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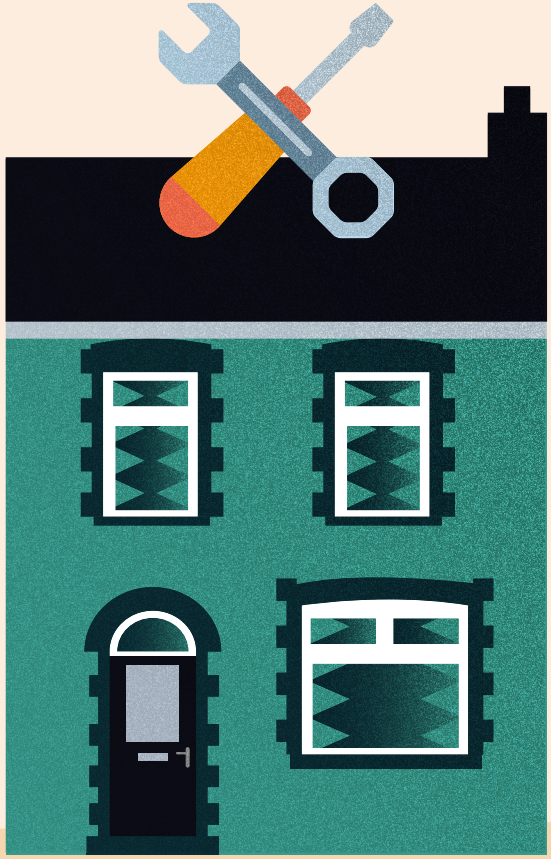
Considering repair, maintenance and adaptation priorities for older properties

Factsheet for housing owners and occupiers.



Introduction

This factsheet aims to provide you with a better understanding of the maintenance, repair and adaptation priorities for older, traditional properties under a changing climate.

Typically, these properties are over 100 years old. Traditional construction is building construction consisting of solid brick, earth or stone external walls, or pre-1919 timber-framed external walls with any infill (BSI, 2023).

Climate change and climate vulnerabilities

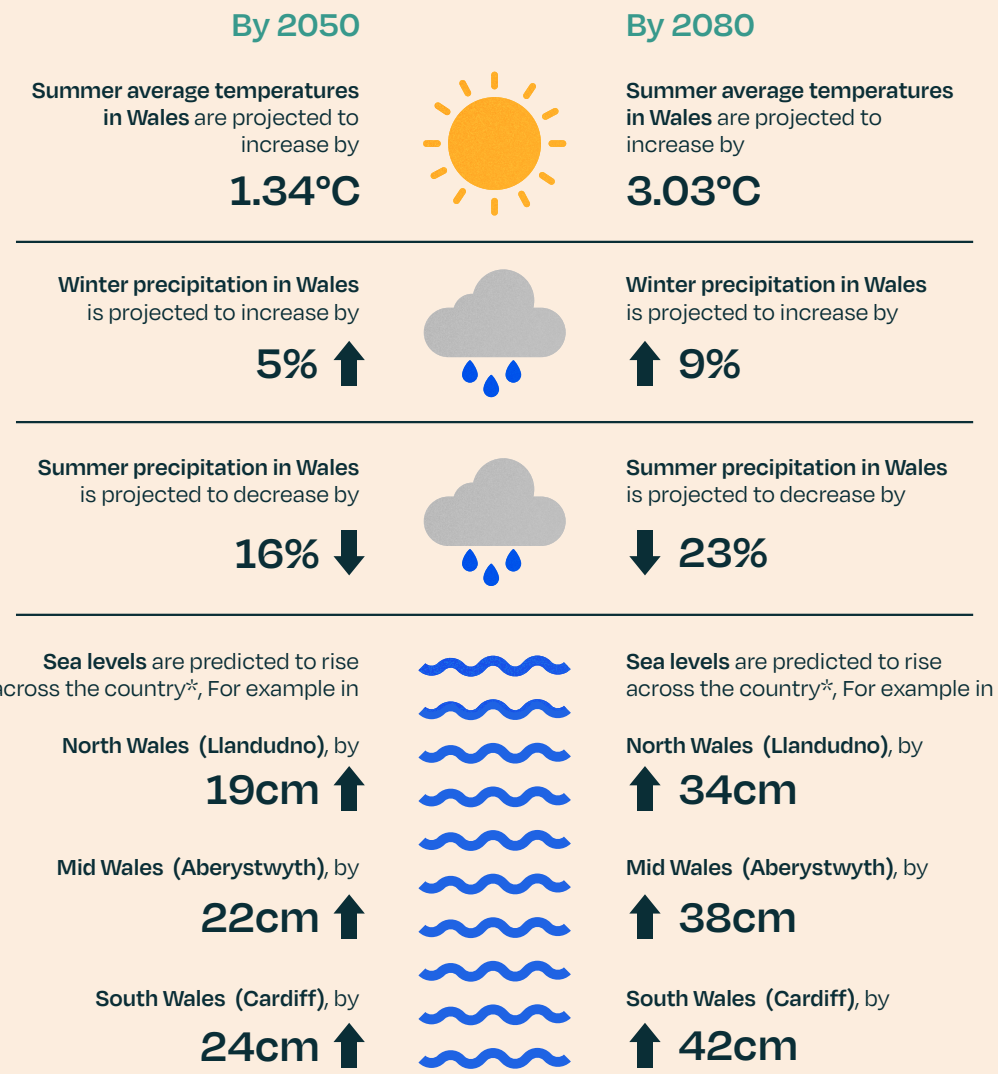
The urgency and likely impact of climate change has been thoroughly assessed by scientists, the results of which are now widely published and regularly reported in the mainstream media.

