United Utilities manage the water and wastewater network in the North West of England, providing services to around 7 million people and 200,000 businesses.

United Utilities

Water for the North West

United Utilities...

- Provide safe drinking water
- Provide quality customer service
- Reduce disruptions to water supply
- Encourage customers to use water wisely around the home
- Ensure there's enough water for now and in the future

- Return cleaned wastewater safely back to rivers, lakes and the sea
- Prevent sewer flooding affecting homes or gardens and local areas
- Ensure sufficient wastewater treatment and drainage for now and in the future

The Water Cycle

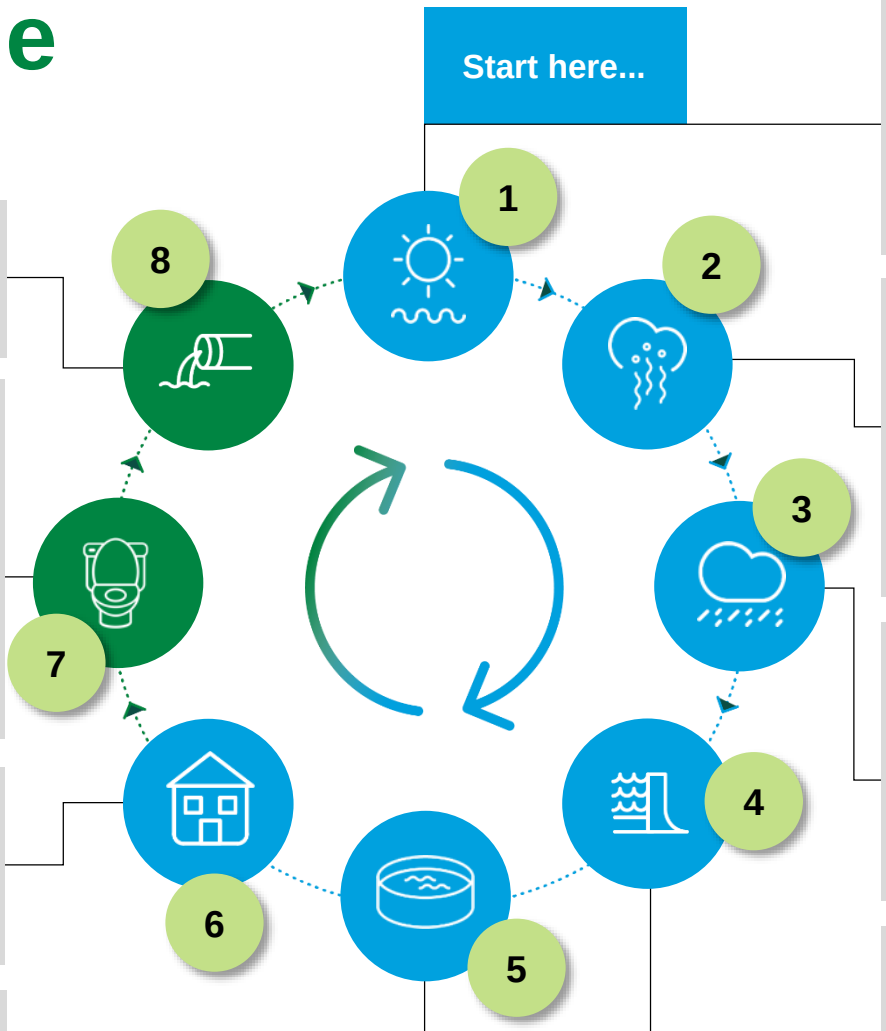
Start here...

When the sun shines on water on the Earth's surface the heat of the sun warms the water turning it into an invisible gas called water vapor. As gases are lighter than liquids, water vapor rises into the sky.

The further you move up and away from the Earth's surface the colder the temperature gets. So, in the sky the water vapor cools and turns back into tiny water droplets. Clouds are made up of these tiny water droplets, so this is the process that enables clouds to form and grow.

Within the cloud, water droplets bump into each other, which causes them to stick together and grow. Water droplets continue to grow until they are too heavy, and this is when the water droplets fall as rain.

Some rainfall falls within a catchment area and therefore, makes its way into a river, lake or reservoir. Water that falls within sewered areas runs off roofs, driveways and roads into drains and sewers. The more rain that falls, the more sewers have to cope with.



Treated water goes back into lakes, rivers and the sea

Households and businesses use the water and produce wastewater, or dirty water. This dirty water needs to go to a treatment works to be cleaned. Rainwater that has run off our roofs and driveways into our combined sewers, also goes to the treatment works.

A reliable supply of clean water is distributed to households and businesses, via a network of pipes.

