



Carbon Emissions Report 2020

Tracking Progress using the Energy Toolkit

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Executive Summary

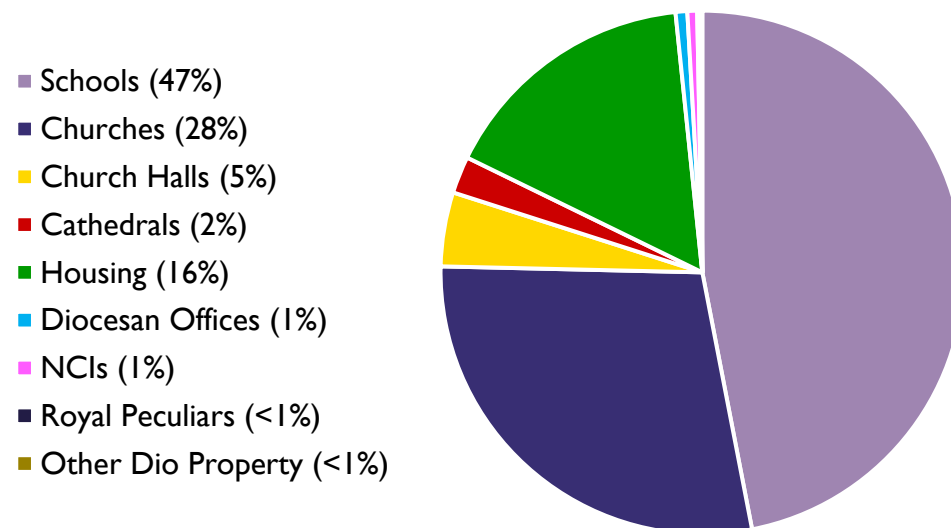
It is estimated that the energy used in in-scope Church of England buildings emitted around 417,000 tonnes of greenhouse gases, measured in tonnes of carbon dioxide equivalent (CO₂e) in 2020. Almost half of the estimated emissions from buildings in 2020 came from schools, with a further third of emissions coming from church buildings and halls. The breakdown of this figure and a graphical representation of percentage contribution by building type, can be found in Table 1 and Figure 1 respectively. Each building type has a more detailed section on its data in this report.

The figure of around 417,000 tonnes CO₂e is based on data from around a third of all Church of England buildings (including 24% of churches and 71% of schools¹) and as such is by far the largest survey ever taken of the energy use of these buildings. Where possible, estimates have been calculated for those buildings for which data were not received. While the dataset is unlikely to be perfect, this is the most robust and reliable dataset to date for calculating the carbon footprint of the Church of England.

Table 1. Estimated net carbon footprint (tonnes) for all building types, calculated from data collected from the Energy Toolkit.

| Building Type | Number of Buildings | Completeness | Total Estimated Net CO ₂ e |
|--------------------|---------------------|--------------|---------------------------------------|
| Churches | 15,500 | 24% | 118,000 |
| Church Halls | 3,000 | 17% | 19,000 |
| Schools | 4,000 | 71% | 195,000 |
| Housing | 9,500 | 38% | 67,000 |
| NClS | 3 | 33% | 2,500 |
| Cathedrals | 42 | 12% | 9,500 |
| TEIs | 22 | 0% | N/A |
| Royal Peculiars | 8 | 0% | 700 |
| Diocesan Offices | 41 | 49% | 3,000 |
| Other Dio Property | 30 | 43% | 600 |
| Total | 32,000 | 33% | 415,000 |

Figure 1. The percentage contribution of different building types to the total estimated net footprint of all Church of England buildings.



¹ Almost entire dataset from schools has come from DEC reports, rather than the true energy use from annual bills that is obtained for churches.

Tracking Progress to 2030

In-Scope for 'Net Zero Carbon by 2030

- The Energy use of the following buildings:
 - o Churches, including church halls and ancillary buildings
 - o Cathedrals
 - o Schools (only Voluntary Aided and Diocesan Academy Trusts)
 - o Clergy housing and bishop's housing wholly owned by the Church
 - o Church bodies' offices, including National Church Institutions (NCIs), diocesan offices and bishops' offices
 - o Pecuiliars, if they come under faculty jurisdiction
 - o Other diocesan property, including common parts of tenanted properties
 - o Theological Education Institutions (TEIs)
- The petrol/diesel used for work-related travel.

Table 2. Total estimated net carbon footprint (tonnes CO₂e) over time towards 2030.

| Type | 2019 | 2020 ² | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 |
|---------------------|------------|-------------------|------|------|------|------|------|------|------|------|------|------|
| Churches | 159,000 | 118,000 | | | | | | | | | | |
| Church Halls | 28,000 | 19,000 | | | | | | | | | | |
| Schools | N/A | 195,000 | | | | | | | | | | |
| Housing | N/A | 69,000 | | | | | | | | | | |
| NCIs | N/A | 2,500 | | | | | | | | | | |
| Cathedrals | N/A | 9,500 | | | | | | | | | | |
| TEIs | N/A | N/A | | | | | | | | | | |
| Royal Pecuiliars | N/A | 700 | | | | | | | | | | |
| Diocesan Offices | N/A | 3,000 | | | | | | | | | | |
| Other Dio Property | N/A | 600 | | | | | | | | | | |
| Work-Related Travel | N/A | N/A | | | | | | | | | | |
| Total | N/A | N/A | | | | | | | | | | |

² It is thought that the drop in net carbon footprint (tonnes CO₂e) in Churches and Church Halls between 2019 and 2020 will be largely due to covid-19 related factors, including national lockdowns. It is estimated that the total value of 137,000 tonnes CO₂e these buildings would have been around 189,000 tonnes CO₂e if 2020 had been a typical year.

