
Ian Bates	Hilton	B1040 through Hilton	24 hour weight limit TRO to improve safety, reduce noise and pollution, and to prevent further damage from HGVs travelling through narrow roads within the village.	AMBER	Initial comments received from police force. Dependant on P&R/Member review of current HGV policy. P&R in agreement with proposal. Plans to be sent to P&R w/c 25/10/21. Amber due to formal consultation process required before installation and likelihood of objections.

Fenland Works Programme

Carried Forward from 2019/20

Total Local Highway Improvement (LHI) Schemes 14
Total Completed 13
Total Outstanding 1

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/20 completion date)	Project Update and any Issues or Variance Explanation
Cllr Connor / Cllr Costello	Pondersbridge	B1040 (Ramsey Road, Herne Road) & Oilmills Road	Traffic calming	RED	Works completed on site, but road safety audit has highlighted some required remedial action. Revised design sent to PC / County Cllrs end of July for comment and review. Public meeting 27/09 with local stakeholders, comments shared, waiting on feedback from Cllr Connor.

Carried Forward from 2020/21

Total LHI Schemes 10
Total Completed 7
Total Outstanding 3

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/21 completion date)	Project Update and any Issues or Variance Explanation
Cllr Tierney	Wisbech	South Brink	Traffic Calming	RED	Draft design complete. Awaiting Member response, member has been chased by CCC Officer. Sent to safety audit 20/10.
Cllr King	Leverington	Sutton Road/Leverington Common	Speed limit reduction	RED	Cost estimate over budget. Design de-scoped in liaison with parish. Re-submitted for pricing 20/10.
Cllr King	Wisbech	North Brink	New one way	RED	Design proposal has been sent to Wisbech Town Council for approval. Drainage survey ordered to assist with detailed design. Investigating requests from applicant re non-standard highway street furniture. Needs Road Safety Audit. Issues with Milestone procuring drainage survey escalated.

Current Schemes for 2021/22

Total LHI Schemes 10
Total Completed 1
Total Outstanding 9

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/22 completion date)	Project Update and any Issues or Variance Explanation
Cllr Tierney	Wisbech	Tinkers Drove	Install speed cushions throught the length	AMBER	Amber due to outstanding milestones prior to delivery on site including road safety audit, formal consultation and pricing. Sent for Road Safety Audit 30/09.
Cllr Count/Cllr French	March	Creek Road / Estover Road	Footway widening / signing & lining	GREEN	Site visit complete. Design underway.
Cllr Hoy	Wisbech	New Drove / Leach Close	DYLs at junction	GREEN	Order raised, waiting for start date.

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/22 completion date)	Project Update and any Issues or Variance Explanation
Cllr Connor / Cllr Boden	Whittlesey	Various (20mph)	20mph & associated traffic calming	AMBER	In detailed design. Survey results indicate can proceed with 20mph zones. Awaiting on approval from Town Council before proceeding to formal consultation.
Cllr Connor / Cllr Boden	Whittlesey	Various (DYLs)	DYLs at junctions	GREEN	Design approved. Town council to informally consult.
Cllr Connor	Doddington	High Street	Adjust kerbing & resurface footway	GREEN	Site visit complete. Design underway.
Cllr King	Gorefield	High Road	Footway resurfacing	GREEN	Work Complete.
Cllr Gowing	Wimblington	Fullers Lane / Meadow Way	Extend existing 7.5T weight limit (signing)	GREEN	Working on detailed design, discussions undertaken with street lighting.
Cllr King	Wisbech St Mary	High Road	30mph extension and traffic calming	RED	RED due to outstanding milestones prior to delivery on site including road safety audit, formal consultation and pricing. Submitting to PC for review WC 01/11.
Cllr King	Parson Drove	Sealey's Lane	New footway construction	GREEN	Site visit complete. Design underway.

East Works Programme

Carried Forward from 2020/21

Total LHI Schemes 13
Total Completed 9
Total Outstanding 4

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/21 completion date)	Project Update and any Issues or Variance Explanation
Cllr Hunt	Wilburton	High Street	Reduce vehicle speeds	RED	Scheme to be tied in with 2021/22 LHI
Cllr Shuter	Brinkley	Carlton Road	Buffer zone, speed cushions	RED	Scheme sent to Road Safety Audit following amendments requested by the applicant.
Cllr Shuter	Westley Waterless	Brinkley Road	Traffic calming	RED	Cost received for work from contractor. Adjusting design prior to raising works order.
Cllr Dupre	Witchford	Main Street	Footway widening	RED	In costing phase with contractor. Overdue. Costs being queried by CCC.

Current Schemes for 2021/22

Total LHI Schemes 10
Total Completed 0
Total Outstanding 10

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/22 completion date)	Project Update and any Issues or Variance Explanation
Cllr J Schumann	Fordham	Carter Street	Raised table and speed cushions	RED	In detailed design, site visits complete. RED due to outstanding milestones prior to delivery on site including road safety audit, formal consultation and pricing. Next stage safety audit WC 01/11.
Cllr Whelan / Cllr Dupre	Little Downham	B1411	Solar studs	AMBER	Waiting on footpath resurfacing before progressing with installation of solar studs. Progression dependent on third party. Scheme designed.
Cllr Dupre	Witchford	Main Street	Pedestrian crossing near school	RED	Meeting held with Parish Council, they would like a Zebra crossing to be installed (not stated at feasibility). Vehicle and Pedestrian Surveys are required - scheme on hold until children return to school in September. RED due to late request from PC to change type of scheme and outstanding milestones prior to delivery on site including road safety audit, formal consultation, and pricing. Surveys complete. Design underway.
Cllr Goldsack	Soham	Northfield Road	Warning signs & improvements	GREEN	Sent to applicant 26/10 for approval.
Cllr J Schumann	Burwell	Ness Rd / Swaffham Rd / Newmarket Rd	40mph buffer zones	GREEN	Working on detailed design drawings. Next stage TRO.
Cllr D Schumann	Stretham	Newmarket Rd	40mph buffer zone & priority give way	AMBER	Design complete. Waiting on traffic surveys before sharing with PC for comment and review. Road Safety Audit required.
Cllr D Schumann	Haddenham	The Rampart / Duck Ln / High St / Camping Cl	20mph limit with traffic calming	RED	In preliminary design. Awaiting speed survey data. RED due to road safety audit and formal consultation still outstanding. Plans to PC for approval WC 08/11.
Cllr D Schumann	Wilburton	Stretham Rd	30mph speed limit	GREEN	Tied in with 20/21 LHI. Designed and with PC for approval.
Cllr Dupre	Coveney	Jerusalem Drove	Gateway with signing & lining	GREEN	Order raised. Waiting on delivery date.
Cllr Sharp	Brinkley	Brinkley Rd / Six Mile Bottom / High St	40mph buffer zone	AMBER	Design work underway. Next stage TRO. Sending to PC for approval WC 08/11.

South Cambridgeshire Works Programme

Carried Forward from 2020/21

Total LHI Schemes 18
Total Completed 17
Total Outstanding 1

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/21 completion date)	Project Update and any Issues or Variance Explanation
Cllr Atkins	Hardwick	Cambridge Road	**Civils** - Installation of priority give way build outs along Cambridge Rd.	RED	Reviewing revised cost from contractor. Some issues need resolving around the upgrading of the existing path running alongside the road. Works order to be raised WC 01/11

Current Schemes for 2021/22

Total LHI Schemes 17
Total Completed 2
Total Outstanding 15

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/22 completion date)	Project Update and any Issues or Variance Explanation
Ros Hathorn	Histon & Impington	Various - centre of village	Civils / Raised feature / Parking restrictions - High St/The Green change alignment of kerbs to narrow junction & imprint block paving pattern to highlight pedestrian desire line. Brook Close use existing desire line & install flat top hump 5m inset into junction. DYL waiting restrictions on Home Close, disabled parking spaces and refresh lining as required. Additional cycle stands are allowed for, exact locations to be confirmed.	RED	Design work complete. Next stage informal consultation with parish. Highlighted RED due to remaining work needed to deliver on site by year end, including formal consultation, road safety audit, and pricing. Parish have still not responded, have been chased.
Maria King / Brian Milnes	Babraham	High St	Raised Features / Speed Limit - Install one single & four pairs of speed cushions along High Street. Single one to go next to existing give way feature. Install a new 20mph zone along High Street from the existing 30mph limit to the pub, moving the 30mph limit out of the village to where the existing cycle path ends.	AMBER	Parish have approved proposals. Scheme now in for Safety Audit - 19/08. Highlighted amber due to remaining work needed to deliver on site by year end, including formal consultation, road safety audit, and pricing.
Mandy Smith	Caxton	Village Wide	Civil - Gateway features at village entry's and MVAS post.	GREEN	Parish have approved designs. Currently waiting on TRO being advertised.
Susan Van De Ven	Whaddon	Whaddon Gap - Just past Barracks entrance	Speed Limit / Civils - Installation of new 40mph limit and 2 no central islands.	AMBER	Parish have approved the design. Now submitted for Road Safety Audit. Highlighted amber due to remaining work needed to deliver on site by year end, including road safety audit and pricing. Work can't take place during December due to it being on an A Road.
Michael Atkins	Barton	Village Wide	Speed limit - Additional lining/soft traffic calming in the 50mph limit area south of Barton. 40mph buffer zone on Haslingfield Rd. Comberton Road existing derestricted length sub 600m so infill whole length to 40mph. Dragons teeth and roundels on Wimpole Rd, Haslingfield Rd, Comberton Rd approaches to Barton. New pedestrian crossing for access to recreation ground on	GREEN	Parish have approved, including revised costs as they have asked for additional work. Road safety audit complete. To be submitted for pricing WC 08/11.

Local Member & Project Number	Parish/Town	Street	Works	RAG STATUS (Progress measured against 31/03/22 completion date)	Project Update and any Issues or Variance Explanation
			Wimpole Road by extending footway on Haslingfield Rd south		
Neil Gough	Cottenham	Oakington Road	Civils / Speed Limit - Introduce a 40 mph buffer combined with a chicane feature, with 500mm drainage channel. Install 2 No new MVAS sockets, remark the 30mph roundel plus red surfacing and dragons teeth.	RED	Following feedback from parish and local residents, redesign sent to parish for approval. Highlighted RED due to remaining work needed to deliver on site by year end, including road safety audit, pricing and if possible work needs to be tied in with developer led footpath. Local member aware.
Maria King / Brian Milnes	Newton	Various - centre of village	Parking restrictions - Double yellow lines to prevent vehicles parking too close to 5 way junction in centre of village and limiting visibility.	GREEN	Parish have approved proposals. TRO consultation review underway.
Michael Atkins	Grantchester	Grantchester Road	Civils / Parking restrictions - Install a new give way feature around 20 metres west of farm access. Install double yellow lines on northern side of Grantchester Road from lay-by to point where it meets existing on southern side. Move 30mph east by around 20m. Install dragons teeth and 30mph roundel at new 30mph location, along with a village gateway feature on the inbound lane (in the verge).	GREEN	Parish have approved. Now in for Road Safety Audit - 19/08.
Mandy Smith	Graveley	Offord Road	Speed limit - Install a new 40mph buffer zone on top of existing 30mph speed limit on Offord Road. To accompany the buffer zone, install chevrons on the right hand bend to highlight it should be navigated at slow speed. Install a 'SLOW' road marking at existing warning sign and dragon's teeth and roundels at the 30/40 terminal signs.	GREEN	In for pricing. Waiting on revised cost from contractor.
Mark Howell	Bourn	Fox Road / Gills Hill / Alms Hill	Raised Features - Install two pairs of bolt down speed cushions at a height of 65mm on the down hill section of Alms Hills from Caxton Road. Includes patching existing road beforehand under road closure.	AMBER	Parish have approved. Now in for Road Safety Audit - 16/08. Highlighted amber due to remaining work needed to deliver on site by year end, including formal consultation, and pricing.
Maria King / Brian Milnes	Harston	Station Road	Signs/Lines - Installation of solar powered flashing school signs and associated road markings.	GREEN	In for pricing. Waiting on cost from contractor.
Henry Batchelor	Willingham Green	Village Wide	Speed Limit - New 50mph in place of existing 60mph limit and associated signs/lines.	GREEN	Work Complete - 26/10/21
Sebastian Kindersley	Wimpole	A603	MVAS unit and mounting posts.	GREEN	Design work complete. Parish approved. With contractor for pricing. MVAS to be procured shortly as part of countywide package.
Sebastian Kindersley	Steeple Morden	Village Wide	Speed limit - 40mph buffer zones on 3 approaches to the village	GREEN	Design work complete. Parish have approved. Currently in for TRO.
Sebastian Kindersley	Gamlingay	Mill Hill	Civils - Installation of 1.80m wide footpath between existing and farm shop	GREEN	Design work complete. Parish have approved. Submitted to contractor for pricing 25/10/21.
Sebastian Kindersley	Litlington	South St / Meeting Lane	Sign / Lines - Improvement to existing lining and signage in vicinity of South St to emphasise the existing one way system.	GREEN	Work Complete
Michael Atkins	Hardwick	St Neots Road	Civils / Speed limit - Village entry treatment at existing 40 limit into village - including central island, section of shared use path widening & 50mph speed limit from A1303 RAB.	AMBER	To be tied in with third party works at the request of the PC. Design complete. However scheme on hold at request of parish council due to proposals from GCP regarding the Camborne to Cambridge Guided Bus and Active Travel Tranche 2 proposals. May just proceed with 50mph limit for now. Further discussion with parish planned for early Nov.

