Agenda – Climate Change, Environment and Rural Affairs Committee

Meeting Venue:
Committee Room 3 – Senedd
Meeting date: 24 January 2018
Meeting time: 09.00

For further information contact:
Marc Wyn Jones
Committee Clerk
0300 200 6363
SeneddCCERA@assembly.wales

1 Private pre-meeting

(09.00 – 09.15)

2 Introductions, apologies, substitutions and declarations of interest

3 Inquiry into 'Low carbon housing: the challenge' – first evidence session

(09.15 – 10.45) (Pages 1 – 42)

Dr Joanne Patterson, Cardiff University
David Thorpe, University of Wales Trinity St David
Chris Jofeh, ARUP

Attached Documents:
Research Brief
Consultation response from David Thorpe
Consultation response from ARUP
Consultation response from Joanne Patterson

Break (10.45 – 11.00)

4 Inquiry into 'Low carbon housing: the challenge' - second evidence session

(11.00 - 12.30) (Pages 43 - 62)

Hugh Russell, Community Housing Cymru

David Bolton, Melin Homes

David Weatherall, Energy Saving Trust

Attached Documents:

Consultation response from Community Housing Cymru

Consultation response from Energy Saving Trust

5 Paper(s) to note

5.1 Welsh Government response to the Committee's Report on the Draft Budget 2018-19

(Pages 63 - 70)

Attached Documents:

Welsh Government response to the Committee report on the Draft Budget 2018-19

6 Motion under Standing Order 17.42(vi) to resolve to exclude the public from the meeting for item 7.

Item 7 of this meeting and the meetings to be held on 1 and 7 February 2018. On 1 February the Committee will receive a private briefing on the Marine Plan. On 7 February the Committee will receive a private briefing from Centrica on local energy markets.

7 Private discussion of evidence

(12.30 - 12.40)

Agenda Item 3

Document is Restricted

David Thorpe is a founder/patron of the One Planet Council, a lecturer in One Planet Development at the University of Wales Trinity St David, a member of Calon Cymru Network, and the author of *Passive Solar Architecture Pocket Reference* (ISES/Routledge, 2017), *Solar Energy Pocket Reference* (ISES/Routledge, 2017), *Best Practices and Case Studies for Industrial Energy Efficiency Improvement* (with Oung, K. and Fawkes, S. UNIDO, 2016), *The One Planet Life* (Routledge, 2015), *Earthscan Expert Guide to Energy Management in Buildings* (Earthscan, 2013, *Earthscan Expert Guide to Energy Management in Industry* (Earthscan, 2013), *Earthscan Expert Guide to Solar Technology* (Earthscan, 2011) and *Earthscan Expert Guide to Sustainable Home Refurbishment* (Earthscan, 2010) amongst other titles.

Each of the consultation questions is answered briefly, followed by further information in six appendices: 4 exceptional existing case studies, a proposal for a route to achieve 'one planet' towns and cities, and some evidence for a definition of 'zero carbon' buildings. References are either in footnotes or the above books.

- **1. What role can housing can play in Wales' low carbon transition, including the potential positive impacts on greenhouse gas emissions?**
    1. The main challenge for housing is to improve the performance of existing housing. Housing is responsible for 27% of Wales' carbon emissions and houses last over 100 years.
    2. The total life cycle impact of the homes needs to be included in the assessment: design, materials sourcing, construction, in use phase, and deconstruction.

2. The development and availability of technology needed for highly energy efficient housing;

1. We already have the technology we need. There should not be an over-reliance on technology to achieve results. Instead results should be achieved by excellent design that is aimed at reducing overall life cycle impacts, which include embodied carbon.
2. Construction materials whether in retrofit or new build play an important part in carbon emissions. Some materials have far higher embodied carbon than others (see Appendix 6). Some materials have negative embodied carbon. These are cellulose products, which should therefore be favoured by Building Regulations (e.g. timber products, Warmcel cellulose insulation, straw bale, wool). These 'lock up' atmospheric carbon in buildings for the lifetime of the product, whereas plastic products (e.g. EPS, PIR, SIPs), being based on fossil fuels, have *caused* carbon emissions in their production cycle and are harder to dispose of end-of-life.
3. Cellulose products, being hygroscopic, also make for breathable buildings whereas plastic products do not. This has an implication for damp management.
4. Achieving Passivhaus Standard (or nearly passive house) has now about the same design and build cost as conventional build, and is a verifiable and absolute standard. It should therefore be mandated by Building Regulations. 'Almost Passivhaus' can sometimes be achieved at a much lower relative cost, without the use of mechanical ventilation with heat recovery.
5. Passivaus is not dependent on a building facing south, unlike passive solar design. But the Solcer House is dependent on being south facing for energy generation. I question the overall life cycle impact of this house and its replicability.
6. Affordability is a significant need in Welsh housing. The Solcer House is not cheap. But, for example, the Pentre Solar design (see Appendix 1) is affordable and made from cellulose and local materials (timber frame plus Warmcel). I favour this more low tech, affordable, near-Passivhaus approach.

7. It is not necessary for every building to generate electricity. In fact it is more cost-effective from the point of view of balance-of-system elements of an electricity supply system for generation to be done at local scale, using a multiplicity of renewable energy sources, including solar pv, solar thermal, wind, heat pumps.
8. We should not use biomass burning as this causes emissions of greenhouse gases and particulates with health impacts. Biomass should instead be sequestered (see point2.2.)
9. A building's form factor affects its energy performance (this is the ratio of exposed, heat-losing, surface area to volume). Therefore apartment blocks and terraces should be preferred over bungalows. Increasing housing density also saves energy and reduces the cost of service provision.

3. What changes are needed to ensure that existing housing stock is as energy efficient as it can be?

1. Retrofit strategies should take advantage of triggers - upon resale and when other work is being done there is an opportunity for a whole house retrofit to the best available standard at reasonable cost, approaching Passivhaus as far as practical.
2. Remembering it is generally cheaper to invest in energy efficiency than energy generation.
3. Retrofits should be mandatory at these points, supported by standards and enforcement.
4. A market needs to be created for investors in energy efficiency, as there is for energy generation plant. This is being supported by the Investor Confidence Project[1].
5. Councils have a role to play to encourage street-by-street retrofits.

4. Whether it is possible and feasible to deliver low carbon, energy positive, affordable housing at scale in Wales and, if so, how this can be achieved;

1. Land prices are a major factor in affordability. Planning system needs changing to prevent land banking and reduce land costs.
2. Smaller, social housing developers should be favoured by procurement strategies with a goal of ending the dominance or even presence in the marker of large commercial home builders focused mainly on profit.
3. This approach can be based on the German Baugruppen model. See attached case study.
4. If councils run competitions for developers where the criteria for success are social and environmental, and profits limited to 15%, as in the Baugruppen model, this creates a market for that type of developer. Many architects want to build this type of housing but do not get a chance as the present system does not favour their approach.
5. Charities, housing co-ops, community land trusts and other types of social enterprises should be put in charge of developing all new housing.

5. What are the barriers to delivering transformative change in house building in Wales?

1. The dominance of big developers - they should be helped to transform to 'one planet' developers by creating a new market which includes social and environmental criteria and curbs their profit. Social enterprise developers such as CLTs should be favoured.
2. The planning system - it should define the route to One Planet Wales.
3. We need a programme of training to upskill the workforce, including in procurement and planning.

6. What is the role of Ofgem and the national grid in enabling grid evolution to accommodate new types of housing, and what are the challenges presented by decentralised energy supply?

1. A decentralised supply needs to provide direct benefits for the local community.
2. Energy Service Companies should ideally follow a community interest company or mutual model (cf Dwr Cymru).

[1] http://europe.eeperformance.org/

3. Opportunities exist at neighbourhood scale for small energy service companies to provide local employment to provide operations and maintenance services for energy efficiency and energy generation.

7. Whether Wales has the requisite skills to facilitate and enable change in the housing sector;

1. It does not. Builders need to be accredited with the necessary skills to provide passive house level construction services, which hardly exist at present. Currently anyone can set themselves up as a builder and also offer retrofit services. This is not a situation that can guarantee reliable results. Accreditation and verification of performance are required.

8. What changes are needed to Building Regulations in Wales to accelerate progress towards 'near zero' energy standards and beyond?

1. Passivhaus Standard (or nearly passive house) should be mandated by Building Regulations.
2. Part L compliance needs to be enforced just as health and safety regulations are.
3. The use of cellulose-based products should be favoured by Building Regulations because these products (e.g. timber products, Warmcel cellulose insulation, straw bale, wool) lock up atmospheric carbon in buildings for the lifetime of the product, whereas plastic products (e.g. EPS, PIR, SIPs), being based on fossil fuels, have *caused* carbon emissions in their production.
4. There should not be an over-reliance on technology to achieve results. Instead results should be achieved by excellent design that is aimed at reducing overall life cycle impacts which include embodied carbon.
5. For rental properties the Minimum Energy Efficiency Standards (MEES) should aim to require a property to have an Energy Performance Certificate (EPC) of at least 'B' by 2025 in order to be rented as a residential property, or renewed to existing tenants. Properties below this rating should then be regarded as 'sub-standard' and non-compliance with the MEES could lead to civil penalties for landlords.

9. How communities can be planned and shaped to be more energy efficient and low carbon (including examples of good practice in Wales and further afield).

1. The location of the housing is important: housing located away from public transport, employment, and services such as schools, shops, community centres and entertainment will result in greater emissions from transport. New housing developments should promote a sense of place and community and be human scale. Planning policy should support this.
2. Towns and cities should be encouraged to declare intentions to, and set goals for, transforming into 'one planet' towns and cities. PPW signifies an intention for all development to reduce its ecological footprint. TAN6 allows for one planet development anywhere in towns, cities or edge of settlement, but no guidance currently exists for towns. Appendix 5 shows how this might work.
3. Ribbon development, where it exists, can be transformed into 'one planet' development by encouraging, with planning guidance based on TAN6, the use of the land directly behind the housing for more intensive land-based employment aimed at providing goods and services.

Appendix 1 Case study: Pentre Solar, west Wales

Useful lessons: Pentre Solar is a demonstration development of carbon-neutral, affordable homes built by local contractors from locally sourced cellulose-based materials which lock up carbon in the buildings.

Dr Glen Peters, CEO of Western Solar, has an ambition for his company to supply thousands of homes and to work with housing associations and local authorities to provide social housing. Peters estimates the build cost at around £120 per square foot. This has led him to set a rental cost of the two-bedroom houses of £480 per month, a level in line with the local 106 planning condition of no more than 80% of local market rents. The three bedroomed houses are set at £620 per month. For the developer, this gives a 3.5-4% ROI.

Right: Glen Peters standing outside one of the two-bedroomed semi-detached houses.

Above: The South-facing front of a three bedroomed house with plenty of glazing to capture the sun's heat. Inside it falls onto a black, melamine-covered concrete floor to absorb the heat.

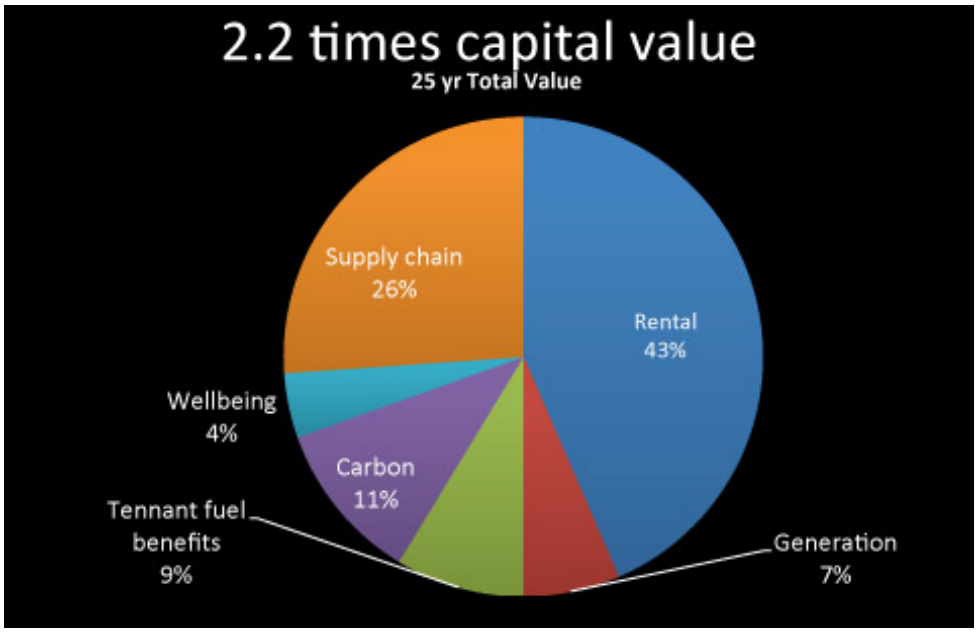
Left: *The North-facing rear of a three bedroomed house. The homes are clad in local larch. This is projected to last at least 25 years before it needs replacing. Much care in the detailing of the design should extend the cladding life well beyond this point.*

Right: A pair of two-bedroomed semi-detached houses. All the homes have solar roofs.

The first tenants moved into Pentre Solar, Glanrhyd, 3.5 miles from Cardigan, in July 2017.

Local materials and labour

Costs have been kept low and as much as possible of the houses manufactured locally from local materials and labour. In total 80% of the building is manufactured locally out of local timber and 40% – the airtight frames – are manufactured in a nearby factory – a converted cowshed – to be assembled on site. Peters reckons that this means that the multiplier effect of the benefit to the local community for every £1000 invested is £2200, a factor of 2.2.



The homes' design builds upon the developer's experience of a prototype house, Ty Solar (Ty is Welsh for House so the name means Solar House in English), in West Wales. Ty Solar was constructed in 2010 using the profit from Peters' solar farm, the first in Wales. It cost about £75,000 and was built with a £47,000 grant from the Sustainable Development Fund.

The unit costs of the Glanrhyd houses, built on the site of a now-demolished garage, were higher mainly because of the land reclamation, provision of services and unusual weather related costs and complying with planning conditions in an area of outstanding natural beauty.

The three-bed homes occupy 100 square metres, the two-bed ones slightly less, but still feel spacious.

The company is focussed on providing social housing as Peters believes there could be a reasonable business to create good quality affordable housing as none of the large developers seem to interested in doing so. Whilst it is economic and technically feasible to build these homes, politically Peters' route has not been easy. "Politicians have been unduly influenced by volume building companies, and while they love the houses it has been difficult to persuade local authorities and housing associations of the benefit of backing this design despite the fact that occupants have virtually zero energy bills. The Key Performance Indicators imposed on Housing Associations are unduly skewed towards capital costs rather than tenant and community welfare," he says.

