

# Building Future Communities Report

Homes for a changing climate



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# Foreword

## Creating homes that are resilient, robust and ready for climate change.

The impact of climate change has never been more apparent. As every season passes, we see the effect of extreme weather on our lives, through storms, flooding and extreme heat. The potential devastation that extreme weather can bring is clear: destruction of possessions, homes and sometimes the loss of life.

Recently at COP27, some of the world's nations revealed how vulnerable they are to the impacts of climate change, from drought, flooding and extreme heat, and progress was made in the 'loss and damage fund'. It was a timely reminder that climate change is a global issue and one that communities need to work together on.

Here in the UK the climate crisis is intensifying. In July 2022, the UK experienced record high temperatures of 40.3°C, shattering the previous high by more than two degrees, leaving roads buckling and homes on fire. By the end of August, many parts of the UK were in official drought;

the aftermath of some of the driest conditions seen in 90 years. At the same time, flood warnings were issued up and down the country, as torrential rain fell on dry ground that could not absorb it.

Autumn 2022 in the UK was one of the warmest on record and in its three-month forecast the Met Office suggested that this winter's wet and stormy weather would be concentrated towards the end of the season, due in part to global weather patterns caused by La Nina in the Pacific.<sup>1</sup> But the extreme weather hit early with a deep freeze in December causing burst pipes in UK homes.

We have had the final wake-up call. We can all see the impact the changing climate is directly having on our communities and our lives. People across the UK are already acting, but even more is required from all of us – collectively and individually – as we adapt to new ways of living and a heightened need for resilience. In its first **Climate-Ready Index**, launched last year, Aviva found that 86% of consumers agreed it was important that our buildings and infrastructure, including rail, buildings, river and sea defences, were adapted to deal with the effects of extreme weather. Where we live – our homes and communities – need to be at the centre of our resilience and adaptation plans.

1 Met Office, *'What Can We Say about the Weather this Winter?'*, 2022



## Section 1

### Foreword

Protecting homes and communities from the impacts we're already seeing and cutting greenhouse gas emissions to achieve the 1.5°C global warming target will not be easy. It requires all of us to make wise and informed choices. Government, business, communities and individuals need to work together to find practical and effective solutions. And consumers need to be equipped with informative and useful guidance that they can act upon to both reduce their emissions and safeguard their homes from the impact of extreme weather. There are plenty of things we can each do, as well as calling on government and industry to build properties with care for the future.

Our first **Building Future Communities report**, published in July 2021, outlined the risks posed by extreme weather to the UK's natural, built and social environment. This second report focusses on the one element of the built environment that is closest to us all: our homes. It explores the impact of extreme weather on UK homes, and what action needs to be taken to protect individuals and communities. And it also looks at how incidences of extreme weather, such as flooding in properties, contribute to climate change through the carbon emissions produced.

By understanding and addressing carbon emissions at their source we can make inroads into the UK's overall carbon footprint as well as work to reduce the impact that weather-related events have on our lives.

A flooded home may well flood again unless we are robust in our approach. Understanding the fragility of our landscape and installing resilient measures in at-risk homes is essential. So too is building new homes in sensible locations. But we also need to go to the source of the issue by looking at the carbon emissions produced every time a home floods. The argument for resilient homes exists both to protect homes and lives, and also to reduce our carbon footprint.

Adapting to extreme weather and reducing emissions are two sides of the same coin, to be tackled together – or we risk creating a vicious cycle. If the UK is to become a leader in hitting Net Zero targets, then it needs to act on the sources of carbon emissions, including less widely recognised sources like the carbon cost of flooding.

We need to lay the groundwork now for homes that are built, repaired and strengthened for UK weather patterns that are inevitably going to be more extreme. From the point of design, planning, construction and repair, we need to consider every aspect of our built environment.

Building Future Communities continues to call for cross-industry and government collaboration to ensure we all can adapt to the changing climate in the way we live and where we call home in the UK.

Adam Winslow

Chief Executive Officer of Aviva UK  
& Ireland General Insurance



“ If the UK is to become a leader in hitting Net Zero targets, then it needs to act on the sources of carbon emissions, including less widely recognised sources like the carbon cost of flooding. ”

## Section 2

Aviva's perspective in Building Future Communities 2023

# Aviva's perspective in Building Future Communities 2023

Aviva's new Building Future Communities analysis has found that failing to protect a single house from flooding can have an enormous carbon footprint: equivalent to six and a half return transatlantic flights. This underlines the relationship between protecting homes and reducing carbon emissions. Climate adaptation and mitigation can no longer be dealt with in silos. They must be addressed as two sides of the same coin.

This is a challenge, but also an opportunity: to make homes safer and more comfortable, to build sustainably in the right locations and with robust materials to reduce energy consumption. By taking a more holistic approach towards homes and homebuilding, it is possible to create a raft of skilled green jobs that will drive innovation and growth in the UK, and build happier, healthier and more financially resilient societies in the long-term.

As the government develops its strategy to accelerate housing delivery and reform planning systems, this opportunity to build safer and more sustainable homes must not be missed. Increasing UK housing stock cannot come at the expense of building safe properties. At the same time, 80% of the buildings that will exist in 2050 have already been built<sup>2</sup> – so retrofitting existing homes is vital.

In the **Building Future Communities Report** in 2021, seven calls for change were outlined – actions that need to be taken collectively and urgently to make properties more resilient to climate change. Although this report focuses on three of these seven calls, Aviva stands by all of them. It sets out in tangible terms how the UK can address the challenges facing homes by developing smarter planning rules for new properties, more incentives to encourage property resilience and joined-up measures that integrate adaptation with emissions reduction and support growth. In this way, we can make sure UK homes are prepared to face the changing climate.

<sup>2</sup> UK Green Building Council, 'Climate Change: UKGBC's Vision for a Sustainable Built Environment is one that Mitigate and Adapts to Climate Change'

## Aviva's seven calls for change

- 1 Greater use of innovative nature-based solutions that are adapted to the UK landscape
- 2 Ensure small and medium-sized enterprises (SMEs) are sufficiently protected against extreme weather
- 3 **Strengthen planning regulation to protect UK properties**
- 4 **More collaboration and research across all stages of the building process to combine sustainability with safety**
- 5 Improve access to home insurance and narrow the insurance gap to protect those most at risk
- 6 **Encourage and incentivise property resilience to aid recovery**
- 7 Collaboration across recovery organisations to strengthen crisis response and resilience at community level

## Section 2

Aviva's perspective in Building Future Communities 2023

### A summary of our calls for change this year

These are examined in more detail later in this report

## Call for change

# Strengthen planning regulation to protect UK properties

## What we are calling for

- Government should make basic cost-effective climate resilience measures mandatory in all new-build properties, not just those in high-risk areas.
- Planning policies should more rigorously direct new development away from current and future high-risk areas and require greater resilience for any properties built in high-risk areas.
- Government should formalise the sign-off processes for development projects to make sure they meet the standards and planning specifications set out during the planning approval stage.
- Housing and property developers should have final payments on new properties withheld until the correct property flood resilience and energy standards have been met.
- Governments should introduce effective mechanisms to hold developers to account when new properties flood.



