

# Future Worlds images

## How do we prepare for a changing climate?

The Earth's climate is changing, and these differences in global temperatures are already altering weather patterns, causing sea level rise and increased frequency and intensity of extreme weather. Even if emissions stop today, our past emissions mean changes to climate will continue for the next 30-40 years.

Altering our behaviour to respond to these impacts of climate change is known as 'adaptation'. It means not only protecting against negative impacts, but also making us better able to take advantage of any benefits. The earlier we start adapting, the less it will cost and the better equipped we will be to cope with these and other potential changes.

The six images presented here show potential ways to adapt to climate change in both urban and natural environments, based on our understanding of what the climate will be like in 2030.

They do not attempt to provide definite answers or solutions as the most appropriate action will depend on local circumstances<sup>1</sup>. Instead, it is intended that they should act as a pointer to some of the issues that you or your organisation needs to start thinking about to enable you to take advantage of the opportunities and minimise the risks from long-term climate change.

### Further information

Details of how the climate might change and guidance on what we can do to prepare is available on our website: [www.defra.gov.uk/adaptation](http://www.defra.gov.uk/adaptation)

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<sup>1</sup> The illustrations are designed to give an indication of what adaptation solutions might look like, and do not necessarily illustrate past, present or future government policy.

# 2030s Domestic House

Incorporating features designed to reduce the effects of the negative impacts of climate change and exploit the opportunities. This illustration is designed to provoke thought about what good adaptation to climate change could entail – it does not attempt to provide any definite answers or solutions.

## Window design

An increased number of double-glazed windows provide both insulation and natural ventilation, while shutters provide shade and screens protect against insects carrying diseases.

## Sustainable drainage

The driveway is made from permeable material so water can drain away easily. Sustainable Drainage Systems will provide a more sustainable approach to draining surface water.

## Plant selection

Plants chosen for their resilience to drought.

## Power points

Power points are positioned further up the wall to guard against flood damage.

## Garden design

A warmer climate would bring increased opportunities for leisure in the garden – trees would provide shade while the pond would provide additional drainage. All this would also help reduce the urban heat island effect.

## Raised flooring

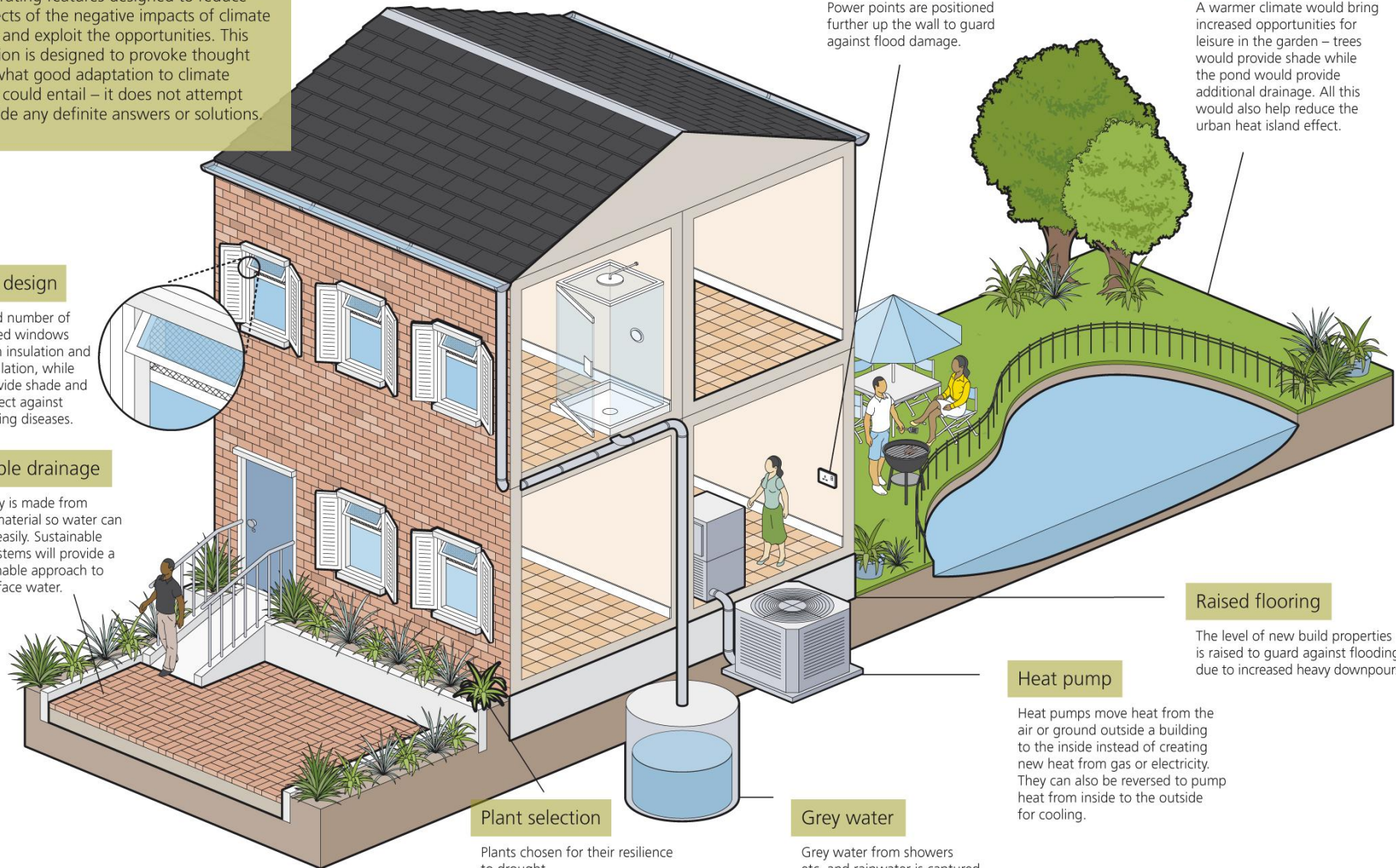
The level of new build properties is raised to guard against flooding due to increased heavy downpours.

