



Joint Strategic Committee
3 December 2019
Agenda Item 7

ADUR & WORTHING COUNCILS

Key Decision [~~Yes~~/No]

Ward(s) Affected: All

Working towards the 2030 target - Adur & Worthing Councils' Carbon Neutral Plan

Report by the Director for Digital & Resources

Executive Summary

1. Purpose

- 1.1. On 9 July 2019 Joint Strategic Committee (JSC) declared 'Climate Emergency'. As part of the declaration, Members committed to:
 - 1.1.1. *'go beyond the previously set 2050 target adopted by Adur & Worthing Councils in 2018 and work towards becoming carbon neutral by 2030'* and
 - 1.1.2. produce *'an outline strategy on how the Councils will work towards the carbon neutral target. The strategy to be produced by January 2020 at the latest'*
- 1.2. The Carbon Reduction Plan has been produced: **'Adur & Worthing Councils' Carbon Neutral Plan: Working towards the 2030 target'**. This report brings the draft plan to members to seek approval for adoption ahead of the scheduled January 2020 deadline.
- 1.3. The Plan sets out an ambitious, challenging and yet achievable pathway for the councils to become carbon neutral by 2030. The report identifies potential delivery mechanisms and identifies synergies with capital

programme works which provide opportunities for successful implementation of the Plan.

2. Recommendations

That the Joint Strategic Committee:

- 2.1. Note that the carbon reduction plan identifies an achievable pathway for the councils to become carbon neutral by 2030; and the resources already in place to progress with this work;
- 2.2. Approve the adoption of the '***Adur & Worthing Councils' Carbon Neutral Plan: Working towards the 2030 target***'
- 2.3. Delegate authority to the Director of Digital & Resources in consultation with the relevant Executive Member to make minor amendments to the Plan prior to publication, in particular the addition of information on business travel.

3. Context

- 3.1. The Carbon Reduction Plan is brought for approval to this committee ahead of schedule in recognition of the urgency in taking meaningful and impactful steps to tackle climate change. As such, Adur & Worthing Councils (AWC) will become the first local authority in East or West Sussex to develop their plan backing up their Climate Emergency declaration. The Plan is attached at **Appendix 1**.
- 3.2. The Plan shows that the route towards becoming carbon neutral will require a strong level of ambition and commitment, backed up by significant interventions and investment across AWCs' operations. The fundamental steps required to deliver the net-zero target are clear and with strong leadership from the Councils these can be set into action now
- 3.3. Development of a carbon reduction plan aligns with national legislation and policy including the Climate Change Act; the Industrial Strategy; the Clean Growth Strategy; Road to Zero; and the Future of Heating. The plan also aligns with regional policy Energy South2East (LEP strategy); and the draft Greater Brighton Economic Board draft Greater Brighton Energy Plan.
- 3.4. Locally, the plan aligns with the AWCs' adopted vision: *Platforms for our Places* which commits to *reduce emissions and shift to clean energy across the councils' estate*; and to *transition council fleet to hybrid and electric vehicles*. It also delivers on carbon reduction commitments in *SustainableAW* the councils framework for action on sustainability.
- 3.5. Following the commitment by Members in July 2019 to produce a carbon reduction plan, consultancy AECOM were appointed to provide the technical expertise to deliver a robust evidence-based plan. The brief was to develop a Carbon Neutral Plan incorporating the following elements:
 - 3.5.1. defining the scope of the Plan, consulting relevant officers;
 - 3.5.2. detailed assessment of council carbon emissions;
 - 3.5.3. undertaking energy audits of key council buildings;
 - 3.5.4. establishment of a current baseline and carbon projection modelling to 2030;
 - 3.5.5. setting out a pathway to become carbon neutral by 2030; and
 - 3.5.6. development of a deliverable, prioritised project list of carbon and cost effective projects for the first phases of the plan, to enable cumulative progression towards 2030 carbon neutrality.

4. Summary of the Carbon Reduction Plan

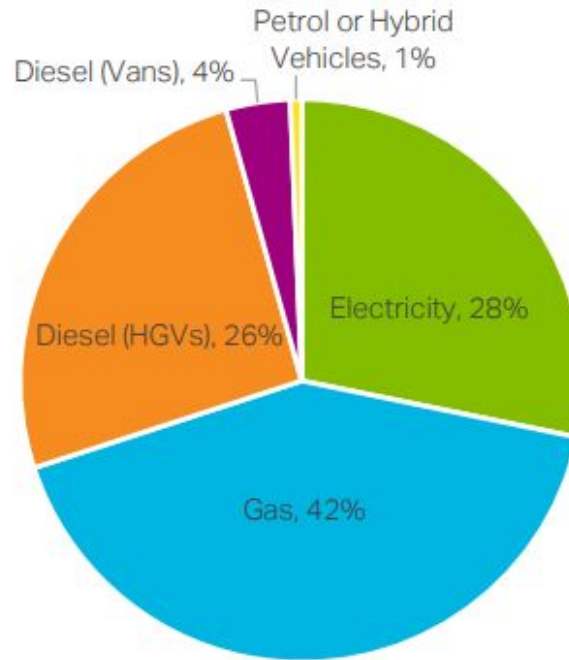
- 4.1. It is vital to note that this carbon reduction plan relates to the Councils' leadership by example, in seriously and urgently tackling the carbon emissions we are responsible for. The report *Sustainable AW*, also on Committee's agenda, demonstrates council commitment to lead and support the development of carbon reduction initiatives at the area level, as part of a proposed wider framework to deliver a more sustainable future for the area as a whole.
- 4.2. The carbon reporting methodology used to develop the plan was defined in line with the Department of Business, Energy and Industrial Strategy (BEIS) 'Emissions Reduction Pledge 2020' guidance. Emissions are divided into three categories:

Category	Description	Agreed data to be used
Scope 1	Direct emissions from sources owned or controlled by the reporting organisation.	Metered gas data in properties owned and operated by, and where the Councils pay for gas.
Scope 2	Indirect emissions from the generation of energy purchased by the reporting organisation.	Metered electricity data in properties owned and operated by, and where the Councils pay for electricity. Mileage for Council-owned vehicle fleet and pool cars
Scope 3	Indirect emissions that result from other activities that occur in the value chain of the reporting organisation, either upstream or downstream.	Metered water use data in properties owned and operated by the Councils.

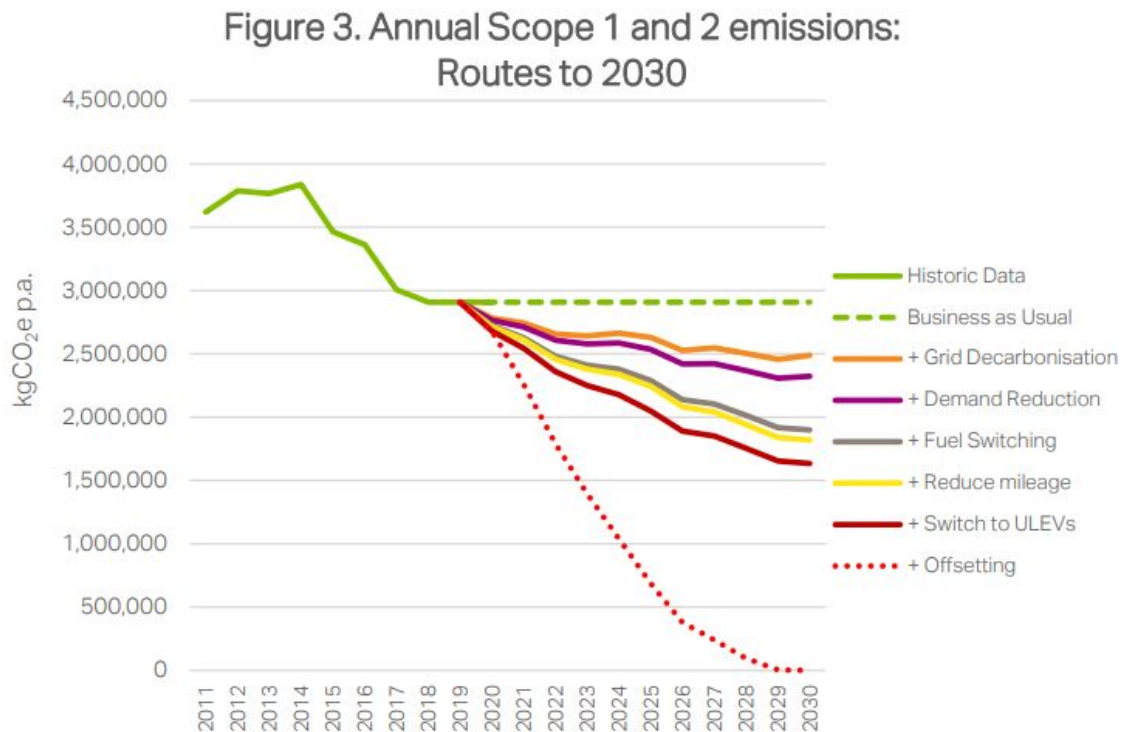
- 4.3. Based on the definitions above, the councils' carbon emissions for the year 2018-19 were **2,908 tonnes CO2 emissions**. This forms the 2018-19 baseline for the Carbon Reduction Plan.
- 4.4. There are additional Scope 3 emissions that the Plan addresses, including those arising from business travel, waste, procurement, and council owned buildings where the council is not the bill payer. Due to insufficient data these have not been quantified in the Plan at this stage. The Plan makes recommendations on how AWC can develop additional data collection methods to provide further visibility of Scope 3 emissions and influence emissions reduction.

- 4.5. Results show that gas and electricity use in buildings accounts for the majority of Scope 1 and 2 emissions (42% and 28%, respectively). The next biggest contributor is fuel use for HGVs (26%). Other vehicles such as cars and diesel vans make up for around 5%. See Figure2 below:

Figure 2. Scope 1 & 2 emissions by fuel type (2018-19)



- 4.6. Based on available data, the Councils' Scope 1 and 2 emissions have decreased since 2014/15 by approximately 23% due to a number of factors. These include efficiency improvements, weather, user behaviour, changes to the Councils' ownership or operation of buildings, and provision of services, but the majority of the reduction is due to national grid decarbonisation.
- 4.7. National electricity grid decarbonisation has resulted in considerable reduction in council carbon emissions since 2014. The carbon intensity of grid electricity is falling progressively, as electricity is generated less from fossil fuels and more renewable energy. The analysis considers the impact of the national grid decarbonisation trajectory published by BEIS reflecting the Government ambition to meet the UK's carbon emission reduction commitments. Grid decarbonisation forms an important strand in the councils' achievement of carbon neutrality in 2030.
- 4.8. Routes to achieve the carbon neutral target are visualised in the following graph from the Plan:



4.9. The Plan sets out a potential pathway to achieve the carbon neutral target, with the requirement to deliver significant change and major transitions across a range of areas. It will be a great challenge, but one we must embrace.

4.10. Adur & Worthing Councils will need to actively work towards enabling the following recommendations from the action plan, set out in key areas for interventions, including:

4.10.1. energy demand reduction in existing buildings through energy efficiency measures and user behaviour, improved insulation for building fabric and glazing, gas boilers replacement, improved building energy control systems, and lighting provision;

4.10.2. switching from the use of gas-fired heating to electric systems such as heat pumps;

4.10.3. transport interventions such as switching to 100% electric vehicles, reducing journey mileage, efficient vehicle routing, and measures to promote a shift towards walking, cycling, ridesharing and public transport;

- 4.10.4. district heating for the Worthing Civic Quarter
- 4.10.5. greater uptake of renewable energy technologies such as solar photovoltaics and battery storage;
- 4.10.6. offsetting remaining emissions by promoting carbon sequestration through sustainable woodland management or other means; or investing in large-scale renewable energy generation.

5. **Resources allocated to deliver the Plan**

- 5.1. The councils have already made significant commitments to deliver carbon reduction, and thus are in a strong position to deliver on commitments over the forthcoming years. Resources include:
- 5.2. Financial resource
 - 5.2.1. £2,186,000 allocated in the Capital Strategy for implementing Carbon reduction across AWC's estate and vehicles 2019-23 (see paragraph 6, Finance section).
 - 5.2.2. A SALIX fund will be set up in 2020. Salix Finance provides interest-free Government funding to the public sector to improve energy efficiency, reduce carbon emissions and lower energy bills.
- 5.3. Staff Resource
 - 5.3.1. The development of a new Carbon Reduction Manager post is planned for 2020 to manage carbon reduction delivery;
 - 5.3.2. An internal Carbon Reduction Delivery Group has been established to coordinate delivery.
- 5.4. Heat decarbonisation: Worthing Civic Quarter Heat Network
 - 5.4.1. An application for funding has been submitted to the government's Heat Network Delivery Unit for funding to undertake a feasibility study for the Worthing Civic Quarter. The study would be produced in early 2020.
- 5.5. Transport decarbonisation
 - 5.5.1. A delivery group works internally to deliver the Sustainable Staff Travel Plan. This delivers decarbonisation projects associated with council business travel, such provision of the easit scheme, Donkey Bikes, cycling facilities for staff, and transitioning the fleet vehicles to low emission vehicles.

- 5.5.2. The current Fleet Replacement policy for council owned vehicles replaces end-of-life fleet with low carbon vehicles. The first 2 EV vans were purchased this year.
 - 5.5.3. AWC will be working with West Sussex County Council on their EV Strategy and programme to deliver 7,000 EV charge points across West Sussex by 2030.
- 5.6. Smarthubs: Smart Local Energy Systems (SLES)
- 5.6.1. The SLES Innovate UK funded project is due to commence 2020-22 with potential to deliver multiple projects across the AWC estate including solar photovoltaic arrays, battery storage, heat pumps and EV charging. This could substantially transform council sites.

6. Engagement and Communication

- 6.1. In the process of developing the Carbon Neutral Plan, four detailed workshops were held with relevant officers from Technical Services, Major Projects, Car Park Management, Planning, Facilities, Adur Homes, Resources and Finance. These were coordinated by the Sustainability Manager and facilitated by AECOM who consulted officers at progressive stages of plan development. Consultation with officers defined the Scope 3 emissions to be included in the plan and the buildings to be audited.
- 6.2. Extensive data was provided to AECOM on the councils' historic gas, electricity and water consumption, transport use, building condition etc. Energy audits were undertaken by AECOM of 17 key corporate buildings with the largest electricity and gas demands. Following data analysis, AECOM presented findings and engaged officers on potential solutions relevant to AWC to define how the plan could deliver carbon reduction.
- 6.3. Executive members have been updated on high level findings of the Plan. Whilst there is considerable budgetary allocation towards carbon reduction in the Capital Investment Strategy, any decisions for large scale investments not already allocated will be brought to members for approval.
- 6.4. Coordination sessions have been held at Worthing Town Hall with officers from East and West Sussex, Hampshire and Brighton & Hove, to share good practice on the process of commissioning and developing carbon plans.

7. Financial Implications

- 7.1. Contained within the capital programme report elsewhere on the agenda are capital budgets to take forward an invest to save programme of works associated with the Carbon Reduction Plan as follows:

	2019/20	2020/21	2021/22	2022/23	TOTAL
	£'000	£'000	£'000	£'000	£'000
Adur	325	-	325	325	975
Worthing	411	-	400	400	1,211
TOTAL	736	-	725	725	2,186

- 7.2. Individual proposals or groups of proposals funded from this budget will be the subject of a business case for approval by the Executive Member for Resources. If a new invest-to-save proposal is identified that cannot be accommodated within this budget, then a business case will be presented to Joint Strategic Committee and Council to seek approval for additional funds.
- 7.3. In addition to these budgets, the Councils will be undertaking a series of improvements to its own buildings and will be seeking to utilise technologies which contribute to carbon reduction. Examples of potential schemes include replacing the Town Hall/Assembly Hall boilers with new energy efficient systems (£200k), replacement of Town Hall air conditioning units in 2nd floor offices (£65k), Worthing Promenade lighting change to LED (£235k).
- 7.4. The programme also regularly includes budgets for replacement vehicles. The current policy is to replace end-of-life fleet with low carbon vehicles where possible.
- 7.5. Other capital schemes across the entire capital programme will be reviewed for compliance to the Carbon Reduction Plan, with opportunities taken to deliver more sustainable solutions.
- 7.6. In order to ensure effective and timely development of capital schemes, a Carbon Manager post will be created to develop and manage the programme. This will be funded from the capital programme.

8. Legal Implications

- 8.1. The Climate Change Act 2008 is the basis for the UK's approach to tackling and responding to climate change and imposes obligations on Local Authorities to reduce emissions of carbon dioxide and that climate change risks are prepared for. It is expected that the statutory obligations imposed on the Council will be increased in due course by the introduction of the Climate Change Act 2008 (2050 Target Amendment) Order 2019 which is currently before Parliament.
- 8.2. Section 111 of the Local Government Act 1972 enables the Council to do anything that is calculated to facilitate, or which is conducive or incidental to, the discharge of any of their functions.
- 8.3. AECOM have been appointed by the Councils as consultants to provide technical expertise. Their appointment followed a lawful, compliant and robust procurement exercise in accordance with Public Contract Regulations 2015 and the Council's Contract Standing Orders.