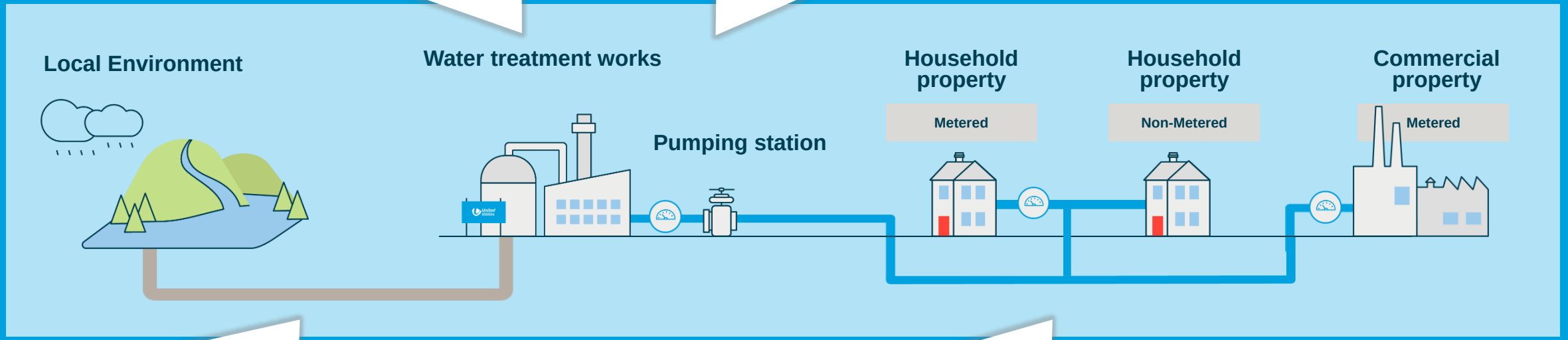
Water is then cleaned via a water treatment works, to produce high quality drinking water.

How does your water get to you?

United Utilities provide water to about 7 million people and 200,000 business customers.

Water is first treated at a Water Treatment Works to ensure it meets drinking water standards.

The pumping station pumps water through the pipes to local homes and businesses.



More than 90% of the water United Utilities supply each year comes from rivers and reservoirs. The rest comes from groundwater.

It is then transferred through a network of pipes straight to your home or business.

What happens when you flush the loo?

Any solids are removed and separated into ‘sludge’, which can be used to generate energy or make fertiliser.

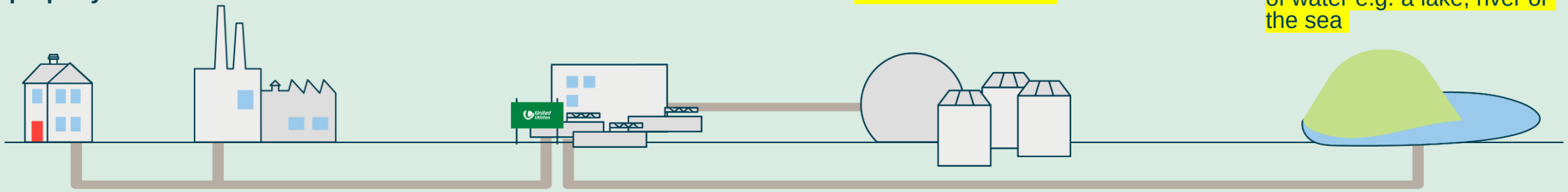
Household property

Commercial property

Wastewater treatment works

Bioresources: natural renewable sources

Outfall: the outlet of a bodv of water e.g. a lake, river or the sea



What you flush and rainwater goes through a network of sewers (often built by the Victorians) to one of 500+ United Utilities Wastewater Treatment Works.

The wastewater is cleaned and returned to lakes, rivers and the sea.

Potential issues of excess rainfall

Higher likelihood of drains being unable to cope with the amount of rainwater.

Higher risk of water becoming polluted.

Higher risk of sewer spills.

Higher costs for water companies, due the increased demand on local wastewater services.

Higher risk flooding.

What is a Combined Sewer Network?

Sewer overflows exist on combined sewers.

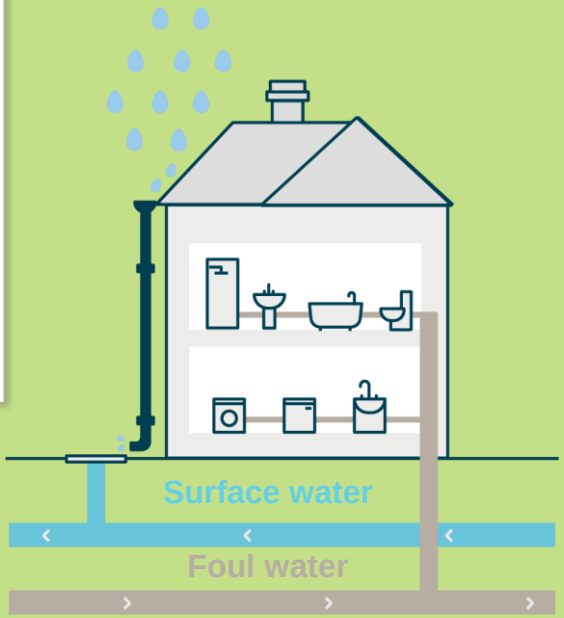
In the North West United Utilities have the highest proportion of **combined sewers** in England (mainly built by the Victorians), **54% of the sewer network is combined.** Prior to the 1970s all sewers were combined and incrementally over time more separate systems have been added.

Combined sewer

A **combined sewer** collects wastewater from our homes (toilets, showers and washing machines etc.) **and** rainwater that falls on our roofs and roads.

This combined wastewater then goes to a treatment facility to be cleaned before being returned to lakes, rivers and the sea.

Separate sewers



Separate sewers keep the wastewater from our homes separate from rainwater on roofs and roads.

Rainwater is taken directly to rivers and the sea whereas the wastewater from our homes is taken to treatment facilities to be cleaned first.