## Heat pump

Heat pumps move heat from the air or ground outside a building to the inside instead of creating new heat from gas or electricity. They can also be reversed to pump heat from inside to the outside for cooling.

## Grey water

Grey water from showers etc. and rainwater is captured and reused.





# 2030s Cityscape

Incorporating features designed to reduce the effects of the negative impacts of climate change and exploit the opportunities. This illustration is designed to provoke thought about what good adaptation to climate change could entail – it does not attempt to provide any definite answers or solutions.

## Emergency services

The positioning of emergency service stations will be crucial, out of the flood zone and well protected against surface water flooding, to ensure they can operate in a flood.

## Outdoor activities

Warmer drier summers would mean increased opportunities for outdoor leisure activities and for businesses.

## Trees for shade

Providing natural shading for workers and residents and helping to cool the urban heat island effect.

## Roof design

Roofs could be “green” (to help with the urban heat island effect, reduce water run-off and help biodiversity), white (to reflect heat from the sun) or fitted with solar panels.

## Building design

Innovative building designs will be needed to guard against an increased risk of flooding and ensure comfort for occupants in higher temperatures. Cooling measures, natural ventilation and insulation will all play a part.

## Green Space and Water

Green space and water help to reduce the urban heat island effect and protect against flooding. Sustainable Drainage Systems will provide a more sustainable approach to draining surface water.

## Road surface

Road surface is made from materials that are able to cope with hotter temperatures and intense rainfall.

## Better drainage

Drainage systems will need to be able to cope with increased heavy bursts of rainfall. Increased use of Sustainable Drainage Systems will provide a more sustainable approach to draining surface water.



# 2030s Major Infrastructure

Featuring measures designed to reduce the effects of the negative impacts of climate change and exploit the opportunities. This illustration is designed to provoke thought about what good adaptation to climate change could entail – it does not attempt to provide any definite answers or solutions, as the most appropriate adaptive action will often depend on local circumstances. To allow inclusion in the illustration some features are shown closer together than they might ideally be situated.

## Rail

Higher standards of rail used to prevent track buckling in increased temperatures, and earthworks strengthened to reduce embankment instability due to moisture fluctuation caused by wetter winters and drier summers.

