Office for National Statistics

Article

Energy efficiency of housing in England and Wales: 2021

Insight on the energy efficiency, environmental impact, carbon dioxide emissions, estimated energy cost and central heating main fuel type for new and existing homes by property type, tenure and property age.

Contact:
Tony Wilkins
better.info@ons.gov.uk
+44 2037 411789

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1 . Main points

- The median energy efficiency score for dwellings in England was 66 and 64 in Wales for all records up to March 2021, which is equivalent to band D.
- Flats and maisonettes were the most energy efficient property type in both England and Wales, with a median energy efficiency score of 72, equivalent to band C.
- Social rented dwellings had the highest median energy efficiency score across all property types in both England and Wales.
- New dwellings were more energy efficient than existing dwellings in both England and Wales, but there was more variation in median energy efficiency scores in existing dwellings across property types and tenure.
- In both countries, almost eight in 10 dwellings used mains gas as a main fuel source for central heating.
- One in 10 local authorities had over half of their dwellings with an energy efficiency score equivalent to band C or above; two thirds of these were in London or the South East.

2 . Energy efficiency of dwellings in England and Wales

There are a number of factors that are associated with the energy efficiency of housing, including property type, tenure and when it was constructed. This article highlights the dwellings that are typically associated with high and low energy efficiency scores to facilitate a greater understanding of the latest data and inform decisions around improvements of energy efficiency in existing housing stock and new dwellings.

Energy Performance Certificates (EPCs) indicate the energy efficiency of buildings. They are based on data about a building's energy features, for example, the building materials used, the heating systems and insulation. These are collected by an accredited energy assessor and entered into a government-approved software to generate a score for the EPC, typically ranging from 0 to 100. Domestic EPCs are banded from A to G, where A is the most energy efficient.

EPC data for England and Wales are available from the Department for Levelling Up, Housing and Communities (DLUHC) Open Data Communities website.

The scores associated with each energy efficiency band are as follows:

- band A – 92 plus (most efficient)
- band B – 81 to 91
- band C – 69 to 80
- band D – 55 to 68
- band E – 39 to 54
- band F – 21 to 38
- band G – 1 to 20 (least efficient)

This analysis uses EPC data to present energy efficiency, main fuel type used in central heating, environmental impact, estimated total annual energy costs and carbon dioxide (CO2) emissions of dwellings with an EPC, for England and Wales separately. The analysis in this article is based upon a filtered dataset of records from 2007 up until the year ending March 2021 (since 2007 EPCs have been required when dwellings are constructed, converted, sold or let), with one record per dwelling. More information can be found in Data sources and quality.

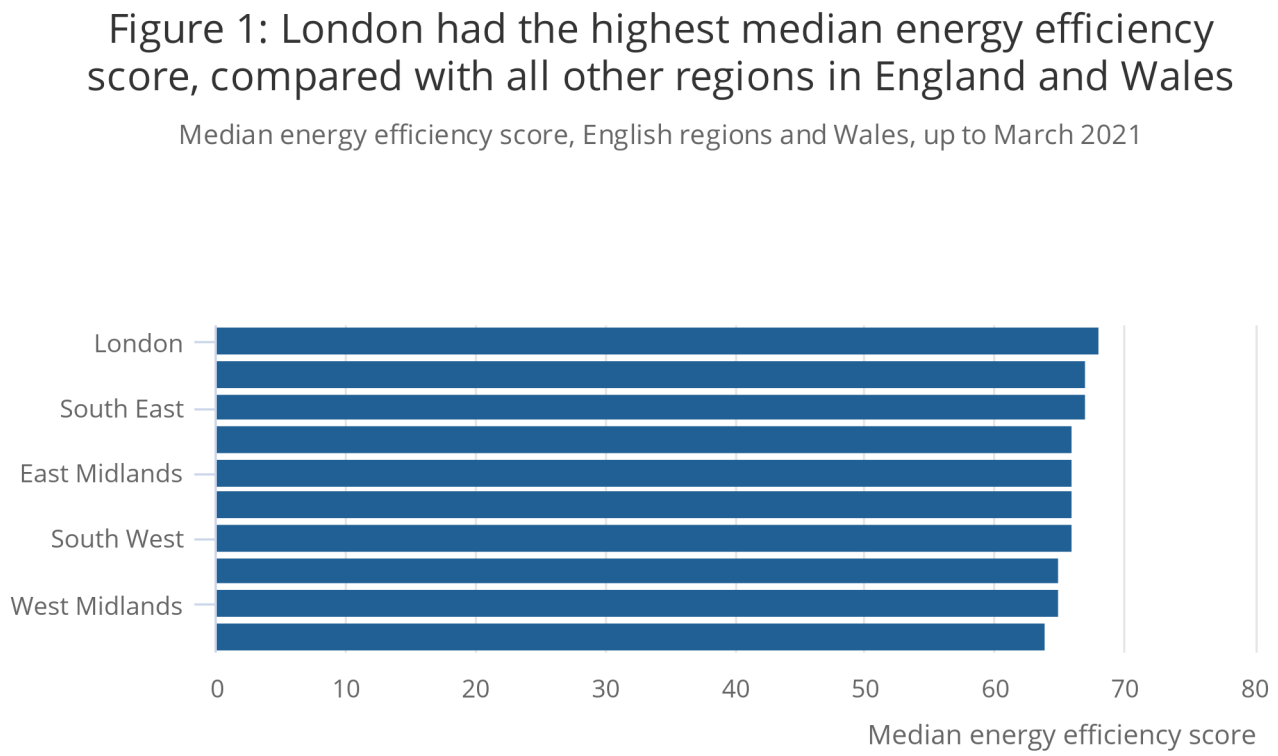
This analysis does not cover all dwellings in England and Wales because not every dwelling has an EPC and so these statistics cannot be viewed as a full representation of the entire dwelling stock. However, these statistics are still useful to provide insight into the energy efficiency of housing as they include the most recent data available for each dwelling that has an EPC.