The Energy Toolkit: A Background

In February 2020, the General Synod of the Church of England formally recognised the climate emergency and set a target for all parts of the Church of England to be net zero carbon by 2030.

The first step towards making radical reductions was to accurately measure starting points and baselines. At this point, the process of measuring the carbon footprint of church buildings was already in development. The Research and Statistics Team, working with Brian Cuthbertson and Enid Barron from the Diocese of London, had developed the Energy Footprint Tool (EFT) for church buildings. The EFT provided estimates for the carbon footprint of all Church of England church buildings for both 2019³ and 2020⁴. The EFT won the “Digital Innovation of the Year: Services” award at The Energy Awards 2021.

Building on this success, the Research and Statistics Team were tasked with expanding the existing EFT into an Energy Toolkit for *all* in-scope buildings within the Church of England.

To make the Energy Toolkit a useful instrument in monitoring progress towards the target of net zero emissions by 2030, a list of all eligible buildings had to be compiled. This included buildings such as schools, housing, offices, and other in-scope buildings (cathedrals, theological education institutions, royal peculiars etc.). In order to build this list, work was undertaken in collaboration with colleagues within the National Church Institutions (NCIs) and within the dioceses.

This report provides the first iteration in which the Energy Toolkit was used to quantify the carbon footprint of all now in-scope Church of England buildings. Data have been collected for around a third of all in-scope Church of England buildings, allowing for a workable estimate for actual 2020 emissions. 2020 was not a typical year, with the Covid-19 pandemic and several lockdowns – there will be some buildings that were used much less frequently than usual, and others that will have been used more than usual. Thus, the irregularity of 2020 will make it difficult to sensibly compare data in this report to any other year, and figures should be used with caution.

It is expected that data from 2021 will give a better picture of a typical annual carbon footprint for the in-scope Church of England buildings. Not only is this because 2021 was a more typical year than 2020, but because the toolkit will be open for data collection for a longer period of time (around six months vs. the two months that the toolkit was open for 2020 data collection), which will hopefully lead to a higher response rate. In addition to collecting data relating to buildings, the Energy Toolkit will also be aiming to capture data concerning work-related travel, which is also included in the General Synod’s net zero carbon by 2030 motion.

³ *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/sites/default/files/2021-02/Energy%20Footprint%20Tool%202019_0.pdf

⁴ *Energy Footprint Tool 2020*, written by Dr Samuel Nunney, as part of the Research and Statistics team for the Church of England. Available from <https://www.churchofengland.org/sites/default/files/2021-11/EnergyFootprintTool2020.pdf>

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Church Buildings

All data provided in this section were published in more detail in the Energy Footprint Tool 2020 Report⁵.

It is estimated that the total net carbon footprint for the Church of England's approximately 15,000 church buildings (and further 3,000 church halls) in 2020 was around 137,000 tonnes CO₂e.⁶

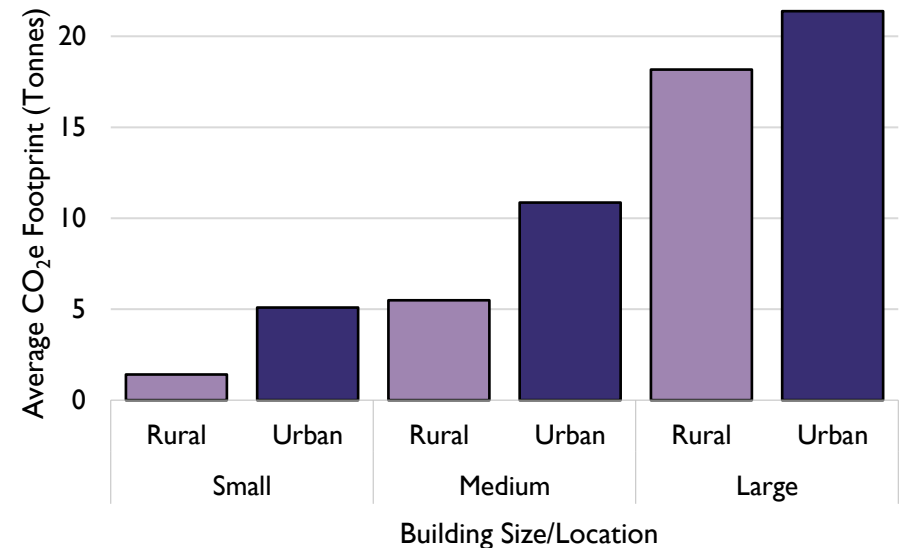
Churches

The estimated total net footprint for the churches or main church buildings alone in 2020 was around 118,000 tonnes CO₂e. This means that the average church has an annual net carbon footprint of around 7.5 tonnes CO₂e.

This estimate was based on responses from 24% of churches. The estimation process for accounting for churches that did not provide data was 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 (see Methodology).

The size⁷ and location (whether the church is located in a rural or urban parish) of a church has a significant impact on its carbon footprint. Figure 2 highlights the differences that these can make, with an average large urban church emitting around 21 tonnes of net CO₂e, around 15 times the amount of an average small rural church, which emits just under 1.5 tonnes of net CO₂e.

Figure 2. The average carbon footprint (tonnes CO₂e) for churches in the Church of England by building size and whether the church is in a rural or urban parish.