## Stronger bridges

Bridges built higher than currently required to accommodate larger tidal ranges due to sea level rise over their lifespan, and foundations reinforced to cope with higher magnitude flood events leading to increased river flow speeds.

## Motorway

Road Surface is made from materials that are able to cope with hotter temperatures and intense rainfall. Emergency gates in the central reservation allow traffic to turn around if the road becomes impassable.

## Increased water storage

Reservoir strengthened to prevent dam-burst after extreme rainfall, and covered in summer to minimise water loss through evaporation.

## Carbon capture and storage power plant

New carbon capture storage power plant, with increased flood defences to protect it from the river. Also uses dry cooling technology that limits the plant's water use, in particular in hot summer months. This will also minimise the amount of warm water put back into the river, minimising possible adverse environmental impacts.

The CO<sub>2</sub> produced by the plant is injected into deep saline aquifers, depleted oil/gas reserves or un-minable coal seams. The pipeline to convey the CO<sub>2</sub> is strengthened to withstand greater temperature ranges, possible increased subsidence and any rising groundwater levels.

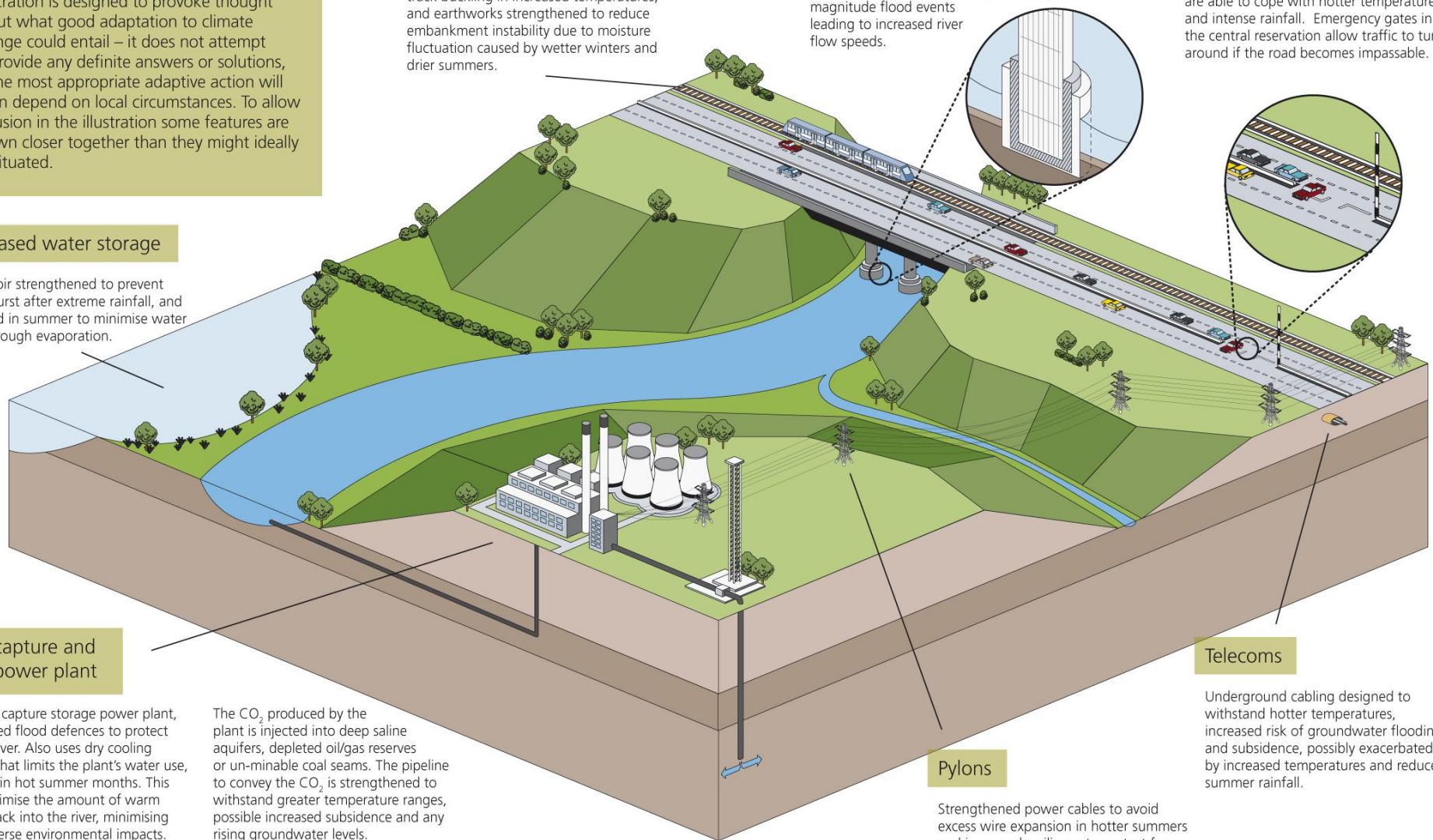
## Telecoms

Underground cabling designed to withstand hotter temperatures, increased risk of groundwater flooding and subsidence, possibly exacerbated by increased temperatures and reduced summer rainfall.

## Pylons

Strengthened power cables to avoid excess wire expansion in hotter summers and increased resilience to protect from increased extreme weather events.

This illustration does not necessarily depict past, present or future Government policy. The illustration concentrates on adaptation actions and does not highlight mitigation and other sustainable development measures.





