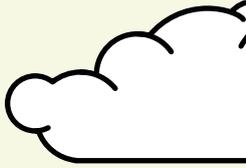
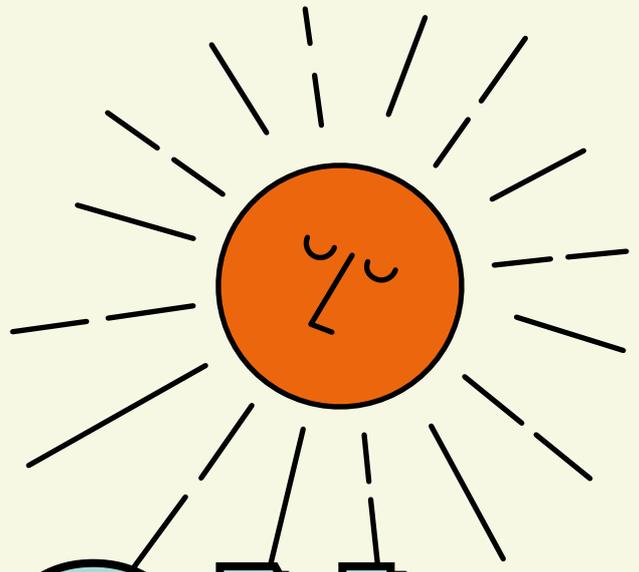


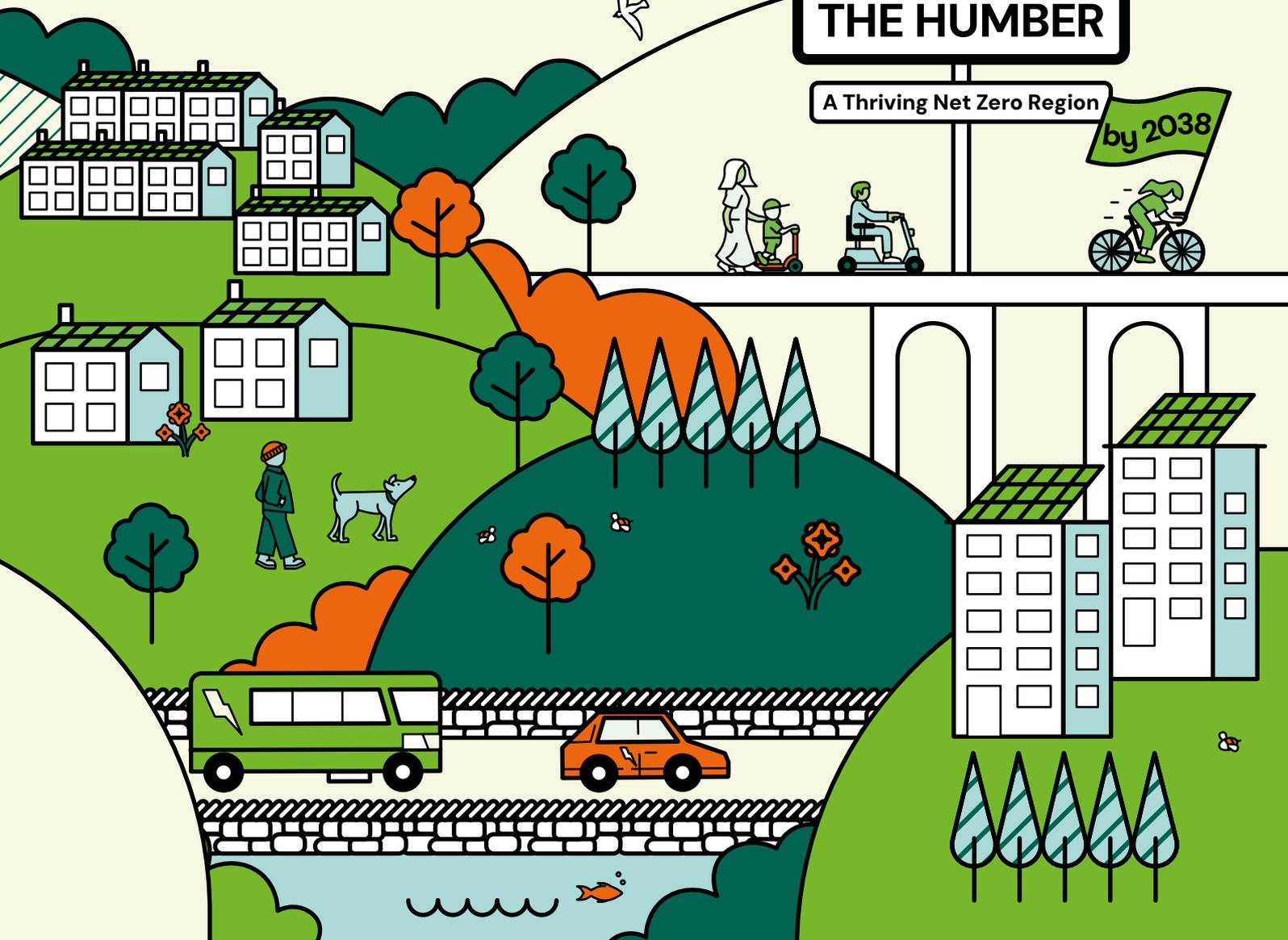
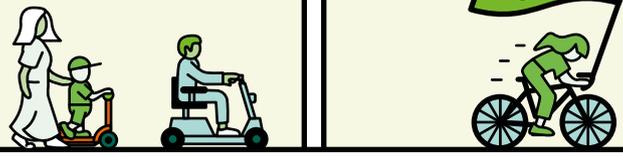
**YORKSHIRE
& HUMBER
CLIMATE
COMMISSION**

OUR CARBON STORY



A Thriving Net Zero Region

by 2038

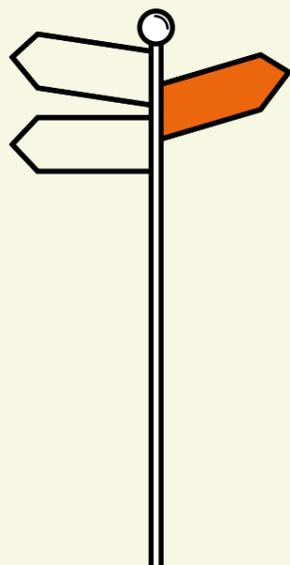


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FOREWORD

It is important to acknowledge the context that we are all now living and working in. Early this year, the first year-long breach of 1.5C warming was confirmed¹, and global sea surface temperatures² reached and remain at their highest ever.

Across the UK, including several areas of Yorkshire and the Humber, crop and livestock production have been severely impacted³ by the prolonged warm wet winter. Across the region, we have experienced many extremes in recent years, from extensive flooding during the winters of 2019/2020, 2021 and 2023, through to heatwaves, drought and wildfires in 2022 and 2023. And in early May 2024, flash flooding caused by a month's rainfall landing within just three hours affected people, cars and trains in many urban areas⁴.

Climate impacts are already being felt in Yorkshire and the Humber, and around the world. We must reduce our impact on the planet, our home. It is imperative that we all act, that we act together, and that we do so with urgency and ambition.

We know we need to go further and faster. We have a regional target to become net zero by 2038⁵, with many organisations in the region committing to earlier targets. We also know that we will only achieve the change at the pace and scale that is needed by working together across political, social, and economic boundaries. Helping us all to do exactly that is one of the core aims of the Yorkshire & Humber Climate Commission (YHCC).

Our Carbon⁶ Story, produced by the Commission, draws on evidence and analysis of emissions in Yorkshire and the Humber⁷ by leading academics in our region and will be supported by sectoral briefings. A Carbon Reduction Assessment for Yorkshire and the Humber is used to tell us how we are doing sector by sector and where we stand the most to gain by aligning and focusing our efforts. We also consider the emissions that come from our consumption – an important but often overlooked aspect of the carbon reduction challenge. The sectoral briefings will be published on the Commission's website in the coming months and provide more detail and celebrate successes across the region. Together, they challenge us to do things differently.

“We know we need to go further and faster. We have a regional target to become net zero by 2038”

We hope that people from all walks of life will embrace the priorities set out here and that we can work together to deliver the economic, environmental, health, and social benefits for the people of Yorkshire and the Humber that will come from living in a cleaner, safer world.

Cllr Claire Douglas, Cllr Jack Hemingway, Cllr Ben Miskell and Cllr Paul West, Yorkshire & Humber Climate Commission, July 2024



Cllr Claire Douglas
 YHCC Vice Chair,
 York & North Yorkshire



Cllr Jack Hemingway
 YHCC Vice Chair,
 West Yorkshire



Cllr Ben Miskell
 YHCC Vice Chair,
 South Yorkshire



Cllr Paul West
 YHCC Vice Chair,
 North Bank of the Humber

THE HEADLINES



We can technically meet our 2038 net zero target.

The interventions are known and available, and the investments are economically sound, with over a third more than paying for themselves⁸.



What we consume in Yorkshire and the Humber adds approximately 38% onto our regional carbon footprint.

There are some consumer choices that we have little control over at a regional level. However organisations can have a direct impact on what is consumed here through procurement strategies favouring local supply chains, supporting community wealth building⁹ and through circular economy initiatives. This will enable more of the goods and services consumed in the region to be produced locally and sustainably, giving greater control over associated emissions and retaining wealth within the region.