⁵ *Energy Footprint Tool 2020*, written by Dr Samuel Nunney, as part of the Research and Statistics team for the Church of England. Available from <https://www.churchofengland.org/sites/default/files/2021-11/EnergyFootprintTool2020.pdf>

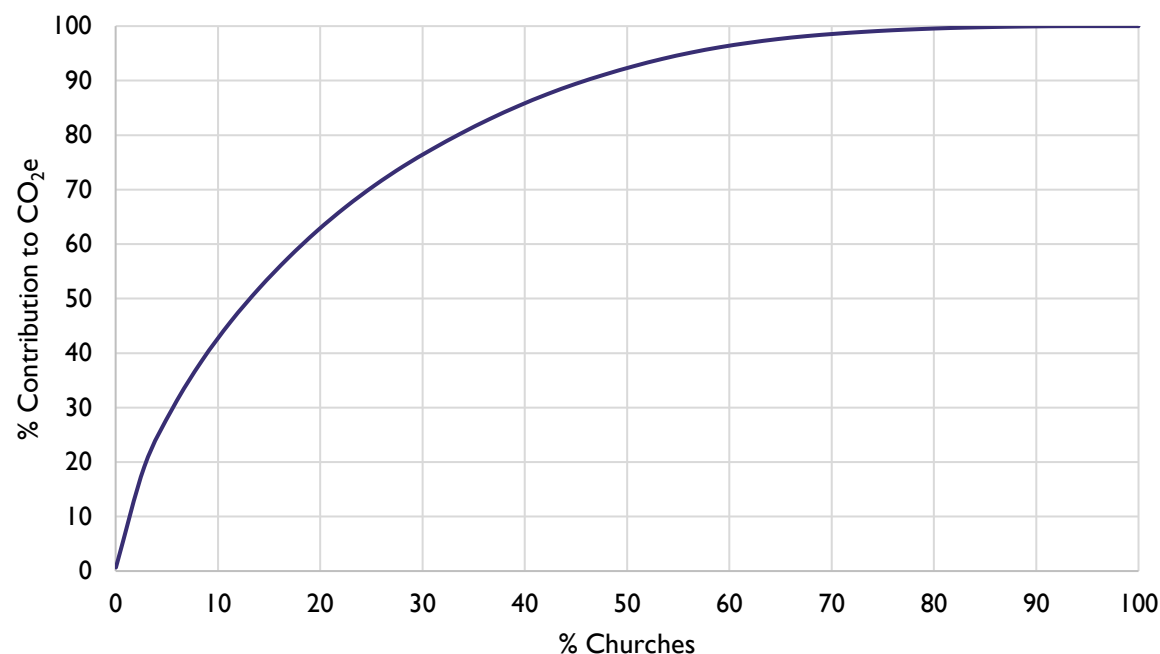
⁶ The Diocese of Europe has been excluded from this exercise.

⁷ For these analyses, a small church has been defined as under 250m², a large church as over 650m² and a medium-sized church as between those two figures.

Contribution of Total Churches Carbon Footprint

Regarding contributions to the overall carbon footprint of main church buildings, data suggest that around 80% of the net carbon emissions come from the 33% highest emitting churches. Less than 1% of the total net carbon emissions come from the 25% lowest emitting churches. This contribution can be seen in Figure 3.

Figure 3. The percentage contribution to the carbon footprint of churches by highest emitting churches (e.g., a value of 10 on the x-axis signifies the 10% highest-contributing churches).



Church Halls and Other Church Buildings

The estimated total net footprint for church halls and other church buildings in 2020 was around 19,000 tonnes CO₂e.

This estimate was based on responses from 500 churches in the original sample. It should be noted that this is currently the best estimate that can be made for the carbon footprint of “other church buildings”, as the number of church halls nationally is not known. Estimates based on the 2019 or 2020 dataset are that there are around 3,000 “other church buildings” nationally.

Adjusting for Covid/National Lockdowns

Due to national lockdowns in 2020, many of the estimated total tonnes CO₂e are lower than they would have been if 2020 had been a typical year. It is estimated that the total value of 137,000 tonnes CO₂e for churches, church halls, and other church buildings would have been 189,000 tonnes CO₂e if 2020 had been a typical year (very similar to the estimated 187,000 tonnes CO₂e for 2019).

Schools

It is estimated that the Church of England schools emitted around 195,000 tonnes CO₂e in 2020. This means that the average school has an annual net carbon footprint of around 49 tonnes CO₂e, around seven times larger than that of an average church.

Emissions by Primary/Secondary Designation

95% of Church of England schools are Primary Schools, which make up 84% to the Church of England's carbon footprint from schools (an estimated 164,000 tonnes CO₂e in 2020). The 4% of Church of England schools that are secondary schools make up around 13% of the Church's annual emissions (an estimated 25,000 tonnes CO₂e in 2020). The schools recorded as "other" are a mixture of all-through schools, middle schools and schools where a primary/secondary designation was not recorded in the dataset. These schools make up 1% of the total Church of England Schools and 3% of the total school emissions of the Church of England. These data can be found in Table 3.

The average secondary school has a larger carbon footprint (170 tonnes CO₂e) than an average primary school (40 tonnes CO₂e). However, secondary schools typically have more pupils (on average 973 pupils) than primary schools (204 pupils). The proportion of total emissions by school type is very similar to the proportion of pupils. There is a significant correlation between emissions and the number of pupils ($r = .67$; $p < .01$). This association suggests that the more pupils that there are in a school, the higher its emissions.

