Wetlands for Water Quality

Creating and managing treatment wetlands to improve water quality

A Route Map

WWT

Humankind's future lies not in the endless degradation of the natural world, but in its restoration, including for the vital services and benefits provided by different kinds of wetlands. They are a vital asset for society and now is the moment to plan for their protection, recovery and expansion."

Dr Tony Juniper CBE
Chair of Natural England

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Incredible things happen when land and water meet to create wetlands. Wetlands teem with biodiversity, providing homes for endangered and much-loved species. They are vital 'service stations' for millions of migratory birds, enabling them to rest and refuel. For us, they provide essential protection against the impacts of the climate crisis, floods, droughts and pollution. We also know that living near or visiting a wetland and its wildlife is good for our wellbeing.

Wetlands are the lifeblood of the planet, but they need our help. They are disappearing at a rate three times faster than forests[1].

The UK's wetlands need strong and effective laws to protect them from harm. They need careful and well-resourced approaches to manage them. They also need restoring. Over the last 300 years the UK has lost over 75% of its wetlands[2].

In more recent times their continuing absence – coupled with further loss and degradation – has helped to fuel some of the greatest challenges we face: the escalating climate crisis, plummeting levels of biodiversity and a rapid decline in our own wellbeing.

But there's hope: WWT are pioneers in wetland conservation. We bring species and wetlands back from the brink and restore, protect and create wetlands around the world.

In 2020, WWT joined calls for a green recovery to build back better out of the COVID-19 pandemic and, crucially, for a 'blue recovery' to be at its heart. We have set out proposals for the creation and restoration of 100,000 hectares (ha) of wetland in the UK, on the advice of the Government's advisers, the Natural Capital Committee[3]. Every single hectare will be filled with wildlife, providing a much-needed boost to biodiversity and to the government's pledge to halt and reverse the decline of our natural world by 2030.

We are now setting out further details of how this blue recovery needs to happen. This route map is the third to be published in a series of four route maps for creating wetlands for urban wellbeing, carbon storage, water quality and flood protection.

Each route map sets out our proposals, the purpose the wetlands will serve, the potential they offer, and the partnerships and policy framework required to make them happen.

I hope you enjoy reading our route maps. We look forward to working with you, so that together we can create and restore wetlands that help encourage economic prosperity, build resilient communities, protect our wellbeing, and improve the health of our planet.

Sarah Fowler, Chief Executive
WWT (Wildfowl & Wetlands Trust)

Wetlands teem with biodiversity, providing homes for endangered and much-loved species.

Executive summary

Wetlands can play a vital role in helping us tackle our current water quality crisis by filtering out pollutants that pass through naturally occurring wetlands.

These amazing qualities can also be harnessed and amplified through creating treatment wetlands and it is these that are the focus of this document

Just 14% of our rivers are in good health. All fail chemical standards. This means every river in England is now polluted beyond legal limits[4]. The Environment Agency estimated that it would cost around £17.5 billion between 2015 and 2052 to bring the UK's waters to 'good status' and generate benefits worth £22.5 billion[5,6].

Water pollution is causing damage to our natural environment and making us sick. With rising public concern about the state of our water environment, now is the time to clean up our act.

There are a range of ways to tackle the challenges of Britain's polluted waters, and wetlands should be a key part of this. Unlike other solutions, wetlands not only improve water quality, they also provide numerous co-benefits for both people and wildlife.

To make the very best use of these multiple benefits, we need a comprehensive effort from government and stakeholders to work together to embrace this new approach.

Poor water quality threatens wildlife and people.

The world faces a biodiversity crisis. Since 1970 there has been an 84% decline in freshwater species[7]. Those that remain depend on good water quality for their survival. But they're threatened by increasing pressures from poor water quality[8]. Swimmers and others that use our waters face serious health concerns caused by pollution.

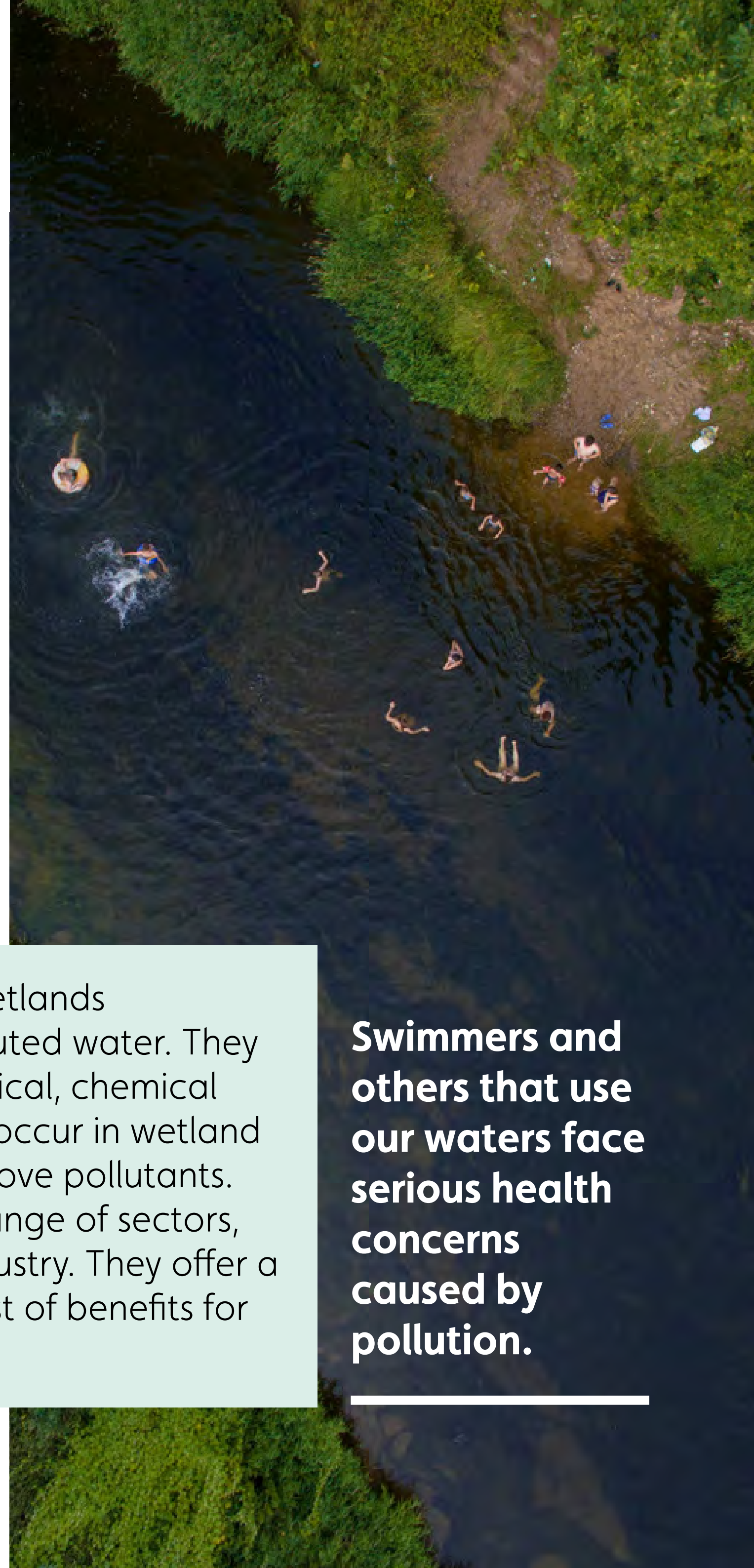
The UK government has committed to improving water quality by setting clear targets[9]. Yet according to the government watchdog the Office for Environmental Protection, it's currently not on track to achieve them[10].

Since 1970 there has been an 84% decline in freshwater species.

Water quality can be improved through using treatment wetlands.

WWT wants to see treatment wetlands used more widely across a range of sectors, to tackle the UK's poor water quality and bring multiple benefits to wildlife and people.

Treatment wetlands are engineered wetlands specifically designed to help clean polluted water. They do this by optimising the natural biological, chemical and physical treatment processes that occur in wetland habitats, in order to transform and remove pollutants. Treatment wetlands can be used in a range of sectors, including agriculture and the water industry. They offer a cost-effective solution that brings a host of benefits for nature and people.



Swimmers and others that use our waters face serious health concerns caused by pollution.

Proposal

Water is polluted by a range of sectors including agriculture, the water industry, housing development, roads, landfills and mining. Pollutants such as heavy metals, chemicals, sediment and nutrients like phosphorus and nitrogen build up in our water causing devastating impacts on people and wildlife. While nutrients are essential for normal plant growth, in excess they are particularly damaging.

Alongside other water treatment systems and significant improvements in the regulation of water polluting activity, we propose the widespread creation of treatment wetlands to improve water quality in all these sectors. Meanwhile, natural wetlands that have been degraded should be restored to enhance the water quality in our natural habitats and protect our wildlife that relies on clean water to survive and flourish.

Without urgent action, the nature that both people and wildlife depend on is in danger.

Purpose

Treatment wetlands also provide other benefits including boosting biodiversity, storing carbon, and improving health and wellbeing. Investors will see the economic benefits of using treatment wetlands over traditional infrastructure (due to lower maintenance costs and no chemical input). The benefits to the government include the creation of green jobs in the UK and the tackling of inequalities, as water pollution disproportionately affects deprived communities. There will also be huge benefits for wider society by providing clean water for recreational use and improved wellbeing.

Traditional infrastructure refers to the water treatment systems that use chemicals and huge amounts of energy in removing pollutants and impurities from water.

Potential

Treatment wetlands must be appropriately designed and well maintained. When designing them, it is important to consider how they will impact protected areas of nature and spaces used for swimming or water sports, as well as how close they are to the sources of pollution. Once they have been created, ensuring they are properly maintained will allow them to continue to filter pollutants effectively. So the design process must allow for their ongoing protection and management.

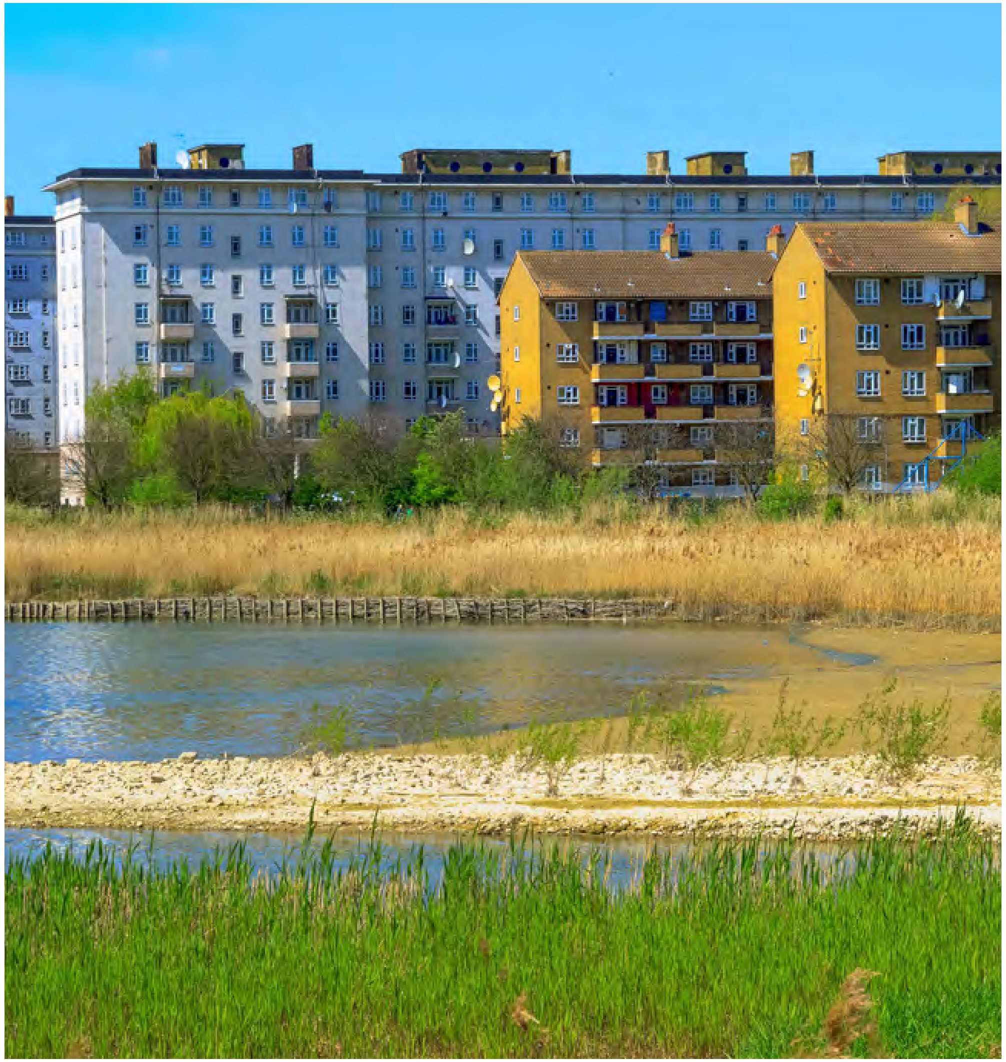
Process

Creating treatment wetlands at scale to improve water quality involves the following three elements:

Delivery: Direct conservation action to create and manage wetlands and to demonstrate and measure benefits.