## Section 2

Aviva's perspective in Building Future Communities 2023

### Call for change

# More collaboration and research across all stages of the building process to combine sustainability with safety

## What we are calling for

- New building regulations and codes must be aligned to the UK's Net Zero strategy and legally binding targets. Existing regulation should also be updated to deliver on these targets.
- Government should develop a strategy to encourage the wide scale adoption of adaptation measures that also reduce emissions. This should set out the role for incentives, codes and regulation.
- Government and industry should collaborate on a review of current certification standards with a view to ensuring the safety, sustainability and resilience credentials of building materials in the future. In particular, the use of engineered timber now and in the future needs to be carefully supported.
- Government and industry should collaborate on future skills development in the wider construction industry to ensure we can adapt the UK's housing stock for the future and benefit the UK economy.



## Section 2

Aviva's perspective in Building Future Communities 2023

### Call for change

# Encourage and incentivise property resilience to aid recovery

## What we are calling for

- Targeted incentives should be introduced for climate-resilient retrofit of existing properties to protect from extreme weather, heatwaves, flooding and surface water, and reduce energy consumption.
- Government should consider the case for making property flood resilience (PFR) materials/ installation VAT-free to encourage much wider uptake.
- Government should introduce an accessible database of all community-level resilience measures to better aid decision-making for those seeking to purchase houses and improve resilience of their own properties.
- Government should ensure there is a national approach to ensure that property is put back into a more resilient and sustainable state after flood. This could involve scaling up the Flood-Re Build Back Better scheme.





## Section 3

The UK climate challenge

# The UK climate challenge

## UK residents are already dealing with the impacts of the climate emergency, including to their wellbeing, finances and livelihoods.

Research commissioned by Aviva in 2022 revealed that more than two thirds of UK residents found it uncomfortable to sleep at night during the heatwaves of summer 2022, and more than half were uncomfortable in their home during the day.<sup>3</sup> Yet the risks of extreme heat go beyond discomfort, with health impacts<sup>4</sup> ranging from cramps and exhaustion to heatstroke and death. Early estimates<sup>5</sup> from the London School of Hygiene and Tropical Medicine suggest that nearly 1,000 people died due to the UK's 40°C heatwave in July 2022.

Flooding also has major physical and emotional health consequences. The direct impacts of flooding can include physical trauma from drowning or exposure to contaminated water but there can be long-term effects from respiratory disease due to mould and damp, something that tragically hit the headlines late last year. But the emotional impacts of suffering and recovering from a flood can be severe and last for many months. These impacts are wide-ranging and

well-documented. People whose homes have been flooded are up to six times<sup>6</sup> more likely to have probable PTSD, depression and/or anxiety than those whose homes have not. This is likely to be a reality for more people in the UK if action is not stepped up at every level. Already,<sup>7</sup> one in five properties in England are at risk of flooding.

Unfortunately, these costs are likely to intensify as the UK faces more episodes of extreme weather. In independent consumer research conducted for Aviva in 2022,<sup>8</sup> more than half of UK adults believed that climate change would impact their home within the next five years. The Climate Change Committee's report on overheating<sup>9</sup> in buildings, published in July 2022, warned that without additional adaptation, increasingly hot summers could lead to a trebling of health and productivity impacts from extreme heat in the UK. The Environment Agency has predicted a 59% increase in winter rainfall by 2050, and that once-a-century sea level flooding events could become annual by 2100.<sup>10</sup> Aviva analysis published in this report suggests that this will come with a huge cost burden for UK residents and communities, potentially making insurance inaccessible in future unless action is taken now.



- 3 Research commissioned by Censuswide for Aviva in August 2022
- 4 World Health Organisation, *'Heat and Health'*, 2018
- 5 New Scientist, *'40°C Heatwave may have killed 1000 people in England and Wales'*, 2022
- 6 UK Health Security Agency, *'Flooding and Health: Assessment and Management of Public Mental Health'*, 2022
- 7 Aviva Flood Mapping Data, 2021
- 8 Research commissioned by Censuswide for Aviva in August 2022
- 9 Climate Change Committee, *'Risks to Health, Wellbeing and Productivity from Overheating in Buildings'*, 2022
- 10 Environment Agency, *'Planning for Flood-Resilient Places'*, 2021

## Section 3

The UK climate challenge

### Case Study

# How resilience measures reduce the costs of flooding

## Case study of an Aviva customer shows how resilience measures can reduce the costs of extreme weather

Mr and Mrs E have lived in their home in Norfolk for seven years, a beautiful barn conversion for the couple and their two young daughters. There was no previous history of flooding at the property, but unfortunately they suffered a flood in June 2016, caused by constant and excessive rainfall, affecting the lower level of the home. The family hoped the storm that caused this flooding was a freak event, possibly a once-in-a-hundred-years event but were keen to put in measures to protect the house against any future flooding. They arranged for flood mitigation devices to be put across their front door, French windows and one brick wall.

Unfortunately, in December 2020, just before Christmas, it had been raining heavily in Norfolk for a prolonged period,

so when – on top of this – a month’s worth of rain fell in a couple of hours, the house flooded again. The flood defences worked, where they were in place, but overall there were still weaknesses that hadn’t been addressed, allowing flood water to enter the property. The kitchen and the children’s bedroom were badly affected, floorboards were damaged and the family had to move out of the home for around six months while rectification works took place.

At this point Mr and Mrs E decided that they needed to re-think their flood prevention strategy. The house was being repaired, so this presented a great opportunity to include property flood resilience measures as part of the process.

The couple had previously installed flood mitigation measures by themselves, but this time around they worked with a flood prevention expert and the Aviva claims team, which arranged for a chartered surveyor to be involved with the process.



## Section 3

The UK climate challenge

# Case Study (continued)

### There were three main drivers of the flood resilience work.

Mr E said: *“First and foremost, we wanted to make sure the house was a safe place for our family. Our daughters share a bedroom and this was affected by the flooding – so I wanted to do everything possible to make sure this didn’t happen again.”*

*“There was also the inconvenience of being flooded. We had to move out of the home after the flood in December 2020 and we didn’t move back in until May 2021. It’s a long time to be out of your family home.”*

*“And finally, we wanted to minimise the impact on the value of our home and make sure that it was an attractive proposition if we put it on the market in the future. Naturally we would need to disclose to future buyers that the property had flooded in the past, but now we can show that we have put measures in place to prevent a repeat event.”*

“The flood resilience measures have really given me peace of mind. I can sleep easier knowing that if anything does happen – particularly during the night – we have defences in place to protect the family. It also means that if we go on holiday, I know we have things in place, so I don’t need to worry about our home.”

*“While it was a challenging time, I feel that we’ve been lucky. Tracey, our home claims consultant, was fantastic and it was great that Aviva helped to fund the chartered surveyor. I feel fortunate that we were able to put these measures in place. Not everyone in the region who encountered flooding has had the same experience.”*

### What changes were made to help prevent future flooding?

- A timber-framed wall was replaced with a brick wall.
- Two sets of wooden French windows and windows in the hallway and utility room were replaced with UPVC double-glazed windows.
- Flood defences were installed by both sets of French windows around 3.5 feet high.
- A pumping station was installed that could ensure that if water was accumulating, it could be pumped away from the home and into nearby ditches.
- The pond owned by Mr and Mrs E was dug out to create a run-off arrangement to ensure excess water flowed into nearby ditches.

## Section 4

The carbon cost of flooding – the other side of the coin

# The carbon cost of flooding – the other side of the coin

## Summary

New Aviva analysis for this Building Future Communities report found that the carbon footprint of restoring a three-bedroom house after a flood was equivalent to that of 6.5 transatlantic flights.<sup>11</sup> However, installing basic resilience measures to protect against flooding could reduce this carbon cost by 64%.