The measures we need to implement to achieve net zero also provide substantial co-benefits¹⁰ for people, the environment and the economy.

By 2050, we could save around £250 billion by realising the co-benefits assessed¹¹, with approximately half of these savings coming from increased physical activity. The technical assessment models don't include important and valuable co-benefits like improved biodiversity, so this is a conservative estimate.



We can achieve net zero by 2038 whilst providing a significant boost to nature's recovery.

Coarsely, the most carbon effective ways to achieve this are by improving farming practices, changing some land use away from animal agriculture to broadleaf woodlands, and protecting and restoring our region's wetlands and peatlands. However, this is a complex area and is less well modelled and understood than other sectors. We will explore this further in the forthcoming sectoral briefing on land use and agriculture.



Decisive, mission-driven action is needed to align policy, regulation and investment to enable deeper and faster changes.

Yorkshire and the Humber needs to reduce its carbon emissions rapidly, approximately four times faster than the business-as-usual pathway¹². Whilst it is good news that our region's emissions have halved in the 34 years since 1990, it means that we only have 15 years, from now (2024), to address the remaining half to meet the regional net zero target by the end of 2038.



We need to rapidly scale up investment.

This will require integrating carbon reduction metrics and outcomes into all decision-making, projects, programmes, planning and policy development. To reach the 2038 target the investment needed is £7.3 billion annually for the next 15 years, totalling almost £110 billion¹³.



We need to be able to account for the economic benefits over the longer term.

Whilst some savings and benefits will be realised in the short term, most investments will need to be evaluated with longer payback periods. The annual investment needed over the next 15 years equates to just under 3% of the regional Gross Domestic Product (GDP¹⁴). In 2038, the total value of energy savings¹⁵ (£4.6 billion) alone would rise to just under 3% of regional GDP.

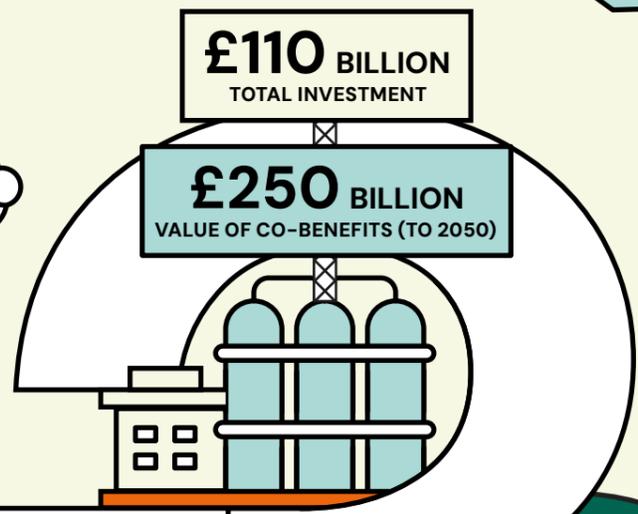




Improving health and air quality

What does the route to net zero by 2038 look like for Yorkshire and the Humber? What are the opportunities and challenges? Here's what our analysis tells us.

Welcome to **YORKSHIRE & THE HUMBER**



A Thriving Net Zero Region



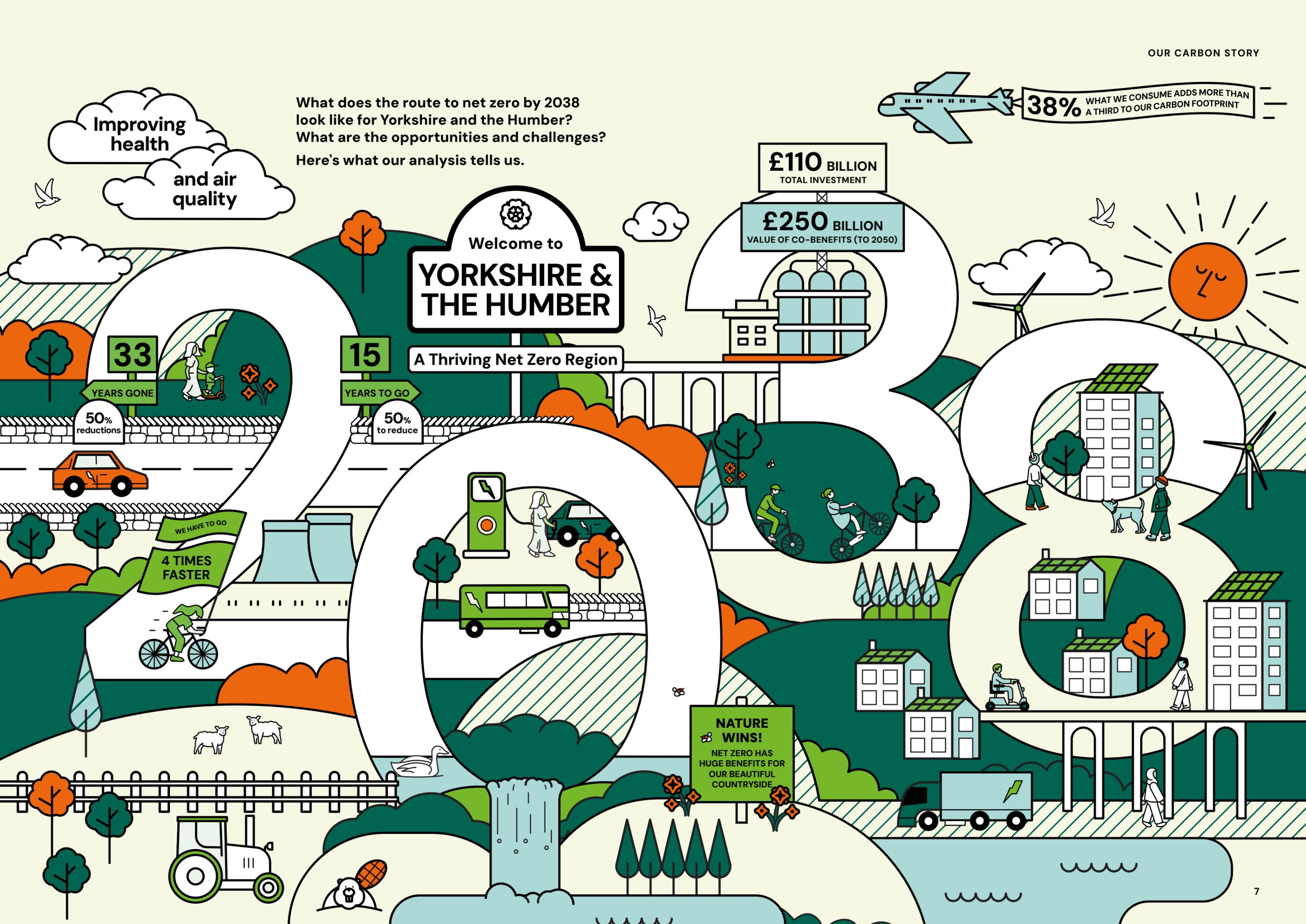
50% reductions



50% to reduce

WE HAVE TO GO
4 TIMES FASTER

NATURE WINS!
NET ZERO HAS HUGE BENEFITS FOR OUR BEAUTIFUL COUNTRYSIDE



INTRODUCTION

The challenge we face, to decarbonise the way we live, is huge.

It would be easy to say that as the climate emergency is a global issue we are too small to make a difference, but that would be to opt out of our responsibilities. Yorkshire and the Humber is a region of 5.5 million people; our population is larger than countries like Ireland or Norway, and the same size as Scotland or Finland. We are internationally relevant, and we must act accordingly.

Herein lies an opportunity: what we learn in Yorkshire and the Humber can be scaled up and applied elsewhere. The size and diversity of our region offers an important test bed for developing new approaches and innovations, as well as for adopting best practice from others and collaborating to develop investable propositions. We can lead the way.

There is also much for us to be proud of. Despite incredibly challenging times, all our local councils and mayoral authorities are committed to rapidly reducing their carbon emissions and are working across their areas to enable, encourage and guide others to do the same, rightly taking different approaches for different places and scales. Similarly, organisations and companies of all sizes across our region are challenging themselves and others to do better, faster. And from my experience leading the Yorkshire & Humber Climate Commission, there is huge appetite to collaborate, pool knowledge and share expertise across all sectors, including our 12 universities and further education institutes.

Yorkshire and the Humber has both so much to offer and many opportunities to do and make things better. It has several cities, each with a strong identity, including the youngest city

in Europe (Bradford); many market towns surrounded by rural areas with approximately 70% of the region's land area utilised as farmland¹⁶; and some of the widest gaps in health inequalities, with the region having the third lowest life expectancy in England¹⁷, affecting not only economic productivity but also people's day-to-day quality of life.

Reducing our carbon emissions does mean we will need to make changes. But, unlike the stories peddled all too prevalently in the media, those changes do not need to be threatening or negative. Done well, with the principles of a fair and just transition in heart and mind, these changes stand to improve the quality of life for all, to reduce health inequalities – thereby increasing productivity and wellbeing – and to create a vibrant place where our young and talented people want to stay, and where all can thrive.

Longer time frames

In Our Carbon Story, we identify the sectors and actions that we must meaningfully and rapidly reduce carbon emissions from, and we provide confidence that these changes and investments will be economically beneficial, using traditional criteria, in the long term. And this is a crucial point. We know that the investments need to come from both public and private sources, and to do this effectively we all need to be able to work with longer time frames. Furthermore, changes within the financial sector are needed to enable investment to flow.

