

In the recent budget, the chancellor committed the UK to the world's first carbon budgets, which fix binding limits on greenhouse gas emissions over five-year periods, including carbon dioxide reductions of 34 per cent by 2020.

That target may be below the recommendations of Lord Turner's committee on climate change, but experts point out that it's still a gargantuan task – especially given that the bulk of the savings must come from our buildings, which single-handedly account for about half of the country's carbon emissions.

Take housing as an example. A recent report by the Economic and Social Research Council has shown that if the Government is to meet its carbon targets, virtually all of the UK's 24 million existing homes would need some attention to reduce their carbon emissions by the required amount. To do that job over the next 40 years would mean refurbishing a city the size of Cambridge every month. That's approximately 23,000 teams of people working on each building for a two-week period, and keeping that rate of refurbishment going non-stop for the next 500 months.

Dr David Strong, chief executive of sustainability consultancy inbuilt, agrees that the scale of improvements needed to UK buildings is huge, but he has also been vocal in warning that the current focus of many of the Government's new codes and regulations for the building sector is too one-dimensional. In our rush to find carbon-cutting solutions, he believes, we risk missing the opportunity to achieve genuine sustainability.

'Over the past 12 months or so there has been an obsession with 'zero-carbon' buildings, and a whole raft of consultations on regulations that will get us there,' he explains. 'Of course I am a strong supporter of zero- and low-carbon buildings. The drive towards zero carbon is very important – it has had a powerful effect in galvanising the

UK house-building and property development community, and in stimulating innovation. Similarly, assessing environmental impact is important. But there is much more to achieving genuine sustainability than zero carbon or notching-up good ratings under BREEAM [Building Research Establishment Environmental Assessment Method], LEED [Leadership in Energy and Environmental Design] or the [UK Government's] Code for Sustainable Homes.

'There is no "one size fits all" approach to delivering genuine sustainability. Success requires a clear and shared definition of targets and objectives. It is unique for every project. As well as environmental sustainability, any development must also satisfy economic criteria and deliver social benefit – spaces and places that are fit for people and the planet.'

Problematic technologies

Strong's views are uncompromising. A single-minded focus on just one aspect of sustainability will lead to perverse outcomes – and he can reel off many examples: so-called 'green schools' where learning outcomes have been severely compromised by such poor indoor air quality that pupils fall asleep; 'ecotowns' that have insufficient links to public transport, and iconic green offices that don't deliver a healthy or productive workplace.

He is equally scathing about the dangers of over-reliance on technology to solve the problem of energy-greedy buildings.

'Take air-source heat pumps, for example,' he says. 'I was involved in the development of the first generation in the late-1970s. They were an exciting new technology – a simple way to absorb heat from outside a building and use it to warm the inside.'

'But there is a fundamental flaw that no-one is talking about. In particular, I am concerned with the way air-source heat pumps actually start to use more carbon than they save when outside temperatures fall below about 50°F – that's a significant part of a typical British winter.'

'Our climate hasn't changed much since the first-generation air-source heat pumps were marketed in the 1970s – nor have the basic laws of physics and thermodynamics. De-icing, noise, operation in heavy snow conditions and reduced heat output at low outdoor air temperatures were major problems then, and despite recent improvements in technology, they are likely to remain problems now. I understand why people are so keen to find solutions, but what we desperately need is objective data before embracing and advocating these systems as a "renewable low-carbon technology".'

Another example of technology that has failed, he says, is small-scale microwind turbines bolted on to homes in urban areas. 'More often than not these become net consumers of energy rather than helping to save energy,' Strong says.

'Whole-system thinking'

So what is the solution? In the face of such a pressing need to transform the UK's building stock, just at the time when the economy can afford it least, what should be done?

The first task, Strong argues, is to think differently and more comprehensively about sustainability, and to adopt 'whole-system thinking'.

'It's about collaborative, multidisciplinary, integrated teamwork. It's also about working to find natural solutions to reduce our dependence on energy-intensive systems.'

Sustainable building is more complex than the one-dimensional responses suggested by government regulation. Sustainability consultant Dr David Strong tells **Pat Thomas** why the way we think about the issue needs to be demolished and rebuilt

Cracking the code

he says. 'There are so many opportunities offered by nature to ventilate, heat, cool and illuminate our buildings for free.'

Whole-system thinking is integral to the ideas behind, for instance, Natural Capitalism, a movement much favoured by Strong and his colleagues at Inbuilt.

Promoted by Amory Lovins of the Rocky Mountain Institute, Natural Capitalism claims to show how it is possible to create a vital economy that uses radically less material and energy. Such an economy can free-up resources, reduce taxes on personal income, increase per-capita spending on social ills (while simultaneously reducing those ills) and begin to restore the damaged environment.

'Natural Capitalism shows us there is another way to reconcile economic growth with a genuinely sustainable future,' Strong explains. 'It's an approach that doesn't require political rhetoric and grandstanding, or seemingly endless rounds of consultation about new all-singing, all-dancing building codes and regulations.'

An interesting aspect of the Natural Capitalism approach also involves tackling *muda*, a Japanese word for which there is no direct English translation but which can be interpreted as meaning 'waste', 'futility' or 'purposelessness'.

The concept of *muda* was originally identified by Taiichi Ohno, the father of the Toyota Production System.

According to Strong: 'Managing *muda* is all about eliminating waste and promoting lean thinking. It's a concept that inspires and informs my colleagues at Inbuilt, and which we find time and again can be applied with elegant simplicity to the built environment.'

'*Muda* sums up the whole raft of design blunders, planning inefficiencies, construction problems and disconnected thinking that besets many of our major building projects.'

In the *muda* for change

One of the worst offenders, in Strong's view, has been Portcullis House, promoted as a landmark scheme to provide MPs with highly sustainable offices: 'The original brief was laudable – the building was designed so that it would not consume more than 90kWh/m² (kilowatt hours per square metre) a year. Despite more than £240 million of public money invested in the building, however, a recent Select Committee report revealed it was in fact consuming more than 400kWh/m² a year. In my view the building has failed because the designers made it far too complex.'

Conversely, Strong is full of praise for the Elizabeth Fry Building at the University of East Anglia. 'This was designed and built more than 20 years ago, but is still an exemplar of genuine sustainability and is probably the most energy-efficient non-domestic building in the UK,' he says.

Another great example is the Brighton and Hove Library: 'Natural ventilation, passive cooling, no green bling – it's the perfect example of great architecture and excellent building physics.'

One of the keys to tackling *muda* and achieving lean thinking is simplification, and one of the ways it can be applied to buildings is through a form of eco-minimalism that takes inspiration from nature and natural systems.

'This is highly appropriate for these straitened times,' he says. 'Inbuilt is working with clients who want to do more with less, using passive design and biomimicry to achieve more cost-effective and sustainable outcomes.'

Strong points out that technology may provide some useful solutions to the challenge of climate change, but



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the risk is that we create yet more *muda* through an overcomplicated and fragmented approach.

'By designing-out technical complexity we minimise *muda*, reduce risk and add value,' he says. 'This ensures that the highest possible performance is achieved, at the lowest cost. Many low/zero-carbon buildings fail because they rely on complex construction methods and technologies. We strive to deliver elegant, uncomplicated solutions that are easy to construct, control and maintain.'

'The best solutions are ones that are deceptively simple – "indistinguishable from magic", as Arthur C. Clarke said – and that fuse together all aspects of sustainability, including a biologically and culturally informed appreciation of what people are and what they want from their environment.'

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