Energy efficiency by region

The housing stock across England and Wales varies and this is reflected in the median energy efficiency scores. The median energy efficiency score was 66 in England and 64 in Wales for all records up to March 2021, which is equivalent to band D. Within England, Yorkshire and the Humber and the West Midlands had the lowest average score (65, equivalent to band D). London had the highest median energy efficiency out of all English regions, with a score of 68 (band D).

Figure 1: London had the highest median energy efficiency score, compared with all other regions in England and Wales

Median energy efficiency score, English regions and Wales, up to March 2021



Source: Department for Levelling Up, Housing and Communities – Energy Performance Certificate data on Open Data Communities

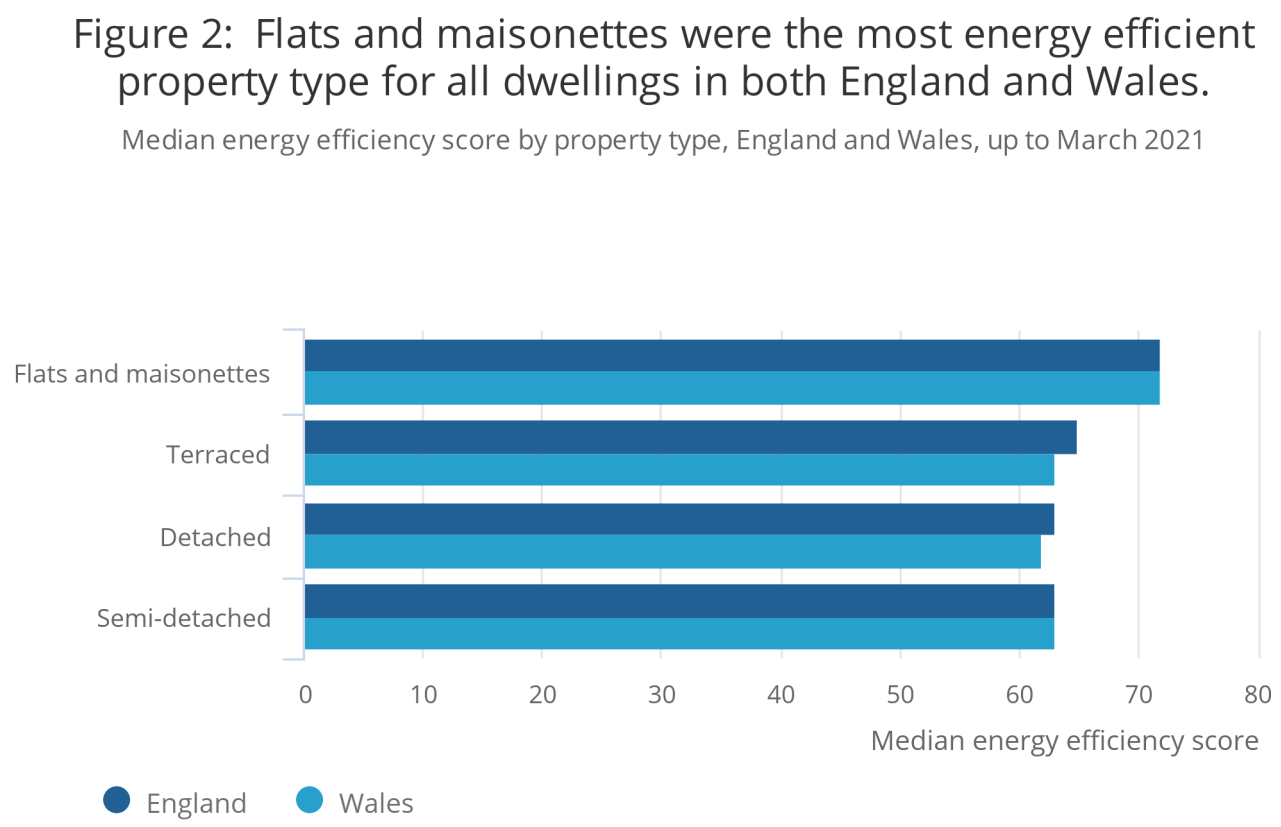
This article does not analyse time-series data on median energy efficiency score. However, analysis of English Housing Survey data has shown that the mean energy efficiency score has improved in England since EPCs were introduced in 2007.

Energy efficiency by property type

Property type can have an impact on energy efficiency. Overall, flats and maisonettes were the most energy efficient property type in both England and Wales, with a median energy efficiency score of 72, which is equivalent to band C (see Figure 2). Detached dwellings scored the lowest in Wales (62), whilst in England, detached and semi-detached (63) were joint lowest. These scores are equivalent to band D. This may be because of external wall exposure being higher in detached properties, compared with flats and maisonettes that are more likely to be grouped in blocks. Whilst there is a large difference in energy efficiency between flats and houses, there was only a small difference between the different types of houses, particularly in Wales.

Figure 2: Flats and maisonettes were the most energy efficient property type for all dwellings in both England and Wales.

Median energy efficiency score by property type, England and Wales, up to March 2021



Source: Department for Levelling Up, Housing and Communities – Energy Performance Certificate data on Open Data Communities

Energy efficiency by property type and tenure

Looking at dwellings solely by tenure, those that were social rented had the highest median energy efficiency scores of 69 in England and 70 in Wales, equivalent to band C. Owner-occupied dwellings scored the lowest in both England and Wales with a score of 62 and 60 respectively, equivalent to band D. However, this does not take into account the property type.

