

Water today, water tomorrow

Resilient supplies

How do we ensure secure water and sewerage services?



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This is one of a series of occasional focus reports. It highlights the work we are doing on a particular policy area, with the aim of encouraging wider debate and discussion.

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1. Safe and reliable supplies

Water, sanitation and drainage are critical to our way of life. They have direct implications for the health of our economy, society and environment.

Delivering safe and secure water and sewerage services relies on there being enough treatment capacity to satisfy consumer demand. It also relies on the assets, such as pipes and treatment works, being maintained to a level that ensures services are not affected during normal, planned operating conditions.

But planning for everyday operating conditions is not the only thing about which the water companies in England and Wales have to be concerned. Extreme events caused by hazards that are beyond their control – such as flooding, drought or even acts of terrorism – can also disrupt services to consumers. The companies we regulate have to manage this risk by giving consumers an appropriate level of protection.

We call this ‘resilience’.

Delivering safer and more reliable services since privatisation

The water companies in England and Wales deliver water, sanitation and drainage services to almost 55 million people every day.

Since privatisation in 1989, they have delivered significant improvements to the services that consumers receive, including safety and reliability.

For example:

- leakage levels are about 35% lower than they were at their peak in the mid-1990s;
- consumers have access to excellent drinking water, with 99.95% compliance with tough EU standards;
- only 1 in 10,000 properties is at risk of low water pressure compared with 133 in 10,000 properties between 1990 and 1995;
- only 6 in 10,000 properties are at risk of unplanned supply interruptions (12 hours or more) compared with 33 in 10,000 between 1990 and 1995; and
- only 1 in 10,000 properties is at risk of sewer flooding incidents (twice in 10 years) compared with 8 in 10,000 between 1990 and 1995.

Over the next five years, the companies will continue to invest to deliver further improvements to services.

Our research shows that consumers continue to place the highest importance on delivering safe and reliable water and sewerage services. So, their resilience remains a key priority, particularly as the issue is likely to become an even greater concern in the future.

The water and sewerage sectors face a number of new challenges that will have an impact on the services provided to consumers.

In particular, climate change projections consistently show that the frequency of extreme weather events will increase in the future. This will require the sectors – and the services they provide – to adapt in new ways.

Climate change projections consistently show that there will be more extreme weather events, which could disrupt services to consumers

We are carrying out work that is designed to encourage the sectors to become more resilient. As part of this process, we have identified a number of issues that will affect the resilience of water and sewerage services that are delivered to consumers. Finding solutions to these issues will not only require input from us and the companies we regulate. It will require all stakeholders to play their part.

We want this document to stimulate and contribute to the debate about how to ensure long-term secure and sustainable water and sewerage services in the face of hazards that are outside of the sectors' control.

Delivering further improvements

In 2009, we set limits on the prices that the monopoly water and sewerage and water only companies can charge their customers between 2010 and 2015.

As part of the price setting process, we published an [analytical framework](#) to help the companies make better investment proposals for improving resilience. It helped them to identify and propose solutions to the most pressing resilience risks.

In total, we included £414 million in the companies' price limits for projects that specifically improve the resilience of services delivered to consumers. This will mean that, by 2016, almost ten million people will benefit from a reduced risk of their service being interrupted by natural hazards.



2. The importance of resilience

There are a number of hazards outside the companies' control that can have a negative impact on the delivery of water and sewerage services. These can be both natural and man-made, including landslides, subsidence and acts of terrorism. But some of the biggest and most visible hazards are weather-related events, such as droughts and floods.

Droughts are periods of prolonged low rainfall. They are a hazard because water scarcity increases the risk of service restrictions and environmental damage. In extreme circumstances, this could lead to service failures.

Heat waves can also be a hazard. Rather than affecting supplies directly, they can create a big increase in the demand for water. This can lead to service failures if demand is greater than the infrastructure can provide.

