Suffolk – Evidence Report – Final

Consultancy Support

Report for Suffolk Climate Change Partnership

CD DW001

ED 13559 | Issue Number - Final | Date 22.04.2021

Customer:

Suffolk County Council

Customer reference:

CD DW001

Confidentiality, copyright & reproduction:

Contact:

James Harries
Ricardo Energy & Environment
Gemini Building, Harwell, Didcot, OX11 0QR, United Kingdom

t: +44 (0) 1235 75 3272

e: james.harries@ricardo.com

Ricardo is certificated to ISO9001, ISO14001 and OHSAS18001

Author:

James Harries, Chris Thorpe, Guy Hitchcock, Chris Williams, Raph Sibille, Callum Forsyth, Martha Preater, Carolina Downey de Oliveira, Christopher Evangelides, Anne Misra.

Approved By:

Chris Thorpe

Date:

[Publish Date]

Ricardo Energy & Environment reference:

Ref: ED13559-

Table of contents

1 Introduction

This Evidence Report provides the background evidence and research undertaken before being condensed, refined and summarised in the Climate Emergency Plan and Table of Actions. It also builds on the original Technical Report provided by Ricardo May 2020[1].

This Evidence Report contains an introductory chapter that updates the greenhouse gas (GHG) emissions inventory for Suffolk County, providing values for 2018. These values are visualised by end-user sector and also by district, as well as on a map of the county. This section also provides an illustrative pathway to Net Zero by 2030.

Following these sectoral chapters, a cross-cutting chapter discusses the research into behaviour change, community action and stakeholder collaboration. In addition, in contains a summary of available financing opportunities, categorised into grant/equity and debt options.

The second chapter starts the first of 5 sectoral chapters, that provide the background research behind the goals, outcomes and actions developed for the Collaborative Action, Sustainable Homes, Low Carbon Transport, Commercial and Industrial Energy Use, and Cleaner Power sectors. The goals, outcomes and actions agreed with the Suffolk Climate Change Partnership and SCCEE board during February 2021 have been provided in two additional documents to this report. The first is a "Table of Actions" document, arranged in tabular format, that contains a Long-list of 102 Actions, and a Short-List of 25 Priority Actions. The second is the Climate Emergency Plan

Where feasible, indicative costs and key delivery partners are assigned per outcome and/or action. Any indicative costs have been provided using a simple banding that represents the overall cost:

- £ = Less than £1m
- ££ = £1-10m
- £££ = £10-100m
- ££££ = £100m-1bn plus

Lastly, a co-benefits chapter shows differences in air quality that were assessed between a baseline scenario to 2030, and the carbon neutral 2030 scenario to estimate any impacts on air quality. In addition, a short summary of wider co-benefits is also mentioned.

Accessibility:

This file may not be suitable for users of assistive technology**.** Request an accessible format.

[1] http://www.greensuffolk.org/assets/Greenest-County/SCCP/SCCP/Misc/2020-06-01-REE-SCEP-Technical-Report-FINAL.pdf

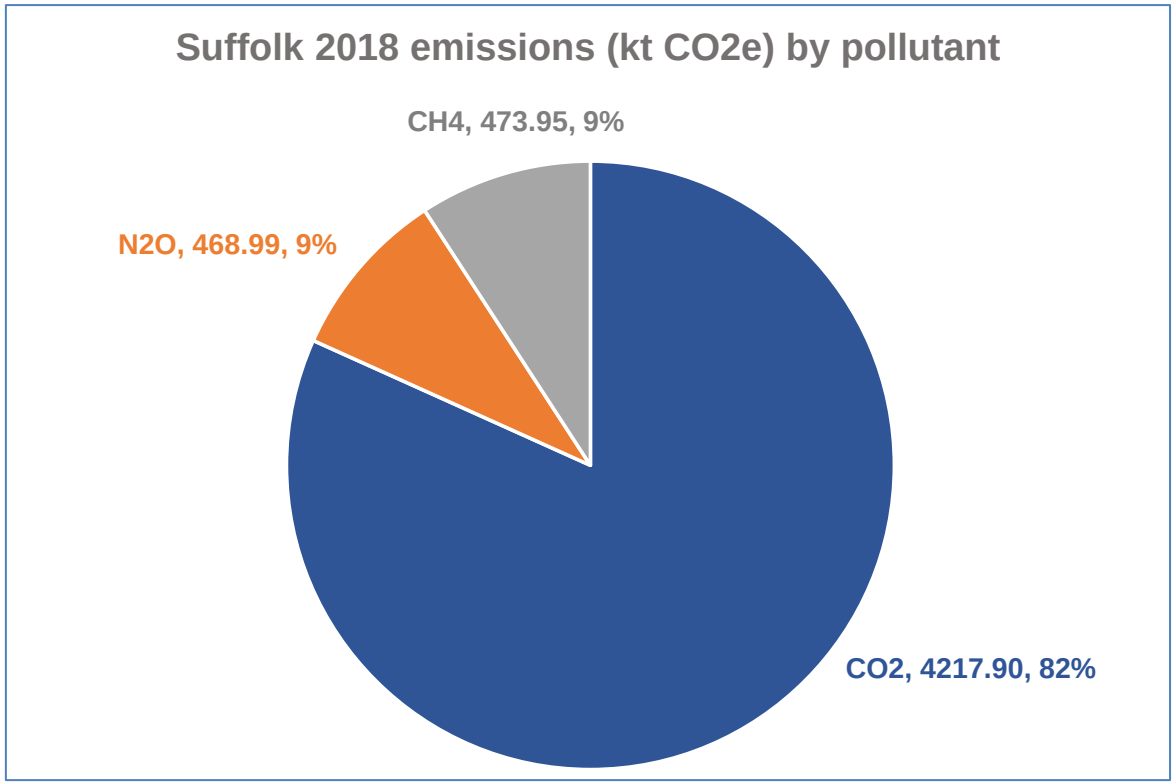
2 GHG emissions across Suffolk County and districts

2.1 Introduction

In 2018, the total GHG emissions across the county of Suffolk was 5,160.84 kt CO2e (kilo tonnes of carbon dioxide equivalent). Carbon dioxide (CO2) was the pollutant gas responsible for 82% of these emissions, equal to around 4,217.90 kt. The remaining pollutant gases were Nitrous Oxide (N2O) and Methane (CH4). The global-warming potential (GWP) of these gases differ to that of CO2, and so in order to compare like with like, a calculation is made to express their values in tonnes of CO2 equivalent (CO2e). Together, N2O and CH4 are responsible for the remaining 18% of GHG emissions across the county, equivalent to around 942.94 kt CO2e. This is visualised in Figure 1.

The CO2 values can be grouped by "end user" (Industry and commercial, Domestic, Transport and Net Land use, Land use change and Forestry (LULUCF) in the publicly available Local Authority CO2 "LACO2" dataset, on the National Atmospheric Emissions Inventory (NAEI) website. [2]

Figure 1 – Suffolk GHG emissions by pollutant in 2018 (kt CO2e)



[2] https://naei.beis.gov.uk/data/local-authority?view=la-co2

The N2O and CH4 values are available as “point source” values, aren’t able to be grouped by “end user” and are also available on NAEI website[3]. These values are summarised below in Table 1.

Table 1 – GHG emissions across Suffolk County by district, sector, and pollutant gas in 2018

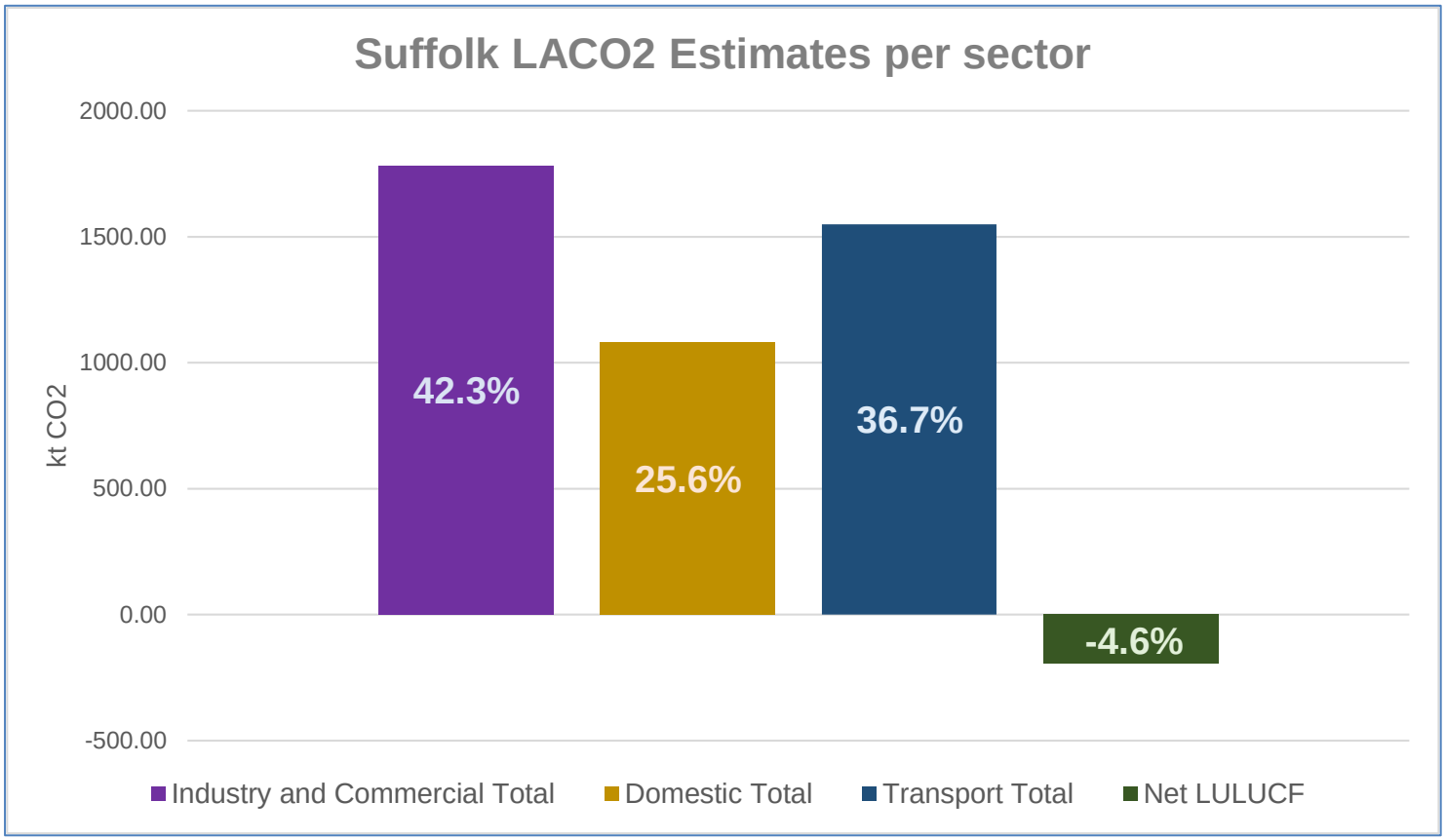
District	Industry and Commercial (CO2)	Domestic (CO2)	Transport (CO2)	Net LULUCF (CO2)	**Total (CO2)**	N2O (CO2e)	CH4 (CO2e)	**Grand Total (CO2e)**
West Suffolk	965.28	250.51	449.43	-49.20	1,616.02	136.07	111.46	1,863.55
East Suffolk	352.18	370.74	426.02	-90.55	1,058.39	148.40	144.88	1,379.66
Mid-Suffolk	202.86	150.13	299.63	-30.26	622.36	118.91	134.05	875.32
Babergh	144.96	140.40	258.22	-23.61	519.97	57.47	62.68	640.11
Ipswich	117.68	169.11	115.68	-1.31	401.16	8.14	20.87	430.17
Total	**1,782.95**	**1,080.88**	**1,548.98**	**-194.92**	**4,217.90**	**468.99**	**473.95**	**5,160.84**

2.2 Breakdown by sectors

When the CO2 emissions across Suffolk are broken down by end user, the Industry and Commercial sector is responsible for the highest level of emissions, accounting for 42.3% (1,782.95 kt CO2). Transport has the second highest level of emissions, at 36.7% (1,548.98 kt CO2), and domestic third, at 25.6% (1,080.88 kt CO2). The LULUCF is a sector that represented a net sink for Suffolk in 2018, reducing the County’s emissions by 4.6% (194.92 kt CO2). This is visualised in Figure 2.

[3] https://naei.beis.gov.uk/data/map-uk-das?pollutant_id=5

Figure 2 – Suffolk CO2 emissions per sector in 2018 (CO2)



2.3 Breakdown by districts

When the CO2 emissions across Suffolk are visually broken down, they appear as visualised in

Figure 3. From across the districts, West Suffolk is observable as having its highest emissions of CO2, originating from the Industry and Commercial end-user sector. For Babergh, Mid-Suffolk and East Suffolk, their highest CO2 emitting sector is the Transport sector, and for Ipswich, their highest emitting sector is Domestic. Further district level details are provided in Figure 4 – Pie charts visualising CO2 emissions per district.

Figure 3 – Map visualising the end-user breakdown of CO2 emissions across Suffolk by district

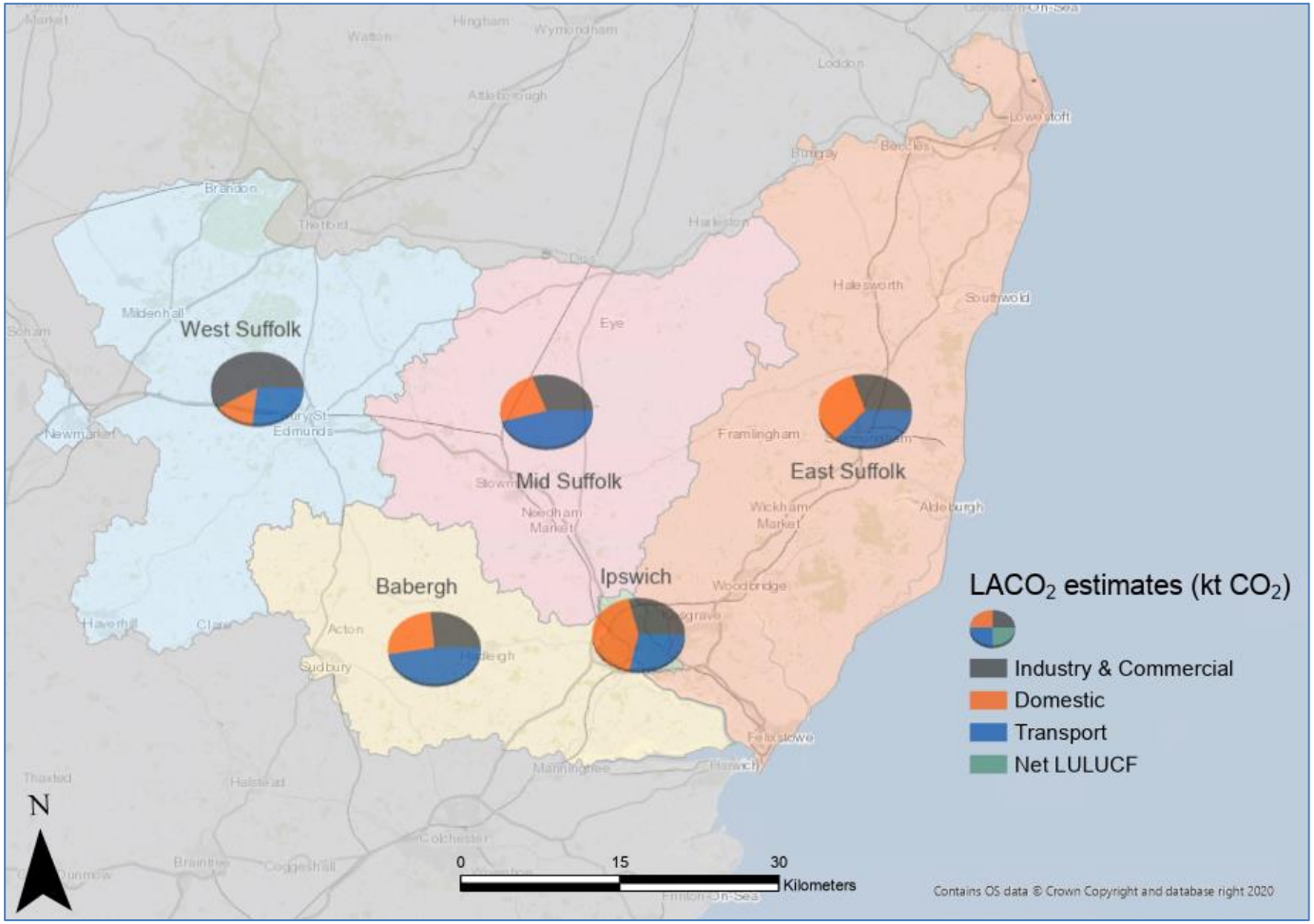
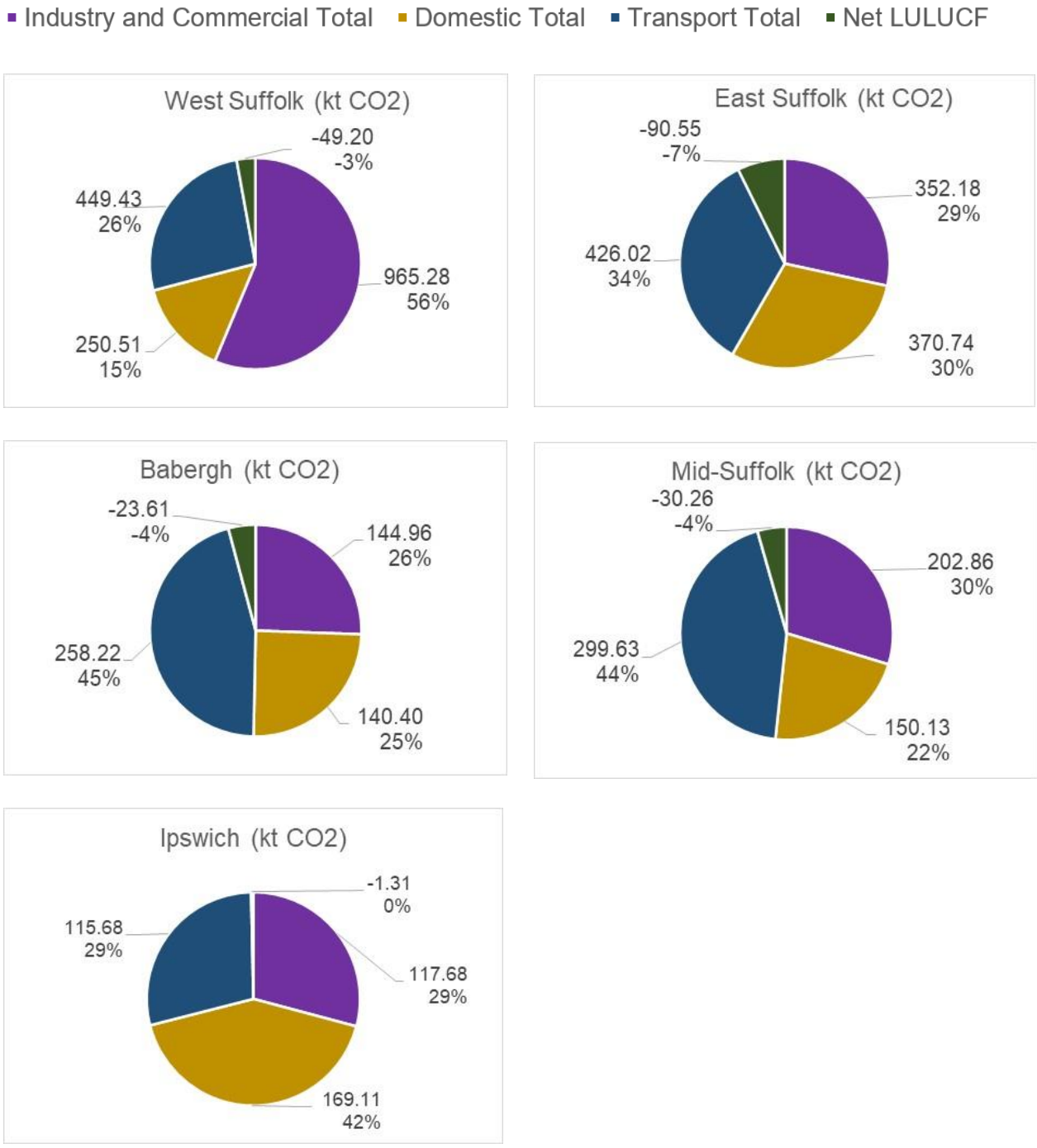


Figure 4 – Pie charts visualising CO2 emissions per district

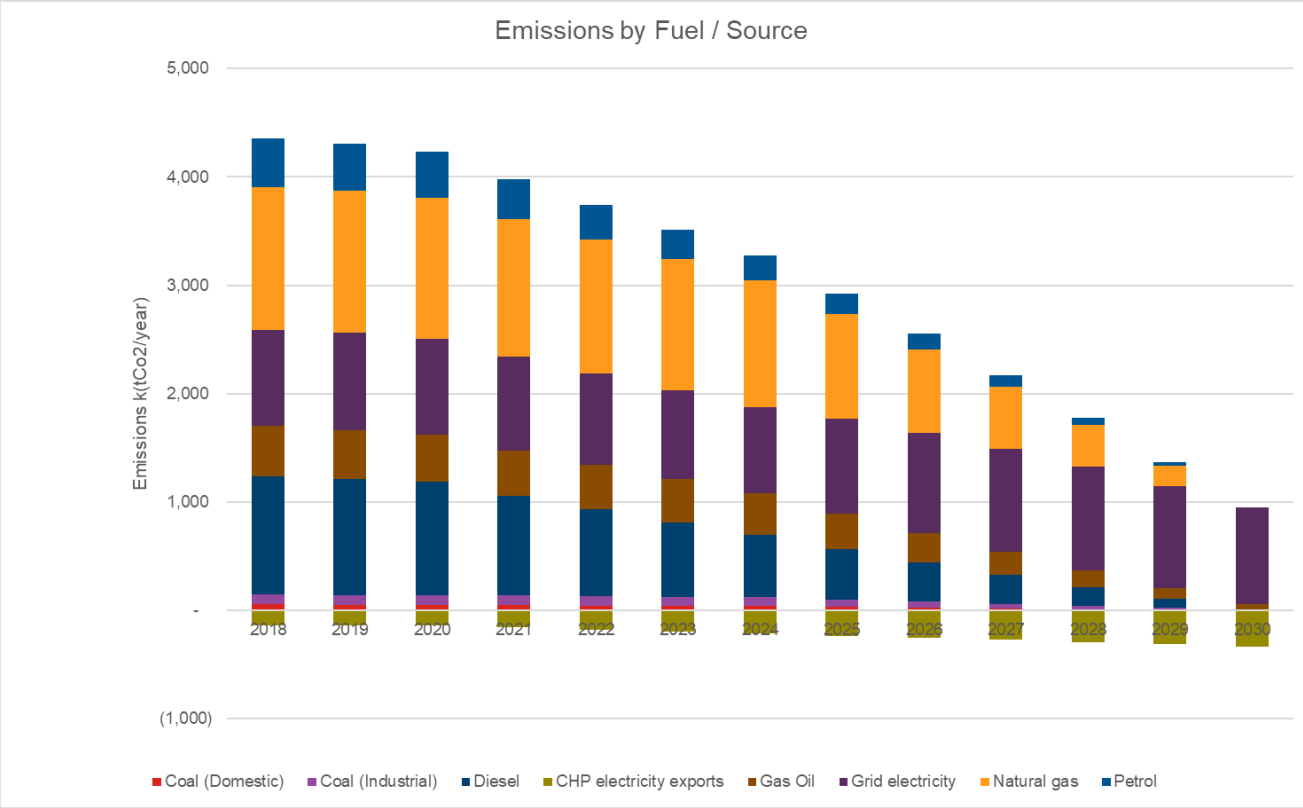
Key:



2.4 An assessment of the journey to carbon neutrality

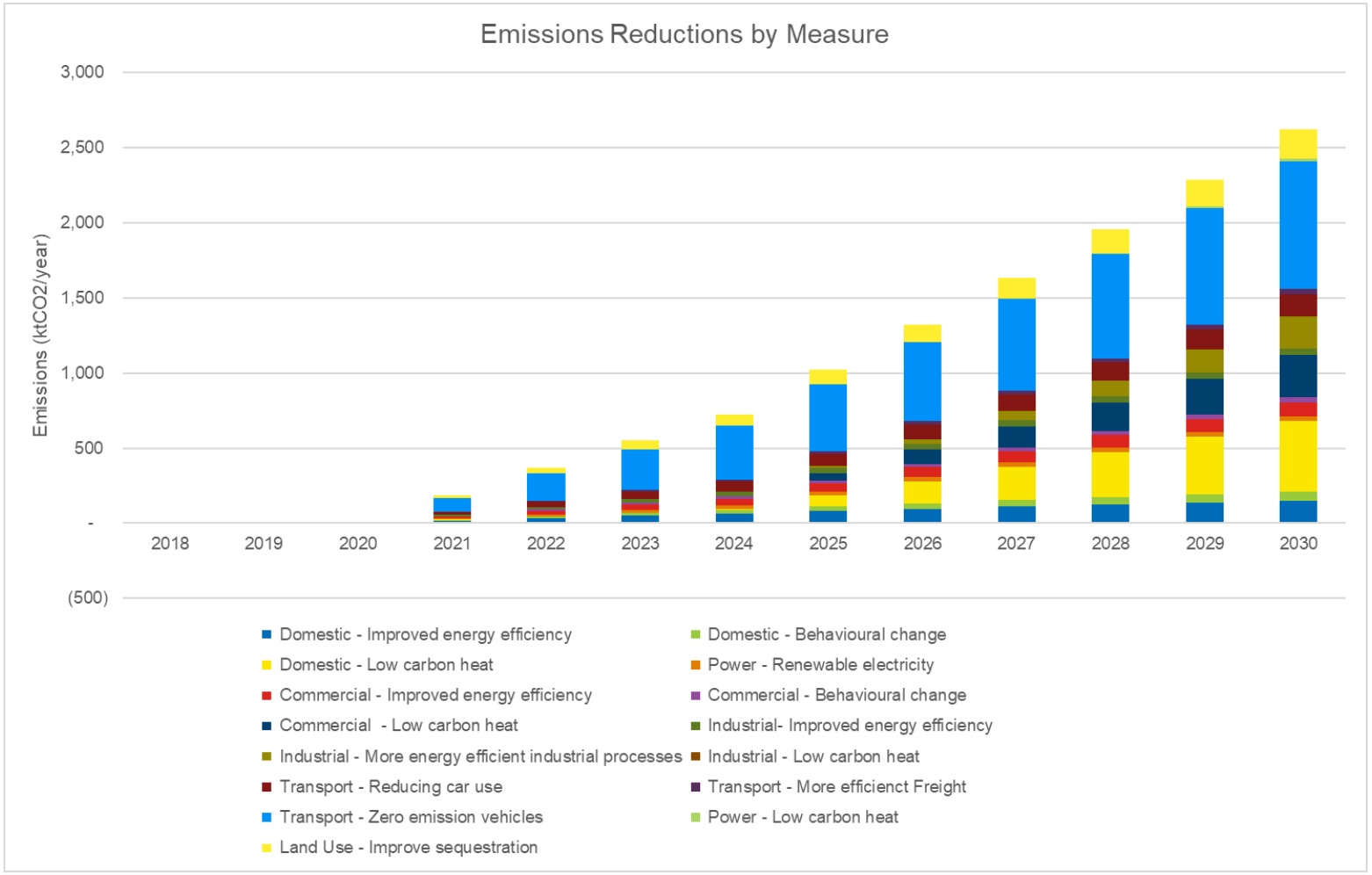
Ricardo's initial technical report from May 2020 explored the type and levels intervention required to achieve carbon neutrality in Suffolk over the period to 2030. The goals, outcomes and actions research required to achieve these interventions is the focus of this report. However, we have also provided an indicative assessment of how these key interventions, grouped in relation to the goals set out in the following sections, will contribute to achieving a carbon neutral Suffolk. Figure 5 below illustrates how fossil fuels would need to be phased out with sectors moving to electric power. It also shows that even by 2030, we would still not be entirely carbon neutral, as there will be residual emissions related to carbon emissions from the national grid which would be beyond Suffolk's direct control.

Figure 5 – Reduction in emissions by fuel



In terms of the potential impact of overall interventions, these are illustrated in Figure 6 below. These combine to reduce emissions by 57% in 2030 compared to 2018. A further reduction could be generated by grid decarbonations, in the region of 24%. This gives a total reduction of 81% by 2030 with the bulk of the remaining emissions related to electricity use, which is somewhat offset by Land Use Land Use Change and Forestry (LULUCF). This indicates that the largest reductions are likely to come from electrifying the vehicle fleet and decarbonising heat in the domestic sector.

Figure 6 – Potential emission reduction impact of key interventions grouped by goal



3 Collaborative action

This chapter is used to capture goals, outcomes and actions which will support the achievement of the actions identified in all sectors, and the implementation of the plan by the SCCP across sectors. As such, they are essential steppingstones enabling the reduction in emissions required across all sectors to achieve carbon neutrality.

3.1 Collaborative action themes and carbon emissions in Suffolk

The enabling actions presented here will not directly deliver emission reductions themselves, but are nonetheless vital for supporting the achievement of emission reductions in the homes, transport, commercial and industrial, and power sectors. As such, they indirectly allow for the emission reductions detailed in following chapters.

3.2 Approach to achieving carbon neutrality in collaborative action themes

The actions in the collaborative action sector enable emission reductions across all sectors and are grouped under the following goals:

Goal 1 – Education, engagement and behaviour change programme
With the Committee on Climate Change estimating at the UK level that 62% of the GHG emission reductions needed to achieve carbon neutrality coming from either behaviour change with technology or behaviour change alone, it is clear that all parts of society – public sector, businesses, and communities (individuals themselves, community and third sector groups) – have a significant role to play in bringing about this change. The outcomes proposed have a range of approaches. With an emphasis on education and information, outcomes include a mass public engagement campaign (across TV and other media) and creation of a climate action information hub. Community climate dialogues emphasise community deliberation and ownership over local transition plans.

Goal 2 – Leveraging Community Action
The goal is to support existing community climate action so it can reach new levels and galvanise new community action. To support existing action, a key outcome is the creation of a community action mutual support network (convening and enabling an online platform for communication and coordination of community action groups). To galvanising new action, outcomes include the mass recruitment of climate action volunteers and support for community currencies to compensate them, nature-based engagement (enabling access of the public to nature) and an annual climate action festival to educate and inspire.

Goal 3 – Fostering further stakeholder and supplier collaboration.
This goal seeks to build on the goodwill and engagement that was created in the development of this action plan, by providing opportunities for stakeholders to continue to convene and collaborate. Together a holistic cross section of users, providers and regulators and sectors is proposed to avoid siloed thinking. Apart from a communications programme and working groups, an annual conference is proposed to provide a focal point for deliberation and action.

Goal 4 – Financing local climate action
Delivering carbon neutrality will involve significant investment so finance will be crucial. Alongside the important task of accessing available government funds for climate action (see Section 7.2 for more details), this plan considers two key local outcomes to support this – Community Climate Finance,

where local authorities support community finance initiatives e.g. with community municipal bonds, and a council-backed carbon offsetting scheme.

Goal 5 – Monitoring and communication of progress

It will be important to track our progress in achieving this goal. Obviously, the key metric of success is overall GHG emissions in Suffolk. However, by itself this may not be enough for two reasons. Firstly, the publication of GHG emissions data always lags by a couple of years. By the time it is clear whether progress in reducing emissions is enough, it may be too late to do anything to change that. Secondly, a more accurate picture of progress can be gained by also measuring other metrics, such as the numbers of electric vehicle charging points installed, or the number of gas boilers that have been replaced by low carbon heat sources. We will work with the relevant data holders to develop a framework of indicators that will be used on an annual basis to take stock of progress, with this information then being used to inform future updates of this plan and future policy and investment decisions.

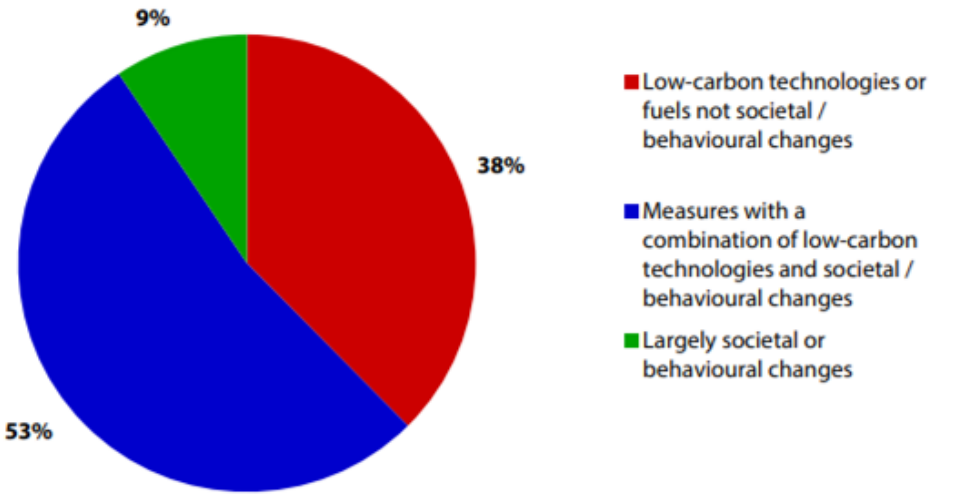
3.3 Goal 1 – Education, engagement and behaviour change programme

According to analysis by the Committee of Climate Change (CCC) [4], only around 38% of the GHG emissions reductions needed to achieve carbon neutrality will come from technology only (e.g. more fuel-efficient cars). The remaining 62% will either come from behaviour change (9%) or a combination of behaviour change with technology (58% e.g. EVs – the EV is the technology but you need people to change their behaviours to buy them). This is depicted below in Figure 7**Error! Reference source not found.**.

Figure 7 – CCC analysis, role of societal and behavioural changes in the Further Ambition scenario

[4] Committee on Climate Change, Net Zero – The UK's contribution to stopping global warming, p 155
https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/

Figure 5.6. Role of societal and behavioural changes in the Further Ambition scenario



Source: CCC analysis.

All parts of society – public sector, businesses, and communities (individuals themselves, community and third sector groups) have a significant role to play in bringing about this change. Here we focus on the kind of behaviour government needs to incentivise, and how this can be brought about through a behaviour change communication programme.

Outcome 1: Mass public engagement campaign

The UK's Climate Assembly voted that 'informing and educating everyone' about climate change should be the 1st principle underpinning the UK's path to net zero. Indeed, this was a recurring point in the workshops that inform this report.

Table 2 – Elements of a Communication Approach, provides an overview of the elements of a communications approach, including behaviour which needs to be incentivised in each sector, and examples of the kinds of initiatives which need to be publicised for inspiration or as support available to the public. Regarding behaviour, this is split into 3 spheres of individual action - at home, within community groups, and through engagement with government and business. Given the inherent uncertainty in predicting levels of behaviour change over the long-term[5], we focus on how the SCCP can facilitate behavioural change rather than quantifying how much can change can be expected.

It should be noted that while the list is long, studies reveal that behavioural change campaigns should prioritise areas where shifts in behaviour are feasible for the individual, within their scope of influence, and could deliver large emission savings. These are primarily in transport, aviation, heating and diet, as a study in Kent found.[6] Further in the context of the current pandemic, in the short term priority should be given to those outcomes which do not conflict with the COVID response.

[5] Carmichael, R. (2019) *Behaviour change, public engagement and Net Zero*. A report for the Committee on Climate Change. Available at https://www.theccc.org.uk/publications/ and http://www.imperial.ac.uk/icept/publications/

[6] The study found there was most willingness to undertake home energy outcomes such as installing RE devices (heatpumps, solar etc), changing to green tariffs, using EVs, avoiding flying by working from home, home insulation, avoid short haul flights by using trains, reducing food waste, avoiding long-haul flights, and reducing meat consumption. An interesting analysis of the carbon opportunity size of each action (%

Regarding the tone of the campaign, it must reflect the urgency of a climate emergency, "breaking with previous messaging to households to make small and easy changes, high-impact shifts in consumer behaviours and choices are needed that are consistent with the scale of the climate challenge, build optimism and commitment, and give weight to new ambitious narratives that inspire wide public participation" [7]. In the current context, it is also important to link this to the COVID recovery agenda.

The narrative must be compelling and honest, facing up to thorny issues such as social inequality and climate change. This includes acknowledging the disproportionate responsibility of wealthier income groups in climate change due to the high-level of consumption in their lifestyles. Equally, it must be acknowledged that the majority of people (those in lower income brackets) have to prioritise immediate survival over climate change, which has longer time horizons. The economics of acting on climate change needs to be affordable, and other chapters deal with this issue thoroughly. Regarding an informational campaign, it must speak to the priorities of the audience, emphasising co-benefits of action for health, wellbeing, biodiversity, jobs and the economy which are tangible and will be enjoyed on much shorter time horizons than the benefits from climate change mitigation. Particular examples include cost savings from insulation measures and the benefits of contact with nature, which is a particular asset in Suffolk as a rural county.

Further, if communities are to be motivated to act on this subject, apart from speaking to their priorities, they must co-create and cooperatively own the solutions to the climate crisis, as an antidote also for fear of change, consumerist culture, and NIMBYISM. These solutions should take into consideration local development and both reduce emission and tackle inequality, viewing climate action as an engine of development.[8] Further thought it given to how to do this in Outcome 3 below.

Such an educational campaign should exist across multiple platforms (TV, radio, social media). While this is potentially a very expensive action, there is the possibility of combining the resources of multiple county councils country wide, who are setting themselves a similar task. Within Suffolk, a series of free online educational webinars could be advertised by the council, in partnership with organisations acting on the issue. It was further suggested that a specific programme for schools and councillors be developed in Suffolk, as well as funding for climate change arts programmes each year or on a rolling basis. Cornwall has held a series of 'Climate Conversation' webinars, enabling education and engagement on waste and recycling, tree planting, sustainable farming, meadows and carbon, parish action, youth climate voices and school action, green skills and home energy efficiency.[9] Further, a number of NGOs such as Global Action Plan[10] have significant experience running behaviour change campaigns, and their support could be enlisted.