Capacity building: Providing advice and training to local councils and developers, creating innovative financing approaches, and investing in the gathering and sharing of evidence. This should look at how to derive multiple benefits from treatment wetlands and how their effectiveness in delivering these benefits can be improved.

Community engagement: Where appropriate, consulting and involving local people in the design and governance of wetlands being created in their community. Where possible, such projects must serve the community rather than be imposed from outside.



Partnerships

Strong, effective partnerships are key to making the very best use of wetlands to improve water quality. We need the involvement of national and local governments, the investment and know-how of businesses and academia, and a process of co-creation with landowners and local communities.

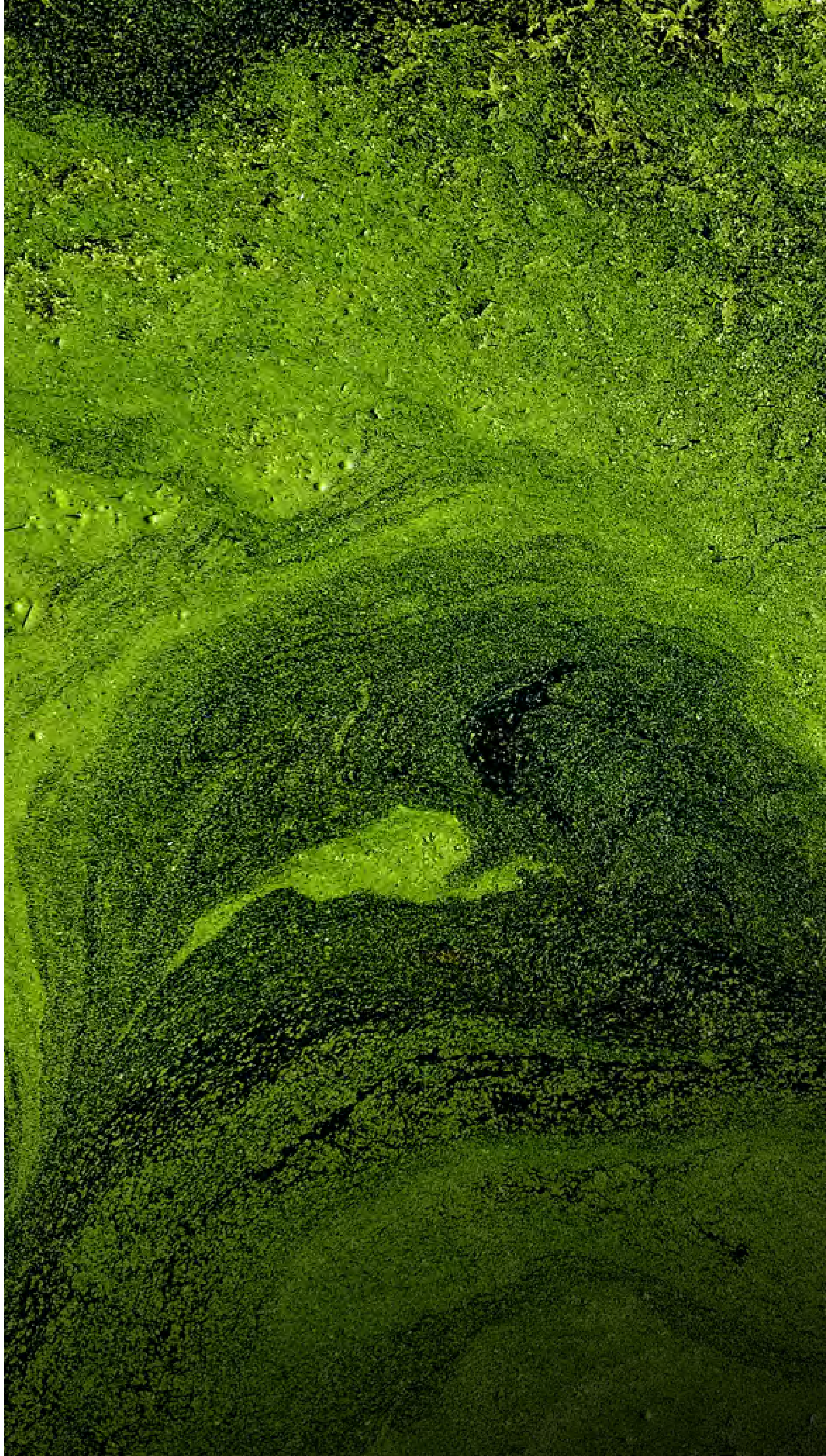
Policy

Creating treatment wetlands at scale will require supportive policies. This means having the information, plans and funding in place to allow stakeholders to create them.

WWT is calling on the UK Government to adopt wetland creation as an important part of its plans to improve its water quality commitments and to help unlock private sector investment in wetland protection and creation.

PRIORITY POLICIES FOR THE UK GOVERNMENT:

- Build confidence in regulators and investors by establishing a pilot scheme for treatment wetlands in the UK by 2025
- Make treatment wetlands the default option for meeting nutrient neutrality targets
- Establish and develop an effective market in nutrient trading and offsetting by creating a nutrient offsetting code



Nutrient neutrality is a way to make sure new developments do not add more nutrients to the environment or catchment. This can be achieved by offsetting existing nutrients through measures to reduce them in the same catchment. These markets are still developing but there is huge potential for private investors to increase the creation of high-quality wetlands through the nutrient neutrality mechanism.

Nutrient offsetting aims to balance the release of polluting nutrients into the environment to protect water quality. It is done by compensating for nutrient pollution in one location by reducing it in another.

A water catchment is an area of land in which rain or melted snow or ice drains into a body of water such as a river, lake, or reservoir, or into underground stores[11]. In England and Wales there are about 100 principal catchments.

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Proposal

We propose the widespread creation of treatment wetlands, which will improve water quality by filtering out pollutants. In addition, degraded natural wetlands should be restored so that they can effectively perform their natural function in filtering out pollutants.

What are wetlands?

Wetlands are unique ecosystems that are either permanently or seasonally inundated with water.

They include lakes, rivers, swamps and marshes, wet grasslands, estuaries, saltmarshes and human-made sites such as reservoirs and some ponds. Wetlands range in size from domestic garden ponds to the Pantanal in Brazil, Bolivia and Paraguay, which is three times the size of Ireland.

Nature-based solutions use the power of natural ecosystems to help tackle major challenges such as climate change.

What do wetlands do?

Wetlands hold much of our natural capital.

They also provide essential ecosystem services that make life on earth possible, providing nature-based solutions to many of our most pressing environmental and social problems. Wetlands give us relief from the stresses of modern life and improve the resilience of communities to the pressures of the climate crisis, pollution and the effects of urbanisation.

Natural capital refers to the world's stocks of natural assets that underpin our economy, including geology, soil, air, water and all living things.

How do wetlands help us?

They treat our polluted water without the use of chemicals

They provide food and act as nurseries for many commercial fish species

They are biodiverse habitats, providing a home for over 100,000 species of animal[12]

They support livelihoods by providing jobs, tourism and food

They provide freshwater for drinking, cooking and cleaning

They protect us from flooding

They prevent coastal erosion by providing a buffer to the sea

They help combat climate change by storing enormous amounts of carbon

What are treatment wetlands?

Treatment wetlands are wetlands that have been constructed specifically to remove targeted pollutants such as nitrogen and phosphorus from wastewater that comes from sources such as sewage, agricultural waste and landfill. They provide nature-based solutions to some of society's most pressing water quality problems.

Alternative solutions that benefit water quality:

Natural wetlands provide habitats for biodiversity. They can also improve water quality when they receive contaminated water. These benefits are dependent on a wetland's location and the amount of pollution entering it, and the pollution can have negative impacts on the wetland when pollution levels are high.

River restoration encompasses a variety of techniques that aim to restore natural function to rivers that have been modified by humans. This includes floodplain reconnection, gravel mobilisation (agitating layers of gravel and moving them through the river) and the addition of fine sediment (which can act as a filter for pollutants).

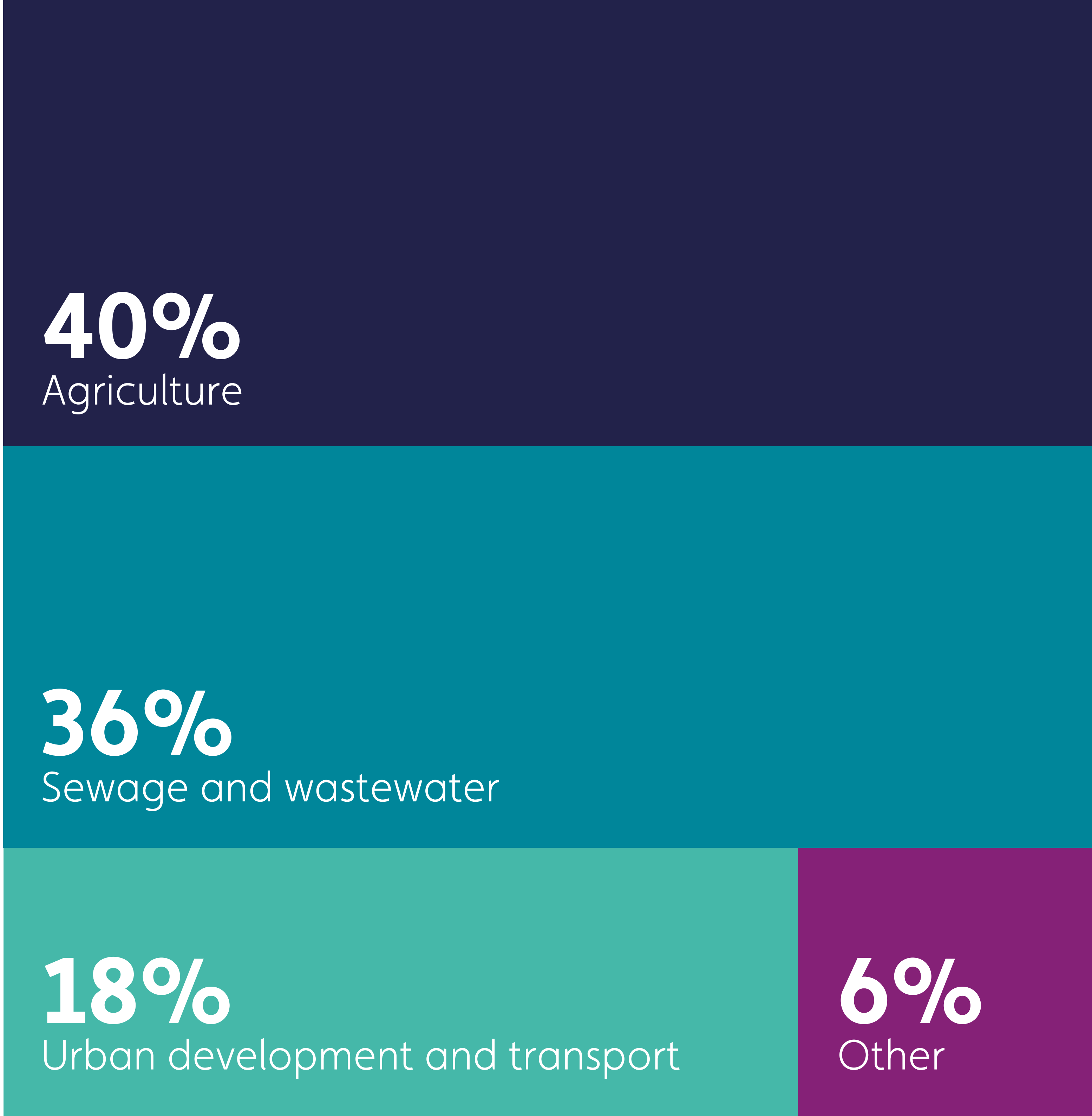
Sustainable Drainage Systems (SuDS) are a set of techniques and practices designed to manage and mitigate the impact of urban flooding, including storm water run-off. SuDS aim to mimic natural drainage processes. They can include measures such as permeable paving, green roofs, rain gardens and swales and can help reduce the risk of flooding, improve water quality and enhance biodiversity in urban environments.

Floodplain reconnection refers to the process of restoring or enhancing the connection between a river and its floodplain, allowing water to flow more freely between the two. It can be achieved by removing river embankments or changing the river's shape to allow water to spill out.

Where does water pollution come from?

