



Review of Home Working Energy Research & Hybrid Plans

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Key Points

- Summary of County Durham Climate Emergency and current carbon footprint
- Overview of research undertaken regarding the carbon and cost impact of working from home for Local Authority and University employees
- Next steps for hybrid working



County Durham



County Durham is here



County Durham Climate Emergency

- Durham County Council declared a Climate Emergency in February 2019
- We consulted with the public and local organisations to develop a 2 year Climate Emergency Response Plan and agreed on the following targets:
 1. Reduce the Council's carbon emissions by 80% by 2030
 2. Investigate what further actions are necessary to make County Durham completely carbon neutral by 2050 and pledge to achieve this.

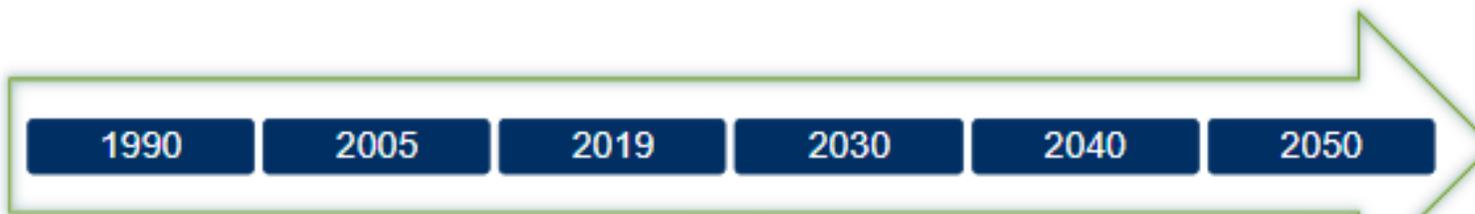
A new two year Climate Emergency Plan will be debated and agreed in May 2022 by the Council. This is likely to have stronger carbon reduction targets than were agreed previously.

<https://climatecountydurham.org.uk/>

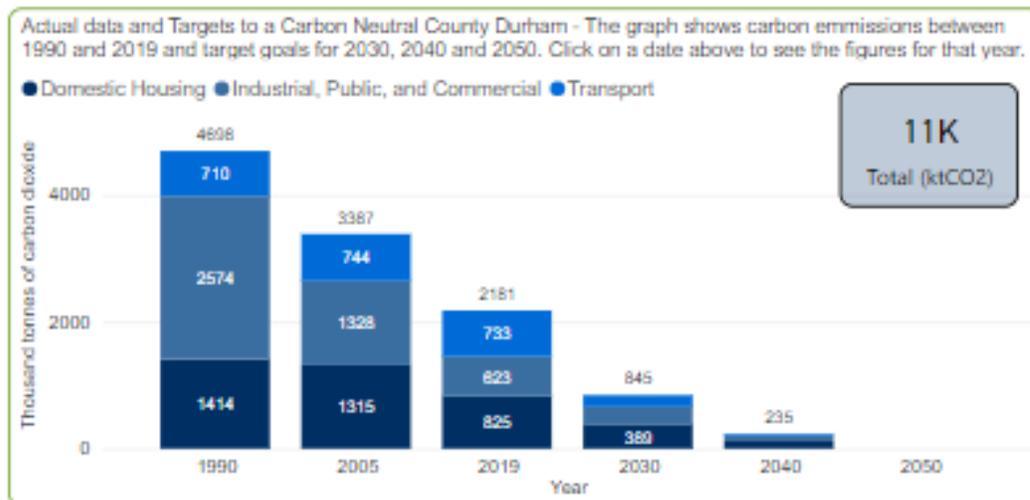


County Durham Carbon Reduction Progress

County Durham's carbon footprint has shrunk since 1990, and we hope it will continue to reduce as we work toward our carbon reduction goals for 2030, 2040, and 2050. Click on a year to find out more about the carbon emissions in the county at that time



0 tonnes of carbon dioxide per year. (target) Our aim is to make County Durham Carbon Neutral by 2050. We might still have some carbon emissions, but these must be offset by actions such as tree planting, peatland restoration, renewable electricity generation, or other carbon negative activities. Our carbon footprint should be zero because any emissions we do have will be countered by these off-setting actions. We may never be completely zero carbon, but where emissions must remain we can make up for them.