Table 3. *Estimated net carbon footprint (tonnes CO₂e) for Primary and Secondary Schools and descriptive percentages.*

| School Type | Number of Schools | Total Estimated Net CO ₂ e | Average Building Footprint | % of Schools | % of School-Emissions | % of Pupils |
|--------------|-------------------|---------------------------------------|----------------------------|--------------|-----------------------|-------------|
| Primary | 3,800 | 164,000 | 40 | 95% | 84% | 82% |
| Secondary | 150 | 25,000 | 170 | 4% | 13% | 15% |
| Other | 40 | 6,590 | 160 | 1% | 3% | 3% |
| Total | 4,000 | 195,000 | 49 | 100% | 100% | 100% |

School Heating Systems

Of the schools for which data were received, 75% use mains gas as their primary heating fuel. Assuming that these figures are representative, then it is estimated that around 3,000 Church of England schools use mains gas as their primary fuel. There were 19% of schools that use oil as their primary heating fuel, 4% use electricity, 2% use liquefied petroleum gas (LPG) and 1% use Biomass.

Urban/Rural Classification

Church of England schools are fairly evenly split between urban and rural locations, with 52% of Church of England schools being situated in rural areas, while 48% are in urban areas. Urban schools appear to be bigger emitters on average than rural schools, with 65% of emissions from schools coming from schools in urban areas. Schools in urban areas are estimated to contribute 127,000 tonnes CO₂e to the Church's carbon footprint, while rural schools are estimated to contribute 69,000 tonnes CO₂e.

However, urban schools typically have a greater number of pupils than rural schools. The average number of pupils in a rural school is 147, while urban schools have an average of 333 pupils. When the total numbers of pupils in Church of England schools in urban and rural areas are examined, emissions are again in line with the distribution of pupils across urban and rural schools. These Urban vs Rural comparisons can be seen visually in Figure 4.

It is important to mention that primary schools have a fairly even split between urban and rural locations, with 54% of primary schools being in a rural location and 46% in an urban location. However, this relatively equivalent split is not the case for secondary schools. Only 9% of secondary schools are in a rural location, while 91% of secondary schools are in an urban location. The average secondary school in an urban location emits around 176 tonnes CO₂e, around 5 and a half times more than an average primary school in a rural location (32 tonnes CO₂e). The average figures for school type and location can be seen in Figure 5.

Figure 4. A graphical representation of the descriptive percentages of Primary and Secondary Schools, broken down by whether they are in urban or rural areas.

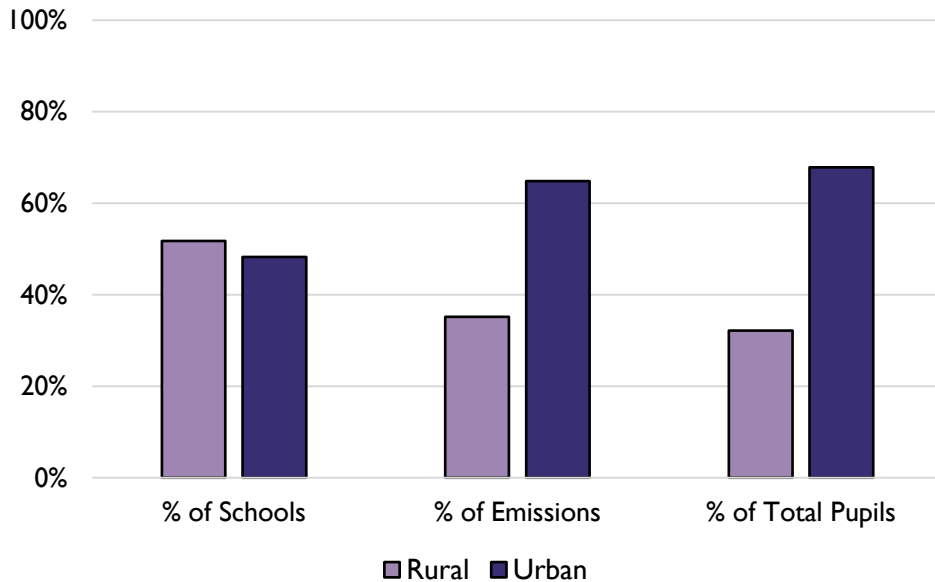
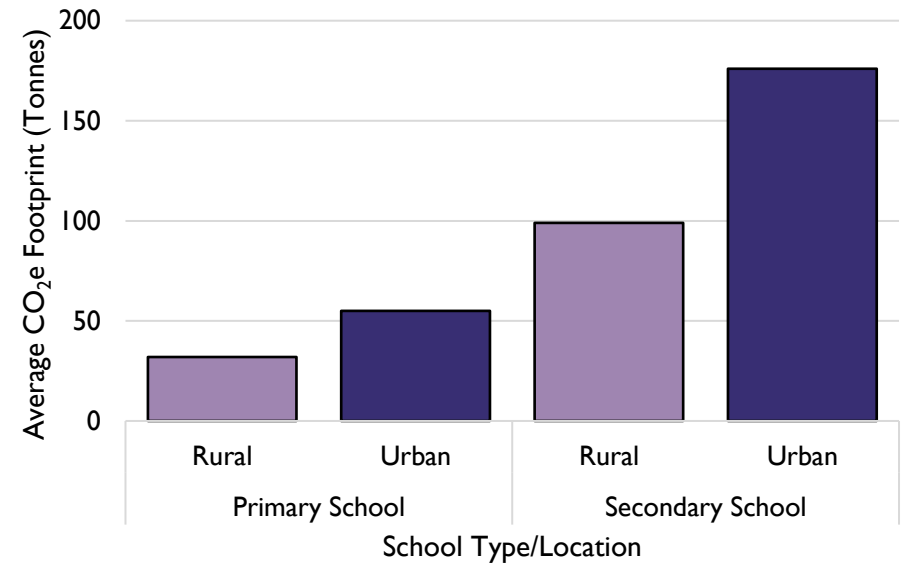


Figure 5. The average carbon footprint (tonnes CO₂e) for schools in the Church of England by school type and whether it is in a rural or urban location.