Trees

Countrywide Summary - Highway Service

Update as at 05.11.2020

Total to date Countywide (starting 1 January 2017)

Removed 202
Planted 2944

Trees	City	South	East	Fenland	Hunts	Total Countywide
Removed 1st January 2017 to 31st March 2019	10	30	8	4	35	87
Planted 1st January 2017 to 31st March 2019	3	1	2752	0	0	2756
Removed 2019/2020	1	14	62	1	16	94
Planted 2019/2020	0	63	32	8	31	134
Removed 2020/2021	1	12	5	1	2	21
Planted 2020/2021	1	34	17	2	0	54

This financial year summary:

Trees	City	South	East	Fenland	Hunts	Total Countywide
Removed 2021/2022	0	3	0	2	3	8
Planted 2021/2022	0	0	3	0	0	3

Comparison to previous month:

Nov-21	Removed	Planted
City	0	0
South	0	0
East	0	0
Fenland	0	0
Hunts	1	0
Total	**1**	**0**

Oct-21	Removed	Planted
City	0	0
South	1	0
East	0	0
Fenland	0	0
Hunts	1	0
Total	**2**	**0**

Please Note: This data comprises of only trees removed and replanted by Highways Maintenance and Highways Projects & Road Safety Teams (inc. LHIs) and Infrastructure and Growth. Whilst officers endeavour to replace trees in the same location they are removed, there are exceptions where alternative locations are selected, as per the county council policy. However trees are replanted in the same divisional area that they were removed.

Key

Background colour	Highlights
Green	Tree Replaced

Cambridge City Tree Works

Total Removed in Current Month NOV 0
Total Planted in Current Month NOV 0

Ward	Cllr name	Location	Number of trees Removed	Reason Removed	Cllr Informed	Number of trees Replaced in Area
Coleridge	Sandra Crawford	**Coldhams Lane**	6	Subsidence	Y	
Castle	Jocelynne Scutt	**Frenchs Road**	1	Obstruction	Y	
Castle	Claire Richards	**Mitchams Corner**	3	Obstruction	Y	
Newnham	Lucy Nethsingham	**Skaters Meadow**	1	Obstruction	Y	3
		Fendon Road	1	Major Scheme - Fendon Road Roundabout, replaces a tree removed previously in the year		1
-	-	**Total**	**12**	-	-	**4**

South Tree Works

Total Removed in Current Month NOV 0
Total Planted in Current Month NOV 0

Parish	Cllr name	Location	Number of trees Removed	Reason Removed	Cllr Informed	Parish informed	Number of trees Replaced in Area
Comberton	Lina Nieto	**Kentings**	1	Diseased / Dead	Y	Y	1
Cottenham	Tim Wotherspoon	**Twentypence Road**	2	Natural Disaster	2017-12-02	2017-12-02	2
Duxford	Peter Topping	**Ickleton Road**	1	Diseased / Dead	2017-02-02	2017-02-02	1
Sawston	Roger Hickford	**Mill Lane**	12	Diseased / Dead	2017-12-02	2017-12-02	12
Little Shelford	Roger Hickford	**Whittlesford Road**	1	Obstruction	2018-10-25	2018-10-25	1
Longstowe	Mark Howell	**High Street**	1	Diseased / Dead	2017-10-10	2017-10-10	1
Oakington	Peter Hudson	**Queensway**	3	Diseased / Dead	2018-10-25	2018-10-25	3
Sawston	Roger Hickford	**Resbury Close**	1	Diseased / Dead	2018-10-25	2018-10-25	1
Bassingbourn	Susan van de Ven	**North End**	2	Diseased / Dead	2018-10-29	2018-10-29	2
Bourn	Mark Howell	**Riddy Lane (behind 3 Baldwins Close)**	1	Diseased / Dead	2018-10-29	2018-10-29	1
Grantchester	Lina Nieto	**Barton Road**	1	Diseased / Dead	2018-10-29	2018-10-29	1
Histon	David Jenkins	**Parlour Close**	1	Damaged	2017-12-02	2017-12-02	1
Girton	Lynda Harford	**Thornton Close**	1	Diseased / Dead	2018-10-25	2018-10-25	1
Grantchester	Lina Nieto	**Mill Way**	1	Subsidence	2018-10-29	2018-10-29	1
Little Wilbraham	John Williams	**O/s 89 High Street**	1	Obstruction	2018-06-01	2018-06-01	1
Waterbeach	Anna Bradnam	**Clayhithe Road**	1	Diseased / Dead	2019-03-11	2019-03-11	1
Bourn	Mark Howell	**Riddy Lane (Church St) corner**	4	Diseased / Dead	2019-11-04	2019-11-04	4
Hardwick	Lina Nieto	**St Neots Rd**	8	Diseased / Dead	2019-11-04	2019-11-04	8
							21
Comberton	Lina Nieto	**Swaynes Lane**	1	Obstruction	2020-02-27	2020-02-27	
Girton	Lynda Harford	**Cambridge Road**	1	Diseased / Dead	2020-04-30	2020-04-20	1
Foxton					2020-09-25	2020-09-25	2
Gamlingay	Sebastian Kindersley	**Stocks Lane**	1	Diseased / Dead	2020-11-02	2020-11-02	2
Gamlingay	Sebastian Kindersley	**Northfield Close**	1	Diseased / Dead	2020-11-02	2020-11-02	2
Grantchester	Lina Nieto	**Coton Road**	1	Dead	2020-12-02		2
Foxton	Caroline ilott	**O/S 73 High street**	1	Dead	2021-01-18	2021-01-18	1
Madingley	Lina Nieto	**The Avenue, Madingley**	2	Diseased / Dead	2021-03-06	2021-03-06	4

Parish	Cllr name	Location	Number of trees Removed	Reason Removed	Cllr Informed	Parish informed	Number of trees Replaced in Area
Bourn	Mark Howell	**Riddy Lane**	3	Dead	2021-03-05	2021-03-05	6
Hardwick	Lina Nieto	**Footpath off Limes Road**	2	Diseased / Dead	2021-03-06	2021-03-06	2
Quy Mill Road	John Williams	**Stow-cum-Quy**				2021-04-00	5
Fowlmere road	Clive Bradbury	**Newton**	1	Diseased / Dead	2021-06-07	2021-06-07	1
Linton Road	Clarie Daunton	**Little Abinton**	1	Obstruction	2021-05-19		
Ickleton	Peter McDonald	**Frogge Street**	1	Dangerous	2021-08-00		
Bassingbourn	Michael Atkins	**Canberra Close**	1	Diseased / Dead	2021-10-00		
-	-	**Total**	**60**		-	-	**102**

East Tree Works

Total Removed in Current Month NOV 0
Total Planted in Current Month NOV 0

Parish	Cllr name	Location	Number of trees Removed	Reason Removed	Cllr Informed	Parish informed	Number of trees Replaced in Area
Ely	Anna Bailey	**The Gallery**	1	Diseased / Dead	2017-09-01	2017-09-01	1
Littleport	David Ambrose Smith	**Queens Road no.5**	1	Diseased / Dead	2017-03-24	2017-03-24	1
Ely	Anna Bailey	**Angel Drove**	1	Diseased / Dead	2017-09-01	2017-09-01	1
Ely	Bill Hunt	**Main St, Lt Thetford No.16**	1	Diseased / Dead	2018-09-20	2018-08-02	1
Ely	Anna Bailey	**St Catherines**	1	Diseased / Dead	2018-07-11	2018-07-11	1
Ely	Anna Bailey & Lis Every	**Lynn Road 83a/85**	1	Natural Disaster	2018-07-11	2018-07-11	1
Ely	Anna Bailey	**The Gallery**	1	Diseased / Dead	2017-09-01	2017-06-22	1
Ely	Anna Bailey	**Witchford Road**	2	Diseased / Dead	2020-07-16	2020-07-16	2
Burwell	Josh Schumann	**Causeway**	1	Diseased / Dead	2018-11-19	2018-11-19	1
Snailwell	Josh Schumann	**The Street**	1	Natural Disaster	2019-05-11	2019-05-11	1
Sutton	Lorna Dupre	**Bury Lane**	1	Diseased / Dead	2019-09-25	2019-09-25	2
Lode	Mathew Shuter	**Northfields**	1	Removed in Error	2020-01-27	2020-01-27	1
Ely	Anna Bailey & Lis Every	**Lynn Road 83a/85**	1	Natural Disaster	2020-02-10	2020-02-10	1
Stow cum Quay / Lode / Swaffham Bulbeck	Mathew Shuter / John Williams	**A1303**	43	A1303 Safety Scheme	2019-11-19	2019-11-19	
Dullingham	Mathew Shuter	**Brinkley Road**	3	Natural Disaster	2020-20-10	2020-20-10	1
Dullingham	Mathew Shuter	**Station Road**	2	Natural Disaster	2020-20-10	2020-20-10	1
Cheveley	Mathew Shuter	**Broad Green**	5	Natural Disaster	2020-20-10	2020-20-10	1
Soham	Mark Goldsack	**Northfields**	1	Natural Disaster	2020-20-10	2020-20-10	1
Snailwell	Josh Schumann	**Newmarket Road**	1	Natural Disaster	2020-20-10	2020-20-10	1
Snailwell	Josh Schumann	**The Street**	1	Natural Disaster	2020-20-10	2020-20-10	1
Chippenham	Josh Schumann	**Chippenham Rd**	1	Natural Disaster	2020-20-10	2020-20-10	1
Cheveley	Mathew Shuter	**Ditton Green**	1	Natural Disaster	2020-20-10	2020-20-10	1
Sutton	Lorna Dupre	**The Row**	1	Dead	2021-01-14	2021-01-14	3
Lt Thetford	Anna Baily	**Ely Rd**	1	Natural Disaster	2020-15-09	2020-15-09	2

Parish	Cllr name	Location	Number of trees Removed	Reason Removed	Cllr Informed	Parish informed	Number of trees Replaced in Area
Ely	Anna Bailey	**Fitzgerald Avenue**	1	Diseased / Dead	2020-06-02	2020-06-02	1
-	-	**Total**	**75**	-	-	-	**30**

Additional Trees

Parish	Cllr name	Location	Number of trees	Replaced Date	**Planted Narrative -** Which trees are being replaced (Location)
Witchford	Lorna Dupre	**plot of land**	70	Phased rollout - On-going	70 Trees agreed to be planted following initiative between the Parish Council and CCC to help reduce the deficit of trees that had been lost countywide.
Witchford	Lorna Dupre	**plot of land**	26	Phased rollout - On-going	26 further trees agreed to be planted following initiative between the Parish Council and CCC to help reduce the deficit of trees that had been lost countywide.
Ely		**Ely Bypass Project**	2678	Project completed in 2018	Number of trees planted as part of the Ely Bypass Scheme
-	-	**Total**	**2774**	-	-

Total planted per area = **2800**

Fenland Tree Works

Total Removed in Current Month NOV 0
Total Planted in Current Month NOV 0

Parish	Cllr name	Location	Number of trees Removed	Reason Removed	Cllr Informed	Parish informed	Number of trees Replaced in Area
Wisbech	Samantha Hoy	**Westmead Avenue**	1	Diseased / Dead	2018-02-20	2018-02-20	1
March	Janet French	**Elliott Road (Avenue Jct with)**	1	Diseased / Dead	2018-02-20	2018-02-20	1
Wisbech	Simon Tierney	**Southwell Rd**	1	Natural Disaster	2018-02-20	2018-02-20	1
March	Janet French	**Elwyndene Road**	1	Diseased / Dead	2018-05-21	2018-10-23	1
Wisbech	Samantha Hoy	**Rochford Walk**	1	Diseased / Dead	2019-08-01	2019-08-01	1
-	-	**-**	-	-	-	-	3
Wisbech	Samantha Hoy	**Mount Drive**	1	Obstruction	2021-02-02	2021-03-01	2
-	-	**Total**	**6**	-	-	-	**10**

