

# Anglian Water 14A. A SYSTEMS APPROACH TO RESILIENCE SHOCKS AND STRESSES



# A SYSTEMS APPROACH TO RESILIENCE

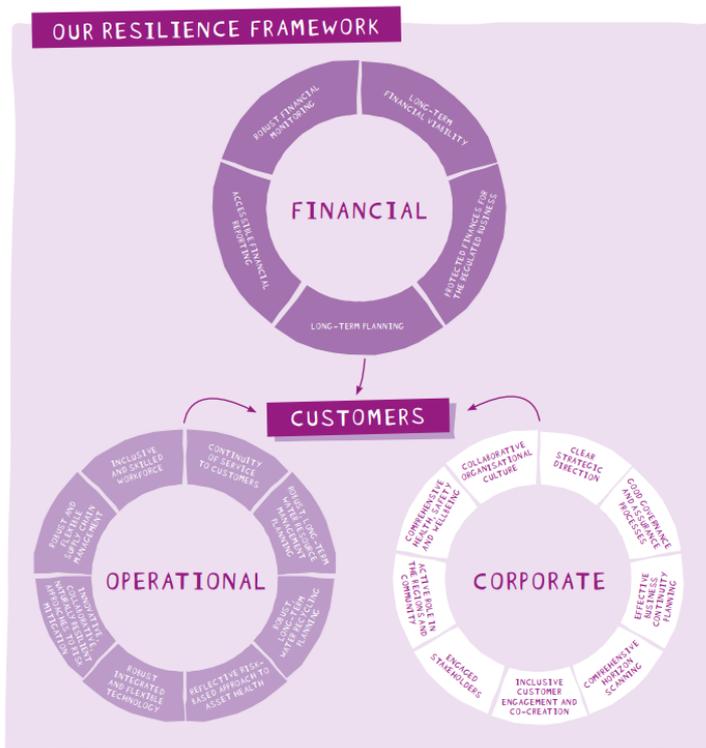
SEPTEMBER 2018

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# 1. INTRODUCTION: RESILIENCE AT ANGLIAN WATER



<p><b>Shocks</b></p> 	<p>Disruptive events, which impact the ability to provide a high quality service. In the water industry, acute shocks include sudden events such as floods, fires or cyber attacks.</p>
<p><b>Stresses</b></p> 	<p>Chronic conditions which weaken the function of the organisation or system long-term. Examples highlighted in particular by Ofwat include population growth and climate change. Stresses are also often felt as shocks when they reach a tipping point.</p>



# 1. INTRODUCTION: A SYSTEMS APPROACH TO RESILIENCE

## Our definition of resilience

Customers expect us to provide a reliable, high quality service, whatever happens. So resilience has been an important part of our planning and operations for a long time.

'Resilient Business' is one of the ten core outcomes we agreed with customers in 2013 and we have set ourselves the long term ambition to make the east of England resilient to the risks of drought and flooding. Ofwat's definition of resilience is 'the ability to cope with, and recover from, disruption and anticipate trends and variability in order to maintain services for people and protect the natural environment now and in the future' (Ofwat, 2017, Resilience in the Round).

'Resilience in the Round' expanded on three resilience themes:

- Corporate resilience: the ability of an organisation's governance, accountability and assurance processes to help avoid, cope with, and recover from, disruption; and to anticipate trends and variability in its business operations.
- Financial resilience: an organisation's ability to avoid, cope with, and recover from, disruption to its finances.
- Operational resilience: the ability of an organisation's infrastructure, and the skills to run that infrastructure, to avoid, cope with, and recover from, disruption in its ability to provide critical services to customers.

## What does resilience mean to our customers and stakeholders?

As well as considering Ofwat's approach, exploring customer views on the topic of resilience has been a major focus of our research and engagement activity. For many customers, imagining the future is a difficult and sometimes worrying task. The pressures of everyday life mean many customers are focused on getting through the next few weeks or months.

In our engagement activities, the term "resilience" was not well understood; people preferred simpler terms such as "long-term planning". But, once they spent more time exploring the topic, customers became much more interested and "awakened" to resilience challenges. When asked to rank our four ambitions, "making the East of England resilient to drought and flooding" was voted top priority by two thirds of customers. They saw these issues as likely to affect everyone in the region on a personal level. Tackling resilience was regarded as our core remit and customers felt that mitigating drought and flooding was especially important in light of pressures on infrastructure associated with the long-term growth in the region.

## Our resilience framework

Working closely with Arup, we have co-created a framework for understanding how Ofwat's approach to Resilience in the Round might be applied in practice in managing risks over the short term alongside longer term trends and lower likelihood risks. In January 2018 we published "A Framework for Resilience PR19 and Beyond". The framework is designed to help us to become a truly resilient water company for the benefit of our customers and the environment.

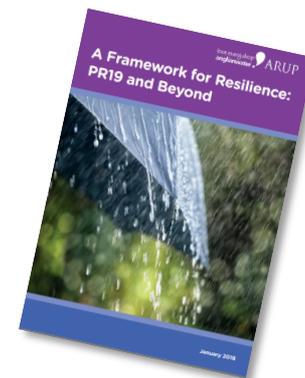
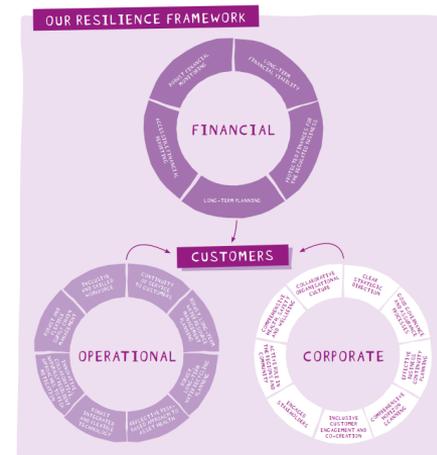