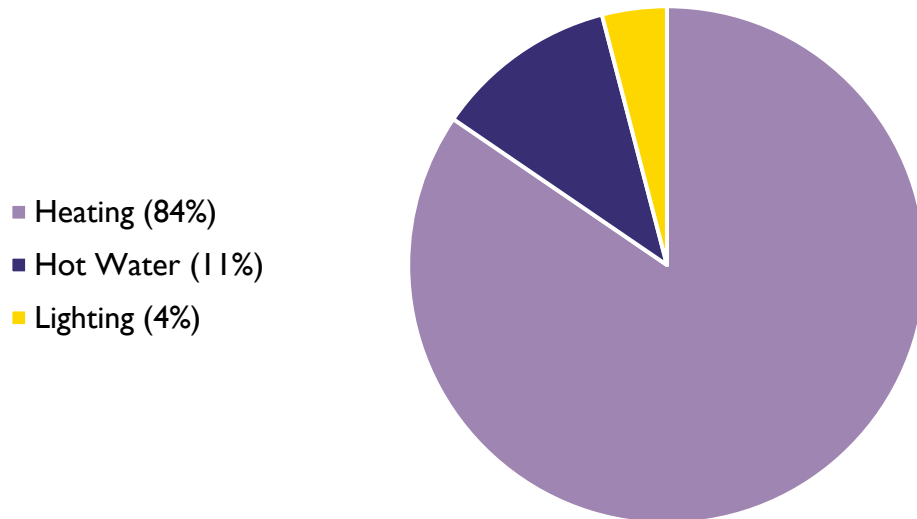
Housing

Emissions from Homes

It is estimated that there are around 9,500 homes owned by the Church of England. The energy use of these homes is estimated to have emitted around 69,000 tonnes CO₂e in 2020. This means that the average home has an annual net carbon footprint of around 7 tonnes CO₂e, very similar to that of an average church. Data suggests that the average UK home emits around 4 tonnes CO₂e annually.⁸

The majority of emissions (84%) from homes came from heating, at an estimated 58,500 tonnes CO₂e. It is estimated that hot water accounted for 11% of emissions, with 7,900 tonnes CO₂e, and that lighting accounted for just 4% of housing emissions (around 2,800 tonnes CO₂e). The breakdown of these emissions can be viewed in Figure 5.

Figure 5. *The contribution of energy uses to housing emissions.*



Heating Systems

The data provided from retrievable EPC records suggest that the vast majority of Church-owned homes (83%) have mains gas as their primary heating system, 15% use oil, 1% use electricity, 1% use bottled liquefied petroleum gas (LPG), and less than 1% use community combined heat and power (CHP), heat pumps (air source), or wood logs.

⁸ <https://www.ons.gov.uk/peoplepopulationandcommunity/housing/articles/energyefficiencyofhousinginenglandandwales/2021>

EPC Ratings

EPC energy efficiency bands are applied to facilitate the understanding of the energy performance of a home. The bands range from 'A' (the most energy efficient) to 'G' (the least energy efficient). Most UK homes fall into a D banding.

Based on the Church-owned homes that have retrievable EPC records, the vast majority are D rated (50%). C and E rated homes both account for just over 20% each. 4% of homes were rated A and B (estimated around 400 in total), while 3% of homes were rated F and G (estimated around 300 in total). The breakdown of all bands and those housing for which an EPC was not found, or a housing list was not provided, can be seen in Table 6.

The average annual footprint of a D rated home is around two and a half times larger than that of an A or B rated home and is just under half the average footprint of an F or G rated home.

The Minimum Energy Efficiency Standards (MEES) stop landlords from renewing or granting new tenancies if a property has a low EPC rating. As of 1st April 2020, F and G rated homes do not meet the domestic MEES and are not legally able to let to private tenants without a valid exemption. It is expected that from 2025 the domestic MEES will be raised to a legal minimum of band C for new tenancies. However, the MEES are unlikely to apply to clergy housing.

Table 6. *The estimated number of homes in each EPC rating band, and their average annual emissions (in tonnes CO₂).*

| EPC Rating Band | % Homes in this EPC Band | Homes in this EPC Band | Average Annual Emissions from Homes in this Band | % of housing-emissions |
|---|---------------------------------|-------------------------------|---|-------------------------------|
| A | <1% | 10 | 2.7 | <1% |
| B | 1% | 140 | 2.8 | <1% |
| C | 8% | 780 | 5.0 | 6% |
| D | 19% | 1,800 | 7.1 | 18% |
| E | 8% | 770 | 11.0 | 12% |
| F | 1% | 100 | 16.5 | 2% |
| G | <1% | 10 | 16.9 | <1% |
| No EPC found | 31% | 2,900 | 7.1 | 30% |
| Homes in dioceses that did not provide a housing list (estimated) | 31% | 2,900 | 7.1 | 30% |
| Grand Total | 100% | 9,500 | 7.2 | 100% |

Other Buildings

National Church Institutions (NCIs)

It is estimated that the major NCIs buildings (Church House Westminster, Lambeth Palace and Bishopthorpe Palace) emitted around 2,500 tonnes CO₂e in 2020.