Background Papers

- [Climate Emergency ... Becoming Carbon Neutral by 2030](#), Item 10 Report to JSC 09.07.11
- Adur & Worthing Councils [Platforms for our Places](#) July 2018
- Adur & Worthing Councils [SustainableAW](#) November 2018
- [Climate Change Act 2008 \(2050 Target Amendment\) Order 2019](#)
- [BEIS, 'Emissions Reduction Pledge 2020: Guidance for emissions reporting in the public and higher education sectors in England 2018-2020'](#) (April 2018).

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Sustainability & Risk Assessment

1. Economic

- Transition to a low carbon economy is vital to provide future energy systems resilience, and to address and reduce potential impacts of climate change.

2. Social

2.1 Social Value

- By securing affordable, low carbon energy into the future, the councils protect budgets from future energy price rises, drawing less budget into council operational costs away from services delivery that benefit local communities.

2.2 Equality Issues

- The impacts of climate change are predicted to impact on all communities, but the greatest impact is predicted to impact the most vulnerable communities. It is imperative that all is done to mitigate climate change.

2.3 Community Safety Issues (Section 17)

- No impacts identified

2.4 Human Rights Issues

- The impacts of climate change are predicted to impact on all communities, but the greatest impact is predicted to impact the most vulnerable communities. It is imperative that all is done to mitigate climate change.

3. Environmental

- The key driver for the Carbon Neutral Plan is mitigate the predicted catastrophic impacts of climate change on the environment, economy and communities.

4. Governance

- The adoption of a Carbon Neutral Plan is intended to show leadership and put the councils own house in order in response to the climate emergency. This aligns with national legislation (the Climate Change Act 2008); national and regional policy, and the councils own policy.



ADUR & WORTHING
COUNCILS

Carbon Neutral Plan

Working towards the 2030 target

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Revision History

Revision	Revision date	Details	Name	Position
1	20/11/19	Draft report	Matthew Turner	Regional Director

Distribution List

# Hard Copies	PDF Required	Association / Company Name
n/a	Y	Adur & Worthing Councils

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Executive Summary

Background and Context

On July 9th 2019, the Joint Strategic Committee of Adur & Worthing Councils declared a Climate Emergency, and committed to working towards becoming carbon neutral by 2030.

As part of this commitment, the Councils resolved to develop an evidence-based Carbon Neutral Plan that would identify the key actions and intervention measures required to set the Councils on the path to net zero carbon emissions. This work is intended to provide the Councils with an understanding of their own carbon emissions baseline and identify the steps that need to be taken to achieve the decarbonisation target by 2030.

Recommendations have been informed by carbon projections modelling, detailed energy audits, and stakeholder engagement workshops, to ensure that the Plan reflects the unique circumstances and priorities of Adur & Worthing Councils as they look towards the future.

Establishing a baseline

In line with the Department of Business, Energy and Industrial Strategy (BEIS) 'Emissions Reduction Pledge 2020' guidance,¹ for the purpose of greenhouse gas reporting, emissions are divided into three categories, referred to as Scope 1, 2 and 3. The table below provides a definition of these terms and summarises the data used in establishing Adur & Worthing Councils' baseline CO₂e emissions.

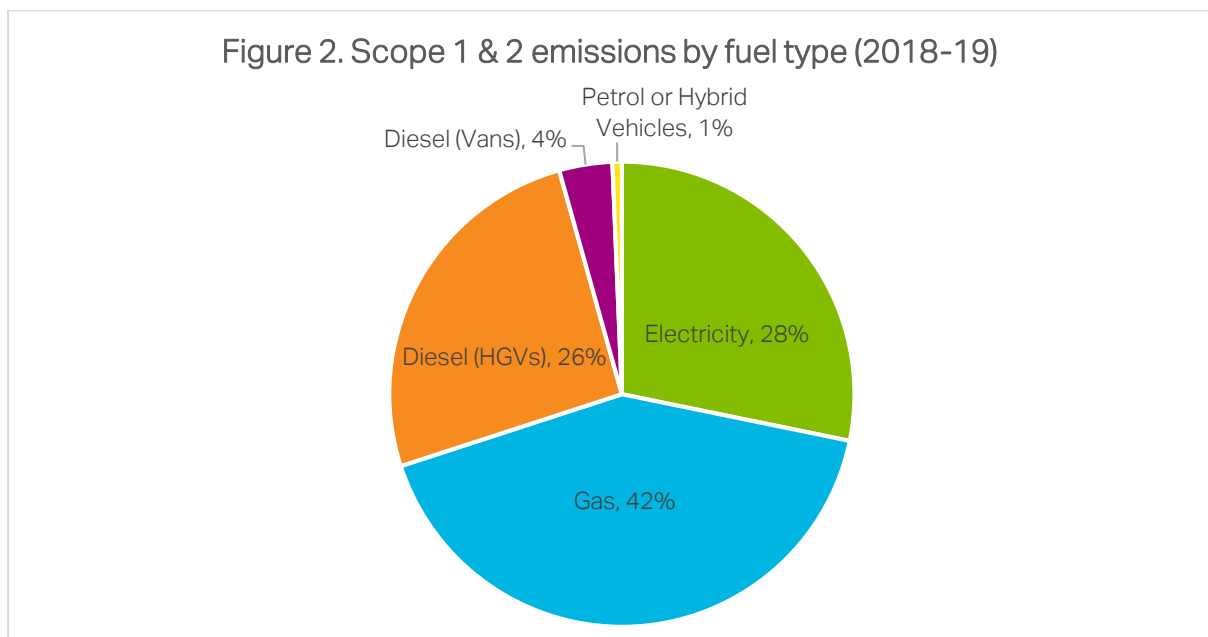
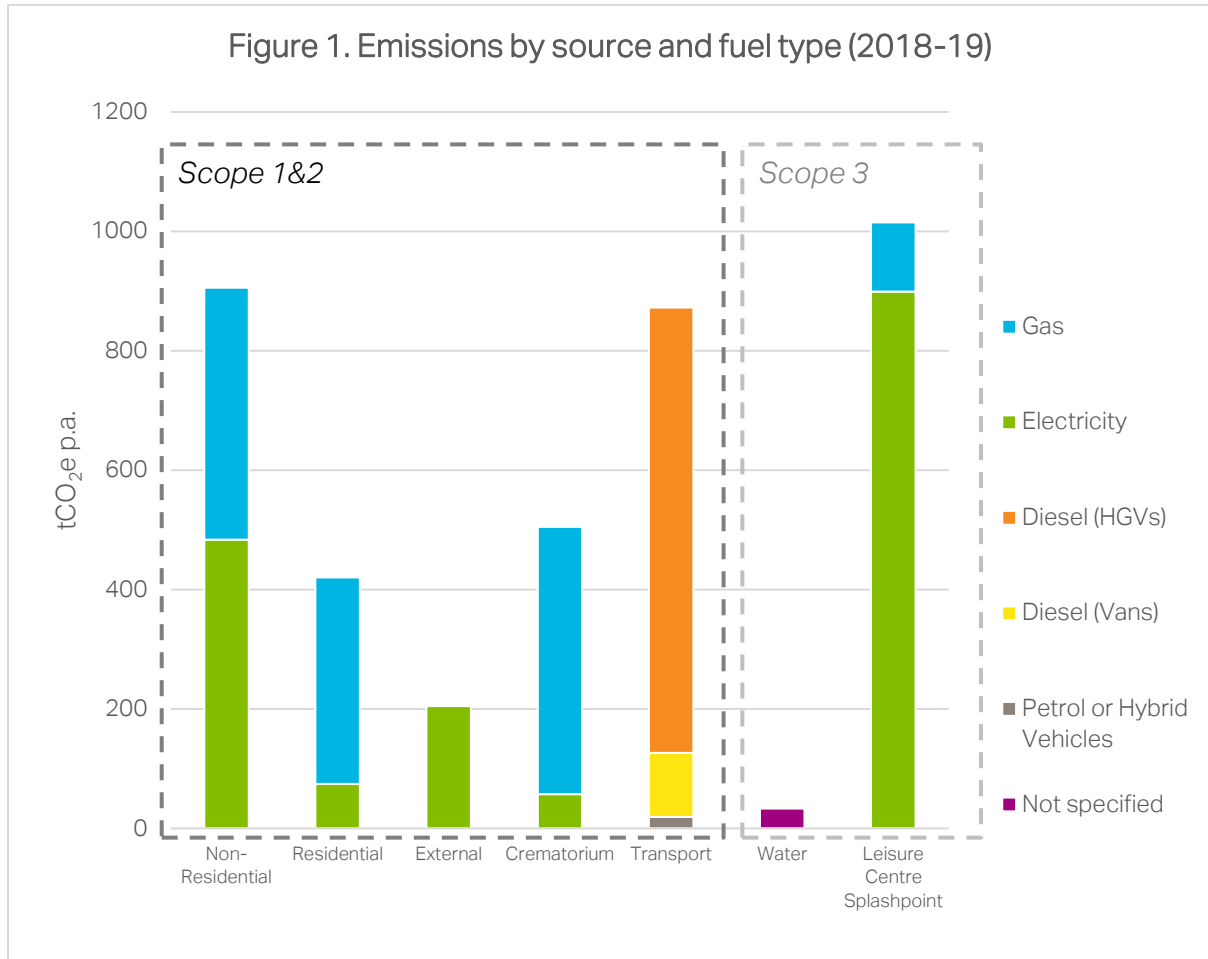
Category	Description	Data used in this analysis
Scope 1	Direct emissions from sources owned or controlled by the reporting organisation	Metered gas data (for buildings where the Councils pay the gas bills) Mileage for Council-owned vehicle fleet and pool cars, along with vehicle make/model and age
Scope 2	Indirect emissions from the generation of energy purchased by the reporting organisation	Metered electricity data (for buildings where the Councils pay the electricity bills) <i>Note that, where data was unavailable, industry standard benchmarks were used to estimate fuel consumption.</i>
Scope 3	Indirect emissions that result from other activities that occur in the value chain of the reporting organisation, either upstream or downstream.	Metered water use data [Not used] Records of business travel by the Councils' employees – insufficient detail to assess CO ₂ e emissions from this activity

Based on this information – gas, electricity, and vehicle use in the year from April 2018-March 2019 – we estimate that the current annual Scope 1 and 2 emissions are approximately 2,908 tCO₂e per annum (p.a.). Scope 3 emissions from water consumption amount to approximately 33 tCO₂e p.a. and emissions from the Worthing Leisure Centre and Splashpoint (based on 2014/15 fuel consumption) accounts for a further 1,015 tCO₂e p.a.

¹ BEIS, 'Emissions Reduction Pledge 2020: Guidance for emissions reporting in the public and higher education sectors in England 2018-2020' (April 2018). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/745003/Guidance_note_for_voluntary_reporting-final.pdf

Note that there are additional Scope 3 emissions, such as those arising from business travel, waste, and procurement, that have not been quantified in this report due to insufficient data. In the future, Adur & Worthing Councils could consider a variety of additional data collection methods that could provide further visibility of these Scope 3 emissions.

Figures 1 and 2 below illustrate the relative contribution from different fuels, building use categories and vehicle types. (Note that emissions from the Leisure Centre and Splashpoint have been estimated using 2014-15 data, which was the most complete information available.)



Results show that gas and electricity use in buildings accounts for the majority of Scope 1 and 2 emissions (42% and 28%, respectively). The next biggest contributor is fuel use for HGVs (26%). Other vehicles such as cars and diesel vans make up for around 5%. The crematorium also represents a major source of CO₂e emissions, primarily due to the gas used for heat.

Based on available data going back to 2011/12, the Councils’ Scope 1 and 2 emissions have decreased by approximately 20% overall and 23% since 2013/14. It is important to note that the annual emissions vary significantly over time, due to a variety of factors not assessed in detail in this report. These include factors such as weather and user behaviour, but a key sensitivity is linked to changes in the Councils’ ownership or operation of buildings or provision of services. This report only considers properties both owned and operated by the Councils where they pay for the electricity and gas. As an example of the potential scale of impact this would have, if the Councils owned and operated the Worthing Leisure Centre and Splashpoint, their Scope 1 and 2 emissions would increase by around 32%.

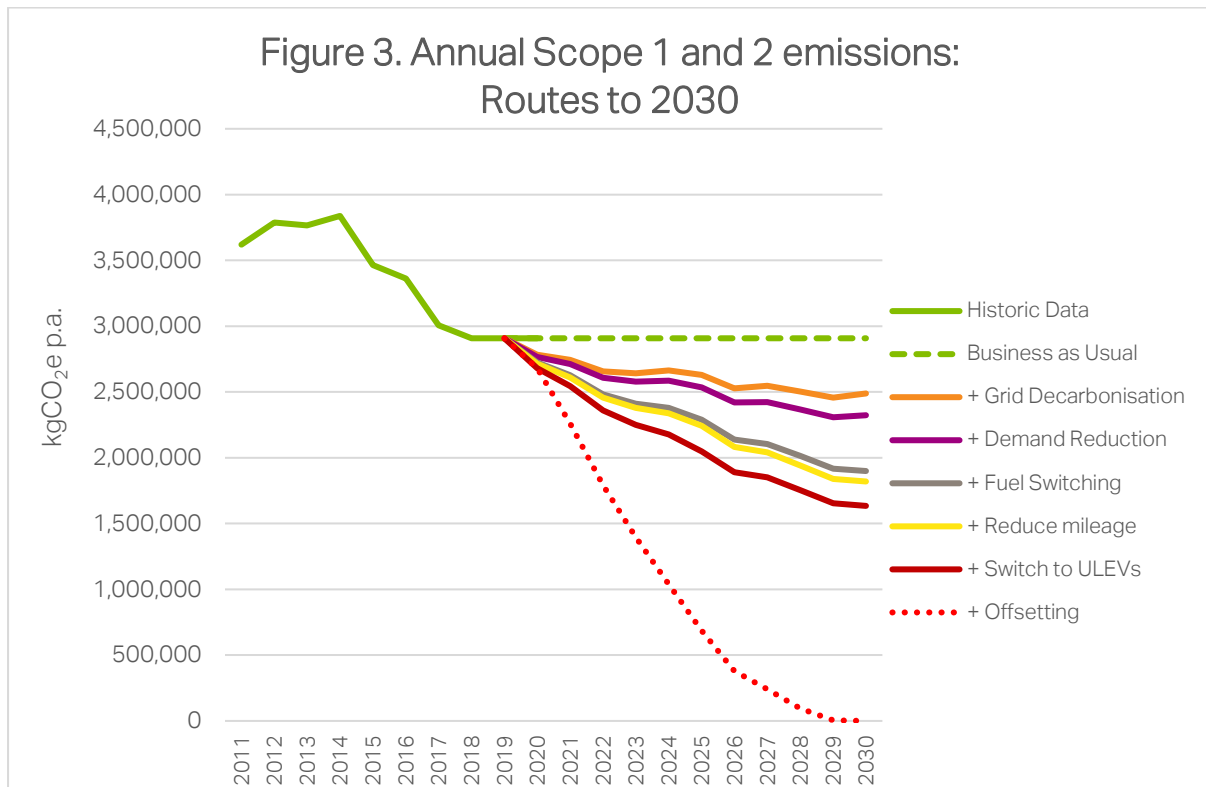
Routes to 2030

Carbon projection modelling has been carried out to assess the potential impact of a range of future trends that are expected to affect the Councils’ emissions.

This includes interventions that would be led by the Councils (e.g. switching to 100% electric vehicles), but also accounts for broader changes expected to take place on a primarily national level (e.g. decarbonisation of the national electricity grid). Other factors considered include energy demand reduction in existing buildings, switching from the use of gas-fired heating to electric systems, such as heat pumps, and reducing journey mileage, for instance, by planning vehicle routes differently, or taking measures to promote a shift towards walking, cycling, ridesharing and public transport.

It is important to note that these scenarios are *not* intended to predict actual fuel consumption or CO₂e emissions. Instead, they used to highlight key issues and support the identification of carbon reduction interventions to inform the actions and recommendations laid out in subsequent chapters of this Carbon Neutral Plan.

The cumulative impacts of these intervention measures are summarised in Figure 3 below.



This analysis indicates that the most significant carbon reductions will result from switching towards the use of electric heating systems and electric vehicles – *provided that the national electricity grid undergoes significant decarbonisation*.

Demand reduction measures (energy efficiency and behavioural change in buildings, and reduced use of transportation) have less impact when considered on their own but are crucial prerequisites for successfully switching switch towards the use of electric heating and vehicles.

For instance, energy efficiency improvements in buildings enable systems such as heat pumps to work at a higher level of efficiency. Similarly, a large-scale shift to the use of electric vehicles must be accompanied by a significant modal shift towards walking, cycling, ridesharing, and an increase in the use of public transport.

