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Carbon Emissions Reduction Pathways – West Yorkshire Update

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Final Version 5

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Project objectives and context

Project objectives and outputs

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Arup has worked with the West Yorkshire Combined Authority (Combined Authority), local authority partners and key stakeholders to update the carbon emissions reduction evidence base for West Yorkshire. By reviewing and updating the Carbon Emissions Reduction Pathways (CERP) evidence base produced in 2021 the Combined Authority and partners can progress with a refresh of the region's Climate and environment plan, setting out the options, measures, policies and actions to tackle the climate emergency.

The objectives of this update to the evidence base are to:

- **Develop a maximum ambition emissions reduction pathway** that can significantly reduce emissions in response to the region's net zero target by 2038.
- **Identify key milestones, decision points, policies and actions** that support the transition towards net zero and bring forward co-benefits from working towards that outcome.
- **Engage local stakeholders** with the region's net zero target and pathways, identifying the contributions they are making to reducing emissions.

Please note: this is a technical report that has been produced by a third party (Arup) for internal use by the Combined Authority, and as such may not fully comply with the Combined Authority's accessibility standards for published documents. The Combined Authority will issue an updated version of this report that meets accessibility requirements in due course.

Scope of evidence base update to inform Combined Authority plans to reduce emissions and tackle the climate emergency

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This update to the CERP reconsiders the technologies, interventions, policy and action plan evidence base that was produced in 2021 to drive reduction in scope 1 and 2 emissions across the West Yorkshire region (only). The evidence base is broad, cross-sectoral and high level.

The objective is to produce a Baseline and maximum ambition Pathway, sectors roadmaps and action plans for emissions reduction, to inform the Combined Authority's future choices, decisions and climate actions. Recognising national policies and decisions by UK Government will have a significant impact and determination on the region's net zero transition, the updated CERP evidence base supports the case to act now and with ambition.

The maximum ambition Pathway is one way the region can significantly reduce emissions. There are significant uncertainties and unknowns that will impact the regions actual pathway. As was the case in 2021, further evidence and analysis is required to support policy feasibility, implementation and investment decisions made by the Combined Authority.

Spatial analysis is needed to guide location, design and investment in projects that reduce emissions which is beyond the scope of this study. The region's local transport plan, local area energy plans, hydrogen work and nature recovery strategy will support the spatial considerations of this evidence base.

The maximum ambition pathway has updated the:

- technologies, interventions, innovation and policies required to deliver significant reductions in scope 1 (direct) and scope 2 (electricity consumption) carbon dioxide equivalent (CO_2e) emissions from transport, buildings, industry, land use land use change and forestry (LULUCF) and agriculture, and
- Forecasted negative emissions from nature restoration and recovery inside the region.

The update has not included:

- Scope 3 and shipping emissions and offsetting outside the region because the Combined Authority has limited / to no control and influence over these sources and wishes to priorities measures and actions where they can have greatest impact.
- Aviation emissions because the Combined Authority believe this is a sector for UK Government and industry to lead on the decarbonisation efforts, with the Combined Authority playing an advocacy role. This also aligns with local government datasets published by UK Government
- Adding emissions from power generated in the region to the maximum ambition pathway to align with local government datasets published by UK Government.

Local and geographical context

The Combined Authority work across West Yorkshire to develop and deliver policies, programmes and services which directly benefit the people of West Yorkshire.

The Mayor of West Yorkshire represents the interests of 2.3 million people across the region. The Mayor has responsibility for transport and economic growth, as well as the functions of the Police and Crime Commissioner.

Everything the Combined Authority delivers involves working in partnership. Working wholly in partnership with the five West Yorkshire local authorities of Calderdale, Bradford, Kirklees, Leeds and Wakefield, towards shared objectives, centred around the goal of improving the lives of the communities that they serve.

The vision for the region, as articulated in West Yorkshire Plan is… *A brighter West Yorkshire - a place that works for all. An engine room of ideas and creativity, where anyone can make a home.*

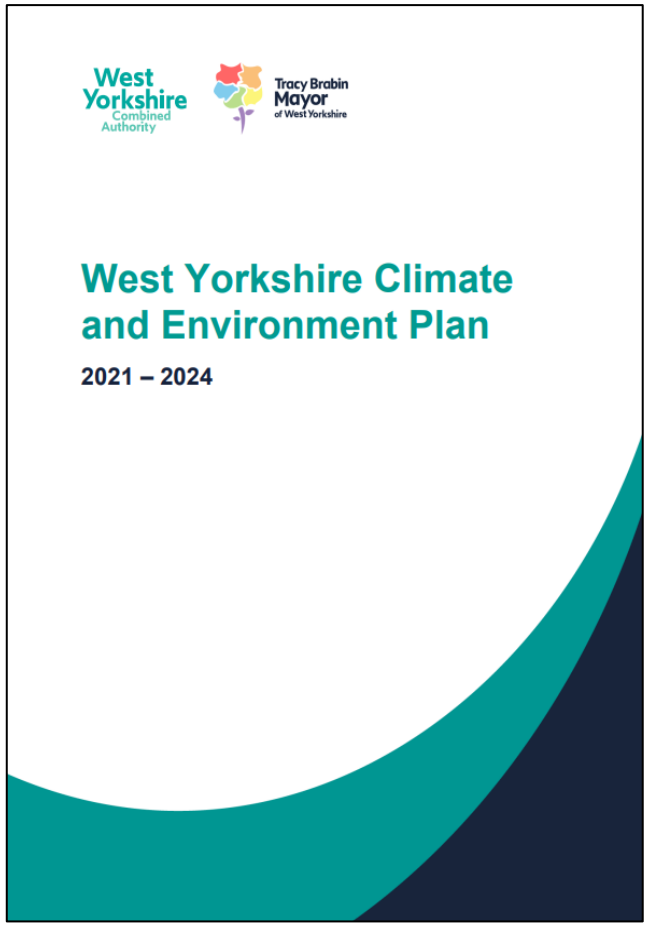
In 2021 the Mayor of West Yorkshire, the Combined Authority and partners launched an ambitious plan to tackle the climate and environmental emergency in West Yorkshire. Creating a cleaner, greener and healthier region and working towards being net zero carbon by 2038 at the latest.

It is acknowledged that meeting the net zero 2038 target requires collective action from across all parts of West Yorkshire.

Commitment to sustainability, decarbonisation and net zero

The West Yorkshire Plan mission (4) is ‘A sustainable West Yorkshire – making lives greener’, with the twin objectives of: ‘a net zero carbon economy by 2038’ and ‘growth in the green economy in West Yorkshire’. The actions for change include:

- A fair and just net zero economy.
- Green sector skills and opportunities for access.
- Supporting generational creativity and innovative solutions.
- Sustainable transport.
- Energy efficient homes, businesses and industry.
- Boosting regional productivity and supporting businesses to capitalise on the opportunities of a carbon-free economy.
- Sustainable, nature-rich region, celebrating, protecting and investing in the natural environment, supporting biodiversity and enhancing green and blue spaces.
- Climate ready region, building resilience for the climate challenges of the future.



The baseline and maximum ambition pathways present ways to reduce emissions with the goal of net zero by 2038

The study requirement was to model two pathways to illustrate the impact on equivalent carbon dioxide emissions of various future possibilities, ranging from no further local action (the baseline pathway) to ambitious, engaged and widespread action by all local and national partners and stakeholders (maximum ambition pathway). These two pathways allow a clear comparison to be made when ambitious and committed local action is taken and will support the Combined Authority in making a compelling case for net zero transitons.

Scenario	Description
Baseline Pathway	This scenario represents the impact of committed and legislated policies and plans by the UK Government (up to July 2024) for each sector to 2040 if no further climate action is taken beyond key national commitments, for example, national electricity grid decarbonisation and sale of zero emission vehicles.
Maximum Ambition Pathway	This scenario represents impact of local leadership and action from all partners and stakeholders, citizens and businesses across the region and, key national partners, namely UK Government, with the intent to be net zero by 2038. This requires strong collaboration and concerted effort to affect immediate and significant emissions reductions. The pathway is at the limit of what is credible and plausible (in context of the strategic modelling approach applied) and in recognition of the challenges and disconnect between regional and national targets, policies, funding and investment opportunities.

Section 2

Summary – key updates

Updating the evidence aims to provide the Combined Authority with the insight it needs to take forward climate action planning and inform delivery of programmes and projects

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Which year has been chosen for current emissions and start of pathway?

Combined Authority requested a current year to be as close to the year of update (2024) in light of available national and local datasets (2022).

How many 2038 pathways (scenarios) have been modelled?

- Two
- Why: Update provides an evidence base for the Combined Authority to choose and pursue an ambitious emissions reduction pathway by providing key evidence on the impact of electrification and hydrogen across all sectors.

How have some key local issues been modelled?

- The role for hydrogen has been identified for industry and transport.
- Significant reduction in buildings emissions is achieved by switching heating from gas to electrification.
- Transport emissions must reduce through a combination of technology and demand management.

How many pathways (scenarios) were modelled for CERP1?

- Four
- No pathway delivered net zero by 2038
- Evidence base kept open key decisions.

What is included in the two pathways and why?

Baseline Pathway: committed and legislated policies and forecasts by the UK Government & other key sources (Transport for the North). Offers confidence in likely emissions reductions achieved by 2038

Maximum Ambition Pathway: combination of local leadership and action from all partners, stakeholders and citizens across the region and national UK Government with the intent to be net zero in 2038.

What emissions impacts are not included?

- Scope 3 emissions, shipping emissions and offsetting outside the region.
- Emissions from power generated in the region added to the maximum ambition pathway.
- Aviation in recognition of Combined Authority role.

Why update the emissions reduction evidence base? And what is included?

- Significant new evidence, commitments and policy have been made since 2020.
- Increasing confidence and pathways for technologies to support decarbonisation of different sectors.
- A single maximum ambition pathway supports decision making and the design of policy for the region's Climate and Environment Plan.
- Technologies, interventions and actions required to deliver significant reductions in scope 1 (direct) and scope 2 (electricity consumption) carbon dioxide equivalent (CO_2e) emissions
- Transport, buildings, power industry, land use, forestry and agriculture, waste
- Forecast emissions from waste at a high-level, and the
- Forecasted negative emissions from nature restoration and recovery inside the region.

The scale of transformative opportunity for West Yorkshire from pursuing a net zero transition is significant

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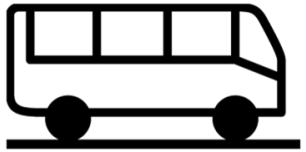
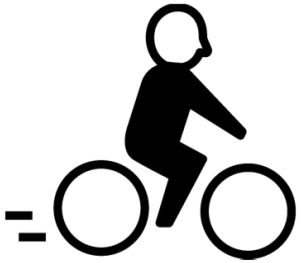
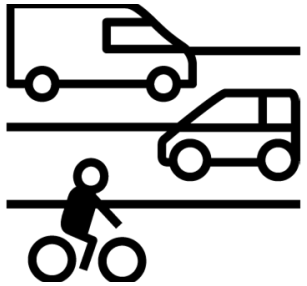
84% of vehicle kms taken by private car are by zero emission battery electric



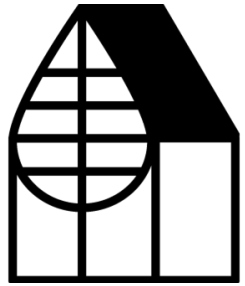
Accessible zero emission bus fleet for all improving air quality



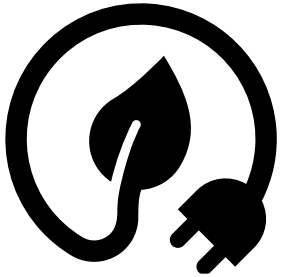
17% of passenger km are active ones made by walking & cycling



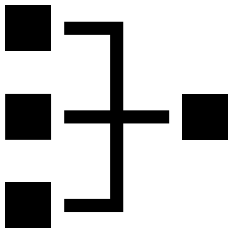
People have the social and economic opportunities and options to travel in a low carbon way



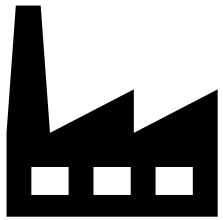
People's homes are warm, healthy and efficient by retrofitting 100% of social and 50% private homes



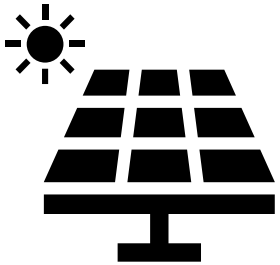
Heating homes is clean and low emission with 838k heat pumps and 205k homes connected to heat networks – no gas for heating homes by 2038



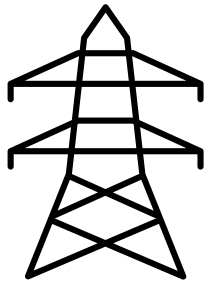
Heat networks are key low carbon, low cost infrastructure for people and businesses with 22% of homes and 28% of non-domestic buildings connected by 2038



Industry is energy efficient, and switches from fossil fuels to cleaner electricity and hydrogen, reducing costs and improving productivity

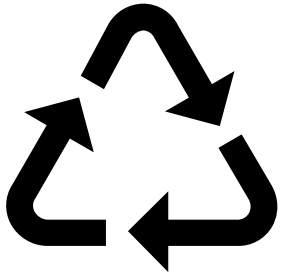


Renewable generation contributes 770MW of clean, secure power to meeting the region's demand for electricity



Increasing investment in renewable electricity, grid reinforcement and capacity means more low carbon electricity can be used in the region

170 hectare of tree planting and 100% peatland restoration reduces emissions and supports restoration of nature

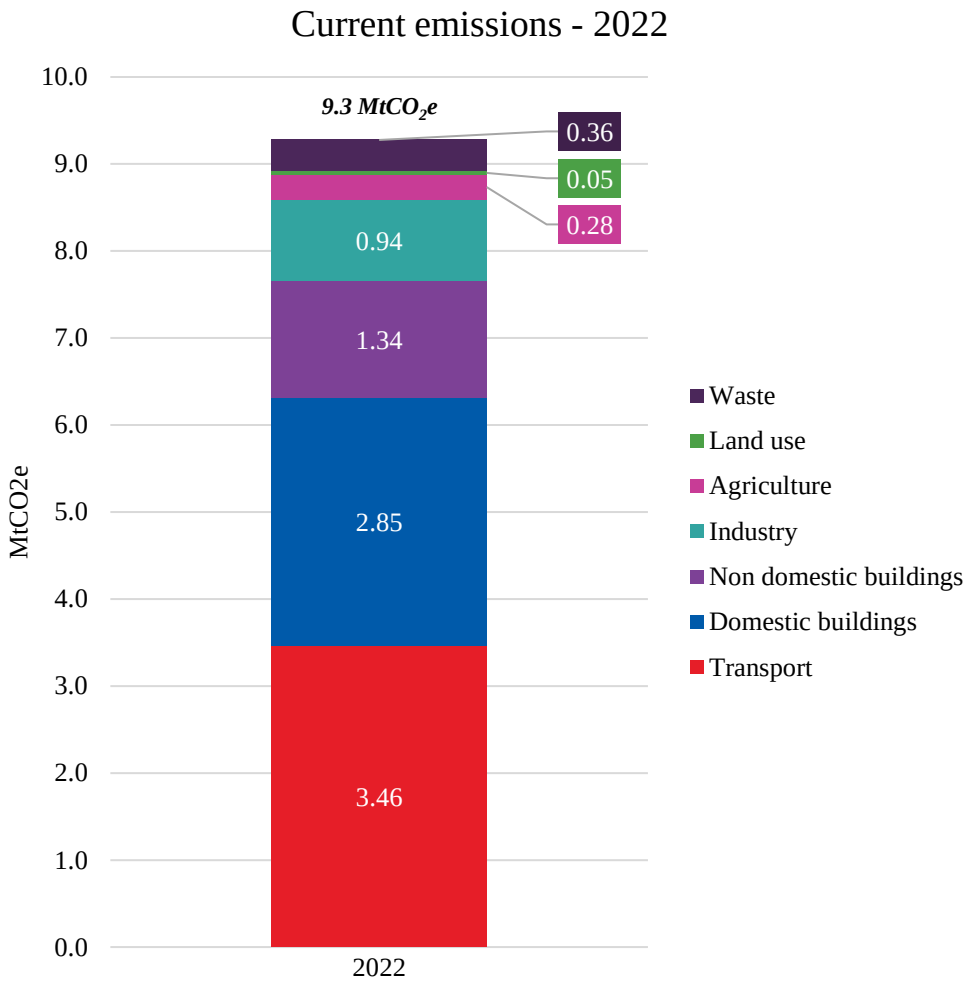


Waste emissions reduce by 38% with less waste sent to landfill and improvements to how wastewater is treated reducing costs and environmental pollution

All key sectors contribute to current emissions, with action targeting transport and buildings offering greatest opportunities to reduce emissions

Current emission contributions by sector are dominated by transport (road vehicles) and buildings (domestic buildings), with current scope 1 and 2 emissions in the region hitting 9.3 $MtCO_2e/yr$ (2022).

- Buildings (domestic and non-domestic combined) are the largest sector source of emissions, with heating - using natural gas – contributing the highest source of emissions due to the carbon intensity of the energy and amount of natural gas consumed.
- Transport is the second largest source of emissions, with road transport and the use of internal combustion engine (ICE) private vehicles making the largest contributions.
- There are limited emissions from industry due to the small size of the sector in the region: small industry, chemicals and glass are the largest sources of sector emissions.
- Land use, land use change and forestry (LULUCF) and agriculture emissions are very small due to the urban characteristics of the region.
- Waste emissions are also very small, with landfill and wastewater treatment contributing the greatest emissions.



Achieving significant emissions reduction is not possible if no local ambitious action is taken, with 27% reduction in emissions achieved by 2038 in the baseline pathway

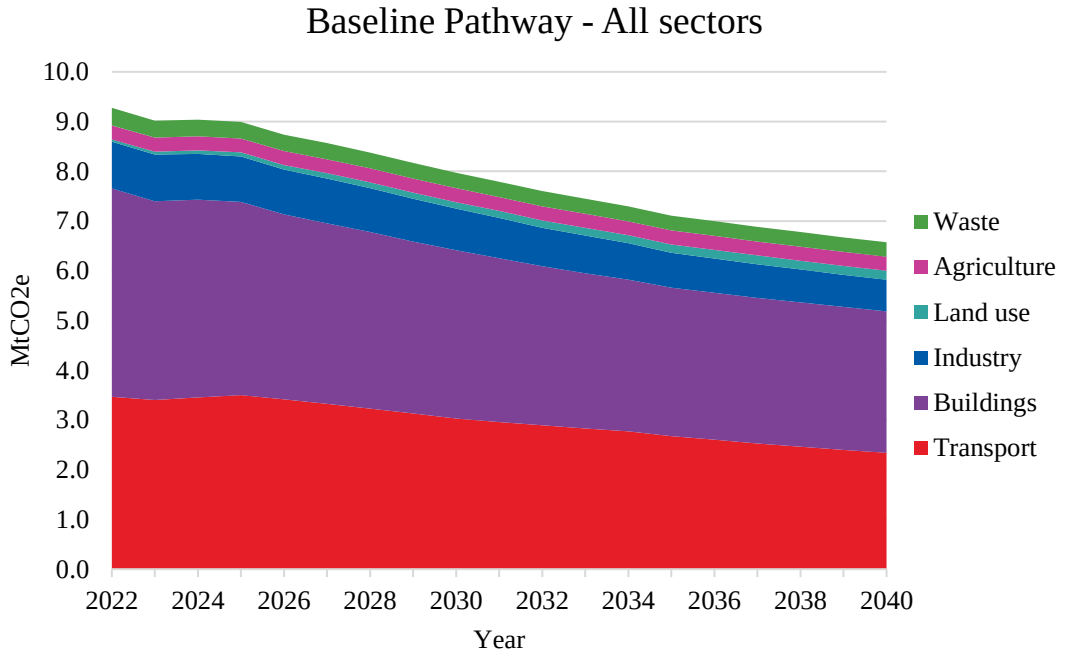
For the Baseline Pathway, the buildings sector contributes the most to the reduction of emissions. With increasing contributions of national renewable electricity supplying West Yorkshire's power demands and the steady improvements in the energy efficiency performance of domestic and non-domestic buildings, emission reduce by 31% by 2038 (when compared to 2022 baseline year). Demand for heat is predominately met by fossil fuels (natural gas) and the decarbonisation of heat is slow due to the high costs of action placed on consumers and businesses. The lack of incentives, regulations and long-standing consumer behaviours are constraints on decarbonising heating.

Transport sector emissions reduce 28% by 2038 (when compared to 2022) due to the slow uptake of low and zero emission technology solutions across the private, public and freight sectors, the high use of private ICE vehicles for short and long-distance journeys, the of lack significant incentives to transition from ICE to zero emission vehicles, and the options in place to complete more local journeys by walking and cycling.

Industry achieves emission reductions of 29% by 2038 (when compared to 2022) due to efficiency improvements and a resulting reduction in energy demand and the use of fossil fuels for industrial activity.

Land use emissions increase 282% (when compared to 2022) predominately due to urban expansion and continued degradation of carbon emitting landscapes like peatlands. Agriculture emissions remains static due the limited change in food production and consumer diets.

The power sector is not shown in this graph or the following graphs, as the emissions from the national electricity grid is included within the sectors consuming electricity.



The graph above shows the contribution of each sector to the region's emissions under a Baseline Pathway (no local action by the Combined Authority and partners).

In this scenario, the region's emissions reduce by 14% by 2030 and 27% by 2038 (compared to 2022) with emission levels at 6.8 $MtCO_2e/yr$ in 2038. No sector achieves net zero. The absence of credible national policy, investments and consumer behaviour contributing to significant emissions remaining for the region.

The updated maximum ambition pathway demonstrates how measures taken by all sectors can deliver significant progress towards net zero across the region

The maximum ambition pathway is presented here, highlighting the required transformations for each sector, the measures to support the transformation and links to CERP 2 actions that inform the delivery of measures

Transport

By 2038 the road transport sector sees the mass uptake of clean vehicles, with 84% of all private cars being battery EVs [T03, T04] and 100% of all buses being zero emission [T09].

Public and active modes of transport are crucial measures for reducing emissions, with 15% of passenger kms taken by train, 8% by bus [T07, T08], 12% by cycling and 5% by walking [T02].

Consolidation of freight sees total freight tonne km reduce 2% each year (compared to the relevant baseline year), and the proportion of freight tonne kms travelled by rail increases from 10% to 16% [T06].

To ensure road transport emissions reduce significantly and at pace the implementation of demand management solutions will be required [T02].

Buildings

The buildings sector is defined by the highly ambitious implementation of energy efficiency measures to the fabric of homes (100% of social homes, 50% of private homes and 63% of non-domestic buildings have a deep retrofit by 2038) [B01-06]. Clean heat is supplied by heat pumps (838k domestic and 55k non-domestic heat pumps) and heat networks (22% / 205k of homes connected to a heat network by 2038) [E01, E04, E05]. Domestic and non-domestic solar PV also supports emissions reduction with 569MW deployed capacity across West Yorkshire rooftops [E08-09]. There should be no homes using natural or hydrogen gas by 2038

Industry

Small and heavy industry will reduce emissions by being more energy efficient and switching to low carbon fuels (electricity, hydrogen, bioenergy) [I03, I04, I07, I09]. The transition to hydrogen energy (with provides 20% of fuel mix / 1.1TWh/year by 2038) [E03] is focused on the industrial sector which could be supplied from large scale production outside the region with pipeline transport, and/or connections and smaller scale decentralised on-site/cluster production.

Power

The power sector (not shown in Pathways) sees rapid implementation of distributed solar PV (from 1% to 35% of 2038 capacity) [E06-10], onshore wind (29% of 2038 capacity), and 44MW of energy from waste fitted with carbon capture and storage by 2038.

A zero carbon electricity grid is applied from 2033 based on the National Grid Holistic Transition Scenario.

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

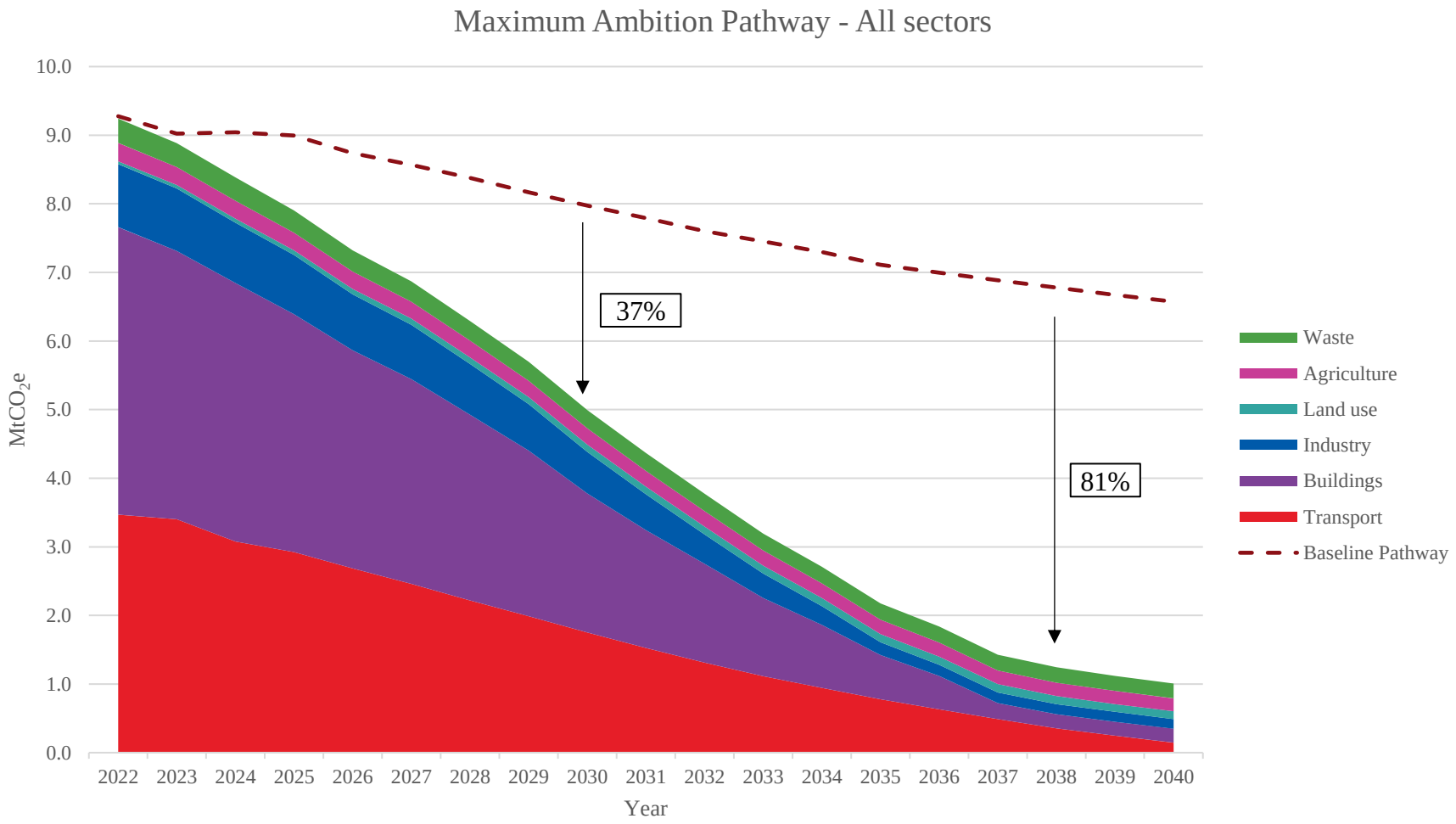
Land use change [L02], tree planting [L09], and peat restoration [L02, L03] have a positive offset impact, supporting the upcoming Local Nature Recovery Strategy [L01]. Agricultural emissions reduce due to changes in types of farming and consumers reducing consumption of meat and dairy, but it is insignificant for the region's overall emissions.

The opportunity for removing the remaining carbon emission by restoring and enhancing nature is limited due to urban land use and expansion of urban land to meet demands from population growth and infrastructure, and the extent of land required for significant sequestration of emissions. The co-benefits of nature restoration and landscape scale intervention (where possible) and the critical importance of tackling the nature emergency to tackle the climate emergency means all efforts and actions for nature should be pursued.

Waste

The waste sector emissions reduce by 38% with avoidance of landfill emissions contributing most to that reduction [W01-03, W07].

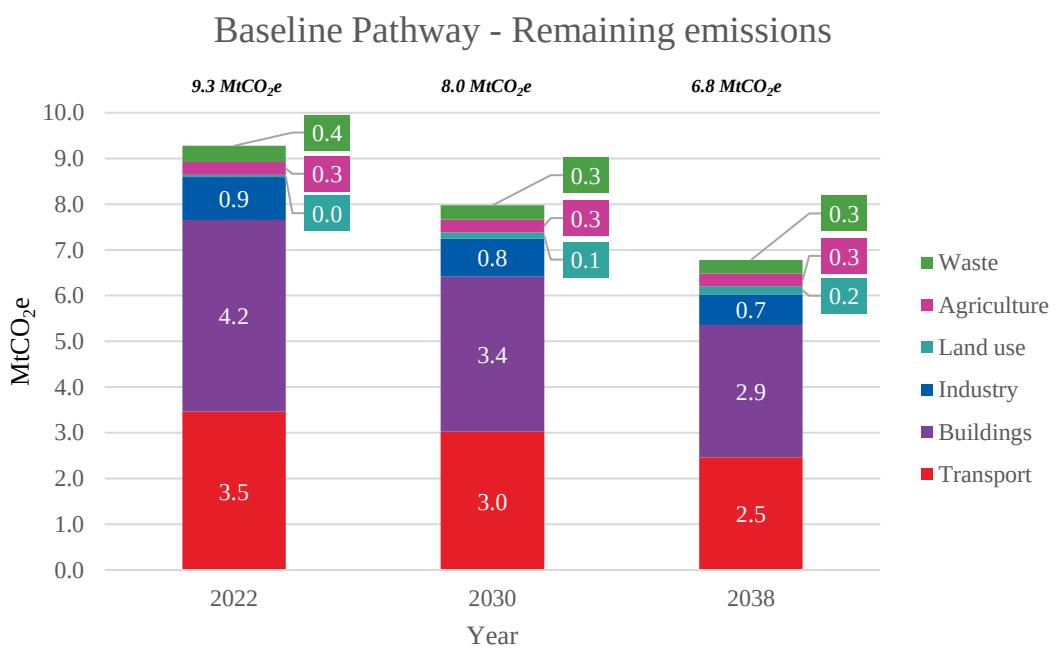
The updated maximum ambition pathway demonstrates how measures taken by all sectors can deliver significant progress towards net zero across the region

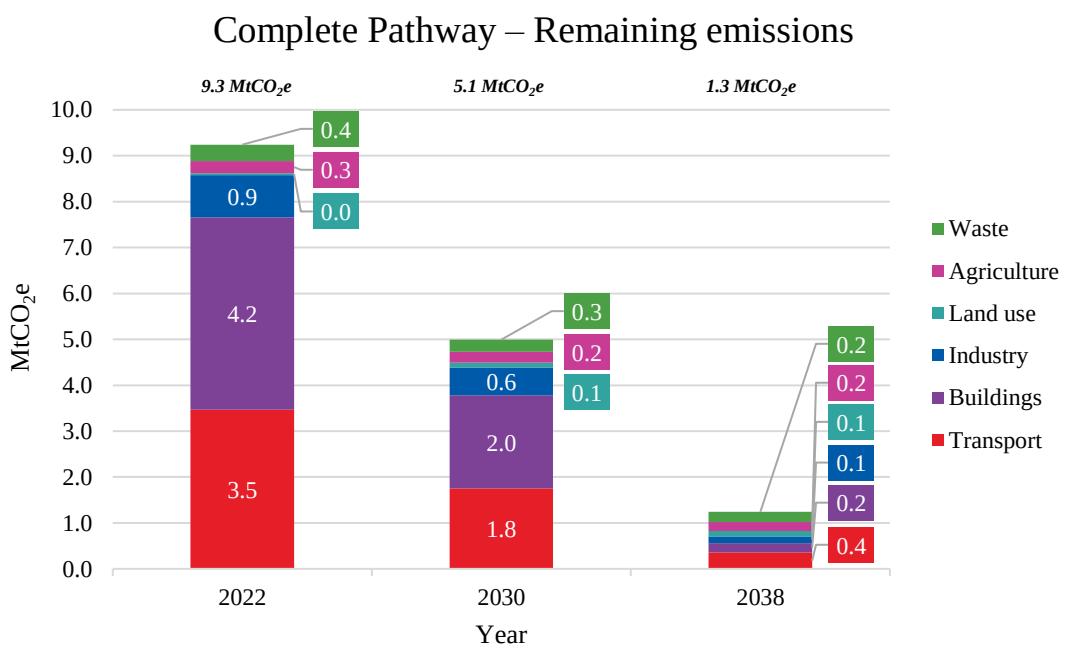


The graph shows the region's emissions projection for the maximum ambition pathway compared against the baseline pathway.

The region's emissions reduce by 37% by 2030 and 81% by 2038 (compared with the baseline pathway) with 1.3 $MtCO_2e/yr$ remaining in 2038. All sectors, except land-use, deliver significant emission reduction if wide ranging incentives and regulations are in place and investment is made across all sectors. Section 4 of this report provides detail on sector pathways.

By following a highly ambitious pathway a significant additional reduction of 8.0 $MtCO_2e$ emissions is achieved by 2038





By following a maximum ambition pathway the forecast in emissions is significant with a reduction of 37% by 2030 and 81% by 2038 compared to the baseline pathway.

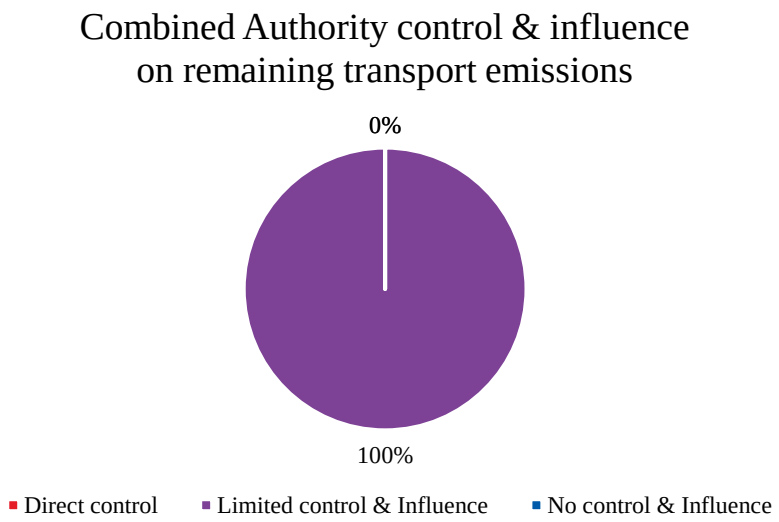
There is 1.3 $MtCO_2e$[1] of emissions remaining by 2038. This means net zero by 2038 is not achieved by following the maximum ambition pathway but it should be recognised that the pathway is highly ambitious and, on the limits of what is credible and feasible for the region. There are highly challenging barriers to be overcome, choices to be made and fundamental changes in the levers and controls available to the Combined Authority to reduce cross-sector emissions if the aim of the Combined Authority is to reduce emissions even further.

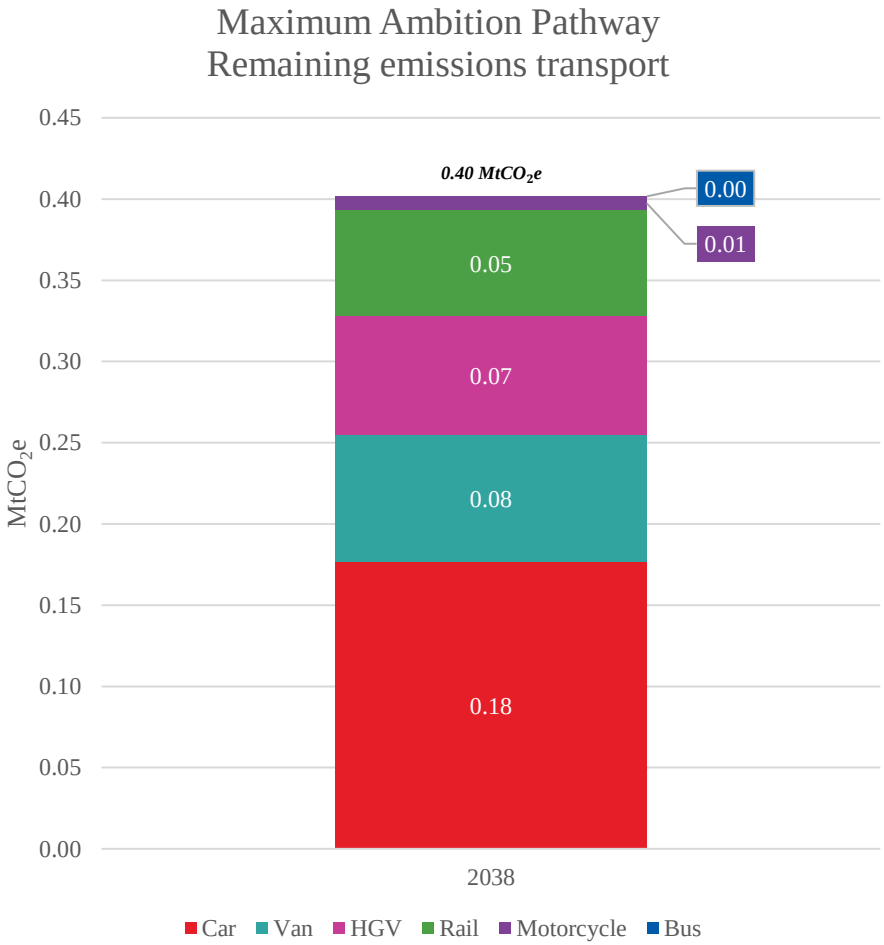
1 Total excludes aviation emissions.

There are limited opportunities and challenging choices for the Combined and Local Authorities to further reduce remaining emissions in the transport sector

Remaining emissions (0.40 $MtCO_2e$) are dominated by the transport sector – which is a sector where the Combined Authorities has some control and influence to reduce these remaining emissions. In this case, it is the role of the Combined and Local Authorities to work with the National Government, business and citizens to further reduce emissions.

Sources of road transport emissions (cars and vans) is where the Combined Authority has some control and influence Going further with measures that affect the way the **local road network is used (demand management and road space reallocation)** by different modes and **support for the transition to zero emission technologies through scrappage of existing ICE vehicles** could be considered for policy implementation by the Combined Authority. Reducing rail emissions (particularly non-local rail) will require collaborative partnerships with regional and national organisations.



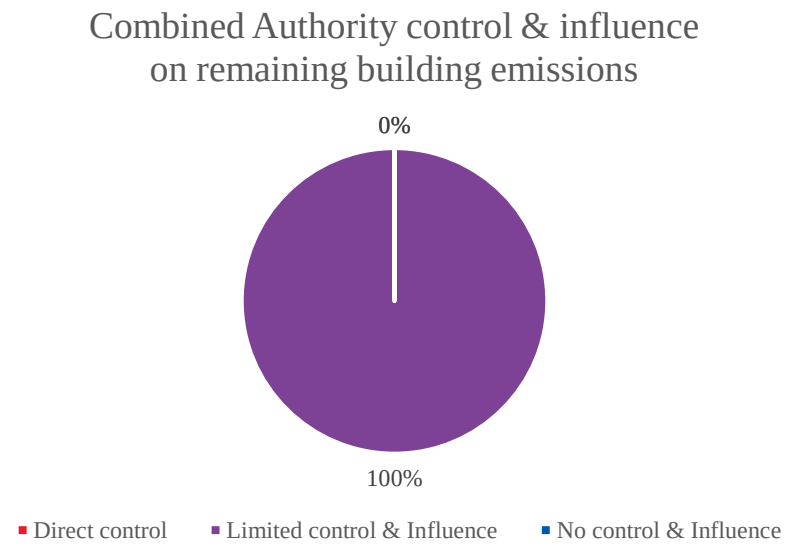


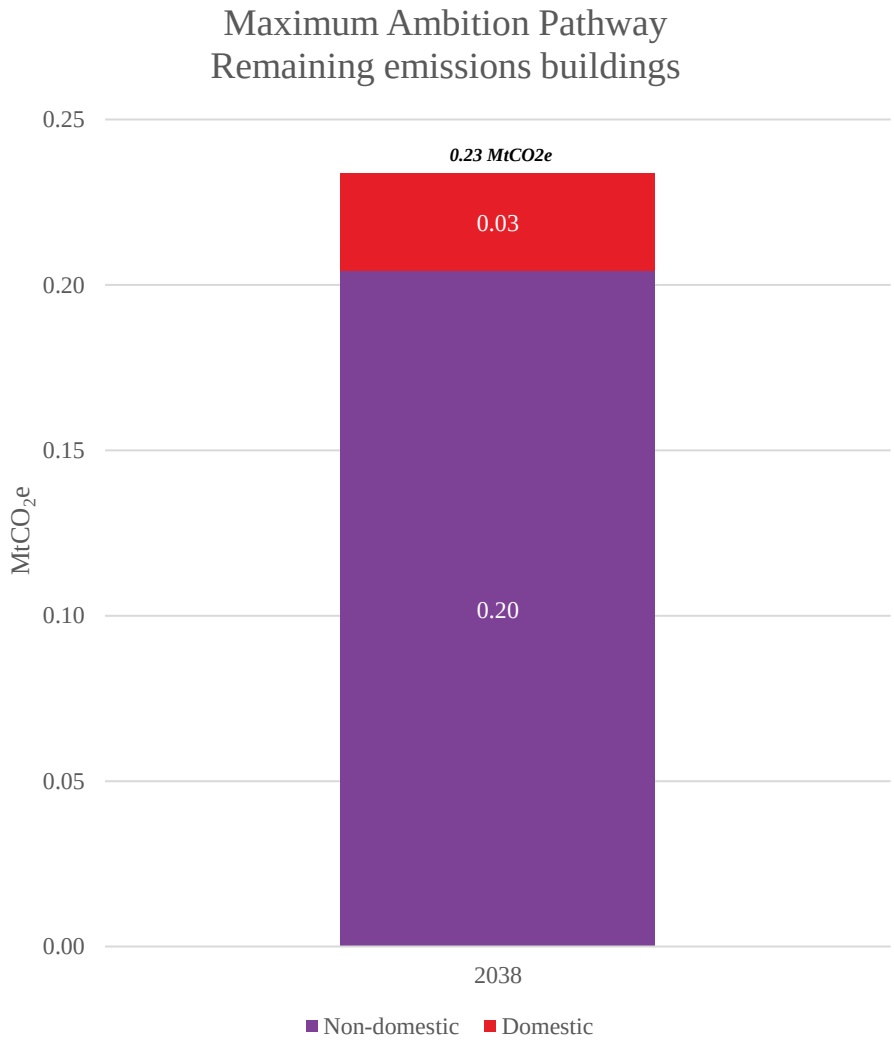
There are limited opportunities and influence for the Combined and Local Authorities to further reduce remaining emissions in the buildings sector

Non-domestic emissions is the largest source of remaining emissions with opportunities to influence emissions reductions in key sectors such as **health, education and public buildings** based on Combined Authority partnerships and influence over these sectors. Supporting the retrofit of existing public and private non-domestic buildings would require significant investment, recognising the limited powers the Authority has to set and enforce energy efficiency standards for this sector .

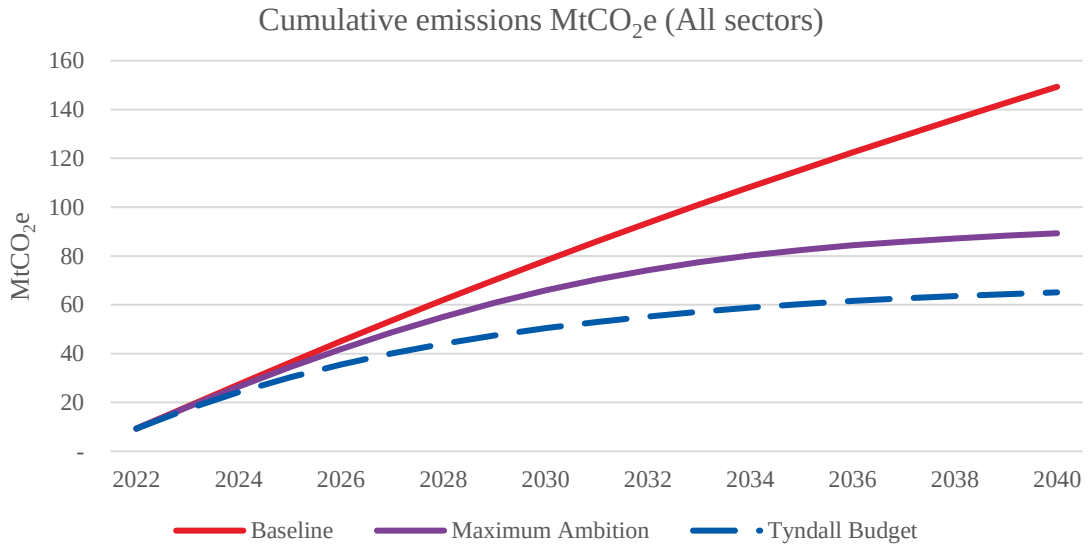
Domestic and non-domestic emissions could be reduced by supporting the roll out of retrofit programmes to private owned and private rented housing and business premises. An area for intervention which is challenging and requires significant investment to deliver emissions reductions

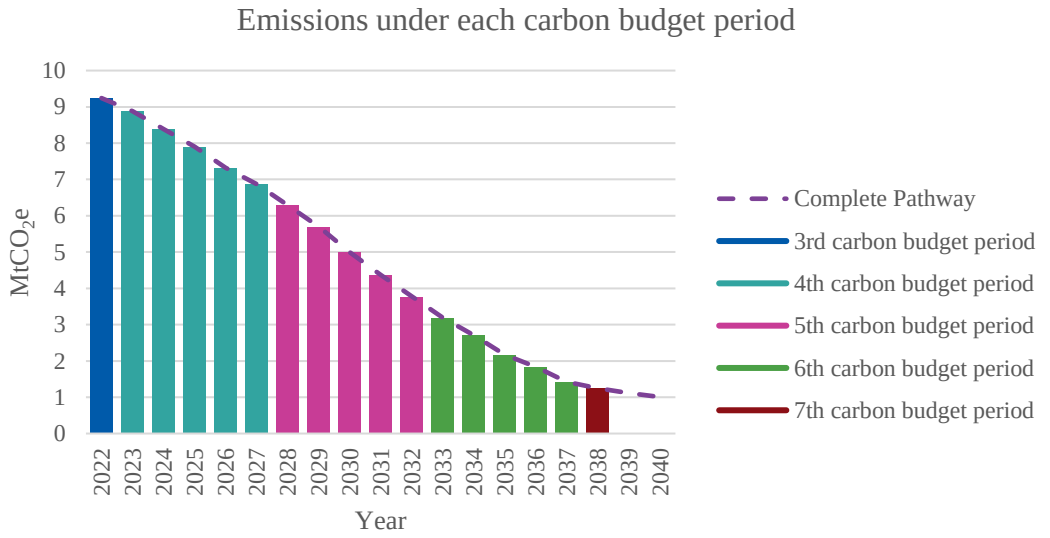
There is also some overlap with industry and power sector measures, as increasing distributed renewable electricity generation and facilitating carbon capture & storage will support the decarbonisation of non-domestic buildings.





Cumulative emissions begin to slow in the 2030s as climate action measures take effect. Setting carbon budgets for the region provides a cap on emissions emitted over five-year periods





The Combined Authority has committed to tackle the climate emergency, so the cumulative amount of emissions emitted within the region is a key guide for assessing action.

Cumulative emissions rise steeply for both the baseline and maximum ambition pathway during the 2020s, but positively flatten during the 2030s as measures slow the increase in emissions.

For all sector emissions, the region reaches 87 $MtCO_2e$ by 2038 for the maximum ambition pathway, 49 $MtCO_2e$ less than the Baseline Pathway. A Tyndall Centre proxy reduction of 13.3% year-on-year from the baseline means net cumulative carbon emissions reach 64 $MtCO_2e$ by 2038.

Possible carbon budgets determined by the maximum ambition pathway trajectory have been aligned with the UK carbon budget periods (see table) for illustrative and monitoring purposes. By setting budgets the Combined Authority can measure progress and allow all partners, businesses and individuals enough time to prepare.

UK Carbon Budget Periods	3rd Carbon Budget (2018-2022)	4th Carbon Budget (2023-2027)	5th Carbon Budget (2028-2032)	6th Carbon Budget (2033-2037)	7th Carbon Budget (2038-2042)
UK Budget $MtCO_2e$	2,544	1,950	1,725	965	Not set
Maximum Ambition Pathway Budget $MtCO_2e$	9 (2022 only)	40	25	12	3 (2038 – 2040)

The Combined and Local Authority partnerships in West Yorkshire are in the centre of delivering bold local climate action – improving people's lives and opportunities

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Combined and Local Authorities are directly responsible for between 2-5% of their local area's emissions from their buildings, operations and travel. Around 33% of emissions can be reduced through their influence on procurement, place-making, showcasing, partnerships, engagement and communication with communities (Local Authorities and the Sixth Carbon Budget, Climate Change Committee, 2020).

The chart shows the levels of control and influence – as determined by the Combined Authority – over the sources of emissions within West Yorkshire. The categorisation of emissions control and influence has been used to identify the Combined and Local Authorities' agency and ownership over reducing emissions. This includes the emissions remaining in the maximum ambition pathway by 2038.

Combined and Local Authorities advocate for and influence best practice in climate interventions through their services, planning and enforcement roles; across housing, regeneration, economic development activities, education and skills services and investments.

However, local levers, alone, are not sufficient to deliver net zero by 2038 target. There are gaps in key governance powers that prevent systems-scale or holistic approaches, policy and funding barriers, and a lack of capacity and skills caused by available funding (Local Authorities and the Sixth Carbon Budget, Climate Change Committee, 2020).

Key challenges and opportunities for West Yorkshire's transition to net zero

It is important that this updated evidence base acknowledges the various limitations and challenges faced by the Combined Authority and local authority partners to reduce emissions to net zero:

- National policy and investment are currently not aligned with local ambition, with the powers, levers and financial resources available for the Combined Authority and local authorities to act being severely limited in ways that constrain the net zero transition in the region.
- The scale of technology deployment is a major challenge for the current supply chain, as enablers of deployment like the availability of local skills and infrastructure readiness, for example the local electricity grid.
- To have all homes (currently heated by gas) in the region heated with a heat pump or decentralised heat networks is highly ambitious and requires further analysis and testing beyond the scope of this study (e.g. research in to housing quality, ability to carry out this intervention and a cost-benefit analysis)
- There is an implicit reliance on the decarbonisation of the national grid and UK energy generation to reduce emissions in all local sectors.
- The lack of cost parity of low and zero emission technologies and energy reduces the incentive and ability to transition away from higher emission alternatives.
- The challenge of informing and influencing consumer behaviours and choices to have a significant impact on emissions reduction in the region.

Acknowledging the challenges helps to inform the choices and climate actions needed. Net zero emissions is a critical goal for West Yorkshire, alongside other reasons to act on climate that bring forward socioeconomic and environmental co-benefits. By improving the public's awareness of the need and benefits of taking climate action, strengthens the mandate of the Mayor of West Yorkshire and local leaders to take forward a bold climate change agenda that can improve lives and opportunities.

Updated sector roadmaps and action plans provide refreshed evidence for future policy, planning and action

The thematic actions in the updated sector action plans have considered the merits and progress of CERP 1 actions and been mapped to modelled measures and outcomes in maximum ambition pathway (see slides 26-31). Each thematic action considers: timeframe, stakeholder roles, estimated cost & resourcing, co-benefits, risk & barriers, and interdependence with other actions. Mapping for synergies with other regional initiatives aims to maximise action impact.

The updated action plans are recommendations on the actions that can contribute to delivering modelled measures and outcomes for the maximum ambition pathway. The West Yorkshire Climate and Environment Plan will provide the policy position and commitments of the Combined Authority. Action Plans are prepared for all sectors and cross cutting areas: Cross Cutting (actions), Buildings, Energy, Industry, Land Use and Agriculture, Transport, and Waste.

While the proportion of actions under the Combined Authority's direct control and influence is the same as CERP 1, the focus applied to direct action means that the Combined Authority leads the implementation of a significant proportion of actions for potential emissions reduction. Where the Combined Authority is not taking the lead role in implementing a thematic action, other important roles of advocacy, convening and influencing of stakeholders have been identified and defined.

A summary roadmap for all sectors and key thematic action recommendations is presented in this section. Roadmaps for each sector is presented in the Roadmaps section, and the action plans for each sector is presented in the Action Plan section.