This research demonstrates that adapting UK homes to face the changing climate could not only protect homes and families, but also reduce carbon emissions. Aviva is calling for change to ensure UK homes and residents are protected from extreme weather.

<sup>11</sup> Based on 5,570km travelled one way and 2022 UK BEIS air travel conversion factors.

## The process of restoring a home after flooding

After a home suffers damage – for example, during a flood – a lot of work is needed to restore it to its previous condition:

### Building restoration

Claims data from Aviva suggests that restoring a flood-hit property can be a time-consuming and disruptive process. Appliances, kitchen units, flooring, skirting boards and doors may all need to be replaced; ground floor walls may need to be replastered and repainted and new items installed. This also creates a huge amount of waste.



## Section 4

The carbon cost of flooding – the other side of the coin

Independent research commissioned by Aviva in 2022 found that one in five people in the UK do not have home insurance, meaning they would be left to foot the bill of flood damage to their home.<sup>12</sup> Given that the cost of repairing a home after a flood can be nearly £40,000, this is a financial blow that few people would be able to afford during the current cost-of-living crisis.

### Home contents

Contents such as furniture and appliances damaged during a flood event need to be restored – and are often damaged beyond repair due to the nature of flood water, which can be contaminated with raw sewage. This has a significant emotional cost, particularly because some items, such as treasured family possessions or photographs, are irreplaceable.

### Alternative accommodation

Residents may have to move to alternative accommodation, sometimes several miles from the home, for six months or more whilst their home is dried out and repaired. This can be emotionally and physically disruptive, especially for families with children or those with mobility issues who cannot easily get to their place of school or work. And it can be challenging to find suitable temporary accommodation for people with pets as many landlords will not accept them.

### Claims assessment

Claims assessors and restorers may also be required to visit multiple times to assess the extent of the damage and track progress, which can be time-consuming.

“Extreme weather can have major mental health impacts. People who have experienced flooding in the past can develop mental health problems in the long-term as a result of the trauma.”

Dr Matt Thomas  
Head of Strategic Insight & Foresight  
British Red Cross

<sup>12</sup> Research commissioned by Censuswide for Aviva in August 2022

## Section 4

The carbon cost of flooding – the other side of the coin

### A solvable equation

It doesn't have to be this way. People should not need to shoulder the damaging financial, physical and psychological costs of an extreme weather event. Resilience measures such as installing flood gates on doors and windows or fitting non-return valves on toilets to stop sewage entering properties, can dramatically reduce the impact of flooding – allowing more people to stay in their homes after a flood, protect their possessions and avoid damage to their property.

Defra research suggests that property resilience measures like these deliver a return on investment through avoided damage of £1.60 for every £1 spent,<sup>13</sup> while research from JBA Risk Management finds that national-level investment in property resilience measures through the **Build Back Better** initiative could pay for itself in under seven years.<sup>14</sup>

<sup>13</sup> Defra, *'Developing the Evidence Base for Flood Resistance and Resilience'*, 2008

<sup>14</sup> *JBA Risk Management*, 2022

### A hidden cost: carbon

In 2022 Aviva explored whether there is another, hidden, cost when homes are not able to cope with extreme weather: carbon emissions. There are many elements of repairing a flood-hit home that could have a carbon cost. Energy is required to dry out a home after flooding, and the amount of energy used in drying is dependent on the severity of the flood in the property. Building and contents repair and replacement comes with a carbon footprint, particularly with larger goods. And residents, restorers and claims assessors must travel back and forth from the property, which results in transport emissions.

Aviva set out to understand the carbon footprint of a flood event on a UK home. And, crucially, it sought to establish whether making homes more resilient to extreme weather could lower this carbon footprint, thereby helping the UK meet its emissions-reduction goals.



## Section 4

The carbon cost of flooding – the other side of the coin

# Research methodology

Using data from its UK General Insurance claims team and real-life case studies, Aviva modelled the potential carbon cost of a flood event in two homes. The homes had identical profiles, except for one important difference: the first did not have property flood resilience measures installed (Home A); the second had simple measures installed in line with the Flood Re Build Back Better funding scheme (Home B).<sup>15</sup>

<sup>15</sup> The homes modelled, and their contents, are theoretical, but based on a real claim made on a property insured by Aviva. In modelling the carbon emissions associated with a flood in these theoretical properties, best estimates of the Aviva claims team have been used, as both actual figures and national average figures are unavailable.

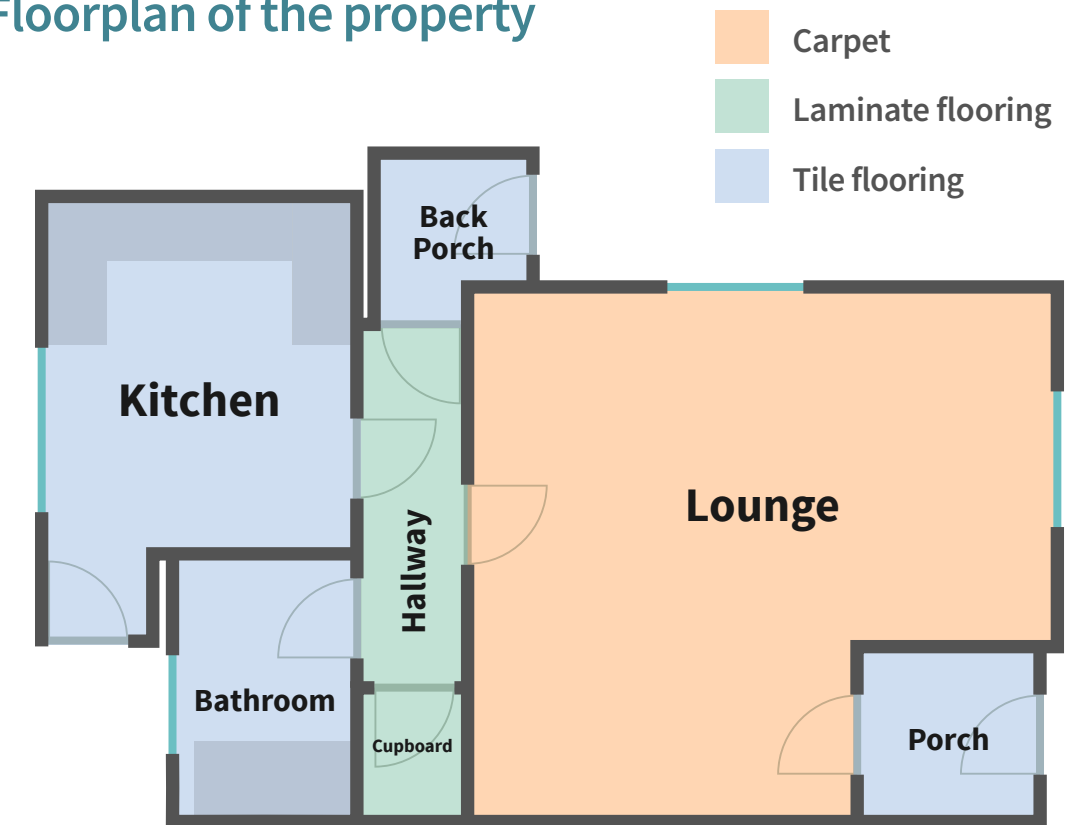
<sup>16</sup> These measures were selected to align with Flood Re Build Back Better recommendations. However, installing additional measures that allow a home to recover faster if floodwater does enter the property – such as tiled floors instead of carpets – may result in even greater benefit.