Huntingdon Tree Works

Total Removed in Current Month NOV 1
Total Planted in Current Month NOV 0

Parish	Cllr name	Location	Number of trees Removed	Reason Removed	Cllr Informed	Parish informed	Number of trees Replaced in Area
Eaton Ford	Derek Giles	**Orchard Close**	2	Diseased / Dead	2018-03-27	2018-10-29	1
Elton	Simon Bywater	**Back Lane**	1	Subsidence	2018-03-27	2+C8:G329/10/2018	1
Fenstanton	Ian Bates	**Harrison Way**	1	Diseased / Dead	2018-03-27	2018-10-29	1
Godmanchester	Graham Wilson	**Cambridge Villas**	3	Diseased / Dead	2018-03-27	2018-10-29	3
Hartford	Mike Shellens	**Longstaff Way**	1	Subsidence	2018-03-27	2018-10-29	1
Hemingford Grey	Ian Bates	**The Thorpe**	1	Natural Disaster	2018-03-27	2018-10-29	1
Huntingdon	Graham Wilson	**Coldhams North**	1	Diseased / Dead	2018-03-27	2018-10-29	1
Huntingdon	Mike Shellens	**Norfolk Road**	2	Diseased / Dead	2018-03-27	2018-10-29	1
Huntingdon	Graham Wilson	**Queens Drive**	1	Diseased / Dead	2018-03-27	2018-10-29	1
St Ives	Ryan Fuller & Kevin Reynolds	**Ramsey Rd**	1	Natural Disaster	2018-03-27	2018-10-29	1
Wyton	Ian Bates	**Banks End**	1	Diseased / Dead	2018-03-27	2018-10-29	1
Yaxley	Mac McGuire	**Windsor Rd**	1	Diseased / Dead	2018-03-27	2018-10-29	1
Warboys	Terence Rogers	**Mill Green**	2	Subsidence	2018-03-27	2018-10-29	2
Fenstanton	Ian Bates	**Little Moor**	1	Diseased / Dead	2018-03-27	2018-10-29	1
Hartford	Mike Shellens	**Arundel Rd**	1	Diseased / Dead	2018-03-27	2018-10-29	1
Huntingdon	Tom Sanderson	**Horse Common Lane**	1	Diseased / Dead	2018-03-27	2018-10-29	1
St Ives	Ryan Fuller	**Chestnut Rd**	2	Diseased / Dead	2018-03-27	2018-10-29	2
St Neots	Simone Taylor	**Cromwell Rd**	2	Diseased / Dead	2018-03-27	2018-10-29	2
Yaxley	Mac McGuire	**London Rd/Broadway**	1	Natural Disaster	2018-03-27	2018-10-29	1
Yaxley	Mac McGuire	**Windsor Rd**	1	Subsidence	2018-03-27	2018-10-29	1
Hilton	Ian Bates	**Graveley Way**	1	Diseased / Dead	2018-03-27	2018-10-29	1
Brampton	Peter Downes	**Buckden Road O/S Golf Club**	1	Natural Disaster	2018-10-17	2018-10-17	1
Godmanchester	Graham Wilson	**O/S School**	1	Obstruction	2018-10-17	2018-10-17	1
Huntingdon	Graham Wilson	**Claytons Way O/S no 13**	1	Diseased / Dead	2018-10-17	2018-10-17	1
Ramsey	Adela Costello	**Biggin Lane O/S 29**	1	Natural Disaster	2018-10-17	2018-10-17	1
Ramsey Heights	Adela Costello	**Upwood Rd O/S Clad's Cottage**	1	Diseased / Dead	2018-10-17	2018-10-17	1

Parish	Cllr name	Location	Number of trees Removed	Reason Removed	Cllr Informed	Parish informed	Number of trees Replaced in Area
St Ives	Ryan Fuller & Kevin Reynolds	**Ramsey Rd**	1	Subsidence	2018-10-17	2018-10-17	
Hemingford Grey	Ian Bates	**High St O/S no 2**	1	Diseased / Dead	2018-10-17	2018-10-17	
St Ives	Ryan Fuller & Kevin Reynolds	**Michigan Road**	3	Dead	2019-06-18	2019-06-18	
St Ives	Ryan Fuller & Kevin Reynolds	**Acacia Road**	1	Subsidence	2019-06-18	2019-06-18	
Bluntisham	Steve Criswell	**High St O/S no 2**	1	Dead	2019-07-24	2019-07-24	
Bluntisham	Steve Criswell	**Sayers Court**	1	Diseased / Dead	2019-07-24	2019-07-24	
Hemingford Grey	Ian Bates	**Green Close**	1	Dead	2020-01-09	2020-01-09	
Brington	Ian Gardener	**High Street**	1	Natural Disaster	2020-02-10	2020-02-10	
Great Stukeley	Terence Rogers	**Ermine Street**	1	Natural Disaster	2020-02-10	2020-02-10	
Bury	Adela Costello	**Tunkers Lane**	1	Natural Disaster	2020-02-10	2020-02-10	
Warboys	Terence Rogers	**Ramsey Rd**	1	Natural Disaster	2020-02-10	2020-02-10	
St Ives	Ryan Fuller & Kevin Reynolds	**Harrison Way**	1	Natural Disaster	2020-02-10	2020-02-10	
Hemingford Grey	Ian Bates	**Marsh Lane**	1	Natural Disaster	2020-02-10	2020-02-10	
Ramsey	Adela Costello	**Wood Lane**	1	Natural Disaster	2020-02-10	2020-02-10	
Offord Cluny	Peter Downes	**New Road**	1	Natural Disaster	2020-02-10	2020-02-10	
Godmanchester	Graham Wilson	**West Street**	1	Natural Disaster	2020-02-10	2020-02-10	
Woodhurst	Steve Criswell	**West End**	1	Dead	2020-08-06	2020-08-06	
Pidley	Steve Criswell	**Warboys Road**	1	Dead	2020-09-01	2020-09-01	
Alwalton	Simon Bywater	**Mill Lane**	2	Diseased / Dead	2021-07-26		
Great Staughton	Ian Gardener	**Beachampstead Rd/Moory Croft Cl**	1	Diseased / Dead	2021-11-15		
Ramsey	Adela Costello	**Pathfinder Close**	1	Diseased / Dead	2021-10-00		
-	-	**Total**	**57**	-	-	-	**31**

Summary of Place & Economy establishment (P&E) – Data compiled November 2021

The table below shows:
- Number of FTE employed in P&E
- Total number FTE on the establishment
- The number of "true vacancies" on the establishment. We are now only reporting the vacancies from our establishment, which means there is a single source.

Notes on data:
- We can report that the percentage of "true vacancies" in P&E as of 25th November 2021 was 22.5% of the overall establishment of posts. Please note this down from the previous month, which was at 30.4%. This is due to ongoing work with the Heads of Service to delete any posts which have been vacant for a considerable period of time, or which are not actively being recruited to.
-

		Sum of FTE employed	Sum of true vacancies	Total FTE on establishment	Percentage of vacancies
Grand Total		**293.6**	**85.3**	**378.9**	**22.5%**
Planning, Growth and Environment	Asst Dir - Planning. Growth and Environment	1.0	3.0	4.0	75.0%
	Flood Risk & Biodiversity	14.6	2.3	16.9	13.6%
	Historic Environment	9.6	1.0	10.6	9.4%
	County Planning Minerals & Waste	10.8	4.5	15.3	29.5%
	Growth and Development	10.8	2.0	12.8	15.6%
	Waste Disposal including PFI	7.7	3.0	10.7	28.0%
Planning, Growth and Environment		**54.5**	**15.8**	**70.3**	**22.5%**
Climate Change and Energy Service	Energy Projects Director	6.7	0.0	6.7	**0.0%**
	Energy Programme Management	2.9	0.0	2.9	**0.0%**
Climate Change and Energy Service Total		**9.6**	**0.0**	**9.6**	**0.0%**
H&T, Highways Maintenance	Asst Dir - Highways	3.0	0.0	3.0	0.0%
	Highways Other	9.0	2.0	11.0	18.2%
	Highways Maintenance	34.8	9.0	43.8	20.6%
	Asset Management	12.0	3.0	15.0	20.0%
H&T, Highways Project Delivery	Asst Dir - Project Delivery	1.0	0.0	1.0	0.0%
	Project Delivery	18.4	22.0	40.4	54.5%
H&T, Transport, Strategy and Development	Asst Dir - Transport, Strategy and Development	2.0	0.0	2.0	0.0%
	Highways Development Management	18.0	1.0	19.0	5.3%
	Park & Ride	15.0	0.0	15.0	0.0%
	Parking Enforcement	15.8	0.4	16.2	2.5%
	Road Safety	35.1	11.1	46.2	24.1%
	Traffic Management	37.6	11.0	48.7	22.7%
	Transport &Infrastructure Policy & Funding	12.3	3.0	15.3	19.6%
Highways	Street Lighting	4.0	6.0	10.0	60.0%
Highways and Transport Total		**217.9**	**68.5**	**286.4**	**23.9%**
Exec Dir	Executive Director (Including Connecting Cambridgeshire)	11.6	1.0	12.6	8.6%
Exec Dir Total		**11.6**	**1.0**	**12.6**	**7.9%**

Agenda Item no. 9

Environment & Green Investment Committee Agenda Plan

Published on 4 January 2022
Updated on 12 January 2022

Notes

The definition of a key decision is set out in the Council's Constitution in Part 2, Article 12.
* indicates items expected to be recommended for determination by full Council.
+ indicates items expected to be confidential, which would exclude the press and public.

The following are standing agenda items which are considered at every Committee meeting:

- Minutes of previous meeting and Action Log
- Finance Monitoring Report
- Agenda Plan, Training Plan and Appointments to Outside Bodies and Internal Advisory Groups and Panels

Committee date	Agenda item	Lead officer	Reference if key decision	Deadline for draft reports	Agenda despatch date
20/01/22 [reserve date]	Annual Carbon Footprint Report	Sarah Wilkinson	Not applicable		
	Digital Connectivity Infrastructure Strategy refresh and programme update	Noelle Godfrey	Not applicable		
	Greater Cambridge Local Plan: First Proposals (Regulation 18) Consultation Response	Colum Fitzsimmons	Not applicable		
	Low Carbon Toolkit for reducing scope 3 emissions by suppliers *(by email only)*	Emily Bolton	Not applicable		
	Performance report *(by email only)*	Rachel Hallam	Not applicable		
	CUSPE 2021: Evidence base for heat zones, Local Area Energy Planning	Sheryl French	Not applicable		
	CUSPE 2021: Cambridgeshire Decarbonisation Fund	Sheryl French	Not applicable		

Committee date	Agenda item	Lead officer	Reference if key decision	Deadline for draft reports	Agenda despatch date
03/03/22	Local Area Energy Planning and Heat Zones	Sheryl French	Not applicable		
	Trees and Woodland Strategy- Consultation Draft	Emily Bolton/ Phil Clark	Not applicable		
	Risk Report: Energy Projects and Programmes	Sheryl French/ Maggie Pratt	Not applicable		
	Northstowe 1 and Phase 2 Section 106 Cost Cap	Colum Fitzsimons	2021/011		
	Stanground Solar and Battery Storage Project- Investment Case	Claire Julian-Smith	Not applicable		
	Draft Net-Zero and Doubling Nature Programme and Resourcing Strategy	Steve Cox			
28/04/22 Reserve date					

Future meeting dates: 7th July 2022, 8th September (Reserve), 13th October, 1st December, 19th January 2023 (Reserve), 16th March and 20th April (Reserve)

Please contact Democratic Services democraticservices@cambridgeshire.gov.uk if you require this information in a more accessible format

Agenda Item No: 10

Digital Connectivity Infrastructure Strategy Refresh and Connecting Cambridgeshire Programme

To:	Environment & Green Infrastructure Committee
Meeting Date:	20 January 2022
From:	Steve Cox, Executive Director Place & Economy
Electoral division(s):	All
Key decision:	No

Outcome: The Committee is asked to consider progress to date and a revised Digital Connectivity Infrastructure Strategy 2021-2025 for Cambridgeshire and Peterborough which sets out the plans and objectives to ensure that the area retains leading edge digital connectivity infrastructure that will:

- Support a strong local economy
- Enable Cambridgeshire communities to thrive
- Facilitate efficient and effective public service delivery
- Contribute to the Council's strategic objectives to combat climate change impacts and support climate change mitigation.

Recommendation: The Committee is recommended to:

a) Note and endorse the Cambridgeshire and Peterborough Digital Connectivity Infrastructure Strategy 2021-2025 which was recently approved by the Cambridgeshire and Peterborough Combined Authority's Housing and Communities Committee;

b) Note the progress of the Superfast Broadband rollout;

c) Note the progress of the Light Blue Fibre joint venture organisation with the University of Cambridge and Cambridgeshire County Council

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Email: lorna.dupre@cambridgeshire.gov.uk; nick.gay@cambridgeshire.gov.uk
Tel: 01223 706398

1. Background

1.1 Connecting Cambridgeshire was established as a multi-agency programme in 2011 by Cambridgeshire County Council to improve Superfast Broadband (24mbps+) coverage for Cambridgeshire and Peterborough which at that time was running significantly behind the national average for the country at less than 60%.

1.2 The remit of the joint programme, funded by both Cambridgeshire County Council (CCC) and Peterborough City Council (PCC) was extended to incorporate all aspects of digital infrastructure, including mobile, public access Wi-Fi and "IoT" (Internet of Things)/Smart technology as well as broadband.

1.3 When the City Deal for Greater Cambridge was created as the Greater Cambridge Partnership (GCP) in 2015 a "Smart Cities" programme, funded and governed by the GCP was incorporated into the Connecting Cambridgeshire Programme

1.4 With the establishment of the Cambridgeshire and Peterborough Combined Authority (CPCA) in 2017 the Connecting Cambridgeshire Programme was further extended with funding and governance oversight from the CPCA. A digital connectivity infrastructure strategy for Cambridgeshire and Peterborough for 2017-2021 was approved by the CPCA, to be delivered via the Connecting Cambridgeshire programme and supported by a partnership agreement between CCC and the CPCA.

