Notice of a public meeting of
Climate Change Policy and Scrutiny Committee

To: Councillors Vassie (Chair), Baker (Vice-Chair), S Barnes, Fisher, Fitzpatrick, Wann and Melly

Date: Tuesday, 9 March 2021

Time: 5.30 pm

Venue: Remote Meeting

AGENDA

1. Declarations of Interest

At this point, Members are asked to declare:

- any personal interests not included on the Register of Interests
- any prejudicial interests or
- any disclosable pecuniary interests

which they may have in respect of business on this agenda.

2. Minutes (Pages 1 - 6)

To approve and sign the Minutes of the meeting held on 8 December 2020.

3. Public Participation

At this point in the meeting members of the public who have registered to speak can do so. Members of the public may speak on agenda items or on matters within the remit of the committee.

Please note that our registration deadlines have changed to 2 working days before the meeting, in order to facilitate the management of public participation at remote meetings. The deadline for registering at this meeting is **5:00pm** on **Friday 5 March 2021.**

To register to speak please visit www.york.gov.uk/AttendCouncilMeetings to fill out an online registration form. If you have any questions about the registration form or the meeting, please contact the relevant Democracy Officer, on the details at the foot of the agenda.

Webcasting of Remote Public Meetings

Please note that, subject to available resources, this remote public meeting will be webcast including any registered public speakers who have given their permission. The remote public meeting can be viewed live and on demand at www.york.gov.uk/webcasts.

During coronavirus, we've made some changes to how we're running council meetings. See our coronavirus updates (www.york.gov.uk/COVIDDemocracy) for more information on meetings and decisions.

4. Carbon Literacy Training (Pages 7 - 12)
The report sets out the proposal for introducing climate literacy training to City of York Council.

5. York's Tree Canopy Expansion Target (Pages 13 - 28)
This report updates the Committee on York's tree canopy expansion target.

6. Establishing Key Performance Indicators to drive a Zero Carbon Roadmap for York (Pages 29 - 62)
Following the December Climate Change and Policy Scrutiny Committee meeting, Agenda Item 6, York Climate Commission, Members are asked to review the section on Targets and Key Performance Indicators and the Net Zero Roadmaps to establish a better understanding of how these indicators will support the zero carbon roadmap for York.

7. Work Plan 2020/21 (Pages 63 - 64)
To consider the Draft Work Plan for 2020-21.

8. Urgent Business

Any other business which the Chair considers urgent under the Local Government Act 1972.

Democracy Officer:

Name: Robert Flintoft
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For more information about any of the following please contact the Democracy Officer responsible for servicing this meeting:

- Registering to speak
- Business of the meeting
- Any special arrangements
- Copies of reports and
- For receiving reports in other formats

Contact details are set out above.

This information can be provided in your own language.

我們也用您們的語言提供這個信息 **(Cantonese)**

এই তথ্য আপনার নিজের ভাষায় দেয়া যেতে পারে। **(Bengali)**

Ta informacja może być dostarczona w twoim własnym języku. **(Polish)**

Bu bilgiyi kendi dilinizde almanız mümkündür. **(Turkish)**

یہ معلومات آپ کی اپنی زبان (بولی) میں بھی مہیا کی جاسکتی ہیں۔ **(Urdu)**

☎ **(01904) 551550**

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City of York Council	Committee Minutes
Meeting	Climate Change Policy and Scrutiny Committee
Date	8 December 2020
Present	Councillors Vassie (Chair), Baker (Vice-Chair), S Barnes, D Myers, Wann, Melly and Fenton (Substitute for Cllr Fisher) Also present were Terry Smithson a co-opted member form the Yorkshire Wildlife Trust and Councillor Rowley as a non-voting invited Member
Apologies	Councillor Fisher

1. Declarations of Interest

At this point, Members were asked to declare any personal interests not included on the Register of Interests, prejudicial interest or any disclosable pecuniary interests which they may have in respect of business on the agenda. None were declared.

2. Minutes

Resolved: That the minutes of the meeting held on the 10 March 2020 be signed as a correct record, subject to an amendment to the recommendations to item 36. One Planet York Update. To read that the Committee resolved: That the Committee recommended to the Executive that it explore One Planet York's involvement in any Climate Change Commission that could be set up.

3. Public Participation

It was reported that there had been no registrations to speak under the Council's Public Participation Scheme.

4. Climate Change Strategy

The chair outlined the actions taken by Council since in 2019 declaring a Climate Emergency and agreeing to a target of York

becoming Net Carbon Zero by 2030. He noted that while the Council was no longer targeting net zero for the whole city by 2030, he highlighted the progress he felt the Council had made and that the Council should be in a stronger position to decarbonise than it had been a year ago.

The Committee welcomed the Council's new Head of Carbon Reduction officer who provided a presentation on the formation of the York Climate Change Strategy and provided an update on the role of the York Climate Change Commission. It was then agreed that Members would use the information from the presentation provided to inform discussion in the next item on York Emissions Reporting & Carbon Neutral Ambition.

Resolved: The Committee noted the presentation on the York Climate Change Strategy.

Reason: So that the Committee remain updated on the progress of the York Climate Change Strategy.

5. York Emissions Reporting & Carbon Neutral Ambition

Officers introduced the report and discussed the challenges of York reaching net zero carbon by 2030 including government policy, available technology, and cost to the Council. The Committee discussed the amended objectives and the opportunity to link up with objectives from other organisations in the region. While it was noted that the amended deadlines for York to reach net zero carbon were to be delayed, the city could still achieve net carbon zero without expending its 5 degree carbon allowance. Members supported the amendments based on the data provided, but stressed the importance of aiming to meet these objectives quickly and being a leader in decarbonisation and to encourage other organisations to also aim to meet the same targets as the Council.

The Committee supported the objective for the Council to become net zero carbon by 2030, noting that it would allow the Council to provide a leading role in the city. However, it was confirmed that there would be challenges to achieving this goal and officers confirmed that this would likely not include services that were not wholly delivered by the Council. Other examples that would likely not be included were housing provided by housing associations or Waste collection services provided by organisations such as YorWaste. The Committee noted that

they would welcome the opportunity to review the objective for the Council to become net zero carbon by 2030, once more detail was confirmed.

Members discussed the importance of a roadmap to plan out the Councils objectives, as well as, the potential benefits to create clear plans for projects which can attach external and government funding. Members enquired as to whether the Council could include a Local Energy Area Energy Plan, it was confirmed this could be a benefit to produce a plan and would allow the Council to work with third parties to develop energy production solutions within the Council's territory. The Committee also considered wider challenges in planning and working with developers and suggested that the Council consider special planning documents to improve higher energy standards in the city.

The estimated cost of York reaching net carbon zero being between £1.1 and £2.3 billion was discussed. It was noted that the city would require external funding to be able to deliver this including Government funding programmes. It was confirmed that while it would cost a lot to deliver net carbon natural, the costs to achieve this would create a cost benefit too many of the projects delivered. With this in mind the Committee recommended the Council identify quick wins and areas to achieve a net zero carbon York which would be the most challenging.

Resolved:

i. Noted the evidence for setting a decarbonisation pathway for York and support the ambition for making the city carbon neutral ahead of the Climate Change Policy which will be produced in Spring 2021.
ii. The Committee recommended that the Executive make a commitment to achieving a net zero carbon council by 2030.
iii. That the Executive Member for Environment and Climate Change use best endeavours to ensure planning is sufficiently resourced to deliver the special planning documents required to ensure higher energy standards in York.

Resolved: To ensure the Committee remain updated on the progress towards the creation of the Council's Climate Change Policy and to promote the objective of making York net carbon natural.

6. York Climate Commission

Members were joined by the Executive Member for Environment and Climate Change for the item. Officers introduced the report setting out the rational for the creation of the York Climate Commission. The Executive Member noted the importance of Commission to bring together stakeholders across the city to advice the Council and promote positive change in helping York reach its Climate Change objectives.

The Committee discussed the proposed commission and expressed concerns regarding the lack of proposed members from a range of sectors across the city. The Executive Member noted that recommendations for who could be invited to join the commission were made from across the Council, and that while some of those approached had turned down the opportunity to join the commission, she noted that there would be an opportunity for new members to join or be part of working groups. It was agreed that it was important that members on the commission came with strong expertise to share and a desire to actively engage in the commission's work.

How those invited to the commission were discussed further. The Committee discussed how the terms of reference could be amended, to ensure key stakeholders could be added to the commission, as well as, engage York's wider public. The Committee also discussed whether there would be a benefit to involving cross party representation on the commission, as voting or non-voting members. Members of the Committee requested if it would be possible to provide a list of all stakeholders that were approached about joining the commission and how the council undertook the work of making invitations.

The role of the Executive Member for Environment and Climate change was discussed in both the setting up of the proposed membership of the commission and there role as the first chair of the commission. The Committee agreed to recommend that the terms of reference state that a new chair be elected within 12 months of the commissions formation. The Committee also

noted that the terms of reference could be clearer in setting out how new stakeholders could join and how chairs of the commission would be selected in future years.

Members also suggested that this Committee should receive more updates from the commission from what was currently recommended. The importance of ensuring that the commission does not duplicate the work of the Committee was highlighted, as well as, concern that the commission could overlap work with One Planet York, an organisation the Council had a role in setting up, but was currently struggling financially to continue its work in the city.

Resolved:

i. That this Committee receive regular updates or minutes from the meeting of the York Climate Commission;
ii. That the Terms of Reference be amended to confirm that the Executive Member for Environment and Climate Change would not exceed 12 months as chair of the commission;
iii. That the Committee receive a presentation at a future meeting on performance indicators showing how we can reach a carbon council and city.

Reason: To support the creation of the York Climate Commission and to ensure the Committee continues to support the Council in achieving its carbon reduction ambitions.

Cllr. C. Vassie, Chair
[The meeting started at 5.30pm and finished at 7.47pm].

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Climate Change Policy and Scrutiny Committee **9 March 2021**

Report of the Chief Operating Officer

Carbon Literacy Training

1. The report sets out the proposal for introducing climate literacy training to City of York Council.

Background

2. City of York Council (CYC) announced a climate emergency in March 2019; subsequently setting an ambition for York to be carbon neutral by 2030.

3. Improving the carbon literacy and understanding of climate change amongst members and officers at CYC can make an important contribution to realising this ambition. Both by delivering behaviour change amongst staff and also leading to more informed policy and project decision making.

Speak Carbon

4. Speak Carbon is a network of trainers delivering Carbon Literacy knowledge for key organisations and communities in Yorkshire.

5. Speak Carbon training is accredited by the Carbon Literacy Project, which is recognised as one of the 100 worldwide Transformative Action Programs.

Pilot Training

6. On 2 March 2021, Speak Carbon delivered a 2hr pilot training session for members of the Climate Change Policy & Scrutiny Committee. This training was designed to provide an overview of the course and allow committee members to evaluate the effectiveness and appropriateness of this format for a wider roll-out.

Phased Roll-out

7. There are different approaches to wider roll-out. A suggested option is a three phased approach:

   Phase one: immediate delivery of Carbon Literacy training to identified key climate emergency cohorts

   To include:

   - Councillors
   - Senior management
   - Internal climate emergency groups

   Decision makers become aware of Climate Emergency impact and planned wider staff / community engagement.
   Raising understanding amongst this cohort is critical for expediting actions and moving the organisation forward along the planned net-zero roadmap.

   Keeping the numbers low on this first stage will allow for the biggest impact.

   Phase two: delivery of Carbon Literacy training across to all CYC staff (this could also include suppliers and contractors).

   Potential routes for delivery include:

   - Peer to peer training (using train the trainer sessions to cascade internal training)
   - Direct training from Speak Carbon
   - Online/short session based training
   - Embedding within induction process

   Delivery would most likely involve a mixture of these and could be tailored to our requirements.

   Phase three: Carbon Literacy learning and engagement to local organisations, communities and citizens across York.

   This would be part of the ambitious goal to bring Carbon Literacy learning to the wider public with the aim of achieving the behaviour change required to achieve our net-zero ambition while simultaneously demonstrating commitment, influence and leadership.

Costing

8. Indicative costing has been provided for phase one of the potential approach outlined above.

9. This cost is based on the following assumptions:
   i. Delivery of phase one, key Speak Carbon training to 2 targeted cohorts of 24 people (48 total). This could be mixed or specific to each group if required.
   ii. Training will consist of 3 x 2hr guided sessions, delivered online, using BEIS funded materials, with bespoke CYC communications
   iii. There will be around 2 hours of additional learning to be completed away from the guided sessions
   iv. The sessions provide understanding of the latest scientific developments, impacts and best practices for Climate Emergency action planning
   v. The cohort will gain accreditation from the Carbon Literacy Project and Carbon Literacy Organisational accreditation, to demonstrate leadership and action
   vi. The two sessions can be run at times and dates to best suit CYC

Item	**Cost per Unit**	**Quantity**	**Total**
Develop training materials and administration of participants	£150	3 days	£450
Online training delivery for 48 (3 x 2hr online sessions)	£69	48	£3,312
CLP accreditation and certification fees	£10	48	£480
Net Total			£4,242
VAT			£752.40
Total			**£4,994.40**

10. Work has begun through the Y&NY LEP and with the Directors of Development group (DoD) to create a mechanism for delivering phase two of the above approach. This would result in Speak Carbon producing a 45 minute training course tailored to our local requirements and training platform that could be made available to all staff. The estimated cost is expected to be covered from the DoD budget, to which CYC contribute, at an apportioned cost of roughly £2,800 to CYC.

Recommendations

11. The Climate Change Policy Scrutiny Committee are asked to:
    - Review & evaluate the training session provided by Speak Carbon
    - Provide suggestions to the Executive Member on whether to proceed with the training, options for funding and the mechanism for delivery

Council Plan

12. The project accords with the Council Plan 2019-2023 in regard to the following core outcomes of the Plan:
    - A greener and cleaner city – Working towards becoming a carbon neutral city by 2030
    - Getting around sustainably – Cutting congestion, pollution and carbon emissions
    - Good health and wellbeing – Promoting active travel, healthy eating and improving air quality
    - Safe communities and culture for all – Supporting groups who are at greatest risk of climate change
    - Well paid jobs and an inclusive economy – Creating employment opportunities in the green economy

Contact Details

Author:	**Chief Officer Responsible for the report:**
Shaun Gibbons	Ian Floyd
Head of Carbon Reduction	Chief Operating Officer
shaun.gibbons@york.gov.uk	**Report approved:** √ **Date:** 26.2.21

Wards Affected: **All** X

For further information please contact the author of the report

Background Papers: Council Plan 2019-2023

Abbreviations:
BEIS - Business, Energy & Industrial Strategy
CYC - City of York Council
DoD - Directors of Development group
Y&NY LEP - York & North Yorkshire Local Enterprise Partnership

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Climate Change Policy and Scrutiny Committee **9 March 2021**

Report of the Chief Operating Officer

York's Tree Canopy Expansion Target

Recommendation

1. Promote an ambition for a 13% target for tree canopy cover by 2050, equating to around 22-27 ha per annum. This target would result in an annual carbon sequestration rate at 2050 of circa 9,000tCO_2 per year; equivalent to around 1% of the regions total CO_2 emissions between 2020-2050.

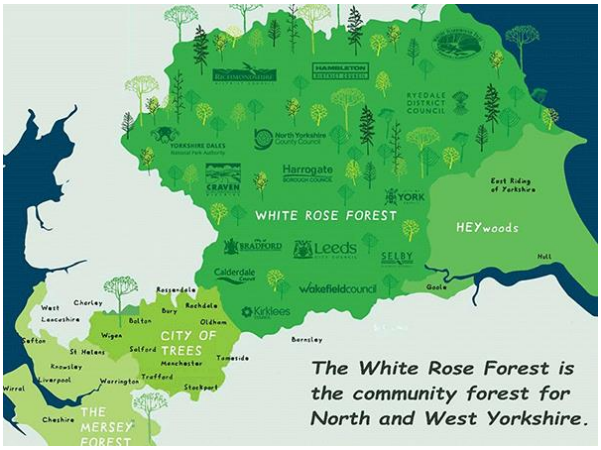
2. This target is considered achievable when balanced against the capacity for tree planting within the unique landscape and setting of York.

Overview and background

3. City of York Council is a member of the White Rose Forest (WRF) partnership, a local authority joint venture hosted by Kirklees Council, which acts as the partnership's accountable body.

4. WRF is the community forest for North and West Yorkshire, one of four community forests in the north of England working together to create the larger Northern Forest that will stretch from Merseyside across Manchester and Yorkshire.

5. WRF are planting millions of trees in urban centres and countryside that will help manage flood risk, combat climate change, create jobs and provide happier and healthier places.



6. The WRF reports to a Director of Development (DoD) group comprising directors of development across each constituent local authority. In Nov 2019, DoDs gave the WRF Carbon Group responsibility to identify a methodology to calculate the region's tree canopy expansion target by 2050. Targets emerging from the methodology will form the basis of a carbon-led tree planting strategy for the WRF area known as the WRF Plan.

7. WRF commissioned a group of regional and national experts to assess the potential level of carbon sequestration that could be achieved through tree planting across the WRF area[1]. Phase 1 of this study was completed in September 2020. The study set out to:
    - help local authorities understand the potential for carbon sequestration through woodland creation and to estimate the carbon contribution of existing trees outside of woodland and;
    - provide local authorities with evidence to help set carbon-led ambitions for 2050 tree canopy expansion.

8. On 14 December 2020 the study findings were presented to the districts to initiate individual district discussions on tree canopy ambitions for 'Phase 2'.

