



Planning decisions, adaptive capacity and insurability: Findings from a case study of flooding in Somerset, UK

The University of Cambridge Institute for Sustainability Leadership

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Authors

The lead authors of this report were Nick Pyatt of Climate Sense and John Ward of Pengwern Associates, with project management assistance from CISL's ClimateWise and JBA Risk Management.

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Executive summary

Flooding is a significant issue in the UK and can provide globally relevant insights on data, adaptive capacity and insurance. As shown in a recent report commissioned by the Association of British Insurers (ABI)ⁱ, flooding is the greatest natural disaster risk in the UK, with an estimated one in six properties in England and Wales, one in 11 properties in Scotland and one in 34 properties in Northern Ireland now at risk of flooding. Furthermore, six of the ten wettest years on record have occurred since 1998.

Somerset is one of the UK regions at significant risk from flooding. According to the ClimateWise *Physical risk framework* report, areas within Somerset were identified as those being where future flood risk would be highest by the 2050sⁱⁱ. This was measured in terms of ten-year losses as a percentage of outstanding mortgage volumes. In addition, Sedgemoor District is identified as one of 20 local authorities that would see the most extensive expected annual damage from flooding in the country by 2080ⁱⁱⁱ. Somerset also has a range of types of flood risk representative of the wider UK risk. Despite the fact that planners are asked to ensure properties are safe from flooding for 100 years, the planning systems in Somerset (and therefore nationally) are not always able to provide such protection for new development. Where this fails, insurance has a critical role to play to provide a safety net. However, a survey conducted by the Somerset Rivers Authority suggests that nationally, around 22% of households do not have insurance cover against flood risk. At the national level, this is most frequently caused by households not having any home insurance. However, on some occasions home insurance policies specifically exclude flood risk¹. Stakeholders in Somerset suggest that the specific exclusion of flood risk is more common than is the case nationally.

Working with Somerset County Council, Somerset Lead Local Flood Authority, Somerset Rivers Authority, Mendip District Council, Sedgemoor District Council and The Environment Agency (EA)², the study aimed to understand:

- whether current planning practice provides a level of flood protection to new developments that retains the flood protection insurance cover for 100 years,
- reasons why this level of protection may not be sustained, and
- how any problems can be rectified.

With this in mind, this project considered two different planning regulatory frameworks for flood risk: fluvial flood risk and surface water flood risk. We explored whether the regulatory framework of these two categories affected the probability of flood protection and insurability. The research also considered how flood risk outcomes were affected by the adaptive capacity of planners, planning enforcers and developers.

¹ Flood cover is included as standard in the UK, and should only be excluded as an exception specifically agreed with the householder. Householders can check eligibility for the Flood Re scheme [here](#). If householders seeking coverage are being refused insurance or told they need to exclude flood cover due to their flood risk, they are recommended to explore coverage via price comparison websites or other channels.

² Mendip and Sedgemoor district councils have recently been included in a merger, along with Somerset West and Taunton and South Somerset district councils and the services provided by Somerset County Council, to form Somerset Council. However, each of these councils operated separately at the point that this research was conducted.

This assessment was made through two case studies. A summary of the findings is below:

- Fluvial flood: Compliance by local authority planners with existing regulation generally offers a significant level of protection. There are some locations which may be exposed to fluvial flood risk taking into account the effects of climate change that may not be reflected in the current flood maps used for constraint checking. However, within the case study area, most of the developments where this concern arises benefit from additional flood defence measures introduced by the EA, and financed through developer section 106 contributions.
- Surface water flood: A local authority invested in advice beyond that required for regulatory compliance. Despite this, a developer ignored the advice, and the local authority did not feel it had the resources to mount a legal challenge. This exposed properties to a potential challenge in un-insurability today, with problems likely to increase further with future climate change.