Figure 1: Our Resilience in the Round Framework

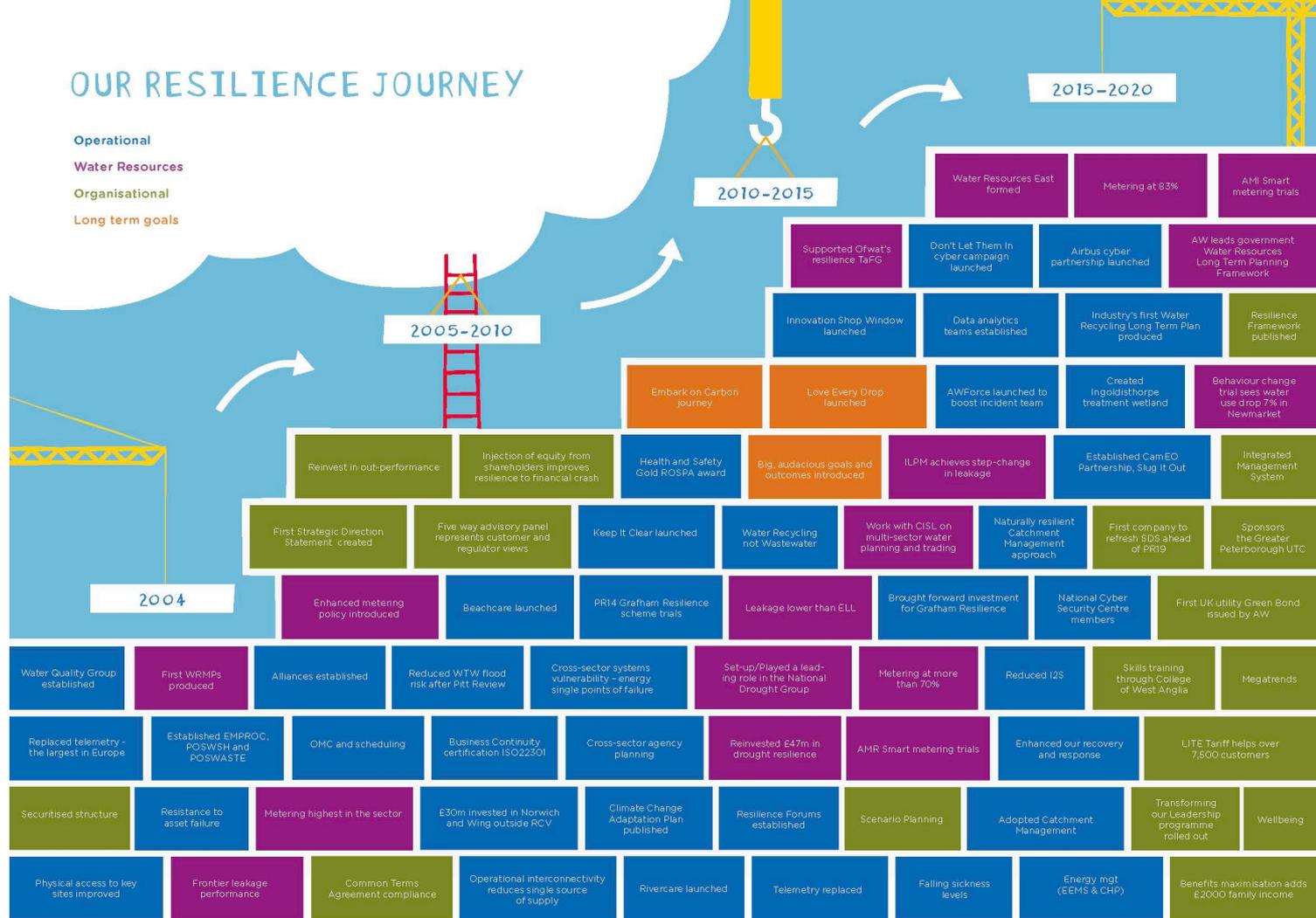


# OUR RESILIENCE JOURNEY

Operational  
Water Resources  
Organisational  
Long term goals

## BUILDING RESILIENCE:

We've been on a resilience journey for a long time, increasing resilience in the round at every step.



## 2. A SYSTEMS APPROACH TO RESILIENCE

### OUR 'ALL HAZARDS' APPROACH TO MANAGEMENT SYSTEMS

Our management systems help to ensure that we meet our customer commitments and deliver our outcomes for customers and the environment (see figure 2).

We take an all hazards approach to our management systems.

We are committed to delivering excellent drinking water and preventing pollution by enhancing the quality of the water we treat and return to the environment. As part of this we comply with relevant legislation, regulation and the standards of:

- Quality- ISO 9001
- Environment- ISO 14001
- Asset Management- ISO55001/PAS 55
- Business Continuity- ISO 22301
- Health and Safety- OHSAS 18001
- MCERTS (self monitoring of effluent flow)
- Anti Bribery - ISO 37001
- Carbon Management in Infrastructure - PAS2080

These management system standards share the same core structure and use common system clauses bringing consistency and compatibility between standards.

LR (Lloyds Register) assess these core set of requirements across our functions and activities, reducing business impact, expanding our view of resilience and maximising the output value of any findings.

We are currently in the process of implementing the following standards:

- Customer Vulnerability- BS18477
- Information Security Management- ISO 27001
- Occupational Health and Safety- ISO 45001
- Personnel Certification- ISO17024

We aim to ensure we have a robust and flexible approach to management of shocks and stresses. We constantly review available management system standards to enable us to provide our customers and stakeholders with the best possible levels of assurance.

All of the documents and associated activities within our management system framework policy and our standards are subject to a risk based audit through both our internal audit programme and our third party verification via LR.

Our Top Tier Risk Register is regularly reviewed by the Anglian Water Services Board and reflects emerging risk as well as current risk. The review challenges our level of controls and our risk appetite to ensure we understand our position and resilience to the risks.

We also carry out a forward look at Management Board and with the Anglian Water Services Board to ensure any mega trends are understood and taken in to account when we review our Risk Register. We have used third party advice from Oliver Wyman and PWC to help ensure a global long term view is taken in to account. The mega trends identified are detailed in section 3.

We also undertake an external annual SEMD (Security and Emergencies Direction) audit including Critical National Infrastructure. This audit is subject to third party verification and assurance undertaken by Jacobs.

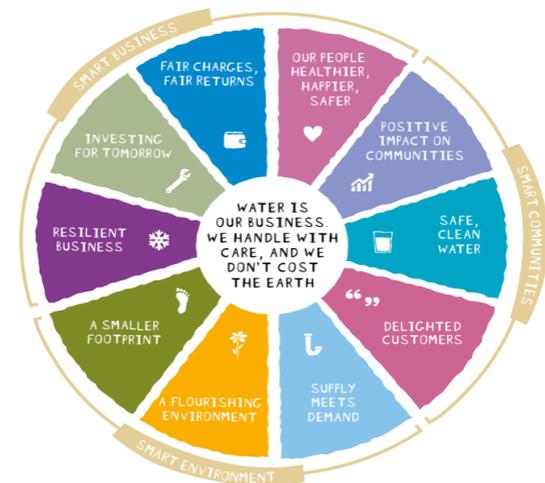


Figure 2: Our ten customer outcomes

## 2. A SYSTEMS APPROACH TO RESILIENCE

### RESILIENCE GOVERNANCE

We are committed to high standards of corporate governance. We published the Anglian Water Services 2014 Corporate Governance Code in December 2013 in response to the governance proposals put forward by Ofwat. Our 2014 Code was updated to reflect changes in the UK Corporate Governance Code with effect from 1 April 2015. The Company Secretary keeps compliance with the Code under review and any changes recommended are subject to approval by the Board.

We have a clearly defined framework of roles, responsibilities and delegated authorities in place which is designed to support the delivery of each outcome. The Board has a formal governance matrix which sets out the matters that are specifically reserved for its decision, through ensuring it exercises control over appropriate strategic, financial, operational and regulatory issues. Matters delegated to management are set out in a Scheme of Delegation.

The roles of the Chairman and Chief Executive Officer are separate, with their roles and responsibilities clearly divided. A document clearly sets out the respective responsibilities and a separate document sets out the role and duties of the Senior Independent Non-Executive Director. These documents can be found on our website.

Independent non-executive directors (INEDs) are (by definition) independent from management and are therefore well placed to ensure that decisions of the Board are taken objectively. Under the Companies Act all directors are required to exercise independent judgment and to have regard (amongst other matters) to the impact of decisions on a range of stakeholders (including

customers) and to the likely consequences of any decision in the long term. INEDs have been the single largest group on the AWS Board since 2015. However, in August 2018, following the retirement of two of our executive directors, INEDs became the majority of Board members. All Board committees (including the Remuneration Committee) are comprised solely of non-executive directors. It follows that non-executive directors play a key role in ensuring that Management is not incentivised to take a short term view. In addition, as part of our securitisation arrangements, no dividend can be paid by AWS unless two INEDs are satisfied that the viability of the business is assured. This viability is tested by reference to a series of financial covenants which are assessed on a forward looking basis.