Zero energy bills

The timber frame houses are built according to passive house principles, although not validated as such because of the cost vs. benefit of doing so. Each monopitch roof sports 8kW of integrated photovoltaic panels. Over a year these generate surplus energy, providing an income from a feed-in

tariff as well as giving the occupants free electricity. Total energy demand is about 12% of a conventionally built home. Beneath the solar panels is a galvanised steel sheet that laps over the timber frame.

They sit on a concrete slab unlike from the prototype, which was constructed using the box beam method with a suspended timber floor. Peters says that concrete is more durable, with more thermal mass, although with a greater carbon footprint, and has a lower maintenance requirement.

The windows are double, not triple glazed to keep costs low as Peters believes that the incremental benefit of the extra pane of glazing is cancelled by the cost in the mild local climate. (This supposition is supported by a post-occupancy evaluation of the effectiveness of the Beddington Zero Energy Development in south London (BedZED).)

The insulation is all 27cm of recycled newsprint pumped into the cavity. This type of eco-insulation is in general the most economic and ecological. The paint is clay-based – breathable and with no off-gassing. Although more expensive per litre, it requires fewer coats on bare plaster.

The houses all come fitted out with the most efficient washing machine, condenser drier, kitchen, water-saving bathroom with occupancy sensors in areas such as toilets, Sky connection, Wi-Fi and an outside socket for charging an electric vehicle. There are LED lights throughout.

All of these relatively spacious homes are provided with the most energy-efficient appliances and attention to detail.

Communal electric car

The occupants of the estate have been provided with a Nissan Leaf electric car to use collectively, charged by the solar panels on the roofs. The South-facing homes are generous in their space, their form determined by the maximum depth allowed by the passive heating.

Energy storage

The rest of the heating is provided in a surprising manner, using the best of old technology with new: solar electricity and storage heaters. Storage heaters contain thermally massive blocks which are heated up by an element. They then release that heat gradually over many subsequent hours.

This form of energy storage was introduced to British homes in the 1960s and '70s on a special tariff called Economy 7. Since nuclear power stations could not be switched off unlike other forms of electricity generation, these tariffs allowed people to use nuclear electricity at night – at a lower rate when national demand was low – to charge the storage heaters.

The problem was that by the time the heat was needed, the following evening, they were often too cool and many people subsequently removed them and installed central heating instead. Here, the idea is to let the storage heaters be heated up during the day by the solar panels on the roof, meaning that they are able to provide adequate heating through the evening and night provided that there has been average sunshine (50% of a June summer day) during the day.

This may not be the case in the depths of winter and so the homes are also grid-connected. They export surplus energy when there is some – after the electric car and storage heaters have been topped up – and purchase it when not enough has been generated.

"Storage heaters are incredibly cheap," says Peters, "and a well proven technology. Whereas the storage we had to start with in the prototype house – lithium ion batteries – were designated a fire risk and we had them taken out. They are also much more expensive – a couple of hundred rather than thousands of pounds."

The prototype house has been monitored and has well exceeded the predicted generation capacity, providing twice the electricity used over the year.

Appendix 2: The Baugruppen model of development

<u>Useful lessons</u>: the involvement of residents in the design of their neighbourhood and housing, which fosters community cohesion; the zero profit housing model; support of local authorities; affordable housing; the use of non-financial criteria in selecting builders to work with.

Baugruppen means “group build” in German. The model originated in Germany. In the last decade, Germany has seen over 1800 Baugruppen developments. With their increasing popularity, the city of Hamburg is now setting aside 25% of its land for Baugruppen developments. Other countries are fast copying this model because of its success in solving multiple social and housing problems.

What is it?

A process that enables individuals to group together to become their own designer and developer. They deliver custom-built and individually designed homes and communities. The future residents design and develop the community, according to their long term needs, rather than investors doing it, who prioritise their own economic benefits. The process of working together in advance of construction helps to create a sense of community, as members collaborate on identifying their own needs and designing their homes and shared spaces.

How does it work?

Baugruppen is a "zero profit" housing model that has the potential to deliver higher quality, more sustainable homes, designed for long-term needs rather than profit. Traditional developer building costs include:

- Land 15-20%
- Construction 45-50%
- Finance and Holding 8-10%
- Fees and Marketing 6-8%
- Developer Profit 15-20%

With Baugruppen there is no developer, so no marketing costs or developer profits. This allows for up to 30% savings. This makes it possible to develop higher quality accommodation with the same or a smaller budget. This was proven in a study of six self-build projects in southern England, which all resulted in significant financial benefits.

Local authorities can support individual baugruppen projects by offering access to cheap land, and this model can be applied anywhere, regardless of financial scope of a local authority. The latest research shows that if local governments want to solve their housing crises they must take a more proactive, participatory role and engage not just in house building, but community building.

<u>Three examples:</u>

So.vie.so

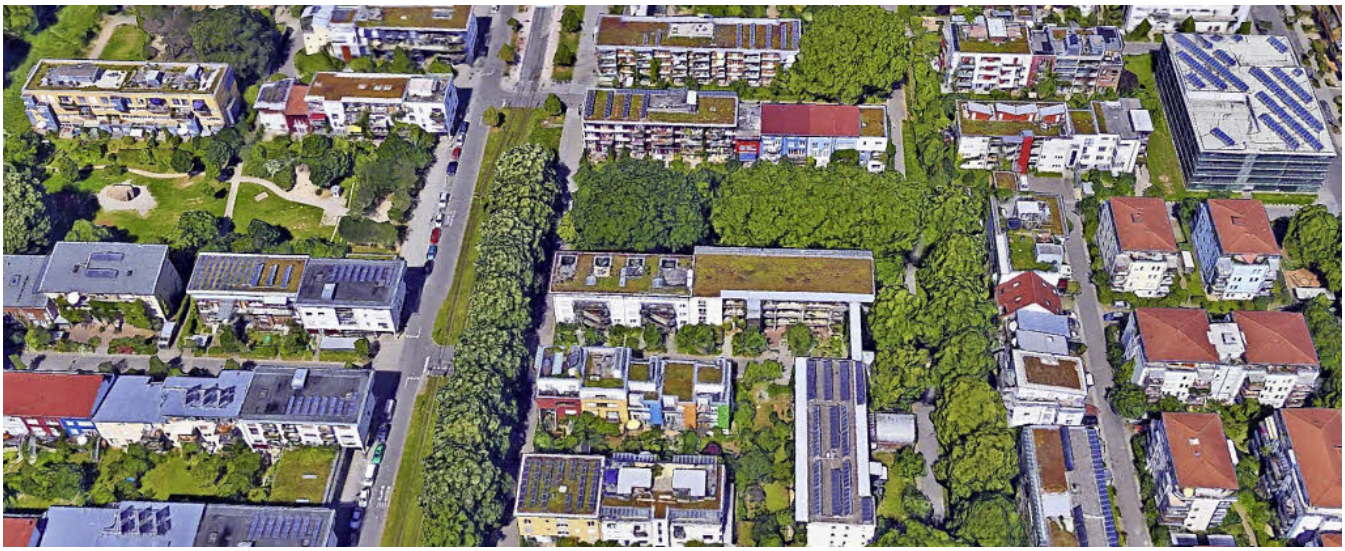
The So.vie.so development in Vienna consists of 111 subsidised rented apartments, communal facilities of different size, shared greenspace with neighbouring

housing schemes and spaces for small businesses, on former railway land.

A housing co-op was formed for the residents to support the planning process and on-going management. In pre-build stage residents collaborate on planning their communal spaces. Different task groups are formed. Over a year of planning the facilitators provided by the housing trust gradually move away, allowing the now-experienced group members to take over tasks such as maintaining the communication processes, organising and holding regular meetings to decide upon the allocation and use of funds or continuous activities.

Finance: To join a scheme there is an initial, one-off deposit which goes towards the land and construction costs, usually between 15,000 and 30,000 Euros for a medium sized to large flat. The higher the initial contribution, the lower the monthly rent. At the end of the tenancy, this deposit is paid back. Some co-op schemes offer buy-out options to tenants. High earners are discouraged, with a ceiling for tenant salaries. The rents are fixed for 10 years and existing rent contracts can be extended beyond then.

Vauban



In the city of Freiburg, Germany, the city council made a conscience decision that developmental rights in the Vauban district (affordable and sustainable housing) would be preferentially given to baugruppen rather than developers. The city and working group felt that prioritizing affordability (through collaboratively-built projects), would make it attractive and feasible financially for families to live there.

Rather than bidding wars, lots were awarded to parties meeting sustainability criteria. These included: social diversity, most ecologically sound, etc. The city council provided facilitators to help a baugruppe procure legal and financial

representation for their project. Verifiability of ecological criteria is achieved using the GEMIS model (Global Emissions Model for integrated Systems), a public domain life-cycle and material flow analysis model and database.

Population density: 5,300 inhabitants over 38 ha., but it has an open feel.

Vienna Wild Garden Housing Project

Vienna Wild Garden Housing Project is for "people who want to shape their living and living situation" - single, family or senior. As is typical, future inhabitants get to know each other in the process of participatory planning to develop and design, together with a planning team, a cross-generational, mixed community.

Planning team consists of:

- single architecture (architecture)
- reality lab (building management)
- YEWO (landscape architecture)
- Schwarzatal (developer)

Included: A common garden, meadow and wild hedge.

Transport: Cars remain at the edge of the neighborhood and park in collective garages under the buildings, as in Vauban. Electric-car sharing, cycle parks and new public transport stations are provided.
Location: about 30 minutes from Vienna city centre.
Units: Approximately 1,100 altogether over 26.5 acres incl. 11.37 acres of green and open spaces. From two-family houses to multi-storey residential building, a neighborhood center, a natural kindergarten, Approximately 200 rented housing, a local supply, 80 owner-occupied apartments, 50 self-financed apartment buildings.

Appendix 3. Case study: Heathcott Road Leicester

<u>Useful lessons</u>: The importance of key driving individual(s), comprehensive community consultation; asset transfer from council; 100% affordable housing; training and the link to food production. It is managed by a charity, with aims including the relief of poverty, environment/conservation/heritage and economic/community development/employment. The leasing of land to a developer, Passivhaus Standard homes, and the rent income used to pay, *inter alia*, for an on-site development officer.

Size: 68 Passivhaus Standard homes for affordable rent set about 20% less than the assessed local market value. These homes can be heated for as little as £13 per year. There are four one-bedroom flats and 23 two-bedroom, 20 three-bedroom and three four-bedroom houses. In June 2017 the first residents moved in.

Origin: This is the brainchild of Neil Hodgkin, Head of Development for the resource centre Saffron Lane Neighbourhood Council (SLNC). The area is one of the most deprived in Leicester. 10 years ago he had an idea for an urban community farm to grow vegetables for SLNC's day care service users. From this, Saffron Acres was born: allotments and a community garden which provide education and volunteering opportunities. Now, fruit grown on Saffron Acres is turned into jams and chutneys to be sold as part of a project providing skills training for local unemployed people and adults with learning difficulties.

Determined to rejuvenate the area, Neil identified housing as a key issue. SLNC embarked on a lengthy process of consultation with hundreds of local residents about the area's housing needs. It acquired 22 acres of former derelict allotment land as an asset transfer from Leicester City Council for £1

Management: SLNC oversaw the project. They leased the land to a developer: emh group, and engaged the architects: rg+p and builders: Westleigh Partnerships. The housing area is 13.3 acres. The cost: £9 million. It opened on 19 June 2017.

Construction took 70 weeks with 40 men on site every day, four of whom have been solely dedicated to achieving the Passivhaus credentials.

Permaculture: Next to the houses is a permaculture farm, intended to provide education on food growing, cooking and healthy eating, an allotment, beehives, a flower meadow, rejuvenation of field

ponds, reinstating of hedgerows and fruit tree planting. Residents are encouraged to work and grow their own fruit, vegetables and supplies on the farm. Existing community gardens are next door.

Awards: The project has already won the RICS East Midlands Awards and Project of the Year – Building Projects at the East Midlands Celebrating Construction Awards. July 2017 and a Best New Affordable Housing Scheme award at the Housing Excellence Awards on 1 June 2017

Social dimension: The income generated by the development pays for a full time debt and welfare support officer who is also onsite and plays a key role in advising and liaising with the community. Buoyed by the success of the development, Neil and SLNC plans a further £1.6m project to build 20 more housing units on the same site. The income from these will help to pay for a further two SLNC staff so they can do more work in the community.

Resident Claire (right) says that the fact that the Resource Centre is so firmly integrated with the development is a real benefit. “The Centre has lots of services we can use; we’ve been invited there for morning coffee and my next plan is to see more of what’s in the area and become part of the community. I can start working. I feel like I’ve really landed on my feet. Being here has changed our lives and opened up everything."

“This project shows that communities can plan, deliver and manage their own housing and address specific wider social needs,” said Neil. “Retaining money within the community to also directly deliver services within the community to help solve local social issues can offer longer-term solutions towards sustainable regeneration of neighbourhoods.”

Appendix 4. Case study: The Cannery, Sacramento, USA

<u>Useful lessons</u>: The inclusion in this project of a farm, agricultural training college, community-supported agriculture, some affordable housing, jobs, renewable energy, energy efficiency, and low-carbon transport, together with the support of the local council make it of interest. The financial approach is conventional (developer investment recouped from high value sales and retail outlet rent). There is an inclusive multigenerational approach to residential development.

The Cannery, is on the site of a former tomato cannery (brownfield site) in Davis, on the outskirts of Sacramento near San Francisco. It is similar to a garden village.

Size: 583 residences, with an average density of 9.5 units per acre; with many sizes, types, densities and styles of housing including ownership and rental, detached and attached homes in low, medium and high densities ranging from three to thirty units per acre. A mix of land uses consisting of low, medium, and high density residential; a mixed-use business park; stormwater drainage retention; greenbelts, agricultural buffers, an urban farm, parks; and a neighborhood centre, on approximately 100.1 acres of land.

Together, these sites could accommodate employment opportunities for **approximately 600 to 850 jobs.**

The Cannery combines environmental engineering and landscape architecture elements into a neighbourhood plan. It contains five districts:

1. The Cannery Farm District
2. The Cannery Commerce District
3. The Urban Residential District
4. The Traditional Neighborhoods District
5. The Neighborhood Park District

Greenspace: A 7.42 acre urban farm is included as a community asset and as a transition between urban uses and adjacent agricultural land. This is part of 20.8 acres of open space consisting of the open space/bioswale, agricultural buffer on the north edge, agricultural buffer/urban farm on the east edge and greenbelts. It is an adaptive reuse and redevelopment of a former industrial site located within the city limits. In this picture, the area assigned to farmland is in the foreground.

Owner and developer: The New Home Company Inc. (fully commercial private company). New Home plans to deed the land to the City of Davis, which will then lease it to the Center for Land-Based Learning, which helps beginning farmers get their start.

