Corporate Services, Climate Change and Scrutiny Management Committee **14 April 2025**

Annex A: Summary of DRAFT York and North Yorkshire Carbon Abatement Pathways (CAP) Study Refresh 2025

Key Findings

- Emissions in York and North Yorkshire are lower now than in 2005; transport, buildings and agriculture remain key sectors for achieving decarbonisation of the local economy.
- Progress to date is reflected in emissions declines as well as progress towards the ambitious targets set out in the Routemap but is still not sufficient to meet the ambition set out in the Routemap published in 2022.
- All the pathways explored show a very ambitious decarbonisation pathway, with a 15-year window of opportunity to achieve negative carbon emissions across the region. All pathways require a paradigm shift that will need to start today.
- The **'York & North Yorkshire Leading the Way**' scenario (labelled 'Max Ambition Scenario' in the 2021 study) allows for regional leadership but faces challenges around cost and rapid behavioural change. It requires the region to maximise opportunities to achieve negative carbon emissions by 2040, noting that without the use of carbon removals it is not possible to achieve the target.
- The challenges associated with the most ambitious scenario should be used to reflect on the appetite to continue pursuing this target: during stakeholder engagement, confidence in the ability and likelihood of achieving this ambition was not always shared.

Proposed Scenario Pathways

A narrative description of each proposed scenario is provided below. Each describes the projected changes in greenhouse gas emissions in the study region. Table 1 summarises the key Scale of Ambition Targets underpinning the scenarios.

▪ York and North Yorkshire Leading the Way Scenario:

Based on the previously adopted maximum ambition scenario included in the CAP Study (2021) and the Routemap to Carbon Negative emissions published in 2022, this pathway implies a significant electrification of heating, transport and industry, as well as a significant increase in low-carbon power generation and high rates of forest planting.

▪ Balanced Scenario (Sixth Carbon Budget):

The CCC plausible scenario based on their assessment. The Balanced Pathway navigates through the range of possibilities across technology and society the CCC identified. All new cars, vans and boilers and most investments will be net-zero from 2030 or soon after. It makes moderate assumptions regarding the scale of behavioural change and innovation.

▪ Policy-driven Scenario (Sixth Carbon Budget):

This pathway shows a likely scenario where decarbonisation is achieved through a combination of policy and behavioural change. Based on the CCC's widespread engagement, it includes high levels of social and behavioural change resulting from policies. People and businesses are willing to make more changes to their behaviour. This reduces demand for the most carbon-intensive activities and increases the uptake of some climate change mitigation measures.

▪ Technology-driven Scenario (Sixth Carbon Budget):

Assumes considerable success in both innovation and social and behavioural change. The widespread innovation scenario goes beyond the balanced scenario to achieve net zero by 2050. Success in reducing the costs of low-carbon technologies enables more widespread electrification, a more resource- and energy-efficient economy and more cost-effective technologies to remove CO2 from the atmosphere. It assumes minor social and behavioural changes compared to the policy-driven scenario.

The following section sets out the measures that would be required to achieve these scenarios.

Sectors/ Scenario Pathway		York and North Yorkshire Leading the Way Scenario	Balanced Scenario (CCC's Sixth Carbon Budget)	Policy-Driven Scenario (Widespread Engagement CCC's Sixth Carbon Budget)	Technology-Driven Scenario (Widespread Innovation CCC's Sixth Carbon Budget)
Transport	Change in car kilometres (relative to baseline)	Reduce private car usage (car kilometres) by 48% by 2030 relative to baseline	Moderate behavioural change, with gradual reduction up to 17% of total car kilometres by 2050	High demand reduction, modal shift and ride-sharing, leading to 34% lower car demand and 11% higher rail demand by 2050	Introduction of connected and autonomous vehicles leads to a net 5% increase in total car demand by 2050
	Change in HGV kilometres (relative to baseline)	Heavy goods vehicle activity (HGV kilometres) decreasing by 19% by 2030 relative to baseline	11% reduction in HGV kilometres (relative to baseline) by 2050	11% reduction in HGV kilometres (relative to baseline) by 2050	11% reduction in HGV kilometres (relative to baseline) by 2050
	Change in van kilometres (relative to baseline)	Van activity decreasing (van kilometres) by 10% by 2030	3% reduction in van kilometres (relative to baseline) by 2050	4% reduction in van kilometres (relative to baseline) by 2050	4% reduction in van kilometres (relative to baseline) by 2050
	Low-carbon technology	End to conventional petrol and diesel vehicle sales by 2030 for cars and vans, and 2031 for buses. Biomethane-fuelled HGVs by the early 2030s.Roll-out of battery electric buses, ensuring they account for 25% of the fleet by 2030 and 95% by 2038.	2032 phase-out date for fossil fuel cars and vans; no clear technology choice for HGVs, so most cost-effective technology mix is deployed. 64% of new buses sales are electric by 2030 and 100% by 2050.	2030 phase-out of fossil fuel cars and vans, with rapid EV uptake driven by engagement; deployment of a substantial ERS network for HGVs. 69% of new bus sales will be electric by 2030 and 100% by 2050.	2030 phase-out of fossil fuel cars and vans, with rapid EV uptake driven by cost reductions; battery density and cost improve leading to high use of BEV HGVs with ultra-rapid charging. 54% of new bus sales will be electric by 2030 and 100% by 2050.
	Proportion of new HGV sales - battery-electric	90% of new HGV sales are battery-electric by 2050	74% of new HGV sales are battery-electric by 2050	74% of new HGV sales are battery-electric by 2050	100% of new HGV sales are battery-electric by 2050
	Modal shift to active travel	6% of car journeys could be shifted to walking and cycling by 2040	5-7% of car journeys could be shifted to walking and cycling (including e-bikes) by 2030, rising to 9-14% by 2050	5-7% of car journeys could be shifted to walking and cycling (including e-bikes) by 2030, rising to 9-14% by 2050	5-7% of car journeys could be shifted to walking and cycling (including e-bikes) by 2030, rising to 9-14% by 2050