Table 2 – Elements of a Communication Approach

Behaviour to incentivise	Examples of Initiatives
Buildings and homes	
• **Act at home.** Change to low carbon heating, insulate homes for cold and hot weather, use efficient appliances, share	**Old Hall Community/ Ecovillage** is a housing association based in rural Ipswich. A group of people share a large building and focus on

of the population willing to take an action multiplied by the amount of carbon saved for doing the action), is also provided, see p14 of Kent County Council, Climate Change Behavioural Insights, Final report, Insight and Engagement Unit at Hampshire, County Council, 22/05/2020 at https://www.kent.gov.uk/__data/assets/pdf_file/0007/116683/Climate-Change-Behavioural-Insights.pdf

[7] Carmichael, R. (2019) *Behaviour change, public engagement and Net Zero*. A report for the Committee on Climate Change. Available at https://www.theccc.org.uk/publications/ and http://www.imperial.ac.uk/icept/publications/

[8] McCabe, Sean, *The People's Transition: Community-led development for Climate Justice,* Foundation for European Progressive Studies, 2020, https://www.feps-europe.eu/resources/publications/762-com_publications.publications.html

[9] Cornwall Climate Action Plan https://www.cornwall.gov.uk/media/40176082/climate-change-action-plan.pdf

[10] Global Action Plan, https://www.globalactionplan.org.uk/

Behaviour to incentivise	Examples of Initiatives
your home (heating, lighting, cooking), parent consciously • **Organise into community action groups.** Eco-housing and eco-villages, energy efficiency community groups, collective purchase of EE equipment • **Engage with government and business.** Engage with local energy hub, take up government funding for warm homes	community living in an environmentally conscious way. **SE Energy Hub** provides information about funding for Energy efficiency measures and Heat (e.g. the heat networks investment project). **Net Zero Leiston** is made up of community representatives, local councils, engineers, experts, and various consultancies. The group solve issues around energy efficiency and affordability in the local area in order to reach Net Zero. **Warm Homes Fund** provides funding to install first time central heating systems in fuel poor households. Work with LAs to access these. **Green Homes Grant** is a national government fund for homeowners, landlords and local governments to retrofit their homes to reduce their energy use or install low carbon heating.
Electricity	
• **Act at home.** Switch to green energy suppliers, generate your own RE, choose a career in the low carbon sector. • **Organise into community action groups.** Start or support a community energy company and/or collective purchase of RE technologies. • **Engage with government and business.** Make use of energy hub and group buying schemes. Campaign govt to support renewables and grid modernisation through target setting, local planning, climate emergency funding, purchase of local renewable electricity, support of local renewables jobs and supply-chain; fossil free UK.	**Green Energy Nayland** is a community owned and financed solar PV project on school roofs **Suffolk Solar Together** group buying scheme high-quality solar photovoltaic (PV) panels and battery storage for communities / domestic and businesses **Community Energy East** is a support network for community energy groups across the East of England. **People and Planets** national Campaign for a Fossil Free UK
Transport	
• **Act at home.** Work from home and community hubs, walk and cycle, use public transport and national rail, reduce and share number of fossil vehicles, use an EV, prefer local produce (food, tech,	**Suffolk Car Share** lift sharing saves emissions and money. There are several carshare 'communities' in Suffolk, e.g. at Suffolk County Council.

Behaviour to incentivise	Examples of Initiatives
furniture etc.), catch trains not planes, avoid seasonal excess (stay close to home). • **Organise into community action groups.** Car sharing clubs. • **Engage with government and business.** Make use of EV grants and "try before you buy" schemes; support businesses with green transport options; Campaign for walking and cycling infrastructure, public transport (buses, bikes) community hubs, broadband, and incentives to reduce private fossil vehicle use, vehicle sharing schemes	**Low Emissions Vehicle grant** You do not need to do anything if you want to buy one of these vehicles - the dealer will include the value of the grant in the vehicle's price. The maximum grant available for cars is £3,000 **Transport East** connect industry and business to develop more sustainable transport infrastructure. Communities should try to be represented in these kinds of bodies. **Department for Transport eCargo bike Grant Application** "This funding will see groceries and other shopping delivered to people's doors by bike instead of vans, helping ensure that as transport increases and we recover from Covid-19, it'll be cleaner and greener than ever before."
Agriculture and Natural Environment	
• **Act at home.** Eat local, seasonal, sustainable food; eat less meat and dairy, Plant an edible garden and/or use an allotment; value and visit nature often, with friends, family and children • **Organise into community action groups.** Community garden, community fridges; tree planting, community environment and wildlife groups. • **Engage with government and business.** Support local and environmentally sustainable farmers, community supported agriculture schemes; campaign for allotments, wildlife protection and rewilding.	**Hubbub** runs community fridge schemes around the UK, already running in Lowestoft and Thetford. Local businesses, organisations and residents donate surplus food to the fridge where it can be collected by any local individual in order to increase a spirit of sharing locally. **OLIO** connects neighbours with each other and with local businesses so surplus food can be shared, not thrown away. This could be food nearing its sell-by date in local stores, spare home-grown vegetables, bread from your baker, or the groceries in your fridge when you go away. **Local Food Suffolk** is an online directory for locally produced foods**.** **People's Community Gardens** is an outdoor community resource in Ipswich, where people of all ages, and from all walks of life, get together to develop and maintain an inspiring green space, growing plants, herbs, fruit and veg. **Visit Suffolk Coast and Heaths AONB** RISBY is a wildlife friendly village - A network of wild areas, maintained and created by residents, on both public and private land to benefit wildlife and people

Behaviour to incentivise	Examples of Initiatives
Consumption and Waste	
• **Act at home.** Consumption: shop consciously; buy less, make more; refuse (non-essentials, single use plastics), shop for less carbon intensive materials (e.g. bioplastics, hemp clothing, green building materials), avoid seasonal excess, share everything (clothes, food, etc), buy pre-loved items. Waste: reduce (food and water waste), reuse and repair, recycle (compost at home). • **Organise into community action groups.** Food waste groups and apps, libraries of things, get the community together to share food, swap useful items (clothes, tools), recycling groups, repair cafes. • **Engage with government and business.** Support shops and suppliers with no packaging, selling efficient, durable, biodegradable goods; campaign for regulation on sustainable goods, increased recycling rates and facilities for business, and anaerobic digestion for food treatment.	**The Groundwork East** of England Hub help people work together to reduce waste, to raise awareness of the need to reuse and recycle and to save money by having access to pre-loved and recycled products. **Library of Things** - "sharing the things we only use now and again cuts down on clutter, is more affordable, brings people together, and is kinder to our planet." E.g. borrow a hoover or a drill. **Too Good to Go** - Every day, fresh food goes to waste at cafes, restaurants, hotels, shops and supermarkets - just because it hasn't sold in time. Too Good To Go lets you rescue a 'Magic Bag' of this food so it gets eaten instead of wasted.
Collaborative action: climate action groups	
• **Organise into community action groups.** Climate action groups act on the issue as a whole. • **Engage with government and business.** Take up funding options available.	**Extinction Rebellion** including Suffolk Sunrise, XR Ipswich, XR Bury St Edmunds **UKYP** gives young people a powerful voice that is heard by decision makers in local and national government and helps young people to use their energy and passion to change the world for the better. **Transition Network Transition Network** is a movement of communities coming together to reimagine and rebuild our world. There are currently groups working around Woodbridge and Framlingham and Saxmundham **Climate Emergency Centres (CECs)** enable you to develop a self-funding Centre that brings together diverse groups and individuals in your local community to build solutions, relationships and resilience in the face of the Climate and Ecological Emergency.

Sources:
Buildings and homes:

- http://www.oldhall.org.uk/,
- https://www.energyhub.org.uk/,
- https://www.netzeroleiston.info,
- https://www.affordablewarmthsolutions.org.uk/warm-homes-fund/
- https://www.gov.uk/guidance/apply-for-the-green-homes-grant-scheme

Electricity:

- http://www.greenenergynayland.org.uk/
- https://www.suffolk.gov.uk/planning-waste-and-environment/initiatives/solar-together-suffolk/
- https://www.facebook.com/communityenergyeast/
- https://peopleandplanet.org/

Transport

- https://liftshare.com/uk/community/suffolk,
- https://www.gov.uk/plug-in-car-van-grants
- https://www.transporteast.org.uk/
- https://dftecargobikeapplication.est.org.uk/

Agriculture and natural environment

- https://www.hubbub.org.uk/
- https://olioex.com/,https://localfoodsuffolk.wordpress.com/yummy-producers/
- https://activlives.org.uk/activgardens/
- https://www.visitsuffolk.com/explore/the-suffolk-coast.aspx

Consumption and waste

- https://www.groundwork.org.uk/hubs/east/services/
- https://www.libraryofthings.co.uk/
- https://toogoodtogo.co.uk/en-gb
- https://toogoodtogo.co.uk/en-gb

Collaborative action: climate action groups

- https://extinctionrebellion.uk/
- https://thesource.me.uk/leisure-and-getting-involved/suffolk-uk-youth-parliament/
- https://transitionnetwork.org/about-the-movement/
- https://climateemergencycentre.co.uk/

Outcome 2: Climate action information hub.

This would be a central repository for the public, council facilitated but enabling partners (community groups, businesses, others) to upload content, on required behaviour, initiatives and schemes (public / private / third sector), scientific evidence, funding and support available etc. Green Suffolk[11] is the current hub, but this should be adapted. It could be developed using the same platform as the Community Action Mutual Support Network, mentioned in **Goal 2 – Leveraging Community Action**. One area of particular interest mentioned in the Student workshop was a list of local and sustainable shops.

Outcome 3: Community Climate Dialogues

[11] http://www.greensuffolk.org/

The UK's Climate Assembly voted that 'fairness within the UK, including for the most vulnerable (affordability, jobs, UK regions, incentives and rewards) in actions, not just words' should be the 2nd principle underpinning the UK's path to net zero. In 10th place (of 25) was the principle that 'local community engagement [should be] embedded in national solutions'.

Based on case studies in rural Ireland, '*The People's Transition*' report was prepared for the EU to advise on how to bring about community led climate transitions. It emphasises that communities must be allowed to co-create, and importantly, cooperatively own, the solutions to the climate crisis.[12] Otherwise, the Yellow Vest protests which were triggered by the implementation of a carbon tax in France show how unpopular climate action can be. The scale of change required to achieve net zero will only be achieved if people feel they are engaged and own the decision-making process which leads to determining actions.

The issue must be looked at holistically. "If social approval is central to a fast and fair transition to a zero-carbon future, and expanding the capabilities of a community is a means to ensure that social approval, then it is inescapable that the basis of climate action must be meaningful community empowerment."[13] As such climate action must focus on the people's wellbeing and therefore address inequality. For example, a holistic, capabilities grounded approach to dealing with the intensification of farming would require restricting the numbers of mega-marts and increasing minimum wage. As such, the report affirms that climate action should seek to deliver a triple bottom-line:

1. Advancing climate action by either mitigating emissions or building adaptive capacity
2. Addressing an immediate development priority or need
3. Delivering opportunities for community wealth building

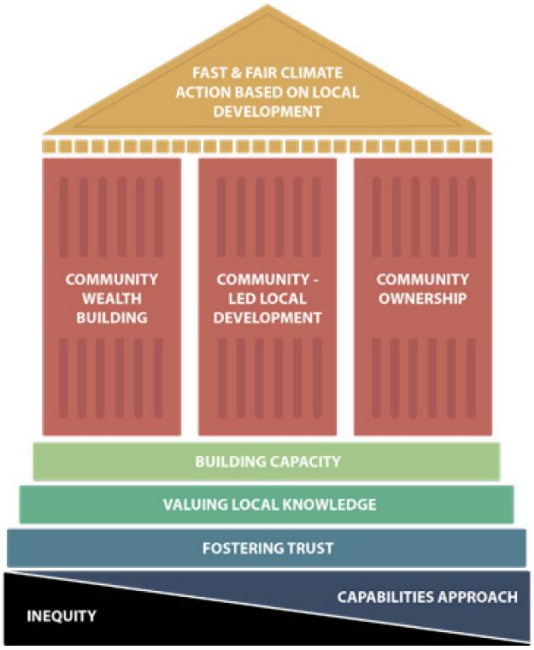
The foundation and pillars for fast and fair climate action based on local development are shown in Figure 8.

[12] McCabe, Sean, *The People's Transition: Community-led development for Climate Justice,* Foundation for European Progressive Studies, 2020, https://www.feps-europe.eu/resources/publications/762-com_publications.publications.html
[13] Ibid

Figure 8 – Pillars of the People's Transition approach

The pillars of the People's Transition approach are shown below. Examples of each pillar include:

- Community wealth building – public procurement as an catalyser of local, community owned, green development; supporting cooperatives which are invested in the local community; community supported agriculture.
- Community Led Local Development: drawing on EU guidance, this adopts a bottom-up, area-based approach, prioritising local partnerships, an integrated and multi-sectoral strategy. Other key principles are networking, innovation, and cooperation.
- Community ownership– includes participatory budgeting processes where local decide how local public funds are spent, and supporting community owned businesses



In order to implement this in practice, "Transition Dialogues" are proposed, leading to the development of the People's Transition Local Action Plans. "The purpose of the dialogue is not to deliberate on what climate action is necessary in the community, but rather to help the community realise their agency and build knowledge of community wealth building, cooperative structures and community business and how this could be employed for climate action."[14]

The process includes capacity building on both climate change and community wealth building, and is facilitated by consensus and capacity building practitioners. While it is similar in some ways to the citizen's assemblies model (See Figure 9, Figure 10), it is less formal in some respects e.g. participant selection. It is currently being trialled in Ireland, and results will be available to share within the year. The People's Transition model could be adopted in Suffolk as part of the neighbourhood climate action work. As part of this work, approaches exist for involving the 'unusual suspects' in such conversations[15] which was as key concern raised during our workshops.

[14] Ibid

[15] Citizen Action Network is an approach developed by the Alternative UK. It is a arefully curated process, which begins with a 'deep hanging out' with the diverse communities of place including the usual and unusual suspects regarding climate action, followed by an involvement in a series of Collaboratory connecting, visioning and action workshops. https://www.thealternative.org.uk/citizens-action-network

Figure 9 – The Oxford Citizens Assembly on Climate Change

A citizen's assembly is where group of people are brought together to discuss an issue, and reach a conclusion about what they should happen. The people who take part are chosen so they reflect the wider population (e.g. age, gender, ethnicity, social class). Participants are given time to learn about and discuss the issue before reaching conclusions and making recommendations.

The Oxford Citizens Assembly on Climate Change took place over two weekends in September and October 2019. Oxford City Council organised the assembly and Ipsos Mori were commissioned to facilitate the event and examine the participants' conclusions. The assembly reached a number of conclusions, perhaps most significant was that Oxford should aim to be net-zero before 2050, although there was little agreement on when the exact date should be. In response to the assembly's findings, Oxford City Council set a climate emergency budget and aimed to reduce council emissions to zero by the end of 2020

Figure 10 – Climate Assembly UK[16]

Climate Assembly UK brought together 100+ people from all walks of life and of all shades of opinion to discuss **how** the UK should meet this target.

The assembly members met over six weekends in Spring 2020. They heard balanced evidence on the choices the UK faces, discussed them, and made recommendations about what the UK should do to become net zero by 2050. Their final report was published on Thursday 10 September 2020.

The assembly considered 10 topics in total: Underpinning principles for the path to net zero; land and air travel, heat and energy use in the home; diets and land use; what we buy; electricity generation; GHG removals; impacts of Covid-19 and additional recommendations.
In total, assembly members agreed 25 underpinning principles for the path to net zero. The most voted principles were:

1. Informing and educating everyone (the public, industry, individuals and government)
2. Fairness within the UK, including for the most vulnerable (affordability, jobs, UK regions, incentives and rewards) in actions, not just words
3. Leadership from government
4. Protecting and restoring the natural world
5. Ensuring solutions are future-proofed and sustainable for the future
6. A joined-up approach across the system and all levels of society
7. Long-term planning and a phased transition
8. Urgency
9. Support for sustainable growth (including pioneering innovation)
10. Local community engagement embedded in national solutions

Interestingly, the 5 least voted principles show an appetite for radical change in line with the seriousness of the issue:

21. Enabling and not restricting individual choice
22. Protect the UK economy, including from global competition
23. Compromise about changing lifestyles
24. Those who bear the most responsibility should act
25. Not negatively impacting other institutions

3.4 Goal 2 – Leveraging Community Action

Community groups, charities, schools and youth organisations, community businesses and local social enterprises, have been working on the ground for decades to achieve environmental and climate action. In many cases, they have pioneered innovative solutions and can more effectively reach specific audiences than the Council can alone. Much can be done to leverage the work happening on the ground at low cost, and benefit from unlocking tremendous potential. The outcomes proposed below emerge both from feedback from the Community Actions and Schemes workshop, and research into the best-practice of community-led climate action.

Outcome 1: Community Action Mutual Support Network

The council should play a role in convening and enabling the creation of a mutual support network with an online platform for communication and coordination of community action groups. There are online platforms which can allow participant self-organisation around issues of interest (free forums where

[16] Climate Assembly UK, The path to net zero – Executive Summary, September 2020, final-report-exec-summary.pdf (climateassembly.uk)

topics can be proposed, coordinated, and knowledge exchanged such as Google groups [17], Slack [18], Loomio [19] or paid platforms such as Delib [20]). The areas of collaboration proposed by workshop participants include:

- Platform for communication (between groups themselves and the council) and coordination for e.g. joint action, funding applications (potentially with the council signposting or backing applications), regular virtual meetings.

- Market place of needs and offers amongst the community. Could include a Timebank[21] system for ease of trade amongst the groups.

- Knowledge sharing – this could link into the information hub mentioned previously, with all sorts of resources for groups and the public, on best practice, funding, training, etc.

Possible starting points for this work in Suffolk are to link into the work being done by the Greenprint Forum[22] in East Suffolk, ESC Community Partnerships,[23] and the Collaborative Communities board[24]. Carbon Neutral Cornwall's Hive (see Figure 11) is one example of this.

Figure 11 – The Carbon Neutral Cornwall Hive

Carbon neutral Cornwall 2030 HIVE	A web space for sharing information and ideas to help tackle climate change introduce by Cornwall Council, who have used Bang the Table's community engagement software 'EngagementHQ'. Cornwall Council hope that residents will use Hive to chat about how we can all 'bee' inspired to make a difference. The aims to encourage 'hive mind' thinking with: • an Ideas Bank • an interactive map for listing low carbon initiatives and schemes, and • information about funding to help get low carbon and environmental projects underway. https://www.cornwall.gov.uk/environment-and-planning/climate-emergency/what-can-i-do/the-carbon-neutral-cornwall-hive/

Outcome 2: Climate action volunteers.

The same platform above can be used to enable mass recruitment of volunteers for climate action. The more a person is involved in the climate action volunteering, the more they are educated and motivated to make changes in all aspects of their life. Such an effort could enable the creation of widespread climate action neighbourhood hubs, including the use of schools as focal points for action. Numerous tested approaches to creating such hubs exist, including Transition Town [25], Climate Emergency Centres [26] or Neighbourhood Parliaments [27]. As an incentive for volunteers, the council could support

[17] https://groups.google.com/
[18] https://slack.com/intl/en-gb/
[19] https://www.loomio.org/
[20] https://www.delib.net/
[21] https://www.timebanking.org/ or https://timebank.org.uk/
[22] East Suffolk Greenprint Forum » East Suffolk Council
[23] Community Partnerships » East Suffolk Council
[24] https://www.suffolk.gov.uk/coronavirus-covid-19/suffolks-response/collaborative-communities-covid-19-board/
[25] Handbook an resources for starting Transition in your neighbourhood exist here: https://transitionnetwork.org/do-transition/starting-transition/
[26] Guidance to develop a self-funded Centre that brings together diverse groups and individuals in your local community to build solutions, relationships and resilience in the face of the Climate and Ecological Emergency. *https://climateemergencycentre.co.uk/*
[27] Groups of neighbours organising to provide mutual aid and act on the Sustainable Development Goals, with training for neighbourhood animators available https://neighbourocracy.carrd.co/

the creation of a community currency as payment for time spent on such social action. Figure 12 provides an example of such a scheme operating in Stoke on Trent. Such a community currency could be council backed in the sense that the council supports with set-up and promotion, which costs in the range of £50-200k.

Figure 12 – Counter Coin – Community Currency

Counter Community's mission is to bring about positive change by helping socially and economically deprived areas transform into successful cohesive communities. Counter community aims to do this by providing digital tools that enable organisations and individuals to connect, contribute and measure the impact they make which turn will lead to more sustainable society and planet. Counter Community's main tool to achieve this is their 'counter coin' system, which provides volunteers with one coin per hour of volunteered. Coins can be redeemed at stores and venues participating in the scheme. In addition, the scheme allows charities to monitor their social value creation – their impact. [28]

Outcome 3: Nature-based community engagement.

There is a particular opportunity in Suffolk given its rural setting and natural reserves to galvanise action on climate by providing people access to the wealth of nature that surrounds them, providing social and psychological benefits. Priority access to grants and training for lower income communities should be provided. Innovative partnerships between nature based solution providers such as Suffolk's Greenlight Trust (see Figure 13), parks, local authorities and landowners could be envisaged to enable such initiatives to reach wide audiences.

Figure 13 – Greenlight Trust Suffolk

"Building Health, Hope and Happiness through the Power of Nature"

The Greenlight Trust works with people who have been marginalised or disadvantaged in to develop using the power of nature. The Trust emphasises that people are part of the natural world, not separate from it. Using this guiding principle, Trust helps to give these people to find social acceptance, develop skills and gain confidence. Working in nature, the Trust works with people on their fundamental life skills such as healthy eating, physical activity and socialising. The Trust operates in five separate locations across the UK, and in 2019, it supported 1,884 people leading to 28% reduction in GP visits within a year of attending a course at the Greenlight Trust. [29]

Outcome 4: Climate Action Festival

An annual festival bringing together actors in this field to educate, entertain and engage the public on the topic of climate action (workshops, climate conversations, possibly in assembly style). These should be run in partnership with the public, private and third sector. One point raised in the workshop was that the 'Climate Change' tag may be off-putting to the public, and other names such as Our Future / Your

[28] https://countercommunity.com/
[29] https://www.greenlighttrust.org/

Future Fair / 'we're not necessarily all doomed yet' could be considered, in the spirit of motivating local action.

Possible venues suggested included Trinity Park and Higham Site for the South Suffolk Show or Town centres such as the Apex, and it was mentioned that the Greenprint Forum would be interested in helping with an annual event Figure 14 provides an example of such an event held in Hastings. Further thought on this outcome is needed, including options to host a network of events and online offerings.

Figure 14 – The Common Treasury of Adaptable Ideas

The Hastings Common Treasury of Adaptable Ideas

This initiative piloted a series of new spaces (both physical and digital) where people can share, adapt, design and initiate ideas that generate new solutions to the challenges faced by small towns. Initiatives aim to help small towns become happier, healthier and more sustainable into the 2020s.

In 2019, the Common Treasury was able to host two festival events that focused on 5 inspiring ideas and provided a platform for people and speakers to work together to explore and adapt their ideas into a local context. Ideas included big emphasis on the idea of a circular economy with less waste and shared resources like the Library of Thing. [30]

3.5 Goal 3 – Fostering further stakeholder and supplier collaboration.

Throughout the 6 workshops held in the preparation of this climate emergency plan, Suffolk Climate Change Partnership convened a wealth of stakeholders who are taking the lead in climate action, and natural allies for the SCCP in delivering the action plan. The intention was to create a collaborative community of partners embarking on this challenging Odyssey. The stakeholders which were intended to be convened[31] are summarised in Table 3, categorised into sectors public, private, third.[32] By virtue of the workshops, a number of connections were made, and follow on collaborative actions suggested.

[30] https://www.commontreasury.org.uk/
[31] In some cases, the stakeholders were unavailable.
[32] Not for profits, NGOs, charities, social enterprises

Table 3 – Stakeholders convened in workshops

Workshop theme	Stakeholders convened
Sustainable Buildings	Private: • Architects • Engineering (e.g., building surveyors) • Service providers (specialists b-env) • Investment/finance • Construction • Property developers • Consultancy (specialists b-env) • Estate management • Property sales Public: • UK Power Networks • Local authorities
Energy and Planning	Private: • Transport • Agriculture • Renewable energy installation / development (large and small scale) • Consultants (renewable energy specialists) Public / utilities: • Local government • Energy suppliers Third Sector: • Sustainable development / transition specialists Other: • Local Energy Partnerships • Renewable energy lobby / interest group
Large industrial and Commercial	Private: • Food and drink • Manufacturing • Leisure • Medical technology Public / utilities • Water • Telecoms • Port • Higher education • Military • Hospital
Small Industrial and Commercial	Private: • Food and drink • Manufacturing • Printing • Hospitality • Agriculture • Estate management • Events • Marketing

Workshop theme	Stakeholders convened
	• Leisure • Private transport Public / Utilities: • Further education Other: • Building society • Chamber of commerce • Local Energy Partnership • Business Improvement Districts • Growth Hub
Transport and Air Quality	Public / Utilities: • Local government • Further education • Maritime transport Third Sector: • Voluntary network • Active travel • Community development
Community Action and Schemes	Public: • Local government Third Sector: • Local youth parliament • Conservation • Education • Carbon reduction • Climate action community groups

The key themes which emerged were a need to continue the conversation with an ongoing programme of communication opportunities, and establishment of a communication network**.** As such, the following outcomes are recommended.

Outcome 1: Communications programme, working groups

These actors should continue be convened, but in the workshops it was felt that it should not be 'owned' by the council, but co-owned by the community of users themselves, although the council could play a role initiating the programme. There are numerous, free, online platforms which allow for participant self-organisation around the issues of interest (forums where topics can be proposed, coordination, knowledge exchange such as Google groups, Slack and Loomio), and organisational structures such as sociocracy which allow for democratic and effective collaboration. If a programme of regular meetings were to be proposed, while the themes above were a useful starting point, they are a hybrid of sector (power, housing, transport) and stakeholder 'category' (private sector – industrial and commercial users, third sector – community actions and schemes). Perhaps a more useful organisation going forward would be to develop working groups for each GHG sectors (energy (power, homes, commercial, industrial, transport), agriculture, waste) inviting a cross section of the relevant stakeholder categories in each sector (public, private and third sector, including communities as users), for a holistic perspective in each working group. There is also the need for clear leadership and integrated strategies,

so a 'top circle'[33] working group with representatives from each of these sectors and stakeholder categories could be formed for overall coordination.

Outcome 2: Annual Conference

An Annual Suffolk Conference of Parties conference could provide further opportunity for stakeholder collaboration and galvanise action on the subject.

3.6 Goal 4 – Financing the Climate Action

This section provides a summary overview of the funding landscape available to support the delivery of the goals, outcomes and actions laid out in this report. Whilst several sources of finance for Local Authorities were announced in Government's 'The Ten Point Plan for a Green Industrial Revolution' [34], the specifics of how these funds can be accessed is forthcoming. At this stage however, the following was identified:

1. £200 million to create two carbon capture clusters;
2. £500 million for hydrogen projects;
3. £525 million for new large and smaller-scale nuclear plants;
4. £1.3 billion for electric vehicle charging infrastructure; and
5. £582 million support for the purchase of ultra-low emission vehicles.

Further to the above five sources of finance, the Local Government Association's (LGA) "Financing Green Ambitions" report highlighted the importance of identifying other sources of finance for outcomes and actions to deliver green objectives.[35] These sources are summarised below, split between equity/grant finance and debt finance.

3.6.1 Equity and grant finance

The Government is likely to be the source of most grant finance available to UK local authorities post EU Exit. There are 12 sources of grant finance in the UK that have been identified, grouped thematically below, some of which comprise several funds. Contact email addresses and refences have been provided where available for each fund:

1. **The Heat Networks Delivery Unit (HNDU)** [36]
    - Provides funding and specialist guidance to Local Authorities developing heat network projects across England and Wales through the provision of grants.
    - Since its inception in 2013, it has awarded support for £25m across 250 schemes across 10 funding rounds, with funding round 11 anticipated to take place in 2011. HNDU grant funding can only cover up to 67% of the cost of a given scheme, with the Local Authority securing match funding of 33% from a 3rd Party or its own reserves.

[33] Drawing on sociocratic terminology, if each of the working groups is a circle, these circles are double linked to a top circle which provides general coordination and decision making with representation from each circle. Sociocracy is recognised as a democratic and effective organisational structure.
[34] HM Government (Nov 2020) The Ten Point Plan for a Green Industrial Revolution. Report. Accessed Jan 2021. https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution
[35] LGA (Dec 2020) Financing Green Ambitions - Full report. Report. Accessed Jan 2021. https://www.local.gov.uk/sites/default/files/documents/Green%20Finance%20Report%20-%20Updated.pdf
[36] GOV.UK Heat Networks Delivery Unit. Website. Accessed Jan 2021. https://www.gov.uk/guidance/heat-networks-delivery-unit

- Map of Local Authorities supported shows that a large number of both rural as well as metropolitan authorities have been supported through round 1-7[37]
- Contact email: hndu@beis.gov.uk

2. **Heat Networks Investment Project (HNIP)** [38]
   - Will make £320m available to support the commercialisation and construction of heat networks across England and Wales, through the provision of grants and loans.
   - During the first two rounds of the scheme, £40m of funding was announced for seven projects, and the HNIP delivery partner (Triple Point Heat Networks Investment) has a dedicated investor relations team that supports project delivery.
   - Contact email: enquiries@tp-heatnetworks.org

3. **One Public Estate** [39]
   - During the eighth round of funding (September to November 2020), a total of £10m of funding was offered alongside an additional £20m of Land Release Fund from Ministry of Housing Communities and Local Government (MHCLG).
   - Submissions had to describe how the project contributes to both strategic Government priorities that included net zero carbon and economic recovery.
   - Contact: onepublicestate@local.gov.uk

4. **Public Sector Decarbonisation Scheme** [40]
   - This Government scheme was launched on 30 September 2020 by BEIS, to be delivered by Salix Finance, with a budget available of up to £1bn. The first-round applications for funding closing between November 2020 and January 2021, depending on the type of applicant organisation.
   - The purpose of the grant scheme is to help make eligible buildings more energy efficient and install low carbon heating outcomes, for example, insulation, glazing, heating controls, and heat pumps (eligible technologies are split into 4 different categories).
   - Contact: grants@salixfinance.co.uk

5. **Public Sector Low Carbon Skills Fund** [41]
   - This fund provides grants to help public sector bodies source specialist and expert advice to identify and develop energy efficiency and low carbon heat upgrade projects for non-domestic buildings.
   - The allocation for funding is available to help with preparing robust and effective applications to the £1bn Public Sector Decarbonisation Scheme.
   - Contact: PSLCSF@salixfinance.co.uk

6. **ECO Flex Grants**

[37] HNDU. Map of Local Authorities Supported by HNDU. Website. Accessed Jan 2021. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/798949/Local_authorities_supported_by_the_Heat_Networks_Delivery_Unit_in_rounds_1-7.pdf
[38] GOV.UK Heat Networks Investment Project. Website. Accessed Jan 2021. https://www.gov.uk/government/collections/heat-networks-investment-project-hnip-overview-and-how-to-apply
[39] LGA One Public Estate. Website. Accessed Jan 2021. https://www.local.gov.uk/onepublicestate
[40] Salix Finance Public Sector Decarbonisation Scheme. Website. Accessed Jan 2021. https://www.salixfinance.co.uk/PSDS
[41] Salix Finance Public Low Carbon Skills Fund. Website. Accessed Jan 2021. https://www.salixfinance.co.uk/public_sector_low_carbon_skills_fund

- The aim of the scheme is to install energy efficiency outcomes in properties that are currently energy inefficient. Local authorities are permitted to identify and designate households as eligible, with the intention of the installed outcomes to then reduce households' fuel bills.
- This fund appears more difficult to apply for than the sources 1-6.
- Contact: eco@ofgem.gov.uk [42]

7. **The Green Homes Grant** [43]
   - The scheme was launched in Sept 2020 and is designed to provide homeowners and private landlords with vouchers of up to £5,000 to install energy saving improvements to their homes.
   - These improvements must firstly fund a primary measure (which include either insulation (such as loft insulation, cavity wall insulation…) or low-carbon heat (such as air source heat pump, solar thermal…)), following which partial additional funding can be provided for a secondary measure (which can include enemy efficiency improvements regarding windows, doors, and heating controls)
   - Vouchers must be redeemed and complete by March 2021.
   - Contact: Webform: https://green-homes-grant.service.gov.uk/contact

8. **Urban Tree Challenge Fund** [44]
   - Whilst this £10m fund is currently closed, it is likely to reopen with further rounds.
   - It is designed to support the planting and establishment of small trees in urban and peri-urban areas in England.
   - Contact: UTCF@forestrycommission.gov.uk

9. **Woodland creation funding and grants**
   - There are five funds that provide grant funding for the establishment and rehabilitation of woodland areas, that are as follows:
     - Woodland Creation Planning Grant (WCPG) [45]
     - The Woodland Carbon Fund (WCF) [46]
     - Woodland Carbon Code (WCC) [47]
     - Woodland Carbon Guarantee (WCaG) [48]
     - Countryside Stewardship Woodland Creation Grant [49]

10. **Green vehicle related funding**
    - There are three funds grouped under green vehicles, that are accessible as follows:

[42] OFGEM Energy Company Obligation (ECO) Guidance. Website. Accessed Jan 2021. https://www.ofgem.gov.uk/environmental-programmes/eco
[43] GOV.UK Green Homes Grant. Website. Accessed Jan 2021. https://www.gov.uk/guidance/apply-for-the-green-homes-grant-scheme#help-and-support
[44] GOV.UK Urban Tree Challenge Fund. Website. Accessed Jan 2021. https://www.gov.uk/guidance/urban-tree-challenge-fund
[45] GOV.UK Woodland Creation planning Grant. Website. Accessed Jan 2021 https://www.gov.uk/guidance/woodland-creation-planning-grant
[46] GOV.UK Woodland Carbon Fund. Website. Accessed Jan 2021 https://www.gov.uk/guidance/woodland-carbon-fund
[47] GOV.UK Woodland Carbon Code. Website. Accessed Jan 2021 https://www.gov.uk/guidance/the-woodland-carbon-code-scheme-for-buyers-and-landowners
[48] GOV.UK Woodland Carbon Guarantee. Website. Accessed Jan 2021 https://www.gov.uk/guidance/woodland-carbon-guarantee
[49] GOV.UK Woodland Carbon Guarantee. Website. Accessed Jan 2021 https://www.gov.uk/guidance/woodland-creation-grant-countryside-stewardship

- Workplace Charging Scheme (WCS) [50]
- On-street Residential Charge-point Scheme [51]
- Air-quality grant programme [52]

11. Active travel and cycles lanes

- The identifiable sources of funding that relate to active travel and cycle lanes stem from the Government's 2018 Clean Air Strategy. They are listed here below but all 3 are set to be closed in 2021. They are included here for reference, with the primary fund to follow here currently being the Shared Prosperity Fund.
  - The Bus Services Act 2017 [53]
  - The Cycling and Walking Investment Strategy 2017 [54]
  - The Shared Prosperity Fund (which will replace the Local Growth Fund (LGF) which has been discontinued) [55]

12. Flood defence

- County councils and unitary authorities have the lead operational role in managing the risk of flooding from surface water and groundwater. District councils have the lead role in managing flood risk from 'ordinary watercourses', for example any watercourse that isn't a main river. A flood risk management authority can apply for grant-in-aid (GiA) to fund Flood and Coastal Erosion Risk Management (FCERM) projects. [56]
- Guidance and helpful case studies can be found on the LGA website. [57]

3.6.2 Debt finance

Debt finance can be secured by Local Authorities and partnerships from different providers and in different ways. The four main sources of debt finance are summarised below, with reference links provided for further information.

In general, the cheapest debt finance (lowest rates) is available when securing a loan against the revenues of the local authority, as this reduces the level of lending risk. Funding can be secured this way through the Public Works Loan Board (PWLB) or through the newer forms of Crowdfunding / Community Municipal Bonds (CMBs). The rates between the PWLB and CMBs are expected to be

[50] GOV.UK Workplace Charging Scheme. Website. Accessed Jan 2021 https://www.gov.uk/government/publications/workplace-charging-scheme-guidance-for-applicants-installers-and-manufacturers/workplace-charging-scheme-guidance-for-applicants-chargepoint-installers-and-manufacturers#guidance-for-applicants

[51] GOV.UK On-street Residential Chargepoint Scheme. Website. Accessed Jan 2021 https://www.gov.uk/government/publications/workplace-charging-scheme-guidance-for-applicants-installers-and-manufacturers/workplace-charging-scheme-guidance-for-applicants-chargepoint-installers-and-manufacturers#guidance-for-applicants

[52] GOV.UK Air Quality Grant Programme. Website. Accessed Jan 2021 https://www.gov.uk/government/collections/air-quality-grant-programme

[53] Department for Transport (2017) The Bus Services Act 2017 – New powers and opportunities. Report. Accessed Jan 2021. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/918498/bus-services-act-2017-new-powers-and-opportunities.pdf

[54] Department for Transport (2017) Cycling and Walking Investment Strategy. Report. Accessed Jan 2021. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/918442/cycling-walking-investment-strategy.pdf

[55] UK Parliament – House of Commons Library (2020) The UK Shared Prosperity Fund - Background and issues for consideration concerning the Government's proposed Shared Prosperity Fund, which will replace EU structural funding now that the UK has left the EU. Website. Accessed Jan 2021. https://commonslibrary.parliament.uk/research-briefings/cbp-8527/

[56] GOV.UK Calculate grant in aid funding: flood risk management authorities. Website. Accessed Jan 2021. https://www.gov.uk/government/publications/calculate-grant-in-aid-funding-flood-risk-management-authorities

[57] LGA Funding arrangements. Website. Accessed Jan 2021. https://www.local.gov.uk/topics/severe-weather/flooding/paying-flood-and-coastal-erosion-risk/funding-arrangements

competitive with each other going forward, with CMBs providing the added opportunity to connect local people to projects in their area. Whilst CMBs might not be able to fund larger Local Authority projects and actions outright, the PWLB and CMBs can be blended to support projects where both local connection and larger funding packages are required [58] Lastly, loans from Salix offer the third affordable way for Local Authorities to secure debt finance.

1. **PWLB**
    - Offers a secure way for Local Authorities to secure finance to fund local actions at low and concessionary interest rates. Rates in Nov 2020, depending on lending term, are at 1.56% annuity rate for a 25-year loan. Can borrow up to 100% of the value of the action. [59]
    - A new requirement (since Nov 2020) is for Local Authorities to provide a three-year capital plan, confirming it does not intend to borrow primarily for a yield at any point during the loan. [60]
    - The LGA Financing Green Ambitions[61] report provides a useful case study on Warrington Borough Council's use of a PWLB loan to buy two solar farms to raise an estimated £150m in revenue over the next 30 years. [62]
    - The PWLB is the main lender to Local Authorities and accounts for around 66% of Local Authority debt in the UK.

2. **Crowdfunding / Community Municipal Bonds (CMBs)**
    - In terms of the cost of borrowing, CMBs have the potential to provide capital on terms which are equal to or better than the PWLB.
    - The bonds have the potential to fund up to 100% of the Local Authority action, although to date Local Authority CMBs above £1m have not yet been tested. In addition, the funding is secured against the local authority credit rating unlike PWLB, which may mean the Local Authority requires a credit rating.
    - In Suffolk, a community finance initiative could be established to establish a local community bank or credit union, which could then focus on providing local climate finance to firms and families to support, especially low income households, in transitioning to being carbon neutral.
    - Similarly, and linked with a measure and action in the Power Sector, Suffolk could look to establish a climate emergency investment fund that invests in high impact zero carbon projects, like rooftop solar. This could also work as a local carbon offset fund, whereby a Local Authority raises funds through selling offsets that then fund local projects. This was highlighted by EEE Coop and Muntons in the Community Workshop.