The study revealed a number of priority actions for government and the insurance industry. To close the global protection gap, priority actions include regulation enforcement, and stronger market signals to developers that effective flood protection measures increase property value. For example, construction phase insurance could require that the building be constructed as per planning approval. An additional step could be for construction coverage for flood risk to be extended at least to the first ten years from occupation. The planning process aims to provide protection for 100 years, so this would be a priority. Further priority actions include capacity building for developers and planners, and a set of co-ordinated actions for the 21st century risk landscape. An assessment of risk to developments could also include an assessment of the adaptive capacity of developers and planners, with lower adaptive capacity resulting in higher risk rating. Metrics are now available to efficiently make these assessments. Ultimately, a climate-ready home is the aim of planners, developers, insurers and, most pertinently, occupiers.

Since the study has been conducted, the Government announced it planned to introduce the long-delayed Schedule 3 of the Flood and Water Management Act 2010 to mandate the use of Sustainable Drainage Systems (SuDS) in new developments in England. The intent is to attempt to address the issues highlighted in the study. During the development of the report, the details supporting this intent had not been settled. Therefore, this report offers a reminder of the factors that drive exposure to flood risk in new developments and the consequences of not fully addressing these risks.

1. Introduction

As the frequency and severity of many climate-related catastrophes continue to grow, so do economic losses. Many of these ultimately flow through to the insurance industry, causing mounting challenges and threatening the traditional role of commercial insurance as society's financial risk transfer mechanism.

At the same time, not all losses are insured, leading to a 'climate risk protection gap' – the difference between the total economic and insured losses associated with climatic events. The climate risk protection gap was estimated at US\$161 billion globally in 2021^{iv} and is set to grow over time. Over the last ten years, only 5 per cent of flood losses in emerging markets were insured, and just 34 per cent in advanced economies^v. In the context of the UK, the economic cost of flooding in 2019–20 was estimated to be £78 millionⁱ.

Adaptation is essential to dealing with the twin challenges of increasing losses and a growing protection gap. For example, in exploring the impact of climate change on physical risk exposure, ClimateWise looked at examples in the UK. These revealed that without adaptation, expected annual losses for residential properties may rise by 60 per cent by 2050 under a 2°C warming scenario. However, this increase would fall to just 26 per cent with targeted adaptation measuresⁱⁱ.

This suggests that to protect society, there is an urgent need and opportunity for insurance industry expertise to support national and regional planners, developers and customers to continually adapt to the changing climate.

To address these issues, this project explored how physical climate and infrastructure data and expertise can support a range of stakeholders to make more informed infrastructure and development decisions. These would incorporate adaptation to improve resilience and wellbeing. The objectives of the project were to:

- clarify the current data available to the government and financial sector to estimate exposure to physical risk with a changing climate and make recommendations for improvement
- identify the current availability and penetration of insurance (protection gap) and how that will evolve as the climate changes
- review the role and impact of adaptation measures within current studies and scope the need for future analysis
- understand the difference that adaptive capacity makes to adaptation decisions and insurability.

Somerset, a county in the southwest of the UK, was chosen as the initial project site as the local government (county council) has been building the area's resilience following severe flooding in 2013–14. The county council has engaged a range of civil agencies and infrastructure operators to improve flood response plans and install adaptation measures. Somerset is now looking wider to consider how to further improve its resilience.

Given the location, the project focused on flood risk; whether fluvial, surface or coastal flooding, or a combination. The project built on the expertise of key stakeholders, including: Somerset County

Council, Mendip and Sedgemoor District Councils, Calm Engineering, Rheos Consulting and JBA Consulting.



Figure 1. Fluvial (river) flooding (left) and surface water flooding (right)

The target outcomes for Somerset and the community were to:

- enable more climate-resilient decision-making through a greater understanding of the insurance implications of current plans and alternative options
- catalyse the development of insurance service offers that improve resilience, both of individuals and collectively, in the county
- add to Somerset's reputation as a place developing innovative climate adaptation measures.

The target outcomes for the insurance industry were to:

- understand the value of current insurance services in an area with a complex and wide range of flood risks yet a relatively low population, thereby presenting a manageable range of stakeholders and interdependencies
- develop further understanding of how risk may change as the climate changes
- develop an understanding of how risk changes with the adaptive capacity of decision-makers in the property development process, including regulators, planners, planning enforcers and developers
- identify opportunities for additional services and approaches to climate risk management.

