

Responses to Housing Supply Strategy – Passive House Association of Ireland

In responding to the questions below, please try to support your response with facts, data, specific examples and/or other forms of evidence to substantiate your point of view:

1. Please confirm whether you are replying as an individual or submitting an official response on behalf of an organisation.

This submission is made by the Passive House Association of Ireland on behalf of the PHAI members.

The mission of the Passive House Association of Ireland (PHAI) is to promote, educate and facilitate, so as to develop a strong identity, understanding and demand for the Passive House concept.

PHAI is an all island not for profit organisation and work closely with the British Passive House Trust and have many active participants in Northern Ireland.

We are particularly interested in how low energy housing can contribute to we are leaders when it comes to meeting our environmental and Emissions targets.

With a focus on how energy performance and how embodied carbon / carbon in use targets can be achieved in new and upgraded buildings, we submit that the Northern Ireland Housing Supply Strategy can take a significant contribution in achieving the objectives of the Northern Ireland Energy Strategy by ensuring delivery of excellence in building energy performance for new build and renovation.

Details of the internationally accepted evidence based Passivhaus standard can be found at <https://passivehouse.com/> and further details of the Passive House Association of Ireland can be found at www.phai.ie.

2. Do you agree that a 'Whole System' approach given the challenges is the right one?

The PHAI agrees with the Whole System Approach.

3. Do you agree with the 15 year timeframe proposed for the Housing Supply Strategy?

Yes. The PHAI recognises the need to plan for the long-term.

However while there are many advantages to a 15 year time horizon, urgent action is required and short term goals (e.g. over a two, four and six year horizon) need to be explicitly stated and achieved, as part of the overall 15 year time horizon. The multi-year action plan is therefore highly desirable and crucially important.

4. Do you agree with the proposed vision for the Strategy?

The PHAI agrees with the proposed vision.

5. Do you agree with the following proposed objectives for the Strategy:

- (a) Increase housing supply and affordable options across all tenures to meet current and future demand.
- (b) Reduce housing stress and homelessness and improve housing solutions for the most vulnerable.
- (c) Improve housing quality

The Passive House Association of Ireland considers that improved housing quality is a key deliverable of the Housing Supply Strategy.

Quality is at the core of The Passive House standard; spanning not only quality of construction, but also ensuring excellent indoor air quality, high levels of comfort (in accordance with the international standard ISO 7730), whilst simultaneously ensuring very low running costs. Recent research has demonstrated the high indoor air quality (IAQ) of passive houses in Northern Ireland.(McCarron, n.d.) It is recommended that Indoor Environmental Quality should conform with international and British standards such as BS EN 16798, and that the housing regulations (including part L and part F) should be updated accordingly.

- (d) Ensure the provision of housing options that contribute to the building and maintaining of thriving, inclusive communities and places.
- (e) Support the transition to carbon neutrality by reducing whole-life carbon emissions from both new homes and existing homes.

Transition to carbon neutrality is a core deliverable of the housing supply strategy. The Passive House Standard has been demonstrated to deliver best in class operational energy performance (and is in compliance with the Climate Change Committee Ultra Energy Efficiency Standard), and therefore significantly reduces the ongoing operational carbon emissions. In this way, a significant contribution to reducing whole life carbon emissions can be achieved by using this proven international standard. Constructing to the passive house standard with the astute choice of building materials will ensure both low operational energy and low embodied energy.

6. The terms good quality, sustainable and affordable mean different things to different people - how would you define these terms?

In defining the terms reference to international standards whenever possible is of paramount importance to ensure objectivity and clarity of purpose.

Good quality: The Passive House Standard ensures good quality for indoor air quality, energy consumption and comfort in accordance with internationally recognised standards including ISO7730 and BS EN 16798. Further, by ensuring that the construction is inspected and documented prior to certification as complying with the rigorous construction methodologies required, construction quality is also assured.

Sustainability: This is a broad term which covers not only sustainable running costs, but also sustainable construction meeting both current and future needs simultaneously. It is of paramount importance that

housing is constructed now to meet the requirements of 2050 to ensure that they will not require retrofitting at considerable expense in the future. Using the passive house standard it is possible right now to build dwellings which are not only carbon neutral, but also meet the demands for sustainable living at low cost into the future thereby ensuring numerous sustainability criteria are met simultaneously.