[58] LGA (Dec 2020) Financing Green Ambitions - Full report. Report. Accessed Jan 2021. https://www.local.gov.uk/sites/default/files/documents/Green%20Finance%20Report%20-%20Updated.pdf
[59] LGA (Dec 2020) Financing Green Ambitions - Full report. Report. Accessed Jan 2021. https://www.local.gov.uk/sites/default/files/documents/Green%20Finance%20Report%20-%20Updated.pdf
[60] Local Government Chronicle (Nov 2020) PWLB rates cut as ban on commercial investments comes into force. Article. Accessed Jan 2021 https://www.lgcplus.com/finance/pwlb-rates-cut-as-ban-on-commercial-investments-comes-into-force-26-11-2020/
[61] LGA (Dec 2020) Financing Green Ambitions - Full report. Report. Accessed Jan 2021. https://www.local.gov.uk/sites/default/files/documents/Green%20Finance%20Report%20-%20Updated.pdf
[62] Room 151 Local Government Treasury, Pensions & Strategic Finance (Oct 2018) Warrington doubles down on solar farm investments. Article. Accessed Jan 2021. https://www.room151.co.uk/treasury/warrington-doubles-down-on-solar-farm-investments/

3. **Salix**
    - Salix administer two sources of Government grant funding (Public Sector Decarbonisation Scheme and Public Sector Low Carbon Skills Fund) as well as providing interest free loans.
    - These loans can fund up to 100% of the Local Authority activity value, but this depends on the payback period, and the loan is secured against the Local Authority.

4. **Green Lenders**
    - This is the most expensive debt finance available, equivalent to rates available for private sector projects. Additionally, tend to only allow borrowing of up to 80% of the value to the Local Authority action.
    - Should be considered as a back-up option compared to a loan from the PWLB, CMBs or Salix

This summary overview of sources of grant/equity and debt finance provide opportunities for funding the outcomes and actions discussed in the report. Contact email addresses and reference links to each of the funds have been provided throughout where possible, allowing for the SCCP team to start planning for which to consider approaching. When planning for which of the funds to approach, the SCCP should consider prioritising outcomes which are either cost-effective that would more than pay for themselves over time or are cost-neutral that breakeven over time.

In addition to this, care and attention should be taken during the planning stages to consider the co-benefits of the finance application, by referencing job creation opportunities, poverty reduction, empowering communities of colour and low-income communities, improvements in public health such as reduction in pollution and/or congestion if applicable, and improving connectivity between communities.

3.7 Goal 5 – Monitoring and communication of progress

The final goal within the collaborative action section regards the monitoring of progress that the SCCP should take following the publication of its final Climate Emergency Plan. There is one outcome for this goal within which there are two proposed actions.

Outcome 1: Regular monitoring of progress in reducing emissions, projections of future emissions and effectiveness of outcomes being introduced

To ensure the regular monitoring of progress, it is suggested that a monitoring working group of key stakeholders is formed, and that a monitoring and evaluation plan is developed. The lead organisation identified for both of these actions is Suffolk County Council, with support from the district councils and the SCCP. It is suggested that the Climate Emergency Plan be reviewed annually, and that during the year, any implemented actions (either Priority or from the Long-list) have associated indicators developed for them, with progress being reported by the SCCP to the County Council and District Councils.

3.8 Synergies between actions and other sectors

By its very nature, this section has several links with the other sectors. As mentioned above, a behavioural change campaign can enable update of home insulation; formation of community energy groups and car shares; support of ethical low carbon businesses.

Further, community groups, charities, schools and youth organisations, community businesses and local social enterprises, have been working on the ground for decades across these different sectors to achieve environmental and climate action. Actions above seek to leverage the work happening on the ground at low cost, and benefit from unlocking climate actions across all sectors.

Regarding stakeholder collaborations, if a programme of regular meetings were to be proposed, working groups could be developed for each GHG sector (energy (power, homes, commercial, industrial, transport), agriculture, waste) inviting a cross section of the relevant stakeholder categories in each sector (public, private and third sector, including communities as users), for a holistic perspective in each working group.

Finally, financing and monitoring goals apply to all the actions in the plan.

3.9 Key messages and priority actions

The task ahead of us is enormous. Achieving it will require every part of society to contribute, and new forms of collaboration to enable that. This chapter seeks to create the foundation for delivery of the plan across all its energy sectors. It builds on the energy which was created in developing this plan, and leverages what is already happening on the ground, with Suffolk County Council acting as prime convenor and motivator.

The elaboration of the plan brought together a diverse range of business, community and professional interests, individuals to workshop the plan's themes, challenge the data and discuss the conclusions. Those who attended have a keen interest in this subject and are the first movers in this field. A priority action will be to develop an ongoing programme of collaboration opportunities for these stakeholders, and any others who wish to be engaged. The council should establish a communication network, and sociocratic working groups for delivering the action plan. While the council will be central for convening the dialogue, this should be self-organising, allowing all attendees to co-develop the agenda. For each of the sectors, a holistic cross section of users, providers and regulators / public, private and third sectors should be brought together.

Secondly, specifically aimed at the community groups and businesses who are engaged in this subject, the council should enable a platform for mutual support amongst these groups, enabling knowledge sharing, a marketplace of needs and offers, and coordination for more effective delivery, e.g. joint fundraising and spending, human resource allocation. Linked to this, the council should support community finance initiatives e.g. community municipal bonds; support a partnership of community banks for climate financing.

Further, a minimum sustainability expectation should be agreed to be included in all public sector procurement, such as Suffolk County Council's Climate Change Commercial Ask. This will support suppliers on their journey to be carbon neutral, recognising that the cost of change will vary between markets and that some markets will be further on their journey to reduce their carbon impact than others.

Finally, a monitoring working group of key stakeholders should be formed, to work with the relevant data holders to develop a framework of indicators that will be used on an annual basis to take stock of progress (some initial suggestions for indicators are presented in each sector below). And work closely with county communications professionals to ensure clear overarching messages on progress to demonstrate and give recognition that action being taken is making a difference.

4 Sustainable homes

4.1 Introduction

This chapter looks at emissions from domestic buildings (homes) and how these can be reduced to near zero by 2030. Emissions from commercial buildings are dealt with in the next chapter along with emissions from industry. This chapter focuses on how homes are heated in Suffolk and on how efficient they are, both in terms of heating and also electricity use (e.g. lighting, appliances etc).

4.2 Context

4.2.1 Carbon emissions

The phase 1 study concluded that to achieve carbon neutrality in Suffolk, emissions from buildings will need to be near zero by 2030.

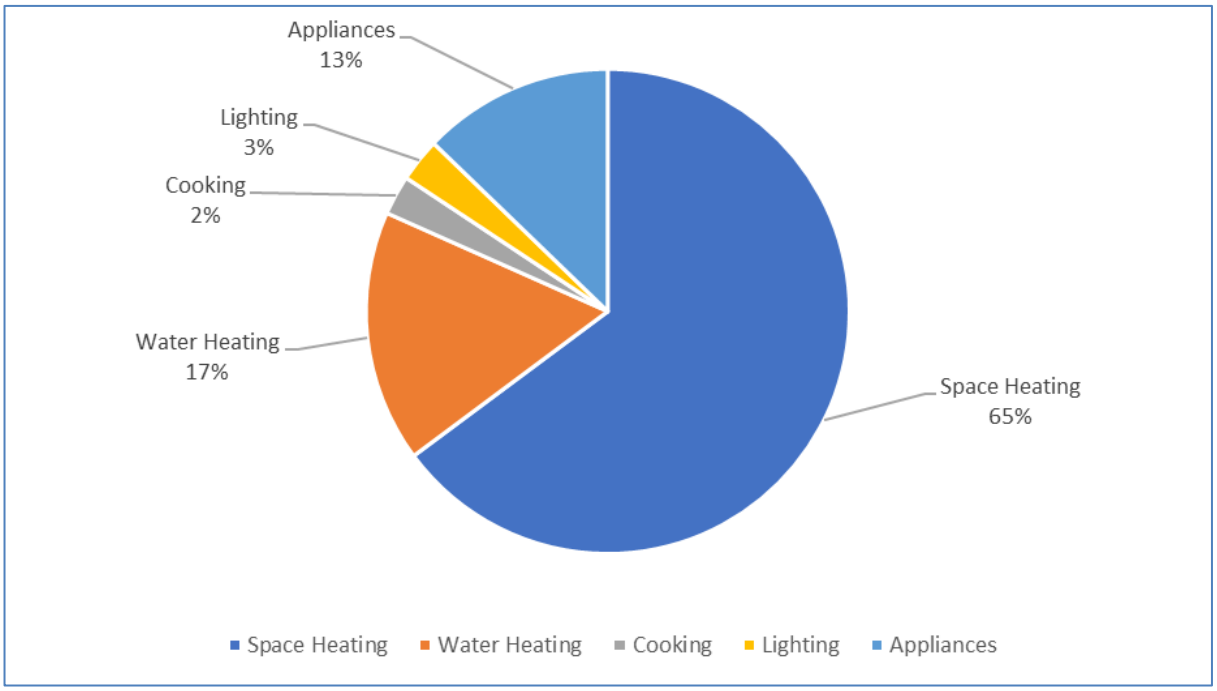
CO_2 emissions of domestic buildings in Suffolk accounted for 25.6% of the total in 2018 (see Figure 2) and have fallen by almost 40% since 2005. This figure includes direct emissions from buildings (from gas boilers), and indirect emissions from use of electricity. Hence it is significantly more than the domestic buildings CO_2 data at the UK level, which only records the direct emissions, and where CO_2 emissions from domestic buildings have fallen by just under 19% over the same time period[63].

The relative share of total emissions from the buildings sector varies between the districts, as illustrated in Figure 3 domestic buildings accounted for 42% of CO2 emissions in Ipswich and 30% in East Suffolk, but as little as 15% in West Suffolk. Nonetheless it is a major source of emissions in all areas and a key aspect of delivering carbon neutrality.

The breakdown of major energy end uses in the UK average dwellings and service sector building in 2018 is shown in Figure 15. This shows the dominance of space and water heating in buildings.

[63] Source: Final UK greenhouse gas emissions national statistics 1990-2018, Table 3 (

Figure 15 – Energy use breakdown for average UK dwelling (2018)



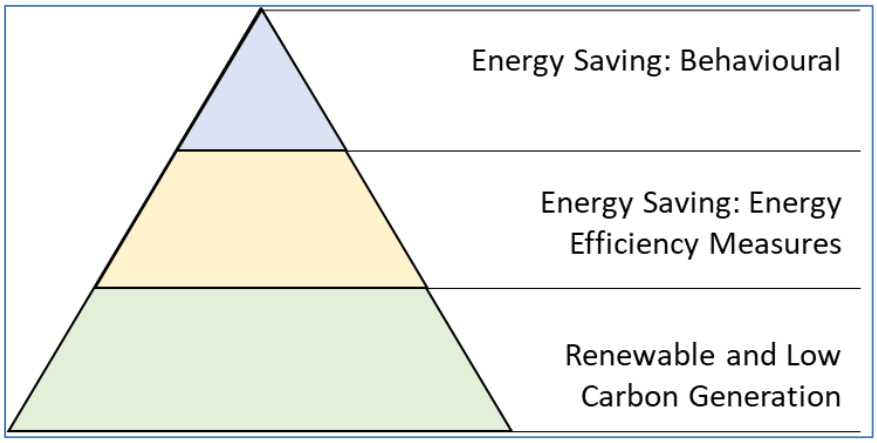
More information on the nature of the buildings sector in Suffolk can be found in the phase 1 report[64]. According to Suffolk County Council (SCC) data, there are currently around 330,000 residential buildings in Suffolk, of which 66% are either detached or semi-detached, and only 6% are flats.[65] The Energy Performance Certificate (EPC) bands in Suffolk are similar to the national average, with most (58%) being in B and D, and only 21% in Bands C and B. Significantly, just over a quarter, 27%, of dwellings in Suffolk are categorised as off-gas grid, which is significantly more than the 2018 national average of 14.1%. This provides an important target for conversion to heat pumps, as they are likely to provide net cost savings compared to the oil boilers that are used in the majority of these properties.

4.3 The approach to carbon neutrality in homes

There are three main areas considered for the reduction of emissions from buildings. These are reducing demand, improving efficiency of energy consumption and reducing the emissions associated with energy consumed in buildings through renewable and low carbon energy supplies. This is shown in the energy hierarchy in the image below.

[64] https://www.suffolk.gov.uk/assets/planning-waste-and-environment/Pledge-to-climate-emergency-declaration/suffolk-climate-emergency-plan-technical-report.pdf
[65] https://www.suffolkobservatory.info/

Figure 16 – Energy hierarchy



The phase 1 study proposed a pathway to near carbon neutrality for the buildings sector based on the following approach. Key to delivering carbon neutrality in the buildings sector is decarbonising the way we heat our homes. The top two elements of the energy hierarchy are important components of reducing emissions, as well as improving comfort and reducing bills. But carbon neutrality cannot be achieved through behavioural outcomes and improved energy efficiency alone. Hence the main priority for Suffolk in achieving carbon neutrality by 2030 is tackling heat decarbonisation. In particular, we would expect numbers of low carbon heating installations to be massively increased in the latter part of the decade. In the first half of the decade, the focus will be on considering and designing policy outcomes which could accelerate this shift in Suffolk, alongside working with early movers to build the market for low carbon heat. This should involve the Councils moving to low carbon heat in its own buildings, and working with other key property owners such as social housing associations to do the same. It will also require scaled-up skills programmes to increase the numbers of qualified heat engineers who are conversant with low carbon heating solutions. There will also be a need to provide materials and information to those private owner-occupiers that are in a position to move to low carbon heating systems earlier in the decade.

As well as providing more immediate emissions reductions in initial years, energy efficiency outcomes have an important role to play in preparing the building stock for greater numbers of heat pumps, as they only work effectively in well insulated buildings. This therefore gives another incentive to push hard on building thermal efficiency in the next few years, and at the very least to ensure that all no regrets outcomes are being adopted.

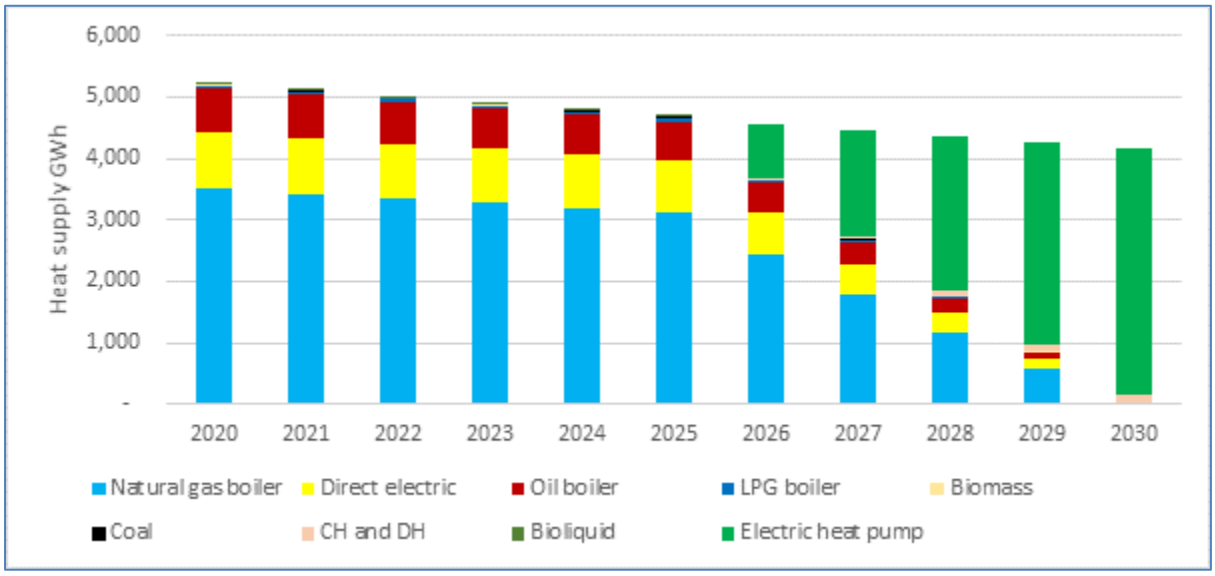
Low carbon heat networks are another option for replacing traditional gas boilers in buildings. But these are only cost effective in areas of high density of heat demand, which tends to be in urban areas. The scope for heat networks in Suffolk is therefore less than in some other, more predominantly urban, local authorities. Nonetheless, a key finding from the buildings stakeholder workshop held in late 2020 was that there was a strong desire to maximise the potential for low carbon heat networks where it makes sense to do so, in particular where waste heat (e.g. from industrial applications) can be captured and used. As with heat pumps, installation of heat networks will take time and will likely be focused in the latter half of the decade, with the initial years being focused on identifying where there is scope and working with building owners to identify and secure demand.

Other low carbon heat options, such as the use of biomethane and hydrogen in the gas grid, are deemed to be less relevant in the timeframe to 2030, so will play less of a role. Nonetheless, there may be some scope and work to identify this should be taken forward, for example to work with local

farmers, sewage treatment facilities and other likely potential generators of biogas, and suppliers of biogas to biomethane upgrading technologies, to review of scope for localised use of biomethane.

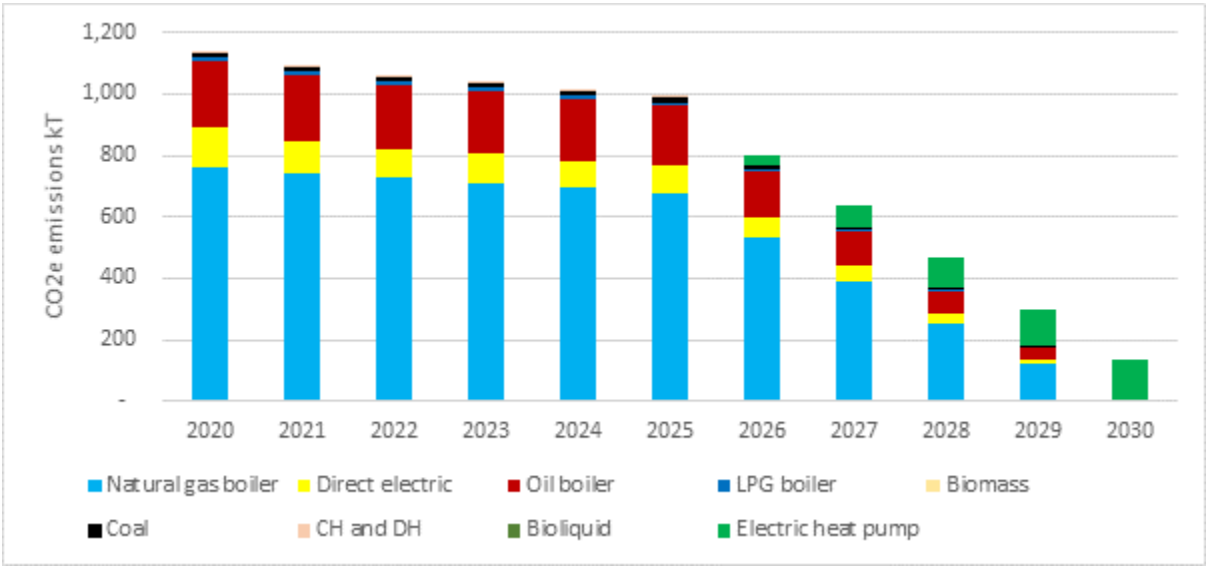
Taking account all of the above, we would expect the way we heat our homes in Suffolk to change radically, as shown by an illustrative pathway in Figure 17, with emissions following a pathway such as the one set out in Figure 18.

Figure 17 – Illustrative carbon neutrality heat supply pathway for the buildings sector



This gives the trajectory to near carbon neutrality as illustrated below in Figure 18.

Figure 18 – Illustrative carbon neutrality pathway for heating in the buildings sector



The actions required to make these reductions happen were discussed briefly in the phase 1 report but are further developed below, for each of the three primary goals and subsequent outcomes:

Goal number	Goal	Outcome
1	Behavioural change to use less energy	• Energy saving promotional campaigns and support. • Self-education and good practice in energy efficient operation of buildings
2	Improved energy efficiency of buildings	Significant roll-out of draught proofing and insulation outcomes
3	Transition to a fully decarbonised heat supply for buildings	• Significant roll-out of individual heat pumps in buildings • Install low carbon heat networks where viable • Addition/use of biomethane in gas grid • Addition/use of hydrogen in gas grid

4.4 Goal 1 – Behavioural change to use less energy

This element of the hierarchy is concerned with the elimination of unnecessary energy consumption using the existing heating and other devices already installed. From an individual or business perspective, interventions associated with eliminating unnecessary energy use are typically low or no-cost and the benefits, typically reductions in energy bills, realised over relatively short timescales. However, it is appreciated that such interventions do require time, so is important that consumers properly understand the significance of each energy use so they can focus their attention on outcomes which will save the most energy and money.

The impact of user behaviour is difficult to quantify and will be lower as the degree of energy efficiency and renewable and low carbon generation technology is increased, but good understanding and practice should always be promoted.

Primary actions	Key delivery partners	Cost	GHG reductions	Supporting actions
Energy saving promotion campaigns and support.	**County, District and Borough councils, Greater South East Energy Hub**	**£**	Difficult to quantify, e.g. 10% for 1C overheating reduction but less once EE and renewables installed.	Wider informational campaigns on carbon neutrality and energy efficiency
Self-education and good practice in energy efficient operation of buildings	**County, District and Borough councils, Greater South East Energy Hub, individuals and community groups**	**£**		

4.4.1 Energy saving promotion campaigns and information literature SCCP and Suffolk's Local Authorities

Media should include:

- Prominent link to SCCP's 'Top tips for saving energy in the home'[66] on the SCCP and Suffolk County and District Council websites' main pages with sub-links to further detailed information.
- Prominent link to the climate emergency declaration[67] and the SCCP website on Suffolk County and District Council websites' main pages.
- Posters in public buildings and places e.g. advertising billboards, hospitals, health centres, schools, bus stops, train stations, supermarkets, restaurants.

Should engage and inform domestic building users to understand, for example:

- The notion of a social contract on energy – i.e. the important role that individuals can take to reduce energy demand, in particular in the next few years before the impacts of new policies can start to take effect.
- The need to identify most significant uses of energy and target these first. Examples of typical top 3 energy uses in target sector where possible (heating usually #1).
- Minimum/maximum healthy winter/summer building temperatures for different people groups and rough impact of overheating/cooling e.g. heating bill increase up to 10% for 1C.
- The importance of setting hot water thermostat to 60C to avoid legionella, but no higher, and impact of setting higher (higher bills and shorter tank life).
- Turning heating/cooling off when out to reduce energy use.
- That heat from electrical appliances only contributes to heating demands when and where heating is required and only without added cost if the building has direct electric heating.
- A suggestion to consider the energy efficiency of appliances when buying or replacing.
- A suggestion to consider investing in smart or optimised heating controls and indication of cost.
- Data to help dispel common myths, for example on the impact on energy and appliance life of switching high energy devices off and on. Or on potential safety issues of timing electrical appliances to come on at night.

It is best to start with general advice and for the Councils to then commission or employ energy experts to progressively add more detailed advice tailored to each sector and subsector as time goes on.

4.5 Goal 2 and 3 – Improved energy efficiency of buildings and transition to a fully decarbonised heat supply for buildings

The two other main goals for the buildings sector are to improve the fabric thermal efficiency of buildings and to switch to low carbon forms of heat supply. In the following section we consider these two goals together as in many cases both can be addressed at the same time through standards for new buildings and whole house retrofit of existing buildings.

As outlined above, achieving carbon neutrality by 2030 across all sectors will require the building sector to achieve near net zero emissions by 2030. This will require the heating systems to be replaced with renewable systems by 2030 or to be connected to heat networks supplied by renewable or waste heat sources. The Climate Change Committee points out that biomass is a limited resource and should be prioritised for sectors with fewer options for decarbonisation such as the cement industry. They discourage the continued support for biomass use in heating buildings where individual heat pumps and heat networks fed by heat pumps or waste heat are the recommended strategy in the short term. Longer term solutions can include biogas and hydrogen, but the bulk of these are unlikely

[66] http://www.greensuffolk.org/assets/Greenest-County/At-Home/Energy/Energy-Saving-Tips.pdf
[67] https://www.suffolk.gov.uk/planning-waste-and-environment/initiatives/pledge-to-climate-emergency-declaration

to be sufficiently developed by 2030 to form a significant part of a decarbonisation strategy for carbon neutrality by that date.

Heat pumps and heat networks (using low carbon sources including heat pumps and waste heat upgraded where necessary by heat pumps) are therefore the main strategy for decarbonising the building stock by 2030. Whilst heat networks will be viable in some urban areas, the heat demand density across Suffolk as a whole is generally quite low. Heat pumps are therefore essential to decarbonisation. However, as acknowledged by the government in clause 2.20 of the Future Homes consultation, the current annual deployment of heat pumps in the UK is around 20,000 which is relatively low compared with gas boilers (over 1,000,000), so replacing all UK gas boilers which currently need replacing with heat pumps is unlikely to be possible as there are not enough trained plumbers to carry out this volume of installations.

According to data from the Council there are approximately 330,000 existing dwellings in Suffolk, while the local plan has an annual target of around 3000 homes per year, meaning an additional 27,000 or so by 2030. Given these numbers and the fact that new dwellings will be constrained to be much more energy efficient, clearly by far the largest obstacle in decarbonisation is decarbonising the existing building stock. However, most heating systems in current dwellings are designed to serve radiators with flow temperatures around 80C which is higher than heat pumps are capable of producing and much higher than the maximum recommended for efficient heat pump operation of around 55°C. Operating current radiators at such reduced temperatures means the radiators will be significantly reduced and may be insufficient in winter. Even where adequate, it will also give a less rapid heat up time than occupants have been accustomed to, which may be negatively perceived. Retrofitting high levels of thermal fabric efficiency outcomes can alleviate such problems so it is recommended that this be done as a matter of urgency to prepare dwellings whilst the heat pump market and supply chain and plumber training is ramped up to cope with rapidly increasing demand for heat pumps. Buildings should be audited, and outcomes prioritised which will enable the buildings to be suited to heat pump installation including replacement of current wet systems with lower temperature ones where necessary, to provide adequate heating at reduced hot water temperatures required for efficient heat pump operation. Lower temperature wet systems include larger or fan assisted radiators and underfloor heating, which may be desirable and cheaper to install if this can be done at the same time as retrofitting floor insulation. It is recommended that at the same time as fabric efficiency improvements, heating temperatures be reduced to those which will be required when heat pumps are later installed to test they can adequately heat the home and prevent occupants from becoming accustomed to accelerated heat-up times followed by a negative perception when heat pumps are later installed. The motivational strategy and funding mechanisms will vary depending on the sector as below. These are generally ordered in order of the level of control which can be exerted in achieving the overall aims and not necessarily the numerical significance of the sector.

4.5.1 Energy efficiency outcomes in homes

The phase 1 report outlined the various options for improving the fabric thermal efficiency of buildings. This includes highly cost-effective outcomes that are a negative cost per tonne of carbon (i.e. save money), such as:

- Cavity wall insulation, especially for easy to treat properties;
- Draught proofing;
- Floor insulation for suspended timber floors;
- Thermostatic Radiator Valve (TRV) only heating controls;
- Loft insulation in easy to treat properties (i.e. those with sufficient roof space).

In addition, there are outcomes that are moderately costly, such as:

- Full heating controls;
- Floor insulation for solid floors;
- Internal solid wall insulation.

And finally, more expensive outcomes include:

- Single to double glazing;
- Loft insulation in hard-to-treat lofts (e.g. those with little access to the roof space);
- External solid wall insulation.

EPC data gathered for the phase 1 report showed the following:

- Around 37% properties in Suffolk are uninsulated and a further 4% have only partial insulation.
- Almost 30% of properties have suspended timber floors.
- Looking specifically at loft insulation, 11% of dwellings that have roofs (i.e. not flats with properties above) currently have insulation with thicknesses equal to or exceeding 270mm.

All of this suggests there is considerable scope for take up of insulation outcomes. On the other hand, 26% of properties have solid walls, and thus will be more costly to insulate, especially with external solid wall insulation.

The CO_2 savings from energy efficiency outcomes specifically for Suffolk have not been calculated. But analysis by Element Energy offers clues as to which individual outcomes are likely to offer the highest emissions reductions. In their analysis, solid wall insulation can offer the highest savings UK-wide, with some outcomes such as loft insulation offering much lower CO_2 reductions[68]. However, an assessment of the carbon savings by itself is only partially helpful. Efficiency outcomes are important as they can reduce domestic bills, improve comfort and reduce fuel poverty. But from a carbon neutrality perspective, they are arguably more important as an enabler to greater uptake of heat pumps, as much as for the carbon savings in their own right. And the analysis by Element Energy also points to significant CO2 savings from boiler efficiency improvements, such as Passive Flue Gas Heat Recovery Technologies (PFGHRT). However to achieve carbon neutrality by 2030, focus needs to be on moving away from natural gas boilers to low carbon heat alternatives (see section 4.5.2 below), rather than improving efficiency of natural gas boilers.

4.5.2 Heat decarbonisation

Decarbonising the supply of heat to buildings is key to delivering carbon neutrality for the buildings sector. As outlined above, there may be some scope for heat to be supplied by low carbon heat networks in more compact urban areas in Suffolk. But for the most part, very large numbers of heat pumps need to be installed in homes throughout Suffolk. The scope for use of biomethane and hydrogen in the gas grid is expected to be limited in the next ten years. Whilst tackling heat decarbonisation in new buildings is important (it would be counter-intuitive to be building homes over the next few years that have fossil fuel heating systems that will only need to be replaced before

[68] https://www.theccc.org.uk/wp-content/uploads/2013/12/Review-of-potential-for-carbon-savings-from-residential-energy-efficiency-Final-report-A-160114.pdf

reaching the end of their useful life), the biggest priority is rolling out low carbon heat options across existing buildings. This means transitioning to a system where the default replacement for a gas boiler when it needs replacing is a low carbon alternative, primarily a heat pump.

Outcomes	Key delivery partners	Cost*	GHG reductions	Supporting actions
Significant roll-out of individual heat pumps in buildings	County and District Councils (including local planning authorities), Greater South East Energy Hub, Housing Associations	£ - £££	High	Energy efficiency outcomes
Install low carbon heat networks where viable	County and District Councils, Greater South East Energy Hub, private sector	£ - £££	Medium	Waste heat recovery in industry
Addition/use of biomethane in gas grid	County and District Councils	£	Low	
Addition/use of hydrogen in gas grid	County Council	£	Low	

* Note that this is the cost of the actions outlined in the Table of Actions document. The actions for biomethane and hydrogen are around engagement and further studies, rather than the cost if implementing such outcomes (which would be much higher).

4.5.2.1 Heat pumps

Heat pumps are likely to be the primary route to heat decarbonisation in Suffolk, with a very high proportion of the 330,000 properties in Suffolk likely to need heat pumps in one form or another. This could be individual heat pumps, heat pumps connected to heat networks (see Section 4.5.2.2 below) or as part of a hybrid system combining a gas boiler (or ideally a hydrogen-ready boiler) with a heat pump. Which heat pump is most appropriate will depend on many factors, including the space available, capital cost and operating cost savings against conventional heating systems (which is dependent on system efficiency – see below) and will be specific to each building.

Ground source heat pumps typically have higher seasonal performance factors (SPF – the average ratio of heat output to electrical input over a heating season) than air source heat pumps (typically around 4 for ground source, and 2-3 for air source). Ground source heat pumps can also be boosted by seasonal heat storage, where heat from the sun is captured in the summer and stored underground, before being released back into the building in winter[69]. Doing this can double the efficiency of ground source heat pumps. This technology has been used at the Suffolk One Sixth Form College on the outskirts of Ipswich[70].

However, ground source heat pumps are much more costly, typically with capital costs at around £8,000-£23,000 dependent on the type of ground source heat pump and extent of works required, compared to £5,000-£15,000 for air source heat pumps.

[69] https://www.icax.co.uk/interseasonal_heat_transfer.html#:~:text=Interseasonal%20Heat%20Transfer%20provides%20sustainable,buildings%20without%20burning%20fossil%20fuels.

[70] https://www.icax.co.uk/Suffolk_One_College.html

Hybrid heat pumps (HHP) are considered to play a role as transitional technologies, as they combine a heat pump with a gas boiler, and can eventually combine heat pumps with hydrogen boilers should a hydrogen network be developed in the area in the long-term. Gas boiler/heat pump systems can offer upfront cost savings of £450-2,800 compared to standalone air source heat pumps[71] however the saving reduces significantly for buildings that are highly energy efficient and are not considered likely to be cost competitive for new build 'zero carbon standard' homes. Hybrid heat pumps are therefore considered suited to existing buildings that are connected to the gas grid that have not had extensive thermal energy efficiency outcomes carried out[72].

There are, however, a number of barriers associated with installing greater numbers of heat pumps, including:

- High upfront costs relative to conventional heating systems.
- Consumer confidence and awareness is currently relatively low although it has grown in recent years. But installation of the incorrect heat pump for the requirement could also dent consumer confidence if stories increase of insufficient heating outputs.
- Unsuitability of current housing stock requiring energy efficiency improvements and retrofitting of heating systems that would be compatible with heat pumps.
- Lack of installer capacity in UK.

It is expected that the market for heat pumps will develop over the next few years, pushed by the Government commitment in its ten point plan for a green industrial revolution for 600,000 heat pumps to be installed per year by 2028, and by the statement in the recently announced Future Homes Standard that heat pumps are expected to be the primary technology for heating new homes. But this market development is not likely to be sufficient for Suffolk to reach its more ambitious carbon neutrality target by 2030. It therefore follows that considerable additional action will be needed to drive heat pump uptake more quickly in Suffolk. There will be a number of actions that can help this transition, including:

- Ensuring that information materials are available for those elements of the owner-occupier market that are able to pay and have an opportunity to consider heat pumps (e.g. need to replace gas boiler, or looking to carry out major building work).
- Working with key public sector organisations to drive the market in the early years and to provide leadership and demonstration, including through uptake of heat pumps on the Councils' own estates and with social housing providers.
- Working with suppliers to help build the network of qualified heat pump installers.

To drive heat pump uptake in the initial years with the councils and social housing providers, work might be needed to better understand the potential. For example, it may be necessary to commission audits to investigate requirements and budgets required to retrofit energy efficiency, renewable heating and PV in council housing and to engage with Housing Associations to do the same for housing association housing. The councils should also look to apply for national funding assistance such as the green homes grant scheme.

Handholding support should also ideally be provided in later years to support the wider uptake of heat pumps in buildings. Experts from SCCP/Suffolk Councils or external policy experts could be

[71] Based on typical standard semi-detached house. Element Energy "Hybrid Heat Pumps Study *Final Report*" https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/700572/Hybrid_heat_pumps_Final_report-.pdf

[72] https://www.suffolk.gov.uk/assets/planning-waste-and-environment/Pledge-to-climate-emergency-declaration/suffolk-climate-emergency-plan-technical-report.pdf, page 48.

commission to provide handholding support to applicants to apply for national funding available for their sector to retrofit fabric efficiency outcomes and underfloor heating or enlarged radiators where necessary to operate adequately at 55°C. The councils can also look to work with Central Government to monitor the rate of funding applications, fabric efficiency and wet system upgrades and renewable heating system and PV or PV-T implementation in Suffolk and then assess progress towards 2025 a target of making all buildings energy efficient and heat pump or heat network ready and 2030 target of decarbonising all buildings. Feedback on the handholding process, along with ideas for improvement, can be requested at a suitable juncture, e.g. 2-3 years into operation so that it's possible to improve the handholding process in response to uptake and feedback.

Ultimately however, it is likely that a dedicated policy measure will be needed to drive heat pump uptake in Suffolk. It has been outside the scope of this report to consider in details the various options and their pros and cons. Funding is currently available for renewable heat outcomes in homes, and are likely to be available in the future. But other additional options for a Suffolk-specific policy measure to drive uptake include the following:

- Linking council tax rates to installation of low carbon heat outcomes.
- Local authority revolving loans.
- Bulk buying of heat pumps by Councils to sell on to homeowners.
- Rates increases for properties using fossil fuel.
- Presumption against planning for properties not using zero carbon heat.
- Bring forward date for banning new gas connections (2025 in Future Homes Standard).
- Engagement and awareness raising (as outlined above).
- Innovative business models and 3rd party finance.
- Emissions limits for heating systems.

A study should be commissioned ASAP to investigate these different options, cost them up in detail and to provide the evidence base needed for councils to take a decision on the preferred route (and required funding). This process could easily take up to the end of 2022, with the policy measure being implemented by 2023 at the earliest, with a view to ramping up heat pump installation numbers over the latter half of the decade.

A list of heat pump installers in Suffolk can be found at the Renewable Energy Hub Website[73].

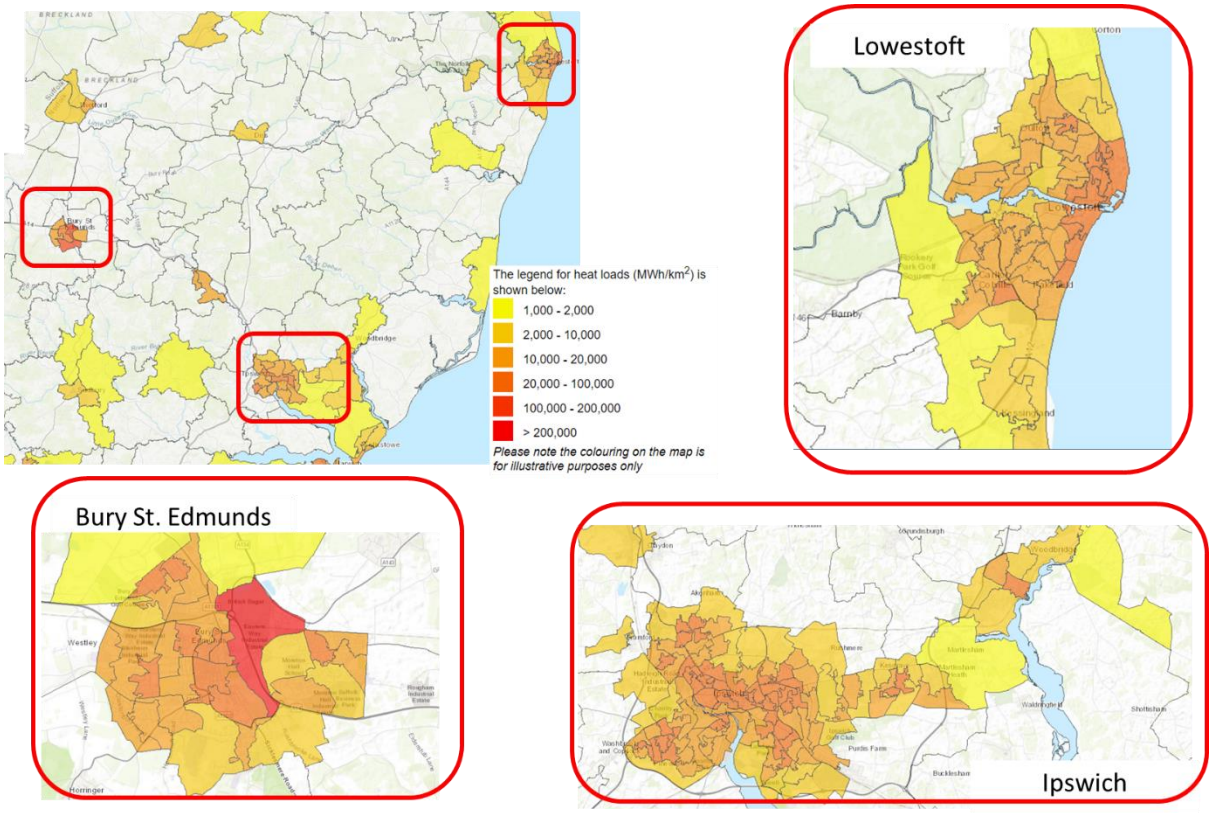
4.5.2.2 Heat networks

Heat networks can be a cost-effective way to reduce carbon emissions from heating. There are a range of different central heat sources (known as ‘energy centres’), all of which may reduce emissions compared to heating homes individually through fossil fuel boilers, to be carbon neutral compliant, the sources will need to be very low carbon ones such as heat pumps.