Our Top Tier Risk Register is regularly reviewed by the Anglian Water Services Board and reflects emerging risk as well as current risk. The review challenges our level of controls and our risk appetite to ensure we understand our position and resilience to the risks.

Below the Anglian Water Services Board, risks are considered in further levels of detail by the Management Board, Business Unit Senior Leadership Teams and down through the structure to individual teams. Risks are also actively managed by other relevant governance groups including:

- Strategic Priorities Board – chaired by the CEO and attended by a majority of Directors to actively manage resource allocations to address risks and ensure delivery of outcomes and performance commitments.

- The Resilience Steering Group – chaired by the CEO and made up of Directors and other senior managers, this group is responsible for resilience issues and providing strategic direction and tactical intervention in relation to business resilience and management system issues, including security, emergency planning, business continuity, and training and exercising activities of operational sites, offices, Anglian Water Services employees, third party contractors and suppliers working on behalf of Anglian Water. The group meets monthly.
- Finance, Treasury and Energy Steering Group – chaired by the Chief Financial Officer, which meets monthly to review the cash position of the business, current funding requirements and market risks. The group also considers energy prices and hedging strategies.
- Climate Change Steering Group – chaired by the Regulation Director, which assesses the latest climate change science, potential impacts on our business, mitigation and adaptation strategies, as well as processes for ensuring climate change impacts are taken into account in day-today investment and operating decisions.
- Fire Risk Steering Group – chaired by Director of Water Services, meets regularly to ensure consistency of application of hazard evaluation and installation of appropriate detection and suppression schemes. We are also working with a leading fire authority to achieve a consistent and robust fire risk assessment process for business-wide application.
- Information Governance Forum – chaired by the Group Legal Director, reviews how we protect data and reviews progress against the GDPR legislation.
- Leakage Steering Group – chaired by Director of Water Services Group and attended by Directors and senior managers, meets monthly to assess current performance and actions required to ensure resources are available to meet leakage targets.
- Water Quality Group – chaired by Group Head of Risk and Resilience, and attended by the CEO, operations Directors and senior managers, meeting weekly to review operational events and risks to ensure action is taken on a timely basis. The group also ensures that lessons are learnt from events and processes updated where needed. Lessons are also actively sought from other companies' events.

## 2. A SYSTEMS APPROACH TO RESILIENCE

### INTEGRATED MANAGEMENT SYSTEMS

Our Integrated Management System unifies our management system processes into a complete framework, enabling us to work as a single unit with unified objectives.

The management system standards which support this framework share the same core structure and uses common system clauses, terms and definitions, bringing consistency and compatibility between standards.

The key components of this approach are:

- Guiding Principles for business resilience and Emergency Management Procedures (EMPROC)
- Policy and Standards for Water Supply Hygiene (POSWSH)
- Policies, standards and procedures for water recycling (POSWASTE)
- Operations Security Manual

#### EMPROC

EMPROC is a collection of structured 'Emergency Management Procedures' which ensure we are sufficiently prepared to respond and recover from any level of impact, event or incident.

Above these is a policy document 'Guiding Principles for Business Resilience' which acts as strategic guidance, ensuring the implementation of SEMD and the Civil Contingencies Act.

All EMPROC Procedures are reviewed on an annual basis.

EMPROC contains procedures for the creation, review and updating of comprehensive response and recovery plans for assets and temporary equipment.

EMPROC covers all facets of the business ensuring resilience is integrated throughout all areas of our operations.

#### POSWSH

POSWSH policy and standards are clearly defined with responsibilities detailed within the supporting procedures to maintain water supply hygiene.

The policy, standards and procedures are regularly reviewed to ensure current best practice and industry learning is embedded within the business. Policy and standards are currently reviewed on an annual basis and are approved by the Policy Advisory Group (PAG) of which the terms of reference require a quorum for approval of any updates and changes to the documents.

POSWH procedures are reviewed every 2

years currently and progress against that review process is monitored at the monthly POSWH update meeting. A member of the Water Quality management team is responsible for each POSWH section.

#### POSWASTE

We have policies, standards and procedures for water recycling (POSWASTES), which is reviewed at the Water Recycling Interlocking Group, the procedures are currently reviewed every two years and progress of the review process is monitored at the meeting.

Associated Work Instructions all have a document sponsor from the water recycling management team and require a minimum quorum for review and approval.

#### Operations Security Manual

The Operations Security Manual contains Policies and Procedures which are embedded within POSWSH, POSWASTE and EMPROC. These define the way in which the business should operate to avoid security being compromised and detail the minimum standards of security required. In the event of a security breach they follow the guidance and instructions to be followed to mitigate further risk, investigate the security incident and provide the legal evidence which may be required. They are comprised of guidance from the Department of Environment, Food and Rural Affairs (DEFRA) and the Centre for the Protection of National Infrastructure (CPNI). These assist with maintaining our compliance with the Security & Emergency Measures Direction 1998.

The procedures are reviewed every 3 years by the Security Team with the support of relevant business unit members to ensure they are in alignment with current guidelines and practices.

Key benefits to this integrated approach are:

- aligned policy and management system objectives
- improved risk management and integration
- optimised use of business resources
- enhanced customer satisfaction through successful delivery of service expectations
- efficiencies gained from third party assessment process; by assessing against a core set of requirements across AW functions and activities, we reduce business impact, minimise disruption and maximise value for money
- full alignment with AW strategic priorities, business goals and outcomes.

**Our Integrated Management System Framework is illustrated on the next page.**

A critical part of resilient thinking is to have an integrated approach across all systems. LRQA are our certification body and with their support we have developed a leading Integrated Management System Framework across the business. This framework approach, illustrated on the following page, now enables us to "bolt on" with ease any new and emerging standards we choose for example Customer Vulnerability (BS18477) which we are currently working towards. We were the first water company to be certified by LRQA to the business continuity standard (ISO22301).



Figure 3: the core of our integrated management systems.

# INTEGRATED MANAGEMENT SYSTEMS FRAMEWORK



## OUR MANAGEMENT SYSTEM FRAMEWORK POLICY

OUR MANAGEMENT SYSTEMS HELP ENSURE WE MEET CUSTOMER AND STAKEHOLDER COMMITMENTS AND DELIVER OUR OUTCOMES



### CUSTOMER

Putting our customers first by delivering a personal, trusted and effortless experience to make Anglian Water a leading service provider in the UK

### WATER QUALITY

Protecting water quality from source to tap, providing confidence that our drinking water supply is always safe and clean

### ENVIRONMENT

Protecting and enhancing the air, water and land where we live whilst sustaining and maintaining the environment

### ASSET MANAGEMENT

Coordinating our business activities to realise value from our assets, reducing capital and operational carbon, providing the services our customers expect

### RESILIENCE

Effective preparation, response and recovery arrangements to mitigate, minimise and ensure we can cope with the impact of disruptive events

### OUR BUSINESS GUIDE TO AMP 6 (2019 TO 2020)

- SLOW DOWN**  
Nothing is so important as the time it takes to do it & stop.
- BE AWARE**  
Know what you are doing and when to do it.
- THINK**  
We believe that we should have a positive impact on the world and that in addition to have our own principles.

We recognise the importance of robust management systems and their role in the on-going success of our business. In addition to our Health & Safety Charter and Policy we have defined arrangements for managing Quality, Environmental, Asset Management, Business Continuity and Anti Bribery activities. This integrated management system framework sets out all our management system standards in a clear and consistent way aligning to strategic priorities, business goals and good outcomes.