Services: Water and sewer services are provided by the City of Davis. Planning the development was done in full cooperation with the planning department under normal processes, but was favoured by the council's policy approach. All the planning documents are here: http://cityofdavis.org/city-hall/community-development-and-sustainability/development-projects/the-cannery/environmental-review

Financing: the sale of market-price houses supplements the affordable housing. There are 110 affordable homes (16%) including 45 units suitable for rental to very-low, low- and moderate-income households.

Energy: Neighbourhood design includes street layouts, building orientation and landscaping to accommodate passive and active solar energy systems and to capture natural cooling and heating opportunities. Design treatments for passive solar are balanced with the neighborhood's overall

objective of reducing heating and cooling demands and providing solar-ready rooftops on south-facing roofs.

Energy efficiency measures increase building performance, livability and comfort well beyond the City's minimum requirement of the 2010 California Green Building Standards (Cal Green) Tier 1 requirement. Residential uses exceed California's 2008 Title 24 Energy Code by 40%, which is equivalent to 33% greater than 2010 Cal Green Tier II requirements. The mixed-use site will exceed California's 2008 Title 24 Energy Code by 15-20%.

All single family detached and attached homes will have a 1.5kW system installed at initial construction with the option to upgrade if desired, upgrading to 'net zero living'.

Transport: 9.9 miles of on-site bicycle and pedestrian improvements connected to existing cycle and pedestrian links into the city have been built. All places are no more than a ten-minute walk or a five-minute bicycle ride from one another. Every residence is within approximately 300 feet of a trail, park, greenbelt or open space area.

Linked to: the Center for Land-Based Learning (CLBL), which "cultivates opportunity for youth, for agriculture, for business, for the environment". This runs the California Farm Academy to help those wanting to break into a career in agriculture.

Food supply: a veggie box Community Supported Agriculture scheme. There are two farming businesses and three farmers at Cannery Farm. There's an agricultural college and a college where young people can study agriculture. Their mission is "to inspire, educate, and cultivate future generations of farmers, agricultural leaders and natural resource stewards". Food is also sold in a local market.

Appendix 5: Towards One Planet Towns and Cities

Here are suggestions for reaching Wales' target of One Planet Wales. For any development, existing or future, we must ask: What is the actual life cycle impact? Where does the food come from? Is the city really sustainable? Let alone regenerative? and How can we know? Here is a way to find out...

What is One Planet Development?

Through Technical Advice Note 6 and Planning Policy Wales (PPW) the Welsh Government sets out land use planning policies to support sustainable rural communities. Planning Policy Wales (2016) says:

> *4.5.11 "Closely aligned to the commitments to tackling climate change is the Welsh Government's approach to reducing the ecological footprint of Wales. Our Sustainable Development Scheme sets out an ambition for Wales to use its fair share of the Earth's resources, where,* ***within a generation, our ecological footprint is reduced to the global average availability of resources – 1.88 global hectares per person.*** *The current footprint shows that, if everyone on the Earth lived as we do, we would use 2.7 planets worth of resources. Reducing Wales' ecological footprint will require a large reduction in the total resources used to sustain our lifestyles****. The policy and guidance set out here in PPW will make an important contribution to reducing our footprint, whilst delivering sustainable development and tackling climate change."***

Section 4 of TAN 6 defines One Planet Developments as being exemplars of sustainable development:

> *4.15.2 One Planet Developments may take a number of forms. They can either be single homes, co-operative communities or larger settlements. They may be located within or adjacent to existing settlements, or be situated in the open countryside.*

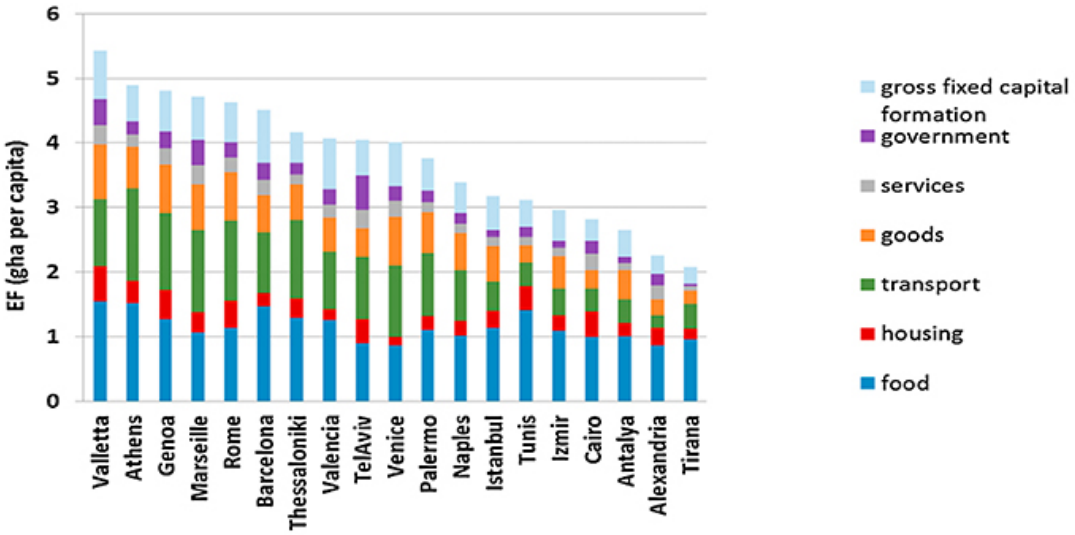
In other words, anywhere. However planning guidance exists only for OPD in the open countryside. It is therefore urgently necessary for planning guidance to be set for making both new and existing settlements satisfy, collectively, the criteria to be measurably 'one planet' within a generation.

Current criteria include:

1. An initial ecological footprint of 2.4 global hectares per person or less and clear potential to move towards 1.88 global hectare;
2. Buildings being zero carbon over their lifetime;
3. Carbon analysis;
4. Biodiversity and landscape improvement;
5. Community impact improvement;
6. Transport assessment and travel plan to minimise carbon impact of travel;
7. Sustainable water supply;
8. Zero waste (including biological waste - sewage treatment)
9. 100% renewable energy.
10. If located in the open countryside over a reasonable length of time (no more than 5 years), to provide for the minimum needs of the inhabitants in terms of income, food, energy and waste assimilation from land-based employment.

No criteria of this nature have yet been determined for urban or peri-urban developments but something comparable is anticipated at a collective community level.

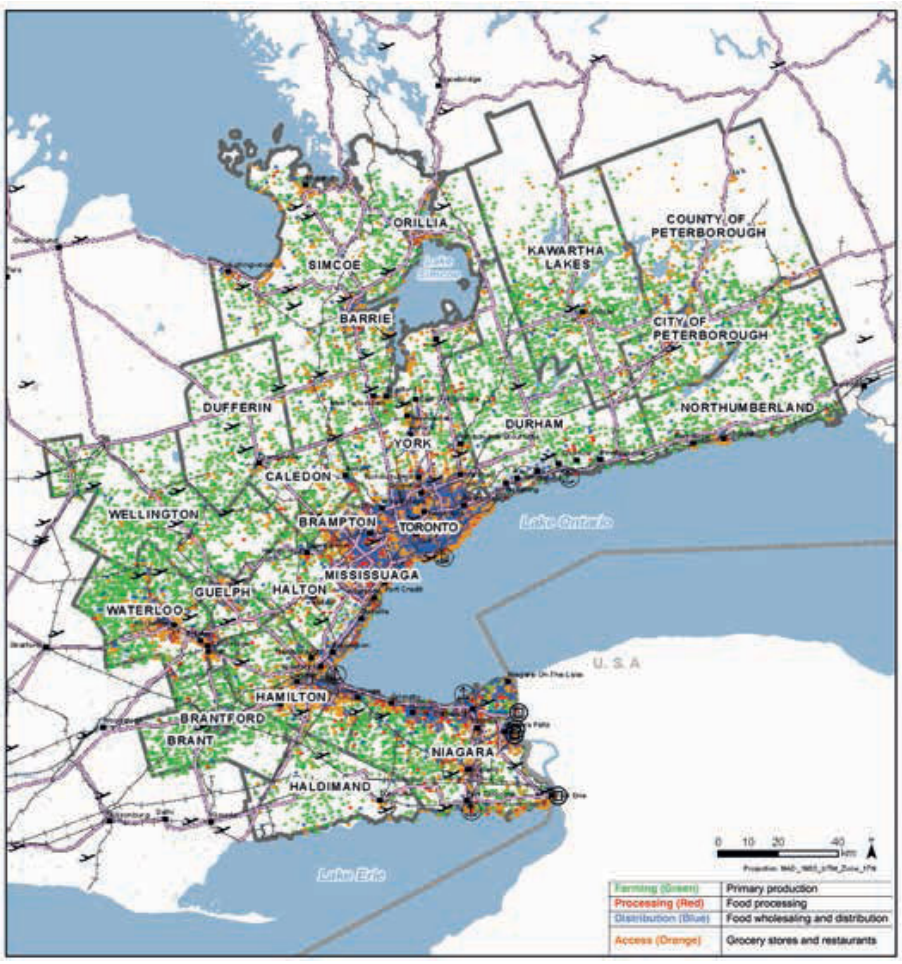
The importance of food



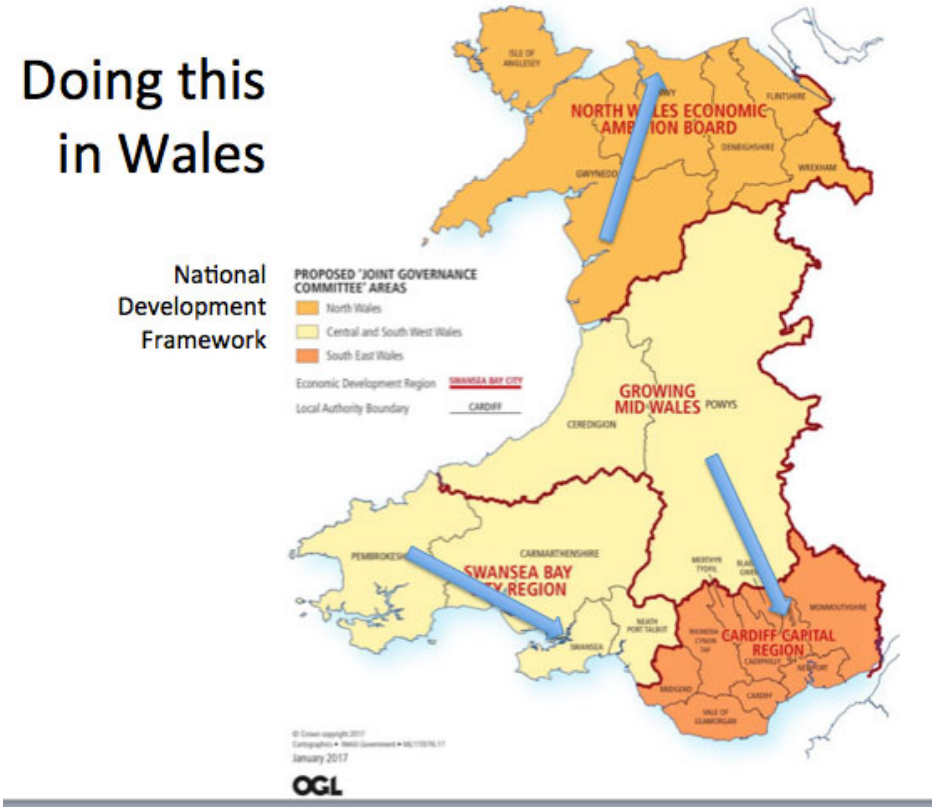
The above analysis of some Mediterranean cities shows that the hardest sector to reduce the ecological footprint of is food (the blue sector stays approximately the same height regardless of the height of the entire column). **But in Wales we have plenty of land.** And food connects all the Sustainable Development Goals that underpin the Wellbeing of Future Generations Act:

It follows that Welsh urban areas should ally themselves with defined hinterlands to develop procurement strategies that result in guaranteed markets for Welsh food and energy suppliers (and other goods and services) to minimise their ecological footprint, as they have in Canada's 'Golden Horseshoe'. This includes the Greater Toronto area. There, 7 municipalities in 2011 set a 10-year 'Golden Horseshoe Food and Farming Plan 2021' which aimed:

- to grow the food and farming cluster
- to link food, farming and health through consumer education
- to foster innovation to enhance competitiveness and sustainability
- to enable the cluster to be competitive and profitable by aligning policy tools, and
- to cultivate new approaches to supporting food and farming.



How can we do this in Wales?



We can begin by making the National Development Framework encourage this process, whereby each of the three largely rural areas of Wales are encouraged to supply their closest urban areas. A powerful message would be sent to the market by procurement strategies under the requirements of the WBFGA to spend public money sustainably that favour procurement from these areas by public bodies such as hospitals and schools. Procurement criteria could include organic production, renewable energy, low carbon transport, and the improvement of biodiversity, as with existing open countryside one planet planning criteria.

Pairing communities' schools and hospitals with local food supplies would have many spin-off benefits in health, awareness and rural regeneration.

Towards one planet Wales

A suggestion: 'one planet' towns and cities can pave the way to One Planet Wales as a whole. Newtown, Powys, is one such town already beginning down this path.

Briefly, the six-step strategy from the present to a one planet future for a town or city would be:

1. Decide standards to use - e.g., ecological footprinting; ISO 37100:2016 (will contribute to UN Sustainable Development Goals through standardization ad is guided by ISO/TC 268); or GEMIS (Global Emissions Model for integrated Systems), a public domain life-cycle and material flow analysis model and database – used by Vauban;
2. Obtain buy-in and feedback at all levels through community participation;
3. Decide the objectives - for each topic: energy efficiency, energy supply, waste, biodiversity, health, transport, food, etc.;
4. Set the baseline – measure the current situation;
5. Set targets for each topic over realistic timescales and set in place ways to measure them
6. Ratchet down consumption over one or two generations via a series of ever-lowering milestone targets.

(This process could be managed by Public Service Boards, in some cases).

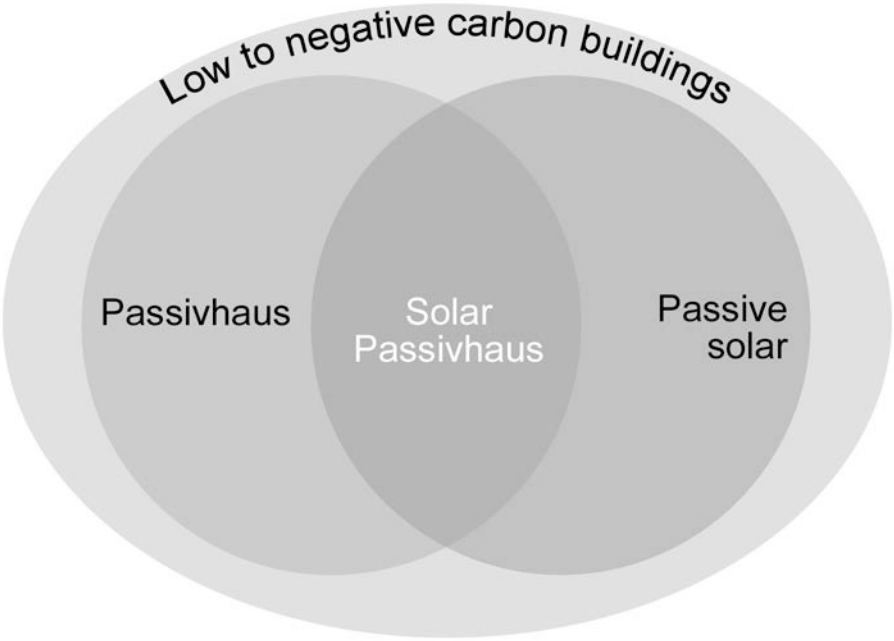
Appendix 6: What is a zero carbon building?