Affordable: the energy consumption of a passive house is so low (space heating costs can be as low as £100 per annum) that it eliminates fuel poverty (Boardman 1991). This is a key criteria for Northern Ireland in particular given the prevalence of fuel poverty and relatively low incomes. As heating costs increase in the future, citizens of Northern Ireland are more vulnerable than those of other regions in the UK.

7. What do you believe are the three main barriers to delivering the objectives for the strategy?

- The building regulations pertaining in Northern Ireland are currently among the worst in Europe. It is estimated that a new house built in the Republic of Ireland consumes half the amount of heating energy as the same house constructed in Northern Ireland. This is a significant impediment to providing quality housing fit for the future.
- There should be cross party agreement on the housing policy for Northern Ireland, as a shared vision among the main Northern Ireland parties is key to ensuring that any long-term vision is achieved in the province.
- Funding needs to be put in place to meet the current and future social housing need.

8. To what extent do you agree that there is a need to establish a more robust understanding of NI Housing Stock, e.g. by tenure, location, condition, etc.?

9. Are you aware of any specific data sources or methodological approaches to estimating existing housing stock, e.g. by tenure, location, condition, etc.?

Sustainable Communities and Homes

10. How can housing supply help create and maintain sustainable communities?

The passive house standard can be a key plank in achieving comfortable energy efficient housing with good indoor air quality. In this way, sustainable communities are enabled throughout Northern Ireland.

Not only that, but by supporting the low energy housing industry in Northern Ireland, there is a real opportunity to aid the development of key capabilities required not only to meet the need for housing to meet the low-energy demands of the future, but also to create sustainable employment in this arena.

11. How do we engage communities more effectively in place making?

12. To what extent do you agree that housing led regeneration policy contributes to reversing the physical, social and economic decline of:

- (a) areas of deprivation
- (b) town and city centres
- (c) rural areas
- (d) suburban areas

13. How can we change the approach to housing led regeneration and ensure that it is more integrated in delivering wider policy outcomes?

The PHAI recommends that the holistic approach of RIBA2030 and the Passive House Standard be considered as a benchmark for all residential development and be incentivised in the Housing Supply Strategy.

There are incremental levels in both RIBA2030 and PH standards that could be encouraged and would ensure that meaningful standards and excellent neighbourhoods could be enabled which meet Northern Ireland's long term policy objectives in a synergistic fashion.

For example with the advent of electric vehicles, (cars and cycles), the promotion of electrical heat pumps for property heating and Smart Grids, it is already evident that the Northern Ireland electricity Grid has serious capacity issues that which will ultimately impact on the population. It is therefore essential that efficiency first is promoted, and this is where Passive House can help.

It has been said that "Every successful energy saving programme needs three main components: carrots to provide incentives, sticks to ensure compliance and tambourines to increase awareness". (ECONOMIDOU 2014).

Therefore PHAI proposes that the Northern Ireland Housing Supply Strategy could be a

vehicle through which real innovation be demonstrated in the achievement of policy outcomes.

There is precedent for this both in Great Britain and in the Republic of Ireland.

A growing number of councils have adopted the passive house standard in Great Britain (“Passivhaus for Local Authorities & Housing Associations” n.d.).

There is an increasing number of examples of how Local Authorities in the Republic of Ireland are using their Development Plans and contribution schemes to incentivise and reward ambitious Climate aware development.

Sligo Development Plan para 13.2.18 Energy efficiency states:

‘Buildings built to the internationally recognised ‘Passive House Standard’ are designed to have a very low energy requirement in terms of heating or cooling’.

Sligo actively incentivises excellence in energy performance by reward Passivhaus projects in their development contributions scheme 2018-2024:

‘In the case of residential development to passive house standard, a 50% reduction on the applicable rate of development contribution. This shall be paid by way of a refund upon submission of a Passive House Certificate for the completed dwelling house’

In Wexford, the Development Contribution Scheme 2018 took a linear sliding scale in relation to incentives and energy efficiency. The following incentives apply in relation to Capital Contributions for Planning:

Incentives will be provided to those who utilise mechanisms to promote the use of green energy in all buildings.

Deduction of between 10% to 50% should be applied to developments that encourage renewable energy and energy conservation. Provisional BER Certificates must be submitted as part of the planning application to avail of the discount. It is necessary for energy conservation to be given consideration in the design process in order to maximise energy use.

