Public Document Pack

EXECUTIVE

Date 15 JUNE 2022

SUPPLEMENTARY AGENDA

4. CORPORATE PRIORITIES FOR 2022/23

To consider and agree the Council's key priorities and areas of focus for 2022/23, for inclusion in the Annual Report, and which form the basis of the corporate performance reporting for the year.

Pages 3 - 12

5. CLIMATE CHANGE UPDATE - JUNE 2022

To consider an update report on the Council's Climate Change Strategy and initiatives.

Pages 13 - 28

Supplementary Agenda Published 10 June 2022

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Part I – Release to Press

Agenda item: ##

Meeting	Executive
Portfolio Area	All
Date	15 June 2022

CORPORATE PRIORITIES FOR 2022/23

KEY DECISION

Authors	Ben Threadgold
Contributor	Assistant Directors
Lead Officer	Matt Partridge | 2456
Contact Officer	Richard Protheroe | 2938

1 PURPOSE

1.1 For Members to consider the council's high level priorities and areas of focus for 2022/23 to inform what is published within the July Annual Report and then reported on through the quarterly performance reports during the course of the year.

2 RECOMMENDATIONS

2.1 That Executive considers and, subject to resulting discussion at the meeting, agrees its proposed priorities for 2022/23.

2.2 That these priorities are included in the Annual Report for 2022/23, to be reported to Executive in July.

2.3 That the priorities form the basis of the Future Town Future Council programme and inform the corporate performance suite for 2022/23. Progress against delivery of the Council's priorities will be reported to Executive on a quarterly basis.

3. BACKGROUND

3.1 Members approved the FTFC Cooperative Corporate Plan in December 2016, and then updated it in July 2021. This framework sets the Council's focus on cooperative working and outlines the key outcomes and priorities for the town through the Future Town, Future Council (FTFC) Programme as shown in Figure 1.

Figure 1 - Future Town Future Council Programme

3.2 Subject to Members consideration it is proposed that the Council should retain the existing areas of focus for 2022/23.

3.3 In considering the priorities for the coming year, thought has been given to a number of local and national themes. These include:

I. Government policy, including the emphasis on Levelling Up, continuing impact of BREXIT, changes in housing regulation, and focus climate change and carbon reduction. A separate report on this meeting agenda goes into further details concerning the key legislative changes and their likely impacts on SBC and its activities
II. External factors including the impact of the war in Ukraine, the cost of living crisis and the associated economic consequences.
III. Local priorities including the regeneration of the town centre, building more homes for local people, providing support for people at risk of homelessness and refugees, and what residents have told us that matters to them through engagement such as the Resident Survey and other consultation activities.
IV. Existing council priorities, achievements and areas for improvement.

V. The long-term central government funding settlements for local government which will require Councils to identify and deliver further savings and new surplus income.

3.4 Further to the points highlighted at 3.3 above, consideration has been given to the broader context that the Council is now working within beyond the impacts of Covid and the Russian invasion of Ukraine. In particular, there have been notable changes to the Council's resourcing position over the last 5 to 10 years including the following:

- £5.3m reduction in Government Grant
- £6.1m of inflationary pressures funded
- £1m of new initiatives absorbed within the budget base
- Circa 8k increase in the local population
- Circa 2,600 additional properties across the Town
- 25 key Strategies / Policies signed off and in the process of being implemented
- Commitment to and delivery of multi-million pound Town Centre Transformation and Housing Development programmes and associated company structures
- Increase in activity at County level including the formation of the Growth Board and the Corridor Boards

With the aforementioned in mind, the Council should be rightly proud of its achievements in recent years especially with regards to maintaining key project delivery whilst responding to the Covid pandemic. The need to address the General Fund budget gap was recognised when the budget for 2022/23 was approved earlier this year and work is being undertaken to develop options for Members to consider ahead of a related report being presented to the Executive in September 2022.

The issues the Council is facing with regards to the recruitment and retention of staff are being experienced by most Local Authorities at both tier levels. Officers are continuing to seek ways and means to address these challenges linked to the ongoing implementation of the Workforce Strategy. Maintaining a healthy, committed and motivated workforce will remain key to our ongoing success.

4 REASONS FOR RECOMMENDED COURSE OF ACTION AND OTHER OPTIONS

4.1 The priorities presented in this report have been informed through discussions held with the Leader and the Portfolio Holders. Where possible they also reflect the current and anticipated national and local contexts. The separate item on this agenda concerning and assessment of the Government's Legislative Programme for 2022/23 highlights potential related impacts for the town and the Council during this year and beyond.

FUTURE TOWN FUTURE COUNCIL PRIORITIES

4.2 The proposed high-level priorities and areas of focus for each of the pillars of the Future Town Future Council programme are set out below:

4.3 **Transforming Our Town Centre**

- Moving the 9 Town's Fund projects to delivery phase following completion of Business Cases
- SG1 – transition to delivery, including detailed design of the public services hub
- Delivery of Multi-storey Car Park & Cycle hub
- Opening of the new Stevenage Interchange
- Delivery of Bus Apron / Garden Square phase one
- Delivery of exciting and engaging comms & marketing campaigns to support the programme and projects

4.4 **More Social and Affordable Housing**

- Delivery of housing schemes at Helston House, Oaks Cross & Phase 1 at Kenilworth Close
- Ongoing support for tackling homelessness through providing additional housing supply for the flagship Housing First programme
- Developing proposals for new housing schemes in places including the Oval
- Developing applications for consideration by the Planning and Development Committee for sites in Brent and in Shephall View.
- Provide support towards the delivery of the garage improvement programme

4.5 Co-operative Neighbourhoods

- Continue the development of the Co-operative Neighbourhoods Programme, including transitioning the core deliverables of the programme into business as usual activities
- Continue to develop innovative ways of capturing and analysing resident feedback, utilising this to drive neighbourhood priorities and improving communication and engagement
- Further develop the Co-operative Neighbourhoods approach as part of the council's transformation programme
- Ensure the successful delivery of the Equalities Commission & Community Renewal Funding as aligned programmes

4.6 Making Your Money Count (MYMC)

- Complete the update of the General Fund Medium Term Financial Strategy (MTFS) to take account of the impact of COVID losses on-going and the cost of living crisis
- Review and update the HRA Business Plan to reflect key legislative impacts, the impact of COVID losses on-going and the cost of living crisis
- Identify sufficient MYMC options are identified to ensure that the General Fund resources match expenditure by 2024/25
- Co-operative Commercial and Insourcing Strategy - implementation of initiatives such as filming rights, trade and bulky waste pricing changes
- Review Fees and charges to support achievement of the MYMC target
- Transformation - Implementation of online first and new customer model to improve the quality, availability and speed of service for customers
- Enlargement of the Shared Revenue and Benefits service which will realise savings for the General Fund

4.7 Clean, Green, Safe and Thriving Town

This pillar brings together a number of the Council's key inter-related strategies and programmes that combine to make tangible and meaningful improvements in the appearance, accessibility and sustainability of the local area, and the safety, health and wellbeing of local people.

In particular, this pillar aims to:

- Improve residents' health and wellbeing
- Build resilient communities, reduce crime & help people feel safe
- Make Stevenage a 'destination creative' town
- Unlock opportunities for the local economy and our residents
- Achieve net zero Council emissions by 2030 and to work towards Stevenage becoming a net zero Town
- Improve sustainable transport across the town

4.8 Each theme is underpinned by detailed action and implementation plans that set out more detail about how they will be delivered and the outcomes they will achieve. In summary, the proposed key priorities within these themes are set out below:

Climate Change	Working towards a Zero Carbon Council: • Delivering c. £1.8m investment in reducing carbon in our housing stock • Continuing the roll out of new lower carbon council homes • Support over 250+ staff to use alternatives to commuting by car at least twice a week • Local Councillors committing to paperless committees • Demonstrating local changes, such as Neighbourhood Wardens to use bike and electric car clubs or walk on their

	site visits Working towards a Zero Carbon Town: • Spending £100k+ on biodiversity improvements • Doubling electric vehicle charging capacity in the town • Developing a new Waste & Recycling Strategy • Develop a zero carbon Planning Policy for the Station Gateway development • Produce a Sustainable Travel Towns plan for Stevenage, an exemplar in Hertfordshire • Implement the Collaboration and Communication Plan • Complete the business case for a bike / e-bike hire scheme
Clean and Green	• Develop costed options for an enhanced schedule of works to improve the “outside my front door” appearance of the Town • Deliver a programme of cyclical works throughout the year (spring clean, grass-cutting, leaf clearance, tree planting etc.) • Retain our 5 Green Flag awards and extend the network of Community Orchards • Delivering year one of the rationalisation of the shrub bed capital programme • Increase recycling rates • Deliver Biodiversity Action Plan activities including the development of community woodland and new meadow grassland sites
Community Safety	• Problem solve and reduce the nuisance caused by fly tipping, including the use of grant funded CCTV cameras • Promote the reporting of hate crime and further promote equality within the community • Provide a whole housing approach to support victims of domestic abuse and their families • Work with partners to further improve the safety of women and girls in the town • Tackle the harm caused by drugs, alcohol and offending • Review approaches to tackling issues with litter, including the greater use of fixed penalty notices along with associated communications as a deterrent
Community Wealth Building (CWB)	• Deliver the Community Renewal Fund programme by the December 2022 deadline • Continue to lead the ongoing related activities of the Hertfordshire Growth Board supported CWB working group, alongside colleagues from all ten districts and borough councils in Hertfordshire and HCC • Develop the economic inclusion activities of the Social Inclusion Partnership • Establish and develop a CWB Working Group for Stevenage, comprised of key internal stakeholders – focusing on our own efforts around the Stevenage Works programme,

	Procurement and Social Value • Produce a CWB balance sheet to demonstrate progress in this area
Culture	• Continue developing new arts and cultural opportunities in local neighbourhoods, led by and in collaboration with local communities • Target work that addresses inequality of cultural engagement and representation by marginalised communities while also cutting across various socio-economic agendas – i.e. skills, job creation • Build Stevenage Museum's research, collections, audiences, partnerships, & track record in preparation for the future museum offer • Develop the Towns Fund work plan for major place-making projects – public realm and meanwhile use. • Support the development of Junction 7 Creatives and the wider Arts & Heritage Forum partnership to increase membership • Deliver major National Lottery-funded programmes, Stevenage Day 2022 and the LGBTQ+ project. • Develop further youth-centred activities that increase access to cultural activity
Future Town Future Transport	• With Herts County Council, deliver the £13m Zebra Electric Bus programme which will use Government funding for 30 single deck, battery electric buses to cover the Stevenage Arriva network • Develop the Stevenage Sustainable Travel Town Implementation Plan • Develop the Stevenage Connection Area Action Plan • Deliver Town Deal projects that increase levels of sustainable transport in the borough, such as the improvement to cycle and walking routes and installing electric charging points in the new Multi Storey Car Park • Developing the Electric Vehicle Strategy in conjunction with Hertfordshire County Council including the provision of more charging points in the town • Delivery of local walking and cycling schemes • Opening of the new Bus Interchange • Ensure sustainable transport options are accessible to as many people as possible
Healthy Stevenage	• Review and update the Healthy Stevenage Strategy and Action Plan • Lead on the Public Health District Partnership supported place based Health Inequalities and Health Improvement initiatives, services and programmes • Continue to develop Active Environments through Towns Fund projects and existing Sports Development activities • Continue to contribute to the Stevenage Together Local Strategic Partnership Recovery Action Plan focussing on

	supporting the mental and physical health of the town • Enable the Healthy Hubs programmes to continue

CORPORATE AND BUSINESS UNIT PRIORITIES

4.9 In addition to the FTFC programme-based priorities outlined above, there are also a number of priorities identified that relate to our core service delivery and corporate effectiveness. These activities are integral to ensuring the council has the right skills, resources, processes and support in place to continue to deliver excellent services for residents.