Current international decarbonisation efforts are unlikely to hold global warming to 1.5˚c. Accordingly, we need to plan for **warmer, wetter weather in Wales** (Figure 1), and with this more extreme weather patterns including high winds, storm surges and intense precipitation. Our summers will be hotter, drier, and we are likely to experience heatwave episodes. We need to prepare for these changing weather patterns and adapt our homes accordingly.

In recent years there has been a focus on decarbonisation efforts, aimed at improving the energy efficiency of our homes whilst reducing our reliance on fossil fuels. However less emphasis has been placed on the importance of appropriately maintaining dwellings.

There are benefits to taking a holistic approach to climate mitigation and adaptation, and buildings need to be put into a good state of repair before any other works to improve their thermal performance is undertaken.

Figure 1: Climate Change predictions by 2050 and 2080 taken from the UK Climate Projections (UKCP18) dataset.[1]



1 – UK Climate Projections (UKCP18), Met Office https://www.metoffice.gov.uk/research/approach/collaboration/ukcp/index

Good maintenance can also help the energy efficiency of a building. For example, maintaining our roofs and gutters, clearing out our drains, addressing any render or mortar cracking or evidence of water damage, touching up exterior paintwork to keep moisture and wood rot at bay, and regularly inspecting window and door seals, are all simple measures that will reduce air and moisture penetration and help with energy efficiency, ultimately reducing energy and carbon consumption.

Current and future risks

Climate vulnerability modelling (Hayles et al., 2022) has demonstrated that the service life of the principal building materials used in our homes will be reduced as a consequence of climate change. There will be a cost attached to this. Therefore, it is more important than ever to consider how we repair, maintain and adapt our buildings to address the challenges caused by a changing climate.