## Home profile

- Three-bedroom, semi-detached, pre-1930s home with solid brick walls and solid concrete floors
- Residents include two adults and one child
- Carpet in living room
- Tile flooring in kitchen, bathroom and porch
- Laminate flooring in hallway
- Furniture including an upholstered sofa and two upholstered chairs, a dining table and four chairs, a TV unit, bookcase, two side tables and washing machine
- Kitchen consisting of MDF core units with integrated appliances including dishwasher, fridge, oven, cooker hood and hob.

## Floorplan of the property



## Section 4

The carbon cost of flooding – the other side of the coin

### The flood event

Both properties were compared against a major river flooding event, based on our experience in the field managing similar UK floods. In Home A, this was projected to lead to 750mm flood water in the home, for a duration of two days. In Home B, this was projected to result in 20-30mm flood water in the home, for the same duration.

### Carbon footprint calculations

The carbon footprint of theoretically repairing and restoring these two homes to their original states was calculated, reflecting the profile of the homes, the severity of the flood, the damage caused and costs associated with the restoration. This allowed Aviva to make a comparison of the carbon cost associated with recovering from a flood event in a UK home (Home A) and the same home where property flood resilience measures have been installed prior to the flood event (Home B). For full details of the assumptions made during this calculation process, see appendix. All results are presented as carbon dioxide equivalent (CO<sub>2</sub>e). This is the standardised unit for measuring emissions, accounting for all greenhouse gases in a single measurement.

# Calculation boundaries

The boundary of the emissions calculation was the complete lifecycle of an Aviva flood claim. Four key material impact areas were identified for a flood claim:



## 1 Building restoration

- Energy use for drying the home after a flood
- Embodied emissions and transport<sup>17</sup> of fixtures, fittings, finishes and integrated kitchen appliances necessary in the restoration of the home
- Contractor travel
- Waste disposal of damaged materials, including building materials, appliances, furniture and other items
- General site energy use, associated with general labour, strip-out and installation activities

<sup>17</sup> Embodied emissions and downstream transport emissions were included in scope of this analysis. Embodied emissions – emissions associated with materials and construction processes throughout their whole lifecycle, including the emissions taken to manufacture and install the appliances.

## 2 Contents

- Embodied emissions and transport of furniture and non-integrated appliance replacement or restoration

## 3 Alternative accommodation

- Energy use during residents' occupation of alternative accommodation
- One journey by residents to and from the home to the alternative accommodation

## 4 Claims assessment

- Travel of claims assessors and restorers

*Embodied emissions of resilience measures were not included within the scope of this calculation.*



## Section 4

The carbon cost of flooding – the other side of the coin

Embodied emissions and installation of flood resilience measures are not included in the calculation as this is a comparative assessment of the carbon costs associated with the like for like restoration of the two homes following a flood, where flood resilience measures had already been installed in Home B. The additional carbon cost of installing flood resilience measures prior to a flooding event is estimated to be between 100 and 166kg CO<sub>2</sub>e.

The range is dependent on the type of flood doors installed, with polypropylene flood doors reflected in the lower range and aluminium flood doors reflected in the upper range of the estimate. See appendix for more details on assumed resilience measures.

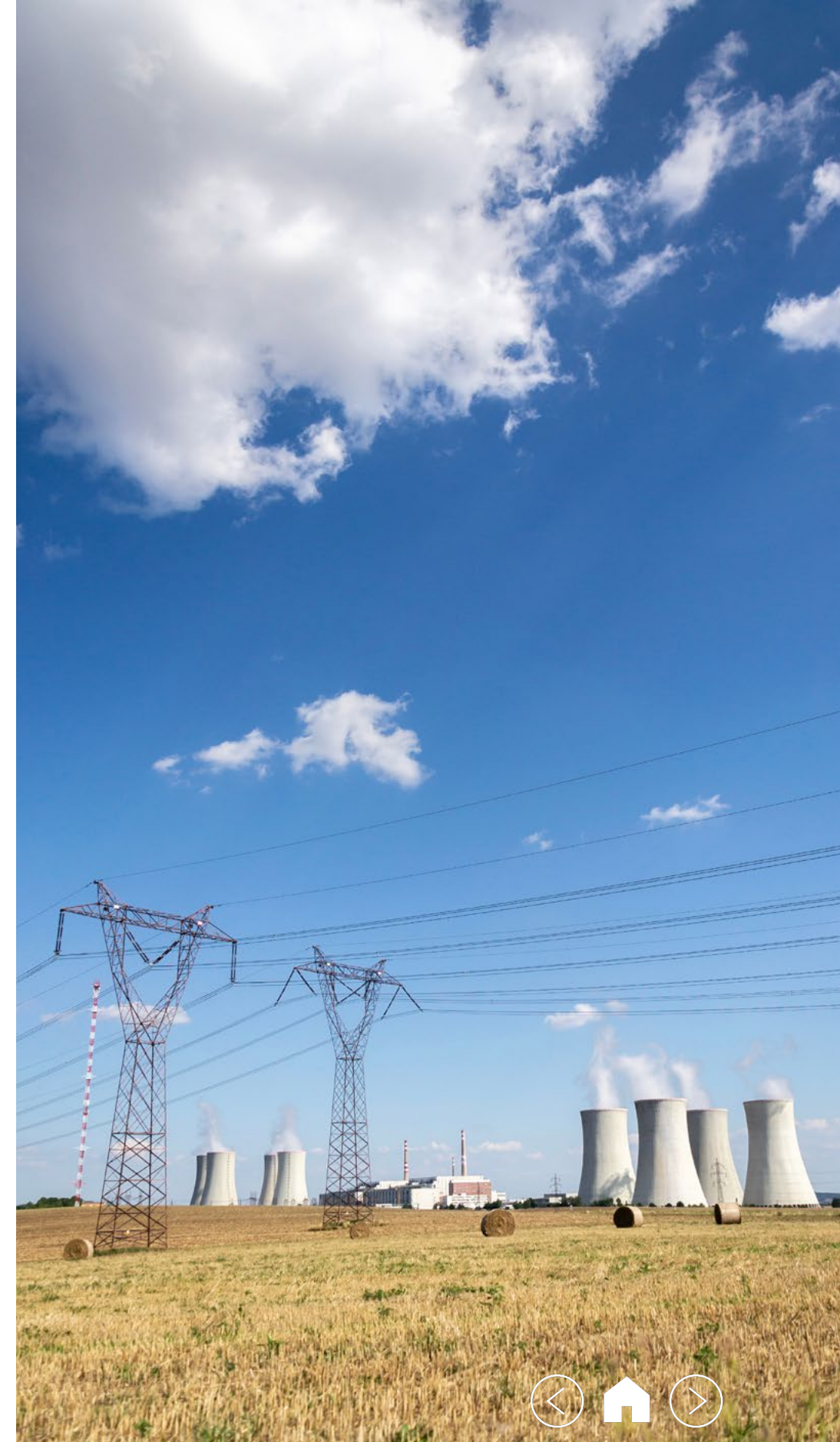
## Emissions factors

Greenhouse Gas Protocol accounting principles were followed to find and apply emissions factors to calculate associated carbon emissions. Emissions factors for relevant activities and products were collected from a range of sources, including the 2022 BEIS conversion factor database<sup>18</sup> and the ICE database.<sup>19</sup> The average-data method was applied where possible, using life-cycle assessment (LCA) emissions factors for specific products or materials, and their equivalent value was removed from estimated claims spends. Spend-based emissions factors were then applied to remaining spends.