Summary of cross-sector and sector specific roadmaps with indicative timetables for implementation of the major thematic actions in the maximum ambition pathway alongside key decisions / milestones

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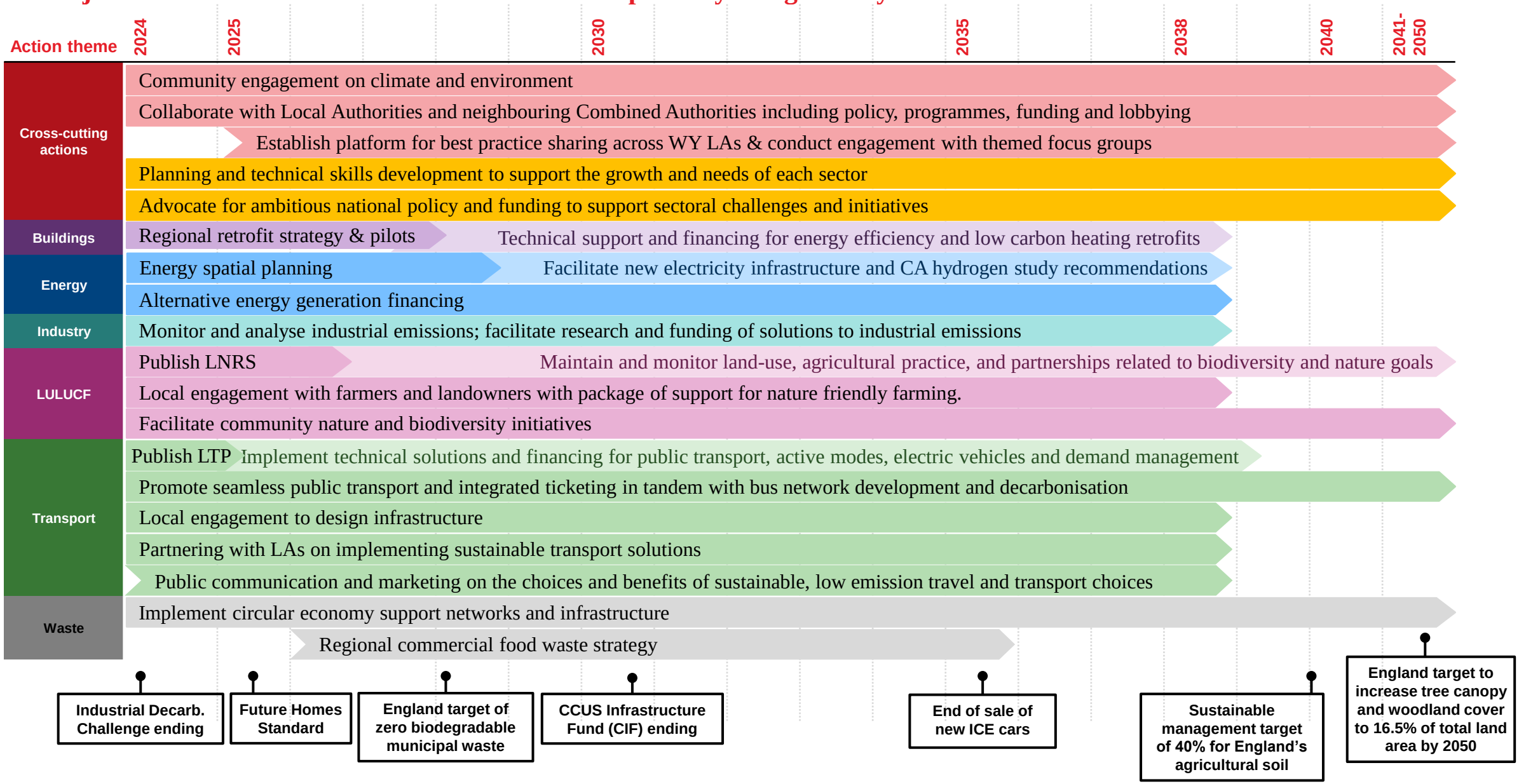

Key thematic action recommendations for each sector

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	Cross-cutting	Buildings	Energy	Industry	LULUCF	Transport	Waste
By 2030	Develop regional offsetting strategy C06	Publish regional retrofit strategy B01 Social housing and LA building retrofits B02, B03	Spatial masterplanning for energy generation and district heating E01, E04 Research skills gap to support energy decarbonisation E14	Technical support for heavy and small industry retrofits I03, I04 CCU feasibility study I08	Publish Local Nature Recovery Strategy (LNRS) and oversee land-use development and local agricultural practice L01, L02 Grow research and local market for sustainable agriculture innovation and products L07, L10	Publish Local Transport Plan (LTP) T01 Engage on and explore zero emissions zones, sustainable freight and EV charging T05, T06, T11 Protect and develop local bus networks T08	Implement home food waste collection & local composting W02 Facilitate LA sustainable materials procurement, catering and food waste management W05, W06
By 2038	Facilitate sustainable energy infrastructure across WY C05	Technical and finance support for energy efficiency and low carbon heating B04, B05	Implement infrastructure for electrification, district heating and hydrogen production E02, E03, E05 Facilitate and finance distributed renewables for Council assets and communities E06, E07, E08, E09	Monitoring and research on industrial emissions interventions I01, I02, I05 Financial support for SME energy and material efficiency solutions I06, I07 Facilitate & finance fuel-switch and Carbon Capture & Storage I09	Local engagement via environmental technical support packages L05 Provide financial support and facilitate green financing for sustainable farming and land-use solutions L06, L08	Implement cycling, EV charging and car-sharing infrastructure T02, T03, T04, T09 Financial assistance and education to encourage public transit T10, T17 LA engagement for sustainable vehicles and commuting T12, T13, T14	Publish regional commercial food waste strategy W04 Engage with SMEs on embedding circular economy practices W07
Long-term	Community engagement on impacts and solutions C01, C04 Collaborate with Local Authorities (LAs) and share best practices C02, C03	Development of local building retrofit skills B06 National government advocacy for housing energy efficiency B07	Development of local energy sector skills E13 National government advocacy, investor engagement and public education on clean energy generation and infrastructure E10, E11, E12	Development of local industrial decarbonisation skills I10 National government advocacy for systemic industrial actions I11	Facilitate community nature and biodiversity initiatives L04, L09 Development of local sustainable ecology and agriculture skills L12 National government advocacy for nature and biodiversity ambition L11	Promote seamless public transit networks T07 Development of local sustainable transport planning skills T18 National government advocacy for sustainable and equitable transport networks T15, T16	Implement community initiatives and public education on circular economy W01, W03 Engage with waste service providers on decarbonising their operations W08

Summary of how modelled outcomes for the buildings sector map to measures and thematic actions

ARUP

Sector	Modelled Outcomes	Measure	Thematic actions to deliver measure
Buildings	**Improved energy efficiency**	Retrofit existing public buildings	**B01** Regional retrofit strategy **B02** Social housing retrofits **B03** Facilitate LA building actions
		Retrofit existing private buildings	**B01** Regional retrofit strategy **B04** Finance low carbon solutions **B05** Technical support on energy efficiency and low carbon heating
		High standards for new buildings	**B01** Regional retrofit strategy
	Switch to low carbon heating	Mass deployment of heat pumps	**B01** Regional retrofit strategy **B02** Social housing retrofits **B04** Finance low carbon solutions **B05** Technical support on energy efficiency and low carbon heating
	Switch to district heating	Deploy district heating	**E01** Energy generation spatial planning **E04** District heating strategy **E05** Facilitating district heating implementation
	Smaller-scale low-carbon generation	Deploy rooftop solar PV	**E06** Alternative energy generation financing **E07** Sustainable energy solutions for Council assets **E08** Distributed renewables and energy storage solution packages **E09** Facilitate community-owned renewables **E10** Advocate for clean energy generation and infrastructure **E11** Engage with investors for sustainable energy infrastructure **E12** Public education on sustainable energy alternatives **E13** Sustainable energy skills development

Summary of how modelled outcomes for the energy sector map to measures and thematic actions

ARUP

Sector	Modelled Outcomes	Measure	Thematic actions to deliver measure
Energy	**Larger-scale low carbon generation**	Carbon Capture & Storage retrofits to large biomass and fossil plants	**I08** CCU feasibility study **I09** Facilitate & finance fuel-switch and Carbon Capture & Storage **E06** Alternative energy generation financing **E10** Advocate for clean energy generation and infrastructure **E11** Engage with investors for sustainable energy infrastructure **E13** Sustainable energy skills development
		Deployment of hydrogen generation	**E01** Energy generation spatial planning **E03** Implement hydrogen study options
		Decarbonisation of Energy from Waste	**E01** Energy generation spatial planning **E06** Alternative energy generation financing **E07** Sustainable energy solutions for Council assets
	Smaller-scale low-carbon generation	Solar PV and onshore wind deployment Limited expansion of anaerobic digestion and small bioenergy	**E06** Alternative energy generation financing **E07** Sustainable energy solutions for Council assets **E08** Distributed renewables and energy storage solution packages **E09** Facilitate community-owned renewables **E10** Advocate for clean energy generation and infrastructure **E11** Engage with investors for sustainable energy infrastructure **E12** Public education on sustainable energy alternatives **E13** Sustainable energy skills development
	Infrastructure	New power infrastructure and renewables	**E01** Energy generation spatial planning **E06** Alternative energy generation financing **E10** Advocate for clean energy generation and infrastructure **E11** Engage with investors for sustainable energy infrastructure **E13** Sustainable energy skills development

Summary of how modelled outcomes for the industry sector map to measures and thematic actions

ARUP

Sector	Modelled Outcomes	Measure	Thematic actions to deliver measure
Industry	**Increased efficiency**	Increased energy efficiency	**I01** Monitor and analyse industrial emissions **I02** Spatial planning governance for industrial sites **I03** Technical support for heavy industry **I04** Technical support for small industry **I05** Research and funding of solutions to industrial emissions **I06** Financial support for SME decarbonisation upskilling and implementation **I07** Finance SME energy & material efficiency projects **I10** Industrial decarbonisation skills development **I11** Advocate for national policy for systemic industrial action
		Increased material efficiency/circularity	**I05** Research and funding of solutions to industrial emissions **I06** Financial support for SME decarbonisation upskilling and implementation **I07** Finance SME energy & material efficiency projects **I10** Industrial decarbonisation skills development
	Decreased industrial carbon intensity	Increased electrification Fuel switch to hydrogen Fuel switch to bioenergy	**I01** Monitor and analyse industrial emissions **I03** Technical support for heavy industry **I04** Technical support for small industry **I06** Financial support for SME decarbonisation upskilling and implementation **I07** Finance SME energy & material efficiency projects **I10** Industrial decarbonisation skills development
		Install carbon dioxide capture	**I08** CCU feasibility study **I09** Facilitate & finance fuel-switch and Carbon Capture & Storage

Summary of how modelled outcomes for the LULUCF and Agriculture sector map to measures and thematic actions

ARUP

Sector	Modelled Outcomes	Measure	Thematic actions to deliver measure
LULUCF & Agriculture	**Negative emissions through carbon sequestration**	New forest planting Agroforestry	**L01** Local Nature Recovery Strategy **L02** Monitor land-use development **L04** Maintain and monitor partnerships related to biodiversity and nature goals **L06** Financial support for sustainable farming solutions **L08** Develop green financing for land-use solutions **L09** Facilitate community nature and biodiversity initiatives **L11** Advocate ambitious policy and funding to support nature and biodiversity **L12** Sustainable nature and agriculture skills development
		Peatland restoration	**L01** Local Nature Recovery Strategy **L03** Banning damaging agricultural practices
		Increase in biomass crops	**L02** Monitor land-use development **L04** Maintain and monitor partnerships related to biodiversity and nature goals **L08** Develop green financing for land-use solutions
	Increased land availability and reduced agricultural emissions	Reduced red meat and dairy consumption Food waste reduction	**W02** Home food waste collection & local composting **W04** Regional commercial food waste strategy **W06** Authority catering & food waste strategy **W07** Engagement with SMEs on circular economy practices **L07** Grow local market for sustainable agriculture products
		Increased stocking density Indoor horticulture Other agriculture practices	**L01** Local Nature Recovery Strategy **L02** Monitor land-use development **L07** Grow local market for sustainable agriculture products **L08** Develop green financing for land-use solutions **L10** Research in sustainable farming innovation **L11** Advocate ambitious policy and funding to support nature and biodiversity **L12** Sustainable nature and agriculture skills development
	Reduce emissions from agricultural machinery	Machinery fuel switching	**L05 F**armers and landowners environmental technical support package **L06** Financial support for sustainable farming solutions **L10** Research in sustainable farming innovation

Summary of how modelled outcomes for the transport sector map to measures and thematic actions

ARUP

Sector	Modelled Outcomes	Measure	Thematic actions to deliver measure
Transport (1/2)	**Decreased private car use**	Decreased travel demand by car	**T01** Publish Local Transport Plan (LTP) **T02** Implement demand management solutions **T12** Engage with LAs on implementing sustainable transport solutions **T14** LA sustainable employee travel **T15** Advocate for increased accessibility and engagement for sustainable and equitable transport networks **T18** Sustainable transport planning and technical skills development
		Increased public transport use	**T02** Implement demand management solutions **T07** Promote seamless public transport with integrated ticketing, travel information and customer support **T08** Protect and develop bus network **T10** Financial assistance for public transit **T15** Advocate for increased accessibility and engagement for sustainable and equitable transport networks **T16** Engagement and advocacy on rail productivity and decarbonisation **T17** Public education on the benefits of public transit & active mobility **T18** Sustainable transport planning and technical skills development
		Increased walking and cycling	**T02** Implement demand management solutions **T03** Making cycling accessible, comfortable and safe **T17** Public education on the benefits of public transit & active mobility **T18** Sustainable transport planning and technical skills development
		Increased shared car use	**T02** Implement demand management solutions **T04** Implement car-sharing schemes

Summary of how modelled outcomes for the transport sector map to measures and thematic actions

ARUP

Sector	Modelled Outcomes	Measure	Thematic actions to deliver measure
Transport (2/2)	**Decreased van and truck use**	Consolidation and shift to cycle freight Shift from road to rail	**T06** Feasibility studies and pilots for sustainable freight **T16** Engagement and advocacy on rail productivity and decarbonisation **T18** Sustainable transport planning and technical skills development
	Low emissions technology	Low and zero emissions cars Low and zero emissions buses Electrification of trains and/or lines	**T05** Implement regional electric vehicle charging infrastructure **T09** Decarbonise bus fleets **T11** Engage with local fleets and businesses on charging infrastructure **T13** LA fleet electrification **T15** Advocate for increased accessibility and engagement for sustainable and equitable transport networks **T16** Engagement and advocacy on rail productivity and decarbonisation

Section 3

Updated baseline pathway for West Yorkshire

Updating the baseline sector pathway

- This section provides an update to the baseline pathway for each of the following sectors: transport, buildings, industry, land use & agriculture and waste (waste is included at a very high level as was the case for CERP 1). Local power sector emissions and measures to reduce emissions have been modelled but these have not been included in the pathway
- The baseline pathway is explained for all sectors with some of the key assumptions, constraints and measures behind the pathway.
- A technical appendix is included to provide further details and assumptions including key modelling assumptions, rational and impacts on emissions.

The Baseline Pathway delivers a 27% reduction in emissions by 2038 with no further local climate action

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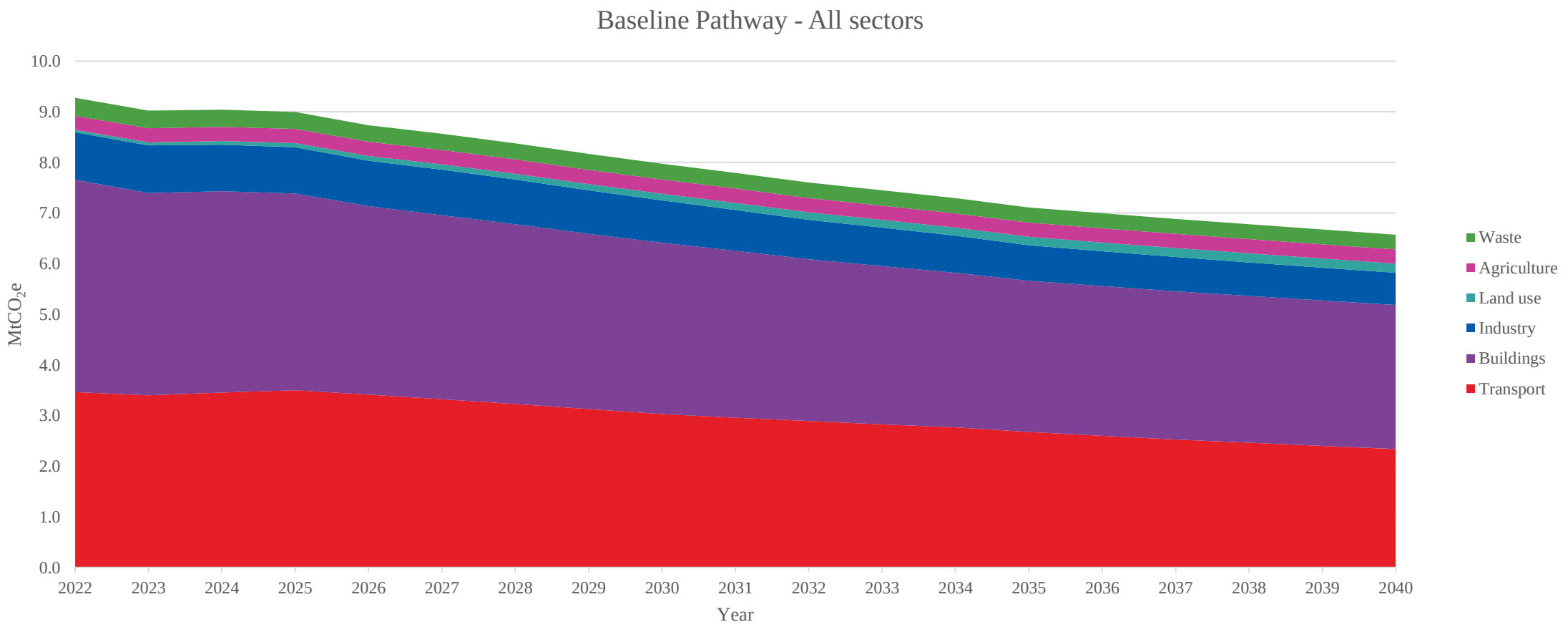
- This section provides an update to the baseline pathway for each of the following sectors: transport, buildings, industry, land use & agriculture and waste (waste is included at a very high level as was the case for CERP 1). Local power sector emissions and measures to reduce emissions have been modelled but these have not been included in the pathway
- The baseline pathway is explained for all sectors with some of the key assumptions, constraints and measures behind the pathway.
- A technical appendix is included to provide further details and assumptions including key modelling assumptions, rational and impacts on emissions.
- The buildings sector contributes the greatest to the reduction of emissions of 31% by 2038 (when compared to 2022) due to the increasing contribution of national renewable electricity meeting West Yorkshire's power requirements and energy efficiency improvements. Demand for heat is predominately met by fossil fuels (natural gas) and the decarbonisation of heat is slow due to high costs faced by the consumer and businesses. The lack of incentives and regulations and long-standing consumer behaviours present challenges to necessary action.
- The transport sector delivers emissions reductions of 28% by 2038 (when compared to 2022) due to the slow uptake of clean, low emission technology solutions, the use of private (internal combustion engine) vehicles for short and long-distance journeys, and the lack of incentives to shift journeys from these vehicles to public transport, walking and cycling.
- The industry sector achieves emission reductions of 29% by 2038 (when compared to 2022) due to efficiency improvements and a resulting reduction in energy and fossil fuel use.
- Land use and agriculture emissions increase by 282% (when compared to 2022) due to population, associated urban expansion and increases in agricultural output using existing production methods to meet demand for unchanged consumer diets. The current uses of land will have impacts on the region's priorities to restore nature, biodiversity and tackle flooding with nature-based solutions.
- The power sector is not shown in this graph or the following graphs, as the emissions from electricity is included within the sectors consuming electricity. This aligns with the current UK government Local Authority accounting of emissions.

The Baseline Pathway delivers a 27% reduction in emissions by 2038 with no further local climate action



- The graph shows the contribution of each sector to the region's emissions under a Baseline Pathway, which includes committed UK Government policy and plans (July 2024) but no local action by the Combined Authority and partners. This pathway is unlikely to be on track with the UK Government 2030 and 2050 net zero target based on the UK Climate Change Committee progress report (2024) to UK Government Parliament .
- In this scenario the region's emissions reduce by 14% by 2030 and 27% by 2038 (compared to 2022) with emission levels at 6.8 $MtCO_2e$/yr in 2038.
- No sector achieves net zero. The absence of national policy, investments and consumer behaviour contributing to the remaining significant emissions for the region.

The Baseline Pathway delivers a 27% reduction in emissions by 2038 with no further local climate action

What has been assumed for the pathway

- Possible likely outcome if no local policies and action are put in place to significantly reduce emissions.
- Clean technology reduces emissions in all sectors but mass roll out does not happen at the scale required to rapidly reduce emissions.
- The continued decarbonisation of the national electricity grid is a key enabling measure to reduce emissions.
- There is growth in demand for travel between 2022 and 2038 (27% increase in total million passenger kms). Private cars are used for the majority of passenger kms (82% in 2038), coupled with low levels of active travel and public transport use.
- Low and zero emissions vehicles (% of vehicle kms) increase out to 2038, with 16% of private car kms made by battery electric vehicles.
- Road transport emissions decrease due to improvements in ICE technologies and some shift to low emission vehicles , with rail emissions increasing due to increased passenger numbers / kms travelled and no technological change to affect emissions.
- There are 1.064 million existing homes and 153k new homes (vs 2022) by 2038 (9,000 per year, as per the West Yorkshire Housing Strategy).
- Most buildings connected to the gas network with the burning of fossil fuels for heat contributing the majority of emissions from buildings
- Higher proportion of old (pre -1919) homes which have lower energy efficiency performance, typically, and often more difficult and costly to retrofit.
- Only 5% of homes have an Energy Performance Certificate rating of A-B – a comparable level the majority of homes across the region need to achieve by 2038.
- Energy efficiency measures applied to buildings have been updated.
  - There is slow progress with decarbonising heat for buildings, with some low carbon heating technologies (3,963 domestic and 5,824 non-domestic heat pumps in 2023); and 5% of non-domestic buildings connected to heat networks (in 2038). Many changes to existing domestic buildings will not pass through the planning system (permitted development) so there is limited control over consumer choices and energy efficiency performance of private homes.
  - New buildings must meet higher building control standards for energy performance significantly reducing emissions compared with existing, older buildings.
  - Non-domestic solar PV building generation reaches 57 GWh/yr by 2038 and 99 GWh/yr for domestic by 2038. Solar PV at this generation level has a very small impact on reducing emissions.
  - Most of the local power emissions come from energy from waste and small fossil generators.
  - Industry emissions reduce by 29% by 2038 to 0.7 $MtCO_2e/yr$, supported by energy and resource efficiency, limited fuel switching, and national electricity grid decarbonisation.
  - Urban expansion to meet projected human population demands for housing and other infrastructure increases land use emissions.
  - Agriculture output serves increased population with no significant change in agricultural practices and consumer diets.
  - Incremental change in land use prioritised for nature restoration.
  - Further detail is provided in Appendix A - showing modelled outcomes & measures for the baseline.

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Section 4

Updated maximum ambition sector pathways for West Yorkshire

Updating sector pathways – key messages

- The maximum ambition pathway has been separated by sector, with an explanation of: the key outcomes, assumptions, constraints and measures behind each sector pathway, emission remaining in 2038 and the control and influence of the Combined Authority and local authority partners on reducing those emissions.
- The maximum ambition pathway requires highly ambitious and effective local and national leadership and policy, partnership collaborations and concerted effort with citizens, communities and businesses to support the mass roll out and adoption of clean technologies, and climate action behaviours (by individuals, communities and organisations) that effectively reduce emissions.
- The aim of the update was to assess the potential of reaching net zero by 2038, with the assumption that highly ambitious measures and actions should be applied to all sectors within scope. The maximum ambition pathway is highly ambitious and at the limits of what is credible, feasible and a likely future. The update to the modelling applies adjustments to the 'status quo' defined by the first pathway study – it does not attempt to optimise the region's future system energy system to maximise emissions reductions. Radical systemic change are out of scope of this update because they were excluded from CERP 1, with CERP 1 suggesting such change could offer further ways to reduce emissions.
- The current powers, levers, funding and investment available, coupled with the current limited controls and influence the Combined Authority and local authority partners have to significantly reduce emissions acts as constraint on achieving net zero by 2038. Local and Combined Authorities are directly responsible for between 2 – 5% of their local area's emissions from their buildings, operations and travel, and around 33% of local emissions they can reduce through influence (procurement, place shaping, showcasing, partnerships, engagement and communication with communities (Local Authorities and the Sixth Carbon Budget, Climate Change Committee, 2020).
- The UK's net zero target by 2050 is an enabler and constraint on achieving net zero by 2038, with the UK target driving commitments, investments and action across all sectors included in this update. The stakeholder engagement and analysis completed for this update highlights that no key sector organisation or body representing West Yorkshire businesses are aligned with the region's net zero by 2038 target. There is support for tackling climate change and working in partnership to do so, but that support is not driving investments and decisions that will accelerate emissions reductions aligned to the 2038 target.
- Remaining emissions (1.3 $MtCO_2e$) are dominated by the transport sector – which is a sector where the Combined Authority and its partners have some control and influence to reduce emissions. It is the role of local government to work with national Government, business and citizens to reduce remaining emissions across all sectors - it is not the sole responsibility of local government.
- The urban and densely populated nature of the region, with very high use of private vehicles and low levels of walking and cycling, coupled with old, energy inefficient and, some hard to decarbonise, housing means the transport and buildings sectors require significant intervention and, are the sectors where the Combined Authority has some opportunity, influence and control, with emerging policy and investment plans in place to act.
- The opportunity for removing the remaining carbon emission by restoring and enhancing nature is limited due to urban land use / expansion and the extent of land required for sequestration. However, the co-benefits of nature restoration and landscape scale intervention (where possible), the costs of carbon sequestration if started too late, and the critical importance of tackling the nature emergency to tackle the climate emergency means all nature-based solutions efforts and actions for should be pursued.

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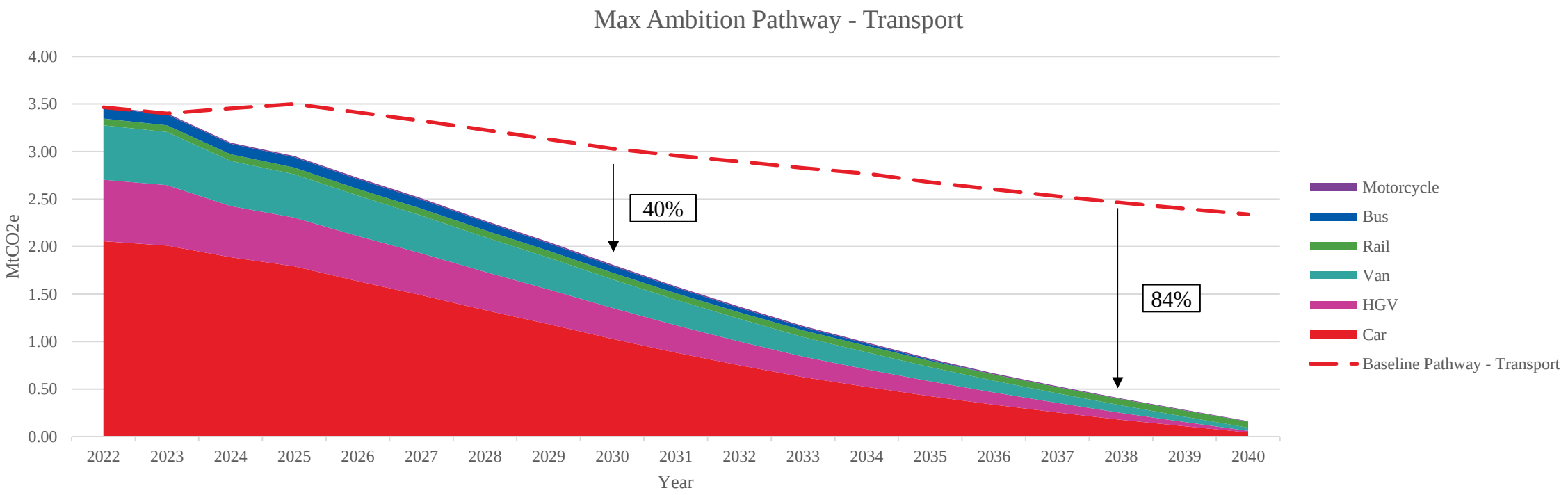
Section 4a

Transport – Maximum Ambition Pathway

Updated maximum ambition transport pathway

(mass uptake of electric vehicles, more journeys completed by active travel modes, and the switching of freight to sustainable modes are significant measures for making progress)



- The graph shows the region's emissions projection for a complete transport pathway compared against the baseline pathway.
- The region's emissions reduce by 40% by 2030 and 84% by 2038 (compared with the Baseline Pathway) with 0.39 $MtCO_2e/yr$ remaining in 2038.
- All parts of the transport sector, except rail deliver significant emission reduction with mass uptake of electric vehicles, active travel and switching of freight from high to low emissions modes.

Updated maximum ambition transport pathway

(mass uptake of electric vehicles, more journeys completed by active travel modes, and the switching of freight to sustainable modes are significant measures for making progress)

What has been assumed for the pathway: (further details and assumptions are provided in Technical Appendix A)

- Increasing mode share (person kilometres) for active travel and public transport (buses and trains).
- Transition to battery EVs for road transport (% vehicle kms) and significant rail electrification[1]
- Increasing demand for rail freight (tonnes kilometres).
- Rail infrastructure capacity may be met using current infrastructure on some lines, increases in infrastructure will be required.
- Significant rail electrification is assumed to mitigate emissions for passenger and freight activity. Reductions are dependent on the carbon intensity of the electricity grid.
- 2% reduction in demand (total passenger travel requirement - km) per year when compared to each baseline year.
- A national zero carbon electricity grid from 2033 based on the National Grid Holistic Transition Scenario[2]

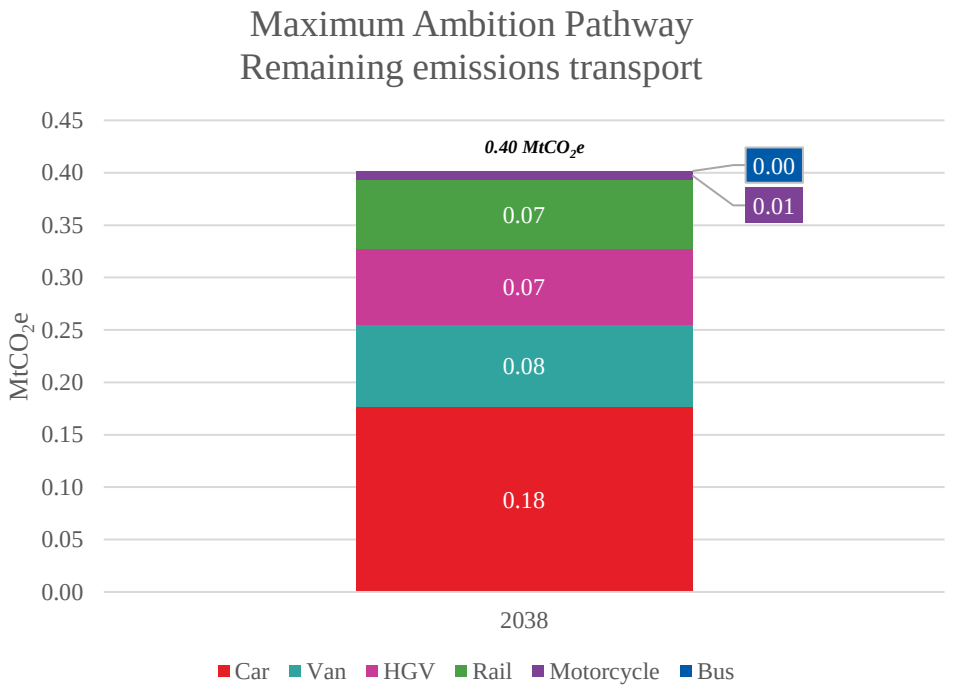
[1] See the Technical Appendix for further detail on powertrain assumptions
[2] See the Technical Appendix for further detail on grid decarbonisation factors

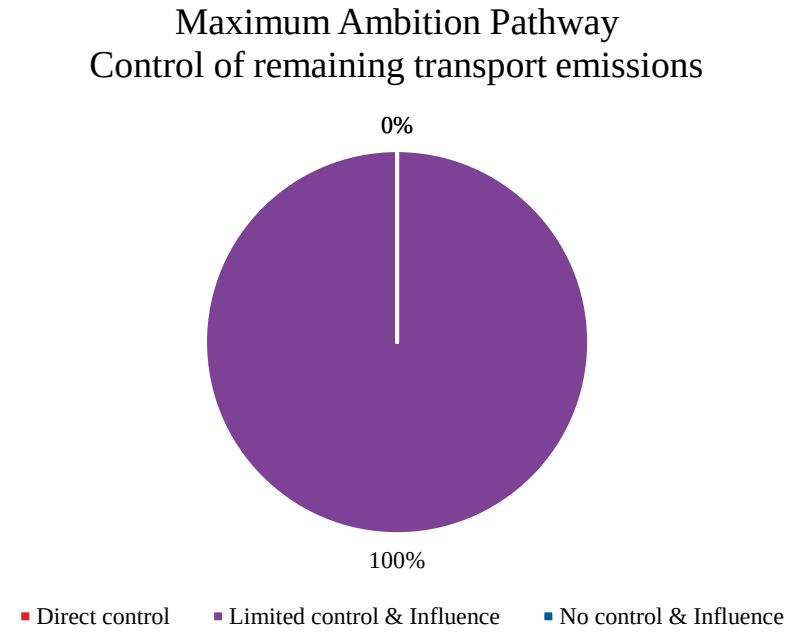
Transport – key messages

What outcomes have been modelled for the maximum ambition pathway to reduce transport emissions

- The maximum ambition pathway represents a highly ambitious rate of emissions reduction and is achieved through a combination of measures that include mass uptake of electric vehicles across private and public road transport (passenger and freight), more journeys made by public transport, walking and cycling relative to private road transport, a shift of freight from road to rail, and the further electrification of rail to reduce emissions.
- The measures applied deliver decreased emissions for all parts of the road transport sector, with rapid and highly ambitious transition to low and zero emission vehicles (passenger and freight), reduction in travel demand of 2% (passenger kms) against an increase in the baseline pathway, highly ambitious shift of passengers to low and zero emission modes (walking, cycling, bus and rail) and almost complete electrification of the rail network.
- The applied transition to zero emission vehicles is incredibly ambitious with 84% of private car kms made by battery electric cars and 100% of bus kms made by zero emission buses.
- These levels of zero emission vehicles result in high electricity demand (2.9 TWh/yr) by 2038, with the need for smart and appropriately deployed refuelling infrastructure.
- The mode share measures applied are also highly ambitious for the region, with 15% of passenger kms undertaken by train in 2038 (Baseline: 7%), 8% by bus (Baseline: 6%), 12% cycling (Baseline: 1%), 5% walking (Baseline: 5%), 5% car sharing (Baseline: 0%)and 54% by private car (Baseline: 81%). With such ambitious mode share measures applied to limited reduction in total passenger kms, travel by train and bus is high to enable longer journeys to be undertaken.
- Shifting people's passenger journeys to sustainable modes and freight to rail supports emissions reduction as the transition to zero emission vehicles takes place out to 2038. The transition to zero emission vehicles is constrained by the rate at which vehicles can be supplied to the West Yorkshire market and the turnover rate of fossil fuel to zero emission vehicles.
- Reducing the demand for passenger journey kms by ICE private vehicles and increasing the demand for clean low and zero emission public transport alternatives will require bold and sustained commitment to changing the way the road network is used. The population density of West Yorkshire must also be considered when the Local Transport Plan is determining the mix of low and zero emission transport options for public and private transport.
- Road freight emissions reduce through the ambitious uptake of low and zero emission vehicles, annual 10% reduction due to behaviour change, an additional 2% reduction due to consolidation and between 76% and 87% of road freight vehicles are zero emission by 2038.
- Rail emissions are reduced by almost total electrification of the network. Reductions are dependent on the carbon intensity of the electricity grid out to 2038, which is outside of local control.

The Combined Authority and local authority partners have opportunities to further reduce remaining emissions from transport





The Combined Authority and local authority partners have some opportunities to further reduce emissions from transport – where you have direct control over bus emissions and some influence over other road transport sources.

Remaining sources of road transport emissions (cars and vans) are where there is some control and influence, but limited options to reduce emissions further. Measure that affect the way the **local road network is used** by different types of vehicles and **support for the transition to zero emission technologies through scrappage of existing ICE vehicles** could be considered**.** These measures are highly sensitive, challenging, and require significant investment and a zero emission vehicle supply chain that can meet demand.

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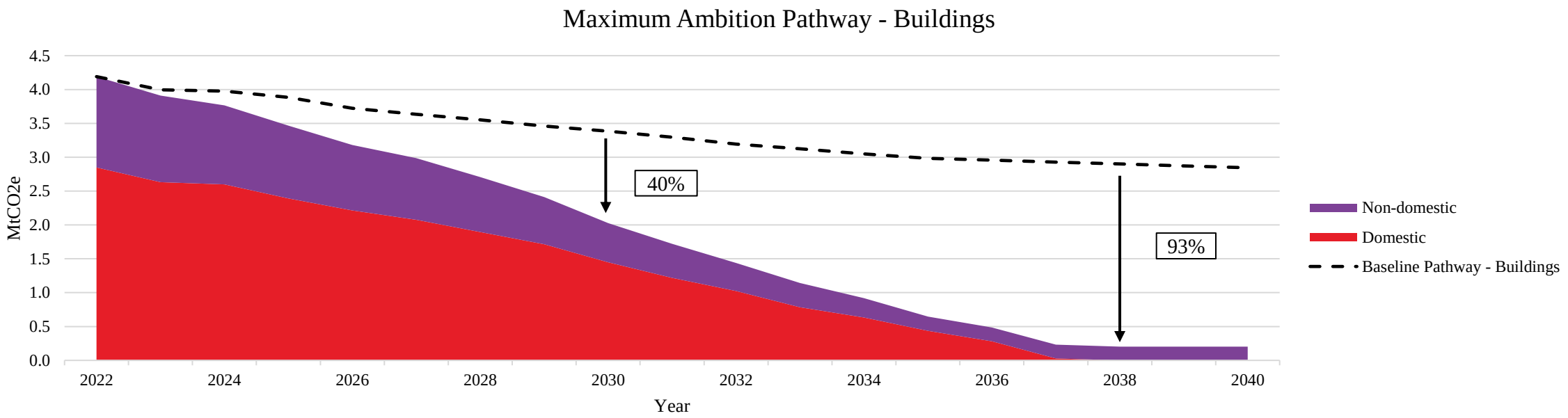
Section 4b

Buildings – Maximum Ambition Pathway

Updated maximum ambition buildings pathway with retrofit of buildings at scale

(mass roll out of heat pumps and heat networks, more rooftop solar PV)



- The graph shows the region's emissions projection for a complete buildings pathway compared against the baseline pathway.
- The region's emissions reduce by 40% by 2030 and 93% by 2038 (compared with the baseline pathway) with only 0.2 $MtCO_2e/yr$ remaining in 2038.
- All parts of the buildings sector deliver significant emission reductions, with existing and new buildings being energy efficient with low carbon heating and increasing local generation of power to meet power demands.

Updated maximum ambition buildings pathway with retrofit of buildings at scale

(mass roll out of heat pumps and heat networks, more rooftop solar PV)

What has been assumed for the pathway - (further details and assumptions are provided in the Technical Appendix A)

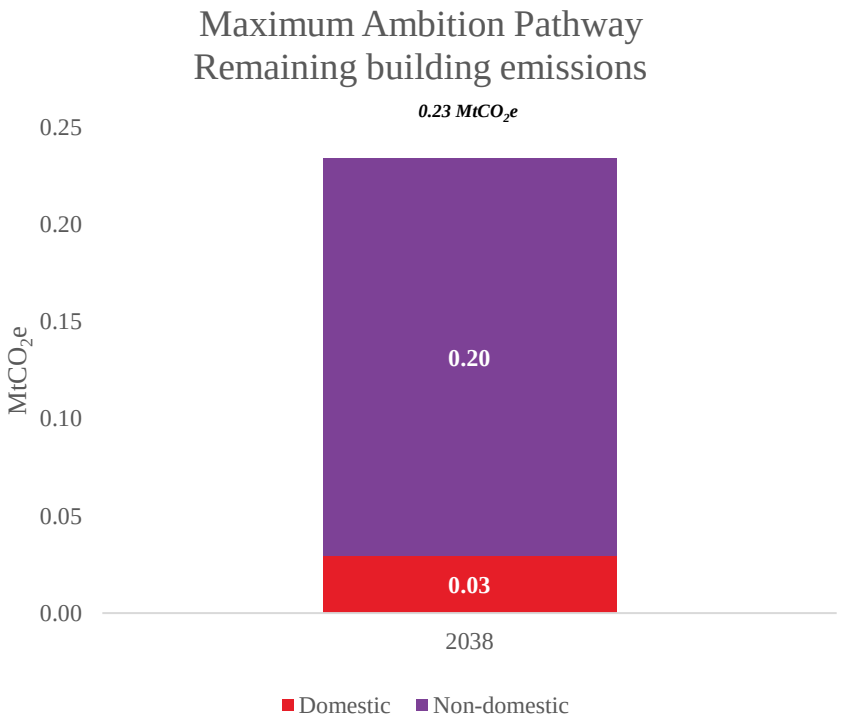
- Apply the fastest feasible and credible rate of emissions reduction.
- Improving the energy efficiency of existing and new buildings with high performance standards - achieved through wall, floor and roof insulation, high performance glazing and doors, lighting and appliances, draught proofing, air tightness and ventilation (see Technical Appendix for details on these standards) - to reduce energy demand and emissions. This modelling is completed at a high level due to the strategic nature of the update and does not look at the impact on emission of individual measures by housing typology and deployment projections).
- Mass roll out of heat pumps and heat networks to significantly reduce emissions from heating buildings.
- No homes heated by gas (natural or hydrogen) by 2038.
- Solar PV for domestic and non-domestic buildings to contribute to power demands including from the electrification of heat.
- Domestic heat pumps provide a 300% performance efficiency compared with a gas boiler offering a performance efficiency of 85%. This increases to 400% for a heat network utilising a heat pump.
- Building 9,000 new high energy performing homes across the region every year out to 2038.
- Rooftop solar PV on existing and new buildings, with solar PV coupled with battery storage offering significantly high levels of consumption of clean power generated.
- A national zero carbon electricity grid from 2033 based on the National Grid Holistic Transition Scenario

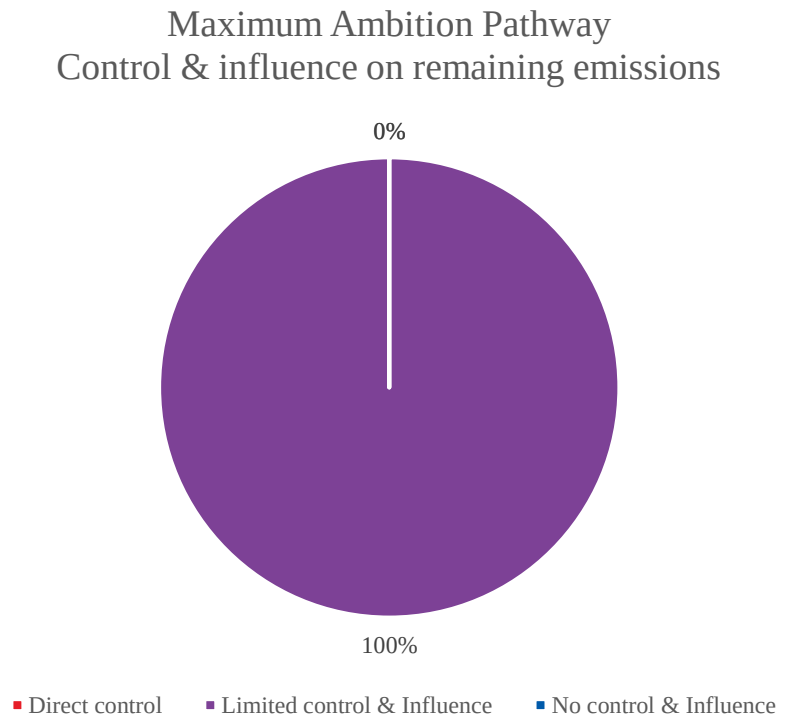
Buildings – key messages

What outcomes have been included for the maximum ambition pathway to reduce building emissions

- The maximum ambition pathway represents a highly ambitious rate of emissions reduction and is achieved through a combination of measures that include improving the efficiency and performance of existing and new buildings with energy efficiency measures (which include high levels of insulation, air tightness, ventilation and heat retaining windows and doors), heat pumps (909,359: domestic 838,478 and non-domestic 70,881) and heat networks (223,780 buildings connected) to slash emissions from heating buildings, with consumption of low emission local power generated from building scale renewables (rooftop solar PV) .
- The measures applied deliver decreased emissions for all parts of the domestic (owner occupied, private rented and social rented) and non-domestic (health, education, public, offices, retail, private, industrial, industrial) buildings sectors. With domestic emissions reduced to almost zero and non-domestic emissions reduced by 69% compared with the Baseline pathway.
- The highly significant and ambitious reduction in domestic emissions is driven by the total move away from gas (natural and/or hydrogen) for heating homes by 2038. This measure coupled with the retrofit of buildings at scale and the building of new homes to high standards of energy performance highlights the scale of ambition required to decarbonise domestic buildings across the region. This combination of measures is pushing the limit of credibility with high levels of optimism on how emissions could be reduced to almost net zero by 2038.
- Consumer acceptance of low carbon heating technologies, like heat pumps and heat networks, and achieving the energy efficiency standards required to support the mass roll out of these technologies are significant challenges that will affect the real-world impact of these measures.
- Non-domestic building emissions reduce significantly through a combination of measures but it is assumed that some buildings will still be using gas for heating in 2038 due to the complexity and heating demands of certain types of non-domestic buildings, for example some health, education and industrial buildings.
- Heat networks play a significant role in reducing emissions, with 22% of homes and 28% of non-domestic buildings connected to some type of network. This measure offers significant opportunity to reduce emissions as heat networks provide a lower carbon source of heat (and power) and will increasingly be a measure that local authorities have some control and influence over.
- The significant reduction of emissions is based on electricity network capacity being in place and ongoing investments in the local grid to meet the increasing demand for electricity. By 2038 a 10 TWh/yr electricity demand for buildings has been assumed compared with a demand of 6.7 TWh/yr in 2022 – a 33% increase in demand.
- The current Government policy to phase out gas boilers in homes by 2035 supports action at the local level and is a key enabler to the mass roll out of heat pumps that the maximum ambition pathway is based on. The policy also goes some way to address the lack of control and influence you have over the owner occupied and private rented sectors.
- Emissions reductions are highly dependent on the carbon intensity of the electricity grid, with the increasing electrification of heating. A national zero carbon electricity grid from 2033 has been applied to the pathway based on the National Grid Holistic Transition Scenario. If Government and National Grid deliver a zero carbon grid sooner than 2033, then emissions will reduce faster.

The CA and LA partners have opportunities to further reduce remaining emissions from buildings





The Combined Authority and local authority partners have limited opportunities to further reduce emissions from buildings. The majority of emissions remaining relate to non-domestic buildings and the fuels used for heating and power.

Offices, retail, private, and industrial buildings are the sources of greatest emissions (0.17 $MtCO_2e$) by 2038 - though the sectors contribution to the region's emissions is very small by 2038. Whilst there is limited control and influence to reduce/remove these remaining emissions, programmes to support these sectors to decarbonise could be considered as this will support the net zero target. **Net zero health, education and public buildings** could also be a goal and focus for action because of the greater levels of control, influence and partnerships in place to work together to reduce emissions for the sectors.

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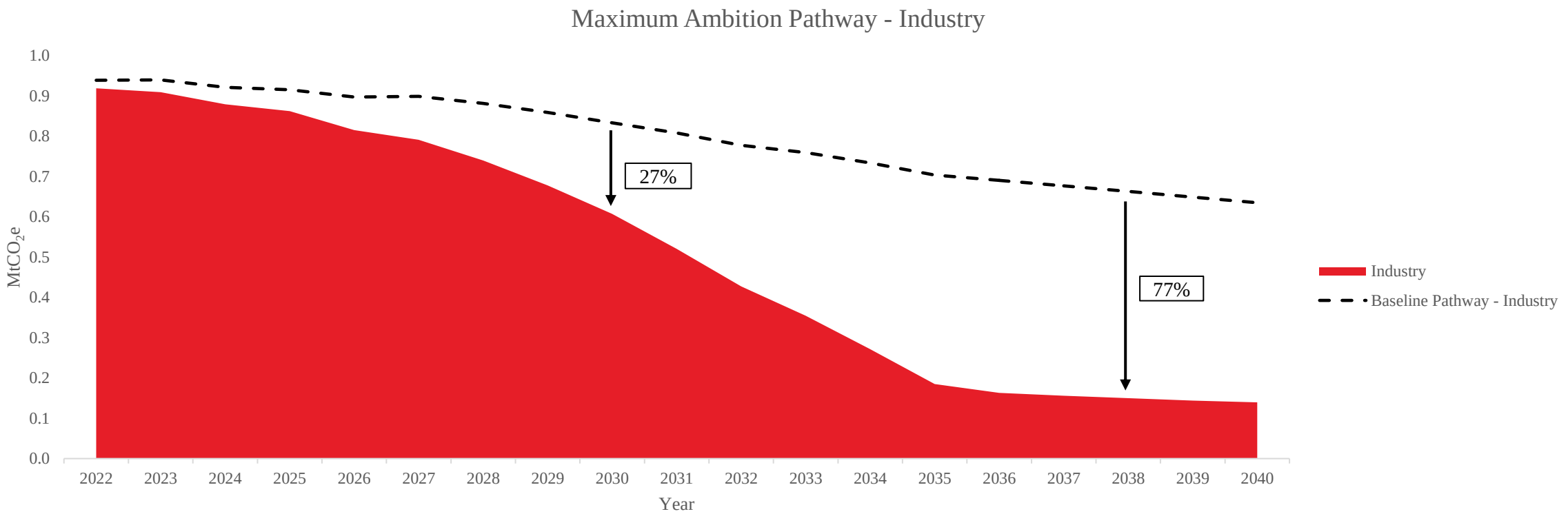
Section 4c

Industry – Maximum Ambition Pathway

Updated maximum ambition industry pathway with increasing efficiency of energy consumption and resources

(used and manufactured, switching to clean electricity and hydrogen, capture and storage of some emissions)



- The graph shows the region's emissions projection for a complete industry pathway compared against the baseline pathway.
- The region's emissions reduce by 27% by 2030 and 77% by 2038 (compared with the baseline pathway) with only 0.1 $MtCO_2e/yr$ remaining in 2038.
- All parts of the industry sector deliver significant emission reductions, with industry demand for energy decreasing, switching of energy demand from fossil fuels to clean electricity and hydrogen.