Year	Grand Total (ktCO2)
1990	4,698
2005	3,387
2019	2,181
2030	846
2040	235
2050	0



- Carbon Targets Timeline
- Durham's Carbon Footprint
- Temperatures in Durham

ESTIMATED IN JANUARY 2022

Durham County Council's Carbon Footprint

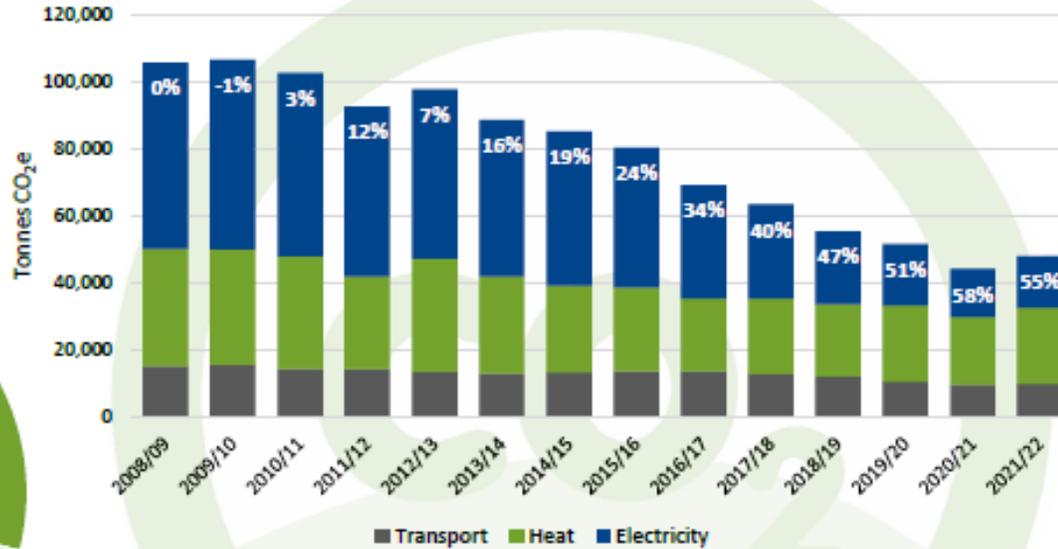


So far, we've achieved 55% reduction since 2008/09.

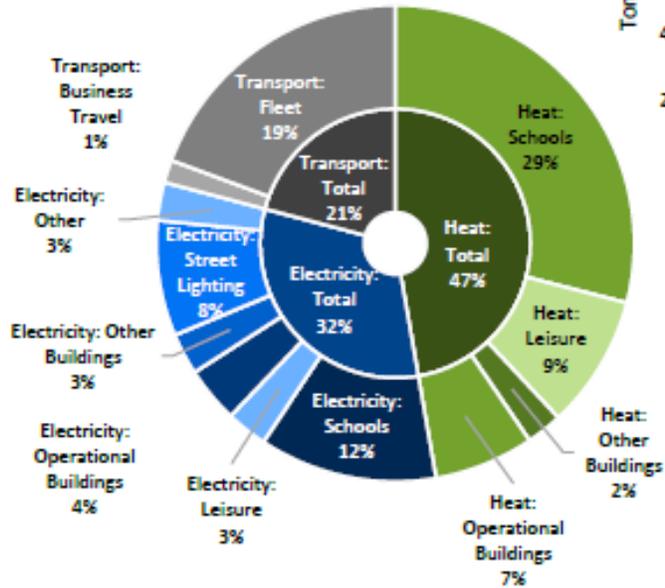
Report Year:	2021/22
Total Carbon Footprint:	48,111 tCO ₂ e

Heat:	22,744 tCO ₂ e
Electricity:	15,325 tCO ₂ e
Transport:	10,042 tCO ₂ e

Annual Emissions and Percentage Reduction



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The bar chart above shows how far we've come.

The pie chart on the left shows what our remaining carbon footprint is made of.

The council's carbon footprint includes all emissions from all of our buildings, schools, vehicles, street lights, and operational activities. Carbon reduction is calculated from a starting point of 2008/09 and we have a target to reduce it by 80% by 2030. That's actual reduction, so offsetting the last 20% would get us to net zero.



REBUS Project

- Durham is one of the partners in this project which has been sharing practice related to public buildings and energy efficiency opportunities.
- Project Partners:
 - **Regional Agency for Waste & Resource Management [formerly Florentine Energy Agency](Italy) Lead Partner**
 - City of Malmo (Sweden)
 - BORA 94 – Non-profit Development Agency, Hungary
 - PNEC – Association of Municipalities Polish Network “Energie Cities”
 - South East Regional Development Agency (Romania)
 - Durham County Council (UK)
 - Region of Crete (Greece)



Home Working Energy Usage Project

Undertaken with Durham University - funded by the Local Government Association – Net Zero Innovation Programme. Started January 2021.