Pollution from agriculture, sewage, roads and plastics contributes to a dangerous 'chemical cocktail' coursing through our waterways.

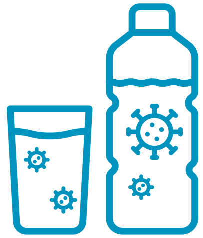
The following chart shows how much each sector contributes to poor water quality in the UK[13].



Agriculture

Agriculture accounts for almost 70% of England's land usage and is linked to nearly 40% of factors contributing to our water's failure to meet good ecological status[14].

Modern farming often involves the use of fertilisers, pesticides, manure and slurry (containing nutrients). These can run off farmland and into watercourses, causing harm to the environment and people. In addition, growing crops on floodplains can often lead to pesticides running directly into rivers because the soil is already saturated with water.



Contamination of drinking water by pesticides alone has been estimated to cost the UK £120 million a year[15].

Heavy farm equipment impacts water quality by compacting the soil. Rain cannot permeate the soil, worsening the damage caused by floods[16]. This increases the transportation of pollutants and can therefore cause poor water quality.

Wastewater from food and drink producers can also contribute to poor water quality because of the harmful impact of untreated chemicals and by-products from the production process.

Sewage and storm overflows

Many water quality problems are the result of the age and inappropriate use of our water treatment infrastructure.

Our infrastructure is outdated and can no longer deal with the scale of the sewage problem. The UK's Combined Sewage Overflow (CSO) system was designed as an emergency measure for use in very heavy rain. It allows untreated sewage to be released into the environment in these exceptional circumstances and requires a permit for use[17]. However, in recent years sewage overflows have been used more frequently, often in dry conditions and without a permit.

This is due to poor investment in infrastructure. Customers who pay their water bills have provided funding for water companies to make improvements to their service and infrastructure, but the water companies have spent only 68% of this[18]. This means they're not on track to deliver the Price Review 24.

In 2021, sewage was discharged into English rivers 375,000 times by water companies[19].

Price Review 24 (PR24) aims to improve water and wastewater services in England and Wales. It involves investments in infrastructure, technology and operations to make services better and more affordable for customers. This process is overseen by Ofwat and implemented every five years by water companies.

Pressure from housing developments

As the UK's population increases and demand for housing grows, so too does the pressure on it's drainage and water treatment infrastructure.

Nutrient offsetting from housing developers will be essential to unlock housebuilding stalled by nutrient standards, while also protecting our water environment.

While there are nutrient neutrality rules in 27 English catchments[20], there are still many other areas that would benefit from these protections. Under these rules, any nutrient production from new development must be offset. Wetlands can be used as an offset through this mechanism, and can also provide the SuDS developers will soon be required to provide in new development. This needs to be scaled up across the UK. See our Creating Urban Wetlands for Wellbeing route map for more detail on SuDS.

Roads

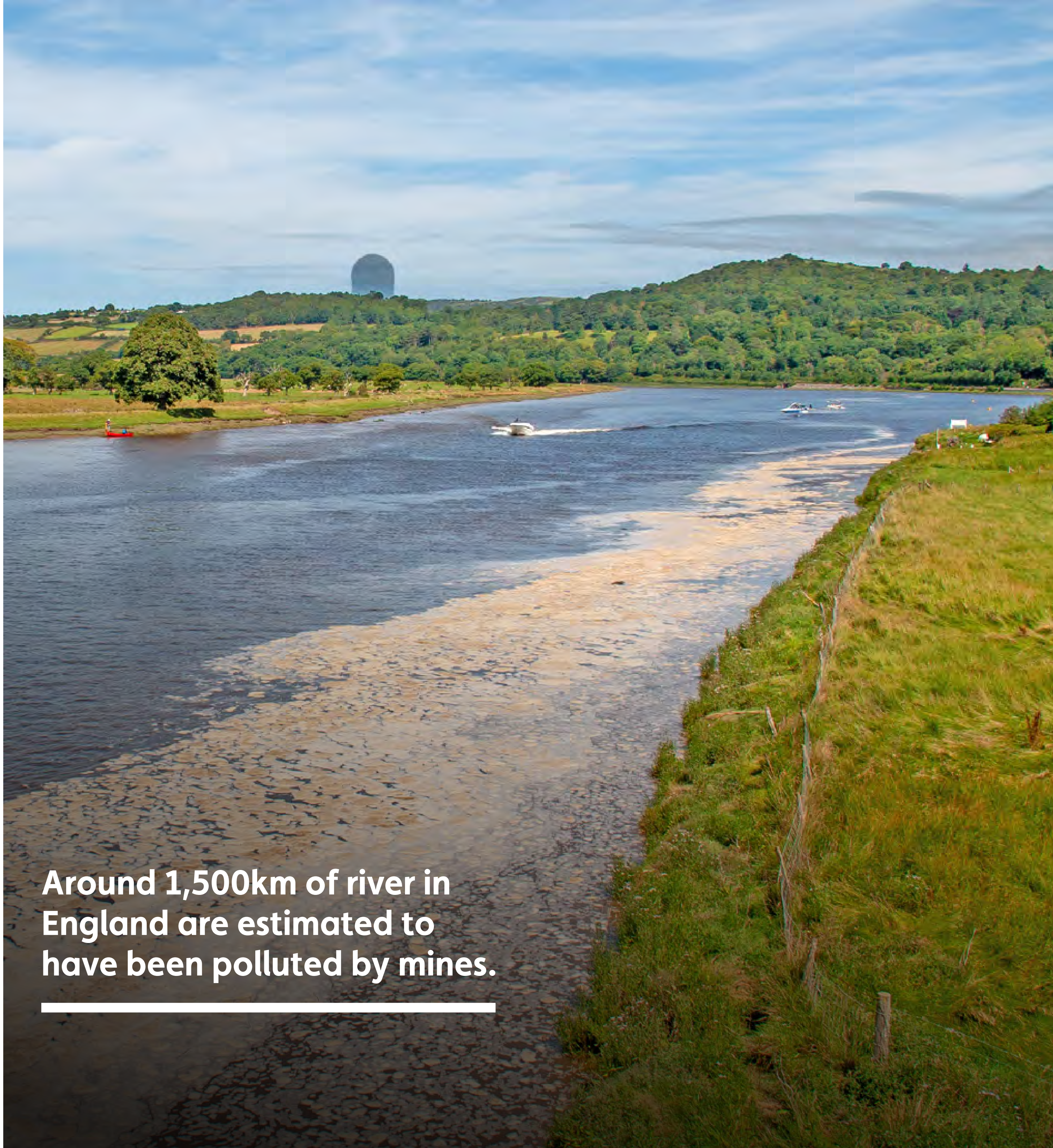
Water that runs off roads is highly polluted.

It contains hydrocarbons, salts, microplastics, heavy metals and silt. These go straight into surface drainage systems and waterbodies like lakes and rivers. Many existing drainage networks are running at, or close to, capacity, so it's essential that future highway development has minimal or no impact on this system.

Mines

Both active and abandoned mines impact water quality because they release pollutants such as heavy metals.

This pollution is caused by water flowing through tunnels created during mining or by rain washing contaminated waste left at the surface into waterways. Around 1,500km of river in England are estimated to have been polluted by mines[21].



Landfills

As rainfall passes through landfills, nutrient pollution leaches into the water.

Rain picks up highly potent and damaging compounds, including nutrients (landfill leachate), from the surface which run-off into our water environment. Landfill sites also contain historic pollutants that are now regulated or restricted, but still threaten water quality[22].

Forever chemicals

Two of the most harmful forever chemicals have been detected in 96% of Environment Agency water samples[23].

PFAS are known as forever chemicals because they do not break down in typical environmental conditions, so they build up over time. They are used in flame retardants, non-stick coating for pans, cosmetics and creams, textiles, paints, pharmaceuticals and other household items.

Existing wastewater treatment water systems have a limited ability to treat these chemicals and it is extremely expensive to do so. There is potential for treatment wetlands to break down these chemicals, but more research needs to be done.

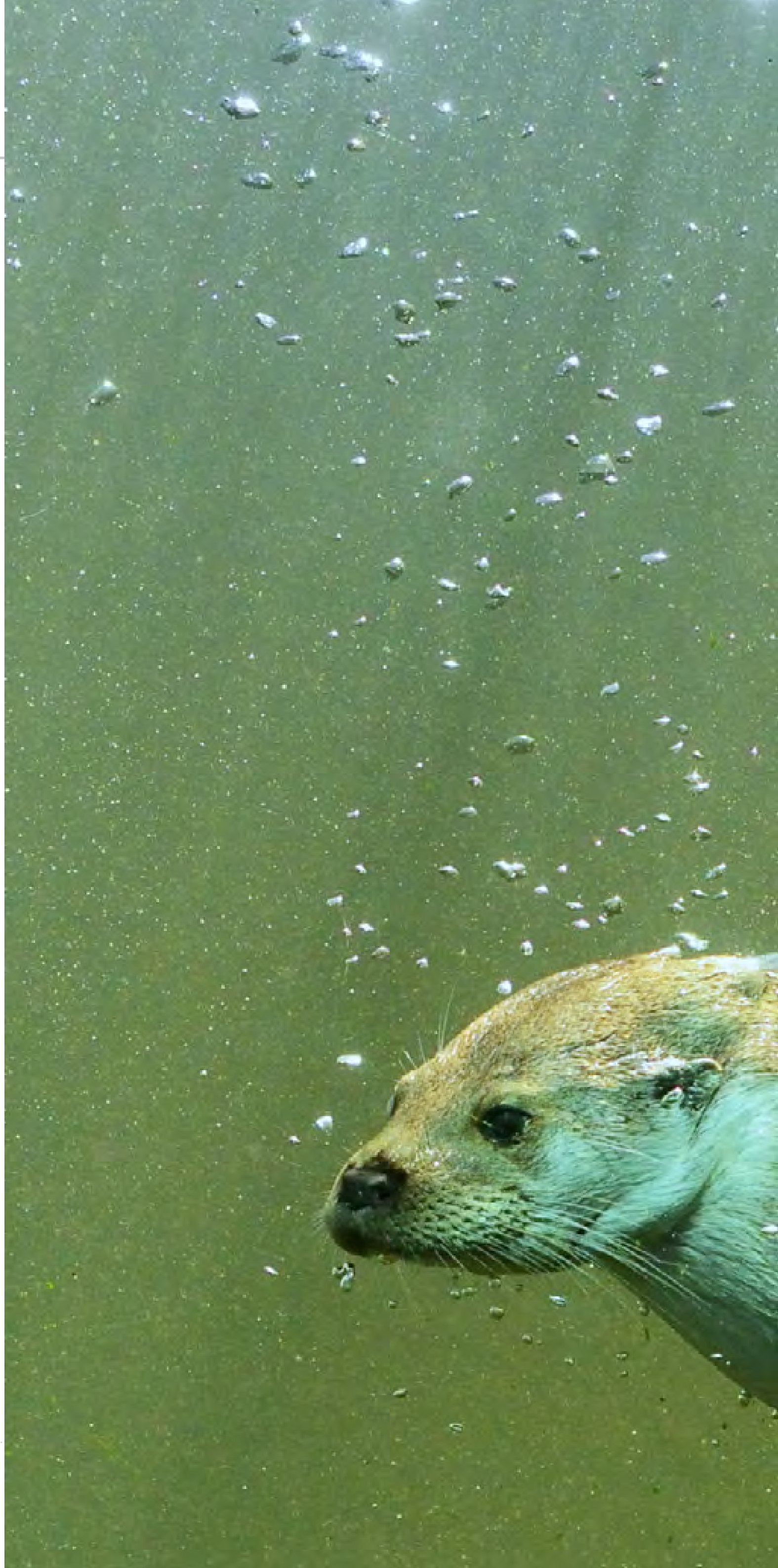
How does poor water quality harm people and wildlife?

High levels of the nutrients nitrogen and phosphorus can cause algae growth and reduced oxygen levels, upsetting the balance of life.

The build up of nutrients from fertilisers, pesticides and sewage leads to the deaths of many fish[24] and the damage can extend to coastal and marine ecosystems[25]. It can also create ideal conditions for invasive non-native plants and animals, enabling them to out-compete native and specialised species.

This reduces overall biodiversity and costs the UK over £1.7 billion a year[26].

There is too much polluted water causing unnecessary and hugely destructive damage to people and wildlife, and it needs to be better regulated (see p69 for more details).



Chemical pollution is causing significant harm to wildlife and humans

Chemicals from pharmaceuticals and personal care products build up over time, which means their negative impact is ever-increasing. Bisphenol A (BPA) from plastic packaging, for instance, has been linked to infertility in women[27] and PFAS have been linked to cancer[28]. Pharmaceuticals have been found to impact the behaviour of aquatic species, critically affecting reproductive success[29].

Swimming in water containing untreated sewage makes us sick and affects our wellbeing

Globally, an estimated 120 million cases of gastrointestinal disease are the result of swimming in polluted waters[30].