By combining property type and tenure a more detailed picture of the energy efficiency of housing appears. Social rented dwellings scored the highest median energy efficiency across all property types in England and Wales, as shown in Figure 3. In England, when property type is taken into account, private rental properties emerge as the tenure that had the lowest median energy efficiency scores. In Wales, private rental properties had the lowest median energy efficiency scores for detached dwellings and flats and maisonettes, whereas owner-occupied dwellings scored the lowest for semi-detached and terraced dwellings.

When housing type and tenure are accounted for together, energy efficiency scores across England and Wales were more similar.

Figure 3: Social rented dwellings were more energy efficient for all property types, in both England and Wales.

Median energy efficiency score by tenure and property type, England and Wales, up to March 2021

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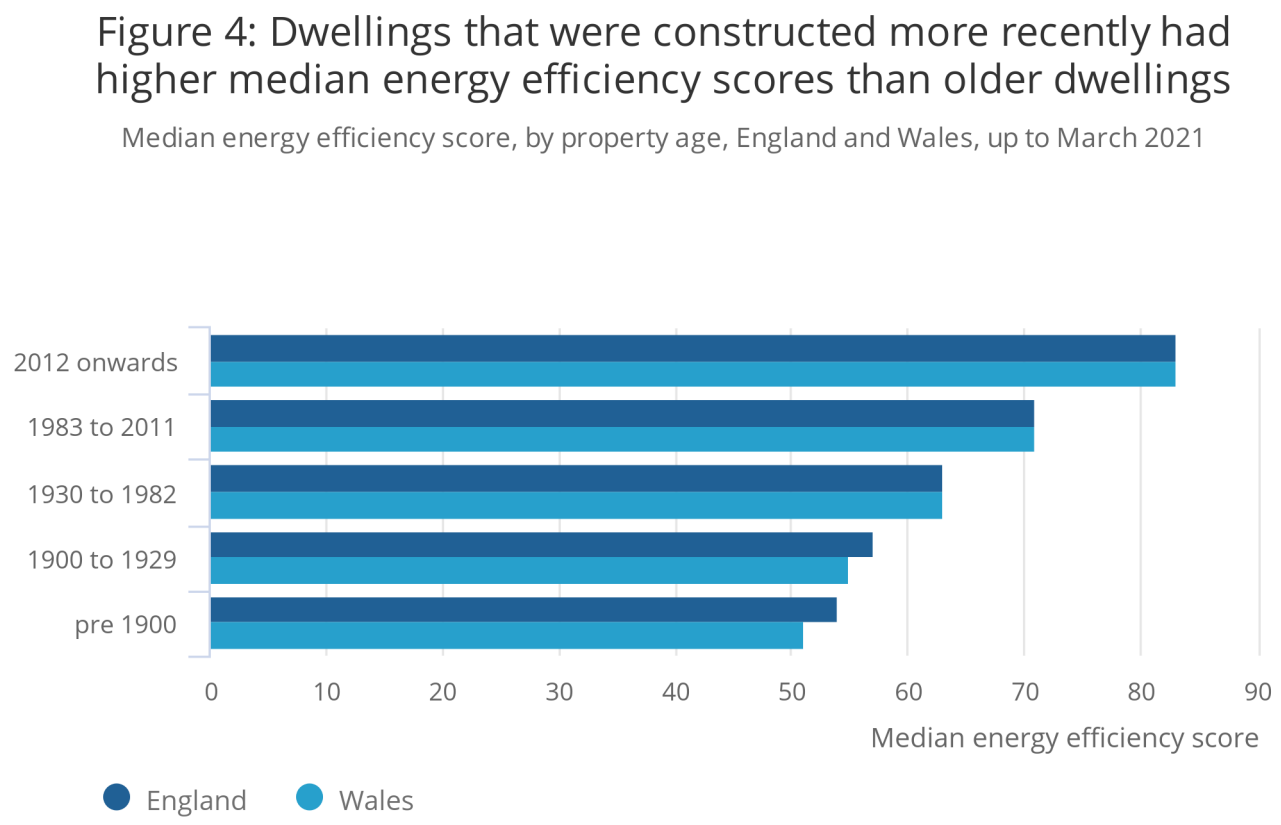
Energy efficiency by property age

The age of a dwelling effects the energy efficiency as building techniques and regulations have changed over time, alongside wear and tear. Dwellings in England and Wales constructed after 2012 had a median energy efficiency score of 83 which is equivalent to band B, as can be seen in Figure 4. In contrast, dwellings constructed prior to 1900 had a median score of 54 in England and 51 in Wales, equivalent to band E.

The proportion of older dwellings can differ across areas, which can influence energy efficiency median scores. For instance, in the EPC records we analysed, Wales had a higher proportion (23%) of older dwellings than England (16%) (built pre 1900 and 1900 to 1929), this may have had an impact on national level medians.

Figure 4: Dwellings that were constructed more recentlyhad higher median energy efficiency scores than older dwellings

Median energy efficiency score, by property age, England and Wales, up to March 2021



Source: Department for Levelling Up, Housing and Communities – Energy Performance Certificate data on Open Data Communities and Valuation Office Agency - Property Attributes data.

Energy efficiency for new and existing dwellings

EPCs were introduced in 2007 and the register is continually updated. For instance, in the financial year ending March 2020, around 1.6 million dwellings were added to the register. This is a mix of newly built or converted dwellings and existing properties that did not have an EPC before. New and existing dwellings are assessed using slightly different methodologies (standard assessment procedure and reduced data standard assessment procedure). For more information about the number of properties added to the EPC register see the UK Climate Change Statistics Portal.

