THE CHURCH OF ENGLAND
RESEARCH & STATISTICS

# Energy Footprint Tool 2020

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# The Energy Footprint Tool in 2020

Building on the success of the Energy Footprint Tool in its inaugural year, I am pleased to present the 2020 edition. It has been a busy year for everyone involved: a Covid/lockdown adjustment has been created, which will allow for a sensible comparison to previous and future years due to the periods of 2020 where buildings will have been closed. There has also been the introduction of the ability to list renewable "green" gas and to note that energy has already been offset by energy providers.

2020 will also be the first year that the expanded Church of England Energy Toolkit will be used. This is a program created by the Research and Statistics team to measure the carbon footprints of all in-scope buildings within the Church of England. This will enable the General Synod to monitor progress towards the target of net zero emissions by 2030.

In other exciting news, the Energy Footprint Tool has been recognised within the sector, winning "Digital Innovation of the Year: Services" at The Energy Awards 2021. This annual ceremony celebrates the achievements of the energy industry from energy professionals, suppliers, brokers, and technology providers. The judges stated that the Energy Footprint Tool would be crucial in making the net-zero carbon by 2030 target possible, and that without it, knowing whether the target had been met would be impossible. They finished with "Helping those not overly familiar with this topic is essential to getting positive changes made and this project clearly shows the benefits of taking action".[1]

A large thank you goes to Brian Cuthbertson in the Diocese of London, for aiding the creation and the development of the tool.

It is with thanks to all of our diocesan colleagues and those who work and volunteer in our churches that we are able to present these reports, with an encouraging response rate, especially given the incredibly difficult circumstances that everyone has faced in the previous few years.

Finally, congratulations are for dioceses that have performed remarkably this year:

Top Three Response Rates:

- Winchester (58.1%)
- Truro (57.9%)
- Leeds (50%)

Top Three Most Improved Dioceses:

- Winchester (+34%)
- Oxford (+19%)
- Hereford (+17%)

## Commentary from the Diocese of Winchester

"As Christians we have a collective responsibility to care for God's creation and work together across communities and nations to tackle the climate crisis. The recent climate change conference brought into focus the urgency of the situation, but it also demonstrated how we cannot wait for others to act before we do so ourselves. While we are encouraged by nations coming together to solve these issues, this report shows the power of individual communities in caring for God's creation. We can all make a difference, and so I am very proud of the efforts that are being taken in parishes across our Diocese to turn the tide on climate change. Every church counts, as does every action.

There is much left to do. The adjusted total net carbon footprint for the Church of England's Church Buildings in 2020 remains equal to 2019. But there is also much to celebrate. The number of churches reaching net zero in carbon output has increased by 4% since 2019, and almost a third of all churches are using renewable electricity tariffs. I would like to thank churches across the Diocese of Winchester and the Church of England for their continued determination and faith. By caring for the world around us we are living out an essential part of our duty as Christians to love our neighbours and follow God faithfully."

**The Right Reverend Debbie Sellin, Bishop of Southampton**

[1] *The Energy Awards 2021:* The Winners, written by H&V News & RAC (2021)

# Executive Summary

## Carbon Footprints

- It is estimated that the total net carbon footprint for the Church of England's church buildings (based on energy use alone) in 2020 was around 137,000 tonnes of greenhouse gases, measured in tonnes of carbon dioxide equivalent or $tCO_2e$.
    - This consists of an estimated 118,000 tonnes from church buildings alone. An additional 19,000 tonnes were estimated for church halls and "other church buildings".
- This figure is 27% smaller than the comparable figure from the 2019 Energy Footprint Tool Report.
- Covid/Lockdown adjustments would suggest that if 2020 was a normal year, without periods of lockdown, there would not be a drop in CO2e nationally at all. The Covid/lockdown adjusted total net carbon footprint for the Church of England's Church Buildings in 2020 would be 189,000 tonnes (163,000 tonnes for church buildings alone, and 26,000 tonnes from church halls and "other church buildings"), almost exactly the same as the figure given in the 2019 Energy Footprint Tool Report.

## Church size and location

- The size and location of the church building still has a large impact on its carbon footprint: generally, the larger the church means the larger the carbon footprint, and churches in urban parishes have a much larger carbon footprint than those in rural parishes.
- The top 12% of church buildings by size account for almost a third of the carbon footprint for all churches.