Avoiding life-cycle emission of greenhouse gases in material sourcing, construction, in use and dismantling, by:

- Favouring local-ish, 'natural' and cellulose-based materials (which store atmospheric carbon);
- Capturing solar energy for lighting and heat, with shading to avoid overheating;
- making the structure airtight (no unwanted draughts);
- making the structure breathable (i.e. permeable to water vapour);
- making it durable, resilient, low-maintenance, fire- and weather-resistant;
- incorporating a large amount of insulation.

Passive solar and passive house overlap, but at extremes, depending on climate, can give rise to different building forms.

- The ideal form for a passive solar building in a temperate climate would be longer on the north-south-facing side than the east-west facing sides, with double or triple-glazed windows on the sun-facing side and very small or no windows on the opposite side.
- The ideal form for a passive house design would be a cube because it minimises the surface area to volume ratio, limiting heat loss.



The Passivhaus Standard:

Energy performance targets and air changes per hour:

- Specific Heating Demand ≤ 15 kWh/m^2 per year
- Specific Cooling Demand ≤ 15 kWh/m^2 per year
- Specific Heating Load ≤ 10 W/m^2
- Specific Primary Energy Demand ≤ 120 kWh/m^2 per year
- Air Changes Per Hour ≤ 0.6 @ n50
- Some features of Passivhaus: continuous thermal envelope and airtightness layer; bringing in fresh air from outside via cooling or heating from a ground heat exchanger; mechanical ventilation with heat recovery.

The Form Factor – keep it low to keep heat in

- The heat loss Form Factor (FF) measures the compactness of a building as a ratio of its external walls and roof area (not including the ground contact) to the floor area:
  Form Factor = Heat Loss Area / Treated Floor Area
- Can be between 0.5 and 5.
- A lower number indicates a more compact, efficient building.
- Aim to achieve 3 or less.

A low surface area to volume (S/V) ratio is better for a building that wishes to conserve energy for heating. This is the ratio between the external surface area and the internal volume. It is a measure of compactness:

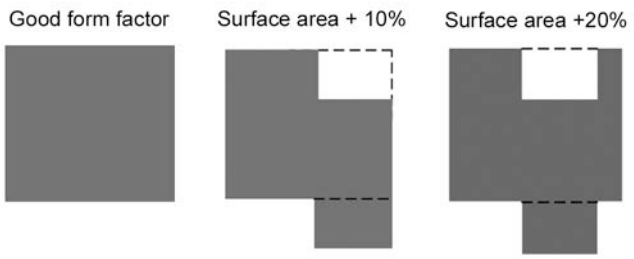
Compactness C = Volume / Surface Area

Size is also a factor: a small building with the same form as a larger one will have a higher S/V ratio.

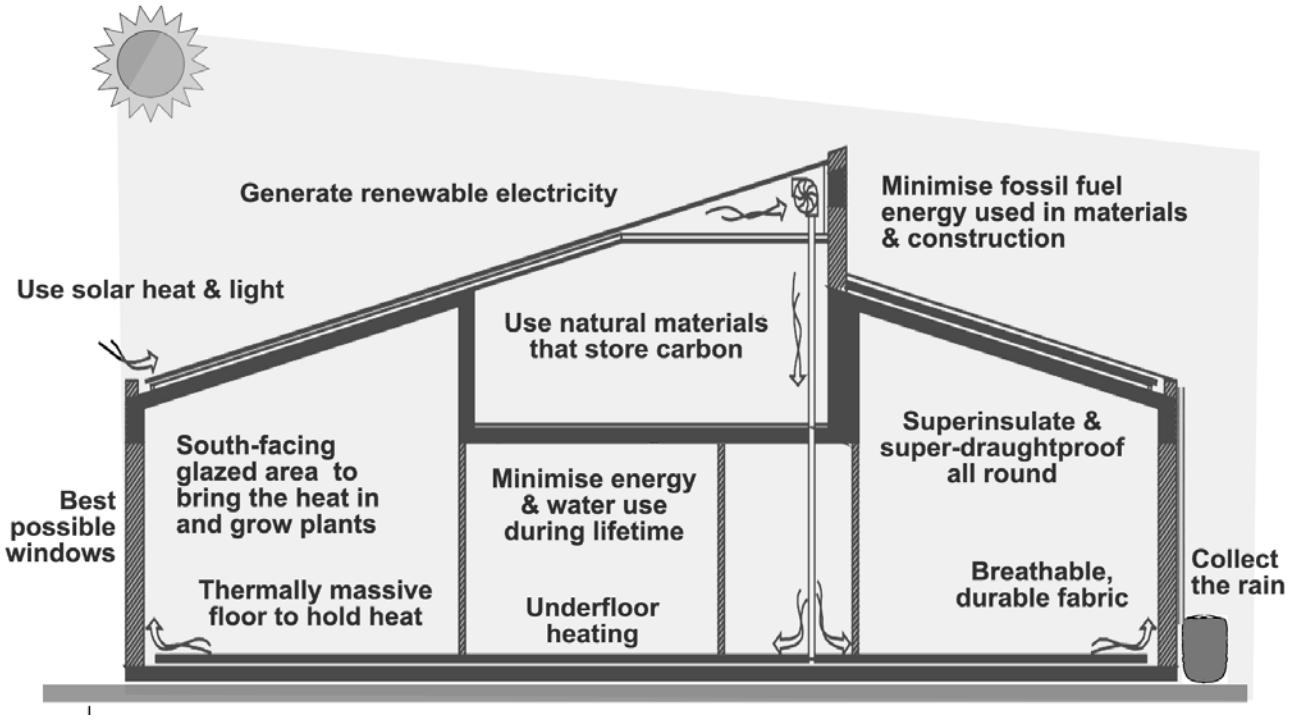
Types of home & form factors:

	Type	Form Factor	Efficiency
	End mid-floor apartment	0.8	Most efficient
	Mid-terrace house	1.7	
	Semi-detached house	2.1	
	Detached house	2.5	
	Bungalow	3.0	Least efficient

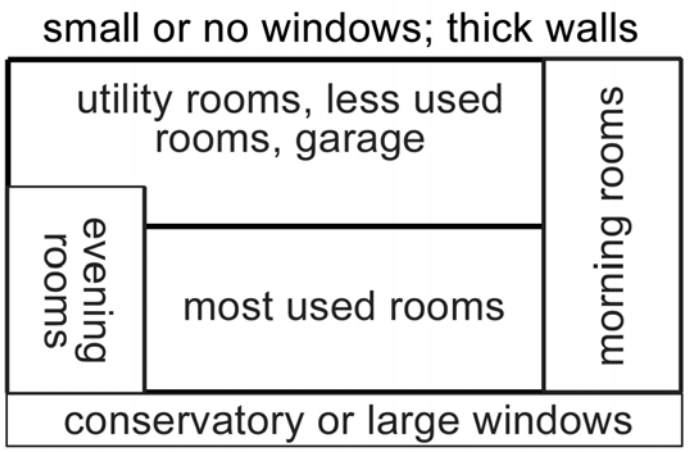
An increase in the Surface to Volume ratio of 10% (the building in the middle below) would require 20mm of insulation more than the good form on the left to achieve the same level of insulation. The one on the right (a 20% higher S/V ratio) would require an extra 40mm of insulation. Therefore compactness should be encouraged.



Features of passive solar

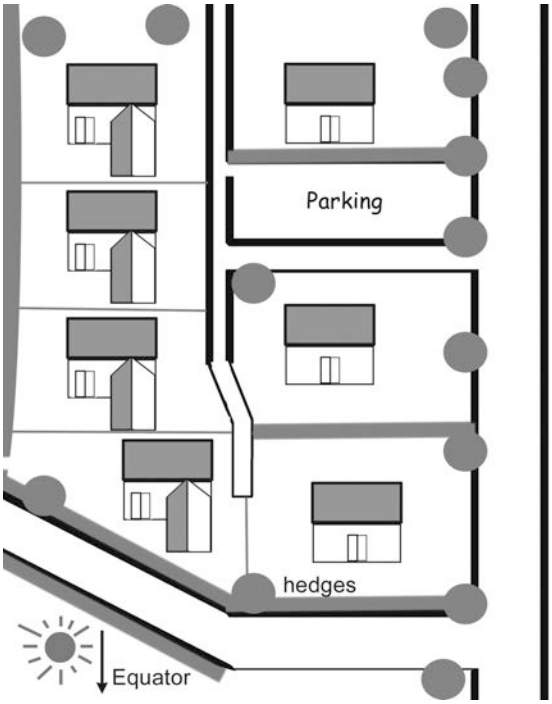


Passive solar room and neighbourhood layout



Sample room layout above. South is at the bottom.

The diagram on the right shows a layout for houses so each house both has privacy and faces south.



Embodied carbon of insulation

Cellulose materials have 'negative carbon' having absorbed it during growth, and so should be favoured over plastic ones:

Material	**Embodied carbon (kgCO2e)**
Cork slab (300kg/m3)	-155
Cork slab (160kg/m3)	-70
Cork board	-65
Woodwool board	-35
Flax	-5
Recycled loose cellulose	-1.9
Glassfibre quilt	3
Rockwool (30kg/m³)	**7**
Glassfibre slab	8
Cork board	9
Rockwool (60kg/m³)	**13**
Expanded polystyrene	15
Rockwool (100kg/m³)	**20**
Cellular sheet glass	28
Foam glass (140kg/m³)	30
Foam glass (130kg/m³)	31
Mineral wool (slabs)	**38**
Expanded polyurethane	160
Unfaced polyurethane	175

K-values of some insulation materials and depth needed to obtain U-value of 0.15W/m^{2}K (Passivhaus standard):

Material	**k-value**	**Depth (mm)**
Foil-faced polyurethane with pentane up to 32kg/m^3	0.020	110
Expanded Polystyrene (EPS) up to 30kg/m^3	0.030-0.045	145-250
Glass wool [up to 48kg/m3]	0.030-0.044	150-230
Mineral wool [160kg/m^3]	0.037-0.040	190-210
Sheep's wool [25kg/m^3]	0.034-0.054	170-330
Cellulose fibre [dry blown 24kg/m^3]	0.035-0.046	175-270
Wood fibre batts or rolls	0.039-0.061	195-350
Hemp lime (monolithic)	0.067	380
Strawboard [420kg/m^3]	0.081	450
Straw bale (monolithic)	0.047-0.063	310-360
Hempcrete	0.12-0.13	640

Cellulose materials

'Natural', 'green', 'bio' or 'renewable' building materials are classed as 'cellulose-based'. They:

- lock up atmospheric carbon in the building;
- have varying degrees of insulation ability;
- are easy to work with;
- make structures that are breathable;
- Are biodegradable or easily recycled at the end of the building's life and may support local agroforestry.

Wood has a greater tensile strength relative to steel – two times on a strength-to-weight basis – and has a greater compressive resistance strength than concrete.

- Sustainably sourced timber must be specified.
- Products for structural use include glued laminated timber ('glulam') and Cross-Laminated Timber (CLT).

Straw bale is used as infill in timber frame structures and is rendered with hempcrete or lime. It has also been used structurally: the tallest frameless straw bale building is three storeys high. Typical properties:

- minimum recommended bale dry density: 110–130 kg/m^3
- thermal conductivity: 0.055–0.065 W/mK (density 110–130 kg/m^3)
- recommended initial moisture content: 10–16%
- recommended maximum in-service moisture content: normally not to exceed 20–25%.
- A 500mm thick structural straw wall with finishes has good insulation: a U-value of around 0.15 W/m^2K.

Wales has the potential to provide a good supply chain of many of these materials, including lime.

Consultation response submitted by ARUP

The Welsh Government must urgently revise Building Regulations to ensure that all new houses are built to 'near zero' energy standards.

Enhancing the building regulations alone will not solve the problem. The house builders will claim higher costs and shift business to England. Planning needs to play a role as well, giving greater certainty and faster decisions in favour of zero carbon schemes. In other words, make designing and building to zero carbon standards a less risky venture than designing and building properties to lower standards.

Wales must, on completion of a successful trial of SOLCER type (low carbon and energy positive) homes at scale, move to extending its energy efficiency requirements for new homes beyond 'near zero' carbon to a level of efficiency where surplus energy is produced.

In time, yes. But let's get 'near zero' embedded first. Give the house building industry confidence by publishing a timeline that says when new higher standards will be introduced, and make sure the timeline properly matches policy timescales to business planning cycles. It is essential to give long-term certainty beyond an Assembly term so as to maintain investment certainty and achieve the intended policy outcomes.

The two recommendations are concerned only with new build, and their implementation will therefore take very long time to have even the smallest impact on Welsh energy consumption and GHG emissions.

The much larger challenge is in reducing energy demand and GHG emissions from the existing housing stock. I would be happy to meet the committee to discuss in detail some ideas for accelerating the slow progress in this area.

Consultation response from Dr Joanne Patterson

- **The development and availability of technology needed for highly energy efficient housing;**
  Technologies required for highly energy efficient housing are available on the market. Careful planning is essential through the entire process from the selection of appropriate solutions (for the housing type), together with correct implementation and utilisation post installation. Collaboration between all stakeholders is essential at all stages from planning, design, implementation and operation so that technologies perform as they should in the long term. Technologies should have appropriate warrantees and should be reasonably supported through appropriate maintenance packages so the risk associated with making the change to normal working practices is lowered.

  Technology is always progressing and therefore, support for new industry and markets in Wales across the supply chain should take place. This should include material technologies and IT and appropriate smart technologies that are user specific. As resources to do this are limited, advice from SMEs that are successful and well established, should be sought to help to support emerging companies that demonstrate ambition and enthusiasm in the field. These companies should also be provided with relevant support, not necessarily finance, but opportunities such as appropriate training in different geographical locations to develop further. The allocation of funds should not be directed because of political influence.