As buildings and vehicles switch away from the use of fossil fuels and towards electricity, it becomes increasingly important to ensure that electricity is supplied from renewable sources. This is important for several reasons, including reducing pressure on grid infrastructure, ensuring security of supply, and protecting consumers from rising electricity prices.

On the other hand, the shift towards the use of electricity means that the route towards becoming zero carbon is increasingly dependent on national grid decarbonisation. This leads to significant uncertainty when projecting carbon emissions but serves to reinforce the message that demand reduction and renewable energy generation should be high priorities for Adur & Worthing Councils.

The scenario testing demonstrated that, even with the most optimistic assessment of grid and transport decarbonisation and highest levels of uptake for energy efficiency measures, there will be significant residual CO₂e emissions that would require offsetting. Further work and consultation would be required to identify the most appropriate and cost-effective opportunities, but these could include:

- Investing in off-site renewable electricity generation. Note that, at present, the Councils purchase electricity that is 100% matched by wind and hydroelectric installations. Additional commitments would be required to offset emissions from all other fuel types.
- Carbon sequestration through land management, woodland creation, and tree planting. For context, as a rough estimate, offsetting the Council's current CO₂e emissions would require conversion of around 800 hectares (almost 8 square kilometres) of low-grade agricultural land to sustainably managed woodland.² As this is clearly not feasible it shows the importance of mitigating emissions as far as possible with this option used to address only the last remaining residual emissions.

Specific intervention opportunities

In order to identify specific opportunities for demand reduction measures in the Councils' own buildings, AECOM carried out building energy audits on a range of properties owned and operated by Adur & Worthing Councils.

The table below summarises the results of these audits, listing the potential intervention areas that could be considered, along with an estimate of the carbon savings that could be achieved. These estimates account for the energy efficiency improvement measures in addition to national electricity grid decarbonisation.

² Estimate based on an average of 3.56 tCO₂e / hectare of new woodland per year, based on nation-wide reporting by the UK Woodland Carbon Registry. See <https://www.woodlandcarboncode.org.uk/uk-woodland-carbon-registry> for more information.

Table 1. Results of building energy audits

Cells highlighted in green indicate that a measure is considered suitable for the specific building listed.

	HVAC & lighting plant								Fabric			Control systems					PV			Other			Results		
	Heat pump replacing boilers or New boilers	Workshop infrared heating	Ventilation heat recovery	Overdoor air curtains	Plantroom insulation	Potential district heating	Variable speed pumps	Lighting upgrade	Glazing repair	Secondary glazing	Loft insulation	BMS temperature review	BMS timeclock review	BMS installed	Server room cooling level	Equipment on timer control	Roof PV	Car park PV	Non-gas cremators	Grey water heat recovery	Rainwater harvesting	Current CO2 emissions per year in 2030 (tonnes)	Estimated max. carbon reduction by 2030	Est. potential CO2 emissions per year in 2030 (tonnes)	
Town hall	Green	Green				Green			Green			Green	Green							Green	187	55%	85		
Portland house	Green	Green				Green		Green													52	54%	24		
Sheltered housing	Green	Green			Green								Green								295	84%	46		
MSCPs																	Green				19	100%	0		
Crematorium					Green													Green			473	41%	280		
Shoreham centre	Green						Green				Green	Green		Green	Green					Green	60	57%	26		
Commerce way	Green	Green	Green					Green		Green				Green			Green				52	77%	12		
Assembly hall	Green								Green			Green	Green								77	65%	27		
Museum	Green	Green				Green			Green			Green	Green								46	74%	12		
Leisure centre	Green		Green														Green		Green	Green	202	99%	3		
Total																					1,463	65%	515		

In total, the above measures could potentially save up to 749 tCO₂e per annum (Scope 1 and 2 only), which is equivalent to roughly one quarter of the 2018/19 baseline.

Further reductions could potentially be achieved by introducing a district heat network within the Councils' Civic Quarter. This report provides an overview of the practicalities that would be involved in such a project, along with a discussion of the potentially significant benefits.

Priority areas and action plan

This work highlights that there is considerable uncertainty in the trajectory to 2030, and that there will be significant challenges in reducing energy demands and offsetting any remaining CO₂e emissions. Adur & Worthing Councils will need to actively work towards enabling the following:



In buildings, it will be necessary to reduce heat and power demands through fabric efficiency improvements and behavioural change. In addition to investing in the existing building stock, this means ensuring that any future development achieves a high standard of energy efficiency in order to minimise any increase in fuel consumption. Long term, all buildings will need to switch from gas / fossil fuels to low and zero carbon heat sources.



Uptake of low and zero carbon (LZO) technologies and battery storage within the Councils' own stock will reduce reliance on fossil fuels, reduce pressure on existing utility infrastructure, improve security of supply, and mitigate against price fluctuations.



A transformation in the **transport** sector must take place, which would replace all existing vehicles with low and zero emission vehicles. In addition, it will be necessary to reduce vehicle use / mileage through behavioural change and modal shift.



A key challenge for Adur & Worthing Councils is the fact that much of the **emissions from vehicles are due to HGVs**, and due to technological factors, it is less certain that zero emission models will become commercially available by 2030. This suggests that careful route planning and other marginal efficiency improvements should be introduced to reduce HGV mileage as much as possible.



In order to **offset any remaining CO₂e emissions**, the Councils will need to explore additional measures, such as promoting carbon sequestration through sustainable woodland management or investing in large-scale renewable energy generation. It is important to note, however, that carbon offsetting is not enough to achieve the net zero target on its own – success relies on maximising demand reduction and renewable electricity generation as a high priority.

The detailed recommendations from the study are set out in an action plan which aims to support the Councils in delivering the intervention measures required to realise their carbon neutral ambition. The recommendations cover the following areas: General actions; Supporting grid decarbonisation; Demand reduction; Low carbon heating systems; Building integrated renewable energy generation and storage; Low carbon transport; Offsetting; and Scope 3 emissions. Consideration is given to measures that could impact CO₂e emissions within the Councils' own operations, as well as emissions from the wider the Local Authority areas.

Conclusion

The results of this analysis show that the route towards becoming carbon neutral will require a strong level of ambition and commitment, backed up by significant interventions and investment across Adur & Worthing Councils' operations. Although the study shows that meeting the carbon neutral ambition will rely upon some factors outside of the Councils' control, such as the decarbonisation of the grid and availability of key technology, the fundamental steps required to deliver the net-zero target are clear and with strong leadership from the Councils these can be set into action now.

1. Introduction and context

1.1 Adur & Worthing's Climate Emergency Declaration

On July 9th 2019, the Joint Strategic Committee of Adur & Worthing Councils declared a Climate Emergency, and committed to working towards becoming carbon neutral by 2030.

As part of this commitment, the Councils resolved to develop an evidence-based Carbon Neutral Plan that would identify the key actions and intervention measures required to set the Councils on the path to net zero carbon emissions within the next decade.

1.2 Purpose of this study

AECOM has been commissioned to support Adur & Worthing Councils in producing this Plan. This work is intended to provide the Council with an understanding of their carbon emissions baseline and identify the steps that need to be taken to achieve the decarbonisation target by 2030.

The recommendations in this Carbon Neutral Plan have been informed by carbon emissions modelling that accounts for key technological trends and policy changes that are expected to take place at national, regional and local levels over the coming decades. It also draws on detailed energy audits of the Councils' own building stock. Proposed actions have been developed through engagement with local stakeholders, to ensure that the Plan reflects the unique circumstances and priorities of Adur & Worthing Councils as they look towards the future.

1.3 Drivers for achieving Net Zero Emissions

A selection of targets, policies and initiatives aimed at reducing CO₂e emissions are described below, particularly those related to decarbonising heat, energy and transportation in Adur & Worthing.

Although it is not possible to fully capture the wide range of environmental, social, and economic drivers for taking action to address the threat of climate change, these are some of the key drivers that have been used to inform the analysis that underpin this Carbon Neutral Plan.

National

UK Climate Change Act 2008

The Climate Change Act 2008 legally commits the UK Government to reducing emissions by 80% by the year 2050, compared with a 1990 baseline. As described by the UK Committee on Climate Change (CCC), *'The Act provides the UK with a legal framework including a 2050 target for emissions reductions, five-yearly 'carbon budgets' (limits on emissions over a set time period which act as stepping stones towards the 2050 target), and the development of a climate change adaptation plan.'*³

Going forward, the Government has suggested increasing the level of ambition of this commitment by becoming carbon neutral by 2050.⁴

The Paris Climate Agreement

The UK ratified the Paris Climate Agreement in November 2016. The Agreement's central aim *'is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2° Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5° Celsius.'*⁵

³ <https://www.theccc.org.uk/tackling-climate-change/the-legal-landscape/>

⁴ <https://www.gov.uk/government/news/pm-theresa-may-we-will-end-uk-contribution-to-climate-change-by-2050>

⁵ <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

Building Regulations (Part L)

Part L of Building Regulations is the key mechanism that prescribes standards for the conservation of fuel and power in buildings in the UK, based on metrics such as the estimated level of energy demand and CO₂e emissions. At the time of writing, the Ministry of Housing, Communities and Local Government (MHCLG) has recently released a consultation on proposed Future Homes Standards, that would significantly reduce emissions from new domestic buildings in the UK.⁶

The Clean Growth Strategy (2017)

The UK Clean Growth Strategy⁷ was published in October 2017 and sets out the Government's vision for decoupling economic growth from carbon emissions. It includes objectives for increasing generation of energy from renewable sources, increasing the delivery of clean, smart and flexible power and accelerating the shift to low carbon transport, smart grids and energy storage.

The Road to Zero (2018)

The Road to Zero report,⁸ published in July 2018, sets out the Government's core mission to *'put the UK at the forefront of the design and manufacturing of zero emissions vehicles and for all new cars and vans to effectively be zero emission by 2040.'* The strategy furthers the ambitions of the NO₂ plan⁹ and Clean Growth Strategy in defining key policies with primary focus upon introduction of low and zero emission vehicles, with the aim that *'at least 50%, and as many as 70%, of new car sales and up to 40% new van sales being ultra low emission by 2030. By 2050 we want almost every car and van to be zero emission.'*

The Government has stated that local action will be supported through new policies, including provision of funding to extend ultra low emission bus schemes and taxi charging infrastructure. Ongoing goals to encourage uptake of clean new vehicles will be backed by developing electric vehicle infrastructure, offering funds and grants for provision of electric charge points. With zero emission vehicle design and manufacture ambition, particularly in research of next generation battery technologies, to similarly promote uptake.

Regional

South2East Local Energy Strategy (2018)

The South2East Energy Strategy¹⁰ was developed by three Local Enterprise Partnerships (LEPs), which are joint private / public organisations intended to drive economic growth in a broad geographic area encompassing Adur & Worthing. The Strategy outlines a vision for achieving clean growth through the year 2050, with a focus on the power, heat and transportation sectors.

It highlights several key opportunities for the region, including:

- Significant renewable energy potential, especially solar, wind, energy from waste and landfill gas;
- Rich natural assets (including a high proportion of woodland); and
- Large amounts of planned new development within the region, offering opportunities for deployment of smart, integrated, sustainable energy system models.

⁶ BEIS, *'The Future Homes Standard Consultation'* (2019). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/843757/Future_Homes_Standard_Consultation_Oct_2019.pdf

⁷HM Government *'Clean Growth Strategy'* (2017). Available at: <https://www.gov.uk/government/publications/clean-growth-strategy>

⁸ HM Government, *'The Road to Zero: Next steps towards cleaner road transport and delivering our Industrial Strategy'* (2018) Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/739460/road-to-zero.pdf

⁹Air quality plan for nitrogen dioxide (NO₂) in UK (2017) <https://www.gov.uk/government/publications/air-quality-plan-for-nitrogen-dioxide-no2-in-uk-2017>

¹⁰ Energy South2East, *'South2East Local Energy Strategy'* (2018). Available at: <https://www.southeastlep.com/app/uploads/2019/03/Local-Energy-Strategy-FINAL.pdf>

West Sussex County Council

The West Sussex County Council has produced an Energy Strategy and Action Plan to address key issues relating to energy in West Sussex, chief among which are security, affordability and sustainability. The documents provide a framework for the County Council to reduce energy demands and increase uptake of renewable technologies.

West Sussex County Council is also in the process of developing an Electric Vehicle Strategy (draft 2019). This states the ambition to ensure that at least 50% of all registered vehicles within the County are ultra low emission or electric (ULEV) by 2030, with an aspirational target of reaching 70% by that time. The Strategy further states that the West Sussex County Council will seek to ensure that sufficient charging infrastructure is installed to enable this shift, and that all charging points are supplied with 100% renewable energy.

SMARTHUBS

West Sussex County Council is one of the main partners in Project SMARTHUBS. This initiative will see Adur & Worthing Councils working in collaboration with private sector partners to deliver new smart, local energy systems in West Sussex, with a particular focus on the Adur and Worthing area.

Some of the key aims of the project are to increase the amount of renewable electricity generated using solar photovoltaic (PV) systems, and use this in combination with battery storage to power both domestic and commercial heat pumps. Notably, this will include the development of a district heat network (DHN) in the Shoreham Port area, which would provide customers with low carbon source of energy for heating.

Other SMARTHUBS projects will focus on delivering sustainable transport in the area, by linking solar PV arrays and battery storage to new electric vehicle charging infrastructure and investigating opportunities to power vehicles using hydrogen gas.

Local

Platforms for Our Places

This programme¹¹ identifies opportunities to improve quality of life in Adur & Worthing by considering five key platforms *'upon which happy, healthy, prosperous, innovative, dynamic and sustainable communities can thrive.'*

As part of this initiative, the Councils have made several commitments aimed at reducing emissions and shifting to clean energy across their estates. These include, but are not limited to:

- Developing a detailed understanding of the Councils' emissions, along with a strategy to save energy and reduce emissions;
- Retrofitting built infrastructure to improve environmental efficiency across corporate buildings and social housing stock; and
- Delivering further clean, renewable energy on Council buildings and sites, including a programme of solar photovoltaic (PV) installations.



Sustainable AW

Building on the commitments made by Adur & Worthing Councils as part of Platforms for our Places, Sustainable AW is an initiative designed to address a wide range of



¹¹ <https://www.adur-worthing.gov.uk/media/media,151817,en.pdf>

environmental issues. These include biodiversity, carbon reduction, energy, transport, waste reduction and water.

The Council has already taken steps to reduce its environmental impact, including but not limited to:

- Sourcing renewable energy through their electricity contract
- PV installations on Portland House and Shoreham Centre
- Ground-source heating at the crematorium
- Ongoing LED lighting replacement across the estate

Units for greenhouse gas emissions reporting: CO₂e

A carbon footprint is measured in tonnes of carbon dioxide equivalent (tCO₂e). The carbon dioxide equivalent (CO₂e) allows the different greenhouse gases to be compared on a like-for-like basis relative to one unit of CO₂. CO₂e is calculated by multiplying the emissions of each of the six greenhouse gases by its 100 year global warming potential (GWP).

A carbon footprint considers all six of the Kyoto Protocol greenhouse gases:

Carbon dioxide (CO₂), Methane (CH₄), Nitrous oxide (N₂O), Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs) and Sulphur hexafluoride (SF₆).

- Carbon Trust, 'CTV043 Carbon Footprinting' (July 2019)

2. Where we are: The carbon emissions baseline

2.1 Scope of the analysis

For the purpose of greenhouse gas reporting, emissions are divided into three categories:

- **Scope 1** – Direct emissions from sources owned or controlled by the reporting organisation. This primarily includes fuel used in boilers to provide heating and hot water and fuel used in vehicles. In the case of the Council's own emissions, this is limited to buildings and vehicles where the Council is responsible for paying the for the fuel.
- **Scope 2** – Indirect emissions associated with the use of electricity purchased by the Council
- **Scope 3** – Indirect emissions that result from other activities that occur in the value chain of the reporting organisation, either upstream or downstream. This includes emissions associated with buildings and services linked to the Council but where it is not responsible for paying the fuel bills, for example leased properties, the leisure centres and the waste management system.

The baseline for the Council's emissions include Scope 1, 2 and some Scope 3 emissions. In the future, additional data collection could be undertaken to better understand the Councils' Scope 3 emissions. These would include, for instance, emissions from business travel (using non-Council owned vehicles), waste disposal, and procurement.

2.2 Carbon emissions in 2018/19

Based metered gas and electricity consumption and recorded vehicle use we estimate that the annual Scope 1 and 2 emissions were approximately 2,908 tCO₂e in the year from April 2018-March 2019. Scope 3 emissions from water consumption amount to approximately 33 tCO₂e p.a. and emissions from the Worthing Leisure Centre and Splashpoint¹² accounts for a further 1,015 tCO₂e p.a.

Table 1 presents a breakdown of the Councils' emissions by category and fuel type, and the results are illustrated in Figures 1 and 2.