4.10 The proposed key cross-cutting and corporate and business unit related priorities for the coming year include:

- Determining a local response to the cost of living crisis and supporting local people and businesses, as well as considering the impact for the council and our staff
- Embedding our approach to equality, diversity and inclusion across all services and programmes
- In a challenging employment market and with several roles in hard-to-recruit sectors, reviewing and improving our approaches to recruitment and retention, and learning and development by implementing our Workforce Strategy
- Continuing to improve our IT infrastructure to support effective and efficient working practices, including upgrading our network, improving our defences against potential cyber-attacks and our firewalls, improving our virtual desktop interface and user experience, and rolling out Microsoft 365 across the council.
- Completing the procurement of a new Leisure Management Contract
- Working towards addressing the significant pressure faced by many local people and their housing needs: including significant demand pressures for temporary accommodation, homelessness, rough sleeping and responding to government requirement in respect of provision of asylum seekers or refugees
- Improving processes and performance of important services to tenants such as empty properties and repairs, and delivering the Major Repairs Contract within the towns low rise flat blocks
- Ensuring compliance is maintained across General Fund and Housing Revenue Account properties
- Deliver improvements in both the quality of garages available and the lettings process
- Reviewing and updating the Housing Revenue Account Asset Strategy
- Undertaking a review of the Housing Allocation Policy
- Continually monitoring and improving the customer contact experience
- Continuing to lead the recovery of the town from the covid-19 pandemic
- Producing a new Corporate Plan

4.11 As part of this element of the programme, thought will also be given as to whether or not to undertake a Corporate Peer Challenge in conjunction with the Local Government Association.

4.12 We will also continue to develop our approach to communication and marketing, ensuring that we celebrate our successes and use clear and consistent messaging that is appropriate for the intended audience. We will continue to use a variety of channels including social media, and multiple means through which to effectively engage with local residents to raise awareness, inform and educate as well as understand and respond to their questions and concerns.

4.13 More detail on our communications approach for 2022/23 will be included in the Annual Report when it is considered at the Executive meeting in July 2022.

COUNTY, REGIONAL AND NATIONAL LEVEL ACTIVITIES

4.14 Beyond the significant range of programmes and projects outlined above, the Council is also very active at County level through its involvement with the Hertfordshire Growth Board, the Local Enterprise Partnership, the Stevenage Development Board and a range of key partners including Hertfordshire County Council and the East of England Local Government Association. For example, the Leader Chairs the North East & Central Growth Corridor Board which reports directly into the Hertfordshire Growth Board and is responsible for the delivery of a number of key county level initiatives.

4.15 The Council is also very well connected to national agencies such as the District Council Network (DCN) of which the Leader is a Vice Chair and the Local Government Association (LGA). By way of another example, the Deputy Leader is a member of the LGA Culture Tourism and Sport Board.

4.16 Accordingly the Council is well placed to influence and inform local, county level, regional and national policy agendas.

SUMMARY

4.17 Once finalised the priorities outlined above will be summarised within a “plan on a page”. This document will not outline the detail that sits behind each priority but will serve to highlight the breadth and scale of our commitment to continuing to improve the lives of local people and how the Council performs.

4.18 As always it is recognised that new matters are likely to arise during the year which may warrant a response. Such matters will be considered as they arise along with any related implications to existing approved activities and priorities.

5 IMPLICATIONS

5.1 Financial Implications

5.1.1 There are no new direct financial implications related to the recommendations outlined within this report. However, officers responsible for delivery of the priorities identified will need to identify and consider any resulting financial implications which arise during the course of the year.

5.1.2 It is recognised that some of the priorities will require external revenue and capital funding to be identified in order for them to be fully realised.

5.2 Legal Implications

5.2.1 There are no direct legal implications from the recommendations contained in this report. However, officers responsible for delivering the priorities over the coming year will need to identify and consider any resulting legal implications.

5.3 Equalities and Diversity Implications

5.3.1 There are no new direct equality and diversity implications from the recommendations contained in this report. However, officers responsible for delivering the priorities over the coming year will need to identify and consider any resulting equality and diversity implications. Where appropriate, Equality Impact Assessments will be completed for activity identified.

5.4 Risk Implications

5.4.1 There are no direct significant risks to the Council in agreeing the recommendation(s). Officers responsible for delivering the priorities, programmes and services identified will need to consider any risk implications from the improvement activity identified.

5.4.2 The Council has an embedded approach to risk management that mitigates any adverse effect on delivery of the Council's objectives and internal control processes and also provides good governance assurance.

5.5 Other Corporate implications

5.5.1 Delivery of the priorities outlined may impact on the development of future policy or procedure.

Facilitating Climate Emergency Response Policy for Stevenage Borough Council

Report by

Prof Lubo Jankovic
Professor of Advanced Building Design, Director of Zero Carbon Lab and
Director of University-wide Centre for Future Societies Research
University of Hertfordshire

26th April 2022

Introduction

Stevenage Borough Council (SBC) established contact with Prof Jankovic of the University of Hertfordshire's Zero Carbon Lab (UH ZCL) in October 2021 when they approached him about taking part in the Council's Scrutiny Committee as an expert witness in a review process of their Climate Emergency Response. Whilst arrangements for this expert review process were being made, an opportunity arose in November 2021 for a short term project to look into SBC's climate emergency response, to be funded by the University's Allocation of QR Strategic Priorities Funding 2021/22. The funding between 1st December 2021 and 31st March 2022 enabled Prof Jankovic as Principal Investigator and Dr Rebecca Onafuye as Research Assistant to investigate interventions for gradual reduction of carbon emissions at SBC to zero. This report explains the process and the outcomes.

First, an initial desk-based research of SBC documents was carried out with the main findings as follows:

- a baseline of 351.8 kt CO2 carbon emissions was established
- the SBC approach was well structured, consisting of 8 themes: People, Biodiversity, Transport, Energy & Water, Business, Homes, Construction & Region, Waste & Recycling, and high level actions within these themes
- there was no quantification of how zero emissions would be achieved within the above themes.

Whilst it was found that SBC were heading in the right direction for reducing carbon emissions, it became clear that there was a need to rigorously quantify a range of interventions that would ultimately result in achieving zero emissions.

Aims, objectives and research questions

The overall aim is to for the team at Zero Carbon Lab of the University of Hertfordshire was scrutinise of the current Climate Emergency Response by the Council. The specific objectives were:

1. To investigate qualitative and quantitate information to be obtained from the Council in order to establish their overall carbon footprint and its future trajectory.
2. To develop carbon emissions reduction scenarios in order to inform the Council's Climate Emergency Response Policy.
3. To inform SBC's Climate Emergency Response Policy.

In response to the above, the main research questions that followed were:

1. What adjustments to the baseline emissions may be required?
2. What will be the effect on internal temperature reduction in domestic sector on carbon emissions?
3. What will be the effect of insulating domestic sector buildings on carbon emissions?
4. How can emissions reduction from transport electrification be quantified?
5. How can emissions reduction from purchasing renewable electricity be quantified?
6. What is the effect of PV generated electricity on emissions reduction?
7. What is the effect of tree planting on emissions reduction?
8. How can gradual increase of baseline emissions be quantified?
9. What is the effect of individual and combined interventions arising from the above on gradual reduction of carbon emissions?
10. What will be ultimately required to achieve zero emissions and by when?

Methodology

The starting point for analysis was the emissions baseline data provided by SBC, as shown in Table 1.

Table 1 Carbon emissions baseline data

Category	Emissions (t CO2)
Industry	45,734
Transport	119,612
Commercial	63,324
Public Sector	24,626
Domestic	98,504
Total	**351,800**

It was noted that the baseline data did not include carbon sequestration from existing trees, and information about the existing trees was subsequently obtained from SBC, as shown in Table 2. In this table, descriptions of mature, semi-mature etc. were allocated age profiles on the basis of further information from SBC.

Table 2 Existing trees in Stevenage

Description	Percentage of the total	Total number	Age profile	Age alignment to 2022
Mature	50.70%	16477.5	45 - 135 years old	90
Semi-Mature	37%	12025	15 - 45 years old	30
Young	12%	3900	Up to 15 years old	15
Veteran	0.30%	97.5	Over 135 years old	135
Total	**100.00%**	**32500**		

In order to allocate appropriate sequestration level for each age profile, age alignment to year 2022 was chosen to be a mid-range year for mature and semi-mature trees and the maximum year in the young and veteran trees. This alignment was made in the supplementary material spreadsheet under 'Stevenage trees data' tab.