The Cities Commission for Climate Investment (3Ci) have recently published a report¹⁸ in which Catherine McGuinness CBE states,

“Whilst our aim may be to retrofit homes, we are also trying to retrofit a financial system and its models to a purpose for which they were not created. A rapid evolution is required, creating an investment ecosystem that will help the market to adapt and new models to emerge”.

Throughout our work with around 300 specialists and experts during the first three years of the Commission, the calls for consistent, proactive regulatory frameworks have been passionately and consistently made, informed by real-life experiences, regardless of the sector. Stability and clarity are needed to give confidence to investors, businesses and decision makers. For example, if the regulatory frameworks for new and upgraded buildings to achieve the highest standards of energy efficiency were already well established, we would be adopting technologies proven in other countries, like heat pumps, and we would naturally unlock the investment in skills that we desperately need for delivery to happen at scale.

Importantly, the findings from A Carbon Reduction Assessment for Yorkshire and the Humber, which this report summarises, show that the same measures are required to reach the national and statutory net zero deadline of 2050, so the decision-making challenges remain, regardless of the target date. Whilst accelerating delivery to achieve the 2038 target increases the urgency of upfront investment in some measures, it should also allow the co-benefits and savings to take effect sooner – presenting a perfect opportunity to ‘level up’, unlocking the potential of the region, and so benefiting the UK economy as a whole.

Counting our consumption

We also look at consumption emissions and the implications for Yorkshire and the Humber. Most carbon emission reduction pathways focus on the emissions that are produced by activity within the place the pathway is for. This means that what we consume is often not captured, leaving the responsibility

of the carbon emissions related to those goods resting with countries that produce them. Calculating and understanding the carbon emissions that come from what people buy and consume is difficult, but it is an important way of understanding how our collective choices impact the climate. For example, if every person in the world consumed as much carbon as the average UK person, we would emit enough greenhouse gases to warm the planet by 1.5C in just nine years¹⁹.

In Yorkshire and the Humber, our consumption emissions add an additional 38% onto the regional footprint. In Our Carbon Story we share the regional consumption patterns with the aim of starting an informed, system-level exploration of this important area, something that is often put in the ‘too hard to do’ box.

Good news

Concerns are rightly being raised across the UK about whether net zero targets sooner than 2050 are realistic, as a recent Climate Change Committee report highlighted in Scotland²⁰. Our Carbon Story clearly demonstrates that it is both technically and economically feasible to achieve the regional net zero target of 2038. That strongly suggests that it is process, prioritisation, perspective, and governance that are the main barriers to realising our goal. This is good news, as these are things within our gift to change.

The opportunities from realising the transformational change to decarbonise the way we live are immense; the risks from not taking them could be catastrophic. Our climate is changing rapidly, and we must act decisively, with pace and with ambition.

If we do, our collective carbon story can still be a positive one.



A rapid evolution is required, creating an investment ecosystem that will help the market to adapt and new models to emerge”

Catherine McGuinness CBE, The Cities Commission for Climate Investment (3Ci)



Rosa Foster
Director, Yorkshire & Humber Climate Commission



SECTORAL HEADLINES



The deterioration of the UK's natural environment could lead to an estimated 12% loss to GDP”

Green Finance Institute

Eighty-seven per cent of our emissions²¹ in Yorkshire and the Humber come from three sectors: industry (33%), transport (29%) and buildings (25%). Land use and agriculture emissions contribute a further 9%²².

Under a business-as-usual scenario, these will continue to be the dominant sectors, with emissions from housing and from land use increasing between now and 2038.

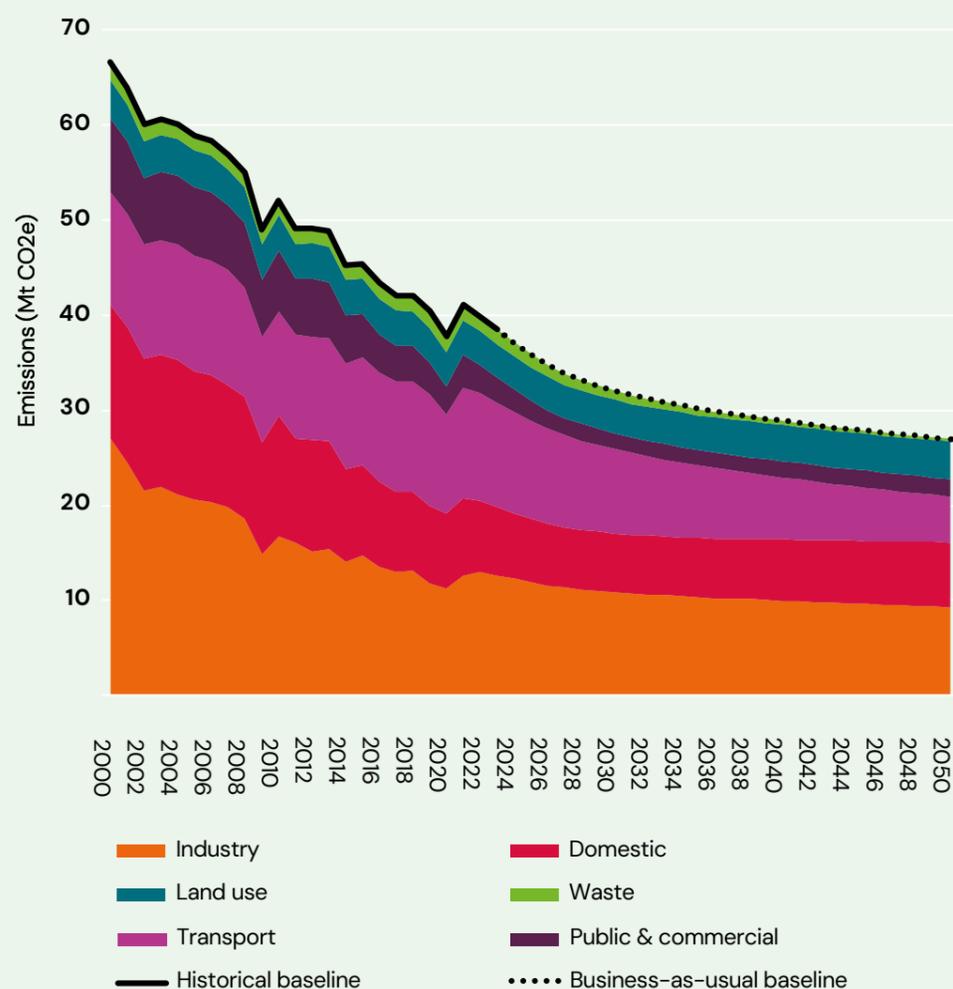


Figure 1: Yorkshire and the Humber carbon emissions (2000 – 2050)

Industry

As a region we can become a globally significant success story of a zero-carbon industrial sector.

A Carbon Reduction Assessment for Yorkshire and the Humber (the 'technical assessment') shows that industry is the sector with the highest emissions in the region, and that the majority (97%) of our industrial emissions arise from the Humber Industrial Cluster (HIC). As the largest cluster in the UK²³, the HIC has its own net zero plan²⁴. The successful delivery of this plan, in line with the highest sustainability standards, is critical to the region's carbon reduction success.

Transport

The transport sector offers the biggest opportunity for unlocking significant co-benefits, especially for people's health, and could do so with interventions that are low-cost, financially attractive, and straightforward in principle.

The changes needed here are about enabling different travel choices that seem surprisingly modest, such as replacing some short car journeys with walking. This sounds simple, but we know it isn't. To enable these changes, the infrastructure needs to be improved to provide safe and attractive routes and crossings, and to create more walkable amenities. The improvements developed also need to be inclusive for those who have different accessibility needs. Real improvements to public transport are key to increasing productivity and social inclusion across the region²⁵ but they must be affordable for all. The potential for this to happen in the time frames needed is very real, with public transport and connectivity being a top priority for all our local authorities and the three recently elected mayors.

Buildings

Retrofitting the region's building stock is the single biggest area where investment is needed.

Whilst all our building stock ultimately needs upgrading to become both low carbon and climate ready, a deep retrofit programme targeted at pre-1930s semi-detached housing and pre-1919 terraced housing would reduce housing emissions by 44%. This would also have the greatest benefits in terms of people's needs for decent homes, lower energy bills and a better quality of life.

The technical assessment this report summarises indicates that approximately £77 billion needs to be invested in building retrofit across the region over the next 15 years. Over time this investment will be economically beneficial because of both the direct energy savings that will accrue and realising the significant co-benefits available.

Land use and agriculture

Our region urgently needs a strategic partnership approach to land use, and land use change, developed with those who are likely to be most affected.

If we continue failing to protect and restore nature, the results will be unavoidably grave. The most recent analysis of the financial implications by the Green Finance Institute states: "The deterioration of the UK's natural environment could lead to an estimated 12% loss to GDP, according to new analysis. In comparison, the financial crisis of 2008 took around 5% off the value of the UK GDP, while the Covid-19 pandemic cost the UK up to 11% of its GDP in 2020."²⁶

The technical assessment²⁷ shows that it is possible to move the agricultural and land use

sector from being a net emitter to net negative²⁸ by the early 2030s, and to do so in a way that would support the region achieving a '30 by 30' biodiversity target²⁹. This is a complex area and there is much scope for innovation and for regenerative agriculture to thrive alongside some of the changes needed. The analysis shows that the most carbon-effective ways to achieve this are by improving farming practices, decreasing the amount of land used for animal agriculture in Yorkshire and the Humber, increasing the area of broadleaf woodlands, and protecting and restoring our region's wetlands and peatlands.