The median energy efficiency score of new and existing buildings can be different because of the use of modern techniques and materials. The score for new dwellings were equivalent to band B (83 for both countries) compared with existing dwellings which were equivalent to band D (64 for England and 63 for Wales), indicating a lower level of energy efficiency.

The median energy efficiency score for new properties was similar across all housing types and tenures (ranging from 80 to 84). However, as existing dwellings make up around 85% of the EPC records we analysed (85% in England, 89% in Wales), the energy efficiency patterns shown in the existing dwellings more closely reflects those shown in the averages for all dwellings.

New dwellings were more energy efficient than existing dwellings, across all property types and tenures for both England and Wales, as shown in Figure 5.

Figure 5: Median energy efficiency scores for new dwellings were higher than existing dwellings.

Median energy efficiency score for new and existing dwellings,byproperty type and tenure, England and Wales,up to March 2021.

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3 . Central heating fuel type for dwellings

One of the main contributors to energy use in the home is central heating, with different sources seen as more or less energy efficient. As part of the Energy Performance Certificate (EPC) assessment the main fuel type of central heating is recorded, if there is no central heating recorded, we group them in the “others and unknown” category.

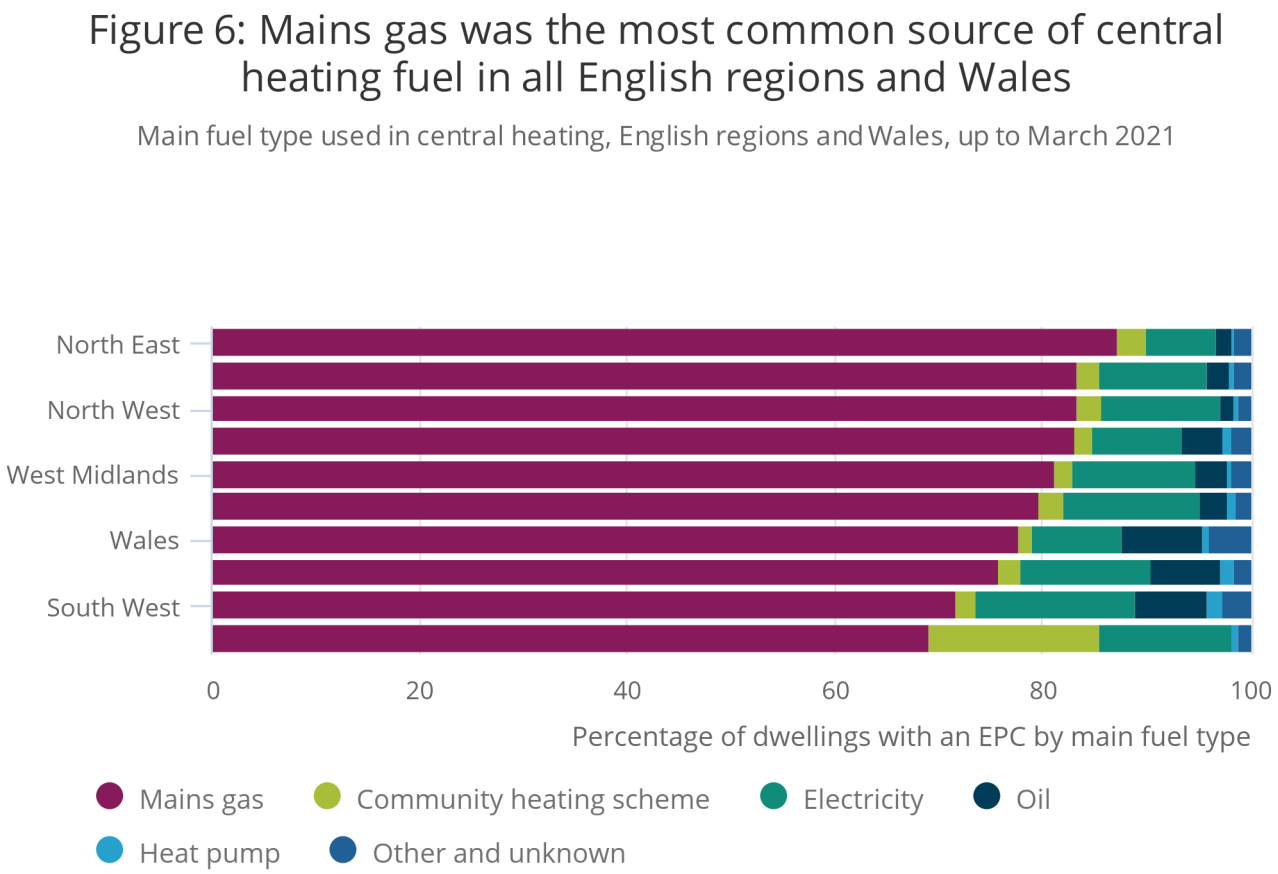
As of March 2021, 79% of dwellings with an EPC that we analysed in England used mains gas to fuel central heating and 78% in Wales.

Electricity was the second most common fuel type used to fuel central heating in England (12%). In Wales, oil and electricity (both around 8%) were joint second.

Among English regions and Wales, the North East had the highest estimated proportion of dwellings that used mains gas (87%) and London the lowest (69%). London also had the highest proportion using community heating schemes (16%), around six times that of any other region.

Figure6: Mains gas was the most common source of central heating fuel inall English regionsand Wales

Main fuel type used in central heating, English regions andWales, up to March 2021



Source: Department for Levelling Up, Housing and Communities – Energy Performance Certificate data on Open Data Communities.

Notes:

1. Other includes B30K (blended biofuel), bioethanol, biogas, biomass, dual fuel (mineral and wood), liquid biofuel, solid fuel (for example coal), tank or bottled gas (like liquefied petroleum gas), wood and when the fuel source is unknown.