## Energy Types

- The most common types of energy used in church buildings were electricity (31%) and a mixture of electricity and gas (44%).
- A mixture of electricity and gas was the energy type associated with the largest average carbon footprint, though this was also the most common energy type used by urban, large-sized and high-usage buildings.
- Electricity alone was the energy type associated with the smallest average carbon footprint, though this was also the most common energy type used by rural, small-sized and low-usage buildings.
- 7% of churches had net zero carbon, up from 4% in the 2019 Energy Footprint Tool Report.
- 31% of sampled churches stated that they are using renewable electricity tariffs (though only 18% are using the pre-accredited suppliers), while 11% of sampled churches stated they are using renewable gas tariffs (with only 2% using the pre-accredited suppliers).
- Almost 2% of sampled churches were using on-site solar panels, while fewer than 1% of churches were using wood chips, pellets, or alternative heating technologies.

## Responses

- 4,700 churches engaged with the 2020 Energy Footprint Tool, down from 5,900 (38%) churches in 2019.
- 3,600 (24%) submitted usable data, down from 4,400 (28%) in 2019.

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## Response Rates

### Nationally

The Energy Footprint Tool officially opened in April 2021 and data collection ran until the beginning of October 2021.

In the second year of the Energy Footprint Tool, collecting data for 2020, 4,700 churches (31%) engaged with the tool, 3,800 (24%) of which, submitted their data. Of those that submitted their data 200 (5%) could not be used in this analysis as the returns offered no data (for example, they would state that the church used electricity and gas but then write "unknown" for both kWh and annual cost of energy). This left 3,600 churches with usable data (23% of all churches).

Of the 3,800 churches that submitted their data, 600 (16%) suggested that they had an extra building to enter data for, however, only 500 (13%) of these supplied energy data for the "other building".

Table 1 shows a breakdown of response rates across dioceses.

### Comparison to 2019 Response Rates

There was an overall drop in response rates between 2019 and 2020, where 5,900 churches (38%) engaged with the tool and 4,700 (30%) submitted their data, and 4,400 (28%) had usable data.

This is most likely due to 2020 being an exceptional year – periods of lockdowns and church closures may have meant that churches did not necessarily see the value in entering data for the year, as it would be so variable to the norm.

However, Figure 1 shows that during the period when the tool was open for responses, response rates for the Energy Footprint Tool for 2020 data were better throughout the period, except for the last few weeks. The major difference here is that in 2019 the Research and Statistics team sent out an automatic reminder to every church that had not used the tool, letting them know that the deadline was coming up – this generated 2,100 submissions in the final three weeks. It was decided that for 2020 dioceses should make the choice as to whether they wanted these automatic reminders to be sent out – only six dioceses took up this option. This led to only 850 submissions in the final three weeks in this period, 600 (71%) of which came from the six dioceses that chose to use the reminder function. This means that the average response rate in those final three weeks from a diocese that used the reminder function was an extra 100 submissions, compared to just 8 submissions on average for a diocese that did not use the reminder function.

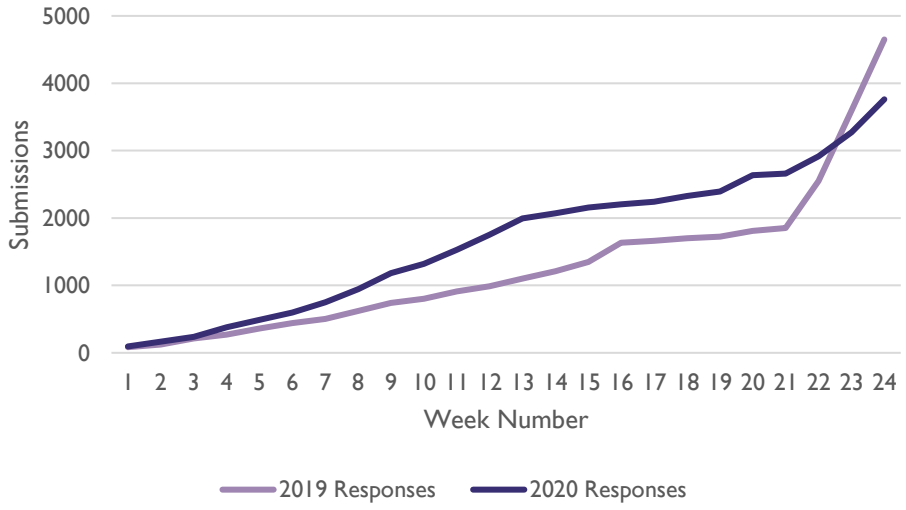


*Figure 1*. The number of churches submitting their Energy Footprint Tool data over time for 2019 and 2020 data collection periods.