This requires us to think and work differently. It is important to recognise that some land use change is required to enable nature's recovery, and that we need to be able to meet food production needs whilst making the region more resilient to the changing climate, regardless of carbon emissions. There are some excellent examples of the leadership and changes we need to see across these sectors already, where organisations have clear ambitions to reduce emissions and improve yields in sustainable ways. We know strong partnership working and collaboration are needed to provide a firm strategic foundation, including policies and interventions that complement and enable the diverse local-scale changes that can deliver progress.

For a more detailed breakdown on each of the sectors above, see Appendix.

PROGRESS AND TARGETS

“
We can technically meet our 2038 net zero target”

Yorkshire and the Humber has set a target to reach net zero emissions by 2038. Whilst it is good news that our region’s emissions have halved in the 34 years since 1990, it means that we only have 15 years to meet this regional target.

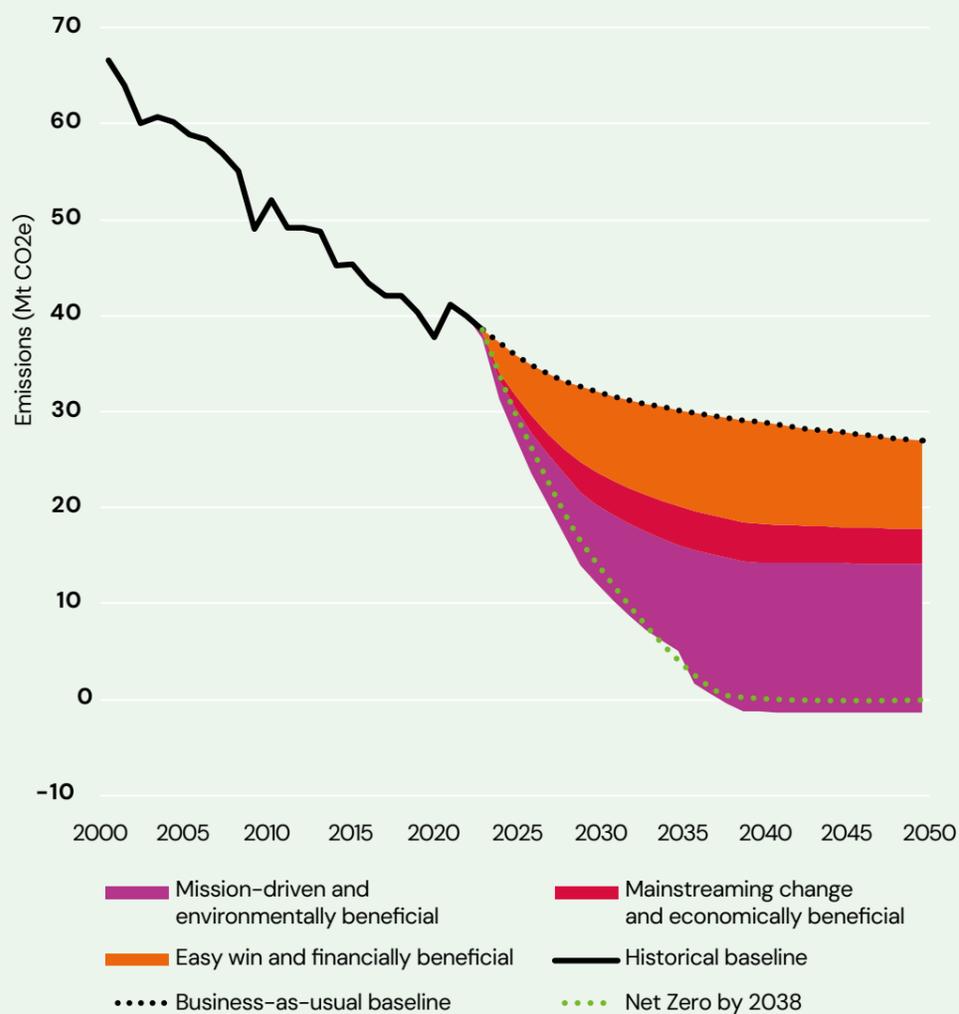


Figure 2: Yorkshire and the Humber’s ‘Business-as-usual’ baseline with ‘Easy win and financially beneficial’, ‘Mainstreaming change and economically beneficial’ and ‘Mission-driven and environmentally beneficial’ levels of change.

Taking the year 2000 as a baseline, and assuming we carry on with current trends (‘Business-as-usual’), our emissions will only have reduced by 56% by 2038 and by 60% by 2050.

We can technically meet our 2038 net zero target. The interventions are known and available, and the investments are economically sound, with over a third more than paying for themselves.

As illustrated in Figure 2, we can confidently implement carbon reduction measures that will reduce our emissions by 50% by 2038, knowing that the levels of change required are both financially beneficial (‘Easy win’) and economically

beneficial (‘Mainstreaming change’). We need to progress these without delay.

It also shows that the region cannot achieve its 2038 net zero target – nor the UK’s 2050 target – without a more ambitious approach (the ‘Mission-driven’ level of change, which is also environmentally beneficial). Ultimately, our success in cutting carbon emissions hinges on how boldly we can pursue that mission.

The investment needed, savings and benefits for each level of change – and a more detailed description of what they include – are explained in the next section.

“
We only have 15 years to meet this regional target.”



INVESTMENT, SAVINGS AND BENEFITS

“To reach the 2038 target the investment needed is £7.3 billion annually for the next 15 years”

We need to rapidly scale up investment. This will require integrating carbon reduction metrics and outcomes into all decision-making processes, projects, programmes, planning and policy development. To reach the 2038 target the investment needed is £7.3 billion annually for the next 15 years, totalling almost £110 billion. This would have the immediate benefit of creating 242,000 years of extra employment (i.e. 12,000 jobs for 20 years) whilst also reducing the region’s energy bill by £4.5 billion a year from 2038³⁰ onwards.

Taking positive and early action to reduce our carbon emissions, with a focus on enabling a fair and just transition through our planning and delivery of interventions, will enable us to generate considerable social and environmental benefits that also provide wider economic benefits.

Table 1 summarises the total investment, anticipated savings and predicted co-benefits for each of the levels of change assessed.



Level of Change	Description	Emission reduction by 2038	Savings from every £1 invested		Total investment required (annually for next 15 years)	Energy bill saving (annually from 2038)	Wider co-benefits (Total savings 2024 – 2050)	Jobs created (a job = 20 years)
			(2024–2050)					
			direct financial	wider benefits				
Easy win and financially beneficial	The ‘no regrets’ measures that would more than pay for themselves through the energy savings they would generate.	36%	£3.10	£7.50	£1.6bn	£2.4bn	£175bn	2,100
Mainstreaming change and economically beneficial	The ‘no regrets’ measures and the technically viable options that collectively would break even through their economic returns.	50%	£1.50	£4.00	£3.7bn	£3.2bn	£220bn	5,400
Mission-driven and environmentally beneficial	The ‘no regrets’ measures, technically viable options, and the measures that require investors to think more broadly than narrow financial returns.	102%	£1.10	£2.30	£7.3bn	£4.5bn	£250bn	12,000

Table 1: Key data for the levels of change in the Carbon Reduction Assessment. All savings information undiscounted³¹.

These findings clearly show that we need to do everything to reach net zero by 2038. It is important to note the challenge that the technical assessment highlights: that the measures that will get us all the way to and even beyond net zero will require us to develop investment cases differently.

Recent research³² shows that, following a comprehensive review in 2020, HM Treasury’s

Green Book provides a good basis for better evaluation of investment cases for complex transformational projects such as those needed to achieve net zero. The review said that appraisal of value for money at local, regional and national level is too focused on measurable monetary quantities, leading to the benefit-cost ratio (BCR) becoming the aspect of appraisals that dominates decision making. The research concludes that HMT’s

approach since the review in late 2020 encourages strategic technical assessments of transformational change benefits and recommends that this should precede the cost-benefit analysis, using a robust, mixed-method and interdisciplinary process of evidence review, stakeholder engagement and deliberation.

Ultimately, this is good news – with the right support, tools, skills and capacity, it should be possible to access public funding to help facilitate the delivery of these schemes. However, these are not consistently available, and schemes are often invested in at risk locally. Managing the complexity of linking this emerging approach to unlock public investment with private sector investments, which still focus on narrow and short-term financial returns on investments, is a considerable barrier to accelerating delivery and realising the benefits available. Tackling this complex challenge is a key focus of the 3Ci partnership³³.

to highlight the range of co-benefits to show the wider value of taking climate action and to build support. At a whole-economy scale, the benefits include improvements in public health, thus reducing pressure on the NHS, greater energy security, growth in the low-carbon jobs market, and a reduction in poverty and inequality.

Climate action can bring a wide range of co-benefits ... such as homes that are more affordable to heat, and improved health and air quality.