Updated maximum ambition industry pathway with increasing efficiency of energy consumption and resources

(used and manufactured, switching to clean electricity and hydrogen, capture and storage of some emissions)

What has been assumed for the maximum ambition pathway as part of this strategy review exercise - (further details and assumptions are provided in the technical appendix)

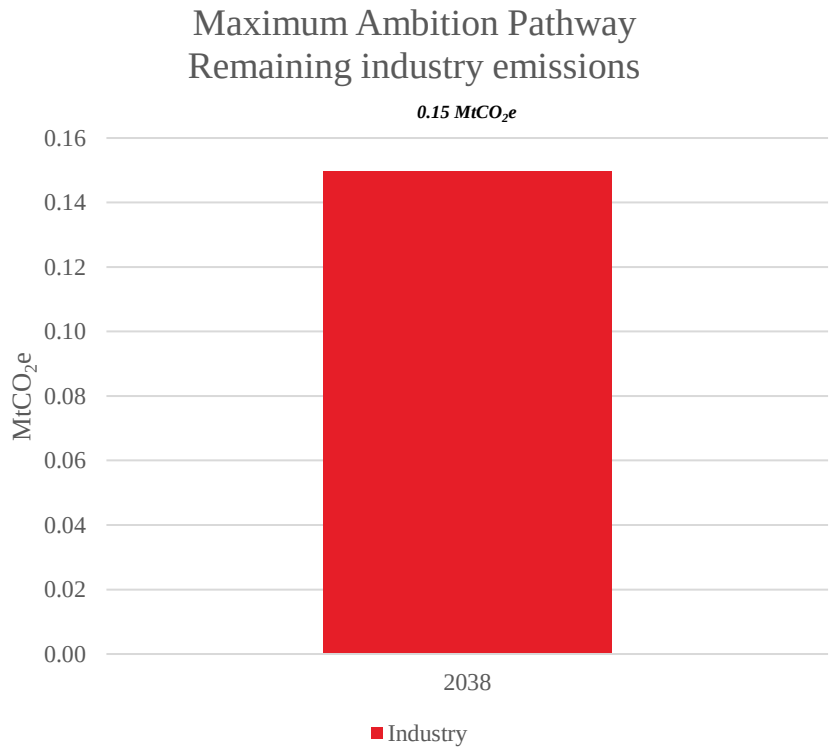
- Apply the fastest feasible and credible rate of emissions reduction.
- Industrial emissions in the region are small, at 0.9 $MtCO_2e/yr$, due to limited heavy industry.
- Energy intensive industries in the region are large glass and chemical plants, with some smaller food and drink and other minerals sites.
- By tackling the source of the majority of emissions (combustion of fossil fuels associated with heat generation) by switching to low carbon fuels, significant emissions reductions can be achieved.
- Reducing energy demand for industries.
- Increasing resource efficiency in the way products are manufactured and materials used for production
- Decreasing use of fossil fuels for power and heat.
- Increasing use of electricity to meet industrial energy needs, which reduces emissions because of decarbonisation of the power sector.
- Increasing role for hydrogen to meet current industrial applications using natural gas..
- Application of carbon capture & storage of emissions from natural gas, bioenergy and industrial processes (glass and chemicals)

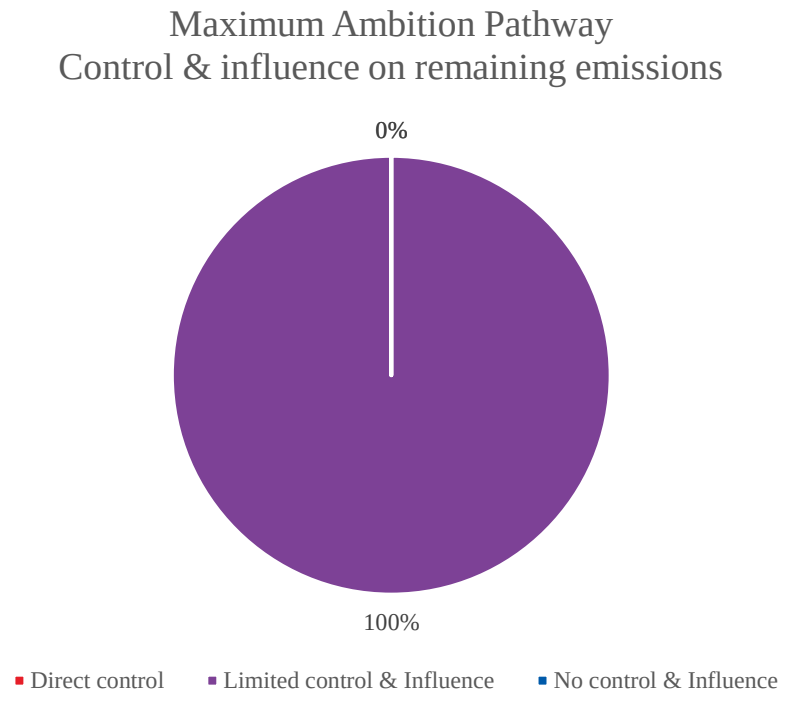
Industry – key messages

What outcomes have been included for the maximum ambition pathway to reduce industry emissions

- The maximum ambition pathway represents a highly ambitious rate of emissions reduction and is achieved through a combination of measures that include improving the energy and resource efficiency of industries, reducing use of fossil fuels and switching to lower emission electricity and hydrogen to meet energy needs, and application of carbon capture & storage of emissions from natural gas, bioenergy and industrial processes.
- Industry decarbonises slowly in the 2020s due to technology readiness (with limited equipment available), efficiency improvements and some electrification to reach 27% reduction in emissions by 2030.
- Energy efficiency and resource efficiency reach levels of 30% (food and drink) and 40% (glass process emissions) in energy consumption, leading to reduction in energy demand by 2038.
- Complete phase out of oil and coal by the 2030s, and almost complete phase out of natural gas for all sectors (except hard to switch uses in some small industry) by 2038.
- Electricity is used predominately by all industries in the 2030s, with increasing use of hydrogen in the glass, chemicals, food & drink and other minerals sectors.
- Electricity consumption more than doubles from 27% to 59%, even with efficiency improvements.
- Hydrogen supplies 20% of industrial energy by 2038 (1.1 TWh/yr), requiring significant generation and distribution infrastructure to developed.
- Bioenergy meets 25% of energy demand in the glass sector.
- Carbon capture and storage plays a limited role in reducing emissions, with large glass and chemical plants implementing the technology due to size and cost effectiveness.
- Glass and food & drink industry emissions reach zero by 2038 through a combination of measures: energy demand reduction, fuel switching and carbon dioxide capture.

The CA and LA partners have limited opportunities to further reduce remaining emissions from industry





The Combined Authority and local authority partners have very limited opportunities to further reduce emissions from industry.

Chemicals and small industry are the sources of greatest emissions (0.12 $MtCO_2e$) by 2038 - though the sectors contribution to the region's emissions is very small by 2038. Whilst the Combined Authority have very limited control and influence to reduce/remove these remaining emissions, research and demonstration programmes and projects that support technologies and processes that can further reduce emissions in these sectors could be considered as this will support the net zero target.

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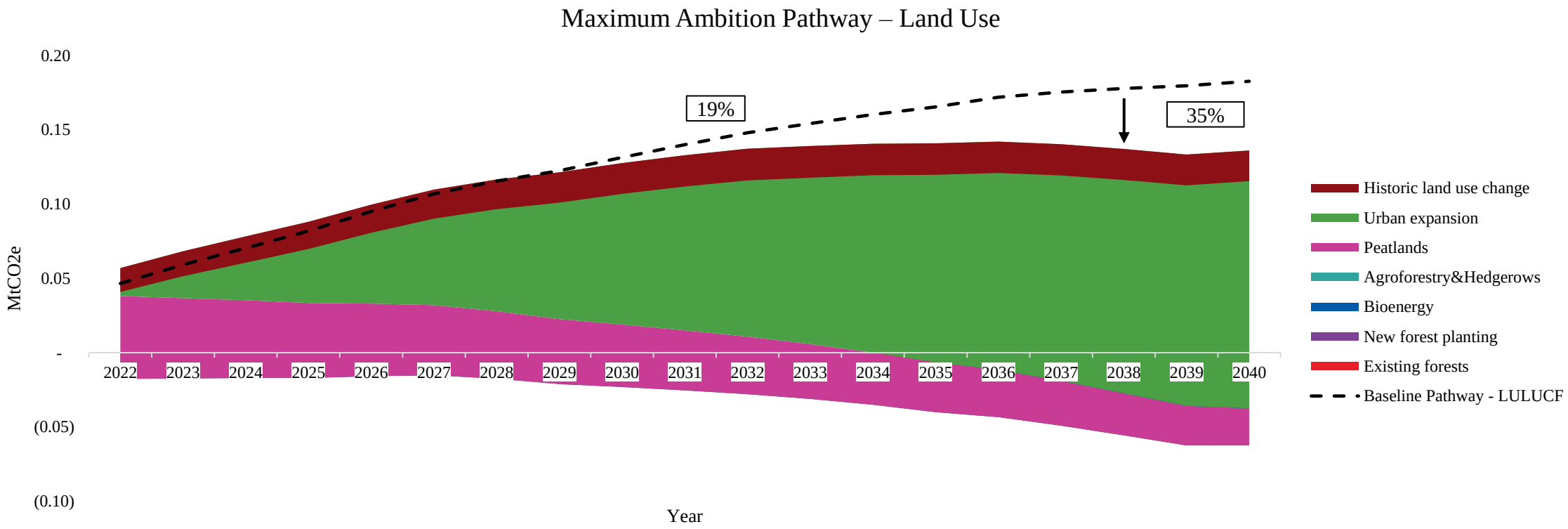
Section 4d

Land use & Agriculture – Maximum Ambition Pathway

Updated maximum ambition land use, land use change & forestry (LULUCF) and agriculture pathway with extensive new forest planting and peatland restoration, changes in some agricultural practices allowing for some farmland to be used for land uses, with changes in diet and food waste reducing emissions



- The graphs shows the region's emissions projection for a complete land use and agriculture pathway compared against the baseline pathway.
- The region's land use emissions reduce 19% by 2030 and 35% by 2038 (compared with the baseline pathway) with only 0.12 $MtCO_2e/yr$ remaining respectively in 2038.
- All parts of the land use and agricultural sectors deliver emission reductions, except urban land use which increases emissions by 800% due to urban expansion.

Updated maximum ambition land use, land use change & forestry (LULUCF) and agriculture pathway with extensive new forest planting and peatland restoration, changes in some agricultural practices allowing for some farmland to be used for land uses, with changes in diet and food waste reducing emissions

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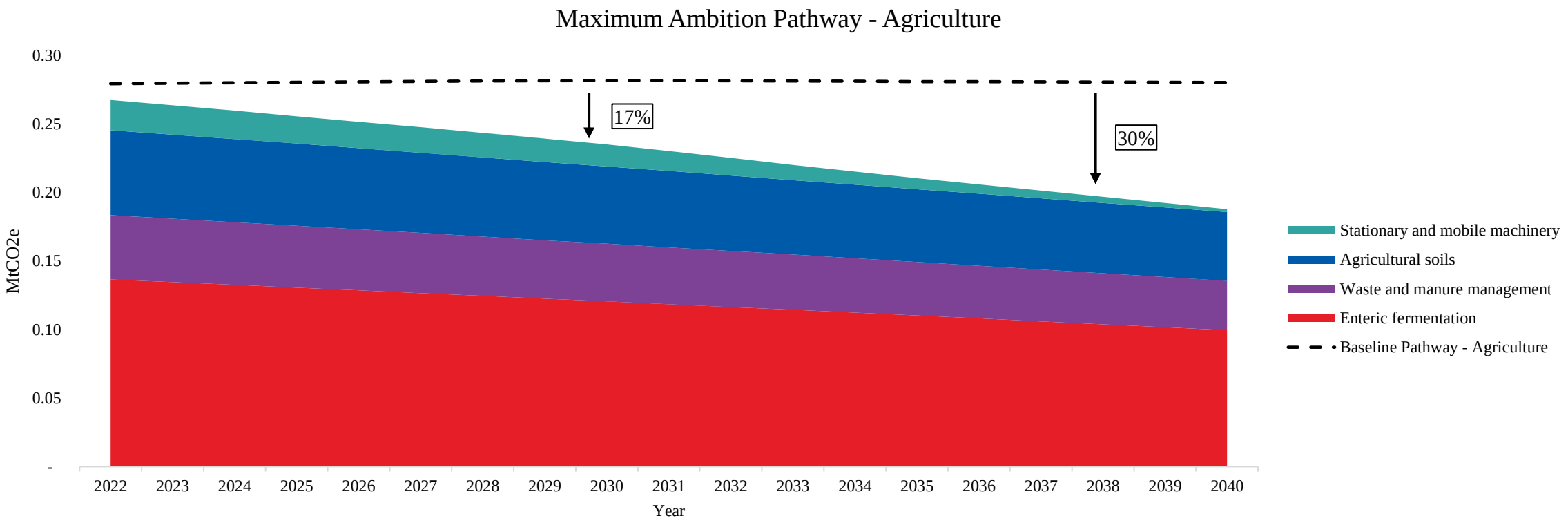

- The graphs shows the region's emissions projection for a complete land use and agriculture pathway compared against the baseline pathway.
- The region's agricultural emissions reduce 17% by 2030 and 30% by 2038 (compared with the baseline pathway) with only 0.2 $MtCO_2e/yr$ remaining respectively in 2038.
- All parts of the land use and agricultural sectors deliver emission reductions, except urban land use which increases emissions by 800% due to urban expansion.

Updated maximum ambition land use, land use change & forestry (LULUCF) and agriculture pathway with extensive new forest planting and peatland restoration, changes in some agricultural practices allowing for some farmland to be used for land uses, with changes in diet and food waste reducing emissions

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What has been assumed for the maximum ambition pathway (further details and assumptions are provided in the technical appendix)

- Apply the fastest feasible and credible rate of emissions reduction.
- Current LULUCF & Agriculture emissions in the region are very small, at 0.04 and 0.27 $MtCO_2e/yr$, due to urban characteristics of the region.
- Peatland emissions are the largest source of emissions at the start of the pathway due to the relatively high proportion of peat in the region.
- Ambitious new forest planting and peatland restoration reduces emissions – acknowledging the need for high quality, traceable and managed interventions.
- Urban expansion increases in line with projected human population for the region, with housing and other urban developments driving the increase in expansion.
- Very limited potential for land measures that can reduce emissions because of demand for land from increasing population and urban development to meet the demand.
- Majority of agricultural emissions (methane and nitrous oxide rather than CO_2) are from enteric fermentation and soils.

Land Use & Agriculture – key messages

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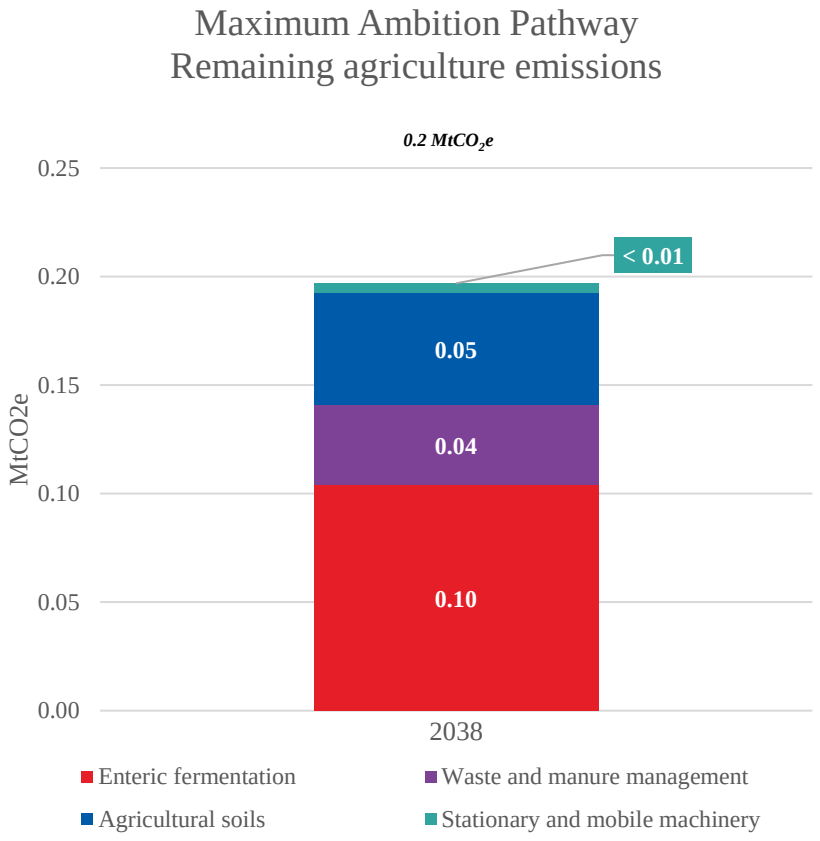
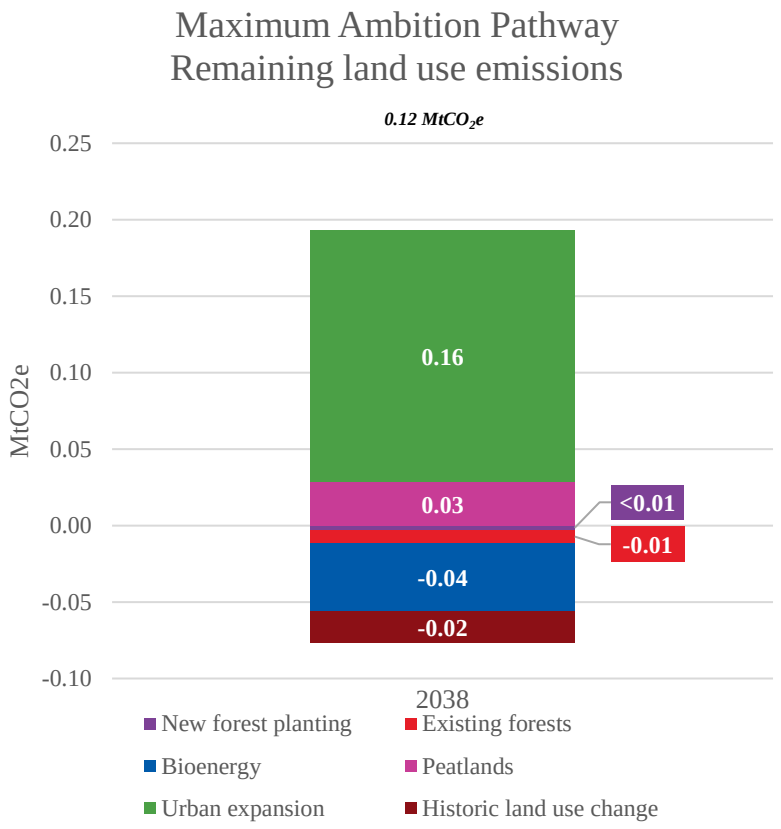
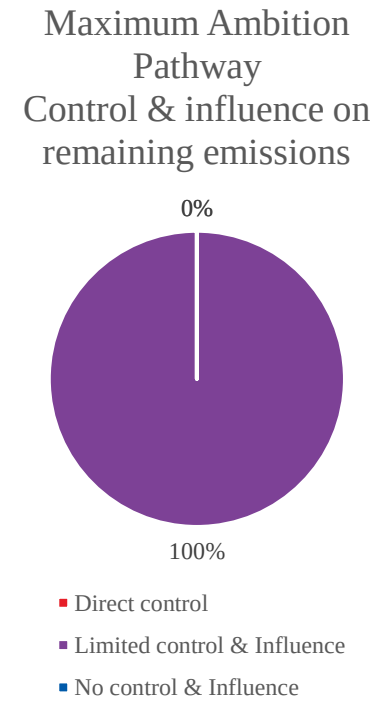
What outcomes have been included for the maximum ambition pathway to reduce emissions

- The maximum ambition pathway represents a highly ambitious rate of emissions reduction and is achieved through a combination of measures that include extensive forest planting and peatland restoration, changes in agricultural practices (such as increases in stocking density of 7% and improved crop yields), diet change and minimising food waste.
- Changes in agriculture (reduction in grassland, grazing land and cropland) supports emissions reductions in the land use sector by creating opportunities for more nature restoration - White Rose Roes Partnership's target is 2124 hectares of new woodland by 2038 - and generating bioenergy for other sectors.
- Restoring 100% of lowland peat and 60% of upland peat (Yorkshire Peat Partnership's target is 100% for all peat) across the region reduces emissions and slowly starts to sequester some emissions.
- Diet change (32% reduction in red meat and dairy consumption by 2038), food waste reduction (35% by 2028) and moving horticulture indoors reduces emissions from livestock and creates more land for land-based emissions reduction activities.
- Urban expansion and higher agricultural production to meet the demands from population increase means applying land-based emissions reduction measures to sequester carbon is very limited.
- Urban expansion increases emissions more than the measures applied to reduce emissions which include peatland restoration, bioenergy crops, diet change and food waste reduction.
- Timescales required to reduce agricultural emissions and the nature of some of the emissions (livestock itself) mean emissions are difficult to reduce.
- Emissions reduction for both sectors is achieved by 2038, but when land use and agriculture sector emissions are combined under the maximum ambition pathway, overall the sector makes no contribution to emissions reductions relative to current emissions.

The CA and LA partners have limited opportunities to further reduce remaining emissions from land use and agriculture







The Combined Authority and local authority partners have very limited opportunities to further reduce emissions from land use and agriculture.

Population increase and demand for urban development and agricultural output severely limits the application of land-based emissions reduction activities. Many measures cannot be applied due to land space constraints. Increasing urban density of urban development and looking to meet more of the regions agricultural production requirements from outside of the region to allow for more nature restoration in the region could help to address the challenges of reducing emissions in these sectors. How land is used and allocated for use requires difficult decisions to be made when trying to balance the need for urban development and infrastructure, land-based employment such as agriculture and measures that reduce emission such as nature restoration and new renewable generation (solar PV and onshore wind).

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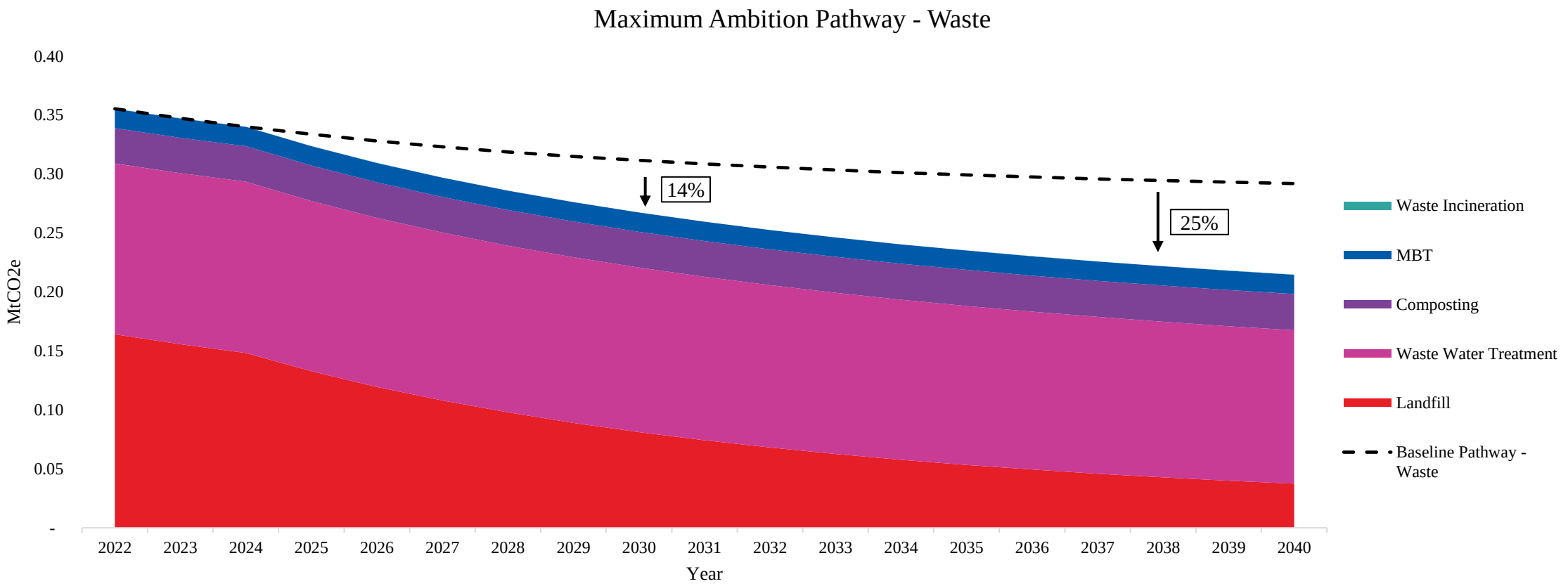
Section 4e

Waste – Maximum Ambition Pathway

Updated maximum ambition waste pathway (following CCC's net zero modelling) with reduction in emissions from landfill and wastewater treatment accounting for the reduction in emissions

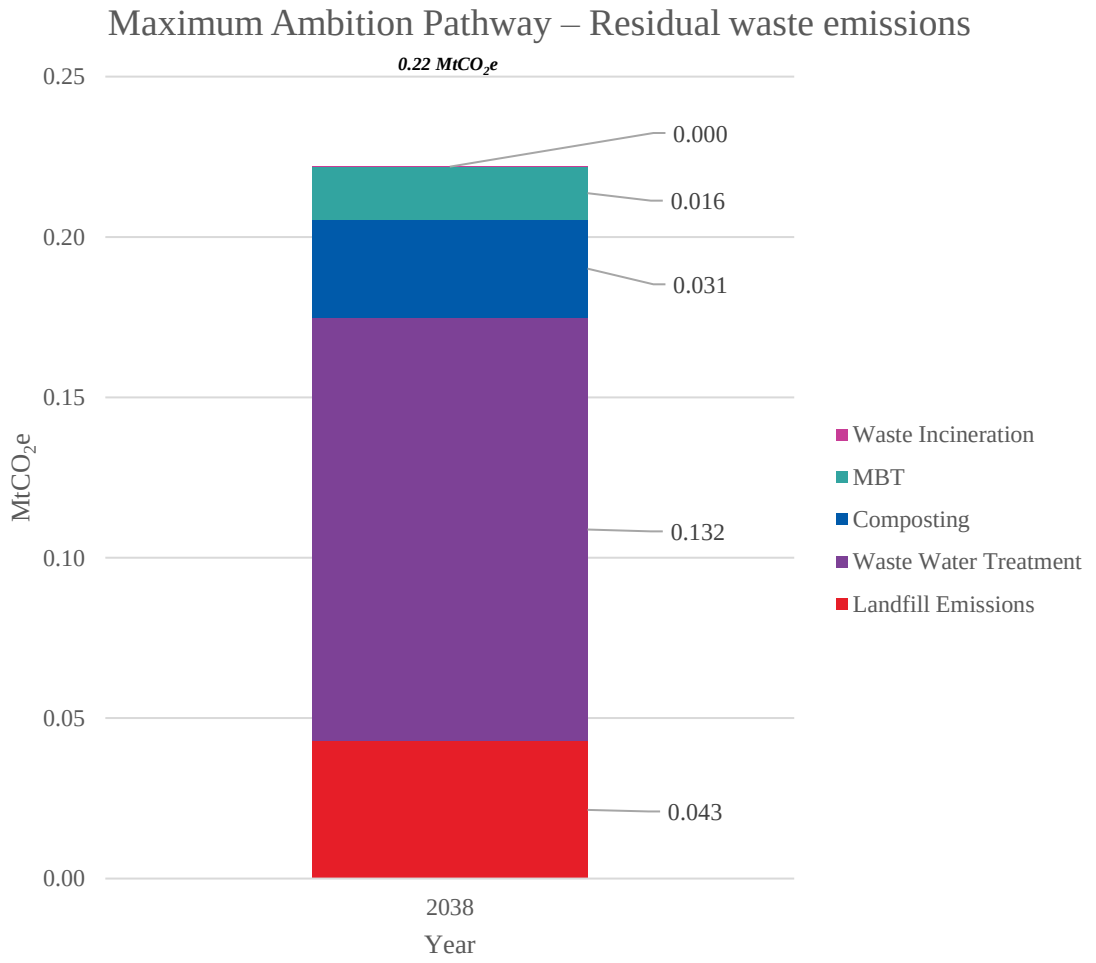


- The graphs shows the region's emissions projection for an updated complete waste pathway compared against the baseline pathway.
- The region's emissions reduce by 14% by 2030 and 25% by 2038, with 0.22 $MtCO_2e/yr$ remaining in 2038.

Maximum ambition pathway (following CCC's net zero modelling) with reduction in emissions from landfill and wastewater treatment accounting for the reduction in emissions

What has been assumed for the pathway as part of this strategic update - (further details and assumptions are provided in the technical appendix)

- Waste sector, out of scope for this update, is modelled at a very high level in order to have a comprehensive regional model.
- Updated current waste sector emissions and maximum pathway based on Climate Change Committee's (CCC) Net Zero Report (2019) and the Further Ambition Scenario within it (as was the assumption for CERP 1).
- Apply the fastest feasible and credible rate of emissions reduction.
- Composting, mechanical biological treatment (MBT) and waste incineration emissions stay almost constant as was the assumption applied for CERP 1.
- Wastewater treatment emissions reduce by 7% by 2038 with efficiency and process improvements.
- Landfill emissions account for the largest reduction in waste sector emissions, 75% by 2038, due to the assumption applied by CERP 1: England-level targets set by CCC's Further Ambition Scenarios, with 20% reduction in avoidable food waste, eliminating 5 key biodegradable waste streams sent to landfill and increasing recycling of municipal waste to 70% by 2025.



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Section 4f

Power – Maximum Ambition Pathway

Updated maximum ambition power pathway (following CCC's net zero modelling) with roll out of renewables, energy from waste with Carbon Capture & Storage and reducing small fossil capacity reduces emissions and increases clean generation

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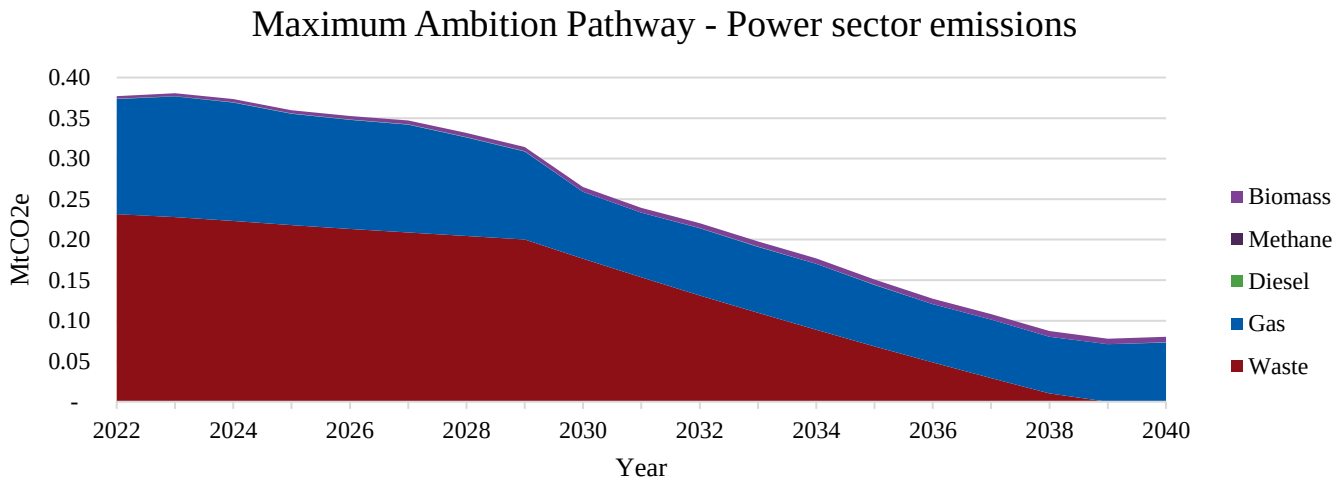
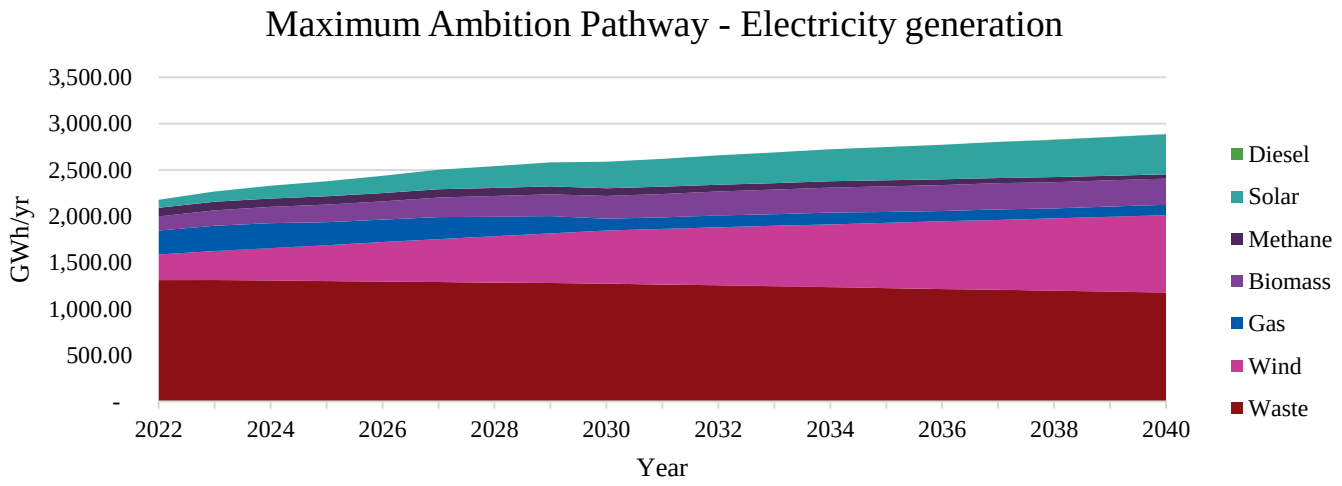




- The graphs shows the region's emissions projection for an updated maximum ambition power pathway.
- The region's emissions reduce by 76% by 2038, with 0.09 $MtCO_2e/yr$ remaining in 2038.
- Electricity generation increases by 2,685 Gwh/yr to reach a generation of 4863 Gwh/yr by 2038.
- The power sector based in the region, whilst not included in the emissions pathways, reduces emissions and increases generation of electricity needed for the electrification of all sectors.

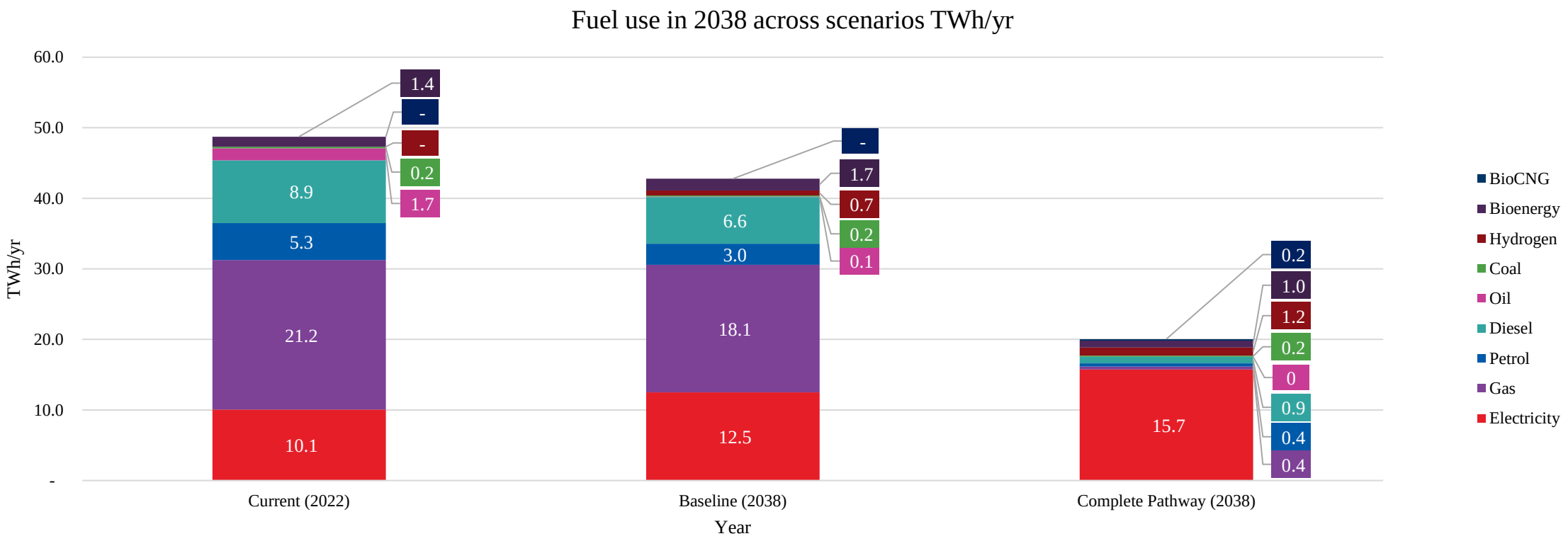
What has been assumed for the maximum ambition pathway

- Emissions in 2022 are from gas and energy from waste electricity generation.
- West Yorkshire is net importer of electricity to meet demand.
- Carbon capture and storage plays a role in reducing energy from waste generation emissions.
- Biomass also supports reduction in emissions.

What measures have been included for the maximum ambition pathway to reduce emissions

- Renewable generation (solar PV and onshore wind) increases significantly to 35% and 29% of the region's capacity by 2038.
- Carbon Capture & Storage is applied to energy from waste which reduces emissions by 0.1 $MtCO_2e$ by 2038. Recognised immaturity of technology.
- Bioenergy generation increases (using local sources) as small fossil fuel generation decreases reducing fossil fuel emissions 61% by 2038.

The maximum ambition pathway sees significant increase in the use of electricity for power, heating and transport, coupled with necessary cuts in gas, petrol and diesel use to reduce emissions by 2038



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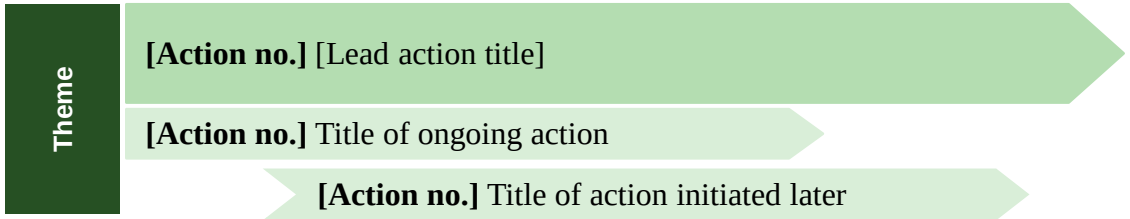
Section 5

Roadmaps

Implementation roadmaps

The implementation roadmaps set out the themed groups, sequence and completion years of each thematic action by sector. The layout is as follows:



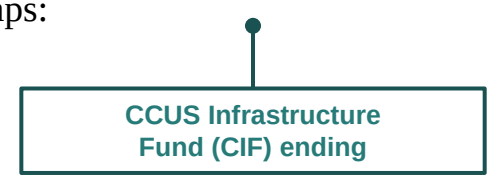
Each implementation roadmap has been designed iteratively between the emissions reduction measures modelled and the actions that support the delivery of the measures. This ensures that the actions are ambitious and focussed on emissions reduction.

The roadmaps have also been designed with consideration of:

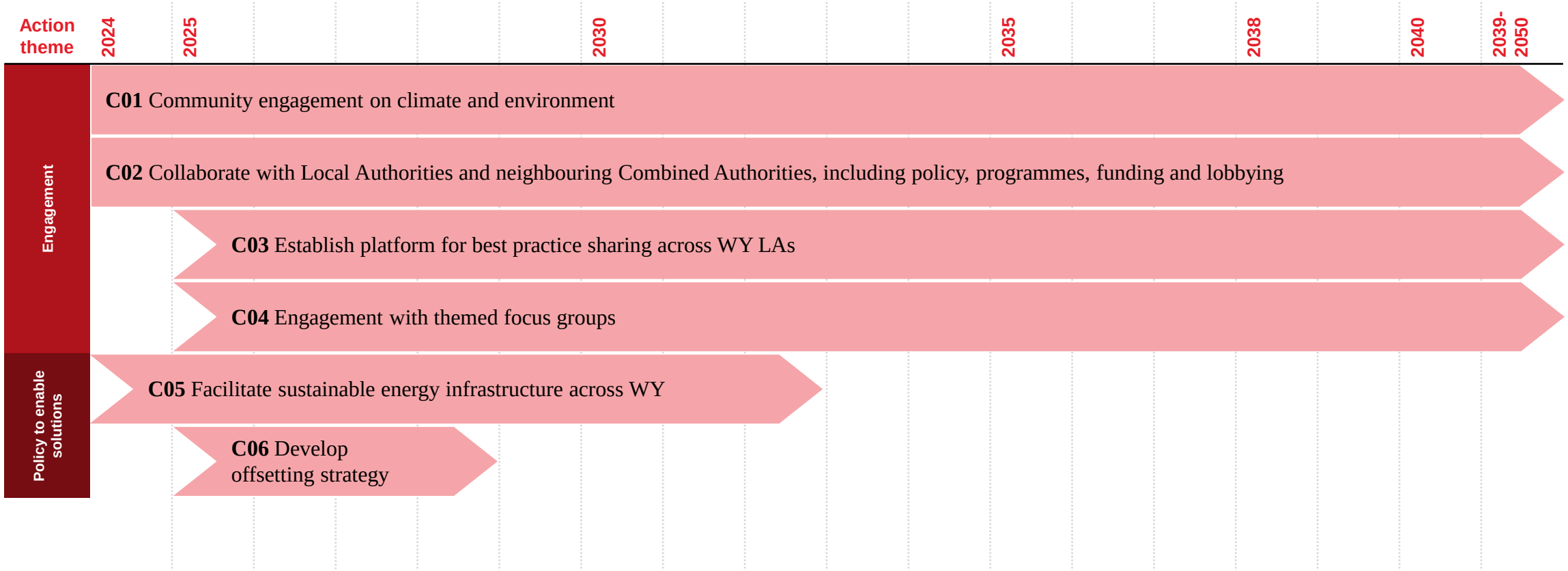
1. the identified co-benefits of climate action set out in the co-benefits value framework and,
2. feasibility by using the feasibility implementation framework to test the actions in the roadmaps.

The roadmaps are accompanied by indicators (as shown here) of modelled projections of measure outputs that an action in the roadmap will support:

Key Decisions / Milestones (as shown here) related to national policy and national Government funding that will support emissions reduction for that sector are also included for all roadmaps:



Cross Cutting Roadmap



Buildings Roadmap

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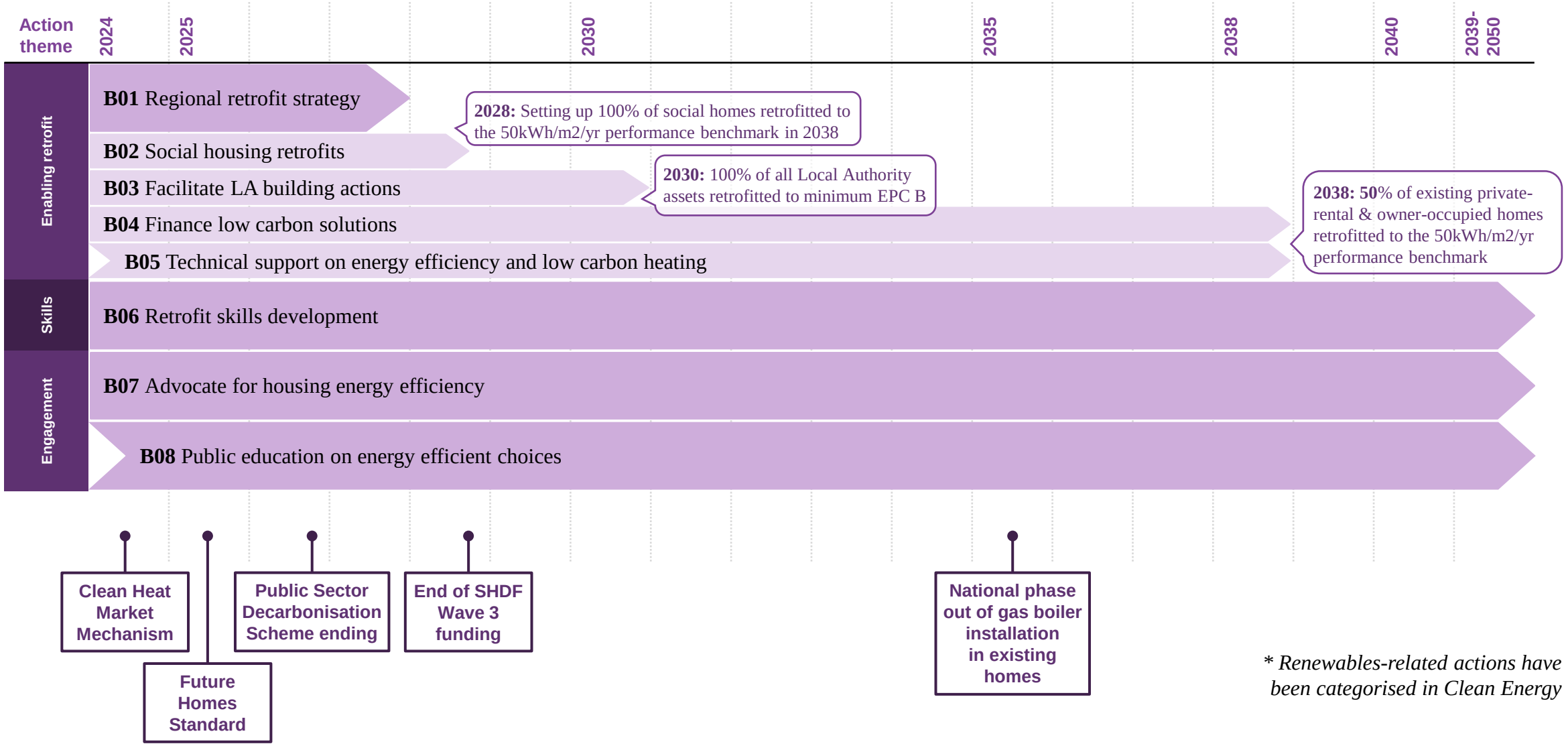

** Renewables-related actions have been categorised in Clean Energy*

Energy Roadmap

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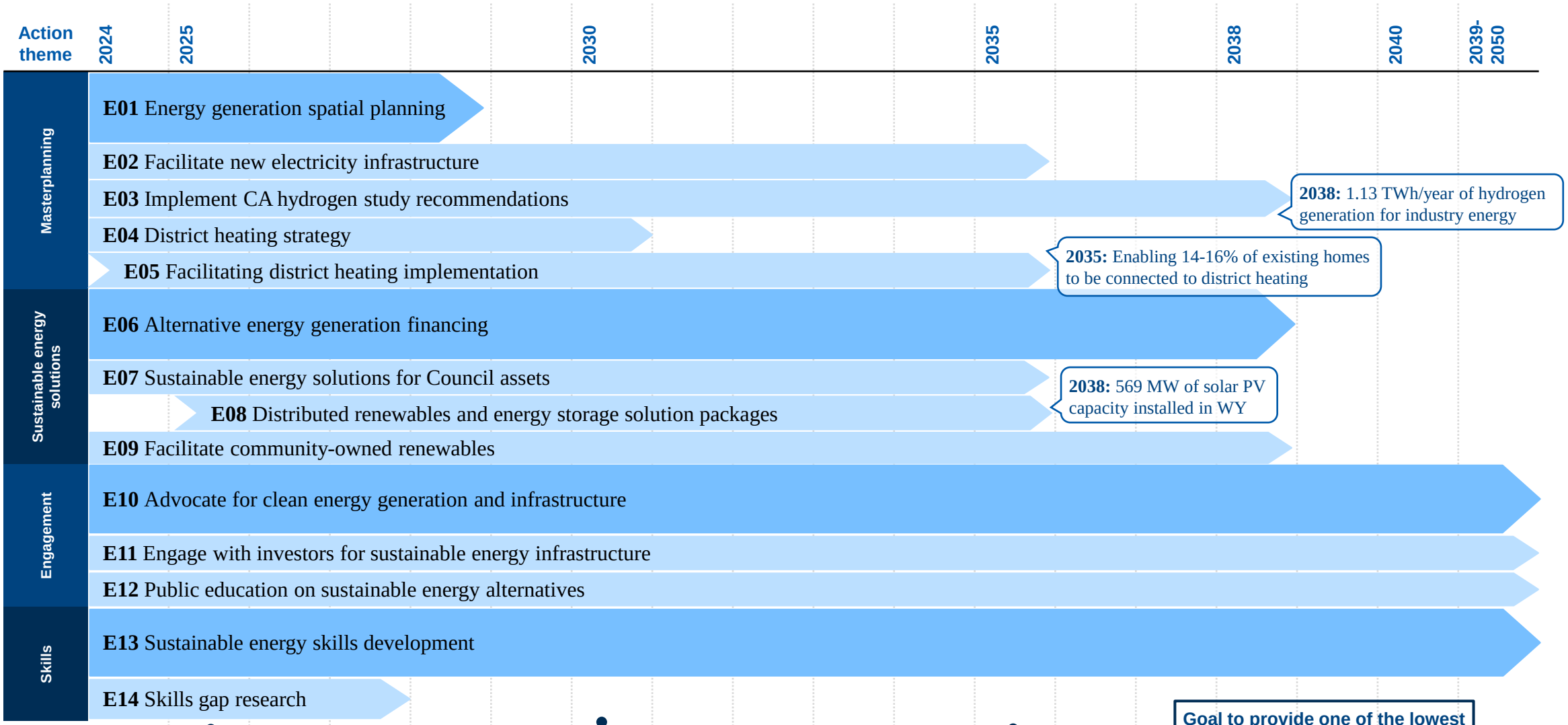

Industry Roadmap

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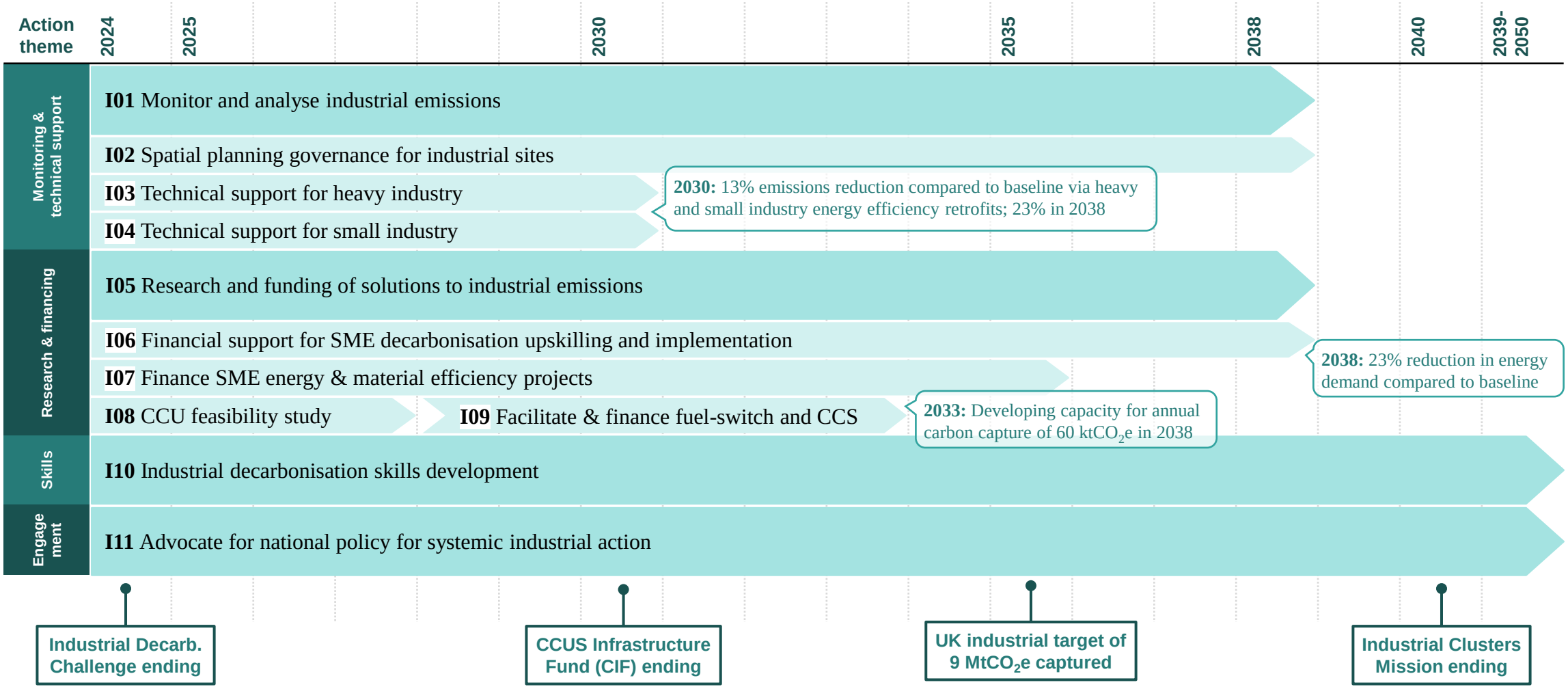

