# ADAPTING OUR HOMES & NEIGHBOURHOODS TO THE IMPACTS OF CLIMATE CHANGE

CHRIS MORGAN

**NOVEMBER 2024**

LOCO HOME RETROFIT

# CONTENTS




Net Zero Scotland
Scottish Government

LET'S DO NET ZERO

# INTRODUCTION

There is now no doubt that climate change is baked into our future, and the issue is that **the slower we are and the less we do to work against it, the worse it will become**.

There is a great deal of uncertainty around the details, but there is some consensus about the overall trends that will affect Scotland and the UK: unless or until the ocean currents fundamentally change things, **it is going to get warmer, wetter, and wilder**.

For those interested in the subject, the UK Climate Change Committee and Adaptation Scotland are useful resources, but the focus here is around the immediate consequences for buildings and the spaces between them.

CHRIS MORGAN
**NOVEMBER 2024**

John Gilbert
ARCHITECTS

# WARMER

**1.1** OVERHEATING
**1.2** URBAN HEAT ISLANDS
**1.3** FIRE RISK
**1.4** THERMAL STRESS IN BUILDINGS

# **1.1** OVERHEATING

To those who feel the cold more keenly, the thought of overheating may seem like a rather welcome change, but the reality is much more problematic. Overheating in buildings in the UK is generally considered a temperature of 25°C or more, and while this is no more than an inconvenience for some, it can become a serious issue for others.

Mild heat-related health effects include dehydration, prickly heat, heat cramps, heat oedema (swelling), fainting, and heat rash. More severe effects include impacts on mental health and heat exhaustion which can lead to heat stroke if not managed. Overheating can be fatal as it may result in strokes and heart attacks as well as exacerbating many pre-existing chronic illnesses. Overheating risks are increased by higher night-time temperatures in bedrooms because it prevents us recovering from heat stress during the day. For this reason it is particularly important to keep bedrooms cool wherever possible.

The biggest problem is that because overheating has been historically experienced less in the UK, **our buildings have little built-in resilience**, and this is particularly the case with most modern homes. Older buildings like tenements are often better because of their thermal mass and higher ceilings, but it is worth remembering that **occupant behaviour - what people do in their homes - is more important than the design of the homes**, which is more important than the location, so this can be more of a problem in Scotland than many might imagine.

South facing windows and spaces are more of a risk because that is where most of the sunshine enters a home. East facing spaces are less of a risk because any overheating will be in the morning, when it is usually cooler, and the sun will move away by lunchtime. West facing windows, on the other hand can be more problematic because on warm evenings, the overheating can follow a warm day, when the rooms are already warm, and the lower sun angles can make it harder to effectively shade, without blocking the view.

# PRACTICAL SOLUTIONS
# FOR OVERHEATING

## EXTERNAL SHADING SOUTH FACING WINDOWS & DOORS

The best solutions are either fixed or movable shades / shutters / louvres / canopies which block the high level sunshine during the middle of the day without necessarily blocking the view. There are many considerations such as planning permission, the structural ability of the building to take external structures and easy and safe access to adjust and maintain anything fixed to the outside of a building. Deciduous trees and planting can have a similar effect.

## EXTERNAL SHADING WEST FACING WINDOWS & DOORS

Overheating can often be more serious in the evenings and overnight and West facing windows can be the culprits for this. High level shading that works for midday sun doesn't work as well, so some form of vertical panels, like the sorts of traditional shutters found in Europe, or contemporary sliding versions would work well. Again, planning, structural and access issues may well be a constraint.

## CROSS VENTILATION

If you have a property where there are windows on opposite sides then 'cross-ventilation', allowing natural air movement through the building can be helpful, but often it is warmest when there is little natural wind, so this solution doesn't always help. This may be the only option for many flats however.

## STACK VENTILIATION

'Stack ventilation' is where warm air rises naturally and is replaced by cooler air from below. In any property, if it is possible to open one high level opening and one low level this can work well. In a detached house, for example, opening one downstairs window and a rooflight over the stairwell can work even in still, warm weather, but this is not always possible in tenement flats. Rooflights facing North or East are preferable to South or West facing options if you have a choice.

With any natural ventilation, bear in mind that during the day, and on the sunny side, the air outside can be warmer than the air inside so it doesn't always help to open windows. Make sure you are only allowing in air from shaded or cooler spaces. Sometimes opening windows, especially from ground floor rooms can be a security issue so it is recommended that ground floor windows have smaller casements which can be safely left open.

## INTERNAL SHADING

Internal shading can be of some value, but it is limited. The 'greenhouse effect' that causes global warming also happens in homes, where it is harder for the heat to escape once it has come through the windows, hence the importance of external shading where possible. Internal shading can reduce the radiant heat of the sun, and when combined with open windows can help when there are few other options.

## INSULATED PIPES

Uninsulated hot water pipes add welcome warmth in winter, but in summer they can be contributors to overheating. Make sure all hot water pipes in your home are fully insulated. Problems often occur with solar thermal systems which only generate warmth in summer and if uninsulated can make things much worse.

