Homeworking emissions Whitepaper

In partnership with

LLOYDS BANKING GROUP

NatWest Group

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an atos company

This whitepaper has been produced by EcoAct in partnership with Lloyds Banking Group and NatWest Group.

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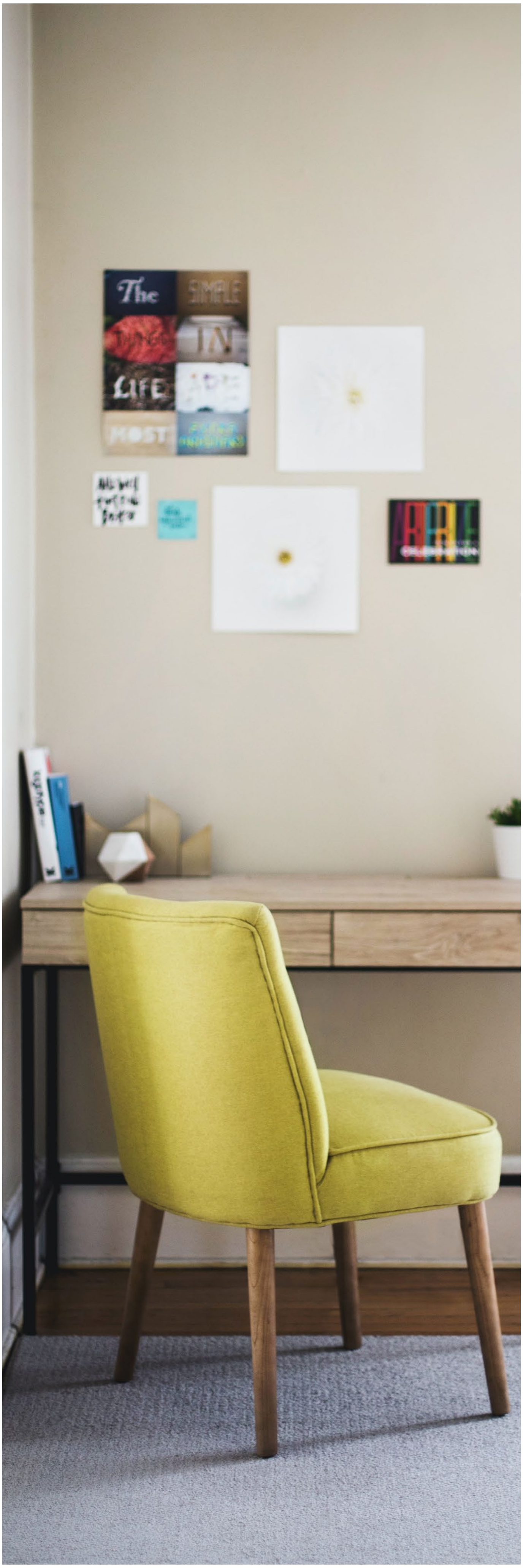
Special contribution

Bulb

Consultation Group

This paper is the product of a professional consultation and working group including six large corporate organisations.

We would like to thank everyone who participated in this consultation phase and contributed to the development of this methodology.



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Glossary

Base case	In this context, this is the baseline scenario for greenhouse gas calculation for each emissions area and is based on a certain set of assumptions as laid out in this methodology.
GCV	Gross Calorific Value related to the combustion of natural gas.
GHG	Greenhouse Gases.
FTE	Full-time Equivalent. This represents the hours worked by one full-time employee.
Incremental energy	In this context this is energy use from office equipment, home heating and home cooling which are being incurred over and above normal home energy use, as a consequence of homeworking.
kWh	Kilowatt-hour. This is commonly used as a billing unit for energy delivered by electricity suppliers.
Location-based methodology	This methodology for emissions calculation uses grid-average emissions factor data specific to location to estimate carbon emissions.
Market-based methodology	This methodology for emissions calculation derives emissions factors from contractual information, therefore using procurement and billing data to estimate carbon emissions.
Typical Domestic Consumption Values	Industry standard values for the annual gas and electricity usage of a typical domestic consumer.
Scope 1 emissions	Direct company emissions from owned or controlled sourcess.
Scope 2 emissions	Indirect emissions from purchased energy.
Scope 3 emissions	Indirect emissions that occur within a company's value chain, both upstream and downstream.
WHpa	Working Hours per annum.
WHpcm	Working Hours per month.