1.5 The CPCA's Housing and Communities Committee has recently approved an update to the Digital Connectivity Infrastructure Strategy for the period 2021-2025, which builds on previous work with updated targets and objectives.

1.6 Much of the current funding and governance in relation to the Connecting Cambridgeshire programme is delivered from Government, GCP or the CPCA. The two exceptions to this are the two Superfast Broadband (SFBB) contracts currently in place, for which the Council is the accountable body and operation of Light Blue Fibre, which is a joint venture organisation between the Council and the University of Cambridge to market fibre assets on a commercial basis.

1.7 This report includes a progress update on: the refreshed Cambridgeshire and Peterborough Digital Connectivity Infrastructure Strategy for 2021-25; the operation of the two SFBB contracts; the operation and current status of Light Blue Fibre.

2. Main Issues

2.1 Cambridgeshire and Peterborough Digital Connectivity Strategy 2021-25

2.1.1 The full strategy is included at Appendix A, a summary of the key points is set out below.

2.1.2 Digital connectivity is hugely important for meeting some of the key challenges of our age, from sustainable growth to climate change mitigation to the management of scarce resources including water and energy.

2.1.3 Reliance on connectivity accelerated in an unprecedented manner during the Covid pandemic and is still incredibly important as we move towards recovery, however at a time when access to healthcare, education and jobs has become increasingly reliant on digital connectivity it has also highlighted and exposed inequality of access.

2.1.4 Cambridgeshire and Peterborough is a hugely diverse area with a rich mix of cities, market towns and rural areas which presents both challenges and opportunities in achieving the leading edge digital infrastructure needed for businesses and communities to thrive.

2.1.5 The strategy proposes a set of challenging targets that reflect the ambitions and aspirations of the area alongside a multi-layered approach that is tailored to needs and priorities at a local level. Each area within the Cambridgeshire & Peterborough Combined Authority is unique with its own challenges and priorities, requiring a local approach to digital infrastructure planning.

2.1.6 Collaborative work with several of the Combined Authority's constituent Local Authorities is already underway to create local digital infrastructure plans, taking into account the geography, opportunities and needs in each locale. The 2021-2025 strategy will further develop this local approach, working with the each of the District and City Councils to co-create a dashboard and digital infrastructure plan.

2.1.7 The strategy for the period 2021-2025 builds on the foundations of the existing programme, incorporating multiple workstreams, targeting the different aspects of digital connectivity from broadband, mobile, 'Smart' technology and public access Wifi to ensure that the Cambridgeshire & Peterborough Combined Authority area has the leading digital connectivity infrastructure required so that:

- All businesses have access to the leading-edge digital connectivity needed to help them succeed and to deliver sustainable growth.

- Communities, particularly in rural areas, are digitally connected and able to access education, jobs, health, social care and other public services.

- Digital connectivity supports home working and remote training alongside other agile working practises, which can contribute to reduced commuting, less traffic congestion and more flexible and more inclusive job opportunities.

- 'Smart' technology, including 'Internet of Things' based connectivity helps to provide ready access to real-time transport information and environmental monitoring, leading to increased use of sustainable transport solutions, reducing private car usage and contributing to a reduction in carbon emissions and meeting climate change targets.

- As a key part of the Oxford-Cambridge Arc, businesses, communities and public services in our area are able to harness digital connectivity and advanced technology to support sustainable growth, good quality of life and a strong local economy with no communities left behind.

2.1.8 The strategy was approved by the CPCA's Housing and Community Committee in November 2021 and the CPCA board will consider the associated business plan and proposed budget allocation of £6.3m in January 2022.

2.2 Superfast Broadband

2.2.1 In 2011 CCC allocated up to £20m capital investment to the Connecting Cambridgeshire programme with £2.25m from PCC and initially £6.75m from Government.

2.2.2 In 2012, following a procurement exercise, CCC entered into a gap funded contract with BT/Openreach to improve the Superfast Broadband coverage across the area, with a target to achieve over 90% coverage by 2015. The contract included a "clawback" mechanism to repay profits over a certain threshold linked to service take-up into a joint investment pot which could then be used to further extend coverage. More information about the SFBB contract delivery is included in the Background section of the 2021-2025 Strategy at Appendix 1.

2.2.2 The 90% target was met and subsequently incrementally extended to 97% and then over 99% with additional phases of SFBB delivery. As part of the extended target a second gap funded Superfast Broadband (SFBB) contract was agreed with BT/Openreach via a further procurement process. Phases 1, 2 and 3 (targeting >97% coverage) of the SFBB contract have been delivered under Contract 1 and Phase 4 (targeting >99% coverage) is still in delivery as part of Contract 2.

2.2.4 The Contract 1 closedown process with BT/Openreach is currently underway, with VFM and state subsidy oversight provided by the BDUK team at the Department for Digital, Culture, Media and Sport (DCMS). There is a contractual underspend of just over £1m, for which the CCC portion is £900k. This reduces the Council's initial £20m capital allocation to £19.1m.

2.2.5 Superfast Broadband coverage across Cambridgeshire and Peterborough currently stands at 98.25% and it is anticipated that the target for over 99% coverage will be achieved at the conclusion of the Contract 2 Phase 4 SFBB rollout which is expected to complete by mid-2022.

2.2.6 All current SFBB rollout is being delivered as full fibre to the premise (FTTP) infrastructure which is future proofed and will directly contribute to new challenging target to achieve over 85% Gb capable infrastructure coverage by 2025 (Further details in Appendix 1 2021-2025 Strategy Broadband section).

2.2.7 The SFBB gap funded contract includes a contractual mechanism for a joint investment (clawback) pot which ensures that if take-up is high and results in higher profits, the provider (BT/Openreach) pay any "excess" profits into the investment pot, which in turn can be used to provide further investment in broadband.

Although the two contracts have not yet been completed, given the evidence of very high take-up since the rollout began, it was clear from an early stage that a substantial pot would build up during the life of the contract. To this end BT/Openreach forward funded the

£5.3m Phase 3 of the contract by borrowing against the investment pot at their risk, and the CCC's Environment and Economy Committee approved forward funding up to £3.6m prudential borrowing for Phase 4 in 2017 (supplemented by up to £5m DEFRA - Department For Environment, Food and Rural Affairs - and EU funding). Projections to date indicate that costs relating to both Phase 3 and Phase 4 delivery will be comfortably met by joint investment pot.

Going forward to 2030 it is anticipated that future requirements for public funding to mitigate broadband market failure will be met by the Government's Project Gigabit Programme, for which Cambridgeshire and Peterborough is one of the pilot areas (further details in Appendix 1 Strategy 2021-2025 Broadband section), and therefore further recourse to the investment pot is not anticipated.

The SFBB Contract 1 joint investment pot will mature and become payable in 2023/24, with the total figure calculated in late 2023, at which point the remaining pot will be divided amongst Government (HMT), PCC and CCC according to the original investment ratios.

2.3 Light Blue Fibre

2.3.1 Following on from the Councils policy decision in 2017 to investigate options to deploy fibre ducting in all Council commissioned infrastructure schemes (a policy which was also adopted by the GCP and CPCA) and success in bidding for Government funding to develop Council assets under the Local Full Fibre Networks Programme (LFFN), a commercial venture was established to market both Council and University owned fibre assets.

2.3.2 Light Blue Fibre, is a joint venture company with the University of Cambridge, established following approval by the Council's Commercial and Investment Committee on 26th April 2019, to develop and market fibre assets on a commercial basis. The aims behind setting up the venture were to further the Councils objectives to increase the fibre footprint across the County and to ensure the enterprise was commercially viable.

2.3.3 Following approval to proceed, the company setup was formally completed on the 2nd October 2019, including agreement of:

- Articles of Association
- Joint Venture Shareholders Agreement
- Licence Agreement (Cambridgeshire County Council to Light Blue Fibre Ltd)
- Licence Agreement (University of Cambridge to Light Blue Fibre Ltd)
- Consultancy Agreement

2.3.4 The company was created with a 50/50 control basis and with equal investment of £20k per annum by both shareholders over the first two years.

2.3.5 The Covid-19 pandemic created a difficult environment for the establishment of a new commercial venture, however overall progress to date has been good with income and expenditure in line with the original projections. The confidential annex (Appendix B) which contains commercially sensitive information, also details delivery against the proposed plan as detailed in the original business case, from April 2020 to date.

2.3.6 It is proposed that future updates will be provided to Committee in June or July (subject to Committee dates) on an annual basis following on from Light Blue Fibre’s financial year end.

3. Alignment with corporate priorities

3.1 Communities at the heart of everything we do
The report above sets out the implications for this priority in Sections 2.1.2-2.1.17 above

3.2 A good quality of life for everyone
The report above sets out the implications for this priority in Sections 2.1.2-2.1.17 above

3.3 Helping our children learn, develop and live life to the full
The report above sets out the implications for this priority in Sections 2.1.2-2.1.17 above

3.4 Cambridgeshire: a well-connected, safe, clean, green environment
The report above sets out the implications for this priority in Sections 2.1.2-2.1.17 above

3.5 Protecting and caring for those who need us
The report above sets out the implications for this priority in Sections 2.1.2-2.1.17 above

4. Source documents

4.1 Source documents

None

Appendix 1 **Cambridgeshire and Peterborough Digital Connectivity Strategy 2021-2025**

Cambridgeshire and Peterborough Digital Connectivity Strategy 2021-2025

In collaboration with

Foreword

Dr Nik Johnson, Mayor of Cambridgeshire & Peterborough

Digital connectivity is hugely important for meeting some of the key challenges of our age -from sustainable growth to climate change mitigation and the management of scarce resources including water and energy.

I want Cambridgeshire and Peterborough to have a future-facing digital connectivity infrastructure that reflects the ambitions and aspirations of our area, shaped by our core values of compassion, co-operation, community, and tackling climate change.

Reliance on connectivity accelerated in an unprecedented manner during the Covid pandemic and is still incredibly important as we move towards recovery. However, at a time when access to healthcare, education and jobs has become increasingly dependent on digital connectivity it has also highlighted inequality of access and the need for us to show compassion by supporting digital inclusion.

Cambridgeshire and Peterborough is a hugely diverse area with a rich mix of cities, market towns and rural areas, which presents both challenges and opportunities in achieving the leading edge digital infrastructure needed for businesses and communities to thrive. Therefore, it is right that we have a unified digital infrastructure strategy that takes a multi-layered, co-operative approach that is tailored to needs and priorities at a local level.

This updated digital infrastructure strategy builds on the past success of our collaborative work with local councils, government and commercial providers, and sets new challenging targets to help ensure that we remain at the leading edge and well positioned to take full advantage of current and emerging technology advances.

Whilst the delivery of digital connectivity infrastructure involves a complex combination of technology, civil engineering and investment, the overarching objectives of this strategy are about community; connecting people and places and supporting businesses to meet their full potential.

<u>Contents</u>

Introduction

The Cambridgeshire and Peterborough area has long had a reputation for the advanced use of technology but has not always had a digital connectivity infrastructure to match. In 2011 when ‘Superfast Broadband’ (24+mbps) coverage issues reached national prominence and became a pressing local concern the area lagged behind the national average with less than 60% coverage.

Over the last decade this deficit has been addressed with an ambitious strategy that has focused not only on broadband connectivity but on mobile coverage, ‘Smart’ technologies and the provision of public access Wifi.

This strategy for the period 2021-2025 builds on the foundations of the multi-agency Connecting Cambridgeshire Programme which is hosted by Cambridgeshire County Council and has been primarily led by the Cambridgeshire & Peterborough Combined Authority since 2017.

It incorporates multiple workstreams, targeting the different aspects of digital connectivity from broadband, mobile, ‘Smart’ technology and public access Wifi to ensure that the Cambridgeshire & Peterborough Combined Authority area has the leading digital connectivity infrastructure required to ensure that:

- All businesses have access to the leading-edge digital connectivity needed to help them succeed and to deliver sustainable growth.
- Communities, particularly in rural areas, are digitally connected and able to access education, jobs, health, social care and other public services.
- Digital connectivity supports home working and remote training alongside other agile working practises, which can contribute to reduced commuting, less traffic congestion and more flexible and more inclusive job opportunities.
- ‘Smart’ technology, including ‘Internet of Things’ based connectivity helps to provide ready access to real-time transport information and environmental monitoring, leading to increased use of sustainable transport solutions, reducing private car usage and contributing to a reduction in carbon emissions and meeting climate change targets.
- As a key part of the Oxford-Cambridge Arc, businesses, communities and public services in our area are able to harness digital connectivity and advanced technology to support sustainable growth, good quality of life and a strong local economy with no communities left behind.

Building on success

This strategy builds on Connecting Cambridgeshire's strength in delivering leading-edge digital connectivity, particularly the successful rollout of broadband and public access Wifi. The programme has established a national reputation for collaborative working at the forefront of innovation, which has attracted significant public and private sector funding to invest in future facing digital infrastructure.