- **What changes are needed to ensure that existing housing stock is as energy efficient as it can be?**
  Investment is needed to take forward holistic retrofit programmes rather than a 'blanket' approach. The holistic approach enables the house to perform efficiently as a whole rather than fixing one problem and then having to return at a later date to fix another problem which can impact negatively on each other. Programmes (such as Arbed) need to be consistent rather than stop/start as this would provide more stability to the supply chain and the skills market adding value to the economy.

  Policy should be modified to increase tax for people that own more than one home. Although there is a shortage in affordable housing, this is exacerbated by multiple home owners who charge high rents for poor quality housing.

- **Whether it is possible and feasible to deliver low carbon, energy positive, affordable housing at scale in Wales and, if so, how this can be achieved;**
  It is possible to deliver low carbon energy positive and affordable housing at scale in Wales – see the demonstration projects, Solcer House and Ty Solar. This has to be done in a staged approach, from demonstration projects to pilots. The Innovative Housing Programme is a great way of doing this to help build confidence in selecting and using new technologies appropriate to context. However, there does need to be careful monitoring of the allocation of these resources to ensure that they are given to housing that is truly 'low carbon, affordable housing' and that projects are carefully monitored – for cost, performance and householder satisfaction and comfort.

The real ‘value’ of providing good quality, low carbon housing has to be considered rather than the capital expenditure. Quality of life, carbon emissions, air quality, health and well-being, fuel poverty, aesthetically improved communities can all significantly improved as a result of good quality, affordable, low carbon housing. This value has to be taken into account for future generations of Wales and to enable low carbon new builds and retrofits to take place.

- **What are the barriers to delivering transformative change in house building in Wales?**
  Skills and knowledge – there is a lack of respect for key staff involved in the construction sector (electricians/plumbers) which limits more academically able people taking up these roles. As the welsh building stock becomes older and the range of technologies increases, these ‘experts’ will need to be more flexible and knowledgeable in their working practices which will require a higher level of education and training. Support will be required to establish and adapt to meet the needs of the building stock.

  Clarity and responsibility in the supply chain – the supply chain comprises of manufacturers, suppliers and installers – at present there is a lack of responsibility with regards to problems that arise. This needs to be more clear to increase confidence in all low carbon technologies.

  Planning procedures – the planning process needs to be clearer with response times for applications being well defined and adhered to, to allow for developments to progress more quickly. From experience it feels as if planners are in place to prevent works to take place rather than to enable them to happen. It is not clear whether this is a lack of clarity from governance or whether there are staff shortages preventing this from happening. Planning should also not be influenced politically but should be guided in a fair and consistent manner. It is should also be flexible to fit the context and not to driven by history.

  Perception that householders do not want change – there is a reluctance for the appearance of housing to be changed as there is a perception that householders do not want change. A survey has confirmed that during a visit to the Solcer House 90% of visitors found the house aesthetically pleasing.

  Stakeholder buy in – there needs to be support from all levels of stakeholder groups:
    - Occupier of the homes need to learn to use technologies and take care of them
    - Owner – (RSL/private rent) – need to provide full support throughout the organisation from maintenance and financial support to allow programmes to take place;
    - Technology suppliers – need to provide long term maintenance, if necessary, with appropriate warrantees. Staff should also be trained to provide quality and confidence with a changing market place.
- **What is the role of Ofgem and the national grid in enabling grid evolution to accommodate new types of housing, and what are the challenges presented by decentralised energy supply?**
  Flexibility to work with fluctuating supply and demand levels.

- **Whether Wales has the requisite skills to facilitate and enable change in the housing sector;**

No it does not. See above.

This information has been obtained through the following experiences:

Jones, Phillip, Li, Xiaojun, Perisoglou, Emmanouil and Patterson, Joanne 2017. Five energy retrofit houses in South Wales. *Energy and Buildings* 154 , pp. 335-342. 10.1016/j.enbuild.2017.08.032

Li, Xiaojun, Jones, Phillip John and Patterson, Joanne 2017. Building and community energy retrofit housing in Wales. Presented at: *World Sustainable Built Environment Conference 2017 Hong Kong Transforming Our Built Environment through Innovation and Integration: Putting Ideas into Action*, Hong Kong, China, 5-7 June 2017.

Jones, Phillip, Li, Xiaojun, Coma Bassas, Ester and Patterson, Joanne 2017. The SOLCER energy positive house: whole system simulation. Presented at: *Building Simulation 2017: 15th Conference of International Building Performance Simulation Association*, San Francisco, CA, USA, 7-9 August 2017. *Proceedings of Building Simulation 2017: 15th Conference of International Building Performance Simulation Association, San Francisco, USA, August 7-9, 2017.*

Patterson, Joanne Louise 2016. Evaluation of a regional retrofit programme to upgrade existing housing stock to reduce carbon emissions, fuel poverty and support the local supply chain. *Sustainability* 8 (12), 1261. 10.3390/su8121261

Jones, Phillip John, Li, Xiaojun, Patterson, Joanne Louise, Coma Bassas, Ester and Lannon, Simon Charles 2016. Preparation for an energy positive community in the UK: modelling-led innovative housing practice in Wales. Presented at: *PLEA 2016 - 32nd International Conference on Passive and Low Energy Architecture. Cities, Buildings, People: Towards Regenerative Environments*, Los Angeles, USA, 11-13 July. Published in: La Roche, Pablo and Schiller, Marc eds. *PLEA 2016 - 32nd International Conference on Passive and Low Energy Architecture. Cities, Buildings, People: Towards Regenerative Environments.* PLEA, pp. 1095-1101

Calzada, Jamie Roset, Kaltenegger, Ingrid, Patterson, Joanne Louise and Varriale, Fabrizio, eds. 2016. *Smart Energy Regions – skills, knowledge and supply chains.* Cardiff: Welsh School of Architecture.

Patterson, Joanne Louise, Coma Bassas, Ester and Varriale, Fabrizio 2016. *Systems based approach to replicable low cost housing: renewable energy supply, storage and demand reduction.* In: Roset Calzada, Jaume, Kaltenegge, Ingrid, Patterson, Joanne Louise and Varriale, Fabrizio eds. *Smart Energy Regions - Skills, knowledge, training and supply chains*, [Smart Energy Regions - Skills, knowledge, training and supply chains]. Cardiff: Weslh School of Architecture, pp. 239-245.

Community Housing Cymru Written Response to the Climate Change, Environment and Rural Affairs Committee's consultation on Low Carbon Housing: The Challenge

CHC's Response

About Us

Community Housing Cymru (CHC) is the representative body for housing associations and community mutuals in Wales, which are all not-for profit organisations. Our members provide over 158,000 homes and related housing services across Wales. In 2016/17, our members directly employed 8,731 people and spent nearly £2bn (directly and indirectly) in the economy, with 84% of this spend retained in Wales. Our members work closely with local government, third sector organisations and the Welsh Government to provide a range of services in communities across Wales.

Our objectives are to:

- Be the leading voice of the social housing sector.
- Promote the social housing sector in Wales.
- Promote the relief of financial hardship through the sector's provision of low cost social housing.
- Provide services, education, training, information, advice and support to members.
- Encourage and facilitate the provision, construction, improvement and management of low cost social housing by housing associations in Wales.

Introduction

CHC welcomes the opportunity to respond to the committee's consultation on low carbon homes. Our members are significant stakeholders in the future of Wales' housing and are invested in reducing carbon emissions from the homes they develop.

In CHC's recently launched Housing Horizons Vision[1] we set an ambitious target for the sector. Based on discussion with hundreds of our members over the last year we laid out a long-term vision for housing associations in Wales. Part of this vision was a commitment that homes built by housing associations will be warm and affordable to run. Specifically, we're aiming for the following targets:

- By 2020, all new homes built by housing associations will be built to near-zero-carbon standard.

- By 2036, we want all our homes to meet this standard.

[1] https://chcymru.org.uk/uploads/events_attachments/Housing_Horizons_vision_-_print.pdf

We acknowledge that these are lofty goals, but we feel that with the right leadership and operating environment, we can deliver for the people of Wales.

Our members' commitment to a low carbon future was noted, in our response to the predecessor committee's 'A Smarter Energy Future for Wales?' consultation and our position remains the same:

"Improving the energy efficiency of homes is one of the key levers to tackling fuel poverty. Energy efficiency lies at the heart of discussions about energy. A home which is highly energy efficient can provide the occupants of those buildings with a more comfortable experience, lower fuel bills, enable reductions in carbon emissions and help ensure increases in energy security for individuals, businesses and communities… The integration of renewable energy technologies when feasible into the built environment offers clear benefits and an additional improvement in the skills and expertise of the workforce operating in the sector in Wales."

What role can housing can play in Wales' low carbon transition, including the potential positive impacts on greenhouse gas emissions?

The housing association sector is ideally placed to help Wales achieve its low carbon delivery plan. Housing is a contributor to carbon emissions and our members are responsible for a significant element of Wales' housing stock (recent statistics show that housing associations are responsible for two thirds of Wales' 228,684 social housing units), so we are clear that our members are key partners in Wales' transition toward decarbonisation.[2]

The incentives for CHC's members to tackle carbon emissions are significant: the latest estimate is that there are 291,000 households living in fuel poverty, equivalent to 23% of households in Wales.[3] By improving the types of homes our members provide to tenants, fuel poverty amongst housing association tenants can be addressed and a significant burden on the income of many of those affected can be diminished. As well as helping Wales to achieve its carbon reduction targets, as set out in the Environment (Wales) Act, and under the Climate Change Act 2008 (N.B. the UK Government's Zero Carbon Buildings policy, designed to help meet the Climate Change Act, provides a useful definition of the core requirements for a building to qualify as zero carbon) the opportunity to contribute to a reduction of the financial pressures on many of our members' tenants, as they continue to deal with the imposition of welfare reform, is one the sector cannot miss.[4]

Further, research carried out by the charity Sustainable Homes into the relative financial performance of social housing units in relation to their energy efficiency rating found that as homes were ranked as more energy efficient, they turned out to be void for a shorter length of time – on average, 31% shorter for efficient band B properties compared to those in bands E and F.[5]

[2] http://gov.wales/statistics-and-research/social-housing-stock-rents/?lang=en
[3] http://gov.wales/topics/environmentcountryside/energy/fuelpoverty/?lang=en
[4] http://www.zerocarbonhub.org/zero-carbon-policy/zero-carbon-policy
[5] http://woodknowledge.wales/special-feature/pentre-solar

In our Housing Horizons vision, CHC has set out an ambition for our members to develop 75,000 homes by 2036. Clearly, this gives us scope to contribute significantly to the reduction of carbon emissions from Wales' housing stock.

The development and availability of technology needed for highly energy efficient housing;

The Solcer project demonstrated, albeit on a very small scale, that near-zero carbon housing can be delivered at affordable rates, using locally sourced technology and materials. CHC members have started to make progress on putting the lessons learned into practice, with a number of successful applications to the Welsh Government's Innovative Housing Programme to fund highly energy efficient housing, utilising a range of available technology (see section on delivery at scale).

While there is a great deal of technology available to developers who are looking to build to near-zero levels and create communities which embrace energy efficiency, much of it presents new barriers, with which our members are currently grappling. The skills issue, touched upon elsewhere in this document, is a key area of focus, in this regard. The skills and knowledge required to install and maintain technology such as ground source heat pumps are often in short supply. Similarly, the behavioural issues mentioned elsewhere are sharply brought into focus when discussing the operation of technology which is new to our members' tenants. While both of these challenges can be overcome, through steady investment in skills on the one hand and the direction of resources to better educate tenants on the other, they remain, at present, areas of frustration for some housing associations and good reasons for a gradual and incremental approach to any new legislation in this area.

Our members also have some concerns about the unintended consequences of rushing into the use of apparently attractive new technology; there is much to learn, for example, about how we maintain air quality in homes built using highly technologically advanced materials. Again, the necessary piloting and learning is ongoing within our sector but we would advise gradual approaches to policy imposition.

What changes are needed to ensure that existing housing stock is as energy efficient as it can be?

Bringing existing stock to as close to zero carbon emissions as possible is going to be a far greater challenge for Welsh housing associations than that of building new homes to higher standards. Wales has, by some estimates, the oldest housing stock in Europe and much of this is in areas which suffer from extreme climactic conditions. Recognition of the significant variance of the challenges faced by our members in decarbonising their stock in any future government policy directives will be vital.

The Welsh Government's ambitious and forward thinking Innovative Homes Programme provides housing associations with excellent opportunities to pilot and learn from novel approaches in the development of new homes, but it does not fund the retrofit of existing properties (understandably, as one of the programme's key goals is to increase the number of homes in Wales). A similar approach from Welsh Government to providing funding and learning opportunities to the retrofitting of existing homes, which are not at the near-zero standard we hope to achieve, would be warmly welcomed by the sector.

As with new build, there are innovative approaches to retrofit available to the sector, such as Energiesprong and Beattie Passive's TeaCosy approach, which Welsh Government could fund pilots of, enabling the sector to minimise the risk in learning from these pilots.[6] As with the Innovative Housing Programme, monitoring and sharing learning would have to be at the heart of any such programme.

On the subject of shared learning on effective (and, more importantly, ineffective) methods of reducing carbon emissions from old stock, the sector can learn much from the forthcoming third round of the Arbed project. From what we have been told, in advance, the latest round of the programme will take a whole house approach, looking at each home in context, as an individual entity, not applying the same method to every building and considering issues such as local climactic conditions, such as wind driven rain, solar gain and risk of flooding. We also understand that Arbed 3 will consider the unintended consequences of retrofit, which is an area of clear interest and builds on the BRE's work on the unintended consequences of solid wall insulation.[7] The results of this programme will have a positive effect on our knowledge as to how to achieve decarbonisation targets. CHC will take an active role in disseminating learning from the programme. We welcome Welsh Government investment in their Warm Homes programme, which includes Arbed.

Whether it is possible and feasible to deliver low carbon, energy positive, affordable housing at scale in Wales and, if so, how this can be achieved;

As noted, successful applications to the Innovative Housing Programme (IHP) will be built up over the coming months and will demonstrate whether and how low carbon, energy positive, affordable housing can be delivered at scale. Successful applicants are judged against the impact they will have on the Wellbeing of Future Generations act's indicators. It is important that the success of these projects in minimising carbon emissions and fuel poverty is effectively monitored and that learning is effectively shared. The housing association sector is well represented in the programme's governance mechanisms and CHC will disseminate learning from the process in conjunction with Welsh Government, as appropriate.

We feel that, in order to develop at the sort of scale necessary to meet the various targets outlined above, it will be necessary to create a great deal of future housing off-site. The benefits of off-site manufacture for developing sustainable, near-zero carbon homes include the fact that quality control is of a higher standard, so it is easier to create higher quality sealed homes in a factory than it is on-site, reducing heat loss from the finished product. Crucially it can also mean quicker production of homes and, if done at sufficient scale, could reduce costs.