Aim: Discover the impact of Covid-19 on energy usage for employers and employees

Methodology:

1. Identify **7** Office buildings
2. Gather energy data from staff and facilities over a two year period
3. Assess the impact of Covid-19 restrictions on **energy usage and carbon emissions of** employers and employees
4. Engage with stakeholders

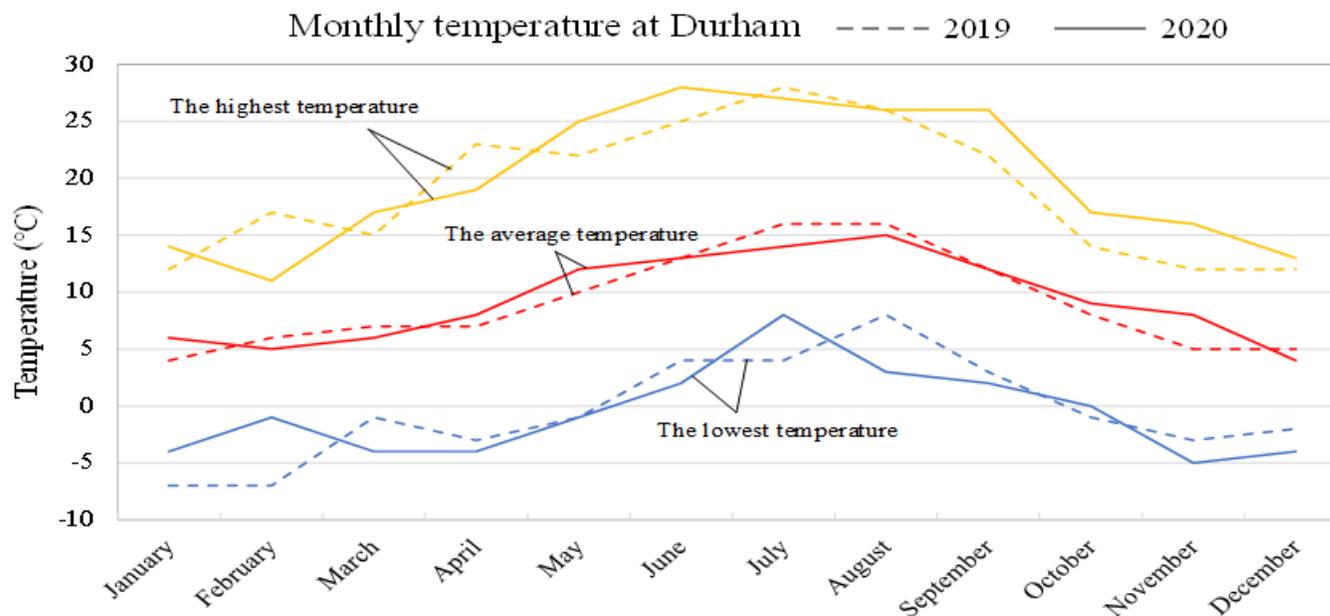


Background information (2):

1. UK lockdown timelines

- First UK COVID-19 lockdown: March 23 to May 28, 2020
- Second UK COVID-19 lockdown: November 5 to December 2, 2020
- Third UK COVID-19 lockdown: Start on January 5, 2021

2. Monthly temperature at Durham in 2019 and 2020:



Carbon emissions from the buildings

The UK government report on the carbon emissions for home on the average energy fuel mix. In 2019, these figures were **0.256 kg of CO₂ per kWh** of electricity and **0.184kg per kWh of gas** [2, 3]. The CO₂ emissions from this building are calculated using this figure.

Carbon emissions from travel

- It is assumed that the carbon emission from commuting travel is saved by the volunteer (depending on her/his working days per week) ,working from home since the first lockdown.
- According to the statistics, the average level of carbon dioxide emissions for all licensed cars in Great Britain dropped to **141.9 grams** per kilometer in 2018.
- The average level of CO₂ emissions for bus in Great Britain is **104 grams** per passenger per kilometer in 2019*.
- The average level of CO₂ emissions for train in Great Britain is **41 grams** per passenger per kilometer in 2019*.