9. WRF set a deadline for districts to conclude these 'Phase 2' discussions and make recommendations regarding their district level tree canopy expansion target for respective DoD sign off by the end of January 2021. CYC have reached an agreement with WRF that we provide a suggested target for York in March 2021, for sign-off by the WRF Steering Group.

10. The WRF area target is due to be presented to the Yorkshire Regional Leaders' Group in spring 2021 with the WRF Plan being officially published on 1 August 2021 (Yorkshire Day).

[1] Led by United Bank of Carbon and University of Leeds

Current Tree Canopy Cover & Regional Targets

11. Annex 1 details current district level tree canopy cover (ha/%). This shows:
    - That average tree canopy cover across the 9 districts is 11.96% against a national average of 13% (Across the expanded WRF area of all 13 districts the average is 10.95%)
    - Leeds and Kirklees are the only two districts with current tree canopy cover in excess of the national average at 17.16% and 15.17% respectively
    - Craven and Selby are well below this average at 5.37% and 9.94% respectively
    - York's current tree canopy cover is 10.76%

12. York currently has 2,926 ha of tree canopy cover, representing 10.8% of its total area. 60% of this canopy cover is made up of trees outside woodlands.

13. The declared 2050 tree canopy targets from 7 of the 9 original WRF districts shows a collective ambition to increase tree canopy cover to an average of 19.14% by 2050

Developing an Evidence Based Tree Canopy Cover Target

14. Increasing York's tree cover from the current 10.76% of total area to 13% (national average) by 2050 would require 608 ha of new cover, or 21 ha per year.

Tree cover in 2050 (%)	New Canopy Cover (ha)	Annual increase (ha/yr)
13	608	21
15	1,150	39
20	2,506	86

15. Achieving 21 ha of tree planting every year in York would result in the annual removal of 1-2% of the estimated regional residual emissions in 2038, rising to 8-15% of residual emissions in 2050.

16. WRF has provided each district with data showing areas for potential low risk woodland creation. This data shows York to have over 8,000 hectares of assessed low risk woodland (LRW) land (low risk in terms of political and ecological constraints).

Area	Total Low Risk Area for Woodland Creation	
	Hectares	% of Total Area
York	8,245	30

17. Officers have combined this dataset with available information relating to heritage and land designation to identify existing and potential constraints and considerations to tree planting and canopy creation (Annex 3).

18. Following this process, it is estimated that a maximum of 6,500 ha of land identified by WRF has potential for tree planting. While further work is required to understand impacts on key views and desirable openness of land, further limiting the available planting area, the implication is that York could accommodate greater tree canopy cover.

19. The rate of viable delivery imposes a significant constraint on new canopy cover. The York Community Woodland project in West York aims to deliver 50-60 ha of new tree cover over the next two years. A 13% target for 2050 would require a similar level of growth every two years.

Recommended Target

20. The current rate of woodland creation and available area indicates that a target of 13% tree canopy coverage in York by 2050 should be possible and would bring York in line with the national average. This would require 608 ha of new canopy cover in the city at an average increase of 21 ha/yr.

Contact Details

Author:	**Chief Officer Responsible for the report:**
Shaun Gibbons Head of Carbon Reduction shaun.gibbons@york.gov.uk	Ian Floyd Chief Operating Officer **Report approved:** √ **Date:** 26.2.21

Wards Affected: **All** X

For further information please contact the author of the report

Annexes:

Annex 1: WRF District level tree canopy ambitions to 2050

Annex 2: Informing a carbon-led tree planting strategy for the White Rose Forest

Annex 3: Mapping of WRF Outcomes with Local Constraints

Abbreviations:

CYC – City of York Council

DoD - Director of Development

LRW - Low Risk Woodland

WRF - White Rose Forest

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Annex 1

WRF District level tree canopy ambitions to 2050

Bradford	Square Metres	Hectares	2050 Target (Hectares)
Total Area	365213134.51	36521.31	
Canopy Cover	46313706.39	4631.37	Not yet provided
Percentage Coverage		**12.68**	

Calderdale	Square Metres	Hectares	2050 Target (Hectares)
Total Area	362737371.69	36273.74	
Canopy Cover	43221868.18	4322.19	6794.50
Percentage Coverage		**11.92**	**18.73**

Craven	Square Metres	Hectares	2050 Target (Hectares)
Total Area	1174871236.56	117487.12	
Canopy Cover	63062379.67	6306.24	
Percentage Coverage		**5.37**	**13%**

Harrogate	Square Metres	Hectares	2050 Target (Hectares)
Total Area	1304739349.92	130473.93	
Canopy Cover	137511106.21	13751.11	16501.33
Percentage Coverage		**10.54**	**12.65**

Kirklees	Square Metres	Hectares	2050 Target (Hectares)
Total Area	407247201.17	40724.72	
Canopy Cover	61787526.01	6178.75	8678.75
Percentage Coverage		**15.17**	**21.31**

Annex 1

Leeds	Square Metres	Hectares	2050 Target (Hectares)
Total Area	549902071.22	54990.21	
Canopy Cover	94369971.87	9437.00	18146.77
Percentage Coverage		**17.16**	**33.00**

Selby	Square Metres	Hectares	2050 Target (Hectares)
Total Area	600206604.80	60020.66	
Canopy Cover	59681708.31	5968.17	10365.49
Percentage Coverage		**9.94**	**17.27**

Wakefield	Square Metres	Hectares	2050 Target (Hectares)
Total Area	337497446.68	33749.74	
Canopy Cover	47620695.04	4762.07	6101.00
Percentage Coverage		**14.11**	**18.08**

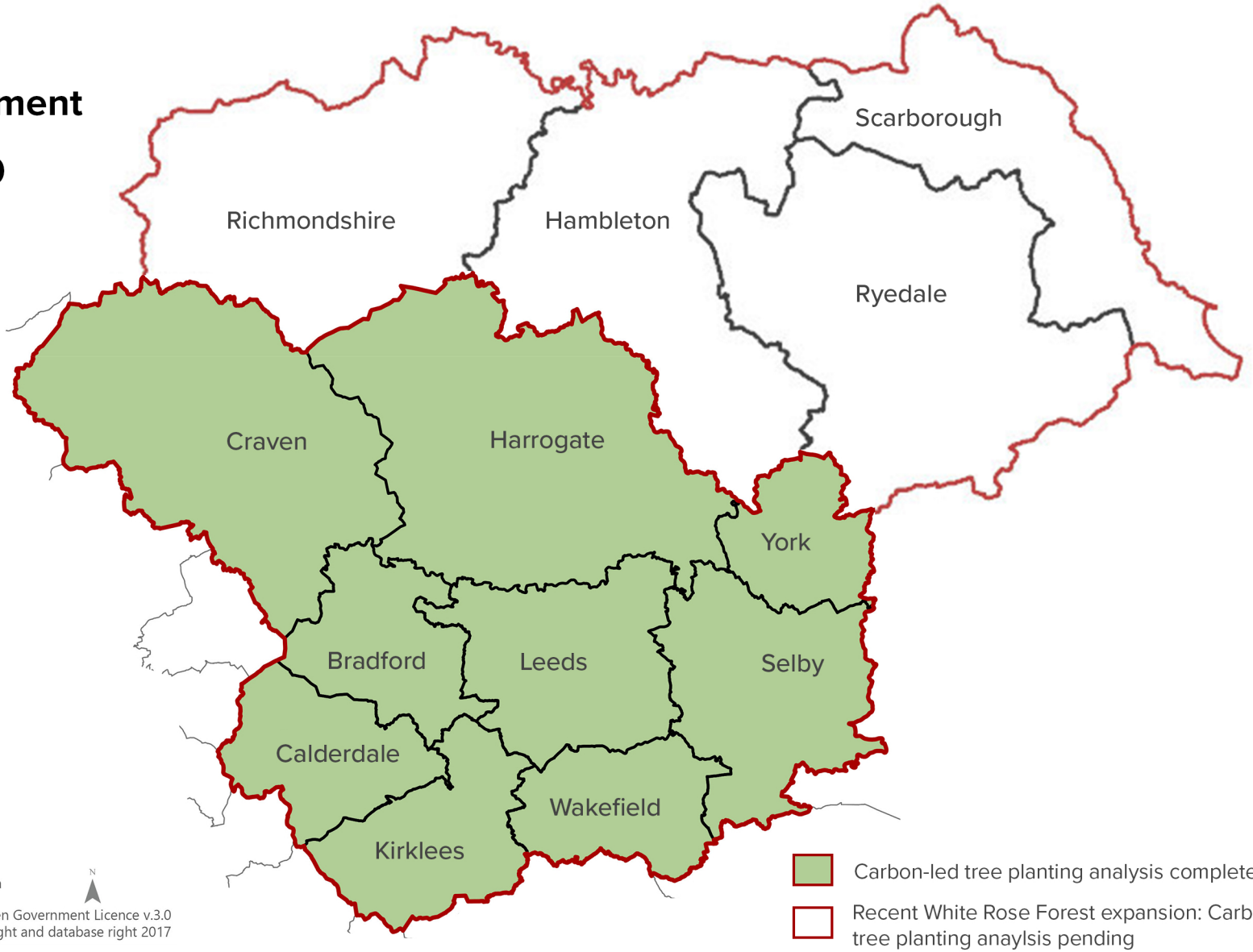
York	Square Metres	Hectares	2050 Target (Hectares)
Total Area	271090262.74	27109.03	
Canopy Cover	29156927.99	2915.69	Not yet provided
Percentage Coverage		**10.76**	

Informing a carbon-led tree planting strategy for the White Rose Forest

Interim report for the

Directors of Development

11th December 2020



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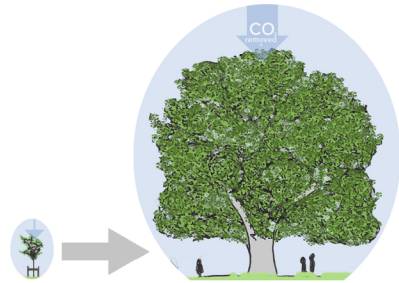
WHITE ROSE FOREST

UNIVERSITY OF LEEDS

What is the potential contribution of woodland creation in your area to meeting net-zero?

Project aim:

To help the local authorities in the White Rose Forest understand the potential for carbon sequestration through woodland creation and to estimate the carbon contribution of existing trees outside woodlands.
To provide local authorities with evidence to help set carbon-led ambitions for 2050 tree canopy expansion targets.



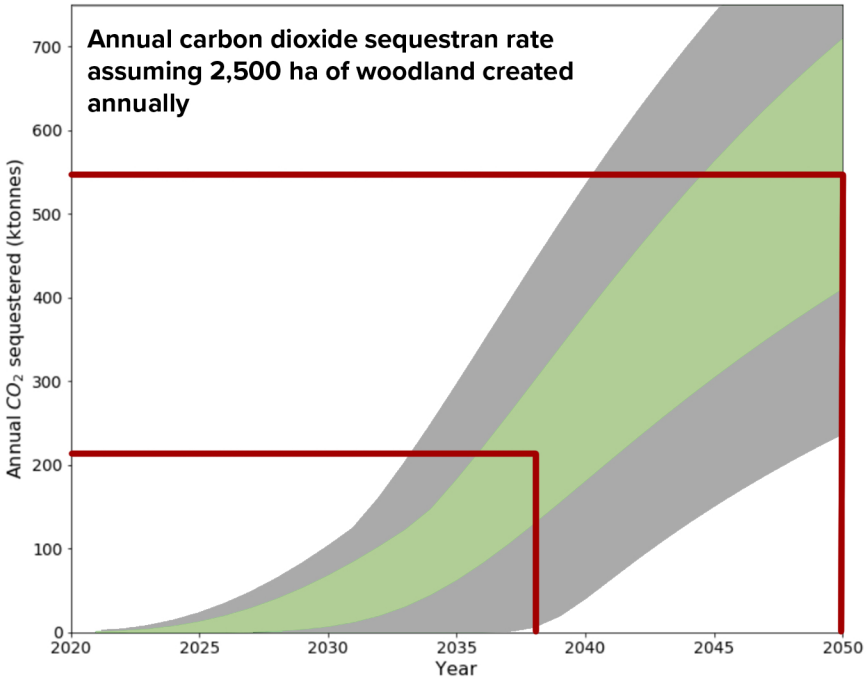
Key results:

Using tree growth rates specific to each local authority[1], the United Bank of Carbon modelled the potential sequestration benefits of woodland creation.

This interim report demonstrates potential carbon sequestration rates across the White Rose Forest under different planting rate assumptions. A tailored calculation for each local authority requires key additional information such as available areas for woodland creation, and local emission reduction pathways.

Example scenario 1:

Planting 2,500 hectares of woodland per year across the White Rose Forest region leads to an estimated annual sequestration rate in 2038 that is equivalent to 3-12% of the region's residual emissions if the emission reduction pathway is followed[2]. By 2050, this sequestration rate rises to between 58-100% of residual emissions[3].



Green shaded area represents average growth rates across a range of woodland mixtures.
Grey shaded area represents minimum and maximum expected growth rates.

The benefits of trees:

Trees provide the most cost effective method for removing carbon dioxide from the atmosphere. The graph illustrates that the benefits of newly created woodlands increases over time.

While the newly planted trees are growing, the existing canopy provides us with ongoing carbon sequestration. We estimated that trees outside woodlands[4] provide nearly half of the total canopy cover which is not fully accounted for in the national inventory of emissions.

Protection of the existing trees and a step change in woodland creation rates is required for the short-term and long-term mitigation of climate change.

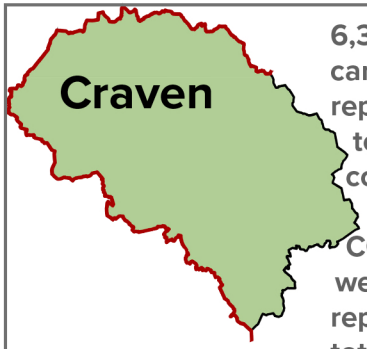
1. Growth rates of trees based on Forest Research's Ecological Site Classification for 4 species mixes. Carbon sequestration rates based on Woodland Carbon Code Calculator v2.3, 2020.
2. Tackling the Climate Emergency: Emissions Reductions Pathway Report, 2020. WYCA. Assuming residual emissions in 2038 are 18-27% of 2018 emissions.
3. Assuming that the region's emissions continue to decline and reach 5% of the 2018 value by 2050. The UK Local Authority Carbon Dioxide Emissions, Department for Business, Energy and Industrial Strategy 2018.
4. Trees mapping provided by Blue Sky National Tree Map™ dataset. Woodland defined as >0.5 ha based on the National Forest Inventory Woodland England 2018, Forestry Commission

UBoC UNITED BANK of CARBON

WHITE ROSE FOREST

UNIVERSITY OF LEEDS

What does it mean for your local authority?

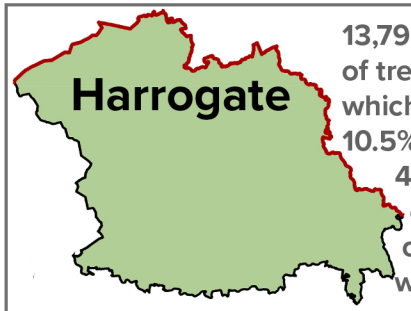


Craven

6,327 hectares of tree canopy cover[1] which represents 5.4% of the total area. 42% of canopy cover is made up of trees outside woodlands[2].

CO_2 emissions in 2018[3] were 349 $ktCO_2$ which represents 0.1% of UK total.

Planting example: 100 ha of tree planting every year will result in the annual removal of 6-19% of the estimated residual emissions in 2038 (assuming emissions reduction pathway followed[4]), rising to 92-160% of residual emissions in 2050[5].



Harrogate

13,797 hectares of tree canopy cover[1] which represents 10.5% of total area. 41% of canopy cover is made up of trees outside woodlands[2].

CO_2 emissions in 2018[3] were 1,081 $ktCO_2$ which represents 0.3% of UK total.

Planting example: 100 ha of tree planting every year will result in the annual removal of 2-6% of the estimated residual emissions in 2038 (assuming emissions reduction pathway followed[4]), rising to 30-52% of residual emissions in 2050[5].

York

2,926 hectares of tree canopy cover[1] which represents 10.8% of the total area. 60% of canopy cover is made up of trees outside woodlands[2]

CO_2 emissions in 2018[3] were 821 $ktCO_2$ which represents 0.2% of UK total.

Planting example: 100 ha of tree planting every year will result in the annual removal of 2-8% of the estimated residual emissions in 2038 (assuming emissions reduction pathway followed[4]), rising to 39-68% of residual emissions in 2050[5].

Bradford

4,647 hectares of tree canopy cover[1] which represents 12.7% of total area. 58% of canopy cover is made up of trees outside woodlands[2].

CO_2 emissions in 2018[3] were 2,036 $ktCO_2$ which represents 0.6% of UK total.

Planting example: 100 ha of tree planting every year will result in the annual removal of 1-3% of the estimated residual emissions in 2038 (assuming emissions reduction pathway followed[4]), rising to 16-28% of residual emissions in 2050[5].

Leeds

9,468 hectares of tree canopy cover[1] which represents 17.2% of total area. 49% of canopy cover is made up of trees outside woodlands[2].

CO_2 emissions in 2018[3] were 3,905 $ktCO_2$ which represents 1.1% of UK total.

Planting example: 100 ha of tree planting every year will result in the annual removal of 0-2% of the estimated residual emissions in 2038 (assuming emissions reduction pathway followed[4]), rising to 8-14% of residual emissions in 2050[5].

Selby

5,988 hectares of tree canopy cover[1] which represents 9.9% of total area. 45% of canopy cover is made up of trees outside woodlands[2].