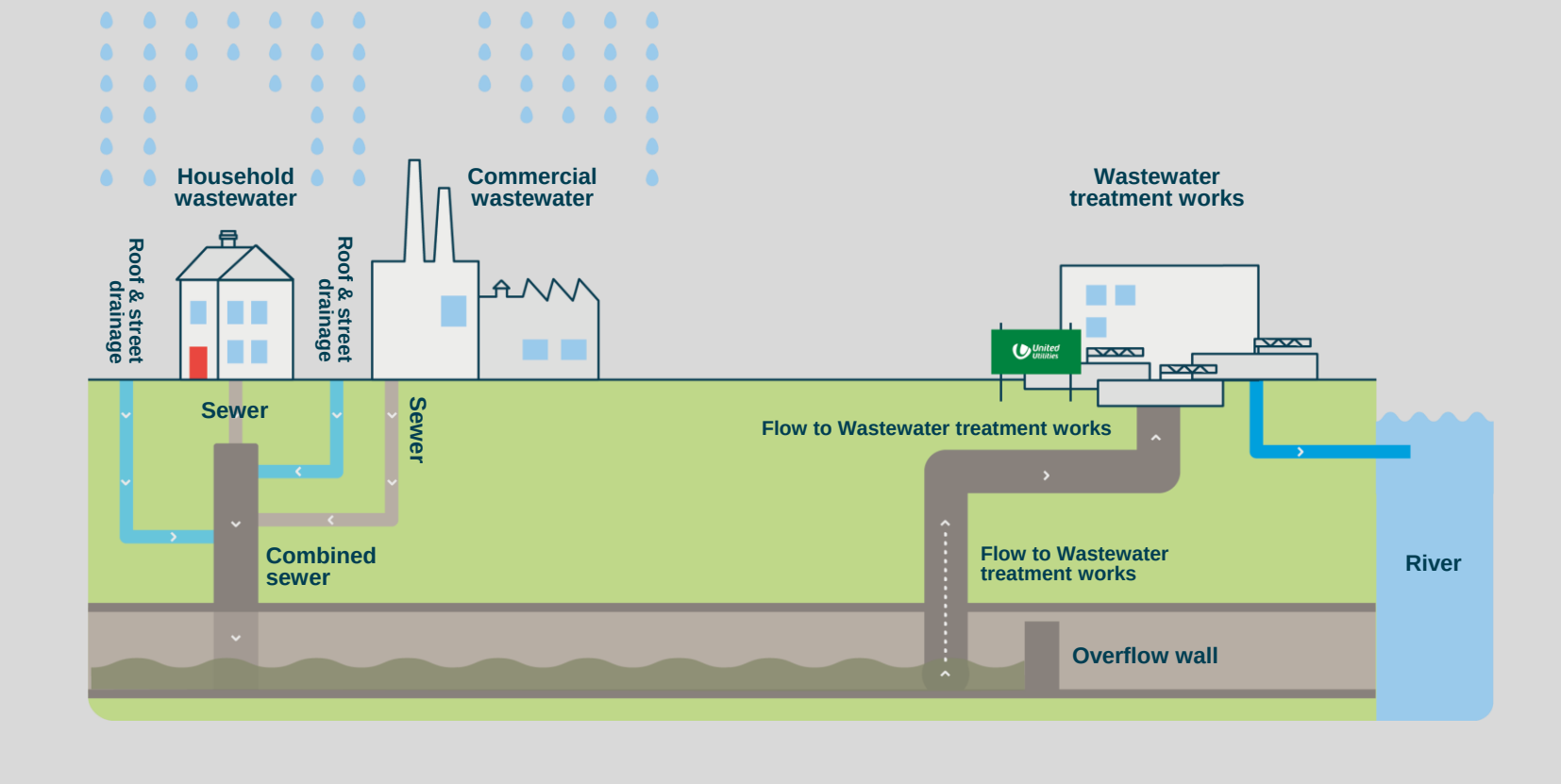
What is a sewer overflow?

Many of the sewers in England were built to carry both sewage and rainfall which means that in periods of heavy or prolonged rainfall sewers can overflow.

Sewer overflow

In extreme rainfall events, sewer overflows are used. Sewer overflows are legally permitted (by the Environment Agency) to discharge when sewers are full because of heavy rainfall. However, in some instances, overflows may spill outside of these conditions and these are not permitted.

Overflows act as emergency release valves to let diluted sewage out to rivers and the sea without being treated. This helps prevent sewers backing up and causing flooding in streets and homes. The more intense winter storms we have, the more we'll be relying on them.



Sewer flooding

If sewers are blocked or overwhelmed with rainwater it can cause sewer flooding as the water comes back up into people's homes or gardens.

Sewers can back up and flood outside spaces such as roads.

Sewers can also become clogged up from all the things that enter them that aren't the three p's (pee, poo and paper). Given time, these can develop into Fatbergs.