Sewage spills mean people are less likely to visit the coast or swim in rivers or lakes, so they miss out on the wellbeing benefits. The local economy can also suffer because there are fewer tourists. There is also huge public appetite for safe designated bathing sites. Anger is building in the public domain around the UK's water problem.

Antibiotic resistance is increasing

Antibiotics used for humans and livestock can end up in the water through untreated sewage or from agricultural run-off. Increased exposure to antibiotics through our waters can lead to the emergence of antibiotic-resistant strains that put human health at risk[31]. UK surfers have already been found to have three times more antibiotic resistance than the general population[32].

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Heavy metal pollution poses a serious risk to our health

Heavy metals are damaging to most species, even in small quantities. They can impair biological functions and growth and can accumulate in our organs causing serious diseases such as cancer[33].

Climate change exacerbates poor water quality

Pollutants become more concentrated in drought events, which are occurring more frequently due to climate change.

In addition, as climate change increases the frequency and severity of flooding, these pollutants can then reach sensitive habitats and bathing waters[34].

Warmer waters carry less oxygen which is needed for aquatic species to function, this can reduce biodiversity[35].

Many UK species are also adapted to live in cold water[36], so their populations could decrease if they are not able to adapt quickly enough.

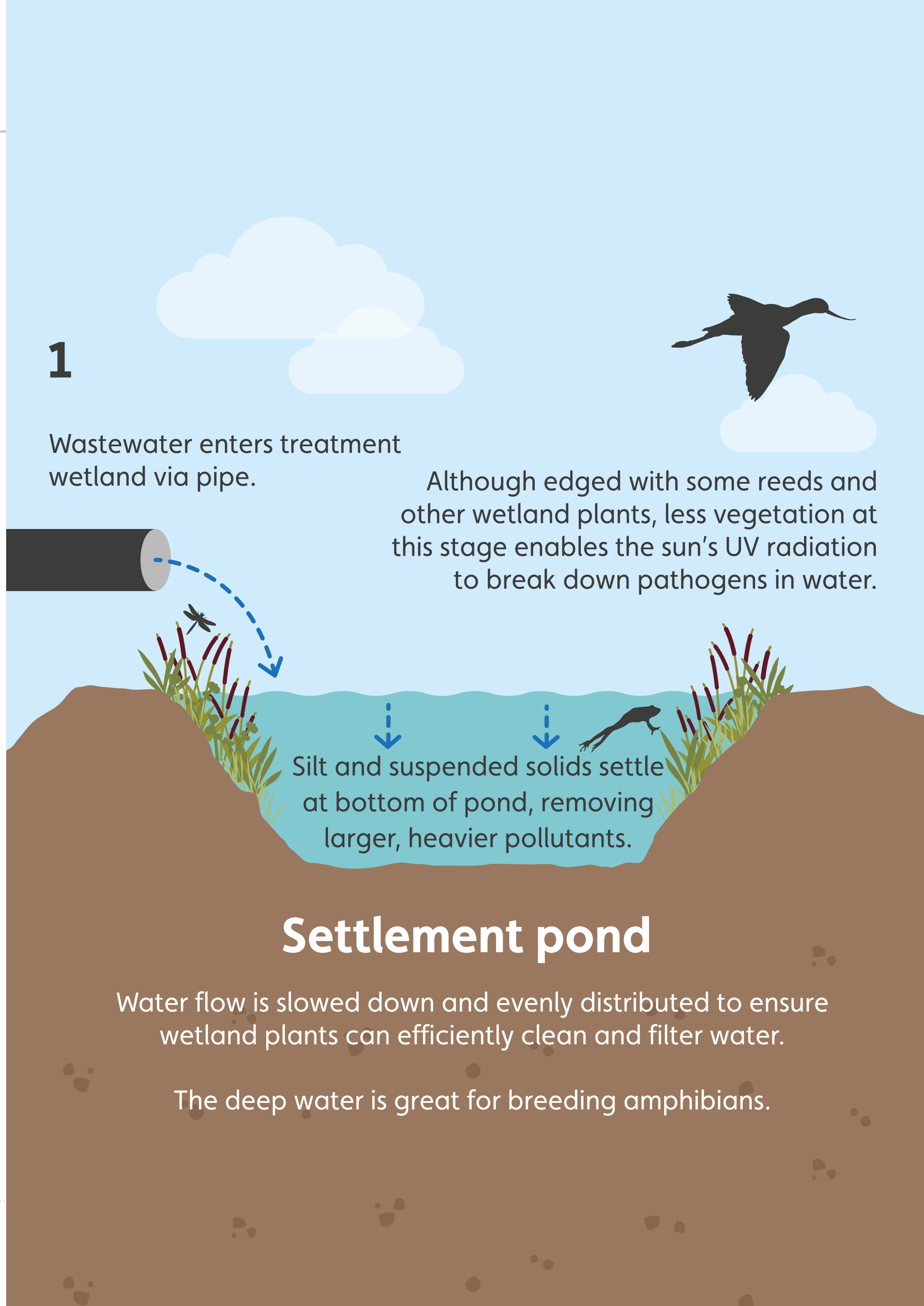
How do treatment wetlands improve water quality?

Treatment wetlands are a great way tto harness the amazing ability of wetlands to naturally clean and filter our water, while also providing a host of other benefits.

Treatment wetlands differ from natural wetlands in that they are engineered systems which have been designed to optimise the natural water treatment functions of wetland microbes within a more controlled environment[37].

They can be designed to target the removal of specific pollutants, thereby improving their capacity to remove water pollutants. In treatment wetlands the flow of water is also controlled so that it spreads evenly among wetland plants and their roots. As a result treatment wetlands are more efficient at cleaning wastewater than natural wetlands.

Treatment wetlands have the ability to remove nutrients, pesticides and sediment from agricultural run-off and to filter pollutants from industrial and road run-off in urban areas.



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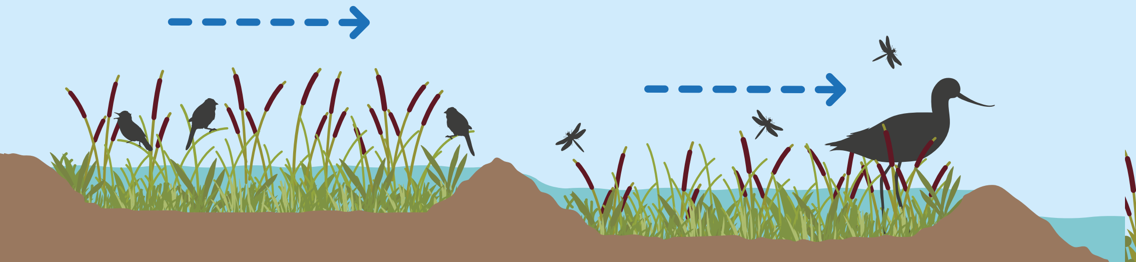
It's important water depth and flow are managed carefully.

The wetland is split into two parallel cells to help maintain a constant water flow.



Reed marsh

Any remaining solids are removed.

Water is directed to plant root systems where microorganisms break down pollutants.

Provides great habitat for warblers.

Emergent marsh

Both marshes can remove a range of pollutants including nitrates and phosphates.

Adjustable pipes control water levels.

Full of life including dragonflies, amphibians and wading birds.

3

A mix of pool and emergent marsh increases filtration and biodiversity.

The two parallel cells of water are mixed together in a pool. This oxygenates water before it flows into vegetated swale.

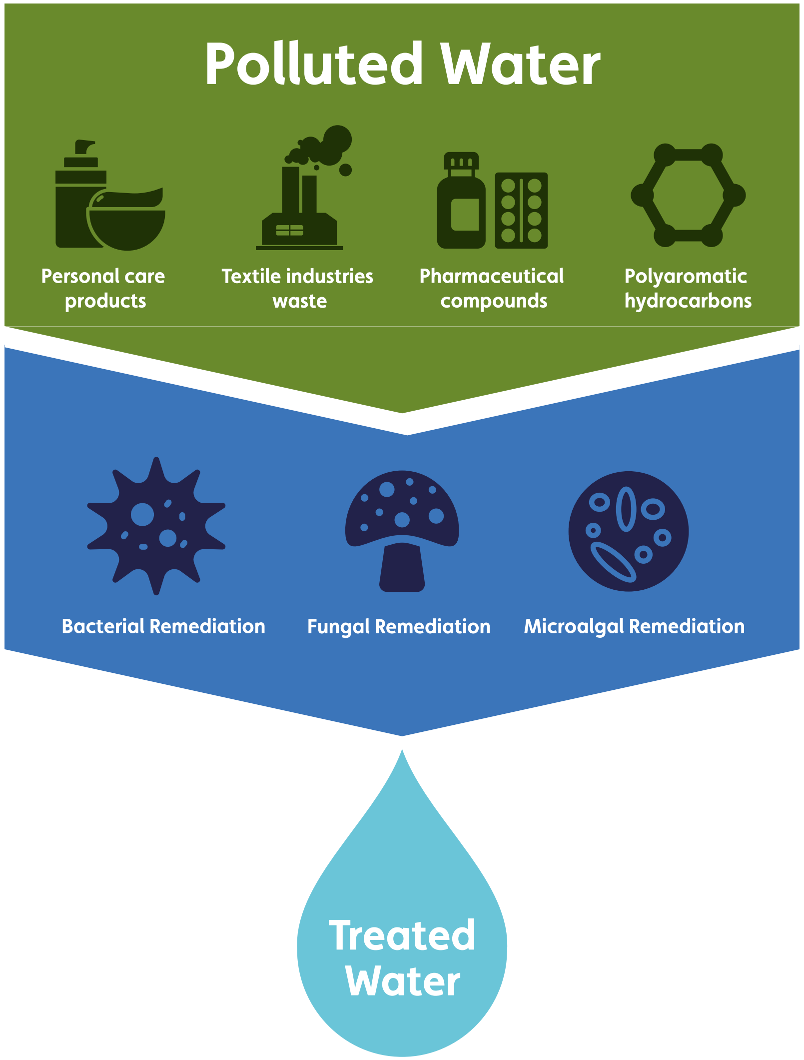
The purified water is channelled into a series of drainage ditches before entering water course.

Pool **Marsh** **Pool** **Swale**

If a two-stage purification process is required, the water can go through a final 'polishing' wetland before entering the waterbody. This further transforms the pollutants and nutrients, making the water even cleaner.

Wetlands are particularly effective at bioremediation. This is due to the lack of oxygen under the water. This creates the ideal conditions to force the microbes to feed on the harmful pollutants, instead of other more easily digestible compounds.

Some of these processes take place in the presence of oxygen, some without. This is crucial, as some pollutants require multiple stages before they're removed from the environment. Microbes that need oxygen take advantage of a wetland plant's ability to transport oxygen below the water surface via its roots.



Bioremediation is a natural process that uses microorganisms such as bacteria, fungi and protozoa, which can be used to break down harmful pollutants into non-toxic substances.

In treatment wetlands, bioremediation is carried out by microbes found within the wetland substrate. They extract the energy they need to survive from the harmful pollutants, and in the process break them down.

Types of treatment wetlands

PREFERRED


Image courtesy of Wessex Water

Constructed treatment wetlands (CTWs) are predominantly used to address pollution at source, or where wastewater is released via a pipe. They are engineered to suit the depth, water level, pathways of water through the wetland, and species of plants used.

Integrated constructed wetlands (ICWs) are engineered to a degree, but also address pollution at catchment scale while maximising multiple benefits to local communities. They are typically larger than CTWs and can receive water from both piped and open sources.


Image courtesy of ARM Ltd.

Vertical flow constructed wetlands (VFCWs) are effective solutions where space is limited, or where pollution is especially potent, as they're engineered to be more effective in a smaller footprint than ICWs. VFCWs use the plants and microbes that natural wetlands and other treatment wetlands use, and although habitat creation is not a primary aim, they offer more multiple benefits than existing wastewater solutions, including stormwater management. Where land is readily available however, it may be preferable to explore the feasibility of CTWs and ICWs in the first instance, to optimise the multiple benefits derived from wetland creation, or use combinations of each wetland type in a hybrid set-up.

The suitability of each of these solutions relies on several factors. These include the amount of land available, the level of maintenance required, the type of pollutants being targeted and the ability of the wetland to provide multiple environmental and societal benefits.

There are opportunities for treatment wetlands to be used in a range of sectors and areas across the catchment.

Agriculture

Farmers can install small ICWs to treat lightly polluted farmyard runoff.

Diffuse pollution can be captured by ICWs on smaller streams or through river restoration techniques.

Housing

For individual homes SuDS can be used to intercept rainfall, so less water enters the sewage and drainage networks, reducing pressure on CSOs.

Housing estates can use treatment wetlands to treat domestic wastewater.