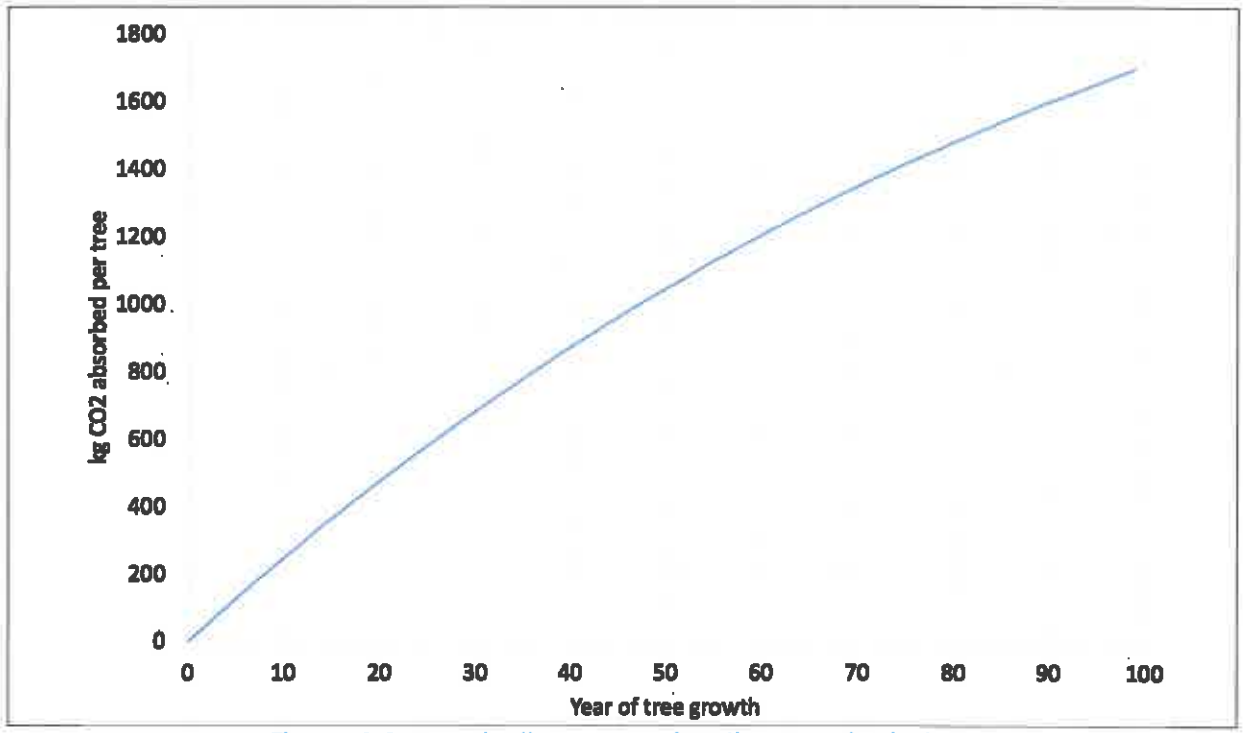


Figure 1 Sequestration approximation per single tree

The amount of carbon dioxide absorbed by a single tree is approximated on the basis of research reported by Lefebvre et al. (2021). That work shows that it takes approximately four years for a tree to absorb 100 kg of carbon dioxide. This information and the shape of the absorption curve published by the same authors was used to create a sequestration approximation curve as shown in Figure 1. Numerical values from this curve were then used in relation to the age alignment figures to year 2022 from Table 2 to calculate the baseline emissions adjustment that takes into account the existing trees.

After establishing this baseline adjustment, the following carbon emissions reduction measures were considered:

1. CO2 reduction through internal temperature adjustment from 21 °C to 19 °C
2. CO2 reduction from retrofit
3. CO2 reduction from transport electrification
4. CO2 reduction from purchasing renewable electricity
5. CO2 reversal from PV electricity
6. CO2 reversal from planting trees.

A gradual adoption of items 1 – 4 from the list above was assumed, and a gradual adoption over time was specified, as shown in Figure 2, so that 100% adoption/change occurs by 2030.

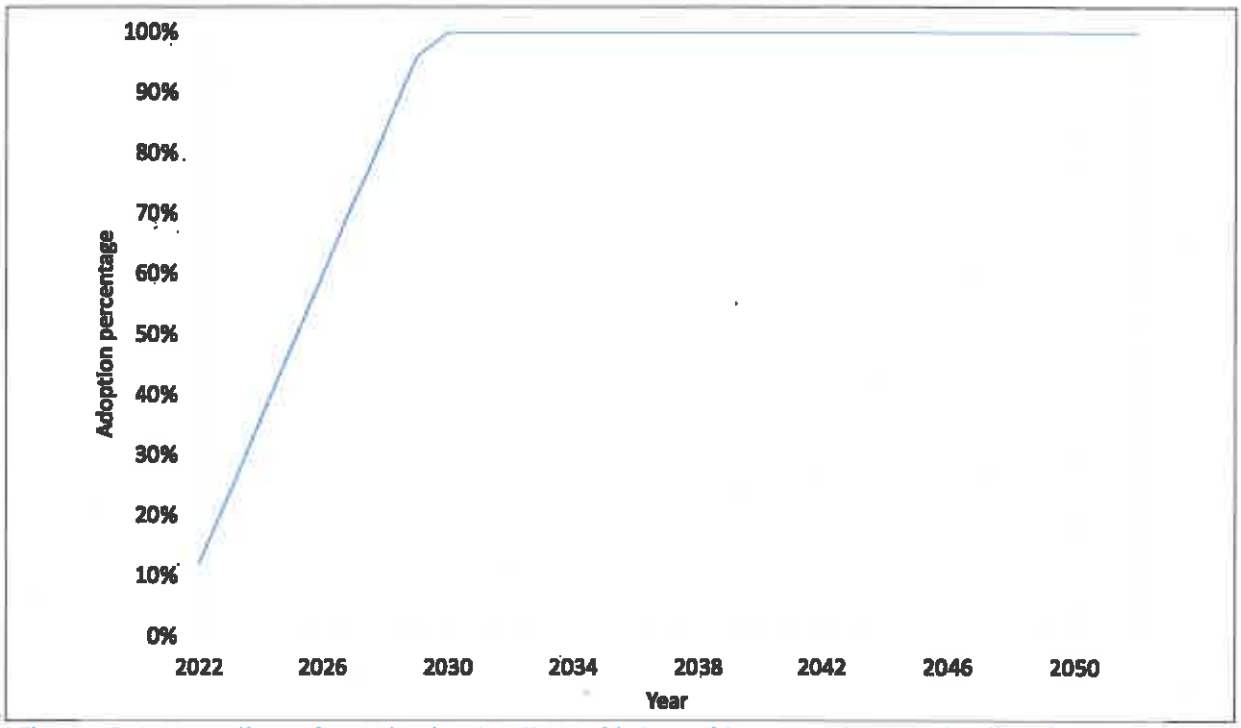


Figure 2 Assumption of gradual adoption of internal temperature reduction from 21 °C to 19 °C, retrofit, transport electrification and purchasing renewable electricity

1. **CO2 reduction through internal temperature adjustment from 21 °C to 19 °C** was calculated using dynamic simulation of a building slice with dimensions of 1m wide, 2.6m high and 6m deep. The widow to wall ration was set to be WWR = 0.3. The front surface of this slice was north facing and in direct contact with external air, and the remaining five surfaces were set to be adiabatic in the computer model, and therefore heat transfer through these surfaces was set to zero (Figure 3). This made the slice representative of an inner floor of either a house or a multi-storey building and it facilitated a simulation of carbon impact of the internal set temperature reduction.

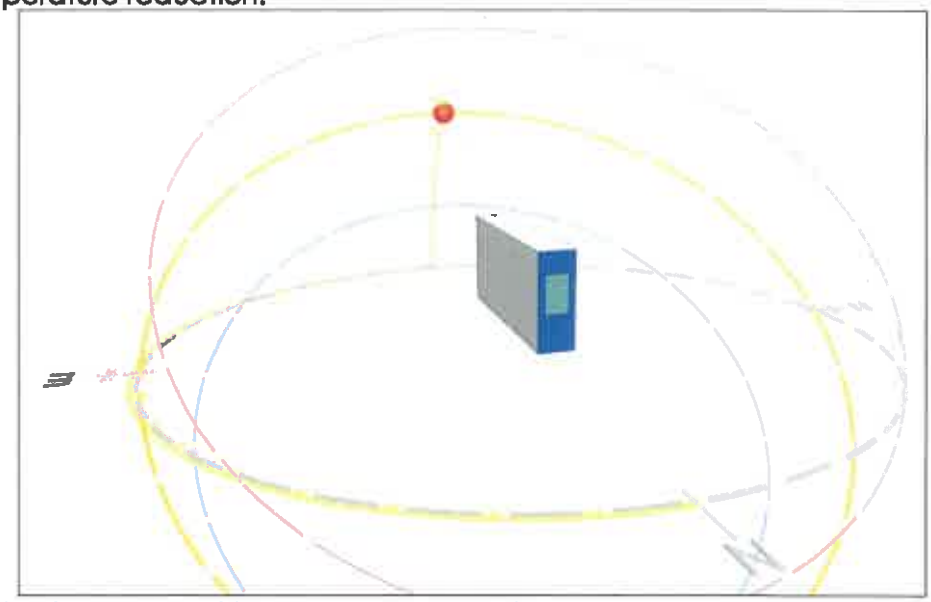


Figure 3 Simulation model for establishing emissions reduction arising from adjustment of internal set temperatures and from increasing thermal insulation through retrofit

The building occupancy was set to 07:00-23:00 hours in the model. The control of the electric lighting was based on daylight sensitive switching using sensor reading values calculated in RadiancelES (IES, 2021). Thus, the lights were switched on during occupancy hours when the daylight sensor reading was below 150 lux. The simulations were carried out using IES Virtual Environment 2021 (IES, 2021). The carbon emissions reduction from temperature adjustment is summarised in Table 3. As it can be seen from this table, there is approximately 10% reduction of carbon emissions per each degree centigrade of reduction of internal air temperature setting. This reduction will be applied gradually on the domestic emissions from Table 1, using gradual adoption curve from Figure 2.

Table 3 CO2 reduction through internal temperature reduction

Set temperature	Emissions (kgCO2/m²)	Emissions reduction
21	41.00	
20	37.00	-9.76%
19	33.00	-19.51%

2. **CO2 reduction from retrofit** was calculated using the same simulation model of the building slice as above (Figure 3), by changing thermal transmittance of the wall from poorly insulated (0.45 W/(m²K)) to well insulated wall (0.15 W/(m²K)) using 150 mm of mineral fibre insulation. The results are shown in Table 4. This reduction will be applied gradually on the domestic emissions from Table 1, using gradual adoption curve from Figure 2, and applying it to 99% of the housing stock, assuming that 1% of the stock is newbuild, and it is consistent with real life retrofit experience of houses by the Author of this report.

Table 4CO2 reduction from retrofit

Emissions before retrofit (kg CO2/m²)	Emissions after retrofit (kg CO2/m²)	Emissions savings (kg CO2/m²)	Percentage savings
5.50	3.5	-2.00	-36%

3. **CO2 reduction from transport electrification** was calculated using transport emissions from emissions figure from Table 1, and applying gradual adoption curve from Figure 2.

4. **CO2 reduction from purchasing renewable electricity** was calculated using domestic emissions from Table 1, and applying gradual adoption curve from Figure 2, to purchase renewable electricity and switch from gas heating to electricity heating in the domestic sector.

5. **CO2 reversal from PV electricity** was calculated on the basis of annual simulation of one square metre of monocrystalline PV panel of 20% efficiency, with south orientation and 35° inclination from the horizontal plane. It was found that annual reduction of carbon emissions from each square metre of the PV panel is -96 kgCO2/(m²,year). This figure will be subsequently used in the scenario analysis, where different PV surface areas will be multiplied by it to produce the total CO2 reduction/reversal from newly installed PV systems.