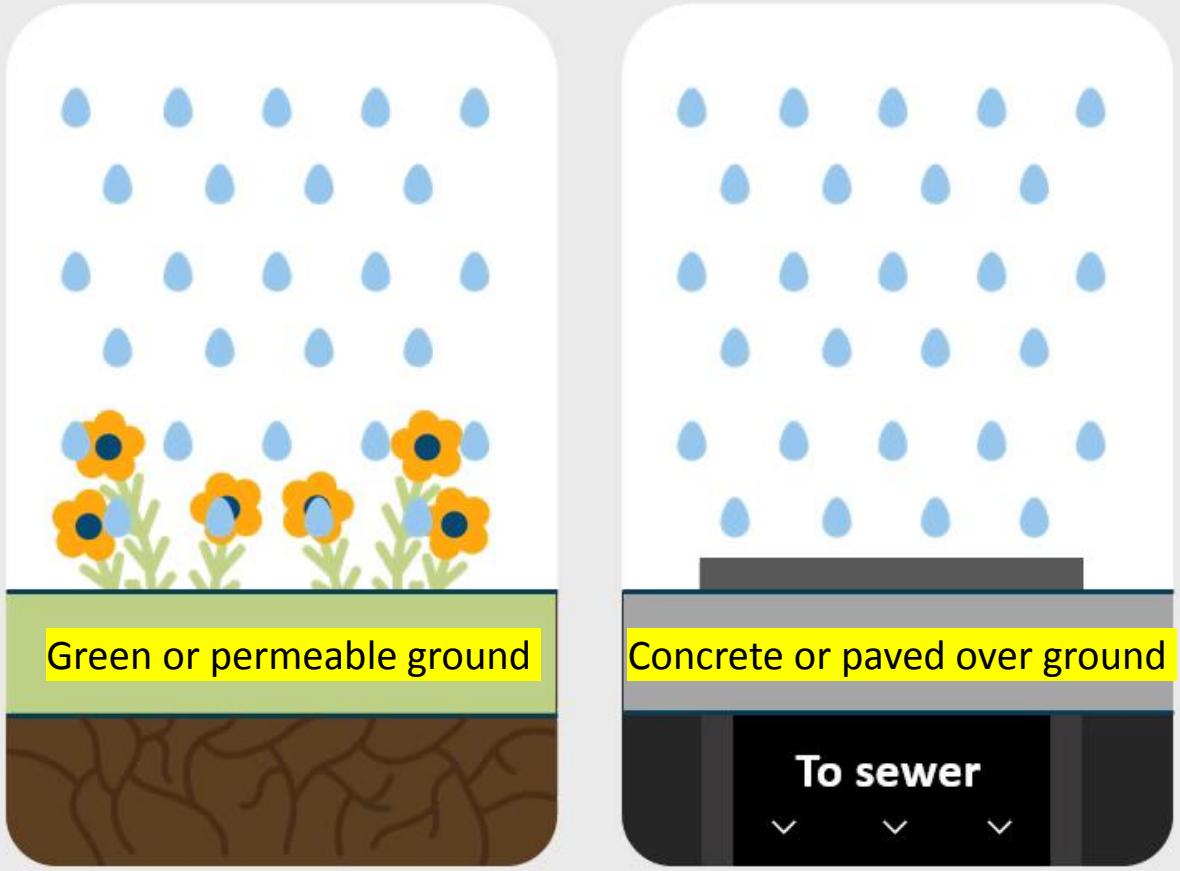
This means there is less space in the sewage network for rainfall.

Urbanisation & development

Gardens and other green spaces are often built on or paved over, this increases the amount and speed of rainwater running off roofs and roads into sewers, which can increase the frequency and volume of spills and flooding.

Everybody can help play their part by protecting green spaces around their homes and community.