Introduction

2020 has been a turbulent year.

The impacts of coronavirus (COVID-19) have resulted in significant changes to our daily lives; affecting family life, leisure time, the way we travel and the way we do business. Many businesses have had to undergo significant adaptations in order to maintain business as usual, which has presented considerable challenges to all sectors. Businesses which deliver services in an office environment have faced challenges to ensure that the infrastructure is in place to support a sudden shift to a remote work force.

Thanks to modern technology and despite some significant stresses imposed on IT and HR teams, the initial challenges have been, by-and-large, overcome. Even in sectors where remote working was previously seen as impractical at best or impossible at worst, operations now continue to a similar standard to pre-pandemic levels.

As the pandemic continues, many colleagues will continue to work from home to minimise the risk posed to themselves or their colleagues. Indeed, certain colleagues would actively prefer to work from home in order to spend more time with family rather than in transit as part of a daily commute. A significant shift is being evidenced.

From an environmental reporting perspective, this shift presents a unique challenge. Companies will be demonstrating a reduction in Scope 1 and 2 emissions performance in line with the reduction of office building energy consumption. Disclosure of these emissions is now common practice due to a mix of compliance schemes and as part of many company's public commitments in this area. However, despite the reduction, these emissions have not been eliminated, rather they have been relocated to employee homes beyond the company's direct control. Some might argue that the decrease in commuting related emissions makes up for this, but it is difficult to claim this without first accounting for all of your company's operations, including those from homeworkers.

EcoAct has been approached by several clients to assist with the calculation of homeworking emissions, frequently with little or no specific data available on which to base the calculation. Initial investigations found significant variances in the approach to calculating and reporting these emissions, and so this paper, written in partnership with Lloyds Banking Group and NatWest Group, seeks to provide a standardised approach to facilitate fair comparison and transparency. It considers the following three main emissions areas: "office" electricity, heating and cooling (where appropriate by region).

Rationale for methodology disclosure

Implications for the GHG Protocol

Most large companies choose to disclose emissions in line with the Greenhouse Gas (GHG) Protocol standards. The Protocol notes that more than 9 in 10 Fortune 500 companies choose to report to CDP using their standard. Under the GHG protocol, homeworking is currently an optional disclosure covered in the Employee Commuting (Category 7) section:

> "Companies may include emissions from teleworking (i.e., employees working remotely) in this category."

In the past, most reporting companies have chosen not to disclose homeworking emissions in this manner due to difficulties in sourcing data on which to base emissions calculations and a previously justifiable assumption that this would not be as material as other elements. It will be difficult to maintain this assertion without due process, following the significant shift to homeworking that has occurred for many in 2020.

Additionally, whilst the GHG protocol notes where to disclose these emissions, it does not provide a methodology for this quantification.

EcoAct's methodology seeks to support the GHG protocol by providing a standard approach which businesses can cite in their disclosure(s).

Implications for reporting on 2020 emissions reductions

In 2020, reporting companies will likely find themselves demonstrating a notable change in Scope 1 and 2 emissions from operations where colleagues are now working remotely. Organisations may see decreases in emissions due to empty premises, though this may be offset by increasing energy requirements in buildings kept active, through additional ventilation requirements for example.

This presents two possible issues for the reporting company:

1. Any movement in reported Scope 1 and 2 emissions will be linked to the change in operational activities seen in 2020. This could mask the impacts of any genuine GHG emission reductions activities by the reporting company.
2. A reporting company may find themselves having to justify a smaller energy reduction than others in their sector because they have seen a lesser impact from coronavirus (through keeping offices open, with higher air-flow requirements, rather than closing buildings completely for example).

In either circumstance, it is in the reporting company's best interest to properly quantify the emissions impacts of changing operational practices.