Peter Simpson  
Group Chief Executive  
July 2018

STRATEGIC AND BUSINESS UNIT PLANS FORM THE BASIS UPON WHICH ANGLIAN WATER SETS AND REVIEW'S ITS OBJECTIVES, OBLIGATIONS AND TARGETS.

### WE ARE COMMITTED TO:

- Directors **leading and being responsible** for achieving the intended outcomes by keeping **our promise to customers**
- Delivering excellent **drinking water quality**
- Preventing pollution** whilst protecting and enhancing the **quality of the recycled water** that we treat and return to the **environment**
- Complying with relevant legislation, regulations and other needs including **requirements and standards of** ISO 45001 Health and Safety  
ISO 9001 Quality  
ISO 14001 Environment  
ISO 55001/PAS 55 Asset Management  
ISO 22301 Business Continuity  
ISO 37001 Anti Bribery  
ISO 27001 Information Security  
BS 18477 Customer Vulnerability  
PAS 2080 Carbon Management
- Making the most** of our employees knowledge and experience by recognising the contribution that they make
- Continually improving** the efficiency and effectiveness of our operating processes and this management system framework

### WE WILL:

- Take account of the needs of our **stakeholders and interested parties**
- Support the **leadership behaviour framework**
- Focus on a culture of **innovation, collaboration and transformation**
- Communicate and promote **strategic priorities, business goals and good outcomes** throughout our business and the companies that work with us
- Effectively manage our assets** to deliver optimal whole life value to all of our stakeholders
- Assess the aspects of our **operational activities and their potential impact upon the environment**
- Undertake **business impact analysis to determine critical products or services** and ensure that robust arrangements are in place to recover these products or services should they be disrupted in any way
- Maintain and protect data to meet our obligations and have reliable, accurate and **complete auditable information on our assets, performance and business activities.**

**Gary Reed, Lloyd's Register Business Development Manager:**

"Anglian Water Services Limited have made significant progress in the integration of their management systems, utilising the Annex SL ten-clause High Level Structure to good effect. This has enabled the business to take on new standards and integrate them into the management framework, with minimum disruption, and duplication.

"From the eighteen months that I have worked with the business, It has been clear that the driver to achieve this level of integration was value for the business, as opposed to collecting certificates.

"This is a refreshing approach, and will lead to enhanced performance and risk mitigation, which is of great value to both Anglian Water Services Limited, and Lloyds Register Group, in certifying their portfolio of approvals."



## 2. A SYSTEMS APPROACH TO OPERATIONAL RESILIENCE

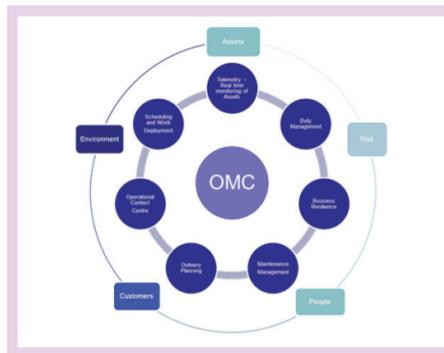
### Operational Management Centre

A key element of our ability to deliver resilient services is the effectiveness of our Operational Management Centre. Our Operational Management Centre (OMC) provides 24/7 management of our operations throughout our region and across the water cycle. It is a key capability for managing risk, customer experience and driving efficiency. We set it up in 2006 to have a single 24/7 view of our operations and to provide an umbrella under which to manage operational risk. We have had an extensive telemetry system for decades, the largest in Europe, which we refreshed in AMP5. It has allowed us to target maintenance based on asset condition and performance.

Some of the benefits it gives us include:

- all Operational workflow is in one centre
- we monitor 750,000 separate telemetry points on Water and Water Recycling Assets
- we manage 1 million separate customer contacts and jobs per year on our Network and Assets
- all work is remotely dispatched to field technicians and tracked and captured on corporate data systems

- the OMC is staffed 24/7 with Senior Operation Managers
- enhanced understanding of asset performance and development of enhanced proactive maintenance strategies
- a dedicated insight and Data Scientist Team.



### Business continuity

Business Continuity is a critical theme in our resilience thinking. We carry out a detailed Business Impact analysis to ensure team and personal resilience in all of our activities.

As part of our Business Continuity Planning we have both internal and externally sourced Work Place Recovery centres. We run regular exercises and system checks to ensure we can continue to operate.

### Assurance

We have an Audit Committee whose principal role is to examine any matters relating to the financial affairs of the Company and to provide effective oversight and governance of the Company's internal control and risk management processes. Internal Audit supports the Audit Committee in evaluating the design and effectiveness of internal controls and risk mitigation strategies implemented by management.

The Audit Committee oversees the relationship with our external auditors, Deloitte, and monitors their independence and objectivity as well as considering the effectiveness of the audit process.

Lloyds Register (LR) provide external third party assessment and certification services. This assessment covers all management system standards that the business has committed to comply with. This external

assessment goes beyond compliance and provides independent assurance and value adding recommendations for continual improvement.

Key business standards currently include health and safety, business resilience, quality, environmental, anti-bribery, asset and carbon management. These management system standards share the same core structure and use common system clauses bringing consistency and compatibility between standards. LR assesses these core set of requirements across AWS functions and activities, reducing business impact, expanding our view of resilience and maximising output value of any findings. We appoint a third party firm, Jacobs, to act as our assurance provider for annual and PR19 non-financial data. The appointment was made in conjunction with our Customer Engagement Forum, which can independently requisition its own reviews or audits of our data, procedures, policies or processes. Third party audits form part of the assurance necessary for our continued certification to ISO9001 and ISO22301. Ofwat's Company Monitoring Framework provides an incentive to ensure our published data is reliable and reported in a transparent and accessible way.

## 2. A SYSTEMS APPROACH TO FINANCIAL RESILIENCE

### Long Term Financial Viability

As a long term business that provides essential services; works within very long (decades plus) planning cycles; has very long lived assets; and with long term investors, we take our long term financial viability extremely seriously. We have put in place a number of systems and checks to ensure our financial resilience and to monitor it.

The securitised structure of the business enhances our financial resilience by imposing a rigorous governance framework which requires continuous monitoring of our financial performance by senior management, and provides an additional layer of control over how we transact with our suppliers, business partners and bond holders. Any dividend payments are subject to stringent covenant constraints as part of our securitisation agreement.

Our covenants include forward-looking compliance statements. Two INED's and two Executive Directors confirm compliance on a forward looking basis. We have a 25 year corporate financial model that is linked to our Strategic Direction Statement

We have maintained stable credit ratings and enjoy open dialogue with the rating agencies.

### Reporting

We publish a Long Term Viability Statement: embracing the five year best practice corporate code methodology.

We have led the sector in producing integrated annual reports. We publish a comprehensive report on activities in the preceding year. This gives all stakeholders information about our activities and financial performance following International Financial Reporting Standards.

Our consolidated accounts provide information on the performance of parent and other group companies.

### Financing

We have a long term investor base formed of pension funds.

Re-financing concentration risk is managed by having access to diversified sources of finance and no more than 50% debt maturing in any 5 year period, and 20% in any 2 year period.

We have also diversified our sources of funding with the issue of the first Green Bond in sustainable finance in the UK Water sector.

### Protected Finances for the Regulated Business

Our finances are restricted to use by the regulated business. There are strict covenants that prevent diversification into non-regulated activities: we also ensure strict cash management; Certain conditions have to be met prior to dividend payments being made.