## Diocesan Breakdown

Table 1: *Diocesan Breakdown of 2020 Response Rates, as well as their comparison to submitted data in 2019.*

| Code | Diocese | Number of Churches | % Engaged 2020 | % Submitted 2020 | % Change from 2019 |
|---|---|---|---|---|---|
| 1 | Bath & Wells | 558 | 14 | 9 | -17 |
| 2 | Birmingham | 182 | 57 | 49 | +15 |
| 3 | Blackburn | 270 | 17 | 13 | -9 |
| 5 | Bristol | 200 | 45 | 36 | -14 |
| 6 | Canterbury | 359 | 23 | 13 | -20 |
| 7 | Carlisle | 329 | 45 | 40 | +9 |
| 8 | Chelmsford | 575 | 16 | 13 | -2 |
| 9 | Chester | 341 | 19 | 13 | -9 |
| 10 | Chichester | 473 | 55 | 46 | +10 |
| 11 | Coventry | 241 | 51 | 43 | +4 |
| 12 | Derby | 311 | 23 | 15 | -7 |
| 13 | Durham | 263 | 22 | 15 | -10 |
| 14 | Ely | 328 | 24 | 17 | -10 |
| 15 | Exeter | 594 | 13 | 9 | -18 |
| 16 | Gloucester | 380 | 29 | 22 | -17 |
| 17 | Guildford | 210 | 31 | 26 | +4 |
| 18 | Hereford | 401 | 49 | 43 | +17 |
| 19 | Leicester | 310 | 13 | 8 | -16 |
| 20 | Lichfield | 543 | 13 | 9 | -2 |
| 21 | Lincoln | 624 | 13 | 9 | -21 |
| 22 | Liverpool | 234 | 12 | 11 | -15 |
| 23 | London | 471 | 59 | 47 | +6 |
| 24 | Manchester | 315 | 37 | 29 | +3 |
| 25 | Newcastle | 237 | 37 | 30 | -9 |
| 26 | Norwich | 638 | 15 | 11 | -7 |
| 27 | Oxford | 809 | 49 | 42 | +19 |
| 28 | Peterborough | 378 | 21 | 14 | -9 |
| 29 | Portsmouth | 166 | 35 | 22 | -1 |
| 31 | Rochester | 258 | 23 | 14 | -16 |
| 32 | St. Albans | 406 | 15 | 15 | -6 |
| 33 | St. Edms & Ipswich | 478 | 25 | 20 | +1 |
| 34 | Salisbury | 564 | 19 | 13 | -16 |
| 35 | Sheffield | 207 | 20 | 15 | -20 |
| 36 | Sodor & Man | 37 | 8 | 3 | -53 |
| 37 | Southwark | 354 | 49 | 28 | +4 |
| 38 | Southwell & Nottingham | 295 | 19 | 14 | -15 |
| 39 | Truro | 299 | 59 | 58 | +15 |
| 41 | Winchester | 356 | 58 | 58 | +34 |
| 42 | Worcester | 273 | 47 | 40 | -8 |
| 43 | York | 581 | 28 | 21 | -2 |
| 46 | Leeds | 592 | 59 | 50 | -4 |
| | **Nationally** | **15,440** | **31** | **24** | **-4** |

# National Carbon Footprints of Church Buildings

## Carbon Footprint of Churches

It is estimated that the total net $CO_2e$ emitted from Church of England church buildings in 2020 was around 118,000 tonnes (with around 120,000 tonnes gross $CO_2e$).

These figures are based on the 3,600 churches whose data were submitted in the Energy Footprint Tool, which had a total of 28,500 tonnes of net $CO_2e$. Of this selection, 250 (7%) had net zero carbon (or lower). Of those with net zero carbon, just under 80% were using 100% renewable electricity tariffs while just over 20% suggested that no energy had been used in the building at all.

An estimation process was used to account for the carbon footprints of churches from which we did not receive data. This process estimated carbon footprints based on a variety of factors, including diocese, building size, whether the church was rural or urban, and utility bills retrieved from parish finance data.

A diocesan breakdown of the carbon footprints within the Energy Footprint Tool data, as well as the estimated total net and gross carbon footprints for just church buildings can be found in Table 2.

## Carbon Footprint of "Other Church Buildings"

The total estimated net $CO_2e$ emitted from Church of England church halls and other buildings in 2020 is around 19,000 tonnes (with around 22,000 tonnes gross $CO_2e$).

As mentioned previously, 500 churches supplied meaningful data for "other buildings". Of these 500 other buildings, a total of 3,800 tonnes of net $CO_2e$ (4,100 gross tonnes $CO_2e$) was emitted. 20 buildings (4%) had net zero carbon or less.

To give a meaningful estimate for church halls and other buildings, we need to also account for the 100 churches that stated they had an "other building" but did not provide data for it. When accounting for these, it is suggested that of the 3,600 churches that supplied data, it is estimated that "other buildings" account for 4,700 tonnes of net $CO_2e$ (5,000 gross tonnes $CO_2e$).