Since the study for this report had been conducted, DEFRA has recommended the implementation of Schedule 3 of the Flood and Water Management Act 2010 to mandate the use of Sustainable Drainage Systems (SuDS) in new developments in England. The intent is to address the issues highlighted in the study. At the time of writing the report, the details supporting this intent had not been settled. An additional objective for the report, as the details of regulation and enforcement of Schedule 3 are developed, is to offer a reminder of the factors that drive exposure to flood risk in new developments and the consequences of not fully addressing these risks.

Project approach

The project was a joint venture between ClimateWise, Climate Sense and Pengwern Associates. It brought together and built on the knowledge and skills developed in the ClimateWise Physical Risk Framework and Societal Resilience programme, Climate Sense's Capacity Diagnosis & Development (CaDD) Explorer and the economic expertise of Pengwern Associates.

The project included two deep-dive case studies with local authorities, flood engineers and district planners to investigate and demonstrate the value of effective planning for adaptation to a changing climate. The case studies tested the ability of planning decisions to ensure that properties were not exposed to more than a one in 75 annual probability of fluvial and surface water flooding over the next 100 years, when considering possible climate change impacts. The case study results were presented to a workshop with the insurance industry to ascertain the implications for the availability and design of insurance products.

2. Flooding: case studies in Somerset, UK

Regulation currently provides more protection against fluvial risk than surface water flooding in the UK. For this reason, risk from these different types of flooding were considered separately.

2.1 Fluvial flood risk

In line with planning guidance, planners in the case study used the Environment Agency (EA) Flood Zone 3 maps. These are used as the starting point for deciding whether or not sites should be permitted for development – although individual applications are subject to more detailed analysis through site level Flood Risk Assessments (FRAs). Flood Zone 3 is land that, before considering the impact of flood defences, has a one in 100 or greater annual probability of river flooding; land having a one in 200 or greater annual probability of sea flooding; or land where water has to flow, or be stored in times of flood under the current climate conditions. All of these risk levels in the Flood Map are assessed under current climate conditions, although site level FRAs should include an allowance for climate change when assessing risk in detail.

To assess the potential impacts of climate change, ‘climate change allowances’ have been identified by the EA. These capture the anticipated changes to peak flow because of climate change. In 2019/20, the EA in Somerset stress tested its flood defence infrastructure by modelling peak river flow with an 85% climate change allowance (as well as a 30% and 40% allowance)³. This was a high-level pilot analysis by the EA to start giving an indication of future risks using the survey and modelling data available at the time⁴. While it is not a substitute for individual site level modelling, it nonetheless provides a useful indication of long-term potential fluvial flood risk in the region. The 85% uplift used in this analysis is very similar to the 82% upper end allowance identified for this region for the 2080s in the EA’s Hydrology Data Explorer⁵.

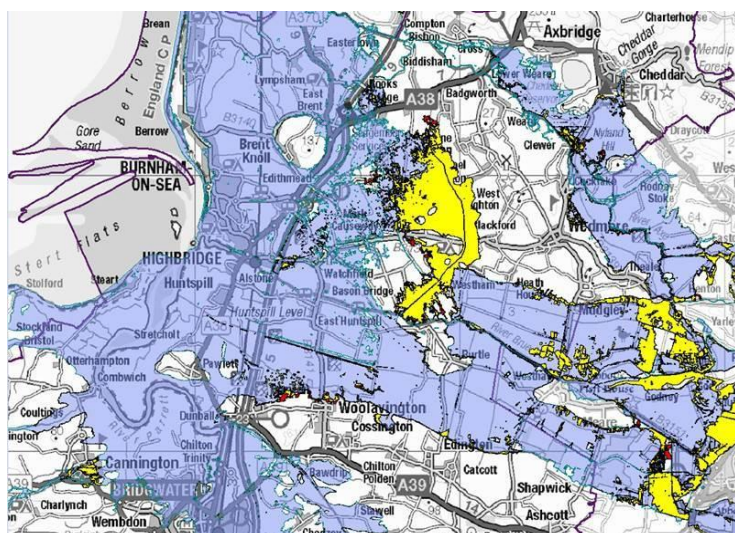
Our project compared the Flood Zone 3 and EA fluvial flood risk stress test to see if there was a possibility that there might be areas that are outside the Flood Zone area 3 - which means they may not have triggered a flood risk assessment (FRA) - but which might, taking into account future climate change, may be subject to fluvial flood risk according to this EA analysis. These are the developments where there could be potential issues for long-term insurability.