Land Use and Agriculture Roadmap

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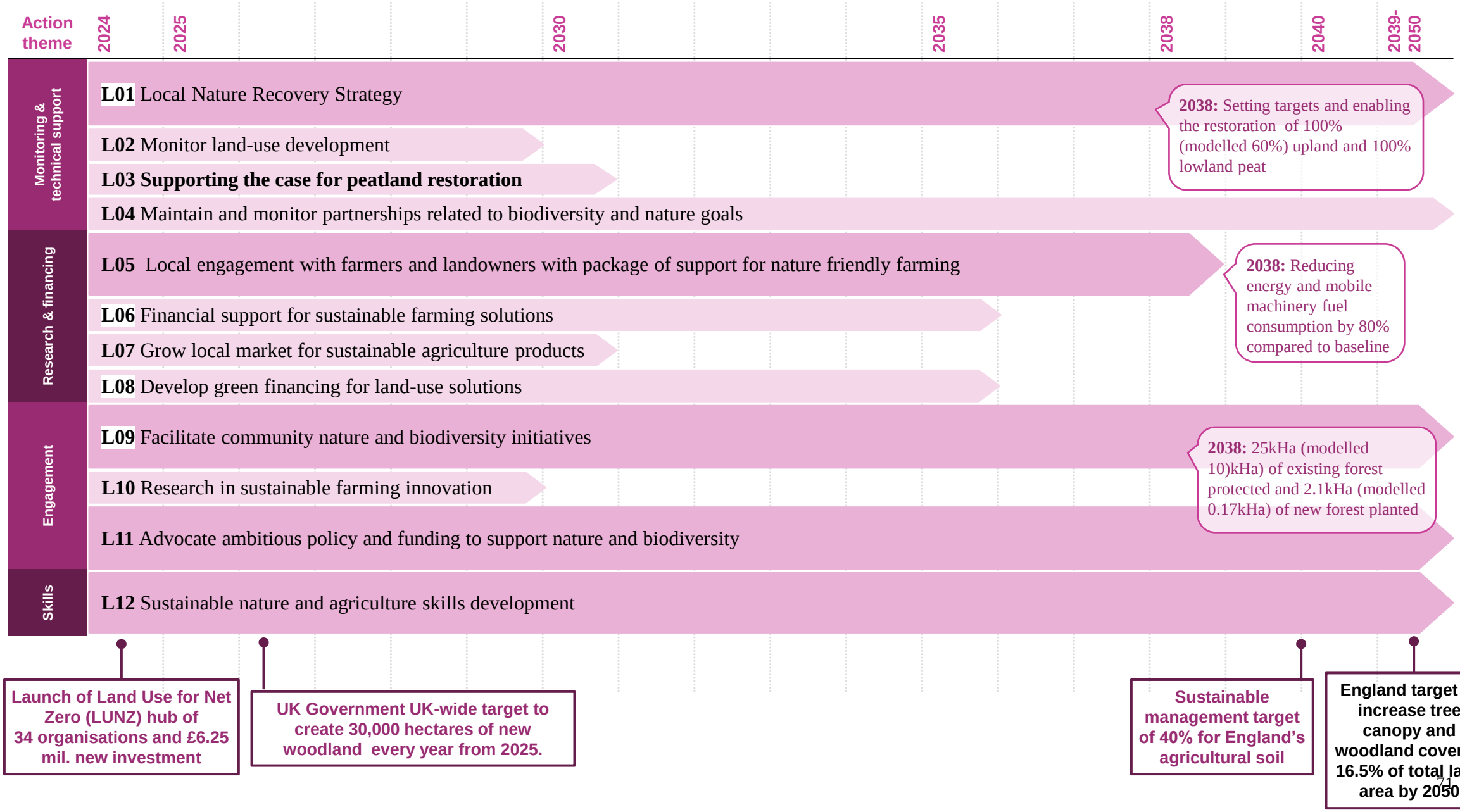
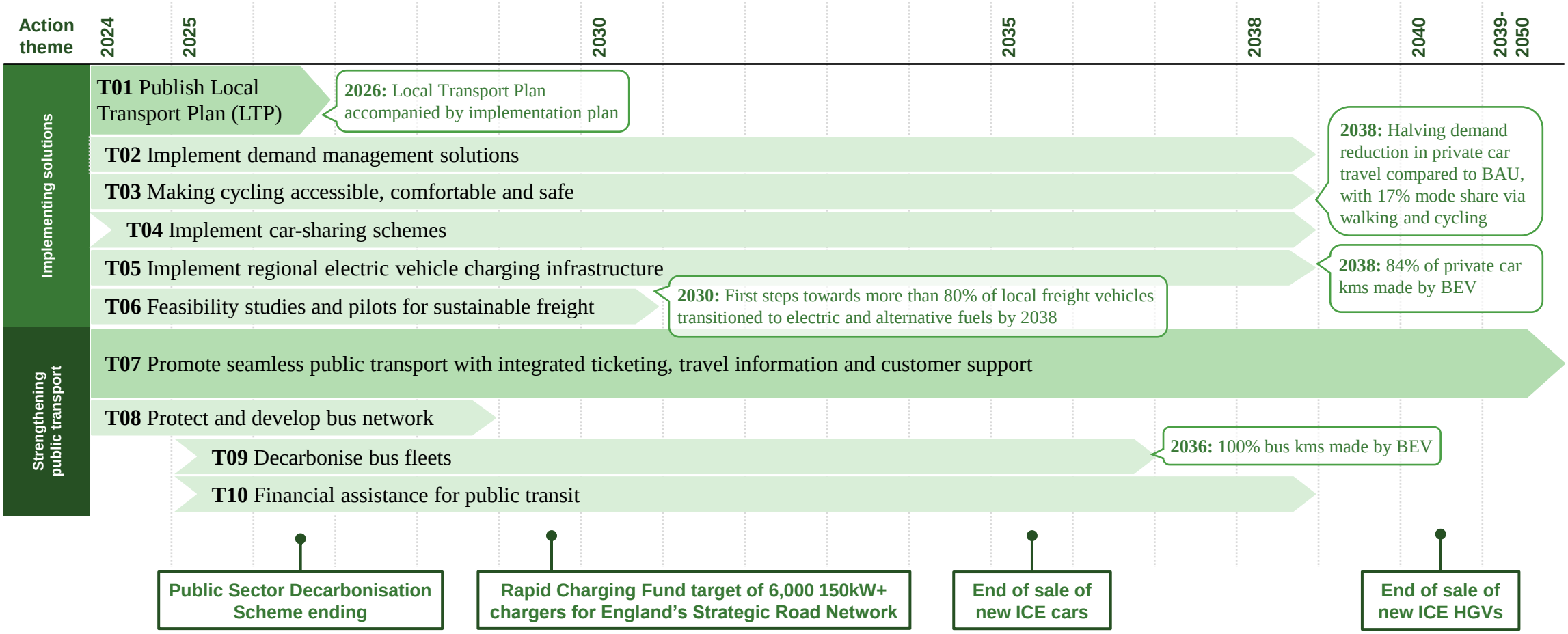
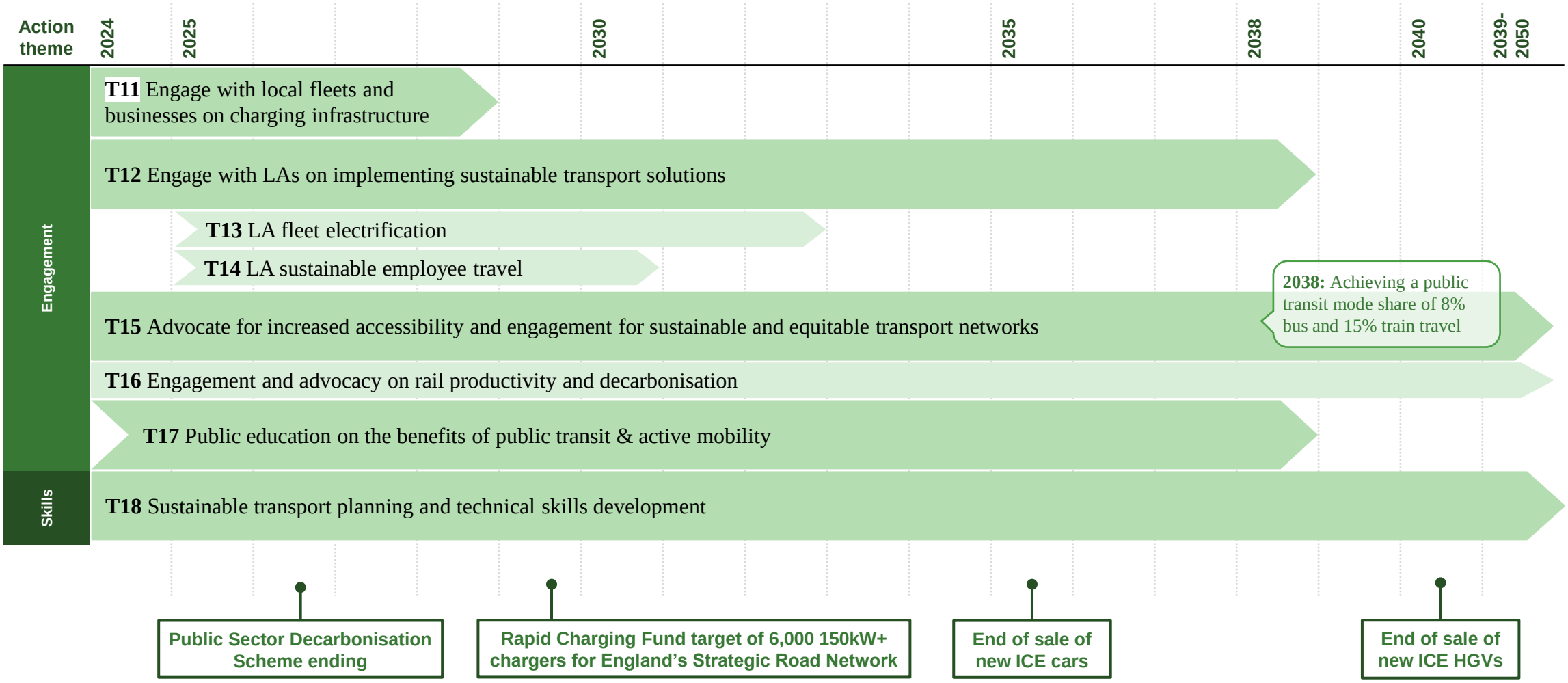


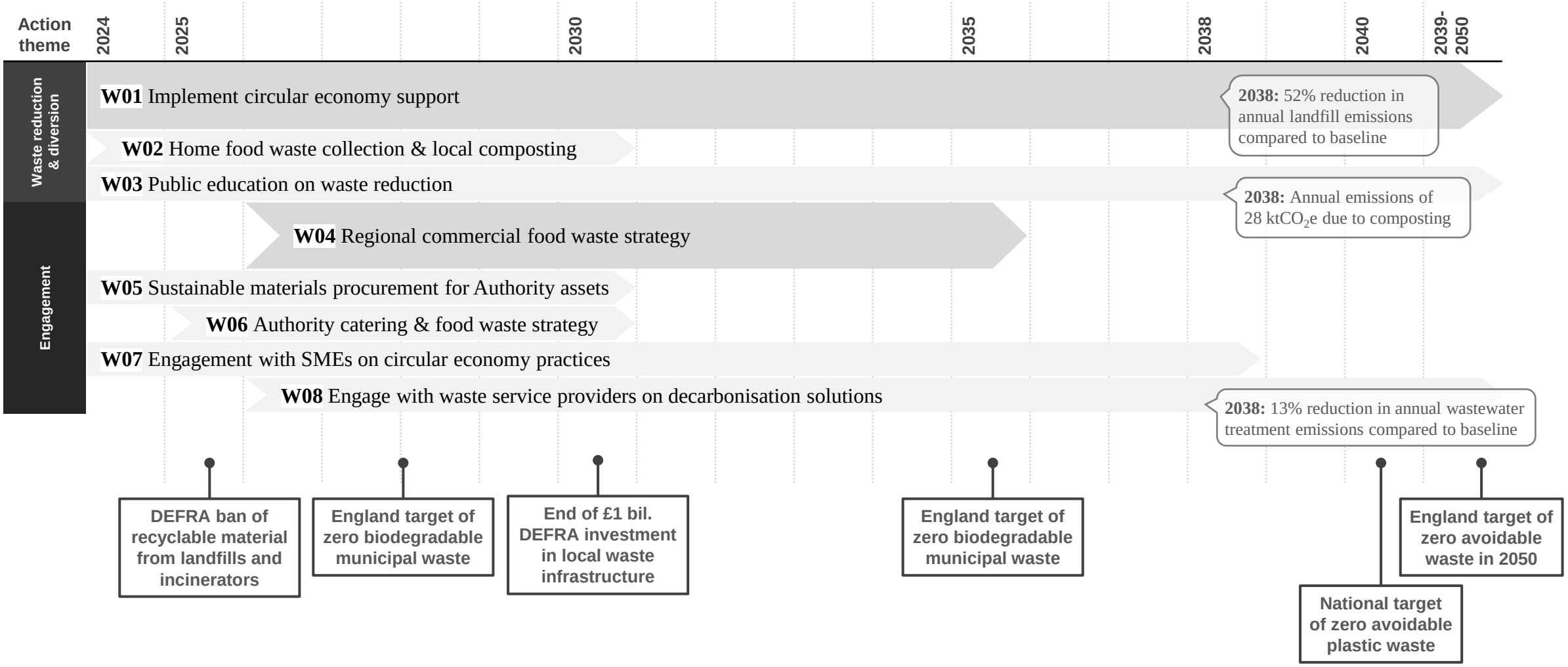
Transport Roadmap



Transport Roadmap



Waste Roadmap



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Section 6

Action Plans for sector emissions reduction

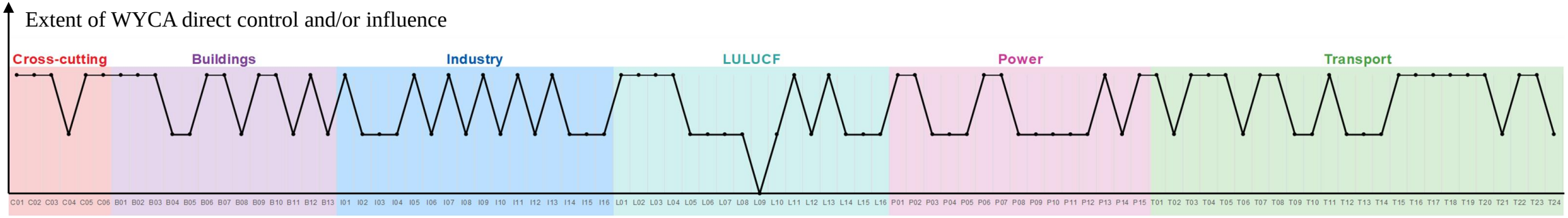
Review of CERP 1 actions and CERP 2 evidence informs recommended actions to reduce emissions

The CERP 1 interventions and actions focussed on five sectors and a cross-cutting theme. The transport sector had the greatest number of actions, with an even distribution of remaining actions across industry, LULUCF & agriculture, power and buildings. Analyses of the action details found that this was due to the granular nature of the actions published, which included enabling research, feasibility studies and policy planning towards an implemented intervention to reduce emissions.

While this meant that the previous CERP actions were detailed in a step-wise manner, it meant that some actions could not be easily linked or quantified in modelling assumptions for the previous emissions pathways. With 48% of the 2021 CERP actions being outside of WYCA's direct control and influence, it was observed that these actions might be challenging to quantify, justify and finance where resources might be limited.

These learnings and the CERP 2 evidence has been applied to the 2024 suite of recommended actions. Recommended actions lead by WYCA are emphasised so that the evidence base can be used to inform regional policy and plan making aligned with priorities, funding and investment decisions taken by WYCA and its partners.

It is also noted that actions related to governance, stakeholder engagement, data monitoring, and skills development contribute to the overall capacity of WYCA, the five Local Authorities and local stakeholders and communities. These increase the feasibility of ambitious action and support the distribution and experience of co-benefits of net zero action in local communities.



Visualisation of the distribution of CERP 1 actions across sectors, noting the extent of control and influence on the vertical axis

Cross-reference with West Yorkshire Climate & Environment Plan

The action analysis also included a review of the West Yorkshire Climate & Environment Plan (CEP) to cross-reference which CERP 1 action areas were taken forward into the regional plan to reduce emissions. The list of action areas in the current plan is noted in the list on the right-side.

It is noted that the CEP covers similar themes to CERP 1, while incorporating more governance, engagement and community development actions.

LE01 Policies and Decision-Making

LE02 Environment and Energy Management

LE03 Monitoring and Evaluation

LE04 Influencing Strategy

CC01 Communications, Engagement and Marketing

CC02 Strategic Planning

CC03 Green Skills and Training

CC04 Green Finance

CC05 Better Neighbourhoods

CC06 Innovation for Net Zero, Nature Recovery and Climate Ready

BI02 Industrial Decarbonisation

BI04 Circular Economy, Waste and Material Efficiency

EG01 Local Area Energy Planning and Delivery

EG02 Community Energy

EG03 Heat Decarbonisation

EG04 Solar Photovoltaics & Storage

HO01 Better Homes Advice Service

HO02 Better Homes Yorkshire Standard and Hub

NE01 Local Nature Recovery Strategy and Biodiversity Net Gain

NE02 Land-Use Data and Evidence

NE04 Regenerative Nature Recovery Schemes

NE05 Farmer & Landowner Information and Support Service

TR01 Connectivity Infrastructure Plan

TR02 Road Space Reallocation

TR04 Cycling and Walking Infrastructure

TR05 Electric Vehicle Charging

TR06 Bus Reform

TR07 Future Rail Provision

TR09 Better Active Mobility Neighbourhoods

Overview of methodology

The suite of CERP 2 actions proposed were collated based on a review of the CERP 1 actions in response to the updated baseline and BAU emissions. Some actions have been rephrased to focus the scope and clarify its tangible outcome, whilst others updated to progress the action from feasibility study or policy planning into an implementation phase. Several other actions have been removed due to being past the stated completion date in CERP 1, or because they were duplicated in scope across multiple sector categories.

This CERP's action categories of Cross Cutting (actions), Efficient and Healthy Buildings, Clean Energy, Decarbonised Industries, Land Use and Agriculture, Transport and Active Mobility, and Low Carbon and Circular Waste are in alignment with DESNZ's emissions reporting categories. This is to ensure that emissions sources are addressed with clarity and focus, whilst facilitating a common vocabulary for the Combined Authority in its emissions planning, monitoring and reporting.

While the proportion of actions under the Combined Authority's direct control and influence is the same as CERP 1, the focus on direct action means that the Combined Authority leads the implementation of a significant proportion of actions and potential emissions reduction. The remaining actions support national or Local Authority emissions reduction efforts via advocacy, convening and influencing of stakeholders.

The baseline scenario highlights the following emissions categories as priority for reduction – to which key intervention areas have been noted to reduce these emissions:

Emissions category	Responding Interventions
Buildings > Domestic	Energy efficiency retrofit at scale and decarbonisation of heating
Buildings > Public and Commercial	Energy efficiency retrofit at scale and decarbonisation of heating
Buildings > Industry energy consumption (gas & others)	Industrial electrification & energy efficiency of heating and processes
Transport > Passenger vehicles, diesel & petrol	Mode-shift to public/active mobility, EV infrastructure, regional buses & trains
Transport > LGVs, diesel & petrol	Accelerate electrification of the fleet, EV infrastructure to support
Large industry processes	Industrial electrification & energy efficiency
Land use	Nature recovery and restoration at scale
Agriculture	Sustainable and regenerative practices
Waste > Landfill	Waste reduction, diversion, circular economy system change

Key definitions

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The actions have been listed with the column headers below – noting important high-level details such as the role of the Combined Authority and other stakeholders in the action, estimated cost, potential co-benefits, and synergies with other CERP actions.

Column header	Definition
2024 updated action no.	Updated action number for 2024 CERP, accounting for changes due to recategorisation and/or reordering of actions.
Thematic action title	Title of the policy and/or action to be implemented.
Action detail	Short descriptions to provide a sense of the action's scope – this is not exhaustive and specific tasks and programmes should be further refined and prioritised by delivering departments.
Timeframe	The estimate start and completion year for the action.
Stakeholder roles	Noting if the Combined Authority is leading the implementation of the action, acting as a convenor of other stakeholders, or presenting advocacy to national government. This also highlights key of stakeholders whom the Combined Authority should co-design or collaborate with to implement the action, including Local Authorities, national government, quasi-autonomous non-governmental organisations (other public bodies), businesses, non-profit organisations, and citizens.
Estimated cost & resourcing	An approximate costing for the action's implementation; including Combined Authority staffing (in FTEs) and potential capital costs for physical and/or digital infrastructure.
Co-benefit themes & key impacts	Potential types of co-benefits associated with the action outside direct carbon reductions.
Risks & barriers	Potential limitations of the action, mostly outside of Combined Authority control
Action interdependence	Notes the action number of any relevant corresponding action across CERP 24, as well as the current Climate and Environment Plan (CEP)

Cross Cutting actions (1/2)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
C01	**Community engagement on climate and environment**	General and specific communications, marketing and engagement campaigns and actions focused on how partners, businesses and residents of West Yorkshire can work together to benefit from tackling the climate and environment emergency	Ongoing To be complete in 2039-2050	CA leads on implementation. This includes co-design with WY Mayor, Local Authorities; and consulting other public bodies, businesses, non-profit organisations, citizens.	£4.5 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Environment Inclusivity & civil society Related CEP action: CC01	Not reaching sufficient proportion of target audience, especially vulnerable residents (eg fuel poor and elderly); Requiring frequent reviews and updates due to evolving national RD&D and policy landscape; Risk of low behaviour change despite targeted information	C02, B05, E12, L04-05, L09, T05, T10, T15, T17, W01-03, advocacy-related actions
C02	**Collaborate with Local Authorities and neighbouring Combined Authorities**	Establish/maintain collaboration on net zero policy, programmes, funding and lobbying to ensure the region's priorities are supported by neighbouring LAs and CAs (for example strategic rail and energy infrastructure across the north, and specifically with partners in the Humber region who are active in contributing to the hydrogen future of the region).	Ongoing To be complete in 2039-2050	CA leads on implementation. This includes collaborating with WY Mayor, Local Authorities; and consulting businesses, non-profit organisations.	£4.2 mil. Est. 1 FTE to coordinate CA implementation	Environment Economic prosperity Essential public services Inclusivity & civil society	Coordination of priorities across regions complex to achieve	C03, B03, E07, T12-14, W05-06
C03	**Establish platform for best practice sharing across WY LAs**	Convene and maintain a regular platform and events for Local Authority officers across West Yorkshire to share their experiences, learning and best practices in delivering climate actions.	Start 2025 To complete in 2039-2050	CA leads on implementation. This includes co-design with WY Mayor, Local Authorities; and consulting national government, other public bodies.	£3 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Environment Economic prosperity Essential public services Inclusivity & civil society	Coordination of priorities across regions complex to achieve	C03, B03, E07, T12-14, W05-06, all skills-related actions

Cross Cutting actions (2/2)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
C04	**Engagement with themed focus groups**	Create themed or sectoral working groups - or piggyback such existing Local Authority groups - with representatives from LAs, Housing Associations, bus partnerships, SMEs, NHS Trusts, etc. to engage on the design and delivery of emissions reduction actions.	Start 2025 To complete in 2039-2050	CA leads on implementation. This includes co-design with Local Authorities; collaborating with businesses, non-profit organisations, citizens; and consulting WY Mayor.	£2.9 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Environment Economic prosperity Essential public services Inclusivity & civil society	Coordination of priorities across regions complex to achieve	B01, E01, E08, I01, I06, L04-05, T11, all skills-related actions
C05	**Facilitate sustainable energy infrastructure across WY**	Support development of Carbon Capture & Storage, hydrogen and electricity infrastructure, through coordinating necessary parties, ensuring planning permission and land are granted/available, supporting funding applications of DNOs to national government, etc. Completing this action successfully will depend on updating local energy plans to better reflect novel low carbon technologies.	Start 2024 To complete in 2032	CA leads on implementation. This includes collaborating with Local Authorities; and consulting WY Mayor, national government, other public bodies, businesses, non-profit organisations.	£898.5k Est. 1 FTE to coordinate CA implementation	Health & well-being Economic prosperity	Infrastructure investment can be very costly and involve cross party risk if assets are not guaranteed to be utilised; Chicken and egg problem with downstream processes	E01-05, I07-I09
C06	**Develop offsetting strategy**	Explore options to reach net zero including development of an offsetting strategy for the region, supporting local trials of innovative technologies such as BECCS in industry and direct air capture, the potential for greater land use solutions (inside and outside the region), and options for achieving fully renewable electricity supply.	Start 2025 To complete in 2028	CA leads on implementation. This includes collaborating with WY Mayor, Local Authorities; and consulting national government, other public bodies, businesses, non-profit organisations.	£75k Driven by capital or consultancy costs for implementation	Economic prosperity	Risk that options are unsuitable for the region; Constantly evolving science base may quickly make results outdated	L01, L08, L11

Buildings (1/4)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
B01	**Regional retrofit strategy**	Develop a regional retrofit strategy that includes evidence-base data collection, analysis and target-setting, and implementation roadmaps for 1. Existing public sector buildings: energy efficiency audits; prioritisation, costing and implementation of retrofits to achieve high performance standards and switch to low-carbon heating; 2. Social housing: Prioritisation of this housing stock to implement energy efficiency, thermal comfort and low-carbon heating retrofits 3. Private rental and owner-occupied sectors: Roadmap of engagement, local policy and enforcement to ensure safe, low carbon heating, energy-efficient, and comfortable homes	Ongoing To be complete in 2027	CA leads on implementation. This includes co-design with WY Mayor, Local Authorities; collaborating with other public bodies; and consulting national government.	£339.5k Est. 1 FTE to coordinate CA implementation	Health & well-being Economic prosperity Essential public services Related CEP action: HO02	Risk of limited buy in from LAs; Risk of supply chain limiting delivery can be mitigated through local skills initiatives	C01-05, B07, E01, E06-12
B02	**Social housing retrofits**	Map, prioritise and initiate comprehensive retrofits (energy efficiency and low carbon technology) in social housing; planning and implementation should be done with consideration and alignment with Social Housing Development Fund Wave 3.	Ongoing To be complete in 2028	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; and consulting businesses.	£1.2 mil. Driven by capital or consultancy costs for implementation	Health & well-being Economic prosperity Essential public services	Appropriate sites for new development must be found; Capital risk must be taken on, and cost may be higher without part financing by housing providers or grants	C01-05, B07, E01, E06-09

Buildings (2/4)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
B03	**Facilitate LA and other public body actions**	Convene LAs and wider public sector (health, education) to establish how to use policy and public estate investments to incentivise delivery of measures. Likely levers include: • Adopting region wide high energy efficiency standards and low carbon technology requirements for new builds, with consideration to Future Homes Standard expected in 2025 • Allowing low carbon alternatives to be permitted development • Exploring relaxation of conservation area planning restrictions to enable older house retrofit • Working towards a region wide heat network connection policy through 'heat zoning' • Transitioning from CHP to low carbon sources in heat networks	Ongoing To be complete in 2030	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; and consulting WY Mayor, Local Authorities, businesses, non-profit organisations.	<£1k Driven by capital or consultancy costs for implementation	Health & well-being Economic prosperity	Increased obligations on developers might reduce the number of new build projects and raise prices; The scope of possible changes may be limited; Planning officers need support and resource to enforce their full powers; Risk that consensus not reached across region	C01-05, B07, E01, E06-09
B04	**Finance low carbon solutions**	Provide financial incentives to support uptake of low carbon measures. These can include: • Purchase grants or low interest loans for technology or energy efficiency above those currently offered locally and nationally • Scrappage schemes, e.g. early focus on oil and biomass boilers, with later focus on gas boilers	Ongoing To be complete in 2038	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with WY Mayor, Local Authorities, businesses; and consulting non-profit organisations.	£1202.8 mil. Driven by capital or consultancy costs for implementation	Health & well-being Economic prosperity Essential public services	High administrative burden; Setting the price point of the subsidy too high risks unnecessary expenditure; Setting the price point too low risks lack of uptake at the required scale; Risk of insufficient uptake despite support	C01-02, B05-06, E01, E06-09

Buildings (3/4)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
B05	**Technical support on energy efficiency and low carbon heating**	Set up a 'One stop shop' for energy efficiency and low carbon heating. The service should act as a single point of contact for residents, private landlords, public organisations and businesses and greatly simplify the process of installing these measure by offering: • tailored information and advice on appropriate measures, which could include funded on site assessment information on the available funding and support in the application process • a preferred list of trusted local suppliers to build consumer / organisation confidence, and help to ensure high quality installation	Start 2024 To complete in 2038	CA leads on implementation. This includes co-design with WY Mayor, Local Authorities; and consulting national government, other public bodies.	£8 mil. Est. 6 FTE to coordinate CA implementation	Health & well-being Economic prosperity Essential public services Related CEP action: HO01	Risk that engagement fails to meet high levels required; Risk that an incomplete service rolled out as a 'one stop shop' might alienate the most interested residents/businesses	C01, C04, B06-07
B06	**Retrofit skills development**	Identify skills shortages and gaps in the workforce (current and future) and implement training programmes to address these gaps and build the local skills base - particular with existing local businesses. Participation in training programmes can be linked to certification and requirement for being included in list of preferred suppliers, to build quality assurance.	Ongoing To be complete in 2039-2050	CA leads on implementation. This includes collaborating with Local Authorities, businesses; and consulting WY Mayor, national government, citizens.	£3.2 mil. Est. 1 FTE to coordinate CA implementation	Economic prosperity Essential public services Inclusivity & civil society Related CEP action: CC03	Risk of insufficient uptake of programmes and/or programmes not resulting in increase in career choice in the sector	C01-02, B07 E13-14, I10

Buildings (4/4)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
B07	**Advocate for housing energy efficiency**	Influence Government to deliver policy and support that supports climate ambition: • Clear policy direction on future of the sustainability and affordabilty of heating • Engage national stakeholders on local transmission and distribution capacity to facilitate distributed solar installation • Consult and develop energy efficiency and thermal comfort standards for private rental sector	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; and consulting WY Mayor, Local Authorities, businesses, non-profit organisations.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Economic prosperity Essential public services	Risk of low uptake; Price reduction likely to be insufficient to enable uptake in low-income households without additional grants	C01-04, B01, B07, E01, E10, I11
B08	**Public education on energy efficient choices**	Public education via events, communications and marketing to inform, encourage and support energy efficient behaviours and consumer choices for households and businesses. This should be framed around the benefits (cost, health, comfort), but with targeted awareness of affordability and agency to change. This could include advice on: choosing energy-efficient appliances and lighting, low-carbon heating and power generation, ways to reduce energy consumption via insulation, energy management, effective use of existing heating and appliance technologies, and signposting to financial support for retrofitting and clean technology adoption.	Start 2024 To complete in 2039-2050	CA leads on implementation. This includes co-design with Local Authorities, non-profit organisations, citizens; and consulting WY Mayor, businesses.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Economic prosperity Essential public services Inclusivity & civil society Related CEP action: HO01	Risk of low participation or negative public perception; challenge with communicating with hard-to-reach community groups	C01-04, B01-02, B05

Energy (1/7)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
E01	**Energy generation spatial planning**	Building on existing local evidence base, complete a comprehensive regional strategic spatial plan which designates best areas to develop future power projects. Provide special emphasis on onshore wind by providing predesignated areas ideal for project development both from a land availability and infrastructure/grid connection point of view. Initial work should focus on renewables and EfW with additional planning for infrastructure and flexibility technologies as more evidence is gathered.	Ongoing To be complete in 2028	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with WY Mayor, Local Authorities; and consulting businesses, non-profit organisations.	£461.7k Est. 1 FTE to coordinate CA implementation	Economic prosperity Inclusivity & civil society Related CEP action: EG01	Reaching consensus among multiple local authorities may be difficult; Evidence gaps still exist and the exact decarbonisation routes unknown; Planning covers many interrelated sectors; Land in West Yorkshire is constrained	C02-05, B01, E02-14, I01-04
E02	**Facilitate new electricity infrastructure**	Support development of new electricity infrastructure, through coordinating necessary parties, ensuring planning permissions and land are granted/available, supporting funding applications to national government, etc. Support NPg to make a case to Ofgem for strategic infrastructure investments.	Ongoing To be complete in 2035	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; and consulting WY Mayor, Local Authorities, businesses, non-profit organisations.	£1.1 mil. Est. 1 FTE to coordinate CA implementation	Related CEP action: CC04	Potential for infrastructure investment to be expensive; Cross party risk if assets are not guaranteed to be utilised	C05, E06-12, I02, I07, T03, T09, T11, T13
E03	**Implement hydrogen study options**	Engage with key stakeholders including NGN, H21 project and local industrial partners to stay informed of H2 developments and plans. As plans progress, there will be a need to work in partnership to develop rollout strategy.	Ongoing To be complete in 2038	CA leads on implementation. This includes collaborating with other public bodies, businesses; and consulting WY Mayor, Local Authorities, national government, non-profit organisations, citizens.	£662.2k Est. 0.5 FTE to coordinate CA implementation	Essential public services	Final strategy dependent on national decisions and those of the key stakeholders	C05, B04-05, E01, E06, E10-14, I03-07, I10, T03, T09

Energy (2/7)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
E04	**District heating strategy**	Develop a district heat network strategy for the region. This should build on/update existing studies where appropriate and include: • Mapping of heat demand to identify suitable areas to establish new networks and expand existing networks (e.g. Leeds PIPES, Northallerton) • Identification of public sector buildings that can act as anchor load • Assessment of opportunities to use heat at industrial sites, sewage works, canals, rivers etc • Identification of appropriate business models and ways to de risk and commercialise schemes • Assessment of policy interventions to increase HNDU support and drive LA DH projects	Start 2024 To complete in 2030	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with WY Mayor, Local Authorities; and consulting businesses, non-profit organisations.	£644.8k Est. 1 FTE to coordinate CA implementation	Economic prosperity Related CEP action: EG03	Risk of natural monopolies forming in areas where heat networks are mandated	C02, C05, B01, E01, E05, I03-04, I07
E05	**Facilitating district heating delivery**	Initiate new low carbon heat network schemes in cost effective and heat density appropriate areas, either directly, through joint venture or through granting concessions to private sector schemes.	Ongoing To be complete in 2035	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; and consulting WY Mayor, Local Authorities, businesses, non-profit organisations.	£2502.1 mil. Driven by capital or consultancy costs for implementation	Economic prosperity Related CEP action: EG03	Long construction and payback timeframes; Heat networks powered by waste heat are relatively novel with limited UK precedent; Capital risk if scheme fails; Demand forecasting uncertain	C02, C05, B01, E01, E04, I03-04, I07

Energy (3/7)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
E06	**Alternative energy generation financing**	Launch a programme providing low interest loans for small and medium scale low carbon power technologies including solar, wind, AD, energy from waste (landfill gas, cooking oil, sewage sludge digestion, etc.), leveraging combination with heat networks to improve efficiency. Include support for flexibility technologies (demand side response, storage) and encourage joint installation of generation and storage.	Ongoing To be complete in 2038	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with WY Mayor, Local Authorities; and consulting businesses, non-profit organisations.	£83.6 mil. Driven by capital or consultancy costs for implementation	Economic prosperity Essential public services Related CEP action: EG04	High administrative burden; Loans may not be suitable for all technologies	C01-04, B01-05, E01-12, I03-04, I07
E07	**Sustainable energy solutions for Council assets**	Installation of solar PV, battery storage, demand side response or other related small-scale generation and flexibility technologies on council owned land & buildings, including affordable housing, offices and commercial space. Generation and flexibility should be considered together. Size and technology choice will depend on individual circumstances of each building/asset and engagement with local residents or stakeholders. This policy can be linked to other activities of the council such as pairing some new transport infrastructure with renewables + storage.	Ongoing To be complete in 2035	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with WY Mayor, Local Authorities, businesses; and consulting non-profit organisations.	£332.1 mil. Driven by capital or consultancy costs for implementation	Economic prosperity Essential public services Related CEP action: EG04	The scheme may introduce administrative and financial burden considering the number of stakeholders; Unique solution needed for each asset	C02-03, B01-03, E01-02, E12, T12-13

Energy (4/7)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
E08	**Distributed renewables and energy storage solution packages**	Develop a combined renewables (e.g. solar PV, wind) and battery storage offer for residents and businesses, for example through aggregated demand services such as Solar Together	Start 2025 To complete in 2035	CA leads on implementation. This includes co-design with WY Mayor, Local Authorities; collaborating with other public bodies; and consulting national government.	£436k Est. 0.5 FTE to coordinate CA implementation	Economic prosperity Essential public services Related CEP action: EG04	Risk of low uptake; Price reduction likely to be insufficient to enable uptake in low income households without additional grants	C01-05, B01-04, I03-04, I07
E09	**Facilitate community-owned renewables**	Provide guidance and support to community renewable projects. Building on NPg's work on community energy projects, develop a common platform to provide guidance and share knowledge on resources and tools available for community project developers. Support applications for national and regional funds and maintain effective communication between communities and other stakeholders, such as DNOs and relevant public offices. Provide free expert consultation to developers directly or through partnerships. Set up a grant and loan scheme to finance feasibility studies and capital investments into community energy projects. Ensure projects are accessible and beneficial to combat fuel poverty. Operational financial incentives may be considered if uptake stays limited.	Ongoing To be complete in 2038	CA leads on convening and advocacy. This includes co-design with national government, other public bodies.	£6.9 mil. Est. 5 FTE to coordinate CA implementation	Economic prosperity Essential public services Inclusivity & civil society Related CEP action: EG02	The small scale of the projects may introduce inefficiencies in terms of people who need to be engaged and higher administrative burden; Setting the level of financial support and the grant/loan distribution may be difficult to ensure it is attractive but does not overcompensate needs re evaluation and adjustment	C01-05, B01-04, E11-12

Energy (5/7)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
E10	**Advocate for clean energy generation and infrastructure**	Engage with the central government to inform and direct national policies on certain issues: • Decouple generation and storage components when dealing with Nationally Significant Infrastructure Projects 1 so local planning has larger influence over medium size projects. • Support early deployment of CCUS infrastructure in Yorkshire & Humber as attractive location and critical for UK decarbonisation • Develop business models for supporting CCUS and hydrogen power generation. • Large scale research on hydrogen for power and storage. • Receive additional investment from Ofgem for infrastructure upgrades in the region. • Push for future EfW facilities to be required to be Carbon Capture & Storage ready or have tangible plans to fully decarbonise.	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; and consulting businesses, non-profit organisations.	£3.6 mil. Est. 1 FTE to coordinate CA implementation	Economic prosperity Essential public services Related CEP action: LE04	Dependence on a third party; Potential concessions to secure future support	C01-04, B01, B07, E01, I11

Energy (6/7)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
E11	**Engage with investors for sustainable energy infrastructure**	Combine and advertise a package of policies/actions to attract larger scale private investment in low carbon energy and flexibility technologies. Actions include supportive local planning policy, pre designated areas for project development, support with grid connection and infrastructure through coordination with DNOs, enhanced public acceptance, providing land/estate owned by the local government or co investment. Pension funds may also be used in directly investing to the region or by having bilateral investment agreements with partner councils.	Ongoing To be complete in 2039-2050	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with businesses; and consulting WY Mayor, Local Authorities, non-profit organisations.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Economic prosperity Essential public services Related CEP action: CC04	Engagement with investors must be unbiased; Using pension funds to invest in the region increases civil servants' exposure to risks involving the regional economy; Local resources (such as land) may be locked away in energy projects creating an opportunity cost	C02-05, B04, E01-02, E10, I07
E12	**Public education on sustainable energy alternatives**	Awareness raising campaigns to increase public knowledge and acceptance around local power projects and strategy. Particular value can be added for onshore wind, CCUS, hydrogen and BECCS. Allow communities to input into large regional plans and facilitate communication between project developers and the public, which can reduce project costs by alleviating some of the burden on developers and accelerate deployment rates.	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; and consulting businesses, non-profit organisations.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Economic prosperity Essential public services Inclusivity & civil society Related CEP action: CC01	Must have unbiased approach; Challenges around public interest, understanding and acceptance	C01-02, B02, B07, E01, E07-E09

Energy (7/7)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
E13	**Sustainable energy skills development**	Collaborate with local training organisations, colleges, companies, etc. to improve and expand their programmes. Disseminate evidence gathered on future skills requirements and influence design of new courses/trainings. Provide financial support for increasing capacity. Establish an internship programme connecting skilled interns/students with organisations developing low carbon technologies. Supplement the programme via grants or compensating part of the internship costs, which will be in addition to any national incentives.	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; collaborating with Local Authorities, businesses; and consulting WY Mayor, non-profit organisations.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Economic prosperity Essential public services Inclusivity & civil society Related CEP action: CC03	Timing and types of training should be determined carefully; Uncertainty around the choice of future technologies; Requires public's active participation and interest	C01-02, B06-07, E14, I10
E14	**Sustainable energy employment research**	Research to understand the future skills and capacity needs for emerging industries and identify pathways to develop this skills base locally. Develop a strategy to build local skills for power infrastructure (including plan for legacy skills). Examples: solar installers, wind turbine repairers, DSR or battery installers, community energy project developers.	Ongoing To be complete in 2027	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with WY Mayor, Local Authorities; and consulting businesses, non-profit organisations.	£414.5k Est. 1 FTE to coordinate CA implementation	Economic prosperity Essential public services Inclusivity & civil society Related CEP action: CC03	Required skills may change as national policy is implemented and decisions are taken (pre-empting national decisions risks stranded skill capacity)	C01-02, B06-07, E13, I10

Industry (1/5)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
I01	**Monitor and analyse industrial emissions**	Collect environmental audit data and work with industrial sites and industry associations (e.g. Food and Drink Federation) to create and maintain a comprehensive database of regional energy use, emissions, technologies, processes and applicability of future low carbon options. This should maximise learnings from the previous Clean Growth Audit. This is the overarching action to govern and inform direct technical and financial assistance to implement emissions reduction solutions on small and heavy industry sites.	Ongoing To be complete in 2038	CA leads on implementation. This includes collaborating with WY Mayor, other public bodies; and consulting national government.	£1.3 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Environment Economic prosperity Related CEP action: LE03	Lack of measured data by small industry; Some businesses may hesitate to get compared to others; Data may not be available in an easily comparable format	C02-C04, E10-12, I02-09
I02	**Spatial planning for industrial sites**	Spatial planning for future industrial sites and infrastructure development should be strategic, considering clustering and synergies with other sustainable solutions related to energy infrastructure, transit and freight, and more. New permits should require facilities and developers to have a decarbonisation plan in place, with spatial and infrastructural strategies that are implementation ready and future-proof (e.g. to integrate Carbon Capture & Storage and hydrogen solutions).	Ongoing To be complete in 2038	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with WY Mayor, Local Authorities; and consulting businesses, non-profit organisations, citizens.	£1.5 mil. Est. 1 FTE to coordinate CA implementation	Environment Related CEP action: CC02	Reaching consensus among multiple local authorities across multiple sectors priorities may be difficult; Evidence gaps still exist and the exact decarbonisation routes unknown	C02-C04, E01-06, I03-09

Industry (2/5)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
I03	**Technical support for heavy industry**	Technical and financial support for large industrial sites to conduct audits and feasibility studies towards developing complete decarbonisation roadmaps depending on their specific circumstances. The Combined Authority will advise site managers and Local Authorities on commissioning quality and constructive audits, potential funding sources, and coordination with related stakeholders - for sites to develop and implement decarbonisation plans that are feasible and cost-effective.	Ongoing To be complete in 2030	CA leads on convening and advocacy. This includes collaborating with WY Mayor, national government, other public bodies, businesses.	£659.8k Est. 1 FTE to coordinate CA implementation	Environment Economic prosperity Related CEP action: BI02	Uncertainty in early studies around future infrastructure and technology availability; Each site has unique circumstances and the actions of one site may inform the actions of others, so plans must be co-developed	C02-C04, E01-06, I05-11
I04	**Technical support for small industry**	Develop a technical support service to coach SMEs in identifying and acting upon decarbonisation opportunities in their operations and processes, via Combined Authority officers providing techncial assistance to SMEs and Local Authorities. This assistance will be underpinned by the development of sub-sector evidence-bases, archetypal decarbonisation routes, and a suite of quick-win solutions. These will be communicated via practical advice services, complemented by partial grants for audits and feasibility studies and singposting to other local, regional and national financial support.	Ongoing To be complete in 2030	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with businesses; and consulting WY Mayor, Local Authorities, non-profit organisations.	£1.6 mil. Est. 3 FTE to coordinate CA implementation	Health & well-being Environment Economic prosperity Related CEP action: BI02	Uncertainty in early studies around future infrastructure and technology availability; Best decarbonisation actions may depend on strategies of larger nearby facilities; Grant level balance between minimising cost and sufficient incentive	C02-C04, E01-06, I05-11

Industry (3/5)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
I05	**Research and funding of solutions to industrial emissions**	Develop West Yorkshire as a region leading on ambitious approaches and solutions to industrial emissions, via research on and financing of pertinant industrial needs and transformational opportunities. This is by convening stakeholders from heavy industry and SMEs, academia, higher education institutions, and national RD&D programmes to: • Develop and finance research scopes • Supplement national funding with loans, grants or OPEX support for pilot projects • Prioritise and educate industry leaders and site managers on technologies with potential for large emissions reductions in the region	Ongoing To be complete in 2038	CA leads on convening and advocacy. This includes co-design with businesses, non-profit organisations; and consulting Local Authorities, national government, other public bodies.	£1.3 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Environment Economic prosperity Related CEP action: CC06 BI02	Risks of duplication of other RD&D programmes in other areas of UK/abroad; Results may not be applicable to all sites; Potential cost overruns; Possibility of failed demos and equipment may not be available in time; Lack of national funding may render demos financially unfeasible	C02-C04, E01, E06, E08, E10-14, I01, I06-11
I06	**Financial support for SME decarbonisa-tion upskilling and implementa-tion**	Establish a funding scheme to support small industry and SMEs with: • Training and educational events with solutions presented by Combined Authority, Local Authority and private sector thought leaders • Subsidies for upskilling at sustainability courses at local higher institutions, and grants to hire sustainability apprentices	Ongoing To be complete in 2038	CA leads on implementation. This includes collaborating with WY Mayor, Local Authorities, national government, other public bodies, businesses, non-profit organisations.	£2.4 mil. Est. 1.5 FTE to coordinate CA implementation	Health & well-being Environment Economic prosperity Related CEP action: BI02	High administrative burden; Risk around setting support levels too high or low; A level of dependence on continued national support	C02-C04, B06, E08, E10-14, I01, I03, I10

Industry (4/5)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
I07	**Finance SME energy & material efficiency projects**	Provide funding and access to finance for energy and material efficiency improvement projects in all industry. For SMEs this can build on the existing Resource Efficiency Fund and focus on circular economy models. For larger industry it may be in the form of zero interest loans for projects which pay back through reduced energy costs or are also nationally supported (e.g. IETF).	Ongoing To be complete in 2035	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with WY Mayor, Local Authorities; and consulting businesses, non-profit organisations.	£3.1 mil. Est. 3 FTE to coordinate CA implementation	Economic prosperity Essential public services Related CEP action: BI04	High administrative burden; Risk of setting the support levels too high or low; A level of dependence on continued national support	C02-C04, B06, E08, E10-14, I01, I03, I10
I08	**Industrial CCU feasibility study**	Procure a study investigating current CO_2 sources and sinks in the region. Facilitate their early coordination and investigate the potential of the region to expand its CCU opportunities (e.g. synthetic fuels, aggregates, etc.). Support early RD&D for new CCU routes in the region and learn from national RD&D programmes.	Ongoing To be complete in 2027	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; and consulting WY Mayor, Local Authorities, businesses, non-profit organisations.	£374.5k Est. 1 FTE to coordinate CA implementation	Environment Economic prosperity Related CEP action: BI02	CCU may not end up being favourable in the region; Sites may be locked in long term for CO_2 storage; Constantly evolving science base may quickly make results outdated	C02-04, I05-09
I09	**Facilitate & finance fuel-switch and Carbon Capture & Storage**	Support large scale fuel switching and Carbon Capture & Storage projects by aiding their application for national funds, speeding up permitting applications and providing support for infrastructure upgrades. Funding likely to be industry/nationally led but financing support (e.g. loan guarantees) may be used to partially support projects on a case-by-case basis.	Start 2028 To complete in 2035	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; collaborating with businesses; and consulting WY Mayor, Local Authorities, non-profit organisations.	£920.2k Est. 1.5 FTE to coordinate CA implementation	Economic prosperity Related CEP action: BI02	Strong dependence on national support; Needs a case by case approach rather than a one-size-fits-all approach	C02-04, I05-09

Industry (5/5)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
I10	**Industrial decarbonisation skills development**	Collaborate with local training organisations, educational institutions, companies, and more to improve and expand their programmes, via: • Disseminating evidence gathered on future skills requirements and influence design of new courses/trainings • Providing financial support for to increase educational capacity • Establish an internship/ apprenticeship programme connecting skilled students with SMEs developing low carbon technologies	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; collaborating with Local Authorities, businesses, non-profit organisations.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Economic prosperity Inclusivity & civil society Related CEP action: CC03	Timing and types of training should be determined carefully; Uncertainty around future technologies and risk of stranded skills; Requires public's active participation and interest	C01-02, B06-07, E13-14
I11	**Advocate for national policy for systemic industrial action**	Engage with the central government to inform and direct national policies: • Support early deployment of CCUS infrastructure in West Yorkshire as attractive location and critical for UK decarbonisation • Develop business models and financial incentives for industrial fuel switching • Research/evidence gathering on H2 and electrification technologies for industry • Receive additional investment from Ofgem for infrastructure upgrades in the region • Development of national green procurement guidelines • Stricter industrial emissions regulations and carbon intensity targets/trajectories	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; and consulting WY Mayor, Local Authorities.	£3.6 mil. Est. 1 FTE to coordinate CA implementation	Environment Related CEP action: BI02	CA/LEP to deliver and reach out to large industrial sites SMEs may be involved voluntarily and LA/CC may help reaching out to SMEs	C01-04, B01, B07, E01, E10

Land Use and Agriculture (1/6)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
L01	**Local Nature Recovery Strategy (LNRS)**	Develop and implement Local Nature Recovery Strategy (LNRS) for the region that also takes into account biodiversity net gain (BNG). The current iteration is to be published in 2026 to commence implementation, and subsequent refreshes to occur every 3-10 years.	Start 2024 To complete in 2039-2050	CA leads on implementation. This includes collaborating with WY Mayor, Local Authorities, national government, other public bodies; and consulting businesses, non-profit organisations.	£6.8 mil. Est. 2 FTE to coordinate CA implementation	Health & well-being Environment Related CEP action: NE01	Risk of poor buy in from stakeholders; Competing land use requirements must be managed (eg housing development targets, local renewables development, conflicts with existing Local Plans etc); Risk of optimal local suitability for measures not delivering carbon ambition	C01-04, C06, I02, L02-13, T02, T05
L02	**Monitor and analyse land-use and agriculture developments**	Improve local data and evidence and carry out detailed local modelling. Data to include: • Current peatland condition and potential for restoration • Carbon intensity of local farming techniques • Optimal livestock stocking densities • Carbon sequestration measurement and monitoring techniques • Extent of food waste along supply chain	Start 2025 To complete in 2029	CA leads on implementation. This includes co-design with WY Mayor, Local Authorities; and consulting other public bodies, businesses, non-profit organisations.	£919.6k Driven by capital or consultancy costs for implementation	Environment Economic prosperity Related CEP action: NE02	Risk of data being unavailable, incomplete or unreliable	L01-11

Land Use and Agriculture (2/6)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
L03	**Supporting the case for peatland restoration**	Collate evidence base to inform a policy position and interventiosn on supporting peatland restoration	Ongoing To be complete in 2030	CA leads on convening and advocacy. This includes collaborating with national government, other public bodies; and consulting businesses, non-profit organisations.	£624.8k Driven by capital or consultancy costs for implementation	Health & well-being Environment Economic prosperity Related CEP action: NE04	Risk of non-compliance and/or expensive enforcement; Risk of conflict with grouse moors	C01, C04, L01, L05, L11
L04	**Maintain and monitor partnerships related to biodiversity and nature goals**	Establish new partnerships and utilise existing links to deliver climate ambitions. These can include: • Building partnerships between LAs and the Forestry Commission to use LA land for tree planting • Build on existing networks (e.g. Yorkshire Land Anchors Network) to coordinate efforts and to raise further funding to restore peatlands and deliver tree planting • Establish development partnerships to help development of appropriate brownfield sites • Building partnerships with food banks to reduce food waste With LAs in particular, the CA will review with them if local plans to deliver climate ambitions, and what further support is needed for their implementation of measures related to natural solutions, biodiversity net gain (BNG), and environmental protection (e.g. for hedgerows).	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; and consulting Local Authorities, businesses, non-profit organisations.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Environment Economic prosperity Inclusivity & civil society Related CEP action: LE04	Risk of partnerships not delivering required ambitions	C02-04, L01, L05-11, W01-02, W05-06

Land Use and Agriculture (3/6)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
L05	Local engagement with farmers and landowners with package of support for nature friendly farming	Establish a package of measures to equip farmers and landowners with the information and support they need to make decisions that are good for their business and the environment. This can include: • Centralised resources with information about: – Options and interventions available – Best practice examples – Sources of funding and support • Access to trusted local advisors • Establishing knowledge sharing networks to ensure best practice and latest evidence is shared, and to embed a shift in culture among local stakeholders towards sustainable, climate friendly practices • Access to training programmes in relevant land use and land management options/techniques	Start 2024 To complete in 2038	CA leads on implementation. This includes co-design with national government, other public bodies.	£2.8 mil. Est. 2 FTE to coordinate CA implementation	Environment Economic prosperity Inclusivity & civil society Related CEP action: NE05	Risk of not reaching sufficient proportion of target audience;; Risk of becoming outdated rapidly due to evolving national policy landscape can be mitigated by frequent reviews and updates; Risk that insufficient measures are taken up despite providing the resource	C01-04, L01-10, L12, W01-02

Land Use and Agriculture (4/6)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
L06	**Financial support for sustainable farming solutions**	Develop a regional programme of grants and financial incentives for farmers and landowners to deliver measures. These can be complementary to ELMs and should aim to fairly reward rural businesses for actions that positively contribute to the net zero target and nature restoration. This can include support for: • Establishing and maintaining woodland. • Peatland restoration and management. • Positive soil management. • Hedgerow restoration. • Waste reduction. • Bioenergy crop production and distribution. • Best available techniques in cattle farming.	Ongoing To be complete in 2035	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with WY Mayor, Local Authorities; and consulting businesses, non-profit organisations.	£31.8 mil. Driven by capital or consultancy costs for implementation	Environment Economic prosperity Inclusivity & civil society Related CEP action: NE04	Risk that funding enables initial uptake but does not maintain land use for the period required to enable change	C01-04, L01, L05, L08
L07	**Develop local supply chain for sustainable agriculture products**	Establish markets for end products of agriculture and land management practices, including: • Bioenergy crops for example, by requiring biomass combustion facilities to source a set share of feedstock from the region • Harvested material from new woodland such as in construction • Established markets must align with local biodiversity and land use goals (i.e. ensuring that end products are crops and materials suitable for the region)	Ongoing To be complete in 2030	CA leads on convening and advocacy. This includes co-design with other public bodies, businesses; collaborating with WY Mayor, Local Authorities, national government; and consulting non-profit organisations.	£999.4k Est. 2 FTE to coordinate CA implementation	Environment Economic prosperity Inclusivity & civil society Related CEP action: CC02	Risk of market not being commercially viable, particularly in early stages as supply scales up	C01-04, L01, L05, L08