Benefits

Climate action can bring a wide range of co-benefits or ‘win-wins’, such as homes that are more affordable to heat, improved health and air quality, and improved energy security. As decisions for communities are rarely made with just carbon reduction in mind, it is important

As with investment, the co-benefits of acting on climate change are not always adequately considered or valued in policy decision-making processes. Cities and devolved administrations are best placed to capitalise on the co-benefits of carbon reduction actions as they hold relevant budgets (e.g. health, transport, housing)

and understand how different policy priorities impact on each other.

By achieving net zero by 2038, we could generate over £250 billion in co-benefits between 2024 to 2050. It is worth noting that the technical assessment does not include important, widely recognised and valuable co-benefits like improved biodiversity³⁴, so this is a conservative estimate.

Figure 3 shows the estimated co-benefits arising from each modelled level of change³⁵.

- Delivering the 'Easy win' actions could generate a huge £175 billion of co-benefits and reaching net zero by 2038 could deliver an additional £75 billion.
- Delivering the 'Mission-driven' actions could generate over £100 billion of value in health benefits from physical activity by increased walking and cycling and almost £60 billion of co-benefits from reduced accidents and reduced congestion.

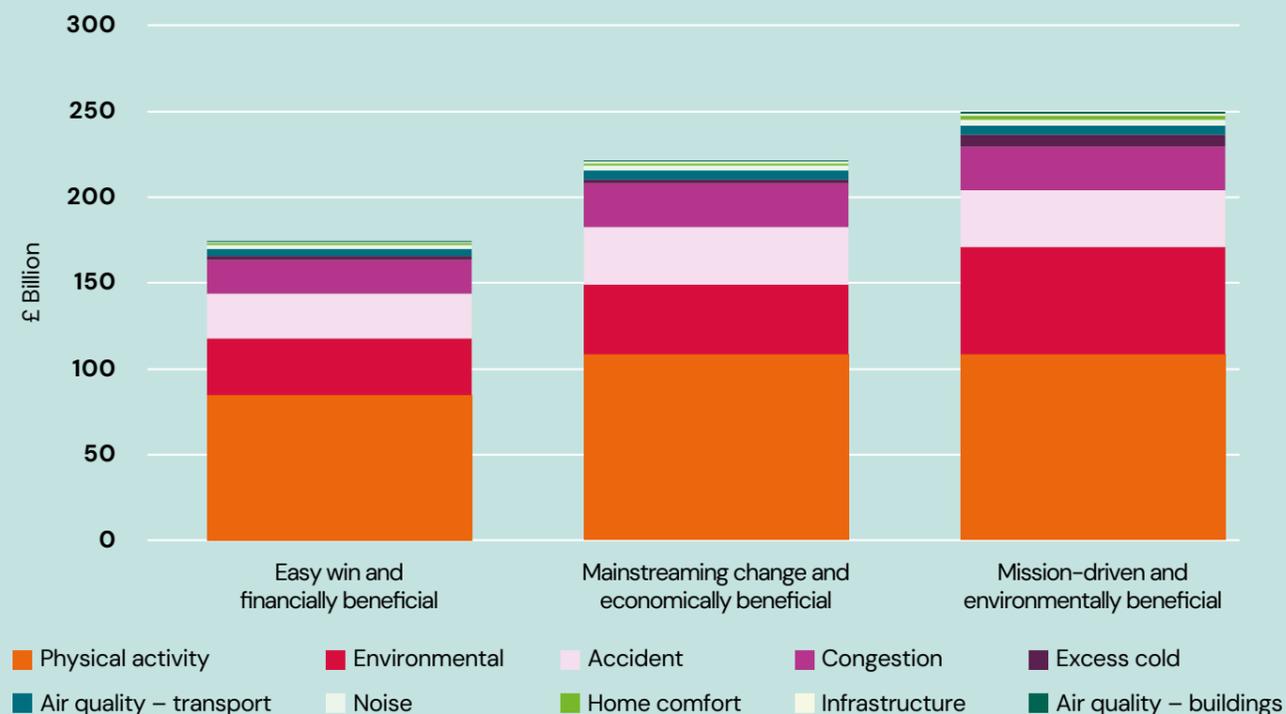


Figure 3: Yorkshire and the Humber's potential co-benefits (2024-2050)



CONSUMPTION EMISSIONS

“
In both accounts, the emissions from transport and homes are the most significant contributors.”

There are two ways we can talk about emissions responsibility. If we draw a line around Yorkshire and the Humber, we can measure the carbon emissions produced within our borders (territorial emissions). However, this neglects the emissions associated with goods and services consumed where the supply chain for these is beyond our borders across the rest of the world (consumption emissions). We are part of a global economy, with demand in the UK responsible for importing just under 50% of emissions. What we consume collectively matters and has a global impact.

In this section of Our Carbon Story we put the focus on the consumption emissions for the region. We use the Local Authority Consumption Accounts³⁶ (Carbon Footprints) tool, which allows you to compare carbon footprints for localities around the UK. It has been developed by disaggregating national data produced for Defra using spend profiles. The data are linked to local authority boundaries. As we are taking a regional overview, we have presented summaries of the overall picture for all areas within Yorkshire and the Humber in this section.

When we include carbon emissions from what we are consuming, as well as what we produce directly within the region, it increases our emissions by 38%³⁷.

The average national increase of including consumption emissions is 64%. Yorkshire and the Humber has a very large industrial sector (the Humber Industrial Cluster), which means our territorial emissions are higher than the national average. This makes the regional percentage increase from our consumption appear smaller than it is³⁸. In fact, Yorkshire and the Humber is only just below the average for UK per capita emissions from consumption (Figure 4).

Figure 5 shows the consumption categories, although we can't directly compare emissions produced within our boundaries against what we are consuming due to different calculation methods and to avoid double counting. We can, however, clearly see that in both accounts, the emissions from transport (notably private transport as 60% of total transport) and homes (notably the use of gas in 66% of housing) are the most significant contributors.

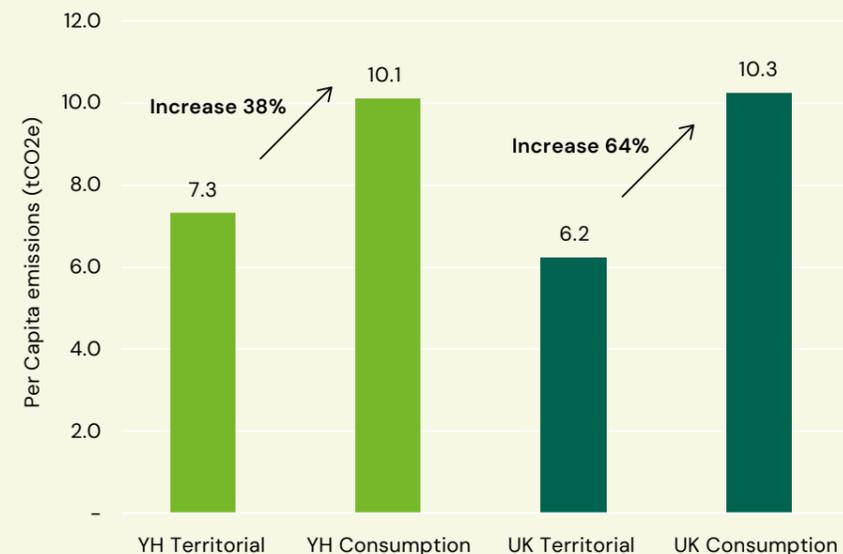


Figure 4: Regional and UK per capita consumption emissions (tCO2e)

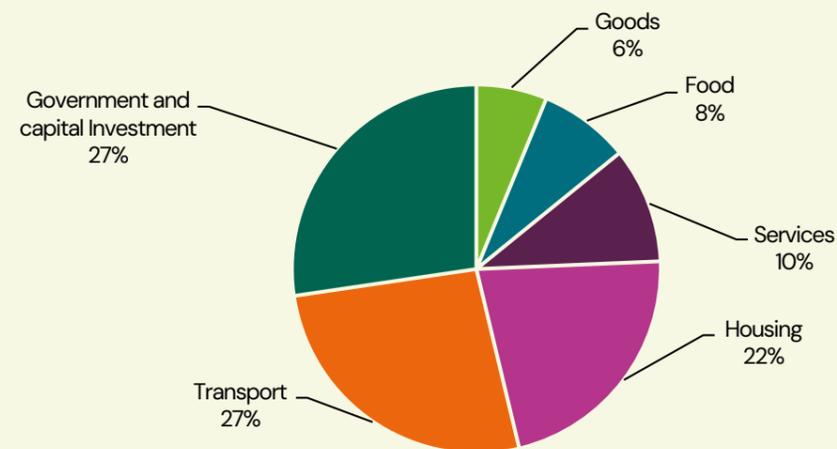


Figure 5: Yorkshire and the Humber's consumption emissions (2019)

Figure 5 shows that government and capital investment (government expenditure on health, defence and infrastructure) contributes to 27% of our region's consumption emissions. This is the only category that is not broken down further here, due to data availability. However, as it is nearly a third of the region's consumption emissions it demonstrates how national and

local government policies impact on carbon emissions, the importance of sustainable supply chains, and that we have influence over this through our democratic processes.

38%
increase in carbon emissions by including what we consume.

~30%
of total transport emissions are from aviation emissions.

60%+
of food and drink emissions come from meat.