This is currently the best estimate that we can make for the carbon footprint of "other buildings", the number of church halls nationally is not known, so therefore this national estimate is less reliable than that of the church buildings, where the total number and most building sizes are known. Both estimation processes for 2019 and 2020 data collection currently suggest that there are around 3,000 "other church buildings" nationally.

## Covid/Lockdown Adjustment

In order to sensibly compare 2020 data to previous and future years, a Covid/lockdown adjustment is required to account for the times that buildings will have been closed for lockdowns and Covid outbreaks.

This adjustment gives an overall comparable estimate of the total net CO2e emitted from Church of England church buildings is around 163,000 tonnes (with around 166,000 tonnes gross CO2e). While the lockdown adjusted estimate for "Other Church Buildings" is around 26,000 tonnes of net CO2e (30,000 gross tonnes CO2e).

The 'Covid/lockdown adjustment factor' used to give the above figures was identified by a piece of work looking at a sample of 150 churches and other church buildings that have used the same energy suppliers in 2019 and 2020, with similar proportions of energy used.

## Comparisons with Previous Reports

The information provided on the church buildings and "other church buildings" would suggest that the total net $CO_2e$ footprint for both nationally would be around 137,000 tonnes $CO_2e$ (with a lockdown adjusted figure of 189,000 tonnes $CO_2e$). Figure 2 highlights how this compares to previous audits.

- The Church of England carbon management project[2] estimated the total footprint (both net and gross $CO_2e$) for the Church of England church buildings and halls to be 212,000 tonnes for 2006.
- The Energy Audit Report 2012/13[3] estimated the total footprint for Church of England church buildings alone to be between 237,000 tonnes and 395,000 tonnes, with church halls estimated to be between 6,000 and 11,000 additional tonnes.
- The Energy Footprint Tool 2019[4] estimated the total net footprint for Church of England church buildings and halls to be 187,000 tonnes.

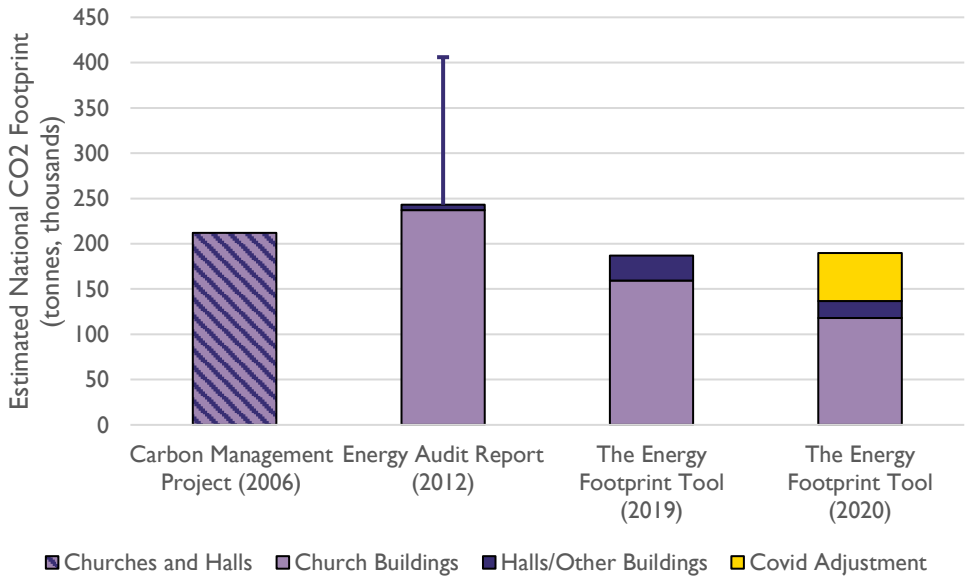


*Figure 2.* Estimates for the total carbon footprint of church buildings in the Church of England, compared with previous estimates. The error bar for the 2012 Energy Audit Report represents the maximum values according to the analysis.

The findings from the Energy Footprint Tool in 2020 suggests a 27% drop (50,000 tonnes) in CO2e between 2019 and 2020. However, this is in a year where many churches were closed for significant periods of time. Covid/Lockdown adjustments would suggest that if 2020 was a normal year without periods of lockdown, there would not be a drop in CO2e nationally at all.

## Offsetting

The combined net footprint for churches, church halls and other buildings from the 3,600 submissions totals 32,300 CO2e. Of this, 1,800 tonnes CO2e (6%) has reportedly already been offset by their energy supplier as part of their tariff. However, it is not currently reasonable to extrapolate this figure any further upwards as it is more likely that those churches that are on renewable tariffs or tariffs that offset their energy are more likely to use the Energy Footprint Tool.