CHC members are increasingly investing in off-site manufacture and the Innovative Housing Programme has provided great opportunities to learn more about this style of development, and not just by investing directly in buildings. A consortium of housing associations and the Wales Co-operative Centre, led by Coastal Housing, has received

[6] http://beattiepassiveprojects.com/woodstock/technical.php ; http://www.energiesprong.uk/
[7] http://www.bre.co.uk/filelibrary/pdf/projects/swi/UnintendedConsequencesRoutemap_v4.0_160316_final.pdf

revenue funding to research the possibilities and benefits of expanding the use of offsite construction in South Wales and, though the work is in its very early stages now, we anticipate that the learning from this research will be of real value in driving forward the off-site agenda for the whole sector.

Various successful IHP applicants have received capital funding and are investing directly in off-site development. As an example, Valleys to Coast (V2C) were successful with a bid to develop 'Barnhaus' style accommodation in Plas Morlais, Bridgend, which will provide 4 homes built to high-energy performance standard, using frames manufactured off-site and straw bale insulation which V2C anticipate providing negative CO2 emissions. Similarly, Linc Cymru are working on a project, which was successful in achieving IHP grant, alongside F1 Modular, an off-site developer based in Powys. The project is an Extra Care facility in Aberdare, which will provide 40 homes and enable Linc Cymru to develop their learning (and that of the wider sector) as to the performance standards achievable using this form of development. A further example is the 16- house 'Homes as Power Stations' Active Home Pobl development in Neath Port Talbot, which will use locally developed timber frames and a factory insulated panel system ('Trisowarm'), as well as integrated solar PV roofs and solar collecting wall cladding. Power generated by these methods will be stored on-site using batteries and negates the need for a gas supply. Early signs indicate that the costs of this approach will be higher than a traditional development, but the purpose of the project is to demonstrate that it can be achieved, and that if rolled out at volume, can be made to work at affordable levels.

In short, we are optimistic that the development of new near-zero carbon homes can be achieved at scale by our members, but are awaiting the learning from the opening rounds of the Innovative Housing Programme to provide certainty as to the best methods to utilise.

What are the barriers to delivering transformative change in house building in Wales?

Behaviour

Members have noted various concerns about the impact of resident behaviour on adoption of new ways of operating near-zero carbon homes. Examples of the types of issues experienced include instances when tenants have turned off fans designed to maintain air quality in buildings, leading to mould growth. Housing associations are adapting to these behavioural issues, providing handover information to tenants, or in some cases designing out tenants' ability to access controls, but as with all aspects of providing near-zero carbon homes, this will take time to get right and requires adaptation from both landlords and tenants.

CHC has done much to promote behavioural economics in other aspects of housing over recent years, with particular focus on how nudges can be used to diminish unwanted behaviours, in housing management, and we feel that there is a clear application here for similar techniques, which we will explore.

Funding

At an event held by CHC recently to discuss the issue of near-zero homes, we were informed that to develop to Passivhaus standard, a housing association could expect to pay an additional £15,000 on top of the costs for traditional build. As noted in the building regulation section, later, these costs would need to be met by some form of enhanced subsidy. Similarly, for the bigger task of retrofitting existing stock to be significantly more efficient, additional funding is likely to be required.

Skills

CHC members have noted some concern as to a lack of appropriately skilled professionals working in the building industry in Wales. As a sector, we are extremely motivated to retain as much of our expenditure within Wales as possible – enhancing our local economies has benefits for residents and landlords alike and in 2016/17 we managed to retain 84p in every £1 spent in Wales. Our Housing Horizons vision is that we will increase this over the coming years to 95p and that by 2036 we will have supported up to 150,000 job and training opportunities. Inevitably many of these will fall within the construction field and we are thus keen that Welsh Government employment strategy takes note of the areas in which we are lacking and that the government works with the housing association sector to enable us to ensure the quantity and quality of appropriately skilled workers within the Welsh workforce.

Land Access

Developers of near-zero carbon affordable homes faces the same issue as those of any other affordable homes and one of the consistent barriers to the sector's ability to do this at the pace needed to overcome the housing crisis is access to land at affordable rates. We have outlined some suggested approaches to enable the freeing up of developable land in our recent report, 'Planning for 20,000 Homes'.[8]

Planning

Planning was noted, in consultation with our members, as being a key issue in stymying the move toward low-carbon homes and is an area we urge the inquiry to give significant consideration to. As an example of how planners might specifically stall low-carbon development, we have been told about homes, designed to be optimally positioned to generate maximum solar energy which have been ordered to be re-orientated for aesthetic reasons, reducing the effectiveness of their photo-voltaic panels.

Planning policy has to look at whether in the future it will be more important to society that energy generation will outweigh current approaches to aesthetic considerations. Ministerial guidance on this point needs to be clear. If we want to develop truly low carbon housing in Wales, we need to make a dramatic shift towards planners favouring low carbon design as a priority.

[8] https://chcymru.org.uk/uploads/events_attachments/Briefing__20000-Homes__ENG__Final-2.pdf

Away from low-carbon homes, specifically, planning is noted by our members as a point of significant concern, generally, in the development of affordable housing. Housing associations have, in some cases, struggled with opposition to developments based on stigma of social housing and social housing tenants, they have experienced problems with overzealous application of pre-commencement conditions and they have had developments delayed by hold-ups caused by utilities companies (with misalignment of Welsh Water's asset management plans with local development plans, in particular, causing significant delays). While we, as a sector, have some contribution to make to bring planners along on this decarbonisation journey with us, we are also clear that strong leadership from Welsh Government will continue to be required. Planning is an area which has been significantly negatively affected by the UK Government's austerity drive and is heavily under-resourced. Again, we have laid out our concerns and suggested remedies in the 'Planning for 20,000 Homes' report.

The recent decision, to deny planning permission to the solar farm at Rhoscoch in Anglesey which would have sustainably powered 15,000 homes, against planning officer recommendation, is an indication of the sort of delay to the decarbonisation agenda that can be thrown up by the planning system, in its current form.

Brexit

Of growing concern to our members are the ramifications of Brexit. Concerns focus not just on the potential reduction in numbers of skilled workers, but also the potential for increase in the cost of materials. There is also a legislative loss, with the removal of EU control over UK legislation comes the removal of the EU's Energy Performance of Buildings Directive, which sets out targets for buildings across Europe. How the UK Government responds to replace this may lead to further delays in the sector's move to decarbonisation.[9]

What is the role of Ofgem and the national grid in enabling grid evolution to accommodate new types of housing, and what are the challenges presented by decentralised energy supply?

CHC has not yet done any research as to how our members can work with Ofgem and the National Grid, but we welcome improved interaction with all utilities providers, given the importance of their roles in reducing fuel poverty and our move toward decarbonised stock and would be glad to discuss with them how our members can work toward these goals.

Whether Wales has the requisite skills to facilitate and enable change in the housing sector;

Broadly, CHC members have highlighted concerns about the availability of skilled professionals in all areas of construction, including installation and maintenance of the technologies needed to deliver near-zero carbon homes. They are concerned about the take-up of courses that would provide the skills needed to develop components, like integrated PV roofs.

[9] https://ec.europa.eu/energy/en/topics/energy-efficiency/buildings/nearly-zero-energy-buildings

There are some reasons for optimism, though. As noted, the Innovative Housing Programme will lead to the development of new skills across a number of projects, which are likely to form the basis of our sector's response to decarbonisation. Additionally, some of our members are taking steps to reduce reliance on the diminished skilled workforce to enable them to build to near-zero standard, regardless. As an example, United Welsh are working on a 17 home development at the site of the former Cwm Ifor Primary School in Caerphilly. The homes are to be built using Beattie Passive's patented system, which delivers highly thermally efficient homes at low cost and using low-skilled workers (and, due to the off-site process employed, require no 'wet trades', at all), with training provided by Beattie Passive. If the sector continues to move toward off-site manufacture, there will inevitably be fewer skilled people needed on-site and more work available in factories creating panels, etc.

What changes are needed to Building Regulations in Wales to accelerate progress towards 'near zero' energy standards and beyond?

The Welsh Assembly's Smarter Energy Future for Wales document called for urgent revision of Building Regulations to ensure that all new houses are built to 'near zero' energy standards. CHC supports this aim, but our members have been clear that any changes to regulations should be implemented incrementally to allow the industry to adapt and respond to the challenges of building near-zero homes, such as potential skills shortages. Applying a blanket SAP rating as a target for all homes would be inappropriate and we would urge a nuanced approach, which takes account of the variety of factors (location, age of stock, material, etc.) which will affect a home's abilities to achieve significant carbon reduction.

One idea posed at a CHC consultation event, on the issue of regulation that allows for incremental improvement to buildings is that landlords (and indeed homeowners, as we feel that these standards should be applied across tenure) could be mandated to bring existing homes to standard at certain 'trigger points' (such as when homes change hands, when planning permission is sought for extensions or when a HA property becomes void). The implications of this for planned maintenance and procurement by HAs would need to be considered, but the benefit of such an approach would be that improvements could be made on a home by home basis and would thus be more likely to be successful, as this approach would necessitate consideration of that house's specific requirements in greater detail than as part of an ongoing programme of work across a larger area.

We are reassured that Welsh Government have stated that they do not intend to review Part L of the building regulations, which covers conservation of fuel and power, in isolation - we understand that Part F, which relates to ventilation, is going to be considered in the same review - and encourage future amends to regulation to maintain this holistic approach, expanding on it where feasible to look at carbon reduction in the round (considering transport and how that can work with housing to reduce carbon output, for example).

Members have also told us that changes to building regulations should not introduce prescriptive requirements in terms of the methods of achieving energy efficiency performance. Rather, increasing the performance requirement through the existing measurement process maintains flexibility in the means of achieving this, which allows

housing associations opportunity to innovate and find the most effective methods for their individual operational contexts. Current building regulations do not heavily prescribe the methods of achieving the required efficiency rating of a dwelling. The SAP rating of the property demonstrates compliance with the performance requirements of these regulations and WHQS.

Changes to regulations should also be matched with changes to funding, as appropriate. If our members are required to deliver more expensive products, we hope that this would be matched by an increase in grant or perhaps an extension of the approach taken by the Innovative Homes Programme, whereby innovative elements of successful bids are funded in addition to the existing grant (though we are not advocating that this be done on a competitive basis!).

On a similar note, consideration should be given to the issue of acceptable cost guidelines (ACG). In the cases in which the development of near-zero homes causes increased costs, there is the potential that, if ACG does not flex with the increased costs, investment in some communities may be made less financially viable for our members.

A further issue to consider is that of Section 106 homes handed over from private developers, which are unlikely to be built to required standards, unless the private sector is mandated to deliver near-zero homes. We would urge that the same incremental approach to improving standards is applied across all developers in Wales, to ensure that the full range of Wales' housing stock is of a standard fit for future generations.

Finally, CHC members have called for any new legislative performance requirements to reflect the differences in producing a new home, compared to bringing an existing home up to standard or creating new homes by converting existing buildings. Each of these three categories will provide different challenges for our members and it would not be appropriate to standardise regulation across all three, without considering these challenges.

How communities can be planned and shaped to be more energy efficient and low carbon (including examples of good practice in Wales and further afield).

The key issues for our members in the development of communities which are more energy efficient come down to behaviour, as set out in the section on barriers.

We have heard examples of good practice from housing associations in addressing resident energy behaviour; for example, Cartrefi Conwy engaged a Knowledge Transfer Partnership with Bangor University to improve energy efficiency of existing housing stock and undertake a feasibility assessment for setting up community renewable energy schemes. Similarly, as part of their Powering Up Communities First project, Melin Homes have employed an Energy Officer whose role covers everything from helping tenants to save money by switching to a cheaper provider to the provision of technical expertise in managing energy saving technology in their homes. By addressing individual behaviours, communities can be developed, which are educated as to how to limit their carbon footprint. The Powering Up Communities First project has introduced a community energy forum for Melin tenants, as well as Green Energy Champions, who can act on a peer-to-peer basis to encourage better energy behaviours amongst other members of their communities.

An alternative approach to overcoming the barriers presented by tenant behaviour in response to new technology is to simplify, as much as possible. The Pentre Solar development in Pembrokeshire is designed to cut down as far as feasible on devices that tenants could misuse and enable simple approaches to temperature control.

On a broader community point, technology can be applied which offers community-focussed solutions to reducing carbon emissions, such as district heating systems. While these can cause issues (should one boiler fail, the whole system is affected), they offer the potential for significant carbon reductions.

Consultation response from Energy Saving Trust

Energy Saving Trust is pleased to submit evidence to the Climate Change, Environment and Rural Affairs Committee as part of its inquiry into low carbon housing in Wales.

Energy Saving Trust is the leading, impartial sustainable energy organisation. We work on behalf of governments and businesses across the UK providing services in the area of data, assurance, grant and loan administration, consumer engagement and advice.

In Wales, Energy Saving Trust delivers the Welsh Government's Local Energy/Ynni Lleol community renewable energy scheme and, as a sub-contractor to British Gas, delivers the advice and customer engagement services for the fuel poverty Nest scheme.

For BEIS, the Energy Saving Trust delivers the telephone-based Energy Saving Advice Service in England and Wales. We also undertake other research and awareness-raising work for the department on a project-by-project basis.

In Scotland, the Energy Saving Trust is a principal delivery partner of the Scottish Government for home energy. We run comprehensive local and national advice and support programmes.

Public engagement on energy is at the heart of our work. Energy Saving Trust has a unique relationship with the public around energy saving and renewable energy and our response reflects that.

Introduction

Due to the Energy Saving Trust's extensive experience working with the public and private sector on sustainable energy issues, we believe we have useful insights to share with the Committee. We have responded to the detailed questions below however due to their breadth we have kept our answers at a relatively high level. We would be happy to provide further detail to the committee on any aspect of our response.

Housing has a crucial role to play in transitioning to a low carbon economy, not only in terms of the emissions the residential sector generates but also because the home is one of the primary points of interaction that individuals have with energy use. We strongly believe that a successful transition to a low carbon economy requires housing at its heart.

Key points of our submission

Decarbonising energy requires involvement from a wide range of actors but the role of national government cannot be understated. Solutions to decarbonise home energy need to be locally tailored but with high level political support. The Welsh Government

therefore has a vital role to play in developing ambitious and credible policy strategies and governance frameworks.

Welsh Government is perfectly placed to provide strategic direction and ambition on low carbon housing. There needs to a long term, high level commitment to improving the state of the Welsh housing stock. Tackling fuel poverty needs to be a high priority but a comprehensive approach to improving energy performance across all sectors (social housing, private rented, owner occupier) and abilities to pay is needed longer term. Different push-pull levers are needed for the different sectors that will need to be designed and implemented with extensive consultation with those affected. We suggest the following specific priorities:

- Introducing stringent new build standards to future proof the housing stock is a vital first step to address built environment emissions. The zero carbon homes policy saw widespread support across industry and the third sector and its axing was widely criticised. The first step should be setting out a robust definition, suited to the Welsh housing market.
- Building on the Nest and Arbed programmes, Welsh Government should seek to put in place a more extensive programme of support for home energy efficiency improvements. There are useful learnings from the Scottish Government's energy efficiency programmes which include an array of complementary incentives and support services.
- Regulation is a vital part of the policy mix and the Welsh Government should be looking at where it can strengthen energy efficiency standards that are already in place, for instance relating to the upcoming private rented sector minimum energy efficiency standards, which, as they are currently designed will not have the desired impact.