### Robust Financial Monitoring

We consider stringent covenant tests required under our securitised structure to provide comfort to our bondholders that our business is viable to the end of the current period and beyond.

The Board reviews financial reports showing variance to budget and prior year each month. Significant variances are highlighted and explained.

The external auditor reports its findings to the Audit Committee in May and November annually. In addition, our internal audit function carry out a range of assurance assignments over the course of the year based on a plan agreed with the Audit Committee. Internal audit reports are rated on the basis of the risks identified and

remedial actions assigned to management as appropriate, with internal audit continuously monitoring progress against the agreed actions.

A regular monthly steering group meeting that involves senior members of the finance and wider regulation team checks progress through the year.

We have regular review meetings with the leading Rating agencies. This involves detailed discussion on financial sensitivities, scenarios including stress tests around macroeconomic and financial risks.

Financial controls are monitored on a monthly basis with around 30 employees responding to some 130 key control questions via a control monitoring tool. This is supplemented by an annual process coordinated by internal audit.

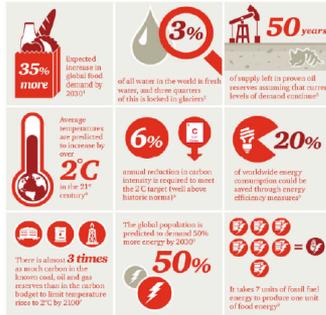
**Our scenario analysis and financial viability statement can be found in the "Balancing, Risk & Reward" section of our PR19 Business Plan narrative.**



# ENGAGEMENT WITH PWC TO HELP WITH LONG TERM RESILIENCE PLANNING

## Megatrends

### 1. Climate change and resource scarcity



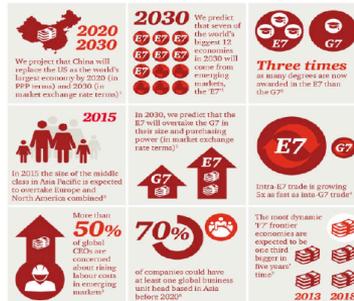
PwC

### 2. Rapid urbanisation



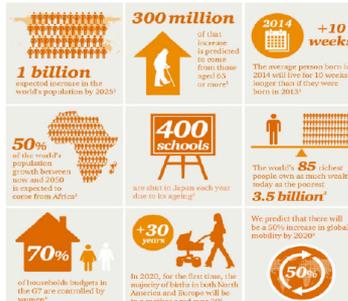
## Megatrends

### 3. Shift in global economic power



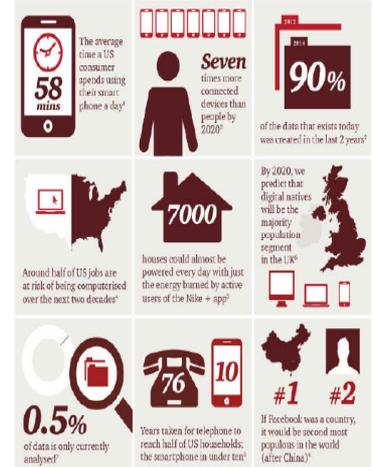
PwC

### 4. Demographic and social change



## Megatrends

### 5. Technological breakthroughs



PwC

### 3. IDENTIFYING AND PRIORITISING SHOCKS AND STRESSES

In order to build our resilience we have considered mega trends (see page 11) and identified the shocks and stresses that may impact our business. We have defined these as:

<p><b>Shocks</b></p> 	<p>Disruptive events, which impact the ability to provide a high quality service. In the water industry, acute shocks include sudden events such as floods, fires or cyber attacks.</p>
<p><b>Stresses</b></p> 	<p>Chronic conditions which weaken the function of the organisation or system long-term. Examples highlighted in particular by Ofwat include population growth and climate change. Stresses are also often felt as shocks when they reach a tipping point.</p>

A long list of these shocks and stresses has been identified and is set out on pages 13 to 16.

We have also mapped both our shocks and stresses together, based on level of control and the relevance of the risk to our business, shown in Figure 4.

Shocks are shown in purple and stresses in blue. Those in the top right quarter of this graph are a particular focus of investment. However for those shocks and stresses where we have less control, we aim to work with our stakeholder and customers to reduce and mitigate residual risks.

The mitigation strategies we have formulated to deal with these shocks and stresses are detailed in the following pages.

These are split by operational security, operational infrastructure, operational technology, operational resilience, operational environmental, corporate, political, legal/regulatory, social, economic, people and financial.