Data from the NCIs was only received from Church House Westminster, so the emissions of both Lambeth Palace and Bishopthorpe Palace were estimated.

Cathedrals

It is estimated that the 42 Cathedrals emitted around 9,500 tonnes CO₂e in 2020.

This estimate is based on responses from 12% of Cathedrals, with the rest of the data estimated based on Cathedral size (building footprint).

Theological Education Institutions (TEIs)

No data were received from the 22 TEIs. Due to a lack of available data, it is currently impossible to estimate their total carbon footprint.

Royal Peculiars

It is estimated that the 8 Royal Peculiars emitted around 700 tonnes CO₂e in 2020.

No data were received from Royal Peculiars. However, other available data made the estimation process possible.

It is expected that the footprints of other in-scope peculiars are collected in the *Church Buildings* section.

Diocesan Offices

It is estimated that the 41 main Diocesan Offices emitted around 3,000 tonnes CO₂e in 2020.

This estimate is based on responses from 15% of diocesan offices, as well as Research and Statistics collecting EPC and DEC data for a further 34% of diocesan offices, making the completeness rate almost 50%.

Other Diocesan Property

It is estimated that other Diocesan Property emitted around 600 tonnes CO₂e in 2020.

This list of buildings is supplied at the discretion of dioceses and may grow. Research and Statistics were able to collect EPC and DEC data for 43% of these buildings.

Diocesan Summary Tables

Table 7. Net carbon footprints for all Church of England building types (except for TEIs and the NCI), by Diocese (in Tonnes CO₂e).

| Code | Diocese | Church Buildings ⁹ | Schools | Housing | Other Buildings ¹⁰ | Total |
|------|--------------|-------------------------------|---------|---------|-------------------------------|---------------|
| 1 | Bath & Wells | 3,000 | 3,600 | 2,000 | 350 | 8,950 |
| 2 | Birmingham | 2,900 | 4,100 | 1,100 | 200 | 8,300 |
| 3 | Blackburn | 2,900 | 7,700 | 1,400 | 150 | 12,150 |
| 5 | Bristol | 2,200 | 3,200 | 1,200 | 250 | 6,850 |
| 6 | Canterbury | 2,900 | 4,800 | 1,300 | 350 | 9,350 |
| 7 | Carlisle | 2,000 | 3,300 | 1,300 | 150 | 6,750 |
| 8 | Chelmsford | 5,200 | 4,500 | 3,300 | 350 | 13,350 |
| 9 | Chester | 4,200 | 5,700 | 1,800 | 250 | 11,950 |
| 10 | Chichester | 4,800 | 6,800 | 2,200 | 300 | 14,100 |
| 11 | Coventry | 2,100 | 3,800 | 1,100 | 300 | 7,300 |
| 12 | Derby | 2,900 | 4,300 | 1,200 | 150 | 8,550 |
| 13 | Durham | 2,800 | 3,900 | 1,300 | 300 | 8,300 |
| 14 | Ely | 2,100 | 4,000 | 1,200 | 400 | 7,700 |
| 15 | Exeter | 3,400 | 5,700 | 2,700 | 300 | 12,100 |
| 16 | Gloucester | 2,100 | 3,500 | 1,400 | 300 | 7,300 |
| 17 | Guildford | 2,800 | 4,000 | 1,500 | 300 | 8,600 |
| 18 | Hereford | 1,400 | 3,000 | 900 | 200 | 5,500 |
| 19 | Leicester | 2,300 | 4,600 | 1,200 | 150 | 8,250 |
| 20 | Lichfield | 5,200 | 5,900 | 3,000 | 250 | 14,350 |
| 21 | Lincoln | 2,700 | 4,500 | 1,600 | 400 | 9,200 |
| 22 | Liverpool | 3,300 | 5,600 | 1,400 | 650 | 10,950 |

| Code | Diocese | Church Buildings | Schools | Housing | Other Buildings | Total |
|------|---------------------------|------------------|----------------|---------------|-----------------|----------------|
| 23 | London | 10,600 | 15,200 | 4,200 | 1,050 | 31,050 |
| 24 | Manchester | 4,500 | 12,900 | 1,800 | 650 | 19,850 |
| 25 | Newcastle | 2,200 | 3,100 | 1,200 | 200 | 6,700 |
| 26 | Norwich | 2,600 | 4,000 | 1,400 | 250 | 8,250 |
| 27 | Oxford | 6,000 | 5,800 | 3,300 | 600 | 15,700 |
| 28 | Peterborough | 2,400 | 2,600 | 1,300 | 450 | 6,750 |
| 29 | Portsmouth | 1,800 | 500 | 900 | 300 | 3,500 |
| 31 | Rochester | 3,500 | 2,300 | 1,600 | 250 | 7,650 |
| 32 | St. Albans | 4,000 | 6,800 | 2,100 | 350 | 13,250 |
| 33 | St. Edms & Ipswich | 2,000 | 3,400 | 1,200 | 200 | 6,800 |
| 34 | Salisbury | 3,300 | 2,000 | 1,600 | 350 | 7,250 |
| 35 | Sheffield | 2,500 | 2,000 | 1,100 | 250 | 5,850 |
| 36 | Sodor & Man ¹¹ | 300 | - | 100 | 50 | 450 |
| 37 | Southwark | 7,300 | 6,400 | 2,800 | 200 | 16,700 |
| 38 | Southwell & Notts | 2,900 | 3,900 | 1,400 | 200 | 8,400 |
| 39 | Truro | 1,600 | 1,400 | 1,000 | 150 | 4,150 |
| 41 | Winchester | 3,500 | 4,000 | 1,400 | 350 | 9,250 |
| 42 | Worcester | 2,300 | 3,100 | 1,700 | 300 | 7,400 |
| 43 | York | 4,200 | 6,100 | 2,000 | 400 | 12,700 |
| 46 | Leeds | 6,300 | 13,500 | 3,100 | 450 | 23,350 |
| | Nationally | 137,000 | 195,000 | 69,000 | 13,000 | 415,000 |