What role can housing play in Wales' low carbon transition, including the potential positive impacts on greenhouse gas emissions?

We would highlight the findings of the Committee on Climate Change (CCC) in this regard, in particular its 2017 progress report[1]. As the committee will be aware, Welsh emissions have dropped by 20% between 1990 and 2015 compared to a UK-wide drop of 38%. This means that Wales is not on track to meet its non-statutory 2020 40% emissions reduction target nor is its current progress in line with the 2050 emissions reduction target set through the Environment (Wales) Act.

[1] https://www.theccc.org.uk/publication/2017-report-to-parliament-meeting-carbon-budgets-closing-the-policy-gap/

The Energy Saving Trust is clear that reducing emissions in homes by supporting the retrofit of existing buildings and mandating high energy performance standards for new buildings is a vital part of tackling climate change. Residential buildings directly account for 8% of total Welsh emissions (more once you incorporate emissions from the power sector associated with buildings' energy use) however due to the constraints and limitations in reducing emissions in other sectors (e.g. heavy industry, agriculture) some sectors, like buildings, have deliver greater reductions. Emissions from buildings are 32% lower than 1990 levels[2] meaning the sector's progress has been better than the Welsh average. However we would highlight the importance of addressing building, in particular residential building, energy efficiency as there are significant, but often under reported, benefits associated with making home energy improvements. This was explored most prominently in the International Energy Agency's report on the multiple benefits of energy efficiency[3] which identified a long list of benefits, including: health and wellbeing, jobs and growth, energy security, fuel poverty alleviation, local air quality and positive impacts on public budgets. Developing a vibrant low carbon economy delivers significant economic benefits. The ONS finds that there are an estimated 243,000 people employed in low carbon and renewable energy (LCRE) in the UK in 2015, generating a turnover of over £45bn[4]. In Wales, the LCRE economy employed around 11,000 FTE employees in 2015, generating around £1.7bn in turnover. We were encouraged that these multiple benefits featured prominently in the Welsh Government's 2016 energy efficiency strategy.

The development and availability of technology needed for highly energy efficient housing

As the committee will be aware, decarbonising heat and addressing home energy efficiency are increasingly being looked at as part of the same challenge. Looking at either heat or energy efficiency on its own fails to capture the interdependence between the two. This finding is reinforced in a recent Energy Research Partnership report[5] that the Energy Saving Trust supported: regardless of the route to decarbonise heat (e.g. dominated by hydrogen or heat pumps or heat networks or mixes), improving the energy efficiency of the building stock is beneficial. Energy efficiency is identified as the "no-regret" option, i.e. large scale demand reduction is compatible with any option to decarbonise heat. This is very much in line with the 'energy efficiency first' principle whereby energy efficiency is the first fuel, the cheapest energy and lowest carbon energy

[2] https://www.theccc.org.uk/wp-content/uploads/2017/04/Welsh-Carbon-Targets-Committee-on-Climate-Change-April-2017.pdf
[3] https://www.iea.org/publications/freepublications/publication/capturing-the-multiple-benefits-of-energy-efficiency.html
[4] https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/finalestimates/2015results
[5] http://erpuk.org/wp-content/uploads/2017/10/ERP_heat_transition-Oct-2017.pdf

being the energy that is not used. This is also aligned with the Welsh Government's energy hierarchy where demand reduction is the first priority, followed by energy efficiency. As such when thinking about the technology needed for highly energy efficient housing we must also consider heating technologies.

We understand that the Department for Business, Energy and Industrial Strategy (BEIS) is currently developing a heat strategy. Whilst we are unclear what the coverage of this strategy will be, in all likelihood it will cover Wales to some degree. A GB or UK-wide strategy, by necessity, can only go into so much detail and policy strategies need to be tailored to local circumstances, for instance to allow for the fact that Wales has a high proportion of off gas grid properties[6]. If it is not already doing so, Welsh Government should be working closely with BEIS to ensure that the heat strategy is consistent with decarbonising heat and improving home energy efficiency in Wales as well as identifying key opportunities for Welsh Government to add value. Beyond that we believe that the Welsh Government should seek to develop its own heat strategy and combine it with an updated energy efficiency strategy. A combined heat and energy efficiency strategy is important to recognise the intertwined nature of these two areas, as argued in the paragraph above. This recommendation echoes that of the CCC in its 2017 progress report for Wales to develop its own heat strategy.

To ensure that a heat and energy efficiency strategy is tailored to local requirements, building an understanding of the current state of the Welsh housing stock will be vital. We understand that the Welsh Government is currently working on its Housing Conditions Evidence Programme which it expects to publish in autumn 2018. We fully support this piece of work and believe that robust and reliable data on the state of the housing stock is essential to deliver effective heat and energy efficiency improvement programmes. Further activities that could be considered include developing a heat map, similar to DECC's heat map for England[7] that combined with the housing stock data could improve targeting.

To go further and ensure that the right technologies are available to develop highly efficient housing in Wales we would point to some of the programmes in place in Scotland, such as the Local Energy Challenge Fund[8]/Rural Energy Challenge Fund[9], the District Heating Loan Fund[10] or the Home Energy Scotland Loan[11]. These schemes support

[6] https://www.nongasmap.org.uk/
[7] http://nationalheatmap.cse.org.uk/
[8] https://www.localenergy.scot/funding/local-energy-challenge-fund/
[9] https://www.localenergy.scot/funding/rural-energy-challenge-fund/
[10] http://www.energysavingtrust.org.uk/scotland/grants-loans/district-heating-loan
[11] http://www.energysavingtrust.org.uk/scotland/grants-loans/home-energy-scotland-loan

an array of new, innovative low carbon initiatives and help build up the local supply chains for low carbon technologies. The projects supported range from community energy programmes, district heating projects to individual home energy efficiency improvements.

As the Committee will know, the Welsh Government supports local energy projects through the Local Energy/Ynni Lleol programme[12]. This provides a comprehensive support programme including development officer expertise and funding to encourage and develop renewable energy schemes that offer multiple community benefits.

What changes are needed to ensure that existing housing stock is as energy efficient as it can be?

This is a wide-ranging question and one that is very difficult to answer comprehensively. We will therefore only attempt to address what we see as the most important issues for the existing stock. We would be happy to provide further information to the committee on request. The main points we would make are:

- Solutions for existing stock are very different to those for new build
- A variety of complementary measures/schemes are needed as part of a stable, long term and credible policy framework including:
    - A robust regulatory regime, particularly important for the private rented sector, accompanied with appropriate communication and engagement activities
    - Sustained and well-funded interventions to tackle fuel poverty
    - A range of incentives for the so-called 'able to pay' sector which also encourage householders to take up private sector finance.
- The Welsh Government can, and should, play a leadership role when it comes to low energy housing, as pledged in the energy efficiency strategy
- Ensuring that national and local actors have access to good quality data on the state of the housing stock is important to deliver retrofit programmes effectively

The first thing that we would note is that solutions for the existing stock are very different from new build homes. The policy levers for new build are comparatively simple as building regulations can be modified with relative ease. This is not to understate the work that must be undertaken to design effective standards. In contrast, retrofitting nearly all 1.4 million existing dwellings[13] in Wales will require a much broader range of policies and tools. The Welsh Government's commitment to energy efficiency in its 2016

[12] http://localenergy.gov.wales/en/
[13] https://statswales.gov.wales/Catalogue/Housing/Dwelling-Stock-Estimates/dwellingstockestimates-by-year-tenure

document was very welcome however we are not confident that the actions outlined will deliver the transformation of the building stock that is required. A greater level of ambition is needed backed up with a robust set of policy levers. Delivering a transformation of the existing housing stock is a significant challenge that will require high level political support, sustained action and support for local actors responsible for delivery.

The Energy Saving Trust believes a variety of different tools, combining incentives, zero interest loans or pay-as-you-save mechanisms, for instance, are needed. The UK Government's over-reliance on the flagship Green Deal programme demonstrates the political and economic risks of putting all your eggs in one basket. Devolution has a very important role to play and we believe that the Welsh Government should be pushing for greater powers on energy efficiency to allow it to develop an ambitious set of policies to transform the built environment. We would point to the policy framework that the Scottish Government has put in place as a good example of this: having set energy efficiency as an infrastructure programme, Scottish Government is currently setting up Scotland's Energy Efficiency Programme (SEEP) – a 15-20 year programme to transform the energy efficiency and heating of Scotland's buildings, backed with around £500m of funding over the next 3-4 years. SEEP will encompass incentives, standards and regulations, supply chain, advice and information, consumer protection and monitoring and evaluation. It will build on existing programmes, which include zero interest loans, cashback schemes and, in some areas, equity release programmes and the infrastructure provided by Home Energy Scotland which provides a 'single point of contact' or 'one stop shop' for all households in Scotland including people struggling with energy bills. Home Energy Scotland – managed by the Energy Saving Trust – provides trusted, independent, impartial advice tailored to an individual's personal circumstances and their actual home.

It must also be recognised that incentives alone will not necessarily drive demand. To be truly effective incentives need to be considered as part of a wide range of policies, including regulation. Effective regulation needs to be in place both to act as a backstop and to ensure that all tenures are adequately covered.

As the committee will be aware, in April 2018 minimum energy efficiency standards requiring rented properties to be at least an EPC band E to be let will come into force in England and Wales. We strongly support these regulations however are very concerned that as they currently stand many, if not most, landlords will be able to avoid making improvements through the no upfront cost exemption. This is whereby landlords of the least energy efficient, coldest homes are exempt from making energy efficiency improvements if they cannot access 100% funding from government or other third parties

to pay for the costs of the necessary improvements. This loophole is very disappointing, the Energy Saving Trust believes that landlords of the least energy efficient homes should be required to invest their own money to bring these homes up to a decent standard. We support the idea of a cost-cap: landlords of F and G banded homes should be required to invest up to a £5,000 to improving their property. Where the costs of the necessary energy efficiency improvements are higher than the cap, then landlords should be able to look for financing support from government.

Research undertaken by Shelter Scotland[14] found that nearly 80% of Scottish renters wish their home was more energy efficient yet 60% feel powerless to take action and are unable to "vote with their feet". The research finds that 85% of all adults and 91% of private renters support introducing minimum energy efficiency standards for the private rented sector.

Whilst we appreciate that the Welsh Government is not in a position to directly modify the PRS standards we believe that it should lobby the Department for Business, Energy and Industrial Strategy to implement a £5,000 cost cap. The Clean Growth Strategy recognises that these regulations are not fit-for-purpose and commits to review how they work but it is uncertain whether this will result in them being suitably strengthened. Longer term it will also be important to ramp up these standards and we very much welcomed the UK Government's commitment to ensure that private rented homes reach an EPC band C by 2030. Again it will be important that this ambitious commitment actually results in strong regulatory action.

Energy Saving Trust will continue to work with Government to ensure that the regulations are sufficiently strengthened however if the end result is not adequate we believe that the Welsh Government should look at implementing its own standards. This would undoubtedly require Welsh Government to obtain greater powers on energy efficiency. This would be important both in terms of ensuring that existing regulations are effective in Wales and that there is a robust long term trajectory to improve the energy efficiency of the PRS. The landlord registration and licensing framework that is in place in Wales will facilitate communication with landlords about energy efficiency standards as well as enforcement. The register is an important asset and one that we believe will prove instrumental in the coming years in improving the state of the private rented sector.

14 https://scotland.shelter.org.uk/__data/assets/pdf_file/0007/1391398/SG_Consultation_on_Energy_Efficiency_the_Views_of_Private_Tenants.pdf/_nocache

As highlighted in the section above, good quality data on the housing stock is vital to design successful interventions. We would like to highlight the work undertaken by our colleagues in Scotland, who, on behalf of Scottish Government, make address level data available to local authorities to help them deliver improved home energy interventions[15].

Whether it is possible and feasible to deliver low carbon, energy positive, affordable housing at scale in Wales and, if so, how this can be achieved?

We believe that other respondents are better placed than the Energy Saving Trust to answer this question. We would simply highlight the work being undertaken by Energiesprong[16] to refurbish homes to net-zero energy level at scale through an industrialised, off site production process. Paying for these high level retrofit involves bringing together funding from two sources: social housing investment asset and management funds and from the energy bill savings achieved as part of the building retrofit. It is important that rent and service charge regulations work with the Energiesproong model to allow social housing providers to recoup the energy bill savings.

What are the barriers to delivering transformative change in house building in Wales?

We believe that the barriers to low energy new homes are primarily supply side. Householders want warmer, comfier homes that are cheaper to heat and easier to use. Once the market starts providing low carbon new homes as standard we believe that consumer demand will be there. Regulation has a very important role to kick-start this process. Work the Zero Carbon Hub undertook in the build-up to the introduction of the Zero Carbon Homes policy showed that the additional cost associated with more ambitious energy performance standards was small. When we updated these numbers earlier this year we found that there was only a 2.5%, 2.6% and 1.5% addition to the final purchase price for detached homes, semi-detached homes and flats, respectively from meeting the Zero Carbon homes standard.

What is the role of Ofgem and the national grid in enabling grid evolution to accommodate new types of housing, and what are the challenges presented by decentralised energy supply?

We would only point out that the role of distribution network operators (DNOs) should not be forgotten. Their role in accommodating new types of housing needs to be incorporated.

[15] http://www.energysavingtrust.org.uk/business/data-and-insight/housing-data-analysis
[16] http://www.energiesprong.uk/

Whether Wales has the requisite skills to facilitate and enable change in the housing sector

No response.

What changes are needed to Building Regulations in Wales to accelerate progress towards 'near zero' energy standards and beyond?

An important first part of this will be defining what is meant by 'near zero' energy standards. Various different definitions are used.

The nearly Zero Energy Building (nZEB) definition used in Article 2 of the Energy Performance in Buildings Directive (EPBD) is for buildings to have a very high energy performance with the nearly zero or very low amount of energy required to be covered to a very significant extent by energy from renewable sources, including energy from renewable sources produced on-site or nearby[17]. This loose definition is designed to allow member states the flexibility to meet the nZEB requirement by the most appropriate means. It is not a viable definition on which to base building regulations however.

The more detailed Zero Carbon Homes policy – laid out by the UK Government to comply with Article 2 in England – sets out a Fabric Energy Efficiency Standard, a Carbon Compliance requirement and Allowable Solutions[18].