We believe in order to provide a credible comparison of year on year performance, homeworking emissions should be recognised. EcoAct hope to offer a clear and consistent methodology to be referenced by reporting companies.

"Lloyds Banking Group has committed to support the UK tackle climate change by helping to finance the transition to a sustainable, low carbon economy. Reducing the environmental impact of our own operations is an important part of our approach and since 2009 we have reduced our operational carbon emissions by 63%. Even before the impact of the Covid-19 pandemic, we have supported an agile approach for our colleagues, enabling them to work from home and look at different working patterns.

"While the Covid-19 pandemic has resulted in a further reduction in our carbon emissions, most notably through less travel, we recognise the need to balance this against the additional emissions caused by colleagues working from home. This report is a valuable step in navigating the challenge of measuring carbon emissions associated with home working and supports organisations in taking action to tackle the threat of climate change."

Fiona Cannon,
Group Sustainable Business Director,
Lloyds Banking Group

LLOYDS BANKING GROUP

Methodology

In order to properly account for home working emissions, energy use from office equipment, home heating and cooling (where appropriate), which would not have occurred in an office-working scenario should be accounted for. We will refer to this as the incremental energy.

Table 1: WFH Calculation Scope

Office equipment

Base Case	Enhanced Case
Account for 100% of colleagues known to be homeworking through the stated estimation methodology.	Account for actual equipment in use data where possible, utilising procurement or colleague survey data where practical (specific numbers of laptops/PCs/Monitors etc).

Heating energy

(e.g. Natural gas, electricity or other combustion fuel)

Base Case	Enhanced Case
Account for a typical home's heating energy requirement as noted within the country of operation.	Account for shared occupancy, considering other home workers or other occupants typically home during working hours.

Cooling energy

(e.g. Air conditioning where regionally appropriate)

Base Case	Enhanced Case
Account for a typical home's cooling energy requirement as noted within the country of operation.	Account for shared occupancy, considering other home workers or other occupants typically home during working hours.

Working hours & days

The first variable which must be determined is therefore the hours during which the incremental energy must be calculated. We have assumed a standard 5-day, 40hr week (8hr/day). Incremental energy should not be calculated for periods of annual leave, therefore the UK's statutory 28-days (4-weeks) of annual leave entitlement is deducted from the base case calculation of working hours:

48 (working weeks) * 5 days per week = 240 working days per year

240 (days/year) * 8 hours = 1,920 working hours per year [WHpa]

1,920 Working Hours / 12 = 160 working hours per month [WHpcm]

Note: where an organisation offers different working hours per day/days per year, these should be used instead.

It is expected that in most cases, organisations will not have detailed information on their employee's homeworking environment, therefore the base case for calculation of homeworking emissions will be a "pure estimation" using reference data and assumptions. Where the calculated homeworking emissions represent a material proportion of an organisation's footprint, the calculation can be improved with the use of internally sourced data.

Office Equipment Emissions - Base Case

While the power consumption of laptops, secondary screens, printers (where available) and lighting will vary considerably, the average "in use" power load per desk has been calculated in CIBSE Guide F (2012) as 140W. This allows for a laptop or PC, monitor, phone and printer. It is worth noting that taking this average value also allows for significant variation in the equipment which may be in use across the workforce. This is the most up to date version of the CIBSE design guide available, and from our initial survey remains applicable for 2020.

The use of lighting in the home office should also be accounted for, though this is again an area which is subject to extreme variation. In a home environment it is likely that the lighting will not be in use for all "office hours" as our homes typically benefit from good levels of natural light. However, there is a vast range of light fittings and associated wattages which could be in use. For the purposes of this methodology, we have assumed an allowance of 10 Watts for lighting throughout the year.

It is recognised that there is likely to be some additional electricity consumption which could arise through supplementary heating or cooling e.g. desk fans or small portable heaters (instead of using the whole house heating system) but due to the high degree of variability expected, coupled with the low statistical proportion of homes (approximately 3%) reported to use portable electric heating, this is not included within the base case estimation. It is recommended that, where employee homeworking emissions are deemed to be material to an organisation's footprint, consideration is given to these additional variables through an internal staff survey to collect specific data.