## HIGHER CEILINGS

Overheating can be more problematic in smaller room volumes and lower ceiling heights. In this way, tenements are actually often better than modern homes.

## INSULATION

Well insulated properties, especially in the lofts are better protected against both the cold and the heat. Upper floor spaces in particular should make sure their loft is well insulated. If it  is possible to open rooflights in hot attic spaces, this can relieve pressure on the rooms below.

## CONTROLS

It is important to understand and control the various heating and ventilating mechanisms in your home to avoid inadvertently make things worse. Not adjusting programmers for summer use, or not setting thermostatic controls, for example, can mean more heat is produced than is needed.

## COOL ROOM

It is not always possible to keep the whole house comfortable, but it can help to keep at least one room cooler to escape from the heat for a while. Because getting good sleep is so important in a heatwave, and because sleep is harder when it is warm, the priority for any 'cool' room should normally be a bedroom. Opening and closing internal doors can help to keep different spaces at different temperatures, while lower floors and North-facing rooms are often naturally cooler. It may be worth having a plan for warmer periods and moving things around to make these work when needed.

## ELECTRICAL ITEMS

Be aware that most electrical items, particularly those with large electrical consumption like fridges and TVs can actually emit a good deal of heat. Where possible, it is better to get more efficient equipment which gives off less heat, but it can also help simply to switch off some items at times.

## PERSONAL BEHAVIOUR

Personal behaviour is often the biggest variable in keeping cool in warm weather. Cooking can be a source of heat, so it is worth considering alternatives to long oven-cooked meals where possible.

# **1.2** URBAN HEAT ISLANDS

Urban Heat Islands are a well-known phenomenon whereby urban areas can become several degrees warmer than adjacent rural areas. This is largely due to the high thermal mass of the large areas of concrete, tarmac, and other masonry surfaces, which heat up and then exacerbate already warm conditions, combined with limited natural shade and air movement.

The same principles that apply to individual homes also apply to urban areas; making darker colours light, breaking up the mass of concrete and tarmac, adding bodies of water that can evaporate and reduce warmth locally, providing shading, particularly trees, and adding planting, for example to rooftops, will all help to reduce the exacerbating effect of urban areas.

“urban areas can become several degrees warmer than adjacent rural areas”

# PRACTICAL SOLUTIONS
## FOR URBAN HEAT ISLANDS

### LOCAL GROUPS

There is little that individuals can do at this scale but anyone with responsibilities for a building or garden space at work, or as part of a tenant's or owner's group may be able to mobilise to effect some changes locally such as greening flat roofs under their control

### SHADING AND SOFT LANDSCAPING

The simplest changes are likely to involve planting trees for shade, and breaking up and removing unnecessarily large areas of tarmac or concrete. Soft landscaping of any sort will not store heat in the same way and any forms of shade will help to reduce overheating locally. Linking this to wider townscape or back court improvements may improve other aspects of placemaking and social interaction.

"linking to wider townscape or backcourt improvements may improve other aspects of placemaking and social interaction"

# **1.3** FIRE RISK

Higher temperatures will make it harder to control fires in both urban and rural areas. As a result, it makes sense to look more carefully at methods to reduce fire risk both in buildings and in surrounding gardens, parks and landscapes.

# PRACTICAL SOLUTIONS
# FOR FIRE RISK

## FIRE SAFETY EQUIPMENT

Make sure all fire safety equipment (sensors / alarms / extinguishers etc.) are well maintained and up to date and that everyone knows what to do in the event of a fire.

## LAND MANAGEMENT

Not everyone will have the capacity to make meaningful change here, but for those who own or manage land of any sort, including communal gardens, there are several known techniques to reduce the risk of wildfires. Tactics can include the type of planting, adjustments to increase water retention, either in the plants themselves or in the ground, additional high level water storage in emergencies and sacrificial fire breaks.

## CLEARING DRY VEGETATION

Ahead of heatwaves, clearing of dry vegetation build-up near buildings is a sensible precaution to reduce the chance of local fires (eg started in a park) spreading to properties

## FURTHER INFORMATION

For those interested, there is a great deal of expertise in the US and Canada, and in the UK, the NFCC (National Fire Chiefs Council) provide advice on wildfire prevention.

# **1.4** THERMAL STRESS IN BUILDINGS

With a mix of general warming and increasing extremes, we will experience more periods of prolonged and very hot temperatures. As a result our infrastructure will experience more failures from thermal stress.

Thermal stress in buildings occurs when parts of the building heat up and want to expand as a result. When they are constrained and unable to expand, they can break. It is fairly common, for example for South-facing glass panels to crack in high levels of heat. Another type of stress is when relatively soft materials simply start to melt or lose their robustness. Many oil and bitumen based products can suffer from this. In addition the increase in temperatures, and fluctuation back to cooler temperatures can soften or degrade a range of materials more quickly.

Having broken or failed components means, of course, higher maintenance costs, but these breakages will also lead to consequential damage like water ingress through a failed flat roof covering.