# A Future Farm

Incorporating features designed to help cope with the negative impacts of climate change and exploit the opportunities. This illustration shows some priority adaptation measures that have been developed with stakeholders who have agreed they are cost-effective and feasible. Many of the measures will only be suitable for certain types of farm, in certain locations or circumstances, but together will help address some of the key risks of climate change. To allow inclusion in the illustration some features are shown closer together than they might ideally be situated.

## Changes to crops

Diversification of crops grown (eg. olives, grapes) to make the most of longer growing seasons and reduced frost. Changes to existing varieties, planting and harvest times to cope with hotter, drier summers.

## Land management

Improved land management to prevent soil erosion and ensure drainage can cope with increased rainfall e.g. by planting trees/hedges and creating sustainable drainage such as porous surfaces and ponds.

## Improved technology

Advances in technology will enable farmers to apply pesticides and fertilisers only where needed, improving efficiency and reducing pollution from increased rainfall.

## Livestock management

Trees planted to provide shade for animals, act as a source of renewable fuel, windbreaks and provide woodland habitat. Improved livestock housing to cope with warmer summers (by reducing heat stress in animals) and provide protection from storms and flooding. Diversifying pasture and moving feeding areas around the farm to keep livestock off waterlogged fields.

## Combined heat and power plant

Combined heat and power plant used to save money, reduce emissions and increase energy security. Powered by wood grown on the farm and used to heat neighbouring crop storage facility.