[A] 140W * # Homeworking FTE * WHpa / 1000 = Workstation kWh

[B] 10W * # Homeworking FTE * WHpa / 1000 = Lighting kWh

[A] + [B] = Total Electricity

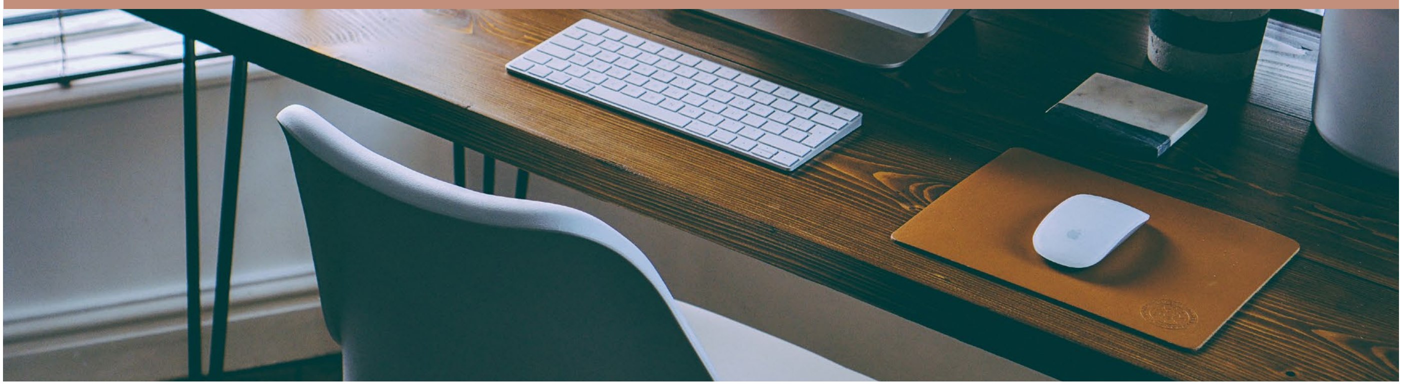
Note: EcoAct use the term Homeworking FTEs to distinguish the number of days worked from home by colleagues. For example, a colleague who works from home 2 days per 5-day week would represent 0.4 Homeworking FTEs, and a fulltime homeworker would represent '1'.

Where an organisation sees significant movement in the proportion of Full Time Equivalent (FTE) homeworking on a monthly basis, the above calculation can be applied on a monthly basis by using WHpcm in place of WHpa. Alternatively, where the proportion of employees who are homeworking doesn't change significantly, an annual calculation can be performed.

Once total electrical energy has been determined, it is possible to calculate emissions by multiplying appropriately sourced emissions factors to represent the corresponding country's grid average factor, in line with the location-based methodology. This is noting that the reporting company, in most circumstances, will not have the required operational or financial control to mandate colleagues opt for low-carbon tariffs available on the market that would otherwise justify the market-based approach.

Table 2: Office equipment summary

	Base Case Assumptions	Enhanced data collection
1	Working hours 1,920WHpa or 160WHpcm (40hr week, 48 working weeks)	Company specific contract hours & working days (considering annual leave allowance)
2	Workstation 140W per desk (CIBSE Guide F - 2012)	Internal records for standard issued equipment (laptop/tablet/screen). Number of devices and typical "in use" power consumption. Or Staff Survey to confirm typical equipment in use. Data from respondents apportioned across non-respondents
3	Lighting 10W per desk	Staff Survey to confirm typical equipment in use. Data from respondents apportioned across non-respondents.
4	Supplemental electric heating/cooling. Not calculated in the base case, but consideration recommended in any more detailed review.	
5	Grid Average GHG emissions factor.	Staff Survey to confirm proportion of colleagues purchasing Green energy at home. Used to support Market-Based reporting and/or the encouragement of green tariff take up.



Heating Energy Emissions - Base Case

Without entering into a sizeable data collection effort, calculating the likely impact of homeworking on heating-related emissions must rely on reasonable assumptions. In this model we have assumed that heating cannot generally be restricted to a small working area and that time spent at home during the heating season requires the whole heating system to be active.