“our infrastructure will experience more failures from thermal stress”

# PRACTICAL SOLUTIONS
# FOR THERMAL STRESS IN BUILDINGS

## IDENTIFY VULNERABLE COMPONENTS

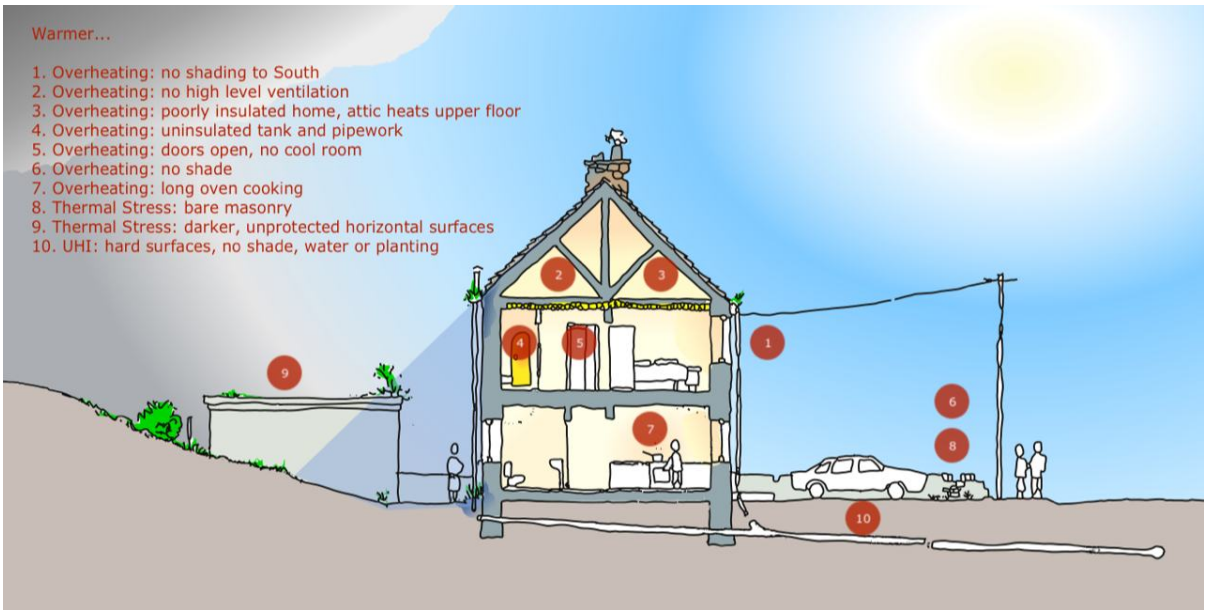
The key is to anticipate these issues and design them out or to alter particularly vulnerable components. Review the building surfaces in your home and identify any that are South-facing, unshaded, horizontal or sloping (facing the sky), or darker in colour. Check if any of these are particularly at risk due to their construction and take action to reduce these risks.

## SHADING AND PROTECTION

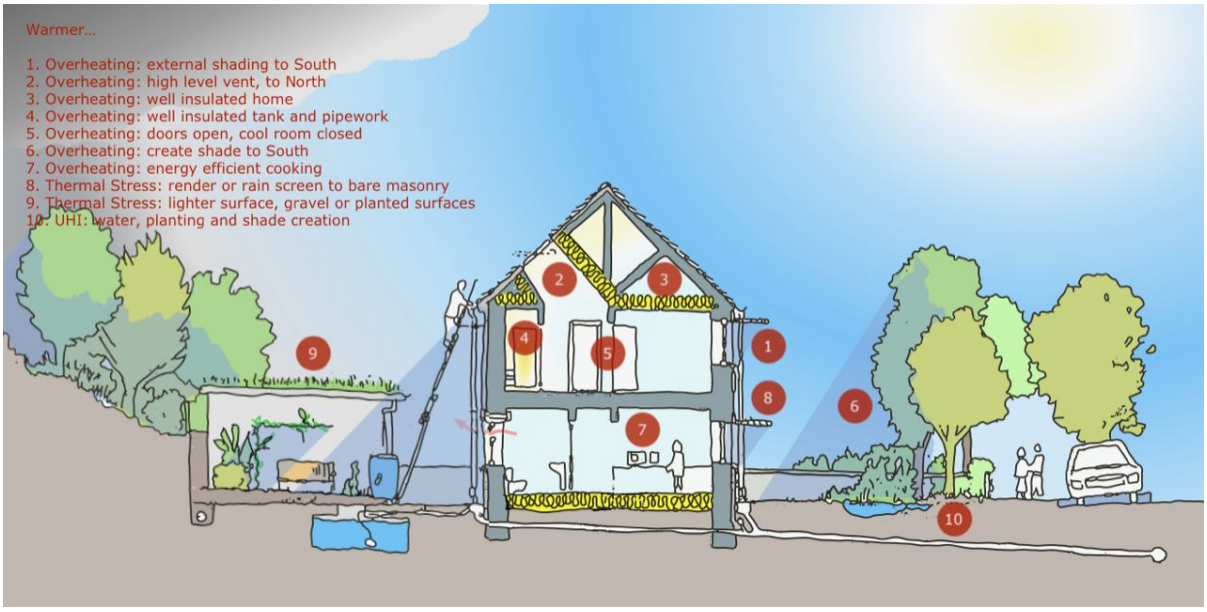
Solutions include providing more shade, other protection (such as insulation) and/or changing the colour of more vulnerable surfaces to pale alternatives (known as the 'albedo effect'). A common example of this is the practice of placing small (usually light coloured) gravel or clippings on bitumen felt roofs. The gravel or chipping reflect more sunlight and protect the felt beneath from excessive heat stress. Planted roofs that add soil and plants are even more effective at protecting membranes from thermal stress, and they can also reduce flood risk and improve biodiversity.