Land Use and Agriculture (5/6)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
L08	**Develop green financing for land-use solutions**	Develop and trial private investment models to attract funding for land use solutions, such as a carbon trading scheme.	Start 2025 To complete in 2035	CA leads on implementation. This includes co-design with national government, other public bodies; and consulting businesses, non-profit organisations.	£75k Driven by capital or consultancy costs for implementation	Environment Economic prosperity Related CEP action: NE04	Risk of off setting being used by organisations to avoid direct action to reduce their own emissions; Risk of insufficient investment to make scheme viable	C01-04, L01, L05, L06
L09	**Facilitate community nature and biodiversity initiatives**	Promote and support community schemes that contribute to net zero aims (including community programmes as aligned with the LNRS), such as: • Community food growth in urban areas • Community tree and hedgerow planting • Outlets for produce that does not meet supermarket standards	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with national government, other public bodies, businesses; and consulting WY Mayor, Local Authorities, non-profit organisations.	£3.2 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Environment Economic prosperity Inclusivity & civil society Related CEP action: CC01	Risk of low impact on behaviour or in delivering overall strategy; Risk of poor quality planting if not coordinated appropriately	C01-04, L01, L05, L07, L10-13, T02, T05, W01-02
L10	**Research in sustainable farming innovation**	Establish R&D programmes and support demonstrator trials to support innovation and gather evidence on new solutions for the region. This can include for example: • Alternative proteins 2 • Vertical farming • Methane reduction techniques • Advanced technology (e.g. robotic harvesting, machine learning)	Start 2024 To complete in 2029	CA leads on implementation. This includes co-design with other public bodies, businesses; collaborating with WY Mayor, Local Authorities, national government; and consulting non-profit organisations.	£417.5k Est. 1 FTE to coordinate CA implementation	Environment Economic prosperity Related CEP action: NE02	Risk that trials are unsuccessful or technologies unviable	C01-04, L01, L05-08, L12

Land Use and Agriculture (6/6)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
L11	**Advocate for ambitious policy and funding to support nature and biodiversity**	Influence Government to deliver policy and support that supports climate ambition: • Funding for tree planting, hedgerow planting, agro forestry and peatland restoration nationally and/or as part of devolution deal • Ensure that ELMS adequately supports measures targeted for delivering net zero • Streamlining application process for afforestation	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with national government, other public bodies, businesses; and consulting WY Mayor, Local Authorities, non-profit organisations.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Environment Economic prosperity Inclusivity & civil society Related CEP action: LE04 NE04	Risk of influencing not achieving intended aim	C01-04, C06, B07, E10, I11, T15
L12	**Sustainable nature and agriculture skills development**	Develop educational programmes (qualifications, apprenticeships etc) to ensure that young people can access a career in land management, forestry, agro forestry etc	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; collaborating with Local Authorities, businesses, non-profit organisations.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Environment Economic prosperity Inclusivity & civil society Related CEP action: CC03	Risk of insufficient uptake of programmes and/or programmes not resulting in increase in career choice in the sector	C01-04, B07, E01, E10, I11, T18

Transport (1/8)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
T01	**Publish Local Transport Plan (LTP)**	Develop, publish and communicate the Local Transport Plan (LTP) and its implementation; working with Local Authorities, transport operators and users to begin programmes and solution implementation to encourage mode-shift to public transport, active mobility, and low emissions vehicles.	Ongoing To be complete in 2026	CA leads on implementation. This includes co-design with Local Authorities; collaborating with WY Mayor, national government; and consulting other public bodies, businesses, non-profit organisations.	£193.5k Est. 1 FTE to coordinate CA implementation	Health & well-being Environment Economic prosperity Related CEP action: TR02	Resistance from road users; Risk of increased congestion, which may impact goods movement, lack of rail capacity, poor rail services limit mode shift	C01-04, E01, T02-17
T02	**Implement demand management solutions**	Implement traffic control measures such as: • Zero emissions zones (ZEZs) in key city and town centres, tying these into high-street community, cultural and commercial events • Traffic control and network management plans for key centres and corridors to reduce through traffic and confine traffic to defined routes e.g. through strategic road closures and/or limiting travel to within defined zones • Roadspace reallocation to make space for and facilitate the development of infrastructure to zero carbon modes. • 20mph limits on all residential roads and appropriate major roads • Access charging (linked to ZEZs, circulation plans etc) and road user charging where appropriate	Ongoing To be complete in 2038	CA leads on implementation. This includes co-design with WY Mayor, Local Authorities; collaborating with non-profit organisations; and consulting national government, other public bodies, businesses, citizens.	£101.1 mil. Driven by capital or consultancy costs for implementation	Health & well-being Environment Related CEP action: TR09	Resistance from freight organisations, road users and local businesses; Disproportionate impact on vulnerable residents and SMEs; Risk of redirecting traffic to other roads, cutting off essential routes without sufficient alternatives are provided (e.g. feeder bus services); Lack of space or loss of space providing other source of revenue (e.g. parking spaces); Insufficient modal shift despite provision	C01-02, T01-04, T15-17

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
T03	**Making walking & cycling accessible, comfortable and safe**	Expand cycle parking provision across the region, including hubs at major rail and bus stations and secure storage in residential areas, and catering for a range of bike types (including cargo bikes). Where possible, implement demarcated or physically segregated cycling lanes to ensure rider safety. Provide interest-free grants or rent-to-purchase schemes for bicycles. Encourage and facilitate local cycling groups, especially those that encourage diverse identity groups to gain skills and confidence with cycling. Walking should be supported by catering for all users needs and addresses challenges of accessibility, comfort and safety through well designed infrastructure, lighting and route planning/finding.	Ongoing To be complete in 2038	CA leads on implementation. This includes collaborating with WY Mayor, Local Authorities, non-profit organisations; and consulting other public bodies, businesses.	£20 mil. Driven by capital or consultancy costs for implementation	Health & well-being Environment Related CEP action: TR04, TR05	Lack of space or loss of space providing other source of revenue (e.g. parking spaces); Insufficient modal shift despite provision	T01, T04-07, T15, T18
T04	**Implement a regional programme for supporting transition to low emission vehicles**	Install EV infrastructure based on the Local Electric Vehicle Infrastructure (LEVI) Capital Scheme across the five Local Authority Areas, by facilitating proposals and implementation. Provide financial incentives for low emission technologies and to encourage behaviour change. This could include purchase grants and/or low/no-interest loans for electric cars and vans, as well as scrappage schemes to incentivise modal shift or electric vehicle uptake.	Ongoing To be complete in 2038	CA leads on implementation. This includes collaborating with Local Authorities, national government; and consulting WY Mayor, other public bodies, businesses, non-profit organisations.	£1617.6 mil. Driven by capital or consultancy costs for implementation	Economic prosperity Essential public services Related CEP action: TR05	Power demand may require costly grid capacity upgrades; Challenge with finding pavement space; This may lock-in car use if not complemented by modal shift measures	C01-04, E01-02, E10-12, I06-07, T01, T05-06

Transport (3/8)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
T05	**Implement car-sharing schemes**	Increase the passenger efficiency of personal car or ride-hailing transport by encouraging car-sharing. This could be via facilitated networks for workplace carpools piloted at the Combined and Local Authorities, or encouraging local ride-hailing services and apps to add car-sharing options.	Start 2024 To complete in 2038	CA leads on implementation. This includes co-design with Local Authorities, businesses; collaborating with national government, other public bodies, citizens.	£1.5 mil. Est. 1 FTE to coordinate CA implementation	Environment Economic prosperity Related CEP action: TR05	Lack of uptake; Lack of viable platforms or services to facilitate car/ride-sharing	C01-04, T01-03, T10, T12-15
T06	**Feasibility studies and pilots for sustainable freight**	Assess feasibility and implement trials of freight modal shift to rail, consolidation and sustainable last mile delivery (including cycle freight and electric road vehicles), switching to low emission vehicles. Encourage the consolidation of local freight by encouraging local warehousing and distribution centres. Investigate and act upon location opportunities to implement hydrogen refuelling, especially for long-distance heavy goods vehicle (HGV) freight.	Ongoing To be complete in 2030	CA leads on implementation. This includes collaborating with WY Mayor, national government, other public bodies, businesses.	£1.1 mil. Driven by capital or consultancy costs for implementation	Economic prosperity Related CEP action: TR01	Loss of space that could generate alternative revenue; Insufficient uptake from businesses to sustain commercial operation; Insufficient scope for emissions impact through consolidation. Lack of rail capacity. Planning barriers.	C01-04, T01-03, T11-13
T07	**Promote seamless public transport with integrated ticketing, travel information and customer support**	Ongoing and proactive action to support, maintain and monitor flexible and integrated ticketing across services (e.g. standard ticketing across bus services, multi modal platforms, rail services etc). Ensure alignment of timetables (where relevant) to increase efficiency of sustainable transport and work with providers to reduce fares affordable and good value to support the service being an attractive alternative to private cars.	Ongoing To be complete in 2039-2050	CA leads on implementation. This includes co-design with WY Mayor, Local Authorities; collaborating with other public bodies, businesses; and consulting non-profit organisations.	£10k Driven by capital or consultancy costs for implementation	Health & well-being Economic prosperity Inclusivity & civil society Related CEP action: TR06 TR07	Risk of alienating users less comfortable with technology if smart ticketing is used; Risk around data protection if smart ticketing is used	C01-04, T01, T08-10, T15-17

Transport (4/8)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
T08	**Protect and develop bus services and network**	Explore options to protect and deliver expanded and improved bus services across the region, as the region transitions to a reformed bus network. Development must work to deliver a more enhanced and inclusive bus network which meets the travel needs of different user types, improving connectivity and last-mile transit across all communities. This could include new routes, improved frequencies and longer services hours, as well as socially necessary services where there is no other alternative for travel. Where required, funding will also be directed to prevent service reductions or route cancellations. Policies and programmes should align with the Bus Service Improvement Plan (BSIP). It must also look for opportunities to integrate with other modes, including rail and mass transit as well as Park & Ride and Demand Responsive Transport.	Ongoing To be complete in 2028	CA leads on implementation. This includes collaborating with WY Mayor, Local Authorities; and consulting national government, other public bodies, businesses, non-profit organisations.	£339.1k Est. 1 FTE to coordinate CA implementation	Economic prosperity Inclusivity & civil society	Long process to establish; Risk of financial loss due to revenue gap if patronage drops; Dependency on overall bus reform to be implemented; Increasing operational costs; Requires operator and driver capacity to deliver	C01-04, T01, T05, T09-10, T14-17

Transport (5/8)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
T09	**Decarbonise bus fleets by 2036** NOTE: retrofit of diesel buses has not been modelled and recommended as an action.	Work with bus operators to decarbonise the bus fleet, including engagement to raise awareness of zero emission options (already complete for West Yorkshire) and strategic introduction of zero emission requirements in tendered services as part of bus reform. Mass transit should be a zero emission solution for delivering public transport options.	Start 2025 To complete in 2029	CA leads on implementation. This includes co-design with WY Mayor, businesses; collaborating with Local Authorities; and consulting other public bodies, non-profit organisations.	£16.4 mil. Driven by congtributor capital or consultancy costs for implementation	Health & well-being Related CEP action: TR06	Risk of low uptake despite engagement; Higher upfront costs for operators	C01-04, T01, T08, T10, T18
T10	**Financial assistance for public transport**	Mobility credit for low income residents to use for public transport and shared transport options (such as car clubs, bike share and cargo bike hire schemes); including the continuation of Mayor's Fares.	Start 2025 To complete in 2038	CA leads on implementation. This includes co-design with WY Mayor, Local Authorities; collaborating with other public bodies, businesses; and consulting non-profit organisations.	£101.2 mil. Driven by capital or consultancy costs for implementation	Health & well-being Economic prosperity Inclusivity & civil society	Lack of space or loss of space providing other source of revenue (e.g. parking spaces); Insufficient modal shift despite provision Affordability	C01-02, T01, T04, T12-17
T11	**Engage with local fleets and businesses to co-design vehicle charging infrastructure**	Engage with local van and HGV fleets to understand their plans and to ensure that refuelling infrastructure is in place to support them. Opportunities to support joint procurement to address vehicle supply chain can be explored.	Ongoing To be complete in 2028	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with Local Authorities; and consulting WY Mayor, businesses, non-profit organisations.	£339.1k Est. 1 FTE to coordinate CA implementation	Economic prosperity	Vehicle and infrastructure supply and certainty currently limit uptake; Higher upfront vehicle costs for operators	C04, E01-03, T01, T03, T06

Transport (6/8)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
T12	**Work with LAs on implementing sustainable transport solutions**	Convene LAs to establish how to use local planning policy to incentivise delivery of measures. Likely levers include: • Requiring minimum standards for new developments on number of EV chargepoints and secure cycle parking • Facilitating mixed use developments, which enable sustainable travel through: high accessibility to services by public and active travel (e.g. '15 minute neighbourhoods '), incentives for residents to use public and shared transport, low access to private car parking • Coordinating zero emissions zone (ZEZ) initiatives and activities such as car-free high street weekends across the region(s) • Investigating and acting upon opportunities for park-and-ride services in coordination with bus networks, especially for travel between LA areas	Ongoing To be complete in 2038	CA leads on convening and advocacy. This includes co-design with other public bodies; collaborating with Local Authorities; and consulting WY Mayor, national government, businesses.	£1.3 mil. Est. 1 FTE to coordinate CA implementation	Economic prosperity Essential public services Inclusivity & civil society Related CEP action: LE04	Requires sustainable transport options to be in place; Relocating services away from existing city or town centres reduces potential benefits to those centres; Risks conflict with existing local plans. Public acceptance.	C02-04, E01-02, T01-06, T15-17

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
T13	**Engage with LAs on Council fleet electrification**	Work with LAs and other local public sector stakeholders (e.g. West Yorkshire Police, NHS, schools) to lead by example by developing and implementing roadmaps to convert their own fleets to zero emission vehicles and to address emissions from 'grey fleets' e.g. travel policies to discourage car use, partnership with car clubs, purchasing low emission pool vehicles etc	Start 2024 To complete in 2032	CA leads on convening and advocacy. This includes co-design with ; collaborating with WY Mayor, national government, other public bodies, businesses.	£676.7k Est. 1 FTE to coordinate CA implementation		Risk of inaction; High upfront costs of vehicles; Transition limited by suitability of current zero emission vehicles for some vehicle types	C02-03, E01-03, T01, T03, T06, T11-14
T14	**Engage with LAs on sustainable employee travel**	Work with LAs and local employers to assess staff travel needs and to implement policies and high impact schemes that reduce emission, including: flexible working, offering cycle to work schemes, car-sharing, public transport ticketing options etc.	Start 2024 To complete in 2027	CA leads on convening and advocacy. This includes collaborating with national government, other public bodies, businesses; and consulting WY Mayor, Local Authorities, non-profit organisations.	£264.5k Est. 1 FTE to coordinate CA implementation		Resistance or lack of buy in from local businesses with low modal shift as a result	C02-03, E01-03, T01, T03, T06, T11-14
T15	**Advocate for increase accessibility and engagement for sustainable and equitable transport networks**	Influence Government and relevant key stakeholders to deliver policy and support that supports climate ambition, including: • Increased devolution powers to give greater control over rail to the region • Ensure rail industry reform increases responsiveness, accountability and cost-effectiveness. • Produce a national decarbonisation strategy for aviation • Introduce a frequent flyer levy • Consider expanding rail services from the North to mainland Europe (e.g. sleeper services) to offer replacement to air travel	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; and consulting WY Mayor, businesses, citizens.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Economic prosperity Related CEP action: LE04	Risk that influencing does not deliver outcome desired or sufficient support to assist delivery; Risk that national priorities differ from those at local level	C01-04, B07, E01, E10, I11, L11

Transport (8/8)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
T16	**Engagement and advocacy on rail productivity and decarbonisa-tion**	Engage with rail industry and government to establish rolling programme of electrification and other rail capacity increases, to increase productivity / capacity / cost-efficiency while eliminating carbon emissions, so encouraging and enabling cost-effective modal shift of passengers and freight. This includes accelerating the decarbonisation of rail, including funding and implementing a rolling programme of electrification where feasible, exploring and/or trialling hydrogen trains, and opportunities for additional measures such as reopening lines, improving signalling, junction improvements etc with TfN, Network Rail and rail operators.	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with Local Authorities, national government, other public bodies; and consulting WY Mayor, businesses, citizens.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Economic prosperity Related CEP action: TR02	Risk that influencing does not deliver outcome desired or sufficient support to assist delivery; Risk that national priorities differ from those at local level	C01-05, T01-10, T17, T18
T17	**Public education on the benefits of public transit & active mobility**	Engage with the public via events and communications on the climate and personal benefits of using public transport, walking and cycling instead of personal vehicles. These engagements are also data and feedback collection opportunities to inform the implementation of other transport actions.	Start 2025 To complete in 2039-2050	CA leads on implementation. This includes co-design with Local Authorities, non-profit organisations, citizens; collaborating with WY Mayor, businesses; and consulting other public bodies.	£9.2 mil. Est. 3 FTE to coordinate CA implementation	Health & well-being	Risk of low impact on behaviour or in delivering overall strategy	C01-04, T01-05, T07-10, T15
T18	**Sustainable transport planning and technical skills development**	Invest in training to develop local skills in zero emission road vehicle technology (installation, maintenance) and rail electrification	Start 2024 To complete in 2039-2050	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with WY Mayor, Local Authorities; and consulting businesses, non-profit organisations.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Economic prosperity Inclusivity & civil society	Insufficient uptake of training to meet market need	C01-02, B06-07, E13-14

Waste (1/3)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
W01	**Implement circular economy support**	Research and coordinate schemes to increase circular economy through local community networks for reuse and upcycling for local homes and businesses. Develop additional capacity in waste services and work in partnership with businesses to link those who have the waste with those who can use them. Investigate integration of circular economy models that provide business opportunities for SMEs. Investigate possiblity of adding a Library of Things to local public libraries.	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with Local Authorities; collaborating with WY Mayor, national government, other public bodies, businesses.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Economic prosperity Inclusivity & civil society	Needs a degree of behaviour change of both the public and other businesses	C01, C04, I03-04, I07, W02-07
W02	**Establish home food waste collection and local composting supply chain**	Work with LAs to use local plans and programmes to implement food waste segregation at home and collection infrastructure. This should also include engagement with local farmers, community organisations, and allotments to establish a local supply chain for composting from food waste.	Start 2024 To complete in 2030	CA leads on implementation. This includes co-design with national government, other public bodies; collaborating with businesses; and consulting WY Mayor, Local Authorities, non-profit organisations.	£499.7k Est. 1 FTE to coordinate CA implementation	Economic prosperity	Potential additional cost to LAs; Risk of low participation, especially by residents in shared properties such as flats	C01-04, L07, W04-07
W03	**Public education on waste reduction**	Awareness raising around waste reduction, recycling and increased waste separation, including separate food waste collection. Communication around local waste strategies and current/future waste disposal plans. These actions would ensure that EfW and AD EfW operate as the last option. Complement this policy by waste audits the determine the likely changes in waste steam availabilities.	Ongoing To be complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with Local Authorities; collaborating with WY Mayor, national government, other public bodies, businesses.	£3.1 mil. Est. 1 FTE to coordinate CA implementation	Environment Economic prosperity	Perceived dilemma between waste reduction and EfW facilities must be addressed; Multiple different targets and procedures in each LA may introduce challenges	C01-04, W01, W04-07

Waste (2/3)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
W04	**Regional commercial food waste strategy**	Develop and implement a regional strategy for supply-side reduction of food waste and single-use packaging, which utilises engagement with SMEs and large businesses to set informed targets, explore locally-relevant measures to deliver them, and culturally-specific ways of communicating to the general public	Start 2026 To complete in 2035	CA leads on implementation. This includes co-design with WY Mayor, Local Authorities; collaborating with national government, other public bodies, businesses.	£955.3k Est. 1 FTE to coordinate CA implementation	Economic prosperity	Risk of strategy and identified measures not delivering the level of change required eg poor uptake among residents and rural businesses	C01, C04, I03-04, I07, W03, W05-07
W05	**Sustainable materials procurement for Council assets**	Adopt a green public procurement scheme relating to industrial products such as glass, chemicals, food and drinks, cement, asphalt, ceramics, lime, etc. Construction materials for council owned buildings can also be added. Ideally benchmark carbon intensities and framework nationally led and regionally implemented, but regional leadership may accelerate if needed.	Ongoing To be complete in 2030	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; collaborating with businesses; and consulting WY Mayor, Local Authorities, non-profit organisations.	£784.6k Est. 1.5 FTE to coordinate CA implementation	Environment Economic prosperity Related CEP action: BI04	Likely to introduce significant administrative burden requiring regularly updating practices; High costs if no national scheme is developed; Risk of setting benchmarks too high or low	C02-05, B02-03, E01-07, T01-03, T12-14, W06
W06	**Implement Authorities' catering and food waste procurement strategy**	Implement food purchasing policies for the public sector that reduce red meat and dairy and reduce waste. This can include: • Purchasing locally where possible and using 'imperfect' produce where offered • Requiring fully plant-based options to be available for all public sector catering menus, including schools, with the share increasing over time • Offering different portion sizes in public canteens	Start 2025 To complete in 2030	CA leads on convening and advocacy. This includes co-design with national government, other public bodies; collaborating with businesses; and consulting WY Mayor, Local Authorities, non-profit organisations.	£551k Est. 1 FTE to coordinate CA implementation	Economic prosperity Environment Health & Well-being	Risk of resistance from employees, parents, and meat and dairy industry; Risk that low behaviour change outside of public sector settings (e.g. school meals do not translate to a shift to more plant-based diets in later life)	C02, W03, W05

Waste (3/3)

ARUP

Action No.	Thematic action title	Action detail	Timeframe	Stakeholder roles	Estimated cost & resourcing	Co-benefit themes & key impacts	Risks & barriers	Action interdependence
W07	**Engagement with SMEs on circular economy practices**	Information and social campaigns to reduce waste, increase recycling rates and incentivise circular industrial products including food and drinks. Promote SMEs using circular economy principles. Adapt the programme as new circular products become available or new labelling schemes emerge. Try to increase public acceptance of such technologies and help project developers with their public outreach and consultation programmes.	Ongoing To be complete in 2038	CA leads on implementation. This includes co-design with WY Mayor, Local Authorities; collaborating with national government, other public bodies, businesses.	£2.6 mil. Est. 2 FTE to coordinate CA implementation	Economic prosperity Essential public services Inclusivity & civil society	Require unbiased approach; Challenges around public interest, understanding and acceptance; Difficult to directly measure policy success	C01-04, I03-04, I07, W01, W04
W08	**Engage with waste service providers on decarbonisation solutions**	Work with LAs and local waste and wastewater management service providers to understand decarbonisation solutions across services, operations and processes. Review contracts for opportunities to implement solutions or pilot projects.	Start 2026 To complete in 2039-2050	CA leads on convening and advocacy. This includes co-design with Local Authorities, businesses; collaborating with national government; and consulting WY Mayor, other public bodies.	£2.8 mil. Est. 1 FTE to coordinate CA implementation	Health & well-being Environment Economic prosperity	The scheme may introduce administrative and financial burden considering the number of stakeholders; Unique solution needed for each contract and type of waste disposal	C02-03, E06, E08, I03-07

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Section 7

Investment in climate actions

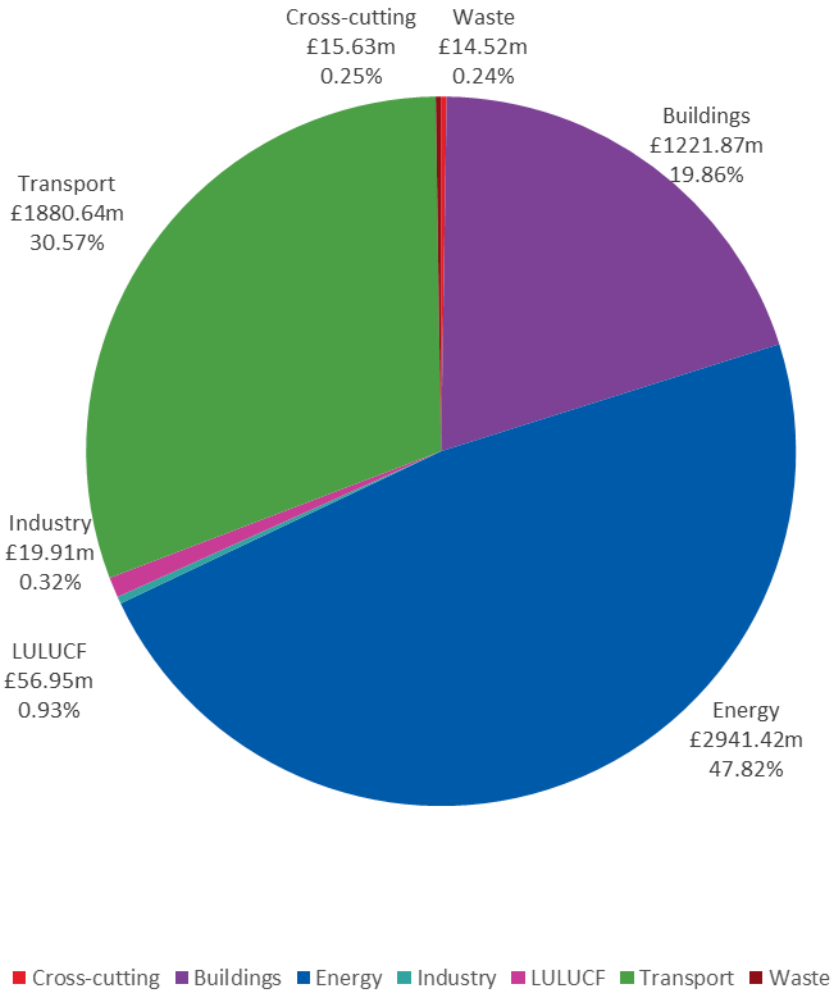
Investment benchmarks for climate actions in the sector plans aims to provide high level information for every action the Combined Authority and Local Authority partners could consider taking forward in the West Yorkshire Climate and Environment Plan. This analysis could be used to inform consideration of investments as part of the Combined Authority business case approval process

Each thematic action in the action plans were assigned estimated, benchmark costs based on the estimated resourcing required (in terms of Full Time Employee (FTE)) at 3 levels of grading provided by the Combined Authority, as well as potential revenue/capital costs of the action. The costing analysis presented evaluates the financial impact of actions across the different sectors, amounting to a total investment of over **£6 billion**. When accounting for **lower limit uncertainty**, the cost is just **under £5 billion**, representing a **24% difference**.

	Investment	With uncertainty (lower limit)	% difference
Total	£ 6,150 million	£ 4,982 million	19%

The majority of investment is concentrated in sectors with the largest emissions contributions: **Transport**, **Buildings and associated Energy**. The analysis highlights the potential for **cost reductions** when accounting for **uncertainties**, offering valuable insights for future **financial planning** and **resource allocation**.

The investment is broken down into **Full Time Employee (FTE)** and **capital** in the next pages.



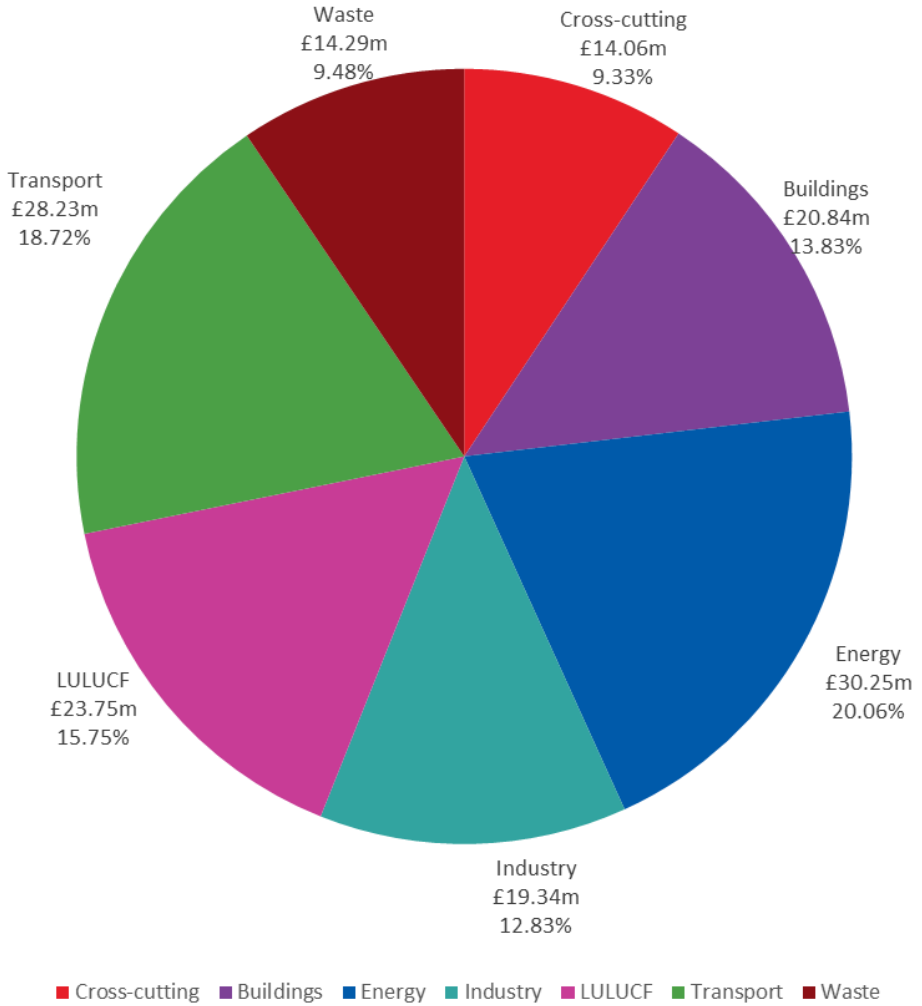
Staff cost observations

The distribution of FTE costs across all sectors is relatively balanced, with no sector dominating excessively.

The Energy sector, while having the highest share at 21%, is not overwhelmingly dominant, indicating that significant labour resources are required but not disproportionately so. Transport requires the second largest investment in staffing, with the Buildings, Industry and LULUCF sectors requiring between 12-16% of the total investment.

Cross-cutting actions by their nature, and Waste actions (based on the scope to act) require between 9-10% of the investment.

This relatively even distribution underscores the balanced approach taken to resourcing local climate actions to ensure all sectors have been considered as you plan to act on emissions reductions across all sectors.

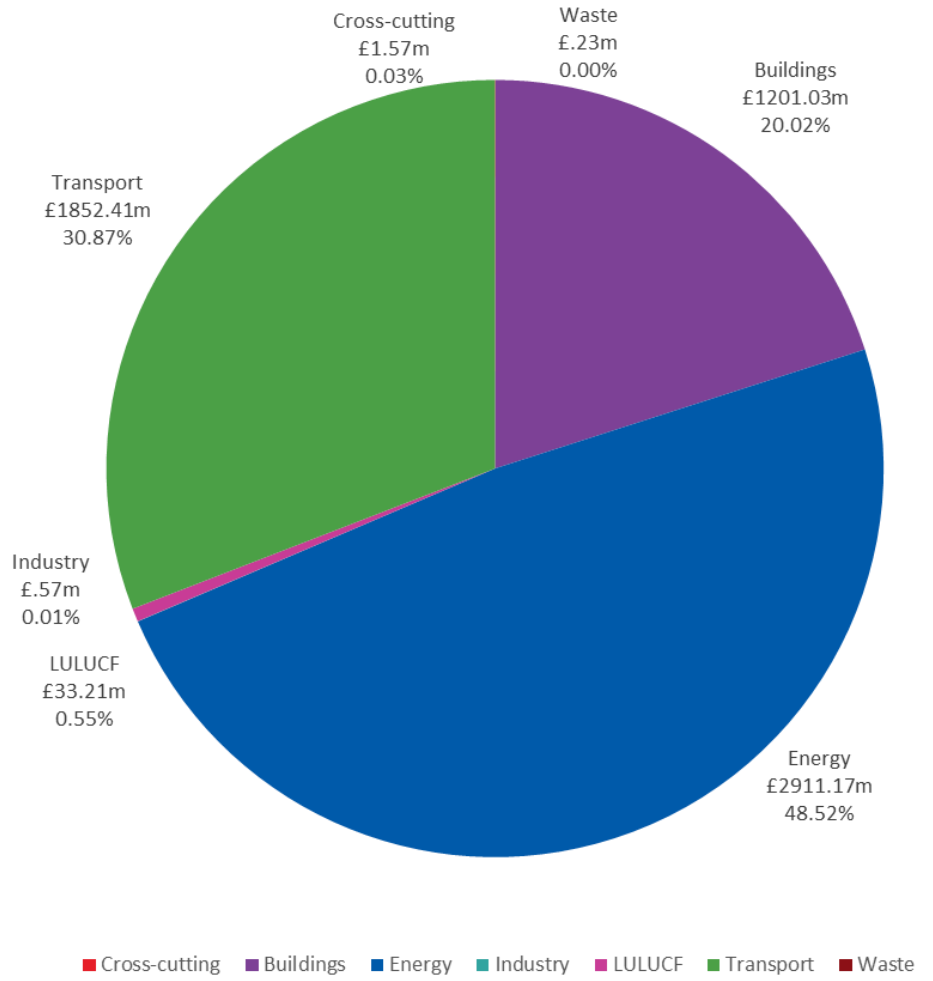


Capital cost observations

The capital investments are significantly higher and more varied compared to FTE costs. This category of costs also includes consultant costs to develop and publish strategies and implementation plans.

The associated Energy investment accounts for nearly half of the total capital investment at 49%. This contrasts to FTE costs and results in the reliance on substantial infrastructure investments to reduce emissions. The Transport sector also shows a high capital expenditure at 31%, reflecting the extensive infrastructure and equipment required for transportation projects. Buildings account for 20% of the capital costs, which, while significant, is more balanced with FTE compared to the associated energy and transport.

In contrast, sectors like Cross-Cutting, Industry, LULUCF & Agriculture, Industry have minimal capital investment based on the proposed actions, collectively making up less than 2% of the total. This suggests that the actions the Combined Authority could consider taking to reduce emissions in these sectors are less capital-intensive and more on human resources to inform and influence change.



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Section 8

Feasibility implementation framework

The feasibility implementation framework will support the CA to assess if actions are ready for implementation and identify high level mitigations to improve the feasibility of actions

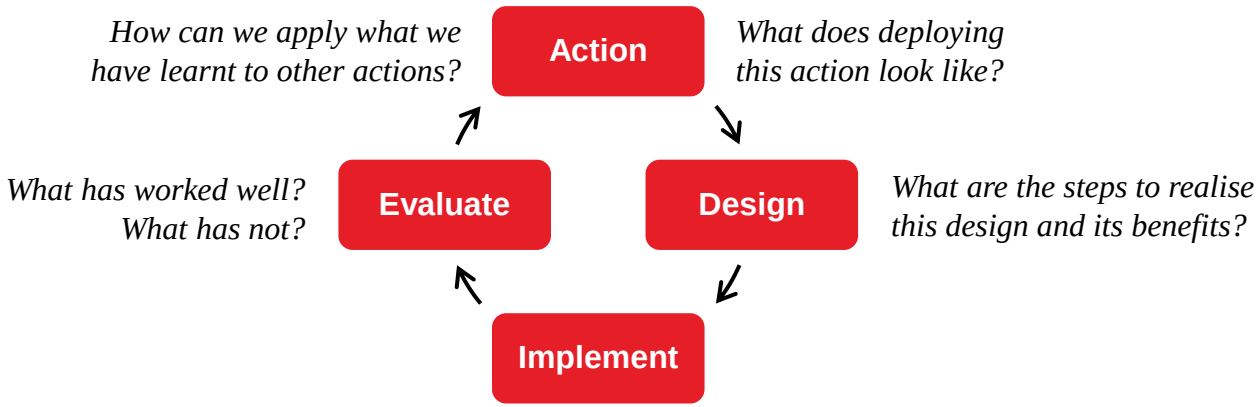
Each action should be analysed for its feasibility of implementation, indicating how straightforward or challenging it could be to implement. This will allow the Combined Authority to prioritise actions as well as recognise enablers needed to unlock the action, and the resulting outcomes and benefits.

The feasibility criteria for this updated CERP 2 were developed around the following delivery considerations, tailored to the Combined Authority operational context:

- Is there clear ownership and accountability for the action?
- Is there clarity on who the key stakeholders and/or potentially vulnerable communities are in relation to the design, implementation and consequences of each action, and how they will be engaged across the stages of action?
- Is there alignment with priorities and policies to progress the action?
- Is the action clearly defined, understood and with confirmed financing?
- Where applicable, is the technological solution(s) to be implemented proven and appropriate for the local context?

Actions included in the sector action plans will have different levels of feasibility at this point in the development of climate actions. The feasibility criteria provide a way to understand potential action implementation readiness, whilst indicating specific feasibility barriers to overcome. A low feasibility assessed score for a specific criteria could also help to pinpoint an enabling action needed for implementation to be effective.

The framework is accompanied by possible mitigation actions for each feasibility criteria, suggesting potential governance, engagement, financing and technological readiness enablers to improve the feasibility of an action, leading to prioritisation, planning and implementation. As the majority of actions respond to a specific source of emissions, it is important to consider implementing as many actions as possible to significantly reduce emissions by 2038. It is also acknowledged that climate actions are often planned and implemented iteratively in practice, following an Action – Design – Implement – Evaluate cycle – adjusting details and adding enabling actions to realise the action and its benefits:



All criteria in the feasibility framework have been set with equal weighting. This could be varied in the future as the Combined Authority takes the actions forward into local implementation. We advise that any variation in weighting should be justified and documented for transparency.

Criteria definitions

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Implementation governance

CA action and asset ownership

Low	**CA nor LA do not lead the action nor own the asset(s)**
Medium	CA and/or LA will lead the action but they do not own the asset(s)
High	CA and/or LA leads the action and either own the asset(s)

Readiness of stakeholders for local engagement

Low	**CA/LA not in contact with relevant stakeholders and vulnerable communities**
Medium	CA/LA are aware of the relevant stakeholders, but have not engaged regularly with them
High	CA/LA are in regular contact with relevant stakeholders to engage, plan and implement

Political will

Political acceptability and support

Low	The action is not aligned with political and/or corporate priorities
Medium	The action is aligned with some political or corporate priorities, in the short to medium-term
High	The action is aligned political and corporate priorities over multiple political cycles

Community acceptance

Low	The action would have opposition with majority of the effected communities
Medium	The action would have mixed reactions from effected communities, depending on demographic
High	The action would be welcomed by the effected communities

Financing

Clarity of action definition

Low	**The action is not clear enough for financing confidence**
Medium	The action is currently being detailed
High	The action has a clear detail for financing confidence

Funding source(s) identified and secured

Low	**Funding source(s) not identified or available**
Medium	Funding source(s) identified but not available or secured
High	Funding source(s) secured

Technological readiness

Proven technology

Low	**The technology is not market-ready nor tested**
Medium	The technology has or is currently being piloted
High	The technology is proven in action and contexts similar to West Yorkshire (WY)

Local suitability

Low	**It is unclear if solution is suitable or appropriate for the WY context**
Medium	The solution needs to be adapted to the WY context
High	The solution is suitable and/or appropriate for the WY context

Key

CA	Combined Authority
LA	Local Authority

Suggested feasibility mitigation enablers

If an action shows low or medium feasibility in any of the criteria, these are the suggested local enablers to improve feasibility and effectiveness of implementation:

Implementation governance

CA action and asset ownership

- If the action or asset is not owned by CA, ensure that there is a clear lead department or working group
- Examine how existing operator or supplier contracts can be updated or renewed in alignment with action(s)

Readiness of stakeholders for local engagement

- Conduct stakeholder mapping to understand which national, regional and local stakeholders should be involved, consulted, or informed about the action's implementation
- Draft a plan with engagement methods appropriate and effective for the stakeholders

Political will

Political acceptability and support

- Analyse which existing and upcoming plans, programmes, people or political priorities within and external to the CA that the action can synergise with

General public acceptance

- Conduct stakeholder engagement analysis to understand the root rationale for public resistance
- Conduct community engagement via or with local organisations to understand and discuss the tensions raised by the action

Financing

Clarity of action definition

- Provide the mandate and resources for the lead and contributing departments to detail action implementation
- Engage with relevant stakeholders and conduct a gap analysis to understand what key details are needed for financial risk assurance
- Work with local communities to co-design the action and its implementation

Funding source(s) identified and secured

- Understand the detail required for identification and applying for financing
- Collate data as further justification for the need and design of the action
- Secure memorandums with public and/or private implementation partners
- Secure external expertise to assist with solution design and implementation
- Map out sectoral funding and grants available from regional and national bodies and private sources

Technological readiness

Proven technology

- Engage with private sector technology providers, academia and implementation experts to inform selection of technology for local context.
- Explore local pilot projects on Combined/Local Authority assets in collaboration with technology providers

Local suitability

- Conduct site surveys and/or community interviews to map suitability of technology solutions
- Analyse and communicate areas of infrastructure or systemic change needed for solution to be deployed
- Secure external expertise or resources for community stakeholder engagement as a means for building internal CA competence

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Section 9

Co-benefit value framework

The co-benefit value framework will allow the Combined Authority and local authority partners to qualitatively assess the acceptability of the proposed actions with regards to the co-benefits offered to local communities

Identifying and multiplying the co-benefits of climate action supports the implementation of an ambitious climate plan and programme. Taking climate action brings forward numerous benefits (economic, social and environmental), and can help with making the case and prioritisation of an action.

CERP 1 identified a range of co-benefits:

- Job creation and retention
- Support for local economy and Small Medium Size Enterprises
- Cost reduction for consumers and Local/Combined Authorities
- Health and air quality improvements
- Fuel poverty reduction
- Inclusive growth and social equity
- Waste reduction and increased circular economy efforts
- Knowledge creation and increased private research & development
- Increased ecosystem services and biodiversity improvement

The co-benefit value framework designed as part of the CERP 2 update builds on the co-benefits above, taking forward some reorganisation of the categories to ensure a balance of diversity and specificity, with this helping to ensure a wholistic recognition of the co-benefits of net zero actions across the region.

Each sector action was qualitatively mapped against the co-benefit value framework, noting a score of 1 for each co-benefit category that it is relevant to. Each action therefore has a score and distribution across the co-benefit categories, which can be aggregated at the level of sectors or overall CERP 2 evidence base. This provides an indication of how many actions – at both the individual and sectoral levels – deliver additional benefits to direct emissions reductions.

As with the feasibility implementation framework, actions and sectors that do not relate to as many co-benefit categories should not be immediately de-prioritised or removed. The score could be due to the specificity of an action with regards to its technical solution or focused use-case. These actions can be just as crucial for emissions reductions.

The co-benefit categories indicate opportunities to collaborate with communities and take local climate action at the neighbourhood level, monitor impacts and communicate the case for social, economic and environmental equity and just transitions for achieving net zero.

For the initial analyses, all categories in the co-benefit value framework have been given equal weighting. This may be varied in the future, according to Combined Authority needs. We advise that any variation in weighting should be justified and documented for transparency.

Categories

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Health & well-being

Air quality
Reduction in local PMx, NOx and SOx levels that results in health improvements for residents, flora and fauna

Public health & safety
Changes in the physical environment support better health and safety for residents

Mental well-being
Blue-green and social infrastructure to support mental wellness & health

Environment

Climate resilience
Increase in adaptive capacity to intensifying heat, rainfall and other climate risks

Water & soil quality
Improvements in the ecological & carbon sequestration functions of water bodies and soils

Biodiversity
Increase in functions and diversity of flora and fauna

Public green spaces
Improvements in the proximity, access and quality of and to green spaces

Economic prosperity

Skills & employment
New & secured opportunities for local green skills and/or employment

Income & poverty
Improvement in income levels & alleviation of social poverty

Cost of living
Reduction in cost of living and/or support for enhanced sustainable public services

Local SME growth
Opportunities for local small and medium enterprises (SMEs) to design and deliver solutions and benefits

Essential public services

Quality housing
Safe, energy efficient, warm & healthy homes

Accessible & affordable mobility
Improved access to clean and affordable transport options

Energy access & poverty
Increased access to reliable and affordable clean energy

Waste management & circular economy
Reduced waste & demand for resources via community and place-based circular economy networks

Inclusivity & civil society

Community representation & participation
Communities represented and participating in local actions & decision making, improving in statistics of included identities and groups

Reduced socioeconomic inequalities
Increased equity for communities, households, individuals and businesses via targeted support

Distribution of co-benefits across actions

The pie chart shows the aggregation of co-benefit scores across all actions, with the view of the distribution of benefits across the five themes and 17 sub-themes. The percentages show the proportion of actions scoring that specific co-benefit criteria.

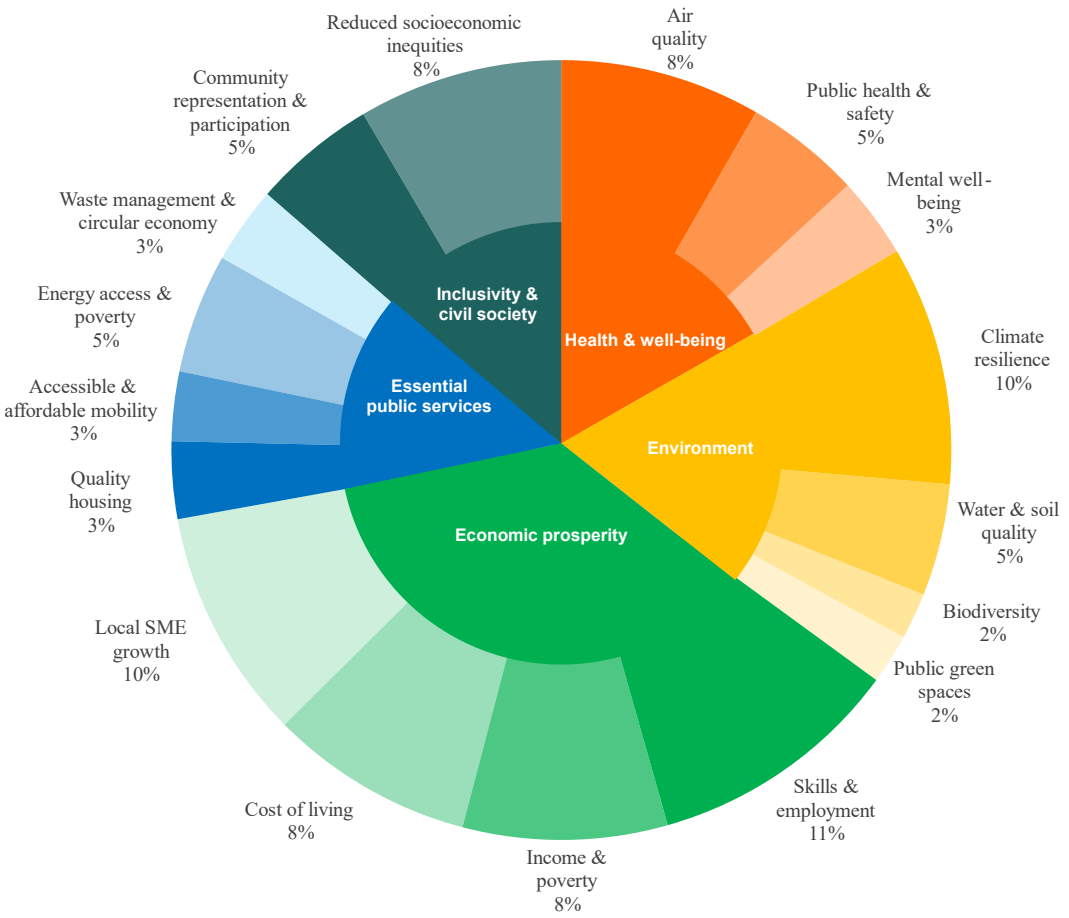
Across all the actions, there is a great potential for stimulating **economic prosperity** across West Yorkshire. This is due to skills development and employment opportunities. Cost of living could also improve via energy bill reductions and increased access to public and active transport.

Many actions also contribute to protecting and developing the region's natural **environment**. Increasing resilience against climate uncertainties and hazards, alongside climate and nature friendly land use and farming.

Air quality improvements are a majority contributor to **health and well-being** benefits, whilst local retrofit and enabling clean energy actions help to address energy poverty – amongst other considerations – in the provision of **essential public services**.

Inclusivity and civil society benefits include engagement with local communities, citizens and businesses, increasing community participation in neighbourhood, place-based climate action.

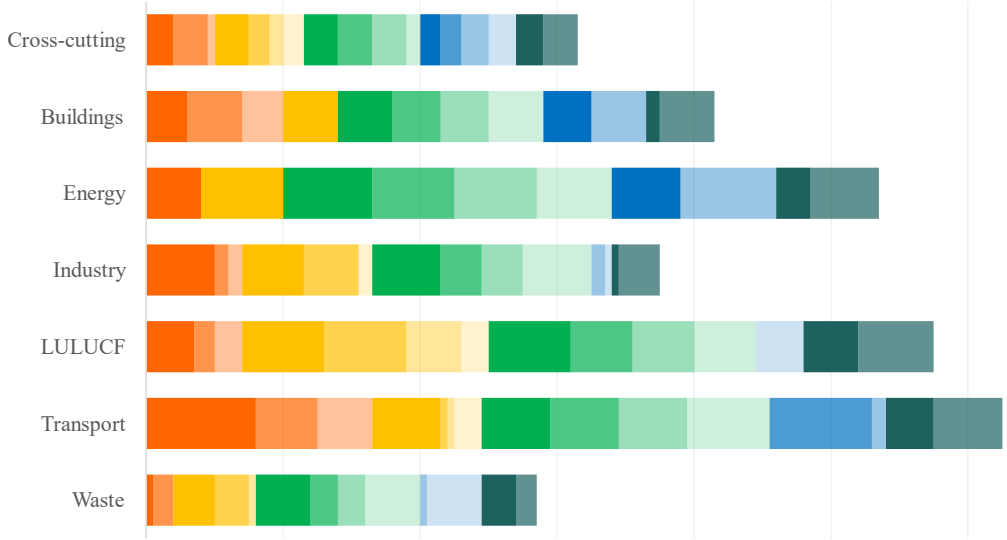
Overall distribution of co-benefit categories associated with actions



Sectoral observations

ARUP

Co-benefit categories associated with sectoral actions



Colour legend

Health & well-being	Environment	Economic prosperity
Air quality	Climate resilience	Skills & employment
Public health & safety	Water & soil quality	Income & poverty
Mental well-being	Biodiversity	Cost of living
	Public green spaces	Local SME growth

Essential public services	Inclusivity & civil society
Quality housing	Community representation & participation
Accessible & affordable mobility	Reduced socioeconomic inequalities
Energy access & poverty	
Waste management & circular economy	

The analysis at the sectoral level was done by aggregating the absolute score for each co-benefit category, for all actions within a sector. The graph on the left stacks the cumulative score for each co-benefit category for the sector. While this cumulative score does also have some relation to the number of actions (which are uneven across each sector), it provides a view of where the greatest co-benefit types might be.

Each sector's suite of actions emphasise different co-benefit categories due to their focus and relevance to different partners, stakeholders and groups in the region. We have noted key co-benefit opportunities for each sector, including the cumulative score for the co-benefit categories highlighted for the sector:

- **Cross-cutting**
  The co-benefits are mostly evenly-distributed according to the aggregated distribution for all sectors, due to the general and enabling nature of the actions.
- **Buildings**
  Due to the actions' focus on improving the quality of housing stock, there is a great potential for public health & safety (8) co-benefits related to climate resilience (8) via adaptative capacity and thermal comfort through housing quality (7) retrofits that address energy access & poverty (8) and reducing socioeconomic inequalities (8). Development of skills & employment (8) is also expected to meet the needs of implementation at pace.

Sectoral observations

ARUP

- **Energy**
  The actions address energy access & poverty (14) benefits the most; leading to other related co-benefits of income & poverty (12) and cost of living (12), reducing socioeconomic inequalities (10), and climate resilience (12) due to improved security and affordability of energy, and air quality (8) co-benefits via transition to renewable energy. There is also a great opportunity to grow green skills & employment (13) and local small and medium enterprise (SME) growth (11) in the region to support sustainable and efficient energy infrastructure.

- **Industry**
  This sector's actions generate co-benefits related to local commerce; particularly skills & employment (10) and local SME growth (10), as well as climate resilience (9). Additional co-benefits related to air quality (10) and water & soil quality (8) should also be expected with improvements in energy and material efficiency, and the decarbonisation of local industrial operations.

- **Land use, land-use change and forestry (LULUCF) & agriculture**
  The actions contribute greatly to climate resilience (12), water and soil quality (12), and biodiversity (8); as well as focused development of skills and employment (12) and reducing socioeconomic inequalities (11) by ensuring a just climate transition in the land use and agriculture sector.

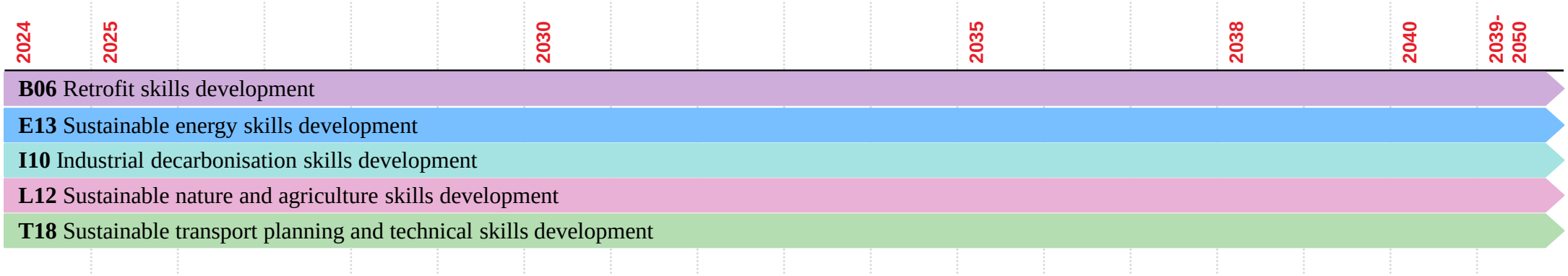
- **Transport**
  The mode-shift and transport electrification actions contribute greatly to air quality (16) and climate resilience (10). Increased accessible and affordable mobility (15) addresses local challenges around income & poverty (10) and cost of living (10) and reducing socioeconomic inequalities (10). There is also sizeable potential for local SME growth (12) by their participation in designing and implementing solutions with the Combined and Local Authorities.