But it is events such as the widespread flooding in 2007 and 2009 that highlight most vividly the disruption natural hazards can cause. During these two periods

alone, there were 14 deaths (13 in 2007 and one in 2009), many thousands of people had to leave their homes and 350,000 consumers were left without piped water supplies. In total, the 2007 floods are estimated to have cost the UK economy £3.2 billion. This shows clearly that flooding events have the potential to create significant economic, social and environmental disruption.

The companies have always had to deal with natural hazards. But the future is likely to bring more extreme weather events because of climate change. Dealing with these events may become progressively more difficult as other challenges, such as population growth and higher living standards, put additional pressure on services.

The resilience of water services is also affected by the resilience of services provided by third parties from other sectors (for example,

electricity supply). This is why it cannot be viewed in isolation. We must consider it in the wider context of a whole range of future challenges.

It would not be feasible to ensure that services are protected from external hazards in all circumstances. This would be an enormously complex, disruptive and expensive task.

So, there is a need for a common and clear understanding of how best to plan and develop resilience in the future. There is also an important role for contingency planning so that services can be restored quickly when they fail. We discuss this in more detail in chapter 3.

The resilience of water and sewerage services cannot be viewed in isolation – we must consider it in the wider context of a whole range of future challenges, as well as the way it interacts with other sectors

The impact of flooding

Water company assets are particularly at risk of flooding of all types. Because of the need to take water out of the environment and return wastewater to it once it has been treated, they are likely to be located in areas vulnerable to flooding.

The exceptional rainfall events during the summer of 2007 led to the flooding of many water and sewerage assets.

Two incidents in particular had a major impact on consumers. This is because flooding compromised the delivery of water and sewerage services, resulting in widespread suffering and inconvenience for the affected communities.

- When Severn Trent's water treatment works at Mythe flooded, 350,000 consumers in the Gloucester area were left without piped drinking water supplies for up to 16 days. This was the result of local rainfall events that contributed to a monthly precipitation volume with a frequency rarer than 1 in 200 years. This water entered a catchment that was already saturated following record rainfall for the previous month. Because of this, the River Severn rose to a level that inundated the water treatment works, disabling it for the first time since its construction in 1870. Most companies would have struggled when faced with such a challenge.
- There was widespread flooding in Hull because the volume of rainwater overwhelmed the drainage system. This highlighted the city's dependence on its pumped drainage system, major elements of which are owned and managed by Yorkshire Water.

In many other areas, the impacts on the services provided to consumers were effectively contained. This is despite many water and sewerage assets being affected, impaired or overcome by flooding because of the exceptional rainfall. But the two incidents outlined above highlighted the need for better analysis of the resilience of services, particularly flooding risks.

This formed part of the [independent review of the lessons learned from the 2007 floods](#), chaired by Sir Michael Pitt (the 'Pitt review').



3. Improving resilience

This chapter highlights a number of areas where we consider the wider water and sewerage sectors collectively need to improve their approach, understanding and delivery of resilience. This task is not something either the water companies or we as the regulator can do alone. Everyone, from Government to consumers, has a part to play. We consider these issues in greater detail in ‘Prevention, protection and preparedness – how should resilient supplies be achieved?’, which is published alongside this document.

Defining policy

Developing a joined-up approach

The water and sewerage sectors in England and Wales operate within the overall legislative and policy framework that is determined by the UK Coalition Government.

An effective framework will provide clear and consistent direction on what the sectors’ approach to resilience should be. Water and sewerage services, and particularly

the assets needed to deliver them, are planned many years in advance of when they are needed. It is important that the sectors understand the framework in which they operate so they can act decisively.

Also, in tackling resilience effectively there is a need for the framework to be joined up with other sectors – particularly those responsible for other forms of national infrastructure.