The analysis found that most areas at risk of flooding in the 85 per cent increase stress test overlapped with the Flood Zone 3 map. This means that most areas considered at risk using high-end flood risk allowances would not be developed even when using the longer standing risk assessment process associated with Flood Zone 3. It should be stressed that this finding cannot be extrapolated beyond this case study region and that a similar assessment in other regions may yield different results.

³These allowances reflected the 2016 guidance that was in place at the time of the work.

⁴For instance, it only considered the impact of fluvial risk in isolation and only considered passive linear defence assets such as embankments and walls, rather than point assets such as pumping stations and sluices

⁵Reference: <https://environment.data.gov.uk/hydrology/explore>



Map key

Blue – Flood Zone 3

Yellow – areas outside Flood Zone 3 but exposed to fluvial flood risk when considering 1 in 75 year event with 85% climate change allowance

Red – additional areas outside Flood Zone 3 exposed to fluvial flood risk when considering 1 in 75 to 1 in 100 year flood events with 85% climate change allowance

Figure 2. Overlay of Flood Zone 3 with potential areas of fluvial flood risk with climate change allowances in Somerset, UK

However, some areas – marked in yellow and red – were identified as being at risk of flooding in the EA climate change analysis, but were outside the current extent of Flood Zone 3. There were nine developments in these areas during the life of the current local development plan, comprising 100 properties in total.

Of these 9 developments, five developments, associated with 96 out of the 100 properties, nonetheless benefited from FRAs. However, none of these FRAs considered fluvial flood risk with an 85 per cent climate change allowance and, indeed, there was only one development (albeit the largest one accounting for more than half of the dwellings) for which there appears to have been any explicit modelled consideration of climate change impacts within the FRA.

Despite this, there is evidence of action being taken to respond to the risk climate change might exacerbate fluvial flood risks in the region, although not by developers. In 2015, planning permission was granted to an Environment Agency scheme to construct a flood relief channel, a flow control structure and offtake/side weir to divert flood water away from Cannington. The need for this scheme was identified by the EA as part of its flood risk management activities and as it is a statutory consultee on new developments. This scheme is likely to benefit 5 of the 9 developments identified in the analysis above, accounting for 92 properties. Importantly, this scheme was designed to be easily upgraded as flood risk increases, so that a one in 100 year protection level could be maintained in response to future climate change⁶ as illustrated by the quote below:

“The design of the scheme allows for future interventions to maintain a 1% AEP [Annual Exceedance Probability] (1 in 100 years) standard through appropriate sizing and design to allow for future re-sizing of key structures such as the culvert under the A39. It is more optimal to address the deterioration in the Standard of Protection through future interventions than at the time of scheme construction. Future operational response will monitor the effectiveness of the scheme and, if necessary, further channel enlargement could be undertaken to offset against changing flood flow response”^{vii}.

⁶ The fact that the scheme can be upgraded to provide additional protection over time, rather than providing protection with an 85% climate change allowance as of today, explains why, despite this scheme, the five developments that benefit from it are still identified in the ‘overlap’ analysis presented above.

A further important finding is that no properties were developed under current regulations within Flood Zone 3 (as noted above, primarily covering fluvial and tidal flood risk) without consideration of the risk through the FRA process. This illustrates the enforcement powers that fluvial flood risk regulation provides.