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<sup>18</sup> Department for Business, Energy and Industrial Strategy, 'Conversion Factors 2022', 2022

<sup>19</sup> Circular Ecology, 'ICE Database V3.0', 2019



## Section 4

The carbon cost of flooding – the other side of the coin

# Results

## Results show that flooding has a major carbon cost.

Aviva's research shows that restoring a flooded home has a major carbon footprint.

This assessment found that the emissions of restoring the flood-hit home equated to 13.9 tonnes CO<sub>2</sub> emissions. That is the equivalent to the emissions from 6.5 return transatlantic flights<sup>20</sup> or taking 55 car trips from Land's End to John O'Groats.<sup>21</sup>

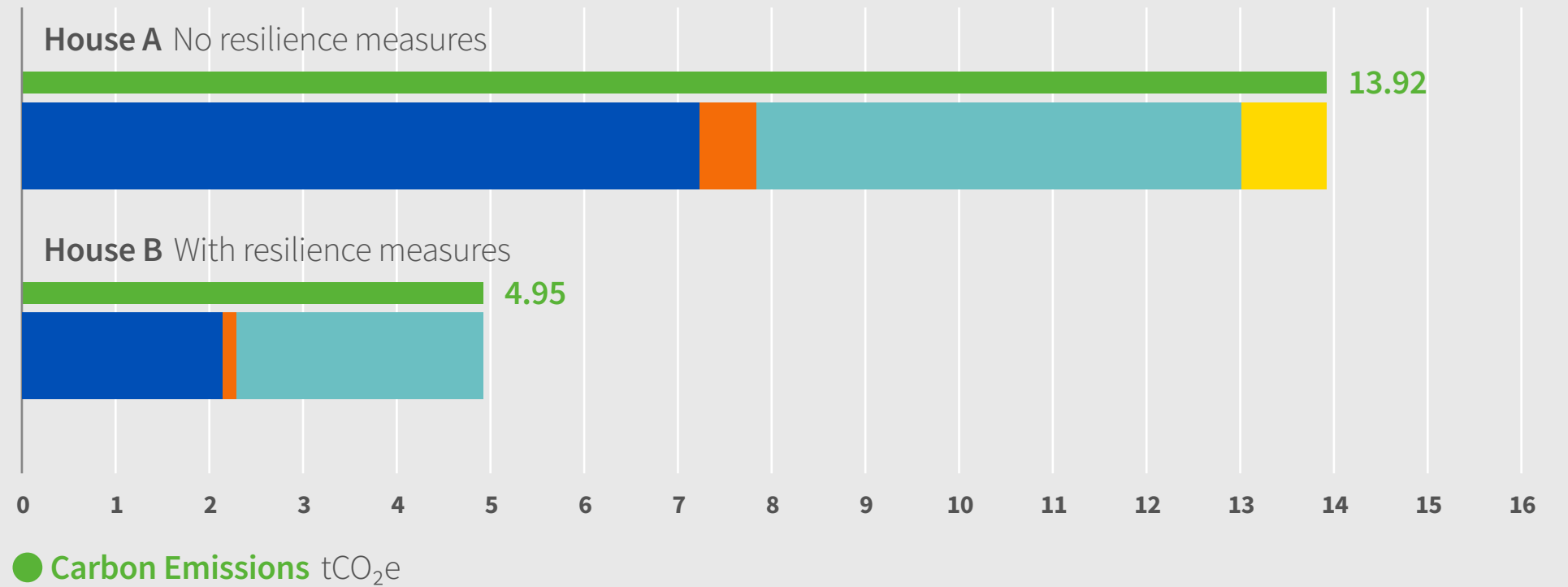
Comparing the protected and unprotected homes shows that failure to install property flood resilience measures comes with a substantial carbon cost. The carbon footprint of a protected home was 64% lower than one without basic resilience measures in place.

<sup>20</sup> Based on 5,570km travelled one way. 2022 UK BEIS conversion factor for an average passenger taking a long haul flight.

<sup>21</sup> Based on a medium-sized petrol car and 2022 UK BEIS land travel conversion factors.

## Comparing flood-related carbon emissions in a non-resilient vs resilient home

The biggest carbon savings came from building restoration and contents



### Flood-related emissions sources in a non-resilient vs resilient home

● Building Restoration ● Claims Assessments ● Contents ● Alternative Accommodation

The carbon footprint of restoring a flooded home was 13.9 tonnes CO<sub>2</sub>e



That's equivalent to 6.5 return flights from London to New York



Or taking 55 car trips from Land's End to John O'Groats

## Section 4

The carbon cost of flooding – the other side of the coin

In a home with property flood resilience measures installed, the greatest carbon savings were in building restoration, with a saving of 5.2 tonnes CO<sub>2</sub>e for this category alone. This is largely because lower flood water levels – the result of flood resilience measures – inside the home led to less damage to the property. That meant fewer materials were needed to replace fixtures, fittings and finishes in Home B. This in turn resulted in less activity involved in restoring the home, as well as fewer site visits by contractors, and much less waste.

There was also a large reduction in contents emissions (2.6 tonnes) due to the lower flood water levels in Home B allowing many contents to be saved or restored rather than replaced. These emissions could be reduced further if residents were able to take responsive or preparative measures, such as moving contents upstairs following a flood warning. Emissions associated with alternative accommodation reduced by 100% in Home B, because residents were able to stay in their home rather than being moved to another property. This has a wider range of benefits too, such as reducing emotional and practical disruption to residents' routines.

### Summary of impacts on Homes A and B<sup>22</sup>

	Home A	Home B
Carbon cost CO <sub>2</sub> e	13.92 TONNES	4.95 TONNES
Financial cost (buildings and contents)	£67,663	£24,000
Total drying time	77 DAYS	10 DAYS
Time residents spent in alternative accommodation	210 DAYS	0 DAYS
Waste volume	24m <sup>3</sup>	12m <sup>3</sup>

<sup>22</sup> Impacts calculated based on Aviva claims team estimates



## Section 4

The carbon cost of flooding – the other side of the coin

# Conclusions

Aviva's analysis suggests that rebuilding, repairing and replacing flood-damaged properties and contents has a very real environmental impact that contributes to the carbon footprint of the UK. Failing to recognise and act on this puts the country on the back foot when it comes to climate readiness.


Proactively building and adapting residential homes to withstand extreme weather before an event not only protects people and their homes but can also help the UK reach Net Zero emissions. As the frequency and severity of flood events increases over the coming years, action to protect homes and communities from perennial flooding could result in a significant carbon saving. And when applied to commercial properties too, this effect could be magnified even further.

Adapting to extreme weather and reducing emissions are two sides of the same coin, to be tackled together. If not, the link identified in this report could create an unforeseen vicious cycle. Failure to adapt buildings to cope with extreme weather could lead to more damage, more carbon cost in repairing that damage, and therefore further intensification of climate change and an increase in extreme weather.

## Research limitations and recommendations for further research

This analysis provides an initial insight into the potential carbon savings of property flood resilience measures in UK homes using illustrative examples. However, a lack of granular data limits the applicability of these results in real-life settings. Further data on the effectiveness of resilience measures and subsequent flood water levels in a major flooding event would strengthen this analysis.