UK Region

In 2020 OFGEM updated their published Typical Domestic Consumption Values in line with the previous 2 years of data. This gives a reliable "typical - medium" expectation of 12,000kWh per year for domestic gas usage, of which research has shown that approximately 77% of annual gas usage in a home is attributed to heating. We will use this statistic as a proxy for unspecified heating energy. It is important to recognise that while there will always be outliers, most homes are not heated 24 hours a day during the heating season. Energy suppliers in the UK suggest that an average of 10 hours per day during the heating season is common. Recognising that the proportion of employees who are homeworking may well vary from month to month, the calculation of heating demand is restricted to the widely recognised northern hemisphere heating season of October to March (6 months / 182 days) and a monthly calculation approach is taken.

182 days * 10 hours heating
= 1,820 hours

(12,000kWh * 77%) / 1,820 hours
= c.5 kWh per hour

In 2020, NatWest Group published an internal staff survey to review homeworking practices. The survey covered circa 1,000 colleagues and found that approximately one third reported that their living arrangements included at least one household member who would normally remain at home during the day, prior to the impact of Covid-19. Therefore 66.7% of colleagues moving to homeworking would result in incremental heating energy. To calculate this, we then use the following formula:

160WHpcm * 5kWh = 800kWh
Incremental heating consumption per Homeworking FTE per month

800kWh * (Homeworking FTE * 66.7%)
= Total Incremental gas consumption per month (UK)

Domestic sector heating in the UK is primarily delivered through natural gas systems, with only a small proportion of homes relying on either oil or electricity for their heating. Thus, for the purposes of this methodology, natural gas is the only heating fuel considered for the UK in the base case estimation due to materiality.

USA Regions

Due to the size of the country, the regional variations in energy use in the US are much more significant. We therefore recommend that energy estimations in the US are conducted at least at a regional or divisional level. The latest statistics published by the Energy Information Administration (EIA) indicate that circa 50% of homes in America use natural gas for heating.

We have sourced the following regional/divisional average gas usage values from the EIA.

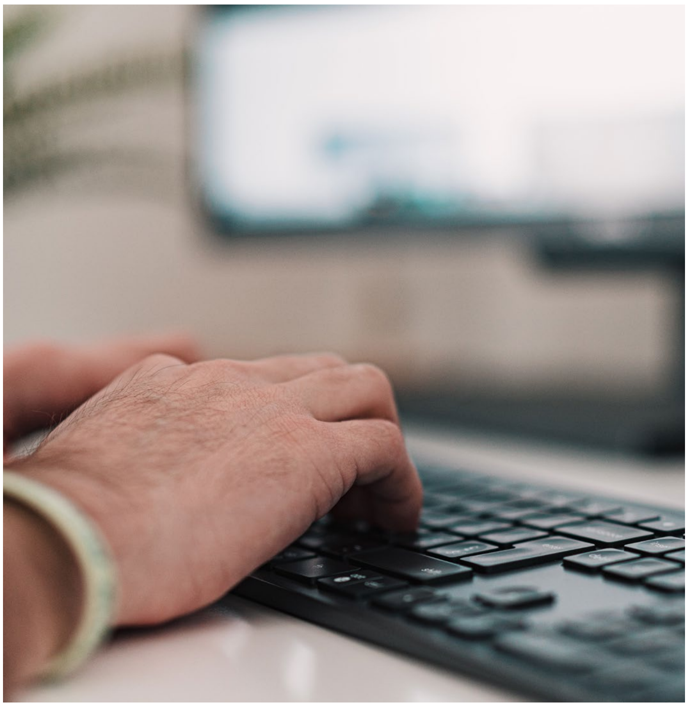


Table 3: US divisional average heating gas consumption

Census region and division	Average annual gas consumption - Space Heating (kWh)	Average hourly heating demand (kWh)
Northeast	9,616	5.28
New England	6,087	3.34
Middle Atlantic	10,900	5.99
Midwest	14,093	7.74
East North Central	15,225	8.37
West North Central	11,623	6.39
South	3,520	1.93
South Atlantic	3,394	1.86
East South Central	3,394	1.86
West South Central	3,775	2.07
West	4,957	2.72
Mountain	9,117	5.01
Mountain North	13,016	7.15
Mountain South	5,310	2.92
Pacific	3,000	1.65