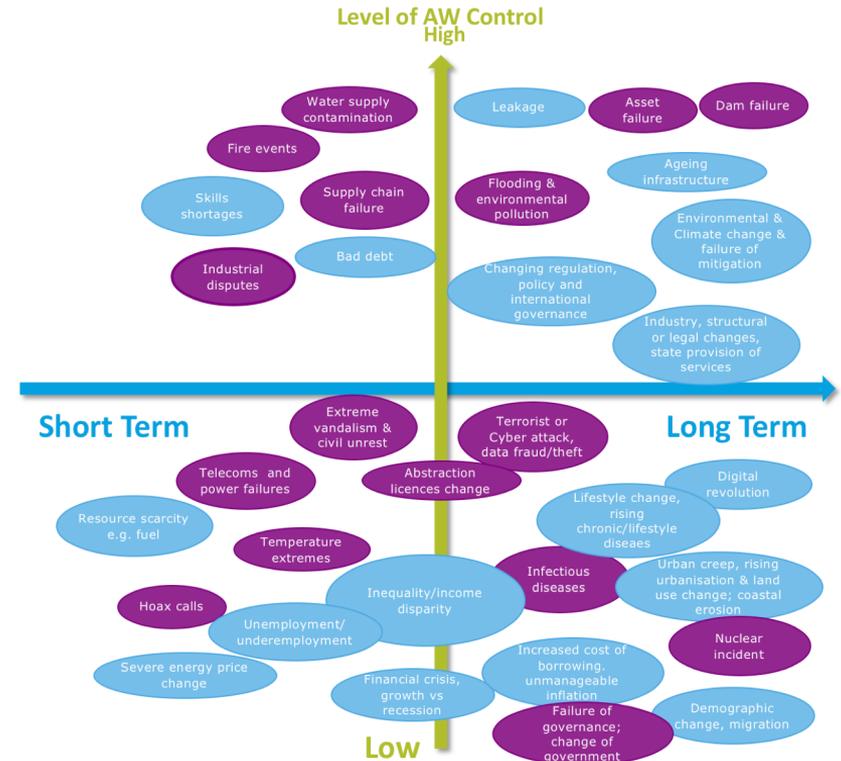


Figure 4: one of our methods for shock and stress mapping



## 3. IDENTIFYING AND PRIORITISING SHOCKS AND STRESSES

### AN ALL HAZARDS APPROACH: SHOCKS THAT MAY IMPACT ANGLIAN WATER

Operational security			
<b>Terrorist attack</b>	Individuals or non-state groups with political or religious goals that successfully inflict large-scale human or material damage. This is defined under the Terrorism Act 2000 for the UK.	<b>Extreme vandalism</b>	Major malicious (or wilful) defacement or destruction of private or public property. This may include trespassing, damage to assets or theft of materials.
<b>Civil unrest</b>	Major social movements or protests (e.g. street riots, social unrest, etc.) that disrupt political or social stability, negatively impacting populations and economic activity.	<b>Hoax calls</b>	A call made to deceive for malicious or humorous reasons. This may be by criminals directed at customers, reducing trust in water companies, causing resources to be diverted to address fake issues.
<b>Cyber attacks</b>	Large-scale cyber attacks or malware causing large economic damages, geopolitical tensions or widespread loss of trust in the internet.	<b>Data fraud/theft</b>	Wrongful exploitation of private or official data that takes place on an unprecedented scale.
Operational Infrastructure			
<b>Asset failure</b>	A sudden, unexpected loss in the service provided by an asset. This may have a knock-on effect on the service of other parts of the network.	<b>Dam failure</b>	Dam breaches, failures, or collapses have the potential to cause massive possible destruction to communities and the environment and as such are defined as installations containing dangerous forces in international law. Causes may include extreme events, lack of maintenance or poor design.
<b>Fire events</b>	Fires in assets or wildfire can cause major disruption and impact on the ability to provide critical services. They may have other knock-on impacts like wildfire impacting water quality.	<b>Supply chain failure</b>	Many companies are reliant on global supply chains, with some materials limited to specific suppliers. Global resource scarcity or disruptions to supply chains may prevent critical products or services reaching their required designations.
<b>Power outages</b>	Unexpected loss of energy supply caused by an issue on site, from extreme events, causing an issue for continuation of services.	<b>Power cut</b>	Unexpected loss of energy supply caused by an external network issue, from extreme events, causing an issue for continuation of services.
Operational technology			
<b>Telecommunication failure</b>	Outage of critical information infrastructure (e.g. internet, satellites, etc.) and networks, causing widespread disruption.		
Operational resilience			
<b>Water supply contamination</b>	Where there is contamination of a drinking water source. This may include chemical, metal, drugs, or microbiological contaminants and may be incidental or malicious.	<b>Nuclear incident</b>	An event where radiation source has led to significant consequences to people, the environment or the facility (defined by the International Atomic Energy Agency). They may be in hospitals, nuclear facilities or in transport of radioactive material.
<b>Temperature extremes</b>	Major property, infrastructure and/or environmental damage as well as loss of human life caused by extreme temperatures.	<b>Flooding</b>	Major property, infrastructure and/or environmental damage as well as loss of human life caused by extreme weather events which cause flooding.
<b>Infectious diseases</b>	Bacteria, viruses, parasites or fungi that cause uncontrolled spread of infectious diseases (for instance as a result of resistance to antibiotics, antivirals and other treatments) leading to widespread fatalities and economic disruption.	<b>Industrial disputes</b>	A dispute between employees and employers, which may lead to disruption in the continuation of service. E.g. Union organised strikes.



### 3. IDENTIFYING AND PRIORITISING SHOCKS AND STRESSES

#### AN ALL HAZARDS APPROACH: SHOCKS THAT MAY IMPACT ANGLIAN WATER

<b>Operational environmental</b>		
<b>Environmental pollution/ Invasive species</b>	Deterioration in the quality of air, soil and water from ambient concentrations of pollutants and other activities and processes. In the case of water, this includes emerging contaminants, such as human pharmaceuticals and hormones, nano materials and recreational drugs.	<b>Failure of climate change mitigation &amp; adaptation</b>
		The failure of governments and businesses to enforce or enact effective measures to mitigate climate change, protect populations and help businesses impacted by climate change to adapt
<b>Political, legal or regulatory</b>		
<b>State collapse or crisis</b>	State collapse of geopolitical importance due to internal violence, regional or global instability, military coup, civil conflict, failed states, etc. (e.g. civil conflict, military coup, failed states).	<b>Failure of regional, national or global governance &amp; planning</b>
		Inability of regional or global institutions to resolve issues of economic, geopolitical or environmental importance.
<b>Abstraction licences change</b>	A change in legal abstraction allowances causing less water to be allowed to be taken from water sources.	
<b>Economic</b>		
<b>Severe energy price change</b>	Significant energy price increases or decreases that place further economic pressures on highly energy-dependent industries and consumers.	



### 3. IDENTIFYING SHOCKS AND STRESSES

#### AN ALL HAZARDS APPROACH: STRESSES THAT MAY IMPACT ANGLIAN WATER

<b>Operational Infrastructure</b>	
<b>Ageing infrastructure</b>	Failure to adequately invest in, upgrade and/or secure infrastructure networks (e.g. energy, transportation and communications), leading to pressure or a breakdown with system-wide implications.
<b>Leakage</b>	Loss of treated water through faulty or ageing infrastructure. Knock on impacts include wasted water, reduced pipe pressure, and supply issues.
<b>Operational Environmental</b>	
<b>Environmental change inc. invasive species</b>	Changes in habitats, ecosystems and biodiversity from pollution, habitat destruction and climate change. This includes invasive alien species arriving and outperforming and replacing the native species.
<b>Climate change (inc. drought and sea level rise)</b>	Change of climate, which is attributed directly or indirectly to human activity, that alters the composition of the global atmosphere, in addition to natural climate variability.
<b>Coastal erosion</b>	Increasing coastal erosion is likely in part due to increased sea levels, causing damage to infrastructure.
<b>Urban creep</b>	Rising number of people living in urban areas resulting in physical growth of cities.
<b>Rising urbanisation</b>	Urbanisation concentrates populations, potentially making them more vulnerable to the effects of natural disasters, disease and deliberate acts of violence.
<b>Land use change</b>	Changes in the use of land. This could be from changes in agriculture, land management or urban creep.
<b>Political, legal or regulatory</b>	
<b>State provision of services</b>	Governments may become less able to provide critical services, meaning other organisations may have to take over this role.
<b>Legal structures</b>	Legal changes in frameworks or obligations may occur that transfers responsibilities or enables processes. This may include legal duties like abstraction licenses or biodiversity duties.
<b>Changing regulation, policy and international governance</b>	Changing landscape of local, regional or global policy, legislation and regulation.
<b>Change of Government</b>	Change in the controlling party of the UK following a general election.
<b>Regulatory changes</b>	Change in regulation in response to questions about trust and legitimacy.
<b>Brexit</b>	The unknown impact of Britain's decision to leave the EU.
<b>Corporate</b>	
<b>Digital revolution</b>	Intended or unintended adverse consequences of technological advances such as artificial intelligence, geo-engineering and synthetic biology causing human, environmental and economic damage.