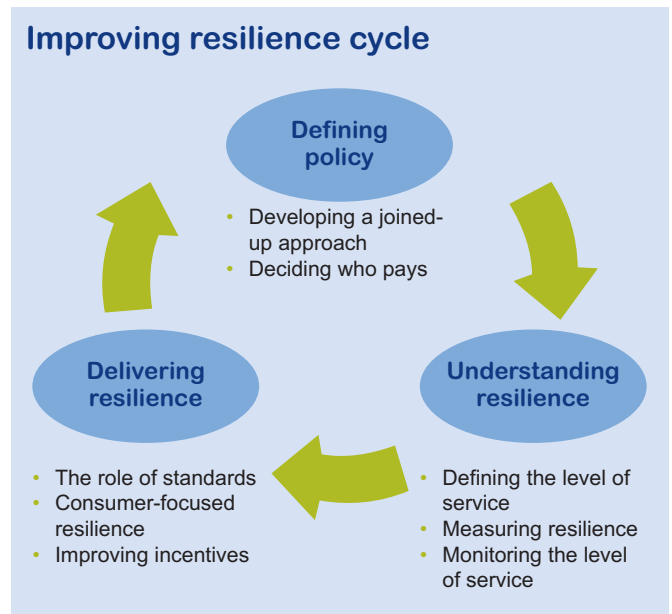
Hazards, such as floods, often affect more than one type of infrastructure. Assets from one sector will often depend on assets from another in order to maintain services – or restore them in a timely manner.

For example, a water treatment works may need electricity from a

sub-station to enable it to operate. It may also depend on roads being passable for the delivery of essential chemicals.

This is why we are pleased that the Cabinet Office and others are currently putting significant effort into creating a strategic framework for improving the resilience of critical infrastructure to disruption from natural hazards.

But there is a need for the water and sewerage sectors in particular



to work with Government and others to make sure that policies are effective and clear. Consistency between different policies and the way that they interact with our regulatory framework is fundamentally important if the protection and value that consumers receive is to be maximised.

Deciding who pays

Under the current regulatory framework for the water and sewerage sectors, we set price limits consistent with the levels of service and investment that efficient companies need to carry out. Each company must show, as part of a wider cost-benefit analysis exercise, that its customers are willing to pay for improvements to services and investment. We consider that customers should pay for investment that benefits them.

But some resilience investment that the companies can carry out may go further than delivering benefits

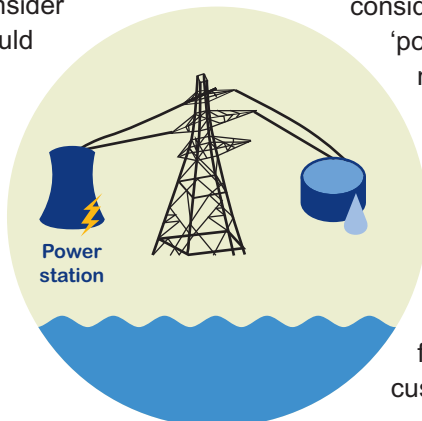
solely to consumers. This includes work that:

- delivers wider national environmental benefits;
- protects water supplies to installations that are of national (or international) economic significance; or
- may protect several infrastructure types at the same time.

In these situations, we think there is a need for key stakeholders to work together to understand:

- who will benefit from different resilience investments;
- when customers should pay for those improvements; and
- how others should be expected to contribute (including consideration of how the 'polluter pays' principle may be applied).

This is particularly important, as the issue of affordability is already a problem for some water customers.



The polluter pays and beneficiary pays principles

The 'polluter pays' principle is a method of allocating the costs of funding environmental improvements. It states that polluters should pay the cost of the damage they do to the natural environment. It gives the polluter the financial incentive to reduce or stop their polluting activities.

An alternative approach is the 'beneficiary pays' principle. This states that consumers do not have a right to receive benefits where the provider will not gain a positive market benefit from carrying out the improvements. As such, even if there is a desire for non-market benefits (for example, a non-polluted environment), the provider should be reimbursed by those that are going to benefit (this would be wider society in the case of the environment).