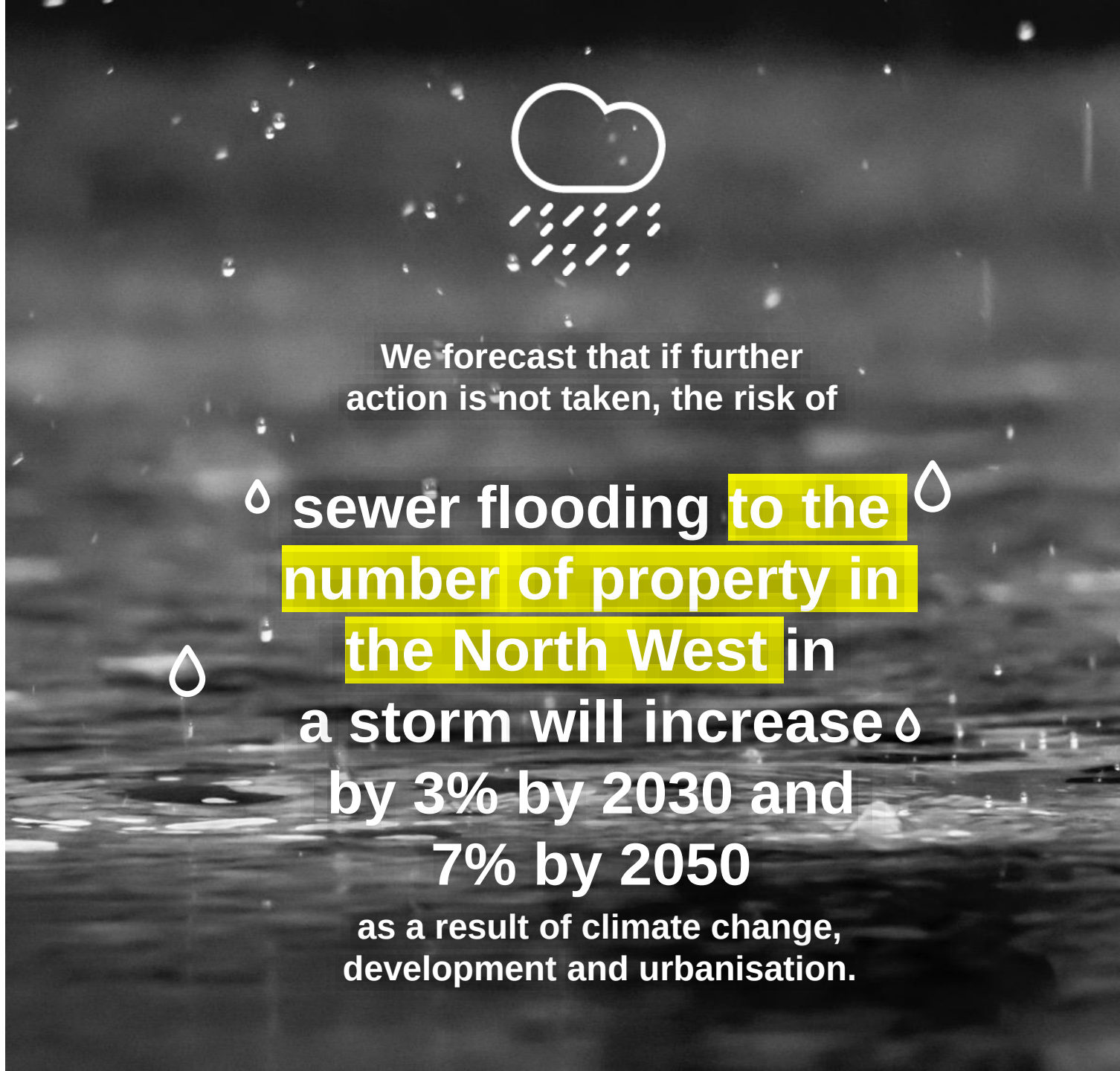
Green spaces or permeable ground (e.g. a gravel driveway) reduce the amount of rainwater coming into the sewers as rainwater gets soaked into the ground or used by plants to grow, and reabsorbed into the atmosphere through evaporation. In comparison a concrete or paved ground e.g. a tarmac drive or a carpark, increases the amount and speed of rainwater running into sewers.



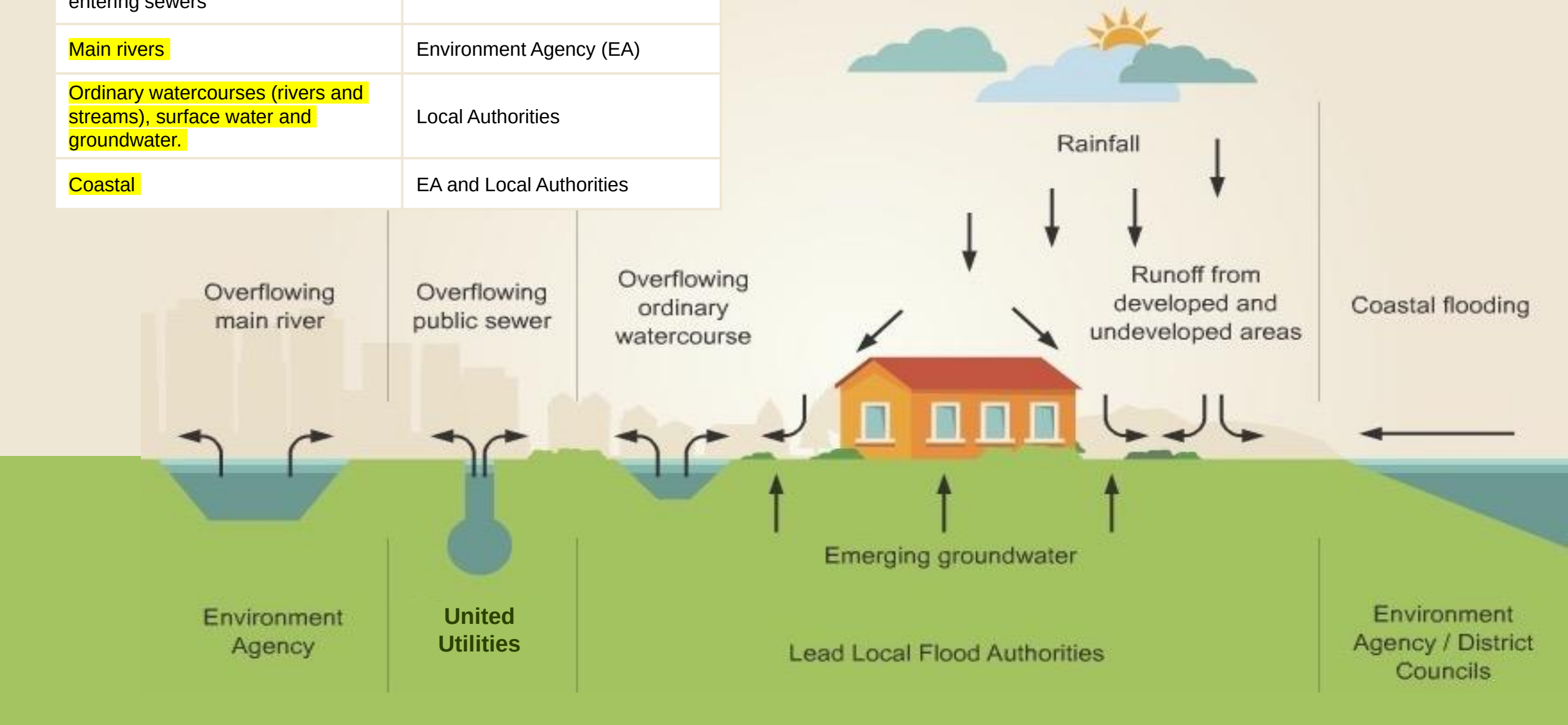
Climate change

Climate change, additional rainfall and changing patterns of weather are key drivers that we need to account for.