# EXAMPLE OF ADAPTATION MEASURES
## FOR WARMER WEATHER

### BEFORE




### AFTER



# WETTER

**2.1** BIOLOGICAL GROWTH
**2.2** RAIN PENETRATION
**2.3** WETTING/DRYING CYCLES
**2.4** FLOODING
**2.5** GROUND MOVEMENT

# **2.1** BIOLOGICAL GROWTH

Warmer, wetter weather generally will encourage all biological growth, including those things we don't particularly want in our buildings, like algae on masonry, bacteria, mould, mosses on roofs and plants in gutters, cracks in walls, and so on.

Plant growth in buildings is already something of a bugbear for those responsible for maintenance, and the reality is that this will just become more of an issue.

Regular and effective maintenance is the key, ensuring effective run-off of rain from roofs, rainwater goods and walls, as well as limiting opportunities for growth to take hold, for example via good perimeter drainage and more regular clearance of gutters etc.

Internally, warmer, more humid conditions will increase the risk of mould and timber decay, either fungal or from insects. Rather than relying on more chemical treatments which can impose significant health risks to occupants, the key will be ensuring adequate ventilation so that the necessary humidity does not build.

"warmer, more humid conditions will increase the risk of mould & timber decay"

# PRACTICAL SOLUTIONS
# FOR BIOLOGICAL GROWTH

## MAINTENANCE SCHEDULE

First and foremost ensure that there is a regular maintenance schedule for all external parts of the building. For gutters and downpipes, these should really be cleared annually, but for things like underground drainage, roof and wall finishes, a 5-yearly check should be adequate.

## GUTTERS AND DOWNPIPES

By far the most important aspect of this is to ensure that gutters and downpipes are kept clear and operational. Access can be difficult on higher buildings but where possible, safe fixing points (for example to tie back a ladder) can be added. Inserting access points at low level on downpipes can allow for blockage clearance more easily than at high level

## EXTRA ATTENTION TO FLAT SURFACES

Surfaces that are horizontal or shallow pitched are often at greater risk because water can ‘pool’ or at least linger whereas moisture will clear more readily from steeper and vertical surfaces. Flat roofs and the top surface of walls, steps and window sills, for example demand a little more care and attention as a result

## REMOVING PLANTS

Plant growth anywhere on a building should be quickly cleared away and the area repaired if needed. Mainly through root damage, plant growth can quickly cause considerable damage to a building. Roof finishes, wall renders and mortar should be kept in good condition at all times.

## CONTINUOUS VENTILATION

Internally the most important solution is to ensure that there is continuous and reliable ventilation to all internal spaces. ‘Natural ventilation’ may not always be enough, especially as buildings are better insulated and made more airtight. Most people are familiar with extract fans and where feasible, these should run continuously, constantly drawing out air and moisture at very low rates. Some ventilation systems also recover heat from the outgoing air and these systems also tend to dry out the humidity inside buildings, further reducing the risk of dampness and mould.

## RELATIVE HUMIDITY CONTROL

'Relative humidity' (RH) is the metric normally used to assess how much moisture is in the air. It is 'relative' because it changes depending on the air temperature, but the ideal RH for air at any temperature is between around 40% and 60%. Discomfort and some health risks, as well as increased risk of decay and mould increase as the RH extends beyond these thresholds so it is worth trying to control the RH internally. The problem is that that may not be enough, as noted above, and most people are not particularly sensitive to RH except at the extremes, so it can be useful to purchase a RH sensor which can tell you what is happening in your home at any time and take action as necessary.

## **2.2** RAIN PENETRATION

More rainfall, combined with higher winds, means that more water will penetrate buildings through poorly maintained areas, cracks in render, or in areas of splash back. Buildings that are more exposed to the weather will suffer more than those which are relatively sheltered.

"many properties rainwater goods are not suitable for short periods of very intense rainfall that climate change is bringing"

# PRACTICAL SOLUTIONS
# FOR RAIN PENETRATION

## MAINTENANCE

Good maintenance is crucial, especially of the roof finish and all roof elements like chimneys, flashing, valleys as well as the gutters and downpipes

## INCREASING GUTTER & DOWNPIPE CAPACITY

Many properties' rainwater goods are not suitable for the short periods of very intense rainfall that climate change is bringing. It is difficult to get accurate data but our understanding is that rainfall in the coming years may well be double what we could expect last century, so consideration should be given to increasing the capacity of gutters and capacity or number of downpipes to cope without overflowing and damaging the property. There are many online gutter and downpipe sizing calculators, usually by the suppliers themselves, including this one. Once you have calculated your roof area (including areas which drain onto it) and provided your location, a suitable size is provided. Our advice would be to opt for a size larger if possible.