CO_2 emissions in 2018[3] were 930 $ktCO_2$ which represents 0.3% of UK total.

Planting example: 100 ha of tree planting every year will result in the annual removal of 2-7% of the estimated residual emissions in 2038 (assuming emissions reduction pathway followed[4]), rising to 34-60% of residual emissions in 2050[5].

1. Canopy cover estimate from Blue Sky National Tree Map™ dataset.
2. Woodland defined as >0.5 ha based on the National Forest Inventory Woodland England 2018, Forestry Commission.
3. UK Local Authority Carbon Dioxide Emissions, Department for Business, Energy and Industrial Strategy 2018.
4. Tackling the Climate Emergency: Emissions Reduction Pathway Report, 2020. West Yorkshire Combined Authority. Assuming residual emissions in 2038 are 18-27% of 2018 emissions.
5. Assuming that the region's emissions continue to decline and reach 5% of the 2018 value by 2050.

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What does it mean for your local authority?

4,336 hectares of tree canopy cover[1] which represents 11.9% of total area. 48% of canopy cover is made up of trees outside woodlands[2].

CO_2 emissions in 2018[3] were 1,039 $ktCO_2$ which represents 0.3% of UK total.

Planting example: 100 ha of tree planting every year will result in the annual removal of 2-6% of the estimated residual emissions in 2038 (assuming emissions reduction pathway followed[4]), rising to 31-54% of residual emissions in 2050[5].

6,199 hectares of tree canopy cover[1] which represents 15.2% of total area. 51% of canopy cover is made up of trees outside woodlands[2].

CO_2 emissions in 2018[3] were 1,910 $ktCO_2$ which represents 0.6% of UK total.

Planting example: 100 ha of tree planting every year will result in the annual removal of 1-3% of the estimated residual emissions in 2038, (assuming emissions reduction pathway followed[4]), rising to 17-29% of residual emissions in 2050[5].

4,778 hectares of tree canopy cover[1] which represents 14.1% of total area. 56% of canopy cover is made up of trees outside woodlands[2].

CO_2 emissions in 2018[3] were 2,073 $ktCO_2$ which represents 0.6% of UK total.

Planting example: 100 ha of tree planting every year will result in annual removal of 1-3% of the estimated residual emissions (assuming emissions reduction pathway followed[4]), rising to 15-27% of residual emissions in 2050[5].

Next steps

1 Each local authority White Rose Forest Group to complete internal discussions and make its recommendations for respective Director of Development sign off by end January 2021.

2 Remaining areas of North Yorkshire to be analysed and integrated into existing study, with North Yorkshire County Council signing off recommendations.

3 By end of February 2021, the White Rose Forest Steering Group approves final White Rose Forest Carbon Group recommendations as our first working target for increasing tree canopy cover by 2050.

4 White Rose Forest Plan presented to the Yorkshire Regional Leaders' Group in Spring or Early Summer 2021 (with existing invitation from Dan Jarvis).

5 Publish and launch White Rose Forest Plan on 1st August 2021.

1. Canopy cover mapping from Blue Sky National Tree Map™ dataset.
2. Woodland defined as >0.5 ha based on the National Forest Inventory Woodland England 2018, Forestry Commission
3. UK Local Authority Carbon Dioxide Emissions, Department for Business, Energy and Industrial Strategy 2018.
4. Tackling the Climate Emergency: Emissions Reduction Pathway Report, 2020. West Yorkshire Combined Authority. Assuming residual emissions in 2038 are 18-27% of 2018 emissions.
5. Assuming that the region's emissions continue to decline and reach 5% of the 2018 value by 2050.

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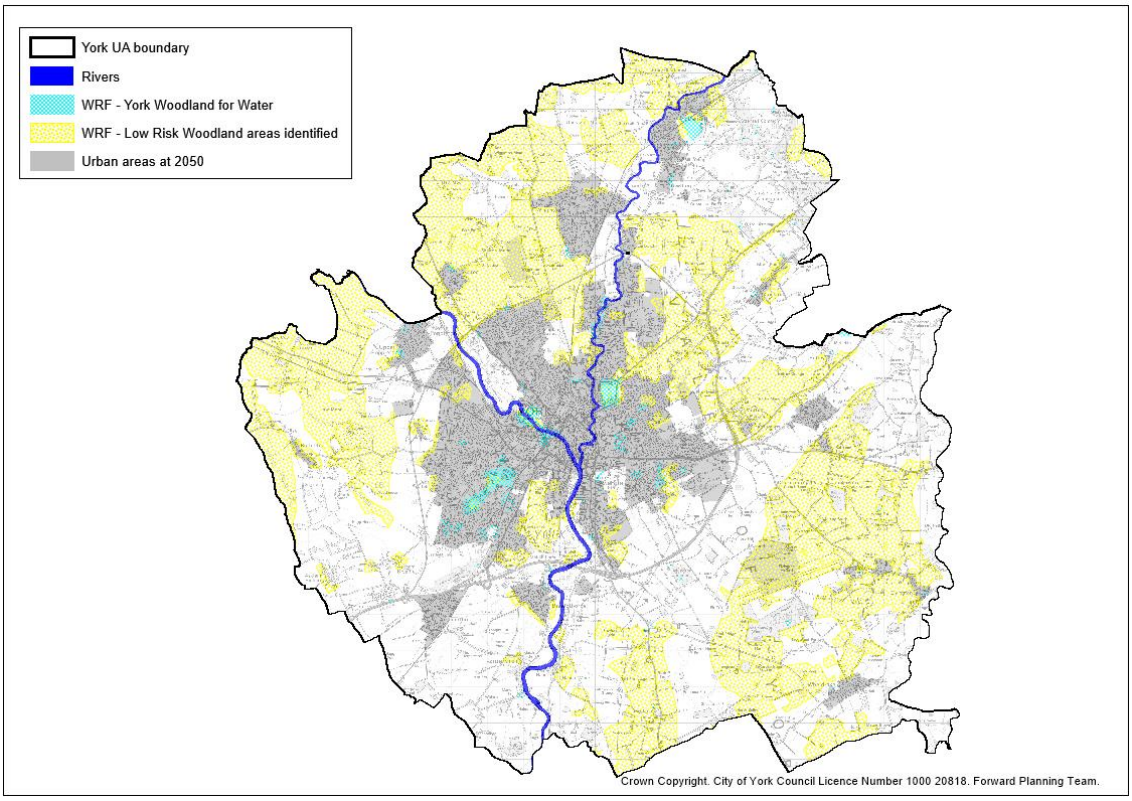
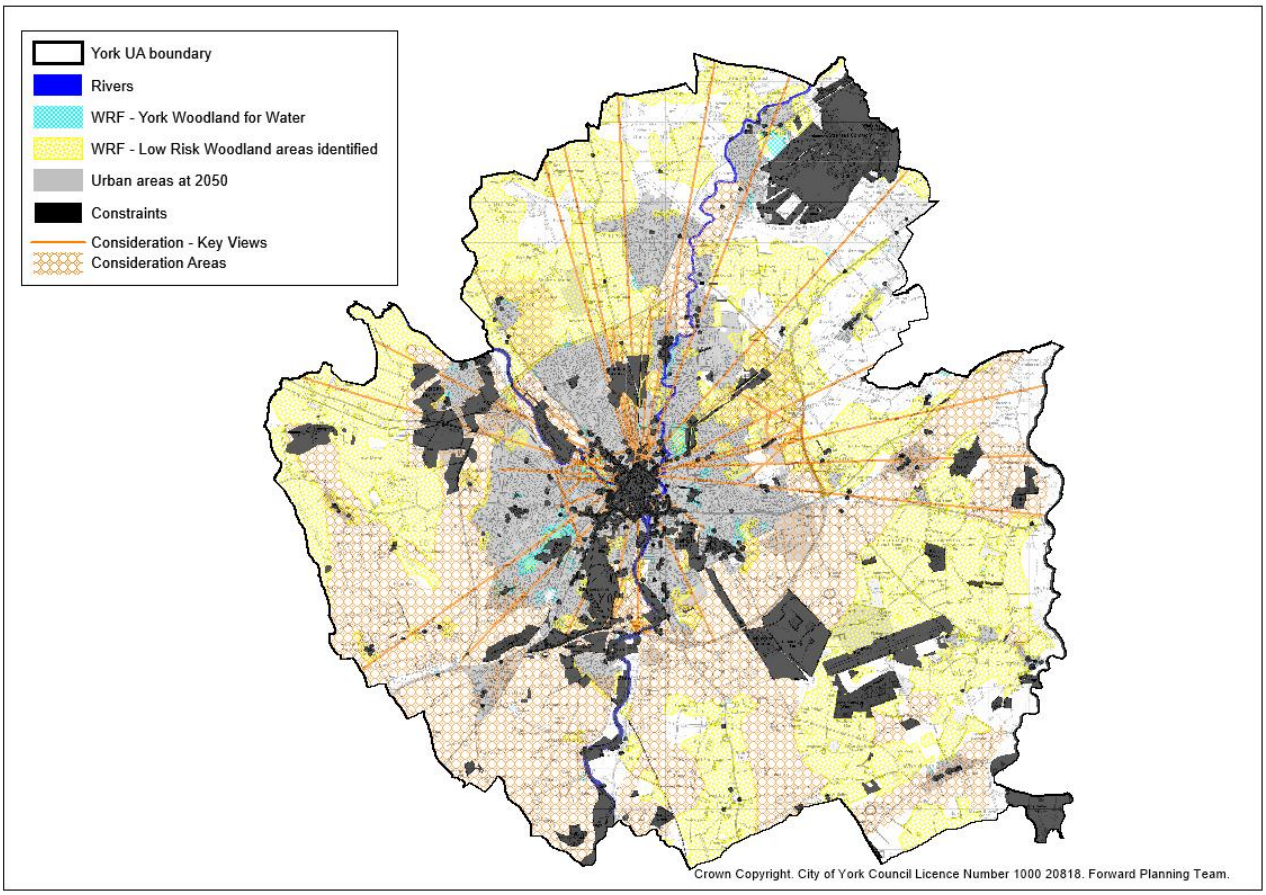
Annex 3

WRF Outcomes



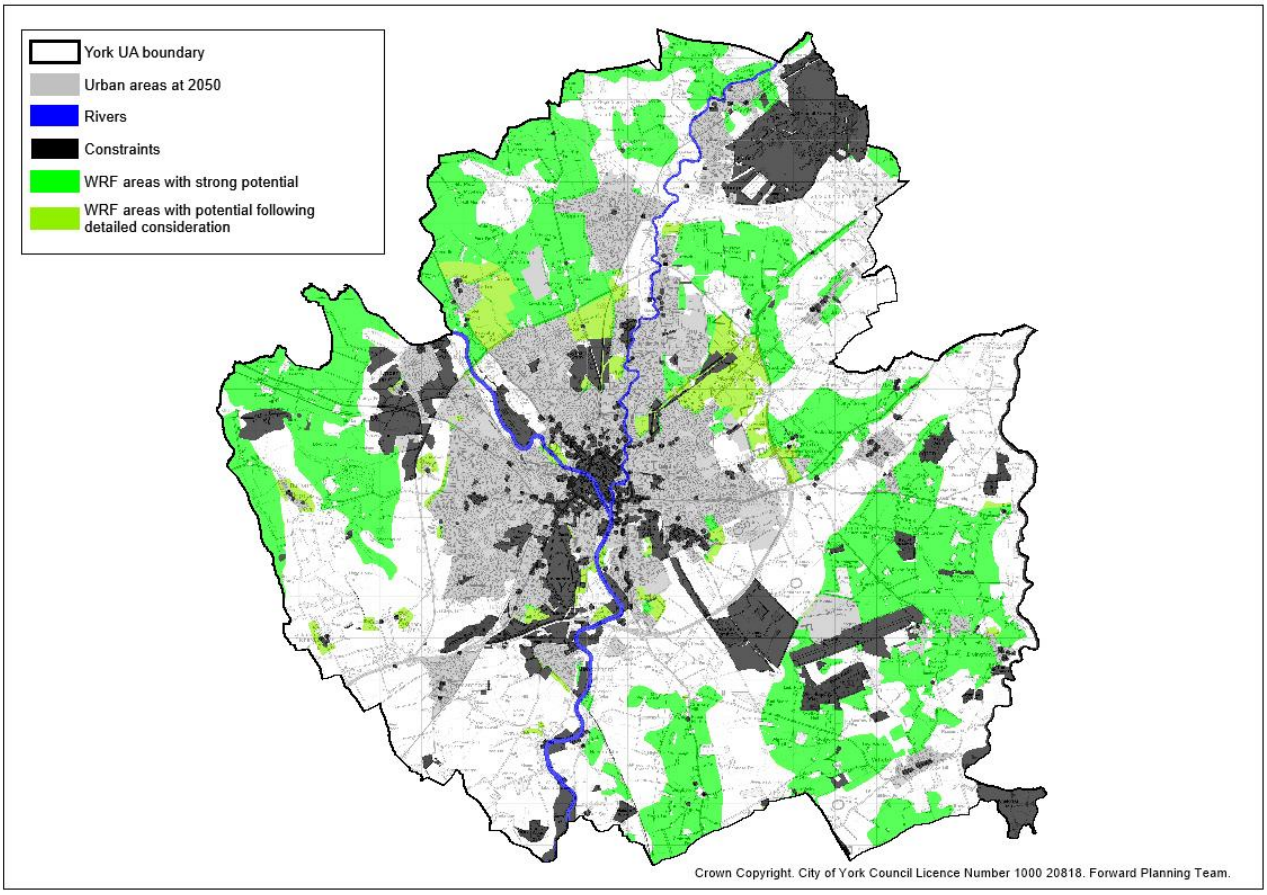
Annex 3

WRF overlaid with constraints and considerations



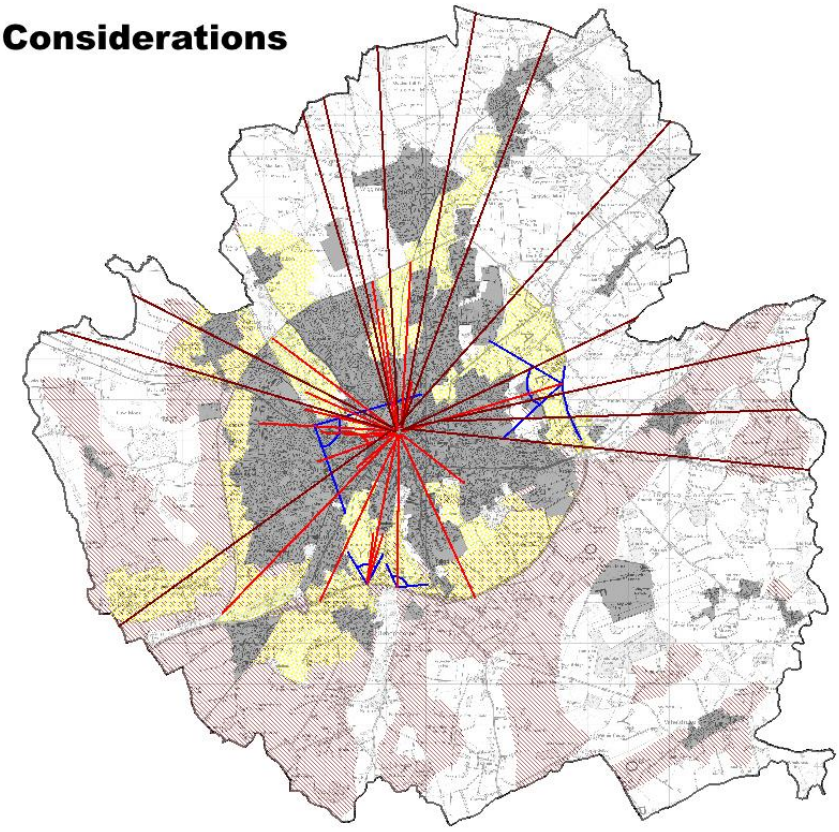
Annex 3

Potential of WRF land identified



Annex 3

Considerations



Legend

Existing and planned built up areas

Heritage Considerations

Historic Character and Setting

Sensitive areas include:
Green Wedges
Areas protecting rural setting of city
areas protecting village setting
Areas preventing coalesence

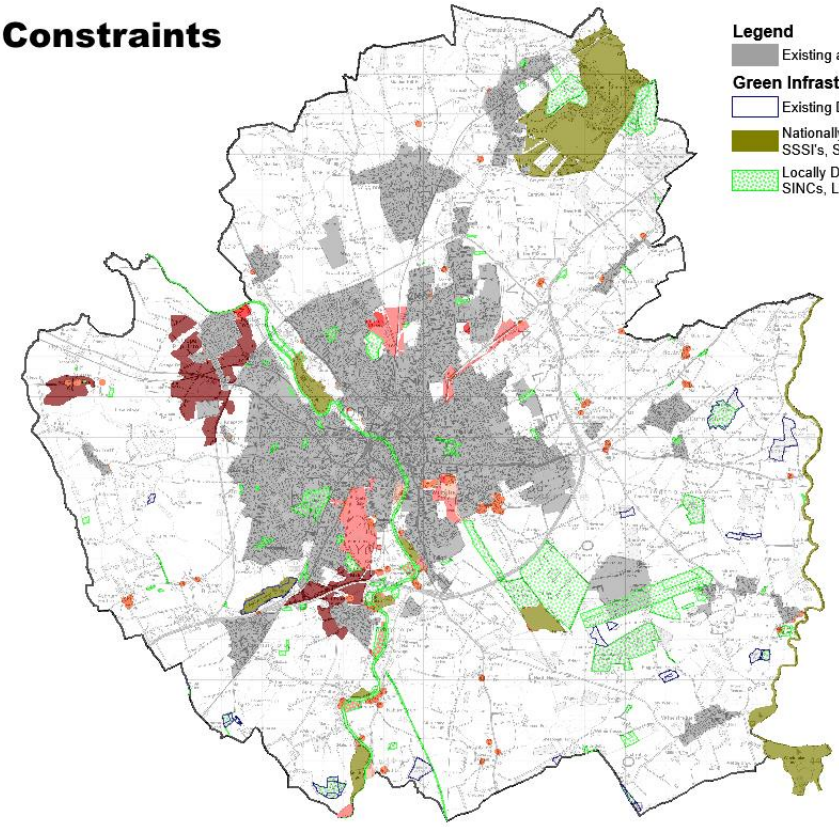
Views

City Wide View
Long Distance View
Important Panoramas

Climate Change Considerations

Agricultural Land Grade 2

Constraints



Legend

Existing and planned built up areas

Green Infrastrcuture Constraints

Existing Designated Ancient Woodland

Nationally Designated Nature Conservation
SSSI's, SACs, SPAs, RAMSAR

Locally Designated and planned Nature Conservation
SINCs, LNRs, Biodiversity Net Gain Areas