	Buildings		Transport			Water	TOTAL	
	Electricity	Gas	Diesel (HGVs)	Diesel (Vans)	Petrol or Hybrid Vehicles	Fuel not specified	Total	% of total
Non-residential	484	422	-	-	-	-	905	31%
Residential	75	346	-	-	-	-	420	14%
External	205	-	-	-	-	-	205	7%
Crematorium	57	448	-	-	-	-	505	17%
Transport		-	746	107	19	-	873	30%
Total Scope 1 & 2	820	1,215	746	107	19	-	2,908	
<i>% of total*</i>	<i>28%</i>	<i>42%</i>	<i>26%</i>	<i>4%</i>	<i>1%</i>	-		

Water consumption		-	-	-	-	33	33	N/a
Leisure Centre & Splashpoint	899	116	-	-	-	-	1,015	N/a
Total Scope 3	899	116	-	-	-	33	1,048	N/a

Table 1: Adur & Worthing Council Scope 1 and 2 CO₂e emissions

* Values may not sum due to rounding.

¹² Note that emissions from the Leisure Centre and Splashpoint have been estimated using 2014-15 data.

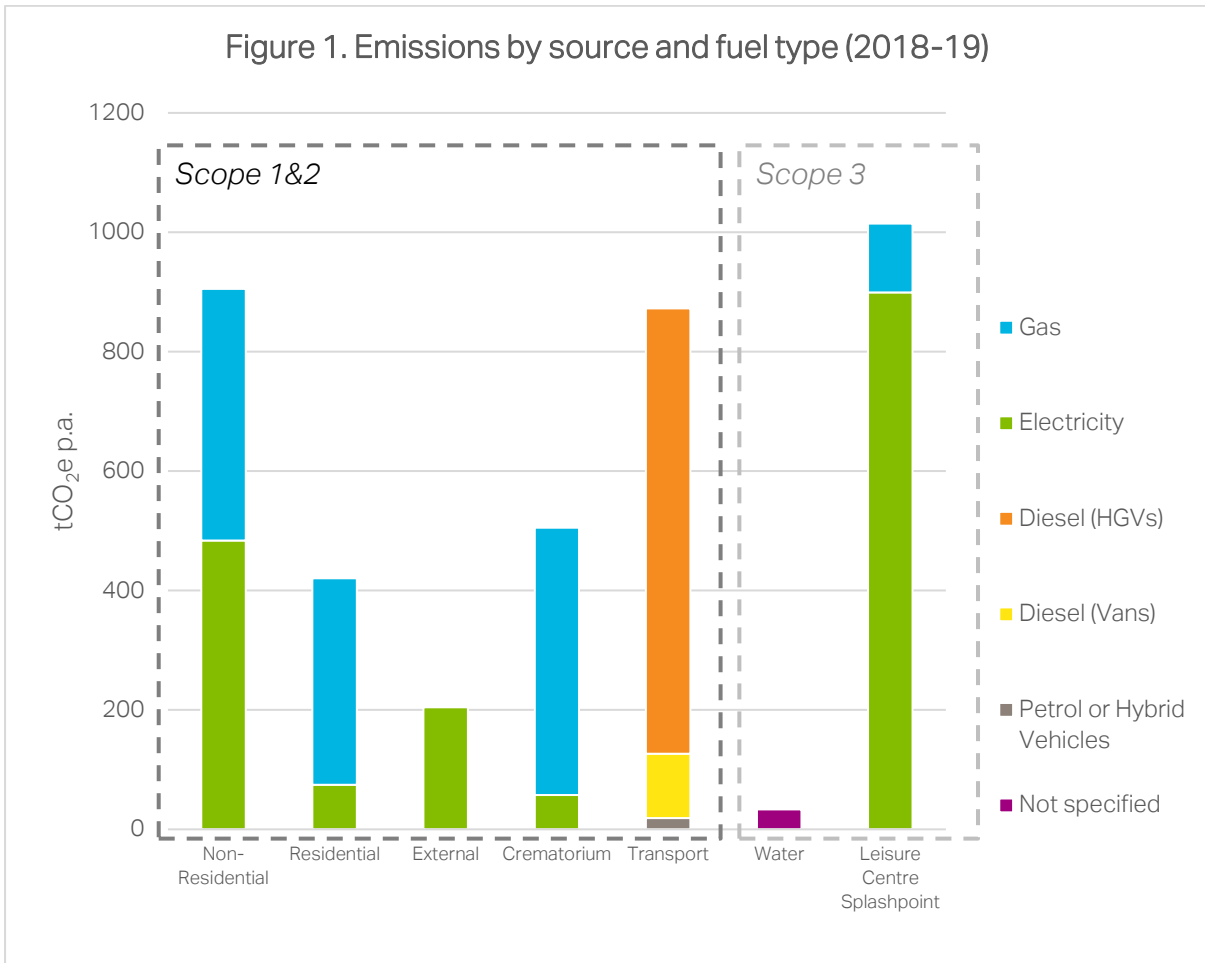


Figure 1. Emissions by source and fuel type (2018/19)

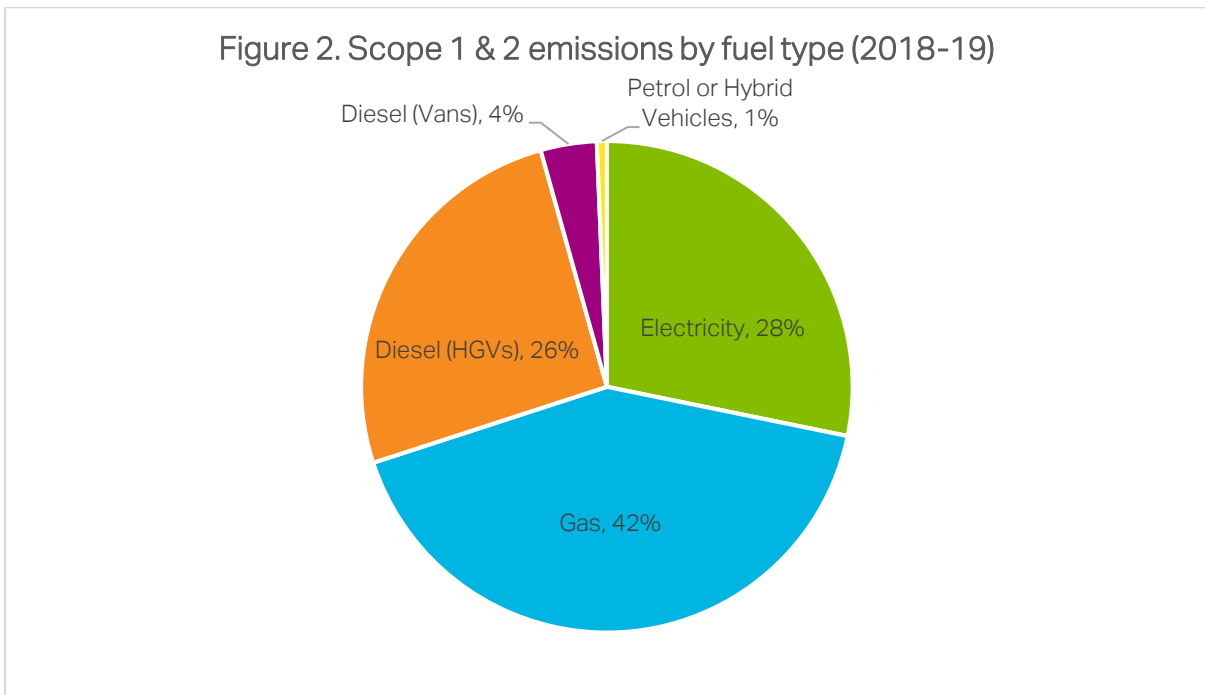


Figure 2: Scope 1 and 2 CO₂e emissions by fuel type (2018/19)

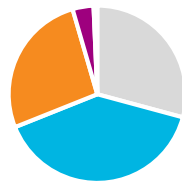
Results show that gas and electricity use in buildings accounts for the majority of Scope 1 and 2 emissions (42% and 28%, respectively). The next biggest contributor is fuel use for HGVs (26%). Other

vehicles such as cars and diesel vans make up for around 5%. The crematorium also represents a major source of CO₂e emissions, primarily due to the gas used for heat.

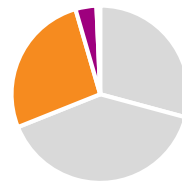
Based on available data going back to 2011/12, the Councils’ Scope 1 and 2 emissions have decreased by approximately 20% overall and 23% since 2013/14. It is important to note that the annual Scope 1 and 2 emissions vary significantly over time, partly as a result of the decarbonisation of electricity supplied by the national grid but also due to a variety of factors not assessed in detail in this report. These include factors such as weather and user behaviour, but a key sensitivity is linked to changes in the Councils’ ownership or operation of buildings or provision of services. As an example of the potential scale of impact this would have, if the Councils owned and operated the Worthing Leisure Centre and Splashpoint, their Scope 1 and 2 emissions would increase by around 36%.

2.3 Implications for the Action Plan

Considering the breakdown of Adur & Worthing Councils’ current CO₂e emissions, the Action Plan will need to include targeted intervention measures that contribute towards the following goals:



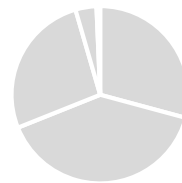
Reduce electricity demands and use renewable electricity



Reduce heating demands and phase out natural gas



Switch to ULEV cars / vans and reduce demand for transport



Investigate options for reducing HGV emissions



Seek to understand and reduce Scope 3 emissions

However, the 2018/19 baseline essentially provides a ‘snapshot’ view of priorities for Adur & Worthing Councils. In order to gain a better understanding of the potential changes over time, high-level modelling has been carried out to project carbon emissions to 2030.

The aim is to show the relative scale and direction of changes that could affect the Councils’ CO₂e emissions in the years ahead and show a range of potential routes towards achieving the decarbonisation target.

3. Routes to Net Zero: Projections to 2030

3.1 Modelling approach

The analysis presented in this report considers interventions that would be led by the Councils (e.g. switching to 100% electric vehicles), but also accounts for broader trends expected to take place on a primarily national level (e.g. decarbonisation of the national electricity grid). Key assumptions are outlined below. The methodology is described in detail in Appendix A.

- National electricity grid decarbonisation** – The emission factor for grid electricity is expected to fall progressively over time, as it will be generated using less fossil fuel and more renewable energy. This analysis considers the impact of a grid decarbonisation trajectory published by BEIS for use in organisational CO₂e emissions reporting and projections, which is illustrated in Figure 3.¹³ Although not a prediction, the trajectory reflects the ambitions set by the Government and seen as necessary to meet the UK's carbon emission reduction commitments.

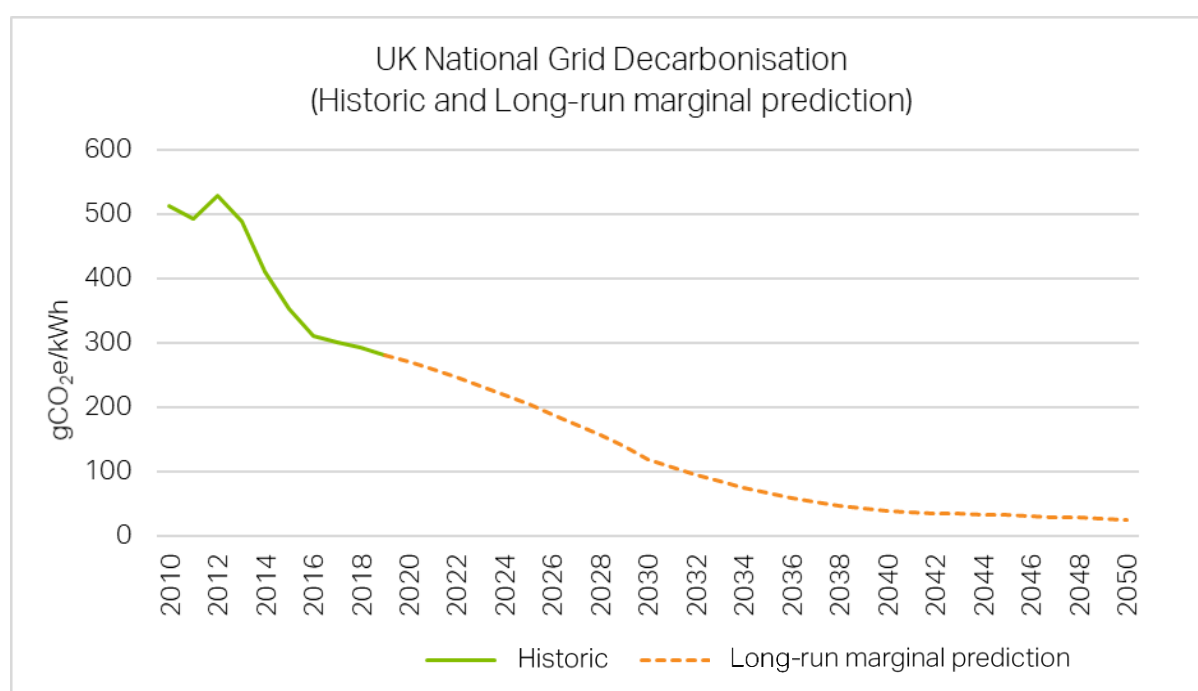


Figure 3: Historic and Long-run marginal grid decarbonisation

- Energy demand reduction** through energy efficiency measures and behaviour change – Based on statistics provided in the UK National Energy Efficiency Database¹⁴ we have assumed that fabric upgrades could reduce demand for heating by around 10%, and that electricity use could decrease by around 5% through a combination of behavioural change measures and smart energy management.
- Switching from the use of gas-fired heating to electric systems** – Based on metered gas data, and accounting for differences in the typical performance of gas boilers, direct electric heating, and heat pumps, we have estimated the fuel use if the total 2018/19 heating requirements were met by these technologies.

¹³ BEIS, 'Green Book Supplementary Guidance: Toolkit for valuing changes in greenhouse gas emissions, Table 1' (2019). Available at: <https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal>

¹⁴ NEED, 'Summary of Analysis, Great Britain' (2019). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/812561/National_Energy_Efficiency_Data_Framework_NEED_report_summary_of_analysis_2019.pdf

- **Reducing demand for transport** – Based on case studies of mileage reduction in similar organisations, we have assumed that a 10% reduction in mileage could be achieved, for instance, by using smart route planning, or taking measures to promote a shift towards walking, cycling, ridesharing and public transport.¹⁵ Due to technological obstacles, we have assumed that HGV emissions reductions will be capped at 15%.
- **Uptake of Ultra Low Emission Vehicles (ULEVs)** in the Councils' vehicle fleet and pool cars – In line with assumptions made by the Department for Transport's 'Road to Zero' report, we have assumed that ULEV uptake will increase rapidly in the coming decade and therefore aside from HGVs, all vehicles operated by Adur & Worthing Councils could be ultra-low emission (powered either by hydrogen or electricity) by 2030.

The model assumes that, in a hypothetical 'No Action' or 'Business as Usual' scenario, no actions are taken to reduce emissions, there is no change to the Councils' building portfolio or vehicle fleet, fuel consumption remains steady, and total CO₂e emissions do not change over time.¹⁶ This is used as a baseline for assessing the cumulative impacts of the intervention measures.

It is important to note that these scenarios are *not* intended to predict actual fuel consumption or CO₂e emissions. Instead, the analysis highlights priority measures for reducing emissions, which has been used to inform the actions and recommendations laid out in the Action Plan in Section 4.

3.2 Carbon emissions projections

The graphs below show historic emissions for the Councils, along with a hypothetical 'BAU' trajectory. The other routes to net zero show the cumulative impact of sequentially adopting measures to:

1. Reduce energy demands in buildings
2. Switch from gas boilers to efficient electric heating systems
3. Reduce vehicle mileage
4. Switch from petrol and diesel vehicles to ULEV (electric or hydrogen) vehicles

Finally, a trajectory to net zero is modelled based on user inputs which illustrate the amount of low and zero carbon (LZC) electricity generation or carbon offsetting that would be required to meet the target.