(Taken from Table CE4.1 Annual household site end-use consumption by fuel in the U.S.—totals, 2015)

The average hourly heating demand is then calculated using the aforementioned typical northern hemisphere heating season. It is recognised that the precise heating seasons may vary, normalising to the same set of "heating season hours" and then "heating season - working hours" creates consistency in the approach. The regional variations in average consumption will be reflected in the resulting incremental energy use calculated.

Incremental gas consumption per month can be calculated for the employees in each region, by following the same formula as presented above.

For the remaining 50% of homes which do not use natural gas, we have assumed that their heating is provided via electricity, with other fuels representing too small a proportion to be material to the base case assumption.

We have sourced the following regional/divisional average gas usage values from the EIA:

WHpcm * Regional Avg Heating demand (gas) * (Homeworking FTE per region * 50%) * 66.7%1

= Incremental gas consumption per month

Table 4: US Divisional Average Heating Electricity Consumption

Census region and division	Average annual electricity consumption - Space Heating (kWh)	Average hourly heating demand (kWh)
Northeast	952	0.52
New England	536	0.29
Middle Atlantic	1,104	0.61
Midwest	1,477	0.81
East North Central	1,381	0.76
West North Central	1,687	0,93
South	2,207	1,21
South Atlantic	2,000	1,10
East South Central	2,917	1.60
West South Central	2,101	1,15
West	1,136	0,62
Mountain	941	0,52
Mountain North	952	0,52
Mountain South	930	0,51
Pacific	1,229	0,68

(Taken from Table CE4.1 Annual household site end-use consumption by fuel in the U.S.—totals, 2015)

Note: the power demand associated with electrical heating is lower than with combustion-based systems due to the higher coefficient of performance typically seen in electrical heating technologies.

The average hourly heating demand is then calculated using the aforementioned typical northern hemisphere heating season. Heating demand varies significantly by region across the United States.

Incremental electricity consumption per month can be calculated for the employees in each region, by following the same formula as presented above. Namely:

WHpcm * Regional Avg Heating demand (elec) * (Homeworking FTE per region * 50%) *66.7%1

= Incremental electricity consumption per month

Once total heating energy has been calculated, it is possible to determine emissions by multiplying appropriately sourced emissions factors in line with typical heating energy usage in that country. For example, in the UK most heating energy will be from natural gas combustion, therefore we would suggest multiplying this incremental heating energy by a natural gas emissions factor (GCV). However, in other countries it will be more applicable to apply a district heating, electric or alternative fossil fuel emissions factor.

"As our ways of working continue to change through this pandemic and beyond, it is essential that companies understand the full impact such changes are having on their carbon emissions.

"This year we announced ambitious targets to reduce our climate impact, which include making our operations net zero by the end of 2020. Homeworking emissions are currently excluded from our footprint calculations due to the historic lack of a clear methodology and the associated data collection challenges. Given the significant shift in working patterns seen in 2020, we feel it is important to be able to assess the materiality of the displaced emissions, enabling us to make better decisions about how we tackle them in the future."

NatWest Group

Table 5: Heating Summary

	Base Case Assumptions	Enhanced data collection
1	Working hours 160WHpcm (applied Oct - Mar in the UK)	Company specific contract hours & annual leave allowance
2	Heating per hour 5kWh (gas) per Homeworking FTE (UK) (Avg annual heating consumption Avg annual heating hours) See Tables for USA Regional values	Staff Survey to confirm typical home energy use and shared occupancy. Where shared occupancy arises and other occupants are "homeworking" companies should report a proportional share of emissions. Where other parties are "stay at home" (e.g. stay at home parent/carer) companies can exclude heating emissions on account of zero increment. Data from respondents apportioned across non-respondents

Cooling Energy Emissions - Base Case

Without entering into a sizeable data collection effort, calculating the likely impact of homeworking on cooling-related emissions must rely on reasonable assumptions. In this model we have considered the regional variations in the typical air conditioning equipment installed in homes in the United States. It should be noted that for emissions in the UK, no allowance is expected for air conditioning as this is highly uncommon in the domestic environment.