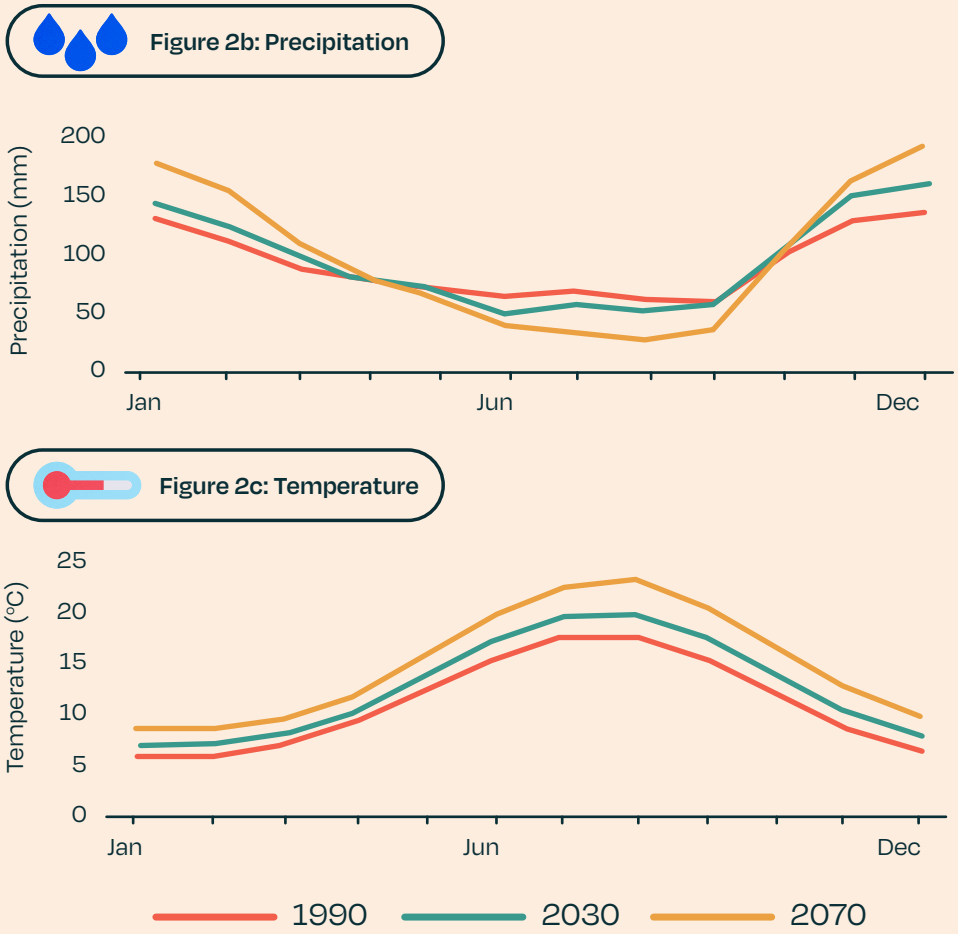
Understanding present and future climate stressors, particularly those associated with precipitation, temperature and solar flux, will help inform climate mitigation and adaptation approaches and how to tackle these concurrently.

Not every building material and component is impacted by every climate variable. For example, masonry walls are not degraded by increased temperatures, although if mortar joints and renders are not properly maintained, water penetration may reduce their life expectancy over time.

Building orientation will play a key role. We will need to repaint our timber doors and windows more frequently on southerly facing elevations to avoid blistering paint from increased solar flux, and any subsequent moisture ingress.

Extreme winds, concentrated downpours, and associated events such as flooding are difficult to predict and therefore there needs to be a level of preparedness. With increased incidences of wind driven rain (WDR) we will need to check that our roof tiles are secure, and our downpipes and our gutters are cleared more frequently to prevent unnecessary and costly damage (see Table 1).

Figure 2: Modelling Cardiff's building fabric vulnerabilities for temperature and precipitation projections