Heat networks are most feasible for areas of high heat density to ensure sufficient revenue from heat sales to pay back costs associated with the network and energy centre. But this is not to say that they have no role to play in Suffolk’s carbon neutrality vision. Whilst the heat demand density across Suffolk is generally quite low, there are pockets of higher demand in urban areas, as shown in the graphic below which was taken from the phase 1 report.

[73] https://www.renewableenergyhub.co.uk/heat-pump-ashp-gshp-ground-and-air-source-installers-in-suffolk.html

Figure 19 – Heat demand density at presented on UK CHP Development Map [74]



Heat networks can also play a part in rural areas and can work well for some more rural off-gas grid communities[75]. There is also a growing recognition of the role of low carbon heat as a potential solution to address fuel poverty, particularly in rural areas.

As well as having different sources of heat, heat networks can be designed in different ways. For example, hot and cold systems. Hot systems rely on the heat being generated centrally and distributed by the network, whereas cold systems are operated at lower temperatures (e.g. up to 25 degrees C) and rely on heat pumps in individual properties to raise the heat to the required level for the property.

4th generation heat networks distribute heat as hot water at 60C or less flow and return 30C or less which can be done with central heat pumps and/or waste heat if hot enough. 5th generation heat (ambient loop) networks distribute groundwater at around the ground ambient temperature and feed individual heat pumps in each building which return the water to the ground at below ambient temperature to be reheated by the ground. The flow can be boosted by very low temperature waste heat sources.

Looking at costs, the high capital costs tend to the be main barrier to implementation, although there is potentially scope for these costs to be brought down by 30-40%[76]. Costs can range from around £1000 per household to around £1800, depending on the heating source used. Around 70% of the costs come from the network itself. But the costs to homeowners can be lower than typical gas boiler heating.

[74] https://chptools.decc.gov.uk/developmentmap

[75] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/696273/HNIP_What_is_a_heat_network.pdf

[76] See https://d2umxnkyjne36n.cloudfront.net/insightReports/District-Heat-Networks-in-the-UK-Final.pdf?mtime=20181105145836 for more details.

Some heat networks have been implemented in Suffolk. One example is Snape Maltings District Heating where heating and hot water is provided to all 66 residential properties and 9,000 sq ft retail areas using a highly efficient biomass heating system[77].

A key next step to take forward this work would be to carry out a County-wide feasibility study to consider the scope and potential demand for heat networks. Some smaller studies have previously been carried out, but these have tended to be at a smaller spatial scale. For example, in 2016 a study was commissioned by what is now West Suffolk Council into the opportunity for heat networks and decentralised low carbon energy at two locations (the Mildenhall Hub site in Mildenhall and the Public Service Village 2 (PSV2) site in Bury St Edmunds). The study concluded that there are opportunities for district heating in Bury St, Edmunds centred on the new Public Service Village development[78].

The proposed feasibility study should to establish techno-economic potential for low temperature or ambient loop heat networks in Ipswich, Lowestoft, Bury St Edmunds and smaller urban areas if applicable. It should identify:

1. Areas of dense heat demand.
2. Core customers, e.g. large public buildings e.g. hospitals, universities and leisure centres, new housing developments and large waste heat sources such as industry or large commercial cooling loads.
3. Likely pipe routes (typically along roads or pathways) and obstacles such as railways.
4. Optimum plant location based on size of loads and minimising pipe distances.
5. Sources of waste heat such as industry or large cooling systems.
6. Options to be compared (e.g. baseline individual air source heat pumps without network, central heat pumps with and without waste heat, ambient ground loop options with individual heat pumps with and without waste heat).

An application could be made to the Heat Network Delivery Unity (HNDU) for funding for the feasibility study (they funded the aforementioned study in West Suffolk). The study would be led by Suffolk County Council, with input from the SCCP, but would also need to involve other stakeholders, such as owners of large public sector buildings, the NHS, universities, leisure centres, commercial businesses, industry, housing associations and developers.

Where heat networks seem viable, appropriate next steps could include:

- Publicising the intention to install a heat network and conducting surveys to gauge interest from other building owners in connecting, guiding potential customers on the technical and costs issues.
- Obtaining technical, commercial and legal support to secure the best partnering arrangement to deliver the scheme and construct with provision for expansion. Applying for HNIP[79] funding to assist with capital costs. Heat network customers will need to plan for district heating connection, retrofitting efficiency outcomes, upgrading wet systems and allocating space for heat interfaces and installing heat pumps for ambient loop systems.

[77] http://www.greensuffolk.org/sgbn/suffolk-case-studies/snape-maltings-district-heating/
[78] https://www.westsuffolk.gov.uk/protecting-our-environment/energy/upload/BuryStEdmundsPublicServiceVillageHeatNetworkOpportunitiesStudyJun2016.pdf
[79] The Heat Networks Investment Project is delivering £320 million of capital investment support to increase the volume of heat networks built - https://www.gov.uk/guidance/heat-networks-overview#:~:text=A%20heat%20network%20%E2%80%93%20sometimes%20called,domestic%20or%20non%2Ddomestic%20buildings.

Key to moving to the construction phase will be appropriate funding. BEIS has published a list[80] of investors that are looking to invest in heat networks in the UK.

4.5.2.3 Biomethane

Biomethane is a naturally occurring gas which is produced by anaerobic digestion of organic matter (where the matter is broken down in the absence of oxygen). The CCC stated in their net zero technical report of 2019 that around 2TWh of biomethane is currently injected into the gas grid every year[81]. This can be injected into the gas grid to displace natural gas. Typical feedstocks can include municipal solid waste, landfill gas and other waste sources. However, as outlined in the phase 1 report, there is still significant uncertainty as to the availability of low cost biomethane resource and the most appropriate use, not least because municipal solid waste (MSW) can also be used as a feedstock for energy from waste (EFW) plants as well as for biomethane/ biohydrogen plants.

There has been a push on biomethane from the UK Government, with plans to heat around 230,000 homes with the fuel. This would mean a significant ramping up of production capacity. Proposals on a green gas levy to support this move were consulted on in September 2020, with the results currently being analysed by the UK Government. Biomethane is more suited to rural rather than urban areas, meaning it could play a role in reaching carbon neutrality in Suffolk. In particular there may be scope for localised supply of biomethane to heat homes. There may also be some further scope for biogas-to-grid facilities like the Euston Biogas plant near Thetford and the Biomethane to Grid Anaerobic Digestion Ellough project, located in Beccles.

An important next step would be to consider further analysis to understand the scope for localised biomethane generation and use.

4.5.2.4 Hydrogen

As outlined in the phase 1 report, while there is increasing interest and strategy developed at a national level around the importance of hydrogen in meeting the Carbon neutrality target, the most likely rollout of hydrogen networks would initially target high density demand centres where there is the infrastructure required to support the generation and distribution of hydrogen. In addition, uses for low carbon hydrogen are likely to be focused on sectors where there are no viable alternatives, for example in some heavy industries or in long-distance freight transport. And achieving carbon neutrality by 2030 means fully decarbonising all energy sectors by then, which is likely to not be compatible with the timelines for hydrogen production to fully ramp up.

For these reasons we did not envisage a role for hydrogen in the decarbonisation of the buildings sector. However, that is not to say that activity to explore hydrogen in the buildings sector should not be taken forward. Where hybrid heating systems are the best option for homes in Suffolk, outcomes should be taken to ensure that the boilers are at least hydrogen ready. And there may be some scope for further blending of hydrogen into the gas grid.

4.5.2.5 Digitalisation and smart heating

Another important element to this outcome will be increasing use of digitalisation and smart heating systems. Digitalisation offers significant potential in decarbonising heating in homes. As outlined by the Energy Systems Catapult, “smart connected home devices could reveal consumer preferences,

[80] List found here - https://www.gov.uk/guidance/heat-networks-overview#:~:text=A%20heat%20network%20%E2%80%93%20sometimes%20called,domestic%20or%20non%2Ddomestic%20buildings.
[81] https://www.theccc.org.uk/publication/net-zero-technical-report/

enabling radically improved innovative energy products and services"[82]. Smart controls coupled with data analytics will help the authorities learn more about consumer demand and preferences, which can help better targeting of the solutions outlined below.

4.5.3 New dwellings

According to data received from the Council there are currently 15,472 dwellings under construction in the Suffolk region and from the Local Plan, while the local plan has an annual target of around 3000 homes per year, meaning an additional 27,000 or so by 2030. This does not account for destruction of existing dwellings. This compares with 330,000 existing homes which will clearly represent the largest obstacle in decarbonisation. However, given 2030 is less than a decade away, it clearly makes sense to build new houses with renewable heating systems or connected to heat networks in line with this target rather than continue installing fossil fuelled heating systems which will then need replacing before they expire. Doing this will stimulate the market and supply chain for renewable heating systems to gear up to the larger challenge of decarbonising the existing housing sector.

New dwellings are currently required to be built to meet the following national Building Regulations 'Part L1A: Conservation of fuel and power in new dwellings' and 'Part L1B: Conservation of fuel and power in new buildings other than dwellings'. These set the required standards in the thermal resistance and air permeability of building fabric and efficiency requirements for heating and ventilation systems in new buildings. Parts L2A and B require building extensions to conform to such standards. In January 2021, the Government announced its response to the consultation on the Future Homes Standard.

This standard will ban the installation of gas heating in new dwellings by 2025. Prior to this, the government proposes to update Part L and also Part F which currently governs ventilation systems in more detail from a health perspective. The Future Homes Standard seeks to make new homes more energy efficient and to future-proof them for low carbon heating systems, in anticipation of a further update in 2025 in which, according to clause 2.15, they anticipate that an average semi-detached home built to meet the Standard would produce 75-80% less carbon dioxide emissions than one built to the 2013 Part L requirements. To achieve this, the Future Homes Standard will require low carbon heating and world-leading levels of energy efficiency. The Standard recognises that to realistically meet the higher 'Future Homes Standard' by 2025, industry will first need to develop the necessary supply chains, skills and construction practices to deliver low-carbon heat, and highly energy efficient new homes and proposes this interim uplift as a stepping stone to the anticipated 2025 standard. This is an important consideration and one that will need to be kept in mind for Suffolk in case it seeks to amend local planning policy to introduce the requirements in the Future Homes Standard more quickly than by 2025.

The Future Homes Standard states that wet space heating systems should be designed to operate with a flow temperature of 55°C or lower in the final heating circuit in order to make them compatible with efficient operation of heat pumps fitted at a future date. This is an improvement on the current situation but not all heat pumps are able to operate efficiently at 55°C so there is a risk of this becomes the norm for housebuilders. It might therefore be prudent for Suffolk to consider the scope for setting local regulations that stipulate a lower maximum flow temperature.

Crucially, as part of the Future Homes Standard, the Government has decided not amend the Planning and Energy Act 2008, which means that local planning authorities will retain powers to set local energy efficiency standards for new homes (the consultation on the FHS had threatened to remove these powers from local authorities). We would therefore suggest that an attempt be made to

[82] https://es.catapult.org.uk/wp-content/uploads/2019/06/Smart-Systems-Heat-Phase-2-Summary-of-key-insights.pdf

update Suffolk Council's planning rules to align with the likely 2025 fabric standards mandating the following for new dwellings, in advance of 2025:

- A wet space heating system designed to operate with a flow temperature of 55°C or lower (ideally underfloor heating);
- The option 1 fabric efficiency standards set out in the FHS;
- PV or hybrid PV thermal (PV-T) on available rooftops;
- A low carbon heating system (new or connection to any existing DH scheme or individual heat pumps).

This would accelerate progress towards the ambitious 2030 carbon neutrality target, help develop the market and supply chain for heat pumps and develop new district heating within Suffolk to assist the much larger challenge of retrofitting low carbon heating into existing dwellings. It will also ensure that buildings are not built to a lower standard than the Future Homes Standard whilst waiting for them to be enacted.

Consideration should be given to the scope for encouraging private homeowners to install underfloor heating rather than oversized radiators and the benefits this will provide to space saving and therefore property value. There should also be a requirement for developers to connect new dwellings to any nearby future heat networks should these be developed, or otherwise install a heat pump. Developers of more than one building in close proximity should be compelled to calculate and compare the capital and operating costs and carbon emissions of serving the buildings with at least the following options, giving reasonable justification if a heat network solution is not preferred.

1. A low temperature heat network served by any nearby heat network, industrial waste heat source or central heat pumps.
2. An ambient loop serving individual ground heat pumps in each dwelling.
3. Individual air source heat pumps.

Where dwellings are very small and extremely well insulated, electric resistance heating might also be considered if it can be shown that this will save the householder money in the long-term taking account of servicing and replacement costs. A calculation template should be used to ensure accuracy and consistency.

4.5.4 Existing public buildings

Installation of energy efficiency outcomes, low carbon heating systems and solar PV or PV-T in Council and public buildings should be a priority to set the example for other sectors. Buildings should be audited, and outcomes prioritised which will enable the buildings to be suited to heat pump installation. The feasibility of establishing a heat network should be investigated, particularly for public buildings which are large and/or in densely built up urban areas or close to an industrial waste heat source. Where this is not the case heat pumps will usually be the lowest carbon heating option. Where internal funding is a problem, central funding sources such as the Public Sector Decarbonisation Scheme grants or loans, funded by government owned Salix Finance Company should be applied for.

4.5.5 Existing council and Housing Association homes

Suffolk Council Planning Authorities should plan to retrofit council owned energy efficiency outcomes to make homes heat pump-ready and engage with housing associations to arrange to do likewise in a manner which is convenient and safe to the tenants. Tenants should be informed this is planned and that this will reduce energy bills and increase comfort where this is the case, and a convenient time

agreed. If not already the case, tenancy agreements should be amended where possible for new tenants to allow the Council or HA reasonable access to install energy efficiency outcomes.

4.5.6 In households receiving benefits

The action plan could seek to encourage and support homeowners of households receiving benefits to install energy efficiency outcomes through central government incentives such as ECO and Green Homes Grants. It will also be important to provide handholding support for the application process depending on the ability of the householder.

Another policy option could be to introduce a variable council tax in 2025 with a carbon surcharge or rebate based on the home's EPC banding. Where an EPC has not already been carried out, an inspection could be carried out that is funded by the council or homeowner depending on means testing.

4.5.7 Privately rented homes

The 2018 'Domestic private rented property: minimum energy efficiency standard Regulations' (often known as the MEES regulations) requires domestic landlords to ensure, with certain exceptions, that their properties have an EPC rating of E or higher before granting a new tenancy to new or existing tenants and to do so from April 2023 even where there has been no change in tenancy arrangements. Exemptions include outcomes with a payback longer than 7 years, outcomes which would damage or devalue the property by more than 5% and a cap on spending more than £3,500 on outcomes.

The improving the energy performance of privately rented homes consultation[83] which closed in January 2021, seeks to update this to require that all domestic privately rented properties in England and Wales achieve an EPC band C or higher for new and all tenancies by 2025 or 2028 respectively with similar but amended exemptions, for example an increase in spending cap to £10,000.

Suffolk Councils should seek to inform, encourage and support landlords in their current and likely future obligations to install energy efficiency outcomes, providing information and assistance with applications for central government or private finance funding such as the green homes grant scheme and green deal finance company loans and ECO funding where eligible (generally where tenants are vulnerable or in receipt of certain benefits). Landlords should be encouraged to focus on fabric efficiency improvement outcomes and installing heat pumps in light of the planned future obligations and discouraged from simply installing new fossil fuel boilers to meet current obligations.

4.5.8 Owner occupiers with no vulnerable occupants

Owner occupied homes with no vulnerable occupants is probably the largest sector and is difficult to influence as they do not have any obligations from central government to be energy efficient and reduced central government grant support for such outcomes. However, as with other sectors, many homeowners are keen to contribute to decarbonisation and educational campaigns Suffolk Councils should seek to similarly engage with and support this sector in installing energy efficiency outcomes, reminding householders that fossil fuel systems will not be available for many more years and providing information and assistance with applications for central government or private finance funding such as the green homes grant scheme and green deal finance company loans and ongoing benefits from the Renewable Heat Incentive while this remains open or any replacement schemes.

[83] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/946175/prs-consultation-2020.pdf

It is hoped that such information and assistance will encourage more affluent households to act first. Meanwhile, efforts to decarbonise new and existing buildings in other sectors and more affluent householders should stimulate the energy efficiency retrofit and low carbon heating market bringing prices down within closer reach of the average homeowner.

In addition, we suggest one or more Suffolk County policies to financially motivate this sector to begin planning to improve fabric efficiency and convert wet systems to be heat pump ready by 2025. For example, a variable council tax which would apply an addition or rebate to the normal council tax based on the EPC rating if worse or better than a certain threshold (e.g. the same threshold as applied to private landlords in the MEES regulations). Such a policy would need to be carefully designed to be flexible and monitored each year to avoid unintended consequences For example, the policy could be designed to balance anticipated additional charges with anticipated rebates to maintain overall council funding, but this would require rates to be adjusted each year and could lead to a funding shortfall if uptake greatly exceeds expectations which would need to be recouped in the following years.

4.6 Synergies with other sectors

This chapter has focused on approaches to energy saving in the buildings sector, and generation of low carbon heat. The issue of how electricity is generated is addressed in Chapter X on the power sector. The fact that very high levels of heat pump uptake are needed mean that there is a close link with the power sector, as this will greatly increase the strain on the grid. This therefore emphasises the importance of some of the power sector outcomes such as increasing grid capacity for new connections (see Section 7.5 on Grid infrastructure and connections). A whole house approach to the buildings sector also requires consideration of scope for rooftop solar alongside other buildings outcomes outlined in this chapter such as heat decarbonisation options.

4.7 Key messages and priority actions

Domestic buildings are a significant contributor to CO_2 emissions in Suffolk and action to tackle their emissions will be crucial to achieving carbon neutrality. Government policy is moving in the right direction in this area, with some firm commitments such as scaling up the number of heat pump installations as outlined in the Government's ten-year plan. But such commitments have not yet been backed up by specific policy outcomes, and anyway Suffolk will need to move faster if it is to achieve carbon neutrality by 2030.

The priority actions for the sector are included in the Suffolk Climate Emergency Plan, and the Table of Actions. In summary, the overriding priority for achieving carbon neutrality in the buildings sector is decarbonisation of the heat supply. Hence many of the priority actions focus on this; by encouraging new build housing to be carbon neutral-compliant in advance of the national 2025 date; by the local authorities showing leadership by installing heat pumps in their own buildings; and by starting work now on a possible policy mechanism that can incentivise uptake of heat pumps in owner-occupier buildings. Alongside this, work will be started to scope out the potential for heat networks, to start the process of finding interested parties and seeking funding, as well as on expanding energy hubs to ensure appropriate advice and support is given on energy saving outcomes.

5 Low carbon transport

5.1 Transport and carbon emissions in Suffolk

Transport emissions of CO_2 across Suffolk county currently account for 37% of its total GHG emissions. They have remained relatively constant since 2005, while other sectors such as the industry and domestic sectors have seen reductions over this period. As such, it is clear that transport emissions will be an important and difficult area of emissions to tackle. The importance of the transport sector does vary between the districts but is a major source of emissions in all areas.

Figure 20 – Breakdown of transport emissions in Suffolk (kt CO2)

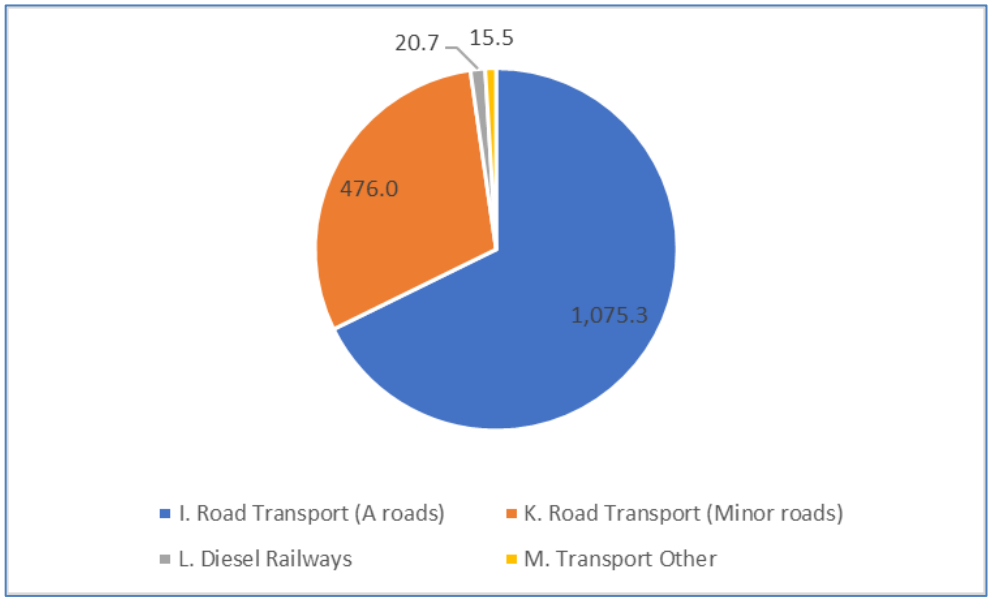
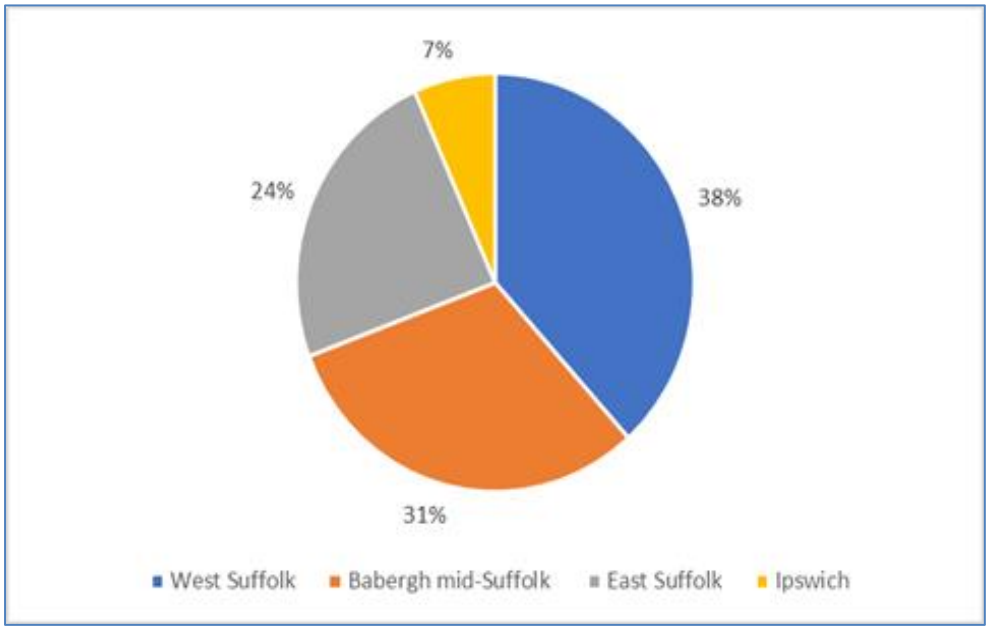


Figure 21 – Breakdown of transport emissions by district



The majority of transport emissions come from road transport. The rate of car ownership in Suffolk is 1.34 cars per household (national average of 1.16) [84]. Commuting journeys are carried out by car (69%) or as a passenger (6%),[85] which are the most highly emitting modes of transport. These modes are more common in more rural areas of the country, as the distances to travel are longer whilst the availability of a reliable public transport system is also a limiting factor.

The other key road users are related to freight. The Suffolk coastline has a number of freight ports, as well as potential forthcoming tax efficient Free Ports, which contribute to large quantities of freight being transported through the county. Freight that passes through the county but is not destined for the county is challenging to influence. However, freight that's final destination is within the county can be more easily influenced.

In all future scenarios, a high uptake of Ultra-Low Emission Vehicles (ULEVs) is essential. The current uptake of ULEV in Suffolk is low. Rates of electrification in Suffolk are higher than the national average (0.16% of vehicles are electric compared with 0.08% nationally) but still a long way away from 100% electrification required.

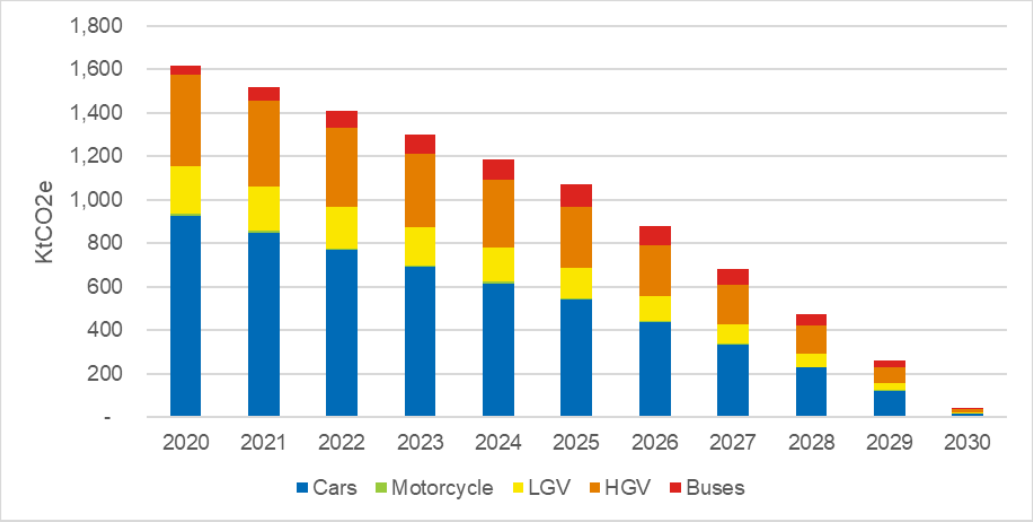
5.2 Approach to achieving carbon neutrality in the transport sector

The proposed pathway to carbon neutrality for the transport sector, based on a balanced approach of reducing vehicle mileage and electrifying the remaining vehicles over the period from 2020 to 2030, is as follows:

- Prepare for, and encourage a sustainable transport system;
- 25% reduction in car use;
- 15% reduction in freight traffic; and,
- Transition remaining vehicles to zero emission technology – a total of some 390,000 vehicles.

This gives the trajectory to carbon neutrality as illustrated below in Figure 22.

Figure 22 – Carbon neutrality pathway for the transport sector



[84] https://www.suffolk.gov.uk/assets/planning-waste-and-environment/planning-and-development-advice/Suffolk-Guidance-for-Parking-2019-Adopted-by-SCC.pdf
[85] Phase 1 – Technical Report https://www.suffolk.gov.uk/assets/planning-waste-and-environment/Pledge-to-climate-emergency-declaration/suffolk-climate-emergency-plan-technical-report.pdf

Although the pathway shows what needs to be done in overall terms to achieve carbon neutrality, it does not define what actions are required to make these reductions happen. These actions are further developed in the chapter sections below.

The key principle in the transport sector for reducing the emissions is the Avoid-Shift-Improve (ASI) approach. The principle is to avoid as much travel as possible, then where travel is required support mode shift to more sustainable forms of transport, and where that is not an option, improve vehicle technology to reduce emissions. This approach is expanded upon as follows:

Avoid - in its simplest form is to not travel at all, making decisions that require no travel. If travel is required, avoid additional distances travelled, e.g. making shorter journeys where possible. So, under this category we assess options to reduce the need to travel and reducing freight movements.

Shift – is about moving a mode of transport to a more efficient mode of transport. As seen in the pyramid above, active travel (cycling and walking) are the best, then public transport, then high occupancy car (more than 1 person in the car) and finally solo-car use.

Improve - is about using the least emitting fuel or vehicle technology possible, which in this case is zero emission fuels. The focus here is on electrifying the fleet as this is the key technology available in the period up to 2030. However, there are other technologies that could be considered in the pathway including early adoption of hydrogen vehicles and biofuels fuels such as biomethane for larger vehicles which are hard to electrify.

This ASI approach can be related to our overall pathway targets and the goals, outcomes and actions key actions needed to achieve these targets. These are illustrated in Figure 23 that visualises an application of the ASI approach, as well as the principles of the vehicle use pyramid in Figure 24.

Figure 23 – Approach to reducing transport emissions through ASI approach.

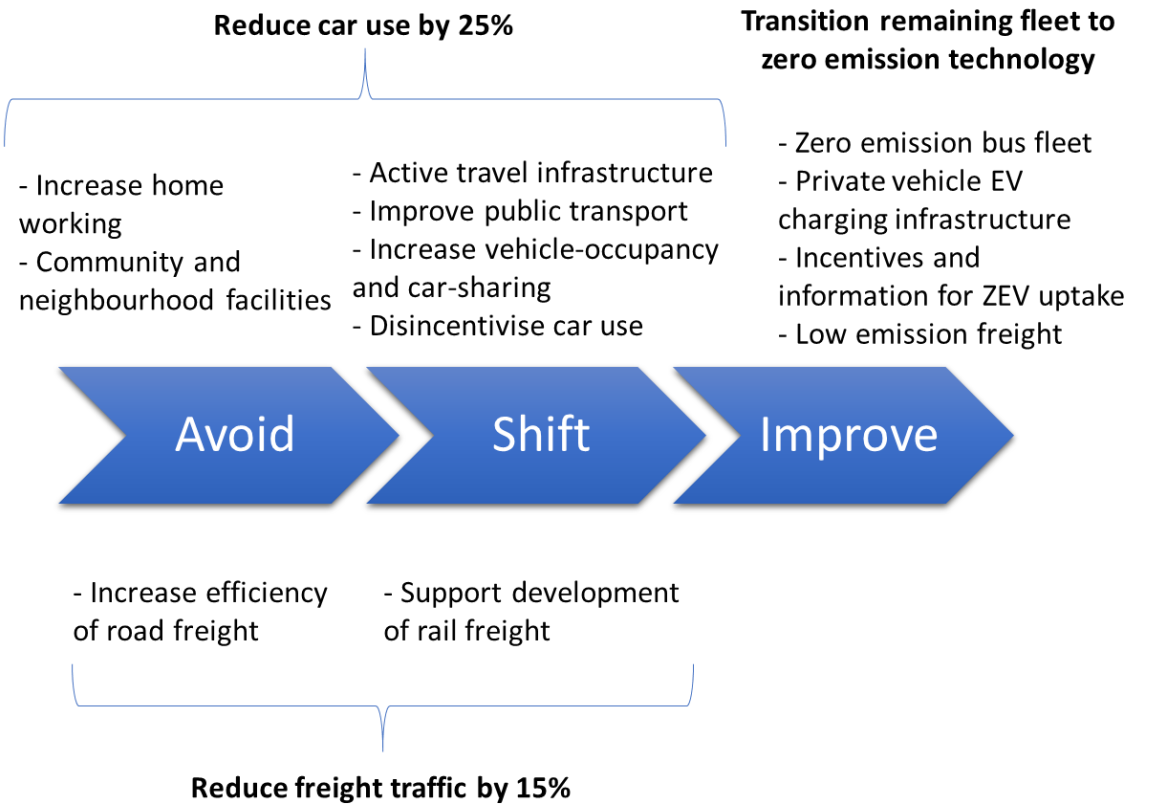
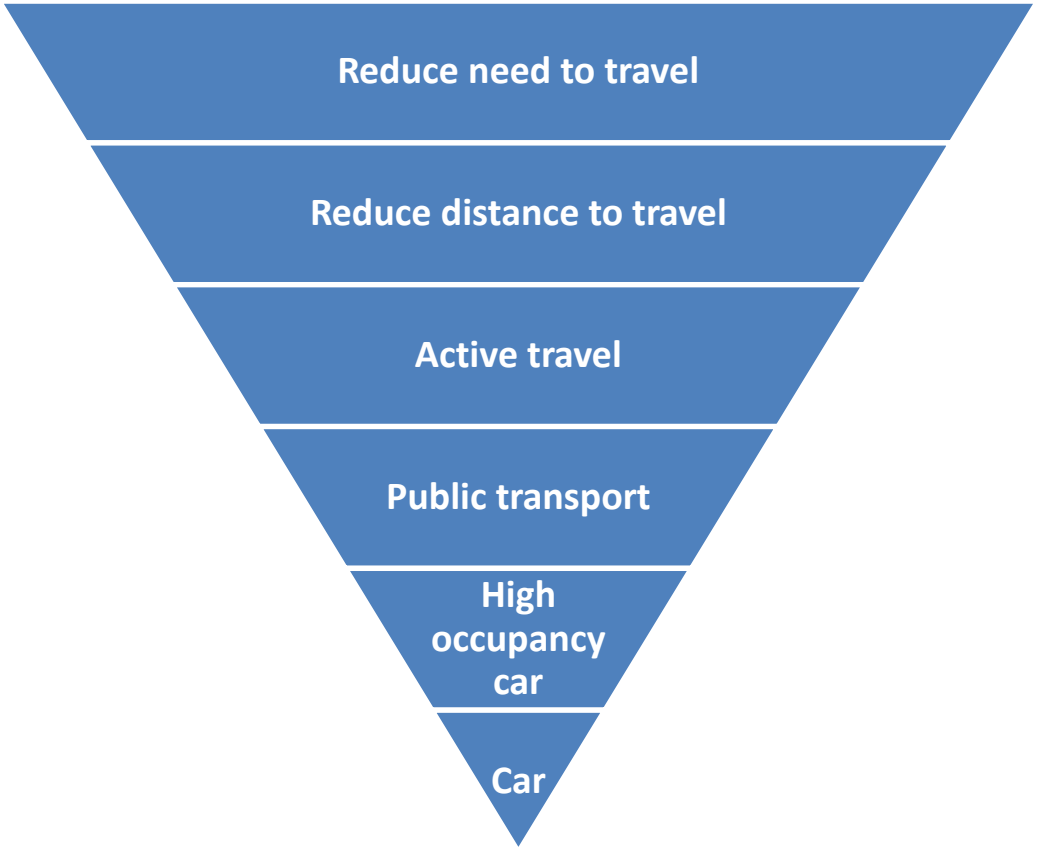


Figure 24 – Principles of the vehicle use pyramid.



Having applied the A-S-I approach and principles of the vehicle use pyramid, 4 goals were developed for the transport sector to achieve the carbon neutrality pathway. These were supported by a total of 13 outcomes, and 39 actions. These are described below, with the goals forming sub-chapters, and their associated outcomes and actions described within each. The goals of the Transport Sector are:

1. Increase sustainable transport readiness
2. Reducing car use
3. More efficient freight
4. Zero emission vehicles

It should be noted that in different parts of Suffolk the focus may be different. In urban areas it may be easier to move to public transport as demand will be higher. In rural locations, increase in home-working may be the best way to reduce car use. Linked to this, Transport East, who are developing a net zero transport pathway for the region, need to be involved in implementing the low carbon transport goals and actions in Suffolk, and are referenced specifically further in the chapter.[86]

[86] https://www.transporteast.org.uk/

5.3 Goal 1 – Increase sustainable transport readiness

For the actions stated in this document to be a success, it is important that some over-arching and enabling actions are implemented. The implementation of these enabling actions will allow for the transport sector to be considered holistically and make sure that interactions between actions are accounted for.

Table 4 – Outcomes supporting Transport Goal 1 – Increase sustainable transport readiness

Outcomes	Key delivery partners	Cost
Prepare for, and encourage a sustainable transport system	**District council and ISP** Employers and Employees	**£**

5.3.1 Prepare for and encourage a sustainable transport system

The first action will be to update the Suffolk Travel Plan with the information that has been compiled in this chapter. This document will consider reduction in car use, reduction in freight and electrification of the transport sector. Additionally, updates to Local Plan documents, both at the county and district level, will be required to ensure that future developments are designed with sustainable transport in mind.

For many of the actions in this chapter, there is a requirement for data to allow for more informed decisions to be made. One of the key pieces of data are current and future travel plans of the citizens and businesses of Suffolk, especially in light of the counties push to Carbon neutrality and the changes to work patterns as a result of COVID-19.

Another key action is the development and implementation of travel plans for key businesses, schools and attractions. For businesses, a key element of their travel plans may include reduction in days required to be in the office (where applicable). Understanding the key barriers and the opportunities to travelling more sustainably it is possible to design and implement travel plans to overcome these. Travel plans should be designed to increase the overall efficiency of the transport system by encouraging the use of active travel, public transport and increased vehicle occupancy. The result of travel plans is often information shared around stakeholders about their travel actions and facilitating increased efficiency. Sometimes, the result of a travel plan may be to provide additional services, i.e. shuttle buses from train station to science park.

Finally, it is important that the Councils have the resources, skills and knowledge within the existing staffing to be able to deliver these actions. Therefore, the Councils should be looking to invest in a widespread education and skills programme for new and existing staff to enable action, and invest further in staff numbers to support delivery.

5.4 Goal 2 – Reduce demand for car use

Car use accounts for 75% of all road traffic in the county, which is estimated at 3,142 million vehicle kms annually, and some 71% of all passenger trips. So, reducing this activity by around 25% in 10 years requires a major shift in travel behaviour with a significant increase in active travel and public transport use, alongside outcomes to reduce overall trip levels in the county.

To achieve the 25% reduction in vehicle-kilometres (vkm) in 10 years requires significant behaviour shift which can be achieved using the following steps:

- Reduce need to travel
- Reduce distance to travel
- Travel actively
- Use public transport
- Increase vehicle occupancy and reduce car ownership.