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[2] *Church of England carbon management project implementation plan*, conducted by Faber Maunsell (2007)
[3] *Energy Audit Report 2012/13*, written by Kate Symonds as part of the Shrinking the Footprint Energy Audit. Available from https://www.churchofengland.org/sites/default/files/2018-11/CCB_Energy-Audit-Report-2012-13_Sep-2013.pdf
[4] *Energy Footprint Tool 2019*, written by Dr Samuel Nunney, as part of the Research and Statistics team for the Church of England. Available from https://www.churchofengland.org/about/research-and-statistics/key-areas-research

## Diocesan Net Carbon Footprint for church buildings

Table 2: *Net carbon footprints for church buildings' energy usage, calculated from EFT data and a total estimated net and gross carbon footprint by Diocese.*

| Code | Diocese | 2020 Total Estimated Net CO2 (Tonnes ) | 2020 Total Estimated Gross CO2 (Tonnes) | 2019 Total Estimated Net CO2 (Tonnes) | 2020 Covid/Lockdown Adjusted Net CO2 (Tonnes) |
|---|---|---|---|---|---|
| 1 | Bath & Wells | 2,700 | 2,700 | *3,700* | 3,700 |
| 2 | Birmingham | 2,300 | 2,400 | *2,800* | 3,200 |
| 3 | Blackburn | 2,800 | 2,800 | *3,900* | 3,900 |
| 5 | Bristol | 2,000 | 2,000 | *2,400* | 2,800 |
| 6 | Canterbury | 2,400 | 2,500 | *3,500* | 3,300 |
| 7 | Carlisle | 1,800 | 1,800 | *2,500* | 2,500 |
| 8 | Chelmsford | 4,400 | 4,400 | *5,800* | 6,100 |
| 9 | Chester | 3,300 | 3,400 | *5,300* | 4,600 |
| 10 | Chichester | 4,000 | 4,100 | *5,900* | 5,500 |
| 11 | Coventry | 1,800 | 1,800 | *2,400* | 2,500 |
| 12 | Derby | 2,200 | 2,300 | *3,000* | 3,000 |
| 13 | Durham | 2,400 | 2,400 | *3,300* | 3,300 |
| 14 | Ely | 1,900 | 1,900 | *2,300* | 2,600 |
| 15 | Exeter | 3,200 | 3,200 | *4,200* | 4,400 |
| 16 | Gloucester | 1,900 | 1,900 | *2,600* | 2,600 |
| 17 | Guildford | 2,600 | 2,600 | *3,500* | 3,600 |
| 18 | Hereford | 1,200 | 1,200 | *1,600* | 1,700 |
| 19 | Leicester | 2,100 | 2,100 | *2,600* | 2,900 |
| 20 | Lichfield | 4,500 | 4,500 | *5,800* | 6,200 |
| 21 | Lincoln | 2,500 | 2,600 | *3,300* | 3,500 |
| 22 | Liverpool | 2,800 | 2,900 | *3,700* | 3,900 |
| 23 | London | 8,900 | 9,100 | *12,500* | 12,300 |
| 24 | Manchester | 4,000 | 4,100 | *5,300* | 5,500 |
| 25 | Newcastle | 1,800 | 1,800 | *2,500* | 2,500 |
| 26 | Norwich | 2,400 | 2,400 | *3,100* | 3,300 |
| 27 | Oxford | 5,400 | 5,600 | *7,600* | 7,500 |
| 28 | Peterborough | 2,200 | 2,200 | *2,800* | 3,000 |
| 29 | Portsmouth | 1,500 | 1,500 | *1,900* | 2,100 |
| 31 | Rochester | 3,100 | 3,100 | *3,800* | 4,300 |
| 32 | St. Albans | 3,700 | 3,700 | *4,700* | 5,100 |
| 33 | St. Edms & Ips | 1,800 | 1,800 | *2,200* | 2,500 |
| 34 | Salisbury | 2,700 | 2,800 | *3,700* | 3,700 |
| 35 | Sheffield | 2,100 | 2,200 | *2,900* | 2,900 |
| 36 | Sodor & Man | 200 | 200 | *400* | 300 |
| 37 | Southwark | 5,900 | 6,000 | *7,600* | 8,100 |
| 38 | Southwell & Notts | 2,200 | 2,200 | *3,000* | 3,000 |
| 39 | Truro | 1,400 | 1,400 | *1,800* | 1,900 |
| 41 | Winchester | 2,700 | 2,800 | *3,900* | 3,700 |
| 42 | Worcester | 1,900 | 1,900 | *2,700* | 2,600 |
| 43 | York | 3,700 | 3,700 | *5,100* | 5,100 |
| 46 | Leeds | 5,600 | 5,900 | *7,800* | 7,700 |
| | **Nationally** | **118,000** | **119,900** | **159,200** | **162,900** |

# Further Analyses

## Church Building Size

For the purpose of this analysis, a small church has been defined as under 250m$^2$, a large church as over 650m$^2$ and a medium-sized church as between those two figures.

