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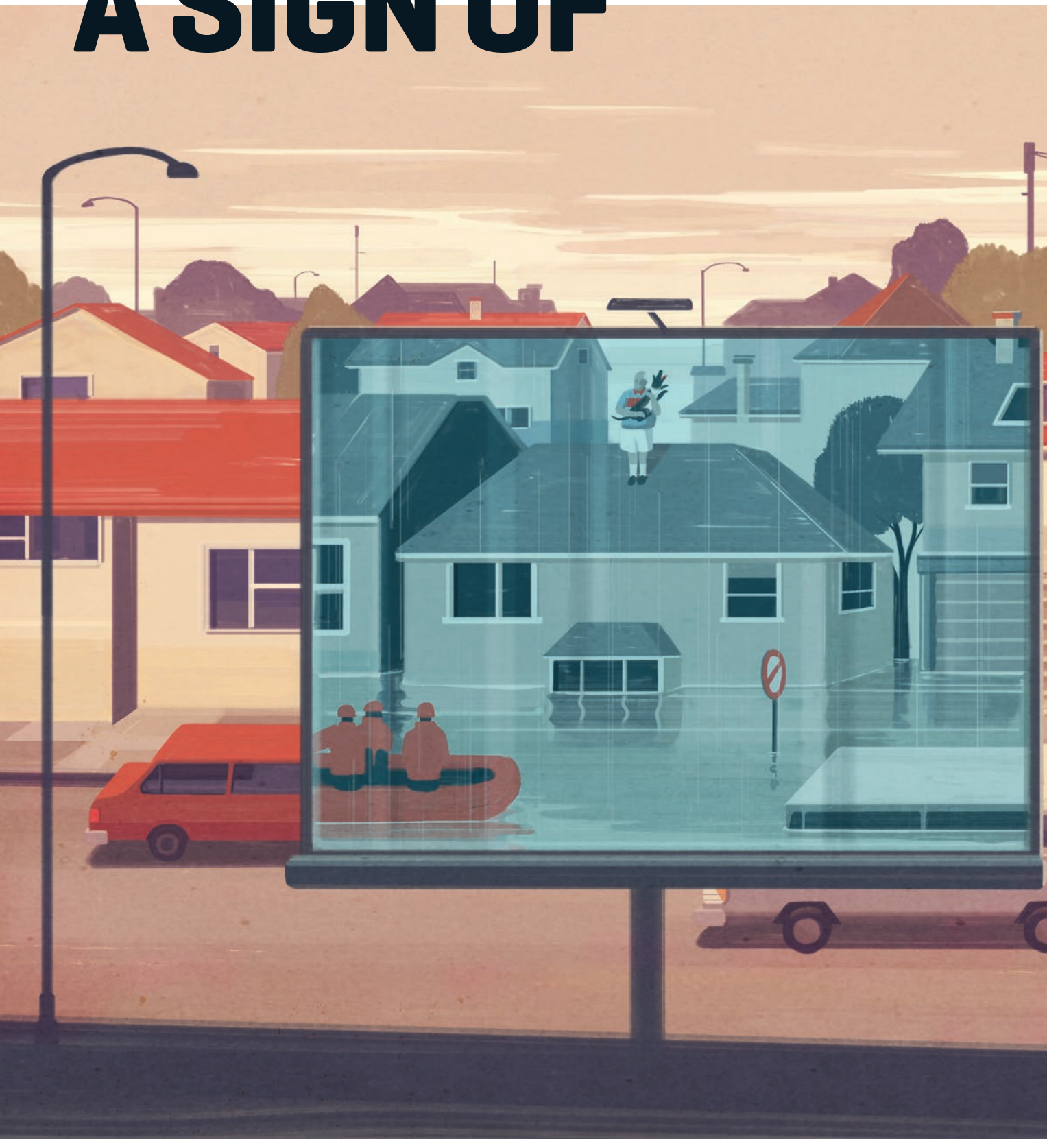

THE TIMES

Climate change has already created a "new normal" of frequent, severe natural events. Why is it taking us so long to adapt our built environment?

Words ***Katie Puckett*** Illustration ***Emiliano Ponzi***

Has such a small number ever held such significance? Even if global warming is held to the 1.5°C limit set by nearly 200 world leaders at COP21 in Paris last December, this still represents a radical change to the global climate.

Humankind faces its greatest challenge yet in adapting to a future where storms, flooding, droughts, cyclones and landslides are more frequent and more intense. But climate change is not a concern for the medium or long term: it is already happening. The latest report from the Intergovernmental Panel on Climate Change, released in 2013, said that warming of the climate was now unequivocal, with many of the changes observed since the 1950s unprecedented over "decades to millennia".

Attention has only recently turned to adapting to climate change, as distinct from mitigating it. The Paris conference devoted more attention to adaptation than any previous climate talks, but it stopped short of setting specific targets or funding mechanisms. The bill is potentially huge. To adapt to a 2°C rise, the World Bank estimated that we would have to spend $70bn-$100bn (£49bn-£70bn) each year between 2010 and 2050. This has far-reaching implications for property at every level, from protecting individual homeowners against heatwaves and flooding, to future-proofing real estate funds worth billions of dollars.