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	Modal shift to public transport	Increase of passenger modal share by bus to 8% of all journeys by 2030	9-12% of trips could be shifted to buses by 2030, increasing to 17-24% by 2050.	9-12% of trips could be shifted to buses by 2030, increasing to 17-24% by 2050.	9-12% of trips could be shifted to buses by 2030, increasing to 17-24% by 2050.
Buildings	Hydrogen boilers	Install hydrogen boilers in between 13%-40% buildings by 2038 (dependant on gas grid deployment)	Hybrid hydrogen scenario in homes, with 14% of homes using hydrogen for heat. Limited use of biofuels in homes.	Hybrid hydrogen scenario in homes, with 12% of homes using hydrogen for heat. Widespread uptake of high-temperature heat pumps and flexible technology. No biofuels in homes.	Widespread network conversion to hydrogen, with 86% of homes using hydrogen for heat. Smaller role for heat pumps across all buildings; 13 million in homes.
	Energy Efficiency	Retrofit of 250k homes to reach EPC C or better (reduced thermal energy demand) by 2038	Retrofit of 225k homes to reach EPC C All new buildings are zero-carbon by 2025, rented homes to achieve EPC C by 2028, and homes with mortgages achieve EPC C by 2033. All homes for sale EPC C by 2038.	Retrofit of 225k homes to reach EPC C All new buildings are zero-carbon by 2025, rented homes to achieve EPC C by 2028, and homes with mortgages achieve EPC C by 2033. All homes for sale EPC C by 2038.	Retrofit of 225k homes to reach EPC C All new buildings are zero-carbon by 2025, rented homes to achieve EPC C by 2028, and homes with mortgages achieve EPC C by 2033. All homes for sale EPC C by 2038.
	Boiler use	Eliminate oil boiler use by 2030	Phase out date (sales) for the installation of oil boilers by 2028, and natural gas boilers starting in 2033.	Phase out date (sales) for the installation for the installation of oil boilers by 2028 and of natural gas boilers starting in 2030.	Phase out date (sales) for the installation for the installation of oil boilers by 2028 and of natural gas boilers starting in 2035.
	Heat networks	Deploy district heating to 10% of buildings by 2030, increasing to 18% of buildings by 2038.	Low-carbon heat networks are built through 2020-2050, with scaling up through to 2028, from which point around 0.5% of total heating demand is converted per year. By 2050, around a fifth of heat is distributed through heat networks.	Low-carbon heat networks are built through 2020-2050, with scaling up through to 2028, from which point around 0.5% of total heating demand is converted per year. By 2050, around a fifth of heat is distributed through heat networks.	Low-carbon heat networks are built through 2020-2050, with scaling up through to 2028, from which point around 0.5% of total heating demand is converted per year. By 2050, around a fifth of heat is distributed through heat networks.