The deductions will be applied in the planning permission as follows;

50% reduction for 0 % energy use and NZEB (Nearly Zero Energy Buildings)

30 % reduction for A1

20 % reduction for A2

10 % reduction for A3

Opportunity for the Housing Supply Strategy to Support indigenous industry in NI.

Not only can Passive House contribute to reducing energy consumption and carbon emissions and facilitate the achievement of numerous objectives in the Northern Ireland Energy Strategy (e.g. reduced demand on the electricity grid), it can also

contribute in a significant way to the generation of significant employment in this key area.

In NI we have a high density of highly trained Passivhaus Designers, Consultants, Contractors and indeed certified manufacturers of Timber frame systems, a number of whom are delivering their innovative products successfully to the GB, the Republic of Ireland and Europe.

We also have already a significant number of Passivhaus Certified projects in NI and many more under construction.

There is a high level of interest and capacity to deliver the Passivhaus standard locally which can also contribute to the built environment positively as the standard of delivery is generally of a high standard.

Research conducted at Ulster University has demonstrated that a three bedroomed house can be constructed to the Passive House Standard for an additional cost of £5,088 compared with constructing to the minimum Northern Ireland building standards. In addition, the multiple benefits which are achieved extend to multiples of this (see Q 39 below).

So, by incentivising Passive House, an innovative, self financing initiative can demonstrate housing led regeneration ensuring not only sustainable homes, but also sustainable communities.

14. To what extent do you agree that it should be a priority to deliver more shared housing developments throughout NI?
15. How can more shared housing developments be delivered here?
16. To what extent do you agree that housing should be an integral part of the care and support system?
17. What challenges do you see in delivering a wider range of housing types, e.g. housing that is better suited to the needs of older people or those with disabilities and how can these be overcome?

The current poor building regulations are a significant impediment to meeting the needs of the elderly and those with disabilities.

The number of people in Northern Ireland who will be over 85 years of age is expected to grow by 38% between 2021 and 2031. Further, the number of people over 65 years of age is due to increase by 26% between 2021 and 2031.

The medically vulnerable and the elderly require higher internal temperatures consistent with “category I” needs as outlined in BS EN 16798 standard (“BS EN 16798-1:2019 Energy Performance of Buildings. Ventilation for Buildings. Indoor Environmental Input Parameters for Design and Assessment of Energy Performance of Buildings Addressing Indoor Air Quality, Thermal Environment, Lighting and Acoustics. M” n.d.).

This requires that mean internal temperatures of 21° to 25° C are maintained in all areas of the building for a 24-hour heating period, rather than the existing 21° C in the living room, 18° C in the rest of the dwelling for two hours in the morning and six hours in the evening as specified in the current NI building regulations assessment methodology.

Therefore the building regulations need to recognise the changing needs of the population.

The Passive House Standard is designed to continuously heat the dwelling to temperatures in excess of 20° C, whilst simultaneously providing eight air changes per day (therefore ensuring good indoor air quality) and exceptionally low heating costs.

Therefore the upgrading of the current building regulations to standards similar to the passive house standard or the requirements of BS EN 16798 would be a key enabler in the provision of adequate housing.

18. How important is mixed tenure to addressing housing supply issues in NI?

19. What challenges do you see in progressing mixed tenure developments, and how could these be overcome?

Equality and Human Rights

20. The Equality Commission has framed local housing demand and supply in relation to three constructs – accessibility; adequacy; and sustainability. Are you content with this framework or are there other issues that may warrant inclusion?
21. In addition to the inequalities or data gaps already identified in the Equality Commission's Statement and the Wallace Report, are there any other issues that should be considered?
22. In relation to the issue of using multivariate analyses (Multivariate analysis is analysis that considers the impact of more than one Section 75 characteristic), are you aware of any work already undertaken that would be useful?

Housing Supply in Rural Areas

23. To what extent do you agree that the Housing Supply Strategy should address the need for affordable homes in rural areas?
24. To what extent do you agree that community led housing should be supported and enabled in rural and urban areas across NI?
25. How can additional innovative multi-agency projects (or approaches such as 'Tackling Rural Poverty & Social Isolation') be created to deliver more affordable housing supply in rural areas?