⁹ Includes churches, church halls, and all other church buildings.

¹⁰ Includes Cathedrals, Royal Peculiars, Diocesan Offices and all other Diocesan Property.

¹¹ There are no Church of England Schools in the Diocese of Sodor and Man

Table 8. Diocesan Response Rates for all Church of England building types from the Energy Toolkit in 2020¹².

| Code | Diocese | Church Buildings | Schools | Housing | Other Buildings | Total |
|------|--------------|------------------|---------|---------|-----------------|-------|
| 1 | Bath & Wells | 9% | 60% | 0% | 0% | 12% |
| 2 | Birmingham | 49% | 96% | 100% | 50% | 75% |
| 3 | Blackburn | 13% | 90% | 0% | 50% | 31% |
| 5 | Bristol | 36% | 69% | 29% | 20% | 38% |
| 6 | Canterbury | 13% | 82% | 0% | 50% | 20% |
| 7 | Carlisle | 40% | 44% | 75% | 50% | 50% |
| 8 | Chelmsford | 13% | 73% | 88% | 50% | 48% |
| 9 | Chester | 13% | 83% | 0% | 67% | 20% |
| 10 | Chichester | 46% | 86% | 0% | 0% | 38% |
| 11 | Coventry | 43% | 77% | 22% | 33% | 41% |
| 12 | Derby | 15% | 58% | 58% | 0% | 36% |
| 13 | Durham | 15% | 95% | 74% | 0% | 45% |
| 14 | Ely | 17% | 92% | 63% | 17% | 40% |
| 15 | Exeter | 9% | 65% | 85% | 0% | 39% |
| 16 | Gloucester | 22% | 75% | 92% | 33% | 47% |
| 17 | Guildford | 26% | 82% | 0% | 67% | 24% |
| 18 | Hereford | 43% | 66% | 65% | 50% | 50% |
| 19 | Leicester | 8% | 71% | 0% | 50% | 16% |
| 20 | Lichfield | 9% | 77% | 26% | 33% | 23% |
| 21 | Lincoln | 9% | 98% | 57% | 33% | 31% |
| 22 | Liverpool | 11% | 32% | 36% | 0% | 24% |

| Code | Diocese | Church Buildings | Schools | Housing | Other Buildings | Total |
|------|---------------------------|------------------|------------|------------|-----------------|------------|
| 23 | London | 47% | 100% | 28% | 0% | 44% |
| 24 | Manchester | 29% | 55% | 29% | 50% | 36% |
| 25 | Newcastle | 30% | 94% | 50% | 50% | 44% |
| 26 | Norwich | 11% | 76% | 68% | 50% | 29% |
| 27 | Oxford | 42% | 82% | 34% | 11% | 43% |
| 28 | Peterborough | 14% | 90% | 0% | 0% | 18% |
| 29 | Portsmouth | 22% | 62% | 55% | 100% | 38% |
| 31 | Rochester | 14% | 0% | 0% | 0% | 7% |
| 32 | St. Albans | 15% | 72% | 0% | 0% | 19% |
| 33 | St. Edms & Ipswich | 20% | 76% | 89% | 0% | 41% |
| 34 | Salisbury | 13% | 36% | 34% | 0% | 20% |
| 35 | Sheffield | 15% | 97% | 69% | 0% | 44% |
| 36 | Sodor & Man ¹³ | 3% | N/A | 0% | 0% | 2% |
| 37 | Southwark | 28% | 54% | 72% | 25% | 52% |
| 38 | Southwell & Notts | 14% | 86% | 71% | 0% | 43% |
| 39 | Truro | 58% | 82% | 84% | 0% | 67% |
| 41 | Winchester | 58% | 90% | 0% | 33% | 44% |
| 42 | Worcester | 40% | 94% | 22% | 50% | 41% |
| 43 | York | 21% | 66% | 60% | 50% | 38% |
| 46 | Leeds | 50% | 17% | 0% | 33% | 27% |
| | Nationally | 24% | 71% | 38% | 28% | 35% |

¹² There are dioceses that have their own data collections ongoing, some of which may have not made it onto the Energy Toolkit for a variety of reasons; it is hoped that there will be more scope for this integration during 2021 data collection.

¹³ There are no Church of England Schools in the Diocese of Sodor and Man.

Methodology

The Energy Footprint Tool for church buildings was open for data collection between April 2021 and October 2021; the Energy Toolkit for all Church of England buildings was open for data collection between November 2021 and January 2022.