6. **CO2 reversal from planting trees** was calculated using sequestration approximation curve per single tree from Figure 1 and multiplying the values from this curve by a number of planted trees in different scenarios. When a tree is planted, it does not absorb much carbon, but the amount of absorbed carbon increases gradually with the age of the tree. The curve from Figure 1 provides cumulative carbon absorption according to the age of the tree, and that is reflected in the cumulative effect of carbon reduction as result of tree planting.

In addition to the combined carbon reduction from the measures 1 to 6, an assumption was made that the base line emissions will also increase year on year by 1%. That gradual increase is represented with a line in Figure 4.

The overall carbon balance is then calculated as follows:

Emissions running total = Baseline emissions x annual increase – reduction through internal temperature adjustment from 21 °C to 19 °C – reduction from retrofit – reduction from transport electrification – reduction from purchasing renewable electricity – reversal from PV electricity – reversal from planting trees.

This was the basis for exploring several different scenarios in the next section.

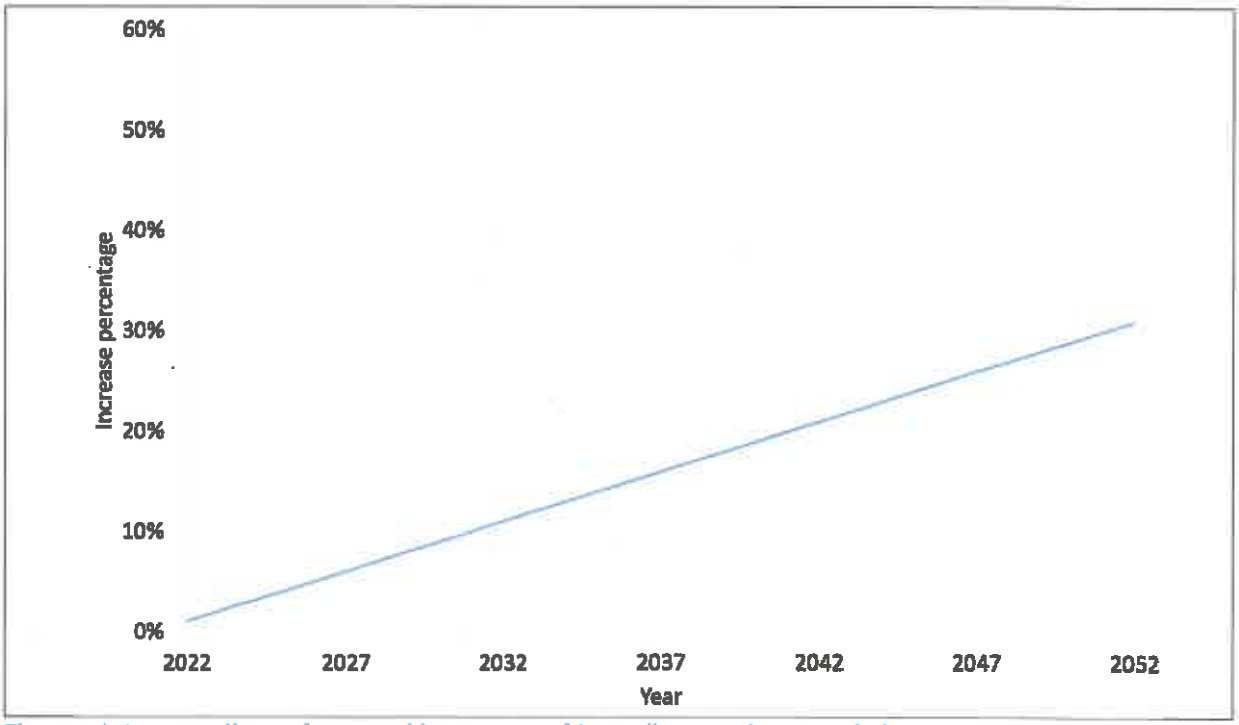


Figure 4 Assumption of annual increase of baseline carbon emissions

Emissions scenarios

The **first scenario** is business as usual, with no reduction interventions and with no increase of the baseline. This is shown in Figure 5. Whilst the top line does not show any changes, the bottom line that takes into account the existing trees shows a gradual decline, however that decline would not be sufficient to reach zero emissions any time within this century.

The **second scenario** includes the baseline and its annual increase, as shown in Figure 6. In this scenario, emissions are increasing year on year and there is no prospect of reaching zero.

The **third scenario** includes the baseline and its annual increase, as well as reduction of internal temperatures from 21 °C to 19 °C (Figure 7). Whilst total emissions remain stable until 2030 caused by the gradual adoption of the measure, they start rising from 2030 onwards, and there is no prospect of reaching zero under this scenario on its own.

The **fourth scenario** includes gradual retrofit of 99% of the domestic sector, assuming that 1% is newbuild (Figure 8). In this scenario, there is a sharper decrease of total emissions until 2028, levelling off until 2030 and then a gradual increase from 2030 onwards. Under this scenario on its own there is no prospect of reaching zero emissions.

The **fifth scenario** includes gradual transport electrification (Figure 9). In this scenario, there is a sharper decrease of total emissions until 2028, levelling off until 2030 and then gradual increase from 2030 onwards. Under this scenario on its own there is no prospect of reaching zero emissions.