Highlights include:

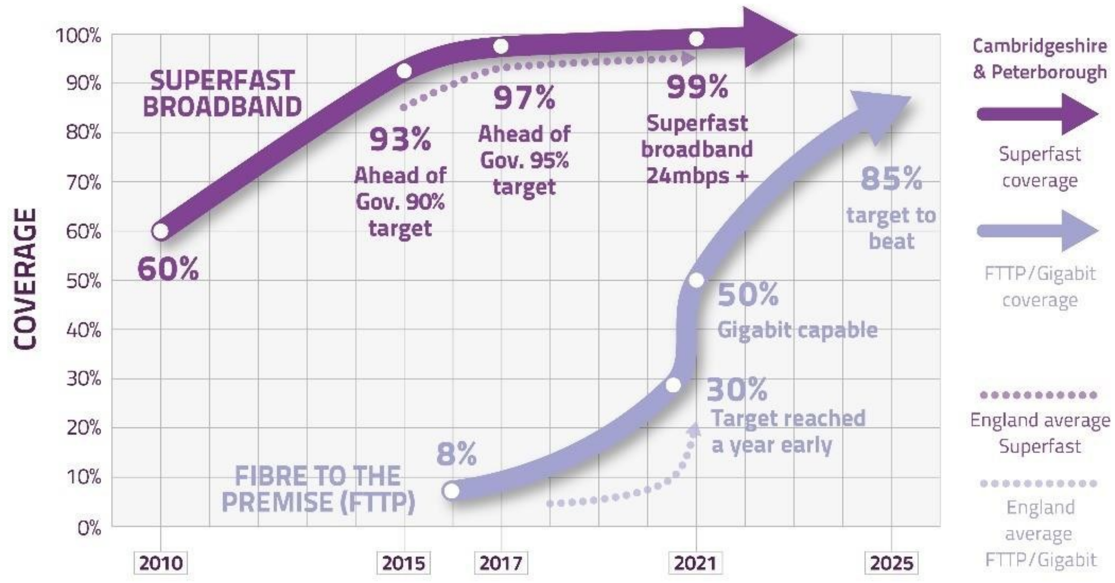
Broadband Rollout

Connecting Cambridgeshire's ambition to improve broadband connectivity for all has meant setting stretch targets to ensure that the programme not only delivers the infrastructure needed, but also keeps pace with evolving technology.

When the Superfast Broadband Programme was first launched in 2012, fewer than 60% of homes and businesses could access superfast broadband. The majority of premises can now upgrade to superfast broadband speeds of at least 24mbps and less than 1% of premises that are harder to reach get below 10mbps.

Both the superfast and the full fibre broadband coverage figures are above the national average and ahead of Government targets.

Full fibre coverage is increasing at pace through a mix of direct intervention and stimulating the market to provide commercial coverage. The full fibre target of 30% by 2022 was reached more than a year early and gigabit capable coverage has climbed rapidly to 50% in 2021.



Broadband champions

Convening a network of 150 broadband champions to work with local communities and business groups to explain and promote the benefits of superfast broadband helped boost take-up of the gap-funded superfast broadband infrastructure to record levels of over 70%.

Community benefit

Residents and businesses in the rural Huntingdonshire village of Spaldwick have experienced the benefits of upgrading from superfast to gigabit broadband speeds since July 2021, following a successful Community Fibre Partnership with Openreach using the Government's Gigabit Broadband Voucher scheme to fund the installation of Fibre to the Premises (FTTP) to the majority of premises.

Broadband Champion Mark Heath said: "*While Fibre-to-the-Cabinet (FTTC) improved speeds over basic broadband, some businesses and families in the village still needed greater speeds and reliability. Fibre-to-the-Premises (FTTP) has transformed the village by giving every single building the opportunity to reliably access ultrafast speeds up to 900 Mbps. Those who have already taken up FTTP are reporting improved reliability and much faster speeds at affordable prices. For example, my next door neighbour is delighted that he has doubled his speeds while saving £3 per month.*"

Significant investment

The programme has been successful in attracting several competitive funding streams to improve the digital infrastructure for businesses, communities and public services including over £8m from Government's Rural Development for England (RDPE) and Local Full Fibre Networks (LFFN) programmes to supplement CPCA funding.

As well as supporting the full fibre rollout, this funding has enabled: 117 public sites including council buildings, schools and libraries to be upgraded with full fibre to support gigabit-capable services; the inclusion of fibre ducting in several Cambridgeshire transport infrastructure schemes to avoid costly retrospective installation; and the delivery of public access Wifi across Cambridgeshire market towns at affordable cost by leveraging existing infrastructure.

Free CambWifi

Public access Wifi, is available at over 200 public buildings, village halls and community sites across Cambridgeshire and Peterborough. The secure CambWifi network has recently been expanded to market town and city centres, working in partnership with District and City Councils, to support digital inclusion and Covid recovery initiatives.

Following the rollout of CambWifi across Huntingdonshire market towns, Councillor Ryan Fuller, Executive Leader of Huntingdonshire District Council said: *"Free wifi on our high streets offers opportunities for businesses, previously unable to operate digitally, to diversify their offering. Residents and visitors can now be seamlessly connected online from town to town, just one of the steps we are taking to promote the market town experience."*

Business impact

Digital connectivity has proved vital for business survival and recovery throughout the Covid pandemic. The programme has supported businesses through grant schemes, information and advice enabling SMEs to make the most of digital technology to grow and compete in a rapidly changing market.

Digital Technology Grants

Over 156 SMEs across Cambridgeshire and Peterborough have benefitted from the allocation of more than £1m of Digital Technology Grants funded by the Cambridgeshire & Peterborough Combined Authority leveraging EU money to boost growth and recovery.

Butlers Auto Electrical Ltd used a digital technology grant to buy the latest diagnostic equipment for hybrid and electric vehicles together with a laptop to develop the business's online presence.

David Butler, Director, said: *"We have been able to future proof the business… which is getting noticed for being able to deliver faster, more accurate results than most garage workshop diagnostic equipment."*

Agile working and virtual training

World leading engineering group Marshalls of Cambridge is a traditional engineering company with a large, skilled workforce of over 1,600 people based in Cambridge. The experience of remote working using digital connectivity during the Covid pandemic has helped to develop their future business plans for agile working to support employees, from apprentices to skilled technicians and engineers.

Patrick Wood, Chief Technology Officer, said: *"Before the pandemic we had design engineers using workstations with powerful computer-aided software on-site. Covid 19 has meant we've had to adapt to remote working for over half of our employees, invest in our digital capacity and resilience, and modify our office environment to support 'smart' working. We've also had to be flexible for those who have to be on-site. Feedback has been very positive and it has improved the work/life balance for many of our employees."*

Enabling Digital Delivery

Connecting Cambridgeshire's proactive approach to 'barrier busting' has been instrumental in speeding up digital delivery for fixed and mobile infrastructure. This has been achieved by working closely with Government's Barrier Busting Taskforce, telecoms providers, Street Works permitting teams, local authority planners and landowners to identify and resolve challenges ranging from complex wayleaves to planning applications for new mobile masts.

Since 2019, public sector organisations in Cambridgeshire and Peterborough have adopted new policies for the delivery of fibre trunking in all transport infrastructure schemes, which both minimises delivery costs and the disruption of retrofitting fibre infrastructure. As part of this initiative a joint venture, Light Blue Fibre, was set up between the University of Cambridge and Cambridgeshire County Council to develop and make both organisations' existing extensive duct and fibre networks available on a commercial wholesale basis.

Dig once policy

As part of the 'dig once' policy, fibre ducting has been successfully installed during extensive re-working of a major road junction in Cambridge and will form part of the extensive Kings Dyke road scheme at Whittlesey providing a springboard for the development of fibre infrastructure.

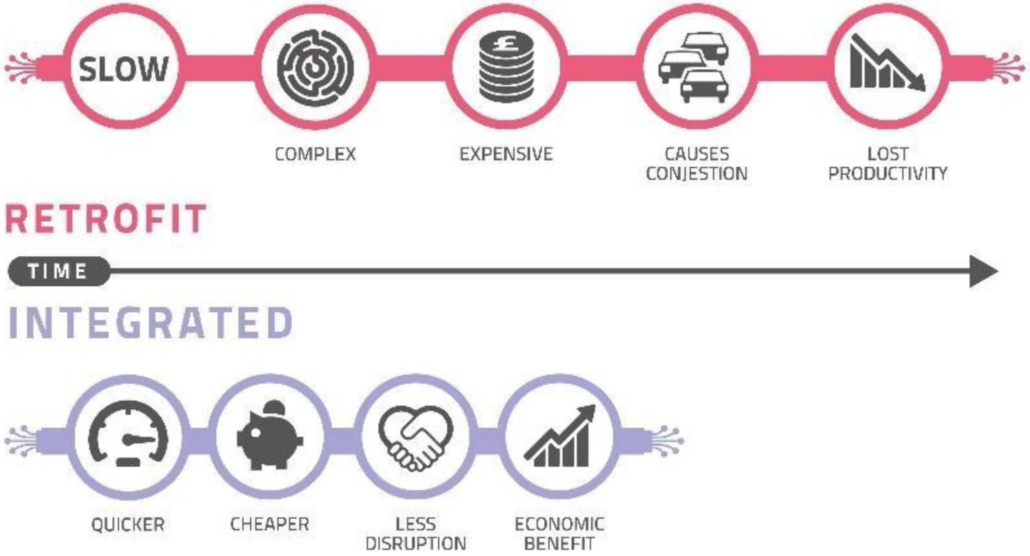


Image: Fibre ducting in transport infrastructure schemes

Mobile

Local surveys mapping mobile coverage have provided more accurate data which has been shared with mobile operators and Ofcom. This has made a significant contribution to understanding of the issues and has resulted in a number of solutions being found to improve coverage, particularly at key train stations, business parks and research campuses.

Smart Innovation

Improving mobile coverage

Following liaison with mobile operators, coverage has improved at Cambridge Station and work is underway to highlight gaps in coverage on main train lines because of the impact for the economy.

Optimising the range and capacity of mobile coverage at the Wellcome Genome Campus has supported staff and students undertaking internationally significant scientific research.

The Connecting Cambridgeshire Programme has developed and delivered the 'Smart Cambridge' programme in partnership with the University of Cambridge for the Greater Cambridge area as part of the Greater Cambridge Partnership Programme over the last five years. A new workstream, sponsored by the Combined Authority was established in 2020/21 to extend elements of the Smart programme to Cambridgeshire market towns.

New technologies are now supporting market towns in their post-Covid recovery plans. Digital totems, and smart panels are being installed to provide useful visitor and journey planning information. Sensor networks are being deployed to collate data on air quality, traffic movements and flooding.

Smart market towns

Digital totems are being installed in Huntingdon town centre to display useful information for residents and visitors about what's on, shopping, and travel options, which will also be accessible via mobile phones.

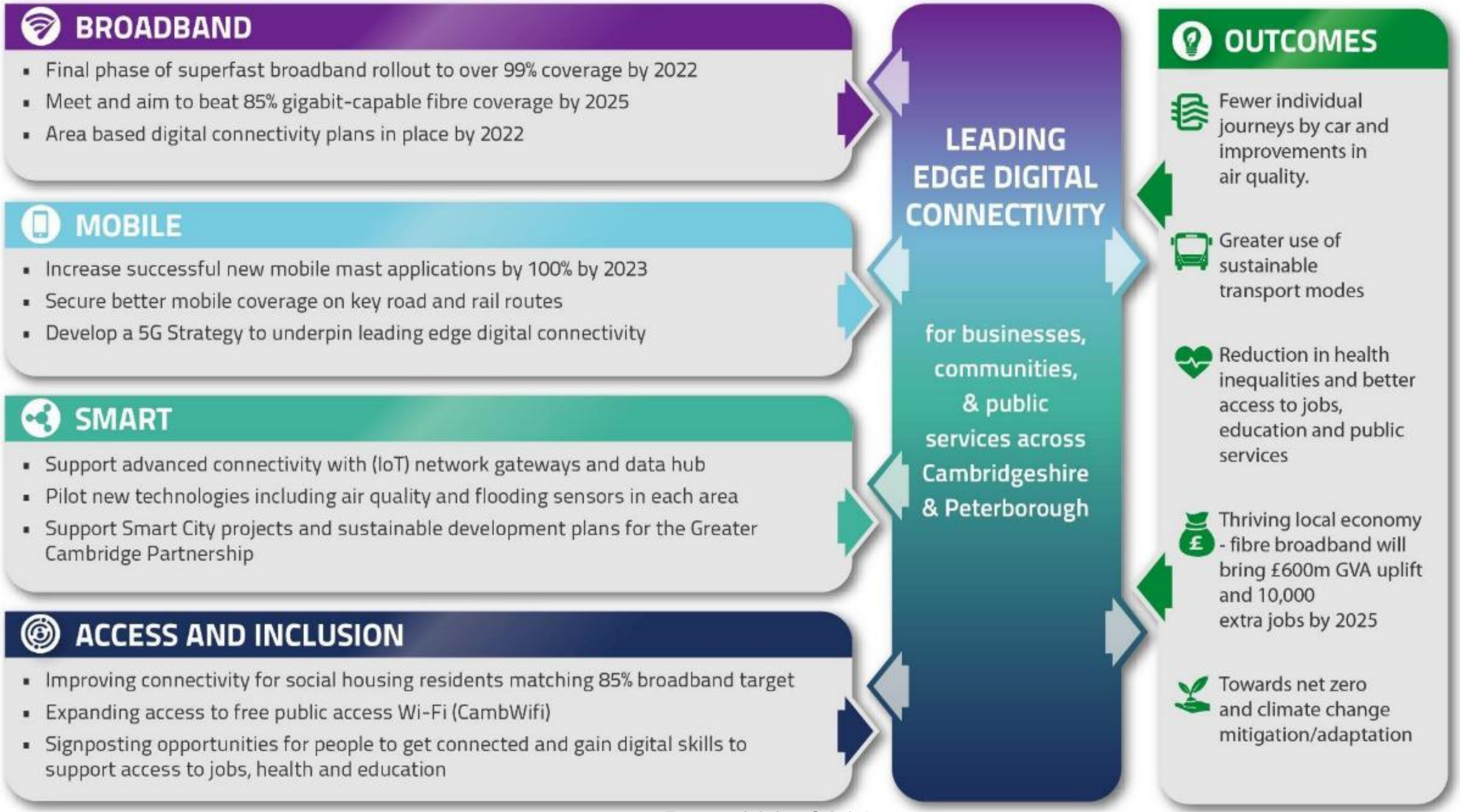
Pocket SmartPanels have been launched in 11 market towns - providing real time bus and train information via smartphones.