There is a need for a joined-up approach to ensure the resilience of all forms of critical national infrastructure – including those assets owned and managed by the water companies

Cabinet Office Critical Infrastructure Resilience Programme for reducing disruption from natural hazards

In June 2008, the Pitt review recommended a series of improvements to the way resilience is managed and controlled in the UK. As a result, the Government has set up a Cabinet Office-led cross-sectoral resilience programme.

The Cabinet Office has published a strategic framework and policy statement, which attempts to clarify how to manage and improve the resilience of critical infrastructure from natural hazards.

A key component of this is the development of a tripartite relationship in resilience monitoring and planning. In conjunction with regulators and infrastructure owners, the lead Government department will compile resilience plans to assess current risks in each sector. These reports will:

- appraise the vulnerability and overall risk of the sector;
- set out future requirements and actions; and
- monitor and report on progress that is made.

Prescribed standards may inform these activities. There is already an interim protection standard of assets that will be impacted by natural hazards at a frequency of 1 in 200 years. This standard applies to sites classified as ‘critical national infrastructure’. These are assets that, if lost or compromised, would have a major impact on the availability or integrity of essential services leading to either severe economic or social consequences, or to loss of life in the UK. This standard is likely to be refined further.

It is proposed that the lead Government department, working with regulators and infrastructure owners, will consider:

- whether the interim standard is proportionate in terms of scope and cost implications;
- the merits of setting standards on economic, social and environmental grounds; and
- public expectations and willingness to pay.

Understanding resilience

Defining the level of service

It is not feasible for the companies we regulate to guarantee services to consumers in all circumstances. It would be impossible in practice and hugely expensive to do so – particularly when the increased likelihood of extreme events associated with climate change is taken into account.

But, the question of what level of resilience consumers should receive remains.

At present, the Security and Emergency Measures Direction (SEMD) offers some protection to consumers against the total loss of services. It sets the minimum standards of service the companies must provide in emergencies in order to protect public health. But the level of service it provides is significantly below that which consumers usually receive.

We think that the best way to find the appropriate level of resilience over and above the SEMD is to consult consumers. Collecting this

The Security and Emergency Measures Direction (SEMD)

The SEMD places an enforceable duty on the companies to keep up-to-date plans to ensure the provision of essential water and sewerage services at all times.

For water services, this includes using alternative means to provide consumers with a minimum supply in the event of an unavoidable failure of a piped supply.

For sewerage services, it means guarding against and dealing with discharges from sewers into water bodies that may be used for abstraction or where aquatic life may be adversely affected. The plans should also cover discharges onto land where they may cause pollution or affect the amenities of the area.

To help delivery of the SEMD, the UK Government periodically issues guidance that the companies must follow.

Current guidance states that the minimum supply of water must be 10 litres of drinking water per person a day or, in the case of a prolonged incident, 20 litres per person a day. This is normally delivered to consumers in bottles or from tankers at nearby locations.

This compares with average consumption of about 150 litres of water per person a day during normal conditions.

type of information, for example by using willingness to pay data, is difficult to determine and validate. So, we want to work with others to

understand the level of resilience that customers want, expect and are prepared to pay for.

Measuring resilience

In order to deliver a level of service – or improve upon it – there is a clear need to understand the level of resilience being delivered. Quantifying this can be difficult. Extreme events, by definition, are rare, uncertain, and likely to be outside of the historical record.

The level of resilience to natural hazards is usually measured by stating the maximum return period of the event that the service can experience and continue to operate. But there are drawbacks to using this approach even though it is well understood.

For example, a 1 in 100-year flood event is different to a 1 in 100-year rainfall event. We may experience a 1 in 100-year rainfall event, but escape a 1 in 100-year flood event – because the extent of flooding depends on the circumstances within a particular river catchment. These could include whether or not the ground is saturated and the speed that surface water runs off the surrounding land into rivers and lakes.