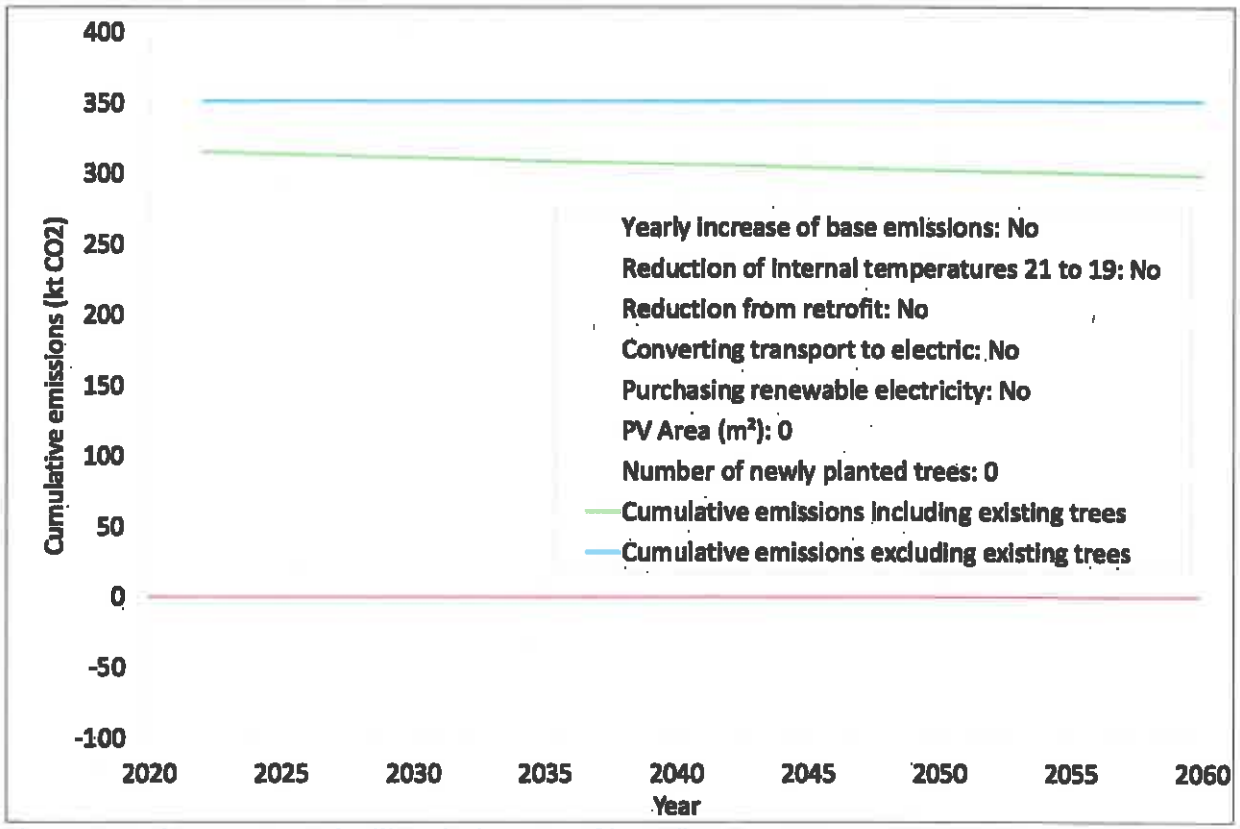


Figure 5 Business as usual without change of baseline

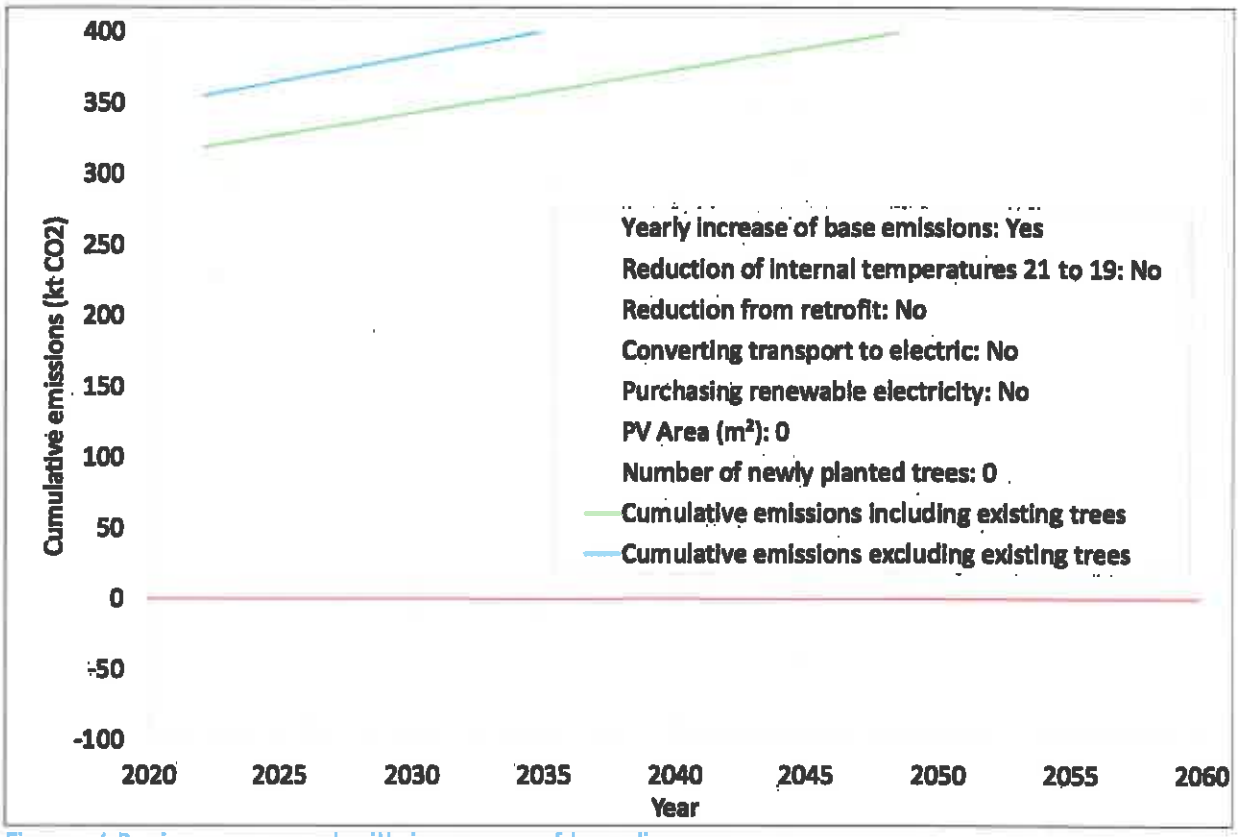


Figure 6 Business as usual with increase of baseline

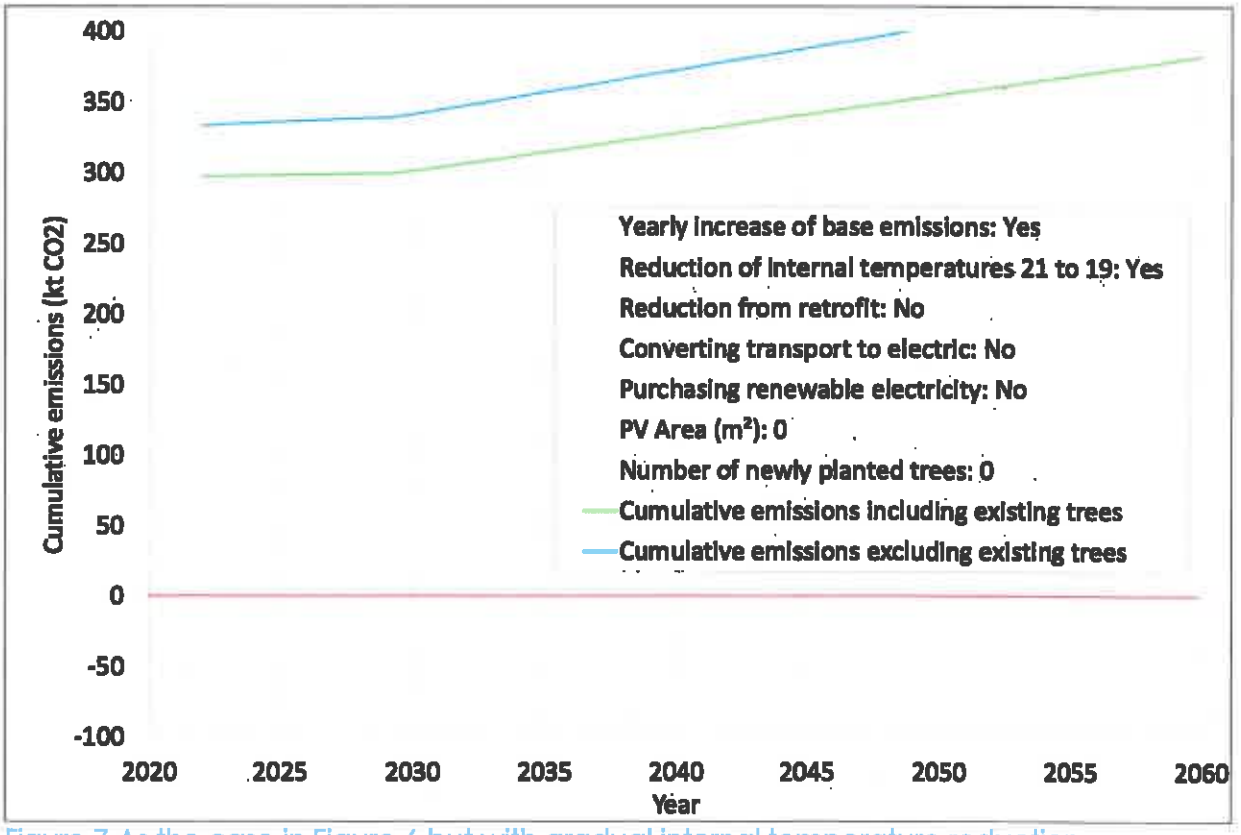


Figure 7 As the case in Figure 6 but with gradual internal temperature reduction

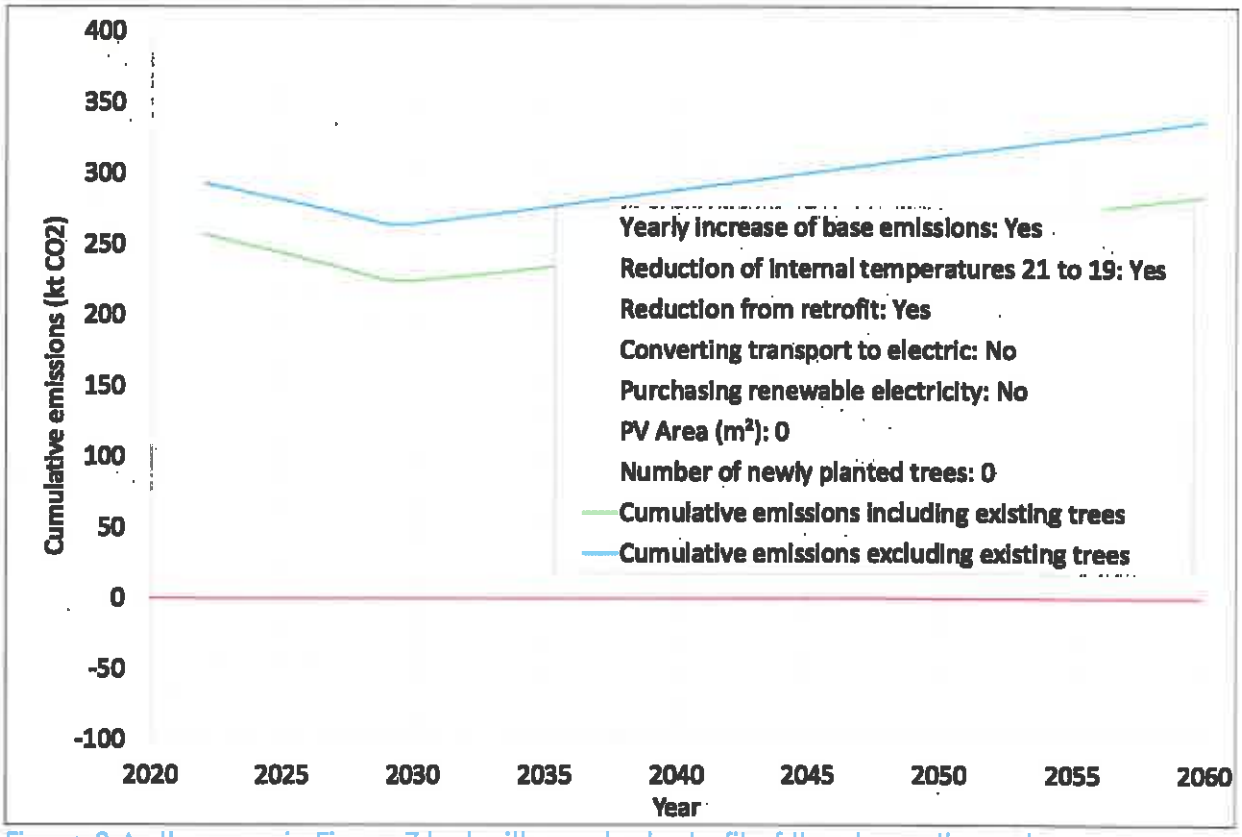


Figure 8 As the case in Figure 7 but with gradual retrofit of the domestic sector