The areas of emissions not covered directly by the Carbon Reduction Assessment are goods, services, food, and aviation. Combined, these make up almost a quarter of consumption emissions. The sections on this page outline the significant high carbon activities within these categories.

Goods

The goods category includes the indirect supply chain emissions associated with making goods purchased by final consumers. The highest emissions, contributing to almost 80%, are hobbies, pets and sports at 42%, clothes at 16% and furniture and homeware at 21% (Figure 6).

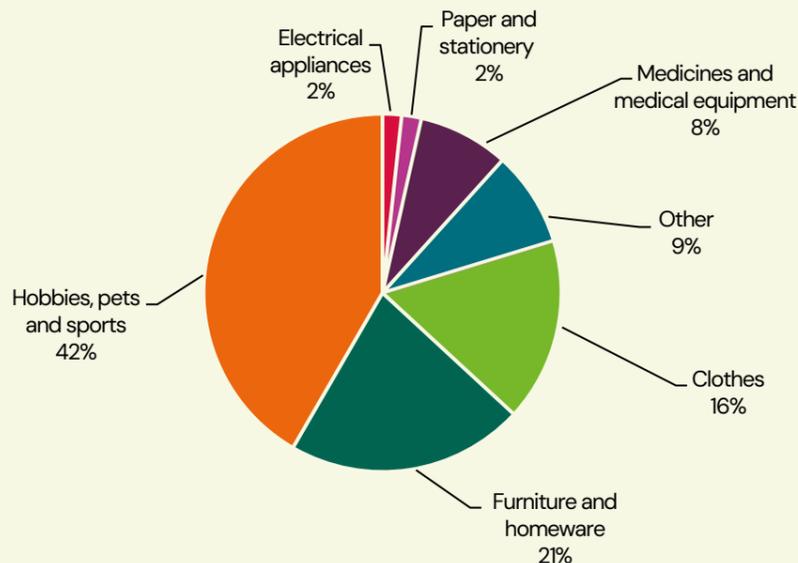


Figure 6: Yorkshire and the Humber's goods emissions. These account for 6% of the region's total consumption emissions (based on 2019 data).

Services

The services category covers the indirect supply chain emissions associated with providing a service purchased by final consumers.

The highest-emission service, contributing almost 45%, is restaurants and cafes, followed by finance and insurance at 18%. Hotels account for 10% (Figure 7).

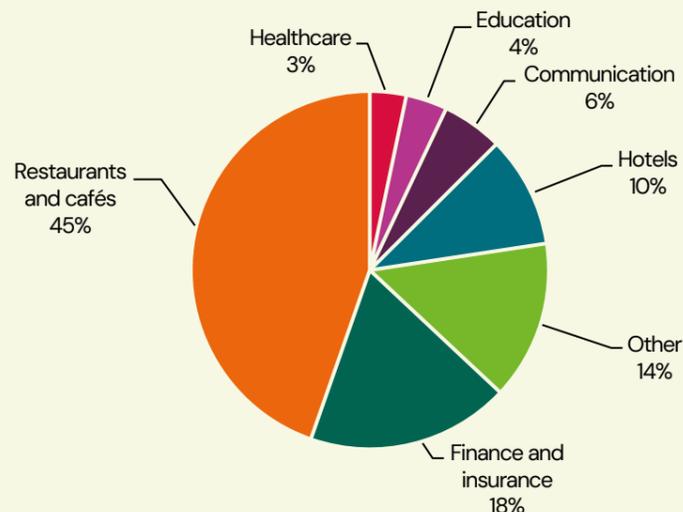


Figure 7: Yorkshire and the Humber's services emissions. These represent 10% of the region's total consumption emissions (based on 2019 data).

Food and drink

The food and drink category (Figure 8) includes the emissions associated with producing, transporting and selling food products to final demand consumers. The food category only includes food purchased for preparation in the home (this would not account for food consumed outside of homes in restaurants or cafes). Meat accounts for over 60% of emissions from this category and we know that beef is the major contributor to emissions within the meat sector³⁹.

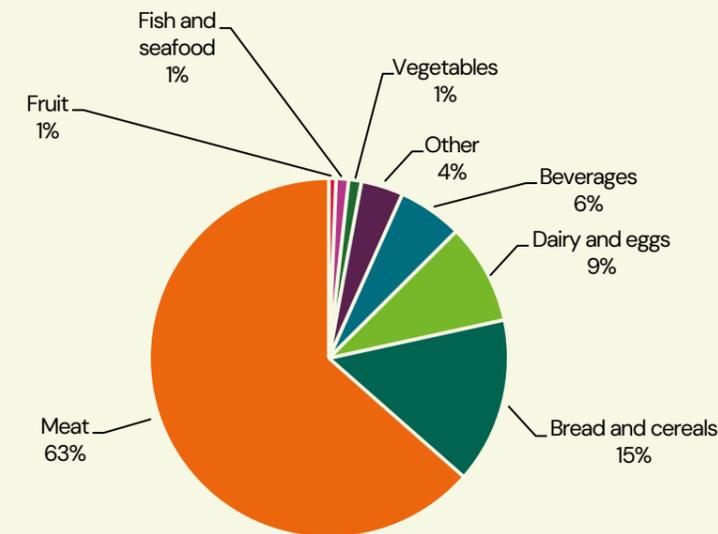


Figure 8: Yorkshire and the Humber's food and drink emissions. These account for 8% of the region's total consumption emissions (based on 2019 data).

Aviation

Aviation emissions contribute nearly 30% of total transport emissions and 8%⁴⁰ of the average resident's carbon footprint. This equates to 8% on top of our territorial emissions. Whilst the UK's Jet Zero⁴¹ Strategy aims to achieve a net zero aviation industry by 2050, there are concerns about whether this can be delivered⁴².

Yorkshire & Humber Climate Commission have advocated for a National Aviation Strategy, and we would wish to see emissions reduction and demand management in line with the Sixth Carbon Budget as central objectives of that strategy⁴³.



Implications of consumption evidence

- Consumption emissions are often seen as personal or business choices, but some aspects are influenced by policies, communication, and financial levers. Further work is needed to understand how consumption data could help shape decision-making within the region. We need to know more about how different aspects of consumption are influenced by regional decisions. We can break this down as follows:
 - Public sector organisations and private businesses in the region can have a direct impact on what is consumed, through local procurement policies, community wealth building and circular economy initiatives. These can enable more of the goods and services consumed in the region to be produced locally, giving greater control over their emissions and retaining wealth within the region to stimulate climate-ready business activity.
- Some consumer choices depend heavily on regional-scale interventions to enable them indirectly, such as reduced energy consumption through take up of heat networks or switching from car journeys to active and public transport through improved infrastructure.
- There are some societal-scale behaviour changes, such as flying less or buying more sustainable clothes, that are significant individual choices, but which local and regional decision-making has little influence over.
- Regional and local policy and investment may also need to respond to changes driven by shifting consumption patterns at a national or global scale, which have local implications. For example, reduced meat-eating and greater take up of electric vehicles will affect the farming industry in the region, and the need for vehicle charging infrastructure.

YORKSHIRE & HUMBER CLIMATE COMMISSION

Yorkshire & Humber Climate Commission⁴⁴ (“the Commission”) is an independent advisory body that brings together a wide range of people from the public, private and third sectors to support, facilitate and enable the delivery of ambitious climate action across Yorkshire and the Humber. It is the largest climate commission within the UK and the only one operating at a regional scale.

The Commission has four interrelated aims:

- to foster climate resilience and adaptation to climate risks and impacts
- to support rapid progress towards net zero carbon emissions
- to encourage a just and inclusive transition that helps reduce inequalities and that leaves no-one and nowhere behind
- to promote action that protects and restores nature and biodiversity.

The Commission is committed to working towards its goals by creating a positive and enabling culture where:

- existing capacity is mobilised through effective engagement
- constructive debate is supported
- our collective evidence base is strengthened
- best practice is promoted and adopted
- capacities are built
- progress is regularly reviewed and analysed.

The Commission is also working to create a more stable policy environment that builds confidence and attracts investment in action on climate and nature within the region.

Find out more about the Commission and our work: yorksandhumberclimate.org.uk

For information about the network of climate commissions built up over the last five years, visit pcancities.org.uk

A CARBON REDUCTION ASSESSMENT FOR YORKSHIRE AND THE HUMBER

In mid-2023 the Commission appointed independent academics to complete a technical assessment of Yorkshire and the Humber’s carbon reduction pathways, identifying how to achieve net zero by 2038. A Carbon Reduction Assessment for Yorkshire and the Humber (the technical assessment referred to throughout this report) is based on the methodology developed for A Net Zero Carbon Roadmap for Leeds⁴⁵ and a series of ‘Mini Stern Reviews’ conducted for other places around the UK led by Professor Andy Gouldson of the University of Leeds. The research models a suite of hundreds of potential interventions, both for their carbon effectiveness and their cost effectiveness, and examines how combinations of these measures can contribute to meeting decarbonisation targets.

It aims to provide an objective basis for comparing different measures to inform policy analysis, decision-making, and communications and engagement.

In addition to previous, similar studies, the technical assessment includes modelling of land-use interventions, such as conversion of some livestock farmland to forestry, and provides analysis of the co-benefits of decarbonisation measures, for example the health

benefits of increased physical activity and better air quality arising from non-motorised transport.