A large proportion of vkm are associated with travelling to and from work. Reducing the need to commute can provide significant reductions in vkm with very small investment. Another way to reduce the vkm, especially if people are not commuting as regularly, is to provide services and facilities closer to homes so that journeys are shorter. Active travel is a zero-emission option for shorter journeys, like those to neighbourhood facilities. Where the distance to travel may be too long for active travel, a well-designed and funded public transport system can provide high-quality and reliable travel which is competitive on price and time. Similarly, in cases where the demand for public transport is not sufficient, on-demand public transport or car/van-sharing solutions should be considered for provision.

This 2nd goal for the Transport Sector aims to reduce car use by some 785 million vkm, with an associated CO_2 saving of 232 kt CO_2e, whilst reducing car modal share to about 54% (see Figure 25 and

Figure 26).

Figure 25 – Current modal split

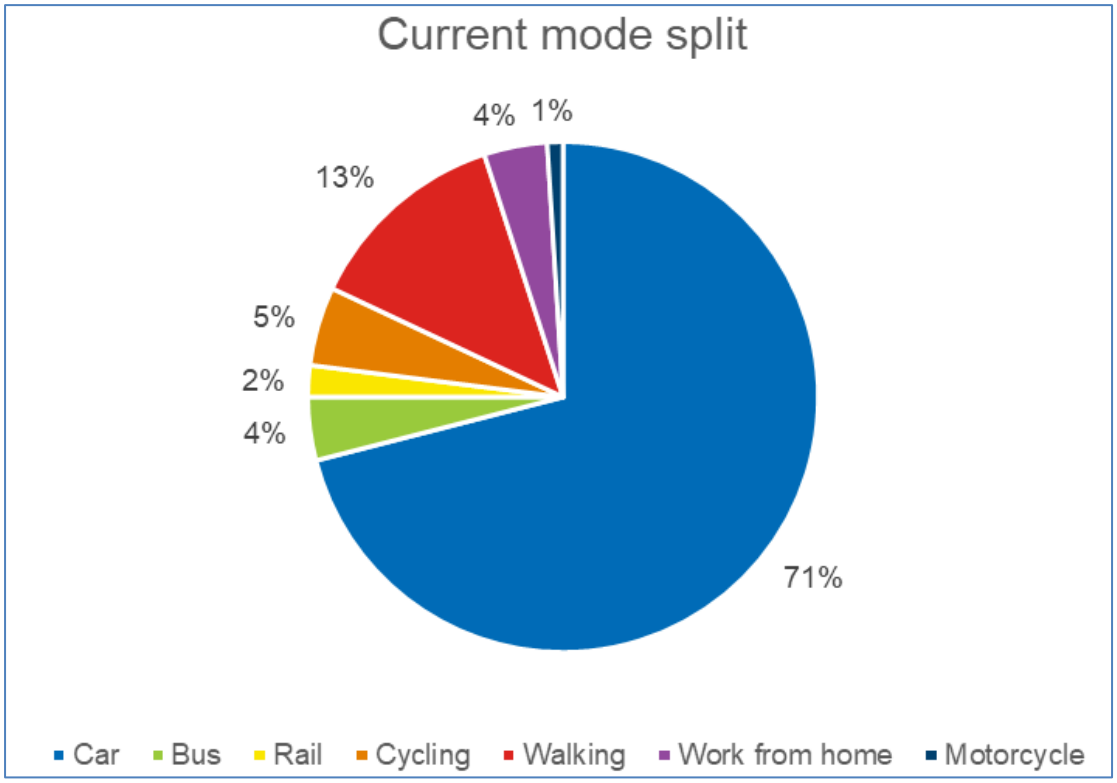
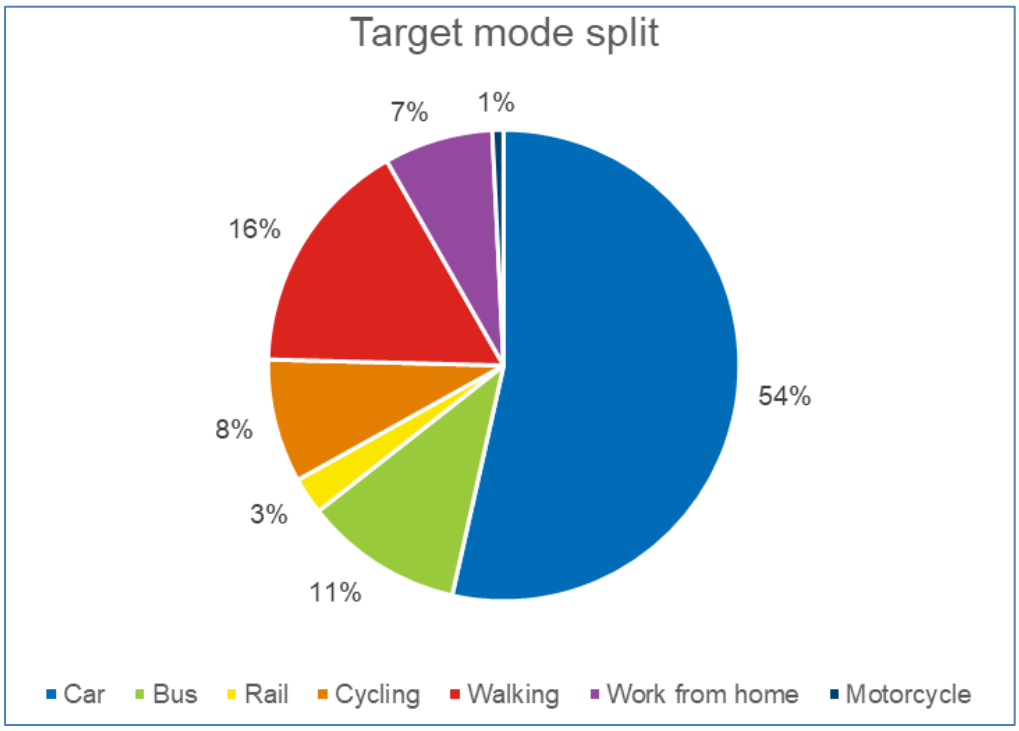


Figure 26 – Target modal split



To target the key behavioural changes mentioned above for this goal, the following outcomes have been devised to achieve the required 25% reduction:

Table 5 – Outcomes supporting Transport Goal 2 – Reducing car use

Outcomes	Key delivery partners	Cost
Increase homeworking	**District council and ISP** Employers and Employees	**£**
Develop community and neighbourhood facilities	**District council** Community groups, Employers and Employees	**£**
Provide walking and cycling infrastructure	**Suffolk Highways and District Planners** Community Groups	**£££**
Improve public transport	**Suffolk Council** Transport East, Bus Providers, Greater Anglia, Network Rail, Town Planners and Suffolk Highways and Taxi/Mini-bus services	**££££**
Increase vehicle occupancy and reduce vehicle ownership	**Suffolk Council** Businesses, schools, Taxi/Mini-bus services, vehicle sharing companies/platforms	**£**
Disincentivise car use	**Suffolk Council**	**£**

5.4.1 Increase home working

By increasing people's ability to work from home you can reduce the need for travel. Some people will need to continue to commute for work, however office workers are likely to be able to have the

flexibility to work from home. Continued home working, for those who are able to has an immediate impact at reducing vkm at no cost. Increased home working can be full-time or part-time.

As seen in the COVID-19 pandemic, businesses have been more adaptable to home working than many thought possible. It is important that the momentum related to home working during the pandemic is maintained. The return to a commuting lifestyle will not appeal to many employees and they may demand increased home working. Increased home working may allow businesses to have less workspace reducing employer costs. Reduced space for parking at work may act to encourage homeworking by disincentivising working in the office.

Remote working is only viable with high quality internet. Investment in broadband infrastructure will allow for reliable working conditions at home. The process of inputting high-speed internet into rural areas is very expensive and will take time[87].

5.4.2 Develop community and neighbourhood facilities

Reduction in vkm can be achieved by creating local hubs that contain the amenities that the local community needs. This action is particularly effective in rural locations where journeys are often longer and less likely to be carried out using an environmental mode of transport. More local facilities also provide a boost to the local economy. Advertising working and shopping locally will help these outcomes be successful.

Local shops can reduce the distance that people need to travel to get everyday essentials. Community work hubs can provide office-space which is closer to home, which provides the benefits that an office environment has whilst reducing the distances commuted. The shorter distance required to commute opens up the possibility to make the journey by active travel. Community work hubs are also a great way of overcoming the prohibitive costs of rural internet installation.

Developments in towns and villages should be designed in a way that facilitates lifestyles with reduced travelling. Larger new developments should come with the amenities that are required to reduce the need for travel. Through zoning and consents in the planning process, the Council can develop towns that reduce the need for travel at all. In the planning process through planning conditions and Section 106 can be used to ensure that developments have sufficient active and public transport facilities to reduce car use.

5.4.3 Provide active travel infrastructure

Suffolk Council should build on the success that they have had as part of the COVID-19 transport recovery[88] and continue to build infrastructure that improves the walking and cycling experience. This can occur in towns but also in rural locations roads can be designated Quiet Lanes making them more appealing to active travel. Additionally, Suffolk County Council should allocate sufficient resources to create Local Cycling and Walking Investment Plans to identify the key areas for investment.

Investment is required for walking and cycling infrastructure into key areas of commerce. The key reason to provide infrastructure for active travel is to improve safety, journey times and the experience. By improving these areas, the journeys can be shown to be more appealing than private vehicle journeys. Journey times are easily improved by creating the most direct route possible without the need to slow down, e.g. at lights and crossings. For walking, infrastructure can include: an increase in benches allowing those less mobile to rest, wide paths allowing wheelchairs and buggies

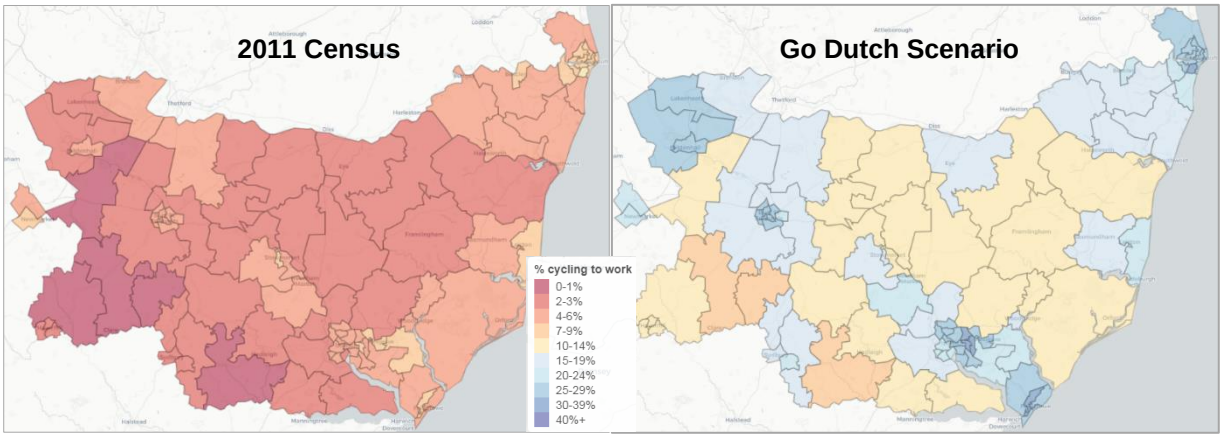
[87] https://www.econstor.eu/bitstream/10419/148695/1/Oughton.pdf
[88] https://www.suffolk.gov.uk/assets/coronavirus/SCC-TransportRecovery-PHASE2.pdf
https://www.suffolk.gov.uk/coronavirus-covid-19/advice-on-travel/active-travel-improvements-for-cycling-and-walking/

to travel easily and safe crossings of roads. Planting greenery along the route can also improve the experience.

Cycling infrastructure fits into two major categories: 1) cycle paths, and 2) end of journey facilities. Safe storage of bicycles is important, especially if the bike is to be left somewhere all day, e.g. work or a station. For cyclists who are cycling longer distances, the provision of showers is also important. Micro-mobility, especially e-bikes, are particularly exciting as they would allow an increase in the distance that people would feel comfortable commuting via bike, as well as providing users with a boost of acceleration away from the cars at the lights. For the safety of cyclists, where possible cycle paths should be separate from bus lanes and the main roads in general by using quieter back streets. Away from towns it is important the cycle paths join all key routes, joining up existing cycle paths, and these paths are maintained to a sufficiently high standard for continued use leading to permanent mode shift.

Currently, walking or cycling account for 18% of journeys but there is significant room for improvement, especially around economic centres. Figure 27 shows the locations where cycling ambitions can increase the most. Rural areas have a slight increase in cycling, but the most marked areas of improved cycling are in and around urban centres where the percentage of people cycling to work can be greater than 20%.

Figure 27 – Map of potential cycling ambitions



Micro-mobility are personal mobility solutions that solve the ‘last-mile’ issues. Micro-mobility allows people to cover the last mile in a more time efficient manner and therefore cut down their journey times from walking the last mile. Last mile solutions are usually electric or active and can increase the range people feel comfortable travelling not in a car. Micro-mobility is a rapidly developing area and the legislation that governs it is developing so this can only be pursued if the legislation is favourable.

It is understood that not everyone is able to active travel and therefore sufficient alternative options are required, e.g. on-demand transport services and accessible public transport.

5.4.4 Improve public transport

In Suffolk, bus transport is the focus of the public transport system. It is important that people are happy and able to use the bus. For people to use public transport it has to be comparable in price, journey time and experience. Information about the comparative costs of car ownership vs bus usage should be made available online for everyone to access. Journey planners that provide accurate journey time estimates should also be made available.

Bus quality partnerships are agreements between local authorities and bus operators. The operators often agree to commit to improving the quality of buses, whilst the authority look to put in bus infrastructure. Local authorities can also look to provide the bus services in a franchise model, where the local authority determine the routes and fares to provide a top down controlled model where the service is run under contract through a competitive tender process. This will provide consistent pricing and make sure that services run in all areas that are required. This may come at additional cost as the local authority may need to subsidise routes as part of the tendering process. For more rural locations, the need for regular services might not exist and to overcome this the provision of community or demand responsive transport (DRT) services can be explored. This is particularly useful for the elderly and disabled.

Reliability of buses is less in control of the operators than trains due to other road users. A key change to road usage through bus priority (e.g. bus lanes, priority signals or avoidance of one-way systems) will improve the reliability of journey times and provide journey times that out-perform car journeys. Bus lanes often cause annoyance from car users due to increased congestion, however, this increased journey time will act as a deterrent and start to cause modal shift.

If people are to take journeys via buses, significant investment is also required at bus stops. Provision of covered bus stops make it a viable option all year around, and the provision of up to date information on the next buses coming to the station are also important. Bus stops need to be accessible for the disabled and elderly.

Additional outcomes can be added to control congestion which will improve the reliability of the service. This will already be improved through all the outcomes targeting reducing vkm. Additionally, this can be done via charging mechanisms which accounts for the externalities of their car use. Mechanism for this include road user pricing or low emission zones, however prior to this information about the external costs of a car's journey should be made readily available. Another way to reduce congestion is the creation of park and rides. This is where large car parks are created on the edge of town on arterial roads and a regular fast and reliable bus service runs people into the centre of town. This reduces congestion on the roads that can handle it the least.

The Greater Anglia service won an award for reliability[89], and with newer trains joining the fleet the reliability should increase and provide a better experience. Nicer train stations and increasing the number of services, especially direct commuter services in the morning can also increase the reliability and experience of using the train.

One of the key advantages of private vehicle ownership is the door-to-door manner of the primary transportation. Public transportation may require additional journey legs, with multimodal journeys including active travel to stops or connection to another form of public transport. Therefore the provision of cycle facilities at key transport husband good pedestrian access is important. Optimisation of the public transport system will help to reduce waiting times and therefore overall journey times.

To make the multimodal transport modes easier and more transparent, a ticketing service that is integrated across all modes allows for quick ticketing. This can be done through a Mobility as a Service (MaaS) app which can perform both journey planning and ticketing. MaaS can run either as a pay-as-you-go or subscription service (similar to season tickets). An easy to use app will make the process of travelling by public transport, especially multi-leg journeys a nicer experience by providing clear information in a single location about the journey. Developing such systems required the full

[89] https://www.greateranglia.co.uk/reliable

buy-in of all the operators in the area plus the implementation of a back-office system to allow the integration.

5.4.5 Increase vehicle occupancy and car sharing

Carpooling is the action of sharing a ride with someone who is making a similar journey. By sharing the journeys it is possible to reduce costs, congestion and emissions. As a result of travel plans, it may be that many people commute from similar start locations to similar end locations. These people could viably car-pool. When the demand for particular journeys is higher still, it may be possible to arrange Van Pooling services which uses the same principle but transporting more people (often using taxi-like vans rather than individual cars).

A new model for vehicle usership has arisen in recent years which uses short-term vehicle usership. It started in the form of bike sharing e.g. Boris bikes, which has evolved to include e-bikes too. This model is now available in cars and vans too. Car clubs provide availability of a car without any of the costs associated with car ownership. Car clubs are run by a third party and will often use electric vehicles. Car sharing works on a similar principle but is a peer-to-peer lending platform. By providing services like this, it is possible to reduce people's reliance on cars and over-time private vehicle ownership will decrease.

5.4.6 Disincentivise car use

Educating car users on the true costs of car use both to themselves and the externalities of their car use may provide the information that stops car usership. This information campaign could prove particularly useful as travel to work becomes less frequent.

Actions can be made to discourage the use of private vehicles through increasing the relative costs of private vehicles through increased costs. By increasing the costs of private vehicle usage, ownership will decrease as other modes of transport are used. This however, can not be implemented until the services for other modes of transport have sufficient coverage and quality. Once this is in place reducing the availability of parking and increasing the cost of that parking will create the correct financial incentives to stop using cars.

Additional levers can be used to change the relative attractiveness of modes of transport through the planning process. Two key ways of doing this are through the management car parking capacity or through transit-orientated developments. By providing less car parking or providing good public transport and active travel facilities in new developments these will be more appealing and enable the behavioural change required.

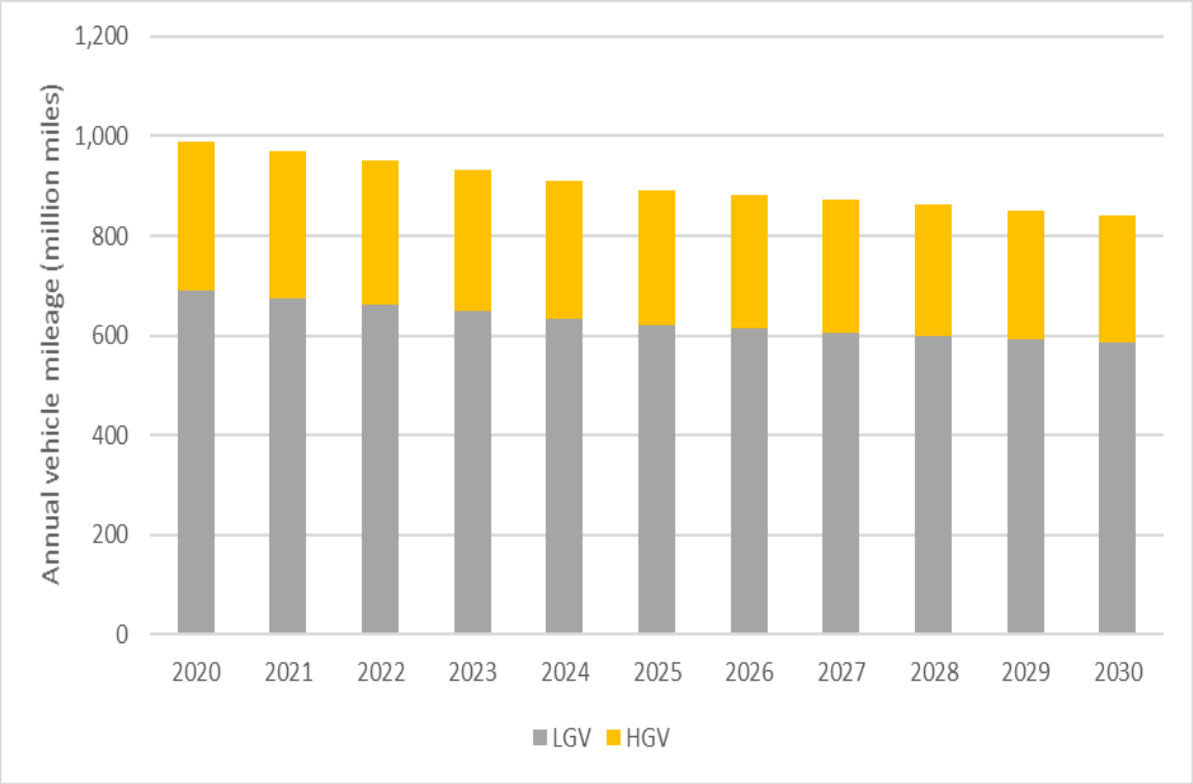
5.5 Goal 3 – More efficient freight

On road freight can be transported by both HGVs and LGVs. HGVs are typically used for transportation of goods long distances and LGVs are better suited to shorter distance deliveries. HGVs account for 7% of road traffic, but a and LGVs account for 16%, accounting for 26% and 13% of total GHG emissions respectively or 40% of total transport emissions. Although a far smaller percentage than private vehicles, unlike vehicles used for commuting which sit stationary for large portions of the day, HGVs and LGVs are likely to be driving all day and so have a much higher average annual mileage. Thus reduction in freight traffic will not only have a proportionally higher impact on carbon emissions than private vehicles, but also on congestion.

However, reduction in freight mileage by 15% in 10 years will require significant behavioural changes to achieve this. Reducing freight traffic by 149 million miles a year by 2030 from a 2020 base year will equate to ~96 kt CO2e. Reductions in freight are more challenging than private vehicles as it is much

more challenging to use another mode of transport. Therefore, as seen below, the reductions in mileage are more limited.

Figure 28 – Target reduction in freight traffic



This strategy requires a reduction of 15% of freight vkm. The key behaviour change to achieve the reduction in vkm is to increase the efficiency of freight by making sure that the vehicles on the road are full and driven efficiently, or to move road freight to rail. The outcomes considered to deliver these behavioural changes are:

Table 6 – Outcomes supporting Transport Goal 3 – More efficient freight

Outcomes	Key delivery partners	Cost
Increase efficiency of road freight deliveries	**Freight company, Suffolk Council, Transport East** Local businesses	**££**
Support development of rail freight at Felixstowe Port	**Felixstowe Port, Network Rail, Transport East**	**£**

5.5.1 Increase efficiency of road freight

Delivery and servicing plans (DSP) look to manage and co-ordinate trips to the same sites from different suppliers. For example, if two eating outlets get some items from one retailer and others from another then there could be four drop offs, but a DSP would coordinate it so that only a single delivery at each site is required. The costs of a DSP for a local authority come through facilitating conversations of different suppliers to the same types of retail outlets. Last mile deliveries are around £3.50[90] which is a cost that can be saved by those making the deliveries.

[90] https://www.centrallondonfqp.org/app/download/12244762/SLFCC+Feasibility+Report+v3.pdf

A freight quality partnerships (FQP) work by grouping freight operators and local councils together to better deal with deliveries. FQPs look for the development of an integrated sustainable distribution system. A key step in designing the FQP is understanding the system in its current state and identifying areas for improvement. Areas of improvement can be provided by local authorities through provision of: signage, strategic routes, loading and unloading bays; and lorry rest provisions. The freight sector can: make sure of efficient vehicle utilisation and driver trainings.

Freight management schemes can provide additional emission reductions through increased efficiency. In addition to the outcomes above, this supporting outcome could further reduce emissions on an individual company basis. These schemes, although they can be done by a collective can also be done by individual companies and drivers. An example of this is the Eco Stars Fleet Recognition Scheme. This scheme provides freight operators with accreditation for public recognition for better freight practices. It may be possible to engage with businesses to better track their fuel usage in relation to freight delivered. By tracking companies individual fuel usage against a target it will be possible for companies to determine where improvements to the efficiency of their deliveries can be made.

5.5.2 Support development of rail freight at Felixstowe Port

Rail freight is currently considered to be 76% more efficient than road freight, 88% if the railway is electrified and 100% better when the electricity grid is decarbonised. Rail freight is more economical than road freight so is beneficial to freight companies. All freight that is transported by rail rather than road, not only improves the efficiency of moving the freight but also acts to reduce congestion on the roads and increases the overall efficiency of the road network. Rail freight is suitable for transporting larger bulk goods over long distances, so a shift from road to rail is only suitable in some sectors of the industry and requires suitable rail infrastructure at both ends of the journey. Rail lines are outside direct control of a local authority, but supporting the development of rail freight out of Felixstowe Port is important for the overall strategy. Suffolk Council should lobby national government to help increase the capacity of rail freight and help removing lorries from the roads.

5.6 Goal 4 – Transition to zero emission fleet

Zero emission vehicles, typically electric vehicles (EVs), have no CO_2 emissions on the road. For EVs, emissions may still be related to electricity generation in the grid, but as the grid decarbonises then EVs will truly become zero emission. EVs have some limitations, primarily longer distances, for which other low/zero emission fuels are available e.g. hydrogen or biofuel/biogas. But as range and recharging infrastructure increases this limitation is reduced.

Zero emission vehicle technology will need to be a key element of the strategy, as without it, Suffolk has no chance of becoming carbon neutral in the transport sector. Figure 29**Error! Reference source not found.** shows the emission reductions expected to be achieved without low/zero emission technology (13%), whereas Figure 30 shows the reductions with low/zero emission technologies (the remaining 87%). This equates to ~1400 kt CO2e additional CO2e reduction when implementing EVs.

Figure 29 – Emission reductions without low/zero emission vehicle technology

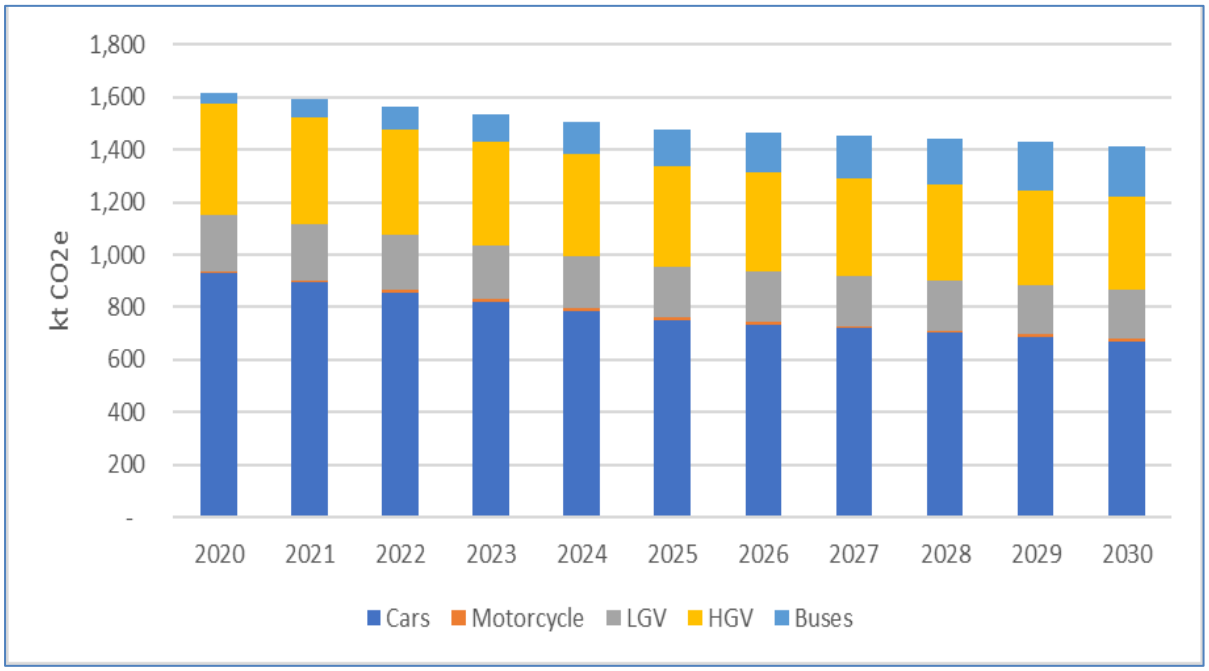
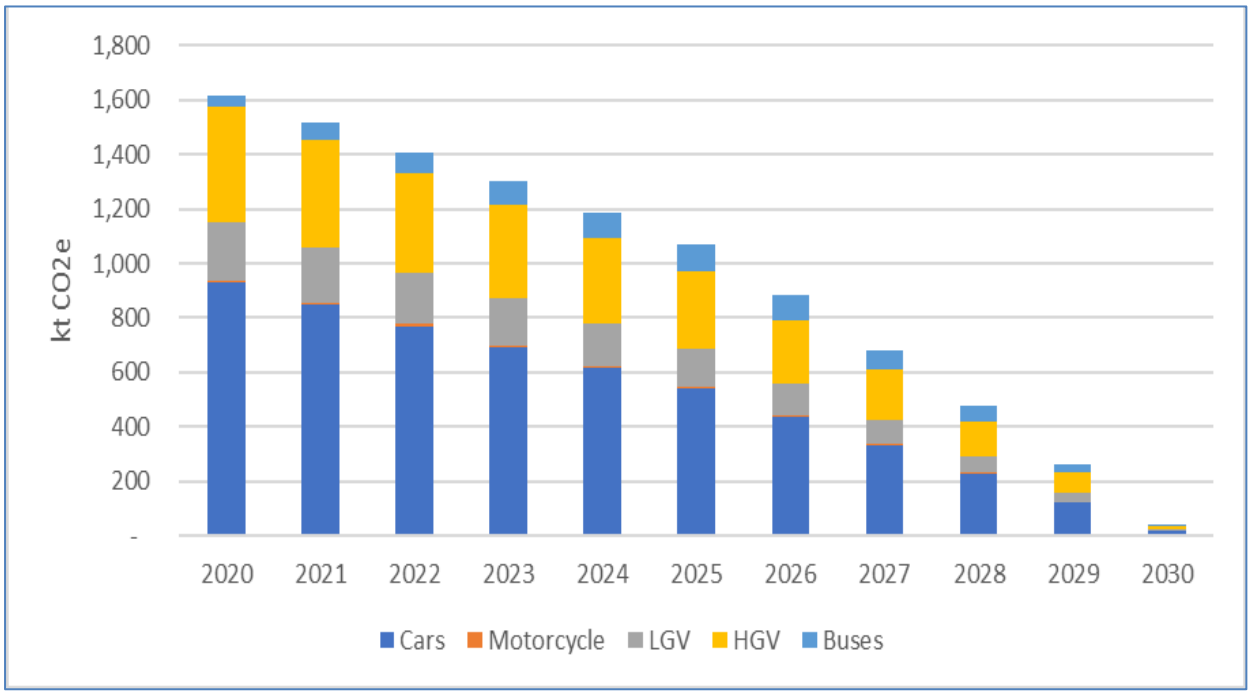


Figure 30 – Emission reductions with low/zero emission vehicle technology.



To achieve the reductions required all fleets in Suffolk will need to become zero emissions. This includes bus, freight, business and private vehicles. Significant public engagement will be required to win over the hearts and minds of those who are reluctant to change. Those reluctant to change to EVs will need significant information and advertising campaigns to pursuade them to change to EV. There is also an signficant economic dimension that will need to be adressed, at least initial, as the in itial captial costs of EV's and other zero emission technologies will be high, albeit operating and whole life costs may be lower than existing technology.

Although Suffolk Council are able to control some elements of the widespread electrification directly, e.g. buses and to a lesser extent businesses including taxis, the majority of the change has to come from private vehicle ownership. This strategy requires private vehicle owners to replace over 300,000 vehicles (at a cost of £9 billion). Similarly, the freight sector will require the electrification of ~50,000 LGVs and trucks.

The outcomes selected to achieve the required decarbonising of the vehicle fleet are:

Table 7 – Outcomes supporting Transport Goal 4 – More efficient freight

Outcomes	Key delivery partners	Cost
Create zero emission bus fleet	**Bus companies** Suffolk Council	**£££££**
Develop comprehensive set of incentives	**National Government and Suffolk Council** Private vehicle owners	**£**
Comprehensive private vehicle electrification and residential charging	**Suffolk Council** Private vehicle owners, Businesses, Transport East, UK Power Network and EV Charging Network	**£££££**
Encourage low emission freight	**Suffolk Council** Freight companies, Felixstowe Port, local businesses, LGV and truck owners	**£££**

For EVs to thrive a study into the grid capacity and resilience is required followed by grid reinforcement. It is also possible to link the charging to distributed renewables that will allow for direct charging using renewable energy. The significant development around on and off-shore wind in the county will contribute to this local decarbonisation of electricity.

5.6.1 Create a zero emission bus fleet

With a significant switch from car to buses it is important that these vehicles also transition to zero emission technologies. This switch will need to occur for both renewed and additional fleet to manage the shift from private cars. The total level of ambition for this outcome equates to ~5,000 electric buses.

Making urban buses, especially park and ride buses, electric is a key priority. Electrification of urban buses has the added benefits of improved air quality in high exposure locations. The shorter routes that are covered by urban bus services will reduce the costs required to supply EV charging to the bus network. Once the urban and park and ride buses are electrified, the next stage is to expand the geographic area that electric buses operate in by increasing the number of buses and charging stations so as to include the local bus services too. Charging infrastructure should focus on bus depots followed by bus terminals. A key step for Suffolk council is to identify the optimum locations for charging infrastructure and the type of charging infrastructure. Careful planning will allow for buses on longer routes not to be impacted during daily duties.

Some of the more rural bus routes are unlikely to be able to be electrified. Other options will need to be considered in the longer term to identify other fuelling options (biogas, biofuels and hydrogen).

5.6.2 Develop comprehensive private vehicle charging infrastructure

Whether right or wrong, there is a perception that electric vehicles are not as reliable due to a fear of not being able to refuel. For most day-to-day activities the range of electric vehicles should not be an

issue. Overnight charging at home or charging during the day at work should be sufficient. Additionally, if the council can prove demand (now or in the future) there is the Onstreet Residential Chargepoint Scheme that will provide a grant to assist in the cost of on street charging infrastructure.

To become carbon neutral, Suffolk needs almost complete electrification of the private vehicle fleet. Until the perception changes about charging there is need to add rapid charging points and hubs in highly visible locations e.g. long-stay car parks and outside public buildings. These locations will provide confidence to potential EV owners that there would be sufficient charging available for them if they were to make the vehicle change.

Suffolk Council has already made important strides (together with EO Charging and Bulb) in establishing Plug in Suffolk is the UK's first truly open public electric vehicle fast charging network. This initiative has established a viable partnership and business model for rolling out public charge points across the county, and importantly, using the charge points has been made easier through a simple pay-as-you-go model. District councils, who own many of the car parks will be key in the delivery of charging facilities in these car parks.

Taxis can travel long distances over the course of a day, so to encourage the uptake of electric vehicles charging hubs could be set up at key pick-up/drop-off locations, e.g. train stations and large businesses. This would have the benefit of improving air quality in areas with high exposure.

Suffolk Council should approach major businesses to encourage the implementation of electric vehicle charging at work. This provides a charge location where a car will remain for a long time and would be very useful, especially to those who are unable to charge at home.

A huge amount of investment for private vehicle charging. Unlikely more metropolitan areas, the ability for private charging is easier due the availability of off-road parking and even on-street parking which is not feasible for many cities. Suffolk will require ~330,000 private vehicle charging sites, which will typically be slow charging for use overnight. Private investment is likely to be greater than £500 million.

5.6.3 Incentivise zero emission vehicle uptake in private vehicles

It is challenging to expect such widespread change in such a short period of time without the correct financial incentives being in place. Incentives of this nature typically come from the National Government with subsidised purchases through grants, changes to road taxation, or even bans of internal combustion engine (ICE) vehicles. The National Government recently banned the sale of new ICE vehicles after 2030 which provides a clear signal to consumers. However, due to the lifespan of a car it would be expected that ICE vehicles will be on the road for ~10 years past the ban. Therefore, the current plan is to encourage people to change to EV long before it is mandatory and therefore significant additional help is required in relation to infrastructure and incentives (some of which will need to come from National Government).

The best way to create a behavioural change is to change the economics of the decision making. There are a number of different tools and incentives that can be used either financially or through preferential treatment. Businesses and taxis are easier to incentivise than private vehicles. For example, taxis licencing could be changed to encourage the uptake of EVs.

The national government provide a number of schemes helping people overcome the higher financial costs associated with purchasing EVs. These schemes act as a financial driver to speed up the turnover of the fleet and increase the number of electric vehicles on the roads. This financial help might be in relation to the charging infrastructure, the purchase of the car itself, or scrappage of an old ICE car. Suffolk council can advertise these schemes and provide assistance to those looking to

apply. Despite this the early adoption of EV's is likely to be mainly in the domain of higher income groups and so additional support or alternative solutions may be needed to manage this equity issue.

Highways England in September 2020 launched an electric vehicle 'try before you buy' scheme, pledging £9.3m to allow businesses to try electric vehicles for 2 months. Suffolk Council can apply to receive funds to implement a 'try before you buy' scheme. Other financial mechanisms that can be attempted are to loan or lease EVs which negates some of the higher upfront costs of ownership.

Parking space that are only reserved for green vehicles that are in prime parking locations, and maybe with charging could make EV vehicle ownership more appealing than that of a normal car.

Providing preferential costs to parking may be enough of a lever to create an increase uptake of EVs. Free parking could be offered to EV drivers in the centre of towns or, if they require it, outside their residence.

Additionally, Suffolk Council can lobby the national government for more scheme and financial aid to create the vehicular turnover required to achieve Carbon neutrality.

5.6.4 Encourage zero emission freight

Freight is a key transport sector that needs to decarbonise. The growth of online purchases has meant that in many cities LGV mileage is actually on the increase. If this trend continues, the importance of decarbonising the freight sector increases.

The first step of creating zero emission freight is through tackling 'last mile' delivery first. The best option would be through cycle freight where practical. Where this is not possible, electrification of more than 50,000 LGVs and small trucks is required. This will require investment in charging infrastructure at key locations, e.g. industrial parks and key drop off locations. Charging infrastructure for freight should expand on the public charging network that will be established for cars.

Many of the incentives for private vehicle uptake will also apply to freight. The outcomes that target businesses will likely have more impact e.g. 'Try-Before-You-Buy' and lease/loan options. The financial savings associated with EVs are likely to be greatest in the freight sector.

Heavy duty vehicles (HDVs) are harder to make zero emissions due to the longer distances that are typically travelled. HDVs would require so many batteries that it is unfeasible for them to become electric. HDVs also carry significant mass which requires a lot of energy to move. Hydrogen fuel cells should be the priority, although consideration of biogas is important, along with other biofuels. Hydrogen East are already doing great work exploring the use of hydrogen in this area. Both investment in new vehicle technology and fuelling infrastructure will be required. A key target will be working with large hauliers and distributions hubs. There may also be opportunities to link hydrogen production with wind power resources in the county.