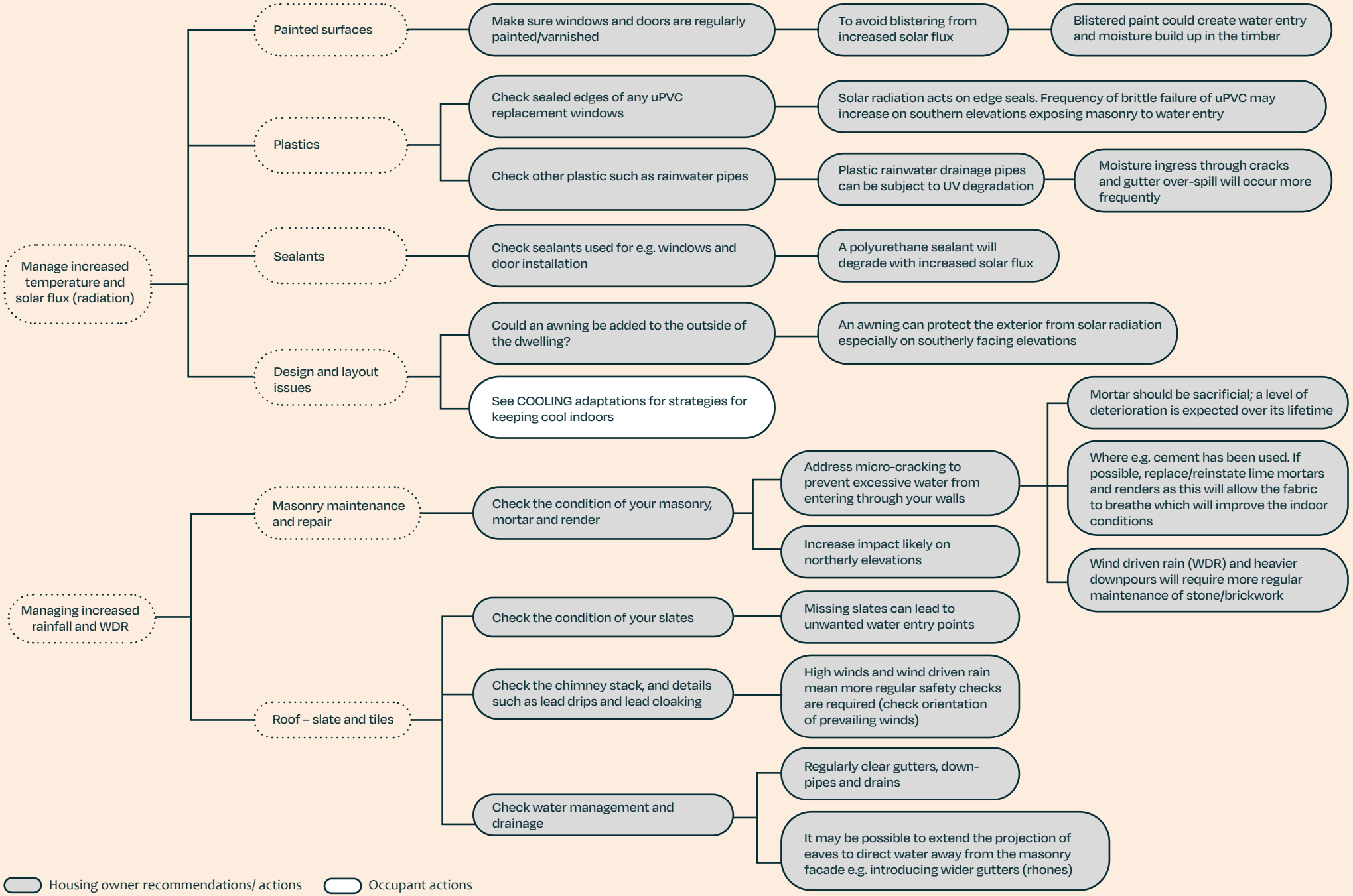
Climate change will inevitably impact on frequency of building maintenance, and we will need to adapt to new, more regular, maintenance patterns.

Climate stressor data (Hayles et al., 2022) can be used in combination with existing knowledge and understanding of building fabric performance and deterioration mechanisms to better inform frequency of repair, maintenance, and adaption, to mitigate further or future damage (see Table 1 and Figure 3).