Mining

On mining sites ICWs can be used directly downstream from the site.

Water treatment

Water companies can locate ICWs directly downstream from treatment works, instead of discharging wastewater directly into rivers. If this isn't possible, river restoration techniques further downstream in the catchment can be used instead.

Food processing

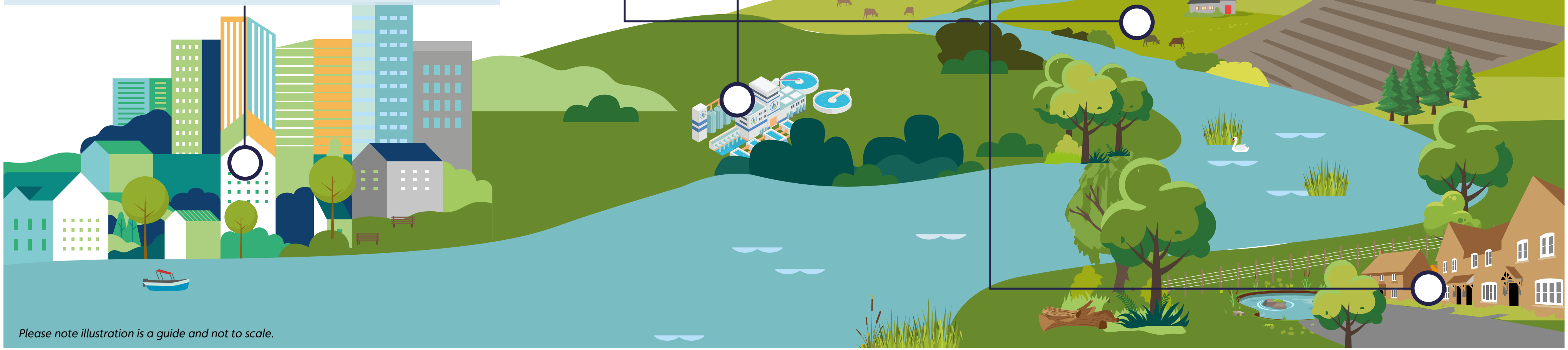
Industries that process food can create ICWs directly downstream from their factories.

Landfill

ICWs could be created directly downstream from landfills.

Urban/business district

Run off from roads and other hard surfaces can drain straight into treatment wetlands or through vortex separators and into balancing ponds.



Please note illustration is a guide and not to scale.

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Purpose

We need a comprehensive effort to clean up our waters. This requires better monitoring, governance and enforcement of water quality to achieve the UK's water quality targets.

Alongside this, we also need to make use of nature-based solutions like treatment wetlands that provide many benefits, including increased biodiversity.

What are the benefits of treatment wetlands?

Water quality

Wetlands are an amazing nature-based solution to water treatment through the removal of nutrients and pollutants. They reduce pressure on traditional, hard-engineered water treatment infrastructure.

Treatment wetlands have the potential to remove up to 60% of metals, trap and retain up to 90% of sediment run-off and eliminate up to 90% of nitrogen[38].

Capturing and storing carbon

Treatment wetlands are a low-carbon solution because they use significantly less energy than an equivalent wastewater treatment system[39].

At Yorkshire Water's Clifton Integrated Constructed Wetland, carbon emissions from energy used in water treatment operations were cut by 79%. Emissions from the whole lifecycle of the treatment system (including transportation, materials used, and construction) were halved[40].

Treatment wetlands have also been shown to store carbon in the long term[41]. However, carbon capture and storage in treatment wetlands is complex and further research is needed to accurately assess their potential.

Flood resilience

Treatment wetlands can manage big changes in water flow. This means they can cope with heavy rain and floods better than traditional wastewater treatment works. They're often designed to allow room for additional water to ensure they're resilient to seasonal fluctuations in rainfall, particularly in areas with high flood risk.

Surface water run-off is a major trigger of pollution, and heavy rain can lead to pollutants being picked up and transported to watercourses. This can be limited by slowing the flow of water through river restoration techniques, such as floodplain reconnection and re-meandering (creating a new meandering course for rivers). Floodplains and SuDS also trap sediments and other pollutants.

Recreation and wellbeing

Treatment wetlands provide clean water to water bodies. Cleaner waters will attract more visitors and could provide greater benefits to local economies by attracting new businesses[42]. Treatment wetlands should be part of a wider effort to remove sewage and other pollutants before they make their way into our waters, so that people can use them safely for swimming and other leisure activities.

Biodiversity

Wetlands provide valuable habitats for a range of wildlife, including mammals, reptiles, amphibians, fish, birds and invertebrates[43,44]. They offer an excellent opportunity to both enhance water treatment and create vital wildlife habitats where none existed before, thus improving local biodiversity. These wetlands can increase habitat connectivity while still ensuring optimal water treatment.

Treatment wetlands have a beneficial knock-on effect on the wider ecosystem because they prevent polluted water from entering the environment.

The best way to increase the biodiversity of a treatment wetland is to reduce the amount of pollutants that enter it in the first place.

Yorkshire Water's Clifton Integrated Constructed Wetland, carbon emissions from energy used in water treatment operations were cut by 79%. Emissions from the whole lifecycle of the treatment system (including transportation, materials used, and construction) were halved.

Image courtesy of BarhaleEnpure JV, Stantec UK & Yorkshire Water

Why should we create more treatment wetlands?

Whether you're a farmer, a water company, or a government department, creating more treatment wetlands benefits us all.

Reaching UK targets

Treatment wetlands would help reach water quality targets by reducing pollution

Under the Environment Act the UK Government has set targets to improve water quality. By 2038 it has committed to:

- Reduce phosphorus loadings from treated wastewater by 80%.
- Reduce nitrogen, phosphorus and sediment pollution from agriculture into the water environment by at least 40%.
- Halve the length of rivers polluted by harmful metals from abandoned mines[45].

The UK is not currently on track to meet these targets[46], but creating more treatment wetlands could (and should) be a central part of a strategy to get there.

Treatment wetlands would help hit biodiversity targets

The UK legal target is to increase species abundance by at least 10% by 2042 compared to 2030 levels[47]. Treatment wetlands provide a more hospitable wider environment for wildlife and can be a new habitat, so helping the UK reach its species abundance target.

Benefitting wider society

They benefit the economy

Surfers Against Sewage estimates that around £21.7 million is lost to the UK economy every year due to sick days caused by polluted water[48]. Treatment wetlands are a cost-effective way to tackle this economically damaging problem.

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Treatment wetlands would help level up opportunity for all across the UK

One in three people don't have access to nature within a 15 minute walk[49].

Lack of access is concentrated in areas with social deprivation, with people in the poorest urban and ethnic communities twice as likely as those in more affluent groups to live in neighbourhoods without good quality blue or green spaces[50].

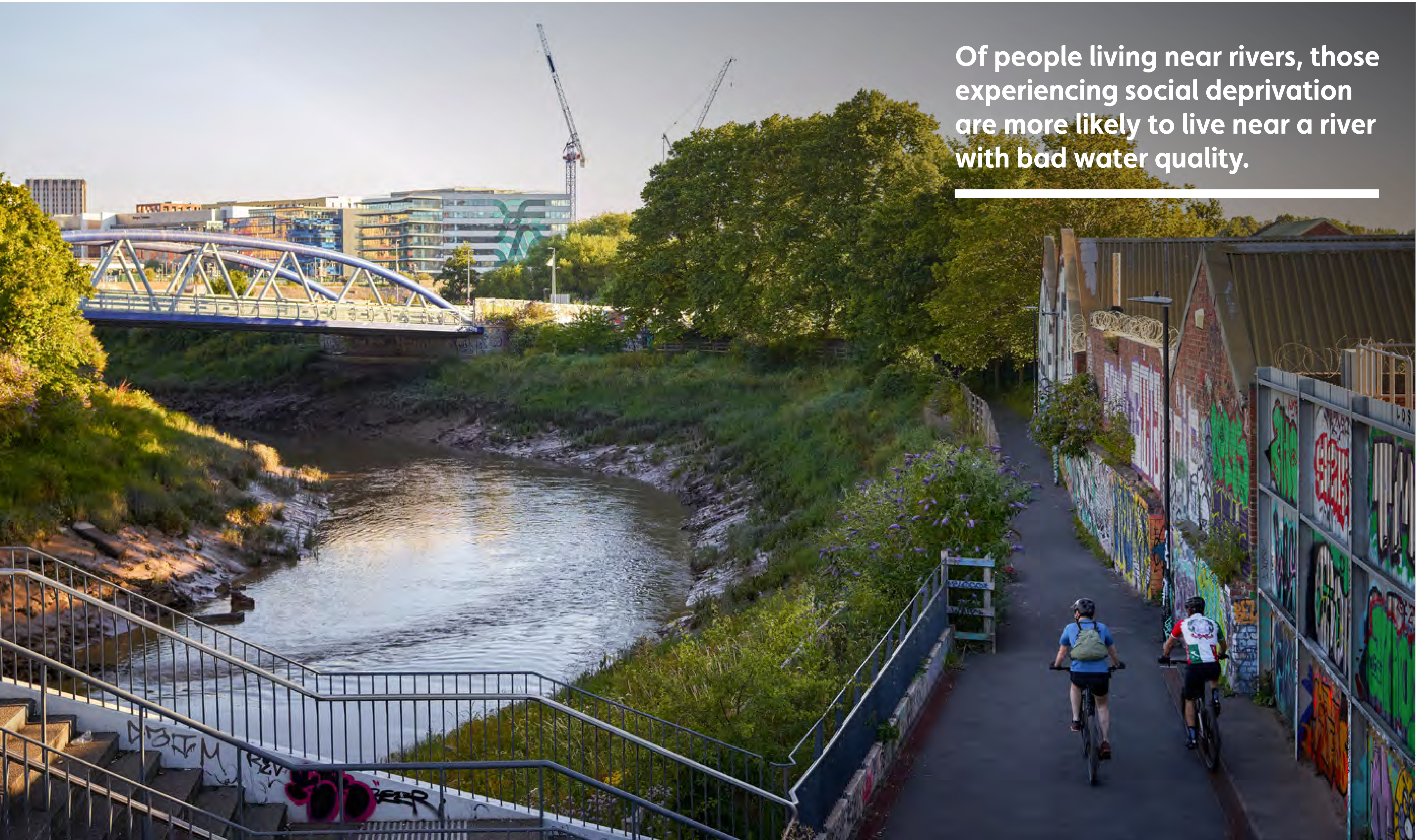
Water pollution disproportionately affects deprived communities.

Of people living near rivers, those who are more deprived are more likely to live near a river with bad water quality[51].

If treatment wetland creation was targeted at more deprived areas this could help tackle these inequalities.

Treatment wetlands would support new jobs and skills

Currently there are not enough engineers with the appropriate skills to create and maintain these wetlands. However, this presents an opportunity to create sustainable employment through training and development.



Of people living near rivers, those experiencing social deprivation are more likely to live near a river with bad water quality.

Saving money

Treatment wetlands save water companies and customers money

They have lower outright purchasing costs (CAPEX), lower operational costs (OPEX) and lower carbon emissions.

Yorkshire Water's Clifton Wastewater Treatment Works created an ICW costing 35% less than building a conventional treatment works would have done. Its operational costs were 40% lower[52].

Lower investment costs could mean lower costs for the customer (water bill payers) so it's a win-win!

Treatment wetlands will save farmers money and prevent pollutants reaching their local community

ICWs in agriculture typically cost 60% less to construct and 90% less to maintain and operate than traditional treatment works[53]. They have multiple benefits which can be felt across the wider community and catchment.

Resilience to climate change

Wetlands help protect against drought and flooding

For example, they can help improve soil resilience during prolonged drought and reduce the risk and impacts of flooding[54].

Wetlands can boost food production

Treatment wetlands aid pollination by providing pollinator habitats and boosting the number of insects that prey on pests[55]. Protecting crops means an improved harvest thereby helping farm incomes.

Case Study **Wessex Water Cromhall Treatment Wetland**

Using nature-based solutions such as treatment wetlands to tackle water pollution is gaining traction.

At its Cromhall sewage works in South Gloucestershire, Wessex Water has teamed up with WWT to create 12 wetlands that prove that nature can be used as a sustainable method of removing excess phosphorus from wastewater.

At present, water companies mostly use a combination of iron-based chemicals and energy-intensive filtration systems to remove phosphorus, which is economically and environmentally unsustainable. At Cromhall, plants and microbes absorb the phosphorus naturally.

The wetland has five years to show it can release water into the nearby Tortworth Brook with phosphorus levels no higher than 2mg/L. After just 18 months, average levels were already down to between 0.5 and 1mg/L.

The wetlands at Cromhall have reduced total phosphorus levels by 27.5%, ammonia by 62% and nitrogen by more than 60%.

This wetland is also helping to bring back wildlife. Swans have made a home in the wetlands; skylarks, linnets, smooth and palmate newts, and six species of bat have also been recorded there since the wetland's construction.