Heritage Constraints

Scheduled Ancient Monuments

Designated Listed Buildings

Designated Historic Parks and Gardens

Historically Important Landscapes
Ings and Strays

Climate Change Constraints

Agricultural Land Value - Grade 1

A Net Zero Carbon Roadmap for York

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Contents

Executive Summary

1. Introduction

2. Our Approach:

a. Measuring an Area's Carbon Footprint
b. Developing a Baseline of Past, Present and Future Emissions
c. Setting Science-Based Carbon Reduction Targets
d. Identifying and Evaluating Carbon Reduction Opportunities
e. Aggregating Up to See the Bigger Picture
f. Developing Targets and Performance Indicators
g. Focusing on Key Sectors

3. Developing a Baseline of Past, Present and Future Emissions for York

4. Setting Science-based Carbon Reduction Targets for York

5. Aggregating Up: The Bigger Picture for York

6. Developing Targets and Performance Indicators

7. Focusing on Key Sectors in York:

a. Domestic Housing
b. Public and Commercial Buildings
c. Transport
d. Industry

8. Innovative Stretch Measures in York

9. Next Steps for York

Appendix 1: League Table of the Most Carbon Effective Options for York

Appendix 2: League Table of the Most Cost Effective Options for York

Appendix 3: Detailed Sectoral Emissions Reduction Potential by Scenario

Appendix 4: Marginal Abatement Chart for York

Appendix 5: Methodology Explored

Executive Summary

Background:

- Scientific evidence calls for rapid reductions in global carbon[1] emissions if we are to limit average levels of warming to 1.5°C and so avoid the risks associated with dangerous or runaway climate change.
- Globally, the IPCC suggests that we will have used up the global carbon budget that gives us a good chance of limiting warming to 1.5°C degrees within a decade. This science underpins calls for the declaration of a climate emergency.
- Dividing the global carbon budget up by population gives York a total carbon budget of just over 10 million tonnes from 2020. Based only on the fuel and electricity directly used within its boundaries (i.e. it's scope 1 and 2 emissions), York currently emits c.888,000 tonnes of carbon a year, and as such it would use up its carbon budget just over 12 years.
- This assessment does not include it's broader carbon footprint – for example relating to longer distance travel or the goods and services that are produced elsewhere but consumed within York (i.e. it's scope 3 emissions).

Baselines and Targets:

- Scope 1 and 2 carbon emissions from York have fallen by 44% since the turn of the millennium. With on-going decarbonisation of grid electricity, and taking into account population and economic growth within the city-region, we project that York's 2000 level of annual emissions will have fallen by a total of 51% in 2030 and 54% in 2050.
- If it is to stay within its carbon budget, York needs to add to adopt science-based carbon emissions reduction targets the build on the emissions reductions already achieved to secure 65% reductions on its 2000 level of emissions by 2025, 76% by 2030, 84% by 2035, 89% by 2040, 92% by 2045 and 95% by 2050.
- Without further activity to address its carbon emissions, we project that York's annual emissions will exceed its carbon budget by 802,000 tonnes in 2030, and 746,000 tonnes in 2050.

The Cost-Effective Options:

- To meet these carbon emissions reduction targets, York will need to adopt low carbon options that close the gap between its projected emissions in future and net zero emissions. This can be partially realised through cost-effective options that would more than pay for themselves through the energy cost reductions they would generate whilst often also generating wide social and environmental benefits in the area.
- More specifically, the analysis shows that York could close the gap between its projected emissions in 2030 and net zero emissions by 47% purely through the adoption of cost-effective options in houses, public and commercial buildings, transport and industry.
- Adopting these options would reduce York's total projected annual energy bill in 2030 by £287 million whilst also creating 3,570 years of employment in the city. They could also help to generate wider benefits including helping to tackle fuel poverty, reducing congestion and productivity losses, improving air quality, and enhancements to public health.
- The most carbon effective options for the city to deliver these carbon cuts include improved deep retrofitting of heating, lighting and insulation in houses, cooling and insulation in offices, shops and restaurants, and a range of measures across the transport sector including mode shift to non-motorised transport and the wider up-take of electric vehicles.

[1] For simplicity, we use the term 'carbon' as shorthand for all greenhouse gases, with all figures in this report relating to the carbon dioxide equivalent (CO_2e) of all greenhouse gases unless otherwise stated. Note that our assessment therefore differs from other assessments that focus only on CO_2.

The Need for Ambition and Innovation:

- The analysis also shows that York could close the projected gap to net-zero emissions in 2030 by 69% through the adoption of options that are already available, but that some of these options would not pay for themselves directly through the energy savings that they would generate. Many of these options would, however, generate wider indirect benefits both economically and socially in the city.
  This means that although it can achieve significant reductions in emissions by focusing on established cost-effective and technically viable measures, York still has to identify other more innovative interventions that could deliver the last 31% of shortfall between projected emissions in 2030 and a net zero target.
- Options identified elsewhere that could be considered in York include targeting a complete transition to net zero homes and public/commercial buildings by 2030, promoting the rapid acceleration of active travel (e.g. walking and cycling), tackling food waste, reducing meat and dairy consumption and reducing concrete and steel consumption/promoting adoption of green infrastructure including accelerated tree planting plans.
- As well as reducing York's direct (scope 1 and 2) carbon footprint, some of these more innovative measures (e.g. reducing meat and dairy or concrete and steel consumption) could start to focus on tackling York's broader consumption-based (i.e. scope 3) carbon footprint.

Next Steps:

- York needs to adopt a clear and ambitious climate action plan. The case for the adoption of such a plan is supported by the evidence that much – but not all - of the action that is required can be based on the exploitation of win-win low carbon options that will simultaneously improve economic, social and health outcomes across the city.
- The climate action plan should adopt science-based targets for emissions reduction. As well as longer term targets, it should adopt 5-yearly carbon reduction targets.
- The action plan should focus initially on York's direct (scope 1 and 2) carbon footprint as these emissions are most directly under the city's influence, but in time it should also widen its scope to consider its broader (scope 3) carbon footprint.
- The action plan should also set out the ways in which York will work towards achieving these science-based targets, drawing on the deployment KPIs listed in this report. Action should also be taken to monitor and report progress on emissions reductions.
- It is important to stress that delivering on these targets will require action across the city and the active support of the public, private and third sectors. Establishing an independent York Climate Commission could help to draw actors together and to build capacities to take and track action.
- Leadership groups should be formed for key sectors such as homes, public and commercial buildings, transport and industry, with clear plans for delivery of priority actions in each sector. All large organisations and businesses in the city should be asked to match broader carbon reduction commitments and to report back on progress.

1. Introduction

Climate science has proven the connection between the concentration of greenhouse gases in the atmosphere and the extent to which the atmosphere traps heat and so leads to global warming. The science tells us – with a very high level of confidence – that such warming will lead to increasingly severe disruption to our weather patterns and water and food systems, and to ecosystems and biodiversity. Perhaps most worryingly, the science predicts that there may be a point where this process becomes self-fuelling, for example where warming leads to the thawing of permafrosts such that they release significant quantities of greenhouse gases leading to further warming. Beyond this point or threshold, the evidence suggests that we may lose control of our future climate and become subject to what has been referred to as dangerous or 'runaway' climate change.

Until recently, scientists felt that this threshold existed at around 2 degrees centigrade of global warming, measured as a global average of surface temperatures. However, more recent scientific assessments (especially by the Intergovernmental Panel on Climate Change or IPCC in 2017) have suggested that the threshold should instead be set at 1.5 degrees centigrade. This change in the suggested threshold from 2 degrees to 1.5 degrees has led to calls for targets for decarbonisation to be made both stricter (e.g. for the UK to move from an 80% decarbonisation target to a net zero target), and to be brought forward (e.g. from 2050 to 2030).

Globally, the IPCC suggests that from 2020 we can only emit 344 billion tonnes of CO_2 if we want to give ourselves a 66% chance of avoiding dangerous climate change. We are currently emitting over 37 billion tonnes of CO_2 every year, which means that we will have used up our global carbon budget within a decade. It is this realisation – and the ever accumulating science on the scale of the impacts of climate change - that led to calls for organisations and areas to declare a climate emergency and to develop and implement plans to rapidly reduce GHG emissions.

2. Our Approach

2(a). Measuring an Area's Carbon Footprint

Any area's carbon footprint – measured in terms of the total impact of all of its greenhouse gas emissions - can be divided into three types of greenhouse gas emissions.

- Those coming from the fuel (e.g. petrol, diesel or gas) that is directly used within an area and from other sources such as landfill sites or industry within the area. These are known as Scope 1 emissions.
- Those coming from the electricity that is used within the area, even if it is generated somewhere else. These are known as Scope 2 emissions. Together scope 1 and 2 emissions are sometimes referred to as territorial emissions.
- Those associated with the goods and services that are produced elsewhere but imported and consumed within the area. After taking into account the carbon footprint of any goods and services produced in the area but that are exported and consumed elsewhere, these are known as Scope 3 or consumption-based emissions.

In this report we focus on Scope 1 and 2 emissions, and exclude consideration of long-distance travel and of Scope 3 or consumption-based emissions. We do this because Scope 1 and 2 emissions are more directly under the control of actors within an area, and because the carbon accounting and management options for these emissions are better developed. We stress though that emissions from longer distance travel (especially aviation) and consumption are very significant, and also need to be addressed.

2(b). Developing a Baseline of Past, Present and Future Emissions

Having a baseline of carbon emissions is key to tracking progress over time. We use local authority emissions data to chart changes in emissions from 2005 to the 2018. We also break this down to show the share of emissions that can be attributed to households, public and commercial buildings, transport and industry.

We then project current emissions levels for the period through to 2050. To do this, we assume on-going decarbonisation of electricity in line with government commitments and a continuation of background trends in *a*) economic and population growth, and *b*) energy use and energy efficiency. Specific numbers for the key variables taken into account in the forecasts are presented below. As with all forecasts, the level of uncertainty attached increases as the time period in question extends. Even so, it is useful to look into the future to gauge the scale of the challenge to be addressed in each area, especially as it relates to the projected gap between the forecasted emissions levels and those that are required if an area's emissions are to be consistent with a global strategy to limit average warming to 1.5 degrees.

2(c). Setting Science-Based Carbon Reduction Targets

To set science-based carbon reduction targets for an area, we take the total global level of emissions that the IPCC suggests gives us a 66% chance of limiting average levels of warming to 1.5 degrees, and divide it according to the share of the global population living in the area in question. This enables us to set the total carbon budget for an area that is consistent with a global budget. To set targets for carbon reduction, we then calculate the annual percentage reductions from the current level that are required to enable an area to stay within its overall carbon budget.

2(d). Identifying and Evaluating Carbon Reduction Opportunities

Our analysis then includes assessment of the potential contribution of c.130 * energy saving or low carbon measures for:

- households and for both public and commercial buildings (including better insulation, improved heating, more efficient appliances, some small scale renewables)
- transport (including more walking and cycling, enhanced public transport, electric and more fuel efficient vehicles)
- industry (including better lighting, improved process efficiencies and a wide range of other energy efficiency measures).

We stress that the list of options that is assessed may not be exhaustive; other options could be available and the list can potentially be expanded.

For the options included, we assess the costs of their purchase, installation and maintenance, the direct benefits (through energy and fuel savings) of their adoption in different settings and their viable lifetimes. We also consider the scope for and potential rates of deployment of each option. This allows us to generate league tables of the most carbon and cost-effective options that could be deployed within an area.

It is important to note that we base the analysis on current capital costs, although future costs and benefits are adjusted for inflation and discounting factors. This could be pessimistic if costs fall and benefits increase as some options become more widely adopted, or if the costs increase as the rates of deployment increase. It is also important to note that, although we consider the employment generation potential of different options, we do not consider the wider indirect impacts of the different options relating to their social, economic or environmental implications.

Beyond the range of currently available options, we also consider the need for more innovative or 'stretch' options to be developed and adopted within the area if it is to meet its carbon reduction targets. These need to be developed in each area, but the some of the ideas for innovative options identified elsewhere include targeting a full transition to net zero homes and public/commercial buildings by 2030, promoting the rapid acceleration of active travel (e.g. walking and cycling), tackling food waste, reducing meat and dairy consumption and reducing concrete and steel consumption/promoting adoption of green infrastructure.

2(e). Aggregating Up to See the Bigger Picture

Based on this bottom-up analysis of the potential for different options to be adopted within the area, we then aggregate up to assess the potential for decarbonisation within that area, and the costs and benefits of different levels of decarbonisation. We then merge the aggregated analysis of the scope for decarbonisation with the baseline projections of future emissions to highlight the extent to which the gap between the projected and required emissions levels that can be met through different levels and forms of action.

To break this gap down, we merge interventions into three broader groupings:

- ***Cost-Effective (CE)*** options where the direct costs of adoption are outweighed by the direct benefits that they generate through the energy savings they secure, meaning the portfolio of measures as a whole has a positive economic impact in present value. These options may also generate indirect benefits, for example through job creation, fuel poverty and improved air quality and public health.

* We evaluate over 130 separate low carbon technologies/interventions applied across sectors, with variable place-specific data on how their productivity and economics will change by application. This results in over 1000 unique data points customised to York's economy, infrastructures and demography.

- ***Cost-Neutral (CN)*** options where the portfolio of interventions mentioned above is expanded to consider investments that may not be as cost effective on their own terms, but where the range of measures as a whole will have near-zero net cost.
- ***The Technical Potential (TP)*** options where the direct costs are not (at present) covered by the direct benefits. However, the cost of many low carbon options is falling quickly, and again these options could generate important indirect benefits such as those listed above.

As it is unlikely that adopting all of the cost-effective or even technically viable options will enable an area to reach net-zero emissions, we also highlight the need for a fourth group of measures:

- ***The innovative or 'stretch' options*** that includes low-carbon measures that are not yet widely adopted. Some of the options within this group may well be cost and carbon effective, and they may also generate significant indirect benefits, but whilst we can predict their carbon saving potential, data on their costs and benefits is not yet available.

2(f). Developing Targets and Performance Indicators

Linked to the analysis detailed above, we extend our evaluation of potential emissions reductions across York's economy to substantive, real-life indicators for the levels of investment and deployment required to achieve targets. These Key Performance Indicators (KPIs) illustrate the scale of ambition required to reach the emissions savings presented in the Technical Potential scenario and are disaggregated by sector.

2(g). Focusing on Key Sectors

As well as presenting an aggregated picture, we also focus on the emissions saving potential in the housing, public and commercial buildings, transport, and industry sectors. We focus in on overall investment needs and returns, and present more detailed league tables of the most carbon and cost effective options that could be adopted in each sector.

3. Developing a Baseline of Past, Present and Future Emissions for York

Analysis shows that York's baseline (scope 1 and 2) emissions have fallen by 44% since 2000, due to a combination of increasingly decarbonised electricity supply, structural change in the economy, and the gradual adoption of more efficient buildings, vehicles and businesses.

With full decarbonisation of UK electricity by 2050, and taking into account economic growth (assumed at 2.5% p.a.), population growth (assumed at 0.1% p.a.) and on-going improvements in energy and fuel efficiency, we project that York's baseline (scope 1 and 2) emissions will only fall by a further 7% by 2030, 9% by 2040, and 10% by 2050. This is a total of just under 54% between 2000 and 2050.