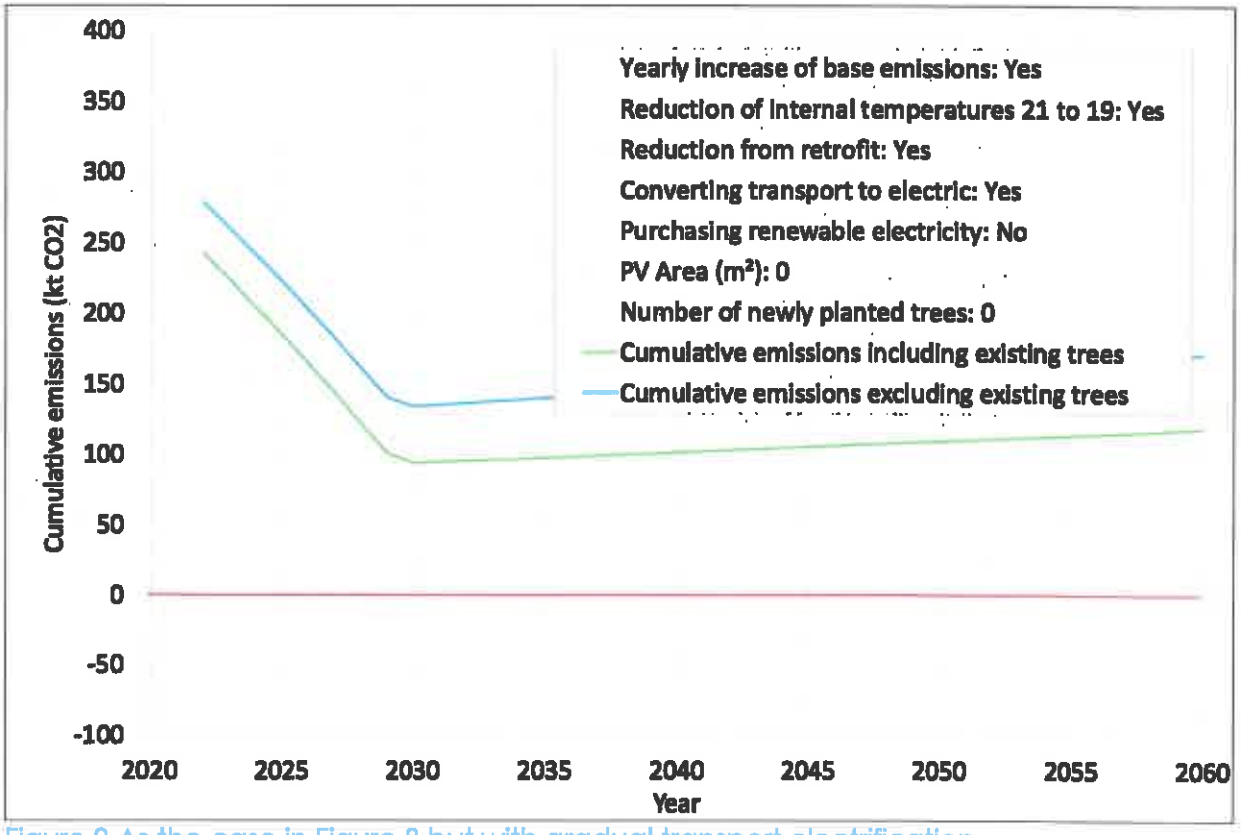


Figure 9 As the case in Figure 8 but with gradual transport electrification

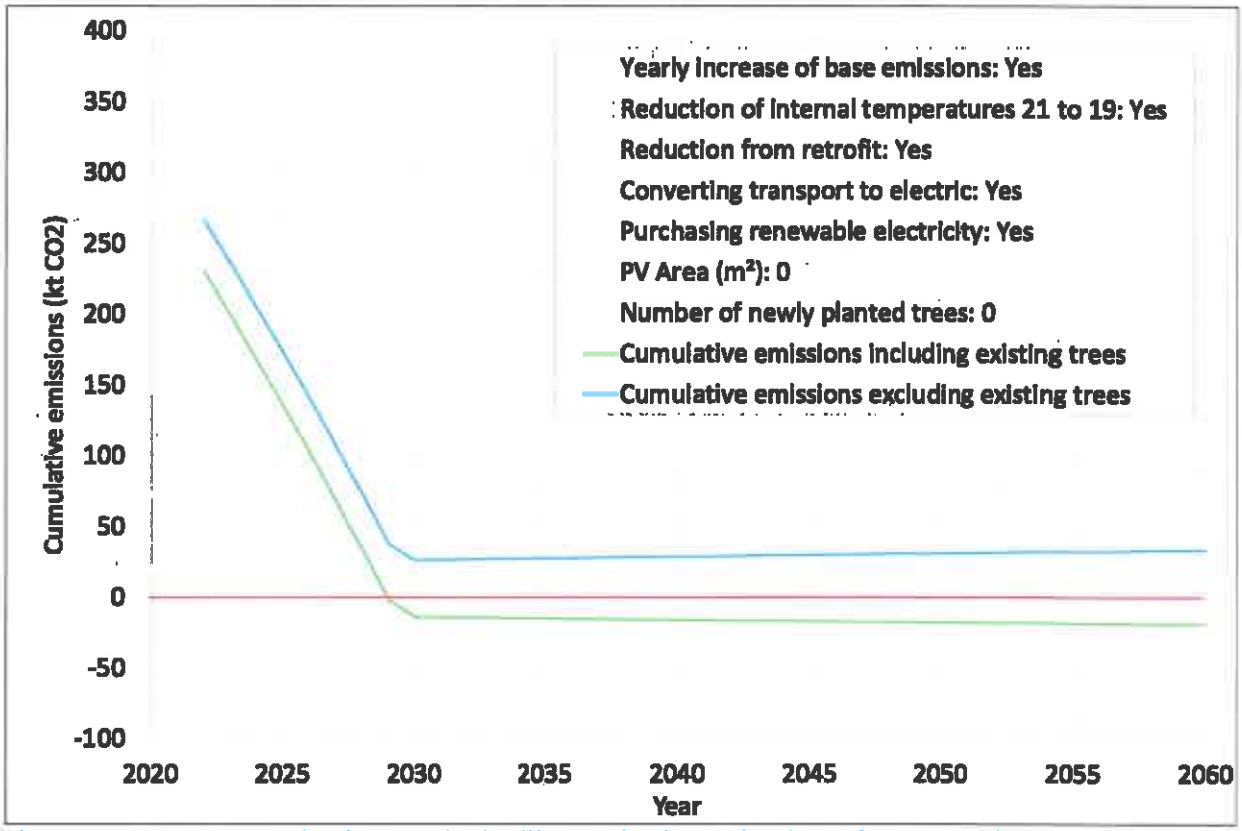


Figure 10 As the case in Figure 9 but with gradual purchasing of renewable electricity

The **sixth scenario** includes gradual purchasing of renewable electricity and switching from gas heating to electricity heating (Figure 10). Under this scenario, zero emissions are reached by 2028.

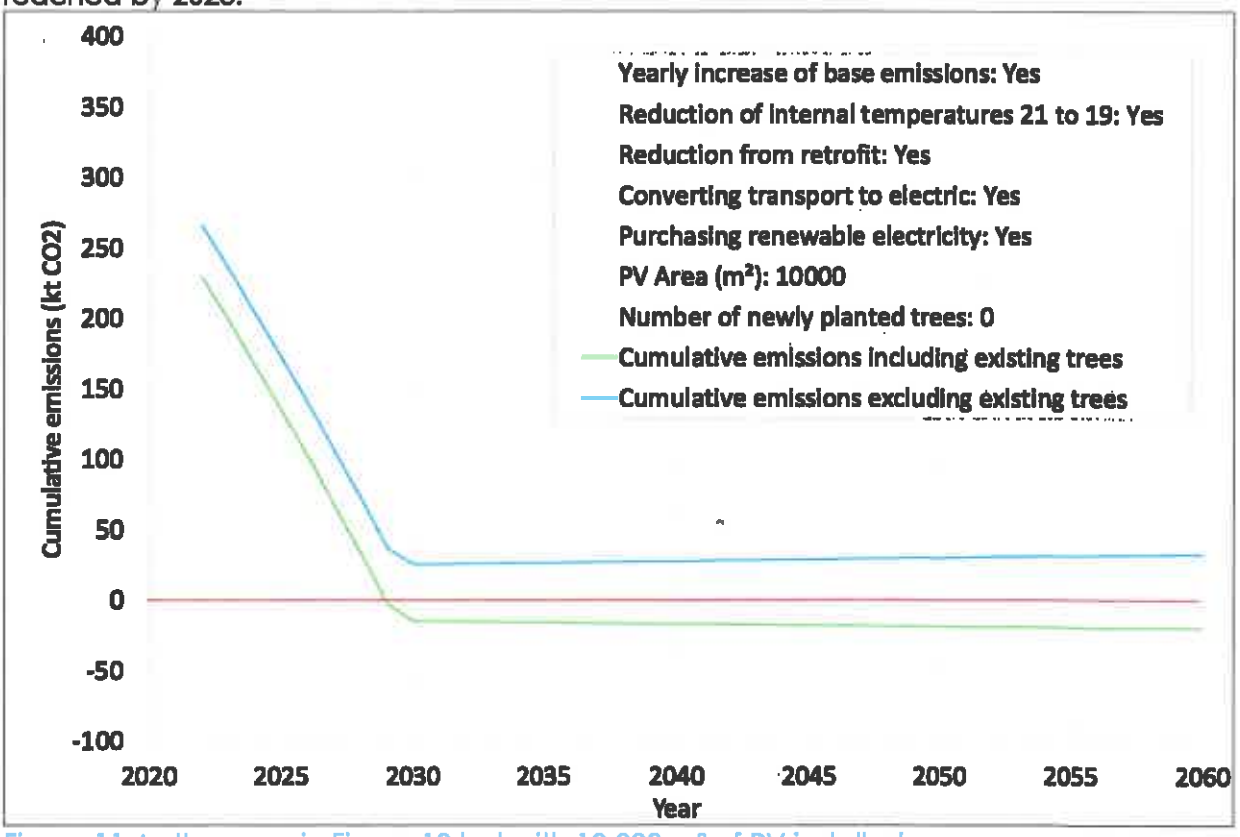


Figure 11 As the case in Figure 10 but with 10,000 m² of PV installed

The **seventh scenario** includes 10,000 m² of new PV installed in the area (Figure 11). There is no significant difference between this and the previous scenario in reducing carbon emissions.