SmartPanels displaying location-specific travel information on large screens are also being deployed in a range of buildings to help people make sustainable transport choices.

Cambridgeshire and Peterborough Digital Connectivity Strategy 2021-2025

Digital connectivity has never been more important for businesses, communities and public services and the key objectives for the future strategy, which builds on the current programme, are set out below. However, each area within the Cambridgeshire & Peterborough Combined Authority is unique with its own challenges and priorities, requiring a local approach to digital infrastructure planning.

Collaborative work with several of the Combined Authority's constituent Local Authorities is already underway to create local digital infrastructure plans, taking into account the geography, opportunities and needs in each locale. The 2021-2025 strategy will further develop this local approach, working with each of the Combined Authority Councils to co-create a dashboard and digital infrastructure plan.

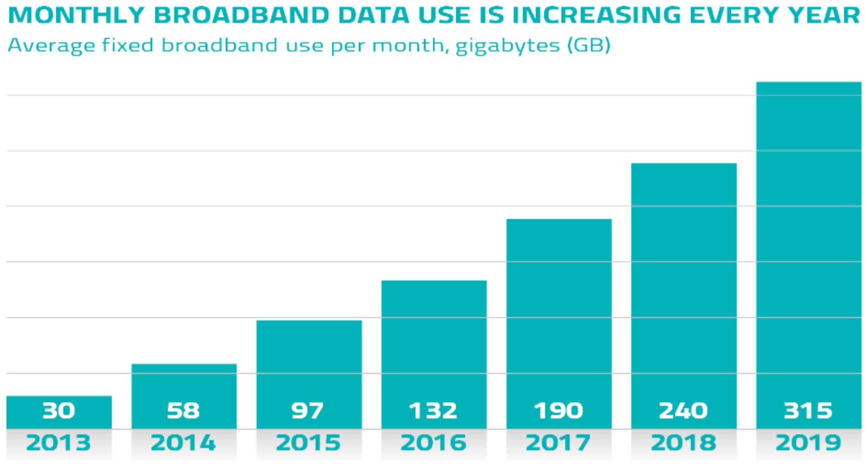


Broadband

Introduction

Although reliance on mobile data continues to increase at a rapid pace, this does not change the need for broadband (or 'fixed' connectivity), which provides connectivity directly as well as underpinning mobile and Wifi solutions. In fact, faster and higher capacity mobile connections have an even greater reliance on fibre connectivity to provide the 'backhaul' between mobile towers and other wireless infrastructure.

Increased home and remote working during the pandemic has significantly impacted the bandwidth requirements for domestic users and key providers saw an immediate 30% increase in data usage by their subscribers in March 2020. However this trend was clear even before the Covid-19 pandemic, as this graph shows.



Source: House of Commons Briefing Paper (April 2021): Gigabit-broadband in the UK: Government targets and policy.

Broadband Infrastructure

Target

Government has a target of 85% gigabit-capable coverage for the UK by 2025, however this is an average for the country and there is a danger that without a specific focus, as a predominantly rural area, we will no longer be at the leading edge and will not have the ubiquitous forward facing infrastructure we need for our area to prosper. Therefore it is important to set a target to meet 85% coverage by 2025 and we will be aiming to exceed this if possible.

This coverage target will be met by a combination of coverage provided by commercial operators, investing their own funds to rollout infrastructure in our area, and by coverage provided on a 'gap funded' basis, which uses public funding to supplement market investment for those areas which would otherwise not be commercially viable.

Our area now has a very dynamic commercial environment with a number of active suppliers planning significant investments in gigabit-capable infrastructure, however the challenges involved in rolling out broadband infrastructure means that the operators need a supportive local environment in order to deliver successfully.

Challenges

The rollout of broadband infrastructure is increasingly complex and there are a number of factors which can make the process time consuming and expensive, increasing the potential for market failure.

- The wide range of challenges includes: obtaining wayleaves and planning permissions from unresponsive landowners; securing Streetworks permits, including road closures; lack of accurate data in relation to the location and condition of some existing infrastructure; and high cost civils causing unpopular disruption to streets and pavements.

Solutions

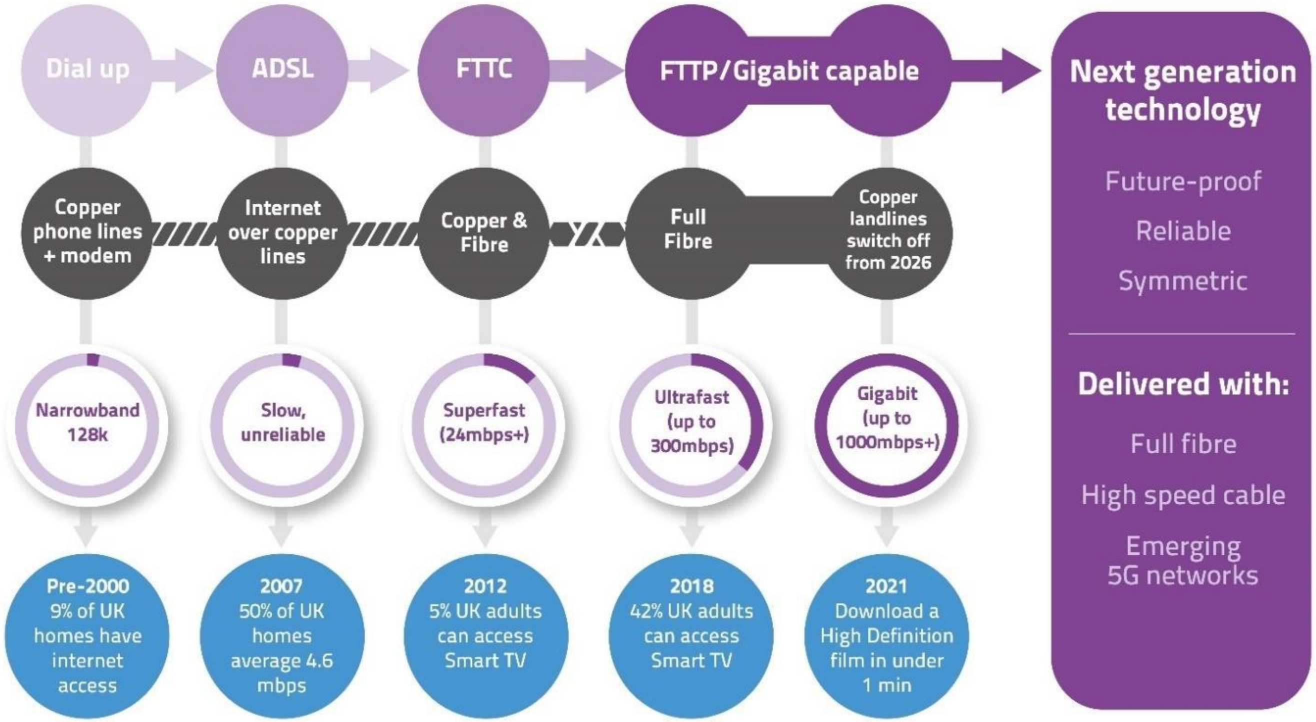
Building on existing work, over the next four years we will target exceeding 85% gigabit-capable coverage by:

- Working with commercial providers and continuing to facilitate industry investment. The target to reach over 30% full fibre by 2022 has been met early and gigabit-capable coverage is currently just under 50%. Work with operators to support investment, remove barriers and facilitate coverage will help to ensure planned commercial investment is delivered.

- Working with government to deliver public funded solutions where commercial coverage is not viable – this includes being in the vanguard of the government's new 'Project Gigabit' programme which will attract ~£40m central government investment to the area. This also includes supporting/extending the national Gigabit Broadband Voucher scheme, which provides government funded vouchers, with a local top-up where needed, for homes and busineses that will not be covered by commercial or gap funded schemes.

- Integrating fibre ducting in transport and other infrastructure schemes where it is feasible to do so, including exploring innovative new solutions such as fibre in water infrastructure and making public sector ducting available to operators on a wholesale basis, via the Light Blue Fibre joint-venture with the County Council and the University of Cambridge.

The Evolution of Broadband



Copper switch off

The Public Switched Telephone Network (PSTN) will start to be phased out from 2026 and replaced with digital systems delivered over broadband connections. This will affect all public services, businesses and domestic premises, making people even more reliant on digital connectivity and will require signposting and awareness raising, particularly among those who do not use mobile phones, or cannot access the internet.

Digital Infrastructure resilience and risk

With increased reliance on digital technology comes greater risk of the impacts of system failures, cybersecurity risks and cascade failures in relation to extreme climate events. Telecommunications is one of 13 sectors overseen by Governmment as part of the Critical National Infrastructure (https://www.ncsc.gov.uk/section/private-sector-cni/cni) . The Programme team will work with local and national stakeholders and suppliers to mitigate and protect against systems failures which might impact on the availability of telecommuncations services.

Mobile – 4G and 5G

Introduction

Mobile services are now at the heart of how most people stay in touch and go online. 95% of adults have access to a mobile phone while Ofcom reported that in 2020, the vast majority (85%) of all adults used a smartphone to go online for a wide range of activities, particularly when face-to-face interactions were restricted due to the Covid pandemic.

People of all ages increasingly rely on mobile internet access for socialising, shopping, home working, banking, public service information, news, and entertainment. Mobile internet has also supported a move to digital payments, particularly where businesses are unable to access fixed-line broadband. Mobile connectivity is also an important underpinning technology to the Cambridgeshire & Peterborough Combined Authority's work to improve bus services. To be successful, Demand Responsive Transport and new travel hubs will need travellers to be able to book, track services and understand disruptions to give the best possible customer experience.

5G is the next generation of mobile communications and is required to underpin future connectivity including 'Internet of Things' (IoT) technology.

Challenges

There are several key challenges that are slowing the delivery of mobile infrastructure:

- Planning – Planning authorities have seen a marked increase in planning applications to upgrade masts for 4G and 5G from mobile operators and new legislation has revised guidance on permitted infrastructure. The provision of mobile masts continues to divide public opinion and mast upgrade planning submissions are problematic for both planning teams and the infrastructure providers supporting mobile operators. 65% of the 44 planning applications for new mobile phone masts across Cambridgeshire and Peterborough decided between April 2019 and August 2021 were refused - particularly taller structures of 18-20m required to upgrade 4G and deliver 5G coverage.

- Access to Infrastructure – street lighting columns are key structures for 'small cell' based deployment of mobile services. As in many other areas of the UK, streetlights in Cambridgeshire are managed under a Private Finance Initiative (PFI) contract with terms which do not allow for the deployment of telecoms equipment and limit opportunities for other uses. Working with the Government's newly established

Digital Connectivity Infrastructure Accelerator (DCIA), offers an opportunity to model a new approach, which includes trialling multi-use utility poles called 'Smart Poles' hosting a range of functions including electric vehicle charging, environmental sensors, small cells and Wifi as well as micro energy generation systems.