As can be seen in Figure 3, there are unsurprisingly statistically significant differences in the average carbon footprint between the building sizes in 2020. The average carbon footprint of a small church is around 2 tonnes, a medium-sized church is around 8 tonnes, and the average large church is around 21 tonnes. As expected, each of these values is slightly smaller than their respective values in 2019.

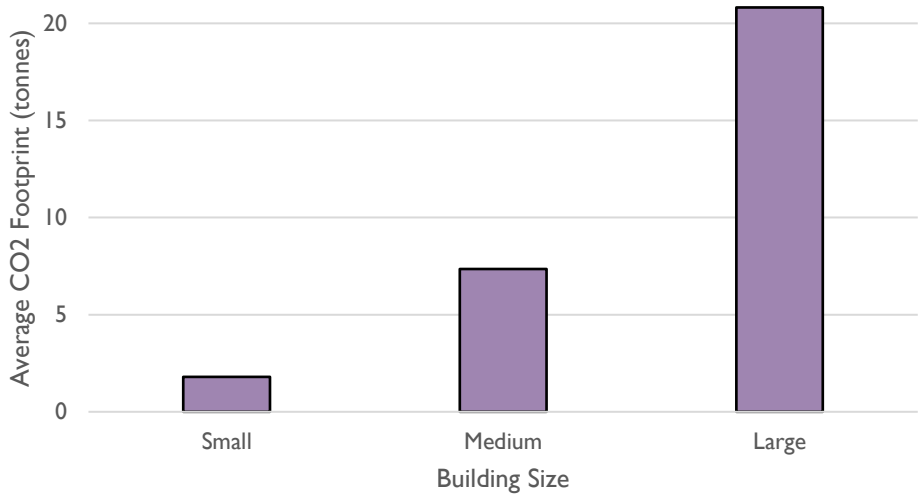


*Figure 3.* The average carbon footprint in the Church of England by building size

The amount each building size category contributed to the total carbon footprint of church buildings within the Church of England can be seen in Figure 4. This shows that small churches account for 6% of the total footprint, medium-sized churches account for 40%, and large churches account for 31% of the total footprint. 23% of the total footprint come from buildings who do not have size data (it is expected that the majority of these would be classed as 'medium-sized').

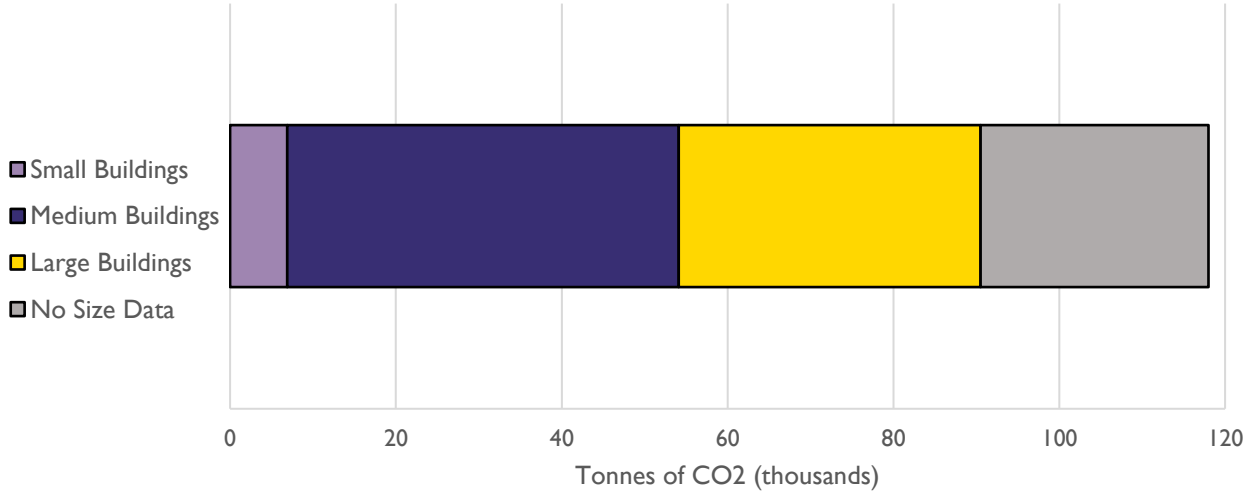


*Figure 4.* Proportions of total national carbon footprint in the Church of England based on building size.