The challenge for property professionals is that climate change is a moving and unpredictable target. Assessing the risks means getting to grips with vast, unfamiliar climate data-sets encompassing many variables. This is why Sven Bienert MRICS, head of sustainable real estate at the University of Regensburg in Bavaria, has been developing tools to help translate climate data into usable metrics for valuers, focusing on extreme events. Since the 1980s, the number of extreme events globally has doubled to an average of more than 800 per year over the last decade, an escalation that is likely to continue at least until the end of the century. "These events have far greater relevance for real estate investors than rising mean temperatures," says Bienert, "but it's not yet a core topic in boardrooms."

This is a serious oversight. Financial losses in real estate and infrastructure due to severe weather events have tripled globally over the last decade. Reinsurers recorded direct losses of $150bn (£105bn) a year, reaching up to 8% of GDP in the worst-hit regions, but this is a substantial underestimate, warns Bienert. It does not include consequential losses, a reduction in tourism for example, or indirect losses, such as reduced turnover and rental income. »

To redress the balance, Bienert's methodology combines data from climate scientists and insurers with property valuations to calculate the annual expected losses from extreme events. He is also developing a geographical information system, covering Europe, to show the likely impact at an individual building level.

The homeowners of Cumbria in north-west England are all too aware of the impact of extreme events on property values; the flooding in December 2015 is estimated to have caused £500m of damage. The key metric for flood protection is return period: how often an event of a certain magnitude will occur. In 2005, Cumbria was hit by a one-in-250-year flood. In 2009, there was a one-in-100-year event, and another in 2015.

Laurence Waterhouse MRICS, technical director of flood resilience at Pell Frischmann, installed barriers in the Cumbrian town of Keswick after the 2009 floods. "We used the level that the Environment Agency said was the peak maximum flood – the biggest ever," says Waterhouse. "But in December, it was exceeded by half a metre. All the modelling is going to have to be revisited."

Waterhouse has noticed the difference over a long career. "In the 1950s, we used to get major floods every 10 years. From 2000 onwards, we've had major events every three or four years. At the moment, we are up to one a year. It's going to be twice a year soon."

It is not just the modelling that needs to be revisited. "We can't go on building barriers," says Waterhouse. "We are moving towards resilient homes, as opposed to resistant homes."

At a community level, resilience means installing features such as sustainable drainage systems to manage heavy rainfall.

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>
> **LAURENCE WATERHOUSE MRICS** Pell Frischmann

For the individual house, it means refitting properties so that they can be easily dried out. This includes stone or tiled floors, rendered walls with tanking to prevent water ingress, raised plug sockets and solid wood furniture rather than MDF or chipboard.

This is what Waterhouse did after his own home was flooded. "If we are ever flooded again, there would be a few hundred pounds of damage," he says. "You have to accept that every so often you're going to flood. I'm afraid that's the future."

An alternative is to build three-storey homes in the Dutch style, with garages on the ground floor and living spaces upstairs.

Overheating presents another potentially lethal threat. According to EM-DAT, the international disaster database, the 2003 heatwave across Europe was the deadliest in history, killing more than 70,000 people. Research from the Met Office, published in 2014, shows that the chance of a repeat event has increased from once in 1,000 years to once in 100.

Buildings will therefore have to be designed to remain comfortable under much hotter conditions. One possible solution is Passivhaus, the ultra-low-energy building standard. Passivhaus buildings are tightly sealed with high levels of insulation and sophisticated ventilation systems to keep the air fresh. This keeps them warm with little heating during winter.

But, as Günter Lang, engineer and CEO of Passivhaus Austria, explains, it also works the other way round. "It's like a Thermos flask – you can use it to keep drinks cold as well as hot," he says. "We know the weather will become more extreme and this can help." Lang's own house remained a pleasant 21°C last summer, without air-conditioning, while temperatures outside hit 38°C.

This is one example where a strategy to mitigate against climate change also works for adaptation. But there might also be dangerous clashes. A survey of overheating in London homes carried out by engineering consultant WSP Parsons Brinckerhoff found that more than 80% of people had suffered from uncomfortably hot homes in summer 2015. Residents of newer homes with better insulation were significantly more affected. A further 8% of those affected installed air-conditioning as a result – a sign that if we fail to address adaptation in time, we will also struggle to mitigate further climate change.

So, what will be the tipping point? What will make owners, developers and investors prepare for something for which there are a lot of scare stories but not yet a robust business case? Unfortunately, research indicates that the worst has to happen – and perhaps more than once. Bienert says that property sales in one flood-prone area of Austria only increased when the region was flooded for a second time.

"Without that, people don't change their behaviour – not their personal behaviour and not their investment behaviour." ■

THE FUTURE

What kind of world do we need to adapt to?

According to the UK Met Office, the global mean temperature passed the 1°C benchmark above pre-industrial levels in September 2015. The UN's analysis of all the national carbon reduction pledges made by October 2015 puts the world on track for a rise of about 3°C. What are the consequences for the planet if that figure is reached?

1°C RISE: 10% of land species face extinction. Fresh water supplies eliminated from one-third of the earth's land surface by the end of the century.
2°C RISE: 15%-40% of species face extinction and a further sea level rise of 40cm by 2100.
3°C RISE: Up to 50% of species face extinction, up to 170 million more people affected by coastal flooding each year. Serious droughts occur every 10 years in southern Europe.
BEYOND 3°C: The Greenland ice sheet could begin melting irreversibly, committing the world to an eventual sea level rise of 7m.