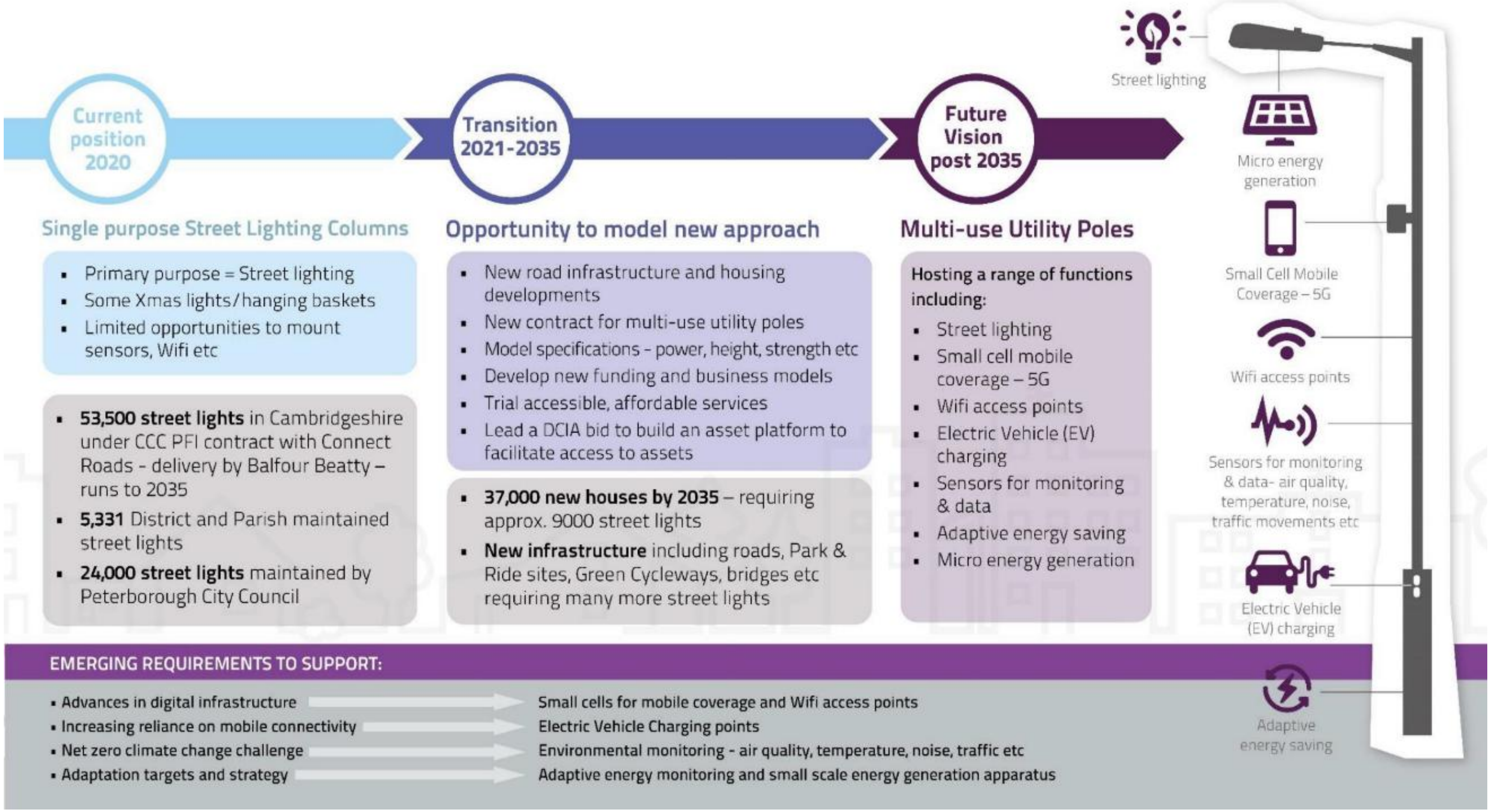


Image: Future Smart Streets

Solutions

The Connecting Cambridgeshire programme is working with planning authorities, mobile operators, leading businesses, and government to improve mobile coverage and capacity to:

- Continue to identify areas of poor mobile coverage affecting businesses and communities and work with stakeholders and operators to find solutions.

- Continue to facilitate mobile infrastructure delivery, supporting operators in deploying masts and equipment to improve connectivity by liaising with key stakeholders.

- Put in place specialist telecommunications planning resource to support operators deploying both 4G and 5G and target increasing successful applications related to new phone masts by 100% over the next two years. The planning resource will ensure that all mobile applications are determined within the statutory limit of 56 days.

- Be at the forefront of innovative use of local authority assets to support the rollout of mobile connectivity by submitting a bid to the Governments Digital Connectivity Accelerator Programme, which is developing online tools to digitalise and, where possible, automate the process of finding and securing rights-of-use of suitable locations.

- Explore opportunities for initial trial deployments of small cells and a longer-term strategy to support access to street furniture.

- Work with Government to develop standards for Smart Poles that will accelerate their development and deployment.

- Collaborate and learn from other leading areas, such as the West Midlands Combined Authority's WM5G unit, to explore barriers to mobile connectivity in greater depth and to trial and test solutions.

5G

Introduction

The Future Communications Challenge Group estimates that if the UK takes full advantage of the opportunities offered by 5G - the next generation of mobile services - the economic impact could be around £164bn (or £2,500 by head of population) by 2030. With a local economy well-placed to take advantage of technology advances, it is imperative that mobile operators are able to deploy 5G in Cambridgeshire and Peterborough as early as possible. However, given the high costs of deployment and the relatively low population density, this area would not naturally achieve ubiquitous coverage very soon. Reducing the barriers to deployment and encouraging rapid 5G infrastructure deployment is therefore extremely important to ensure that this area maintains its leading edge.

Mobile operators are at the beginning of the rollout of 5G, which is more than just faster mobile Internet. 5G will become a vital building block of the wider digital transformation that is taking place throughout society. With 5G peak speeds will reach and exceed 1Gbps with the ability to manage traffic more efficiently than with 4G and network capacity will increase. New techniques including ‘network slicing’, ‘software defined networks’ (SDN) and ‘virtualisation’ will mean that a single network can be ‘sliced’ into multiple virtual networks that can support different radio access. For example, a network may be partitioned to allow consumer access, secure access to emergency services and to allow Internet of Things (IoT) devices to connect, which can then be controlled via software, allowing the spectrum of radio frequencies to be used differently.

These advances mean that users will be able to enjoy higher and more consistent average speeds. Even in crowded scenarios or in areas with less-than-ideal coverage, ‘real-time’ applications will become possible and more devices will be able to connect to a 5G cell site - supporting the expected explosion in the number of devices as part of the IoT.

Consequently, 5G will unlock a number of technology developments including: the provision of high-speed broadband to properties using mobile networks particularly in areas where it is hard to deploy fibre; delivering telehealth care into people’s homes using high definition video and Artificial Intelligence (AI); and Agritech technologies and mass-sensing of infrastructure, for improved industrial processes.

Agritech

Agricultural IoT devices will allow farmers to better measure crop health: using sensors to monitor moisture, fertilization and nutrition levels and report on current/predicted weather patterns to allow for improved crop management. This will mean agriculture can become more productive and more sustainable, with benefits such as a reduction in the amount of water needed to grow crops.

Challenges

To deliver increased speeds and capacity, mobile operators will need to deploy a network of small cells which will be located on-street. Issues include:

- Access to infrastructure to deploy small cells, lighting columns are the ideal location to deploy small cells and issues with the PFI contractual arrangements will slow the deployment of 5G.

- Additional ‘street clutter’ and capacity on street lighting columns could be a problem if all four main mobile network operators attempt to deploy small cells in similar locations. Potential solutions include greater infrastructure sharing and the deployment of a ‘neutral host model’.

- Roll out of 5G into areas such as market towns, villages and rural areas is not currently a priority for mobile operators. A study has been recently commissioned to understand more about the challenges and opportunities to accelerate 5G deployment in market towns and rural areas, and the analysis will used to inform future planning.

Solutions

- Work with operators to support the initial deployments of 5G ready infrastructure including small cells, which will result in the first 5G deployments in Cambridge and Peterborough.

- Work with business and campuses to support the deployment of private 5G networks (deployed for the use of private companies or developments) and identify opportunities for private networks to support public connectivity through network slicing.

- Develop an approach to support a passive neutral host model while working with operators to understand how an active neutral host model could support 5G connectivity.

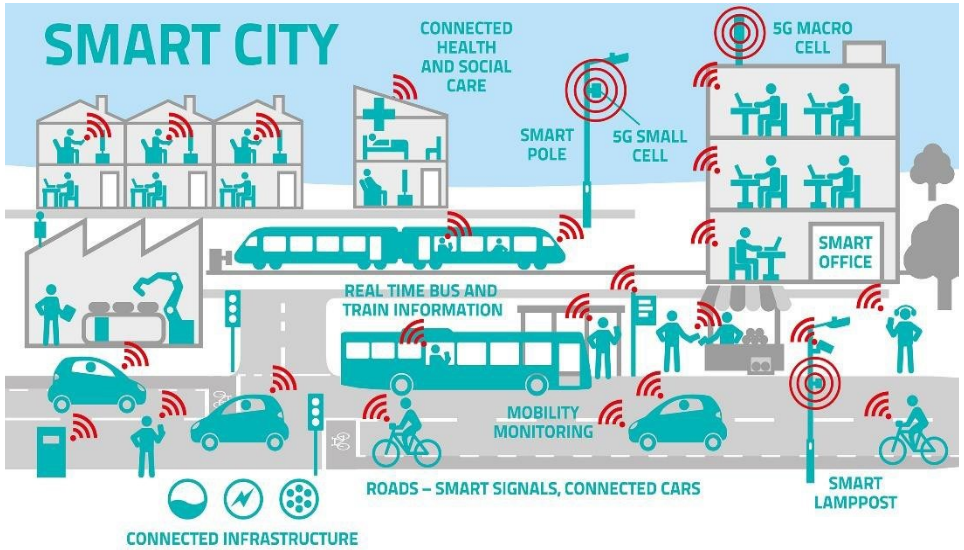
- Work with operators and industry to submit bids for Government funding through the Department for Digital, Culture, Media and Sport (DCMS) to fund the trialling of 5G technologies specifically small cells which will support the development of a deployment model and use cases.

- Work with Government on reducing the barriers to the deployment of 5G services.

Smart

Introduction

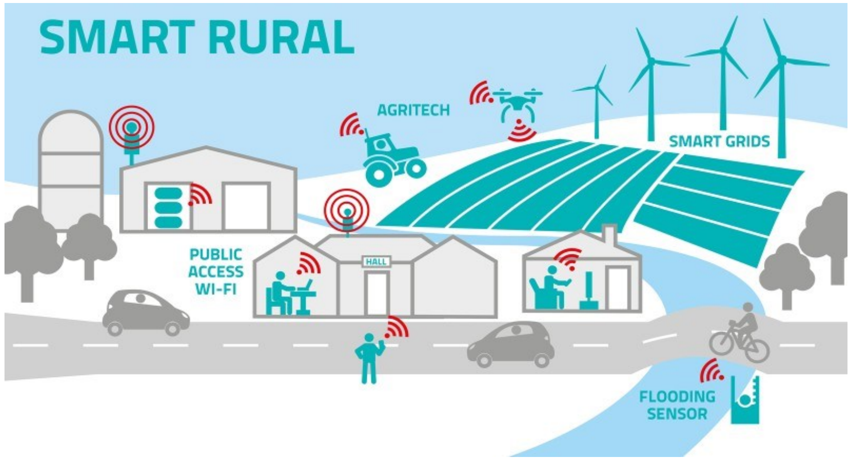
Advanced data techniques, sensor technology and digital connectivity are creating opportunities to support the sustainable growth of local economies, create better places and to help address some of significant challenges of our time, such as moving towards net zero, climate change mitigation and adaptation and the reduction in transport congestion and air pollution.



These infographics illustrate the range of opportunities for smart technology and digital connectivity to enhance how we live and work in our cities, towns and rural areas.

IoT – Internet of Things - where things such as sensors, devices and cars are connected to the internet.

LoRA – a low powered communication network for sensors.



Data collected from sensors can help in addressing these issues, for example:

- Health and Social care - supporting in-home care by sensing whether someone has fallen, is using their cooker and kettle, or has left their home.

- Water Consumption - monitoring of water usage and flooding, allowing better management regimes to lower water consumption and give better warning of flooding events. Low-cost IoT-based networks such as LoRa can support the deployment of flood sensors which are inexpensive to install and maintain due to their long battery life. The sensors can measure the level of water in streams and culverts giving an early warning alert and even averting flooding.

- Air Pollution - air quality sensors can measure pollution, informing policies to reduce the impact on residents' health.

- Better real-time travel information can help residents make more sustainable journeys.

- Smart Energy Grids Data underpins advances in the way energy is managed through smart grids.

- Monitoring of new developments - sensors can be used by planners and developers to understand the impact new developments are having on infrastructure such as water and power, traffic movements and the impact on air quality, for the site and surrounding communities.

Challenges

To be able to begin to collect and exploit data to address these challenges there needs to be in place:

- Connectivity – Making sure sensors can connect via local low power wide area networks (LPWAN). Because these networks are low power, batteries can last for up to 10 years and the networks cover large areas. LoRa networks have already been deployed in Cambridge, Ely, South Cambridgeshire and St Neots and work with district council partners is underway to extend the networks to Soham, Huntingdon, St Ives and Ramsey.