* Source: BEIS/Defra, Greenhouse Gas Conversion Factors 2019



Home Working Energy Usage Project

In order to find the impact of Covid-19 on energy usage and carbon emissions of employers and employees, the energy consumption data of 7 office buildings and employees' homes are collected (from DCC and Durham University)

The office buildings are:

A. Durham County Council:

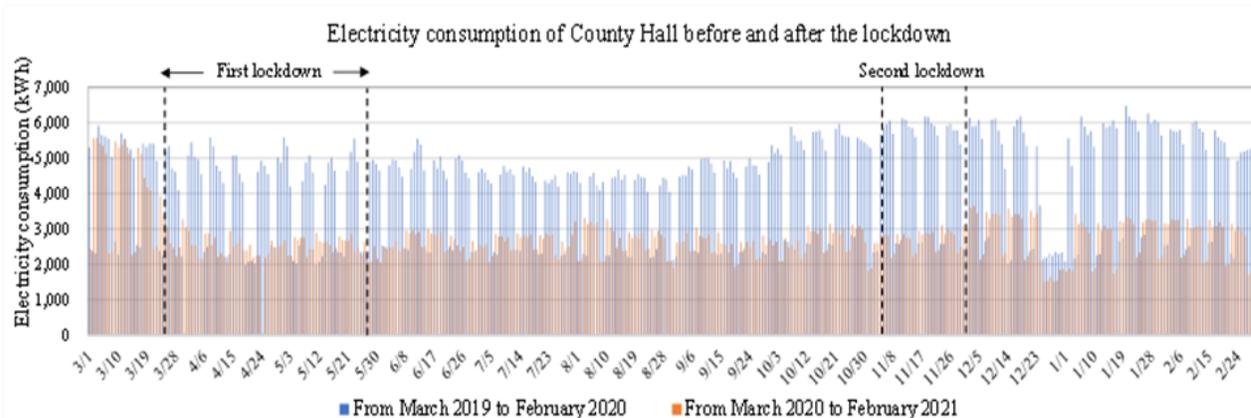
- 1) County Hall
- 2) Crook
- 3) Comeleon
- 4) GreenLane
- 5) Spectrum

B. Durham University:

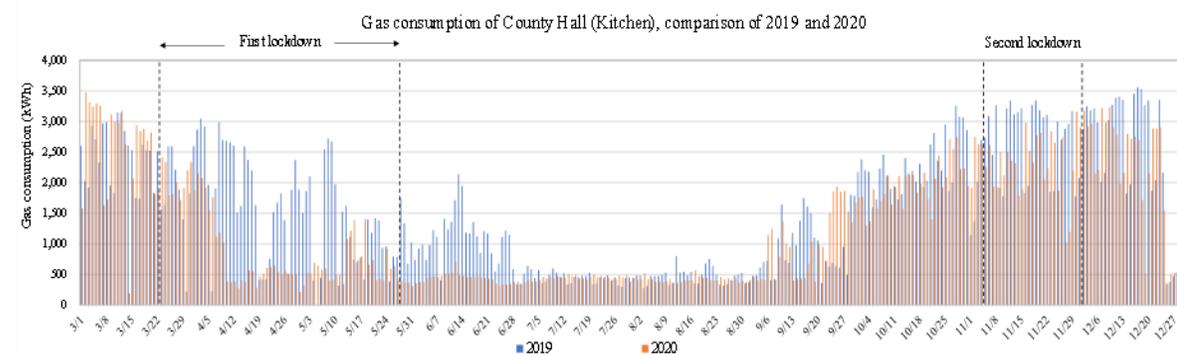
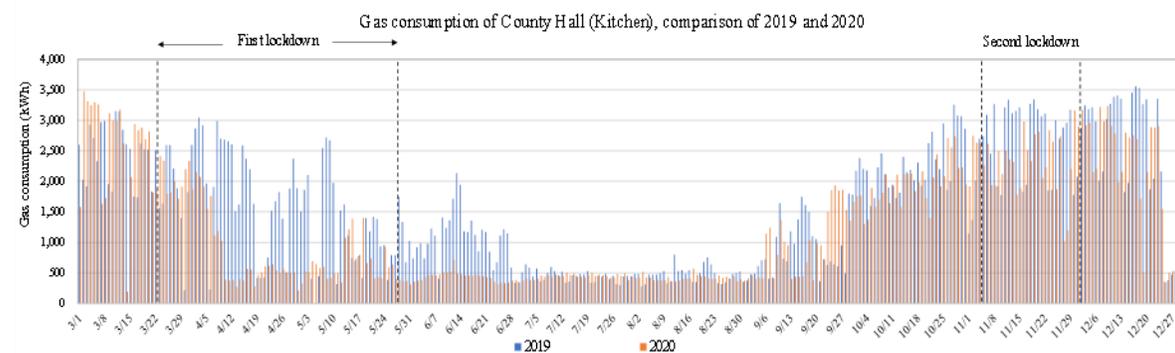
- 6) Engineering (Christopherson & Higginson)
- 7) Mountjoy