Figure 5 highlights the differences between the proportions of particular building sizes and their percentage contribution to the total carbon footprint of church buildings. While only 12% of the church buildings were regarded as "large", they account for almost one third of the total carbon footprint of church buildings in the Church of England. Only just over 5% of the total carbon footprint of church buildings in the Church of England were emitted by churches classified as 'small', despite these accounting for a quarter of all buildings.

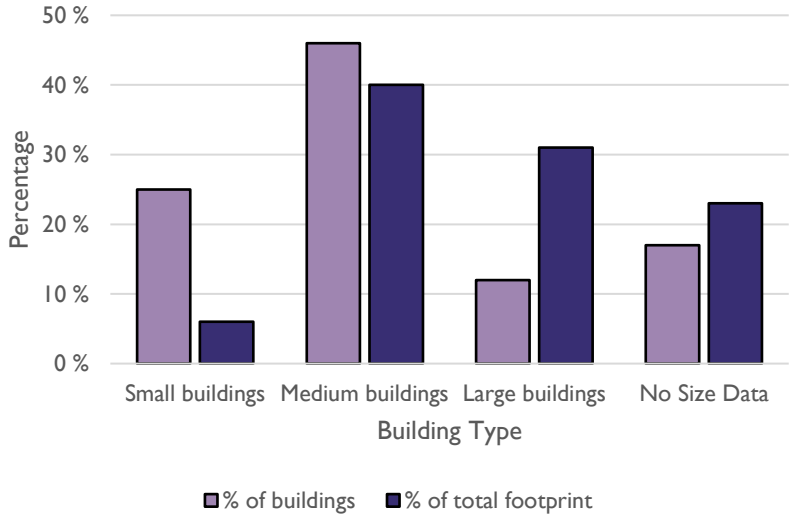


*Figure 5.* The proportions of church buildings sizes in the Church of England and their percentage contribution to the total carbon footprint.

## Urban vs Rural Churches

Alongside the significant differences between building size, significant differences can also be found in whether the church is within a rural or urban parish. Figure 6 highlights the differences that this can make, with the average large urban church emitting around 21 tonnes of net $CO_2e$, around 15 times the amount of an average small rural church, which emits just under 2 tonnes of net $CO_2e$.

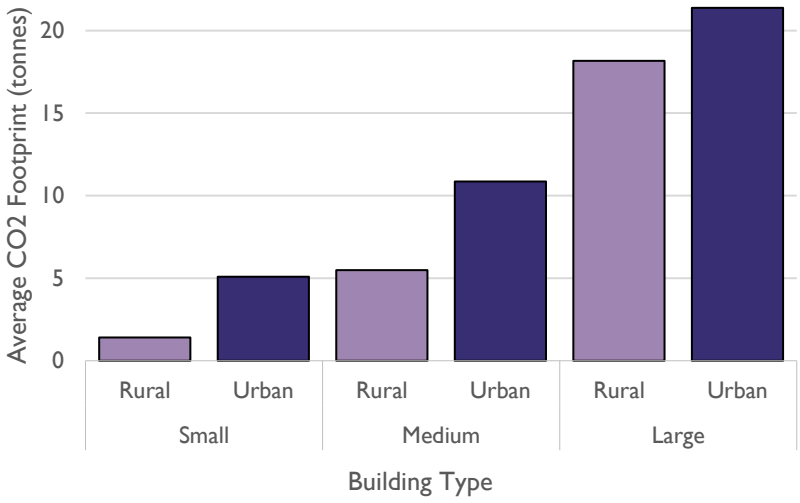


*Figure 6.* The average carbon footprint in the Church of England by building size and whether the church is in a rural or urban parish.

## Types of Energy

For the purpose of this analysis, for a particular type or combination of energy to be included, there needed to be at least 50 churches that had selected it.

Table 3 shows a breakdown of the different energy types used by churches and the types of churches that use them. It can be seen that a mixture of Electricity and Gas is the most common energy type (45% of churches) and also has the largest average net $CO_2e$ footprint. However, it is also shown that it is this energy type that is used by the vast majority of urban churches and large-size churches. Electricity alone leads to the smallest average net $CO_2e$ footprint, though this is the most common energy type rural churches and small-sized churches.

Regarding totals of types of energy, 92% of churches stated that they use electricity, 47% of churches state that they use gas, and 17% use oil.