- **Waste**
  The actions support the local self-development of waste management and circular economy (8) networks, as well as local SME growth (8) stimulated by skills and employment (8) to support waste diversion and material efficiencies.

This analysis highlights that the enabling Energy, Land Use & Agriculture, and Transport sectors offer the greatest co-benefit opportunities.

All of the co-benefits identified at action and sector levels could help to support the case for investment in ambitious climate action by the Combined Authority and local partners.

Local skills development to support sectoral interventions



Sectoral skills development actions

Interventions to grow the pools of skilled green jobs across West Yorkshire are included across the sectoral action categories. The types of skills for employment in these sectors include and are not limited to:

- Technical and applied engineering skills to retrofit homes, commercial building and industrial facilities to be more energy efficient and manage temperatures – including fixtures, wall insulation and decarbonised heating solutions.
- Energy planning and engineering skills to support the implementation of decarbonised energy generation and distribution infrastructure, including distributed renewable energy such as rooftop solar PV.
- Emissions inventory and modelling skills for the planning and implementation of emissions reduction measures in industrial facilities and operations.
- Forestry, agriculture and land-management skills to monitor environmental and soil quality, as well as to implement nature-based solutions to sequester carbon and respond to intensifying climate risks.

Wherever possible, training opportunities for such skills should be increased in local educational institutions such as technical colleges and universities. Primary and secondary school education should also be integrated with sustainability considerations. This would increase young people's multi-disciplinary awareness of how they can contribute to responding to anthropogenic climate change, but also the STEM, administrative and governance sector employment opportunities according to their skills and sectoral interests.

Strengthening small and medium enterprises (SMEs) and start-ups

The pipeline of sustainability talent in West Yorkshire increases the implementation feasibility of climate interventions in the region. It also both supports and necessitates the development of SMEs and start-ups in the region – especially those concerned with transitioning towards more sustainable products and services, involved in the technical and technological delivery of climate action, and developing new and unique climate solutions in the region. One example of this would be local start-ups for bike- or electric vehicle-sharing initiatives, or resident networks to practice circular economy principles at the community level.

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Section 10

Engagement with net zero initiatives & stakeholder analysis

Regional Synergies

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Regional synergies to engage with have been identified in West Yorkshire, as well in neighbouring authorities, cities and the wider Yorkshire and North East regions, categorised by ‘people’, ‘plans’, ‘places’ and ‘programmes’.

People = organisations with carbon reduction interests or those undertaking activities which support climate action and carbon reduction.

Plans = documented plans, initiatives or strategies by organisations which support climate action and carbon reduction.

Places = geographical areas where carbon reduction activities, led by people and their plans, are taking place.

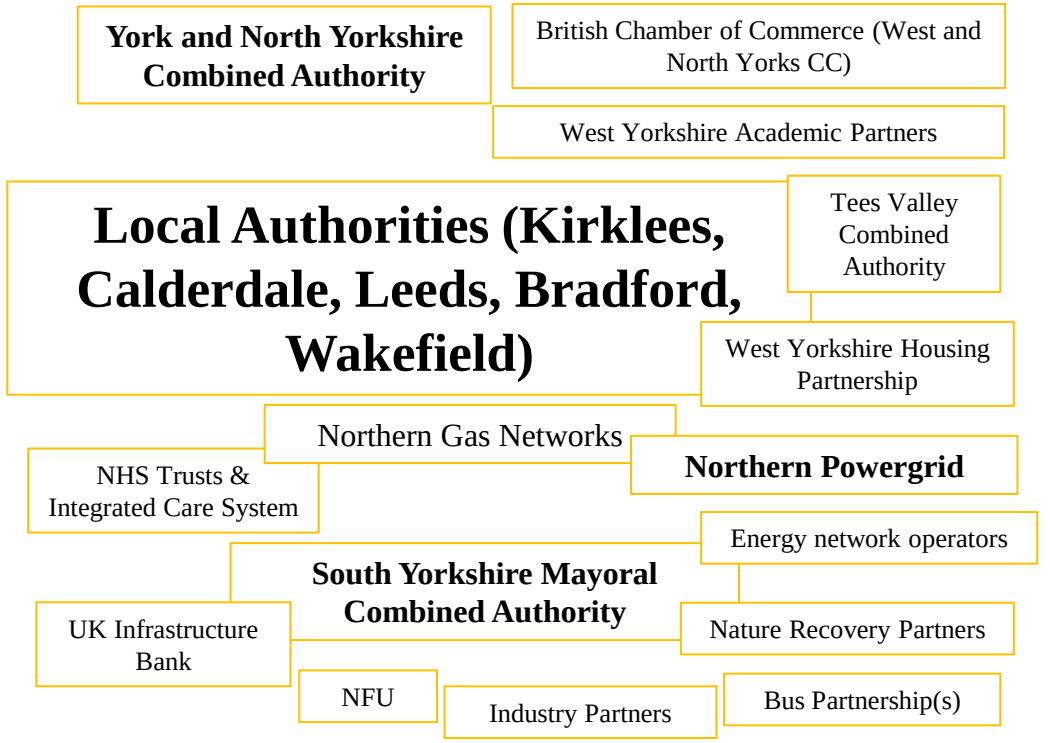
Programmes = strategic activities comprised of numerous projects, spanning across the region – or across multiple regions.

The synergies have been identified because they support the sector action plans. Following a review of the actions, a desktop study was undertaken to review publically documented policies, strategies and plans and to identify the links between these and the action. Synergies have been identified across the sectors in scope, as well as those which apply to more than one sector - these have been categorised as ‘cross cutting’ synergies.

Whilst not a finite list, the CERP 2 actions and the associated synergies indicate where connections can be made and partners can be engaged to make progress with reducing emissions across the region.

Word clouds on this and the following slides illustrate the synergies with key **people** identified through this exercise, across the six sectors and those which ‘crosscut’. The size of the text in the word cloud is relative to the number of action areas identified with ‘people’. The larger the text, the more actions align with this organisation. The importance of the organisation has not been analysed as part of this study – and therefore the size of the word cloud text does not indicate importance. A full list of the synergies identified can be found in ‘WY_CERP 2_Action_Data’ excel file.

Cross-cutting Stakeholders



Regional Synergies – People

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Land Use and Agriculture

- **Yorkshire Wildlife Trust**
- **NFU**
- DEFRA
- Moors for the Future
- Yorkshire Peat Partnership
- National Parks Authority
- UK Infrastructure Bank
- **Local Authorities (Kirklees, Calderdale, Leeds, Bradford, Wakefield)**
- Natural England
- White Rose Forest

Buildings

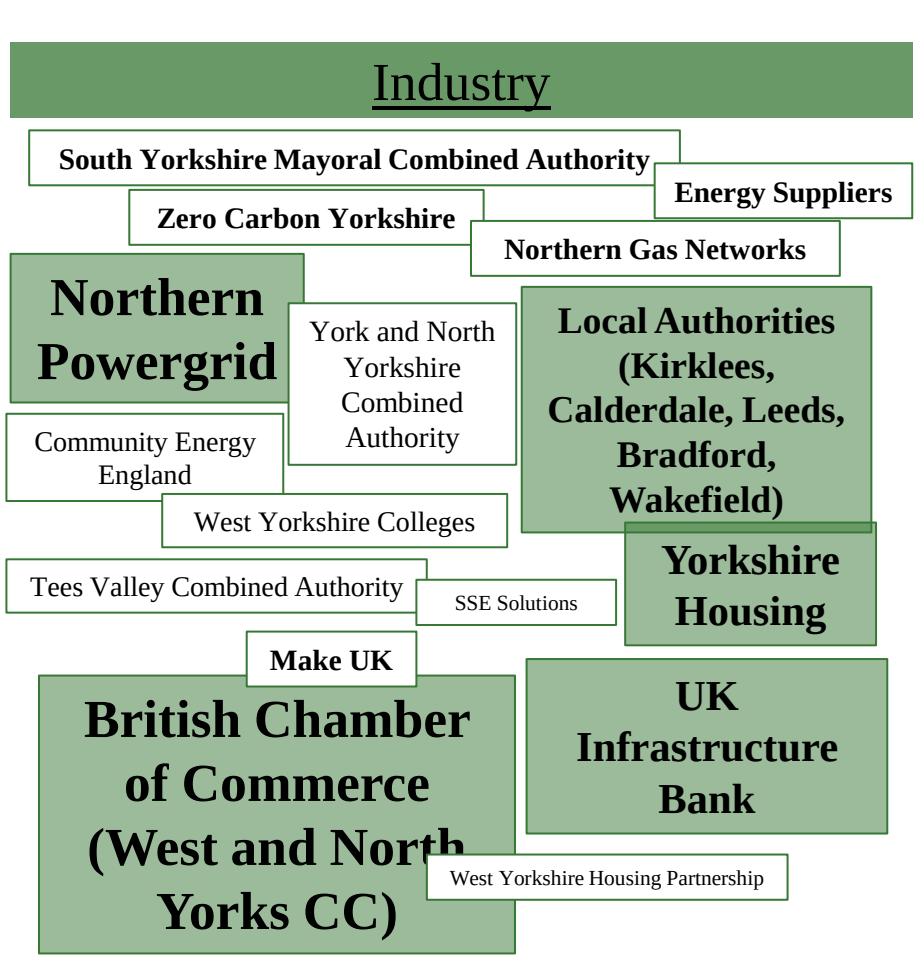
- Homes England
- **DESNZ**
- Groundwork Leeds
- LGA
- National Retrofit Hub
- West Yorkshire Housing Partnership
- **Local Authorities (Kirklees, Calderdale, Leeds, Bradford, Wakefield)**
- Industry Partners
- West Yorkshire Strategic Place Partnership
- **Innovate UK**
- UKGBC
- West Yorkshire Consortium of Colleges

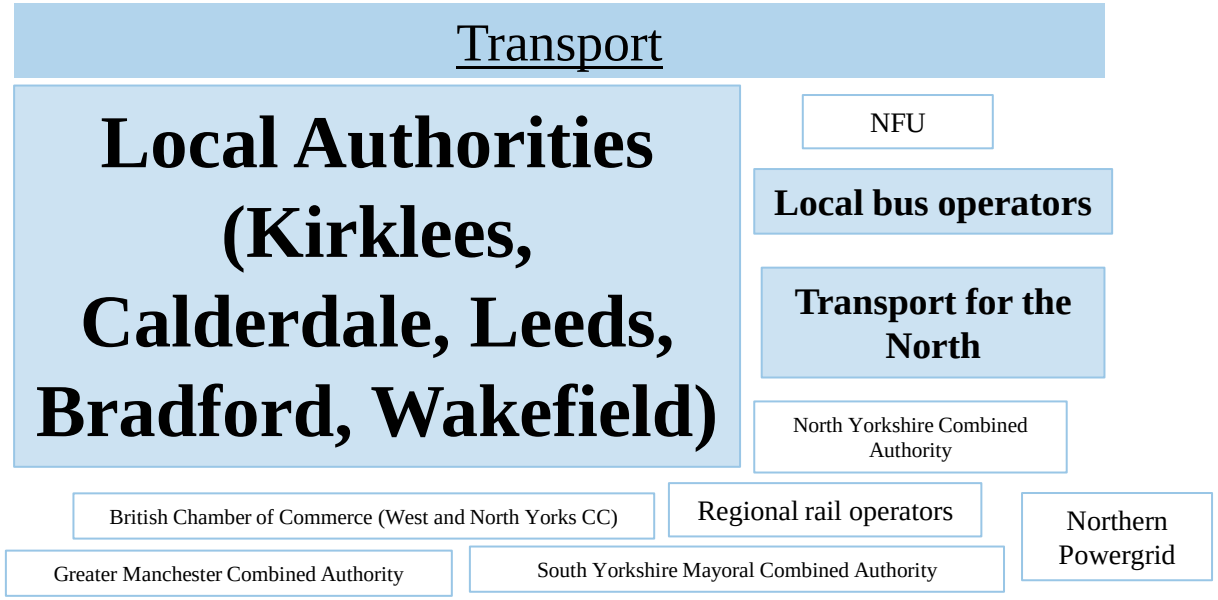
Waste

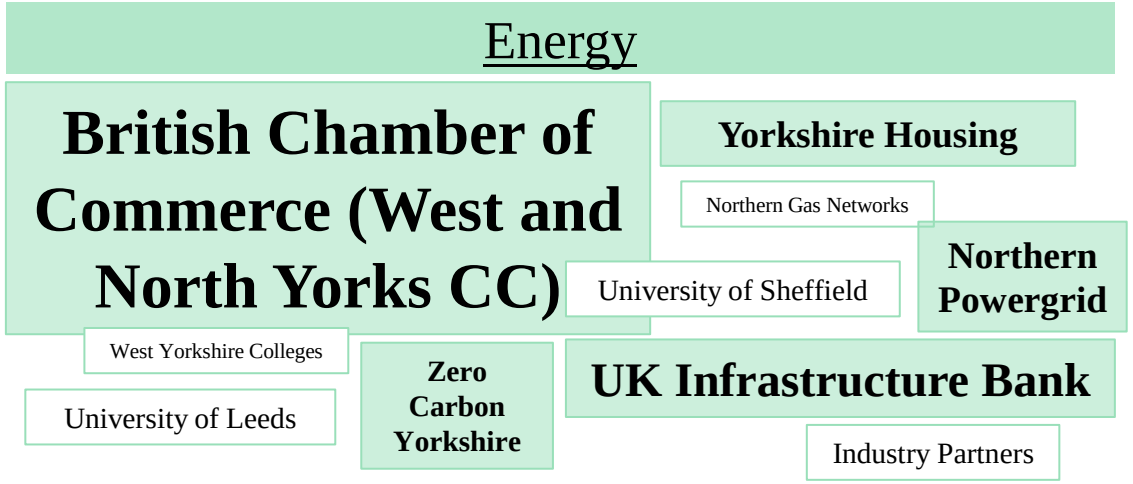
- **Transport for the North**
- Yorkshire Wildlife Trust
- Yorkshire and Humber Climate Commission
- Yorkshire Circular Lab
- FoodWise Leeds
- York and North Yorkshire Local Enterprise Partnership
- South Yorkshire Mayoral Combined Authority
- **Local Authorities (Kirklees, Calderdale, Leeds, Bradford, Wakefield)**

Regional Synergies – People

ARUP





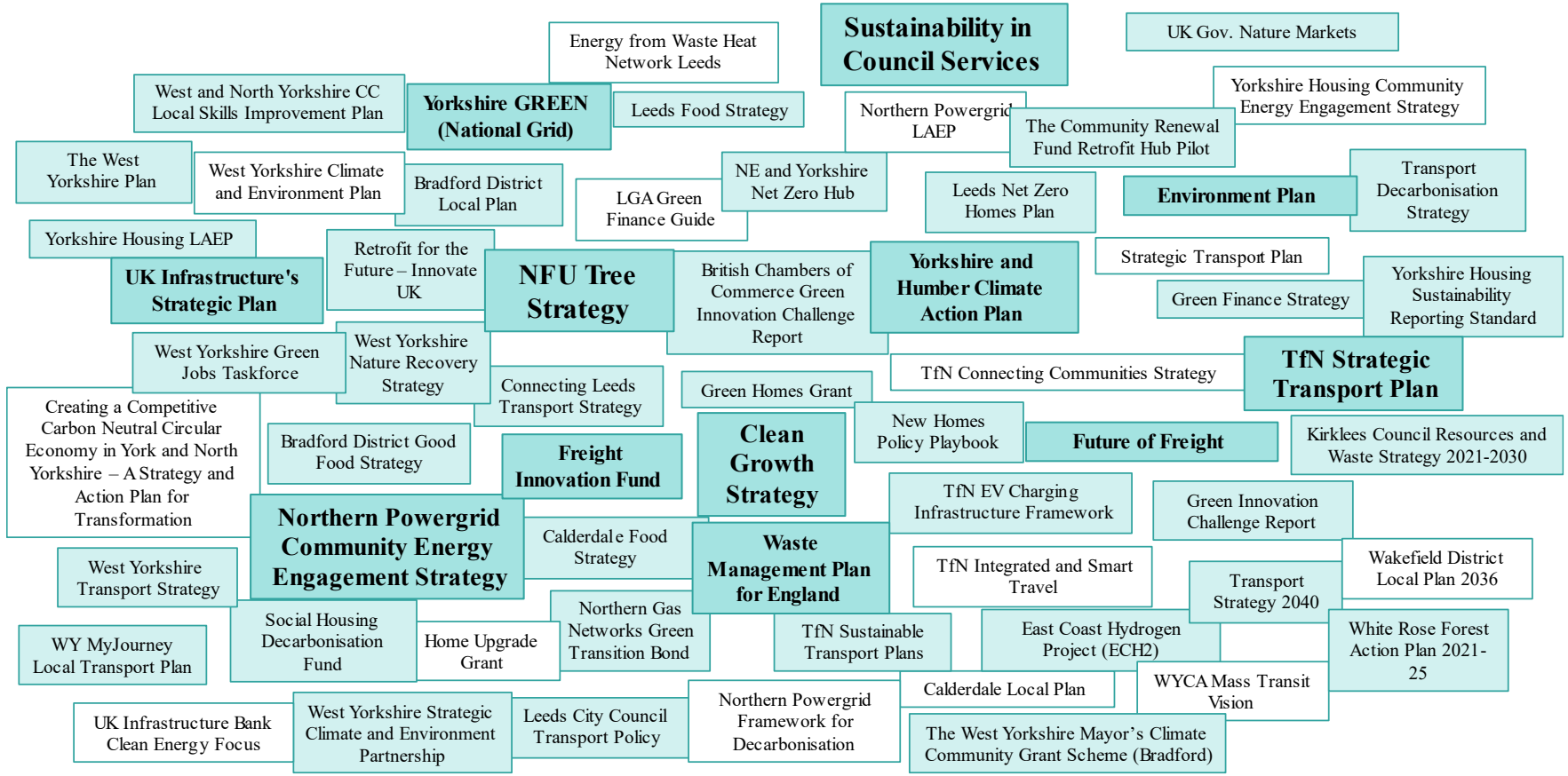


Regional Synergies - Plans

This word cloud illustrates the synergies with key **plans** in the region and beyond.

As with the previous word clouds, the size of the text in the word cloud is relative to the number of CERP 2 action areas identified with these plans. The larger the text, the more action areas align with the plan.

A full list of the synergies identified can be found in 'WY_CERP 2_Action_Data' excel file.



Stakeholder Engagement Analysis

As part of the update to the CERP, the Combined Authority selected key stakeholders to engage with. Key stakeholders in the region were invited to attend an informal interview hosted by Arup. The aim of the interviews were to understand their priorities and commitments in relation to the net zero agenda for the region, gather information on the measures and interventions they are taking forward and, identify opportunities and challenges they face in contributing to the region's net zero goal. Focus of the engagement was in relation to the Combined Authority's interaction with stakeholders, as opposed to individual Local Authority engagement.

During the stakeholder engagement phase of the update the following organisations were interviewed:

- Transport for the North
- Yorkshire Housing
- Northern Powergrid
- Northern Gas Networks
- West and North Yorkshire Chamber of Commerce
- National Farmers Union (NFU) and NFU Energy
- UK Infrastructure Bank

A summary of the stakeholder interviews has been provided in the following slides, along with some analysis of their existing net zero commitments, areas of influence for the Combined Authority to consider, and opportunities for impact and success from prioritising regional stakeholder engagement.

Transport for the North

ARUP

Proposed pathway measures to Net Zero (General/Regional)

- Targeted policies and regulations on vehicle sales, mode-shift, demand reduction and improved fuel efficiency.
- To make meaningful change, wider considerations for reform of transport should be made e.g. social exclusion. Equity and economic importance of sustainable transport has a big role to play in decarbonisation.
- Management of vehicles and providing more choice for users.
- Strategic Transport Plan focuses on social inclusion for transport, and this will be reflected in TfN's updated decarbonisation strategy.
- Action should be place based e.g. focus on electric vehicle (EV) charging points in areas where there is already higher uptake.
- Provide more options for ways of travel and incentivise them – it's not about reducing distances travelled.
- Move away from mode specific funding.
- *"if we get to 2050 and we've got a diesel bus fleet, but everybody's using it, it will be in a pretty good place"*
- Need to investigate how National Highways and Network Rail can support integrated solutions.

Interventions Required in West Yorkshire

- Place based solutions – suited to both the urban and rural communities across the region.
- Increase distances by sustainable modes (most of which are on road), for example increase bus patronage on existing diesel bus fleets - not just a focus on zero buses as the decarbonisation solution.
- Clear and effective communication and marketing with the public and stakeholders on the benefits of net zero and decarbonisation to support the change and transition.

Opportunities

- Increased local ambition from local authorities, Combined Authority, industry and stakeholders.
- Would welcome an opportunity to attend CA Committee and present an update on their baseline, pathway and strategy for transport decarbonisation. Pathway and policies produced by November 2024, with public consultation from Summer 2025.

Challenges

- Lack of Clean Air Zone (CAZ) in Leeds.
- National conversation – demand management not publicly palatable at this time.

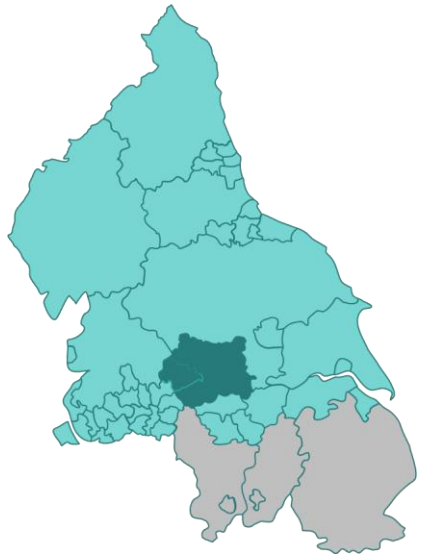
TRANSPORT FOR THE NORTH

2045 Near Zero Emissions target

Transport for the North (TfN) is a sub-national transport body in the north of England, which brings local transport authorities and business leaders together to inform local policy and drive investment.

TfN aspires to transform the North of England into a more socially inclusive region by 2050. This will be achieved through a transformed, near-zero emission, integrated, safe, affordable and sustainable transport system, which will enhance connectivity, support mode shift and resilience and improve journey times for all users

TfN's Transport Decarbonisation Strategy requires measures such as Zero Emission Vehicles, demand management and improvements to conventional vehicle efficiency in order to deliver on policy commitments.



Regional areas of operation

- Active
- W.Yorks

West Yorkshire Housing Partnership

ARUP

Proposed pathway measures to Net Zero (General/Regional)

- National and regional funding is being used to retrofit housing stock and ensure homes with an Energy Performance Certificate (EPC) rating of lower than C, are prioritised for retrofit improvements first with the aim of all homes achieving an EPC of C or above by 2030 – this is an ambition not a public committed target.
- The focus of retrofit is not net zero, it is lifting people out of fuel poverty and creating warm and healthy homes.
- Current national government like Social Housing Decarbonisation Fund, and other national sources, is being utilised by WYHP to achieve their ambitions.
- WYHP have a committed agenda and programme to tackle the climate emergency and contribute to the region's net zero target.

Interventions Required in West Yorkshire

- Collaboration across the building retrofit supply chain - to stimulate retrofit at scale, enable green skills and jobs, engage with funders and secure additional investment.
- Create a managed pipeline of opportunity – to influence scale and delivery

Opportunities

- Extension of devolution powers to support net zero targets, retrofit and low carbon heating programmes.
- Pilots for large scale solar PV and battery storage installation in WYHP stock.
- Combined Authority to facilitate engagement and act as an influencer between social housing providers, investors and key stakeholders like Northern Powergrid
- Continued commitment on strategic approaches like investment planning.

Challenges

- Funding availability, communication and coordination of different funding streams by the WYHP.
- Net Zero is not a priority in isolation, there is a balance with other investment priorities, for example building safety & maintenance, fuel poverty, and the funding / investment in place for all priorities.
- Local supply chains and procurement of services – trying to manage demand locally to avoiding over inflated prices.

West Yorkshire Housing Partnership

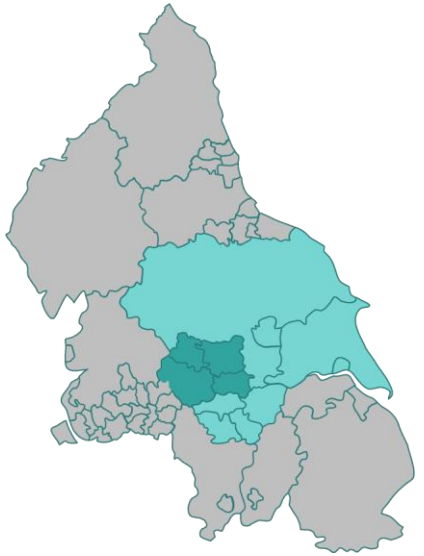
2050 Net Zero across existing and new build homes

Their 2022 Annual Report describes how West Yorkshire Housing Partnership (HWHP) have successfully bid jointly with the Combined Authority for the social housing decarbonisation fund wave 1.

They are highly commended regional housing association by the Yorkshire and Humber Efficiency awards and became an active member of the Mayor's Green Jobs Taskforce.

In 2022, WYHP progressed the solar PV and battery storage project, and joined the sustainable housing action partnership to access best practice from other regions.

WYHP also support Better Homes Hub for West Yorkshire, working with Leeds City Council (LCC) and Combined Authority to establish ready to implement retrofit models in five neighbourhoods.



Regional areas of operation

◆ - Active ◆ - W.Yorks

Northern Powergrid

ARUP

Proposed pathway measures to Net Zero (General/Regional)

- Norther Powergrid (NPg) is technology agnostic and works with partners and stakeholders to facilitate and enable their net zero plans and programmes rather than focus on a specific technology to decarbonise the region's power system.
- Support initiatives run by Combined Authorities and Local Authorities, such as electric vehicle charge point roll out.
- Provide data and education on electricity use in the region to support the work of organisations with their net zero targets and decarbonisation.
- They have no commercial or regulated incentive to support retrofit of buildings (despite this benefitting the electricity grid) but they do support and enable the roll out and use of electricity to decarbonise buildings, transport and industry.

Interventions required in West Yorkshire

- Enhanced facilitation of strategic electricity planning and investment – across all sectors of the West Yorkshire economy.

Opportunities

- Combined Authority is valued as a good facilitator of their work and would like to see this role continue and enhanced.

Challenges

- Engaging and influencing private businesses and industries – particularly regarding new developments and grid connections.
- Looking ahead to private sector requirements in the future.

NORTHERN POWERGRID

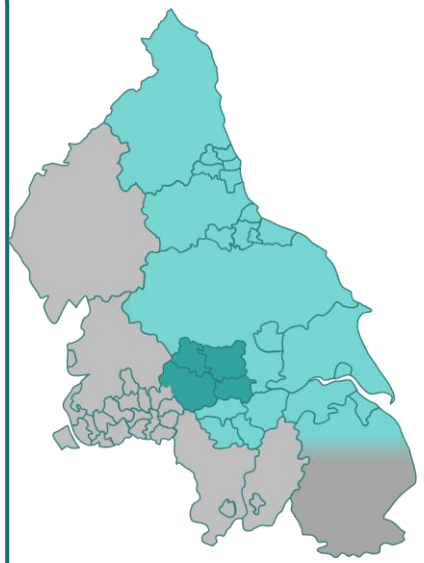
2040 Carbon Neutral Target

Northern Powergrid aims to be carbon neutral by 2040. They will achieve this by managing their net carbon emissions and electrifying their fleet, working with contractors to reduce their carbon footprint, delivering services to support low carbon technology roll-out, and by raising awareness about the transition to Net Zero.

Northern Powergrid is set to invest £135m between 2023 and 2028 towards reducing their carbon footprint as part of its Environmental Action Plan.

Northern Powergrid's Sustainability Strategy describes their aspirations to achieve net zero targets by reducing their carbon footprint, reducing pollution and working towards a circular economy.

In 2020, Northern Powergrid became the founding member of the Mayor of West Yorkshire's Green Jobs Taskforce.



Regional areas of operation

◆ - Active ◆ - W.Yorks

Northern Gas Networks

ARUP

Proposed pathway measures to Net Zero (General/Regional)

- Aiming for transformation of the gas grid to transport hydrogen.
- Looking to blend hydrogen into the natural gas network to enable emissions reductions – a 20% blend of hydrogen will cut carbon dioxide emissions by circa 6%.
- Priorities are to keep bills low, and maintain a safe secure gas supply – then tackling net zero and climate change.

Interventions required in West Yorkshire

- Incentivisation for investment in green technologies.
- Promote and build on heritage and industrial culture of the region to support green transformation.

Opportunities

- Research and development opportunities in West Yorkshire to demonstrate what benefits hydrogen can provide – e.g. Leeds City Gate (H21).
- Coordination and collaboration with Northern Powergrid and National Grid – part of the energy system transition.
- Bilateral engagement in region with Combined Authority, Local Authorities and business.

Challenges

- Wait times for power grid upgrades is creating uncertainties for the energy transition.
- Switch to fleet electric vehicles is unrealistic now due to infrastructure available for charging and the range required for vehicles - as most are used for emergency call outs and need to access remote areas across the region.
- Customer feedback indicates net zero investment must be economically feasible.
- Manufacturing industry difficult to transform and generate appetite for net zero transition.
- 90% of operational carbon emissions come from gas leakage.

Northern Gas Networks

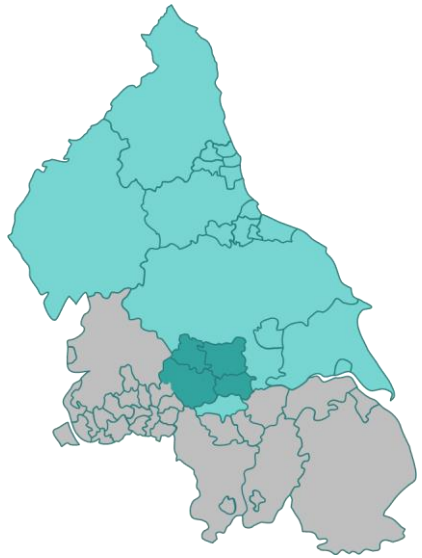
Daily operations net zero by 2031

Northern Gas Networks (NGN) aim to make their daily operations net zero by 2031 by reducing waste and preparing for a low carbon sustainable future.

NGN aims to reduce its Scope 1 and 2 greenhouse gas (GHG) emissions by 31% between a 2018 baseline and 2026. They have already achieved a 20% reduction by 2023

NGN's Environment Policy states that they will strive to protect the environment by preventing pollution, reducing waste, minimising harmful emissions and use of fossil fuels, as well as mitigating against and adapting to climate change.

Northern Gas Network has previously worked with the Combined Authority to ensure the continued safe and reliable supply of gas to customers.



Regional areas of operation

◆ - Active ◆ - W.Yorks

West and North Yorkshire Chamber of Commerce

ARUP

Proposed pathway measures to Net Zero (General/Regional)

- There is no publicly stated net zero target for the W&NY Chamber of Commerce, but it has a role to share best practice between member organisations.
- More generally, business Environment, Social & Governance agendas are developing and expanding amongst member organisations – but this is in it infancy, with net zero specifically not high on the agenda (based on the conversations with members).

Interventions required in West Yorkshire

- Combined Authority to present case study examples of activities across region related to net zero transition.
- Combined Authority to act as a facilitator and communicator for change.
- Support network across the region – linking public and private sectors.

Opportunities

- Publicise and communicate net zero activities in the region – with Combined Authority involved.
- Present net zero transition as an opportunity rather than a challenge and a cost.
- Combined Authority facilitated network across the region.

Challenges

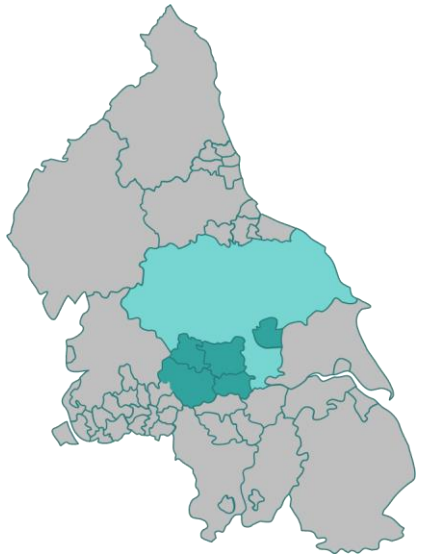
- Convincing business to support net zero – there is concern within the regional business community of the labour costs to support a transition.
- Supply chain and access to materials across region – there is no network to support sustainable supply.

West & North Yorkshire Chamber of Commerce

No publicly stated NZ Target

Whilst the regional chamber specifically doesn't have a net zero target the British Chamber of Commerce (the parent organisation) has a Green Innovation Hub. The hub supports businesses with opportunities to reach net zero and has created a network of support for businesses across different sectors.

The North and West Yorkshire Chamber of Commerce engages with the hub, encouraging businesses of all sizes to adopt sustainable practices such as reducing waste, transitioning to renewable energy, and promoting greener supply chains.



Regional areas of operation
- Active
- W.Yorks

National Farmers Union and Nation Farmers Union Energy

ARUP

Proposed pathway measures to Net Zero (General/Regional)

- Identifying ways to support farmers with making cost efficiencies whilst targeting net zero benefits.
- Council funded energy audits from Share Prosperity Funds with NFU Energy across all sectors in farming – created a positive intervention showing how carbon emissions and costs can be reduced. Audits have taken place in North Yorkshire but this could be applicable to West Yorkshire region too.
- Audits can then inform regional Local Area Energy Plans.
- Larger farms are focused on carbon credit solutions with the support of NFU.
- R&D ongoing into how methane on farms can be reduced through different livestock feeds.

Interventions required in West Yorkshire

- 'Touch points' with Combined and Local Authorities. Currently, minimal interaction between NFU and authorities.

Opportunities

- Promotion of sustainable food partnerships in region e.g. British raised halal lamb – joining up food, farming, sustainability and community.
- Sharing of 'what works' case studies across farms and rural communities.
- Focus on farming 'waste' use e.g. anaerobic digestion and energy from waste streams. But also, circular economy and links with biodiversity and nature friendly farming.
- Facilitating conversations about the links between sustainable food, sustainable supply chains, emissions reductions and nature friendly farming.

Challenges

- West Yorkshire has a high proportion of tenant and upland farmers – who are more isolated and financially vulnerable – and therefore face more barriers to act on net zero agendas.
- Communication between farmers, landowners and local authorities – farmers often left out of conversations.

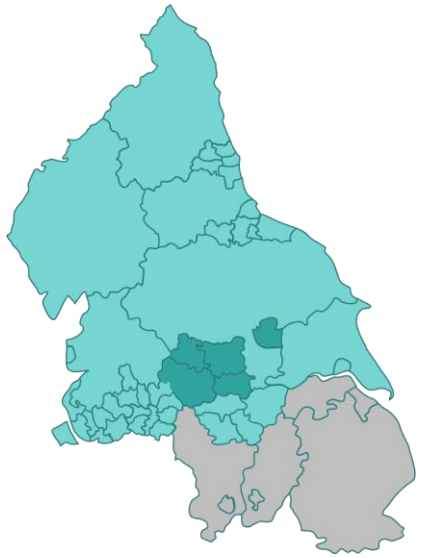
NFU ENERGY

2040 Net Zero target

The NFU aims to achieve net zero emissions in British farming by 2040. NFU energy provides a comprehensive carbon footprinting service and quantifies potential carbon emission reductions on farms.

The NFU focus on improving resource use efficiency across all farming sectors, increasing on-farm carbon storage in vegetation and soil, and boosting land based renewable energy production to generate credits for emissions avoided and removed.

The White Rose Action Plan 2021-2025 requires the NFU to plant 7 million trees across North and West Yorkshire within 4 years.



Regional areas of operation

◆ - Active ◆ - W.Yorks

UK Infrastructure Bank

ARUP

Proposed pathway measures to Net Zero (General/Regional)

- Lending and advisory roles to incentivise innovation in net zero and natural capital.
- Support regional economic growth by supporting Combined and Local Authorities across five key sectors: energy, transport, digital, waste and water.
- Placed based decarbonisation a necessity to achieve Net Zero.

Interventions required in West Yorkshire

- Stimulation of local markets and generate enthusiasm for net zero investment.
- Partnerships across organisations in region.

Opportunities

- To establish a formal role for the UKIB with the Combined Authority Committee.
- Housing – decarbonisation beyond social housing – looking at housing stock across the region and investment in improvements – particularly as West Yorkshire has an old housing stock.

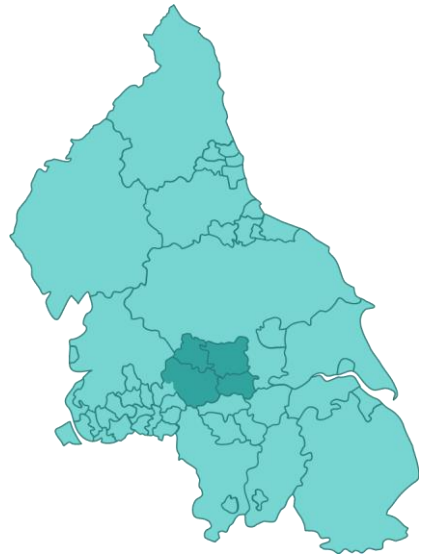
Challenges

- Variety of rural and urban environments across West Yorkshire so complex and overlapping solutions required.
- Long term uncertainty about policy and funding for measures which support net zero e.g. retrofit, heat networks.
- Establishing long term partnerships with Combined and Local Authorities – need to look at roles, responsibilities and mechanisms to engage with and work alongside that is not just based on individual relationships.

UK INFRASTRUCTURE BANK

2050 Net Zero target

The UK Infrastructure Bank aims to reach Net Zero by 2050. They are achieving this by financing the scale up of existing green technologies and infrastructure and accelerating the deployment of new green technologies such as hydrogen and carbon capture usage and storage (CCUS). They will consider investing in projects or technologies that support energy efficiency, including the retrofit of existing homes and buildings, and the decarbonisation of heating.



Regional areas of operation

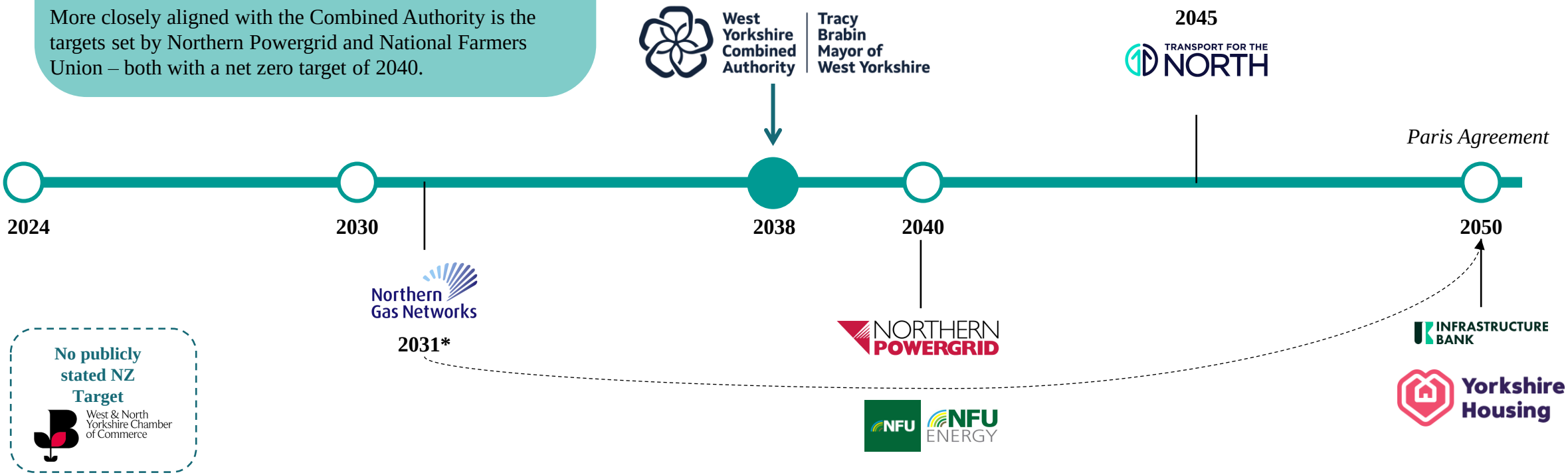
- Active
- W.Yorks

Stakeholder Net Zero targets

Of the seven key stakeholders interviewed – six of them have publicly stated net zero targets.

Northern Gas Networks has the most ambitious target of 2031 – however this target is only for net zero daily operations. To be a net zero business its ambition aligns with the UK Government target of 2050.

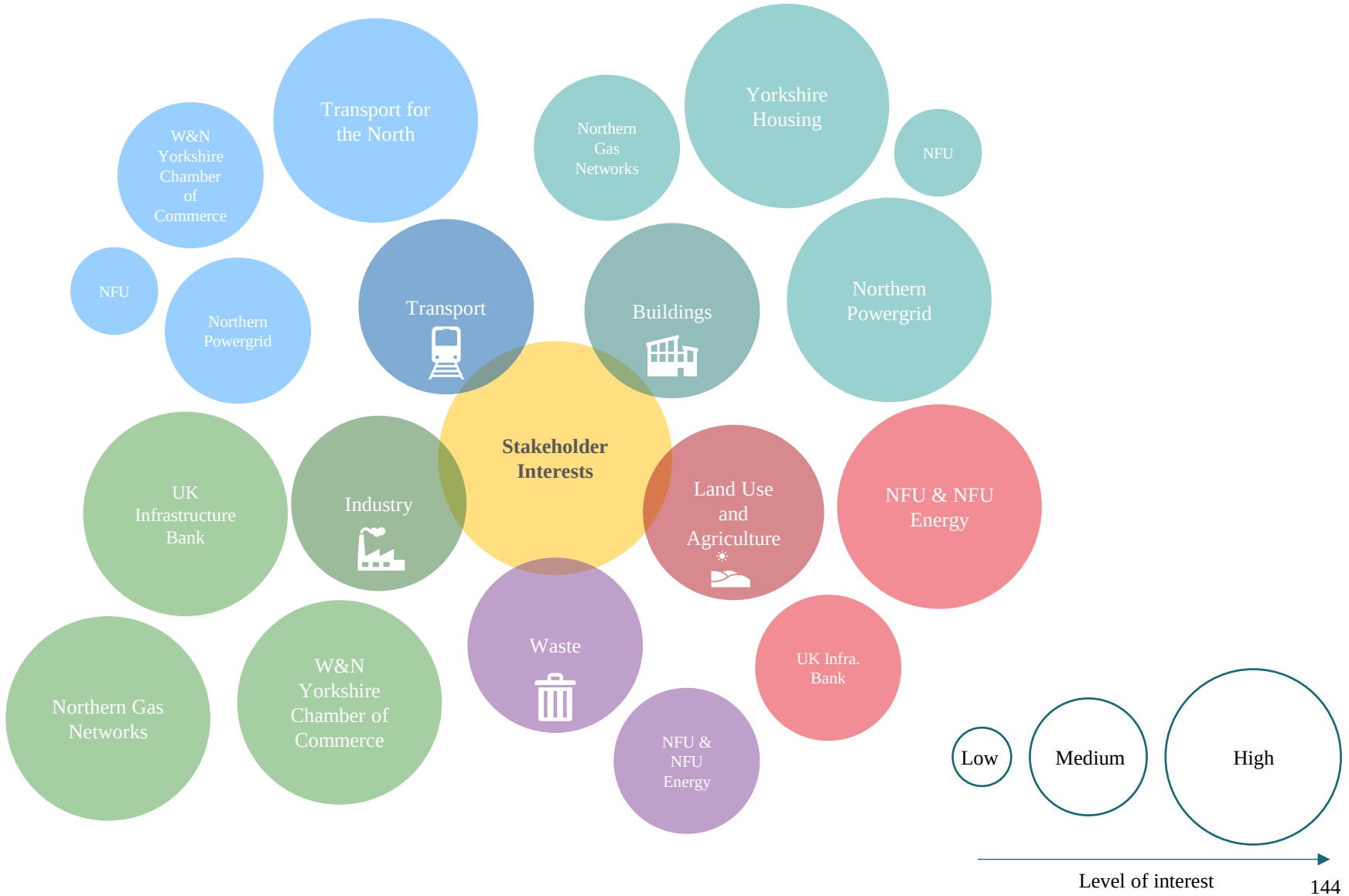
More closely aligned with the Combined Authority is the targets set by Northern Powergrid and National Farmers Union – both with a net zero target of 2040.



Stakeholder interest mapping

Stakeholders were interviewed stakeholders which fit broadly into the sector categories the roadmaps and modelling align to.

However, beyond the direct sector they are part of, the stakeholders had wider interests – to varying degrees. The diagram to the right shows the levels of interest stakeholders have in each sector and where collaboration between the Combined Authority and these stakeholders would be pertinent to ensure successful delivery of the complete pathway.



Role of partnerships to reduce sector emissions across the region

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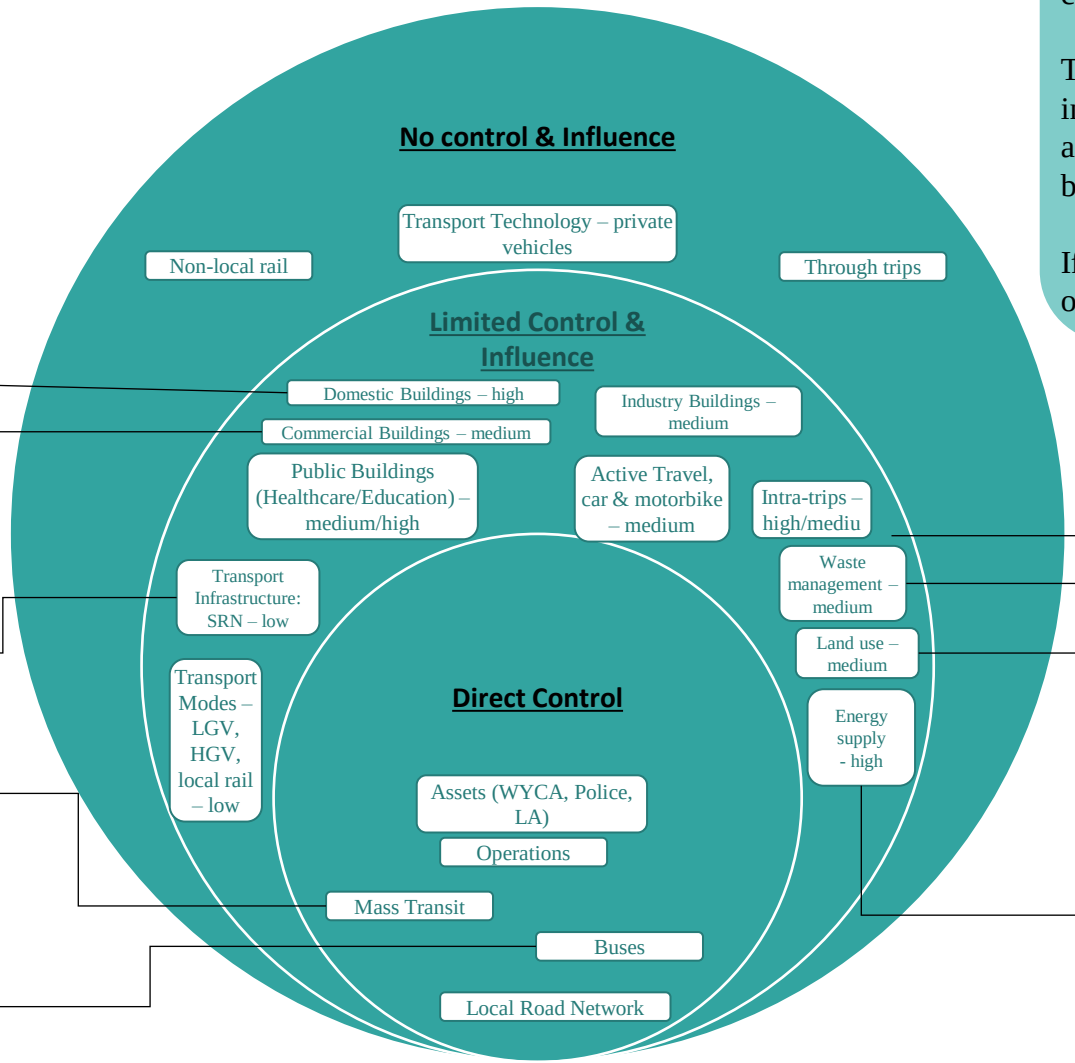
The identification of emissions areas the Combined Authority has control and influence over are shown in the circular diagram.

To support collaboration and highlight partnership opportunities in these areas, connections with the key stakeholders interviewed as part of this study and the themes from the pathway sectors have been illustrated.

If no connection is shown, it is deemed to be out of the influence of the key stakeholders engaged with.



West Yorkshire Housing Partnership

INFRASTRUCTURE BANK

INFRASTRUCTURE BANK

TRANSPORT FOR THE NORTH

TRANSPORT FOR THE NORTH

TRANSPORT FOR THE NORTH

West & North Yorkshire Chamber of Commerce

NFU NFU ENERGY

NFU NFU ENERGY

Northern Gas Networks

NFU NFU ENERGY

NORTHERN POWERGRID

INFRASTRUCTURE BANK

Our engagement with key stakeholders identified common themes in terms of focus areas, challenges and opportunities to achieve net zero. The headlines have been summarised

Role of the Combined Authority - A consistent view expressed by stakeholders was that there is an opportunity for the Combined Authority to take on a greater facilitation role – acting as convenor and engaging stakeholders with the net zero pathway. Whilst some stakeholders are already engaged and involved in committees and working groups, there was a consensus that this could be developed further and the Combined Authority could support a local network of stakeholders, all with an interest in and opportunity to accelerate the race to net zero. By acting as a convenor and promotor of net zero and climate action, the Combined Authority could harness the local commitments for decarbonisation and net zero, developing a network which supports its ambitions and targets. Interviews were carried out in the context of the stakeholders' engagement with the Combined Authority – as opposed to specific Local Authorities. However, whilst respondents answers focused on the role of the Combined Authority could have – however there was acknowledgement that opportunity exists for engagement at a more local level.

Stakeholder Relationships - All of the stakeholders interviewed operate across a range of boundaries, and so have interfaces with other regional authorities, cities, networks and organisations. Barriers and limitations are often met when there are regional boundaries to overcome. It is imperative for these organisations, as well as the Combined Authority, to establish robust regional networks, sharing knowledge, best practice and identifying collaborative opportunities to progress the net zero agenda.

Net Zero Targets - Net zero targets vary by organisation – with a range of 19 years across targets. Most of the key stakeholders have targets from 2040 onwards, which means the Combined Authority regional target is the most ambitious. Stakeholders were receptive to an ambitious regional target, however, they acknowledge the scale of the ambition and viewed this as a challenge if it were to be applied to their own activities.

Geography of West Yorkshire – it was mentioned several times in the interviews that the variety of environments in West Yorkshire provides challenges to the organisations' activities (generally and in terms of net zero). Whilst the region has large cities and urban environments, there are very different needs in the rural environments of the region. Whilst existing Combined Authority action areas benefit some communities and areas, stakeholder were cognisant of not applying a 'one size fits all' approach to net zero action. This was noted with regards to the transport and agricultural sectors, rural vs urban communities.

Funding and Political Uncertainty - The biggest challenge, to varying degrees, identified by all stakeholders, was political and policy uncertainty and availability of financing and funding for net zero action. A positive response to achieving net zero targets through regional pathways was clear for stakeholders however the uncertainty of funding, finance and investment is a significant challenge for organisations.

Section 11

Technical appendix A

Scope

As per the scope of this commission, the region's baseline pathway and a maximum ambition pathway have been developed using the previous CERP 1 modelling.

The purpose of this technical appendix is to provide clarity on the methodology used to develop these pathways, the measures modelled, and outline key assumptions for each sector.

This appendix is intended for a technical audience, so uses more technical terminology and assumes a level of existing knowledge of the sectors in scope.

This annex is structured into the following sections:

- General assumptions
- Sector specific assumptions / methodology/ data sources
    - Transport
    - Buildings
    - Industry
    - Land use and agriculture
    - Waste
    - Power

Modelling outputs

Two Excel workbooks have been provided to WYCA. '*WYCA CERP_All sector modelling (exc. Domestic)'* draws together a series of modelling sheets for transport, non-domestic buildings, Industry, Power, LULUCF and waste. '*WYCA CERP_Domestic sector modelling'* includes the modelling sheets for domestic buildings. Arup has provided fully unlocked and unlicensed spreadsheet workbooks. The workbooks are intended as a source of information for the Combined Authority to understand the modelling that sits behind the baseline and maximum ambition pathways. The workbooks are intended for internal use and purposes, They are not a tool for modelling new pathways, measures and policies. The results produced within the workbooks rely entirely on the inputs entered and underlying assumptions. Arup accepts no responsibility for any issues with the workbooks if changes are made to these inputs / assumptions.

Comparisons with UK Government national statistics

The UK Government Department for Energy Security and Net Zero (DESNZ) local authority and regional greenhouse gas emissions national statistics – published annually - present the UK Government's best view of local emissions levels - and is based on a combination of metered data (for some energy consumption) which is then mapped to postcodes and aggregated up to Lower layer Super Output Area (LSOA)/Data Zone (DZ), Middle layer Super Output Area (MSOA)/Intermediate Zone (IZ), local authority and English region and devolved administration levels, and modelling outputs (e.g. for transport emissions).