1) County Hall



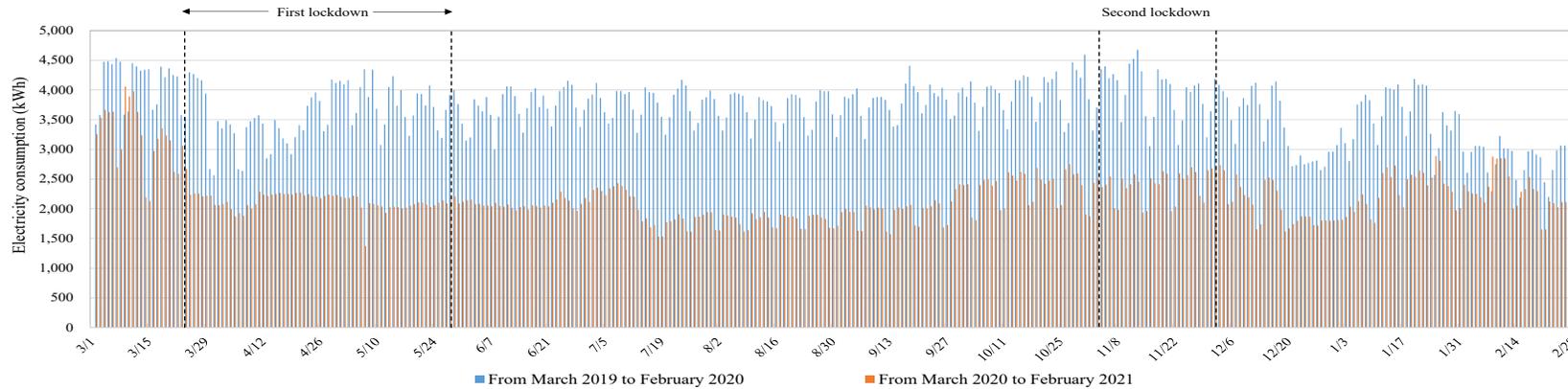
- The total electricity consumption in 12 months is **1,566,575 kWh** from 01 Mar 19-29 Feb 20; compared with that of **1,003,844.7 kWh** from 01 Mar 20 – 28 Feb 21. The electricity consumption after lockdown reduced by **35.9%**.



- The total gas consumption of County Hall from 01 March 2019 to 29 Feb 2020 are **3,774,439 kWh**; compared with that of **3,787,710 kWh** from 01 March 2020 to 28 Feb 2021. The consumption in 12 months after lockdown reduced by **0.4%**.

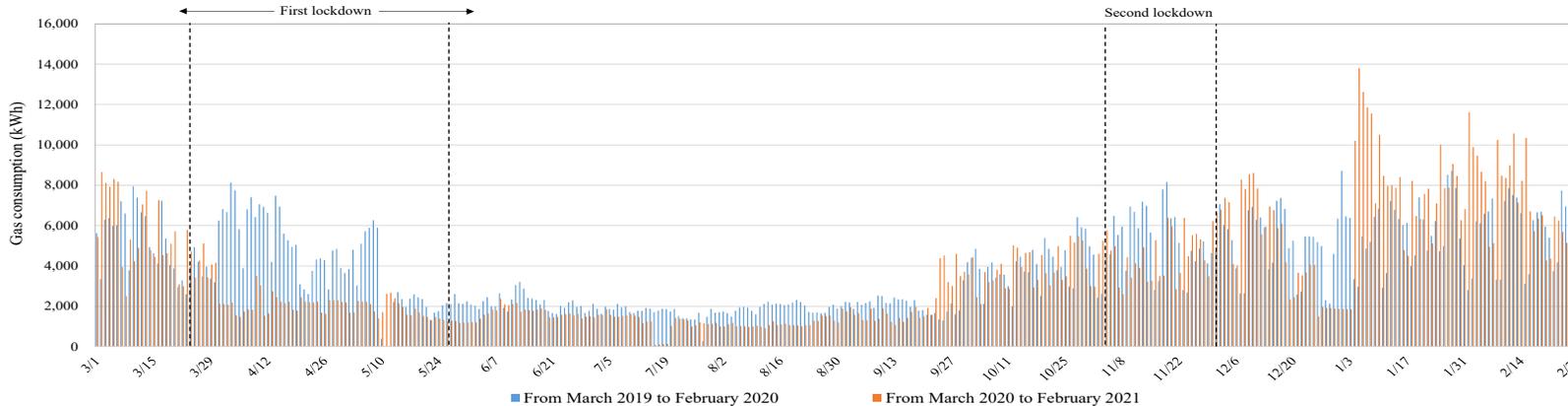
6) Engineering (Christopherson & Higginson) Building

Electricity consumption of Christopherson and Higginson buildings before and after the lockdown



- The total electricity consumption in 12 months (01 Mar 19- 29 Feb 20) was **1,336,641 kWh**; compared with that of **800,460 kWh** from 01 Mar 20 - 28 Feb 21. The consumption after the lockdown reduced by **40.1%**.