Table 3. *A breakdown of different energy types used by churches and the types of churches that use them.*

| | Electricity | Elec + Gas | Elec + Oil | Gas | Oil |
|---|---|---|---|---|---|
| Average CO2 Footprint | 1.15 | 12.90 | 7.29 | 11.52 | 6.68 |
| % Churches with this energy | 31 | 44 | 17 | 3 | 1 |
| % Small-size churches with this energy | 67 | 14 | 13 | 1 | 1 |
| % Medium-size church with this energy | 24 | 47 | 22 | 2 | 1 |
| % Large-size churches with this energy | 3 | 85 | 4 | 3 | 1 |
| % Rural churches with this energy | 46 | 23 | 23 | 1 | 1 |
| % Urban churches with this energy | 7 | 81 | 4 | 3 | 0 |

## Net Zero Carbon Churches and Renewables

As mentioned earlier, 250 (7% of the sample) church buildings had net zero carbon (or lower), which is up from 4% of the sample identified in 2019. Of these, just 3% were in large-size buildings, 33% were in medium-sized buildings, and 53% were in small-sized buildings (11% were in buildings with no size data).

Regarding renewable electricity, a larger number of churches in our 2020 sample used renewable electricity from one of our pre-accredited suppliers (18% in 2020 vs. 14% in 2019). There was no difference in the number of churches stating that they were using renewable electricity more generally (around 31%).

It was the first year that renewable gas was enabled as an option for churches using the Energy Footprint Tool. 11% of sampled churches stated that they were using renewable gas tariff, however, only 2% of churches were using renewable gas from a pre-accredited supplier.

Regarding renewables, of the sample of the data collected, fewer than 1% were using wood chips or pellets, fewer than 1% were using alternative heating technologies, and almost 2% were using on-site solar panels.

## Net Zero Churches Mapped

*Figure 7.* A map of the locations of the 'Net Zero Church Buildings' in 2019.

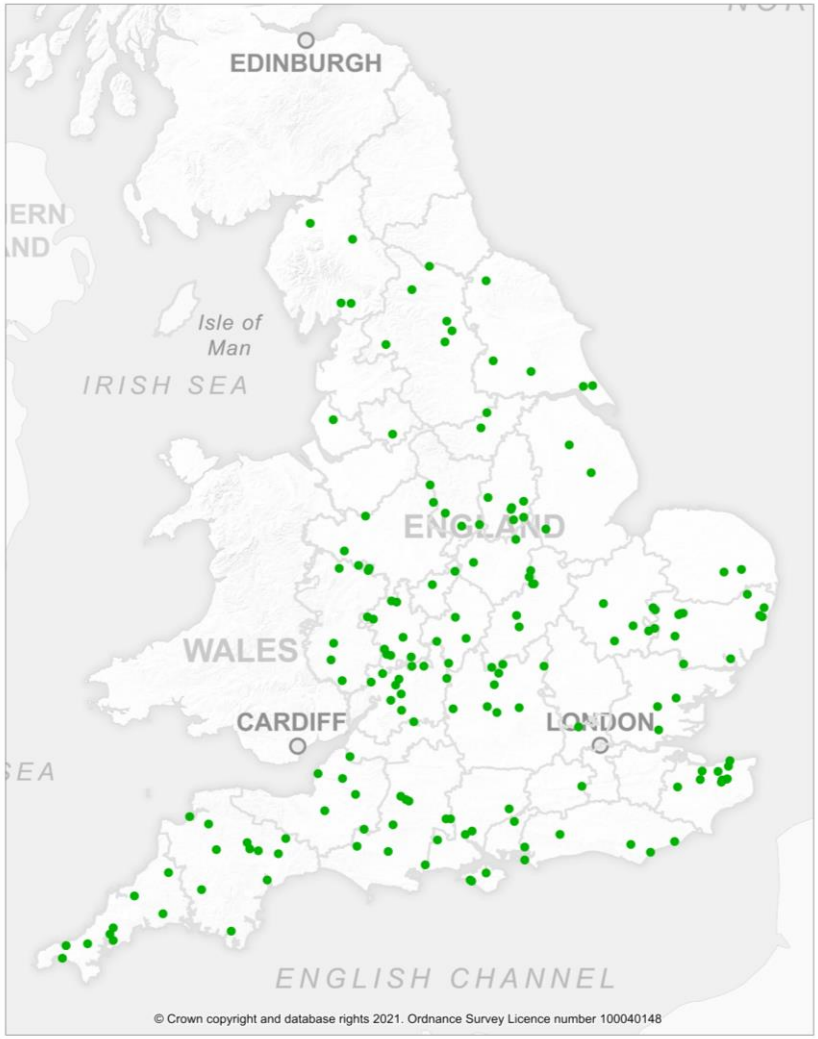


*Figure 8.* A map of the locations of the 'Net Zero Church Buildings' in 2020.