Air conditioning usage is subject to significant regional variations, therefore any calculation of emissions arising from the use of air conditioning should be applied at a regional level. In the US, availability of air conditioning in homes has been rising steadily, with a recent survey reporting 90% of homes having access to air conditioning. There are then two main types of air conditioning system to consider; central or window/wall units. Window/wall units can be expected to be controlled locally as required, while central systems may be connected to a programmable thermostat.

Table 6: US Regional Average Domestic AC Use

Finally, the EIA have published a study showing the proportion of homes which will leave their "central" air conditioning system running all summer rather than using a programmable thermostat to adjust according to needs. The number of Homeworking FTE in any region, should then be split according to the following percentages:

For Example, if there are 100 Homeworking FTEs in the Northeast, then 90 have air conditioning at home. 40 would be using a central system (44% of 90), 14 would be using central air-con which is on all summer (35% of 40), 26 FTEs would have an air conditioning system with a programmable control (65% of 40). Finally, 50 FTE will be using individual units (56% of 90).

Incremental energy use for air conditioning while homeworking can then be calculated for the proportion of Homeworking FTE falling into the last two columns, where "as needed" local control is expected. It should be noted that central AC systems typically use more energy per hour (3.5kW/hr) than smaller, localised window or wall units (1.4kW/hr).

Census region	FTE having A/C at home	% using central system	central: on all summer	central: programme controlled	% using individual units
Morthwest	90%	44%	35%	65%	56%
Midwest	90%	76%	37%	63%	24%
South	90%	85%	67%	33%	15%
West	90%	74%	38%	62%	26%

In the US, the cooling season is typically accepted as the summer months, from June to September. Therefore the following monthly calculation should be applied to those months.

For Homeworking FTEs using central systems:

WHpcm * 3.5 kWh

= Incremental cooling electricity (central) per month, per Homeworking FTE

For FTEs using individual units:

WHpcm * 1.4 kWh

= Incremental cooling electricity (individual) per month, per Homeworking FTE

The above formula represents a base case estimation only scenario. Where it is material to a reporting company's footprint, the above calculation can be refined with the use of specific data obtained (primarily through a staff survey), confirming the systems in use in colleagues' homes and the typical hours of use.

Measure to reduce

Once homeworking emissions data has been determined using the above methodology and where materiality assessment indicates further review would be worthwhile, there are several ways to reduce emissions. The options below are provided not as an exhaustive list, but as a suggested starting point. They also have wider benefits for climate related employee engagement and wider employee satisfaction.

- Providing energy efficiency training for colleagues &/or personal carbon footprint analysis and advice.
- Encouraging colleagues to move to LEDs, possibly through subsidised schemes.
- Purchasing renewable energy certificates equivalent to estimated electricity and thermal energy purchases.
- Encouraging colleagues to switch to renewable energy tariffs for their home energy.
- Investing in more energy efficient technology for colleagues WFH. This could involve setting green procurement requirements for all new laptops, monitors and other technology.
- Incentivising colleagues to move to more energy efficient heating and cooling systems.

Concluding thoughts

We're facing a fundamental shift in how we do business and with the growing attention on companies to address climate change across their full value chains, it is anticipated that corporates will be expected to fully and robustly account for the impacts of increased homeworking.

It is vitally important that we don't ignore what is potentially a significant emissions source for many companies, and in so doing, undermine any climate progress being made which could jeopardise our urgent global goals.

We acknowledge that this methodology is imperfect and reliant upon estimated emissions. As with all Scope 3 emissions, there are challenges of data collection and measurement to overcome. However, we believe this to be a robust first step towards better understanding the full GHG emissions impact of today's business operations.

We welcome and encourage all corporates to further develop and validate this methodology, through active implementation and data collection via colleague surveys, and to play a role its ongoing evolution.