Gas consumption of Christopherson and Higginson buildings before and after the lockdown



- The total gas consumption in 12 months (01 Mar 19 – 29 Feb 20) are **1,429,321 kWh**; compared with that of **1,314,183 kWh** from 01 Mar 20 – 28 Feb 21. The consumption after the lockdown reduced by **8.1%**.

In summary, the total energy consumption, i.e., electricity plus gas was **2,765,962 kWh** from March 2019 to February 2020 compared to that **2,114,643 kWh** from March 2020 to February 2021. The reduction of total energy consumption is **23.5%**.

Home Working Energy Usage Project

- Initially recruited ~60 volunteers from Durham County Council and ~25 from Durham University.
- Further refined to 41 case studies with usable data.
- Developed Staff Case Studies:
 1. Short commute by car to the office
 2. Commute by bicycle to the office
 3. Long Commute by bus to the office
 4. Walk to the office



Home Working Energy Usage Project

Example 1: Travel by car; energy usage: electricity and gas; living nearby office (Durham County Council).

Home Working: Outcome from Analytic Study

(No. 202103110106)

1. CO2 emission from home

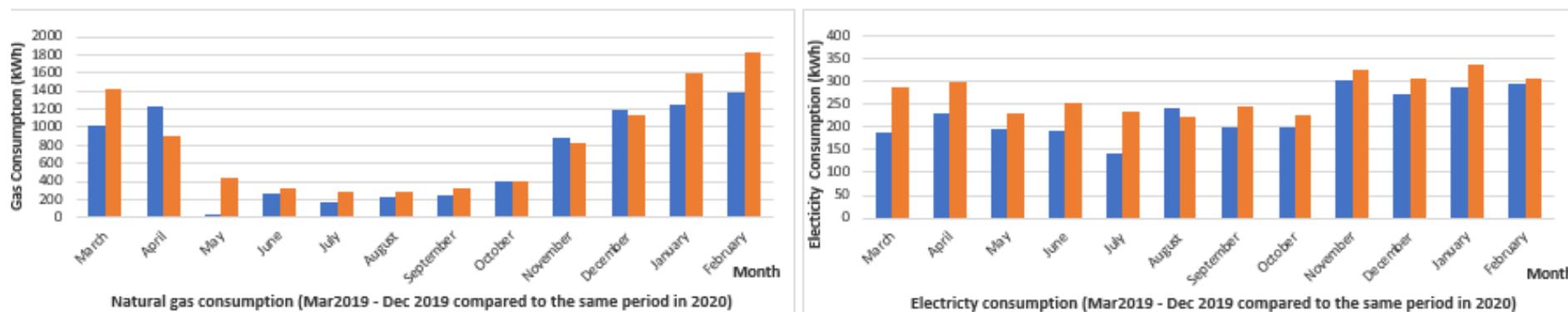


Figure 1 shows the energy (electricity and natural gas) consumption from the home building, in the period of March 2020 – February 2021 (red columns in the figure) compared to that in March 2019 – February 2020 (blue columns in the figure), From Figure 1 it can be seen that:

- The gas consumption **increased** by 1450.2 kWh. The CO2 emission increased by 266.8 kg.
- The electricity consumption **increased** by 528.7 kWh, the CO2 emission increased by 135.4 kg.
- The total CO2 emission **increased** from home is 402.2 kg.



Example 1:

2. CO2 emission from the car when travel

- It is assumed that the carbon emission from travel (4 days per week) is saved by the volunteer, who has been working from home since the first lockdown.
- The distance of the travel is (2 × 23 miles) which is 73.6 km per day. The CO2 from the journey is: 10.44 kg/day.
- Therefore, the CO2 emission in this period would be: **2172.0** kg.
- The CO2 saved from travel is then **2172.0** kg.

3. Conclusion: CO2 emissions saved by the volunteer from Home Working

The CO2 emission saved by the volunteer:

- 1) CO2 saved from travel is **2172.0** kg;
- 2) CO2 increased in home is 402.2 kg;
- 3) CO2 reduction in office on average per person is 65 kg.
- 4) The CO2 saved by the volunteer is: **1835.1** kg.