The Carbon Reduction Assessment acknowledges that it has only considered the technical and economic aspects of the measures it has modelled and not, for example, any political or ethical obstacles.

The assessment is based on analysis of the region’s territorial emissions, meaning those produced within the region’s borders. This is because the UK’s target of net zero by 2050 is based on territorial emissions and the Department for Energy Security & Net Zero publishes progress biannually. Exclusions from this data are aviation and shipping, imported goods and services, and biomass. In Our Carbon Story we address this gap by drawing on other research that uses consumption-based data.

For full details, including data tables and graphs, please refer to A Carbon Reduction Assessment for Yorkshire and the Humber: yorksandhumberclimate.org.uk/carbon-reduction-assessment-yorkshire-and-humber

Research data on consumption emissions can be found here: localfootprint.uk



APPENDIX

A breakdown of emissions reductions per sector (see pp 10-11) to achieve net zero emissions in Yorkshire and the Humber by 2038.

Industry

Industrial emissions have declined 54% since 2000 and are projected to fall a further 18%⁴⁶ between now and 2038. The technical assessment shows an investment of £340 million annually for 15 years into efficiency measures would unlock a further 10% reduction in emissions. Whilst significant, this is not enough. Figure 9 illustrates the relationship of the four measures identified in the Humber Industrial Cluster Plan.

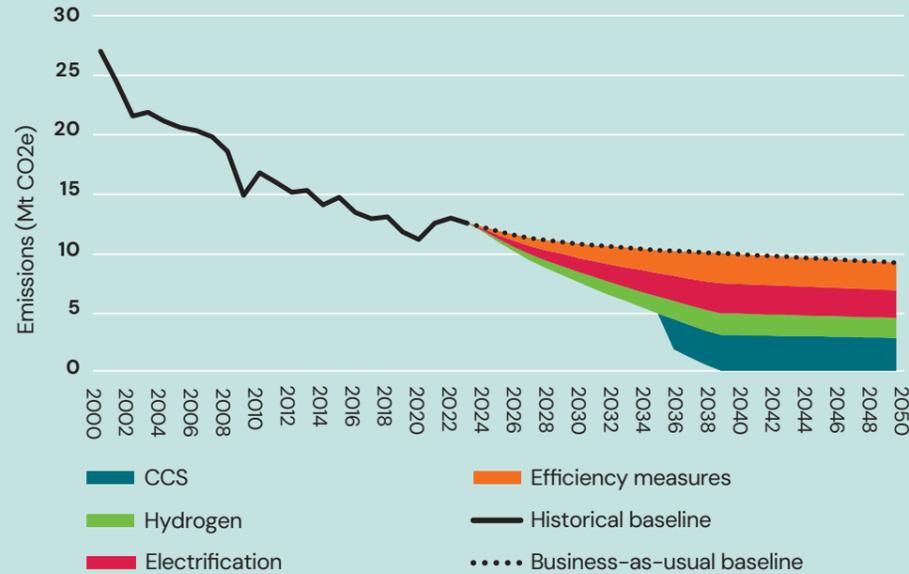


Figure 9: Yorkshire and the Humber's industry emissions, including historical baseline, business-as-usual baseline, efficiency measures, electrification, hydrogen, and carbon capture & storage (CCS) change levels

Buildings

Housing accounts for 74% of buildings emissions. Housing emissions have declined 50% since 2000 and are projected to fall a further 8% between now and 2038, with a projected slight increase towards 2050. The picture for public and commercial buildings (26% of buildings emissions) is very similar to that for housing.

Figure 11 demonstrates that shallow retrofit will only get us a third of the way ('Easy win'), and that in order to reach our target we need a deep retrofit programme ('Mission-driven').

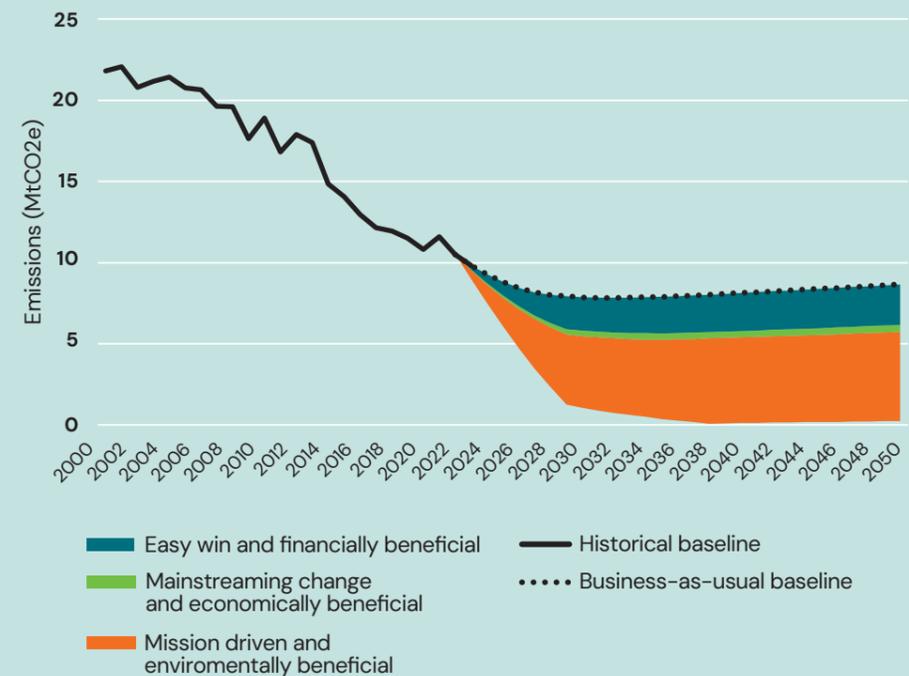


Figure 11: Yorkshire and the Humber's total buildings emissions to 2050, showing the change levels needed to achieve net zero

Transport

Transport emissions have declined 3.5% since 2000 and are projected to fall 35% between now and 2038. The business-as-usual trajectory for transport is based on the existing rate of switching to electric vehicles and electrification of the grid. It is well known that these changes fall far short of what is needed for a zero-carbon transport sector.

Figure 10 shows that it is possible to reduce transport emissions by 80% using measures that are financially beneficial and achieve 100% by also implementing measures that have many co-benefits, including for people's health and wellbeing.

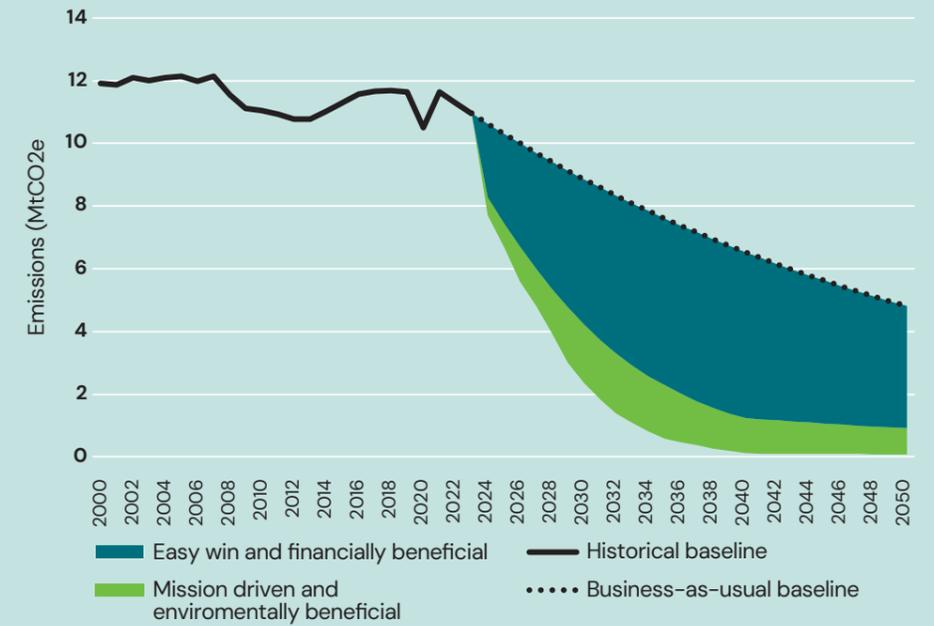


Figure 10: Yorkshire and the Humber's transport emissions to 2050, showing the change levels needed to achieve net zero

Land use and agriculture

Agriculture and land use currently contribute to 9% of the region's emissions, predominately through animal agriculture emissions. This is a net total contribution, taking into account the significant carbon sinks that exist in our forested areas. In a business-as-usual scenario, emissions are projected to increase to 12% in 2050 due to increased agricultural production and continued degradation of peatlands and soils.

The technical assessment has modelled a land-use scenario which corresponds with the UK's '30 by 30' commitment for 30% of all land and water to be actively managed for nature by 2030 (Figure 12).