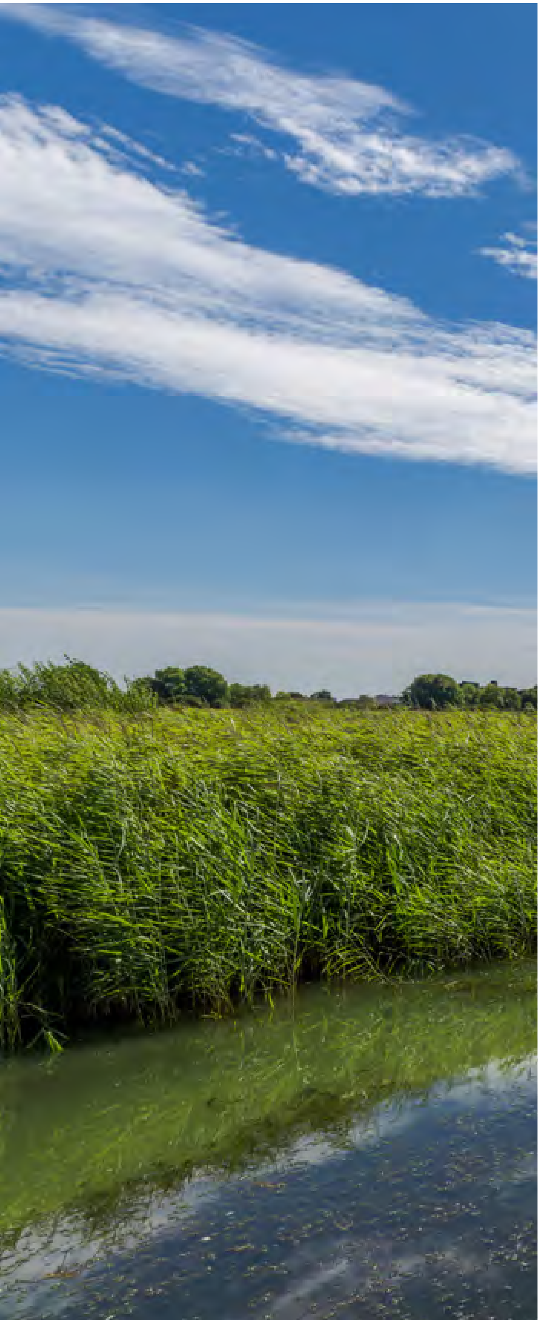
The wetland offered a low-cost, low-carbon, low-maintenance solution and achieved water quality above targets set by the Environment Agency.

The example of Cromhall Treatment Wetland shows why WWT is calling for more water companies and businesses to incorporate treatment wetlands into their business plans.

We hope that this case study will inform government policy and enhance the evidence base to enable more wetland solutions to be implemented in the future by all water companies, not just Wessex Water.

Ruth Barden, Director of Environmental Solutions at Wessex Water[56].

Image courtesy of Wessex Water



3.

Potential

There is amazing potential to create treatment wetlands across the UK. WWT is working to map potential areas for wetland creation, including treatment wetlands.

There is strong evidence to support more extensive use of these wetlands. But to unlock investment and help identify priority sites, there needs to be further research into their potential benefits.

What to consider when creating a treatment wetland

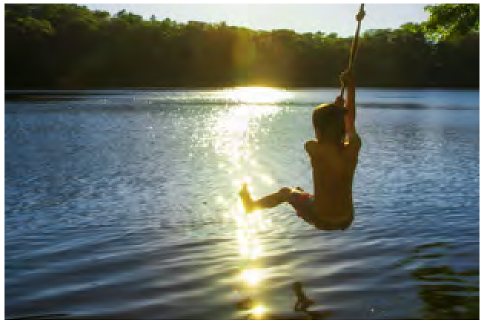
Factors to consider when prioritising treatment wetland creation:

Impact on protected sites

Many of our protected sites are damaged by water pollution. This has led to the creation of nutrient neutral catchments. To prevent any further pressure from development, these catchments now have targets to receive no additional nutrients. By prioritising the catchments upstream of these sites, we can protect biodiversity and improve the condition of currently affected habitats. Treatment wetlands can be located to help reduce pollution entering nutrient neutral catchments.

Impact on recreational waterbodies

Treatment wetlands can clean water before it enters lakes, rivers and streams. This means that people can use water recreationally, without the risk of sickness.



Proximity to the sources of pollution

We can prevent pollution by installing treatment wetlands directly downstream of the source (for example a wastewater discharge point or a highway). This approach will ensure the watercourse is protected from further damage for the maximum distance possible.

Where this is not viable, we can use ICWs or river restoration techniques, such as floodplain reconnection, to reduce the impacts of pollution.

Protection and management

Treatment wetlands must be properly maintained in order to function well and effectively filter out pollutants. If these wetlands deteriorate, they will begin to release pollutants they have trapped back into the water, undoing their positive effect on water quality. Proper protection and management should be a fundamental aspect of their design. Thus, developers must create a plan for their maintenance and protection at all stages.

Where can we use treatment wetlands?

It is critical that effective regulatory measures are in place to prevent pollution from entering water bodies in the first place. However, there are also a range of ways that wetlands can be used to treat polluted water.

Creating more treatment wetlands across a range of sectors could dramatically improve water quality in the UK.

Agriculture

Treatment wetlands can be installed on farms to treat lightly polluted farmyard run-off that contains sediment, silage and manure.

There are broad government incentives for farming businesses to separate clean rainfall from the dirty water produced by agricultural activities. However, this is not always possible.

Treatment wetlands can effectively treat the remaining wastewater from farmyards and provide a backup system in case of leaks from manure and feed storage. Run-off from fields can be intercepted using ICWs in small watercourses (such as streams) to reduce the downstream impacts of pollution.

Case Study: Dunhill farms catchment, County Waterford, Ireland

The village of Dunhill illustrates how treatment wetlands can work well for agriculture.

ICWs have significantly improved water quality in this farm-dominated catchment[57] in the Anne Valley project. It demonstrates that an ICW can provide a relatively low-cost solution to tackling pollution at source and diffuse pollution (spread over a wide area).

This wetland system reduced the total phosphorus in the water by 95% and the ammonium nitrogen by 98% in eight years[58].

This demonstrates how constructed treatment wetlands can be used to filter nutrients from agricultural run-off. However, there is still a need for more UK case studies to further improve the evidence base.

Image courtesy of VESI Environmental

This wetland system reduced the total phosphorus in the water by 95% and the ammonium nitrogen by 98% in eight years.

Water Industry

There is a huge opportunity for water companies to invest in treatment wetlands on or near wastewater treatment works to treat primary, secondary or tertiary wastewater. This will help them meet legal water quality targets and public demand to reduce their reliance on sewage overflows.

Campaigns and greater media attention have increased public awareness of water pollution from combined sewage overflows (CSOs) and Governments and regulators are having to respond.

A UK Government Storm Overflow Taskforce has issued targets for water companies to reduce the effect of sewage overflow events to zero severe incidents by 2030[59]. This will require all overflow use to be monitored and reported to the regulator and made public.

Chemical dosing (treating wastewater with chemicals) has traditionally been used to meet these targets, and water companies are becoming even more reliant on these expensive, non-renewable solutions to treat water faster. Treatment wetlands are being increasingly used as an alternative, but this needs to be more widespread.

Primary wastewater is untreated wastewater generated from households, businesses and industries that contains various contaminants including organic matter, suspended solids, nutrients, pathogens and heavy metals.

Secondary wastewater is partially treated wastewater that has undergone chemical and biological processes to break down organic matter, reducing the concentration of pollutants.

Tertiary wastewater is highly treated wastewater that has undergone advanced treatment processes to further purify the water and remove remaining pollutants, making it safe for discharge or reuse.

Where there is enough land available, treatment wetlands can be used to intercept combined sewage overflows (CSOs) to prevent them reaching watercourses. However, if CSOs discharge directly into a watercourse, an ICW can be installed downstream to limit their damage.

Water companies could also benefit from investing in SuDS, which will regulate and reduce the volume of surface water entering sewer systems during heavy rain (see our Urban Wetlands for Wellbeing route map for more detail on SuDS). Reducing reliance on CSOs will help prevent the discharge of raw sewage into watercourses.

WWT is in the process of mapping out potential wetland creation and restoration sites that will assist in the location of priority sites. But we will need specialist expertise to identify suitable areas for development.

Case Study: Severn Trent Sewage Treatment Works

Severn Trent commissioned ARM Ltd in Hulland Ward to design a treatment wetland that would replace a rural sewage treatment works with a vertical flow constructed treatment wetland system.

The wetland utilises a primary sludge treatment stage to remove solids, with a subsequent biological stage to remove reactive pollutants, such as ammonia, from the wastewater. This system has been successful in lowering operational costs, requires lower maintenance and energy, and provides a habitat for local wildlife.

The treatment wetland at this site services the waste of over 1,000 people and was the first of its kind in the UK[60].

Image courtesy of ARM Ltd.

Housing

Treatment wetlands in the housing sector will help developers meet the need for more housing, whilst also meeting nutrient neutrality obligations.

Treatment wetlands can become a mainstream option to reduce on-site pollution. Balancing ponds are currently commonly used to manage surface water on new housing estates. However, treatment wetlands can help manage domestic wastewater without the need to connect to the combined sewer system.

This is particularly beneficial in light of the enactment of Schedule 3 of the Flood and Water Management Act (2010) where developers no longer have automatic rights to connect into the sewerage system.

In rural settings, small-scale treatment wetlands can prevent effluent escaping from septic tanks.

Septic tanks remain unregistered in England and rural development often means they're used beyond their limitations. This results in nutrient-rich effluent leaving the system. By installing small treatment wetlands where septic tanks are sited, this could be easily remedied.

Case Study: WWT Slimbridge Millenium Reedbeds

An example of treatment wetlands working successfully is the Millennium Reedbeds at WWT Slimbridge.

This is a domestic wastewater system designed to clean wastewater from the reserve, optimise biodiversity by providing habitat and food for pollinators and insects, and to improve the aesthetics of the area. The wetlands treat waste from on-site facilities including the visitor centre and kitchens, to which there could be 3,000 visitors each day.

Such a model can be applied to a wide range of circumstances including rural businesses and housing development, which are currently using unregulated and poorly maintained septic tank infrastructure.

Transport

Treatment wetlands can be integrated into existing drainage systems to address pollution from roads.

Balancing ponds regulate the amount of excess surface water entering the drainage system while providing a wetland habitat for wildlife alongside roads and railways. However, these can require high levels of maintenance because of the amount of sediment they receive during periods of heavy rainfall. In addition, the habitats they provide are often low quality because of the presence of toxic pollutants such as heavy metals[61].

However, treatment wetlands can be integrated into existing wetlands as drainage solutions, trapping and treating hydrocarbons, microplastics, heavy metals and salts. Best practice in design and construction of these systems includes the use of a vortex separator[62].

Vortex separators are an effective option for transport drainage systems and can be used alongside treatment wetlands.

They are a pre-treatment stage for surface run-off from transport networks. They are contained within small and easily maintained chambers and do not need an energy supply. They capture sediment and oils and - because they remove pollutants closer to source - they also reduce the cost of maintaining drainage infrastructure. Vortex separators are easier for highway engineers to maintain compared to having to remove sediment from balancing ponds. This is because they are more accessible and require less specialist machinery.

Mining

Treatment wetlands have the potential to intercept surface water from abandoned mines. This wastewater is often acidic and contains high concentrations of polluting heavy metals.

Treatment wetlands have previously been developed through funding from the Coal Authority. They store and remove pollutants to below the level required by the Coal Authority's Environmental Quality Standards. They have also been shown to benefit macro-invertebrate and fish populations at a catchment scale.

Treatment wetlands have the potential to remove up to 96% of iron from mine wastewater, as demonstrated by a study on Welsh mines[63].

Due to the high potency of mine wastewater, treatment wetlands often need additional processes to function. These can include adding lime to neutralise acidity, to optimise the natural treatment processes of wetlands.

The Environmental Improvement Plan sets targets to halve the length of rivers polluted by harmful metals from abandoned mines by 2038[64]. Around 40 new mine water treatment schemes are needed to fulfill this target.

The UK Government's Environmental Improvement Plan (EIP) is a plan to address environmental challenges and promote sustainability through specific actions and policies across various sectors of the economy. Its ultimate goal is to create a cleaner and healthier environment in the UK.

Treatment wetlands have the potential to remove up to

96% of iron

from mine wastewater.

Landfill

Treatment wetlands can be used where the water runs out of landfill sites. They would protect surrounding waterbodies by filtering out nutrients and other pollutants[65].

These wetlands also improve chronic pollution (permanent pollution caused by repeated or consistent release of pollutants) by raising dissolved oxygen levels and bringing the pH closer to neutral, limiting the impact on aquatic species (in particular invertebrates)[66].