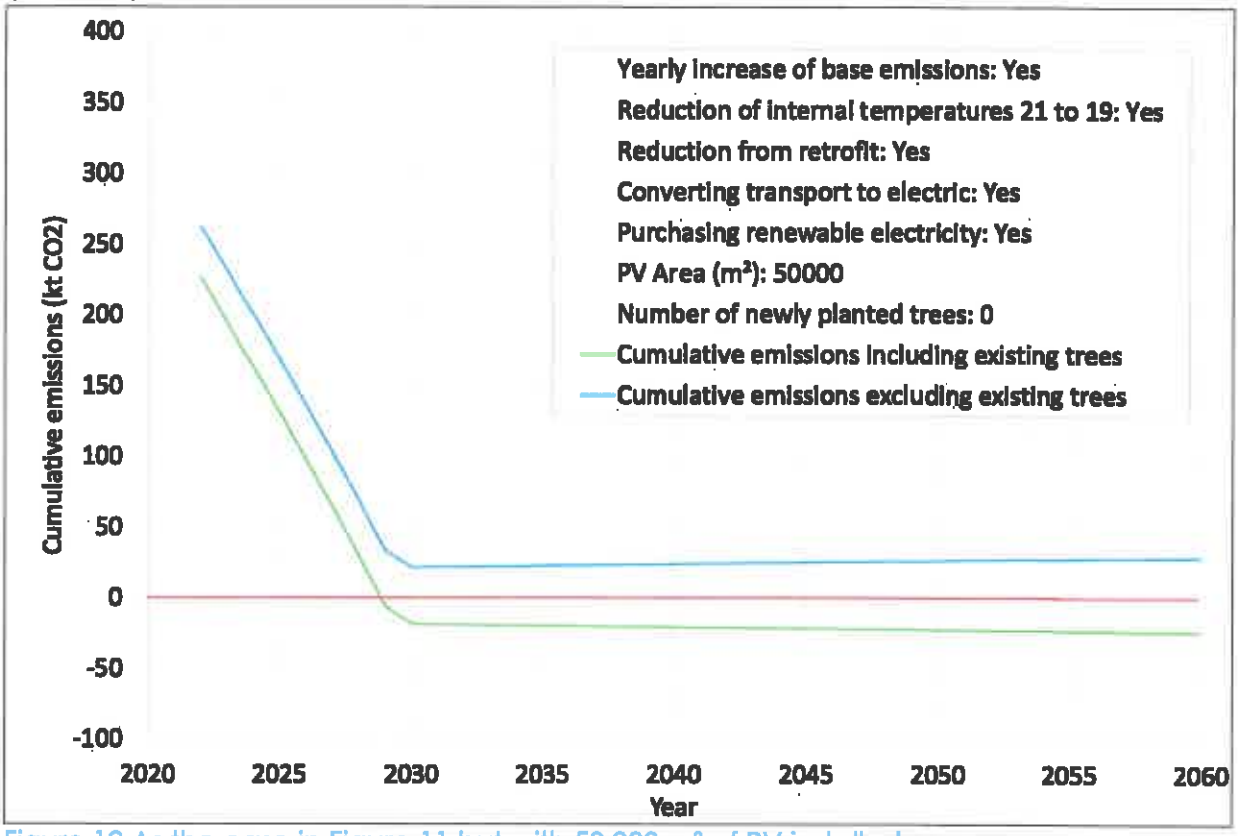


Figure 12 As the case in Figure 11 but with 50,000 m² of PV installed

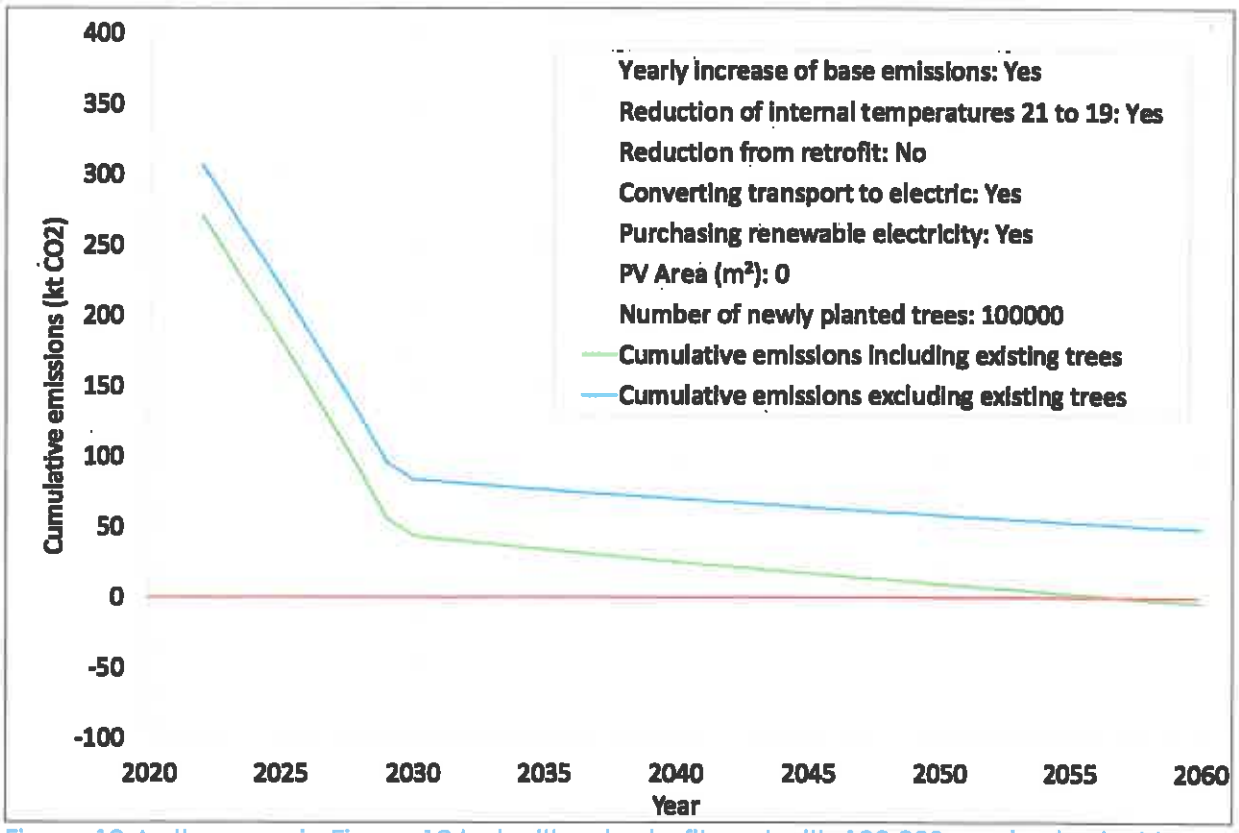


Figure 13 As the case in Figure 12 but without retrofit and with 100,000 newly planted trees

What would be the effect of increasing the surface area of newly installed PV? As shown in the **eighth scenario** (Figure 12), after increasing the PV surface area to 50,000 m², there is only a marginal difference from the previous scenario.

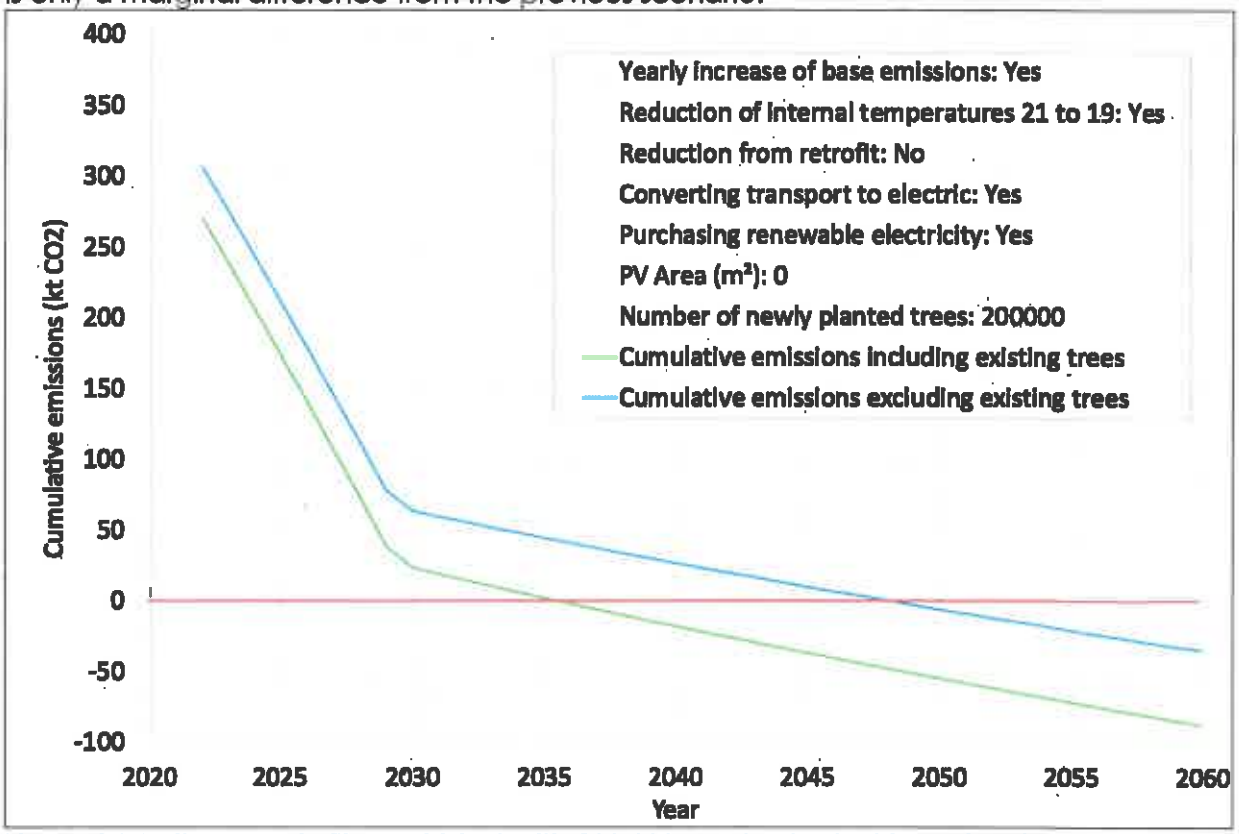


Figure 14 As the case in Figure 13 but with 200,000 newly planted trees (excludes retrofit)

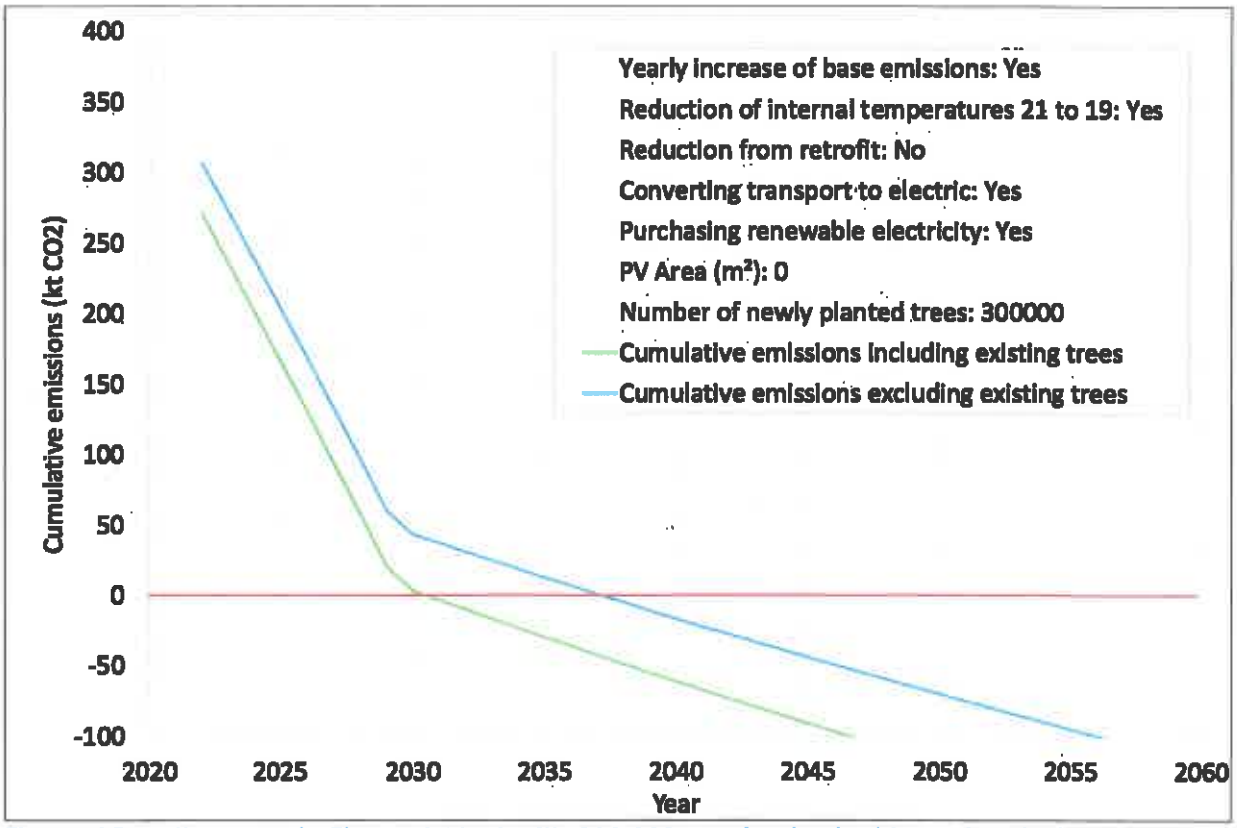


Figure 15 As the case in Figure 14 but with 300,000 newly planted trees (excludes retrofit)