We understand from the Cabinet Secretary's response[19] to recommendation five in the Smart Energy Future for Wales report that Part L (conservation of fuel and power) is being revised to ensure compliance with EPBD. Whilst this work is no doubt useful we would urge the Welsh Government not to limit itself to mere compliance with the 2020 EPBD target. Instead WG should be seeking to lead the way and implement ambitious '2050-ready' new build standards in recognition of the significant economic, environmental and health and wellbeing benefits.

The work undertaken by the Zero Carbon Hub is a very solid foundation upon which to build however there may be areas that Welsh Government wishes to tailor to national circumstances. One area that it will be important to consider will be the balance between carbon offset, renewable production and energy efficiency.

[17] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:153:0013:0035:EN:PDF
[18] http://www.zerocarbonhub.org/zero-carbon-policy/zero-carbon-policy
[19] http://senedd.assembly.wales/documents/s57872/Welsh%20Government%20Response.pdf

How communities can be planned and shaped to be more energy efficient and low carbon (including examples of good practice in Wales and further afield).

We believe communities have a strong role to play in facilitating the transition to a low carbon future in Wales. There could be significant scope to incorporate community energy renewable projects in new developments and existing communities and we welcome the work the Welsh Government is doing through the Local Energy/Ynni Lleol programme. Community energy projects generate renewable electricity on-site, provide a source of revenue for community project, raise awareness of energy issues and boost community cohesion.

Further, we believe that communities need to be planned to prepare them for future changes in transport and heat demand. This means ensuring that there is adequate provision of public and private charging points as well as ensuring that there are suitable public transport and active travel options. Communities need to be planned so that as demand for transport and heating services changes communities can change too. This may require future-proofing electricity networks – as referenced in relation to the question on Ofgem and the National Grid.

Lesley Griffiths AC/AM
Ysgrifennydd y Cabinet dros Ynni, Cynllunio a Materion Gwledig
Cabinet Secretary for Energy, Planning and Rural Affairs

Llywodraeth Cymru
Welsh Government

Mike Hedges AM
Chair of Climate Change, Rural Affairs and Environment Committee

12 January 2018

Dear Mike

Welsh Government Draft Budget 2018-19

Thank you for your letter of 1 December, regarding the Climate Change, Environment and Rural Affairs committee's report on the Welsh Government Draft Budget 2018-19.

On behalf of Hannah Blythyn AM, Minister for Environment and myself, the formal response required to all 15 recommendations is enclosed. It is also noted on request of the Committee a number of these recommendations will have further formal responses on progress in six months.

Regards

Lesley Griffiths

Lesley Griffiths AC/AM
Ysgrifennydd y Cabinet dros Ynni, Cynllunio a Materion Gwledig
Cabinet Secretary for Energy, Planning and Rural Affairs

Bae Caerdydd • Cardiff Bay
Caerdydd • Cardiff
CF99 1NA

Canolfan Cyswllt Cyntaf / First Point of Contact Centre:
0300 0604400
Gohebiaeth.Lesley.Griffiths@llyw.cymru
Correspondence.Lesley.Griffiths@gov.wales

Written Response by the Welsh Government to the report of the Climate Change, Environment and Rural Affairs Committee entitled Scrutiny of the Welsh Government Draft Budget 2018-19

Detailed responses to the report's recommendations are set out below:

Recommendation 1

In future, the draft Budget should be presented in such a way that intended outcomes are identified for all investment allocations, so that progress can be monitored.

Response: Accept in Principle

I have been clear in presenting the spending plans for my portfolio that I had to make difficult decisions. In doing so, I ensured that the information within the evidence was fully transparent in its presentation. In addition to the levels of reductions my portfolio faced, a number of my budgets have been re-allocated and prioritised to ensure the right balance of investment across the portfolio to support the National Strategy "Prosperity for All" priorities.

I also made it clear I had to re-prioritise much of my capital programme in line with our priorities and in my evidence submitted to the Committee I stated what the investments would be for my re-profiled capital budgets, although I will ensure there will be added focus on outcomes in future budget evidence submissions.

As part of this year's budgets preparations, we have taken steps to build in consideration of carbon impacts in helping to inform our priorities for capital investment, aligned with the Well-being of Future Generations Act. We have prioritised proposals that offer the most sustainable positive long-term impact, whether in financial terms – by helping to generate recurrent revenue expenditure savings – or in terms of supporting the decarbonisation agenda.

As I stated in the Evidence submitted to the Committee, we are developing the regulations to set the emissions targets and carbon budgets, which will allow us to guide delivery, better evaluate progress and provide certainty and clarity for investment and business.

Recommendation 2

In order to demonstrate how the Wellbeing of Future Generations (Wales) Act 2015 informs the budget process, the Welsh Government should incorporate in its impact assessment process an assessment against its well-being objectives

Response: Accept

I am fully supportive of exploring how effective strategic impact assessment could better identify how the Wellbeing of Future Generations Act has influenced budget decisions.

Within my portfolio, I will continue to work with the Future Generations Commissioner over the course of the next budget round to make sure the Well-being of Future Generations Act is further embedded in the budget-making process.

I also intend to develop the way we work with our partners and stakeholders in response to our participatory budgeting pilots following the publication of the draft Budget.

Working more widely across the Welsh Government, we will be taking forward a project, in 2018, to deliver a new framework for impact assessment. The objectives for the framework include giving clearer and more explicit purposes for impact assessments across the range of government interventions; reducing complexity and applying impact assessments to interventions in a proportionate way. Our approach will focus on the quality of understanding, evidence and judgment; and integrating the impact assessment process with the substantive direction of the Wellbeing of Future Generations Act.

The project will include training and development for the workforce to assess impact more effectively.

Recommendation 3

The Welsh Government should report to the Committee within six months on its considerations regarding increasing local authority recycling targets.

Response: **Accept**

Local Authority recycling targets form an integral part of the consultation of the review of the national waste strategy for Wales. This review will be informed by detailed consideration of the costs and benefits of potential changes to Local Authority recycling targets. The consultation will be published in July 2018.

Recommendation 4

The Welsh Government should undertake an assessment of the risks and estimated savings arising from the transfer of funding for waste management to the local authorities Revenue Support Grant, and should do so in consultation with stakeholders.

Response: **Reject**

The transfer of funding for waste management from the Single Revenue Grant (SRG) in my portfolio to the Revenue Support Grant (RSG) within the Local Government portfolio was decided after extensive discussion with stakeholders. At

the waste Ministerial Programme Board (MPB) in January 2017 the Cabinet Secretary agreed that officials and colleagues from the Welsh Local Government Association (WLGA) establish a Task & Finish Group to examine the issues of the possible transfer of funds from specific grant into the RSG. The WLGA invited representatives of the County Surveyors Society (CSS) waste sub group and Local Authority officers from the waste management and finance functions to take part in the considerations.

Following several meetings of the Task & Finish Group and extensive consideration of the issues the then Cabinet Secretary for Environment and Rural Affairs and the then Cabinet Secretary for Finance and Local Government agreed to the transfer of £35 million from the SRG into the RSG. This decision and the figure of £35 million were reached following an assessment of the risks and opportunities following consultation with the stakeholders on the Task & Finish Group. As the money is available to local authorities within the RSG for waste services the overall effect of the transfer is neutral.

Recommendation 5

The Cabinet Secretary should undertake an assessment of the short and medium term staffing resource requirements within her department arising from Brexit. The Cabinet Secretary should report back to the Committee within six months on that assessment.

Response: **Accept**

An exercise conducted earlier this year to assess the staffing requirements has already resulted in a number of temporary posts being identified as being needed with arrangements underway to fill those posts. Going forward, the resourcing need will continue to be kept under review as more clarity emerges on the implications for Wales. The Welsh Government will report back to the Committee on this matter in June 2018.

The financial implications of Brexit within my portfolio area are continually under review, with discussions planned for obtaining further funding to assist with the additional costs for resources.

Recommendation 6

The Welsh Government should provide information on the status and scope of its planned legislation on agriculture and fisheries, along with details on any proposed consultation activity and the timetable for such legislation.

Response: **Accept in principle**

The timing and extent of future agriculture and fisheries bills will evolve as we continue to negotiate our exit from the European Union. The stakeholder round table are and will be engaged in shaping future legislation. The timing and scope of both

the UK Withdrawal Bill and the respective UK agriculture and fisheries bills will also form part of my consideration around future legislation. I will write to the Committee once the position is clearer.

Recommendation 7

The Welsh Government should undertake an assessment of the potential shortfall in funding if the UK Government does not maintain current levels of EU funding after Brexit.

Response: **Accept in principle**

The UK Government has committed to maintaining existing funding levels through to 2020 but there remains a lack of clarity as to what will happen beyond this date. Given the significant uncertainties surrounding the nature and extent of any transition period with the EU, the market conditions that prevail after any such transition period and the funding model that will be deployed, we will continue to press the UK Government for greater clarity. In parallel we have worked collaboratively with the Brexit Roundtable to look at the impact of scenarios, including where less funding is available.

Recommendation 8

The Welsh Government should progress contingency planning to address any shortfall in funding if the UK Government does not maintain current levels of EU funding after Brexit.

Response: **Accept**

My Department is heavily engaged in planning post Brexit and actively engaging the sectors encompassed by the portfolio on sectorial readiness against a range of scenarios. As there remains significant uncertainty as to what conditions will ultimately prevail on EU Exit, this work will need to be constantly updated to reflect the latest position, including in terms of the levels of funding that will be available where we continue to seek assurance and greater clarity from the UK Government.

Recommendation 9

The Welsh Government should publish its projections for when Bovine TB will be eradicated in Wales and should provide information on the associated cost reductions.

Response: **Accept in principle**

Targets were announced for the eradication of bovine TB for each of the TB Areas and Wales as a whole was announced in December 2017. If these targets are achieved Wales will be Officially TB Free (OTF) by 2041. The targets are intended to

be ambitious and to stretch us to ensure we achieve eradication as soon as is possible.

It is not possible to reliably forecast the associated cost reductions. This is because costs are linked to policies on compensation, surveillance and case management, the future details of which are not known. It is also important to recognise that while there remain to be endemic disease levels in Wales the continuing investment is necessary to drive progress. However, as we approach eradication we expect to realise significant savings associated with compensation because fewer and fewer animals will need to be slaughtered for TB control.

With declining numbers of TB breakdowns there will also be reductions in the costs associated with managing and following up on those breakdowns. Eventually, when Wales is OTF, it may also be appropriate to reduce the frequency of surveillance testing to reflect the fact that the disease is no longer endemic.

Recommendation 10

The Welsh Government must, in discussion with Natural Resources Wales (NRW), keep under review the capacity of NRW to fulfil its responsibilities and statutory functions. The Welsh Government should provide an initial report on this matter to the Committee within six months.

Response: **Accept**

Regular meetings are held with NRW to review their capacity to fulfil responsibilities and statutory functions. The Welsh Government will report back to the Committee on this matter in June 2018.

Recommendation 11

The Welsh Government should report back to the Committee within the next six months with details of how the £2.3 million of funding is allocated for marine and fisheries. This should include details of the spending plans for the additional £0.5 million allocated to marine and fisheries.

Response: **Accept**

A report will be produced in June 2018 detailing the spending plans for the marine and fisheries allocated budget.

Recommendation 12

The Welsh Government should provide further information to the Committee on any discussions with the MPA Management Steering Group in determining how the additional funding for marine and fisheries should be allocated, including whether

any consideration was given to funding an area-based approach to MPA management.

Response: **Accept**

An additional £0.5 million has been allocated to marine and fisheries to meet additional budget pressures. These pressures are largely driven by preparation for EU Exit and marine and fisheries sector readiness, work required for the implementation of the Wales Act 2017, the final phase of development and the implementation of Wales' first Marine Plan and the need to build on our current programme to help ensure our network of MPAs achieve and remain in favourable condition. As these are developing work areas it is not possible to offer a breakdown of how the £0.5 million will be allocated at this stage. This information will be provided to the Committee within the next 6 months.

The Welsh Government is working with the MPA Management Steering Group to consider how some of the additional funding could best be used for MPA management. Given the demands on resources I would expect to see an approach which targets action and activity where it will have the greatest impact on improving and maintaining the condition of the MPA network as a whole. An update will be provided to the Committee within the next 6 months.

Recommendation 13

The Welsh Government should work with National Parks to explore how they can raise revenue. This should include support to develop plans to realise their potential for income generation. The Welsh Government should report back on progress within six months.

Response: **Accept in part**

The Welsh Government acknowledges it is in the best interest of both National Parks and National Park Authorities if resources in support of the landscape of the areas are derived from a wide range of sources. The Welsh Government has worked with the National Park Authorities during the Future Landscapes Wales process to explore ways of diversifying the funding base which included raising their own income. Whilst such an approach can help mitigate the impact of budget cuts to the Authorities from the Welsh Government, it is also an acknowledgement that much of the work in support of the purposes of National Parks needs to be taken forward in collaboration with a wide range of partners who are already making spending decisions which can impact positively or negatively on the landscape.

The Welsh Government will explore further with the Parks their plans for revenue generation and share with them the recent experience of CADW. Whilst the development of plans specifically on this issue is a matter for the individual Park Authorities, the Welsh Government agrees that clear policies and plans for revenue generation which have considered the merits and potential pitfalls of different approaches are advisable.

Recommendation 14

The Welsh Government should update the Committee on its projections for when it will meet its fuel poverty target.

Response: **Accept in principle**

We continue to invest significantly in our energy efficiency and fuel poverty programmes to improve the energy efficiency of low income homes throughout Wales, helping people to keep warm and healthy.

However, some of the key factors which influence whether a household is in fuel poverty are not devolved. Powers over Welfare Reform and the regulation of the retail energy market rest with the UK Government and changes in these areas can have a significant impact on the levels and severity of fuel poverty in Wales. Despite our limited powers, we are making progress. Latest modelled figures estimate fuel poverty in all households has reduced in Wales from 29% in 2012 to 23% in 2016. Updated fuel poverty figures will also be available at the end of 2018 as part of the Welsh Housing Conditions Survey and we will use this data, once available, to help determine our future actions and realistic timescales.

Fuel poverty is also being considered in the context of decarbonisation and how we improve the quality of our existing housing stock to meet our challenging carbon commitments. We have established a cross-departmental resource to look specifically at decarbonising domestic buildings, including those occupied by the fuel poor.

Recommendation 15

The Welsh Government should consider the lessons learnt from the pilot can and bottle deposit scheme in Scotland before progressing any such pilot work in Wales. The Welsh Government should keep the Committee updated on progress in this area.

Response: **Accept**

The Welsh Government is liaising closely with the Scottish Government to share their experience of initiatives and pilots regarding container deposit return schemes. This will be taken into account in considering feasibility studies in Wales. We will keep the Committee informed of the progress made in the deposit return feasibility work.