2.2 Surface water flooding

The surface water case study is a site in Mendip District that has approval for a major development of several hundred dwellings.

In response to the initial flood risk assessment, two attenuation ponds were included in the developer's proposal. However, the planning department's review of the proposal found that these measures were insufficient to manage the water flows identified in the flood risk assessment. It proposed additional flood protection measures, including improvements to the developer's proposed attenuation ponds and an additional bund or embankment around the property. Despite this suggestion, the developer did not make the proposed changes and indeed reduced the level of flood protection compared to that included in its plans. Planners did not challenge the developer because weak regulation related to surface water risk management made the risk of losing a costly court case too high in the view of the district authority. The weaknesses in regulation relate both to the fact that surface water flooding is not included on flood zone 2 and 3 maps or is yet on the flood map for planning - meaning that the guidance on what is and is not acceptable in any one location is less clear - and because there is currently no requirement for developers to ensure that they include surface level SuDS or that developments deal with existing surface water flow routes through development sites.

To better understand the implications of these decisions, we modelled and tested the development's flood protection measures against current levels. This included a 20 per cent and 40 per cent increase in peak surface water flow compared to current climate levels, in line with EA surface water flood protection guidance⁷. Figure 3 shows that a bund or swale intervention would reduce the number of properties prone to flooding from 6 per cent to 4 per cent in current circumstances, from 9 per cent to 6 per cent under the middle case climate change scenario and from 10 per cent to 9 per cent with the upper end of climate projections.

The inability that the planning authority felt it had to enforce planning decisions, in contrast to the enforcement of fluvial flood risk regulation, is a key example of the weakness of the current surface water flooding regulation.

⁷Reference: <https://www.gov.uk/government/publications/peak-rainfall-climate-change-allowances-by-management-catchment>

% of properties at flood risk			
Interventions beyond developer's plan	Base rainfall	'Central' uplift +20%	'Upper end' uplift +40%
Developer-implemented interventions	5%	9%	11%
Bund [‡] interventions (required by planners but ignored by developer)	6%	9%	10%
Swale [§] interventions (included in developer's planning application plus the effect of the bund)	4%	6%	9%

Figure 3. Summary of scenario and rainfall events, and corresponding percentage of properties flooded

2.3 Adaptive capacity

Limited flood protection and lack of preparedness for future protection due to climate change is a systemic issue in the property planning process. Figure 4 divides the planning system into four levels: regulation, planning, enforcement and development. The decision to contribute to high, intermediate, or low probability of effective flood protection is given in green, amber and red respectively. Decisions at one level affect the ability to provide flood protection at the level below.

The rectangular blocks along the 'Development' line show the final level of risk at the level of individual development.

Regulatory obligations directly impact what is delivered at a local level.

- Fluvial flooding is currently regulated more effectively than surface water flooding (as demonstrated by the case studies).
- Outcomes for surface water flooding are therefore less likely to be effective than for fluvial flooding, which is illustrated in Figure 4.

At the planning level, current resource limitations, access to appropriate skills and sometimes politics mean we can expect planning authorities to be restricted to somewhere between the red and amber range (dashed red circles). Any green activity would be deemed 'exceptional'.