DESNZ caveat that whilst the estimates are "*to help those working on local or regional indicators and inventories as part of their efforts to reduce greenhouse gas emissions. On their own, however, they cannot give all the information necessary to plan and monitor the progress of all local emissions reduction initiatives"*.

While common datasets have been used where possible, it is important to note that the DESNZ estimates and the modelling undertaken for the CERP 2 update employ different methodologies - as a result there will be differences in the totals reported for each sector category.

General assumptions

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Modelling years

The starting year for the baseline and maximum ambition pathways is 2022. 2022 has been selected as a) actual data is available e.g. National Travel Survey, and b) it is the most recent year for which the DESNZ national statistics are available as a comparator.

The modelling for both the baseline and maximum ambition pathways runs until 2040.

Key exclusions

- Emissions associated with the generation of electricity in the region are included within the Excel workbook, however, they are not included within either the baseline or maximum ambition pathways.
- Emissions from shipping.
- Scope 3 embedded emissions in product/service imports.
- Emissions offsetting outside region.
- Mass transit (It is understood that mass transit will form part of the region's future transport system, however, at the time of modelling, limited information was available upon which to calculate the potential impact on emissions. Given this limitation, and the fact that it is likely to have a relatively minor impact on overall emissions by 2038, the decision was made to omit mass transit from detailed modelling).

Carbon intensity of fuels

The carbon intensity of most fuels is taken from DESNZ Corporate Reporting factor, with a few exceptions:

- **Grid electricity**: The Baseline Pathway uses the HM Green Book national electricity carbon intensity projection. In order to demonstrate the impact of a more ambitious and rapid decarbonisation of the electricity grid, the maximum ambition pathway uses the Holistic Transition projection developed by National Grid in its Future Energy Scenarios (2024). The Holistic Transition scenario is based on *"Net zero met through a mix of electrification and hydrogen, with hydrogen mainly around industrial clusters. Consumer engagement in the transition is very strong with demand shifting, with smart homes and electric vehicles providing flexibility to the grid"*[1].
- **Hydrogen**: The Hydrogen carbon intensity used within the modelling is the same as which was developed by Element Energy for the previous CERP – *"The Hydrogen carbon intensity is calculated from the assumed supply sources, with the breakdown between electrolysis and methane reforming varying by scenario"*.
- **Gas grid**: The gas grid carbon intensity used within the modelling is the same as which was developed by Element Energy in the previous CERP – *"The regional gas grid carbon intensity is calculated by scenario through the blend of natural gas, biomethane and hydrogen. The maximum availability of biomethane is from the Northen Gas Network projections and hydrogen is limited to 20% by volume"*.

[1] Future Energy Scenarios (FES) | ESO (nationalgrideso.com)

Comparison with UK local authority and regional greenhouse gas emissions national statistics

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Overview

DESNZ publishes annual greenhouse gas GHG emissions statistics for local authorities and regions across the UK. These statistics provide a detailed breakdown of emissions from various sectors, helping local authorities monitor and manage their emissions reduction efforts.

- **Release date**: The dataset is typically released in June each year. The most recent release was on June 27th, 2024, covering emissions data up to the year 2022.
- **Coverage**: The dataset includes emissions data from 2005 onwards, covering carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Fluorinated gases are not included. The dataset includes emissions from several key categories:
  - **Transport**: Emissions from road transport and railways.
  - **Industrial**: Emissions from industrial processes and fuel combustion in manufacturing and construction.
  - **Commercial**: Emissions from commercial and public sector buildings and operations.
  - **Residential**: Emissions from household energy use, including heating and electricity consumption.
  - **Agriculture**: Emissions from agricultural activities, including livestock and soil management.
  - **Waste Management**: Emissions from waste treatment and disposal, including landfill sites and wastewater treatment.
  - **Public Sector**: Emissions from public sector buildings and operations, such as schools and hospitals.
- **Sources**: The main data sources are:
  - DESNZ sub-national gas and electricity consumption statistics;
  - Information from devolved administration organisation such as the Environment Agency and the Scottish Environmental Protection Agency;
  - Point source data from large industrial installations;
  - Emissions distribution mapping data developed under the National Atmospheric Emissions Inventory Programme; and
  - Land use, land-use and forestry regional data collated under the NAEI programme.
- **Purpose**: The statistics are designed to support local and regional authorities in planning and monitoring their emissions reduction initiatives. However, the dataset does have caveats which include:
  - **Not for Real-Time Monitoring**: The dataset is not designed for real-time monitoring of emissions. It provides annual estimates and is updated once a year, so it cannot reflect immediate changes or short-term trends.
  - **Not for Detailed Local Planning**: While the dataset offers a comprehensive overview, it may not provide the granularity needed for detailed local planning and monitoring. Local authorities might need additional, more specific data to plan and track their emissions reduction initiatives effectively.
  - **Not for Attribution of Emissions to Specific Sources**: The dataset provides aggregated emissions data by sector and region but does not attribute emissions to specific sources or facilities.

Comparison with UK local authority and regional greenhouse gas emissions national statistics

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Differences with CERP 2 results

As outlined above, there are a several methodological differences (data sources, carbon factors, assumptions etc) which mean that the final numbers reported vary. The table below provides a comparison of emissions by sector.

Sector	DESNZ results (2022)	CERP 2: Baseline (2022)	Difference
	$MtCO_2e$		
Domestic	2.86	2.85	-0.01
Industry	1.62	2.28 Non-Domestic Buildings: 1.34 Industry Buildings: 0.94	-0.82
Commercial	1.06		
Public sector	0.42		
Transport	3.64	3.47	-0.17
Waste	0.5	0.36	-0.14
LULUCF	0.02	0.05	+0.03
Agriculture & Livestock	0.35	0.28	-0.07
Total	**10.47**	**9.28**	**-1.18**

Transport - Overview

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Approach to modelling

Transport emissions for both the baseline and maximum ambition pathways have been modelled largely following the methodology which was used in CERP 1. However, there are a number of instances where new data sources or assumptions have been used.

As shown in the table to the right, the transport modelling quantifies the impact of a number of modelled outcomes e.g. mode shift.

The following slides provide an overview of the methodology used to quantify passenger transport and freight emissions, including key datasets and assumptions.

Modelled outcomes

Sector	Modelled outcome
Road transport - passenger	Reduction in total passenger travel requirement (km)
	Change in mode share (proportion of total passenger travel requirement)
	Change in occupancy rates
	Change in vehicle powertrain
Road transport – freight	Reduction in total freight travel requirement (tonne km)
	Change in mode share (proportion of total freight travel requirement)
	Change in vehicle powertrain
Rail - passenger	Change in mode share (proportion of total passenger travel requirement)
	Change in fuel i.e. electrification
Rail - freight	Change in mode share (based on road transport – freight)
	Change in fuel i.e. electrification

Road transport - passengers

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Modelling overview

- Total passenger travel requirement (km)
- Mode share by passenger km
- Occupancy rates (passengers per mode)
- Total vehicle km
- Mode by power train (%)
- Vehicle km by powertrain
- Fuel/ energy consumption by mode and powertrain
- Emissions

CERP 2 Modelling approach		Difference to previous CERP
Road transport - passenger		
1	Vehicle km by subregion and vehicle type built from DfT datasets	Updated sources e.g. 2022 NTS Updated assumptions e.g. reductions in total passenger travel requirement (km)
2	Current passenger modal share (walking, cycling, car, bus, motorcycle, train) derived at subregion level from analysis of National Travel Survey data (2022)	
3	Average passenger occupancy (number of passengers per vehicle) derived from analysis of National Travel Survey data (2022)	
4	Passenger km per mode estimated at subregion level using vehicle km and average occupancy, with walking, cycling and train passenger km scaled to match modal share analysis.	
5.1	Vehicle kms by powertrain based on Transport for North (TfN) modelling (Business-As-Usual Pathway)	**Baseline Pathway**: TfN future fleet mix used rather than Element Energy analysis of Ecco model **Maximum Ambition Pathway**: Uplift on previous CERP assumptions with the exception of hydrogen which is not included within the car mix, instead this has been apportioned to Battery Electric Vehicles (BEV).
5.2	Bus fleet share projections by fuel type based on those developed by Element Energy in CERP1 for Combined Authority Zero Emission Bus Roadmap	No change in modelling approach
6	Emissions and energy consumption calculated based on fleet average real world fuel consumption, well-to-wheel emissions factors and energy density (Please refer to the CERP1 Technical Appendix for further detail on fuel consumption data sets)	

Road transport

Key datasets

Data set	Year	Modelling sector	Modelling element
DfT Traffic Statistics (TRA8905)	2023	Road	Vehicle activity data
DfT Traffic Statistics (TRA0206)	2023	Road	Vehicle activity data
DfT Road Traffic Forecasts	2022	Road	Vehicle activity data
National Travel Survey	2022	Road	Occupancy data
TfN traffic data (provided by WYCA)	2021	Road	BAU vehicle km by powertrain
ONS Population projections for Local Authorities	2020	Road	Population growth estimates
The UK passenger rail system: how and why is it changing?	2018	Rail	Passenger forecasts

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Key assumptions

Modelled outcome for	Baseline		Maximum Ambition Pathway	
	Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Total passenger travel requirement (km)	Total passenger travel requirement in West Yorkshire grows in line with DfT traffic projections for Yorkshire and Humber region.	Assumption is as per CERP 1, just with updated versions of the same datasets.	The baseline million passenger km have been reduced from the DfT projection by 2% in each modelled year. This means passenger kms increase but are consistently 2% lower than DfT estimates.	Through conversations with WYCA it was agreed that there was the potential for some overall demand reduction, however, the majority of savings would come from other measures e.g. mode shift, and therefore demand reduction assumptions should be kept minor. 2% is considered a relatively modest, albeit challenging, reduction – it can also be viewed as equivalent to slowing growth by around 2-3 years. However, the scale reflects the need to target all aspects of travel emissions to address the shorter timescales for WYCA to reduce transport emissions compared to national strategies out to 2050, and also reflects that transport is generally an area where WYCA has greater degrees of control to manage demand and resultant emissions.

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Key assumptions

Modelled outcome for	Baseline		Maximum Ambition Pathway	
	Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Mode share	Mode share is based on analysis of National Travel Survey data. The baseline assumes that mode share does not change.	Assumption is as per CERP 1, just with updated versions of the same NTS information.	A broadly similar degree of mode shift from car to public transport / active travel has been assumed with regards to CERP 1. The percentage of vehicle kms travelled by private car reduces from around 82% to around 54% by 2038.	TfN's Strategic Transport Plan (STP) has a target for the share of trips made by sustainable modes (public transport and active travel) to be 43% by 2030 and 51% by 2050 (linearly this would equate to approximately 46% by 2038). Whilst it is acknowledged that this is a 'trips' target rather than a 'passenger or vehicle km' target (as used in CERP2 modelling), it is considered a useful representation of the direction of travel for mode shift within the region. Upon reviewing the CERP 2 outcome metrics it was assessed that these levels were very challenging at the time, and that it is not considered feasible to move significantly beyond these within CERP 2. The CERP 2 modelling has assumed 28% of passenger kms are made via public transport and active travel by 2030, and 40% by 2038. The changes in mode share see a reduction in private car usage (passenger kms) with all other modes seeing significant increases in usage (including scaling in cycling uptake and travel distances) albeit with total passenger kms reduced compared to baseline.

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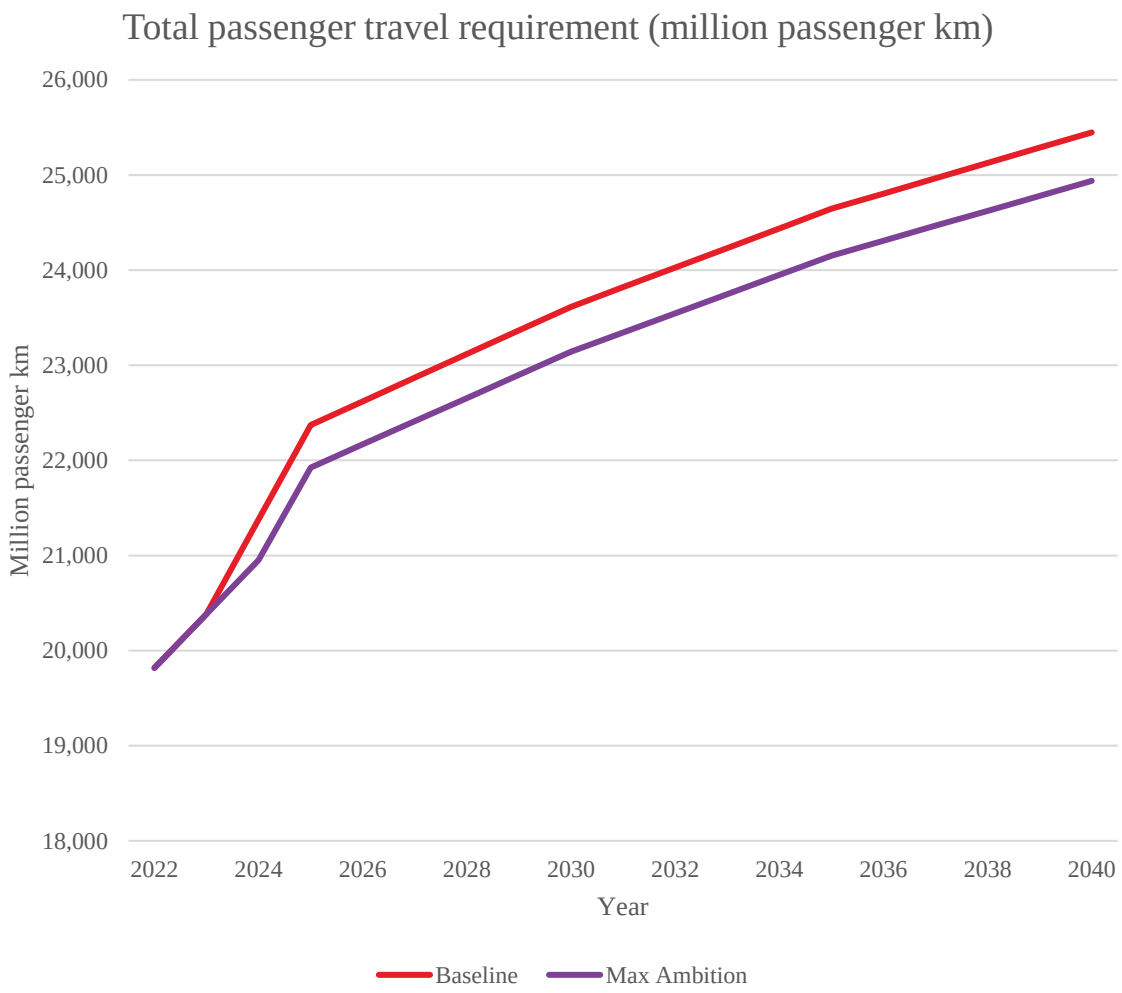
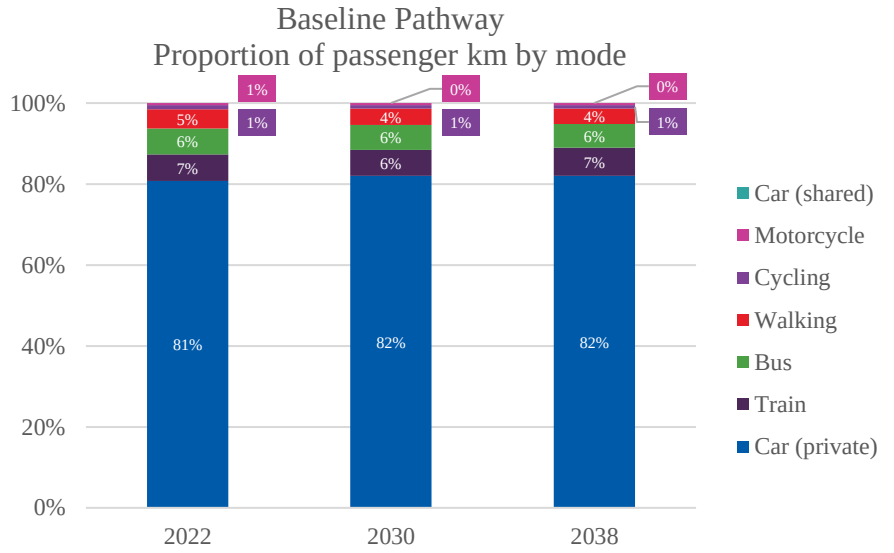
Key assumptions

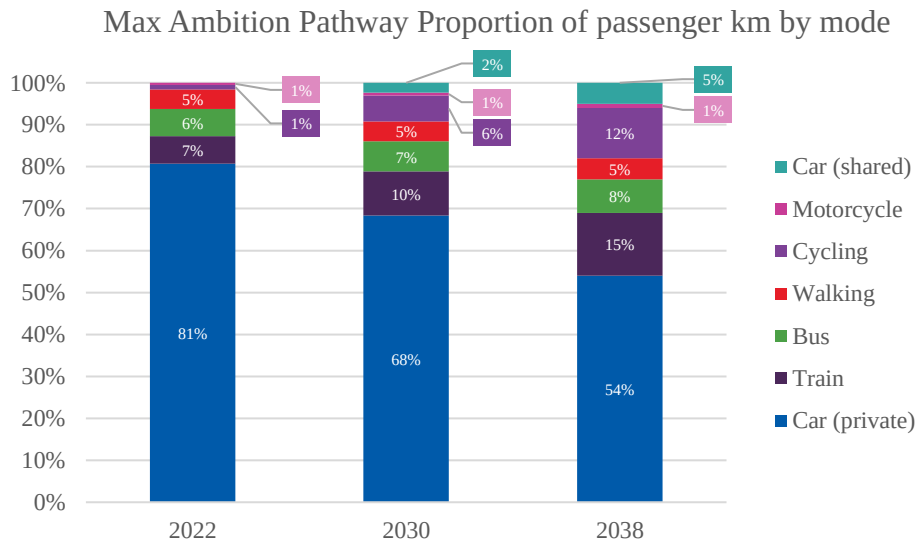
Modelled outcome for	Baseline		Maximum Ambition Pathway	
	Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Occupancy	The baseline assumes that there is no transition from private cars to shared cars, and that occupancy rates of private cars remains static at 1.33.	Assumption is as per CERP 1.	The maximum ambition pathway assumes a significant transition from private cars to shared cars by 2038 (5%). Vehicle occupancy rates are as per CERP 1.	The transition from private cars to shared cars is the same as CERP 1 and seeks to increase significant usage of car sharing (either car clubs or car sharing).
Powertrain	Powertrain trajectories for road transport are in line with TfN 'BAU future fleet' projections.	It has been considered that the TfN dataset represented a more accurate trajectory for West Yorkshire than the approach taken at CERP 1.	Significant uptake of EVs across all modes.	The projections within the TfN BAU dataset have been increased National projections for EV uptake in passenger cars are available from a number of sources, including the Transport Appraisal Guidance (TAG) and Common Analytical Scenarios (CAS). The trajectories set out within both these data sets have been reviewed, with TAG taking a more cautious approach (59% by 2038), and CAS – which aligns with the UK Governments Transport Decarbonisation Plan – presenting a far more ambitious trajectory (82% by 2038). The CERP 2 modelling has assumed 84% of car kms will be battery EVs by 2038 – slightly more ambitious than the trajectory set out within CAS which might reflect some additional local measures over and above national trends. It has been assumed, and agreed with WYCA, that by 2038 all buses will be zero emission vehicles.

Road transport - passengers

Total travel requirement and mode share







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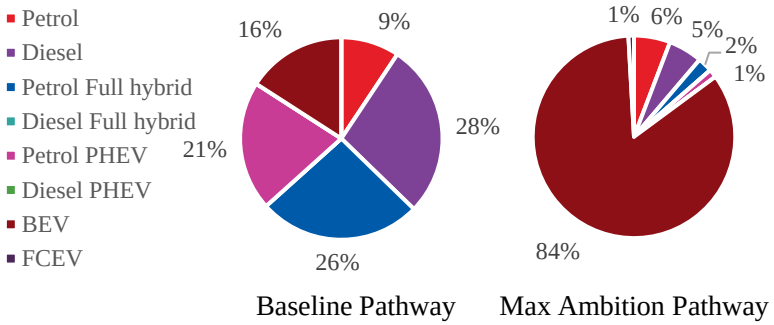
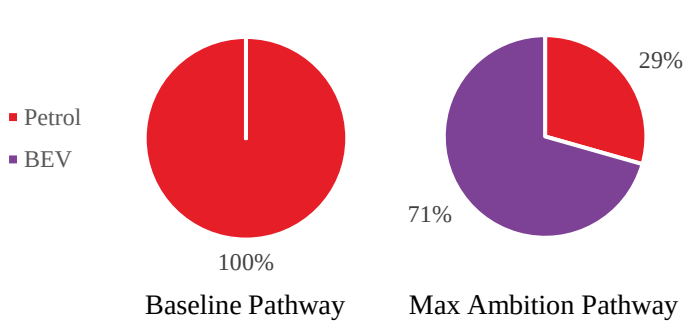
Powertrain

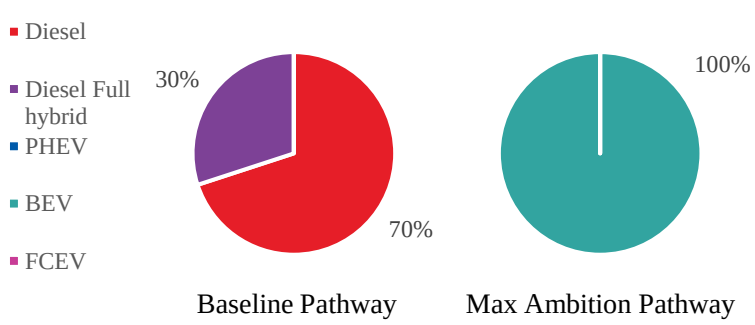
Cars by powertrain (2038)



Motorcycles by powertrain (2038)



Buses by powertrain (2038)



	Car (2038)		Motorcycle (2038)		Bus (2038)	
	Baseline	Max Ambition	Baseline	Max Ambition	Baseline	Max Ambition
Petrol	9%	6%	100%	29%	0%	0%
Diesel	28%	5%	0%	0%	70%	0%
Petrol – Full hybrid	26%	2%	0%	0%	0%	0%
Diesel – Full hybrid	0%	0%	0%	0%	30%	0%
Petrol – PHEV	21%	1%	0%	0%	0%	0%
Diesel – PHEV	0%	0%	0%	0%	0%	0%
BEV	16%	84%	0%	71%	0%	100%
FCEV	0%	1%	0%	0%	0%	0%

Road transport - freight

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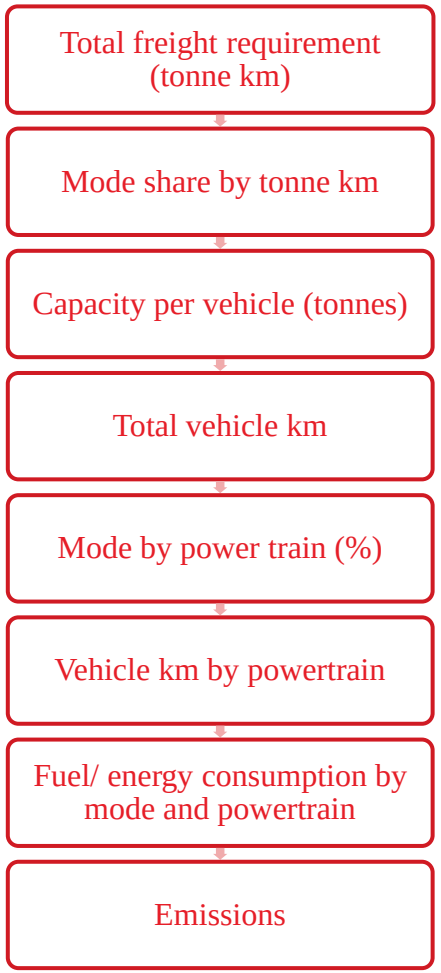
Modelling overview



CERP 2 Modelling approach		Difference to previous CERP
Road transport - freight		
1	Vehicle km by subregion and vehicle type built from DfT datasets	No change in modelling approach
2	Average freight capacity (tonnes per vehicle) for heavy goods vehicles estimated to be in line with UK data; for simplicity of modelling, van freight capacity is set to 1 but is not intended to reflect real behaviour	
3	Tonne km per mode estimated at subregion level using vehicle km and average freight capacity	
4	Vehicle km by powertrain based on Transport for North (TfN) modelling (Business-As-Usual Pathway)	**Baseline Pathway**: TfN future fleet mix used rather than Element Energy analysis of Ecco model **Maximum Ambition Pathway**: Uplift on original CERP assumptions.
5	Emissions and energy consumption calculated based on fleet average real world fuel consumption, well-to-wheel emissions factors and energy density	No change in modelling approach

Road transport - freight

Key datasets

Data set	Year	Modelling sector	Modelling element
DfT Traffic Statistics (TRA8905)	2023	Road	Vehicle activity data
DfT Traffic Statistics (TRA0206)	2023	Road	Vehicle activity data
DfT Road Traffic Forecasts	2022	Road	Vehicle activity data
TfN traffic data (provided by WYCA)	2021	Road	BAU vehicle kms by powertrain

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Key assumptions

Modelled outcome for	Baseline		Maximum Ambition Pathway	
	Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Total freight travel requirement (km)	Total freight travel requirement in West Yorkshire grows in line with DfT traffic projections for Yorkshire and Humber region.	Assumption is as per CERP 1, just with updated versions of the same datasets.	The baseline million tonne km have been reduced by 12% for each modelled year. 10% of this is assumed as a reduction associated with behaviour change, and the additional 2% due to order consolidation.	10% and 2% assumptions are the same as CERP 1.
Mode share	Mode share is based on DfT traffic statistics.	Assumption is as per CERP 1, just with updated versions of the same information.	A greater mode shift from LGV/HGV to cycle freight and rail has been assumed than was used in CERP 1.	Mode shift to cycling is moderate. More ambitious target for rail freight than set out in CERP 1 in response to Combined Authority ambition.
Vehicle capacity	The CERP 2 baseline assumes the same vehicle capacity levels as CERP 1, and that rates remains static from 2022 - 2038.	Assumption is as per CERP 1	Assumed the same as Baseline Pathway	n/a

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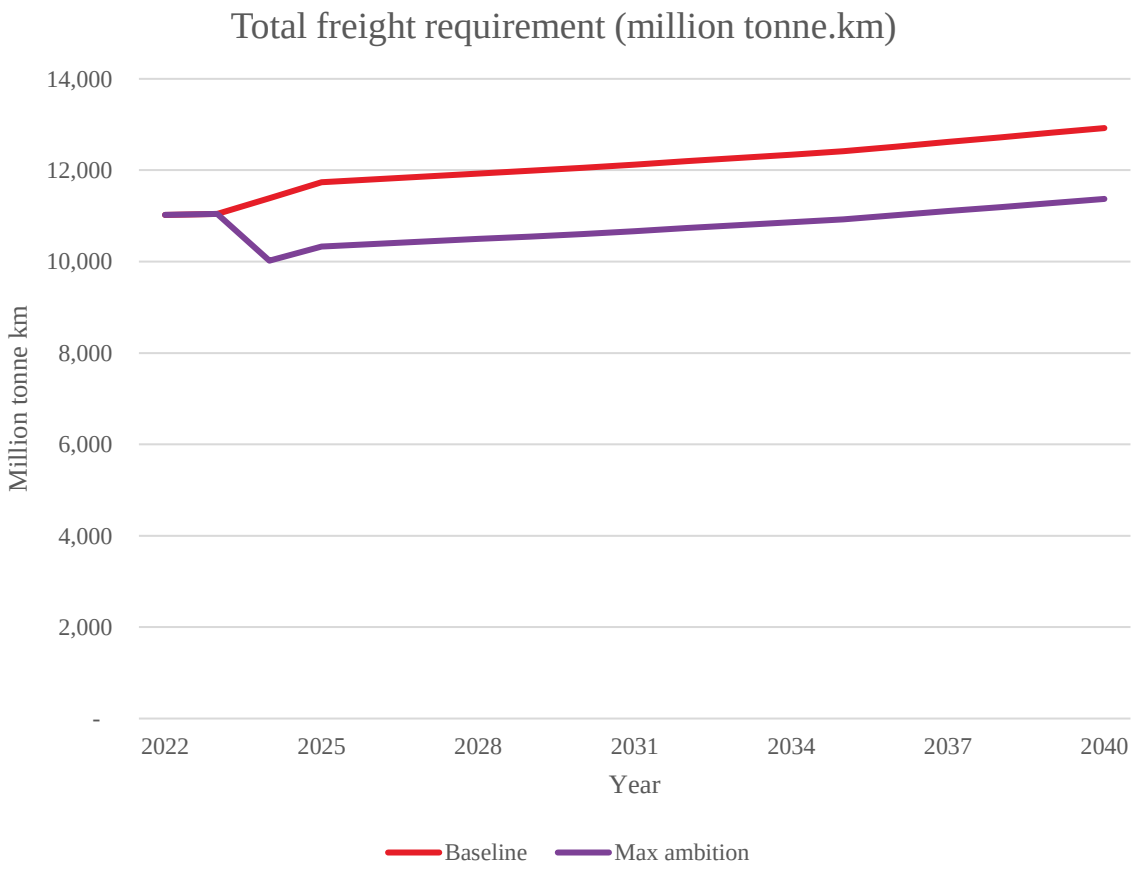
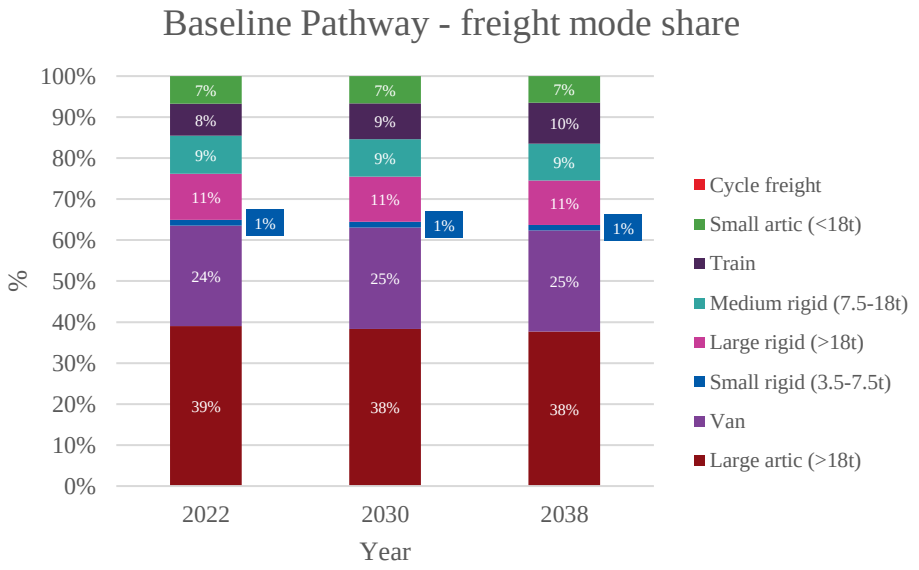
Key assumptions

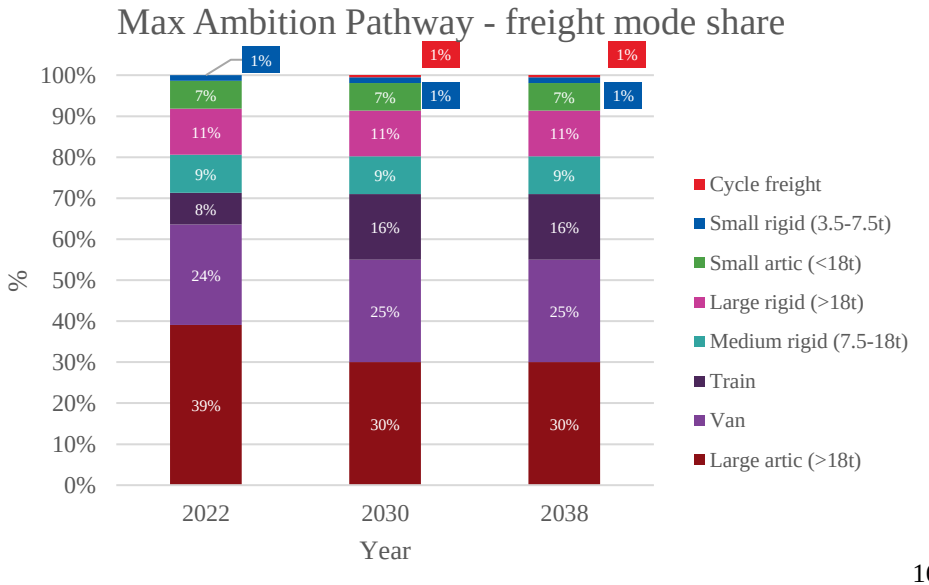
Modelled outcome for	Baseline		Maximum Ambition Pathway	
	Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Powertrain	Powertrain trajectories for road transport are in line with TfN 'BAU future fleet' projections.	It has been considered that the TfN dataset represented a more accurate trajectory for West Yorkshire than the approach taken at CERP 1.	Significant uptake of EVs across all modes.	The projections within the TfN BAU dataset have been increased National projections for EV uptake in passenger cars are available from a number of sources, including the Common Analytical Scenarios (CAS). CAS assumes 59% of Rigid freight vehicles will be EVs by 2038, and 55% of Artics. The CERP 2 modelling has taken a more ambitious trajectory than set out within CAS, and assumes rates of between 75% and 85% (depending on vehicle type).

Road transport - freight

Total travel requirement and mode share







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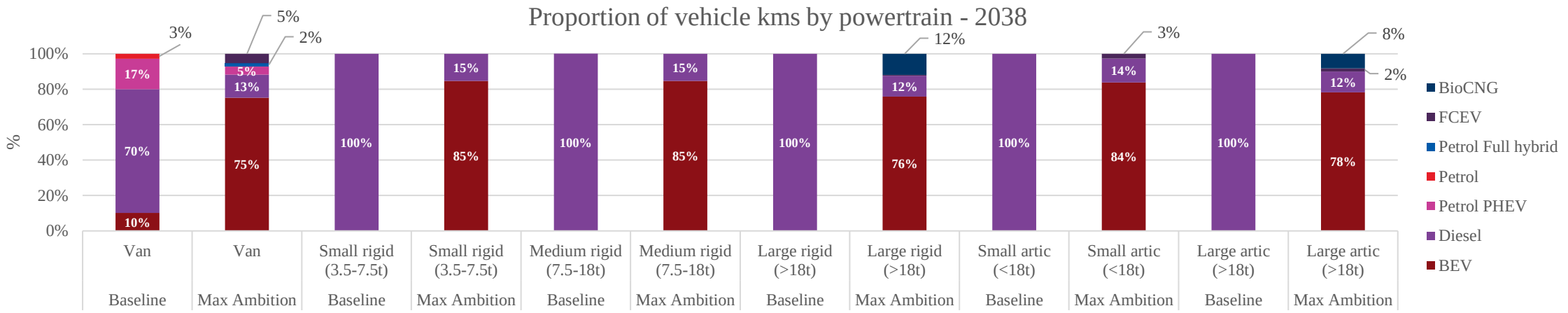
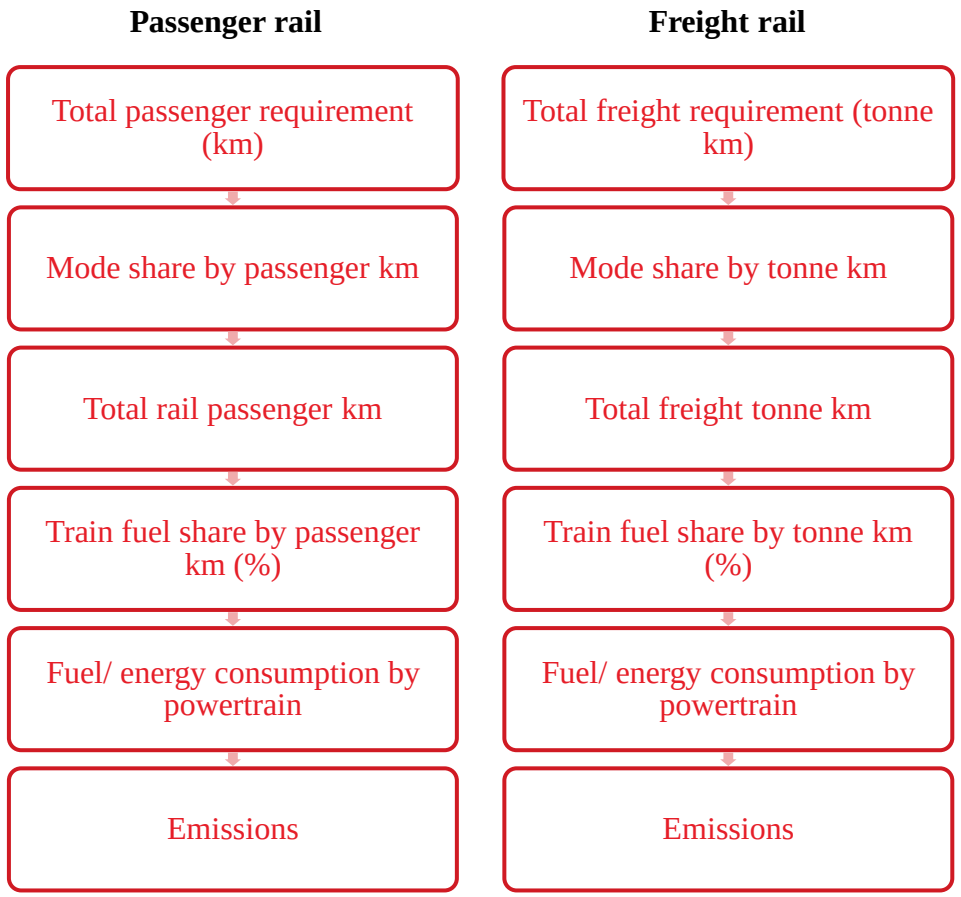
Powertrain



	Petrol	Diesel	Petrol Full hybrid	Petrol PHEV	BEV	FCEV	BioCNG
	Max Ambition (2038): Proportion of vehicle kms by powertrain						
Van	0%	13%	2%	5%	75%	5%	0%
Small rigid	0%	15%	0%	0%	85%	0%	0%
Medium rigid	0%	15%	0%	0%	85%	0%	0%
Large rigid	0%	12%	0%	0%	76%	0%	12%
Small artic	0%	14%	0%	0%	84%	3%	0%
Large artic	0%	23%	0%	0%	78%	2%	8%

ARUP

Modelling overview



CERP 2 Modelling approach		Difference to previous CERP
Rail		
1.1	Passenger km derived at subregion level from road transport data.	No change in modelling approach
1.2	Freight tonne km estimated using average tonne/km factors.	
2.1	Passenger km fuel share estimated using CERP 1 assumptions/ data on “analysis of Leeds City Region passenger loads and line electrification”	
2.2	Freight fuel share assumed to be in line with UK average.	
3	Emissions calculated relative to historic diesel emissions, with electric rail emissions estimated based on relative CO_2 intensity adjusted for future grid decarbonisation and with share of emissions assigned to freight assumed to be in line with UK average.	

Rail

Key datasets

Data set	Year	Modelling sector	Modelling element
The UK passenger rail system: how and why is it changing?	2018	Rail	Passenger forecasts
Rail market share - Table-1350	2022	Rail	Freight moved
Rail freight forecasts: Scenarios for 2033/34 & 2043/44	2020	Rail	Freight forecasts

ARUP

Key assumptions – passenger rail

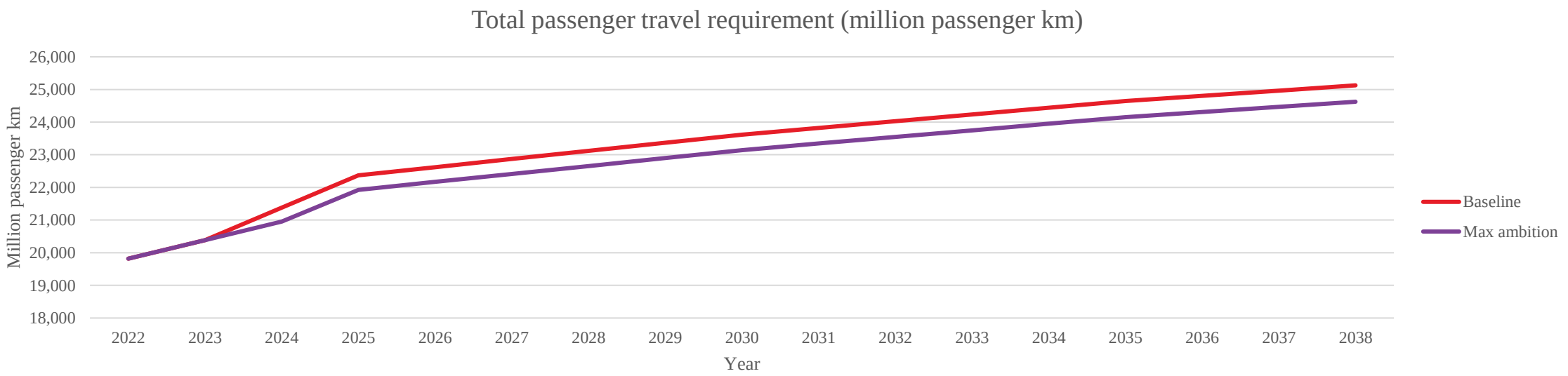
Modelled outcome for	Baseline		Maximum Ambition Pathway	
	Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Total passenger travel requirement (km)	Total passenger travel requirement in West Yorkshire grows in line with DfT traffic projections for Yorkshire and Humber region.	Assumption is as per CERP 1, just with updated versions of the same datasets.	The baseline million passenger km have been reduced by 2% for each modelled year.	Through conversations with WYCA it was agreed that there was the potential for some overall demand reduction, however, the majority of savings would come from other measures e.g. mode shift, and therefore demand reduction assumptions should be kept minor. See notes on Road Transport for further information.
Mode share	Mode share is based on analysis of National Travel Survey data. The baseline assumes that mode share does not change.	Assumption is as per CERP 1, just with updated versions of the same NTS information.	A greater mode shift from car to public transport / active travel has been assumed than was used in CERP 1.	TfN's Strategic Transport Plan has a target for the share of trips made by sustainable modes (public transport and active travel) to be 43% by 2030 and 51% by 2050. See notes on Road Transport for further information.
Train fuel share (%)	Assumed no increase in electrification	Assumption is as per CERP 1	Significant increase in passenger rail electrification (89% by 2038)	The UK Government's Transport Decarbonisation Strategy includes an ambition to phase out all diesel-only trains by 2040. WYCA's Rail Vision outlines plans for a rolling programme of electrification across all routes in the region. After Tiers 1 and 2 are completed, 80% of route-kilometres in the region will be electrified.

ARUP

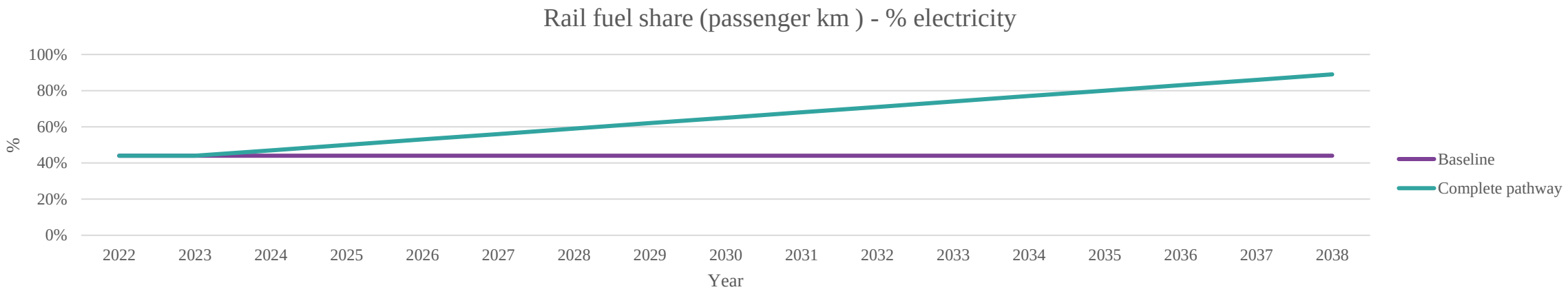
Key assumptions – rail freight

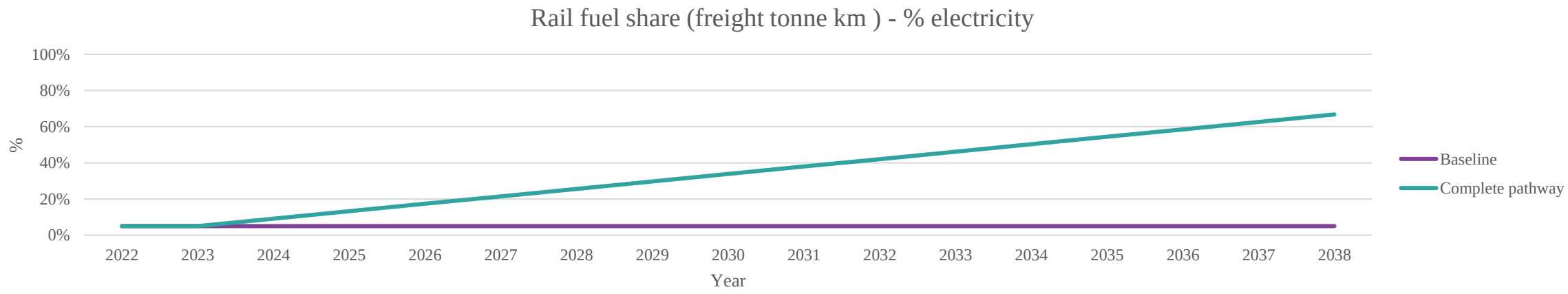
Modelled outcome for	Baseline		Maximum Ambition Pathway	
	Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Total freight travel requirement (km)	Total freight travel requirement in West Yorkshire grows in line with DfT traffic projections for Yorkshire and Humber region.	Assumption is as per CERP 1, just with updated versions of the same datasets.	The baseline million tonne km have been reduced by 12% for each modelled year. 10% of this is assumed as a reduction associated with behaviour change, and the additional 2% due to order consolidation.	10% and 2% assumptions are the same as CERP 1.
Mode share	Mode share is based on DfT traffic statistics.	Assumption is as per CERP 1, just with updated versions of the same information.	A greater mode shift from HGV to rail has been assumed than was used in CERP 1.	TfN's Strategic Transport Plan has a target to treble rail's share of freight carried to 25.5% by 2050. The CERP 2 modelling has assumed 16% of tonne kms are made rail by 2038 – broadly aligning with the TfN target's trajectory.
Train fuel share (%)	Assumed no increase in electrification	Assumption is as per CERP 1	Significant increase in freight rail electrification (67% by 2038)	The UK Government's Transport Decarbonisation Strategy includes an ambition to phase out all diesel-only trains by 2040. WYCA's Rail Vision outlines plans for a rolling programme of electrification across all routes in the region. After Tiers 1 and 2 are completed, 80% of route-kilometres in the region will be electrified. The assumption for rail freight is lower than passenger rail as it is anticipated that transition away from diesel in the freight sector may take longer.

Total travel requirement



Total travel requirement





Modelled measures & outcomes (activity & emissions)

ARUP

Category	Mode	Maximum Ambition Pathway (Activity)				Maximum Ambition Pathway (Emissions)			
		2022	2030	2038	Unit	2022	2030	2038	Unit
Active travel	Walking	931	1,105	1,231	Million passenger km	n/a	n/a	n/a	n/a
	Cycling	207	1,422	2,955	Million passenger km	n/a	n/a	n/a	n/a
Road transport – passenger	Car	12,029	12,166	10,613	Million vehicle km	2.06	1.03	0.18	$MtCO_2e$
	Motorcycle	99	168	246	Million vehicle km	0.01	0.01	0.01	$MtCO_2e$
	Bus	109	142	169	Million vehicle km	0.11	0.08	0.00	$MtCO_2e$
Road transport - freight	Van	2,700	2,620	2,798	Million vehicle km	0.57	0.30	0.08	$MtCO_2e$
	HGV	1,000	907	894	Million vehicle km	0.65	0.33	0.07	$MtCO_2e$
Rail	Rail – passenger	1,305	2,427	3,694	Million passenger km	0.07	0.08	0.05	$MtCO_2e$
	Rail - freight	854	1,240	1,791	Million tonne km				

Domestic buildings - overview

ARUP

Approach to modelling

Emissions associated with domestic buildings have been modelled using a different approach as that which was used in the previous CERP, but with newer data sources.

The domestic building modelling covers the following building categories:

- Owner occupied
- Private rented
- Social homes

Modelled outcomes

Sector	Modelled outcomes
Domestic buildings	Energy efficiency retrofits
	Space & Water Heating - Heat pumps - Direct electric - Gas boiler
	District and communal heating
	Solar PV

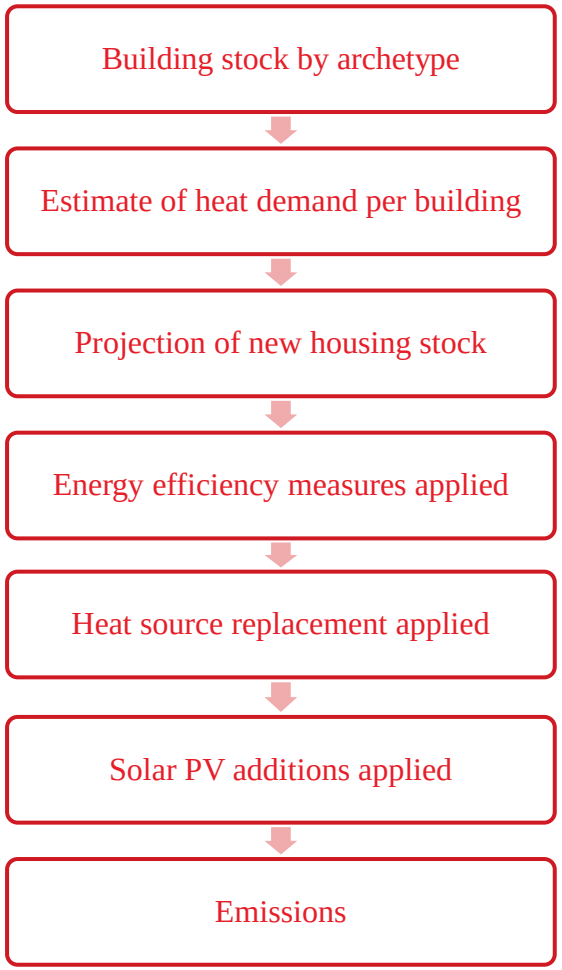
Key datasets

Data set	Year	Modelling element
UK Total final energy consumption at regional and local authority level: 2005 to 2021	2019-2021	Forms basis of baseline energy consumption
Energy Savings Trust – West Yorkshire Housing Stock data	2023	Analysis of housing stock for breakdown of size, tenure, fuel use.
Ofgem: Energy Price Cap data	2023	Used to build up energy usage of housing archetypes
West Yorkshire Housing Strategy 2040	2023	Figure of 9,000 new homes per year used to account for electricity energy demand growth
Energy and Emissions Projection 2022-2040 – Annex F: Final energy demand	2022-2040	Energy demand projection used for all fuels except electricity
BEIS Greenhouse gas reporting	2019-2040	Conversion factors used for kWh of Gas, Manufactured fuels, Bioenergy and coal consumption to tCO_2e
National Grid Future Energy Scenario	2019-2040	Conversion factors used for kWh electricity consumption to tCO_2e
Microgeneration Certification Scheme: Solar PV Self-Consumption	2022	Guidance used for calculating self-consumption potential of domestic solar

Domestic Buildings

ARUP

Modelling overview



	CERP 2 Modelling approach	Difference to previous CERP
1	Domestic building stock model built from national datasets such as NEED and ONS, broken down into building types, age and current fuel type -> building archetypes.	Domestic building stock data taken from Energy Savings Trust data set. Data includes tenure, age, fuel source, main heating, SAP band etc. This allows for the development of archetypes by size and tenure and breakdowns of on gas/off gas.
2	Heat demand per building estimated from national assumptions by building archetype. Final fuel consumption then scaled to match local authority energy datasets	Heat demand per building built up using national assumptions from Ofgem and applied to housing stock data from EST.
3	New building stock projections provided by N&W Yorkshire teams and domestic demolition assumed to be zero.	New building stock projection from the West Yorkshire Housing Strategy 2040 of 9,000 homes per year. 9,000 homes per year assumed to be split in tenure across the same split as existing stock and domestic demolition assumed to be zero.
4	Energy efficiency measures applied to each building archetype based on EE analysis for the CCC net-zero technical report and for the NIC, as well as the CGS2,3,4,5	Energy efficiency measures applied to each building archetype are based on Arup analysis of current energy intensity of existing stock and target efficiency under a Max ambition scenario in 2038 of 50kWh/m^2/yr.
5	Low carbon heating system installation in each building archetype based on EE analysis for the CCC, but accelerated to decarbonise more rapidly; roll-out rates moderate for next few years, then accelerate after planning following targets in CGS and CCC recommendations 2,3,4,8	Low carbon heating system measures applied to each building archetype are based on Arup analysis of current heating systems of WY housing stock (data from EST) and applying efficiency improvements based on improvement to coefficients of performance associated with low carbon heat system vs that of the existing system. Under a maximum ambition pathway, it is assumed that these low carbon heating systems are applied post energy efficiency measures or stand alone.
6	New buildings have high efficiency standards; they continue to install some gas boilers for next few years, but from 2025 all new build must install low carbon heat, primarily heat pumps	
7	Solar PV projections based on National Grid Future Energy scenarios	Solar PV projections based on Northern PowerGrid DFES projections.