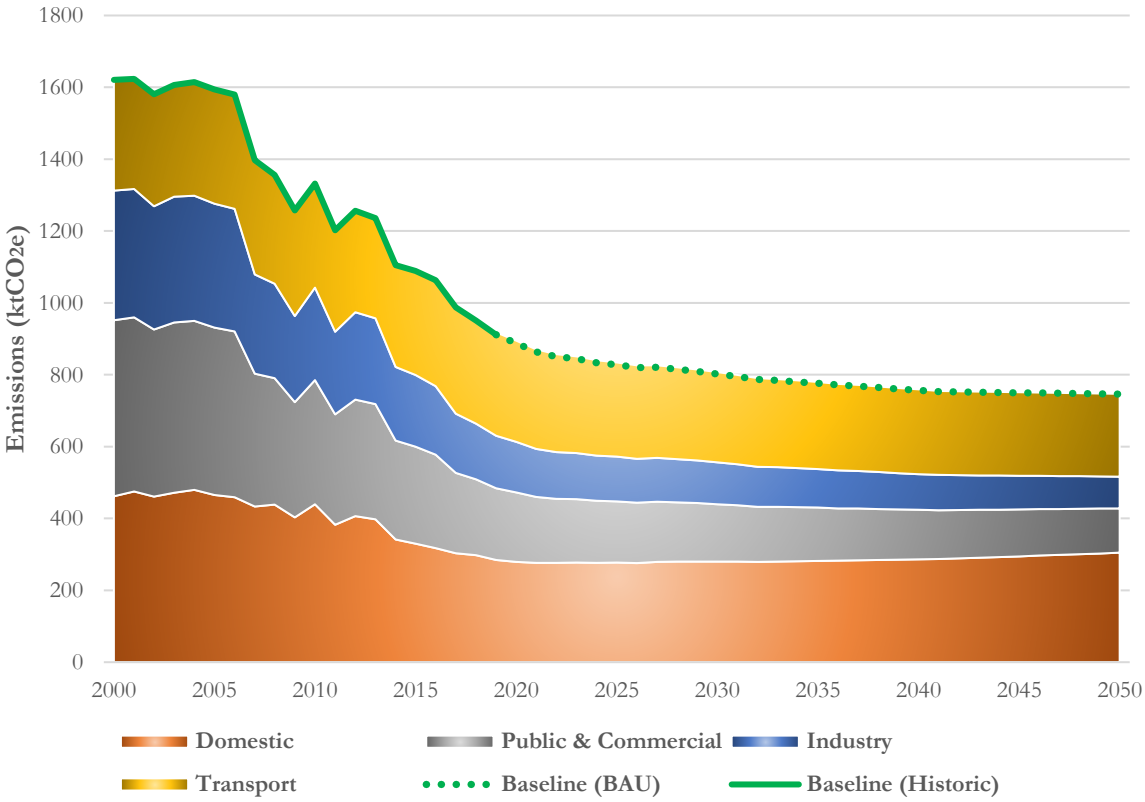


Figure.1: *York's Scope 1 and 2 GHG emissions (2000-2050)*

Currently, 32% of York's emissions come from transport, with the domestic housing sector then responsible for 31% of emissions, public & commercial buildings for 22% and industry 16%. Emissions related to land-use contribute c.0.5% and are not considered technically in this report. By 2050, we project emissions from transport will decrease very slightly (still producing c.31%) with a significant 10% increase in the proportion of emissions from housing. Small decreases are forecast in the proportion of emissions from public & commercial buildings and industry, largely a result of expansion in the output of the domestic buildings sector over this period.

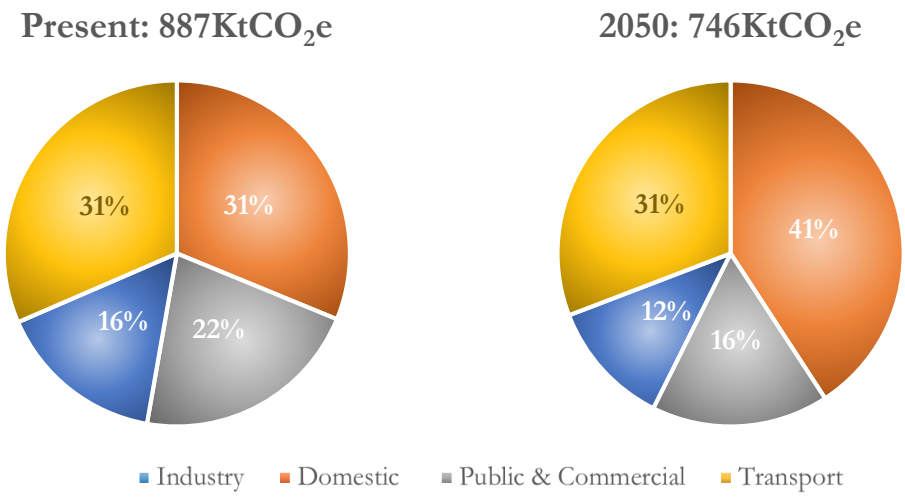


Figure.2: *York's Present and Projected Emissions by Sector*

Related to this emissions baseline, after evaluating the range of energy sources York consumes (spanning electricity, gas, all solid and liquid fuels across sectors) we find that in 2019 £299 million was spent on energy across the city. Transport fuels generated the majority of this demand (44%), followed by domestic buildings (35%) then public & commercial buildings and industry (13% and 9% respectively). By projecting demand and energy prices into future with reasonable baseline assumptions over population, inflationary measures and efficiency gains across the economy, we find that York's business as usual energy expenditure will likely grow to just under £320 million per year in 2030 and c.£435 million per year in 2050, with transport expenditure growing in its contribution to York's total (see Figure 3 below).

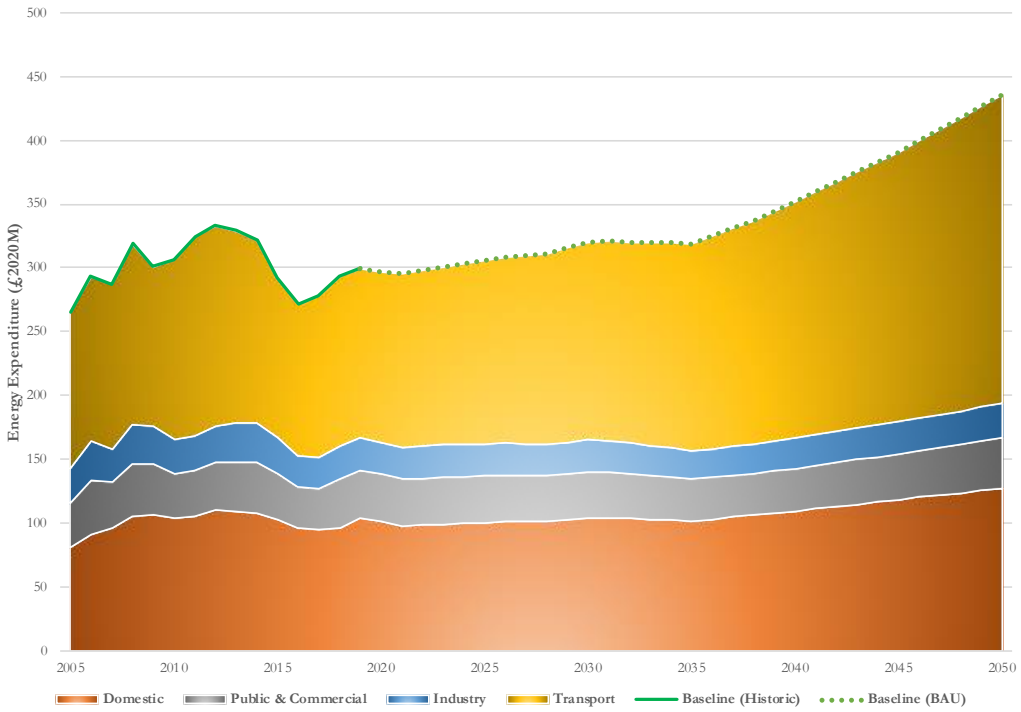


Figure.3: *York's Present and Projected Energy Expenditure by Sector*

4. Setting Science-based Carbon Reduction Targets for York

The Inter-governmental Panel on Climate Change (IPCC) has argued that from 2020, keeping within a global carbon budget of 344 gigatonnes (i.e. 344 billion tonnes) of CO2 emissions would give us a 66% chance of limiting average warming to 1.5 degrees and therefore avoiding dangerous levels of climate change. If we divide this global figure up on an equal basis by population, this gives York a total carbon budget of c.10 megatonnes (i.e. 10 million tonnes) over period between the present and 2050.

At current rates of emissions output, York would use up this budget in just over 12 years at some point during the spring of 2032. However, York could stay within its carbon budget by reducing its emissions by just over 7% year on year. This would mean that to transition from the current position where emissions are 44% lower than 2000 levels to a local pathway that is consistent with the world giving itself a 66% chance of avoiding dangerous, runaway climate change, York should adopt carbon reduction targets (on 2000 levels) of:

- 65% by 2025
- 76% by 2030
- 84% by 2035
- 89% by 2040
- 92% by 2045
- 95% by 2050.

Such a trajectory would mean that the majority of all future carbon cuts needed for York to transition to a 1.5 degree consistent pathway need to be delivered in the next 10 years.

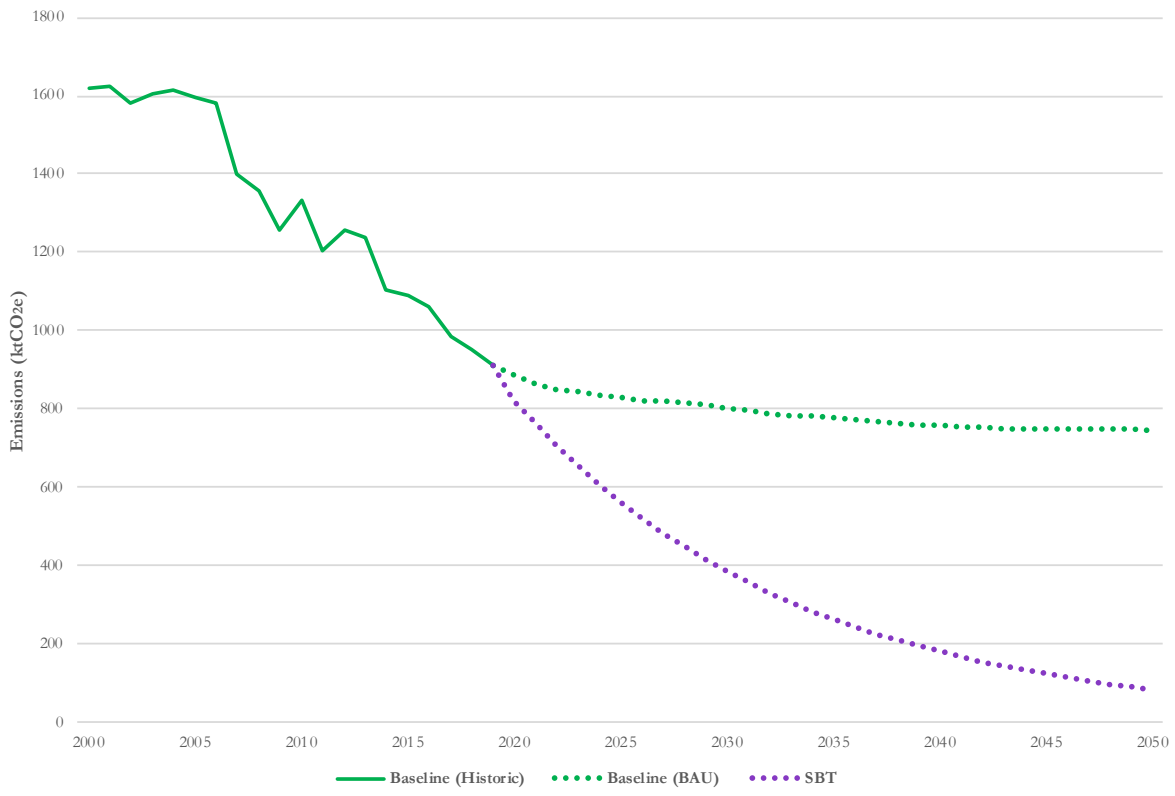


Figure.4: *York's Baseline and Science-Based-Target Emissions Pathways*

5. Aggregating Up: The Bigger Picture for York

a) Emissions reductions

Our analysis predicts that the gap between York's business as usual emissions in 2030 and the net zero target could be closed by 47 % (379ktCO_2e) through the adoption of Cost-Effective (CE) options, by a further 15% (118ktCO_2e) through the adoption of additional Cost-Neutral (CN) options at no net cost, and then by an additional 7% (53ktCO_2e) through the further adoption of all technically viable (TP) options. This means that York still has to identify the innovative or stretch options that could deliver the last 31% (252ktCO_2e) of the gap between the business as usual scenario and net zero in 2030.

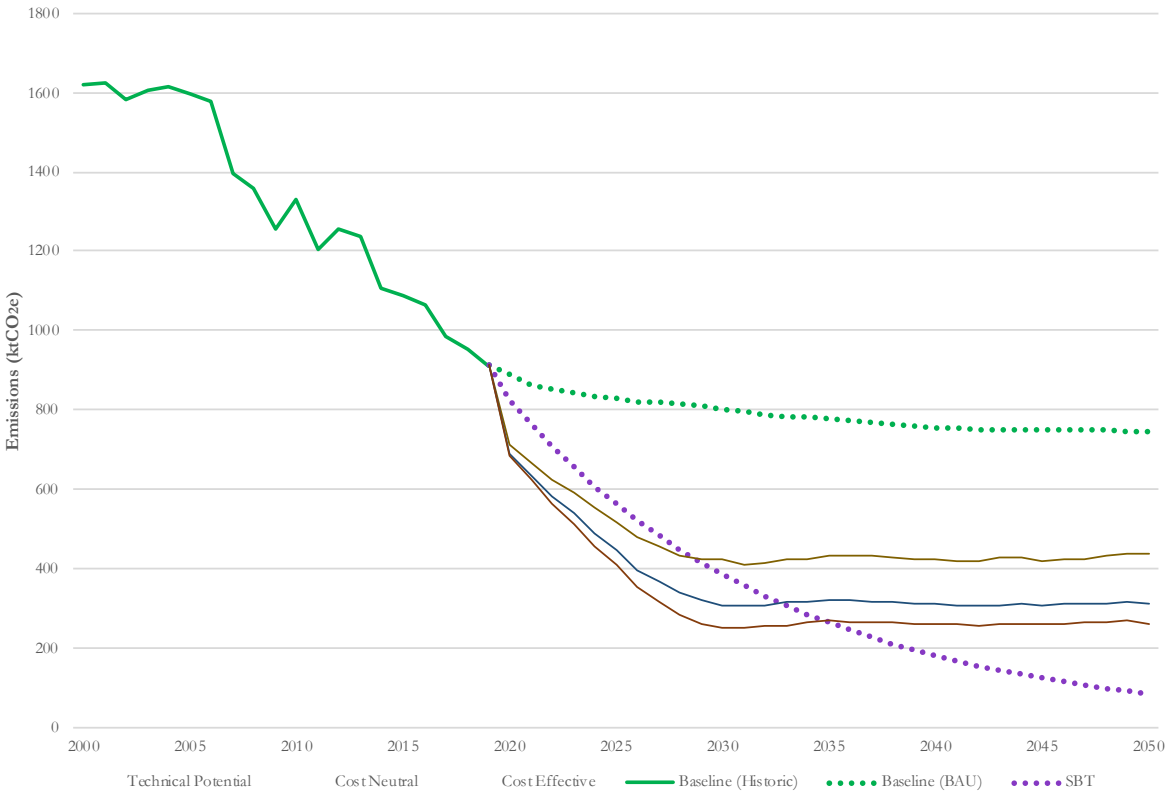


Figure.5: *York's BAU Baseline with Cost-Effective, Cost-Neutral, & Technical Potential Scenarios*

		2025	2030	2035	2040	2045	2050
Reduction on BAU Baseline	**CE**	38%	47%	44%	44%	44%	41%
	CN	46%	62%	59%	59%	59%	58%
	TP	51%	69%	65%	66%	65%	65%
Reduction on Present Emissions	**CE**	35%	43%	39%	37%	37%	35%
	CN	43%	56%	51%	50%	50%	49%
	TP	47%	62%	57%	56%	55%	55%

Table.1: *York's Potential 5-Year Emissions Reduction Percentages*

b) The most carbon and cost-effect options

Figure 6 below presents the emissions savings that could be achieved through different groups of measures in York. Appendices 1 and 2 present league tables of specific measures and their potential emissions savings over this period.

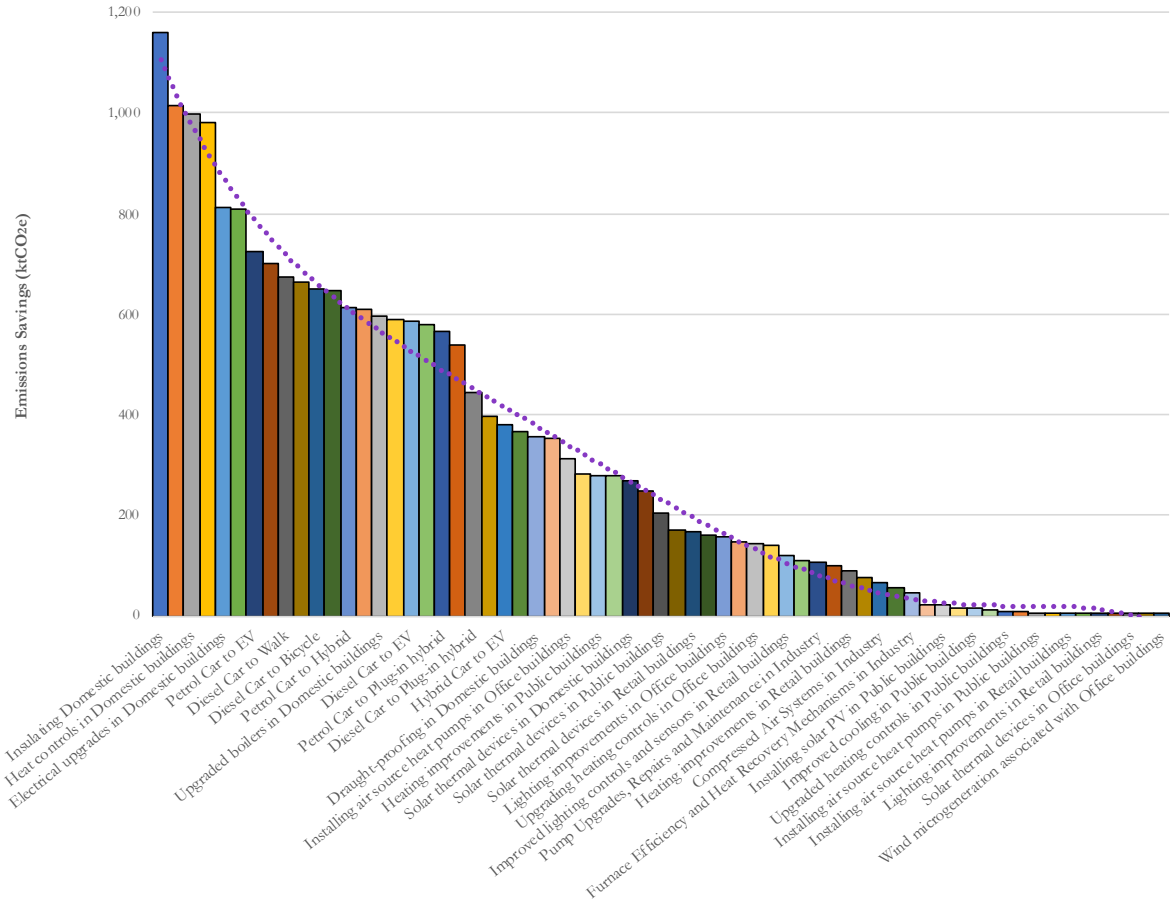


Figure.6: *Simplified Emissions Reduction Potential by Measure for York*

Simplified league tables of the most cost and carbon effective options in York are presented below (see Appendices 1 & 2 for more detailed league tables).