**i.e. a saving of 20% of CO₂ against average household.
Transport CO₂ is five times greater than energy kg.**



Example 3: Travel by bus; energy usage: electricity and gas; not living near an office (Durham County Council.)

Home Working: Outcome from Analytic Study
(No. 202103110113)

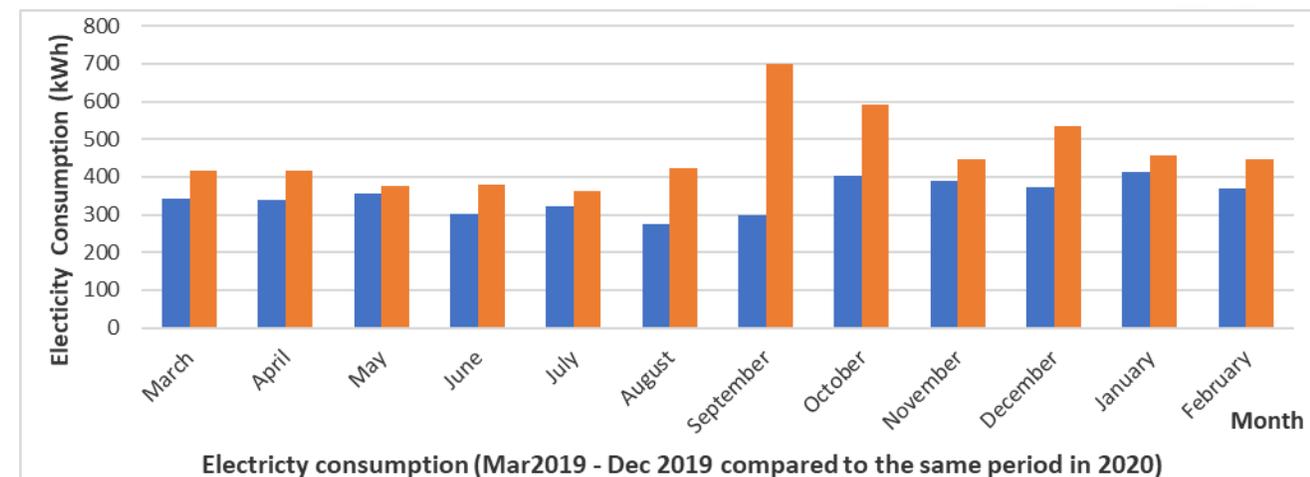
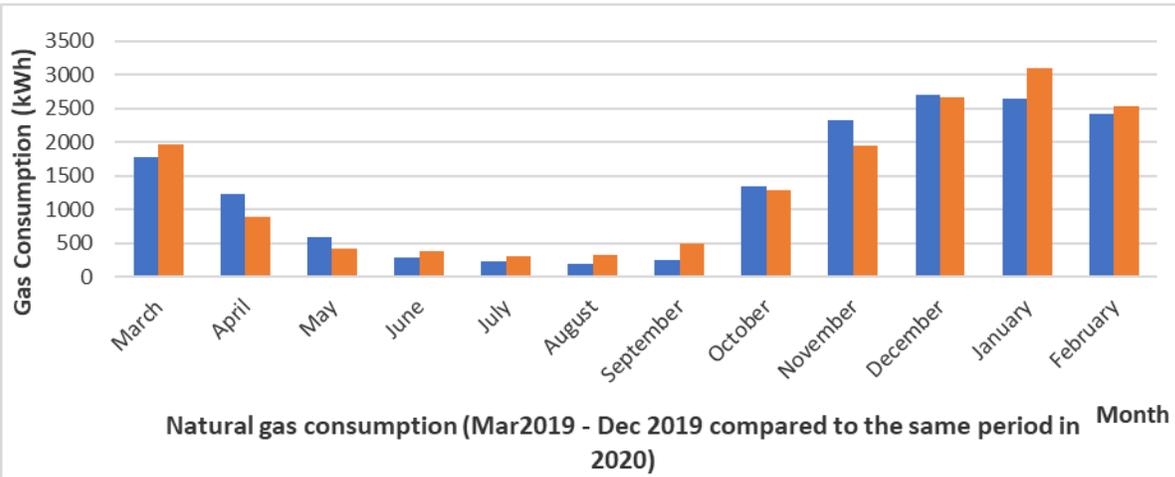


Figure 1 shows the energy (electricity and natural gas) consumption and CO2 emission from the home building. From Figure 1, it can be seen that:

- Gas consumption increased by 331.3 kWh. The CO2 emission increased by 61.0 kg.
- Electricity consumption increased by 1374.8 kWh. The CO2 emission increased by 351.9 kg.
- The total CO2 emission increased from home is 412.9 kg.