Table 1: Building fabric performance and deterioration mechanisms

Material/component	Deterioration mechanisms	Climate stressor adaptations
Solid stone or brick	▪ Masonry deterioration is associated with excessive moisture content. ▪ Water ingress, wet-dry cycles, freeze-thaw cycles, rain splatter at base of walls. ▪ Discoloration (staining) micro-cracking, biological/organic growth. ▪ Relative humidity < 75% can escalate crystallisation–hydration cycles, so drier, hotter summers could be a potential threat.	▪ WDR and heavier downpours will require more regular maintenance of stone/brickwork ▪ Address micro-cracking to reduce moisture ingress. ▪ Increased impact likely on northerly elevations.
Painted render	▪ Water ingress, wet-dry cycles, freeze-thaw cycles, rain splatter at base of walls. ▪ Discoloration (staining), cracking, biological/organic growth. Loss of strength may also occur. ▪ A reflective/pale coating can prevent walls exposed to sunlight reaching a critically high temperature	▪ Address cracking to reduce moisture ingress. ▪ Increased impact likely on northerly elevations.
Painted/treated timber (window frames and doors)	▪ Solar radiation and moisture lead to erosion or stains and blistering of varnish/paint, that allow timber saturation. ▪ With high Solar flux, increased blistering will occur on painted timber on south facing elevations increased frequency of repair. ▪ If level of moisture is raised >20%, rot can damage frames.	▪ Frequency of repaint/retreating will increase on southern elevations.
uPVC replacement window frames and doors	▪ Moisture, atmospheric gases, and solar radiation acts on edge seal.	▪ Frequency of brittle failure of uPVC may increase on southern elevations.
Lime/cement mortar repointing	▪ Mortar should be sacrificial; a level of deterioration is expected over its lifetime	▪ Repointing the mortar more regularly will reduce moisture ingress in stone/brickwork. ▪ Increased impact likely on northerly elevations.
Roof – slate and tiles	▪ Rare delamination of poor-quality slates [usually fixings/supporting timbers that deteriorate before the slate tiles themselves]	▪ High winds/WDR, more regular safety checks required including chimney stack (check orientation of prevailing winds)
Decorative ceramics	▪ Moisture in backing or adhesives	▪ WDR and heavier downpours will require more regular maintenance of ceramic tiles
Guttering uPVC	▪ Plastic rainwater drainage pipes can be subject to solar degradation and physical impacts during maintenance access. ▪ Moisture ingress through cracks and gutter over-spill will occur more frequently.	▪ WDR and heavier downpours will require more regular maintenance of gutters, joints, and drainage
Drains	▪ Pooling and rain splatter at base of walls.	▪ Heavier downpours will require more regular maintenance of grates and drainage
Sealants	▪ Moisture, atmospheric gases, and solar radiation. A polyurethane sealant will degrade in sunlight, whilst a silicone sealant will be virtually unaffected. Hardening, chalking, crazing, cracking, and reverting all suggest the sealant needs replacing.	▪ Frequency of replacement of polyurethane sealant will increase on southern elevations

Figure 3: Building Fabric Climate Vulnerabilities and Adaptations for Pre 1919 Dwellings