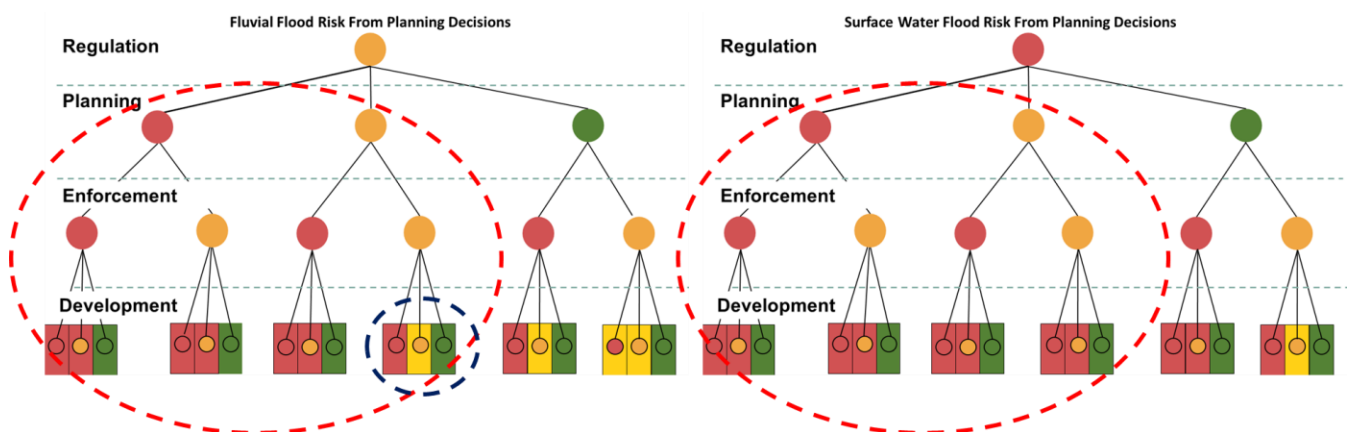
At the enforcement level, it is only possible to have either ineffective (red) or intermediate (amber) capacity; enforcement cannot contribute to 'beyond compliance', ie green.

[‡] A bund is a tried and tested barrier to protect property from flash flooding and rising rivers.

[§] Swales are shallow, broad and vegetated channels designed to store and/or convey runoff and remove pollutants. They may be used as conveyance structures to pass the runoff to the next stage of the treatment train and can be designed to promote infiltration where soil and groundwater conditions allow.

At the development level, developers can contribute to either high (green), intermediate (amber) or low (red) probability of effective flood protections, as the examples in the two case studies illustrate.

Within the range of likely planning capacity scenarios (dashed red circles), only one of the possible outcomes reduces flood risk to an 'intermediate' level (dashed blue circle). This is compliance with fluvial flood risk regulation by all parties, without the exceptional case of a developer operating beyond the requirements of compliance. This is reported by planners and advisors to this project as a common outcome in fluvial flood risk management, but is not inevitable. Surface water flood risk does not achieve 'amber' flood risk without exceptional action by a developer.



Key			
●	Decisions contribute to a high probability of effective flood protection	■	Developments with high probability of flood protection
●	Decisions contribute to an intermediate probability of effective flood protection	■	Developments with intermediate probability of flood protection
●	Decisions contribute to a low probability of effective flood protection	■	Developments with low probability of flood protection

Figure 4. Adaptive capacity of decisions and flood risk

3. Planning decisions, adaptive capacity and insurability

3.1 Challenges

Examining flood risk at the regional scale shows the interconnectedness and landscape impacts of climate risk. For example, the flood risk of surface water is unpredictable due to the effect of drainage and sewerage systems that crisscross individual properties. The following section identifies improvements in planning and flood assessments that might help each achieve better outcomes and meet their purpose in the context of climate change.

In terms of planning, the analysis revealed several flood management issues. For surface water flooding, in particular, the local authority had limited ability to affect the decisions and actions of developers during both the planning and construction phases. This was not helped by fragmented roles, and accountability in flood management allowed loopholes to be exploited by a developer in areas highly vulnerable to flooding. In addition, stakeholders reported that recruitment is difficult due to limited people with the right skillset.

There are also flood management implications for the insurance industry that are currently not being addressed. Ensuring initial and ongoing insurance availability for a property is not currently a requirement of the planning application process. This means that there could be difficulties providing homeowners of new build homes in flood risk areas with affordable and accessible cover without the Flood Re scheme, as the scheme does not include properties built after 2009 and will only run until 2039. Since being launched in 2016, more than 350,000 flood risk households have benefited from access to affordable cover^{viii}. A further challenge is that the disconnect between construction insurance and ongoing residential and commercial property insurance means details of construction methods and materials are not readily available.

