Briefing Paper

Are Eco Homes the answer to the United Kingdom's Housing and Climate Change Issues?

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It is widely accepted that there is a lack of affordable housing in the United Kingdom. It has been stated that United Kingdom house price rises for 2014 are almost twice as high as predicted (Guardian, 2014). First time buyers are struggling to get onto the property market in cities throughout the United Kingdom where nine out of ten houses are too expensive for locals (Robinson, 2014). An eco home can be defined as a structure and using process that is environmentally responsible and resource-efficient throughout a building's life-cycle: from siting to design, construction, operation, maintenance, renovation, and demolition (Plainiotis, 2006).

Many have stated that eco homes may provide an answer to the United Kingdom's housing and climate change issues due to the number of socio-economic advantages they have. However when many people think of what is an eco house they often imagine some 'hippy' way of living and envisage something which looks like something out of a sci-fi film. It has been found that the appearance of eco homes is one of the biggest barriers preventing their popularity (Orr, 2008). Many are in support of eco homes but when asked if they would consider living in one themselves the answer is often 'no'. People assume that if you lived in an eco-home you would have to sacrifice your normal lifestyle for a far more basic one. However this is a misconception. Many eco home developers understand that this misconception is a barrier and are now designing eco homes which are more 'traditional' in form. Jones has stated that eco-homes are now being built to 'very high standards of thermal efficiency, without compromising on quality and while providing a beautiful, organic ambience to the house that increases well-being' (Jones, 2009).

If I said that you could build a two bedroom straw bale house for as much as £14,000 (Hodge, 2006), would this change the way you view eco homes? Part of the affordability of eco homes is due to their construction. Eco homes aim to get constuction materaials as locally as possible and often use materials which produce low levels of CO_2 levels during construction. The University of Nottingham's 'The Gateway' Building achieved both these aims by being constructed from 1,954 straw bales which were harvested from the University's very own farmland which was just 200 yards from the site (Brooke, 2012). The building is the largest prefabricated straw bale building in Europe (Brooke, 2012). Straw Bales are a readily available building material with over two million tonnes of straw being produced as surplus to requirement each year in the United Kingdom (Jones, 2009). Eco homes are often built from recycled or natural items. This factor makes the homes affordable as building materials are often low cost. The Brighton Earthship for example was constructed out of a thousand recycled tyres per house. In the United Kingdom, forty million tyres are dumped a year. Building tyre walls therefore finds a use for this unwanted material, which in theory could be used to build 40,000 Earthship's (Decker, 2007).

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From left to right: the Brighton Earthship, Brighton; The Gateway Building, Nottingham; The Bickleigh Down Eco village, Plymouth.

It has been found that as eco homes are built out recycled materials they can often be more efficient at insulating a building than traditional building. For example a car tyre wall which is compacted with earth with a thickness of 1m diameter will keep a house warm without heating. This is due to the large thermal mass this construction method has (Decker, 2007; Low Carbon Trust, 2012). This allows heat to be stored and released later, during the night and on cloudy days. The tyre walls will also act as a system to cool the house in summer, due to the surrounding earth and the car tyres being colder than the open air (Decker, 2007; Miller, 2009). Using this method of insulation in a home can produce an inside temperature that varies between 17 to 24 degrees all year round (Decker, 2007; Low Carbon Trust, 2012; Miller, 2009).

Eco homes are not just environmentally friendly in their construction but also in their operation. Eco homes aim to be as sustainable as possible. They achieve this in a number of ways. Many eco homes are autonomous and therefore are not connected to mains water or electricity. Eco homes usually utilise rain water for water supply and are fitted with containers which will collect the rain which falls upon the roof. Rainwater can be considered the cleanest naturally occurring water. Mains water accounts for only 40% of total precipitation (Water Aid, 2012). There is therefore a large scope to gain water from precipitation. There are many advantages to using this method of water collection, for example the materials needed for construction are relatively cheap and construction is easily done. As well as this water system homes can also be fitted with eco toilets and showers. Conventional toilets account for around 30% of water used each day (Lea, 2009). An eco toilet only uses one and a half or four litre flushes, which is a massive reduction when compared with nine litres for a normal toilet (Lea, 2009). By having eco toilets and showers residents could save up to a total cost of £1.10/m3 water saved (Lea, 2009). Eco showers save about 50 litres of water each time, and therefore in heating and water you could save up to £42 a year (Raven Housing Trust, 2010).