In most regions the proportion of mains gas for new homes is similar to those for all dwellings. However, in London only 29% of new dwellings used mains gas compared with 69% for all dwellings, with more new dwellings using community heating schemes (57%). In the North West, 18% of new dwellings used electricity as their main fuel source while 6% of new dwellings in the South West used heat pumps.

4 . Subnational statistics

Local authority areas and middle layer super output area level

To provide a local picture of energy efficiency, it can be useful to look at smaller geographical areas, such as middle layer super output areas (MSOAs) and local authority districts (LADs).

For local authority areas across England and Wales, Energy Performance Certificate (EPC) data up to March 2021 showed a few interesting trends.

- In England, the median energy efficiency scores ranged from 77 for Tower Hamlets in London to 45 in Isles of Scilly in the South West.
- In Wales, median scores ranged from 68 for Newport to 56 for both Gwynedd and Ceredigion.
- 1 in 10 local authority districts across England and Wales had more than half of dwellings with an energy efficiency rating of C or above (69 or above); almost two-thirds of these areas were in London or South East England, none were in Wales.
- In England, Tower Hamlets and Newham had the highest percentage of dwellings in energy efficiency band C or higher (75% and 65%, respectively), while the Isles of Scilly and Castle Point had the lowest percentage (11% and 21%, respectively).
- In Wales, Newport and Cardiff had the highest percentage of dwellings in band C or higher (49% and 46%, respectively) and Gwynedd and the Isle of Anglesey had the lowest percentage (23% and 24%, respectively).
- The median energy efficiency of new dwellings were higher than existing dwellings in all local authorities in England and Wales; Gwynedd in Wales had the largest difference (29 points) in median energy efficiency score between new and existing dwellings, whilst Tower Hamlets, in London had the smallest difference (12 points).
- In Newham, London, almost 9 in 10 new dwellings were mainly heated by a community energy scheme, while Ceredigion, Wales and Kings Lynn, East of England both had almost a third of new dwellings mainly heated with a heat pump.

Figure7: Energy efficiency of dwellings in your area

Notes:

1. At small geographies such as middle layer super output area (MSOA) there are some median energy efficiency scores that are over 100, this indicates that in these areas the dwellings that have Energy Performance Certificates produce more energy than they consume.

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5 . Environmental impact and carbon dioxide emissions

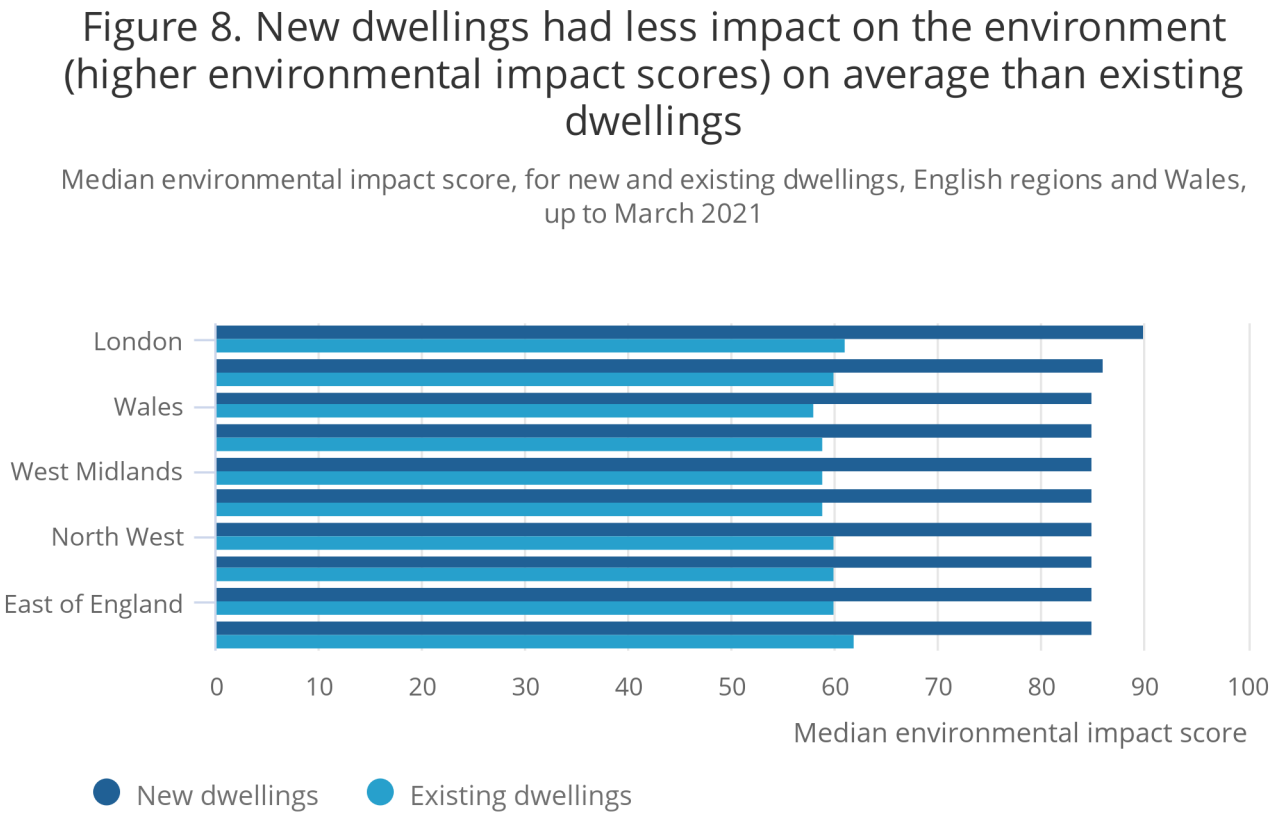
Median environmental impact score for new and existing dwellings

Energy Performance Certificate (EPC) assessments include an environmental impact score based on expected carbon dioxide (CO2) emissions. The higher the rating, the less impact it has on the environment. As can be seen in Figure 8, new dwellings had substantially lower impact on the environment than existing dwellings in both England and Wales.