Estimating Emissions from Church Buildings

31% of churches used the Energy Footprint Tool, while 24% of churches submitted their data. This was a drop from 2019, where 38% used the tool and 30% submitted their data.

Churches entered kWh and/or cost from their annual energy bills into the system, which were then weather-adjusted and converted into both gross and net CO₂e emissions using 2020 conversion factors¹⁴. To account for buildings that had not supplied data, their CO₂e emissions were estimated. This estimation process was completed using multiple linear regression models based on the data that existed for each building type. The explanatory variables used were diocese, building size (floor area), whether the building is in a rural or urban parish, and any available utility bills and/or finance data. For “Church Halls and Other Church Buildings”, CO₂e emissions were estimated for churches that had submitted data declaring that they had an “other building” but did not provide data for it. This was then scaled up to account for the churches that had not submitted any data to the Energy Footprint Tool. Regarding the Covid/National Lockdowns adjustment, this was done by taking a random sample of 100 churches that were using the exact same energy providers from 2019 to 2020 and creating a factor from the proportions of their gross kWh usage.

Estimating Emissions from Schools

Dioceses were given the option to supply data for each school from either a Display Energy Certificate (DEC), or from the school’s energy bills. To ensure that schools were included and engaged in the Church of England’s Net Zero targets, dioceses were encouraged to invite schools to complete the toolkit themselves. If a school was unable or unwilling to enter data, diocesan users were able to submit data on a school’s behalf.

Response rates to this data collection exercise varied between dioceses, ranging from 0% to 99%, with an overall 15% response rate at the time the toolkit was closed. In order to supplement these data, we used DEC records from the Department for Levelling Up, Housing & Communities (DLUHC) API¹⁵. This exercise increased the response rate to 71%. Reasons to not retrieve records for schools could be due to there not being a record that exists, the existing record is out of date, or there were differences in the formatting of addresses between diocesan and DLUHC records.

For schools that submitted data, energy use in kWh from the school’s bills or DEC were weather-adjusted and converted into net CO₂e emissions using 2020 conversion factors. For schools with missing data, figures were calculated via a multiple linear regression model based on the following variables: primary or secondary designation, urban or rural area, and number of pupils. This supporting information about schools was retrieved from the Get Information about Schools service¹⁶.

¹⁴ <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020>

¹⁵ <https://epc.opendatacommunities.org/>

¹⁶ <https://www.get-information-schools.service.gov.uk/>

Estimating Emissions from Housing

28 dioceses (68%) supplied lists of the houses that they own to the Research and Statistics Team. For the remaining 13 dioceses (32%) who did not supply a list of their houses, their number of homes was estimated using a multiple linear regression model that included number of churches and number of clergy. It was estimated that the total number of homes owned by Church of England dioceses is 9,500.¹⁷

The housing lists supplied by dioceses were used to gather EPC records using the DLUHC API. 55% of the homes recorded on the supplied lists had EPC records that could be retrieved via this method. The remaining 45% of homes did not have EPC records that could be retrieved via this method. Where no EPC record could be retrieved, it was assumed that no EPC record exists. It is however possible that there are a small number of homes where an EPC record exists, but it was not retrievable due to differences in the formatting of addresses between diocesan and DLUHC records.

For each home with an EPC record, the lighting, heating, and hot water costs recorded were converted into a kWh energy use figure using the standard assessment procedure (SAP)¹⁸, which assumed unit costs of fuels that are applicable to the EPC inspection date. Assuming that these energy use figures would be unchanged since the date of the report, the kWh figures were converted into CO₂e emissions figures using 2020 CO₂e conversion factors to give an estimate of emissions from each home in 2020 (rather than the emissions figure from the EPC report, which relates to the year that the EPC was commissioned). For homes that were missing an EPC report, it was assumed that they possessed the average emissions from a D rated home within the Church of England housing dataset.

Estimating Emissions Other Buildings

NCIs, Cathedrals, TEIs, Royal Peculiars, Diocesan Offices, and all other buildings, could enter kWh and/or cost from their annual energy bills into the system, which were then weather-adjusted and converted into both gross and net CO₂e emissions using 2020 conversion factors.

For those buildings that had not supplied data, their CO₂e emissions were estimated if building size, EPC, or DEC data were available. These figures were then scaled up to account for the buildings for which no data were available. This process was not possible for TEIs, as there was no submitted or available/retrievable data for any of the buildings.

¹⁷ Diocese in Europe has been excluded from this exercise.

¹⁸ "RdSAP fuel prices from January 2021" retrieved from <https://www.bregroup.com/sap/standard-assessment-procedure-sap-2012/>

Glossary

- **DEC** – Display Energy Certificate; shows the energy performance of non-domestic buildings based on actual energy consumption.
- **DLUHC** - Department for Levelling Up, Housing & Communities
- **EPC** – Energy Performance Certificate; measures the energy efficiency of a property on a scale of A-G from estimated energy costs and summaries of a home's energy performance-related features.
- **Gross CO₂e** – Total emissions garnered from energy use (kWh) within a building.
- **kWh** - Kilowatt hour; measure of energy use.
- **NCIs** – National Church Institutions; several national administrative bodies that work together to support the mission and ministries of the Church of England.
- **NET CO₂e** – Gross Emissions minus the emissions that were created from fully renewable energy sources.
- **TEIs** – Theological Education Institutions.
- **Weather-Adjustment** – A weather-correction calculation that is applied to the emissions to take account of the weather experienced during that year. This is to allow for a more sensible comparison for absolute emissions year-on-year.