Monitors are often fitted within eco-homes so users are more aware of their usage. The Scottish Energy Centre at Edinburgh Napier University in 2011 conducted a study to see if monitors given to tenants would reduce energy usage? It was found that in the homes where the monitor was visible, gas use dropped by 20% and electricity use by 7% (Lloyd, 2011). Raven Housing Trust found that tenants in their eco homes were aware that they cut down on their water usage but were unsure on how. Therefore the water conservation officer met with residents to promote the project and discuss water saving. This enabled tenants to ask questions and learn how to be more careful with their water usage. This indicates the importance of training tenants to use the facilities correctly to enable them to gain the most from their homes (Lea, 2009). This led to the instalment of water meters so that tenants can see how much water they are using daily (Raven Housing Trust, 2011).

Energy efficiency is considered to be a significant component of sustainable living. The United Kingdom government as part of the Climate Change Act 2008 has made a commitment to an 80% reduction below 1990 levels CO_2 emissions by the year 2050 (Pilkington, 2011; Hall, 2010). Most eco villages are autonomous and produce their own energy. In most cases solar energy is used using solar panels which are designed to provide hot water and photovoltaic panels and tiles which provide electricity (Smit, 2012). Solar water heating systems are usually installed and can operate all year round and are connected to a water harvester which will be buried in the ground for insulation (Smit, 2012; Bird, 2010). A well installed and properly used system can save £55 per year when replacing gas heating and £80 per year when replacing electric immersion heating (Energy Saving Trust, 2012). Obviously the method also produces no carbon and offers carbon savings of around 230kgCO2/year when replacing gas and 510kgCO2/year when replacing electric immersion heating (Energy Saving Trust, 2012). The Energy Saving Trust conducted a study into solar water heating and found that in 88 of the study sites across the United Kingdom the systems are providing as much as 60% of homes' hot water (Energy Saving Trust , 2012).

Eco villages are becoming a more popular way of living and over the years a number of developments have been built. In March 2012 Plymouth City Council announced plans to construct the United Kingdom's first large scale zero carbon community. The Bickleigh Down eco village plans to consist of up to 66 houses and 20 flats with opportunities for self built properties (BBC News, 2012). The houses are designed to consume a minimum amount of energy for heating, hot water, lighting and ventilation. If the homes are used to their full potential the homes should have net zero energy bills. Throughout the course of a year the homes will use solar panels to generate more electricity than they consume. The income from electricity generated will cover all energy bills, including standing charges and the additional cost on the house mortgage of the energy system (Plymouth City Council, 2014). The predicted energy bill for a full Code 6 home is £360, compared with £1,260 for the average energy bill in the United Kingdom (Bickleigh-Eco-Village, 2014). The village has also been designed to give a priority to pedestrians, encouraging cycling and minimising car traffic. This aims to reduce carbon emissions and aims to encourage car sharing. The village also has a Community Interest Company owned and run by the residents with ownership of the 'green' and over an acre of woodland (Bickleigh-Eco-Village, 2014).

From left to right: A drawing of the steet at The Bickleigh Down eco village; A picture of the interior of one of The Bickleigh Down eco homes. Both of these pictures demonstrate how eco homes can have a traditional appearance.

As climate change occurs and as we run out of natural resources it will become more important for us to move to a zero carbon lifestyle (Purcell, 2009). The government has announced that it wants all new homes in England to be zero-carbon by 2016. Carbon dioxide emissions from the houses alone in the United Kingdom have risen by more than 5% since 1997 and account for 27% of the United Kingdom's carbon footprint (Osmani, 2009). As the effects of climate change worsen I predict there will be an increase in the number of eco villages being built within the United Kingdom and therefore the building of Zero Carbon communities such as the one which is planned for Bickleigh Down is a step in the right direction.

Anna Waite
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