# 3. IDENTIFYING SHOCKS AND STRESSES

## AN ALL HAZARDS APPROACH: STRESSES THAT MAY IMPACT ANGLIAN WATER

<b>Social</b>	
<b>Demographic change</b>	Global population growth is predicted, the location of these population is expected to change. This also includes ageing populations in developed and developing countries driven by declining fertility and decrease of middle-and old-age mortality.
<b>Migration</b>	Large-scale movement of people voluntarily or involuntary induced by conflict, disasters, environmental social or economic reasons.
<b>Lifestyle change</b>	Changes in the way people live, causing a change in the resources used and expectations of services provision.
<b>Inequality and increasing income disparity</b>	Increasing socioeconomic gap between rich and poor in major countries or regions.
<b>Rising chronic and lifestyle diseases</b>	Increasing rates of non-communicable diseases, also known as “chronic diseases”, leading to rising costs of long-term treatment and threatening recent societal gains in life expectancy and quality.
<b>People</b>	
<b>Shortage of skilled labour</b>	A shortage of unknown or emerging specialist skills required for the continued running of businesses, systems and services.
<b>Skills shortages</b>	A shortage of known specialist skills required for the continued running of businesses, systems and services.
<b>Unemployment and underemployment</b>	A sustained high level of unemployment or underutilisation of the productive capacity of the employed population.
<b>Economic</b>	
<b>Structural change</b>	Change in the basic way a market or economy functions, caused by a variety of factors, such as globalisation, labour changes or resource variability.
<b>Macro industry change</b>	Economic changes causing changes in the sectors of the economy. For example a shift from primary and secondary sectors (extraction of raw materials and manufacturing) to tertiary sector (service sector).
<b>Resource scarcity(inc. fuel)</b>	Reduction in resources availability, locally, regionally or globally, this may include water, energy, fuel, chemicals or any finite physical resource.
<b>Financial</b>	
<b>Growth vs recession</b>	Significant growth or decline in the activity across an economy lasting at least a few months. This recession may be seen negative economic growth.
<b>Financial crisis</b>	The loss in the nominal value of financial assets. For example asset bubbles where unsustainably overpriced assets such as commodities, housing, shares, etc. in a major economy or region.
<b>Unmanageable inflation</b>	Unmanageable increases in the general price levels of goods and services in key economies.
<b>Bad debt</b>	Debt which cannot be recovered, often linked to the debtor being insolvent. Risk of bad debt is often linked to the strength of the wider economy.
<b>Increased cost of borrowing</b>	Increased interest rates causing increased financial burdens on individuals and organisations.

## 4. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL SECURITY

We have a clear strategy for how we manage and mitigate the challenges of operational security. The three key challenges are physical, personnel and cyber.

Our works, pipes and pumps are part of the UK's national infrastructure and are needed to help run the country and deliver essential services.

Some of that infrastructure is considered 'critical' because of the serious effect on the economy and on people's lives if it were to be damaged or lost. Cyber attack poses a large and increasing threat to critical infrastructure across the world. We have a significant and award winning programme to minimise the risk and impact of a cyber attack. An important part of this programme has been about internal personnel resilience to cyber attacks.

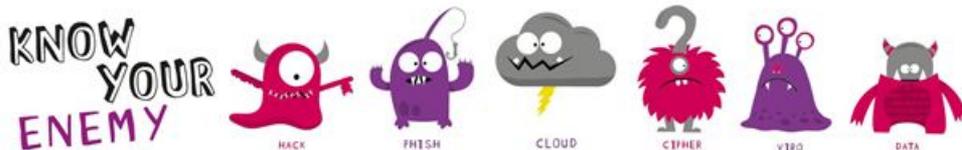


Figure 5: Our award winning Cyber Programme

Our Resilience Steering Group meets to review current security threats and monitor our theft reduction programme. The group also keeps abreast of where risks are emerging and reviews our mitigation against these. Matters of civil unrest or hoax calls would also be part of this mitigation review.

We work closely with Category 1 responders and specifically Counter Terrorism Security Advisors (CTSAs) to keep a finger on the pulse of any emerging risks and to use their knowledge to measure and improve our resilience in this area.

The Information Governance Forum also reviews how we protect data and reviews progress against the new GDPR legislation.



Figure 6: A snapshot of one of our security newsletters

# 4. MITIGATION OF SHOCKS AND STRESSES

## OPERATIONAL SECURITY

### Mitigation of physical security challenges

Our Security Manual and EMPROC set out processes and practices to help our resilience against terrorist attack and extreme vandalism. We also ensure we comply with SEMD requirements and the associated Advice Notes. We have physical hardening of buildings and critical processes, we have an extensive training and exercise programme and have carried out awareness workshops across critical teams.

 <p><b>Terrorist attack</b> <i>Individuals or non-state groups with political or religious goals that successfully inflict large-scale human or material damage. This is defined under the Terrorism Act 2000 for the UK.</i></p>	 <p><b>Extreme vandalism</b> <i>Major malicious (or wilful) defacement of destruction of private or public property. This may include trespassing, damage to assets or theft of materials.</i></p>
<ul style="list-style-type: none"> <li>• We ensure DEFRA security threat information is communicated and acted upon via reporting up to Resilience Steering Group.</li> <li>• We work with CTSA's (Counter Terrorist Security Advisors) and CPNI provide support, analysis and intelligence to ensure that we are prepared to respond to any increase in risk.</li> <li>• We have invested to meet the requirements of SEMD and the associated Advisory Notes. We have ensured these requirements are contained within our minimum asset standards to ensure future assets also comply.</li> <li>• Our critical assets and teams have business continuity plans in place which are externally audited and certified to ISO 22301.</li> <li>• We have also put in place workplace recovery provision for our major offices in the event of a disruption. Our response arrangements are regularly tested and exercised.</li> <li>• We are audited annually against the requirements of the Security Emergency Measures Direction (1998), and an approved SEMD programme of capital works is in place to ensure we meet security requirements.</li> <li>• The Business Resilience Security Manager works closely with our Human Resources team to identify any roles where new employees may require security screening or checks are undertaken e.g. those working at critical national infrastructure sites or undertaking activities which allow them access to sensitive personal information.</li> <li>• We have a heightened security procedure and process ensuring relevant staff will be alerted and measures such as extra "manning" and vigilance across our key sites.</li> </ul>	<ul style="list-style-type: none"> <li>• Our Security and Emergencies Advisor role has a specific portfolio role for theft reduction and reports to our Resilience Steering Group on the success of this targeted approach.</li> <li>• We have CCTV at a large percentage of our sites particularly key water sites to both deter and track intruders.</li> <li>• We use SmartWater to deter theft but also to help track and recover after theft. We also use them to monitor trends in both types of theft/vandalism and geographical location so we can alert operational managers.</li> <li>• A range of anti-theft activities are in place including covert operations in vulnerable or repeat target areas. We maintain close working relationships with local police services throughout our region supporting intelligence sharing. We have been targeting Theft Reduction across our assets and have made significant reductions and built heavily on site resilience.</li> <li>• Regular reports are shared with internal stakeholders including trend reporting.</li> <li>• SEMD programme of capital works for AMP6 on going to install equipment in accordance with DEFRA security requirements.</li> <li>• A rolling programme is in place for the application of Smartwater to key operational installations.</li> <li>• We have Drinking Water Safety Plans in place supported by our emergency response arrangements which are audited and externally certified to ISO22301: Societal security: Business Continuity.</li> <li>• DEFRA security threat information is communicated and acted upon.</li> </ul>

## 4. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL SECURITY

#### Mitigation of personnel security challenges

<p><b>Civil unrest</b> Major social movements or protests (e.g. street riots, social unrest, etc.) that disrupt political or social stability, negatively impacting populations and economic activity.</p>	<p><b>Hoax Calls</b> A call made to deceive for malicious or humorous reasons. This maybe by criminals directed at customers, reducing trust in water companies, or may to be water companies, causing resource use to address fake issues.</p>
<ul style="list-style-type: none"> <li>Our incident response process addresses a wide range of threats and events.</li> <li>We ensure our “field” employees are briefed if there are any areas to avoid or circumstances which required a change to their routine duties.</li> <li>Our sampling staff have detailed briefings of how to deal with any local disruptions or areas where the risk of entry may be of concern.</li> <li>Our events team and recreation teams all have “counter terrorism” awareness training and are briefed ahead of any large events</li> <li>We have a heightened security procedure and process ensuring relevant staff will be alerted and measures such as extra “manning” and vigilance across our key sites.</li> </ul>	<ul style="list-style-type: none"> <li>We work with a range of stakeholders including local police forces and local resilience forums to cascade information and educate our customers so that they can recognise bogus callers.</li> <li>We have processes in place to allow for verification of our employees’ identity. We have undertaken a campaign through our Bogus caller information leaflet, shown in Figure 7.</li> <li>We also brief call centre staff to ensure any unusual calls are reported and escalated, these are then reported to the Police if appropriate, Defra and where applicable to the cyber security team.</li> <li>We train and exercise with our Facilities Management provider to ensure we are well practised and can respond to such incidents.</li> <li>We participate in Warning and Informing groups within Local Resilience Forums to disseminate key messages.</li> <li>We work with agencies, partners and customers to ensure our processes for verification of employee identity are understood to try and prevent bogus callers and improve the resilience of our customers.</li> </ul>



Figure 7: Our Bogus caller information leaflet

# 4. MITIGATION OF SHOCKS AND STRESSES

## OPERATIONAL SECURITY

### Mitigation of cyber security challenges



#### Cyber attacks

Large-scale cyber attacks or malware causing large economic damages, geopolitical tensions or widespread loss of trust in the internet.