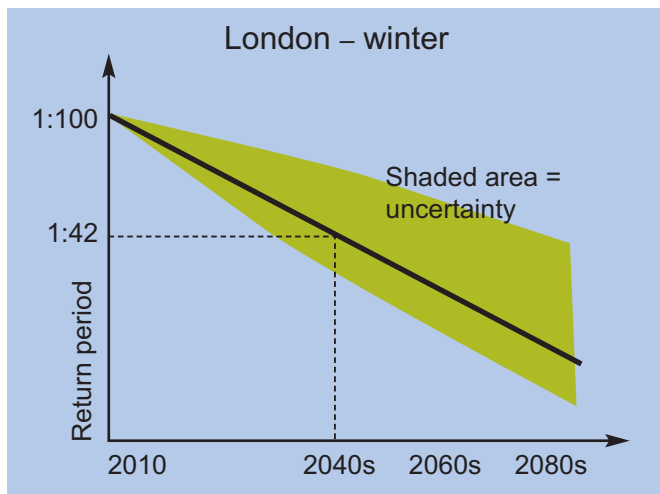
We want to understand the level of resilience that consumers want and expect, and are prepared to pay for

Because of this, an inconsistent approach to measuring resilience could easily misrepresent current and future protection standards and risks.

The problem is that if return periods change but resilience standards remain fixed, the companies may have to invest significant amounts in upgrading the protection of their assets and services incrementally, rather than planning improvements in advance.

We think it is important that the companies develop a common understanding of how resilience should be measured. This approach needs to be used consistently to ensure that future levels of risk are represented appropriately.

Also, a changing climate is likely to increase the frequency of extreme natural hazard events. This means that future return periods will not equate to those seen today.



Climate change, return periods and the need for change

In 2010, we commissioned a report by the Met Office to provide information on how daily rainfall return periods will change in the future.

'Changes in the frequency of extreme rainfall events for selected towns and cities' considers how daily rainfall volumes with current return periods of 1 in 5, 10, 20, 30, 50 and 100 years are predicted to change in the future (specifically for the 2040s, 2060s and 2080s). It analyses return periods for 40 towns and cities across England and Wales.



The main findings of the report are as follows.

- Winter daily rainfall events of a particular magnitude are projected to become more frequent. For example, using the central estimate, a current winter 1 in 100-year daily rainfall event in London is predicted to become a 1 in 42-year event by the 2040s (see opposite).
- There is no clear signal for the change in frequency of summer daily rainfall events of a particular magnitude. Many of the locations show little change. The central estimate for London shows that a current 1 in 100-year summer daily rainfall event becomes a 1 in 97-year event in the 2080s.
- There is a large spread in the projected rainfall amounts, which means that specific values (particularly those for summer) should be used with caution. In the summer example for London, the spread ranges from a 1 in 100-year event becoming a 1 in 38-year event for the most extreme scenarios, and a 1 in 401-year event for the least extreme.

The data in this report will help shape and guide our ongoing work, particularly in implementing our strategy and delivering our future regulation programme of work. For example, it will influence our work on sustainable drainage, resilience and our wider stance on climate change.

Although there is a great deal of uncertainty associated with the data in this report, it makes a compelling case for change. In particular, the projected winter rainfall return periods suggest that the companies' approaches to managing such events need to be sufficiently robust to cope with significant changes.

Monitoring the level of service

The task of providing water and sewerage services, including a level of resilience, takes place under constantly changing conditions.

So, it is important to monitor the level of resilience provided to consumers.

At present, the need for resilience improvements is determined by highlighting geographical areas or

specific assets that are potentially vulnerable to hazards. This process identifies consumers who are at high risk of service failure ('resilience hotspots'). Identifying these hotspots has allowed investment to be focused on areas where it is most needed.

But there are problems with this approach. For example, resilience hotspots may only become visible once a failure has occurred – that is, after consumers have been affected.

Also, by focusing on areas most at risk there tends to be a bias toward assets that serve large numbers of people. This means that the approach does not reveal the level of resilience that other consumers receive. It may be that smaller, less obvious assets are overlooked, even if their failure would lead to service interruptions for the consumers they serve.