Housing and Poverty

26. Is there a need for this Housing Supply Strategy to play a role in reducing poverty?

The provision of high quality low energy housing is key in the elimination of fuel poverty and ensuring that the houses built today will not require significant expenditure in the future to improve their energy efficiency ("UK Housing: Fit for the Future?" n.d.). The housing supply strategy needs to ensure that high quality dwellings are built now to standards which meet the needs of the future housing stock has laid out in the UK Climate Change Committee's (CC) Ultra Energy Efficiency Standard (UEES). It is noted that the energy requirements laid out in this standard can be exceeded by building to the passive house standard. In this way the future upgrade costs of meeting the standards of the future are eliminated. These can extend to £26,300 ("The Costs and Benefits of Tighter Standards for New Buildings (Currie & Brown and AECOM)" n.d.).

The passive house standard can be used to meet and exceed this standard, obviating the need for this future excessive expenditure required to retrofit the UEES standard.

27. Currently housing stress is identified as 'those experiencing intimidation, insecurity of tenure,

housing conditions, health and social wellbeing issues'. Do you have any comments on this definition of housing stress or are there other causes of housing stress that need to be considered?

28. To what extent do you agree that more needs to be done from an interdepartmental perspective to improve the lives and life chances of those who are homeless or at risk of homelessness?
29. How do we help homeless people transition from temporary accommodation to long term homes?
30. To what extent do you agree that housing plays a significant role in reducing economic inactivity/enabling individuals to take up employment?

The support of indigenous companies which are supplying low energy houses can achieve the objective of increasing the supply of low energy homes and also enabling individuals to take up employment in this vital industry sector. The Passive House Association of Ireland would like to see PH being incentivised in order to provide the critical mass necessary for the establishment of this vital capability within Northern Ireland.

Land and Property

31. Are there changes to land & property legislation, policies, processes or procedures that could transform housing supply for the better?

The current building regulations in Northern Ireland require urgent attention. By upgrading them to match the standards applying elsewhere in Europe and the UK would make a significant improvement. A phased implementation of improved standards to those approaching the passive house standard (or UK Climate Change Committee Ultra Energy Efficiency Standard) would send a clear signal to industry which will enable them to train and plan for the provision of housing to modern standards .

32. Should the options for making public sector land (local and central government) available to support a wider variety of housing options be explored?
33. Are there land & property practices adopted in other UK or European jurisdictions that you believe would transform supply if adopted here?

The Irish Government Land Development Agency could be seen as a potential model to help inform policy in Northern Ireland. The land development agency is currently planning for the delivery of 572 units in Shanganagh Castle in Dun Laoghaire Rathdown, Co Dublin and will achieve the Passive House Standard.

Planning

34. Are there changes to planning legislation, policies, processes or procedures that could transform housing supply for the better?

Numerous councils and local authorities (in excess of 30) across the UK are implementing low-energy standards via Passive House (“Passivhaus for Local Authorities & Housing Associations” n.d.). These include a number in Scotland (Ayrshire, Glasgow City Council) and also England (Bristol city council, Cambridge city council, the Greater London authority, Exeter city council).

35. Are there planning practices adopted in other UK or European jurisdictions that you believe would transform supply if adopted here?

36. Is land banking hindering housing supply here?

Finance

37. To what extent do you agree that the NICS could better utilise existing funding (e.g. Block Grant, Financial Transactions Capital, Housing Association Grant, Reinvestment and Reform Initiative) to leverage greater levels of private finance for housing development?

It is imperative that the limited resources which are available are deployed in the most efficient manner possible. Passive House can help in this respect, as the design of the houses tailored to the local climatic conditions.

Funding should be applied to delivers optimised building performance based on site specific or local climate data. In this way money is not wasted in providing insulation to standards that are not required due to local benign climatic conditions.

By concentrating on the fabric (i.e. ensuring that the building consumes more energy than it should) the need for extra expenditure on renewables is avoided and can be redeployed to better use.

38. Are there other ways the private and voluntary community and social enterprise sectors can leverage other forms of funding to increase housing supply?

Low-energy homes consume less energy and are therefore less expensive to run. This is recognised in the marketplace and innovative financial institutions (for example Allied Irish Banks) are providing lower mortgage rates for buildings which are energy efficient, reflecting the lower default rates i.e. occupants can more easily afford to pay the mortgage given that the running costs are lower.

Passive Houses in Northern Ireland have been demonstrated to require less than 40% of the energy compared with buildings constructed to the prevailing minimum building regulations (Colclough, Griffiths, and Hewitt 2019).

39. Are there any other areas of market failure that need public and/or private intervention?

The housing stock in Northern Ireland is being built to the wrong standards. This is a significant oversight and

one which ensures that Northern Ireland continues to build dwellings which will require upgrading in the future. This is significant market failure and one which needs to be addressed urgently.