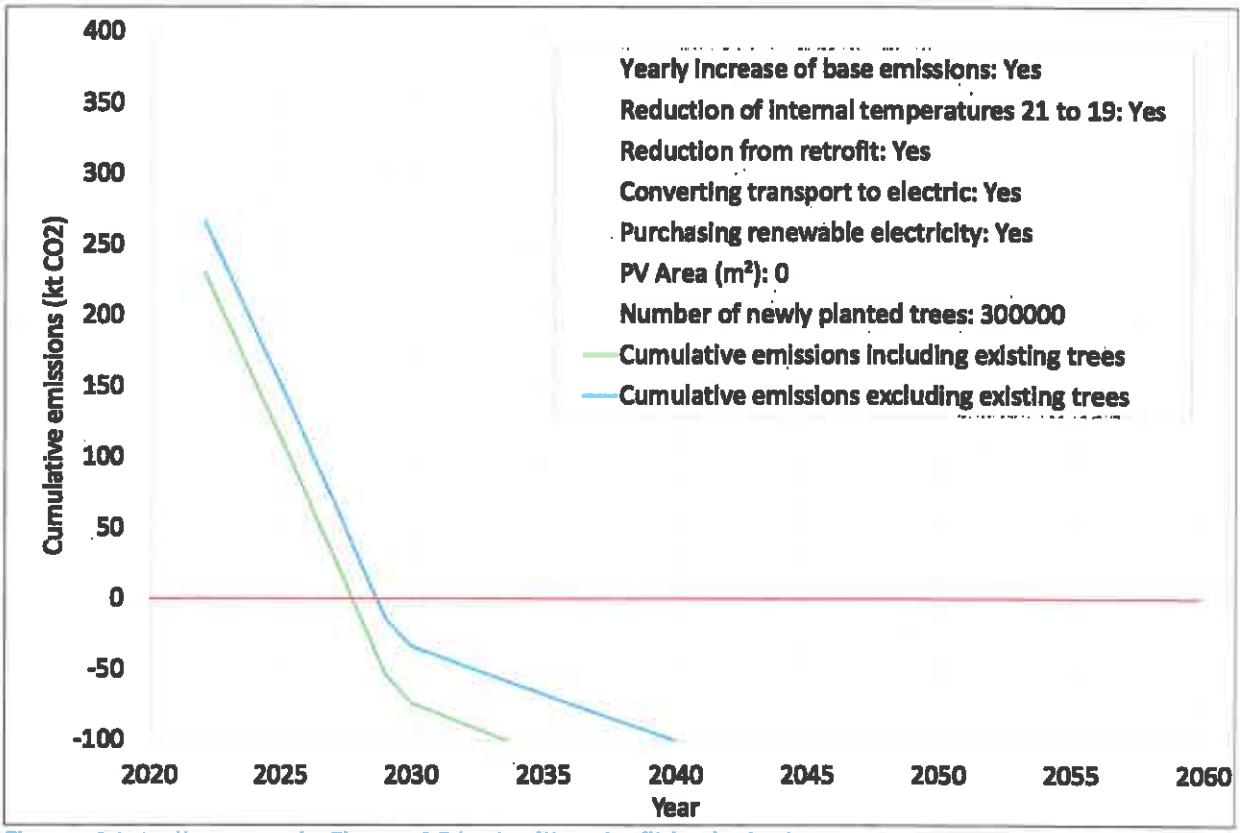


Figure 16 As the case in Figure 15 but with retrofit included

For this reason, it appears that PV does not make a noticeable difference to carbon emissions, as it has immediate annual effect but not cumulative effect. In the next, **ninth scenario**, PV is reset back to zero, retrofit is excluded, and 100,000 new trees are planted (Figure 13). As the trees appear to have a cumulative effect on emissions, considering that their volume and therefore sequestration grows year on year according to a curve in Figure 1, cumulative emissions reach zero by 2057.

Increasing the number of newly planted trees to 200,000 in the **tenth scenario** (Figure 14) achieves zero total emissions just after 2035.

A further increase of newly planted trees to 300,000 in the **eleventh scenario** (Figure 15), achieves total zero emissions just after 2030.

If retrofit is subsequently enabled in the **twelfth scenario** (Figure 16), zero is reached by 2028.

The lessons learnt from these scenarios will be discussed in the next section.

Discussion

The first thing that can be said about these scenarios are that they are based on a set of assumptions. Although the assumptions made are deemed to be realistic, a different set of assumptions will reach different outcomes of the scenarios.

However, what we can learn from the scenarios as presented here is that the measures that include CO_2 reduction through internal temperature adjustment from 21 °C to 19 °C, CO_2 reduction from retrofit, CO_2 reduction from transport electrification, and CO_2

reduction from purchasing renewable electricity, when combined together, will be sufficient to reach zero total emissions before 2030 (Figure 10).

Another somewhat surprising result is that solar generated electricity does not make much difference to the baseline and to the overall carbon emissions reduction (Figure 11and Figure 12). This is explained by its instant rather than cumulative effect on the baseline reduction.

However, it is encouraging to see that planting trees has a significant effect on the baseline reduction and that zero emissions can be reached sooner or later, depending on how many trees are planted. This is because carbon sequestration in trees is proportional to the tree mass and age, and therefore it has cumulative effect on carbon emissions reduction.

If no retrofit is carried out, then planting of 300,000 trees will be required to reach by 2030 (Figure 15). If retrofit is carried out, then zero can be reached by 2030 by combining all of the other measures except PV installation and planting trees (Figure 10).

Conclusions and future work

This document reports on a short term project funded by University of Hertfordshire's Allocation of QR Strategic Priorities Funding 2021/22, which focused on helping SBC with the scrutiny of their Climate Emergency Response.

A number of interventions for reducing baseline carbon emissions were identified. These were presented as a series of 12 quantified scenarios. It was found that different interventions had varying degree of success in carbon emissions reduction. Interventions such as internal temperature adjustment from 21 °C to 19 °C, retrofit of the domestic sector, transport electrification and purchasing renewable electricity were sufficient to achieve zero emissions if combined all together. Installation of PV systems provided minor annual reductions with no cumulative effect. Three planting provided a cumulative effect on gradual reductions over time. Trade-offs can be achieved between tree planting and retrofit in order to plan zero emissions by a specified year.

The results of this work are based on a series of assumptions. If these assumptions are changed, the results will also change. For that reason, the University research team is providing SBC with a detailed spreadsheet of assumptions and scenario calculations as supplementary material, in order to enable SBC to interrogate and evolve the Climate Emergency Response over time. Technical reference for this supplementary material is provided in the Appendix.

A more in-depth study is required in order to address details of many of the high level actions that could not be addressed as result of the short term nature of this project. This includes but it is not limited to construction of all new homes to net zero with immediate effect; accounting for emissions embodied in building materials and construction process; retrofitting of non-residential buildings; quantifying the effects of water savings; quantifying the effects of waste recycling and others.

It is recommended to continue the collaboration between SBC and University of Hertfordshire, and to seek strategic funding for developing methods and tools for real time management of Stevenage carbon emissions using digital twin technology. A Digital Twin is a process-based and physics-based digital replica of a building, an estate or an area, connected to live data sources that enable evaluation of energy and carbon emissions

performance in the real time. This would be an integrated approach to low-carbon energy generation, storage and management. It would cover domestic and commercial buildings, heating and cooling systems, demand management, energy networks and energy storage, power purchasing collaborations, grid flexibility and other local conditions. The approach would aim at ensuring a realistic representation of the current performance, identifying any inefficiency and opportunity for operational savings, using the data uploaded at the start, as well as the live data feeds. By 'pushing and poking' such digital twin model, carbon emergency response policy could be strengthened and fine-tuned on the fly, facilitating the best match to the changing landscape of carbon emissions over time.

References

IES, 2021. VE 2021 [WWW Document]. URL https://www.iesve.com/VE2021 (accessed 11.8.21).

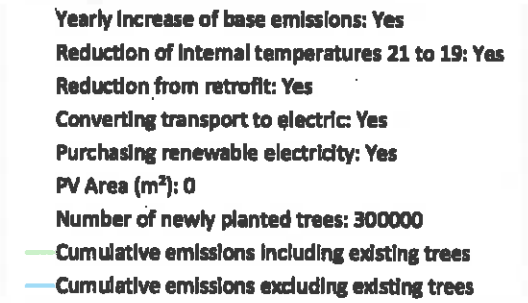
Lefebvre, D., Williams, A.G., Kirk, G.J.D., Paul, Burgess, J., Meersmans, J., Silman, M.R., Román-Dañobeytia, F., Farfan, J., Smith, P., 2021. Assessing the carbon capture potential of a reforestation project. Sci. Rep. 11, 19907. https://doi.org/10.1038/s41598-021-99395-6

Disclaimer

This report, its results and supplementary content are provided to Stevenage Borough Council as a guide only and not as solutions to particular emissions problems. The Author of this report and the University of Hertfordshire will not accept any liability expressed or implied arising from the application of the material in this report and the associated supplementary content.

Appendix – Supplementary content

The scenarios investigation spreadsheet named:
SBCEmissionsScenariosByUniversityOfHertfordshireZCLab.xlsx is submitted as supplementary content with this report. This Appendix gives an outline of the spreadsheet tabs and information within the corresponding worksheets under each tab.

Tab Name (exactly as they appears)	**Description**
About	Title, author, background and disclaimer information tab. Password protected.
Baseline	Baseline emissions data obtained from SBC
Scenarios data	Data used to generate scenarios, as per Methodology section. Cells C3-C8 are used for switching individual on/off interventions. Cells B9 and B10 specify PV surface area and the number of newly planted trees respectively. Numerical data of the scenarios are in columns H-S.
Scenarios chart	Emissions scenarios chart, using 'Scenarios data' to generate the 12 scenarios as reported in the Emissions Scenarios section of this report. The first seven lines of the legend show the individual interventions chosen in the corresponding scenario. The last two lines of the legend show the colour codes for the curves on the chart. 
Savings from lower room temp	Summary results of dynamic simulations showing emissions reduction from reducing internal set temperature. Data used for calculations in 'Scenarios data'. Password protected.
Savings from retrofit	Summary results of dynamic simulations showing emissions reduction from retrofit. Data used for calculations in 'Scenarios data'. Password protected.
Stevenage trees data	Data on the total number of existing trees in Stevenage, their age profile and age alignment to 2022. It applies sequestration approximation calculations per age profile. Data used for calculations in 'Scenarios data'.
Sequestration approximation cur	Visualisation of 'Sequestration approx data'.
Sequestration approx data	Tree carbon sequestration quantities on the basis of research reported by Lefebvre et al. (2021)
Adoption curve chart	Visualisation of 'Adoption curve data'
Adoption curve data	Assumption of gradual adoption of internal temperature reduction from 21 °C to 19 °C, retrofit, transport electrification and purchasing renewable electricity
Increase curve chart	Visualisation of 'Increase curve data'
Increase curve data	Assumption of gradual increase of baseline emissions at 1% per year