5.7 Synergies between actions and other sectors

With any sustainable transport strategy, the approach needs to be holistic. All of the actions discussed need to be considered together. Travel plans will act as a key tool to join up transportation thinking across different modes.

Community and neighbourhood facilities need to be connected via active travel routes and buses, they should act as central points for transport which will embed their success. Public transport needs to facilitate key journeys at key times, whilst the stops need to provide sufficient secure storage of micro-mobility or bikes. The timetable of public transport needs to be considered, so that key

connections on services are made. A bus that arrives at a train station 5 minutes before a train rather than 5 minutes after a train will have very different usage.

To create the behavioural change required a viable alternative is required. Reductions in car journeys cannot be expected without creating the correct levers. To generate a mode shift you need to disincentives the unfavoured mode whilst incentivising the favoured mode. For example, by providing bus lanes for exclusive bus usership, bus journey times improve whilst increased congestion disincentivises the use of cars due to increased journey times.

There are many interactions between the transport actions in this chapter. Taking cars off the road will increase the efficiency of the transport system by reducing congestion. Reduction in the journeys travelled by car reduces the scale of electrification. Reducing the inefficiencies in the freight sector will also reduce the scale of electrification.

Electrification of different fleet types and the infrastructure required for those fleet types have been discussed separately in this chapter due to the level of control that Suffolk Council has over these fleets and the levers that can be used to create the change. However, the infrastructure for charging that will be implemented should not be considered in isolation but should be considered as parts of a complete system and charging infrastructure should be shared between vehicle classes.

The key themes in the transportation actions interact, but there are also additional interactions between other areas of the Carbon neutrality strategy. Widespread electrification of vehicles will significantly reduce the emissions from the transport sector, but there will still be emissions from the electricity coming from the grid until the grid fully decarbonises. With an increase in EVs the increase in the electricity being drawn from the grid, and the temporal pattern which the electricity is required will change. A key element to deal with the increase in electrical demand is through grid reinforcement. Storing electricity is another way of overcoming the change in electricity use patterns. Electricity usage for a completely electrified fleet would equate to additional electricity demand of 1000GWh (30% of current consumption).

Increasing the penetration of renewables in Suffolk and utilising the high wind potential will further green the electrification of the vehicle fleet. One specific way of doing this would be to add renewables at locations like bus depots by putting PV on the roof. Long distance HGV haulage will also require renewable technology and will need to be considered in the wider context of biofuels or renewable hydrogen.

The strategy discussed in this chapter will come with significant benefits to the people of Suffolk. Increased home working reduces waste time commuting which can have significant personal benefits. Staying local also increases the sense of community and boosts small local businesses. Increasing active travel will have health benefits for those who partake in it. The infrastructure development related to active travel will also provide better shopping environments in towns which will act as a boost for the local economy. Reduction in road traffic, and the electrification of the remaining vehicles will improve air quality.

5.8 Key messages and priority actions

Suffolk's current local transport plan is from 2011 and runs to 2031. The first key step is to update this document to include consideration of the recommendations set out in this chapter. This document will then provide a single document covering all the transport strategies and make sure that they align with carbon neutrality ambition.

To understand the situation of travel in Suffolk, and how it has changed due to COVID is important. One of the first actions would be to get up to date data through a county wide travel survey. The

Council should evaluate the results to determine the best actions to take and make sure the travel demands of the county are met. Suffolk Council should then work with schools, businesses and attractions to further develop and update travel plans to help reduce car use.

A key element of the transport goals is to get people out of cars and into more sustainable modes of transport. One easy way to do this is to discourage car use. This can be achieved by increasing the costs of parking, reducing parking availability, lowering priority for cars at junctions (below buses, pedestrians and bikes) and reducing road space for cars (by adding bus lanes, widening pavements and adding cycle lanes – where space allows it).

Below are the implementation plans that will be required to make the improvements to lead to carbon neutrality by 2030. The implementation requires fast and aggressive action in the transport sector as an overhaul of the status quo is needed.

To get anywhere close to carbon neutrality by 2030, the entire transport sector needs to electrify (with some use of hydrogen for larger vehicles). This requires massive investment both privately and publicly. To help to reduce the requirements for vehicle electrification, and associated charging infrastructure, a target 25% reduction in car use and 10% reduction freight milage is proposed.

Although COVID-19 has been devastating, it has provided some key opportunities that should be taken advantage of to help manage travel demand. Primarily, the reduction in traffic as associated with increased home working and the increases in active travel. It is essential that momentum on these issues is maintained.

Suffolk Council should work with businesses to encourage the continued working from home where possible. Suffolk Council should stimulate the development of community and neighbourhood facilities. In existing locations this may be to provide financial help to start the facility, whereas in new developments it may be through the use of the planning application procedures.

Walking and cycling infrastructure can be actioned relatively quickly. Implementing the correct infrastructure can create modal shift, but can also transform roads and shopping areas. Active travel infrastructure needs to connect the key public transport hubs to allow for multi-modal transportation in an efficient manner. This may include the use of short-term bike/e-bike rental models and other micro-mobility solutions

A key element of any sustainable transport system is a reliable public transportation system. Suffolk Council should consider a Bus Franchise, Bus Quality Partnership or Supported Bus network approach to have increased control over the bus network. To improve the reliability of buses, priority should be given to buses through: signals; use of more direct routes; and bus lanes. To mitigate congestion and increase the reliability of buses, park-and-ride facilities can be created near major road junctions on the edge of town providing reliable access to the town centre and avoiding high parking charges. Suffolk should identify key strategic investment opportunities with Greater Anglia and Network Rail to increase the modal share of trains. Successful public transport systems now rely heavily on mobile phone applications to relay information about time and pricing of journeys. Suffolk Council should look to invest in the development of a MaaS app to facilitate public transport usage.

Following the transport surveys and plans, Suffolk Council will know not only where the demand for journeys is but where demand is not high enough for public transport. Suffolk Council should act as a match maker between users and on-demand transport providers. This can work as on demand services for rural locations or through car-pooling/van-pooling. This can provide transportation for people who would otherwise rely on cars. Other actions to reduce car ownership, is for the council to further explore carsharing and car-club opportunities.

Suffolk Council should facilitate the improved efficiency of road freight through engagement with freight operators to sign them up to delivery and service plans. Suffolk Council could perform a study on the feasibility of consolidation centres in the Borough. If feasible, the Council should identify potential locations and tender the running of the service. In the tender, the Council should add clauses to encourage the use of EVs for deliveries from the centre. Suffolk Council should develop freight quality partnerships and agree to improve signage, provide loading bays and lorry rest provisions. In addition, Suffolk Council should encourage the training of increased efficiency of freight drivers through schemes like eco-stars. For rail freight, the council should continue to support the investment at Felixstowe Port.

As the mode shifts from cars towards public transport it is important that buses become electric. With the increased control that the Council has over the bus network through a Bus Franchise, Bus Quality Partnership or Supported Bus system, the Council can mandate e-Buses whilst provide assistance in getting the relevant funding for the buses and the charging infrastructure. By far the most challenging outcome of the transport strategy is the complete electrification of the private vehicle fleet. Suffolk Council has more limited policy levers to use for this and requires the support of the National Government to provide clear signals and financial aid. However, Suffolk Council can use the levers of infrastructure, incentives and information.

Suffolk Council has control over public charging locations and should apply for funding from National Government especially to build fast and rapid charge points at key locations. Suffolk Council should encourage major employers to pursue the Workplace Charging Scheme and help with applications. The Council can also apply for On-Street Charging from the national government to help in more residential locations. Due to Suffolk's rural setting, off-street parking is available for many and therefore overnight charging at home is an option for many. The Council should advertise the Electric Vehicle Homecharge Scheme and help with applications when required.

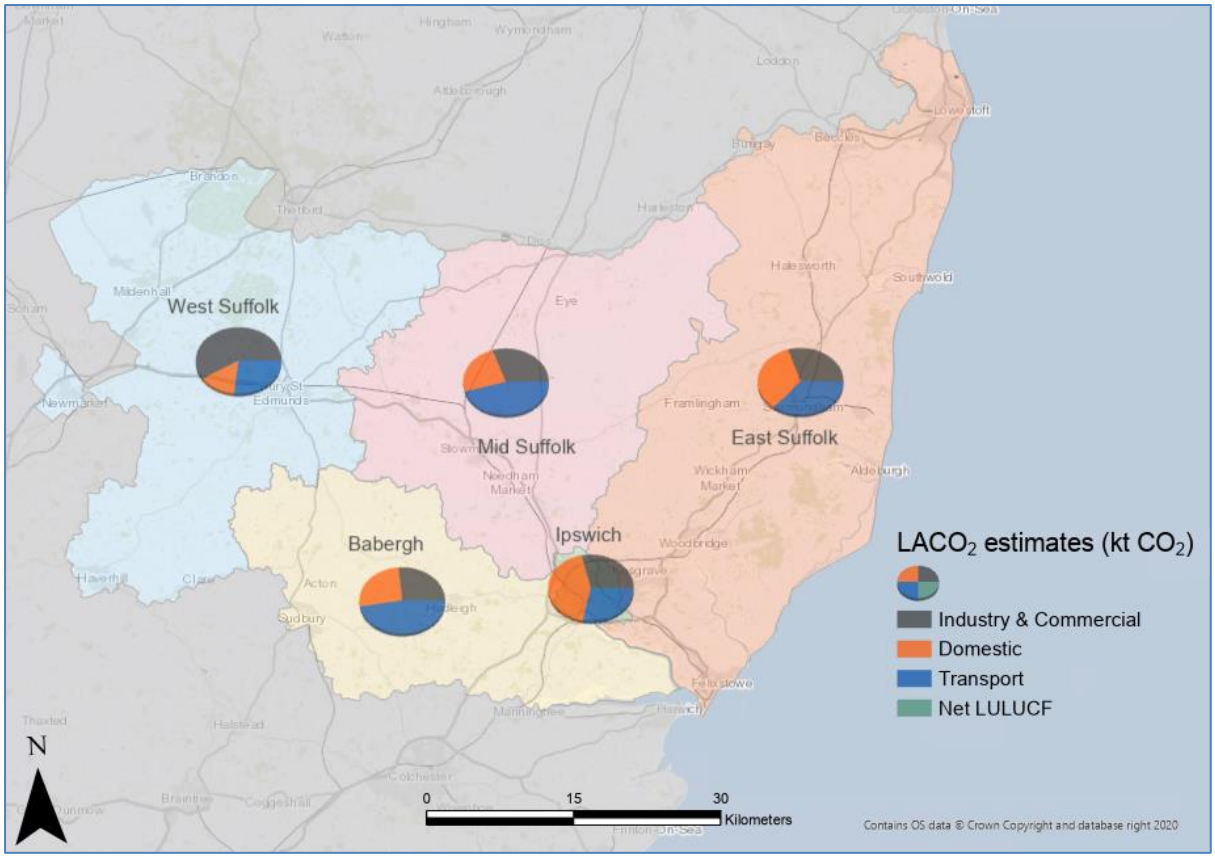
Businesses and taxis are easier to incentivise than private vehicles through changes to rates and licencing. Additionally, there are schemes set up toward private businesses including 'try-before-you-buy' and loan/lease schemes. Incentives for private vehicle users is more challenging but can be achieved by Suffolk Council who require significant help from National Government. It will be important that Suffolk Council advertise the availability of any funding available and provide assistance to those who require it during applications. One of the best ways to incentivise private EV uptake is through changing the costs of parking. Electrification of LGVs and trucks can be encouraged in the same way as cars – through increasing charging infrastructure and incentives. Zero-carbon HGVs are more challenging and the solutions are not well established. Suffolk Council should promote the technology that develops in the coming years. The priority actions for the sector are included in the Suffolk Climate Emergency Plan, and the Table of Actions.

6 Commercial and industrial energy use

6.1 Commercial and industrial carbon emissions in Suffolk

The commercial and industrial sector includes energy use in non-domestic buildings (including commercial buildings such as shops but also public sector buildings such as Council offices) and energy use in industry. Total CO_2 emissions from commercial and industrial energy use in Suffolk fell by 29.3% between 2005 and 2018 (the latest year for which we have emissions data) and represented 42.3% (1,782.95 kt CO_2) of total CO_2 emissions in the county in 2018. It is therefore clear that decarbonising the industrial and commercial sector is key to achieving net zero across the County and is particularly relevant in certain districts. The industry and commercial sectors contribute the most to emissions in West Suffolk, since several large manufacturers are situated in this area, such as British Sugar and Pauls Malt Ltd. This is illustrated in the figure below. West Suffolk's main industrial sectors are business administration and support services (19.1%), health (11.7%) and manufacturing (10.6%)[91].

Figure 31 – Local Authority CO2 estimates by sector for Ipswich, West, Mid and East Suffolk areas.



Large industrial and commercial energy users in Suffolk primarily consist of organisations related to food and drink production, manufacturing and technology, health and water management. Smaller industrial and commercial energy users in the region include sectors such as finance, retail, sport and entertainment, education, and hospitality. This is a very diverse sector, meaning that the carbon neutrality solutions will vary depending on the specific sub-sector in which the energy is being used. Emissions from industrial and commercial sectors can be grouped into energy-related and process emissions. Energy-related emissions are those which arise from fuel combustion and fugitive

[91] Strategic Framework 2020-2024 (2020), p.9, available online at: https://www.westsuffolk.gov.uk/Council/Policies_Strategies_and_Plans/upload/StrategicFramework2020-2024.pdf

emissions from fuels[92]. Process emissions are the direct result of physical production processes or chemical reactions, including waste gases, such as those produced from a furnace[93]. Both energy-related and process emissions are relevant to the achievement of carbon neutrality in Suffolk, but the focus of this report and the accompanying action plan is on energy use. Some of the common energy uses within the commercial and industrial sectors include; lighting and space heating, refrigeration, transport of goods and industrial processes such as dust extraction, air compression, drying and separation, running motors and distillation[94].

6.2 Technological options for decarbonisation in the commercial and industrial sector

Exploring this in more detail, the uses of energy are varied within the commercial and industrial sectors. Within the food and beverage industry, **62%** of total energy demand goes toward process heat[95], while the rest is mostly used for cooling/refrigeration and space heating[96]. Meanwhile, almost 40% of the energy used in the textile and clothing industry goes toward space heating[97]. Energy consumption within other industries, which include manufacturing of wood and plastic products, waste and water collection and treatment, mostly contributes to running motors (40%), low temperature processes (23%), drying/separation (12%) and compressed air (9%)[98]. Therefore, mitigation options need to be targeted depending on the activities and processes of each sector. For instance, if most energy goes toward space heating, the primary mitigation options would need to include improving insulation of the building, using electric heat pumps (or other forms of decarbonised heat) and deriving energy from renewable sources[99]. If a large proportion of energy use goes toward processes such as compressed air or running motors, mitigation options should focus on improved efficiency (minimizing pressure drops, waste heat recovery) and good maintenance (changing filters, fixing leaks)[100].

Some processes within the commercial and industrial sector are predominantly fuelled by natural gas, including high and low temperature processes, drying/separation and space heating. Meanwhile, compressed air, lighting, refrigeration and running of motors all use electricity[101]. Solid fuels and oil can also be used for space heating, drying and high temperature processes[102]. Converting to

[92] EN01 Energy related greenhouse gas emissions (2015), available online at: https://www.eea.europa.eu/data-and-maps/indicators/en01-energy-related-greenhouse-gas-emissions/en01
[93] Waste gases and process emissions sub-installation (2011), p.5-7, available online at: https://ec.europa.eu/clima/sites/clima/files/ets/allowances/docs/gd8_waste_gases_en.pdf
[94] The future role of energy in manufacturing (2013), p. 11-12, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/285771/ep11-future-role-of-energy-in-manufacturing.pdf
[95] Not to be confused with process emissions. This refers to heat that is generated to be used in an industrial process, and the emissions that are associated with the combustion of fuels to generate that heat.
[96] Discover process heating (2020) available online at: https://www.trust-ee.eu/discovery/discovery-center#:~:text=What%20is%20industrial%20process%20heating,and%20biomass%20supply%20these%20processes.
[97] Energy consumption in the UK (2020), ECUK: End uses data tables, Table U4, available online at: https://www.gov.uk/government/statistics/energy-consumption-in-the-uk
[98] Energy consumption in the UK (2020), ECUK: End uses data tables, Table U4, available online at: https://www.gov.uk/government/statistics/energy-consumption-in-the-uk
[99] Ofgem's Future Insights Series, The Decarbonisation of Heat (2016), p.7, available online at: https://www.ofgem.gov.uk/system/files/docs/2016/11/ofgem_future_insights_programme_-_the_decarbonisation_of_heat.pdf
[100] Capturing the full electricity efficiency potential of the U.K (2012), p.17, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48456/5776-capturing-the-full-electricity-efficiency-potentia.pdf
[101] Energy consumption in the UK (2020), ECUK: End uses data tables, Table U4, available online at: https://www.gov.uk/government/statistics/energy-consumption-in-the-uk
[102] The future role of energy in manufacturing (2013), Figure 3, p. 12, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/285771/ep11-future-role-of-energy-in-manufacturing.pdf

electrification of processes can help to reach carbon neutrality, as the electricity grid gradually switches to renewable energy sources, reducing emissions and energy costs over time[103].
Within a commercial (as opposed to industry) environment, the key approaches to reduce electricity demand are improved insulation and the use of lighting controls alongside heat decarbonisation. For industry, the key mitigation options are technical improvements and usage optimization of motors, pump optimization and improved boilers[104].

Co-benefits to improvements in commercial and industrial energy efficiency include cost savings, for instance reduced spending on energy and lower maintenance costs due to improved insulation and greater efficiencies[105]. Energy efficiency in commercial buildings has also been shown to increase worker productivity and property value[106]. Air quality will also be improved, for instance through reduction of particulate matter due to introduction of an electrified transport fleet. This leads to health benefits in the local area[107].

The key near-term options toward decarbonisation within commercial and industrial sectors can be summarised as:

1. Improving efficiency in the consumption of heat. This includes actions such as waste heat recovery, boiler optimisation and improved insulation of buildings[108];
2. Improving efficiency in the generation of heat. For example, improving the efficiency of steam generation through use of heat pumps.

Longer-term benefits can be achieved through fuel switching. For instance, from natural gas to hydrogen, biofuels or electricity.

6.2.1 Current policies and outcomes

Many businesses in Suffolk have already taken steps to set emissions reduction targets and are working to improve energy efficiency, increase renewable energy and to reduce emissions from energy use in industrial processes. Examples of local policies and outcomes that have already been taken include:

- A Local Industrial Strategy for Norfolk and Suffolk is being developed, which follows on from the Norfolk and Suffolk Economic Strategy, focussing on three opportunity areas: clean energy, agri-food and ICT/digital creative.
- Suffolk Growth Strategy lays out the priorities for growth in the commercial and industrial sector, with a focus on green economic growth.
- Strategic Framework 2020-2024 identifies challenges and opportunities at the local level for West Suffolk, as well as strategic priorities including growth of the local economy.
- The Local Energy East Strategy sets out ambitions for 2030, including clean economic growth.

[103] Plugging in: What electrification can do for industry (2020), available online at: https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/plugging-in-what-electrification-can-do-for-industry
[104] Capturing the full electricity efficiency potential of the U.K. (2012), p.12, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48456/5776-capturing-the-full-electricity-efficiency-potentia.pdf
[105] Co-Benefits with Energy Savings (2019), available online at: https://energyefficiencyimpact.org/wp-content/uploads/2-CoBenefits-EEReport-Printable.pdf
[106] Co-Benefits with Energy Savings (2019), p.6 available online at: https://energyefficiencyimpact.org/wp-content/uploads/2-CoBenefits-EEReport-Printable.pdf
[107] Multiple Benefits of Energy Efficiency (2019), available online at: https://www.iea.org/reports/multiple-benefits-of-energy-efficiency/air-quality
[108] Capturing the full electricity efficiency potential of the U.K (2012), p.3, available online at: https://webarchive.nationalarchives.gov.uk/20121217165912/http://www.decc.gov.uk/assets/decc/11/consultation/electricity-demand-reduction/7035-capturing-full-elec-eff-potential-edr.pdf

- The Suffolk Carbon Charter is an award recognising carbon reduction outcomes in Suffolk's SMEs and Business Energy Efficiency Anglia has a grant pot for funding energy efficiency outcomes in businesses, with money already being used on lighting and heating upgrades, electric vehicles, new machinery etc.
- In terms of the public sector, Suffolk is taking advantage of current funding available for decarbonisation. For example, West Suffolk Council recently secured £1.43m of funding from the Government's Public Sector Decarbonisation Scheme for outcomes such as replacing gas boilers with heat pumps and installing energy efficient controls in key public sector buildings.

At the national level, several government initiatives are already in place to support industry in reducing energy consumption, including[109]:

- The Climate Change Agreements scheme, which allows energy intensive participants to pay significantly reduced rates of Climate Change Levy – a tax on the supply of energy - in exchange for signing up to energy efficiency or carbon reduction targets agreed with government.
- The Energy Savings Opportunity Scheme (ESOS), a mandatory energy assessment scheme.
- The CRC Energy Efficiency Scheme, a mandatory emissions trading scheme covering 2,000 large users of energy across the business and public sector.
- The Industrial Heat Recovery Support (IHRS) programme, to recover and use heat from industrial processes that would otherwise be wasted.
- The Industrial Energy Efficiency Accelerator (IEEA), which aims to lower the cost of near-market energy efficient technologies for a range of industrial sectors through demonstration projects.
- National funding such as the Public Sector Decarbonisation Scheme and the Industrial Decarbonisation Challenge.

6.3 The approach to carbon neutrality

As with other sectors, to achieve carbon neutrality in Suffolk, energy use in the industrial and commercial sectors will need to be reduced to practically zero by 2030. This is to allow any emissions removals in Suffolk to offset residual emissions in the harder to tackle sectors, such as agriculture and waste. This will mean phasing out fossil fuel use and replacing it with low carbon alternatives. As with the buildings sector, this will take time to ramp up, and so the focus in the earlier years would be on maximising quick wins from energy management and demand reduction, as well as improving insulation in industrial and commercial buildings. In other words, the energy hierarchy would again be applied, with the focus being on the top two approaches in the initial years. The plan should also focus in earlier years on engaging with national-level policies and funding to support industrial decarbonisation and lobbying national government for a supportive policy framework. In the latter part of the period up to 2030, more focus should be on transformational action to help the commercial and industrial sector decarbonise heat supply and to further improve efficiency, with some consideration also being given to longer term options such as hydrogen.

The County and District Councils have relatively more scope for influencing energy use in non-domestic buildings, and many of the viable outcomes and policy solutions will be the same as those set out in the buildings chapter in this report, for example, building fabric efficiency improvements, installation of heat pumps and development of heat networks. The councils have relatively less influence over industry, with their role more focused on influencing national-level policy and facilitating

[109] Helping businesses to improve the way they use energy (2018), p.49-50, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/726711/Call_for_Evidence_-_helping_businesses_to_improve_the_way_they_use_energy_.pdf

engagement and coordination. Overall, the councils can assist in the development of these and other outcomes by:

- Identifying local barriers which prevent implementation of government initiatives toward decarbonisation. For example, by supporting audits of the local commercial and industrial sector.
- Facilitating communication.
- Providing funding to make outcomes more cost effective.
- Education through showing good examples of practice by energy users. British Sugar are a good example- creating by-products and improving energy efficiency.
- Facilitating the identification of sites which can use waste heat.

More information on these can be found in the following sections.

6.4 Goal 1 – Behavioural change to use less energy in I&C sector

A series of outcomes can be applied to encourage behavioural change to use less energy within the commercial and industrial sector.

Landlords should set aside some time to:

- Rank building appliances in descending order of energy consumption (heating usually top) and focus on reducing the consumption of the largest.
- Understand minimum healthy winter temperature and maximum summer temperature and set thermostats accordingly.
- Ensure heating and cooling are turned off when the building is unoccupied except where preheating in the morning.
- Develop good habits to reduce energy consumption for heating and cooling and other appliances within their time constraints with existing technology.
- Consider the energy efficiency of appliances when buying or replacing.
- Investigate which controls to invest in to help automate this process, e.g. smart controls and optimisers.

6.4.1 Incentives

Incentives can be used to promote positive behavioural change. For instance, environmental award schemes can be used to showcase examples of best practice[110].

Energy saving promotion campaigns and support can be applied to encourage organisations to make the most of the co-benefits associated with reduced emissions and energy efficiency. Small and medium-sized enterprises (SMEs) in manufacturing and services can be made aware of financially attractive opportunities to improve sustainability, such as tax privileges. In Suffolk, several incentive schemes are already in place. This includes the Greener Business Grant[111] funded by West Suffolk Council to help local businesses and organisations reduce their energy use and save money; Business Energy Efficiency (BEE) Anglia, a grant which funds energy efficiency outcomes within businesses[112] and West Suffolk Council's Solar For Business And Energy Efficiency Fund, which funds renewable energy technologies such as ground source heat pumps, biomass boilers and energy efficient

[110] Somerset Climate Emergency Framework (2019), p.18, available online at: https://wwwmedia.somerset.gov.uk/wp-content/uploads/2020/01/Somerset-Climate-Emergency-Framework-Final.pdf
[111] Greener Business Grant (n.d.), available online at: https://www.westsuffolk.gov.uk/Business/Start_and_Grow_Your_Business/upload/West-Suffolk-Green-Business-Grant.pdf
[112] Business Energy Efficiency (2020), available online at: http://www.beeanglia.org/

lighting[113]. Businesses can also be recognised through the Creating the Greenest County Awards[114] or accredited to the Suffolk Carbon Charter[115].

6.4.2 Knowledge sharing

Support for information sharing between businesses and industries is key to encouraging behavioural change. A peer network can be developed to promote engagement and collaboration, sharing knowledge and best practice examples. Support can be provided through knowledge sharing platforms where businesses and industries can share feedback[116]. Currently, local initiatives are supported between businesses, education and local authority partners through the New Anglia Local Enterprise Partnership[117]. Information can also be accessed through government platforms such as the Energy Technology List (ETL), a list of energy efficient plants and machinery such as boilers, motors and refrigeration equipment, which meet robust energy saving criteria[118].

Climate summits can be held to share business-specific information, which can assist to develop sustainable strategy plans. Climate Summits can be conducted at a local through to international level. For example, food and drinks producers can get involved in the 2021 UN Food Systems Summit, which aims to align food systems with the sustainable development goals (SDGs)[119].

And of course, this should be supported by the provision of appropriate information for businesses on approaches that they can adopt to save energy. These kinds of approaches tend to be cost effective for businesses, with a relatively short payback period. A good example of the kind of information that can be produced for SMEs is the guide to energy efficiency produced by BEIS in 2015[120]. As well as tips and advice, this includes a series of case studies to illustrate typical financial benefits. For example, an electronics components manufacturer added occupancy sensors to its store area and toilets and the initial £225 investment was paid off in only three months.

6.4.3 Improve monitoring and reporting

A generic methodology or 'toolkit' can be designed to assist businesses and industries in quantifying, and then reducing, supply chain emissions. This can be developed, for instance, by following existing government guidance on measuring and reporting GHG emissions[121]. The Local Economic Assessment (LEA) for Suffolk identifies issues for Suffolk's economy and develops solutions for key sectors in the region[122]. In future, the LEA can incorporate the monitoring of progress in emissions reductions for these key sectors.

[113] Greener Suffolk Business Service (n.d.), available online at: https://www.westsuffolk.gov.uk/Business/Start_and_Grow_Your_Business/upload/WSC-Solar-for-business-leaflet.pdf
[114] Creating the Greenest County Awards (2021), available online at: http://www.greensuffolk.org/awards
[115] Suffolk Carbon Charter (2021), available online at: http://www.greensuffolk.org/charter/
[116] Somerset Climate Emergency Framework (2019), p.18, https://wwwmedia.somerset.gov.uk/wp-content/uploads/2020/01/Somerset-Climate-Emergency-Framework-Final.pdf
[117] New Anglia Local Enterprise Partnership for Norfolk and Suffolk (2021), available online at: https://newanglia.co.uk/
[118] Energy Technology List (ETL) (2020), available online at: https://www.gov.uk/guidance/energy-technology-list
[119] 2021 UN Food Systems Summit (2021), available online at: https://sdg.iisd.org/events/2021-un-food-systems-summit/
[120] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/417410/DECC_advice_guide.pdf
[121] Guidance on how to measure and report your greenhouse gas emissions (2009), available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69282/pb13309-ghg-guidance-0909011.pdf
[122] Suffolk's Local Economic Assessment (2011), available online at: https://www.westsuffolk.gov.uk/planning/Planning_Policies/local_plans/upload/B67-Suffolk-s-Local-Economic-Assessment.pdf

6.5 Goal 2 – Improved energy efficiency of buildings in the commercial sector

Improved energy efficiency of lighting and heating can be achieved through various actions described below. These actions can be supported by the County and District Councils by looking for opportunities to continue funding (and expanding) schemes such as BEE Anglia. A programme of retrofit of energy efficiency outcomes to Council offices, supported by audits where needed, can also be applied to improve efficiency. Doing this can help build the market and show leadership.

6.5.1 Improve lighting efficiency

Energy efficient lighting can reduce energy consumption and costs[123]. For instance, a case study in an independent cinema in Scotland found that lighting upgrades could lead to savings of £4,770 annually[124]. Lighting systems can be replaced by high-efficiency LED lightbulbs to reduce emissions[125] and electricity can be sourced from renewable sources. Smart systems and technology can be automated to create more efficient lighting controls, such as dimmable ballasts, automatic lighting and photo-sensors which can optimise the light for occupants in a room[126].

6.5.2 Improve heating efficiency

Due to the high usage of electricity in heating, ventilation, and air conditioning (HVAC) within commercial buildings, the greatest energy saving potential comes from building shell improvements such as retrofitting, improving insulation, and using high efficiency HVAC and water heating systems. Buildings can be sealed to avoid air leakages, for example by draught proofing windows and doors or installing cavity insulation. HVAC systems can also be adjusted to suit building occupancy, minimising wasted energy on re-cooling air[127].

Loft, floor and cavity wall insulation, double glazing, smart sensors and heating controls represent a relatively cheap method to improve the energy efficiency of buildings and assist in the effective application of low carbon technologies such as heat pumps[128].

In terms of actions, we would recommend planning rules be revised to mandate the installation of high building fabric efficiency standards, rooftop PV or hybrid PV-T panels, low temperature renewable space and water heating systems with connections to any existing nearby heat networks, consideration for new heat networks serving multiple new buildings and failing that, individual heat pumps.

[123] Lighting (2021), available online at: https://energysavingtrust.org.uk/advice/lighting/
[124] How to save money and energy on lighting systems Advice and support for organisations in Scotland (2016), p.1, available online at: https://energy.zerowastescotland.org.uk/sites/default/files/How%20to%20save%20money%20and%20energy%20on%20lighting.pdf
[125] Net Zero The UK's contribution to stopping global warming (2019), p.25, available online at: https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf
[126] Capturing the full electricity efficiency potential of the U.K (2012), p.15, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48456/5776-capturing-the-full-electricity-efficiency-potentia.pdf
[127] Capturing the full electricity efficiency potential of the U.K (2012), p.15, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48456/5776-capturing-the-full-electricity-efficiency-potentia.pdf
[128] Ofgem's Future Insights Series, The Decarbonisation of Heat (2016), p.7, available online at: https://www.ofgem.gov.uk/system/files/docs/2016/11/ofgem_future_insights_programme_-_the_decarbonisation_of_heat.pdf

6.6 Goal 3 – Heat decarbonisation in the commercial sector

6.6.1 Significant roll-out of individual heat pumps in commercial buildings

Over 70% of heat energy for the domestic, industry and service sectors comes from burning natural gas[129]. To reduce reliance on fossil fuel-based energy sources, technologies such as electric heat pumps, hybrid heat pumps, smart storage heating and district heating can be used in conjunction with alternative energy sources including hydrogen.

Air source heat pumps use outdoor, indoor or exhaust air as an energy source. Heat pumps can be designed to use the waste heat, for example from industrial plants or public swimming pools[130], and this can be a particularly attractive source of heat for industrial and commercial buildings. Heat Pumps can also use water or the ground as a heat source (ground source heat pumps). In addition, geothermal energy uses heat from rocks and fluids deeper beneath the earth's surface. No data has been found on geothermal potential in Suffolk, and it was outside of the scope of the East of England Renewable and Low Carbon Energy Capacity Study carried out by AECOM in 2011. It is therefore assumed that potential for geothermal heat is low.

Various heat generators can be combined to form a hybrid system, for instance by combining heat pump technology with a gas or biomass boiler to assist during the peak load[131]. Smart controls can be used to operate hybrid heat pumps in a way that limits grid congestion[132].

In order to encourage heat decarbonisation in the commercial sector, the councils should look to retrofit heat pumps to council offices, supported by audits where needed, to help identify where there is the greatest scope. And this action links to Section 6.4.2 on knowledge sharing, as the councils should look for opportunities to share information on heat pump installations with commercial operators across Suffolk to demonstrate leadership and to help generate demand.

6.6.2 Further development of heat networks and hydrogen networks

Energy storage systems can be installed to help manage increased electricity demands[133]. Heat can be supplied through a network from a centralised plant in areas of concentrated demand. This can represent significant carbon savings, as it allows lower carbon fuels and sources of waste heat to be used. Currently, most heat networks use gas as their fuel, however they can make use of various sources of heat including biomass and biogas fuelled boilers, heat pumps and energy from waste facilities. Converting a fuel to heat and power simultaneously – combined heat and power (CHP) – improves efficiency and provides additional value[134]. The Heat Networks Investment Project (HNIP) is available as a government funding programme aiming to increase the number of heat networks being

[129] Ofgem's Future Insights Series, The Decarbonisation of Heat (2016), p.4, available online at: https://www.ofgem.gov.uk/system/files/docs/2016/11/ofgem_future_insights_programme_-_the_decarbonisation_of_heat.pdf
[130] Heat pumps technology and environmental impact (2005), p.60, available online at: https://ec.europa.eu/environment/ecolabel/about_ecolabel/reports/hp_tech_env_impact_aug2005.pdf
[131] Heat Pumps, Integrating technologies to decarbonise heating and cooling (2018), p. 21-22, available online at: https://www.ehpa.org/fileadmin/user_upload/White_Paper_Heat_pumps.pdf
[132] IEA HPT Programme Annex 42: Heat Pumps in Smart Grids (2018), p.3, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/680514/heat-pumps-smart-grids-executive-summary.pdf
[133] Clean Growth - Transforming Heating (2018), p.6, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/766109/decarbonising-heating.pdf
[134] Ofgem's future insights series The decarbonisation of heat (2016), P.8, available online at: https://www.ofgem.gov.uk/system/files/docs/2016/11/ofgem_future_insights_programme_-_the_decarbonisation_of_heat.pdf

built and deliver carbon savings, with £320 million of funding is currently in place to support low-carbon heat networks[135].

Heat networks require the distribution of hot water through large insulated pipes, which can mean high capital costs for spatial requirements, infrastructure, and retrofitting. A secure baseload of customers is also needed, which causes some difficulties in securing the required investment for widespread take-up. These complexities mean that district heating projects currently have a higher risk profile than those across gas, electricity and water[136].

The current UK gas grid can be adapted so that the natural gas networks include a blend of lower carbon gases, for example through the addition of biomethane or hydrogen to the gas grid. The current cost of gas as a heating fuel should be considered, as generally, gas-fired heating is cheaper than using other fuel sources [137]. A decline in the use of natural gas due to the use of alternative fuels and a switch to electricity networks may mean the decommissioning of gas networks[138].

Hydrogen networks can also be trialled at a local level and rolled out as part of the process to decarbonise heat at the regional level. This is likely to require government support and a funding model to encourage network development[139]. The New Anglia LEP is developing a business-led network, Hydrogen East, to promote the role of East Anglia as a UK Hydrogen cluster[140]. In Suffolk, Hydrogen East is raising awareness about potential opportunities to promote hydrogen-related technology and supply chains[141].

The council can support heat network development, for instance by amending planning permission for non-domestic buildings to require renewable heating systems or connection to heat networks. The council may also Engage with Cadent to discuss timelines for hydrogen network roll-out and with Hydrogen East to help identify potential areas of demand for hydrogen.

6.7 Goal 4 – More energy efficient industrial processes

6.7.1 Improve efficiency of using heat

6.7.1.1 Heat recovery and insulation

Energy recovery can be used, for example heat recovery from flue gases from boilers. Industries which use low-grade heat such as food and drink manufacturing can co-locate with industries that have low grade heat available such as pulp and paper. Waste heat could also be used in district heating networks to provide heat for local housing or non-domestic buildings[142].

Implementing waste heat recovery, CHP and avoiding heat loss is expected to reduce overall CO_2 emissions in the food and drinks sector by 11%, with CAPEX costs between £500,000- 1,000,000[143].

[135] Heat Networks Investment Project (HNIP): overview and how to apply (2020), available online at: https://www.gov.uk/government/collections/heat-networks-investment-project-hnip-overview-and-how-to-apply#:~:text=The%20Heat%20Networks%20Investment%20Project,heat%20network%20market%20to%20develop
[136] Ofgem's future insights series The decarbonisation of heat (2016), P.9-13, available online at: https://www.ofgem.gov.uk/system/files/docs/2016/11/ofgem_future_insights_programme_-_the_decarbonisation_of_heat.pdf
[137] Ofgem's future insights series The decarbonisation of heat (2016), p.7, available online at: https://www.ofgem.gov.uk/system/files/docs/2016/11/ofgem_future_insights_programme_-_the_decarbonisation_of_heat.pdf
[138] Ofgem's future insights series The decarbonisation of heat (2016), P.14, available online at: https://www.ofgem.gov.uk/system/files/docs/2016/11/ofgem_future_insights_programme_-_the_decarbonisation_of_heat.pdf
[139] Ofgem's future insights series The decarbonisation of heat (2016), P.11, available online at: https://www.ofgem.gov.uk/system/files/docs/2016/11/ofgem_future_insights_programme_-_the_decarbonisation_of_heat.pdf
[140] join new hydrogen business network (2020), available online at: https://newanglia.co.uk/join-new-hydrogen-business-network/
[141] Hydrogen East (2020), available online at: https://hydrogeneast.uk/about-us/
[142] Industrial Decarbonisation & Energy Efficiency Roadmaps to 2050 (2015), p.17, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/419912/Cross_Sector_Summary_Report.pdf
[143] Industrial Decarbonisation & Energy Efficiency Roadmaps To 2050 (2015), Appendix C, Table 13, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415954/Food_and_Drink_Appendices.pdf

The County and District Councils can work with industry in Suffolk to identify opportunities for utilising waste heat, including matching of industrial supply and non-industrial demand.

Energy can be saved by equipping tanks, pipelines and other equipment with appropriate insulation. This has been found to be an effective energy saving technique in the brewing industry, for instance[144].