Climate change is predicted to cause drier summers, which will affect our water supplies, but the frequency of heavy rainfall and storms is also predicted to increase, which could result in more flooding and more spills from overflows.

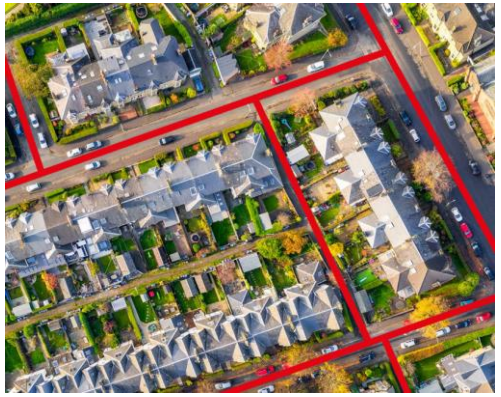


Sources of flooding and pollution	Responsibility
Sewers, including rainwater entering sewers	United Utilities
Main rivers	Environment Agency (EA)
Ordinary watercourses (rivers and streams), surface water and groundwater.	Local Authorities
Coastal	EA and Local Authorities



What are the options to managing excess rainwater?

Concrete solutions: **‘Concrete solutions’** refer to adding extra storage capacity to the existing sewer network. This involves **a)** making existing sewers bigger, **b)** creating large concrete storage tanks to alleviate sewer flooding and store rainwater in times of high rainfall. **Advantages:** High confidence that concrete solutions will deliver on storing rainwater and reducing the risk of pollution. **Disadvantages:** negative short term environmental impacts, and a high carbon footprint, due to the amount of construction required. Construction also causes disruption to customers (noise and roadworks) and there is a possible corresponding impact on customer bills, to account for the high cost.



Separating sewers: Remember how we saw that 54% of United Utilities’ sewers are combined? Well, one solution is to separate them out. This would involve a lot of road works across communities. All parts of the road network would likely be required to be closed in order to then start laying separate systems so that the dirty water used in the home and the rainwater that runs off roads, driveways and roofs drain away separately. **Advantages:** Big improvements in the performance of the sewer system can be achieved as the system can handle more rainfall; one organisation owns and maintains it. **Disadvantages:** disruption for towns and cities for 3 – 5 years (red lines on image indicate major road works would be required with possible closures); large costs for the work, which would be added to customers bills.

Sustainable drainage solutions: **‘Sustainable drainage solutions’ or ‘SuDS’** which mimic nature, provide areas to store water in natural contours in the land and can be used to allow water to soak into the ground or evaporate (rather than storing it in concrete tanks). These sustainable solutions can be incorporated into our towns and cities as you can see in the image here as well as into rural areas.

Which can lead to flooding as the flow of water and drainage is restricted

Sustainable Drainage Solutions (SuDS)

Some of the key benefits of SuDS…

- Manage the volume of rainwater that flows from hard surfaces such as roads and into sewers. This then reduces the impact of growing urbanisation on flooding.
- Provide opportunities for using rainwater where it falls. For instance, SuDS can provide an attractive habitat for wildlife in urban settings.
- Protect or enhance river water quality (because sewers won't get overwhelmed and so Combined Sewer Overflows won't have to release dirty water into rivers and the sea).
- Are sympathetic to the environment and the needs of the local community.
- Provide opportunities for evaporation rather than allowing rainwater to flow straight into sewers that can quickly become full during heavy storms.
- Create better and more attractive places to live, work and play.

Some of the key drawbacks of SuDS…

- These solutions manage rainwater at the surface, meaning there is limited storage capacity, especially when compared against installing tanks.
- Can be less space in urban towns and cities to installs SuDS.
- Outcomes less certain compared to large concrete solutions.
- Multiple agencies are responsible, including customers meaning upkeep and management is dependant on multiple parties.
- If installed on your property, you will be responsible for maintenance, which can include checks that gutters, inlets and outlets are kept clear of leaves and debris.
- Not all components can be sourced within one place and could require advanced DIY skills to complete.

Your own properties!

Here are some examples of sustainable drainage components and what they do:

Swales: Swales and Conveyance channels are shallow, broad, and often grassy ditches that are designed to collect and transport excess water to larger areas of water that are better able to deal with it, such as a lake or river.

Rain gardens: Rain gardens are small lowered areas with absorbent yet free-draining soil. They are filled with plants and/or grass which can withstand heavy rain and temporary flooding.

Soakaways: Soakaways are pits dug into the ground to a depth of around one meter. These are then lined with materials designed to collect and drain excess surface water efficiently such as gravel, stone, or plastic soakaway crates.

Permeable paving: Permeable surfaces are an alternative to hard landscape areas such as concreted or tarmac surfaces. Surfaces can be altered to include specially designed permeable paving, which allows them to drain much more effectively.