Rank	Measure	Cost Effectiveness (£/tCO2e)
1	Fabric improvements in Retail buildings	-571
2	Diesel Car to Bus (diesel) Journeys	-458
3	Improved cooling in Retail buildings	-393
4	Petrol Car to Bus (diesel) Journeys	-373
5	Diesel Car to Walk Journeys	-345
6	Diesel Car to Bicycle Journeys	-345
7	Petrol Car to Bicycle Journeys	-323
8	Petrol Car to Walk Journeys	-323
9	Fabric improvements in Public buildings	-276
10	Petrol Car to Plug-in hybrid Journeys	-214

Table.5: *York's Top-10 Most Cost-Effective Emission Reduction Options*

Rank	Measure	Emissions Reduction Potential 2020-50 ($ktCO_2e$)
1	Insulating Domestic buildings	906
2	Upgraded Heating controls in Domestic buildings	846
3	Electrical upgrades in Domestic buildings	669
4	Installing heat pumps in Domestic & Office buildings	653
5	Petrol Car to Bicycle Journeys	636
6	Petrol Car to Walk Journeys	636
7	Fabric improvements in Retail buildings	515
8	Petrol Car to Bus (electric) Journeys	485
9	Upgraded boilers in Domestic buildings	481
10	Electricity demand reduction in Domestic buildings	475

Table.6: *York's Top-10 Most Carbon Effective Emission Reduction Options*

Some of the ideas for innovative options identified elsewhere that could also be considered for York include targeting a full transition to net zero homes and public/commercial buildings by 2030, promoting the rapid acceleration of active travel (e.g. walking and cycling), tackling food waste, reducing meat and dairy consumption and reducing concrete and steel consumption/promoting adoption of green infrastructure. These are highlighted in section 8.

c) Investment needs, paybacks and employment creation

Exploiting the cost-effective options in households, public and commercial buildings, transport, industry and waste could be economically beneficial. Although such measures would require total investments of around £1.1 billion over their lifetimes (equating to investments of 110m a year across all organisations and households in the city for the next decade), once adopted they would reduce York's total energy bill by £287 million p.a. in 2030 whilst also creating 3,570 years of employment – or 357 full-time jobs for the next decade.

By expanding this portfolio of measures to at no net cost to York's economy (the Cost-Neutral scenario), investments of £2.3 billion over their lifetimes (or £230m a year for the next decade) would generate 5,887 years of employment (or 588 jobs for the next decade) whilst reducing York' emissions by 62% of projected 2030 levels.

Exploiting the all technically viable options would be more expensive (at least at current prices, c.£3 billion or £300m a year for the next decade) but realise further emissions savings – eliminating 69% of the projected shortfall in York's 2030 emissions, whilst saving hundreds of millions of pounds on an annual basis.

		2025	2030	2035	2040	2045	2050
Cumulative Investment (£M)	**CE**	763	1,160	1,162	1,163	1,164	1,164
	CN	1,442	2,223	2,254	2,256	2,257	2,257
	TP	1,934	2,964	2,995	2,997	2,997	2,997
Annual Energy Expenditure Savings (£M)	**CE**	203	287	284	285	281	284
	CN	188	258	256	248	239	233
	TP	187	255	252	245	235	227

Table.2: *Potential 5-Year Investments and Energy Expenditure Savings*

Sector	Scenario	Investment (£M)
Domestic	**CE**	584
	CN	924
	TP	1,170
Public & Commercial	**CE**	448
	CN	504
	TP	909
Industry	**CE**	17
	CN	198
	TP	287
Transport	**CE**	115
	CN	631
	TP	631

Table.3: *Potential Investments by Sector & Economic Scenario*

		Total	Domestic	Industry	Transport	Public & Commercial
Years of Employment	**CE**	**3,570**	1,250	58	157	2,106
	CN	**5,887**	1,975	676	864	2,371
	TP	**8,623**	2,503	982	864	4,274
Jobs (20-year Period)	**CE**	**179**	62	3	8	105
	CN	**294**	99	34	43	119
	TP	**431**	125	49	43	214

Table.4: *Potential Job Creation by Sector & Economic Scenario*

6. Developing Targets and Performance Indicators

To give an indication of the levels of activity required to deliver on these broader targets, the tables below detail total deployment across different sectors in York through to 2050. We also give an indication of the rate of deployment required in the city if it is to even approximate its climate targets. These lists are not exhaustive, and also apply by measure; any one building or industrial facility will usually require the application of several measures over the period. These figures effectively become Key Performance Indicators (KPIs) for the delivery of climate action across the city.

Domestic Homes:

Measure	Total Homes Applied	Mean Annual Rate of Installation (homes)
Lighting Upgrades	51,631	**2,963**
Floor Insulation	48,546	**2,732**
Glazing Upgrades	45,597	**2,589**
Gas Boiler Upgrades & Repairs	46,800	**2,506**
Solar PV	35,810	**2,055**
Thermostats & Heating Controls	35,116	**1,976**
Solar thermal	36,430	**1,955**
Loft insulation	32,283	**1,748**
Wall Insulation	23,111	**1,290**
Draught Proofing	18,401	**1,044**
Cavity wall Insulation	15,350	**856**
Heat Pumps	3,780	**215**

Public & Commercial Buildings:

Measure	Floorspace Applied (m^2)	Mean Annual Rate of Installation (m^2)
Lighting/Heating Controls and Sensors	1,450,231	**82,076**
Retail Heating Upgrades	1,420,740	**80,425**
Wind Turbines	795,241	**45,815**
Office Lighting Upgrades	398,040	**23,006**
Office Fabric Improvements	279,564	**15,595**
Office Heat Pumps	114,492	**6,328**
Office Solar PV	93,984	**5,168**

Transport:

Measure	Deployment
Additional EVs Replacing Conventional Private Cars	**1,536**
Additional Electric-Buses Procured and In-service	**85**
High Quality Protected Cycling Highways Built	**9** kilometres
Increase in Public Transport Ridership	**4M** trips per annum

Table.7: *York's Sectoral Emissions Reduction KPIs*

7. Focussing on Key Sectors in York

At full deployment (technical potential) across York, we calculate that there is potential to avoid over 14MtCO2e in emissions that will otherwise be produced in the city between 2020 and 2050. The transport sector will contribute most significantly toward this total, with a decarbonisation potential of between 4MtCO2e (cost-effective scenario) and 6MtCO2e (technical potential) through the period. However, domestic housing , industry and public and commercial buildings also play a major role:; upgrading and retrofitting of York's built environment (including the domestic, public and commercial sectors) could reduce emissions by up to c.8MtCO2e over the same period at full technical potential, with industry similarly showing the potential to decarbonise nearly 500ktCO2e under the same conditions.

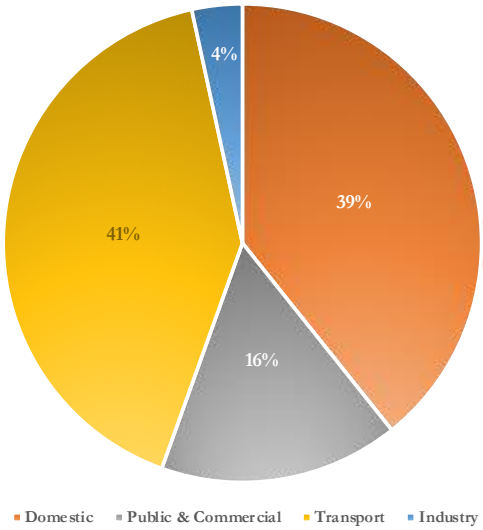


Figure.7 *York's Emissions Reduction Potential (2020-2050) by Sector*

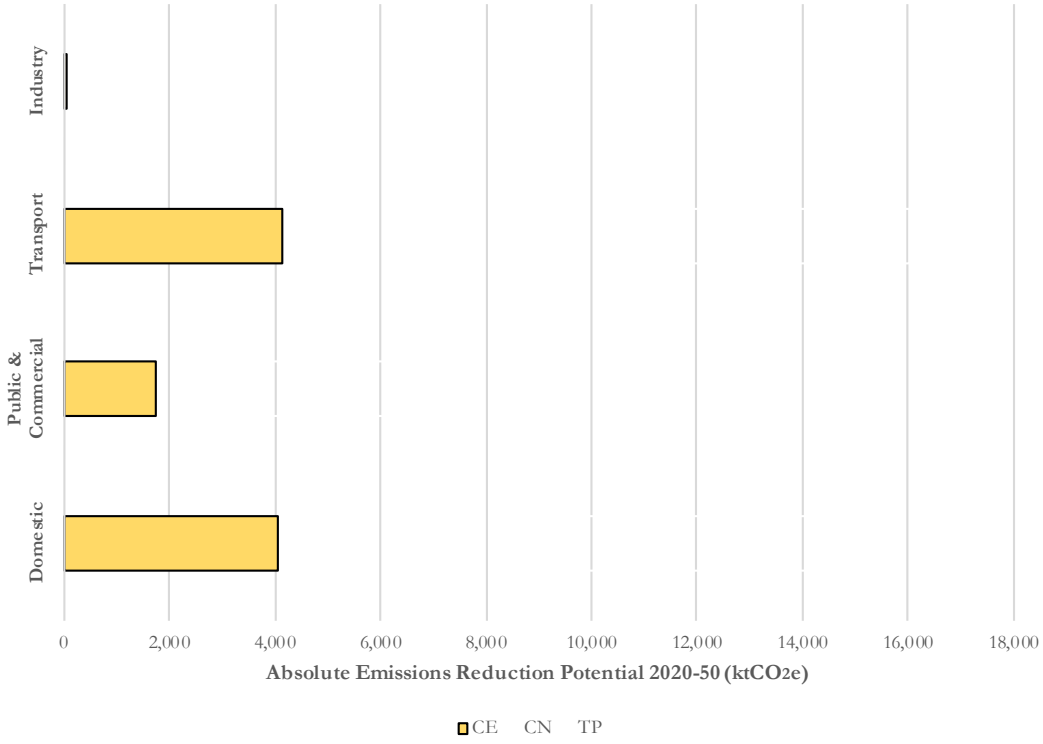
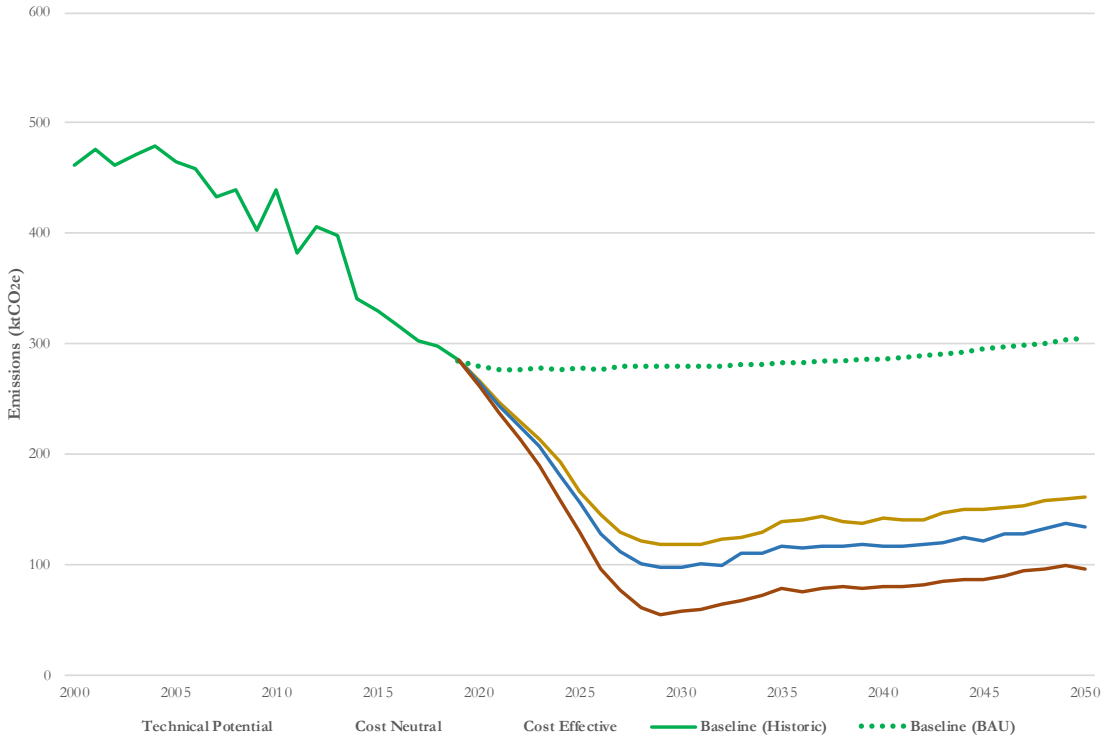


Figure.8: *York's Emissions Reduction Potential By Sector & Economic Scenario (2020-50)*

In the following section, summaries of the emissions reduction potential and economic implications of investment are presented for the four main sectors. For display and continuity purposes, each sector is displayed with a summary of the same metrics: (*1*) emissions reduction potential over time in the three economic scenarios, (*2*) 5-year totals for cumulative emissions savings, investment requirements and annual energy expenditure reductions, and (*3*) a simplified table of the most cost effective low carbon measures applied in each sector across York.

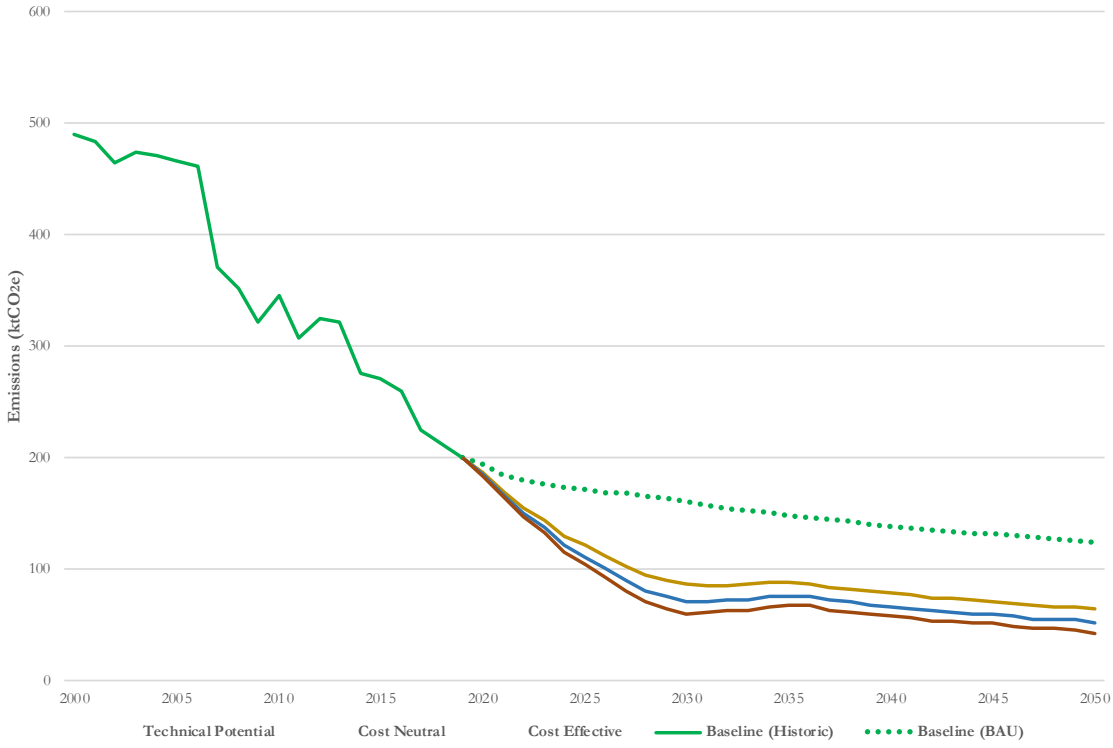
7(a). Housing



		2025	2030	2035	2040	2045	2050
Emissions Reductions ($ktCO_2e$)	**CE**	111	154	143	144	153	143
	CN	121	183	167	169	174	170
	TP	148	222	203	206	209	209
Annual Energy Expenditure Savings (£M)	**CE**	67	110	113	116	113	118
	CN	83	137	140	141	142	147
	TP	70	114	116	118	118	122
Cumulative Investment (£M)	**CE**	368	584	584	584	584	584
	CN	575	924	924	924	924	924
	TP	727	1,170	1,170	1,170	1,170	1,170