The building regulations in Northern Ireland (unlike all other jurisdictions in the UK and Europe) have not been upgraded for nine years.

The UK Climate Change Committee in its recent report (UK housing: fit for the future?) found that significant future upgrade costs are being embedded in infrastructure due to low building standards throughout the UK. The situation is at its most severe in Northern Ireland.

While it currently costs approximately £5000 to build a three bedroom semi detached home to the passive house standard compared with the prevailing Northern Ireland minimum building regulations (Colclough and McWilliams 2019; 2019), this is in stark contrast to other regions. Due to the higher minimum building regulations in the Republic of Ireland, it has been demonstrated that passive houses can be constructed for little or no additional cost. This ensures that best in class performance can be provided to all of the citizens in Northern Ireland, but only if the to address the significant market failure.

By building to standards such as the UK's Ultra Energy Efficiency Standard, future upgrade costs are avoided, and lower running costs insured, eliminating fuel poverty and high thermal comfort.

Infrastructure

40. Are there changes to infrastructure legislation, policies, processes or procedures, such as the establishment of an Infrastructure Commission that could transform housing supply for the better?

Yes. The building regulations need to be improved significantly. There are many precedents for how this has been achieved successfully elsewhere over the past decade in relation to the passive house standard. For example a decade ago, Brussels decided to implement the passive house standard for all new buildings, and established appropriate legislation. Further details can be found in "How Brussels Went Passive - Passivehouseplus.ie" n.d.)

41. To what extent do you agree that coordination of housing provision and infrastructure services need to be better aligned?

The provision of housing needs to be considered in relation to infrastructure. This is particularly evident in relation to the electricity network. By providing low energy demands, passive houses are seen to require less energy from the electricity network, therefore enabling lower cost electricity infrastructure.

42. To what extent do you agree that a Housing Supply Strategy should consider both the provision of new homes and protecting existing supply?

43. How do we ensure that our housing supply integrates and brings together all the essential infrastructure (hard/soft & critical) required to create thriving homes and communities?
Through the Planning System Regional and Local Plans.

Climate Change/Net Zero

44. Are there changes to climate, sustainability and environmental legislation, policies, processes or

procedures that could transform housing supply for the better?

45. Transitioning to low carbon homes will require significant behavioural changes by householders. Is support required to aid the necessary behavioural changes?
46. Taking into account social impact, what incentives or disincentives could be introduced to positively impact the current and future delivery of low carbon homes?

Financial incentives should be made available for buildings complying with low-energy standards including passive house. There is precedent for this with the elimination of rates which was rolled out as part of the 'low carbon' and 'zero carbon homes' incentives grant scheme between 2006 and 2008 in Northern Ireland.

This incentive scheme led to the construction of Northern Ireland's first Passive House, which was a beacon project in that a number of similar houses were constructed subsequently.

By incentivising low-energy homes, significant multiple financial benefits are enabled. Research carried out at Ulster University indicates that the benefit to Northern Ireland of constructing homes to the passive house standard over a period of 10 years accrue to an excess of £1 billion. Therefore significant financial benefits (e.g. savings in carbon tax, import of fossil fuels, reduced healthcare expenditure et cetera) can be used to fund the incentives required to embed the low-energy methodologies across the province.

Innovation

47. Should existing buildings, including our heritage assets, play an enhanced role in transforming housing supply?
48. Are you aware of any innovations relating to housing including design, construction, procurement, contracting and commissioning that could help transform supply?

The passive house standard has the potential to transform the speed and quality with which housing can be provided. By using Modern Methods of Construction, rapid housing is possible.

Invest NI are supporting indigenous companies in the manufacture of Passive Houses in off-site facilities, which enable the rapid provision of dwellings to a very high standard.

However, supporting legislation is required if the benefits of low-energy dwellings are to be enjoyed by all. Specifically, the building regulations need to be upgraded to modern standards.

Skills

49. To what extent do you agree that the Housing Supply Strategy could act as a stimulus to improve and modernise construction skills and increase the importance of the sector?

There is a significant strategic opportunity available to Northern Ireland by means of the Housing Supply Strategy. Currently industry is not capable of delivering low-energy houses at scale. It will need support and a clear vision in order to increase its skills to the required level.