There is also an opportunity to enhance the wellbeing of the local community by transforming a landfill site into a recreational space.

Case Study: Shaw Forest landfill site, Swindon

This landfill site has used treatment wetlands to treat landfill leachate.

In consultation with WWT the 40-hectare community park was able to deal with landfill leachate by creating and maintaining treatment wetlands.

The site now has a range of habitats from woodland to hedgerows and wetlands. It's home to many species of wildlife, including birds of prey, waterbirds, amphibians, deer and foxes[67]. There's also a nature walk, which is open to the public[68].

Food and drinks industry

Treatment wetlands have been installed at large agricultural washing centres and drinks company processing sites to capture waste that may also contain agricultural pesticides.

Industries (such as those producing and processing olives, alcohol, seafood and dairy) can effectively treat pollutants and toxic substances through the use of treatment wetlands[69,70].

There is a huge opportunity for these small interventions to have a cumulative effect at a landscape scale, while protecting businesses from fines arising from potential regulatory enforcement.

Case Study:
Glengoyne Distillery, Scotland

WWT worked with Glengoyne Distillery to design treatment wetlands to deal with its wastewater.

The whisky distillation process creates significant volumes of waste liquids called 'pot ale' and 'spent lees'. Instead of having to be sent off site to an industrial treatment plant, this wastewater is now filtered on site.

The liquid makes its way through a series of 12 specially created wetlands, where reedbeds filter and clean the liquid before it flows into the local burn and then on to Loch Lomond.

Using wetlands in this way has meant the company has been able to cut its overall waste by 25%. Because Glengoyne no longer need to transport hundreds of thousands of gallons of spent lees off site, it has cut the number of journeys by 21 per week. And as the process uses gravity, it only takes a 1.5kW pump to send the spent lees on their way.

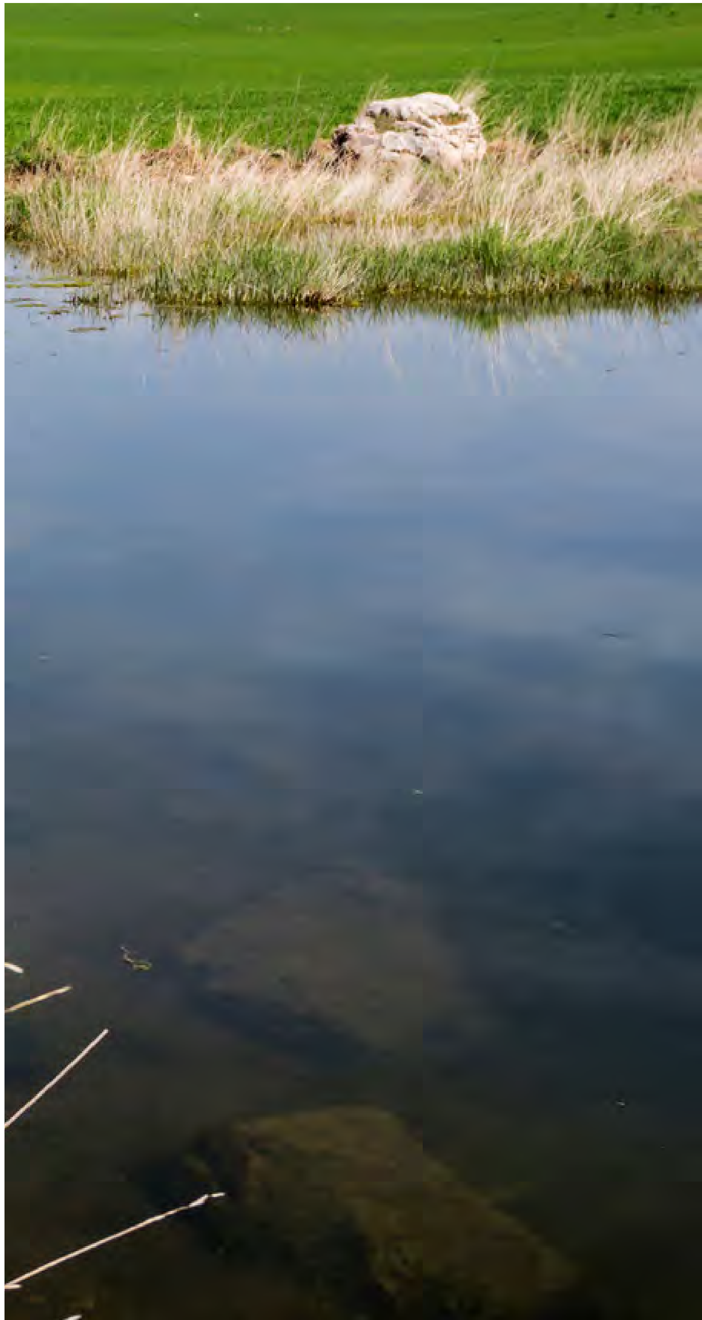
The wetlands are excellent for biodiversity, supporting dragonflies, birds and many wetland plants[71].

Image courtesy of Glengoyne Distillery. Photo by Laura Meek

4.

Process

Creating wetlands to improve water quality requires building capacity. This can be done through developing evidence, advice and training and also by engaging with communities on project design and delivery.



Creating treatment wetlands involves the following three elements:

Delivery

Direct conservation action to create and manage treatment wetlands to tackle pollution and provide co-benefits.

WWT alone cannot create treatment wetlands at the scale required; this requires partnership working with Government, business, landowners, communities and civil society bodies.

Capacity building

Providing advice and training to potential investors/developers, creating innovative financing approaches, and gathering and sharing further evidence on how to derive multiple benefits.

Community engagement

Consulting and involving people in shaping their local community wherever this may be appropriate to the project.

What are the priorities for the creation of treatment wetlands?

Set out below are the priority actions that will kick-start the creation of treatment wetlands.

Delivery

Creating and demonstrating the benefits of treatment wetland creation

Habitat creation at scale

While there are chances to develop treatment wetlands through current government-led initiatives like environmental land management schemes (ELMs), they lack sufficient resources to bring about significant change. Additional funding and policies specifically designated to support the widespread adoption of these interventions are necessary.

Private investment, for instance through nutrient neutrality, could have most potential for scaling up the delivery of these systems at the pace needed.

Nutrient neutrality is a new finance mechanism. To develop early projects, it will be necessary to use existing expertise and evidence.

These projects must exhibit exemplary standards and comply with government and investor demands for nutrient removal rates. They also need to create high-quality habitats for wildlife and other benefits associated with wetland habitats.

The research and learning opportunities provided by these ‘early adopter’ sites will help fill evidence gaps. This will build the business case for new income streams associated with other natural capital elements such as health and wellbeing benefits and natural flood management.

Capacity building

Building the capacity of stakeholders to create treatment wetlands:

Advice and training

Planning, delivering and managing treatment wetlands requires specific skills, expertise and engineering capacity. There are currently relatively few organisations and individuals that can create and manage habitats at the scale proposed in this document.

It is therefore critically important that those with existing skills, resources, capacity, knowledge, expertise and experience are involved in the early stage of a UK-wide wetland treatment creation programme. Over time, other bodies will need to be engaged and supported to build their capacity to deliver. It will also be necessary to increase the size of the workforce, so that we have the necessary skills to create effective treatment wetlands.

This should be a significant opportunity for job creation. The training sector should consider how it can scale up professional training in the different areas of expertise required to meet the coming demand.

Evidence

There is currently a strong evidence base that demonstrates the benefits of treatment wetlands. However, much of this evidence is gathered from small scale treatment wetlands and those from outside the UK. Building on this evidence by delivering and monitoring more UK treatment wetlands at scale will build investor's confidence to create them in a range of different sectors.

Regular monitoring of treatment wetlands and their effectiveness is essential to reduce any perceived risk associated with these nature-based solutions while demonstrating their value to investors. Research objectives should be based on identified needs and be focused on overcoming existing challenges. This is critical to fill evidence gaps and to ensure enough people are available to monitor and verify project success.

Community engagement

Working with and for the community to create treatment wetlands where appropriate

Project development

Some projects will not involve any community engagement. However, where this is appropriate and feasible, the local community should be a central part of developing projects. To ensure projects serve the community and are not out of place in the local landscape, local people should be consulted.

Use

Running and facilitating activities that remove barriers to accessing nature will ensure the benefits are widespread and equitable. This may not be appropriate in all cases (for instance, treatment wetlands dealing with sewage). However, where it's appropriate, this could include community activities, educational classes and walks, and school outreach programmes based around projects.

Maintenance

Maintaining treatment wetlands will ensure lasting benefits to the community and wider environment.

How will treatment wetlands be financed?

Water companies

The UK's Water Restoration Fund provides support for water companies to invest in new approaches to water treatment like treatment wetlands. The UK Government has also released £1.6 billion for extra infrastructure investment to address pollution from CSOs[72].

Water companies are also able to finance their own improvements by reducing share dividends on annual profits. **It is critical that the cost isn't passed on to consumers.** The Water Industry National Environment Programme (WINEP) will see up to £5 billion of investment by water companies in the natural environment between 2020 and 2025[73].

Nutrient offsetting

The requirement for nutrient neutrality has led to the creation of a market-based system for trading nitrogen credits. (Phosphorus credits are also being used now, but this is still in the early stages). This system is not perfect, and more action is required to take developments beyond neutrality into the active reduction of pollution at a catchment scale (nutrient negativity). The use of Environmental Impact Bonds allows for sharing risk where uncertainty lies in the use of wetlands in place of source reduction.

Environmental Land Management Schemes (ELMs)

Countryside Stewardship Plus (CS+) currently offers 50% funding for constructed treatment works[74], acknowledging an element of the 'polluter pays' principle[75] in the agricultural environment. Full funding is needed to increase uptake among land managers, with the potential for this to be delivered through ELMs directly, or by blending private finance with public money where possible. ELMs could also be used to fund work that provides secondary water quality benefits such as Integrated Pest Management and Natural Flood Management.

Environmental Impact bonds (EIBs) are a financial tool used to fund environmental projects such as ecosystem restoration or climate change mitigation. EIBs are structured as pay-for-performance contracts, whereby investors provide upfront funding for a project; the project's success is evaluated against predetermined environmental outcomes. If the project meets the outcomes, the investor receives a return on their investment; if not, the investor bears the financial risk.

5.

Partnerships

No single organisation will be able to create treatment wetlands on its own. Creating these wetlands at the scale and pace we need requires the involvement of national and local governments, the investment and know-how of businesses, and a process of co-creation with landowners and local communities.

We have identified key partners from across the UK to facilitate the UK-wide creation of treatment wetlands.

Delivery

Government

As well as working to protect existing natural wetlands the UK Government must develop and implement policies that facilitate and scale up the creation of treatment wetlands. WWT will encourage this by:

- **Advocating for policies,** often in coalition with other organisations meeting policymakers to discuss barriers to change
- **Working with the All-Party Parliamentary Group for Wetlands** to influence parliamentary processes and decision-makers

Creating treatment wetlands will require working with the UK government and its agencies and making use of their skills and expertise.

Key departments:

- **Department for Environment, Food and Rural Affairs (Defra)**
  Responsible for protecting and enhancing nature, including how people interact with nature
- **The Environment Agency**
  Responsible for environmental protection and managing flood risk
- **Natural England**
  Responsible for safeguarding and improving the natural environment, promoting biodiversity and managing public access to the countryside

  Government bodies with less experience of working with nature, but which are important for developing planning law, such as the Department for Levelling Up, Housing and Communities, and Homes England, will also be important. This will require bridging the gap between these bodies and nature-focused bodies.
- **The Water Services Regulation Authority (Ofwat)** will be crucial in leveraging water industry action as the body responsible for economic regulation of the privatised water and sewerage industry in England and Wales.

Business

Creating treatment wetlands at scale will require the involvement of a wide range of businesses and companies, including:

- Landowning organisations or utility companies, particularly those in the water sector
- Farmers and food/drink production industries
- Developers and planning organisations

Civil society

Community groups and local charities must be consulted where appropriate so that projects can become a valued part of community life and be delivered in a way that genuinely meets local needs.

Capacity building

Government

Training and advice will be needed to build the capacity of the various agencies to construct treatment wetlands. Government should work in partnership with businesses, water companies, farmers and others to ensure that any guidance meets their needs. It's important that advice is tailored to different catchments.

Business

There is demand from business for robust private finance mechanisms to unlock development. Government needs to facilitate this, and to provide advice on best practice for how to create quality treatment wetlands that can be effectively and efficiently integrated into new water treatment infrastructure.

To encourage business to invest in treatment wetlands, it is necessary to provide evidence of their effectiveness in order to increase confidence and manage risk. It also needs a substantial increase in supply of viable projects. Evidence should be shared with businesses on the potential for financial savings through investment in treatment wetlands, and on how to make best use of treatment wetlands and SuDS to ensure multiple benefits for people and nature.