Whitepaper

Your climate experts.
Your partner for positive change.

EcoAct, an Atos company, is an international consultancy and project developer, dedicated to helping businesses and organisations succeed in their climate ambitions. We simplify the challenges associated with environmental sustainability, remove complexity and empower individuals and teams to deliver bespoke solutions for a low carbon world.

Our experience tells us that climate action and commercial performance are no longer mutually exclusive. Our mission is to lead the way in delivering sustainable business solutions that deliver true value for both climate and client.

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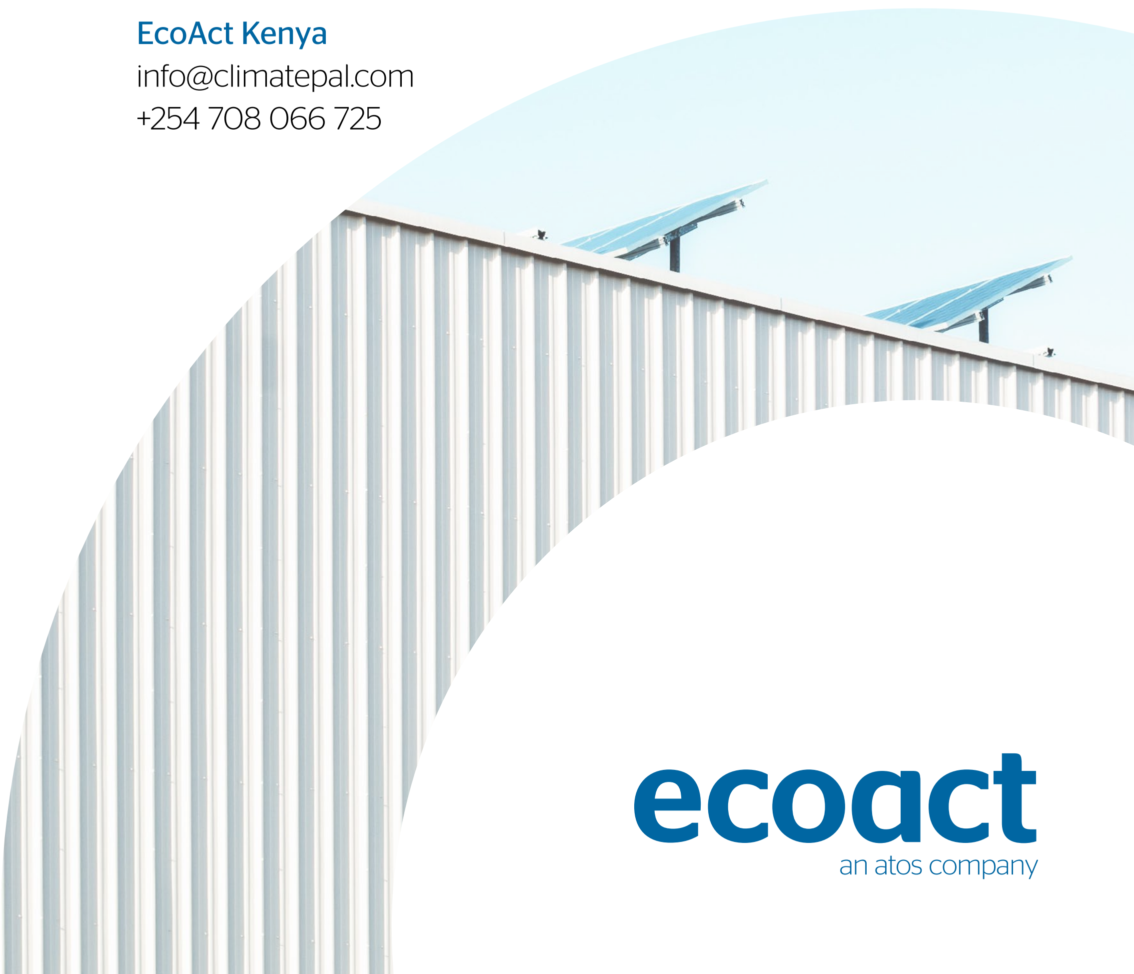

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