¹⁵ Department for Transport and Energy Savings Trust 'Mileage Management – A Guide For Fleet Managers' (2015). Available at: https://www.energysavingtrust.org.uk/sites/default/files/reports/4548_EST_A4_mileage_mmt_4.pdf

¹⁶ In reality CO₂e emissions depend on many variables, including economic trends, energy prices, and weather, to name only a few. For example, see National Grid 'Future Energy Scenarios' (2019). Available at: <http://fes.nationalgrid.com/fes-document/>

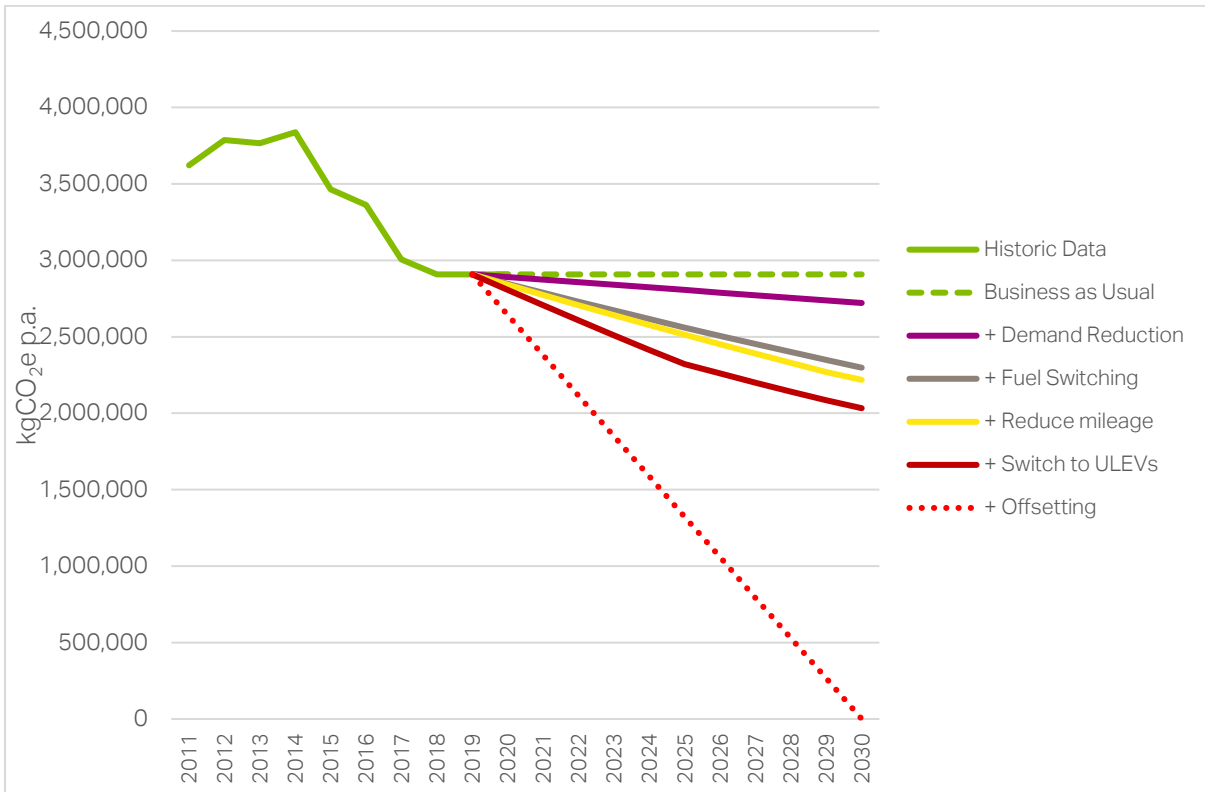


Figure 4: Scope 1 and 2 emissions –No change to electricity grid emissions

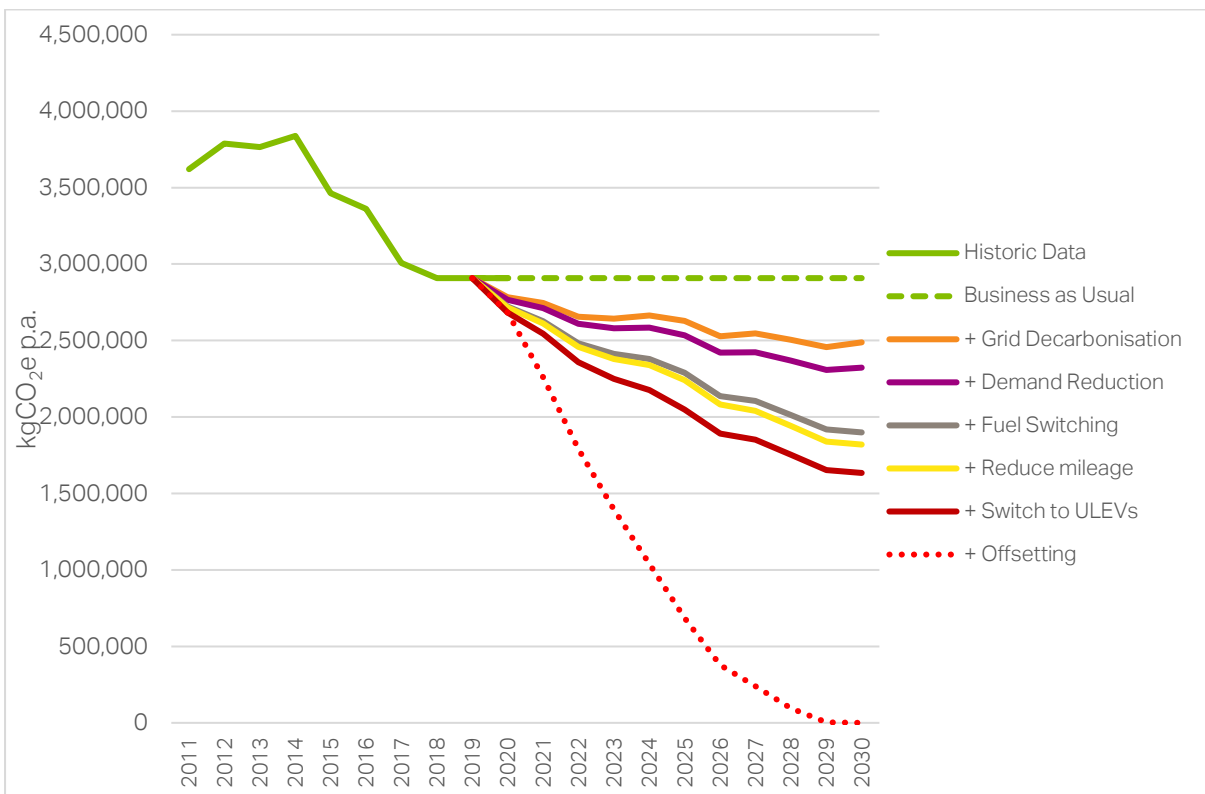


Figure 5. Scope 1 and 2 emissions –Accounting for grid decarbonisation

Figure 4 shows the potential CO₂e reductions that could be achieved assuming that there is no change in the national electricity grid. In this scenario, if all measures (excluding renewables and offsetting) are adopted, this would reduce Scope 1 and 2 emissions by 30% by 2030. The residual emissions (2,032 tCO₂e p,a.) would need to be made up for through renewable electricity generation and carbon offsetting. For context, this would require around:

- 11 MW of ground-mounted PV (i.e. solar farms totalling around 55-60 acres of land); or
- 4 MW of large-scale onshore wind (2-4 large turbines); or
- Approximately 575 hectares of new woodland.

By contrast, Figure 5 shows what would happen using the same assumptions, assuming the electricity grid decarbonises at the rate suggested by the BEIS Green Book Guidance.

In this scenario, if all measures (excluding renewables and offsetting) are adopted, this would reduce Scope 1 and 2 emissions by 44% by 2030. The residual emissions (1,634 tCO₂e p,a.) would need to be made up for through renewable electricity generation and carbon offsetting.

However, because the CO₂e savings from renewable technologies are measured by the amount of grid electricity that they displace, as the grid decarbonises, it becomes progressively more difficult to reduce net emissions in this way. Therefore, based on the projected 2030 CEFs, offsetting this amount of CO₂e would require

- 17 MW of ground-mounted PV (85-90 acres of solar farm); or
- 6 MW of large-scale onshore wind (3-6 large turbines); or
- Approximately 460 acres of new woodland – note that sequestration rates do not depend on grid emission factors as the mechanism for CO₂e reduction is different.

This emphasises the fact that grid decarbonisation and offsetting will not be enough for Adur & Worthing to achieve their 2030 target – it must be supported by strong actions to reduce demand for fuel in buildings and transportation.

Impact of grid decarbonisation

A comparison of these results shows that grid decarbonisation is one of the most important variables that will determine whether the Councils are able to meet their target. This has both positive and negative implications. On one hand, if the BEIS decarbonisation scenario were to occur, the Councils' Scope 1 and 2 emissions could decrease by up to 14% even if no other actions were taken. On the other hand, this presents a key risk, because it means that much of the reliance on achieving the net zero target will rely on factors outside of the Councils' control.

To address and mitigate this risk, consideration must be given to how the Council can best facilitate the government's objectives in decarbonising the grid as well as what measures it can take to best insulate itself from the eventuality that grid decarbonisation does not happen as quickly and/or as deeply as the Government intends.¹⁷

Reducing demands for electricity and heating

The demand reduction measures modelled in this report have relatively little impact when considered on their own, offering savings of around 6% of total Scope 1 and 2 emissions. The analysis uses a

¹⁷ Although there has been significant progress in this area in recent years, future decarbonisation is anticipated to be much more difficult to achieve. To date, the decarbonisation of the national grid has been primarily achieved through the significant reduction in the use of coal fired power stations and the increase in the use of renewable technologies, particularly large-scale wind and biomass (where it is used for co-firing in power stations). However, the use of gas remains a significant component of the generation mix and the timely replacement of the existing nuclear fleet is already proving to be challenging. Furthermore, significant additional pressures from the use of electricity to provide heating and power vehicles may incentivise firm power generation from fossil fuel sources to deal with greater peaks in demand.

conservative estimate of the potential reduction in demand that could be achieved; this suggests the need for a more ambitious programme of energy efficiency improvements.

Furthermore, demand reduction is a crucial prerequisite for successfully switching towards the use of electric heating and vehicles. For instance, energy efficiency improvements in buildings enable systems such as heat pumps to work at a higher level of efficiency. Similarly, a large-scale shift to the use of electric vehicles must be accompanied by a significant modal shift towards walking, cycling, ridesharing, and an increase in the use of public transport.

One of the key obstacles to achieving this would likely be the absence of a policy driver that requires energy efficiency upgrades to existing buildings. The Minimum Energy Efficiency Standards (MEES) regulations are intended to drive progressive improvements in the existing stock but the impact this will have is not yet clear. Therefore, it will be important to identify any potential sources of funding to implement this measure. Adur & Worthing Councils could also consider lobbying the Government to promote additional regulations in this area.

Minimum Energy Efficiency Standards

Under the MEES regulations, as of 1st April 2018, any properties newly rented out in the private sector must have a minimum Energy Performance Certificate (EPC) rating of E (some exceptions apply). Fines will be applied for non-compliance.

Owners of buildings with a lower EPC rating will be required to implement energy efficiency measures, though consideration will be given to financial viability, the anticipated payback time and impacts on property value.

Over time, the Government intends to progressively increase the minimum EPC rating, meaning that buildings must become more efficient in order to be sold or rented. A recently-published consultation proposed that the minimum rating should be raised to B by 2030, subject to actions meeting a seven-year payback test.

- BEIS, *'The Non-Domestic Private Sector Minimum Energy Efficiency Standards: The Future Trajectory to 2030'* (2019)

It is important to note that there are important reasons other than CO₂e which support refurbishing the existing stock. Fabric and building services efficiency improvements can help to protect consumers against changes in fuel prices, mitigate fuel poverty and improve health, wellbeing and comfort.

Similarly reducing vehicle mileage, if accompanied by increased walking and cycling, can also improve health. Alongside this ULEVs will have significant benefits in relation to improvements in air quality.

Phasing out natural gas

Unlike electricity, which can be generated from a range of renewable technologies, natural gas is a fossil fuel which unavoidably emits CO₂e during combustion. In order to meet the net zero target, it will therefore be crucial to phase out the use of gas, because the scale of investment that would be required to offset these emissions would be significant.

The two main options for achieving this, based on currently available technologies, are to (1) reduce the total demand for heat and (2) switch to using electric heating systems such as direct electric heating (DEH) or heat pumps.¹⁸ This would have the effect of reducing the Council's emissions by up to 20%, depending on the technology used. As the electricity grid decarbonises, the savings would increase, so fuel switching (with necessary enabling works) could potentially result in a 35% decrease in emissions by 2030.

Heat networks have also been identified by the Government as a key component of the move to decarbonise the supply of heat. A heat network involves the centralised generation of heat to serve

¹⁸ It may be possible to decarbonise the gas grid by injecting it with biomethane or hydrogen, but this would require a technological step-change and has therefore not been considered given the timeframe for the Councils to reach net zero.

multiple buildings. Future heat networks will need to deliver low or zero carbon heat and therefore are likely to utilise heat pump technology or waste heat sources. The advantage of a heat network is that a single project can enable multiple buildings to switch to a low carbon heat source in one go, speeding up the process of fuel switching. Heat networks can also enable the use of lower carbon heat, larger and more efficient equipment, thereby delivering higher carbon savings with lower capital and operational costs than solutions for each individual building.

Switching to ultra-low emission cars and vans

Switching to ULEVs where possible would reduce emissions by around 1% if they were charged using national grid electricity. The savings would increase as the electricity grid decarbonises, or if the vehicles were charged using 100% renewable energy – for instance, generated by PV on the roof of a Council-owned car park. This would deliver savings of up to 4%.

The electric vehicle market has seen considerable growth in recent years, and it is estimated that the price of electric, hybrid and traditional fuel cars could converge within the next decade.¹⁹ The Councils should take this into account in their fleet replacement strategy.

Although switching to ULEVs will be an important part of reaching the decarbonisation target, even if this goal is achieved, it creates additional challenges. For instance, Adur & Worthing Councils will be more reliant on electricity emission factors for achieving their net zero target. It will also create pressure on grid infrastructure, which may not have the capacity to accommodate such a shift and require the use of more renewable electricity generation to meet demand.

The National Grid report *'Future Energy Scenarios 2019'* suggests that there could be between 2.7 and 10.6 million EVs on the roads by 2030 which would present a broad-ranging challenge across all areas of electricity infrastructure.²⁰ The use of smart EV charging and, potentially, vehicle-to-grid systems could mitigate some of the effects on peak demand and help to alleviate some of this pressure.

Reducing emissions from HGVs

At the time of writing, ultra low emission HGVs are not commercially available and are not expected to become so in the next decade. Barring a technological step-change, this could present a challenge in achieving the net zero target, which will require all the existing HGV fleet to be switched from diesel to ULEV alternatives. Adur & Worthing will need to be mindful of the development of this technology and undertake a review when the existing fleet is due for renewal.

In the short-term the Government has suggested a target of reducing emissions from HGVs by 15% through efficiency measures such as driver training. Adur & Worthing Councils will therefore need to assess whether such measures can be implemented within their own fleet. Reducing HGV emissions by 15% would reduce the Councils' Scope 1 and 2 emissions by roughly 4% overall.

Increasing renewable electricity generation

As buildings and vehicles switch away from the use of fossil fuels and towards electricity, it becomes increasingly important to ensure that electricity is supplied from renewable sources. Reasons include:

- reducing pressure on grid infrastructure
- ensuring security of supply, and
- protecting consumers from rising electricity prices.

¹⁹ Cambridge Econometrics and Element Energy, *'Fuelling Europe's Future: How the transition from oil strengthens the economy'* (2018). Available at: https://europeanclimate.org/wp-content/uploads/2018/02/FEF_transition.pdf

²⁰ National Grid, *'Future Energy Scenarios'* (2019). Available at: <http://fes.nationalgrid.com/media/1409/fes-2019.pdf>

Offsetting residual emissions

The scenario testing demonstrated that, even with the most optimistic assessment of grid and transport decarbonisation and highest levels of uptake for energy efficiency measures, there will be significant residual CO₂e emissions that would require offsetting.

Further work and consultation would be required to identify the most appropriate and cost-effective opportunities, but these might include tree planting or new woodland creation. The UK Woodland Carbon Code, for instance, provides a means of gaining certification for this type of project.²¹

Reducing Scope 3 emissions

Scope 3 emissions from water consumption can be reduced through installation of water-efficient fittings and behavioural change programmes. Case study evidence suggests that these types of interventions could potentially reduce water use by more than 20%.²²

The Councils should also investigate opportunities for reducing energy demands and switching to decarbonised heat sources in the properties that they lease, or those that they own but lease to others. For instance, AECOM's audit of the Worthing Leisure Centre has identified significant CO₂e savings.

3.3 Key findings of the analysis

The table below summarises the potential impacts of the measures described above. It reports the maximum potential percentage (%) reduction in CO₂e that could be achieved through adoption of each measure, compared with a 'Business as Usual' baseline.