We think there is a need to understand how information on the service resilience that all consumers experience at present could be collected, and by whom.

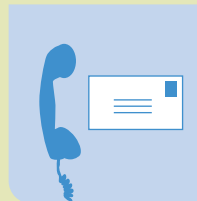
Monitoring service standards

We use a number of key performance indicators (called the DG indicators) to measure the service the companies provide to consumers. These are a series of absolute and comparative indicators in areas of:

- customer service (complaint and contact handling, telephone performance and meter reading); and
- providing and maintaining core services (avoiding interruptions, hosepipe bans and sewer flooding incidents, and maintaining pressure).

We set assessment criteria for the companies to perform against and may take regulatory action if their performance falls below an acceptable level.

The effects of resilience-type events are covered under the 'Properties with unplanned interruptions' indicator. But this only measures actual failures from all causes rather than the risk of service failure from natural hazards.



Delivering resilience

The role of standards

One way to improve the level of resilience is to set mandatory standards that are based on the likelihood of asset failure. For example, the UK Government has set an interim 1 in 200-year standard for the protection of critical national infrastructure. There are significant benefits for both water consumers and wider society from protecting such important assets. While the issue of who should pay for this investment remains (see page 9), we agree that unambiguous standards will help ensure that protection is delivered effectively for the most critical assets.

But the question remains about whether such standards should also be applied to all other (less critical) assets.

We think that it is inappropriate to set a single definitive standard for all other assets. It could lead to customers served by these assets receiving poor value for money.

When compared with assets classed as critical national infrastructure, the benefits are unlikely to be as clear. This is because, smaller, less critical assets may not have a significant impact on service provision and benefits may be dwarfed by significant costs.

In determining the level of resilience for non-critical assets, we think that consideration also needs to be given to the:

- capacity of assets and services to recover or cope;
- consumer expectation for continuity of service delivery; and
- costs compared to benefits.

This consideration should be made before any standards – or investment – are agreed.

Developing consumer-focused approaches

Traditionally, resilience has been considered in terms of assets that are at risk, rather than services to consumers. This is understandable from the perspective of the asset

owners, but irrelevant from that of the consumers. If safety and quality are unaffected, the failure of particular assets may not inconvenience consumers. But they do suffer when there is a service failure.

Even the most critical assets – based on how many people they serve – may not necessarily pose the largest risk to services. It will also depend on:

- how likely the asset is to fail – for example, whether it sits on a flood plain; and
- the ability of the water company to manage the situation in the event of an asset failure – for example, whether it could deliver a reduced or normal service from alternative assets.

We think that using a more consumer-focused approach would reveal more accurately the effect that particular asset failures have on consumers. Such an approach is more likely to lead to optimum, cost-beneficial investments.

Current incentives and deterrents for the water companies to provide resilient services

- **Emergency operational incentive.** Resilient networks allow the companies to deal with emergencies more effectively, reducing the need for expensive contingency operations.
- **Routine operational incentive.** Joined-up networks, which provide resilience, can lead to efficiencies, for example through optimising operations. This may include the ability to share or trade water more easily between water resource zones or with other companies.
- **Reputational incentive.** The companies may improve their reputation if they maintain customer service successfully in difficult circumstances.
- **Financial deterrent.** If the companies fail to protect themselves against natural hazards, they are likely to incur significant repair, remedial and contingency costs. The company's owners would have to meet these costs as we would not allow this inefficiency to be included in customers' bills.
- **Reputational deterrent.** Service failures are likely to harm the companies' reputations in the eyes of consumers and investors.
- **Customer service deterrent.** Large service failures lead to significant additional demand on the companies' customer service functions. On top of this, goodwill payments to customers and communities are likely to be needed.
- **Legislative deterrent.** Enforcement action under the Water Industry Act 1991 may be taken against companies and water supply licensees that fail to adhere to the SEMD and that fail to:
 - provide supplies to premises and make them available to consumers who demand them; and
 - provide, improve, maintain and effectively drain their sewerage systems. This is also the case for polluting the environment as a result of the failure of the sewerage service.