- Data Platform – A means to collect data into one place, making the sharing and re-use of data easy as well as making it available to be fed into tools which support the modelling and visualisation of data to draw intelligence and insight from it.

Solutions

- Once initial deployment of gateways has been completed (2021/22), a gap analysis of the network will be undertaken and additional gateways deployed as needed to to ensure complete coverage.

- Working with the District Councils, County Council and the GCP, a data hub will be developed that allows data sharing between public sector organisations and with businesses and communities.

- Collaborating with partners on pilots and trials of new technologies including deployment of air quality sensors, water level and flooding sensors as well as a investigation of use cases driven by the needs of the District and Town Councils.

- Assisting the inclusion of future proof digital connectivity infrastructure in the Local Plan, with consideration of how emerging technologies may support sustainable developments. Providing input to the NE Cambridge Area Action Plan (AAP) process, and supporting the development of other AAP documents, to incorporate Future Mobility, Advanced Connectivity and Environmental Monitoring.

- Collaborating with infrastructure delivery, utility and housing organisations to exploit advanced connectivity, including Anglian Water, UK Power Networks, , Network Rail and Highways England.

- Working with the Greater Cambridge Partnership to deliver its Smart Workstream, which will support more sustainable travel, create more sustainable developments and support work in addressing climate change.

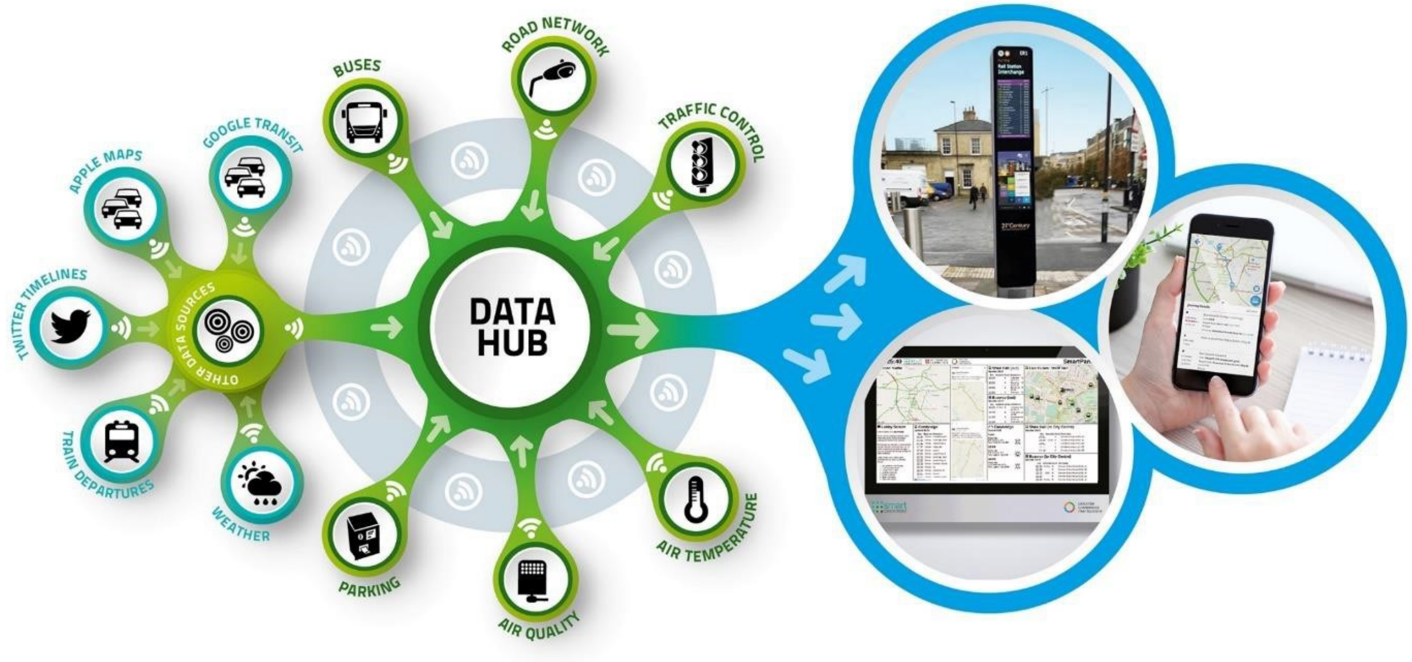


Image: Real world applications using data collated through the digital platform

Flooding resilience

The LoRa network and the increasing availability of other types of low powered networks will make it increasingly simple to deploy sensors that measure water levels and flow. An application could show waterway segments, allowing thresholds to be set on each sensor for high, normal and low water levels. Alerts can then be set that warn of problems such as blocked culverts and drainage ditches or give early warning of flooding. This information can then be passed on to the County Council’s Flood Risk team, or other responsible bodies, to ensure that early interventions are made. Residents could also receive an early warning of potential flooding giving them more time to prepare and helping communities to become more resilient.

Access and Inclusion

Introduction

Many more people are now connected to the Internet as a direct result of the challenges of Covid-19, however whilst simultaneously accelerating our reliance on connectivity, the pandemic has also sharpened and exacerbated the digital divide in the UK.

Whilst the reasons for digital exclusion are multi-layered, research from Dr Gemma Burgess at the Cambridge Centre for Housing and Planning Research highlights that access to digital connectivity is one of the key issues.

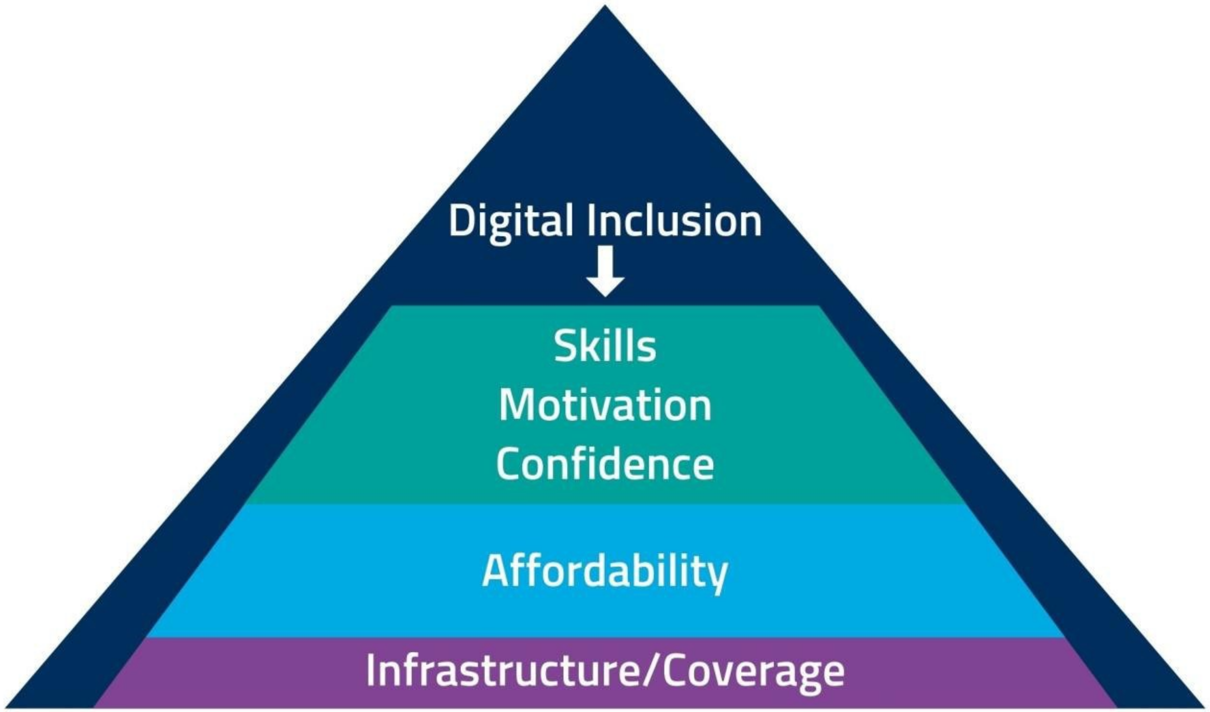


Image: Factors influencing digital inclusion

"Pay the Wifi or feed the children" Coronavirus has intensified the UK's digital divide… What we are seeing is an increasing divide between those who have access to information and communications technology and those who do not, giving rise to inequalities in access to opportunities, knowledge, services and goods….

This point is emphasised by the Lloyds Bank 2021 Consumer Digital Index Study, whose research shows that manual workers with high or very high digital engagement, earn £421 more per month than their less digitally engaged peers, in the same roles.

Challenges

Whilst addressing the full range of issues which impact on digital inclusion – motivation, skills, confidence and affordability – is beyond the scope of the digital infrastructure strategy, supporting increased access to digital connectivity is a key part of the picture and this strategy focuses on two specific aspects: public access Wifi provision and digital connectivity infrastructure for social housing residents.

Public Access Wifi

Free to use public access Wifi can be an important factor in helping to ensure that as many people as possible have access to digital connectivity as well as supporting struggling high streets as part of the economic recovery from the Covid pandemic.

In recent years the Connecting Cambridgeshire programme has enabled the roll-out of the single-sign-on 'CambWifi' service which provides free to use, seamless Wifi connectivity in hundreds of locations across the area, including cities, market towns and rural village halls in both indoor and outdoor places.

In Peterborough the newly installed public access Wifi service will play a key part in supporting the vibrant nature of the revitalised City Centre, encouraging a wider demographic and increased dwell time. Additionally, some of the most rural village halls now have access to CambWifi, enabling a range of community activities supporting community cohesion and greater well-being, and in Huntingdonshire CambWifi will provide connectivity to support service delivery to residents of the Oxmoor Estate.

Targets

Moving forward the focus for public access Wifi will be to:

- Investigate opportunities and funding to further expand the CambWifi services into more locations across Cambridgeshire and Peterborough.
- Consolidate existing public access Wifi services by broadcasting CambWifi in as many locations as possible.
- Publicise logon information and the locations where CambWifi is available to ensure that as many people as possible benefit from the service.

Social Housing Broadband Infrastructure Access

It is estimated that out of the 11m people in the UK without access to the Internet, 37% live in social housing and anecdotally it's clear that reliable access to the Internet amongst social housing tenants across Cambridgeshire and Peterborough is far lower than in market housing. Although affordability is a factor, initial research amongst local Registered Social Landlords (RSLs), telecommunications providers and Council Housing Teams highlights that the commercial provision of broadband infrastructure is poor, which means connectivity options are limited. There appear to be multiple reasons why commercial broadband infrastructure coverage is lower than in market housing, including: wayleaves and access; complex ownership models; legacy gaps in infrastructure and the capacity of housing associations to engage in the technical and legal steps required. Meanwhile telecommunications providers find it difficult to find an appropriate point of contact within RSLs and Government-funded connectivity vouchers are oriented towards owner occupiers rather than tenants.

Some local Councils which operate their own housing stock have been able to address this issue for their properties. For example, Cambridge City Council has recently devised and implemented a standard 'bulk' wayleaves scheme for their properties, which has resulted in a marked increase in access to full fibre provision for tenants. However, only a small proportion of social housing across Cambridgeshire and Peterborough is overseen directly by local Councils and therefore a wider approach is needed to resolve the current issues.

Solutions

- Explore the issues that affect digital connectivity for social housing and develop approaches to resolve these issues.

- Make more public access Wifi available via CambWifi: seek further funding streams and look to extend and expand current provision, working with local District and City Councils.

- Continue to liaise with partners and key stakeholders to signpost digital inclusion activities to support access to jobs, health and education.

Targets

- Improving gigabit-capable broadband coverage for social housing, matching the 85% target for market housing by 2025.
- Develop and agree policy for all new homes commissioned by the Combined Authority from 2022 to include gigabit-capable broadband provision.

Glossary

A comprehensive glossary of digital connectivity infrastructure terms can be viewed as a pdf on the Connecting Cambridgeshire website.

Useful links

Broadband

House of Commons Briefing Paper (April 2021): Gigabit-broadband in the UK: Government targets and policy

Openreach re.Covid impact https://www.fiercetelecom.com/telecom/openvault-covid-19-pandemic-drives-51-spike-broadband-traffic-2020

Copper Switch off https://www.openreach.co.uk/cpportal/products/product-withdrawal/wlr-withdrawal

Mobile

Ofcom Adult's Media Use and Attitudes report 2020/21 (ofcom.org.uk)

5G Microsoft Word - 5G Literature Review - final report 05062018c.DOCX (publishing.service.gov.uk)

Smart

Connected Nations Spring Update 2021 (ofcom.org.uk)

Housing data https://cambridgeshireinsight.org.uk/housing/

Access and Inclusion

Dr Gemma Burgess, Cambridge Centre for Housing and Planning Research, University of Cambridge
https://www.cam.ac.uk/stories/digitaldivide

Lloyds Bank 2021 Consumer Digital Index Study https://www.lloydsbank.com/banking-with-us/whats-happening/consumer-digital-index.html

Good Things Foundation https://www.goodthingsfoundation.org/the-digital-divide/

Contact

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