Potential change in carbon emissions from these measures...	Without grid decarbonisation	With grid decarbonisation
Changes to electricity grid		
Grid decarbonisation, no other changes	N/a	-14%
Demand reduction in buildings		
Reduce demand for electricity and heat	-6%	-20%
Reduce demand and switch to electric heating systems	-20%	-35%
Low carbon transport		
Mileage reduction, no other changes	-3%	-3%
Switch to ULEVs (excludes HGVs)	-1%	-4%
Reduce emissions from HGVs	-4%	-4%
Total reductions		
All measures implemented (excluding offsetting / renewables)	-30%	-44%
Residual emissions to be offset (tCO ₂ e p.a.)	2,032	1,634

Other opportunities to reduce emissions

These technologies have not been included in the quantitative analysis above, but should be considered by Adur & Worthing Councils to help enable their decarbonisation target:

- **District heat networks.** Heat networks offer an opportunity to switch multiple buildings on to lower carbon heating systems and use larger and more complex technologies to deliver higher carbon

²¹ <https://www.woodlandcarboncode.org.uk/>

²² The Ripple Effect, 'Cost-effective water saving devices and practices' (2005). Available at: http://www.wrap.org.uk/sites/files/wrap/GG522_commercial%20Cost-effective%20water%20saving%20devices%20and%20practices%20for%20commercial%20sites.pdf

savings with lower overall capital and operational costs than addressing each building separately. However, by virtue of being larger projects they can be more complex to deliver although the Government is providing technical support and funding through the Heat Network Delivery Unit and Heat Network Investment Programme to assist local authorities in delivering these projects.

- **Smart energy management:** One of the key benefits of smart meters is by improving transparency and user access to their own energy data, making it easier to identify areas of waste. Although it is not clear to what extent this affects user behaviour in the long term, the improved data collection could also facilitate the introduction of demand side response, and on a broader scale, help to balance energy demand and supply, which is particularly important at peak times.²³ In principle, therefore, these have the potential to reduce energy consumption.
- **Battery storage:** There have been significant improvements in battery storage in recent years with implications for energy consumption across all sectors. Although batteries are likely to become crucial to future energy infrastructure, they do not offer CO₂e savings per se. Instead, they help to facilitate uptake of LZC technologies by moderating the intermittency of wind and solar energy generation. Combined with EV uptake and the introduction of vehicle-to-grid systems, this could have a transformative effect on the design of energy infrastructure and the built environment.
- **Carbon capture and storage:** At present, carbon capture and storage technologies have been deployed as pilot projects in the UK. Although these form part of the Government's *Clean Growth Strategy* (2017), at present there is insufficient evidence to provide a realistic estimate of their potential contribution towards the decarbonisation target.²⁴

Potential increases in CO₂e emissions

Adding to the Councils' building portfolio

In the event that Adur & Worthing Councils build or purchase additional buildings, this would likely increase the Councils' Scope 1 and 2 emissions. Any increase will make the decarbonisation target more difficult to achieve and increase the cost of mitigation measures and offsetting. Therefore, it will be vital to ensure that any new buildings are constructed or retrofitted to be capable of becoming net zero in operation²⁵ and incorporate low and zero carbon technologies as standard.

Although not captured in existing datasets, it is also worth noting that there are Scope 3 CO₂e emissions associated with the construction and demolition process itself, as well as the materials used in construction. In order to minimise these emissions, the Councils should also consider

- Carrying out a comprehensive options assessment to consider whether it is necessary to build new, and how to maximise the use of existing buildings, materials, and infrastructure
- Use of renewable energy on-site (i.e. avoid diesel generators)
- Routinely carrying out embodied carbon lifecycle assessments of all proposals
- Maximising the end-of-life value of any buildings, materials and infrastructure that cannot be reused by assessing opportunities for reclamation, remanufacturing, recycling, etc.
- Designing new buildings to facilitate maintenance (e.g. through use of robust materials) and future changes in use (e.g. generous floor to ceiling heights) so that, in the future, demolition and new construction can be avoided

²³ BEIS, 'Smart Meters and Demand Side Response' <https://www.gov.uk/government/publications/smart-meters-and-demand-side-response>

²⁴ For more information, see <https://www.gov.uk/guidance/uk-carbon-capture-and-storage-government-funding-and-support>

²⁵ For more information, see <https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings>

A note on overheating, cooling and climate change

Although one of the biggest challenges in decarbonising buildings in the UK relates to heat demand, it is generally agreed that demand for cooling is likely to increase in the future as a result of climate change.²⁶

Therefore, when considering interventions in its own building stock, it will be important for Adur & Worthing Council to:

- Prioritise passive cooling measures, in order to reduce the need for air conditioning;
- Deliver cooling efficiently using highly efficient systems; and
- Incorporate building-mounted PV where possible, as solar panels will tend to generate more power on hotter days with higher cooling demands.

²⁶ JRC Science for Policy report by the European Commission, 'Assessment of the impact of climate change on residential energy demand for heating and cooling' (2018)

4. Achieving Net Zero: A plan for Adur & Worthing

4.1 Action plan

Key areas of influence

As illustrated in Figure 6, although the Councils have control over their own Scope 1 and 2 emissions to some extent, achieving the decarbonisation target will also depend on changes occurring on a primarily national or regional level. However, the Councils do have opportunities to exert pressure across multiple spheres of influence, even if this is indirect.

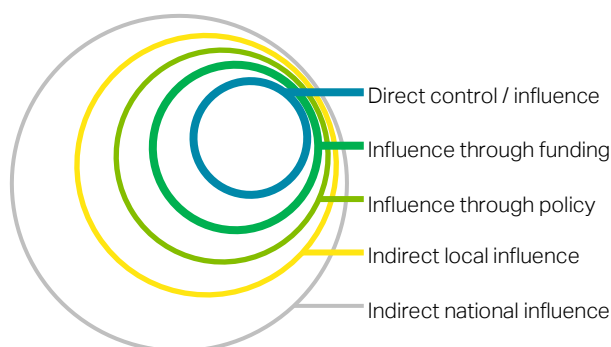


Figure 6: Adur & Worthing Councils - Spheres of influence

On this basis, potential responses from Adur & Worthing Councils could include:

- **Direct control:** Taking a leadership role by adopting best practices wherever possible by reducing energy demand in its own building stock, adopting behavioural change programmes, switching to renewable energy sources and adopting a zero-emission vehicle fleet.
- **Buildings /services owned but not operated by the Councils:** engage with tenants and service users to promote demand reduction measures, encourage uptake of renewables, etc.
- **Procurement:** Ensure that there is a rigorous approach to embedding sustainability into procurement, e.g. with reference to Government Buying Standards, the Flexible Framework, and British Standard 8903:2010.

In addition to mitigating their own emissions, the Councils should also take a leadership role and consider ways it can exert influence within the local area more broadly, for instance:

- **Influence through funding:** For instance, by offering subsidies to SMEs wishing to undertake building energy audits.
- **Influence through policy:** Supporting the delivery of heat networks and renewable energy projects within the area by taking a positive approach to renewable energy generation in planning policies and decision-making.
- **Minimising emissions from transport in the local area** through design of infrastructure and traffic management, adopting an approach to spatial planning that reduces reliance on private vehicles, and supporting initiatives to encourage the use of public transport, ridesharing, walking and cycling.
- **Supporting higher standards of sustainable design and construction.** This could be done through awareness and training; for instance, by establishing best practice networks or offering training to facilities managers.
- **Exerting indirect national influence:** Lobbying the Government to bring forward more ambitious policies (e.g. transport strategies, research and development, updates to Building Regulations).

Action Plan

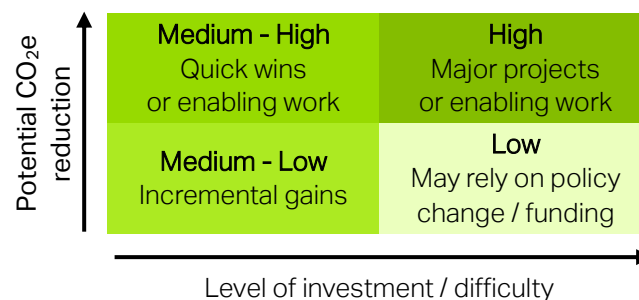
The following pages describe a set of proposed actions for Adur & Worthing Councils that reflect the findings of this carbon reduction study. These actions will need to be reviewed and agreed by the Council prior to being adopted and taken forward. The proposed actions have been presented with the following information:

- **Reference code**
- **Action** – Summary of the proposed action
- **Description** – Any other relevant details relating to the proposed action
- **Timeframe** – Describes the timeframe (short, medium or long-term) during which the proposed action needs to be delivered, either short term (0-6 months), medium term (6-12 months) or long term (1-5 years).
- **Effectiveness** – This is framed in terms of the level of potential CO₂e reductions that could be achieved, informed by the analysis presented in Sections 2 and 3.
- **Deliverability/Roles** – Key considerations and relative effort required, considering factors such as Adur & Worthing Councils’ level of influence or role in delivery and required involvement of other parties.
- **Investment Resource implications** – The relative level of resource (e.g. officer time) that Adur & Worthing Councils would need to commit in order to deliver the proposed action. Where possible, we have provided an estimate of the scale of investment required, based on published industry figures and AECOM’s own experience in delivering similar projects (where applicable).



Note that these are preliminary figures intended only to provide a sense of potential scale of investment required, subject to further detailed analysis. These are labelled as ‘investments’ rather than costs because many of them have potential financial returns and some or all of the required financing could come from other parties.

- **Priority** – This field sets out the relative priority of the proposed action, based on the considerations listed above. Note that some projects with a higher priority ranking may not result directly in CO₂e savings, but enable other high-priority actions to take place. This is illustrated in the diagram below.



The actions are grouped into the following broad categories: General actions (G); Supporting grid decarbonisation (D); Demand reduction (R); Low carbon heating systems (H); Building integrated renewable energy generation and storage (E); Low carbon transport (T); Offsetting (O); and Scope 3 emissions (S).

LEGEND

	Measures specific to the Councils' operations
	Measures that would impact the wider Local Authority area

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
General actions							
G1	Disseminate the results, conclusions and recommendations of this study within A&WC	Send out copies of the report and promote the Climate Emergency Plan to build capacity and support within A&WC for taking the recommendations and actions from this report forward.	Short term	N/a – enabling action	Internal action (A&WC)	Limited officer resource required	N/a – enabling action
G2	Identify senior officers and members to champion the programme and key projects	Senior officer and members will be vital in taking forward the recommendations and actions proposed in this report.	Short term	N/a – enabling action	Internal action (A&WC)	Limited officer resource required	N/a – enabling action
G3	Establish a means of monitoring and reporting progress against the recommendations and action plan	Set up a monitoring and reporting mechanism to enable progress towards the decarbonisation target to be assessed over time as well as re-	Short-medium term	N/a – enabling action	Relatively straightforward but will require A&WC officer(s) to become familiar with existing data, tools and resources. Additional complexity will be added depending on	Officer resource required	N/a – enabling action

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
		appraising actions and priorities.			the scope of monitoring. For guidance, see BEIS, 'Emissions reduction pledge 2020: Emissions reporting in public and higher education sectors' (2018). ²⁷		
G4	Establish roles for delivering the recommendations and actions	The agreed set of actions following on from this study should be allocated to specific officers to ensure responsibility for delivery.	Short term	N/a – enabling action	Internal action (A&WC)	Officer resource required	N/a – enabling action
G5	Work with Government and other Local Authorities to identify existing and forthcoming funding sources to support further studies and specific projects	Many of the measures identified in this report will have significant capital cost implications and therefore funding may be required to support their implementation. Any further work to define specific project opportunities should include an analysis of funding options.	Short term but must be ongoing to reflect future opportunities	N/a – enabling action	A&WC to work with government and other local authorities	Officer resource required	N/a – enabling action
Grid decarbonisation							
D1	Speak to UKPN about future energy infrastructure plans	A&WC should arrange a meeting with UKPN to discuss the plans for future energy	Short term	N/a – enabling action	A&WC to meet with UKPN and other stakeholders. This should be done in parallel with Actions T1-T4	Limited officer resource required	N/a – enabling action

²⁷ Available at: <https://www.gov.uk/government/publications/emissions-reduction-pledge-2020-emissions-reporting-in-public-and-higher-education-sectors>

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
		infrastructure in the area and how they can support and facilitate this through planning policy and other mechanisms.			which relate to low carbon transport.		
D2	Monitor progress on national decarbonisation	A&WC should monitor progress of the decarbonisation of the national grid to understand the implications for meeting the decarbonisation target. This can be done by accessing national (BEIS) datasets on an annual basis.	Medium-long term	N/a – enabling action	Relatively straightforward but will require A&WC officer(s) to become familiar with existing data, tools and resources. See BEIS, ' <i>Emissions of carbon dioxide for Local Authority Areas</i> ' (online). ²⁸	Limited officer resource required	N/a – enabling action
D3	Support decarbonisation of the national grid through planning policy	A&WC should provide support through planning policy for strategic energy infrastructure developments that seek to deliver and support the national decarbonisation target.	Medium-long term	N/a – enabling action	As for planning policy in general. Relies on engagement with internal and external stakeholders including local community members. May require additional resource to raise awareness of the strategic importance of such schemes.	Officer resource required	N/a – enabling action

²⁸ Available at: <https://data.gov.uk/dataset/723c243d-2f1a-4d27-8b61-cdb93e5b10ff/emissions-of-carbon-dioxide-for-local-authority-areas>

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
Demand reduction							
R1	Produce an estate-wide carbon-reduction plan	A&WC could commission further audits of its assets to understand the potential for demand reduction measures and develop an estate-wide carbon reduction plan.	Short term	An initial set of audits have been carried out on selected buildings as part of this study to provide an insight into the potential intervention options. There is scope for more detailed investigations to be carried out on these buildings and for audits expanded to other buildings.	A&WC to produce carbon management plan	A further budget will be required to carry out additional audits, the cost of which will depend upon the nature and number of audits undertaken.	High
R2	Undertake energy efficiency retrofits of all Council properties	Deliver the recommendation from the initial audits along with those from further audits and the estate-wide carbon management plan proposed in Action R1. To speed up delivery, this work should be co-ordinated with Actions H1, 2 & 3 for switching to heat pumps.	Short-term (initial audits) Medium term (additional audits)	Critical for delivering the Council decarbonisation plan	A&WC to develop programme for carrying out the energy efficiency works identified in the carbon management plan and identify funding and delivery approach	The full costs of this cannot be estimated at this stage, due to the range of building types and uncertainty of the package of measures that would be required for each. However the initial audits provide a guide to the costs and the full costs would be quantified as part of the estate-wide carbon management plan in Action R1.	High
R3	Instigate a behavioural change programme across all council properties to reduce energy consumption	A behaviour change programme should be initiated across the Council's key buildings to encourage staff to reduce energy consumption. Nominated staff will be	Short term	Critical for delivering the Council decarbonisation plan	A&WC to instigate and support an ongoing behavioural change programme	This will require officer time to instigate and maintain, including a member of staff with overall responsibility and time for staff within each building	High

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
		required to drive the programme in each office and senior level involvement and support will be crucial.					
R4	Review BMS operation strategy	Currently the BMS at A&WC occupied sites are accessed and programmed by external third-party organisations. The set programs should be reviewed against current building operation patterns and updated accordingly. Where possible, control could be given to the building occupiers.	Short term	Highly effective where local control has been implemented (i.e. Worthing Leisure Centre). Where sites have dedicated facilities management personnel, i.e. Town Hall (AW&C operated), Assembly Hall (tenant operated), local control will be highly effective at inexpensively and immediately reducing energy consumption.	A&WC to commission / undertake study	Budget required to commission a study (estimate £1-5K depending on scope) and provide officer resource.	High
R5	Link carbon reduction plans with existing maintenance and retention strategies for Council-owned properties	A&WC could carry out a review to understand the retention strategy, typology and age of buildings to inform more targeted interventions for projects, guidance and funding	Short-medium term	N/a – enabling action	A&WC to commission / undertake study	Officer resources required	Medium
R6	Monitor results of energy efficiency programmes	A&WC to monitor the performance of energy efficiency programmes within AW&C operations	Medium-Long term	N/a – enabling action to identify future interventions	A&WC to monitor results	Officer resources required	Medium

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
R7	Business engagement and support, particularly for Small and Medium Enterprises (SMEs), related to energy efficiency	A&WC could provide guidance to SMEs, in the form of forums, presentations, events, training or funding, to deliver energy efficiency improvements.	Medium term	Important for showing leadership within the community	A&WC to develop and deliver training. Implementation relies on actions from businesses and other external stakeholders.	Budget required to provide this service as well as officer resource to establish and manage. Cost to A&WC depends on the precise service offered but developing basic guidance materials and delivering training workshops could be £5-15K.	Medium
R8	Consider subsidised energy audits	A&WC could consider providing subsidised energy audits to support SMEs in identifying energy improvement opportunities.	Medium term	Important for showing leadership within the community	Delivery of energy efficiency improvements will rely on actions of other parties (SMEs).	Budget required to provide this service as well as officer resource to establish and manage it. Cost to A&WC depends on the precise service offered. Energy audits for a single building might range from £2-5K+, though this is heavily depending on size and complexity of the building and scope of the analysis.	Low-Medium
R9	Monitor results of external energy efficiency programmes	A&WC to monitor the performance of energy efficiency programmes within the Local Authority area to identify opportunities to provide additional support	Medium-Long term	N/a – enabling action to identify future interventions	A&WC to monitor results	Officer resources required	Low-Medium
R10 (a)	Understand use of other fuels (aside from gas and electricity) in the Local Authority area – Domestic sector	Undertake an assessment of the use of fuels other than gas and electricity (for instance, properties that use oil, coal or wood for heating) to	Medium term	CO ₂ e reduction not assessed – this action would enable assessment to be made. In order to reach the decarbonisation target it will be important to consider	A&WC to commission / undertake study	Budget required to commission a study (estimate £10-15K depending on scope) and provide officer resource. This action could be carried out in conjunction with R10(b).	Low-Medium