## FILLING CRACKS

For walls, any cracks or faults in the surface could lead to water ingress so again maintenance is critical. Cracks and gaps in pointing should be filled and it may be worth considering rendering otherwise 'bare' masonry surfaces to afford more protection. Doing so makes a significant change to how a building looks and may not be acceptable to adjacent properties, nor the Planning department. If considering a render, traditional lime renders are much more forgiving than more modern cement based renders which tend to be harder and brittle, leading to cracks which can allow moisture into the wall behind.

## RAIN SCREEN

A more robust solution still is a 'rain-screen' which is a separate layer, with ventilated cavity behind, which will rebuff the weather, leaving the wall behind entirely dry. This screen can be made of almost anything, for example timber, slate, metal or a rendered board to match existing render.

## REDUCING SPLASHBACK

Splashback at low level can be a serious problem in some cases, especially where roads are close to older buildings or where drainage is particularly poor. All efforts to lower ground levels, reduce splashback directly through screening or barriers and to improve drainage and air movement will help in those conditions.

## BREATHABLE MATERIALS

Note that ‘breathable’ materials (like lime render, timber and natural insulation products) will more readily desorb (let go of) moisture than most modern, synthetic materials and while they do not reduce the incidence of rainfall, they do improve the potential of walls and other surfaces to dry out effectively, thus indirectly reducing the negative effects of increased rainfall.

## **2.3** WETTING/DRYING CYCLES

Increases in moisture levels generally, combined with higher winds will lead to an increase in the wetting and drying of exposed materials. Where this is already an issue, such as where salts are slowly leaching from masonry, it is likely to become more of an issue.

.

“potential solutions...may be rendered finishes... rainscreen cladding options, and improved details to shed water”

# PRACTICAL SOLUTIONS
## FOR WETTING/DRYING CYCLES

### FINISHES, CLADDING AND IMPROVED DETAILS

Potential solutions are the same as for some of the other aspects and all involve greater protection to exposed surfaces. This may be rendered finishes in preference to bare masonry, rainscreen cladding options, and improved details to shed water more generally.

# **2.3** FLOODING

More rainfall will lead, inevitably, to flooding in some areas. This will be linked to a range of other issues such as rising sea levels, river flooding and higher groundwater in some areas at times.

Impermeable surfaces like roads, car parks, pavements, and hard surfaces generally add to the problem, as will poorly maintained drains and already waterlogged ground. In many cases, location makes it difficult to escape the risks; being 'downstream' will always be a greater risk than being 'upstream' and there will probably come a time when certain areas or properties become uninsurable or essentially untenable as properties.

Areas especially vulnerable to flooding include any locally low-lying areas, coastal areas, and areas close to rivers, especially when there is not a lot of spare capacity in the landscape form, the rivers themselves are relatively level and the land is flatter. Many of the most effective tactics to address flooding need to be undertaken at a large scale beyond the scope of this guidance, but many options are available to individuals and groups who can exercise control over their immediate surroundings.

"impermeable surfaces like roads, car parks, pavements, and hard surfaces generally add to the problem"

# PRACTICAL SOLUTIONS
# FOR FLOODING

## WATER RETENTION

At a building or street level, the key is to create as much natural water storage as possible while also protecting buildings. Avoid impermeable surfaces wherever possible and create retention areas, with the ground itself being the main one, supplemented where necessary by man-made storage. Greater absorption and slower release of water can also be improved by swales and ponds, as well as tree planting and other greenery which will contain and slow down the rate of release of that water.

## MAINTAINED RAINWATER GOODS

To protect buildings on an individual basis, it is important to ensure the rainwater goods, downpipes and nearby drains are clear and well maintained to avoid blockages and local flooding.

## SUMP

Where flood risk is relatively manageable, it is sometimes possible to create a sump at a suitably low level along with land drainage around the perimeter of the building, such that if the sump begins to fill, a pump can automatically remove water seeping into a safe place.

## FLOOD RECOVERY

In some cases, flooding is inevitable and in these cases, there are some useful tactics to minimise damage and ease the process of recovery. Many of the following points come from the this website which is dedicated to helping those who have suffered from flooding.

- DROP DOWN SERVICES

Ensure where possible that all ground floor services drop down from the first floor, rather than rise for the ground as is more normal. All sockets should be raised further up the walls.

- FLOOD RESISTANT GROUND FLOOR

Ground floor construction should be flood-resistant, for example a concrete slab over inert insulation and a tiled finish. Avoid cavities and organic materials, like timber, that could rot.

- ## AVOID TIMBER SKIRTING BOARDS

Avoid timber or MDF skirting boards, use tiling or plastic options.

- ## BUTT HINGED DOORS

Where feasible, opt for rising butt hinged doors, which allows them to be removed, while solid timber doors will dry and can be reused unlike composite doors.

- ## RESILIENT KITCHEN

If you want a fitted kitchen, consider ‘floating’ kitchen units or as a minimum removable kickboards. Alternatively, free-standing and removable units can be used for most situations and stainless steel components (like commercial kitchens) provide a more robust solution.