Carbon capture and storage (CCS) could provide a significant contribution to reduced industrial emissions. In the food and drink sector, CCS can lead to CO_2 emission reductions of as much as 50%, with CAPEX costs ranging between £2,000,000- 7,000,000[145]. The CO_2 produced from burning fuels or other industrial processes can be captured and diverted, for example to underground sites such as depleted North Sea oil and gas fields[146].

6.7.1.2 Maintenance and upgrading technology

Motors and pumps are the largest end user of electricity in the industrial sector, so represent a significant opportunity for reduction of energy consumption. This can be done through good maintenance such as fixing leaks or changing filters as well as replacing old motors, pumps and compressed air systems with higher efficiency instruments, for example with higher quality materials. Motors are often oversized compared to the load when installed, so energy can be saved by replacing these with a correctly sized motor. Improvements can also be made to the process design to improve efficiency. For instance, a demand management device can be used to automatically optimise the usage based on demand[147].

Efficiency benefits can come from assessing the performance of equipment used for refrigeration, for example by considering compressor, fan and pump controls. Efficiency can be improved by limiting the heat loads entering the building or equipment with reduced ventilation and better insulation[148], improved door controls and reduced electrical loads[149]. Better insulation and reduced ventilation in refrigerators and freezers is estimated to lead to around 80% energy savings[150]. Investing in new refrigeration technologies is expected to reduce overall CO_2 emissions in the food and drinks sector by 35%, with CAPEX costs up to around £200,000[151]. The performance can then be continuously monitored in order to understand improvements in efficiency. Emissions of non-CO_2 greenhouse gases such as HFCs can also be reduced by leak repair, refrigerant recovery and recycling, and proper disposal and replacement by alternative refrigerants (ammonia, HC, CO_2)[152]. Where waste heat is available, this can also be used to drive the cooling processes.

[144] Opportunities and barriers for efficient energy use in a medium-sized brewery (2013), available online at: https://www.sciencedirect.com/science/article/pii/S1359431112003560?via%3Dihub
[145] Industrial Decarbonisation & Energy Efficiency Roadmaps To 2050 (2015), Appendix C, Table 17, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415954/Food_and_Drink_Appendices.pdf
[146] The future role of energy in manufacturing (2013), p. 15, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/285771/ep11-future-role-of-energy-in-manufacturing.pdf
[147] Capturing the full electricity efficiency potential of the U.K (2012), p.17, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48456/5776-capturing-the-full-electricity-efficiency-potentia.pdf
[148] Industry (2014), p.761-762, available online at: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter10.pdf
[149] Improving the Energy Efficiency of Cooling Systems (2020), available online at: https://www.star-ref.co.uk/smart-thinking/improving-the-energy-efficiency-of-cooling-systems/
[150] Industry (2014), p.766, available online at: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter10.pdf
[151] Industrial Decarbonisation & Energy Efficiency Roadmaps To 2050 (2015), Appendix C, Table 13, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415954/Food_and_Drink_Appendices.pdf
[152] Industry (2014), p.744, available online at: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter10.pdf

6.7.2 Improve efficiency of generating heat

Heating processes within industry can be optimised, for instance through furnace insulation and optimisation, by reducing the size of furnace entry and using the residual heat[153]. Heat pumps are also an option to reduce energy consumption from process heating. Heat pumps provide energy for heating, hot water, cooling and dehumidification through closed energy cycles, reducing the need for additional energy. The feasibility of heat pump technology use in industrial processes depends on the temperature levels needed in production, as heat pumps can provide temperatures ranging from 80-150°C[154].

This could potentially be supported by soft loans and grants to support efficiency improvements in heat generation, which is something the councils could give further consideration to.

6.7.3 Fuel switching to electricity or hydrogen

Systems currently using fossil fuel-based technology can be replaced through electrification of commercial and industrial processes, allowing for renewable energy deployment. Some renewable energy technologies have the dual function to substitute both heat and electricity-intensive processes such as solar cooling[155].

Hydrogen also represents an alternative to burning natural gas and can be blended into natural gas networks, which may present less infrastructure changes than heat pumps and district heating[156]. Hydrogen can be used as a fuel for heating and hot water, using traditional boilers as well as alternative technologies such as heat pumps and combined heat and power units[157]. Hydrogen can be made with zero-carbon electricity in order to minimise emissions and costs[158]. As outlined in the net zero technical report produced by Ricardo for the Suffolk Climate Change Partnership, scope for switching to hydrogen by 2030 is likely to be limited in Suffolk, but it could represent a potential longer-term option in case carbon neutrality can't be achieved by then. And it is important that work on hydrogen continues in the coming years to prepare for possible future changes. And, as outlined by the Committee on Climate Change, the industrial sector is one of the sectors that may have more scope for switching to hydrogen applications. It will be important that in coming years the County Council and Hydrogen East, on behalf of the County as a whole, continues to engage with national government on their emerging hydrogen strategy.

Dielectric heating (radio frequency or microwave heating) technologies can save carbon emissions and costs though uses in the food sector such as pasteurisation, sterilisation and drying processes of

[153] Capturing the full electricity efficiency potential of the U.K (2012), p.18, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48456/5776-capturing-the-full-electricity-efficiency-potentia.pdf
[154] Heat Pumps, Integrating technologies to decarbonise heating and cooling (2018), p. 54-56 https://www.ehpa.org/fileadmin/user_upload/White_Paper_Heat_pumps.pdf
[155] Renewable energy options for the industry sector: global and regional potential until 2030 (2014), p.14, available online at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2014/Aug/IRENA_RE_Potential_for_Industry_BP_2015.pdf
[156] Ofgem's future insights series The decarbonisation of heat (2016), P.9, available online at: https://www.ofgem.gov.uk/system/files/docs/2016/11/ofgem_future_insights_programme_-_the_decarbonisation_of_heat.pdf
[157] Clean Growth - Transforming Heating (2018), p.30, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/766109/decarbonising-heating.pdf
[158] Decarbonization of industrial sectors: the next frontier (2018), p.8, available online at: https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/Sustainability/Our%20Insights/How%20industry%20can%20move%20toward%20a%20low%20carbon%20future/Decarbonization-of-industrial-sectors-The-next-frontier.pdf

food production[159]. Microwave drying and heating in the food and drink sector is thought to reduce CO_2 emissions by around 5%[160].

Biofuels have technical potential as an alternative to fossil fuels, particularly in high-temperature applications (such as steam generation) and as a feedstock for materials production[161]. Biomass has the largest substitution potential in manufacturing industry[162]. Meanwhile, solar thermal can generate industrial process heat for low and medium temperature processes. This technology has the most technical and economic potential in small scale plants and less energy-intensive industries like the food and textile sectors, for instance for drying, washing and pasteurising processes[163].

The economic potential of these alternative fuels is dependent on the availability of low-cost resources and the economic policies which promote renewable energy[164]. According to the International Renewable Energy Agency, heat production costs are relatively low for geothermal technology, heat pumps and biomass boilers, especially those used alongside CHP. Costs are higher for solar thermal technology[165]. In the food and drink sector, CO_2 emissions can be reduced by electrification of heat (100%) and switch to biomass/bioenergy (90%), with high CAPEX costs of over £7,000,000[166]. Other fuel shifts may only reduce CO_2 emissions by 5%, with lower CAPEX costs of £1,000,000- 2,000,000[167].

6.8 Other options for the commercial and industrial sector

A number of other options exist for the commercial and industrial sector to decarbonise.

6.8.1 Improve efficiency in industrial transport

Many industrial and commercial practices have significant fleet operations and therefore will be looking for opportunities to reduce fuel use and costs by switching to more efficient vehicles. Activities such as the introduction of electric vehicles to commercial fleets are summarised in Section 5 on transport. There may also be opportunities to decarbonise fleets of heavier vehicles, such as heavy good vehicles and the refuse trucks that are operated by or on behalf of councils, through introduction of hydrogen-fuelled vehicles. Hydrogen East has a workstream called the New Anglia Clean Transport Hub, which is looking at the supply of hydrogen for use in agriculture, food processing and transport in West Suffolk where there are initial plans to switch over to hydrogen for refuse wagons, agricultural vehicles and buses[168].

[159] Decarbonisation of heat in industry (2013), p.31, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/230949/D13_951813__Ricardo_AEA_Industrial_Decarbonisation_Literature_Review_201___.pdf
[160] Industrial Decarbonisation & Energy Efficiency Roadmaps To 2050 (2015), Appendix C, Table 14, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415954/Food_and_Drink_Appendices.pdf
[161] Renewable energy options for the industry sector: global and regional potential until 2030 (2014), p.3, available online at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2014/Aug/IRENA_RE_Potential_for_Industry_BP_2015.pdf
[162] 5, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2014/Aug/IRENA_RE_Potential_for_Industry_BP_2015.pdf
[163] Renewable energy options for the industry sector: global and regional potential until 2030 (2014), p.12, available online at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2014/Aug/IRENA_RE_Potential_for_Industry_BP_2015.pdf
[164] 3, https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2014/Aug/IRENA_RE_Potential_for_Industry_BP_2015.pdf
[165] Renewable energy options for the industry sector: global and regional potential until 2030 (2014), Figure 5, available online at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2014/Aug/IRENA_RE_Potential_for_Industry_BP_2015.pdf
[166] Industrial Decarbonisation & Energy Efficiency Roadmaps To 2050 (2015), Appendix C, Table 15, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415954/Food_and_Drink_Appendices.pdf
[167] Industrial Decarbonisation & Energy Efficiency Roadmaps To 2050 (2015), Appendix C, Table 15, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415954/Food_and_Drink_Appendices.pdf
[168] https://hydrogeneast.uk/hydrogen-and-east-anglia-a-continuing-clean-energy-success-story/

6.8.2 Improve efficiency in industrial IT services and finance

Several key steps can be taken to develop decarbonised IT and finance sectors[169], including:

- Ensuring electricity is from renewable sources;
- Recognising energy efficiency within the core business strategy;
- Institutionalising a systematic 'energy efficiency audit' process on loans to projects or clients in key energy-using sectors in order to systematically capture energy efficiency gains.
- Collaborating with others on development of technology EE standards and benchmarks in order to standardise approaches and facilitate financing and technology transfer.

6.8.3 Improve resource efficiency and product substitution

Taking a more holistic view, reduced production emissions can be achieved by taking demand-side outcomes, as outlined in the CCC's net zero technical report. For example, materials can be replaced with more sustainable alternatives such as cement being replaced by materials such as wood. Demand for high-emission food such as meat and dairy products could be replaced by demand for other, lower-emission foods[170]. Additionally, the circularity of products can be increased. This means that, for instance, by increasing the reuse or recycling of plastics in a product, the production of virgin materials is reduced and therefore associated CO_2 emissions are lowered[171]. In the food and drink sector, reduced packaging can lead to CO_2 emission reductions of 10%, with CAPEX costs ranging between £200,000- 500,000[172].

The level of demand for new and replacement products has a significant effect on the activity in the industry sector and resulting GHG emissions. Therefore, extending the product life or durability of products by improving product design or materials can also have a positive impact[173].

6.9 Key messages and priority actions

In relation to non-domestic buildings, the Councils and other public sector bodies have a key role to play in developing the market for decarbonised heat solutions, such as heat pumps, and demonstrating leadership. Alongside this they should look to support ongoing collaborations with the sector, working closely with organisations such as the New Anglia LEP and the Greater South East Energy Hub, to disseminate information, advice and best practice. Any opportunities to continue and expand funding for energy efficiency measures and low carbon heat should be seriously considered, such as the BEE Anglia scheme, as well as looking to take full advantage of national-level funding. The County Council also has an important role to play in supporting maximisation of potential for using waste heat, by matching demand (both in the non-domestic but also domestic buildings sectors) with supply from industry. As well as continuing to engage national government on its emerging hydrogen strategy. The priority actions for the sector are included in the Suffolk Climate Emergency Plan, and the Table of Actions.

[169] Energy efficiency and the finance sector (2009), p.5-7 available online at: https://www.unepfi.org/fileadmin/documents/Energy_Efficiency.pdf
[170] Industry (2014), p.762, available online at: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter10.pdf
[171] Decarbonization of industrial sectors: the next frontier (2018), p.25, available online at: https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/Sustainability/Our%20Insights/How%20industry%20can%20move%20toward%20a%20low%20carbon%20future/Decarbonization-of-industrial-sectors-The-next-frontier.pdf
[172] Industrial Decarbonisation & Energy Efficiency Roadmaps To 2050 (2015), Appendix C, Table 16, available online at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/415954/Food_and_Drink_Appendices.pdf
[173] Industry (2014), p.776, available online at: https://www.ipcc.ch/site/assets/uploads/2018/02/ipcc_wg3_ar5_chapter10.pdf

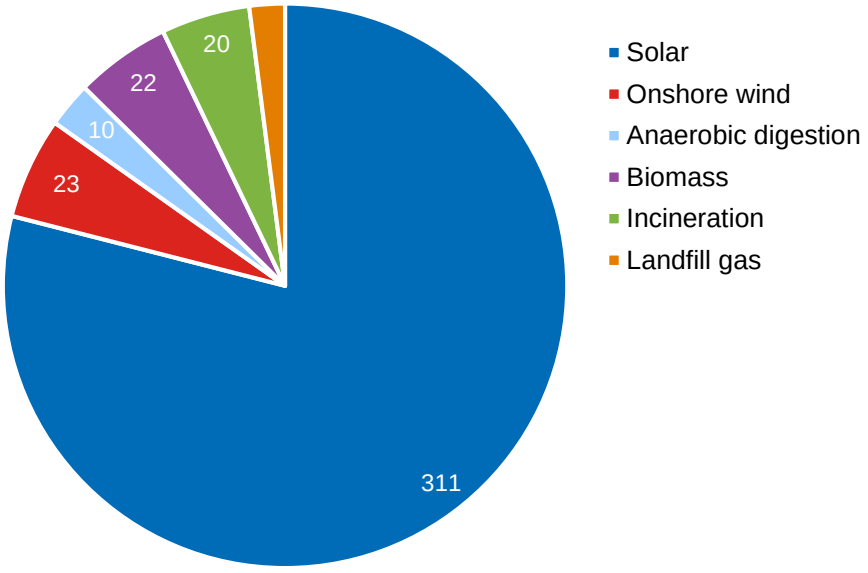
7 Cleaner Power

Electricity emissions account for approximately 19% of total emissions in Suffolk, or 783kt CO_2e. The electricity supply in the UK has been decarbonising rapidly over the past 10-15 years and this trend is expected to continue, despite a growing reliance on electricity. Decarbonisation is being driven by big power sector trends, including the growth of low carbon generation and the retirement of older, fossil fuel power stations. These national trends are also clearly evident in Suffolk.

7.1 Renewable energy in Suffolk

The capacity of renewable energy generators in Suffolk has increased rapidly in the last decade. The current renewables/low carbon capacity stands at 393MW, representing a significant increase from the 62.2MW capacity installed in 2010[174]. Note that this does not include the largest offshore and nuclear generators, which are analysed in the National Low Carbon Power Infrastructure section below.

Figure 32 – Operational renewable capacity (MW) in Suffolk 2020



The information has been collated using public datasets and local authority planning data. BEIS's Renewable Energy Planning Database (REPD) tracks larger renewable energy projects (>150kW) as they move through the planning system. Feed-in Tariff (FIT) scheme statistics are published for each local authority area. The FIT offered a premium payment per unit of electricity generated from renewable energy technologies. The incentive was introduced in 2010 and led to tremendous growth in small and medium scale renewable energy capacity. The scheme has now closed and has been replaced by the Smart Export Guarantee.

7.1.1 Solar power

Solar photovoltaic (PV) systems come in many different forms, from small rooftop arrays on homes to commercial-scale, ground-mounted solar farms with thousands of panels. Of the 311MW of solar in

[174] AECOM (2011) East of England renewable energy capacity study

Suffolk, around two-thirds of this is from large solar farms, located across Suffolk, such as the 31.6MW scheme at Stradishall Airfield and the 20.9MW scheme at Lackford Estate.
18,500 domestic solar PV schemes were registered in Suffolk under the FIT at the end of March 2019. The average capacity is under 4kW. Rooftop arrays are on 5-8% of all homes and along with larger commercial rooftop systems (typically in the 10-100kW range), they comprise 109MW of installed capacity. These are located across Suffolk, although have a higher concentration in urban areas such as Ipswich and Bury St Edmunds.

7.1.2 Onshore wind power

Suffolk has 23MW of operational onshore wind capacity. They are mostly located nearer to the coast where wind speeds are highest and most consistent. This includes the 11.5MW Upper Holton Wind Farm, which began operating in 2016. No large wind turbines have been installed since.

7.1.3 Biomass power

Biomass power plants generate electricity from burning wood or other organic material, such as agricultural waste. There are currently three dedicated biomass energy plants in Suffolk:

- Eye Biomass Plant (14.3MW) in Babergh and Mid Suffolk (power only).
- Bentwaters Combined Heat and Power (4.6MWe) in East Suffolk.
- Ipswich Hospital Energy Centre (2.6MW) in Ipswich (power only).

7.1.4 Energy from Waste

Energy from waste (EfW) refers to a group of technologies which produce electricity from waste resources. In combined heat and power (CHP) systems, the heat produced is also used.

Direct combustion of waste is classed as renewable, which is undertaken at the 20MW Great Blakenham incinerator.

Anaerobic digester plants break down organic matter in the absence of oxygen to produce biogas and biofertilizer. Combustion of the biogas is used to generate power. There are four anaerobic digester schemes in Suffolk, totalling just over 10MW, with the largest scheme of 5MW being the British Sugar AD plant in Bury St Edmunds.

Landfill gas is a composition of biogas (typically 50% methane, 50% carbon dioxide) that is generated by decaying waste matter such as food and paper at landfill sites. There are currently three operational landfill gas sites in Suffolk totalling 8MW, with the largest scheme being the 5.5MW Masons Power Plant Landfill Scheme in Babergh and Mid Suffolk.

7.2 The potential for growth in renewables

Evidence indicates that there is significant untapped potential for new onshore wind and solar development in Suffolk. AECOM conducted a renewable energy resource study[175] in 2011 which assessed the potential for future renewable and low carbon energy installations, with physical and environmental constraints as well as landscape and cumulative impacts taken into account.

While the performance of renewable technology has improved and costs have fallen since the study, the assessment of onshore wind and solar PV capacity continues to provide an indication of the large untapped potential for new installations in Suffolk.

[175] AECOM (2011) *East of England Renewable Energy Capacity Study*. Available at https://www.eastsuffolk.gov.uk/assets/Planning/Suffolk-Coastal-Local-Plan/Document-Library/Infrastructure/east-of-england-renewable-energy-capacity-study.pdf

It estimates that there is potential for approximately 1,706MW of onshore wind capacity in Suffolk. The resource assessment modelled a wind turbine with 100m rotor diameter and 135m tip height. For solar, the potential for solar farms is estimated to be 651MW with a further 256MW from smaller roof-mounted installations, a combined total of 907MW.

Table 8 – Installed vs potential wind and solar capacity in Suffolk

Technology	2020 installed capacity (MW)	Potential capacity (MW)	Growth factor
Solar farms	311	907	3x
Onshore wind	23	1,706	74x

7.3 Community energy

Community involvement in energy projects can yield important additional benefits. Community-led projects can retain more of the benefits locally and can bring investment in social and environmental infrastructure. Informed and engaged residents can influence energy projects, helping to address concerns about scale and sensitivity to the local context.

7.3.1 Community energy in Suffolk

Although there is evidence of small-scale community-led renewables in Suffolk, there is vast potential for more to be done to contribute towards the decarbonisation of the power supply in Suffolk.

Selected local organisations include:

- Cookpole Energy Action, based in East Suffolk, focus their efforts on solar power and electric bikes, with notable projects including a 4kW rooftop solar PV scheme at the Walpole Pavillion and an 11kW wind turbine generating 20MWh annually.
- The Emmanuel Church in East Suffolk, who have installed a total of 220 solar PV panels on the roofs of the community rooms.
- Transition Nayland installed solar PV at Nayland Primary School and Ferriers Barn day centre.
- There are many other community energy groups including Halesworth in Transition and Greener Fram.

7.3.2 Community onshore wind

Although onshore wind can now compete in Contracts for Difference (CfD) auctions following a four-year hiatus, gaining planning consent is still the primary barrier to development.

In 2015 planning guidance put the concerns of local communities at the heart of the process, with local planning authorities only advised to grant planning permission if they have previously identified the site as suitable for wind and "it can be demonstrated that the planning impacts identified by affected local communities have been fully addressed and therefore the proposal has their backing"[176].

This sets the bar for community consent to onshore wind in England very high. Little onshore wind has been developed as a result, except for community-led schemes like Ambition Lawrence Weston near Bristol[177].Supporting community energy groups to bring their ideas and plans to life is an important role that local government can play in Suffolk.

[176] https://www.gov.uk/guidance/renewable-and-low-carbon-energy
[177] https://www.bbc.co.uk/news/uk-england-bristol-54736218

7.3.3 Supporting community energy

Community groups need to be committed if they are to make their renewables projects a reality. There are a number of barriers which they must overcome, including planning and technical advice, commissioning professional studies, funding, contracting and operations.

Experience from Scotland and Wales shows how public sector support through their journey can make a huge difference to the outcome. Suffolk can do the same, with local authorities and the energy hub helping community energy groups with advice, support as well as grants or loans to support local energy development.

7.4 Power Goal 1 – Grow renewable energy capacity

The outcomes selected to grow renewable energy capacity in Suffolk are:

Table 9 – Outcomes and actions supporting Power Goal 1 – Grow renewable energy capacity

Outcomes	Actions
Plan positively for renewables	Set ambitious and supportive renewable energy planning policies in updated Local Plans. Planners will take an evidence-led approach to identifying areas where large-scale solar and wind farms are most likely to be acceptable.
Renewables for new developments	Incorporate on-site renewable energy into new development energy policies planning in updated Local Plans. Planners will take an evidence-led approach to setting enhanced energy performance standards which are consistent with the climate emergency declaration.
Support community energy	Help community energy groups to deliver local renewables projects. Offer support throughout their journey from concept to construction and operation, including: • Signposting to grants and funding • Technical, planning and funding advice • Providing access to practical and specialist support • Help preparing successful RCEF applications • Making connections with potential customers • Networking opportunities for groups to share their experiences • Promoting community energy schemes and share offers • Purchasing community energy

7.5 Grid infrastructure and connections

7.5.1 How the distribution grid works

Power stations and renewable generators transfer the electricity they produce to customers via the grid, a national network of pylons, cables and transformers. It is made up of the transmission network and the distribution network. The transmission network is the backbone of the electricity network and moves large volumes of power at high voltage across the UK. Each region is managed by a

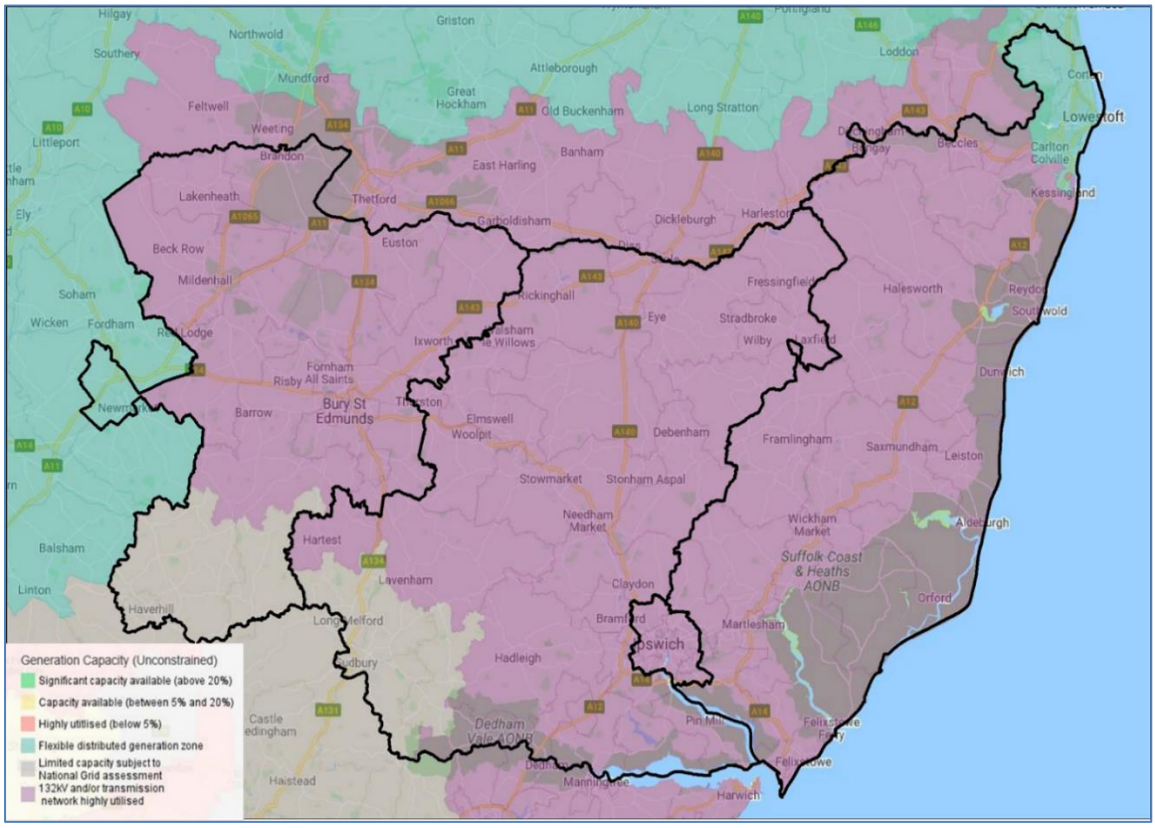
Distribution Network Operator (DNO) with responsibility for making new connections to generators and to consumers while ensuring the supply is reliable. The DNOs are natural monopolies and are regulated by Ofgem. Their licences set the rules on what infrastructure they build and how it is maintained. It includes protections for consumers and limits on the amount they can charge. UK Power Networks (UKPN) is the DNO for Suffolk. While it is the duty of the DNO to always offer a new connection, they will pass on the cost of any necessary network upgrades which can be prohibitive to new renewable projects.

Traditionally, distribution networks have been passive systems, with electricity flowing to consumers with little active operational management. Today, DNOs are undergoing a transformation into Distribution Service Operators (DSO). This is introducing monitoring, control and automation to the network. This smart grid technology allows active management of supply and demand in real time making the network more flexible and efficient. The benefit is that more renewable electricity generators can be connected at lower cost.

7.5.2 Availability for generation connections

UKPN's Distributed Generation mapping tool[178] is a GIS-based interactive service which indicates where new larger renewable electricity generators are likely to be able to connect to the network. It shows the location of 33kV and 132kV overhead electricity network infrastructure as well as the connection status of substations. Around 90% of Suffolk is '132kV and/or transmission network highly utilised'. This means that grid reinforcements would be needed before a large renewable generator, like a solar farm, could be fully connected.

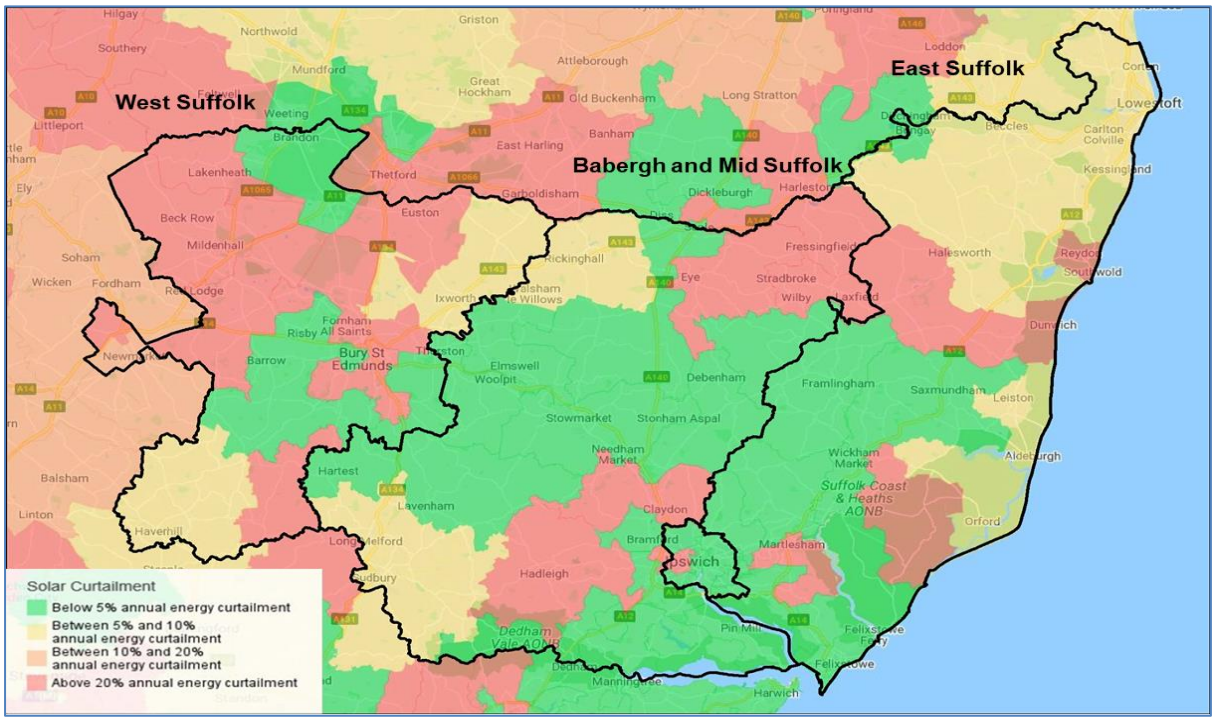
Figure 33 – UKPN's generation capacity constraints map for Suffolk local authority areas



[178] UKPN's DG mapping tool

Increasingly, UKPN are now managing the network actively. An Active Network Management zone was introduced in Suffolk in 2019. This allows then to offer new connections, but they are 'non-firm', giving them powers to curtail power output to varying degrees in response to pressure on the infrastructure. The majority of new schemes in Suffolk will face some level of constraint. West Suffolk is the most constrained area, with above 20% annual curtailment likely Much of the centre of the Babergh and Mid Suffolk LA is below 10% of annual curtailment, whilst East Suffolk is quite varied, with higher curtailment (10-20%+) along the coast and a large area from the centre to the south as below 5%. Ipswich has high annual curtailment of over 20% in the centre, urban areas, with low curtailment (under 5%) in the suburbs and more rural areas. Curtailment significantly impacts on the commercial case for renewable energy projects.

Figure 34 – UKPN's solar curtailment heat map for Suffolk local authority areas



7.5.3 Transition to DSO

UKPN published its Flexibility Roadmap in 2019[179], which identifies the ways it can modernise the local grid, by procuring flexibility from connected generators. This flexibility can avoid the need for new grid infrastructure while also addressing the risk from unplanned interruptions. They estimate that their market for flexibility could be more than 200 MW by 2023.

The Advancing Communities Towards Low-Carbon Energy Smart Systems (ACCESS) project is a European funded smart grids innovation project. West Suffolk are a partner and are deploying a peer to peer trading scheme and energy storage system at Mildenhall industrial estate[180].

7.6 Power Goal 2 – A smart and flexible grid

The outcomes selected to create a smart and flexible grid in Suffolk are:

[179] UKPN (2019) Flexibility Roadmap
[180] The Advancing Communities Towards Low-Carbon Energy Smart Systems (ACCESS) project

Table 10 – Outcomes and actions supporting Power Goal 2 – A smart and flexible grid

Outcomes	Actions
Increase grid capacity for new connections	DNO to accelerate the deployment of flexibility mechanisms which can make network capacity available for new connections. UKPN has already introduced Active Network Management in Suffolk and its Flexibility Roadmap includes other ways it can modernise the local grid, including flexibility procurement.
Network innovation	Deploy network innovations in Suffolk to address local challenges and exploit opportunities. The DNO in partnership with local stakeholders should deploy a Network Innovation Competition project in Suffolk. This could include the deployment of smart grid technology to reduce constraints or electrifying heating systems to address fuel poverty for example.
Strategic network planning collaboration	Enhanced strategic collaboration between the public sector and the DNO, integrating network, planning and climate emergency activities. This would involve improved sharing of knowledge, including information on future energy demand from site allocations, pre-planning enquiries and site planning progress. UKPN has prepared a Distribution Future Energy Scenarios report and planners should be given support to integrate this into the planning process

7.7 National low carbon power infrastructure

Suffolk hosts major low and zero carbon infrastructure projects, including offshore wind projects, nuclear power stations and interconnectors. Several significant new power infrastructure projects are proposed or are under development, all vital to meeting our national carbon neutrality commitment.

7.7.1 Offshore wind power

The East of England has now become a leader in the offshore wind energy scene. The 60MW Scroby Sands offshore wind development was one of the first offshore wind developments in the UK, originally commissioned in 2004. There are currently three offshore wind farms operating off the Suffolk coast: 504MW Greater Gabbard, 353MW Galloper and 714MW East Anglia ONE, with a combined total of just over 1.5GW. There are currently another three offshore wind farms in development: 800MW East Anglia ONE North, 900MW East Anglia TWO and 1.4GW East Anglia THREE. This would provide a cumulative capacity of over 4.5GW of offshore wind located directly off the coast of Suffolk and across the East of England Coast.

7.7.2 Nuclear

Nuclear power plants are controversial but by supplying low carbon baseload power, can play a major role in the low carbon transition. Lifecycle emissions are in the same range as solar and wind, with emissions from construction reduced by zero carbon operation and a long operating life.
Sizewell nuclear power stations, located on the central coast of Suffolk, currently host Sizewell A and B reactors. Sizewell A is currently being decommissioned, whilst Sizewell B is still in operation and is the UK's newest operating nuclear power station. Sizewell C is a proposed 3.2GW reactor which is at an early stage of development. It would replicate the design and technology used at Hinkley Point C, with two reactors capable of generating enough power for approximately six million homes.

7.7.3 Interconnectors

Interconnectors are transmission cables that run from one country to another to allow power transfer between the countries. These can help lower supply prices, increase energy security, and continue to decarbonise power supply. The Nautilus Interconnector is a proposed second interconnector between Great Britain and Belgium with a 1.4GW high voltage direct current (HVDC). Theoretically, the connection could supply power to one million homes. It would come online in the late 2020s.

7.8 Goal 3 and 4 – National low carbon power infrastructure and public sector leadership on renewable electricity

The outcomes selected in relation to the national low carbon power infrastructure in Suffolk are:

Table 11 – Outcomes and actions supporting Power Goal 3 – National low carbon power infrastructure

Outcomes	Actions
Promote Suffolk's nationally significant low and zero carbon power projects	This contribution should be championed, featuring in climate emergency and carbon neutrality strategy documents, plans and publications.
Low carbon economy and skills	Local authorities will actively support companies in local supply chains through its economy programmes, targeting support and investment in skills at low carbon infrastructure sectors, such as offshore wind and nuclear power.
Withhold support to new fossil fuel infrastructure	District and County Councils to make their position with regard any new carbon-intensive fossil fuel projects clear publicly.
Withhold support to new fossil fuel infrastructure	Local authorities to make their position with regard any new carbon-intensive fossil fuel projects clear publicly.
Renewables on public sector buildings and land	Host renewables installations on public buildings, as well as public land holdings and brownfield land. Establish a collaborative relationship and work with community energy groups to co-develop the schemes where possible.
Renewables serving civic, government and infrastructure sites	Deliver opportunities for on-site or near-site renewable schemes to serve large energy users, like hospitals, universities, and

	transport infrastructure. Work with community energy groups where possible.
Purchase electricity from local and community owned renewables projects through long term agreements (PPAs).	Engage with energy suppliers in advance of electricity supply contract renewals to pave the way for a PPA. Speak to other local authorities who have signed PPA's, to benefit from their experience.

7.9 Key messages and priority actions

Emissions from electricity have been falling significantly in recent years as a result of growing low carbon generation, retiring older, fossil fuel power stations and increasing energy efficiency. Going further and achieving a nearly zero carbon electricity supply is a key requisite for meeting Suffolk's climate commitment. Not only will it remove emissions from existing uses of electricity, but its importance will only grow as vehicles and heating are increasingly electrified.

Decarbonising the electricity supply is a shared national goal and isn't about local energy self-sufficiency or independence. Instead, we should consider how each region or area can contribute its 'fair' share. What is fair? This must take into account a range of factors, including its renewable resource and the opportunity for new schemes within natural constraints, such as existing infrastructure, landscape, community & nature.

There is no 'right' amount, but Suffolk's climate emergency declaration means that local potential should be increased substantially. The evidence from existing capacity studies indicates that there is significant potential for new onshore wind and solar development.

Suffolk's 'All Energy Vision' aims to deliver a coherent vision for Net Zero across the county. This will focus on collaboration through generation, innovation and integration to deliver social, economic and environmental benefits to the people of Suffolk. Outlined within their Energy Prospectus[181] are the important roles of a flexible energy system that delivers solutions through a range of technologies and local engagement practices, which are instrumental in delivering this vision.

To achieve this, Suffolk will need to implement the action plan in order to achieve the following goals:

- Grow renewable energy capacity
- A smart and flexible grid
- National low carbon power infrastructure
- Public sector leads the way with renewable electricity

Together, these are important contributions to achieving the rapid and deep emissions reductions from the power sector that are required. The priority actions for the sector are included in the Suffolk Climate Emergency Plan, and the Table of Actions.

[181] Suffolk County Council (2021) *Suffolk's Energy Vision*.

8 Air quality and additional co-benefits

8.1 Introduction

The potential benefits of Suffolk becoming a carbon neutral county in 2030 on air quality across the country were assessed against the following three pollutant emissions (reported in units of mass i.e. tonnes) and concentrations (reported in units of mass per unit volume i.e. µg/m^3) :

- NOx which stands for Nitrogen oxide;
- PM_{10} which stands for Particulate Matter that have a diameter of less than 10 micro-meters.

8.2 Method

To calculate the emissions impacts in 2030, we adopted a top-down assessment using 2018 UK baseline emission data from the National Atmospheric Emissions Inventory[182] (NAEI) and 2030 UK baseline emissions from the Defra Scenario Modelling Tool (SMT)[183].

The SMT, as with the NAEI, was developed by Ricardo Energy & Environment on behalf of Defra. Permission from Defra was granted to use the SMT for the work carried out for Suffolk Country Council. The SMT forecasts emissions for the above pollutants at NAEI at a 1km by 1km resolution. The NAEI provides publicly available data.

To calculate the co-benefits from the proposed carbon neutral outcomes on NOx and PM_{10} in 2030, we selected equivalent, predefined UK outcomes within the SMT, e.g. electrification of fleet, reduction of traffic. Assumptions on the uptake rate of these outcomes where further modified to link them as closely as possible to the Suffolk carbon neutral outcomes.

8.3 Results

The results below summarise the differences that would be observed in 2030 between an emissions baseline, and an emissions under the carbon neutral scenario. These are presented in both emissions and concentrations of PM10 (which and NOx, with accompanying explanatory text highlighting the key benefits between the baseline and the scenario.