Providers of education to planning, development, construction and allied professionals are well placed to increase business knowledge and training for developing treatment wetlands and SuDS.

Civil society

The success of our ambition will be dependent on collaborating with academic institutions to access scientific expertise and address any gaps in evidence.

We will also work with community groups and local charities to increase the skills of their members so they can adopt and manage projects they help create, and initiate projects of their own.

Community engagement

Government

Local authorities have a responsibility for planning, flood prevention and public health. They will therefore be essential partners in ensuring projects are delivered and that we make the very best use of the many benefits treatment wetlands can provide.

Business

Projects involving developers and water companies should engage community members as equal partners.

Civil society

Local and national charities have a part to play in raising public awareness and building meaningful and effective engagement to build the call for change from the public.

It will be essential to work alongside community groups and stakeholders that use our waterbodies, such as anglers and wild swimmers. Community engagement at every stage is vital to ensure that the water quality network meets local needs and becomes accepted as an important part of local communities' infrastructure.

6.

Policy

WWT wants to see the widespread use of wetlands to help meet water quality targets. Such wetlands must be seen as critical infrastructure in reducing poor water pollution and in bringing life back to our communities.

To make this happen, stakeholders need the right evidence, information and funding.

The UK government must adopt the following policies to ensure we can make the best use of treatment wetlands.

Information

TOP PRIORITY

Evidence: establish a pilot scheme of treatment wetlands in the UK by 2025

While technical evidence for the performance and feasibility of treatment wetlands is academically robust, it has failed to attract confidence from regulatory bodies and investors.

The UK government's EIP 2023 commits to achieving clean water targets through the 'use (of) nature-based solutions to reduce pollutants entering the water environment through sustainable drainage, wetlands, and more'[76]. This can be addressed through building a national evidence base of treatment wetlands.

By establishing a pilot scheme, the UK Government would drive the trialling of treatment wetlands on a wider scale and allow for much greater consolidation of the existing evidence base. In addition, a national working group could identify how to increase the use of treatment wetlands based on the trials. This could also help monitor and promote the full range of benefits that treatment wetlands provide – improved water quality, flood defence and wildlife habitat, carbon storage and cost effectiveness.

The pilot would require new funding, or it could be allocated to The Big Nature Impact Fund. The £30 million currently available from this fund is not sufficient to tackle the scale of the water quality problem.

Introducing a pilot scheme by 2025 allows time for the scheme to be developed, however it requires investment now so that targets for water quality can be reached.

Sites: identify existing wetland sites that are improving water quality and prioritise locations for further wetland creation

In the EIP, the government announced a commitment to establish a UK Wetlands Inventory that would map out all existing wetlands and identify actions for their protection[77]. To make full use of this resource we also need to see mapping of the potential for creation of wetlands, including treatment wetlands. There are similar models for flood risk, but this has not been replicated for water quality.

Some opportunity maps exist already, and WWT is working to create comprehensive maps to identify the location of potential wetlands across the UK, including treatment wetlands. However, Defra needs to bring existing mapping together and develop this, providing better data that would increase transparency and make it easier to identify investment opportunities. This would also help overcome the lack of confidence some stakeholders may have, allowing them to better understand the potential for treatment wetlands in their areas.

Mapping should be undertaken alongside the UK Wetlands Inventory (ideally by 2024, in time for the Ofwat determination of water company business plans).

Guidance: Develop comprehensive guidelines on the creation and maintenance of treatment wetlands that meet national standards for best practices

We need comprehensive guidance on best practice for creating treatment wetlands that are effective, efficient, low cost and maximise the benefits they can offer. In the EIP, the UK Government commits to 'develop clear guidance' on 'water positive' or 'net zero water' developments and the roles for developers and water companies (including water company incentives).

Existing guidance for treatment wetlands is out of date and limited. There is some guidance on constructed farm wetlands, for example, and WWT contributed to Natural England's Treatment Wetland Framework. However, this is limited to England and does not take account of radically different land management, such as the changing future of agricultural support under ELMs. It is also not easily accessible. By including provisions about when and how to build treatment wetlands, the plans can encourage developers to invest.

New Government guidance should allow for the creation of high-quality treatment wetlands across sectors that could benefit from their development. Government needs to provide guidance and tools through the Planning Advisory Service; this forms part of local plans and can require development to be done in a certain way.

The guidance should be produced by 2025, in line with the pilot scheme.

Planning

TOP PRIORITY

Targets: make treatment wetlands the default solution for meeting nutrient neutrality targets

Treatment wetlands should be the default option for achieving nutrient neutrality, and this needs to be incorporated into all existing and future legislation around nutrient neutrality.

Current targets do not incentivise the use of treatment wetlands. There are targets to address nutrient pollution but currently there is no requirement for developers to use nature-based solutions (including treatment wetlands) to achieve this.

In July 2022 a new assessment of the Habitats Regulations placed a legal duty (Levelling Up and Regeneration Bill 2022) on water companies in England to upgrade by 2030 wastewater treatment works in 'nutrient neutrality' areas to the highest achievable technological levels. The assessment also outlined a new Nutrient Mitigation Scheme established by Natural England, which facilitates the construction of thousands of homes while creating new wetland habitat. This will allow local planning authorities to grant planning permission for new developments in areas with nutrient pollution concerns, ensuring that building can go ahead. In total, 27 catchments receive advice on how to meet nutrient neutrality obligations from Natural England.

It is crucial to ensure that the government remains committed to enacting nutrient neutrality legislation and implementing policies that protect our most sensitive freshwater sites. Government must also ensure that the impact of new developments is minimised or neutralised. However, there is currently no requirement for nature-based solutions to be used to achieve these targets. The Environment Agency should make developers accountable for implementing these schemes (but needs increased funding to do so).

Ideally, this would be done by 2025, getting us on track to fulfilling nutrient neutrality obligations.

Strategies: update plans to tackle pollution from Combined Sewer Overflows through the creation and use of treatment wetlands and SuDS.

Defra's Storm Overflows Discharge Reduction Plan[78] (required by the Environment Act) was an opportunity to improve on the weak legislation that exists in this area. We welcome the additional support for nature-based solutions in the plan, but ultimately it falls short of matching and overcoming the urgent problems posed by Combined Sewage Overflows (CSOs). It does not adequately tackle the pollution caused by sewage and needs reform.

In England in 2021, sewage was pumped into waterways for 2.6 million hours[79], contributing to rapid declines in the health of our freshwater environments.

The Storm Overflows Discharge Reduction Plan relies on self-monitoring by water companies and does not set targets for the action desperately needed to enable a rethink of how storm overflows are managed.

The plan will not be reviewed until 2027, which is too late. Such a review should be informed by a more holistic assessment of the benefits and reduced costs of nature-based interventions such as SuDS. This will allow the UK to tackle the scale of the problem at the pace required.

Standards: create standards, rules and training for good-quality treatment wetlands.

It's important to address the skills deficit relating to treatment wetlands. This lies in the design, modelling and feasibility of treatment wetlands. To take advantage of the opportunities presented, we will need to have a larger pool of highly skilled individuals. Their training will ensure that sectors can meet demand and that quality products are delivered, avoiding reputational risk to investors.

According to the EIP, the government aims to 'drive demand for new types of green jobs as innovation and research develop new ways to improve the natural environment'. Treatment wetlands deliver just that, so we need new and existing funding packages to support this. For instance, the Nature for Climate Fund supported up to 3,400 jobs associated with tree planting and peatland restoration. A similar fund for water quality may be necessary to create jobs at the scale required to meet the commitment of the EIP.

There is a need to incorporate this training and guidance into mainstream education and apprenticeships or develop a course. This should be targeted at consenting, regulating and delivery bodies including land managers, planning authorities and practitioners. This training would produce appropriately skilled individuals who could follow the guidance and ensure treatment wetlands reached their full potential. Government will need to work with professional bodies to develop training materials and courses.

This should be delivered once the appropriate evidence base, and mapping have been established (by 2027).

Funding

TOP PRIORITY

Financial incentives: establish and develop an effective market in nutrient trading and offsetting by creating a nutrient offsetting code.

The government has set clear nutrient neutrality targets for developers under the Habitats Regulations. Wetlands must be used to meet these targets (and to go beyond them where possible). However it is vital that they are created in a way that maximises their potential benefits. Wetlands should be used on site to treat nutrients, but they should also be used elsewhere to offset harm created by nutrients.

It is important that developments are wildlife friendly and minimise the impact of pollution on sensitive environments. Financial incentives will motivate developers to reach nutrient neutrality targets more quickly, and potentially exceed them.

Any offsetting scheme would need strict criteria to ensure offsetting is applied correctly and provides genuine environmental benefits. This would be done through the creation of a nutrient offsetting code. Nutrient offsetting creates the opportunity to sell 'credits' to mitigate the impact of new homes and allow house building. If designed and managed well this will create new space for wildlife.

To give time for the code to be developed the government should aim for 2026.

Private funding: require water companies to set out business plans that make treatment wetlands the default option for wastewater where it is feasible to do so.

Water companies are legally required to produce business plans that are approved by Ofwat, with legal obligations underpinning the plans. But they are expected to go beyond the minimum requirements.

Water companies are 'expected to consider using catchment and nature-based solutions' including wetland creation. They are also required to produce Drainage and Wastewater Management Plans (DWMPs). These set out how water and sewage companies 'intend to extend, improve and maintain a robust and resilient drainage and wastewater system over the long term' to ensure it provides sustainable services for customers and the environment. No existing plans use treatment wetlands as a default option for treating water, so there needs to be a requirement from Ofwat for them to do so wherever this is feasible.

The UK Government has committed to 'encourage water companies to reduce their pollution through upgrading wastewater treatment infrastructure and rolling out nature-based solutions for example, integrated wetlands'[80]. Currently, treatment wetlands are not widely adopted by water companies. There's little incentive to invest outside of protected areas, where water and wastewater companies are legally required to meet lower discharge consents. Therefore, the motivation to invest in treatment wetlands is low. A change in Ofwat guidance could drive this change and lead to significant increase in treatment wetlands.

Once we have clear mapping of treatment wetland opportunities, water companies can use it to take advantage of these opportunities when treatment wetlands are the most feasible and effective solution.

Public funding: support land managers by incentivising wetland creation to improve water quality.

Increased funding to incentivise the creation of treatment wetlands in agriculture is essential.

Current land management practices, underpinned by public subsidies, contribute to poor water quality. Under ELMs, the government hopes to deliver 'public money for public goods'[81], particularly through CS+ and the Landscape Recovery scheme through which farmers and landowners are financially rewarded for sustainable farming practices and nature restoration.

We welcome the intention for ELMs to build on the previous European Common Agriculture Policy system, however this is unlikely to fully address the scale of the problem. Moreover, while ELMs does make provision for supporting wetlands (for example constructed wetlands will now be added to the CS+ scheme) it currently lacks sufficient incentives to really make a difference at scale. In addition, the issue of uptake must be tackled to make these practices widespread.

CS+ currently offers 50% funding for CTWs[82], acknowledging an element of the 'polluter pays' principle[83] in the agricultural environment. Funding of 100% is needed to increase uptake among land managers, with the potential for this to be delivered through ELMs directly or by blending private finance with public money where possible.

ELMs is due to be introduced in 2024, so we need these changes now.

Conclusion

WWT is calling for urgent action to unlock the potential of treatment wetlands to help tackle our water quality crisis.

These wetlands will provide a low-cost solution to treating water, while bringing a range of benefits for people and wildlife.

There are exciting opportunities to incorporate treatment wetlands to tackle water pollution in agriculture, the water industry, housing, transport, mining and landfills.

By creating them at scale we can tackle our growing water pollution crisis, while also boosting biodiversity and bringing life back to our local communities. This should be part of a wider approach to tackling water quality issues, by regulating pollution activity and using other water treatment systems where treatment wetlands may not be feasible.

There is an opportunity to change the way we treat our water.

There are already some amazing treatment wetlands across the UK cleaning up our waters. But there is huge potential to do a lot more.

To create these wetlands at scale will require determined efforts from governments, businesses and communities across the UK.

Treatment wetlands should be the default solution to improving water quality. But we can only make this shift with the right incentives, standards, guidance and skills. With the right partnerships, funding, and policy changes we can make this happen.

The health of our water environment is in danger. Our poor water quality is making people sick and threatening our wildlife. We need to act now, if we're to be able to address the scale of the challenge while bringing nature and people with us.

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There are many exciting opportunities to use treatment wetlands to tackle the UK's poor water quality. Whether you're interested in working with WWT on a project, helping us build the capacity of stakeholders to create more treatment wetlands or helping us put in place the policies needed to support their creation, we'd love to hear from you.

Together we can help secure a future where healthy wetland nature thrives and enriches lives.

WWT

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