- ## RAISED APPLIANCES

Install all appliances where possible into raised drawers or in some other way off the ground.

- ## NON-TIMBER LEGS

Use metal or plastic legs for breakfast bars. Consider how all items, such as cupboards, can be raised off the ground, using non-timber legs.

- ## NON RETURN VALVES

Fit non-return valves in downstairs toilets to prevent back flow from flooded sewers.

# **2.3** GROUND MOVEMENT

More rain means more moisture in the ground, which increases its fluidity in some places, particularly on slopes and where combined with increased expansion and contraction of clays. This can lead to slumps or landslides and instability more generally.

Buildings situated on affected slopes may be at risk, but effective land drainage can help, along with more disruptive 'engineered' solutions. Where a house or building appears to be at risk this is something that should be designed by a qualified engineer.

"this can lead to slumps or landslides and instability more generally"

# PRACTICAL SOLUTIONS
## FOR GROUND MOVEMENT

### LAND DRAINAGE

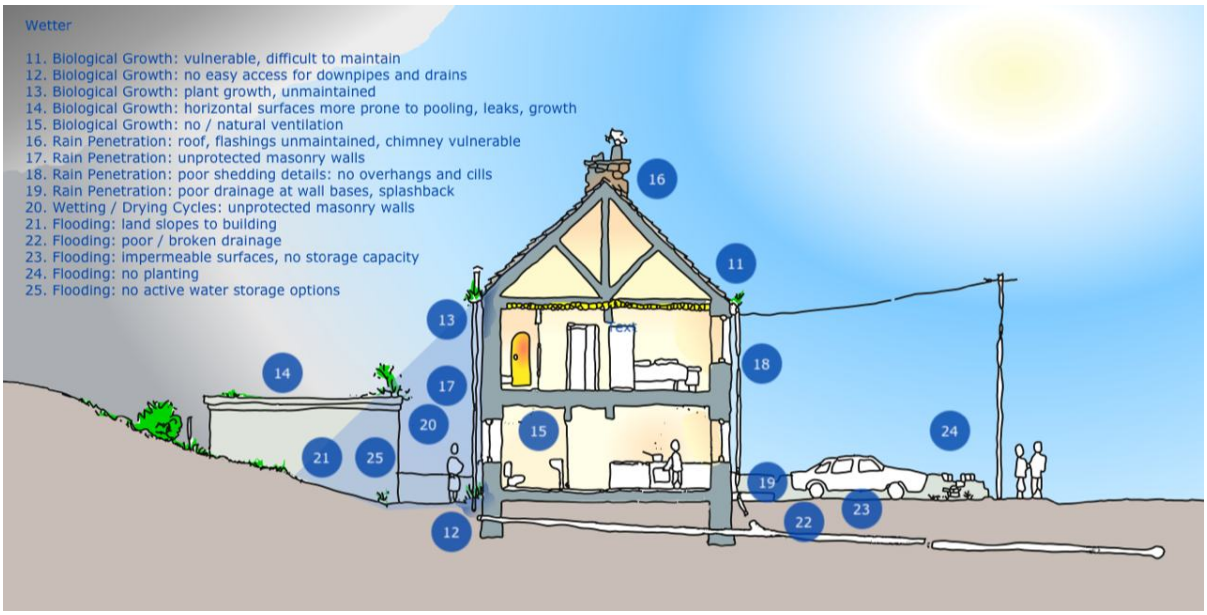
The most important solution in most cases is to reduce the amount of water flowing through the ground and this involves effective land drainage

### TREES AND PLANTS

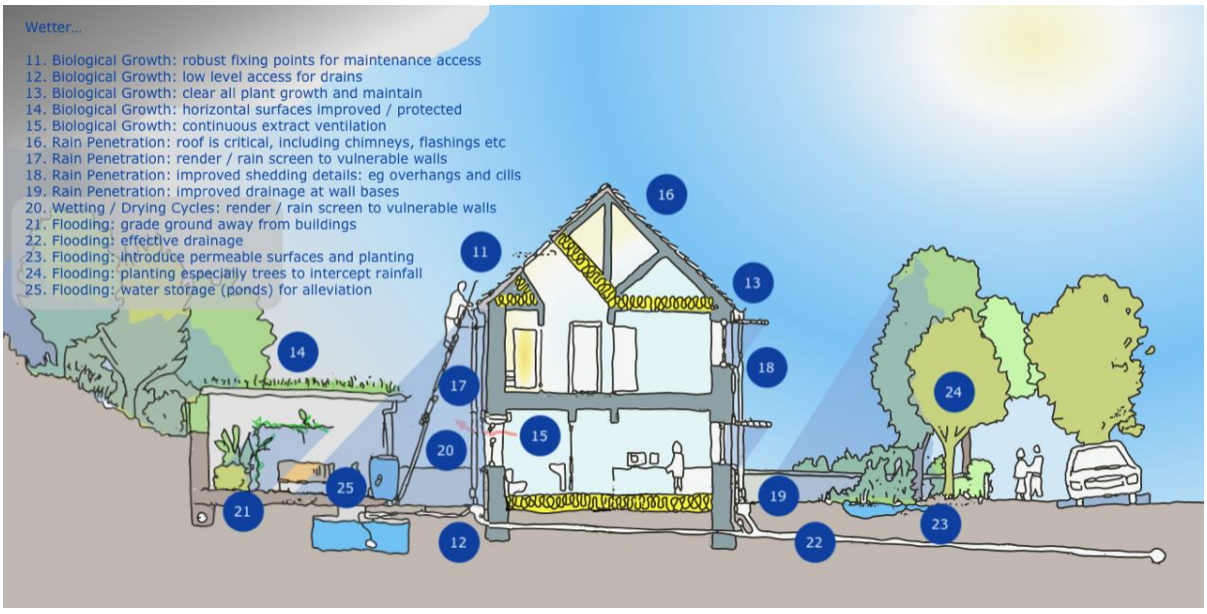
Another partial solution involves planting trees and other plants. Their leaves reduce the water falling on the ground and their roots can help stabilize the ground itself