An inability to fulfil requirements under the Water Industry Act 1991 may lead to a revoking of a company's licence to operate.

We think that using a more consumer-focused approach would reveal more accurately the effect of particular asset failures

Improving incentives to companies

The companies respond to incentives placed upon them to deliver particular outcomes for consumers. This includes ensuring protecting the efficient and effective delivery of services to consumers. At present, there are implicit incentives and deterrents for the companies to provide resilient services (see opposite). But they are not legally required to protect assets and services beyond the minimum levels that the SEMD specifies.

Also, while customers are entitled to payments under the guaranteed standards scheme, this does not include extreme weather events. This meant that customers who were left without piped water supplies in Gloucestershire in 2007 were not entitled to any payments. They also had to pay their water and sewerage bills as normal, even when they were without normal services.

As the frequency of natural hazard events is likely to increase in the future as a result of climate change, we think that we need to consider if the current incentives for the

companies are strong enough to encourage them to deliver an appropriate level of resilience to consumers. This includes considering whether other incentives or deterrents (such as compensation payments) would better protect consumers.



The guaranteed standards scheme

Water customers are entitled to minimum standards of service under the guaranteed standards scheme (GSS). If a company fails to meet a standard, it must make a payment to the affected customer.

At present, the GSS covers the following service areas.

- Making and keeping appointments.
- Appropriate management of complaints, account queries and requests about payment options.
- Providing notice of interruption of supply.
- Timely restoration of supplies following an interruption.
- Providing adequate water pressure.
- Avoiding internal and external flooding from sewers.

Many companies also offer enhancements to the legal regulations and commit to higher standards of service. They pay compensation if they fail to meet these higher standards.

Severe or exceptional weather events are exempt from GSS compensation payments.

4. Next steps

The issues we have raised in this document are wide-ranging.

Finding the right solutions to ensure secure and sustainable water and sewerage services over the long term will require the involvement of everyone across the

wider water and sewerage sectors – and from other areas of the economy.

We will be carrying out work, with our stakeholders and others, on each of the issues that we have identified in this document. We list

the most significant work areas in the text box below.

Moving towards a new approach to resilience

We think it is very important for consumers to receive effective and appropriate resilience provision that represents value for money. We are responsible for making sure that we are in a position to make fair, clear and defensible regulatory decisions. This will be of critical importance when considering how future investment should be justified and challenged.

We are seeking to build on the good progress that has already been made in understanding and delivering resilience provision by gathering information from:

- engagement with stakeholders on the issues that we have raised in this document;
- information that we gathered during the 2009 price review (as presented in 'Climate change – good practice from the 2009 price review');

Before the next price review, we intend to:

- continue to engage with national resilience policy formers, such as the Cabinet Office, to integrate the principles of our regulatory framework within the wider work on resilience;
- understand in greater detail how investment that is not primarily for the direct benefit of customers should be funded;
- investigate with stakeholders how to determine consistently the level of resilience consumers currently receive and understand their expectations relating to the ongoing delivery of their service;
- develop effective ways of monitoring resilience, including considering how, and by whom, information would be most appropriately collected;
- build on our existing approach for resilience (which considers risks to service, consumer expectations, the ability to cope, costs and benefits) when determining the most appropriate action; and
- consider whether there is a need for greater or modified incentives for resilience, and whether these should be made more consumer facing.

- relevant findings from other work coming out of our future regulation programme; and
- a review of current and future legislation, policy and regulation.

We will analyse this information and use it to update our approach to resilience. Before the next price review, we will set out our expectations on resilience issues to help the companies plan their investment proposals.

Links with our other work

We are currently carrying out our future regulation programme of work. Our aim is to review how we regulate the water and sewerage sectors for the long term. Our ongoing work on resilience will be informed – and help inform – work in the areas outlined in the following pages.