## Farm shop / cafe

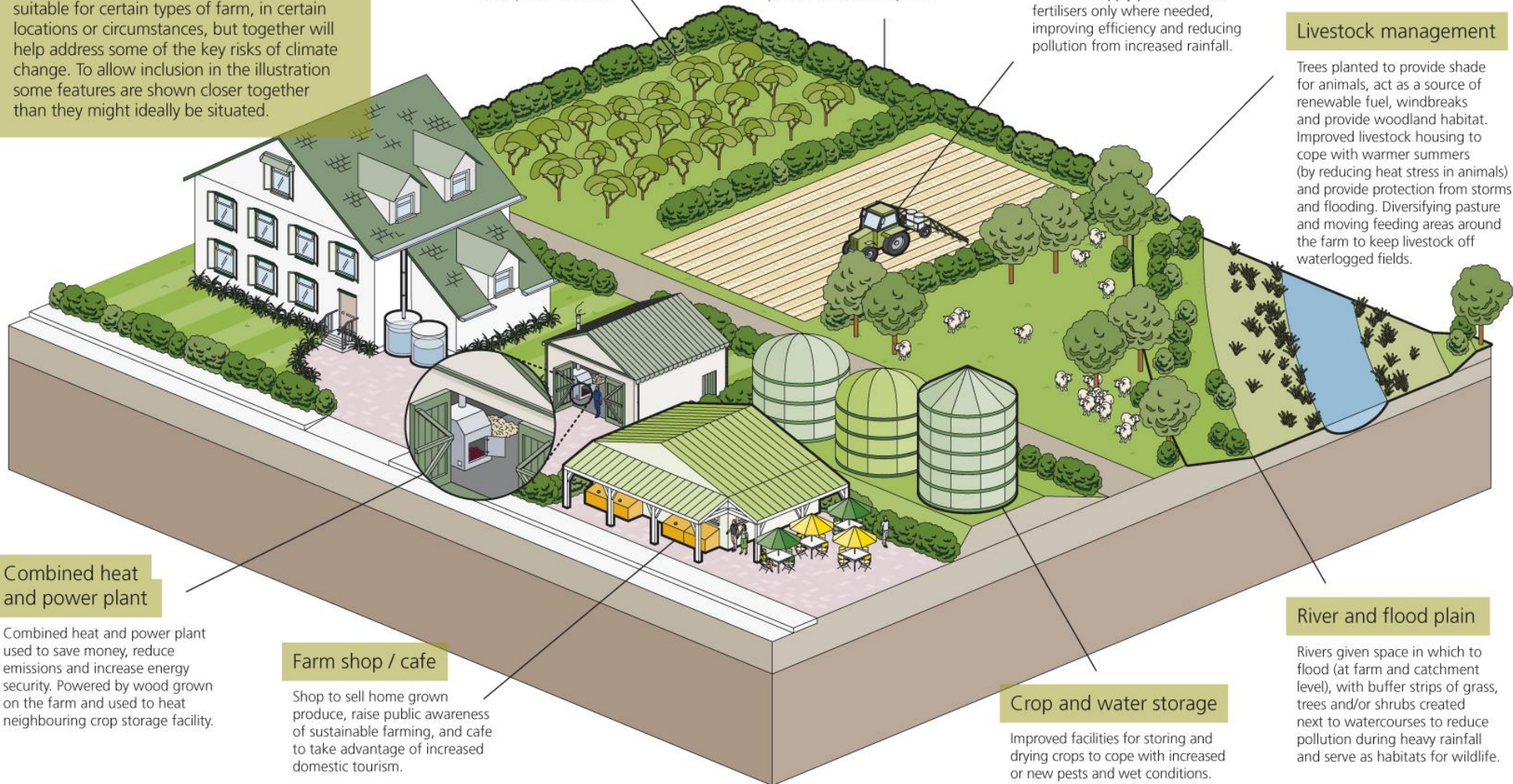
Shop to sell home grown produce, raise public awareness of sustainable farming, and cafe to take advantage of increased domestic tourism.

## Crop and water storage

Improved facilities for storing and drying crops to cope with increased or new pests and wet conditions. Rain water captured and stored for use around the farm.