ARUP

Key assumptions

Modelled outcome for	Baseline		Maximum Ambition Pathway	
	Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Increased number of homes	9,000 homes per year	Assumption is as given in the West Yorkshire Housing Strategy 2040.	9,000 homes per year	Assumption is as given in the West Yorkshire Housing Strategy 2040.
Performance of existing homes	Avg 133kWh/m^2/year (heating + hot water)	Assumption is based on domestic gas consumption for West Yorkshire from the DESNZ Total final energy consumption dataset, combined with Energy Savings Trust data on housing stock to calculate average consumption across tenures and home sizes following Ofgem price cap archetypes.	50 kWh/m^2/yr (space heating demand) 9.5kWh/m^2/yr (water heating demand)	50kWh/m^2 is the LETI standard[1] for best practice achieved heat demand following a deep fabric retrofit. Measures assumed include wall, floor and roof insulation, high performance glazing and doors, draught proofing, air tightness and ventilation.
Performance of new homes	35 kWh/m^2/year (energy use intensity)	Assumption is based on the LETI residential new build benchmark.[2]	25 kWh/m^2/year	Represents Future Homes Standard to be introduced in 2025 Calculations assume that the heating source for these new build homes would be electric heat pumps (air, ground or water source dependent on feasibility).
Solar PV roll out	107MW of solar PV installed in West Yorkshire as of 2023. At 3kW capacity per home that equates to 32,485 homes, ~3% of homes.	Assumption that solar capacity of domestic homes remains static.	569 MWs of rooftop solar c. 175,000-200,000 properties, 15-17% of homes in 2038.	Northern PowerGrid's max projection for domestic solar PV has dropped since CERP1 from 569MW to 451MW in West Yorkshire. Previous 569MW figure used for CERP 2 Max ambition.

[1] LETI Climate Emergency Retrofit Guide. Available at: https://www.leti.uk/_files/ugd/252d09_c71428bafc3d42fbac34f9ad0cd6262b.pdf
[2] LETI Climate Emergency Design Guide. Available at: https://www.leti.uk/_files/ugd/252d09_3b0f2acf2bb24c019f5ed9173fc5d9f4.pdf

ARUP

Key assumptions

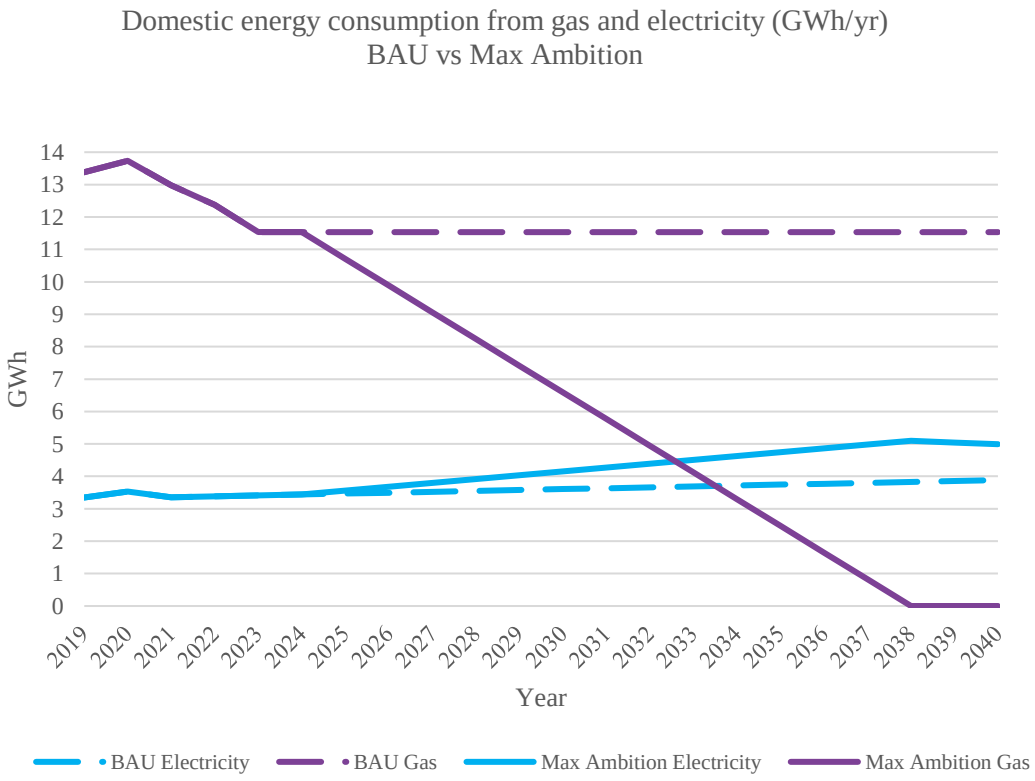
Modelled outcome for	Baseline		Maximum Ambition Pathway	
	Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Heating source replacement	Assumed no replacement of direct electric heating sources with Heat Pumps (HPs) or Heat Networks (HNs) in existing homes	As there are no confirmed mass-rollout plans for heat networks and heat pumps in West Yorkshire/UK the assumption is that under a baseline scenario no gas heating sources will be replaced with these technologies.	Linear roll out to 2038 of HPs and HNs to: • 78% of Owner Occupied homes on gas - 635,696 • 78% of Private Rented homes on gas – 141,077 • 78% of Socially Rented homes on gas – 154,626 **931,398 homes by 2038** • 78% delivered by Heat Pumps (COP 3.0[1]) • 22% delivered by heat networks (COP 4.0[2])	To reach net zero emissions gas consumption should be reduced as much as possible. Replacement of all gas heating sources is therefore needed. However, it is acknowledged that WYCA does not have the control to replace 100% of Owner Occupied and Private Rented homes heating sources by 2038. Therefore, an ambitious target of 78% is used for those homes. Number of homes are calculated using Energy Savings Trust housing stock data.
	Assumed no replacement of direct electric heating sources with HPs or Heat Networks in existing homes	As there are no confirmed mass-rollout plans for heat networks and heat pumps in West Yorkshire/UK the assumption is that under a baseline scenario no gas heating sources will be replaced with these technologies.	Linear roll out to 2038 of HPs to: • 100% of OO homes direct electric – 34,904 • 100% of PR homes direct electric – 48,130 • 100% of SR homes on direct electric – 28,954 **111,988 homes by 2038** 100% delivered by Heat Pumps (COP 3.0[1])	Assume a linear roll out strategy to replace 100% of direct electric heated homes. Number of homes are calculated using Energy Savings Trust housing stock data.

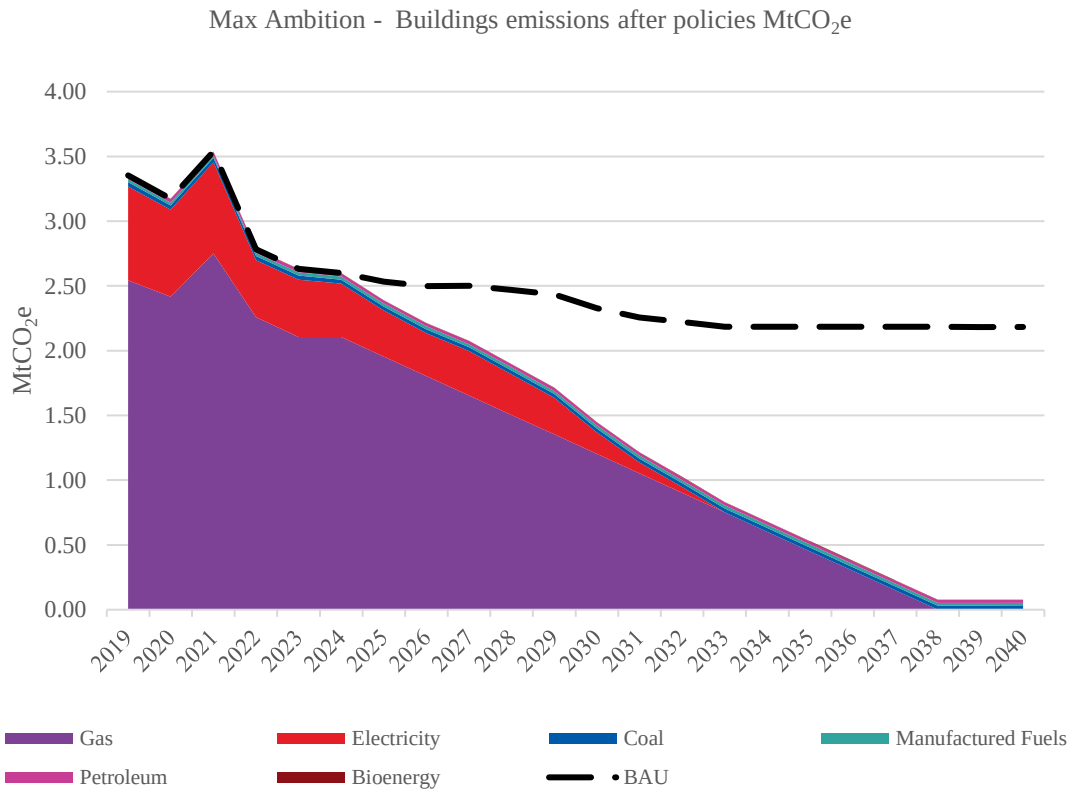
[1] COP of 3.0 used for heat pumps in individual homes. Assumed to be a mixed role out of Air Source and Ground Source Heat Pumps dependent on feasibility. COP of 3.0 is a conservative estimate based on assumptions from other projects. Heat Pump performance can vary based on different source types, source temperatures (affected by season and climate), supply temperatures (50°C flow temperature rather than 40°C results in a higher COP) and system controls.

[2] COP of 4.0 used for heat networks. Heat networks are documented to achieve COPs of 3.0 to 5.0, with Danish examples of 5.3. However, Danish systems feature heat recovery systems that significantly improve efficiency. It is assumed that installed heat networks over the coming years will exceed the lower end of 3.0 and achieve a COP of 4.0 .

ARUP

Domestic consumption





Modelled measures & outcomes (activity & emissions)

ARUP

Policy	Measure	Tenure	Rate of deployment	2030		2038	
				Number of homes	tCO_2e saving vs BAU	Number of homes	tCO_2e saving vs BAU
Energy efficiency retrofit	Retrofitting existing buildings with Gas boiler to 50kWh/m^2/yr benchmark	Owner Occupied	22,703/yr	136,221 (21%)	-164,693	317,848 (50%)	-384,284
		Private Rented	5,038/y	30,321 (21%)	-29,457	70,539 (50%)	-68,734
		Social homes	11,045/yr	66,268 (43%)	-53,337	154,625 (100%)	-124,452
	Retrofitting existing buildings with direct electric heating to 50kWh/m^2/yr benchmark	Owner Occupied	1,247/yr	7,479 (21%)	-541	17,452 (50%)	See note
		Private Rented	1,719/yr	10,314 (21%)	-666	24,065 (50%)	See note
		Social homes	2,068/yr	12,409 (43%)	-707	28,954 (100%)	See note
Improved benchmark for new builds	Benchmark of 25kWh/m^2 vs BAU 35kWh/m^2 9,000/yr split across tenure types to match existing stock breakdown	Owner Occupied	6,143/yr	36,856 (100% of new homes)	-1,445	85,997 (100% of new homes)	See note
		Private Rented	1,363/yr	8,179 (100% of new homes)	-290	19,085 (100% of new homes)	See note
		Social homes	1,494/yr	8,965 (100% of new homes)	-278	20,918 (100% of new homes)	See note

Note: in the case of efficiency improvements to electric based heating systems, emission saving of electricity reduces to zero as carbon factor of grid electricity reaches zero, eliminating benefit per kWh saved.

Modelled measures & outcomes (activity & emissions)

ARUP

Policy	Measure	Tenure	Rate of deployment	2030		2038	
				Unit	tCO_2e saving vs BAU	Unit	tCO_2e saving vs BAU
Heat pumps	Gas heating replaced with heat pumps	Owner Occupied	22,703/yr	212,504 (33%)	-335,598	495,843 (78%)	-873,775
		Private Rented	5,038/yr	47,160 (33%)	-61,191	110,040 (78%)	-159,319
		Social homes	9,940/yr	51,689 (33%)	-42,190	120,608 (78%)	-109,846
	Direct Electric heating replaced with heat pumps	Owner Occupied	2,493/yr	14,959 (43%)	-2,327	34,904 (100%)	See note
		Private Rented	3,438/yr	20,627 43%)	-2,900	48,130 (100%)	See note
		Social homes	2,068/yr	12,409 (43%)	-1,529	28,954 (100%)	See note
District & communal heating	Heat networks replacing gas boiler systems	Owner Occupied	9,990 homes/yr	59,937 (9%)	-140,511	139,853 (22%)	-355,881
		Private Rented	2,217 homes/yr	13,302 (9%)	-25,466	31,037 (22%)	-64,500
		Social homes	2,430 homes/yr	14,579 (9%)	-12,097	34,018 (22%)	-30,638
Solar PV	MWs rooftop solar	All tenures	41MW/yr	244MW capacity	-2,292	569MW capacity	See note
	MWs rooftop solar – uplift with batter installation	All tenures	28MW/yr	171MW capacity	-3,025	398MW capacity	See note

Note: in the case of efficiency improvements to electric based heating systems, emission saving of electricity reduces to zero as carbon factor of grid electricity reaches zero, eliminating benefit per kWh saved.
Similarly, at the point of the grid reaching carbon neutrality CO_2e savings are no longer realised as the solar energy consumed is no longer displacing a more carbon intensive grid.

Non-domestic buildings - overview

Approach to modelling

Emissions associated with non-domestic buildings have been modelled using the same approach as that which was used in the previous CERP, but with newer data sources.

The non-domestic building modelling covers the following building categories:

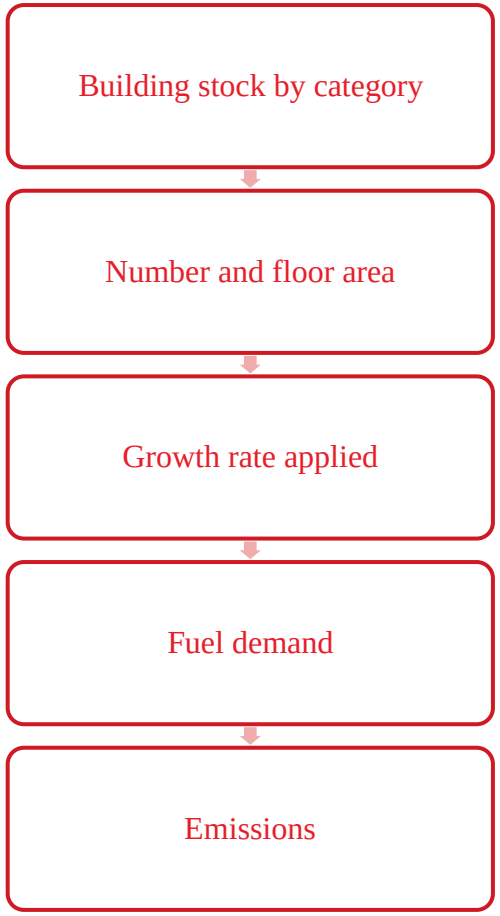
- Health
- Education
- Public other
- Offices
- Retail
- Industrial
- Private other

Modelled outcomes

Sector	Modelled outcomes
Non-domestic buildings	Energy efficiency retrofits
	Heat pumps
	District and communal heating
	Solar PV

Non-domestic buildings - overview

Modelling overview



	Modelling approach	Difference to previous CERP
1	Non-domestic building stock defined in terms of energy use (ECUK data) by building archetype by end-use application	Estimates updated to be informed by most recent ECUK data available (2022).
2	Number and floor area as supplementary information from government datasets	Estimates updated using 'UK Business, activity, size and location' published by ONS (2022).
3	Non-domestic growth rate follows subsector SIC growth provided by LCR team	CERP 1 data re-baselined to show growth increase relative to 2022 base year.
4	BEES, ECUK and BEIS datasets used to assess current fuel demand breakdown by sector/application	Estimates updated to be informed by most recent ECUK data available (2022).
5	Energy efficiency assumptions (heat and non-heat) from EE analysis for the National Infrastructure Commission, based on the BEES datasets and cost of efficiency measures	CERP 1 assumptions unchanged.
6	Heating system projections based on a range of sources, including non-domestic subsector current state (BEES), CCC analysis and recommendations and CGS	CERP 1 assumptions unchanged.

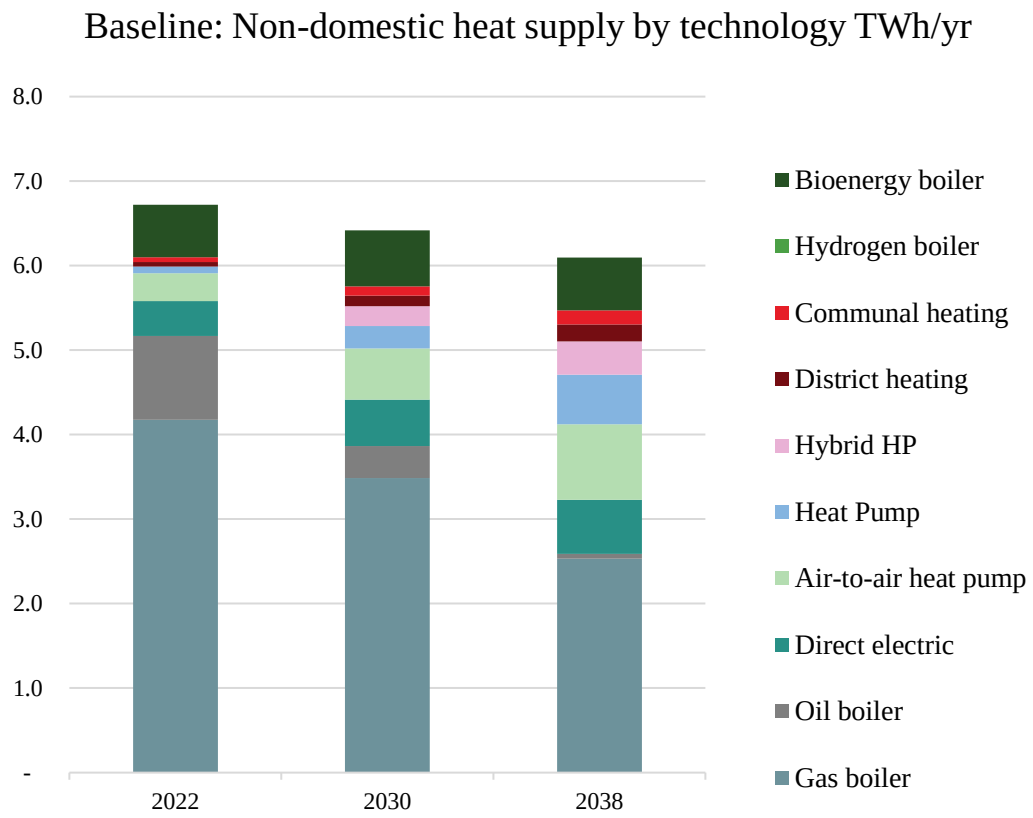
ARUP

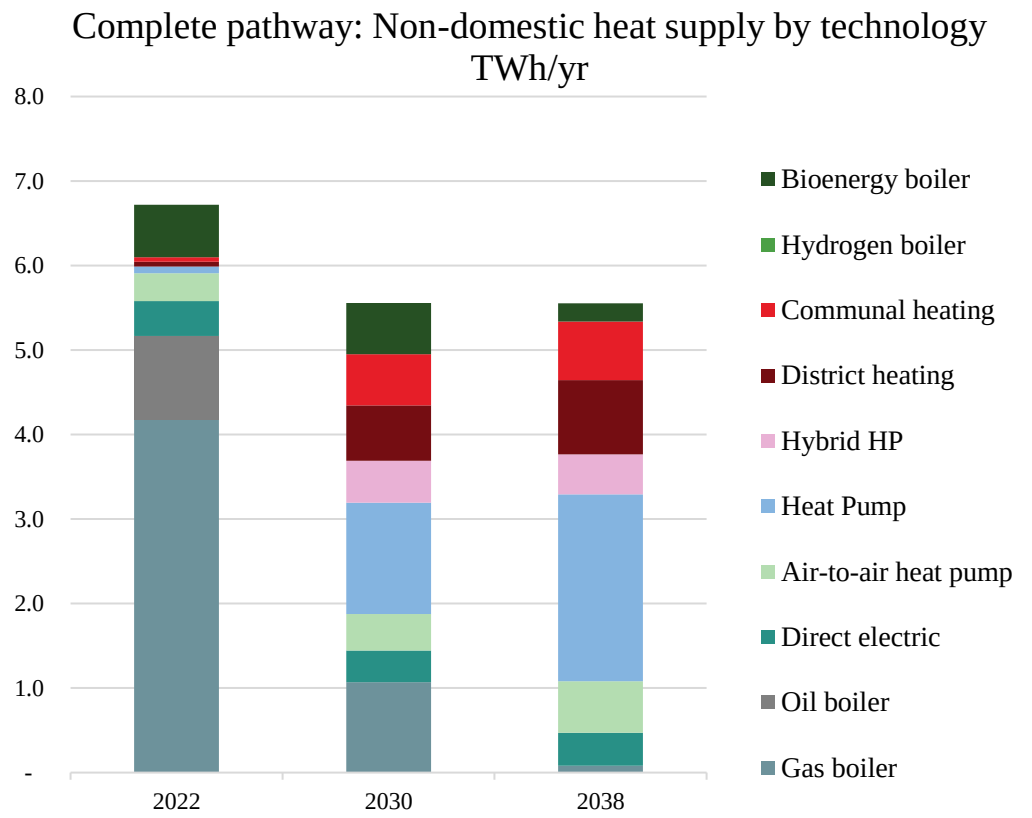
Key assumptions

Modelled outcome	Baseline		Maximum Ambition Pathway	
	Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Proportion of non-domestic heating systems by heat delivered - existing buildings	Heat system projections over time based on sources such as Clean Growth strategy targets, CCC non-domestic assumptions (all non-domestic heat supplied by DH or heat pumps by 2050, 45% DH) and EE modelling	The non-domestic sector has a diverse heating mix, with a greater proportion of warm air heating systems. Heat pumps installations continue at a slow rate, increasing only a little from current rates under the Renewable Heat Incentive.	Heating systems transition away from gas boilers to heat pumps, district heating etc.	Highly ambitious heat pump roll out. Oil heating is rapidly phased out in off-gas buildings. District and communal heating systems are applied in heat dense / urban areas or multi-building complexes. Direct electric heating is deployed in buildings which are not suitable for heat pumps, for example those with space or efficiency constraints. Air-to-air heat pumps are deployed in the non-domestic sector where dry heating systems are required.
Energy efficiency retrofits	10% reduction in total heating energy consumption	This assumes only low-cost, cost-effective measures are applied	19% reduction in total heating energy consumption	This assumes all measures with cost effectiveness < £400/tCO_2e are applied
Solar PV in non-domestic buildings	64 GWh/yr annual generation	Non-domestic solar PV increases at half the rate it did under the Feed In Tarif subsidy.	96 GWh/yr annual generation	Non-domestic solar PV increases at the rate it did under the Feed In Tarif subsidy.

Non-domestic buildings

Heat supply by technology





Modelled measures & outcomes (activity & emissions)

ARUP

Category	Type	Maximum Ambition Pathway (Activity)				Maximum Ambition Pathway (Emissions)			
		2022	2030	2038	Unit	2022	2030	2038	Unit
Energy efficiency retrofit	Existing buildings	0%	18%	19%	Average heat demand reduction	0	-0.012	-0.001	$MtCO_2e$
Gas boilers	All buildings	59,076	20,677	1,743	Number	0.55	0.12	0.00	$MtCO_2e$
		n/a	-5,019	-336	Number / year				
		62%	23%	2%	% existing buildings				
Heat pumps	All buildings	5,824	43,370	70,881	Number	0.01	0.02	0.00	$MtCO_2e$
		n/a	5,081	1,235	Number / year				
		6%	48%	83%	% existing buildings				

Modelled measures & outcomes (activity & emissions)

ARUP

Category	Measure	Maximum Ambition Pathway (Activity)				Maximum Ambition Pathway (Emissions)			
		2022	2030	2038	Unit	2022	2030	2038	Unit
District & communal heating	All buildings	1,519	24,412	33,746	Number	0.01	0.03	0.01	$MtCO_2e$
		n/a	3,182	1,094	Number / year				
		2%	23%	28%	% existing buildings				
Solar PV	Existing buildings	1,200	1,700	2,250	Cumulative from baseline year	-0.005	-0.003	-0.000	$MtCO_2e$
	New buildings	0	200	400	Cumulative from baseline year	0	-0.000	-0.000	$MtCO_2e$

Industry - Overview

ARUP

Approach to modelling

Industry emissions for both the Baseline and Max Ambition Pathways have been modelled using the same approach as that which was used in the previous CERP, but with newer data sources.

Key datasets

A large number of datasets are used in the modelling for the industry sector. All datasets are references within the excel workbook.

Key datasets / sources for assumptions are set out in the table to the right.

Data set
NAEI Point source emissions
Energy Consumption in the UK ECUK dataset
DESNZ subnational energy consumption statistics
ONS UK business workbook and floorspace
Industrial decarbonisation and energy efficiency roadmaps
CCC Net-zero reports
Various Element Energy modelling / assumptions used in the previous CERP

Industry – modelling overview

ARUP

	Modelling approach	Difference to previous CERP
1	Take regional emissions of large point sources (emissions intensive industry) and categorise by subsector and region	Point source emissions updated to 2021 NAEI dataset, no new point sources found in region, but some sources have shut down
2	Estimate the energy consumption and fuel breakdown of these large sites using fuel emissions factors and ECUK fuel breakdown by sector. Add on the electricity consumption for each sector (no direct emissions).	Estimates updated to be informed by most recent ECUK data available (2022).
3	Add 'small industry' fuel as that remining in the non-domestic sector of the local authority energy datasets once non-domestic buildings are removed. Use the government employment and business count datasets to understand a rough distribution of sectors within small businesses	
4	Apply industry growth factors supplied by LCR by SIC code	Updated the base year to apply the growth factors from
5	Apply energy efficiency and resource efficiency measures from a number of sources, primarily the industrial decarbonisation roadmaps by sector	Additional sources consulted including; Industrial Decarbonisation Strategy, Second National Infrastructure Assessment
6	Apply net-zero solutions by industry sector (shown later), either fuel switching to hydrogen, electricity, bioenergy; or Carbon Capture & Storage application	
7	Estimate adoption of Carbon Capture & Storage as a net-zero solution for industrial emissions, define adoption levels by industry sector	Max Ambition and Baseline scenarios differ in future Carbon Capture & Storage efficiency
8	Explore potential for hydrogen in industry in the West Yorkshire area through planned and potential projects	Inclusion of new potential projects and more up to date understanding of where hydrogen fits within the future of local industry based on Hydrogen Study (2024)

ARUP

Key assumptions

Modelled outcome for		Baseline		Maximum Ambition Pathway	
		Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Energy demand reduction relative to BAU due to energy and resource efficiency	Resource Efficiency	Small resource efficiency savings in-line with reported BAU pathways for specific sectors	The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf (theccc.org.uk)	Resource efficiency savings utilised where possible, due to both methodology changes and technological advancements	Industrial Decarbonisation Strategy (publishing.service.gov.uk)
	Circular Economy	Limited introduction of circular economy principles in industry	The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf (theccc.org.uk)	Circular economy utilised in sectors where the possibility exists, could be up to 40% emissions reduction in specific sectors when combined with Resource Efficiency savings	Industrial Decarbonisation Strategy (publishing.service.gov.uk)
	Energy Efficiency	Energy efficiency options utilised by industry as cost saving measure and implemented in-line with baseline government initiatives. Evidence of efficiency savings in sectors over past few decades show strong case for these savings even in BAU scenario	The-Sixth-Carbon-Budget-The-UKs-path-to-Net-Zero.pdf (theccc.org.uk)	Efficiency savings between 50% and 100% higher than in the baseline pathway depending on sector	Industrial Decarbonisation Strategy (publishing.service.gov.uk)

ARUP

Key assumptions

Modelled outcome for		Baseline		Maximum Ambition Pathway	
		Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Electricity demand	Fuel Switching	Certain large industrial sectors transition into electricity for much of their fuel, penetration into small industry is limited.	Industrial Decarbonisation and Energy Efficiency Roadmaps to 2050 - GOV.UK (www.gov.uk)	Small industry transitions largely to electricity, almost all remaining natural gas and petroleum products in large industry are replaced where electricity is feasible	Deep-Decarbonisation Pathways for UK Industry (Element Energy) - Climate Change Committee (theccc.org.uk)
	Industrial Demand	Electricity becomes responsible for between 35% – 40% of West Yorkshire's industrial energy demands by 2040, which combined with Industry growth is roughly an 30% increase in electricity demand from current day	Industrial Decarbonisation and Energy Efficiency Roadmaps to 2050 - GOV.UK (www.gov.uk)	Electricity demand increases by roughly 55% from current day and becomes responsible for fulfilling ~60% of energy demand in the region	Deep-Decarbonisation Pathways for UK Industry (Element Energy) - Climate Change Committee (theccc.org.uk)

Key assumptions

Modelled outcome for		Baseline		Maximum Ambition Pathway	
		Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Hydrogen demand	East Coast Hydrogen	East Coast Hydrogen not completed	WP6 Understanding Industrial Appliances Report (squarespace.com)	East Coast Hydrogen undertaken, including smaller pipelines in West Yorkshire. The network in the region is almost complete by 2038 and most major industry is connected where applicable.	West Yorkshire Hydrogen Study
	On Site Hydrogen	Some sectors opt for on-site hydrogen where there is a logical business case for doing so. This is more prevalent in the Glass and Mineral Sectors.	WP6 Understanding Industrial Appliances Report (squarespace.com)	Some sites not connected to East Coast Hydrogen move to on-site production as a strong business case exists. Some sectors see remaining natural gas that hasn't been replaced with electricity / bio-energy phased out entirely in favour of hydrogen	West Yorkshire Hydrogen Study

ARUP

Key assumptions

Modelled outcome for		Baseline		Maximum Ambition Pathway	
		Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Carbon dioxide captured	Carbon Capture & Storage Efficiency	85-90% currently, 95% by 2040	Deep-Decarbonisation Pathways for UK Industry (Element Energy) - Climate Change Committee (theccc.org.uk)	85 – 90% currently, 99% by 2040	nic.org.uk/app/uploads/Final-NIA-2-Full-Document.pdf
	Carbon Capture & Storage Utilisation	Carbon Capture & Storage is not utilised due to no infrastructure in the region and no business case for exporting captured carbon.	Deep-Decarbonisation Pathways for UK Industry (Element Energy) - Climate Change Committee (theccc.org.uk)	Carbon Capture & Storage utilised in sectors where possible, but limited to larger industrial sites and not adopted in Small Industry	nic.org.uk/app/uploads/Final-NIA-2-Full-Document.pdf
	Carbon Capture & Storage Infrastructure	Creation of a Carbon Capture & Storage pipeline not completed in the West Yorkshire Region	Deep-Decarbonisation Pathways for UK Industry (Element Energy) - Climate Change Committee (theccc.org.uk)	Carbon Capture & Storage network is completed passing through the West Yorkshire area either as part of a national network or regional network linking to completed Carbon Capture & Storage projects in the Northeast	nic.org.uk/app/uploads/Final-NIA-2-Full-Document.pdf

Modelled measures & outcomes (activity & emissions)

ARUP

Category	Measure	Max Ambition (Activity)				Max ambition (Emissions)			
		2024	2030	2038	Unit	2024	2030	2038	Unit
Energy demand reduction - energy and resource efficiency	Existing Industry	0%	13%	24%	% reduction relative to BAU	0	0.01498	0.02765	$MtCO_2e$
Electricity demand	Existing Industry	2.138	3.131	3.458	TWh/year	0.2138	0.2505	0.1383	$MtCO_2e$
	Existing Industry	33%	51%	61%	% fuel	0.2138	0.2505	0.1383	$MtCO_2e$
Hydrogen demand	Existing Industry	0	0.480	1.125	TWh/year	0	0.04320	0.0338	$MtCO_2e$
	Existing Industry	0%	8%	20%	% fuel	0	0.04320	0.0338	$MtCO_2e$
CO2 captured	Annual					0	0	63	$ktCO_2e/yr$
	Cumulatively					0	0	0.3600	$MtCO_2e$

Land Use and Agriculture - Overview

ARUP

Approach to modelling

Agriculture and land use emissions for both the baseline and maximum ambition pathways have been modelled using the same approach as that which was used in CERP 1.

Key datasets

As per CERP 1 - land use and agriculture modelling is based on work completed by UK Centre for Ecology & Hydrology (CEH) and partners for the CCC net-zero technical report, as well as other modelling and Green House Gas methodology developed by CEH. This is applied to the study region by assessing the regional land area for different applications, number of livestock etc.

Please refer to the CERP 1 Technical Appendix for further detail on the methodology and assumptions used by CEH.

Modelled measures & outcomes (activity & emissions)

ARUP

Category	Measure	Maximum Ambition Pathway (Activity)				Maximum Ambition Pathway (Emissions)			
		2022	2030	2038	Unit	2022	2030	2038	Unit
Land use	Existing forests	9.51	9.63	9.64 25 (including White Rose Forest (WRF) soureced figure for reference	kha	-0.017	-0.01	-0.008	$MtCO_2e$
	New forest planting	0	0.15	0.17 2.1 (including WRF Target as reference)	kha	-0.0005	-0.002	-0.003	$MtCO_2e$
	Bioenergy	0.8	3.2	5.7	kha	-0.001	-0.011	-0.044	$MtCO_2e$
	Agroforestry & Hedgerows	-	-	-	-	-	-	-	$MtCO_2e$
	Peatlands	10% (upland) 17% (lowland) *2020 assumptions	37% (upland) 61% (lowland	60% (upland) 100% (lowland) 100% (including Yorkshire Peat Partnership target as reference)	% restored	0.05	0.04	0.03	$MtCO_2e$
	Urban expansion	-	-	-	-	0.04	0.1	0.2	$MtCO_2e$
	Historic land use change	-	-	-	-	-0.02	-0.02	-0.02	$MtCO_2e$

Modelled measures & outcomes (activity & emissions)

ARUP

Category	Measure	Maximum Ambition Pathway (Activity)				Maximum Ambition Pathway (Emissions)				
		2022	2030	2038	Unit		2022	2030	2038	Unit
Agriculture	Increased stocking density	0	5	7	%	Enteric fermentation	0.1	0.1	0.1	$MtCO_2e$
	Move horticulture indoors	0	15	28	%	Waste and manure management	0.05	0.04	0.04	$MtCO_2e$
	Diet change	0	16	32	% reduction in red meat & dairy consumption	Agricultural soils	0.06	0.06	0.05	$MtCO_2e$
	Food waste reduction	0	25	35	% reduction	-	-	-	-	-
	Fossil fuel stationary and mobile machinery	90%	74%	22%	%	Fossil fuel stationary and mobile machinery	0.02	0.02	0.01	$MtCO_2e$

Waste - Overview

Approach to modelling

Transport emissions for both the Baseline and Max Ambition Pathways have been modelled using the same approach as that which was used in the previous CERP, but with newer data sources.

Key assumptions

A list of key assumptions made in the modelling of the waste sector are provided in the table on the right.

<table>
<tr><th colspan="3">Assumption</th></tr>
<tr><td>1.</td><td>Split of UK emissions by country</td><td>Source: CCC Net Zero Report (2019) as per CERP 1</td></tr>
<tr><td>2a</td><td>Scenarios for deep emissions reductions from the waste sector</td><td>Source: CCC Analysis (2019) as per CERP 1</td></tr>
<tr><td colspan="3">The following table shows whether there’s any difference in emissions between the years for various waste categories.
<table>
<tr><th>2017 (baseline)</th><th>2050 (Core)</th><th>2050 (net-zero)</th></tr>
<tr><td>Landfill</td><td>--- Change ----</td><td>--- Change ----</td></tr>
<tr><td>Waste water</td><td>--- Change ----</td><td>--- Change ----</td></tr>
<tr><td>Waste incineration</td><td>--- None ----</td><td>--- None ----</td></tr>
<tr><td>Composting</td><td>--- Change ----</td><td>--- None ----</td></tr>
<tr><td>AD</td><td>--- Change ----</td><td>--- None ----</td></tr>
<tr><td>MBT</td><td>--- None ----</td><td>--- None ----</td></tr>
</table>
As it’s evident, CCC’s forecast do not change emissions from waste incineration, composting, AD and mechanical biological treatment (MBT), therefore these emissions are kept constant in the model.</td></tr>
<tr><td>2b</td><td>Scenarios for minimising emissions from waste management</td><td>Source: CCC Analysis (2019) as per CERP 1</td></tr>
<tr><td>3.</td><td>Data to support high level waste modelling</td><td>• The figures for England for 'landfilled', 'recycled-composted', 'population' and 'incineration’ have been taken directly from published sources (2022)
• The figures for West Yorkshire for 'landfilled', 'recycled-composted' and 'incineration' for 2022 have been calculated as a proxy using 2019 data (from the previous CERP 1 model). The data for 'population’ has been taken directly from published source.</td></tr>
</table>

Waste – modelling overview

	Modelling approach	Difference to previous CERP
1	The waste sector, out of scope for this study, is modelled at a very high level in order to have a comprehensive regional model. Only a baseline and a single emissions reduction scenario are created.	No change in modelling approach
2	The CCC's Net Zero Report (2019) forms the basis of the model. The report identifies 6 waste emission types. AD is removed from the model due to it being in the power sector.	No change in modelling approach
3	CCC's forecast do not change England-level emissions from waste incineration, composting and mechanical biological treatment (MBT), therefore these emissions are kept constant in the model.	No change in modelling approach (see next slide)
4	Landfill and wastewater treatment emissions are reduced by the same ratio as the CCC model.	No change in modelling approach
5	Current wastewater emissions are estimated by regional population.	No change in modelling approach
6	Current emissions from landfill, composting, incineration and MBT are estimated from local authority waste disposal data. Total tonnes of waste disposed through each pathway is compared to the England total to calculate the % of emissions attributable to the study regions.	No change in modelling approach
7	When waste percentages are compared with population it is apparent that Waste Yorkshire sends 60% less waste per capita to landfill compared to York & North Yorkshire	Not relevant
8	MBT emissions are assumed to be distributed by the same % as waste sent to composting.	No change in modelling approach

Modelled measures & outcomes (activity & emissions)

ARUP

Category	Measure	Emissions Reduction Scenario			
		2022	2030	2038	Unit
Waste	Landfill	0.185	0.097	0.052	$MtCO_2e$
	Wastewater Treatment	0.112	0.114	0.117	$MtCO_2e$
	Composting	0.023	0.026	0.028	$MtCO_2e$
	Mechanical Biological Treatment	0.016	0.016	0.016	$MtCO_2e$
	Waste Incineration	0.000	0.000	0.000	$MtCO_2e$

Power - Overview

Approach to modelling

The power modelling covers generation in West Yorkshire. The modelling is based on historical data from 2022 and projects power generation up to 2040.

Note – the power sector is not included as a sector within either the baseline or maximum ambition pathway.

Key datasets

A large number of datasets are used in the modelling for the power sector. All datasets are references within tab 5.5 ‘Power Data’ of the excel workbook.

Key assumptions

A list of key assumptions made in the modelling of the power sector are provided in the table on the next slide.

ARUP

Key assumptions

Modelled outcome	Baseline		Maximum Ambition Pathway	
	Modelled assumption	Rational for assumption	Modelled assumption	Rational for assumption
Solar PV – operational emissions	The pathways only account for operational emissions which are assumed to be zero for Solar PV.			
Onshore wind – operational emissions	The pathways only account for operational emissions which are assumed to be zero for Onshore Wind.			
Energy from waste – Carbon Capture & Storage	Carbon Capture & Storage is not considered as part of the BAU pathway.		Carbon Capture & Storage will be implemented on Energy from Waste Plants, from 2030.	See CERP 1 Technical Appendix for further detail.
Energy from waste - Cooking Oil	Power generation from cooking oil will remain constant (2MW) from 2022-2040.	See CERP 1 Technical Appendix for further detail.	Power generation from cooking oil will remain constant (2MW) from 2022-2040.	See CERP 1 Technical Appendix for further detail.
Anaerobic Digestion	There have been no assumption changes regarding Anaerobic Digestion.	See CERP 1 Technical Appendix for further detail.	There have been no assumption changes regarding Anaerobic Digestion.	See CERP 1 Technical Appendix for further detail.
Bioenergy	There have been no assumption changes regarding Bioenergy.	See CERP 1 Technical Appendix for further detail.	There have been no assumption changes regarding Bioenergy.	See CERP 1 Technical Appendix for further detail.

Power – modelling overview

	Modelling approach	Difference to previous CERP
Distributed generators		
1	The power sector is modelled by determining current and future installed generator capacities, load factors and emissions intensities of all generation technologies, which are then used to calculate total emissions and generation by each technology, as well as the regional grid intensity.	The- installed capacities and emission intensity values have been reviewed and updated for all technologies.
3	The installed capacity of solar PV, for the baseline year (2022) are taken from the Renewable Energy Planning Database, whereas baseline capacities for onshore wind, bioenergy, sewage sludge and landfill gas are taken from BEIS Renewable Electricity by Local Authority.	CERP 1 used the same sources but for a baseline year of 2019.
4	Power from cooking oil was not included in the Renewable Energy Planning Database for 2022 thus, it has been assumed power generated from cooking oil would remain at 2MW/annum as recorded in the 2019 data. Due to the small proportion of generation capacity, this has minimal effect on the overall pathway (accounting for 1% or less of the total emissions).	Assumed cooking oil consumption remains consistent from CERP 1.
5	CHP Energy from Waste (EfW) capacities and short-term growth rates are based on a UK market review by Tolvik. For these technologies, a single decarbonisation scenario is created where a third of all new capacity is assumed to be CHP plants. Total capacity is capped by UK waste gap analysis and by 2040 half of all capacity is converted to EfW Carbon Capture & Storage, in accordance with CCC.	This methodology is the same as that used in CERP 1 but based on a market review of 2022.
6	Future solar and onshore wind capacities are determined by taking a percentage of new added UK capacities in National Grid's Future Energy Scenarios (FES) according to the land area of the study region, and the deployment accelerated to account for regional net-zero targets. FES are also used to calculate capacities of dedicated bioenergy, anaerobic digestion and landfill gas generation, as well as battery storage installations.	This methodology is the same as that used in CERP 1 however, it should be noted that updated FES scenarios are expected to be published in July 2024, which could affect these assumptions.
7	Capacities of small fossil generation are taken from Northern Powergrid's Embedded Capacity Register.	Previously CERP 1 small fossil fuel generation was based on data from Northern Powergrid's System Wise Resource Register.
8	Renewable technologies are assumed to have a constant load factor equal to past regional averages.	The same approach has been used in both CERPs.

Power – modelling overview

	Modelling approach	Difference to previous CERP
Large centralised plants		
1	Drax is situated outside of the West Yorkshire boundary and has therefore been discounted from this update.	CERP 1 was for the region and did therefore include generation and emissions for Drax although the model assumed Drax would not being using coal from 2021.
3	A new large-scale gas power plant is assumed to be built in North Yorkshire in 2023/24, in accordance with Drax's plans. This plant is fitted with Carbon Capture & Storage in early 2030s but again lies outside the scope of this update.	The new gas power plant is not considered in the update as it lies outside of this scope.
4	No hydrogen power plants are assumed to be built within the West Yorkshire boundary, as outlined in the North East & Yorkshire Net Zero Hub Hydrogen Roadmap, thus this model does not account for any hydrogen generation or emissions.	In CERP 1, a 300 MW hydrogen power plant was planned to be built in 2030, in the Balanced and Max Ambition Scenarios, followed by another 2 plants in High H2. This lies outside the scope of our update.

Modelled measures & outcomes (activity & emissions)

ARUP

Category	Measure	Complete Pathway (Activity)				Maximum Ambition Pathway (Emissions)			
		2022	2030	2038	Unit	2022	2030	2038	Unit
Solar PV	Cumulative installed capacity	12	224	430	MW	0.00	0.00	0.00	$MtCO_2e$
	% of 2038 capacity	1%	22%	35%	% of 2038 capacity	0.00	0.00	0.00	$MtCO_2e$
	Build rate	26.5	15.7	15.7	MW/year				
Onshore wind	Cumulative installed capacity	71	200	340	MW	0.00	0.00	0.00	$MtCO_2e$
	% of 2038 capacity	7%	20%	29%	% of 2038 capacity	0.00	0.00	0.00	% of 2038 emissions
	Build rate	16.2	11.3	11.3	MW/year				
Energy from Waste and Sewage	Dedicated	143	132	83	MW	0.22	0.18	0.10	$MtCO_2e$
	CHP	32	30	30	MW	0.02	0.01	0.01	$MtCO_2e$
	Carbon Capture & Storage	0	5	44	MW	0.00	-0.01	-0.10	$MtCO_2e$
	Cooking oil	2	2	2	MW	0.00	0.00	0.00	$MtCO_2e$
	Sewage	6	6	6	MW	0.00	0.00	0.00	$MtCO_2e$
	Combined % of 2038 capacity	18%	17%	16%	% of 2038 capacity	2.73	2.02	0.11	% of 2038 emissions
	Combined build rate	-1.6	-1.2	-1.2	MW/year				

Modelled measures & outcomes (activity & emissions)

ARUP

Category	Measure	Maximum Ambition Pathway (Activity)				Maximum Ambition Pathway (Emissions)			
		2022	2030	2038	Unit	2022	2030	2038	Unit
Anaerobic Digestion	Cumulative installed capacity	5	12	12	MW	0.00	0.00	0.00	$MtCO_2e$
	% of 2038 capacity	0.5%	1%	1%	MW	0.00	0.00	0.00	% of 2038 emissions
	Build rate	0.8	0.1	0.1	MW				
Bioenergy	Cumulative installed capacity	12	33	40	MW	0.00	0.01	0.01	$MtCO_2e$
	Combined % of 2038 capacity	1%	3%	4%	% of 2038 capacity	0.00	0.00	0.00	% of 2038 emissions
	Combined build rate	2.7	0.9	0.9	MW/year				
Other (Gas, Diesel, Methane)	Cumulative installed capacity	296.4	173.0	150.1	MW	0.18	0.08	0.07	$MtCO_2e$
	% of 2038 capacity	30%	17%	15%	MW	2.10	0.95	0.80	% of 2038 emissions
	Build rate	-15.4	-2.9	-2.9	MW				
Total:		**579**	**817**	**1009**	**MW**	**0.42**	**0.26**	**0.09**	**$MtCO_2e$**

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Section 12

Technical appendix B

Discontinued CERP 1 actions (1/3)

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Documentation of CERP 1 actions to note prior completion and/or duplication with the refreshed actions by sectors.

Sector	Action No.	Thematic action title and description	Completion timeframe	Reason for discontinuation and/or removal
Cross-cutting	C02	**Regulatory & planning:** Develop a spatial development strategy for the region which considers and incorporates competing land use needs for the region, including: • LULUCF potential and nature recovery network future needs • Potential and required capacity for renewables • Housing growth, with a focus on densification WY specific) and co-location of homes, workplaces and services (e.g. '15 minute neighbourhood' concept) • Transport infrastructure, including road reallocation to cycle infrastructure • Public transport integration • Infrastructure needs for future transitions to H2 and Carbon Capture & Storage, as well as increased electrification	2023	Duplication with sectoral actions
Cross-cutting	C05	**Planning & regulatory:** consider implementing a hydrogen zoning plan by pre-determining areas of the gas network which will be converted to hydrogen in the future. Follow up by requiring and regulating that gas boilers and industrial gas equipment installed in these regions are hydrogen ready. If this policy is nationally led, complement by communicating, enforcing and supporting implementation of H2 ready equipment.	Starting 2025	Duplication with energy sector actions
Buildings	B05	**RD&D:** Explore the most appropriate solutions for hard to decarbonise homes in the region, including: • Back-to-back terraced homes • Very old (pre-1919) properties	2022	Duplication with other buildings sector actions
Buildings	B06	**RD&D:** Explore rooftop solar opportunity in the region. This should quantify and map where greatest opportunity is to enable support and advice to be targeted. It could include development of an online resource (e.g. GLA's Solar Opportunity map).	2023	Duplication with other buildings sector actions

Discontinued CERP 1 actions (2/3)

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Sector	Action No.	Thematic action title and description	Completion timeframe	Reason for discontinuation and/or removal
Energy	P04	**RD&D:** Facilitate urgently needed RD&D by forming partnerships and providing coordination between academics, higher education, private industry and other national RD&D programmes. Share results of regional RD&D activities with national stakeholders and vice versa. Feed results back into regional planning and action plan. Also supplement national funding by providing additional financial support in the form of loans, grants or OPEX support for initial demonstration projects in the region to prove innovative technologies, business models and gather evidence. Areas include: storage technologies (hydrogen, ammonia, compression, chemical flow), demand side response, hydrogen electricity generation, CO 2 capture, CO 2 utilization.	2023	Duplication with other buildings and energy sector actions
Energy	P09	**Planning & Regulatory:** Require all large new EfW facilities to be ready for future CCUS retrofits or alternative deep decarbonisation plans. Future contract renewals should also require development of decarbonisation strategies, including robust business plans relating to future reduced availability of waste, and actively working with the LAs to achieve such goals. Start communications quickly as facilities tend to be bound by long term contracts.	Starting 2021	Duplication with other buildings and industry sector actions
Energy	P10	**Feasibility:** Work with existing EfW facilities in developing decarbonisation strategies and future CCUS retrofit plans. This may include grants for having feasibility assessments of decarbonisation strategies. Facilitate communication between the facilities and future CO_2 infrastructure developers or other large customers in the region.	2030	Duplication with other buildings and industry sector actions
Industry	I06	**Infrastructure:** Support development of Carbon Capture & Storage, hydrogen and electricity infrastructure, through coordinating necessary parties, ensuring planning permission and land are granted/available, supporting funding applications to national government, etc. Support NPg and NGN make a case to Ofgem for strategic infrastructure investments.	Starting 2023	Duplication with other buildings and industry sector actions
Industry	I04	**RD&D, strategy:** Survey the small industry sites to understand the current technologies on all sites and applicability of low carbon options. Feed these results into future planning and infrastructure policies, especially for hydrogen network development in late 2020s.	2025	Duplication with other industry sector actions
LULUCF	L10	**Regulatory & planning:** Work with LAs to use local plans to deliver climate ambitions. This can include: • Ensuring local plans are aligned with the wider regional strategy • Using net gain requirements to support and deliver natural solutions • Reviewing local regulations as appropriate, for example to enhance protection for hedgerows	2024	Duplication with other LULUCF sector actions

Discontinued CERP 1 actions (3/3)

ARUP

Sector	Action No.	Thematic action title and description	Completion timeframe	Reason for discontinuation and/or removal
Transport	T02	**Regulatory & Planning:** Develop a region wide parking strategy that discourages private car use and encourages low emissions technology uptake. This should include: • reducing on street parking and reallocating to other uses such as: car clubs, cycle parking, parklets, micro consolidation etc. Likely steps include: an audit of available parking across all local authorities, consultation with residents and businesses to determine priorities, development of an implementation strategy. • Implementing banded parking charges that vary with vehicle emissions, including residents permits and both on street and off street public parking. It is recommended that charges for ICE vehicles are raised above current levels, particularly for on street parking. • Introducing workplace parking levies where appropriate, and to assess implementing a cap on business parking permits.	2022	Duplication with other transport sector actions
Transport	T03	**Regulation & Planning/Financial:** Develop and implement region wide cycling & walking strategy that significantly expands active travel infrastructure provision. Accelerate/ encourage development and implementation of LWCIPs, including expanding reach beyond town and city centres	2023	Duplication with other transport sector actions
Transport	T09	**RD&D:** Continue to support trials of innovative services, such as on demand shared transport to support public transport provision, to integrate into wider strategy (already being explored in both YNY and WY	2023	Understood as complete and duplicating other transport sector actions
Transport	T11	**RD&D:** Update studies of feasibility and demand for passenger and freight rail services to determine scale of capacity upgrade needed and develop strategy, including reopening of lines, protecting sidings and investment in interchanges. Needs to link with decarbonisation plans to incorporate benefits of electrification to capacity	2023	Understood as complete and duplicating other transport sector actions
Transport	T14	**Financial:** Provide telematics services for local fleets and small businesses to help them identify suitable zero emission options	2023	Duplication with other transport sector actions
Transport	T15	**Financial/RD&D:** Explore opportunities for Council/CA supported shared mobility, such as bike sharing and increasing the car club offering	2023	Duplication with other transport sector actions
Transport	T16	**Financial:** Invest in digital infrastructure to enable working from home and transport technology rollout, and training to improve local digital skills	2022	Understood as complete and duplicating other transport sector actions
Transport	T21	**RD&D:** Engage with Northern Gas Networks, HGV fleets, bioCNG refuelling station providers and AD plant developers to understand their plans for gas in transport in the region, and the potential role of the Council/CA in facilitating rollout (e.g. funding, providing land, partnership etc) and future proofing for a potential transition from bioCNG to H2	2022	Duplication with other transport sector actions

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