EPC data on the estimated CO2 emissions are based on standardised assumptions about how residents will use the dwelling (such as number of occupants, heating patterns and lighting and hot water usage). As such, the environmental impact score is related to the homes regular impact on the environment and does not include any environmental impact during construction.

Figure 8. New dwellings had less impact on the environment (higher environmental impact scores) on average than existing dwellings

Median environmental impact score, for new and existing dwellings, English regions and Wales, up to March 2021



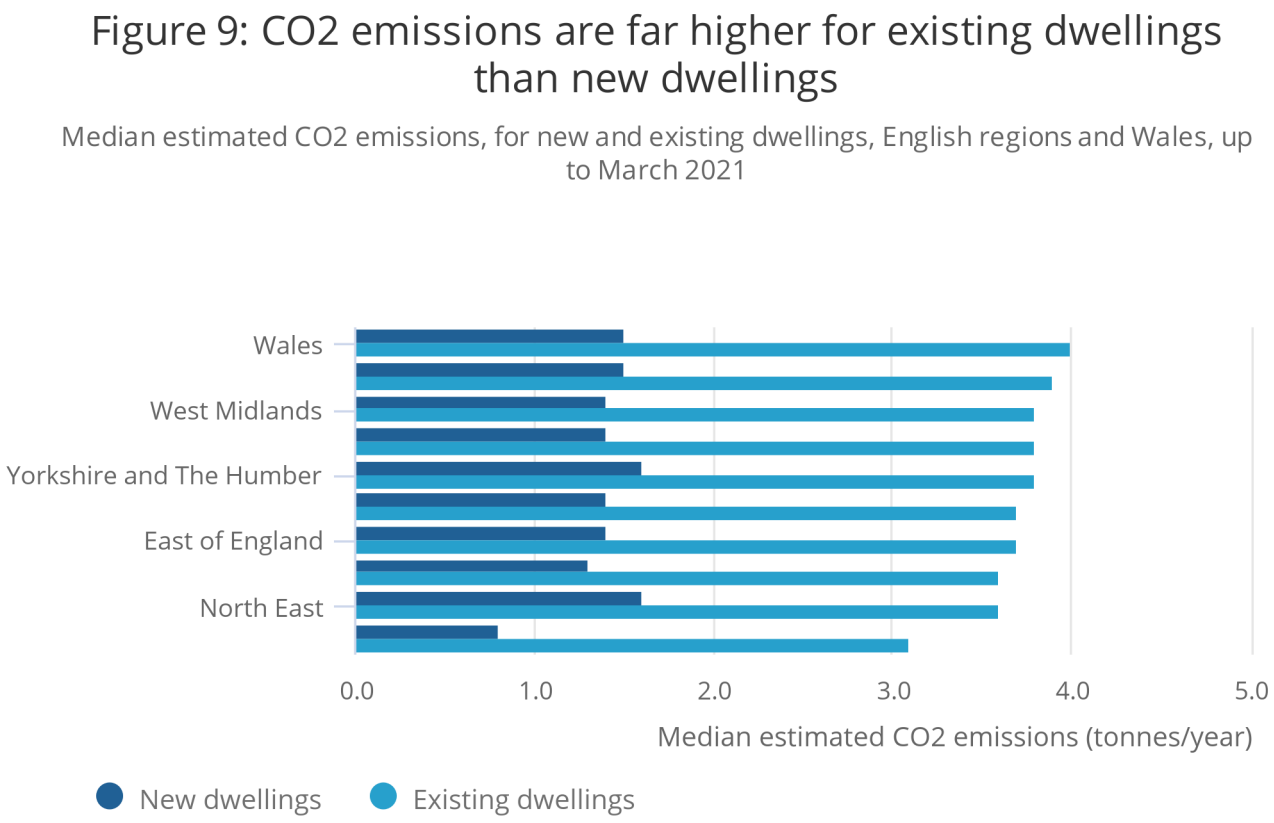
Source: Department for Levelling Up, Housing and Communities – Energy Performance Certificate data on Open Data Communities.

Median estimated CO2 emissions per year for new and existing dwellings

As can be seen in Figure 9, for records up to March 2021, in all English regions and Wales, the median estimated CO2 emissions for existing dwellings were more than the emissions of two new dwellings combined.

Figure9: CO2 emissions are far higher for existing dwellings than new dwellings

Median estimated CO2 emissions, for new and existing dwellings, English regionsand Wales, up to March 2021



Source: Department for Levelling Up, Housing and Communities – Energy Performance Certificate data on Open Data Communities.