Green roofs: Vegetation is planted on a roof and acts as a sponge during times of heavy rain, allowing water to be absorbed into the plants or stored in the soil and then naturally evaporates back into the atmosphere

Water butts: Collect rainwater and store it for reuse. The stored water is then reused for watering plants the garden.

Smart water butts: Collect rainwater and store it for reuse but also uses radar technology to drain water away before additional rain falls.

Property Level SuDS that you could deploy!

Here are some typical examples of the costs, effectiveness, difficulty to install and subsequently maintain some of these.

Type	Cost to you (£) £££	How effective is it?* ***	Multiple benefits	Difficulty to install	Maintenance
Swales	**££**	***	• Water stored • Water quality improved • Amenity value	**Medium** Disconnect downpipe, digging and checking levels.	• Grass cutting • 6 monthly leaf litter inspection • Clearing and ensuring free flow of channel
Rain gardens	**££**	**	• Water stored • Water quality improved • Biodiversity increase • Amenity value	**Medium** Disconnect downpipe, digging, checking levels and planting.	• Pruning plants • 6 monthly leaf litter inspection • Clearing and ensuring free flow of channel
Soakaways	**£££**	***	• Water stored	**Hard** Likely requires a local contractor to dig and install.	• Annual visual checks for silt

Type	Cost to you (£) £££	How effective is it?* ***	Multiple benefits	Difficulty to install	Maintenance
Permeable pavement	**£££**	**	• Water Stored • Amenity value	**Hard** Likely requires a local contractor to install	• Seasonal scrubs • Annual visual checks for silt
Green roofs	**£££**	*	• Water stored • Water quality improved • Biodiversity increase • Amenity value	**Medium** Can be done DIY, but may need support of a handyman.	• Annual visual checks for structural integrity
Water butt	**£**	*	• Water stored	**Easy** DIY requiring a hacksaw only.	• Release of water to garden or permeable area when butts are full and more rain forecast
Smart water butts: where radar drains water away before rain falls	**££**	**	• Water stored • Amenity value	**Hard** Would require a contractor to install and set up.	• Annual inspection of operating valves

Key: £ >> £0-250 **££ >> £250-1,000** **£££ >> £1,000 to 5,000** Range dependent on the size of the installation which is dependent on factors such as the amount of space available.

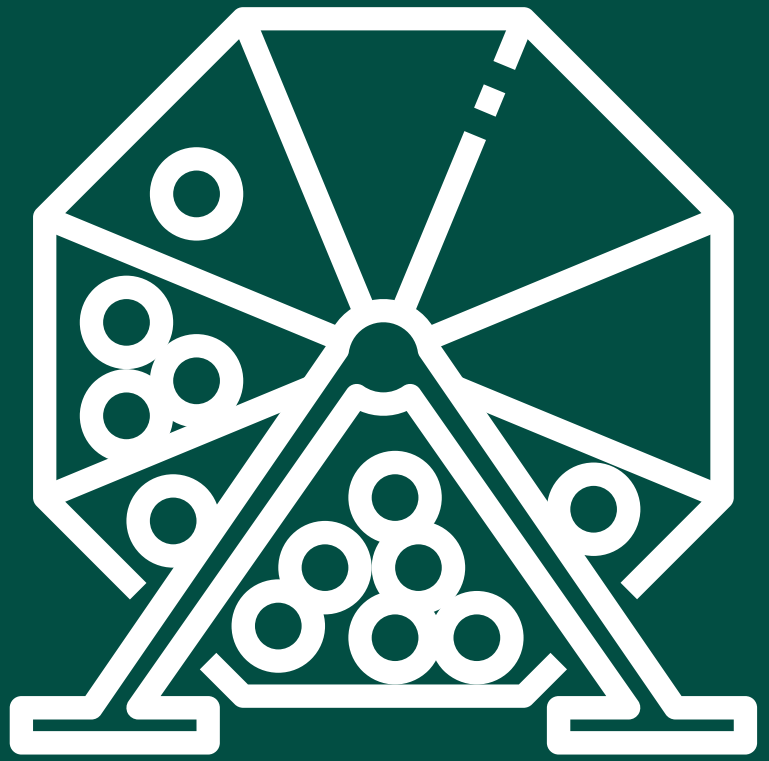
***small amount of rainwater managed** ****medium amount of rainwater managed** *****large amount of rainwater managed**

Incentivising SuDS

1. **Prize Draw**

Customers that have installed sustainable drainage solutions and water re-use systems would be entered into a lottery prize draw.

On undertaking a one-off action (such as installing a sustainable drainage solution or water efficient device), customers will be entered into a prize draw which offers a large bill discount (up to 100%) for up to one year.



Incentivising SuDS

2. Small discount applied for a few years

Customers that have installed sustainable drainage solutions and water re-use systems would be eligible for a small discount on their bill for multiple years.

When customers install a sustainable drainage solution, water efficiency device or water re-use system they will be placed on a discounted tariff.

The more sustainable drainage solutions or water efficient systems you install, the greater the discount on your bill.

Incentivising SuDS

3. Community reward

Communities that have achieved a reduction in the amount of rainwater that is drained by the installation of sustainable drainage solutions would be eligible for a discount on their bills.

If the community as a whole reduces its amount of surface water drainage, a reward is given to all members of the community.