# EXAMPLE OF ADAPTATION MEASURES
## FOR WETTER WEATHER

### BEFORE




### AFTER



# WILDER

**3.1** DROUGHTS
**3.2** STORM DAMAGE

# **3.1** DROUGHTS

Although the general trend in the UK, is for warmer and wetter conditions, the broader destabilisation of global climate patterns means that at times, we will see increasing droughts, even in Scotland.

Agriculture and industry use a great deal of water, but in buildings, it is possible to reduce our water demands through water conservation products such as those described below. Where water is metered, this can also save costs and note that savings in hot water consumption also reduce energy consumption and increase the financial savings.

“it is possible to reduce our water demands through water conservation products”

# PRACTICAL SOLUTIONS
FOR DROUGHTS

## SHADE

For those with land or garden space, providing shade will reduce evaporative losses while some of the same techniques used to prevent flooding- in particular, avoiding impermeable surfaces and maximising plant growth - can improve and increase the capacity of the ground to store water.

## WATER STORAGE

Storing water in ponds, rainwater tanks and water butts increases storage capacity and these can be used to water the garden during hosepipe bans, while proprietary rainwater harvesting systems can also be used to flush toilets and in some cases provide all the water for a household's needs.

## REDUCING WATER CONSUMPTION

Within homes it is possible to significantly reduce water consumption through aerated taps and shower-heads, low-flush toilets, minimising bath use and keeping to relatively short showers (less than 5 minutes). Composting toilets offer a more radical water-free solution.

## **3.2** STORM DAMAGE

Increased frequency and ferocity of winds will bring increasing disruption and damage. This will take two forms: direct (e.g., roof tiles blown off) and indirect (e.g. trees or power cables knocked over onto houses).

"while trees represent a risk, they also provide shade, soil stabilisation, flood risk reduction"

# PRACTICAL SOLUTIONS
# FOR STORM DAMAGE

## MAINTAINANCE

Once again, regular maintenance is the key issue here, along with the addition of some form of risk assessment.

## REMOVING OVERHANGING BRANCHES

Indirect risks to the building might include nearby trees or overhanging branches (which could break off), boundary walls or fences and overhead cables. While trees can represent a risk, they also provide shade, soil stabilisation, flood risk reduction, and a host of other ecological and climate change adaptation benefits so should not be removed unless clearly unsafe. Tree surgeons are usually the people to assess this. A good compromise where a larger tree represents a potential risk is to remove any branches that are overhanging, dead or dying, or too close to the building.

## FIXINGS

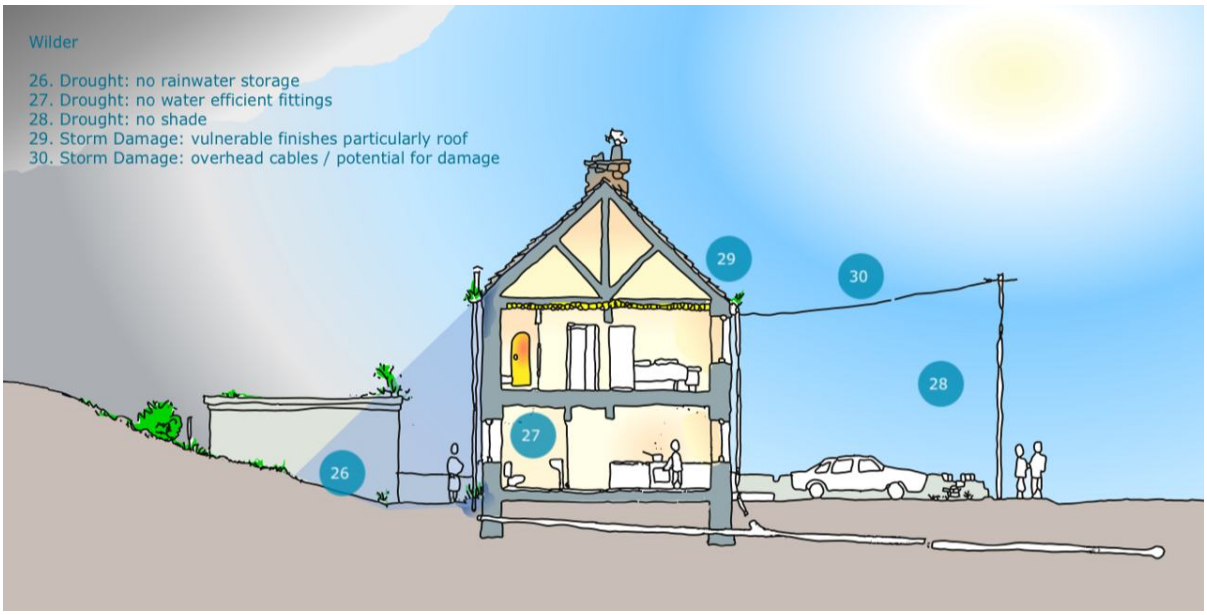
Another risk comes from larger items, often situated in gardens, which can more easily become airborne in high winds. Trampolines, sheds and other structures that could be dislodged and lifted by high winds should all be carefully checked and robustly fixed back to adjacent structures or the ground.