Further analysis should include embodied and installation carbon emissions of flood resilience measures and determine the long-term carbon return on investment in the event of repeated floods. Additionally, analysis could investigate the potential savings that could be made at a broader, community and even societal level, and potential contributions to the UK's Net Zero by 2050 targets.



“Many of us make a conscious effort to reduce our carbon footprint through decisions on how we travel, power our homes, and what clothes we wear and food we eat. But what this study shows is that if our homes are not flood resilient, then a lot of those efforts to reduce carbon emissions can be significantly undermined.

Adapting and making your home more flood resilient will not only reduce your impact on the planet but can help speed up recovery times and minimise the disruption to your life and the physical / psychological trauma that floods can cause.”

Edward Barsley

Author of *Retrofitting for Flood Resilience* and Founder of The Environmental Design Studio

## Section 5

Making homes sustainable and resilient

# Making homes sustainable and resilient

### UK residents want action to protect against extreme weather – but not enough is being done.

Independent research conducted for Aviva in 2022 found that four in five people think it is important to build homes that are resilient to flooding.<sup>23</sup> Almost three quarters (74%) say it is important to build homes that can withstand extreme temperatures. At the same time, government and industry needs to work together to ensure householders, both homeowners and renters, have access to guidance and support to enable them to make sensible choices that will improve the adaptation and resilience of properties to climate change.

As part of its 2022 growth plan, the UK government has set out its intention to accelerate housing delivery and increase the number of houses granted planning permission. It is clear that the UK needs new homes, but this must be balanced with making sure these homes are fit for a changing climate in the long-term.

Stronger regulation at the right stages in the planning process can ensure that the right homes are being built in the right places, with simple, low-cost resilience measures implemented as standard. This will help residents feel safe and comfortable in their homes, as well as saving money on bills and repairs.

In particular, there are three areas where urgent attention is needed as part of our calls for change:



**Four in five people** think it is important to build homes that are resilient to flooding

**74% of people** think it is important to build homes that are able to withstand extreme temperatures

<sup>23</sup> Research commissioned by Censuswide for Aviva in August 2022

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# 1. Strengthen planning regulation to protect UK properties

## Regulation is currently failing to protect residents

Current building and planning regulation still leaves residents to bear the cost of extreme weather. And even where regulation does exist, it is not always being properly followed.

In 2021, the Climate Change Committee warned that 1.5 million homes due to be built across the UK will lock in climate vulnerability<sup>24</sup> unless planning and building policy is changed now. The Department for Levelling Up, Housing and Communities has published updated planning guidance for councils, designed to direct development away from areas at risk of flooding.<sup>25</sup> Aviva welcomes this new guidance. However, regulatory loopholes mean that developers can still build properties in high-risk areas before agreeing what resilience measures will be in place. In practice, this allows developers to sell properties in vulnerable areas even if they do no more than leave space for flood defence measures to be installed in the future – with no guarantee that this will happen. And in England, Wales and Northern Ireland, there is also still no process for holding developers to account if the properties they build are damaged by flooding.

The decision to build poorly protected houses in flood zones is not affecting us all equally. Those least able to cope with climate events are being forced to bear the greatest burden. The UK's Climate Change Committee has noted that housing developments in areas prone to frequent flooding have been disproportionately concentrated in the most socially vulnerable neighbourhoods (for example, lower income areas where social networks are weaker).<sup>26</sup> The UK requires smarter regulation and enforcement to protect those who need it most.

<sup>24</sup> Climate Change Committee, *'Independent Assessment of UK Climate Risk'*, 2021

<sup>25</sup> UK government, *'Better Flood Protections for New Homes'*, 2022

<sup>26</sup> UK Climate Risk, *'UK Climate Risk Independent Assessment (CCRA3): Technical Report'*, 2021

<sup>27</sup> Climate Change Committee, *'UK Housing: Fit for the Future?'*, 2019

“ The way new homes are built and existing homes retrofitted often falls short of design standards. This is unacceptable. In the long run, consumers pay a heavy price for poor-quality build and retrofit. ”

UK Climate Change Committee  
2019<sup>27</sup>

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# 2. More collaboration and research across all stages of the building process to combine sustainability with safety:

## Building standards are not aligned with emissions reduction targets

Current building standards are not aligned with the UK government's legally binding target to reach Net Zero emissions by 2050. In fact, a 2022 study estimated that, based on today's trends, housing alone will consume 104% of England's entire carbon budget by 2050.<sup>28</sup> Energy efficient homes are more comfortable and cheaper to inhabit, as well as better for the climate. When an Energy Performance Certificate (EPC) band D to G-rated home in England is improved to at least a band C, inhabitants save on average £282 per year in energy bills.<sup>29</sup> Yet 54% percent of all homes in England currently have EPC ratings of D or worse.<sup>30</sup>

Building and running homes in a way that increases emissions will exacerbate the risk of climate events, in turn leaving UK residents at even greater risk. This vicious cycle must be broken.

To adapt the UK's housing stock for the future, the nation also needs tradespeople who are trained in resilient building and retrofit. This is a valuable opportunity to create skilled jobs, as well as improve the overall quality of homes and help make the UK a global leader in climate-resilient building. However, the Climate Change Committee warned in 2019 that the “chopping and changing” of government policy has inhibited skills development in design, construction and the installation of new resilience measures, including property flood resilience.<sup>31</sup> This is a missed opportunity.

<sup>28</sup> Ecological Economics, *'A Home for all within Planetary Boundaries: Pathways for meeting England's Housing Needs Without Transgressing National Climate and Biodiversity Goals'*, 2022

<sup>29</sup> Department for Levelling Up, Housing & Communities, *'English Housing Survey'*, 2020-2021

<sup>30</sup> *'English Housing Survey'*, 2020-2021

<sup>31</sup> Climate Change Committee, *'UK Housing: Fit for the Future?'*, 2019



When an Energy Performance Certificate (EPC) band D to G-rated home in England is improved to at least a band C, inhabitants **save on average £282 per year** in energy bills

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### 3. Encourage and incentivise property resilience to aid recovery:

#### Not enough is being done to incentivise property resilience

It is not enough to build properties that are adapted to the current level of risk. Within the lifetime of homes being built today, almost all of the UK will be at greater risk of extreme weather events. Yet today, there are no requirements for even basic climate resilience measures to be installed in new-build properties, and no incentives to retrofit measures to prevent overheating in existing homes.<sup>32</sup>

Simple, low-cost measures, such as raising electrical sockets, fitting non-return valves on toilets and installing air brick covers could make a major difference to inhabitants over the course of the home's occupation – particularly for those who are more vulnerable, including tenants. These simple measures help to avoid damage to homes and possessions during flooding, allow people to stay in their home after a flood event and thereby minimise physical and emotional disruption to families and communities. Many resilience measures, such as cool roofs which reflect more sunlight and absorb less solar energy, also bring even broader benefits: not only reducing the risk of overheating, but also lowering energy bills and increasing comfort for residents.

Straight after an extreme weather event is a timely opportunity to make homes safer, more comfortable and more sustainable. Last year, Flood Re – a joint initiative between the insurance industry and the UK government – launched its Build Back Better scheme.<sup>33</sup> Aviva was one of the first insurers to sign up to the scheme, which offers homeowners the chance to install property flood resilience measures when repairing their properties after a flood. Schemes such as this mean people are better prepared when their property floods again, with many able to return in a few days rather than several months. Recent research<sup>34</sup> from JBA Risk Management suggests that uptake of these measures could significantly reduce projected financial losses from floods in the UK. And, as Aviva analysis shows, they can also help to reduce the carbon cost of a flood event – as well as saving people time, money and emotional and physical disruption.