It is vital that the Housing Supply Strategy enables the development of appropriate construction skills by setting out a clear vision for the standards required in the future and a timetable for achieving them.

With financial supports, innovators within the low-energy industry will obtain the confidence required to further invest and deliver the first phase of low-energy homes. This will enable all stakeholders to understand what is required in order to deliver the homes of the future and simultaneously stimulate the marketplace.

The Housing Supply strategy plays a key role in setting the vision and the roadmap through which the delivery of low-energy homes will be enabled.

50. Does the Construction Sector in NI need support to skill up in digital technologies, Modern Methods of Construction, low carbon construction and the whole life performance of housebuilding etc.?

Yes. Significant support are required to enable industry deliver the low-energy homes required in the future. Targeted support should be put in place (e.g. for the achievement of the certified passive houses). In addition, the supporting infrastructure (e.g. education, architects, engineers, tradespeople) also need support and a clear signal for what is required along with a realistic time frame to achieve the low-energy standards.

51. Does the age profile and make up of the construction sector (older workers/ self employed) require a specific intervention to support our housing supply in the future?

All skills need to be upgraded to enable delivery of the future housing stock. Training and support is required to for all stakeholders.

52. Does NI need some large Green Building Projects such as those being developed elsewhere to help create momentum for a changed skills agenda here?

Green building projects are currently available within Northern Ireland to demonstrate what is possible. For example the crest Centre in Enniskillen has been built to the passive house standard. In addition, the Erne campus has been built to the passive house premium standard, the first of its kind for an education establishment in the world. Further, there are approximately 10 homes which have been built and certified as complying with the passive house standard in Northern Ireland.

It is seen therefore that Northern Ireland currently possesses a number of green buildings which can be used to demonstrate what is possible.

Further Green Building Projects would significantly help to increase visibility and train industry for the delivery of the required standard.

53. Are there any other areas that could impact on the development of the Housing Supply

54. To what extent do you agree that the NICS could better utilise existing funding (e.g. Block Grant, Financial Transactions Capital, Housing Association Grant, Reinvestment and Reform Initiative) to leverage greater levels of private finance for housing development?
55. Are there other ways the private and voluntary community and social enterprise sectors can leverage other forms of funding to increase housing supply?

References

- Boardman, Brenda. 1991. "Fuel Poverty Is Different." *Policy Studies* 12 (4): 30–41. <https://doi.org/10.1080/01442879108423600>.
- "BS EN 16798-1:2019 Energy Performance of Buildings. Ventilation for Buildings. Indoor Environmental Input Parameters for Design and Assessment of Energy Performance of Buildings Addressing Indoor Air Quality, Thermal Environment, Lighting and Acoustics. M." n.d. Accessed June 16, 2021. <https://shop.bsigroup.com/ProductDetail?pid=000000000030297474>.
- Colclough, Shane, Philip Griffiths, and Neil J Hewitt. 2019. "Winter Performance of Certified Passive Houses in a Temperate Maritime Climate: NZEB Compliant?" In *Sustainable Building for a Cleaner Environment*, 103–13. Springer.
- Colclough, Shane, and Martin McWilliams. 2019. "Cost Optimal UK Deployment of the Passive House Standard." In . ISBN 978-1-912532-05-6.
- ECONOMIDOU, Marina. 2014. "Overcoming the Split Incentive Barrier in the Building Sector." Publications Office of the European Union.
- "How Brussels Went Passive - Passivehouseplus.ie." n.d. Accessed January 9, 2020. <https://passivehouseplus.ie/magazine/insight/how-brussels-went-passive>.
- McCarron, Barry. n.d. "Certified Passive House : An Effective Control of Radon in Domestic Construction." PhD Thesis, Queens University Belfast.
- "Passivhaus for Local Authorities & Housing Associations." n.d. Accessed February 5, 2020. https://passivhaustrust.org.uk/competitions_and_campaigns/passivhaus-for-local-authorities/.
- "The Costs and Benefits of Tighter Standards for New Buildings (Currie & Brown and AECOM)." n.d. *Climate Change Committee* (blog). Accessed July 13, 2021. <https://www.theccc.org.uk/publication/the-costs-and-benefits-of-tighter-standards-for-new-buildings-currie-brown-and-aecom/>.
- "UK Housing: Fit for the Future?" n.d. *Committee on Climate Change* (blog). Accessed September 24, 2019. <https://www.theccc.org.uk/publication/uk-housing-fit-for-the-future/>.