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
		understand the type and frequency, and identify suitable ways of targeting interventions.		incremental gains to minimise the amount of offsetting required.			
R10 (b)	Understand use of other fuels (aside from gas and electricity) in the Local Authority area – Non-domestic sectors	Similar to R10(a), but with a focus on the non-domestic sector. Understanding the fuels used in specific in industries within the area can potentially highlight high emitting activities or sectors that could be targeted for intervention.	Medium term	See note on R10(a).	A&WC to commission / undertake study	Budget required to commission a study (estimate £10-15K depending on scope) and provide officer resource. This action could be carried out in conjunction with R1(a).	Low-Medium
R11	Investigate potential to use business rates to drive energy performance	A&WC to consider the option of linking business rates to EPC/DEC ratings, offering a discount for better performing buildings and/or where buildings can demonstrate an improvement through investment in energy efficiency.	Medium-long term	Depends on the level of energy efficiency improvements that are required by the policy.	A&WC to commission / undertake study. This type of policy could be challenging or controversial and, if implemented, could lead to a reduction in Council revenue. Any proposals should consider how the Government is proposing to deliver / enforce MEES.	Officer resources required to carry assess the potential costs and benefits. Potential cost to Council in relation to the reduction in Business Rate revenue	Low
Low carbon heat							
H1	Heating system replacement for Council owned buildings	Review heating system asset plan for Council owned buildings and identify opportunities	Short term	Modelling indicates that switching to heat pumps could potentially reduce the CO ₂ e emissions of each site	A&WC to develop replacement programme	Officer resources required to develop heating replacement programme.	Medium-High

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
		<p>for switching to heat pumps. Develop a programme for replacing existing gas boilers with efficient heat pumps.</p> <p>Specific opportunities have been identified through energy audits of key A&WC buildings.</p> <p>Replacement of heating systems should be combined with demand reduction measures (R2)</p>		by 20-80% by 2050, subject to electricity grid decarbonisation.		<p>Indicative cost of installing a heat pump are:</p> <ul style="list-style-type: none"> £500-1000/kW for non-domestic buildings £4-10k for domestic buildings <p>Costs will depend on the type of system and level of additional infrastructure required, including electrical capacity reinforcements.</p> <p>For comparison, if replacing with a gas boiler:</p> <ul style="list-style-type: none"> £60-100/kW for non-domestic buildings £1-2k for domestic buildings 	
H2	Investigate the potential for a low carbon heat network in and around the (i) Civic Quarter in Worthing Town Centre and (ii) the Shoreham Centre area.	A&WC to undertake a feasibility study to assess the technical feasibility and financial viability of delivering a heat-pump led heat network in and around the two identified sites.	Short term	CO ₂ e reduction depends on which buildings are connected. A heat network could offer higher reductions than individual systems with lower capital and operational costs.	A&WC to commission / undertake study Feasibility study would identify practical barriers and other considerations to address going forward	<p>Budget required to commission an initial feasibility study (est. £10-35K per study depending on scope) and provide officer resource. HNDSU subsidy is available for projects of this nature (funded by BEIS).</p> <p>This study will define the total capital costs, whole lifecycle financial and carbon benefits of delivering a heat network in this location.</p>	Medium-High
H3	Explore opportunities for other heat networks	A&WC to review other opportunities for heat networks	Medium-Long term	A heat network could offer higher reductions than individual systems with lower capital and operational costs.	A&WC to commission / undertake study	Good opportunity areas are those near a considerable heat source (i.e. Shoreham Power Station), public operated estate(s) and/or new development sites.	Medium

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
						Cost of undertaking a study into an identified opportunity area is as per Action H2.	
Building integrated renewable energy generation and storage							
E1	Identify further opportunities to install PV on Council buildings	A&WC should build on previous experience and expand the installation of PV on the roofs of Council owned properties to support the roll out of heat pumps and EVs.	Medium-long term	<p>Good carbon savings in the short term but will decrease as the grid decarbonises.</p> <p>Significant benefits in supporting operational costs and security of supply for Council buildings where heat pumps and EV charging points are installed.</p>	<p>A&WC has successful experience of PV installations.</p> <p>The financial viability of PV has been reduced by the removal of incentives from the Feed-in Tariff (FIT) scheme but increasingly PV installations are becoming viable without incentives, particularly in combination with battery storage, EV charging and heat pumps.</p>	Roof-mounted PV is likely to cost in the region of £750-1500/kW fully installed depending on scale and complexity of installation.	High
E2	Identify opportunities to install PV on the roofs of Council-owned car parks	A&WC should investigate and (if feasible) install solar carport PV arrays on Council owned car parks.		<p>Good carbon savings in the short term but will decrease as the grid decarbonises.</p> <p>Significant benefits in supporting wider EV rollout.</p>	<p>A&WC are already looking at this with the West Sussex Energy Hub.</p> <p>Solar car parks are a technically proven solution with successful examples in Exeter, Cambridge and Nottingham.</p>	Industry estimates suggest that roughly 2kW PV can be installed per car parking space and fully installed costs could be expected to be in the range of £900-1400/kW (BRE Solar Car Park Guide)	High
E3	Investigate opportunities to install batteries in Council buildings	A&WC should monitor the viability of battery systems and assess the viability of including		Battery storage does not reduce carbon emissions per se but can improve the efficiency of other systems	At current prices the installation of batteries is likely to make more commercial sense for	Battery systems can be profitable where they combine the income from peak shaving, avoidance of use of service charges, arbitraging	Medium

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
		these in projects involving heat pump replacements, PV installations and/or EV charge points.		and reduce the reliance on the grid, saving both money and improving security of supply, both of which will be important as the Council moves to the use of heat pumps and EVs.	larger projects. If a heat pump led heat network is delivered for the Civic Quarter or Shoreham Centre (Action H2), potentially along with PV and EV charging), this may be of sufficient scale to make a battery system viable.	grid prices with time of use tariffs, frequency response contracts and additional value of PV and/or EVs.	
Low carbon transport							
T1	Review AW&C fleet and replacement plans	Conduct an audit of vehicle fleet to assess opportunities for renewal with zero emission alternatives	Short term	N/a – enabling action	Internal action (A&WC)	Officer resources required	Medium
T2	Replace AW&C car and van fleet with zero emission alternatives	Based on the audit carried out as part of Action T1, replace A&WC vehicles with zero emission alternatives as these come up for replacement	Medium term	Cars and vans represent around 5% of AW&C’s Scope 1 and 2 emissions, but the importance of this measure is also linked with the Councils taking a leadership role to encourage the wider uptake of EVs.	Internal action (A&WC)	Depends on the technology in question and prices are likely to change significantly in the coming years. Currently EVs tend to be more expensive in whole lifecycle costs than conventional vehicles. This is primarily due to high capital costs and depreciation rates, although the running costs are lower. Note that the cost to drivers of using EV, hybrid and traditional fuel vehicles may converge in the coming decade.	High
T3	AW&C to plan for future replacement of HGVs	Replacement of the Council owned HGV	Long term	Emissions from Council owned HGVs represent a	This action relies upon the technology to become	Costs will depend on technology readiness, the state of the LEV	High

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
	with zero emission alternatives	fleet with low carbon alternatives will be needed to achieve the 2030 decarbonisation target and therefore should be accounted for in relevant plans and budgets		large proportion (around 26%) of the Council's Scope 1 and 2 emissions.	available and cost effective by the time the replacement is due – deliverability uncertain.	market and Government incentives at the time of investment.	
T4	AW&C to install public charging infrastructure in its own estate	Help to support EV uptake through further provision of infrastructure within A&WC's own estate. This would involve carrying out a review of existing car parks and parking spots, assessing the current and future level of demand for EV charging, and identifying locations that would be suitable based on the findings.	Short-medium	Shows leadership in promoting sustainable transport and helps to overcome the 'chicken and egg' problem of EV uptake relying on available charging infrastructure. At present, the number of public EV charging points in the Local Authority area ²⁹ is <ul style="list-style-type: none"> Worthing: 10 public charging points (3 rapid) Adur: 2 public charging points (0 rapid) 	This should be coordinated with Action D1 (discussions with UKPN) to understand infrastructure capacity / constraints.	Budget required to commission a study of suitable locations and types (estimate £15-30K depending on scope). Indicative costs for different EV charging points ³⁰ are as follows – <ul style="list-style-type: none"> Slow (3.50-7kW): £500-1000 Fast (7-22kW): £2,000-3,000 (AC) or £19,000 (DC) Rapid (up to 50kW): £20K-40K Costs will depend on the level of additional infrastructure required, including electrical capacity reinforcements. There is a difference in cost when considering upfront installation compared with retrofitting. Per DfT estimates – <ul style="list-style-type: none"> Typical domestic: £976 for upfront versus £2,040 for retrofitting 	Medium-High

²⁹ See <http://maps.dft.gov.uk/ev-charging-map/>

³⁰ Energy Saving Trust, 'Guide to chargepoint infrastructure for business users' (2017). Available at: https://www.energysavingtrust.org.uk/sites/default/files/reports/6390%20EST%20A4%20Chargepoints%20guide_v10b.pdf

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
						<ul style="list-style-type: none"> • Typical non-domestic: £3,822 for upfront versus £4,925 for retrofitting ³¹ 	
Offsetting							
O1	Undertake an assessment of opportunities for offsetting residual CO ₂ e emissions	A&WC to commission a study to review specific project opportunities for delivering carbon savings through investment in renewables or other projects, both within and outside of the Local Authority area, including a review of costs and benefits. Opportunities could include e.g. investing in large-scale PV or wind generation, woodland creation, etc.	Medium term	Potentially high impact, but note that energy demand reduction measures, and reducing the use of fossil fuels are a higher priority than carbon offsetting.	A&WC to commission / undertake study	<p>Budget required to commission a study (estimate £10-30K depending on scope) plus officer resources.</p> <p>Estimates of potential delivery costs are provided below, based on published figures.³²</p> <ul style="list-style-type: none"> • Solar farms – Cost in the UK can be around £1,000,000 per MW. A 5 MW solar farm may occupy around 25 acres of land.³³ • Large-scale wind – Cost of onshore wind can be around £1,000,000 per MW. A large turbine of 1.5 MW might be 70-100m in height. <p>Note that costs have decreased significantly in recent years and, in future, may vary widely depending on UK Government policy initiatives, funding, etc.</p>	Low-Medium

³¹ Department for Transport, 'Industrial Strategy: Electric Vehicle Charging in Residential and Non-Residential Buildings' (July 2019). Available at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/818810/electric-vehicle-charging-in-residential-and-non-residential-buildings.pdf

³² International Renewable Energy Agency, 'Renewable Power Generation Costs in 2018' (2018). Available at: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2019/May/IRENA_Renewable-Power-Generations-Costs-in-2018.pdf

³³ According to the UK Solar Trade Association: <https://www.solar-trade.org.uk/solar-farms/>

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
						<p>For context, as a rough guide based on the calculations in this report, to fully offset A&WC’s current annual Scope 1 and 2 emissions would require either around 16 MW of solar farms (occupying around 75-80 acres) at a cost of around £16 million or 6 MW of onshore wind capacity (3-6 large wind turbines up to 100m tall) at a cost of around £5.5-6 million.</p> <p>The same amount of PV could be installed as roof-mounted systems which can have a lower visual impact but tend to be more expensive than ground-mounted solar farms. It is estimated that building-mounted PV would cost closer to £20-25 million. This does not include the cost of land, environmental assessments, planning permission, maintenance, etc.</p> <p>The overall costs of woodland creation depend multiple factors, such as the potential timber revenue, agricultural opportunity costs, etc. but are estimated at around £5,095 per hectare for planting and fencing, plus government / local authority</p>	

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
						<p>administration costs of around £637 per hectare.³⁴</p> <p>To fully offset A&WC's current annual Scope 1 and 2 emissions would require creation of roughly 800 hectares of new woodland (8 square kilometres) at a cost of around £4-5 million.³⁵ Again, this does not include the cost of land, environmental assessments, planning permission, carbon reduction certification, etc. Accounting for the cost of land, this option may be comparable in price to solar farms, but the spatial requirement is clearly inhibitive.</p>	
O2	A&WC to consult on the options for delivering offsite CO ₂ e emissions savings	Based on the results of this studies and the other studies recommended above, A&WC should discuss the 'offset' options internally to agree on an approach that would be most acceptable, taking account of the measure and location.	Medium term	N/a – enabling action	Internal action (A&WC)	Officer resources required.	Low-Medium
Scope 3 Emissions							

³⁴ Forestry Commission, 'Comparing the cost-effectiveness of forestry options for climate change mitigation' (January 2019) – see 'Table 3: Afforestation Costs by Country'. Available at: <https://www.forestryresearch.gov.uk/research/comparing-cost-effectiveness-forestry-options-climate-change-mitigation/>

³⁵ Based on nation-wide statistics from the Woodland Carbon Code, new woodlands created from low-grade agricultural land have the potential to sequester around 356 tCO₂e per hectare over 100 years, or 3.56 t CO₂e per hectare per year on average. See Forestry Commission, 'Woodland Carbon Code Projects in the UK at 31 March 2019' (published June 2019). Available at: <https://data.gov.uk/dataset/058df59a-bb57-4959-8a39-2dc35b0d894f/forestry-statistics-woodland-carbon-code-statistics>

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
S1	Work with suppliers to provide better emissions data	In order for the Council to better understand its Scope 3 emissions further information will be required from its suppliers in relation to the CO ₂ e emissions associated with the services being procured by A&WC. This requirement needs to be discussed with existing suppliers and built into all new contracts.	Short-term	N/a – enabling action	Internal action (A&WC) but requiring the support of suppliers	No additional costs are envisaged for this, but officer resources will be required to engage with suppliers.	High
S2	Reduce waste production in Council offices	A&WC to review existing waste streams, identify relevant opportunities and guidance related to waste reduction and implement appropriate measures.	Short-term	Although the CO ₂ e emissions associated with waste generated by the council have not yet been quantified, any measures to reduce waste generation and waste sent to landfill will have a positive environmental impact	Internal action (A&WC)	Officer time to review existing waste streams and identify suitable measures to promote waste reduction and recycling.	Medium
S3	Reduce water consumption in A&WC offices	A&WC to reduce water consumption in buildings through the use of low water use toilets, flow restrictors on taps and showers and leak detection systems. Grey/rain water systems could also be investigated.	Medium-term	Potentially low-medium in terms of CO ₂ e emissions reduction but offers other environmental and cost benefits due to conservation of water resources	A&WC to develop rollout programme for easy win measures and specify low water-use fittings as part of any refurbishment programmes	Minimal costs for flow restrictors and if sanitaryware is part of planned replacement works. Grey/rainwater systems would have higher costs.	Medium

Ref	Action	Description	Timeframe	Effectiveness	Deliverability	Investment / resource implications	Priority
S4	Low carbon heating systems in Council leased properties and / or properties owned by the Council but leased by other organisations	Undertake a review of the buildings Council leased properties and / or properties owned by the Council but leased by other organisations to identify whether there are opportunities for installing low carbon heating systems.	Short term	See previous notes on the benefits of low carbon heating systems. Decarbonising heat will be crucial to achieving the decarbonisation target.	AW&C to undertake assessment. Deliverability depends on the specific contracting / tenancy arrangements for the building(s) in question.	Officer resources required to develop heating replacement programme. As per costs above.	Medium
S5	Support waste reduction and water conservation measures across the Local Authority area	A&WC to identify and keep informed of waste reduction and water conservation initiatives and actively seek out opportunities to engage / promote these schemes on an ongoing basis	Short-term	As above, measures that the Council can take with its waste contractor to reduce waste production and improve composting and recycling will reduce CO ₂ e emissions in the wider area	A&WC and waste contractors	Officer time to promote waste reduction and recycling	Medium

4.2 Measuring progress

Monitoring and review

We recommend that the Councils set up a monitoring and review process to assess progress against the CO₂e emission projections and other targets. This could be done on an annual basis or, to align with the Committee on Climate Change’s national carbon budgets, be split into 5-year periods.

Quarterly:

- Monitor progress against the action plan
- Report to members and partners

Annually:

- Report progress to internal and external audiences
- Monitor renewable energy generation and installed capacity
- Monitoring of the economic benefits achieved. This could be done, for instance, by measuring investment in LZC energy projects, and estimating the income retained in local economy through renewable energy supply and cumulative job creation.

In addition to reporting on the steps taken to achieve specific actions, the priorities of this Action Plan should also be reviewed on an annual basis. This should account for broader factors such as policy or technological changes. Where necessary, the Action Plan should be updated to reflect such changes.