<sup>32</sup> UK Climate Risk, *'UK Climate Risk Independent Assessment (CCRA3): Technical Report'*, 2021

<sup>33</sup> Flood RE, *'Build Back Better'*, 2022

<sup>34</sup> The Flood People, *'JBA's Study Reveals Impact of Property Flood Resilience Measures'*, 2022





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# Aviva is calling for action to protect homes and householders

**It is essential that UK homes are resilient to climate change impacts, that UK government and businesses capitalise on the growth opportunities presented by the green economy and that UK residents are not forced to shoulder the many costs of leaving properties unprotected.**

Aviva's Building Future Communities campaign consists of seven calls for change to protect the UK built, natural and human environment. In 2022, based on its new analysis, Aviva is focussing on three of these calls, with specific asks under each one to protect UK homes from the costs of flooding.

- 1 Greater use of innovative nature-based solutions that are adapted to the UK landscape
- 2 Ensure small and medium-sized enterprises (SMEs) are sufficiently protected against extreme weather
- 3 Strengthen planning regulation to protect UK properties
- 4 More collaboration and research across all stages of the building process to combine sustainability with safety
- 5 Improve access to home insurance and narrow the insurance gap to protect those most at risk
- 6 Encourage and incentivise property resilience to aid recovery
- 7 Collaboration across recovery organisations to strengthen crisis response and resilience at community level



# The Building Future Communities priority calls for change in 2023

## Strengthen planning regulation to protect UK properties

- Government should make basic cost-effective climate resilience measures mandatory in all new-build properties, not just those in high-risk areas.
- Planning policies should more rigorously direct new development away from current and future high-risk areas and require greater resilience for any properties built in high-risk areas.
- Government should formalise the sign-off processes for development projects to make sure they meet the standards and planning specifications set out during the planning approval stage.
- Housing and property developers should have final payments on new properties withheld until the correct property flood resilience and energy standards have been met.
- Governments should introduce effective mechanisms to hold developers to account when new properties flood.

## More collaboration and research across all stages of the building process to combine sustainability with safety

- New building regulations and codes must be aligned to the UK's Net Zero strategy and legally binding targets. Existing regulation should also be updated to deliver on these targets.
- Government should develop a strategy to encourage the wide scale adoption of adaptation measures that also reduce emissions. This should set out the role for incentives, codes, and regulation.
- Government and industry should collaborate on a review of current certification standards with a view to ensuring the safety, sustainability and resilience credentials of building materials and construction in the future. In particular, the use of engineered timber now and in the future needs to be carefully supported.
- Government and industry should collaborate on future skills development in the wider construction industry to ensure we can adapt the UK's housing stock for the future and benefit the UK economy.

## Encourage and incentivise property resilience to aid recovery

- Targeted incentives should be introduced for climate-resilient retrofit of existing properties to protect from extreme weather, heatwaves, flooding and surface water, and reduce energy consumption.
- Government should consider the case for making property flood resilience (PFR) materials/installation VAT-free to encourage much wider uptake.
- Government should introduce an accessible database of all community-level resilience measures to better aid decision making for those seeking to purchase houses and improve resilience of their own properties.
- Government should ensure there is a national approach to ensure that property is put back into a more resilient and sustainable state after flood. This could involve scaling up the Flood-Re Build Back Better scheme.

## Section 6

Afterword: Homes for a changing climate

# Afterword: Homes for a changing climate

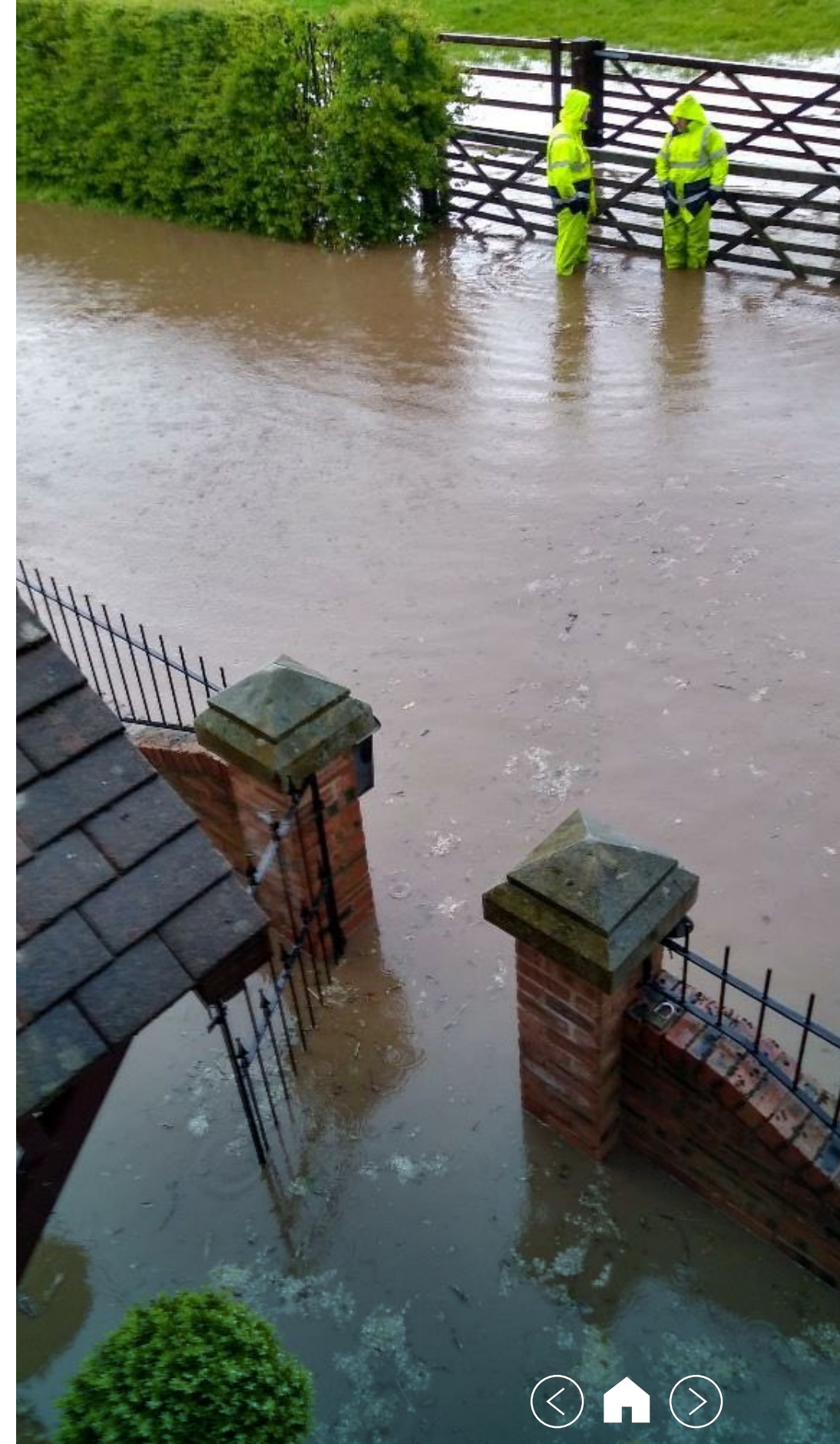
## Acting today can make the UK more climate-ready, now and in the future

This report, and Aviva's calls for change, set out several crucial measures that must be taken to protect UK homes and residents from the costs of extreme weather. For householders, it is essential that more is done to protect families and their homes from the distress and heartache of property damage due to extreme weather. But in addition, in our commitment to achieving Net Zero in the UK, we also need to construct homes that are resilient to the impact of floods and storms, and that do not in themselves contribute to carbon emissions. Every sector of our society, including the design, planning and building industry needs to work to create a UK economy that minimises carbon emissions, whether it is in the materials used, the locations chosen or the resilience measures implemented. This is our responsibility.