Rank	Measure	Cost Effectiveness (£/tCO_2e)
1	Electrical & Appliance upgrades in Domestic buildings	-208
2	Lighting improvements in Domestic buildings	-145
3	Electricity demand reduction in Domestic buildings	-137
4	Draught-proofing in Domestic buildings	-50
5	Installing heat pumps in Domestic buildings	-37
6	Upgraded Heating controls in Domestic buildings	-28
7	Glazing improvements in Domestic buildings	-27
8	Installing biomass boilers in Domestic buildings	-24
9	Solar thermal devices in Domestic buildings	-18
10	Upgraded boilers in Domestic buildings	-11

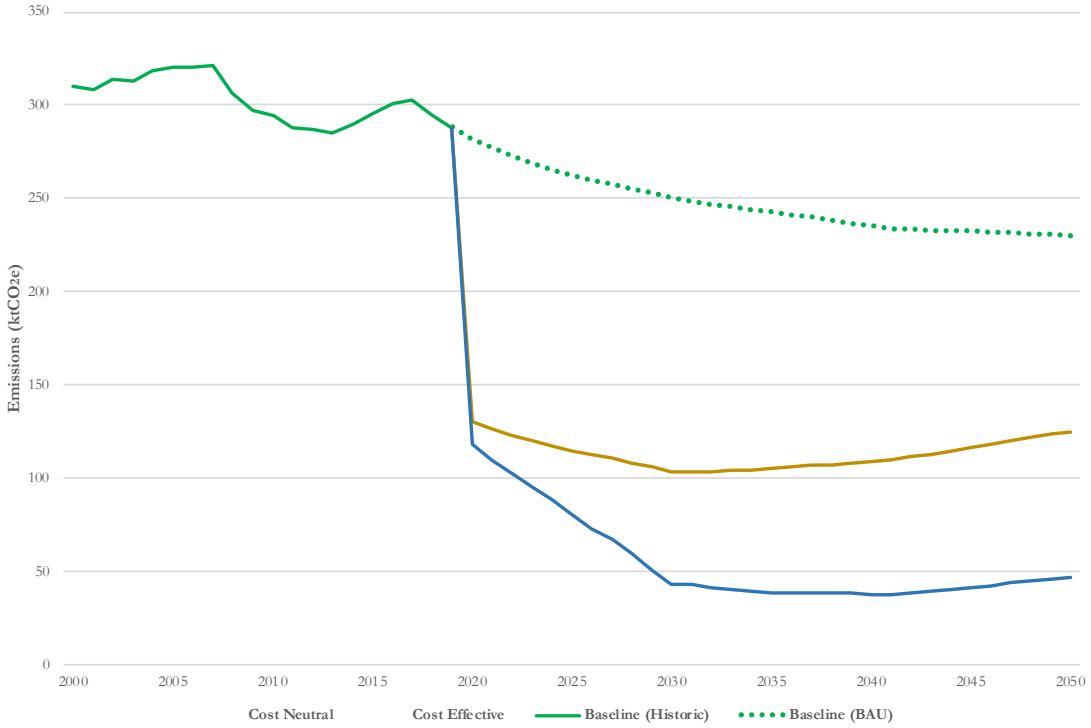
7(b). Public & Commercial Buildings



		2025	2030	2035	2040	2045	2050
Emissions Reductions ($ktCO_2e$)	**CE**	50	74	61	60	60	60
	CN	60	90	73	72	72	73
	TP	67	100	82	81	80	81
Annual Energy Expenditure Savings (£M)	**CE**	65	107	105	110	113	117
	CN	21	35	34	36	37	39
	TP	33	53	52	55	57	59
Cumulative Investment (£M)	**CE**	278	448	448	448	448	448
	CN	314	504	504	504	504	504
	TP	565	909	909	909	909	909

Rank	Measure	Cost Effectiveness (£/tCO_2e)
1	Fabric improvements in Retail buildings	-571
2	Improved cooling in Retail buildings	-393
3	Fabric improvements in Public buildings	-276
4	Lighting improvements in Public buildings	-200
5	Improved cooling in Office buildings	-198
6	Heating improvements in Public buildings	-139
7	Lighting improvements in Retail buildings	-132
8	Improved cooling in Public buildings	-97
9	Heating improvements in Office buildings	-82
10	Heating improvements in Retail buildings	-53

7(c). Transport



		2025	2030	2035	2040	2045	2050
Emissions Reductions ($ktCO_2e$)	**CE**	148	148	137	127	116	105
	CN	182	208	204	198	191	183
	TP	182	208	204	198	191	183
Annual Energy Expenditure Savings (£M)	**CE**	68	67	64	59	54	49
	CN	75	78	73	65	56	47
	TP	75	78	73	65	56	47
Cumulative Investment (£M)	**CE**	100	111	113	114	115	115
	CN	355	598	629	631	631	631
	TP	355	598	629	631	631	631

Rank[i]	Measure*	Cost Effectiveness (£/tCO_2e)
1	Diesel Car to Bus (diesel)	-458
2	Petrol Car to Bus (diesel)	-373
3	Diesel Car to Walk	-345
4	Diesel Car to Bicycle	-345
5	Petrol Car to Bicycle	-323
6	Petrol Car to Walk	-323
7	Petrol Car to Plug-in hybrid	-214
8	Diesel Car to Plug-in hybrid	-136
9	Petrol Car to EV	-133

Note: Due to the high cost-effectiveness of many transport mode-shift options, the TP scenario has been removed and emissions pathways are covered by CE and CN only.
* Journey transitions

10	Petrol Car to Bus (electric)	-129

7(d). Industry

		2025	2030	2035	2040	2045	2050
Emissions Reductions ($ktCO_2e$)	**CE**	5	4	2	0	0	0
	CN	19	16	12	8	7	7
	TP	24	21	16	11	10	10
Annual Energy Expenditure Savings (£M)	**CE**	3	3	3	1	1	0
	CN	9	9	9	6	4	0
	TP	10	10	10	7	5	0
Cumulative Investment (£M)	**CE**	3	17	17	17	17	17
	CN	40	198	198	198	198	198
	TP	57	287	287	287	287	287

Rank*	Measure	Cost Effectiveness (£/tCO_2e)
1	Improving Efficiency of Boilers and Steam Piping in Industry	307
2	Fan Correction, Repairs, & Upgrades in Industry	663
3	Condensing & Insulation Measures to Boilers & Steam Piping in Industry	719
4	Pump Upgrades, Repairs and Maintenance in Industry	825
5	Compressed Air Systems in Industry	1,055
6	Furnace Efficiency and Heat Recovery Mechanisms in Industry	3,213
7	Refrigeration Efficiency and Technical Upgrades in Industry	15,656

* For display purposes interventions in industry have been aggregated here into the 7 relevant process types

8. Innovative Stretch Measures in York

Even with full delivery of the broad programme of cross-sectoral, city-wide low carbon investment described above, there remains an emissions shortfall of 31% between York's 2030 BAU baseline and the net zero target. Here we briefly consider the productivity of certain key technologies and interventions that may well be able to plug this gap into the future. Many of these so-called 'stretch options' are innovative by nature but they will be required to reach York's targets in future.

		2025	2030	2035
Annual Emissions Reduction Potential ($ktCO_2e$)	Zero Carbon Heavy Goods Transport	11	48	48
	Industrial Heat and Cooling Electrification	12	12	7
	870 Ha. Reforested Annually 2020-29*	47	120	148
	Electrification of Domestic Heat	6	33	48
	Electrification of Domestic Cooking	2	11	15
	Electrification of Commercial/Public Heating	3	8	3

Table.7: *Stretch Measures' Decarbonising Potential (* Sequestration Values)*

Figure 10 below shows the impact that the adoption of these stretch measures would have on York's carbon emissions, with the red dotted line showing the 'business as usual' baseline, the purple dotted line showing emissions after adoption of all technically viable options and the blue dotted line showing emissions after all technically viable and stretch options. This indicates that York would still have some residual emissions through to 2050. For illustration, the green dotted line shows that in theory York could offset is residual emissions through a UK based tree planting scheme, however this would require the planting of 39 million trees, which even with the densest possible planting would require 8,700 hectares of land, equivalent to 32% of the total land area of the city.

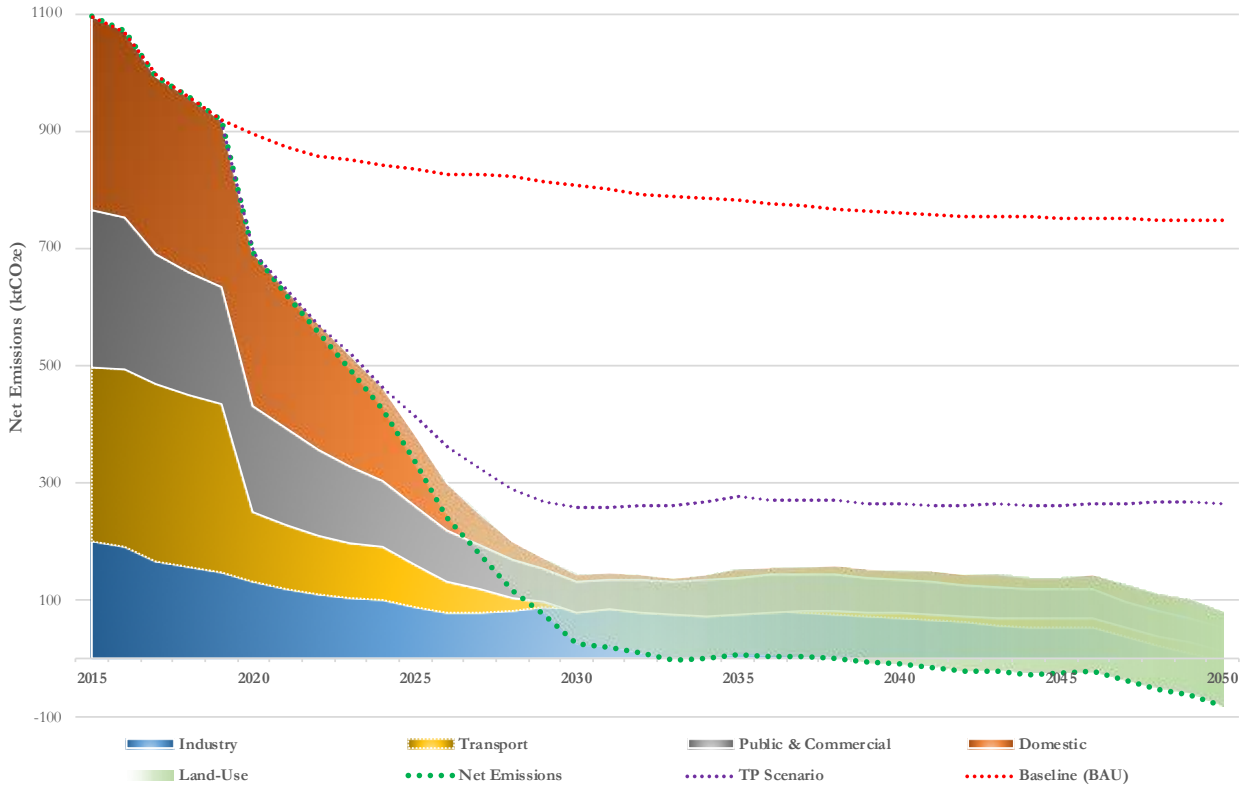


Figure.10: *Sectoral Emissions Shortfall Reduction with Stretch Measures*

9. Next Steps for York

Based on the analysis presented above, we recommend that if York wants to stay within its share of the global carbon budget, it needs to adopt a clear and ambitious climate action plan.

The case for the adoption of such a plan is supported by the evidence that much – but not all - of the action that is required can be based on the exploitation of win-win low carbon options that will simultaneously improve economic, social and health outcomes across the city.

A climate action plan for York should adopt science-based targets for emissions reduction, including both longer term targets and 5-yearly carbon reduction targets.

The action plan should focus initially on York's direct (scope 1 and 2) carbon footprint as these emissions are most directly under the city's influence, but in time it should also widen its scope to consider its broader (scope 3) carbon footprint.

The action plan should clearly set out the ways in which York will work towards achieving these targets, drawing on the deployment KPIs listed in this report. Action should also be taken to monitor and report progress on emissions reductions.

It is important to stress that delivering on these targets will require action across the city and the active support of the public, private and third sectors. Establishing an independent York Climate Commission could help to draw actors together and to build capacities to take and track action.

Such a Commission could act as a critical friend to the city, helping to promote stakeholder engagement and build buy-in and a sense of common ownership for the climate action plan, as well as in supporting, guiding and tracking progress towards its delivery.

Through such a Commission, cross-sectoral leadership groups could be formed for key sectors such as homes, public and commercial buildings, transport and industry, with clear plans for the delivery of priority actions in each sector. All large organisations and businesses in the city should be asked to match broader carbon reduction commitments and to report back on progress.

Appendix 1. League Table of the Most Carbon Effective Options for York

Measure*	Emissions Reduction Potential ($ktCO_2e$)
Insulating Domestic buildings	906
Upgraded Heating controls in Domestic buildings	846
Electrical upgrades in Domestic buildings	669
Installing heat pumps in Domestic buildings	653
Petrol Car to Bicycle	636
Petrol Car to Walk	636
Fabric improvements in Retail buildings	515
Petrol Car to Bus (electric)	485
Upgraded boilers in Domestic buildings	481
Electricity demand reduction in Domestic buildings	475
Diesel Car to Walk	464
Diesel Car to Bicycle	464
Installing solar PV in Domestic Buildings	444
Petrol Car to EV	439
Petrol Car to Bus (diesel)	395
Petrol Car to Plug-in hybrid	375
Petrol Car to Hybrid	375
Diesel Car to EV	370
Diesel Car to Bus (electric)	341
Fabric improvements in Public buildings	338
Diesel Car to Plug-in hybrid	276
Lighting improvements in Domestic buildings	276
Draught-proofing in Domestic buildings	257
Installing biomass boilers in Domestic buildings	252
Hybrid Car to EV	240
Glazing improvements in Domestic buildings	228
Diesel Car to Bus (diesel)	224
Heating improvements in Public buildings	213
Solar thermal devices in Domestic buildings	193
Condensing & Insulation Measures to Boilers & Steam Piping in Industry	185
Installing air source heat pumps in Office buildings	163
Solar thermal devices in Public buildings	148
Lighting improvements in Office buildings	133
Improving Efficiency of Boilers and Steam Piping in Industry	131
Solar thermal devices in Retail buildings	125
Wind microgeneration associated with Public buildings	103
Improved lighting controls and sensors in Public buildings	89
Upgrading heating controls in Office buildings	86
Improved lighting controls and sensors in Office buildings	86
Improved cooling in Office buildings	85
Improved lighting controls and sensors in Retail buildings	72

* Measures listed here have been grouped and summed across multiple applications for display purposes; 'ICE' and 'NMT' refer to Internal Combustion Engine and Non-Motorised Transport respectively; Transport measures refer to transitions between travel modes.