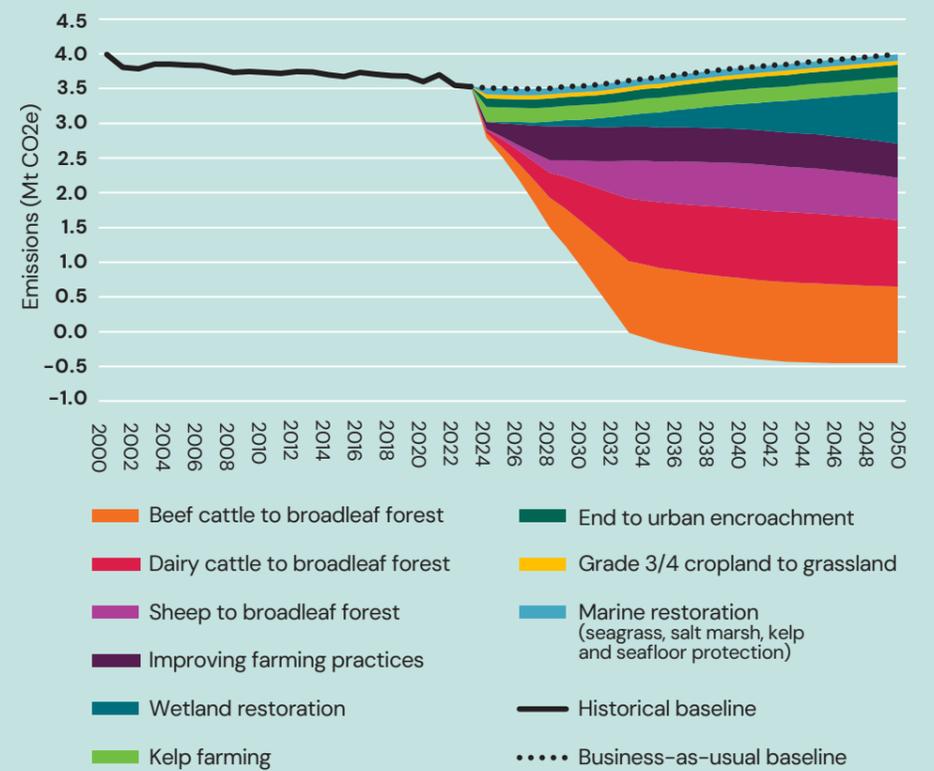


Figure 12: Yorkshire and the Humber's land use emissions modelled under '30 by 30' reduction measures, also showing impact of improving farming practices.

REFERENCES

1. <https://www.bbc.co.uk/news/science-environment-68110310>
2. https://ichef.bbci.co.uk/news/976/cpsprodpb/FO4E/production/_133281516_era_5_global_sea_temp_lines2024-05-05-nc.png.webp
3. <https://www.bbc.co.uk/weather/articles/cy63gg6zge5o>
4. <https://www.bbc.co.uk/news/uk-england-leeds-68970025>
5. By 2038, any carbon we are still releasing into the atmosphere needs to be cancelled out by measures that remove carbon from the air and return it to the ground.
6. This report uses 'Carbon' as shorthand for general Greenhouse Gas Emissions
7. Gouldson, A., Sudmant, A., and Higgins-Lavery, R. (2024) A Carbon Reduction Assessment for Yorkshire and the Humber, Report for Yorkshire and Humber Climate Commission, and <https://localfootprint.uk/about/> developed by Dr Anne Owen, University of Leeds.
8. These measures have a strong economic case for action and are readily available. The financial benefits of the interventions are more significant than the investment costs over the period 2024 – 2050. Examples include non-motorised transport, high build standards for new construction, and heat pumps in new construction.
9. <https://cles.org.uk/community-wealth-building/what-is-community-wealth-building/>
10. <https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/briefing-papers/Co-benefits-of-climate-change-mitigation-in-the-UK.pdf>
11. Co-benefits assessed, using estimates by the UK Research and Innovation (UKRI) include: physical activity, air quality (transport and buildings), home comfort, excess cold, noise, infrastructure, accident, and environmental (but excluding biodiversity, clean water and flood risk). <https://www.ukri.org/wp-content/uploads/2022/03/IUK-090322-AcceleratingNetZeroDelivery-UnlockingBenefitsClimateActionUKCityRegions.pdf>
12. It is important to note that to achieve 2050, we need to reduce emissions approximately 30% faster – so acceleration is needed, regardless of the target.
13. The report does not focus on changes to national infrastructure (e.g. large-scale electricity generation, or networks and offshore infrastructure necessary for carbon capture, utilisation and storage) that are driven primarily by national rather than regional or local policies, but it does take the potential impact of such changes on the region's carbon footprint into account.
14. Gross Domestic Product (GDP): the total value of goods produced and services provided in a country during one year. Regional GDP in 2022 was £152 billion (Fenton, Trevor 25 April 2023. "Regional gross domestic product: all ITL regions". Office for National Statistics). The investment period considered is 2024-2050.
15. Throughout this report, Energy Savings refer to undiscounted cash flows that are not adjusted to incorporate the time value of money, i.e. they are not the Net Present Value <https://sprintfunding.com/what-is-the-difference-between-discounted-and-undiscounted-cash-flows/#:~:text=Definition,and%20thus%20is%20highly%20accurate.>
16. <https://eprints.whiterose.ac.uk/204854/1/YHCC%20Sustainable%20Food%20Systems.pdf>
17. https://www.yhealth4growth.info/wp-content/uploads/sites/2/2024/02/Empowering_local_places.pdf
18. https://www.3Ci.org.uk/wp-content/uploads/2024/03/CPC00561_3Ci-Net-Zero-Future-1.pdf
19. <https://tred.zendesk.com/hc/en-us/articles/4405393802513-What-is-1kg-of-CO2-equal-to>
20. <https://www.theccc.org.uk/2024/03/20/scotlands-2030-climate-goals-are-no-longer-credible/>
21. Territorial emissions cover emissions that occur within the UK's borders and are used to track UK-wide progress towards international and domestic targets, such as Net Zero emissions by 2050.
22. Waste currently accounts for 4% of emissions, however, the methodology uses the assumption that as the other sectors decarbonise, the waste outputs will automatically reduce. Yorkshire & Humber Climate Commission recognises that waste, and the move to a circular economy, is important and complex, and we will address this separately.
23. <https://pcancities.org.uk/sites/default/files/Fig%201%20Industrial%20clusters.jpg>
24. <https://www.humberindustrialclusterplan.org/>
25. Transport for the North's Strategic Transport Plan: <https://transportforthenorth.com/our-north/strategic-transport-plan/>
26. <https://www.greenfinanceinstitute.com/news-and-insights/assessing-the-materiality-of-nature-related-financial-risks-for-the-uk/>
27. Gouldson, A., Sudmant, A., and Higgins-Lavery, R. (2024). A Carbon Reduction Assessment for Yorkshire and the Humber, Report for Yorkshire and Humber Climate Commission
28. In this context, net negative means that the land has not only stopped being a contributor of green house gas emissions, it has also started to be able to absorb them.
29. <https://naturalengland.blog.gov.uk/2023/12/11/30-by-30-a-boost-for-nature-recovery/>
30. The Carbon Reduction Assessment for Yorkshire and Humber estimates that in 2024 the regions' total energy bill (all petrol, diesel, gas and electricity) will amount to £13 billion.
31. Undiscounted cash flows are not adjusted to incorporate the time value of money, so this can mean the Net Present Value is overstated: <https://sprintfunding.com/what-is-the-difference-between-discounted-and-undiscounted-cash-flows/#:~:text=Definition,and%20thus%20is%20highly%20accurate.>
32. <https://icasp.org.uk/2023/07/24/how-to-unlock-green-and-place-based-public-investment-with-the-help-of-hm-treasurys-green-book-and-systems-thinking-in-economics/>
33. <https://www.3Ci.org.uk/about/>
34. Biodiversity is all the different kinds of life that you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life. An area with poor biodiversity will have a low number of varieties and different species. Conversely, an area with high biodiversity will have a wide range of varieties of life and different species.
35. The 'environmental' co-benefit shown here is a carbon value set by the UK Government which places a monetary estimate on the value of mitigating one tonne of carbon, as a result of reduced need for future investment in carbon mitigation. It represents a societal benefit which reduces future spending by the Exchequer and society as a whole.
36. Data produced and tool created by Dr Anne Owen, Associate Professor, University of Leeds. Tool can be found here <https://localfootprint.uk/>
37. The report takes the latest available reliable data from 2019, as the more recent data for 2020 and 2021 was affected by Covid 19 restrictions.
38. Comparison of territorial emissions from UK local authority and regional greenhouse gas emissions statistics, 2005 to 2022 Department for Energy Security and Net Zero and tool created by Dr Anne Owen, Associate Professor, University of Leeds. Tool can be found here <https://localfootprint.uk/>
39. <https://interactive.carbonbrief.org/what-is-the-climate-impact-of-eating-meat-and-dairy/>
40. Across the region the proportion of per capita emissions from aviation range from 1% – 10% of their total carbon footprints. The UK average proportion of emissions from aviation is 7% of per capita footprint. <https://localfootprint.uk/charts/>
41. <https://www.gov.uk/government/publications/jet-zero-strategy-delivering-net-zero-aviation-by-2050>
42. <https://committees.parliament.uk/publications/42703/documents/212154/default/>
43. <https://yorksandhumberclimate.org.uk/position-paper-aviation>
44. <https://yorksandhumberclimate.org.uk/>
45. https://pcancities.org.uk/sites/default/files/Net-Zero%20Carbon%20Roadmap%20for%20Leeds_0.pdf
46. Business-as usual-reduction in Industry is due to ongoing decarbonisation of grid electricity, a continuation of background trends that are gradually improving the energy efficiency of the industrial sector in Yorkshire and the Humber.

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