6 . Energy costs

Median estimated total energy costs for new and existing dwellings

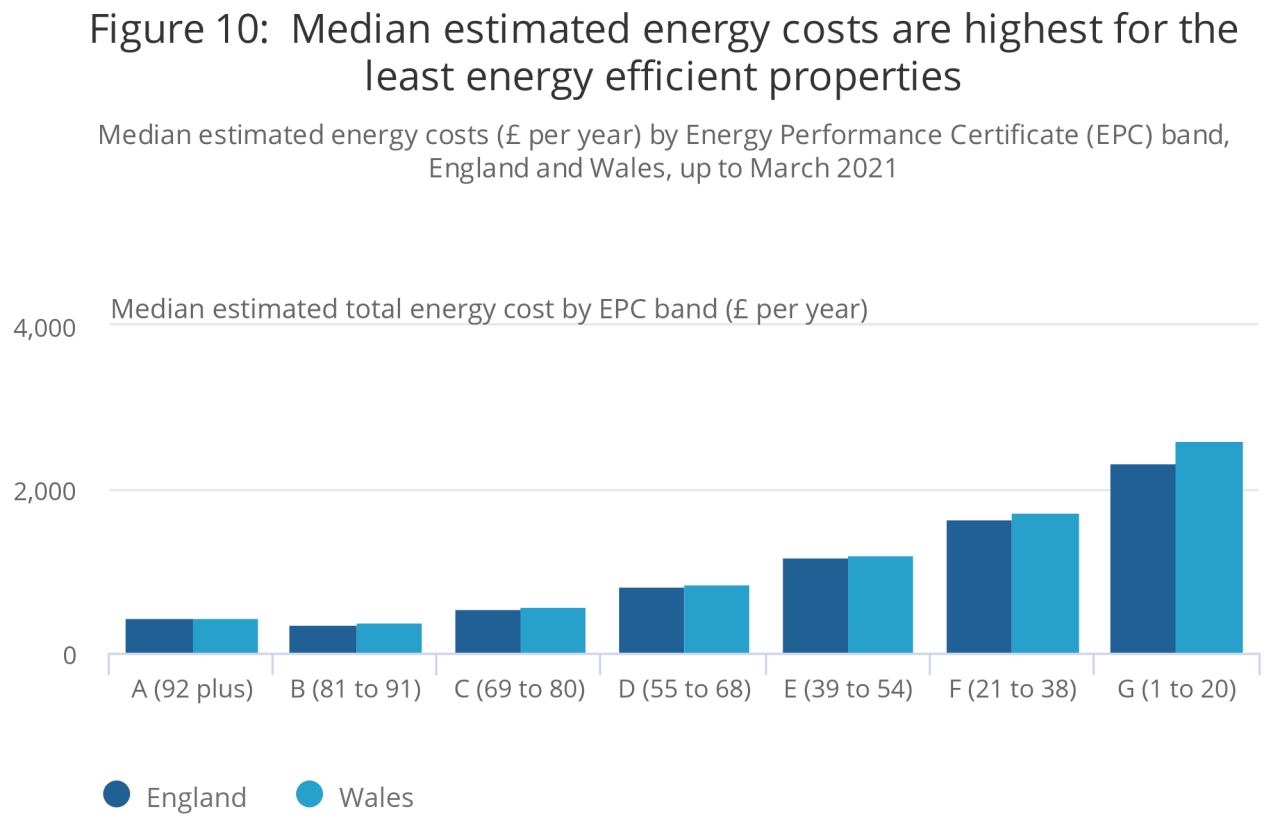
Energy Performance Certificates (EPCs) also provide an estimated energy cost based on standardised assumptions (as above), comprising of lighting, heating and hot water costs (this does not include use of appliances). The median estimated energy cost per year for an existing dwelling was £797 in England and £852 in Wales, both being more than twice as much as that estimated for a new dwelling (£390 in England and £412 in Wales).

When considering these estimates, the figures reflect estimated energy costs at the time of each assessment and so do not necessarily reflect costs today. However, they remain useful for comparisons across EPC bands as shown in Figure 10. Similarly to estimated CO2 emissions, estimated energy costs are also based on standardised assumptions about how residents will use the dwelling and do not reflect the actual energy usage of a dwelling.

Figure 10 shows how energy costs vary by EPC band; less energy efficient dwellings had the highest estimated energy costs. This suggests that if a dwelling were to have energy efficiency improvements, they could potentially reduce their estimated energy costs.

Figure10: Median estimated energy costs are highest for the least energy efficient properties

Median estimated energy costs (£ per year) by Energy Performance Certificate (EPC) band, England and Wales, up to March 2021



Source: Department for Levelling Up, Housing and Communities – Energy Performance Certificate data on Open Data Communities.

Notes:

1. Median energy costs are rounded to the nearest pound.

7 . Energy efficiency of housing in England and Wales data

Energy efficiency of housing, England and Wales, cumulative financial years
Dataset | Released 10 November 2021
Data on the energy efficiency of dwellings in England and Wales for cumulative financial years up to March 2021. These are broken down by property type, tenure and whether a dwelling is new or existing.

Energy efficiency of Housing, England and Wales, middle layer super output area
Dataset | Released 10 November 2021
Data on the energy efficiency of dwellings, environmental impact score, estimated CO2 emissions and estimated energy costs in England and Wales at the middle layer super output area (MSOA) level. These are broken down by property type, tenure, age of property and whether a dwelling is new or existing.

Energy efficiency of Housing, England and Wales, country and region
Dataset | Released 10 November 2021
Data on the energy efficiency of dwellings, environmental impact score, estimated CO2 emissions and estimated energy costs in England and Wales at the country and region level. These are broken down by property type, tenure, age of property and whether a dwelling is new or existing.

Energy efficiency of Housing, England and Wales, local authority districts
Dataset | Released 10 November 2021
Data on the energy efficiency of dwellings, environmental impact score, estimated CO2 emissions and estimated energy costs in England and Wales at the local authority district level. These are broken down by property type, tenure, age of property and whether a dwelling is new or existing.

8 . Glossary

Community heating scheme

A community heating scheme is a distribution system of insulated pipes that takes heat from a central source (usually in the form of hot water or steam) and delivers it to a number of different buildings or dwellings within the same building.

Dwelling

A dwelling is an address containing a unit of accommodation that can comprise one or more household spaces.