Diesel Car to Hybrid	66
Lighting improvements in Public buildings	66
Compressed Air Systems in Industry	54
Pump Upgrades, Repairs and Maintenance in Industry	49
Heating improvements in Retail buildings	42
Fan Correction, Repairs, & Upgrades in Industry	34
Furnace Efficiency and Heat Recovery Mechanisms in Industry	34
Installing solar PV in Public buildings	13
Fabric improvements in Office buildings	10
Improved cooling in Public buildings	10
Refrigeration Efficiency and Technical Upgrades in Industry	7
Improved cooling in Retail buildings	7
Installing solar PV in Office buildings	5
Heating improvements in Office buildings	5
Installing air source heat pumps in Retail buildings	4
Upgraded heating controls in Retail buildings	4
Installing air source heat pumps in Public buildings	4
Lighting improvements in Retail buildings	4
Wind microgeneration associated with Retail buildings	4
Upgraded heating controls in Public buildings	4
Solar thermal devices in Office buildings	4
Installing solar PV in Retail buildings	3
Wind microgeneration associated with Office buildings	3
TOTAL	**14,306**

Appendix 2. League Table of the Most Cost Effective Options for York

Measure*	Cost Effectiveness (£/tCO2e)
Fabric improvements in Retail buildings	-571
Diesel Car to Bus (diesel)	-458
Improved cooling in Retail buildings	-393
Petrol Car to Bus (diesel)	-373
Diesel Car to Walk	-345
Diesel Car to Bicycle	-345
Petrol Car to Bicycle	-323
Petrol Car to Walk	-323
Fabric improvements in Public buildings	-276
Petrol Car to Plug-in hybrid	-214
Electrical upgrades in Domestic buildings	-208
Lighting improvements in Public buildings	-200
Improved cooling in Office buildings	-198
Lighting improvements in Domestic buildings	-145
Heating improvements in Public buildings	-139
Electricity demand reduction in Domestic buildings	-137
Diesel Car to Plug-in hybrid	-136
Petrol Car to EV	-133
Lighting improvements in Retail buildings	-132
Petrol Car to Bus (electric)	-129
Petrol Car to Hybrid	-114
Improved cooling in Public buildings	-97
Heating improvements in Office buildings	-82
Insulating Domestic buildings	-76
Diesel Car to Bus (electric)	-63
Heating improvements in Retail buildings	-53
Lighting improvements in Office buildings	-53
Draught-proofing in Domestic buildings	-50
Diesel Car to EV	-41
Fabric improvements in Office buildings	-38
Installing heat pumps in Domestic buildings	-37
Upgraded Heating controls in Domestic buildings	-28
Glazing improvements in Domestic buildings	-27
Upgrading heating controls in Office buildings	-26
Installing biomass boilers in Domestic buildings	-24
Solar thermal devices in Domestic buildings	-18
Diesel Car to Hybrid	-12
Upgraded heating controls in Public buildings	-11
Upgraded boilers in Domestic buildings	-11
Upgraded heating controls in Retail buildings	-8
Installing air source heat pumps in Retail buildings	-1

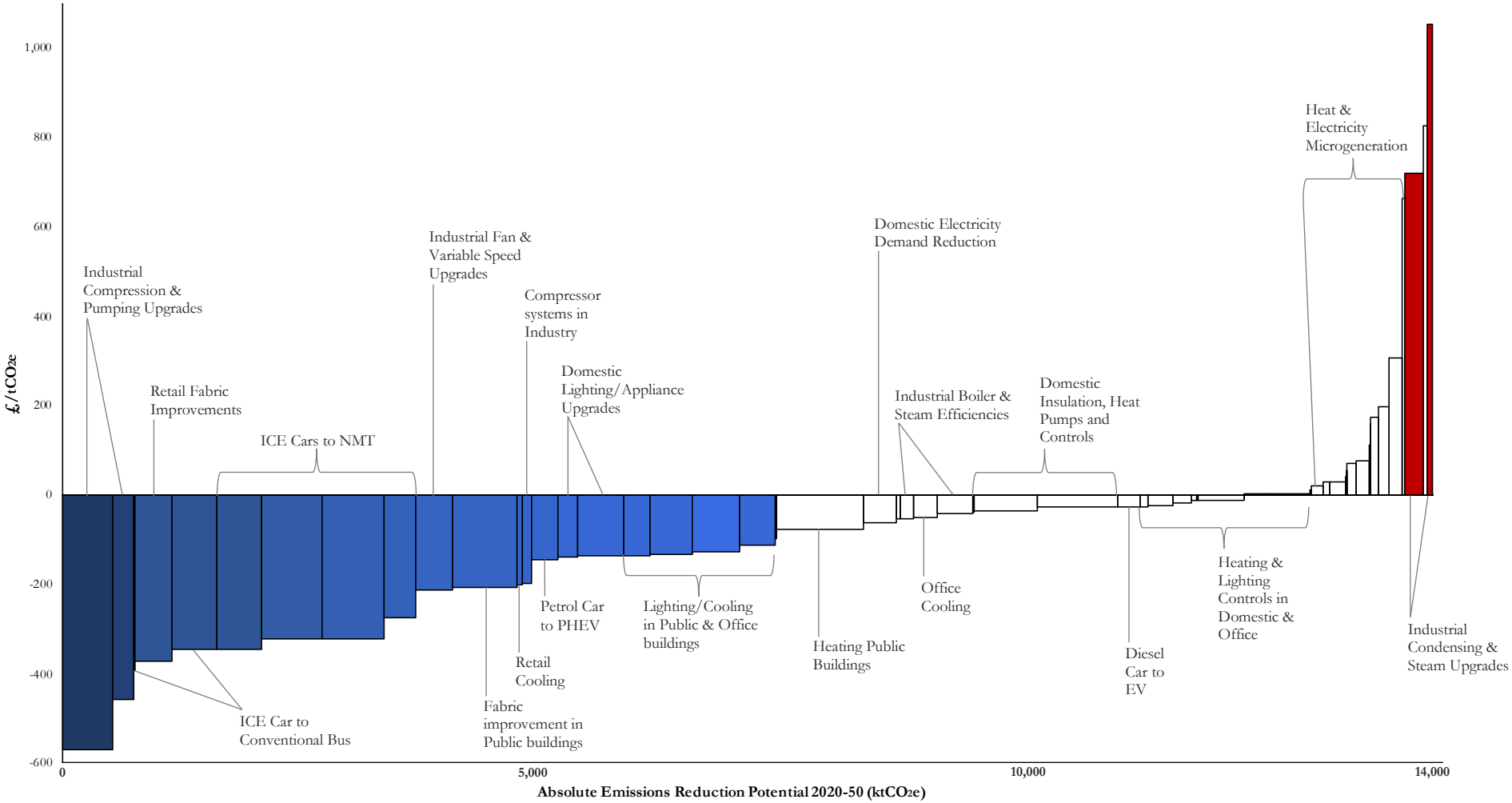
* Measures listed here have been grouped and summed across multiple applications for display purposes; the cost per tonne of emissions reduction displayed here are mean values across applications.

Hybrid Car to EV	3
Installing solar PV in Domestic Buildings	3
Installing air source heat pumps in Public buildings	10
Solar thermal devices in Retail buildings	19
Improved lighting controls and sensors in Retail buildings	29
Installing air source heat pumps in Office buildings	30
Installing solar PV in Public buildings	40
Installing solar PV in Office buildings	53
Installing solar PV in Retail buildings	55
Improved lighting controls and sensors in Office buildings	71
Solar thermal devices in Public buildings	76
Solar thermal devices in Office buildings	112
Wind microgeneration associated with Office buildings	158
Improved lighting controls and sensors in Public buildings	174
Wind microgeneration associated with Public buildings	196
Wind microgeneration associated with Retail buildings	307
Improving Efficiency of Boilers and Steam Piping in Industry	307
Fan Correction, Repairs, & Upgrades in Industry	663
Condensing & Insulation Measures to Boilers & Steam Piping in Industry	719
Pump Upgrades, Repairs and Maintenance in Industry	825
Compressed Air Systems in Industry	1,055
Furnace Efficiency and Heat Recovery Mechanisms in Industry	3,213
Refrigeration Efficiency and Technical Upgrades in Industry	15,656

Appendix 3. Detailed Sectoral Emissions Reduction Potential by Scenario

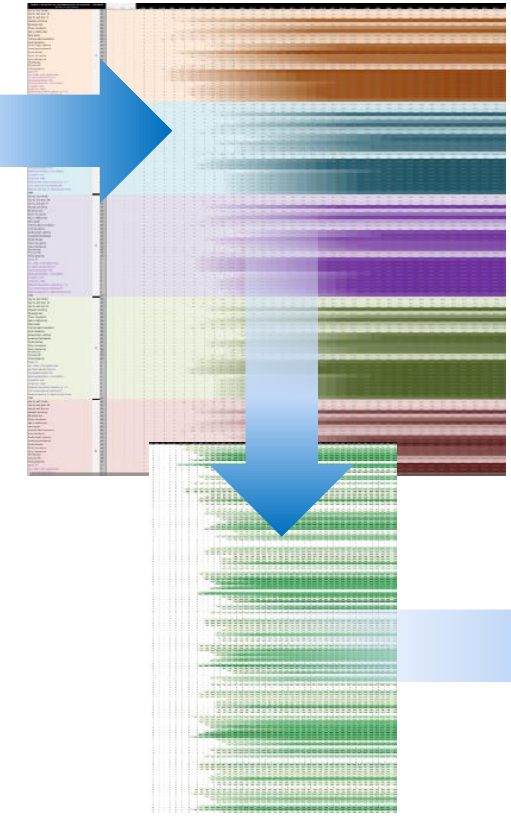
			2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050
Domestic Housing	Reduction on BAU Emissions ($ktCO_2e$)	CE	5%	10%	17%	23%	31%	40%	47%	54%	57%	58%	55%	58%	56%	53%	54%	51%	50%	49%	51%	52%	50%	52%	52%	50%	49%	52%	51%	51%	48%	47%	47%
		CN	5%	12%	19%	25%	35%	44%	54%	60%	64%	66%	65%	64%	64%	61%	61%	59%	59%	59%	59%	59%	59%	59%	59%	59%	58%	59%	57%	57%	56%	55%	56%
		TP	7%	14%	23%	32%	43%	53%	65%	72%	78%	80%	79%	79%	77%	76%	75%	72%	73%	72%	72%	73%	72%	72%	72%	71%	71%	71%	70%	69%	68%	68%	69%
	Reduction on 2020 Emissions ($ktCO_2e$)	CE	5%	10%	17%	23%	30%	40%	47%	54%	57%	58%	55%	58%	56%	53%	55%	51%	51%	50%	52%	53%	52%	53%	54%	52%	51%	55%	55%	55%	51%	51%	51%
		CN	5%	11%	18%	25%	34%	43%	53%	60%	64%	66%	66%	64%	64%	61%	62%	60%	60%	60%	60%	60%	60%	61%	61%	61%	60%	62%	61%	61%	61%	59%	61%
		TP	7%	14%	22%	31%	43%	53%	64%	72%	79%	81%	80%	79%	77%	76%	75%	73%	74%	74%	73%	74%	74%	74%	74%	74%	74%	75%	74%	73%	73%	73%	75%
Public & Commercial buildings	Reduction on BAU Emissions ($ktCO_2e$)	CE	4%	8%	13%	19%	25%	29%	34%	39%	43%	45%	46%	46%	45%	44%	41%	41%	41%	42%	42%	43%	44%	44%	45%	45%	46%	46%	46%	48%	48%	48%	49%
		CN	5%	10%	16%	23%	30%	35%	40%	47%	51%	54%	56%	55%	53%	53%	50%	49%	49%	50%	51%	52%	52%	53%	54%	54%	55%	55%	56%	57%	57%	57%	59%
		TP	5%	11%	18%	25%	34%	39%	45%	52%	57%	61%	63%	62%	60%	59%	56%	55%	54%	56%	57%	58%	58%	59%	60%	60%	62%	61%	62%	64%	64%	64%	66%
	Reduction on 2020 Emissions ($ktCO_2e$)	CE	4%	8%	12%	17%	22%	26%	29%	34%	37%	38%	38%	38%	35%	34%	32%	32%	31%	31%	31%	31%	31%	31%	32%	31%	32%	31%	31%	32%	31%	31%	31%
		CN	5%	9%	15%	21%	27%	31%	35%	41%	44%	46%	47%	45%	42%	42%	39%	38%	37%	38%	37%	38%	37%	37%	38%	37%	38%	37%	37%	38%	37%	37%	38%
		TP	5%	10%	17%	23%	30%	35%	39%	45%	49%	51%	52%	50%	47%	47%	43%	42%	41%	42%	42%	42%	42%	42%	42%	42%	42%	42%	42%	42%	42%	41%	42%
Transport	Reduction on BAU Emissions ($ktCO_2e$)	CE	54%	54%	55%	55%	56%	56%	57%	57%	58%	58%	59%	59%	58%	58%	57%	57%	56%	56%	55%	54%	54%	53%	52%	52%	51%	50%	49%	48%	47%	47%	46%
		CN	58%	60%	63%	65%	67%	69%	72%	74%	77%	80%	83%	83%	83%	84%	84%	84%	84%	84%	84%	84%	84%	84%	84%	83%	83%	82%	82%	81%	81%	80%	80%
		TP	58%	60%	63%	65%	67%	69%	72%	74%	77%	80%	83%	83%	83%	84%	84%	84%	84%	84%	84%	84%	84%	84%	84%	83%	83%	82%	82%	81%	81%	80%	80%
	Reduction on 2020 Emissions ($ktCO_2e$)	CE	54%	54%	53%	53%	53%	52%	52%	52%	52%	52%	52%	52%	51%	50%	50%	49%	48%	47%	46%	46%	45%	44%	43%	43%	42%	41%	40%	40%	39%	38%	37%
		CN	58%	59%	60%	62%	63%	65%	67%	68%	69%	72%	74%	73%	73%	73%	73%	72%	72%	72%	71%	71%	70%	70%	69%	69%	68%	68%	67%	67%	66%	66%	65%
		TP	58%	59%	60%	62%	63%	65%	67%	68%	69%	72%	74%	73%	73%	73%	73%	72%	72%	72%	71%	71%	70%	70%	69%	69%	68%	68%	67%	67%	66%	66%	65%
Industry	Reduction on BAU Emissions ($ktCO_2e$)	CE	2%	3%	4%	4%	4%	4%	4%	4%	4%	3%	3%	3%	3%	3%	3%	2%	2%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		CN	6%	10%	14%	17%	16%	16%	16%	15%	15%	14%	14%	14%	13%	13%	12%	12%	11%	10%	9%	9%	8%	8%	7%	7%	7%	7%	8%	8%	8%	8%	8%
		TP	8%	12%	17%	20%	20%	19%	19%	19%	18%	18%	18%	17%	17%	17%	16%	15%	14%	13%	13%	12%	12%	11%	11%	11%	11%	11%	11%	11%	11%	11%	12%
	Reduction on 2020 Emissions ($ktCO_2e$)	CE	2%	2%	3%	4%	4%	4%	3%	3%	3%	3%	3%	2%	2%	2%	2%	2%	1%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
		CN	6%	9%	13%	15%	14%	14%	14%	13%	13%	12%	12%	11%	11%	10%	10%	9%	8%	7%	7%	6%	6%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
		TP	8%	11%	15%	19%	18%	17%	17%	16%	16%	15%	15%	14%	13%	13%	12%	12%	11%	10%	9%	9%	8%	8%	7%	7%	7%	7%	7%	7%	7%	7%	7%

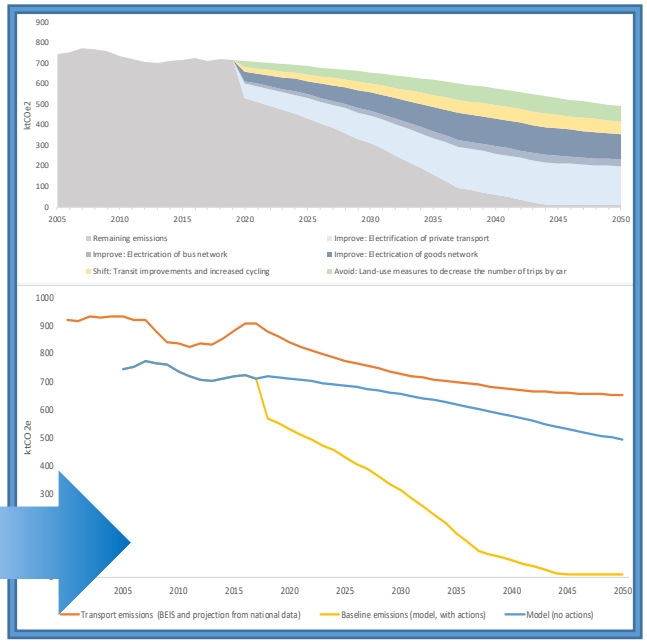
Appendix 4. Marginal Abatement Chart for York



Appendix 5. Methodology Explored

Sector	Measure	Application Data
Commercial	*Office T5 Lighting (conversions & new luminaries)*	kWh/m² - £2018 CAPEX/OPEX/EoL -
	Retail PIR Movement & Daylight Sensors	kWh/m² - £2018 CAPEX/OPEX/EoL -
	…	
Transport	*Private EV Penetration*	kWh/m² - £2018 CAPEX/OPEX/EoL -
	Public EV Buses	kWh/m² - £2018 CAPEX/OPEX/EoL -
	…	
Domestic	*Detached House Cavity Wall Insulation*	kWh/m² - £2018 CAPEX/OPEX/EoL -
	High-Rise Flat Draught Proofing Measures	kWh/m² - £2018 CAPEX/OPEX/EoL -
	…	
Industrial	*Boilers/Steam Systems Upgrades*	kWh/m² - £2018 CAPEX/OPEX/EoL -
	Furnaces/Process Heaters Improvements	kWh/m² - £2018 CAPEX/OPEX/EoL -
	…	





The figure above displays, at a high level, the methodology applied in this analysis. First, thorough evaluation of many hundreds of application-specific interventions was undertaken to develop data on what each measure will institute in energy savings (across several energy vectors), and the costs involved in its application and lifecycle. Next, lifecycle energy and cost savings are applied to reliable projections for market prices, costs, energy vector by type, emissions factor by source, and a variety of other economic and environmental variables over time. The ongoing productivity and savings of each intervention can then be then 'scaled-up' to the local conditions for deployment potential and place-specific penetration available in York's context – the number of houses (by type) recommended a certain measure year-on-year, area of commercial building judged suitable, possible percentage mode-shift in transport journeys, etc. This process enables the carbon savings attributable to each intervention (specific to York) to be aggregated into the sectoral, and ultimately city-wide outputs.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Climate Change
Economics and Policy


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Climate Change Policy and Scrutiny Committee

Draft Work Plan 2020-21

Tuesday 9 March @5:30	1) Carbon Literacy Training 2) York's Tree Canopy Expansion Target 3) Establishing Key Performance Indicators to drive a zero carbon Roadmap for York 4) Work Plan
Tuesday 20 April @5:30 (Forum)	1) Relationship between the Local Plan and the Climate Change Strategy

Council Plan Priorities relating to Climate Change
A Greener and Cleaner City
• A new climate change strategy
• A road map to zero carbon by 2030
• Review of waste collection options
• Align strategies to protect the environment
• Supplementary Planning Guidance on zero carbon buildings
• Review of single use plastics
• Mitigate and adapt to extreme weather events
An Open and Effective Council
• Use procurement approaches to address climate emergency
Getting Around Sustainably
• Identify options to move fleet to low/zero carbon
• Expand York's electric vehicle charging point network
• Work in partnership to deliver low/zero carbon public transport
• Implement York's first Clean Air Zone and closely monitor air quality