3.2 Opportunities

To address these challenges, there are a number of opportunities to incentivise adaptation and resilience across development, planning, construction and occupation, many of which can be led or supported by the insurance sector. These opportunities could be affected by two channels – supporting changes to the planning and flood assessment process, and enhancing insurance products and services.

Planning and flood assessment

- Ensure there are no inappropriate developments in flood risk areas. Mandate a more transparent planning application process with clear monitoring and reporting by local authorities on planning decisions, especially when the decisions have been taken against the advice of the EA or devolved agency equivalent.
- Create greater alignment between Defra and the Department for Levelling Up, Housing and Communities (DLUHC) on planning and development policy. This could be achieved through a joint minister, a co-ordination unit or, as the Climate Change Committee has called for, a new Office for Risk and Resilienceⁱ.
- Incorporate mandatory flood resilience in building regulations and planning criteria for residential and commercial developments, including those buildings outside Flood Re's

remitⁱ.

- Ensure developers are held responsible for any measures necessary to ensure that properties are protected from flood risk to the highest possible standard for at least ten years from occupationⁱ.
- Make it mandatory for developers to report flood risk assessment details and mitigation measures to buyers, and make these available to (re)insurers.
- Develop a training framework (potentially led by the insurance industry) to provide planners and developers with better skills in flood risk assessment and increase planners' capacity to enforce regulation^{ix}.

Insurance industry products and services

- Provide advisory insurance services to developers to assist with preparing planning proposals. Insurance products could potentially be made available if the process becomes difficult.
- Extend and deepen insurers' engagement with the design, approval, construction and occupation of developments. This might include construction insurance requiring the building to be as per planning approval, or construction coverage extended to flood risk in the ten years from occupation.
- Provide insurance to property owners, banks and capital providers for the financing of properties against developers who build in flood zones or where flood mitigation plans have not been followed.
- Move towards Flood Re's Build Back Better initiative as an industry standard, which is designed to reduce the cost and impact of future floods by including property resilience measures as part of flood repairs^x.
- Provide premium incentives for individual property- resilience measures that promote resilience such as flood doors, pumps and raised electrical sockets^{ix}, and more generally publicise and encourage homeowners to adopt these measures.
- Explore the potential for (re)insurers to act as long-term real estate investors to partner with developers on climate-ready infrastructure.

In short, the focus of future work should be to inform and work with government and clients to reduce the risk exposure – limiting developments in areas prone to flooding in the future, and bolstering adaptation and resilience measures.

Schedule 3 opportunities

Schedule 3 of the Flood and Water Management Act 2010 has been recommended for implementation to mandate the use of SuDS in new developments in England. The intent is to try to provide more protection through effective SuDs than we see in this study. At the time of writing this report, the details supporting this intent had not been settled.

Possible outcomes will deliver varying levels of additional protection. The capacity of planning departments to enforce their decisions, and market responses to developers that do not follow planning decisions, will be central to the effectiveness of the schedule. Outcomes of Schedule 3 will also be affected by Local Authority resources and skills.

4. Conclusion

Although climate data, scenarios and assessment methods continue to improve, it is clear from the case studies that sufficient information on flooding already exists in some regions to achieve better planning outcomes.

The research highlighted that the poor outcomes of development result from:

- a lack of knowledge sharing
- limited regulations on UK residential property flood risk management at the planning and construction stages
- limited enforcement of regulations
- weak market signals to developers to provide resilient flood protection.

The risk management loopholes in the current policy and regulatory landscape exacerbate the problem and create property development unsuitable for the long term. The flood risk exposure is passed down from developers and planners to property owners and government emergency services.

Engagement and work with governments to progress the specific requirements detailed above is vital. This should be supported by a coherent and consistent insurance industry position as provided by associations such as ClimateWise and the Association of British Insurers (ABI). The regulatory changes this action can unlock will highlight the opportunities, encouraging developers to change both their business model and culture.

The planned introduction of Schedule 3 is welcome. If it does not address the drivers of risk identified in this study, new homes throughout England, that are built without effective risk mitigations, will be growing at risk of becoming uninsurable during the next 100 years.

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