Energy efficiency

Energy efficiency relates to the concept of efficient energy use, which means using less energy to provide a given amount of heating or lighting. Using less energy, reduces emissions of carbon dioxide.

Energy efficiency score

The energy efficiency score (SAP score) is a measure of the overall efficiency of a building. This score is based on the performance of the building and its fixed services (such as heating and lighting). The higher the score the more energy efficient the home. The score is produced during an Energy Performance Certificate (EPC) assessment and is based on standardised assumptions for occupancy and behaviour. This enables a like-for-like comparison of dwelling's energy efficiency performance. The higher the score the more energy efficient the home.

Environmental impact rating

The environmental impact rating is a measure of a home's impact on the environment in terms of carbon dioxide (CO2) emissions. The higher the rating the less impact it has on the environment. This rating is based on the performance of the building and its fixed services (such as heating and lighting).

Energy Performance Certificate

Energy Performance Certificates (EPCs) are required for all buildings (domestic and non-domestic), when constructed, sold or rented. There are some exemptions, for example buildings used as places of worship. EPCs are valid for 10 years. The EPC records how energy efficient a property is as a building, using an A to G rating scale where A is the most efficient and G is the least efficient. The certificate also lists the potential rating of the building if all the cost-effective measures are installed.

Existing dwelling

Statistics for existing dwellings were created using data from the latest EPC record available for existing dwellings in a financial year. Existing dwellings are those that are required to undergo an energy performance assessment as they are either being sold or let and are not newly constructed or converted.

Heat pump

A heat pump is a device that absorbs heat from one environment and transports it into another using electricity. For example, an air-source heat pump extracts heat from the air outside and transfers it into the home. This heat can then be used to warm radiators and underfloor heating systems.

New dwelling

Statistics for new dwellings are generated statistics using data from new dwelling EPC records. A new dwelling is any dwelling that has been newly constructed, created by conversion or has undergone a change of use and is now required to have an energy performance assessment.

9 . Data sources and quality

How we used the Energy Performance Certificate (EPC) data

This article contains analysis of key variables in the EPC data downloaded from the Department for Levelling up, Housing and Communities (DLUHC) Open Data Communities website, for England and Wales.

Data tables produced analyse EPC data in two ways. Firstly, all dwellings up to March 2021 (to coincide with the end of the financial year). These data tables include all EPC records from 2007 up to March 2021, for properties that still exist. Only one record per dwelling (latest) is included. Secondly, cumulative records up to financial year ending (FYE) 2011 through to FYE 2021. These data tables provide a time series of data, which include all EPCs up to the given FYE. Only one record per dwelling (latest) is included.

How we used the property attributes data

To quality check the EPC records used for analysis, EPC data was linked to Valuation Office Agency (VOA) property attributes data at the address level. This enabled checking that the dwelling with an EPC record still existed, and that there was consistent property information (property type and age of property band) across both data sources. We excluded records that had a direct contradiction between data sources on these property variables from the analysis. After these quality assurance checks were applied, we were left with 59% of the original EPC dataset upon which we conducted our analysis.

Below is an overview of the data parsing process including the reduction of records as a percentage of the original 21,001,474 records and the type of remaining record.

- EPC records for properties that no longer exist are filtered out of the dataset (3.3% of original records).
- Records with implausible values on key variables (<0.1%) are filtered out.
- EPC records where there is direct contradiction between property types provided in EPC and VOA property attributes (where both have property type information available) are removed (5.5%).
- EPC records where there is direct contradiction between age of property band provided in EPC and VOA property attributes, where both have age of property information available are removed (17%).
- Duplicated EPC records based on multiple variables including Unique Property Reference Number and inspection date (0.2%) are removed.
- EPC records that have been superseded by a later record for the same dwelling (14%) are removed.
- 12,423,034 EPC records (59%) are retained and used for analysis.

Interpreting these statistics

The analysis in this report does not cover all dwellings in England and Wales because not every dwelling has an EPC (these are only required when a dwelling is constructed, converted, sold or let). EPC's are valid for ten years, so do not necessarily reflect energy efficiency improvements. Dwellings can have more than one record, but we keep the latest only for our analysis, so dwellings are not double counted.

Some dwellings included in our statistics may have changed tenure since the date of their latest EPC. For instance, dwellings that had an EPC for reasons other than being let may have since entered the private or social rented sector.

10 . Related links

Energy Performance of Buildings Certificates
Collection | Last updated 28 October 2021
The Department of Levelling Up, Housing and Communities (DLUHC) publish quarterly EPC statistical releases. These focus primarily on describing the Energy Performance Certificates (EPCs) themselves, presenting timely information for domestic and non-domestic buildings in England and Wales.

Welsh Housing Conditions Survey (energy efficiency of dwellings)
Statistics | Released 23 October 2021
The Welsh Government also provides analysis on the energy efficiency of dwellings in Wales, based on data from the Welsh Housing Conditions Survey.

Scottish house condition survey
Statistics | Released 1 December 2020
The Scottish house condition survey contains statistics on energy efficiency, based on an annual survey sample of around 3,000 dwellings. This is the primary source of data at a national level on the energy efficiency of the Scottish housing stock.

Northern Ireland Housing Statistics
Report | Last updated 4 February 2021
The Northern Ireland Housing Statistics report contains information and statistics relating to domestic energy and energy efficiency of homes in Northern Ireland.

Energy efficiency of housing in England and Wales
Article | Released 23 September 2020
Previous Office for National Statistics (ONS) analysis of the energy efficiency estimated carbon dioxide emissions and energy cost of dwellings in England and Wales with an Energy Performance Certificate.

UK Climate Change Statistics Portal
Statistics Dashboard | Updated regularly
A prototype portal for data and insights on climate change.