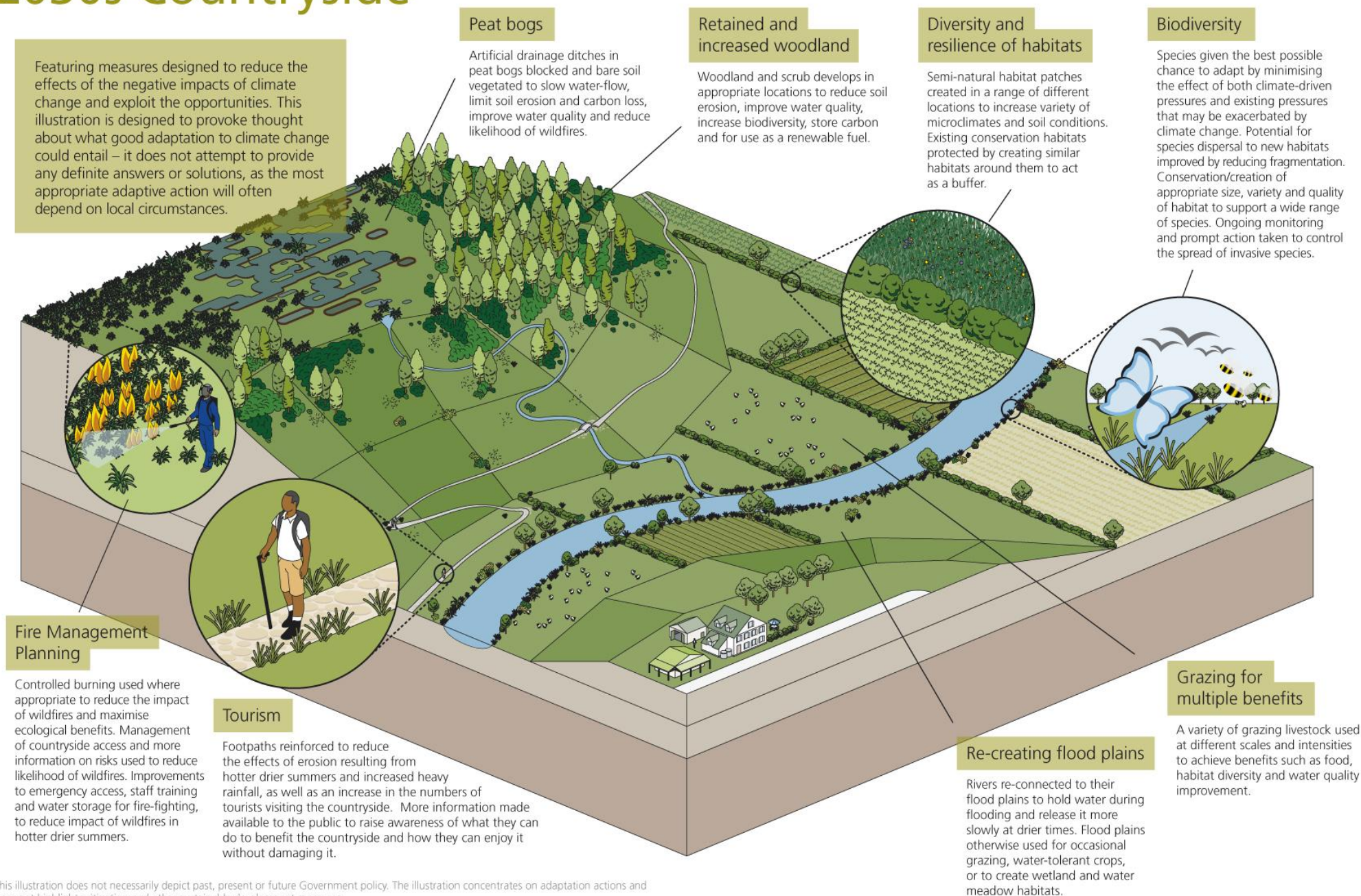
## River and flood plain

Rivers given space in which to flood (at farm and catchment level), with buffer strips of grass, trees and/or shrubs created next to watercourses to reduce pollution during heavy rainfall and serve as habitats for wildlife.





# 2030s Countryside



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# 2030s Coastal

Incorporating features designed to reduce the effects of the negative impacts of climate change and exploit the opportunities. This illustration is designed to provoke thought about what good adaptation to climate change could entail – it does not attempt to provide any definite answers or solutions. To allow inclusion in the illustration some features are shown closer together than they might ideally be situated, for example the next round of wind farm developments will be far from the shore.

## Increased tourism

Warmer drier summers would mean increased opportunities for coastal activities and for businesses. More information made available to the public to raise awareness of what they can do to benefit the British coast and how they can enjoy it without damaging it.

## Managed realignment

Sea allowed to reclaim certain areas to form mudflat or saltmarsh. Eases pressure on more critical nearby flood defences and can replace habitats lost to sea level rise.

## Wind farm

Offshore renewable energy schemes including onshore substations are built with potential sea level rise and extreme weather events in mind.

## Port

The harbour wall is protected against sea level rise and new tide gates ensure extreme tidal surges can be kept at bay. Dockside cranes are adapted to be able to work in hotter temperatures.

## Changes in fish stocks

Commercial fisheries and aquaculture practices will need to adapt in response to climate change risks to the marine environment – ocean acidification could be a serious threat to many marine organisms, including commercial shellfish, and changes to sea surface temperature could lead to changes in fish distribution. There may also be opportunities in changing fish stocks and tourism.

This illustration does not necessarily depict past, present or future Government policy. The illustration concentrates on adaptation actions and does not highlight mitigation and other sustainable development measures. Traditional responses to flood and coastal erosion management may not always be the most sustainable or affordable. Defra is currently investigating this with the Coastal Change Pathfinder Programme.