[182] https://naei.beis.gov.uk/data/
[183] https://ee.ricardo.com/downloads/air-quality/designing-a-scenario-modelling-tool-to-inform-policy-on-air-pollutant-emissions

8.3.1 Emissions of PM10 in 2030 – baseline versus carbon neutral scenario

In terms of the differences in PM10 emissions in 2030 between the baseline and carbon neutral scenario, there are observable reductions in a number of locations, notably urban areas such as Ipswich and Lowestoft. Figure 35 provides a visualisation of PM10 emissions across the county in 2030 under the baseline, and Figure 36 under the carbon neutral scenario.

Figure 35 – PM_{10} emissions under baseline scenario in 2030

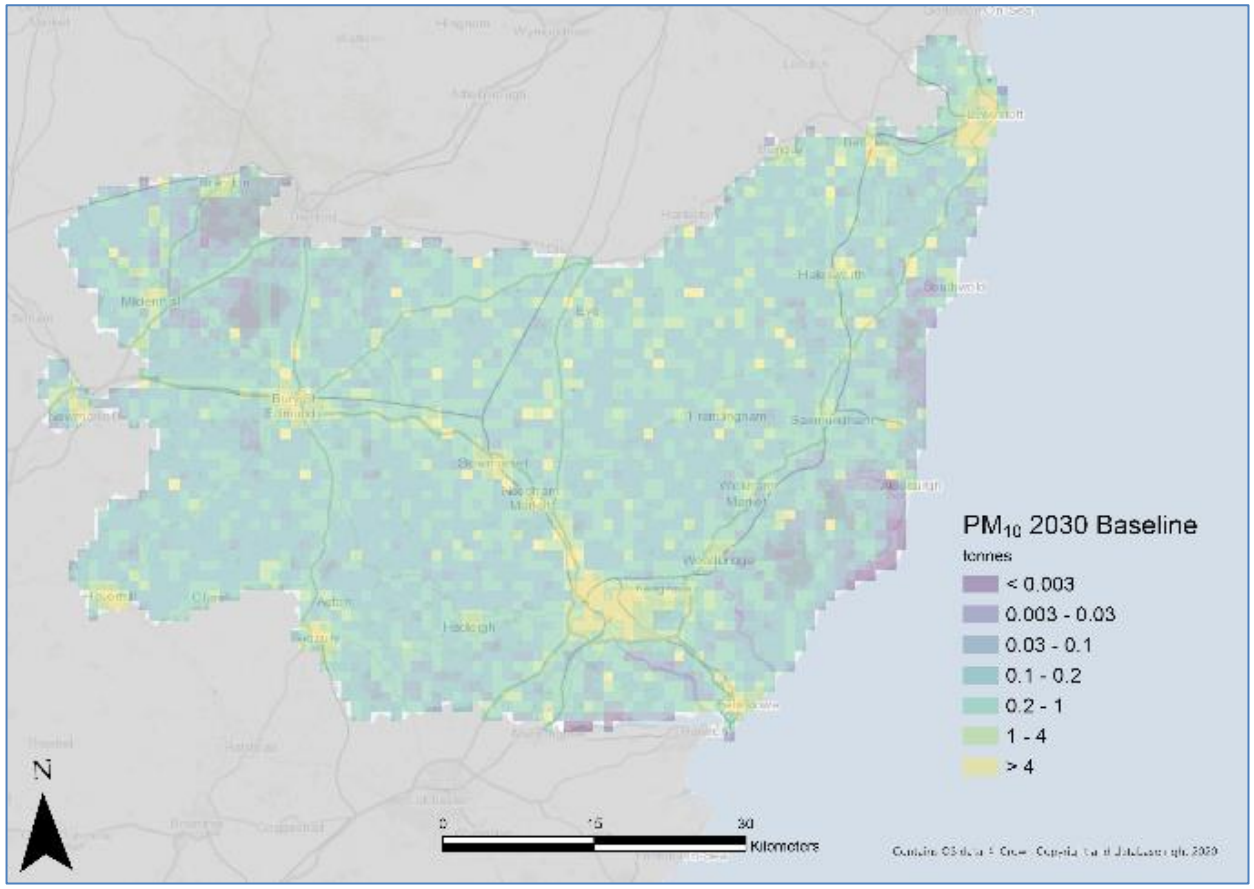


Figure 36 – PM_{10} emissions under carbon neutral scenario in 2030

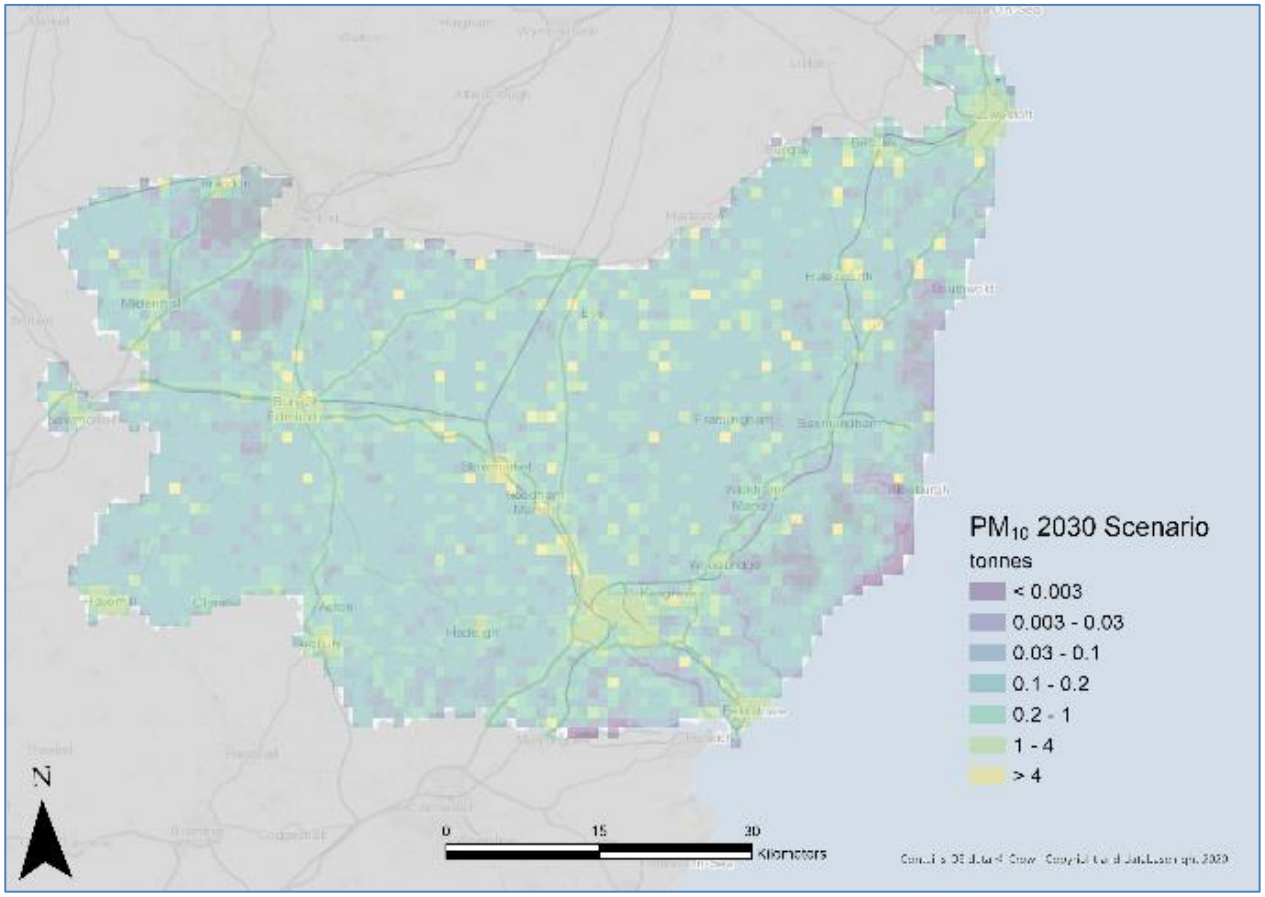
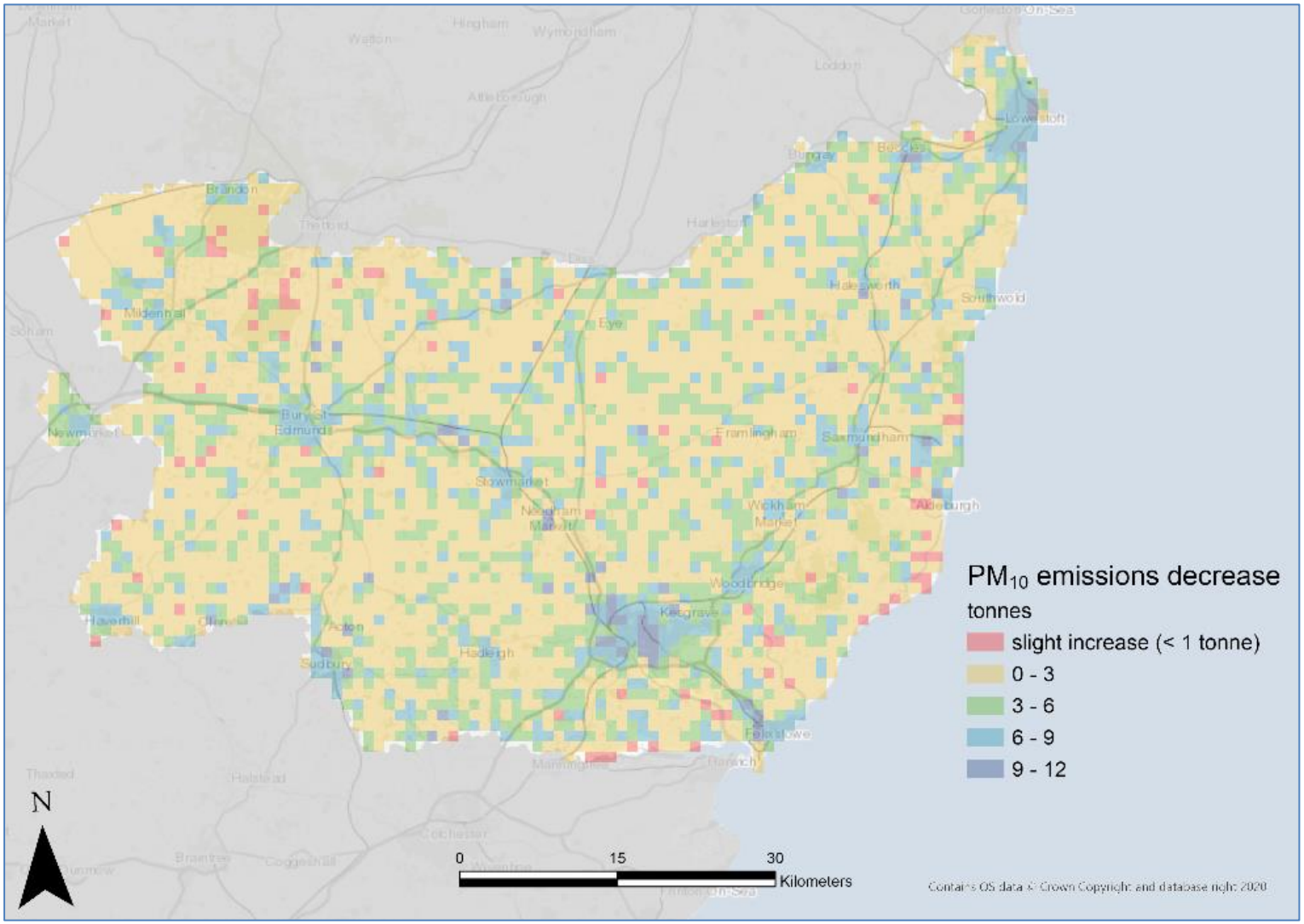


Figure 37 visualises these reductions more clearly, showing the emission savings of PM_{10} (calculated as 2030 baseline emissions *minus* 2030 carbon neutral scenario).

Figure 37 - PM_{10} emission savings (tonnes) if proposed scenario is adopted



8.3.2 Emissions of NOx in 2030 – baseline versus carbon neutral scenario

In terms of the differences in NOx emissions in 2030 between the baseline and carbon neutral scenario, there are observable reductions in a number of locations, similar to PM_{10}, which are notably the urban areas such as Ipswich and Lowestoft as well as along major roads. Figure 38 provides a visualisation of NOx emissions across the county in 2030 under the baseline, and Figure 39 under the carbon neutral scenario.

Figure 38 – NO_X emissions under the carbon neutral scenario

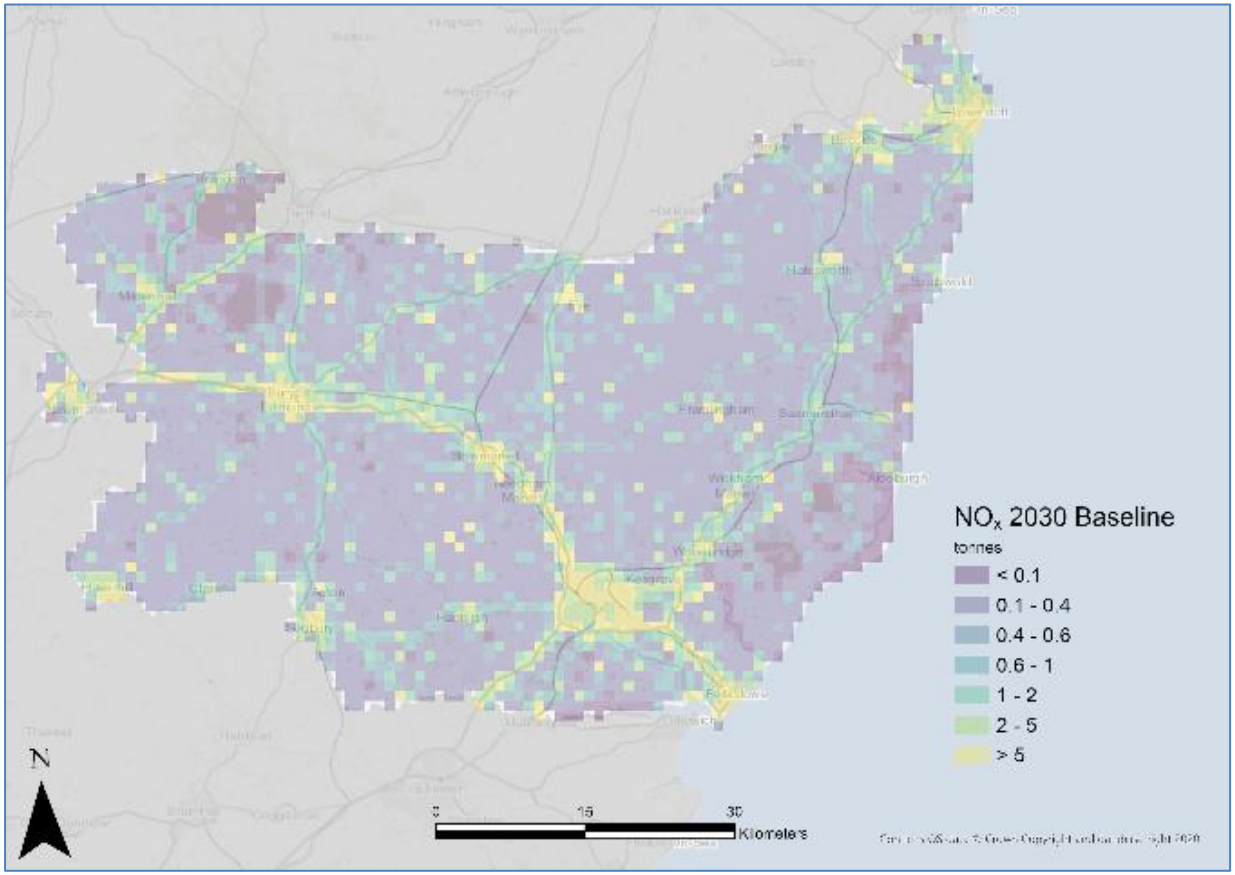


Figure 39 – NO_X emissions under the baseline scenario

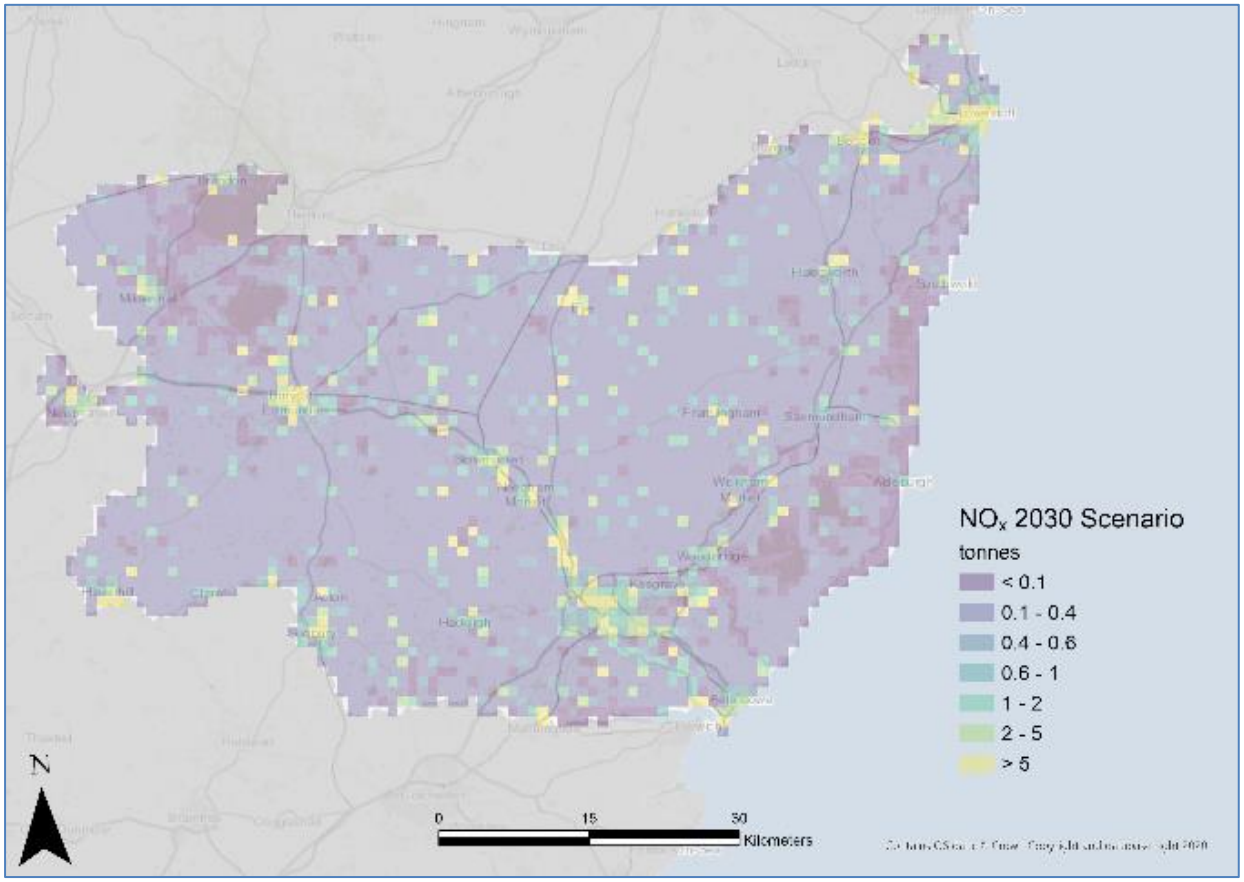
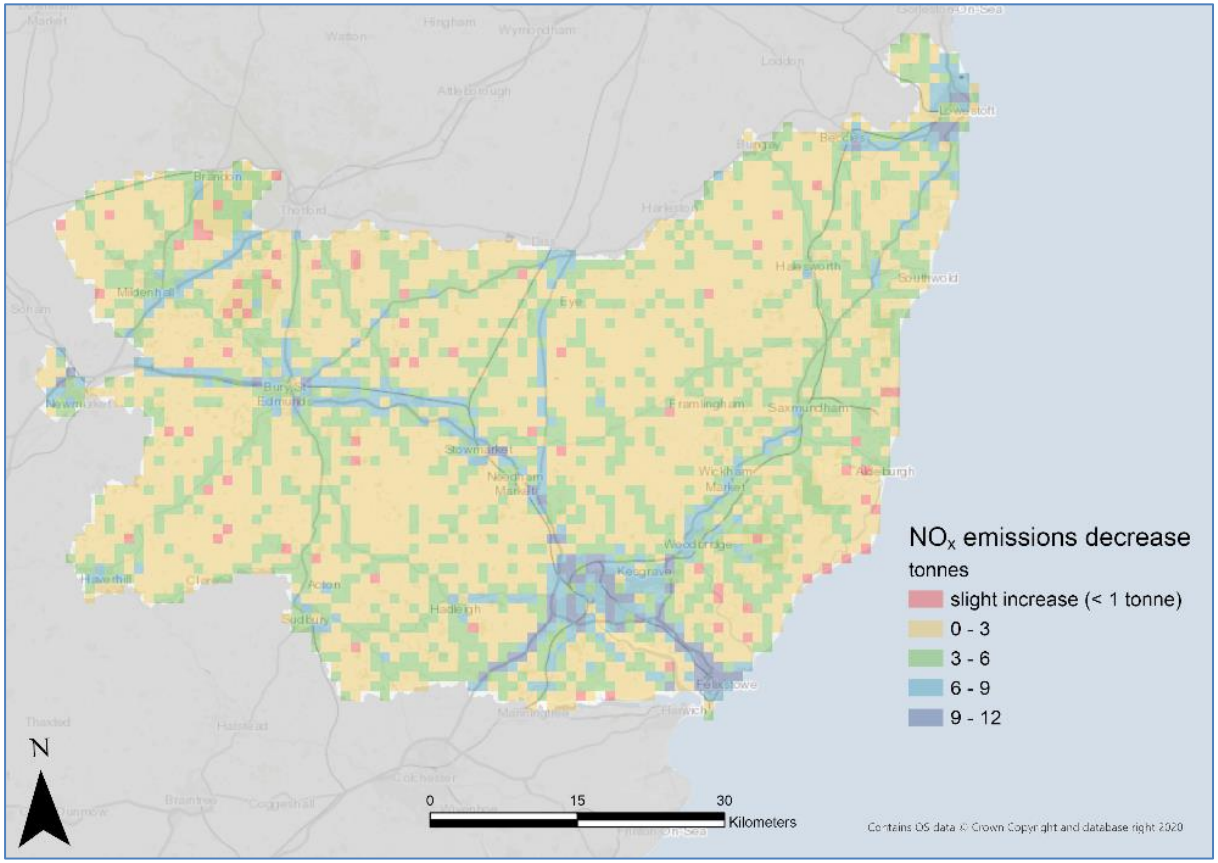


Figure 40 visualises these reductions more clearly, showing the emission savings of NOx (calculated as 2030 baseline emissions *minus* 2030 carbon neutral scenario).

Figure 40 – NOx emission savings (tonnes) if proposed scenario is adopted



Overall, the results for both NO_X and PM_{10} indicate an overall decrease in emissions for the country as a whole. Noticeable decreases take place in Ipswich due to a large decrease in the road transport sector (specifically A14, A12). This is due to the electrification of the fleet and the proposed fleet reduction for each of the vehicle classes under the carbon neutral scenario. Therefore, it is no surprise that the main roads do not appear as pollution hotspots in the scenario maps.

8.3.3 Distribution of pollutant emissions in 2018 by district and sector

The following maps provide more insights into the emission profile in 2018 for each sector (Transport, Domestic Buildings, Commercial/Industry) and each local authority emission. The transport and industry sector are dominated by NOx emissions whereas the domestic sector shows a more even distribution of emissions by NOx and PM_{10} ($PM_{2.5}$ is also included here, but is essence is a sub-set of PM10, and follows the same trend as visible below).

Figure 41 – Transport emissions per pollutant in 2018

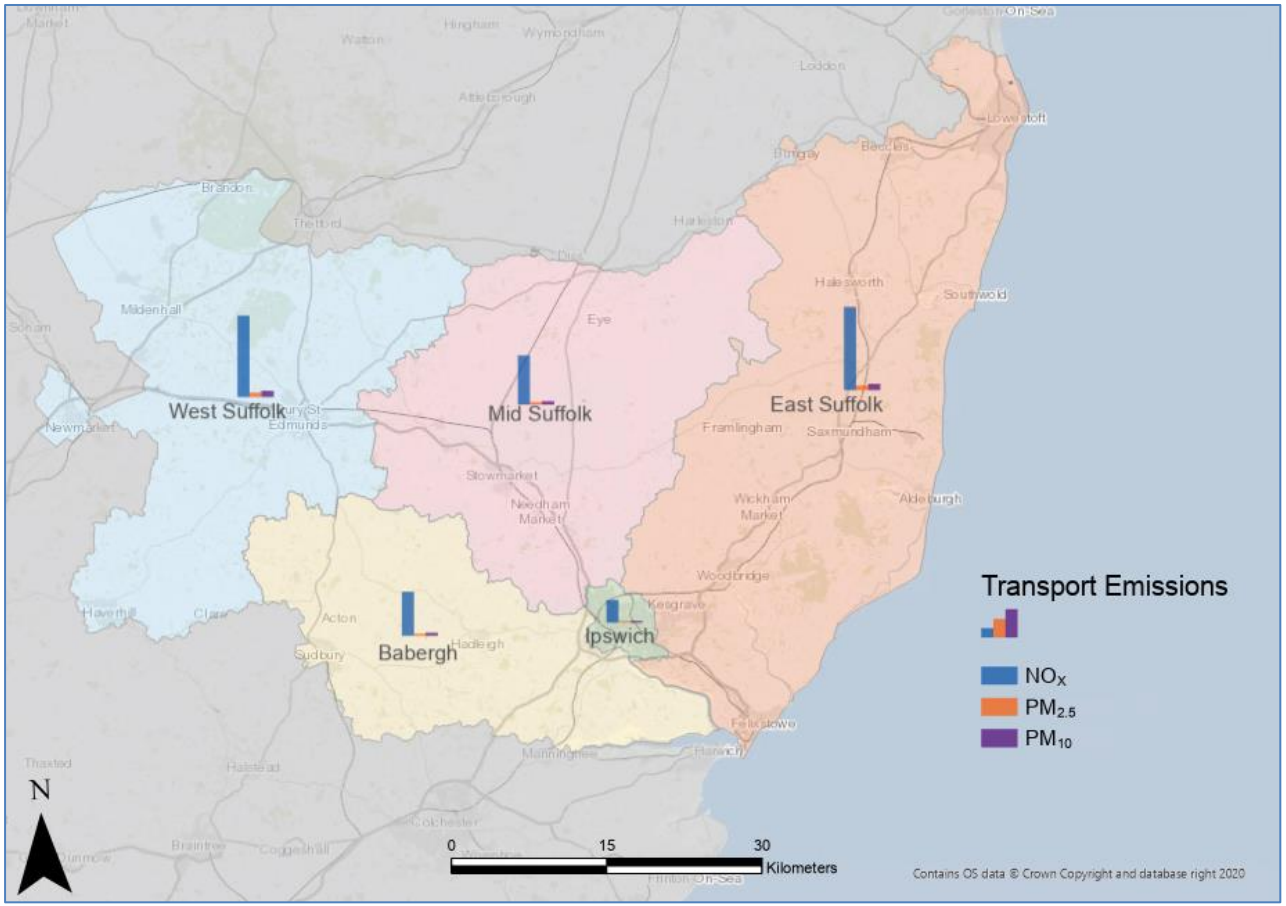


Figure 42 - Domestic/housing emissions per pollutant in 2018

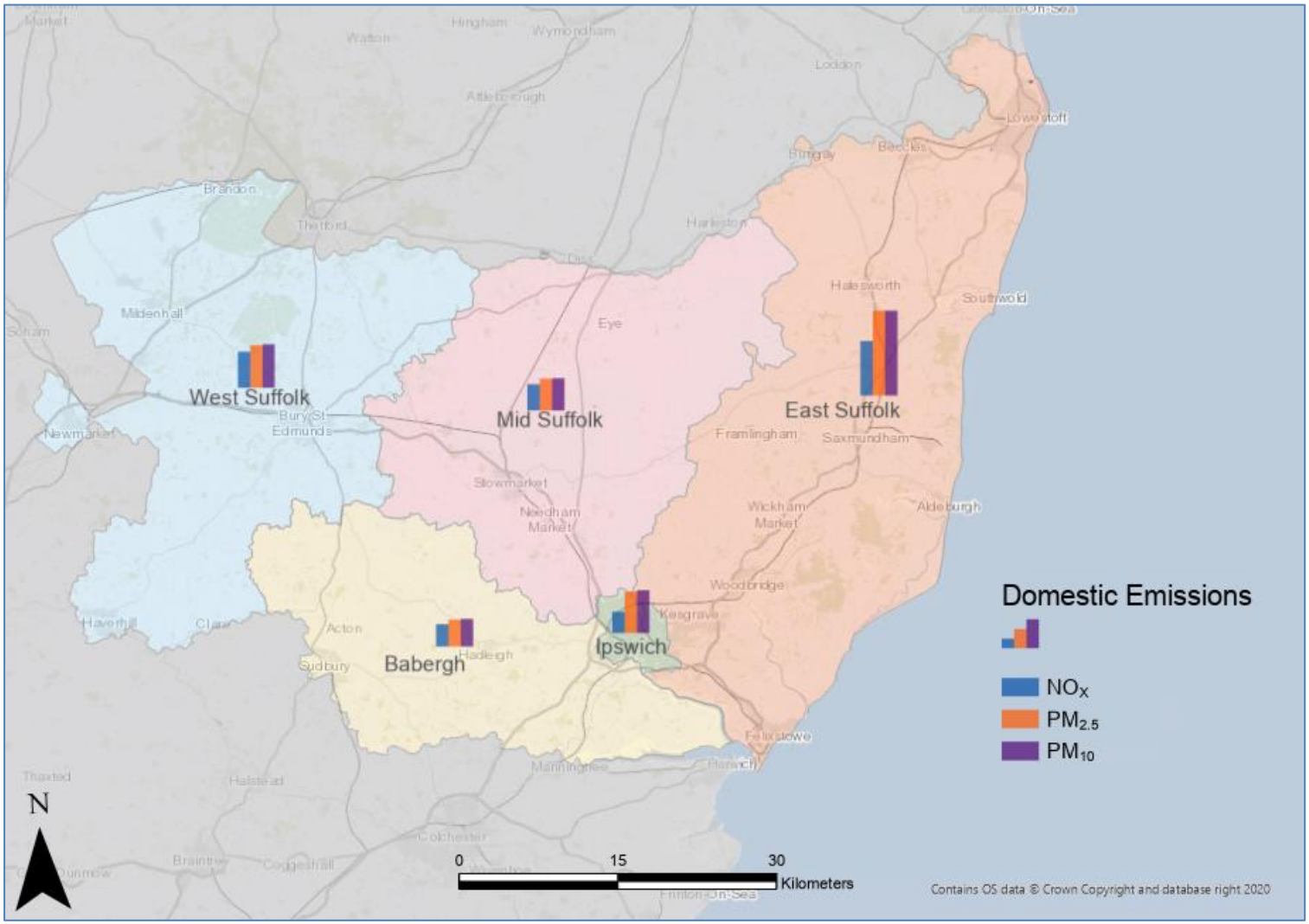
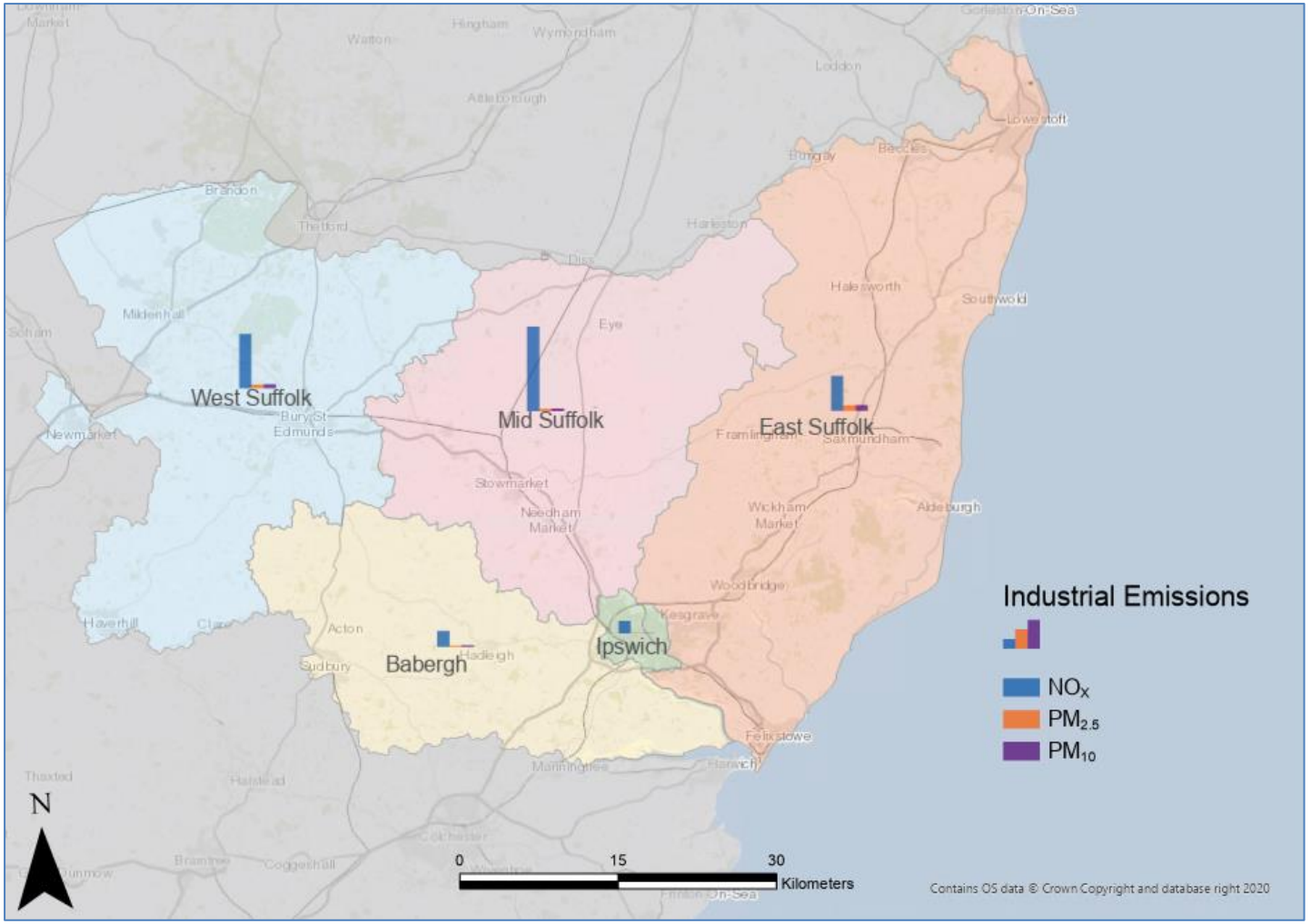


Figure 43 – Industrial emissions per pollutant in 2018



Evidently, the industrial sector contributes the most to the emissions of Suffolk followed by the transport sector and the domestic, for which the pollutants have a more equal distribution.

8.3.4 Estimated damage costs

To understand the financial implications of the emissions savings achieved on air quality, damage costs have been calculated for the calendar year 2030. Damage costs are a set of impact values, measured per tonne of emission by pollutant, that estimate the societal costs associated with the reduction in pollutant emissions under the carbon neutral scenario. They enable proportionate analysis when assessing relatively impacts of actions and outcomes on air quality and were calculated by converting the emission savings into damage costs using Defra's Air quality appraisal: damage cost guidance[184]. These saved damage cost values are shown in Table 12.

The benefits are driven by the overarching aim to be carbon neutral in 2030. The largest benefits can be seen for the transport sector due large contribution of this sector to the overall emissions. And due to the outcomes being implemented, i.e. electrification of the entire fleet as well as reduction of vehicle numbers across every vehicle class.

Table 12 – Damage cost values in 2030 per pollutant and sector

Pollutant and Sector	Damage cost values million £, 2020 prices)
NOx commercial	7.1
NOx domestic	3.3
NOx road transport	11.3
PM10 industry (area)	0.8
PM10 domestic	3.0
PM10 road transport	7.1
PM2.5 industry (area)	0.3
PM2.5 domestic	2.9
PM2.5 road transport	3.0
Total	**38.8**

[184] https://www.gov.uk/government/publications/assess-the-impact-of-air-quality/air-quality-appraisal-damage-cost-guidance#damage-costs

8.4 Additional co-benefits

The evidence compiled in the report's chapters (GHG emissions across Suffolk, Domestic buildings, Transport, Commercial and industrial energy use, power, collaborative action, and air quality) all provide the direction to follow in order to reduce GHG emissions. The main co-benefit elaborated on in this report is that of air-quality as mentioned above, however there are other notable co-benefits.

From a health perspective, a reduction in the burning of fossil fuels across Suffolk will lead to benefits. These will come not only from the improved air as mentioned above, but also from a number of the outcomes and actions that advocate for increasing active travel, and community engagement. Increases in active travel will lead to physical and mental health benefits, notably from the increases in exercise such as walking and cycling, which increase an individual's activity levels. Increased individual engagement and participation in their community can have mental health benefits too, from an increase in feelings of connection, purposefulness, and collaboration.

One such example of a community-based climate change action organisation is Winchester Action on Climate Change (WINACC). This not-for profit organisation, run both by volunteers as well as paid staff, organises working groups across the Winchester District that anyone can get involve in. These groups include a food waste action group, a science and technology advisory panel, and transport group.[185]

Figure 44 - WINACC community

From the perspective of ensuring a just transition, numerous outcomes and actions can be implemented to contribute towards inclusive growth and reduction in fuel poverty. Examples include maintaining and expanding existing energy hubs to provide information and support to access funding for energy efficiency outcomes and low carbon heating, as well as the district councils prioritising improving the insultation and energy efficiency of council housing.

Regarding the co-benefits for skilled jobs in Suffolk, the Government has recognised the importance of skill development across its population in order to implement the transition to a net-zero economy during the 2020s, 30s, and 40s. As outlined by the Committee on Climate Change, new skills to support for designers, builders and installers is urgently needed for low-carbon heating (especially heat pumps), energy and water efficiency, ventilation and thermal comfort, and property-level flood resilience. Whilst this will present a challenge, it should be seen as an opportunity to both petition the Government to ensure that those in transitioning industries are given the support to upskill (e.g. through the Skills Advisory Panels), as well as position Suffolk at the front of the net-zero transition.[186]

[185] https://www.winacc.org.uk/
[186] https://www.theccc.org.uk/wp-content/uploads/2019/05/Net-Zero-The-UKs-contribution-to-stopping-global-warming.pdf

The Gemini Building
Fermi Avenue
Harwell
Didcot
Oxfordshire
OX11 0QR
United Kingdom
t: +44 (0)1235 753000
e: enquiry@ricardo.com

ee.ricardo.com