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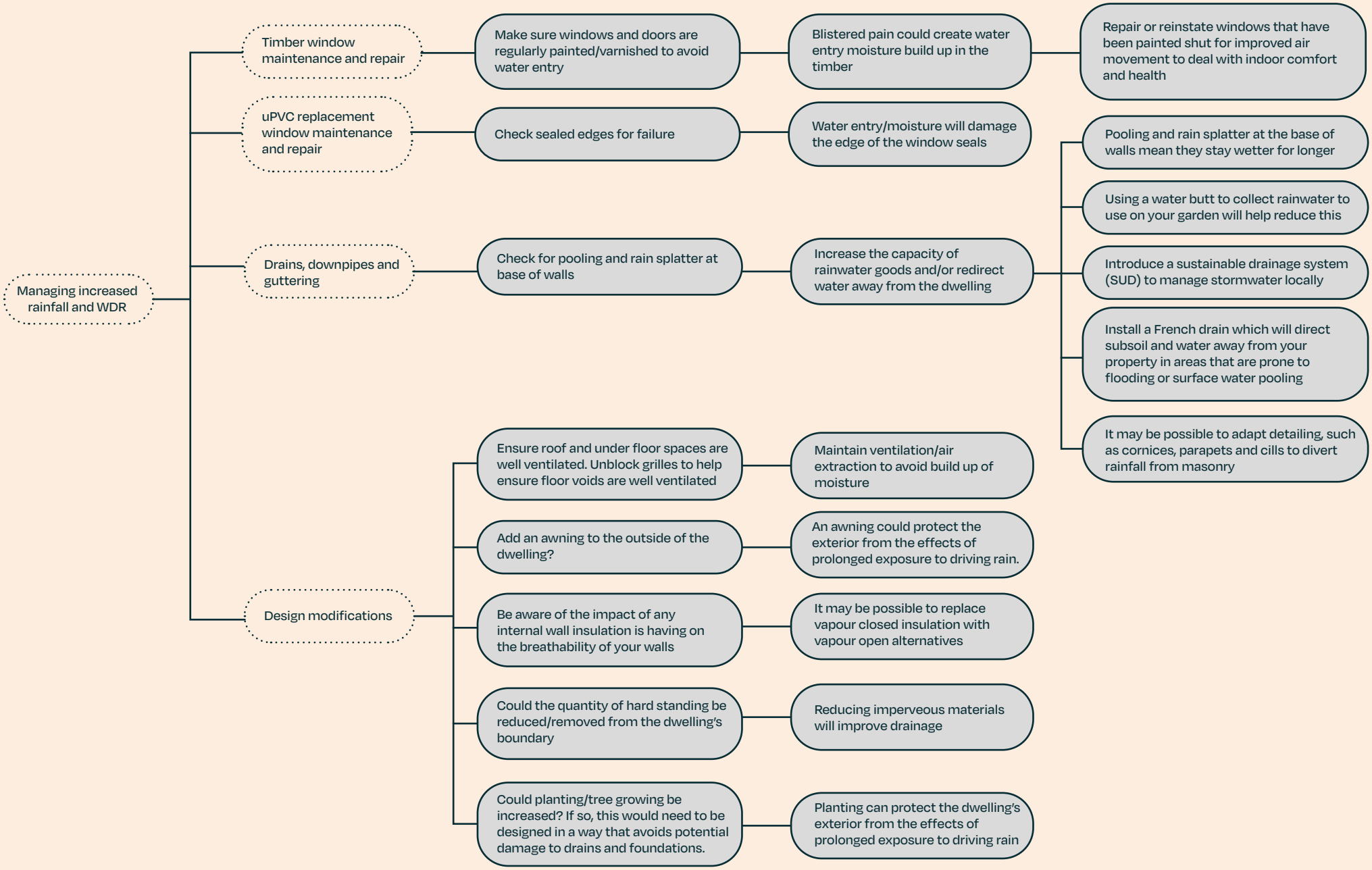