Your views

In developing our future approach to resilience, we would welcome your views on the issues that we have raised in this document or on resilience issues more widely. In particular, we would welcome your thoughts in response to the following questions.

- What standards of service should and do consumers expect?
- How do we properly account for climate change when considering future resilience provision?
- What are your views on the Cabinet Office's interim guidance to the economic regulated sectors, which considers 1 in 200-year event protection for the most critical assets?
- Who should pay for resilience? How should private costs and public benefits be treated?
- Basic sewerage services may not be affected when assets fail. Should sewerage assets be treated in the same way as water assets?
- Do the companies understand how resilient they are and are they transparent in how they communicate this to their customers?
- Are the incentives right to encourage the companies to find an appropriate level of resilience?
 - Is there adequate compensation in place for when things go wrong?

Please contact Mike Keil, our Head of Climate Change Policy (mike.keil@ofwat.gsi.gov.uk) if you would like to contribute to the wider debate.

Encouraging sustainable consumption

As part of our future water charging project, we are investigating how charging and metering, along with other advice and incentives for consumers, can promote more sustainable choices about water and wastewater disposal.

This could also have a positive impact on the overall resilience of networks. For example, it may be easier to manage the stress on distribution systems resulting from an extreme event if more users have water meters, or if their overall demands are for smaller volumes. Equally, managing the demands we place on drainage infrastructure may, over time, cumulatively improve resilience to flood events.

In the future, smart forms of metering could add to resilience by creating opportunities for dynamic control and monitoring of supplies during times of water stress or extreme events.

Market reform

We are carrying out a number of projects that consider the introduction of markets into different stages of water and sewerage service delivery where there are clear long-term benefits to customers and the environment.

In distributing scarce resources efficiently, markets should offer value in terms of the cost that customers pay and the service that they receive. But they may also be able to help value water across boundaries so that it can be delivered to where it is needed most.

Greater connectivity as a result of market signals between regions is likely to be greatly beneficial from a resilience perspective.





Understanding surface water flooding

Our sustainable drainage project is considering the issue of surface water flooding caused by overloaded drainage systems.

When the surface water that results from heavy rainfall drains into the sewerage system, the companies' ability to provide sewerage services can be put at risk. Large surface water flows are also likely to lead to surface water flooding, which has the potential to impact on all infrastructure.

Traditional engineering approaches, such as increasing the diameter of public sewers or constructing separate systems, are not economically viable or practical on a large scale. So, we are looking at ways to reduce the volume of water entering sewerage systems by developing a framework to manage surface water flows sustainably. This will help ensure that the most appropriate solutions to surface water drainage can be chosen for each location.

Integrating consumer priorities

Among other things, our future price limits project will consider how consumers' priorities are taken into account in the price limits we set for monopoly water and sewerage services.

A greater level of engagement will allow the companies to deliver what consumers want rather than attempting to make the correct decisions on their behalf.

This applies to all areas of service delivery, including resilience.

5. Further information

Specific supporting documents

[‘Prevention, protection and preparedness – how should resilient supplies be achieved?’](#) This document explores the issues that we have raised in this document in greater detail.

Specific response to Cabinet Office recommendations.

[‘Changes in the frequency of extreme rainfall events for selected towns and cities’](#), Met Office report commissioned by Ofwat, July 2010.

Related information

[‘Lessons learned from the 2007 summer floods’](#), the Pitt review final report, June 2008.

[‘PR09/12 – Asset resilience to flood hazards: development of an analytical framework’](#), Ofwat, June 2008.

[‘Climate change – good practice from the 2009 price review’](#), Ofwat, March 2010.

You can find more information about our future regulation programme of work on our website at www.ofwat.gov.uk/future.



Ofwat (The Water Services Regulation Authority) is a non-ministerial government department. We are responsible for making sure that the water and sewerage sectors in England and Wales provide consumers with a good quality and efficient service at a fair price.



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