Example 3:

2. CO2 emission from travel by bus:

It is assumed that the carbon emission from travel is saved by the volunteer, who has been working from home since the first lockdown.

- The distance of the travel is (2 × 4 miles) which is 6.4 km per day.
- The CO2 from the journey is: $6.4 \text{ km/day} \times 104 \text{ g/km} = 1331.2 \text{ g} = 1.331 \text{ kg/day}$.
Therefore, the CO2 emission in this period would be: $1.331 \text{ kg/day} \times 211 \text{ day} = 280.9 \text{ kg}$.
- The CO2 saved from travel is: 280.9 kg.

3. Total CO2 emissions from Home Working

The CO2 emission saved by the volunteer:

- 1) CO2 saved from travel is 280.9 kg;
- 2) CO2 increased in home is 412.9 kg.
- 3) CO2 reduction in office on average per person is 65 kg.
- 4) The CO2 saved by the volunteer is: $280.9 \text{ kg} - 412.9 \text{ kg} + 65 = - 67.0 \text{ kg}$.

Conclusion: The CO2 saved by the volunteer is - 67 kg (That is increased by 67 kg in a year).



Home Working Energy Usage Project

Conclusions and recommendations:

- Office buildings saved a large amount of CO₂ emissions (in the first lockdown).
- Lockdown reduced travel and reduced a large amount of CO₂ emissions from cars (travel). This was 5 times greater than the impacts of energy usage at home
- Home working produced around 5% more CO₂ emissions from gas and electricity
- **Overall, home-working reduced a large amount of CO₂ emissions (20% on average for car commuters – it increased in general for those walking, cycling or using public transport)**



Home Working Energy Usage Project

Key Findings (1)

- **There were significant and unexpected difficulties** in getting attracting the number of volunteers required by the project and a great deal of time was required to get their energy data.
- **There was considerable surprise in the finding that people who switched energy supplier subsequently struggled to access their previous energy data**
- **Household saving of CO₂ largely due to savings in commuting carbon, 5 times larger than increase in energy CO₂ experienced.**
- **CO₂ reduction in office buildings not as significant as expected**, due to staff continuing to use buildings. Thought required whether to shut the building down or continue with office working. A hybrid approach increases CO₂.



Home Working Energy Usage Project

Key Findings (2)

- **Need for energy efficiency and insulation in all buildings** to minimise energy usage for buildings when unoccupied. Smart Building management systems
- **Importance of identifying issues such as change of vehicle** (to EV in some cases); changes in energy use from behaviour / technology change in the home
- Employers and employees need to consider and **manage the CO₂ from commuting**. Opportunity for a 20% reduction for car users.



Next Steps

- We didn't see the expected level of reductions in energy use in office buildings because many of them have heating systems that can't be zoned, so they are on for 20 staff or for 1300 staff
- There has been national interest in the project and we are now working at a national level with APSE energy and 13 other local authorities to explore how we can build our learning into new ways of working (and recognising that the travel impacts will be very different in a rural, dispersed county like Durham, compared to urban/ city areas. Cornwall County Council did similar research and got similar findings (also a rural County))



- Return to workplaces commenced 28th February 2022 (following the removal of UK government restrictions) – with ‘office-based’ staff returning to workplaces in a hybrid way.
- It has been accepted as part of the ‘returning to workplaces’ that there will be a variety of different ‘roles’ requiring different ways of working i.e. some more mobile/field based by nature than others.
- Hybrid working supports different council priorities including – employee wellbeing, productivity amongst other things.
- The model was proposed as temporary model to get people back to returning to workplaces and using offices space again – with ‘presence’ stated as an integral part of hybrid working.
- Covid considerate principles have been applied –social distancing where possible/ continued use of face coverings in crowded/shared spaces/ advice on ventilation plus personal risk assessments for high-risk/vulnerable groups



- The temporary model requires employees to attend the **workplace for a minimum of 3 days per week** (for full-time employees) however with the acceptance that ‘workplaces’ will be a variety of workplace settings.
- There have been no contractual changes – and the **return to offices will be reviewed** over the coming months to help form our future model/new ways of working programme.
- The review will be largely undertaken by the Inspire Steering Group – which includes representatives from multi-functional council teams including the Low Carbon Team and Equality and Diversity to ensure relevant input
- This group will link in with a strategic group responsible for oversight of the accommodation strategy.
- Durham will also continue to **research best practice working models** as part of our ‘people agenda’.



Any questions?



*... It is not easy
being green...*