Housing owner recommendations/ actions Occupant actions

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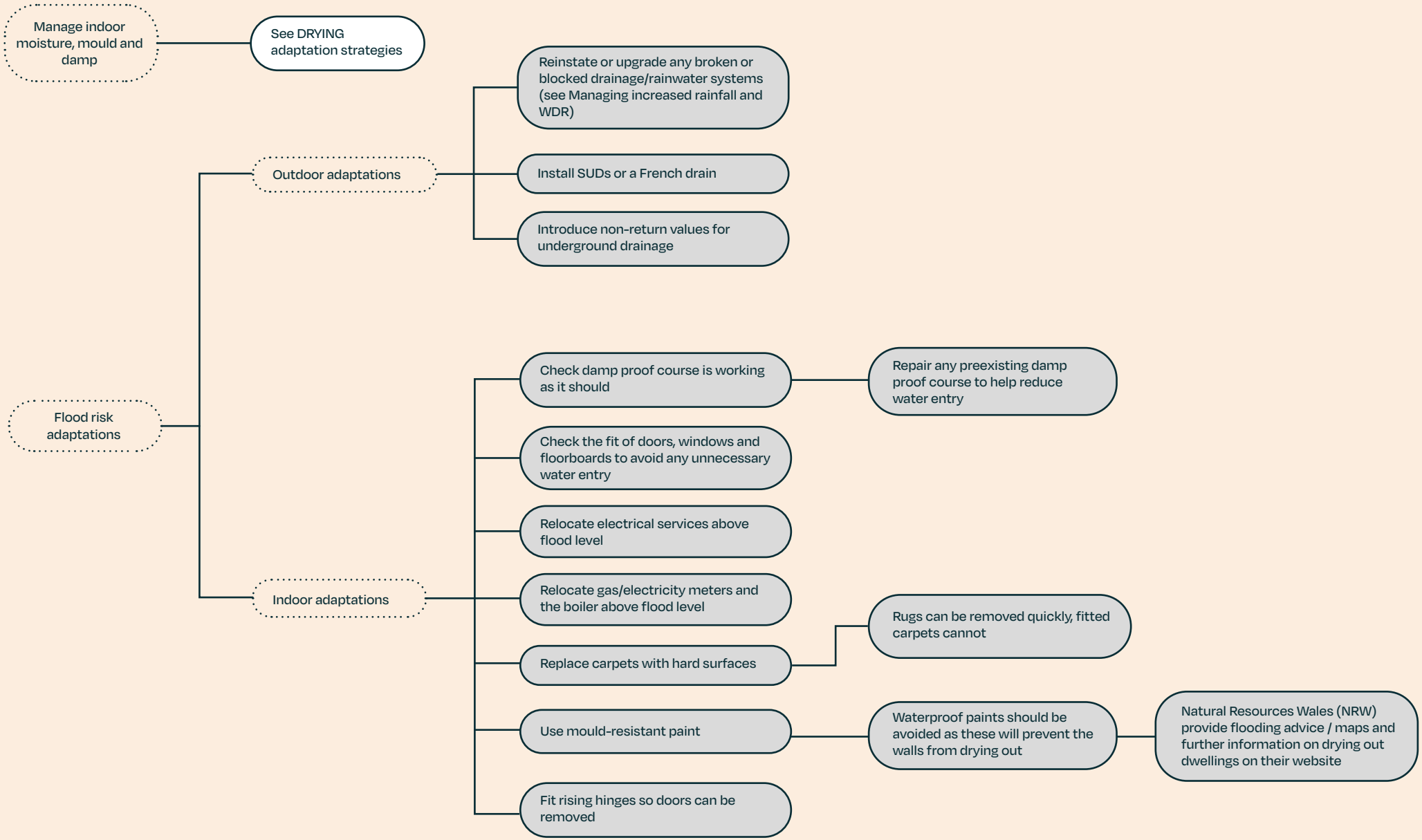

Organisations

- BRE https://bregroup.com
- Cadw https://cadw.gov.wales
- Historic England Historic England - Championing England's heritage | Historic England
- Historic Environment Scotland Historic Environment Scotland | Àrainneachd Eachdraidheil Alba
- National Trust https://www.nationaltrust.org.uk/
- The sustainable traditional buildings alliance STBA – UK Centre of Excellence for traditional buildings (stbauk.org)
- UK Centre for Moisture in Buildings UKCMB home - UK Centre for Moisture in Buildings

Links to advice and guidance for older building maintenance and care

- Adapting to Climate Change | Cadw (gov.wales)
- Flooding and historic buildings in Wales | Cadw (gov.wales)
- How to Improve Energy Efficiency in Historic Buildings in Wales | Cadw (gov.wales)
- Looking After Historic Buildings | Historic England
- Maintenance and Repair of Older Buildings | Historic England
- Publications | Leading Public Body for Scotland's Historic Environment
- Maintenance Matters! | Cadw (gov.wales)
- Repair of Traditional Buildings | Historic Environment Scotland

Further reading on climate vulnerability modelling

- Hayles, C. S. (2022). How resilient are buildings in the UK and Wales to the challenges associated with a changing climate? Welsh Government. Available online at https://gov.wales/resilience-buildings-challenges-associated-climate-change-report
- Hayles, C.; Huddleston, M.; Chinowsky, P.; Helman, J. 'Quantifying the Effects of Projected Climate Change on the Durability and Service Life of Housing in Wales, UK'. Buildings 2022, 12, 184. https://doi.org/10.3390/buildings12020184

Additional references

- BSI. PAS 2035:2023 Retrofitting dwellings for improved energy efficiency – Specification and guidance. British Standards Institution

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