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			under paludiculture farming by 2050	under paludiculture farming by 2050	under paludiculture farming by 2050
	Hedge creation & management	Increase amount of hedgerows in the region by 20% by 2038, alongside improvements in hedgerow width and health	Increase hedgerows by 40% and managed 30% by 2050	Increase hedgerows by 40% and managed 30% by 2050	Increase hedgerows by 30% and managed 10% by 2050
	Agriculture machinery	Decarbonisation of on-farm machinery	Mix of electrification, hydrogen and later phase-out of biofuels of agriculture machinery.	Focus on electrification and biofuels of agriculture machinery.	Focus on hydrogen, electrification and biofuels of agriculture machinery
Waste	Food waste	Achieve 30% reduction in food waste by 2030	51% fall in edible food waste by 2030 and 61% by 2050**	51% fall in edible food waste by 2030 and 71% by 2050**	51% fall in edible food waste by 2030 and 61% by 2050 (+50% fall in inedible food waste by 2050)**
	Reuse & recycling rate	Reduce overall waste arisings	33% reduction in all waste by 2037	33% reduction in all waste by 2037	28% reduction in all waste by 2037
	Recycling	Increasing recycling of municipal waste to 70% by 2025	68% recycling by 2030	68% recycling by 2030 and 79% by 2050	68% recycling by 2030
	EfW plants installing CCS	-	CCS is fitted to 100% of EfW plants by 2050, starting from early 2040s	CCS is fitted to 100% of EfW plants by 2050, starting from early 2040s	CCS is fitted to 100% of EfW plants by 2050, starting from late 2020s
Industry	Energy efficiency of non-domestic buildings	Retrofit over 62% of existing business premises by 2038	All commercial efficiency renovations completed by 2030. Non-residential buildings heat and catering demands mainly electrified with some hydrogen.	All commercial efficiency renovations completed by 2030. Non-residential buildings heat and catering demands mainly electrified with some hydrogen.	All commercial efficiency renovations completed by 2030. Heat networks supplied by hydrogen and large-scale heat pumps.
	Bioenergy	Increase fuel switching to bioenergy, so that bioenergy accounts for 10% of industry fuel use by 2030	Biomass is only used in sectors that are already using biomass and is allocated according to the CCC hierarchy for	Biomass is only used in sectors that are already using biomass and is allocated according to the CCC hierarchy for	Biomass is only used in sectors that are already using biomass and is allocated according to the CCC hierarchy for

Sectors/ Scenario Pathway		York and North Yorkshire Leading the Way Scenario	Balanced Scenario (CCC's Sixth Carbon Budget)	Policy-Driven Scenario (Widespread Engagement CCC's Sixth Carbon Budget)	Technology-Driven Scenario (Widespread Innovation CCC's Sixth Carbon Budget)
			best use of biomass.	best use of biomass.	best use of biomass.
	Electrification of industry	Increase electrification of industry, particularly for low temperature heat and heat on smaller sites (%s increase in electrification are highly dependent on sector and technology options). Hydrogen equipment developed and deployed for industry.	Balance of electrification and (mostly) blue hydrogen.	Mostly electrification, some green and blue hydrogen.	Electrification and green hydrogen. Higher CCS capture rates.

Notes: For further detailed information please refer to the CAP Study (2021) and the CCC's Sixth Carbon Budget Sectoral Reports.

(*) Up from 18,000 ha/year to 30,000 and 50,000 respectively

(**) per-capita edible food waste reduction

Table 1: Summary of Scale of Ambition Targets underpinning modelling of scenarios pathways

Carbon Budgets

In 2019 the Tyndall Centre completed an analysis for West Yorkshire Combined Authority (WYCA) to make its 'fair' contribution towards the Paris Climate Change Agreement. The calculations specific to North Yorkshire and City of York were not available to this study. However, the high-level messaging included in the 2019 report has been reviewed: advice included to "reach zero carbon no later than 2041" and "Initiate an immediate programme of CO_2 mitigation to deliver annual cuts in emissions averaging 13% to 15% - depending on allocation method - to deliver a Paris aligned carbon budget".

The Tyndall Centre analysis estimated carbon budgets apply to CO_2 emissions from the energy system only. In addition to setting global average temperature targets, they have considered the foundational principals of common but differentiated responsibility.

It is recommended that YNYCA reflect on the carbon budgets set by Tyndall Centre and the updated analysis completed in this report by using The Global Carbon Budget32 developed by the University of Exeter's Global Systems Institute.

Key messages from their Global Carbon Budget 2024 include:

- Globally, no clear signs of peak in global fossil CO_2 emissions yet. Total CO_2 emissions from fossil fuel use and land use change combined have plateaued in the past decade, but not declined. The growth in fossil fuel CO_2 emissions is compensated by the decline in land use change CO_2 emissions. There is still no sign of the rapid and deep decrease in total CO_2 emissions that is needed to tackle climate change.
- Net CO_2 emissions from land use change remain high, but they have decreased since their peak in the late-1990s, in particular in the past decade.

An initial estimate comparing the potential number of years left in current carbon emissions (CO_2) in 2022 and the Carbon Budget 2023 to ensure alignment between current estimated carbon emissions and global carbon budget has been undertaken. This is provided as a guide to understanding the impact of change rather than a formal recommendation of what future regional carbon budgets might look like. It has, therefore, only considered population figures in the region to estimate the regional budget on a per capita basis.

City of York			
Current CO_2 Emissions in 2022	0.74 $MtCO_2$	**Per Capita Emissions**	3.63 tCO_2
To limit average temperature rise to:	Carbon Budget	Period	Would use up carbon budget in:
1.5°C	9.61 $MtCO_2$	from 2023	13.0 years
1.7°C	18.46 $MtCO_2$	from 2023	24.9 years
2°C	31.10 $MtCO_2$	from 2023	41.9 years

Table 2: Estimated regional carbon budget for a range of warming scenarios