## ROOF FIXINGS

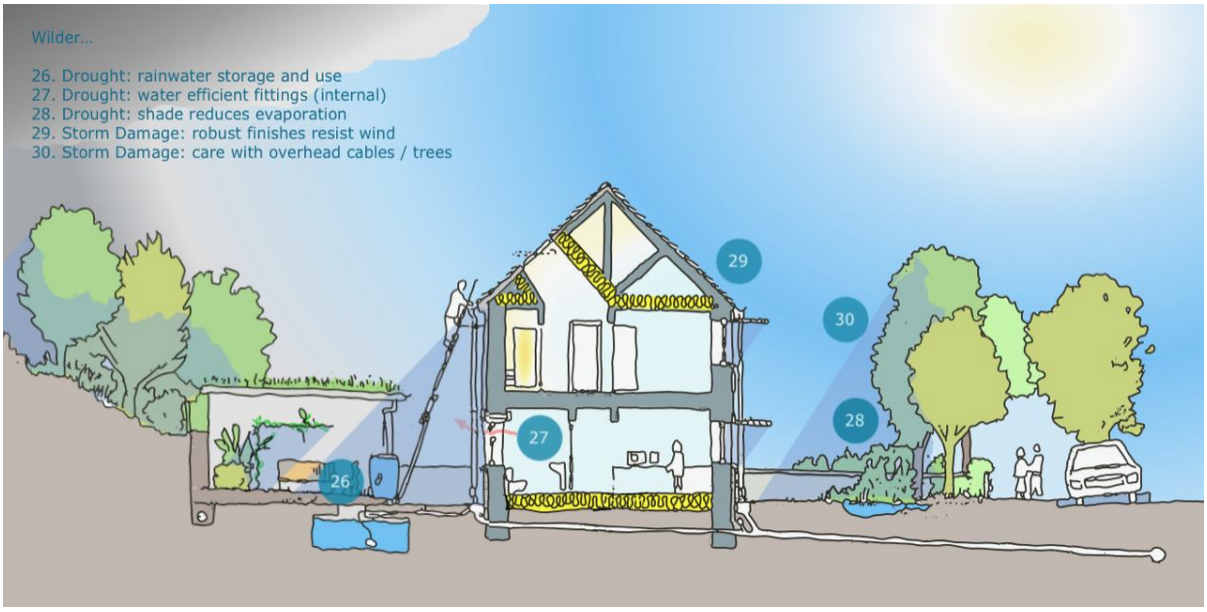
Direct risks to the building include wind damage to the roof (for example, lifting slates), damage caused by items fixed to the building (like aerials or canopies) and water damage from rain forced into the building through the high winds combined with heavy rainfall. Accordingly, it is worth ensuring that roof coverings are securely fixed, particularly around the edges of the roof where uplift forces can be stronger, ensuring gutters are large enough to carry rainfall safely away even in a storm, and that any fixed items are robust in themselves and securely fixed.

# ADAPTATION MEASURES
FOR WILDER WEATHER

## BEFORE




## AFTER



# ADAPTING OUR HOMES TO THE IMPACTS OF CLIMATE CHANGE


authored by
**CHRIS MORGAN**
JOHN GILBERT ARCHITECTS


Chris has over 30 years' experience as an architect and is certified in Passivhaus, Permaculture and Building Biology. Chris holds RIAS advanced sustainability accreditation and is a former Chair of the Scottish Ecological Design Association.

John Gilbert Architects are a Glasgow-based architectural studio, passionate about designing places for people and the planet. We deliver beautiful, efficient, affordable projects designed with users, residents and the community. We undertake design work from a strategic level to detailed architecture with creativity, enthusiasm and knowledge.


commissioned by
**LOCO HOME RETROFIT**


Loco Home Retrofit is a Glasgow-based co-operative of householders, contractors and advisers focused on promoting energy efficiency within our homes, tackling the climate crisis and keeping energy bills affordable.


LOCO
HOME
RETROFIT


John Gilbert
ARCHITECTS


Net Zero
Scotland
Scottish
Government


LET'S DO
NET ZERO