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Zero-emissions housing is not rocket science

IN THE CHALLENGE TO RECONFIGURE THE WORLD WITH SUSTAINABLE OBJECTIVES, ARCHITECTURE CAN AND SHOULD PLAY A LEADING ROLE.

Wouldn't it be great if the global warming deniers were right? If the climate was just fine and human activity had no impact on our environment? As someone with faith in experts, however, I choose to believe the climate scientists, sadly anticipating they will be shown to be the true prophets in this regard.

So, what should we architects be doing about climate change? Can we do anything that will really matter anyway?

Somewhere between 20 and 40 per cent of carbon dioxide emissions, depending on where you are in the world, is produced by the operation of our building stock. The most cost-effective means of carbon abatement is to make them energy-efficient. This would suggest that architects in fact have a very important role in addressing the challenge of climate change.

At the end of last year I was awarded the Byera Hadley Travelling Scholarship, administered by the NSW Architects Registration Board, to research the architecture of zero-emissions housing. Given that all new housing in the UK is to have zero emissions by 2016, and that the EU has a similar requirement for 2018, it seems appropriate to consider whether we should make similar plans here in Australia. To date, my research has uncovered a few key issues that require greater attention if architects are to successfully embrace zero-emissions housing.

Unlike flying to the moon – which no-one knew how to do when the target was announced – zero-emissions housing is not rocket science and can be achieved with existing knowledge and products. If we decide to stop arguing about whether climate change is happening and whether we should do something about it, if we decide energy efficiency is a part of the classic "firmness, commodity and delight", then we may be able to focus our attention and intelligence on developing exciting, innovative and cost-effective solutions.

Professor Chris Tweed from Cardiff University once said to me that if we were to redesign the professions today, they would most probably look nothing like what we have now. He was referring to the complexity in dividing such areas as planning and building, engineering and architecture. Currently, there is very little teaching of professionals in issues that did not previously fall into their purview, but now do. Professor Susan Roaf from Harriot-Watt University, Edinburgh, has spoken many times about the cities of the future where we architects will need capacity calculators and resource allocators – skills we are not being taught but should be.

As we are unlikely to have the opportunity to dramatically change the professions in the near future, we might instead consider the observation attributed to Charles Darwin: "In the long history of humankind... those who learned to collaborate and improvise most effectively have prevailed." I believe we should actively embrace collaboration earlier, more closely and with the full spectrum of people involved in each project, including builders, engineers, landscape architects and others. In this way we can harness broad intelligence to positively influence outcomes. We should also reconsider how we work and charge, so that identifying smaller, more sustainable and even no-build solutions will become more feasible.

The issue of site-suitability impacts greatly on the operational and embodied energy of buildings. Buildings should be suitable for the particular climate of their setting. When buildings understand their specific sites, they allow their occupants to interact with »

» their place and achieve natural comfort with minimal heating and cooling. Similarly, in addition to appropriate forms, size should be determined by the actual needs of the client.

We need to carefully consider the extent and performance of windows and doors. While essential in providing natural light and a strong connection to the external environment, they are also the weakest links in the building envelope. Less can indeed be more.

Very closely linked to this is the issue of ventilation. As we seal up our buildings to make them more efficient, the need to provide fresh air becomes more important. Natural ventilation, however, can become problematic as the difference between external and internal temperatures and humidity increases. While some might deem efficient heat exchangers a solution, others are reluctant to overly mechanise our homes.

As we include higher levels of insulation, we need to understand and properly detail what constitutes the right quantity, type and material for their specific locations. Misuse can result in unintended negative consequences. Similarly, good thermal performance depends on a climate-appropriate approach to how much thermal mass is included, and how it is detailed to connect (or not) with the external environment.

With reducing operational energy levels and less leaky internal environments, the building materials' embodied energy and offgassing become increasingly important. We need to support the development of comprehensive and accessible material databases.

In Europe, there is a move away from the use of all fossil fuels, including gas, as the energy source for buildings. They are turning to on-site renewables such as solar, geothermal and wind, and biomass such as wood pellets, with top-up from off-site local renewable energy systems. While access to fossil fuels is less secure in Europe than here in Australia, our access to an overwhelming wealth of renewable resources shows a similar move for us is very achievable. Beyond Zero Emissions, a not-for-profit organisation based in Melbourne, has developed a road map that shows how Australia can reach 100 per cent renewable base load energy within a decade, using technology that is commercially available right now.

So, the big question I often get asked is: "Is this affordable?" Many of these ideas can be incorporated at the outset at no additional cost. In addition, they will provide resilient housing that can provide its own energy requirements in a future with guaranteed high energy costs. Also, as noted at the outset, this approach to carbon abatement is the most cost-effective – indeed it is cost-positive. Time may prove that it is unaffordable not to embrace these ideas.

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So what will such housing be like? Is the achievement of zero-emissions housing in conflict with good architecture. Will it constrain our creativity?

I believe good architecture is defined by how well it positively contributes to the environment in which it is located, while providing long-lasting, desirable accommodation for its inhabitants. This means planning for zero-emissions housing here in Australia. Architecture that matters will need to be designed to truly endure, provide the required shelter and do so in a delightful way.

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