However, the task does not stop here – and every one of us must play our part.

At Aviva, we are taking action across our business to support this process. In 2022, we were one of the first insurers to sign up to the Flood Re Build Back Better scheme. Through it, we will offer eligible homeowners the chance to install Property Flood Resilience measures when repairing their properties after a flood.<sup>35</sup> This is over and above the cost of restoring the home to its previous condition.

<sup>35</sup> This will be in place during 2023. Aviva will provide this regardless of whether the policy is ceded to Flood Re.



## Section 6

### Afterword: Homes for a changing climate

Through our partnership with WWF, a pilot project in the **River Soar catchment** in Leicestershire has been launched to explore nature-based solutions that will increase the UK's resilience to a range of climate risks. Nature-based solutions are crucial for mitigating risks such as flooding, as well as reducing the UK's carbon impact. In this project, we are bringing together different groups, from farmers and landowners to insurers and local government, to explore ways of working with nature and provide a best-practice model that addresses the 'triple challenge' of feeding a growing population, combatting the climate crisis and reversing nature loss. Separately, the Aviva Foundation has also partnered with the University of Hull's Flood Innovation Centre on its 'Mapping the Gaps'<sup>36</sup> project which considers post-flood recovery processes. Together, we will identify areas where better knowledge and communication between organisations could help communities recover more quickly after a crisis.

Last year we also launched our Climate-Ready campaign to help the UK become the most climate-prepared, advanced economy in the world.<sup>37</sup> We aim to do this by supporting people, businesses and communities to reduce carbon emissions and adapt how we live and work to be as protected as possible from the impacts of climate change.

The UK also needs an enabling policy environment that supports Net Zero investment decisions and drives the transition across the economy. Through its partnership with WWF, Aviva is calling for the government to adopt its own Net Zero transition plan.<sup>38</sup> This would allow the private sector and civil society greater clarity on how Net Zero is to be delivered in the real economy, leveraging private sector finance to accelerate the transition.

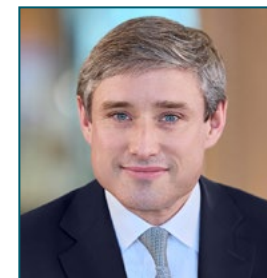
**By acting now, we can ensure that UK residents are not left to bear the brunt of the emotional, physical and financial costs of extreme weather, whilst accelerating progress towards cutting UK emissions for good.**

<sup>36</sup> University of Hull, *'Mapping Flood Recovery Gaps'*

<sup>37</sup> Aviva, *'Climate Ready Index'*, 2022

<sup>38</sup> WWF and Aviva, *'Aligning the UK Financial System to Net Zero: a WWF-Aviva position paper'*, 2022

Adam Winslow  
Chief Executive Officer of Aviva UK  
& Ireland General Insurance



## Research assumptions

### Where Aviva was not able to provide specific data, the following assumptions were made:

- Alternative accommodation emissions were calculated based on UK government average energy consumption of a <50m<sup>2</sup> purpose built flat in 2019.
- Waste density was assumed to be 1.2 tonnes per m<sup>3</sup> of skip waste produced.
- Waste emissions were calculated based on the sum weight of electrical goods and plaster being replaced in each home, and waste quantities provided by Aviva. Electrical goods and plaster-specific emissions factors for waste disposal by recovery were applied, and remaining waste from building activity was classified as “Commercial and industrial waste”. Based on UK statistics on non-hazardous construction and demolition waste,<sup>39</sup> it was assumed 93.2% of total waste was recovered (recycled and/or incinerated), including electrical items and plaster. Remaining waste was assumed as sent to landfill.
- Emissions were calculated using LCA data where available for specific building and content materials, and representative costs found online were subtracted from the claim cost.

- To calculate emissions associated with strip-out and installation, a spend based emissions factor for site activity was applied to the remaining building claim cost.
- To calculate emissions associated with contents of Home A not specified by Aviva, a spend based furniture emissions factor was applied to the remaining Contents claim cost.
- The emissions associated with contents in Home B were calculated by applying a percentage reduction to Home A’s contents emissions equivalent to the reduction in Contents costs between Home A and B provided by Aviva.
- Dehumidifier power was assumed as 0.427kWh, and air mover power was assumed as 0.440kWh, based on online sources. The number of dehumidifiers and air movers was based on one per 25m<sup>2</sup> floor space.
- Representative product weights were determined using online sources, or LCA specifications.
- A quarter of the quantity of wall repair materials (plaster and paint) was assumed to be required in Home B compared with Home A.
- Half the height of the bathroom walls is assumed to be tiled.
- Room heights were assumed based on an average UK room height of 2.4m.

<sup>39</sup> Department for Environment Food & Rural Affairs, ‘UK Statistics on Waste’ 2022

### The following additional assumptions were made in the calculation of emissions:

- Where the boundary of LCAs or emissions factors was cradle-to-grave or cradle-to-retailer, an average emissions factor for distribution from European or UK manufacturers to site, respectively, was used.
- The following equation was used to calculate the energy use for drying:  
$$\text{Electricity used} = \sum(\#dehumidifiers * power + \#airmovers * power) * 24h * \#drying\ days$$
- Due to a lack of specificity with regards to electrical work, emissions have not been specifically calculated for electrical wiring and associated site activity. We have assumed that this may be included within the total Building Claims cost, and as such, would be covered by the general site activity estimations.



## Estimating the carbon cost of resilience measures

Additional analysis was carried out to calculate the emissions associated with installing flood resilience measures. The following data was provided by Aviva on the installation of the same flood resilience measures to the homes detailed in this report:

### Materials:

- 2 flood doors (polypropylene or aluminium).
- Application of water-resistant coating applied to brickwork to a height of 1m around the perimeter of the property.
- Raising of electrical points requiring additional cable and dry connection joint boxes.

### Labour:

- An additional days labour of 4 contractors to carry out installation of flood doors, sealing external brickwork and electrical work.

## The following assumptions were made regarding the installation of flood resilience measures:

- The materials and labour associated with raising electrical points assumes this work would be completed as part of a standard renovation or restoration, as is common practice, and therefore would incur no additional carbon cost associated with redecorating.
- Installation of flood doors and application of water-resistant coating can be carried out any time without further disruption to the property.
- Representative product weights were determined using online sources, or LCA specifications.

## Research methodology:

**Sustainability consultancy Good Business,  
research and content support, February 2023**

### **Censuswide consumer research, August 2022**

Research commissioned by Censuswide for Aviva in August 2022.  
2000 nationally representative respondents.

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#### **Media relations contacts:**

For further information, contact

**Diane Mangan**

**[Diane.mangan@aviva.com](mailto:Diane.mangan@aviva.com)**

**+44 7800 691714**

**Liz Kennett**

**[liz.kennett@aviva.com](mailto:liz.kennett@aviva.com)**

**+44 7800 692675**