Incentivising SuDS

4. United Utilities service

United Utilities could provide a service where a partner will install sustainable solutions at your premises e.g. a permeable driveway so you don’t have to worry about installation.

The installation costs would be covered by United Utilities.

United Utilities

Water for the North West

Incentivising SuDS

5. United Utilities service *with discount*

United Utilities could provide a service where a partner will install sustainable solutions at your premises e.g. a permeable driveway so, you don’t have to worry about installation.

The installation costs would be covered by United Utilities, and you would receive a small discount on your bill.

United Utilities

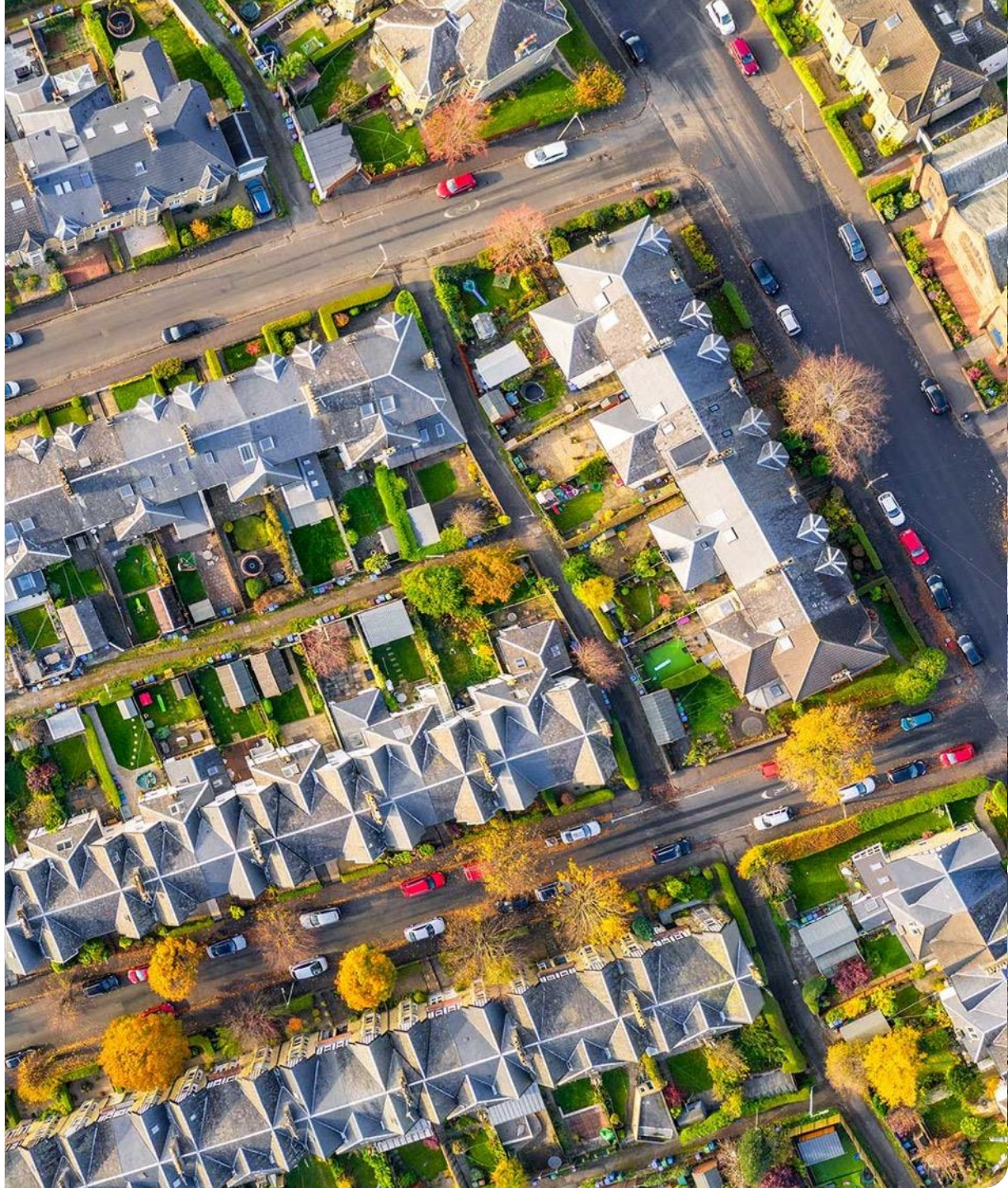
Water for the North West

Retrofitting Sustainable Drainage Solutions

This involves integrating sustainable drainage into public spaces or to private properties to better manage rainwater.

Advantages: The advantages are that the public get to enjoy green spaces in their communities which in turn can increase property values. They can be installed into different urban spaces where the space exists. They are also very kind to the environment.

Disadvantages: This comes at a high cost and relies upon partnership working and agreements to 3rd party maintenance of the Sustainable Drainage Solution once it is built. There can also be a limited amount of space in towns and cities that is suitable for Sustainable Drainage Solutions to be installed. The outcomes can also be less certain vs some of the large concrete solutions you have seen (i.e. building big concrete storage tanks or separating sewers).



Retrofitting SuDS

Re-purpose existing urban spaces

Parks

RBG Pocket Parks, London

West Gorton's Carbon 'Sponge Park'

Integrate SuDS as part of active neighbourhoods

Greener Grange Town, Cardiff

SuDS within school environments

All Saints Primary School