Assessment metrics

In addition to annual CO₂e emissions, other metrics can be used to monitor positive enabling steps taken by Adur & Worthing Councils. Examples provided in the table below could be used to set additional quantitative targets.

	Topic	Method
1	Deployment of low carbon heating systems (heat pumps and heat networks) in Council-owned properties	Councils to maintain internal records
2	ULEV vehicles in the Council-owned fleet / pool cars (number of vehicles and % of total journeys or distance travelled)	Councils to maintain internal records
3	Improvement in energy efficiency of Council-owned buildings as a result of improvement works	EPC and DEC records or other surveys
4	Capacity of LZC energy technologies installed by the Council (MW)	Councils to maintain internal records
5	Amount of renewable heat or electricity generated by LZC energy technologies, used onsite and / or exported (MWh p.a.)	Councils to maintain internal records
6	Electric or biodiesel buses (number and % of total journeys or distances travelled)	Councils to maintain internal records
7	EV charging points owned / operated by the Council (number, type, location)	Councils to maintain internal records
8	Deployment of smart meters within Council-owned properties (number and % of total properties)	Councils to maintain internal records
9	Assessment of the progress of national electricity grid decarbonisation	Carbon factors are published annually by BEIS
10	Any other CO ₂ e offsetting e.g. areas of woodland created, trees planted, or carbon reduction certification achieved	Councils to maintain internal records

5. Conclusion

5.1 Recommendations

The measures described in this Carbon Neutral Plan reflect the following overarching recommendations:

- Adur & Worthing Councils should take a leadership role in reducing CO₂e emissions by examining their own operations, buildings, vehicle fleet, services and investments and identifying best practice measures that can be implemented
- The Councils should recognise that demand reduction, fuel switching and LZC energy generation are top priorities. However, given that some carbon offsetting will inevitably be required to meet the decarbonisation target. The Councils should immediately start carrying out further research to understand the offsetting opportunities that might be available.

Some of the actions laid out in this Plan will rely on broader trends that are outside of the Councils' control. Therefore, additional recommendations are as follows

- The Councils should proactively support other local authorities and organisations in delivering the actions required to reach net zero carbon. The SMARTHUBS project is an example of an opportunity for the Councils to exert indirect influence in this regard.
- The Councils should take steps to lobby the Government to achieve more rapid deeper decarbonisation across key priority areas, including higher energy efficiency standards for new and existing buildings, policies that support uptake of renewable and low carbon technologies, and the development of low carbon transport and infrastructure.
- The Councils should proactively support such measures through its own planning policy and decisions. In particular, the Council should take a proactive and positive attitude towards increasing the amount of local LZC energy generation and ULEV uptake as an important means of 'doing their part' on national electricity grid decarbonisation.

5.2 Next steps

Based on the findings of this report, the Councils should consider the following immediate next steps:

- Disseminate findings of this report and carry out further consultation to review and approve the Carbon Neutral Plan.
- Begin the process of reaching out to stakeholders, including local authorities, LEPs, utility companies (e.g. UKPN, Southern Gas), government departments / agencies (e.g. Department for Transport, Department of Environment, Food and Rural Affairs, and the Forestry Commission), and others (e.g. WRAP) to identify opportunities for collaboration and engagement.
- Review any ongoing or near future projects that are relevant to the measures listed in the Action Plan to ensure that activities are well-coordinated and integrated. This would include, for instance, plans for redeveloping the Civic Quarter, plans to reduce vehicle mileage in waste collection routes, and plans to refurbish or replace existing buildings, in addition to the Council's general strategies for building management or fleet replacement.

5.3 A final note

The results of this analysis show that the route towards becoming carbon neutral will require a strong level of ambition and commitment, backed up by significant interventions and investment across Adur & Worthing Councils' operations. Although the study shows that meeting the carbon neutral ambition will rely upon some factors outside of the Councils' control, such as the decarbonisation of the grid and availability of key technology, the fundamental steps required to deliver the net-zero target are clear and with strong leadership from the Councils these can be set into action now.

Appendix A – Modelling methodology

A.1 Data sources

The table below summarises the data used in establishing Adur & Worthing Councils' baseline CO₂e emissions.

Category	Description	Data used in this analysis
Scope 1	Direct emissions from sources owned or controlled by the reporting organisation	Metered gas data (for buildings where the Councils pay the gas bills) (kWh and £) Mileage for Council-owned vehicle fleet and pool cars, along with vehicle make/model and age
Scope 2	Indirect emissions from the generation of energy purchased by the reporting organisation	Metered electricity data (for buildings where the Councils pay the electricity bills) (kWh and £) <i>Note that, where data was unavailable, CIBSE Guide F 2012 'typical practice' benchmarks for 'local government office' have been used to estimate fuel consumption.</i>
Scope 3	Indirect emissions that result from other activities that occur in the value chain of the reporting organisation, either upstream or downstream.	Metered water use data (m ³) [Not used] Records of business travel by the Councils' employees – insufficient detail to assess CO ₂ e emissions from this activity

Although a sense-checking exercise was carried out to ensure the completeness and accuracy of this data, AECOM accepts no responsibility for any errors or omissions therein.

A.2 Baseline carbon emissions

General approach

The carbon emissions baseline was estimated in compliance with the methodology and conversion factors for greenhouse gas emissions reporting published by BEIS in 2019.

CO₂e figures for different fuel types and activities were taken from the BEIS 'Green Book Supplementary Guidance: Toolkit for valuing changes in greenhouse gas emissions, Table 1' (2019). These include figures for CO₂e emissions from:

- Use of natural gas (kgCO₂e / kWh)
- Use of UK grid electricity (kgCO₂e / kWh)
- Distance travelled (figures are provided for various different vehicle types) (kgCO₂e / km)
- Water consumption (kg CO₂e / m³)

Figures for electricity and gas consumption (kWh), vehicle mileage (km) and water consumption (m³) were multiplied by these CO₂e figures to obtain an estimate of the total emissions from each category.

Estimating vehicle mileage

Adur & Worthing councils provided AECOM with a dataset of vehicles which included the total mileage, the fuel type, the year of manufacture and the registration number of each vehicle.

In order to estimate emissions from the Councils' vehicle fleet, average yearly mileage figures were calculated based on the total mileage and the years in service for each vehicle. Then, the annual carbon emission figures for vehicles up to 3.5 t were estimated based on the fuel type, revenue weight (obtained from gov.uk MOT database³⁶ using registration numbers) and the corresponding CO₂e figures provided by the BEIS under Scope 1. The same procedure was followed for the heavier vehicles using the average laden values provided by BEIS.

In order to estimate emissions from pool car usage, a similar approach was taken. The council provided a dataset which included fuel types, trip distances and registration numbers of all the vehicles hired. The emissions were estimated based on the fuel type, trip distances, the engine size (also obtained from the gov.uk MOT database) and the corresponding CO₂e figures provided by the BEIS under Scope 3 ('business travel'); however, these are included in Scope 1 in this report because Adur & Worthing Councils control the operation these vehicles.

A.3 Carbon emission projections

The carbon emissions projections are carried out based on the following key assumptions.

Grid decarbonisation pathway

Carbon emission factors (CEFs) for electricity were taken from HM Treasury/BEIS 'Green Book Supplementary Guidance: Toolkit for valuing changes in greenhouse gas emissions, Table 1' (2019) which is intended for use by organisations reporting on their greenhouse gas emissions. Note that this trajectory reflects the level of decarbonisation that would be necessary for the UK to meet its current decarbonisation targets. It is not a projection of the likely emissions from grid electricity.

Electricity demand reduction

Evidence suggests that reductions of around 5% can be achieved through measures such as behavioural changes, smart metering, and zone lighting. Case studies suggest that greater reductions are possible for some organisations. However, in recognition of the fact that electricity use has increased in the past decade due to factors such as increasing use of electronic appliances, 5% has been used as a conservative estimate.

The model assumes that total electricity consumption will decrease linearly through the year 2030, at which point this reduction will be achieved.

Heating demand reduction from energy efficiency measures

Evidence from the National Energy Efficiency Database (NEED) indicates that installing multiple energy saving measures (such as cavity wall or loft insulation) can reduce heating bills by around 10%. From a technical standpoint, higher savings (over 75% in some properties) could be achieved with more ambitious retrofitting strategies,³⁷ so this assumption has been used as a conservative estimate.

This would not necessarily require all buildings to undergo a retrofit – it represents an average across the entire stock. In other words, some buildings could be retrofitted to a higher standard, while others (such as Listed buildings) receive no upgrades.

The model assumes that total gas consumption will decrease linearly through the year 2030, at which point this reduction will be achieved.

Impact of fuel switching

This calculation assumes that the metered gas consumption is delivered by individual gas boilers (80% efficiency). The total metered gas consumption data is used to provide a rough estimate of the amount of electricity that would be required if this level of demand was instead met using direct electric heating

³⁶ <https://vehicleenquiry.service.gov.uk/ViewVehicle>

³⁷ <https://passipedia.org/certification/enerphit>

(100% efficiency) or heat pumps (COP of 2.5, which is intended as a conservative estimate that reflects the performance of air source heat pumps in situ).

It is assumed that the Crematorium will also switch to an electric system offering similar performance levels (see energy audit report for further details).

The model assumes that 90% of Council-owned buildings will switch to an electric heating system by 2030. This would require an ambitious programme of heating system replacement with significant cost implications. Therefore, the calculation also assumes that 50% of the new heating systems will be DEH and 50% will be ASHP as an illustrative scenario, in recognition of the fact that DEH may be cheaper and more practical to install. Additional carbon reductions could potentially be achieved if more systems were replaced with ASHPs.

The model assumes that gas heating systems will be replaced with electric heating systems at a consistent rate (i.e. linearly) to 2030.

Vehicle mileage reduction

According to the 'Road to Zero' report: *'Evidence from 60,000 fleet drivers receiving training through the Energy Saving Trust (EST), a key partner supporting the efficient motoring agenda, gave an average 15% saving of fuel and CO₂ [...] Organisations that have incorporated a wider package of behavioural and procedural measures in managing their fleets (see the case study below) have delivered typical emission savings of between 10-30%.'*

In this report we have assumed a 10% reduction in mileage is possible across the organisation, based on case study evidence,³⁸ and that emissions from HGVs could decrease by up to 15%.

The model assumes that a 10% reduction in either journeys, vehicles, or miles travelled will result in a 10% reduction in CO₂e emissions from those vehicles. In reality, a travel strategy aimed at reducing emissions would likely seek to target certain types of trips, vehicles, or users, so this approach should be understood as a rough estimate. However, for the purpose of this analysis, it is considered sufficient to show a simple proportional reduction to highlight the relative scale of impact such a measure could have, relative to other interventions.

Impact of switching to ULEVs

Based on the estimated mileage for each vehicle type, we have re-calculated CO₂e emissions using BEIS Green Guide figures for electric vehicles.

Carbon savings from LZC energy generation

Carbon savings from LZC energy generation are based on the amount of national grid electricity that would be offset by renewable electricity.

The user inputs a total figure for the amount of LZC capacity that will be installed by 2030, and the model assumes that the total savings increase linearly up to that point.

An estimate is then made of the potential amount of renewable electricity that could be generated by those technologies (large-scale PV or wind). The electricity generation figure is multiplied by the CEF for a given year to provide an estimate of the total CO₂e savings in a given year.

- *Large-scale PV*: Assumed output of 800 kWh/kWp based on typical performance in the UK
- *Large-scale onshore wind*: Capacity factor based on renewable energy capacity and generation figures for Adur and Worthing, per BEIS, *'Renewable energy by Local Authority'* (2019)

³⁸ Department for Transport and Energy Saving Trust, *'Mileage Management – A Guide for Fleet Managers'* (2015). Available at: https://www.energysavingtrust.org.uk/sites/default/files/reports/4548_EST_A4_mileage_mmt_4.pdf

Note that, as the electricity grid decarbonises, more LZC energy generation is required to offset any residual emissions. Therefore, although the amount of LZC capacity is assumed to increase linearly, the savings per MW decrease as time goes on.

Carbon reductions from woodland creation and tree planting

Based on nation-wide statistics from the Woodland Carbon Code, new woodlands created from low-grade agricultural land have the potential to sequester around 356 tCO₂e per hectare over 100 years, or 3.56 tCO₂e per hectare per year on average.

It is assumed that the amount of new woodland increases linearly to 2030. Based on user inputs for the number of hectares planted, the model calculates the total potential carbon reduction potential. This is subtracted from the total estimated carbon emissions following adoption of all intervention measures, after accounting for renewable energy generation.

A.4 References

BEIS, 'Emissions reduction pledge 2020: Emissions reporting in public and higher education sectors' (2018). Available at: <https://www.gov.uk/government/publications/emissions-reduction-pledge-2020-emissions-reporting-in-public-and-higher-education-sectors>

BEIS, 'Green Book Supplementary Guidance: Toolkit for valuing changes in greenhouse gas emissions, Table 1' (2019). Available at: <https://www.gov.uk/government/publications/valuation-of-energy-use-and-greenhouse-gas-emissions-for-appraisal>

BEIS, 'Greenhouse gas reporting: Conversion factors 2019' (2019). Available at: <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019>

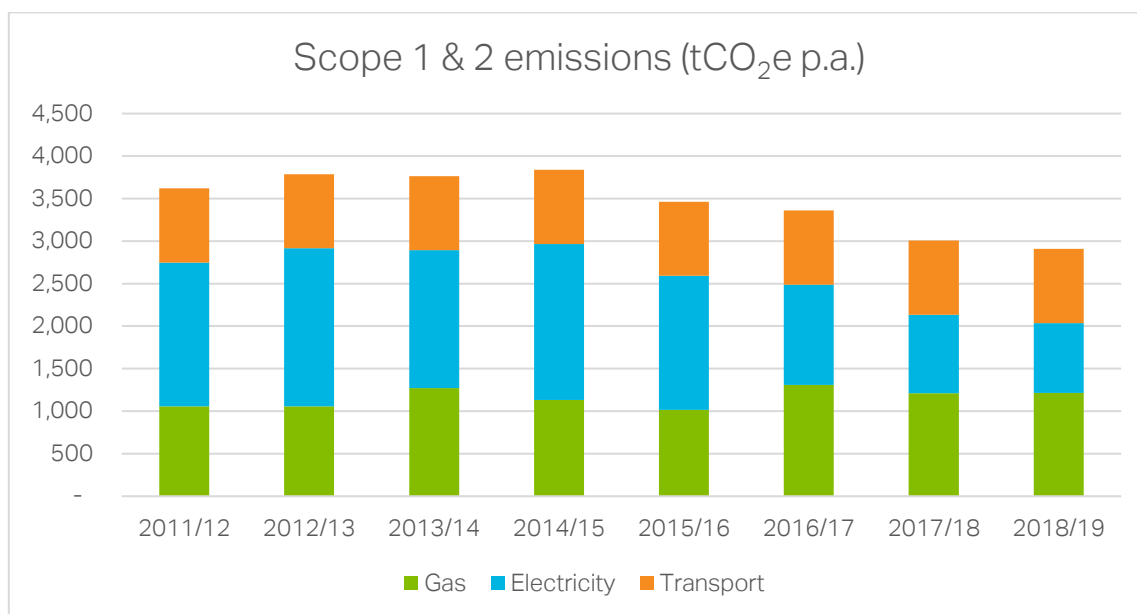
BEIS, 'Renewable energy by Local Authority' (2019). Available at: <https://www.gov.uk/government/statistics/regional-renewable-statistics>

Forestry Commission, 'Woodland Carbon Code Projects in the UK at 31 March 2019' (published June 2019). Available at: <https://data.gov.uk/dataset/058df59a-bb57-4959-8a39-2dc35b0d894f/forestry-statistics-woodland-carbon-code-statistics>

NEED, 'Summary of Analysis, Great Britain' (2019). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/812561/National_Energy_Efficiency_Data_Framework_NEED_report_summary_of_analysis_2019.pdf

Appendix B – Historic Scope 1 & 2 emissions for Adur & Worthing Councils

Scope 1 & 2 emissions for the financial years 2011/12 through 2018/19 are presented below, based on the data and methodology as described in Appendix A.



Category	Fuel	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Non-Residential	Elec	894	982	1,005	922	820	598	491	484
	Gas	388	388	440	405	387	415	465	422
Residential	Elec	133	147	230	199	161	114	90	75
	Gas	415	415	409	359	354	350	369	346
External	Elec	576	633	277	619	511	400	284	205
Crematorium	Elec	88	97	110	94	83	67	58	57
	Gas	254	254	422	368	276	546	377	448
All categories	Elec	1,057	1,057	1,271	1,132	1,017	1,310	1,212	1,215
All categories	Gas	1,692	1,859	1,622	1,834	1,575	1,178	923	820
Transport	All	873	873	873	873	873	873	873	873
TOTAL	All	3,621	3,788	3,766	3,838	3,464	3,361	3,007	2,908