#### Data fraud/theft

Wrongful exploitation of private or official data that takes place on an unprecedented scale.

- The physical security process and practices links with our cyber protection programme which seeks to make us more resilient to cyber attacks and data fraud/theft.
- An overarching and holistic security strategy has been defined and approved by RSG. This describes the direction of travel for all elements of security including cyber and includes alignment of Cyber, Personnel and Physical security as well as future certification against a recognised framework for management of cyber risk (ISO27001).
- The cyber security team has expanded in remit and resources to address a broader set of risks; this includes the appointment of a Chief Information Security Officer and re-focusing of the different risks between Information Technology and Operational Technology across the AW group.
- Key governance and controls are in place to monitor and identify threats from incoming attacks. Detective and preventative technical controls have been implemented to reduce likelihood of attacks being successful.
- In addition to enhancing technical controls an ongoing awareness and education campaign continues to modify employees' behaviours towards cyber risk, with regular checks to test people's understanding. Additional vetting of new employees and an extension to our supplier risk assessment has been implemented to support our security improvements.
- A managed outsourced security service has been contracted and has significantly matured. This has included the implementation of critical security technologies. These technical controls have improved detection and prevention response as well as enabling faster response to incidents.
- Threat Intelligence services have been introduced to proactively respond to new threats and to ensure that services are protected from known attacks more quickly.
- Our IT infrastructure has been tested against cyber attack, and changes made to existing systems have been reviewed for impact on security architecture.
- The Phishme monitoring tool provides measurement of employee understanding and awareness of attack issues.
- Training and development continues to be a key focus within the cyber team with investment in ISO27001, GICSP, SEC+ and CCSP all being completed in 2018 and further investment planned for 2018/19 and beyond.
- Cyber playbooks have been developed that identify the top 10 most likely incident types for both Information Technology and Operational Technology assets and for each scenario a set of actions have been designed and trained to the Incident response teams to minimise the impact of future cyber events.
- A significant investment programme has been undertaken in respect of the new General Data Protection Regulation. This has involved a comprehensive review and update of all relevant policies, identification and assessment of data collection and processing activities, embedding privacy by design into new projects and data processing activities and a review of new technologies needed to support ongoing compliance with the regulation.
- The SAP Cyber security team manages our activities around the assessment of access rights and privileges within the SAP system. Their work includes detailed reviews of risks concerning data security and fraud and we have focussed on tightly controlling all access provisioning for all users in order to minimise the risk of fraud. The work of the team is externally audited in detail, over several months each year

### Strategy for the Management of Cyber Security

"To enable Anglian Water to continue to embrace frontier technologies by adopting appropriate processes and controls to protect our systems, staff and customers"

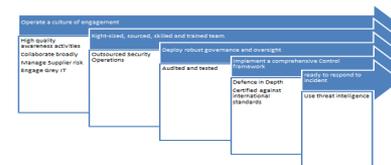


Figure 8: (above) our cyber security strategy (below) Our cyber security campaign to raise awareness with out staff.



## 4. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL INFRASTRUCTURE

#### Mitigation of operational infrastructure challenges



##### **Asset Failure**

*An sudden, unexpected loss in the service provided by an asset. This may have a knock on effect on the service of other parts of the network.*



##### **Dam Failure**

*Dam breaches, failures, or collapses have the potential to cause massive possible destruction to communities and the environment and as such are defined as installations containing dangerous forces in international law. Causes may include extreme events, lack of maintenance or poor design*



##### **Ageing infrastructure**

*Failure to adequately invest in, upgrade and/or secure infrastructure networks (e.g. energy, transportation and communications), leading to pressure or a breakdown with system-wide implications.*

- Our incident management processes support response to asset failure; response and recovery plans are produced by supply system and critical assets identifying contingencies in place should sites or assets fail.
- Governance supporting processes when designing, implementing or modifying Supply Systems ensure that resilience is given adequate consideration and that supply resilience mitigation schemes are well managed.
- A significant part of our investment programme is targeted at maintaining Asset Health and ensuring our infrastructure is resilient for the future. We have reliability and criticality models for all of our asset inventory which are used to identify and prioritise investment requirement to maintain asset health and serviceability to customers.

#### **A few examples are detailed below :**

- Schemes are being completed during AMP6 at Grafham and Wing WTWs providing additional capacity or improving the resilience of these sites. Additionally, several smaller scale schemes are being delivered to provide additional resilience where schemes initiated due to water quality or maintenance are taking place. To mitigate the risk of flooding at critical sites, capital solutions are being delivered across three alliances (IMW, IOS and IMR).
- All of our dams are maintained and inspected in accordance with the requirements of the Reservoirs Act and specific investment is ring-fenced for this activity.
- We have established a dedicated Restoration team working across the business to enable supply restoration activities before repair and ensuring that all planned work considers restoration techniques to minimise interruptions.
- In order to reduce the risk of failure, routine maintenance programmes are carried out to monitor the condition of our assets and replace where required.
- Pump Replacement - activities aimed at reducing the number of pumps out of service and the mean time to replace / repair. Targeting below 5% pumps out and a 10 day level of service for all replacements.
- Pumping Station Serviceability visits - Planned teams in Maintenance carry out a programme of serviceability visits on our pumping stations with frequency dependent on risk based assessment.
- Planned Preventative Maintenance for sewer jetting and wet well cleaning - 5469 km of sewers jetted according to risk-based programme and 518 wet well cleans. Partnership funding - capital contributions made to third-party schemes which deliver cost beneficial flooding benefits to our customers.
- We have developed a predictive analytics model to identify high risk sewers which are then included in our CCTV survey and remedial works programme.
- To mitigate the risk of pollutions, our 'Pollution Watch' campaign targets communications for the general public and river users to contact us in the event of potential pollution. This increases our self-reporting and improves reactive response times to potential incidents. A Pollutions app is also now in use to support technicians to collect data during incident management.
- High risk pumping stations have been identified and a programme put in place targeting risk reduction at these assets. Maintenance resources have also been increased to carry out planned work.
- To reduce the impact on the network of customer behaviour we also promote our Keep it Clear campaign, a programme of activity to drive behavioural change in disposal of fats, oils and greases and unflushables into the sewerage network to reduce blockages.

## 4. MITIGATION OF SHOCKS AND STRESSES OPERATIONAL INFRASTRUCTURE

### Mitigation of operational infrastructure challenges

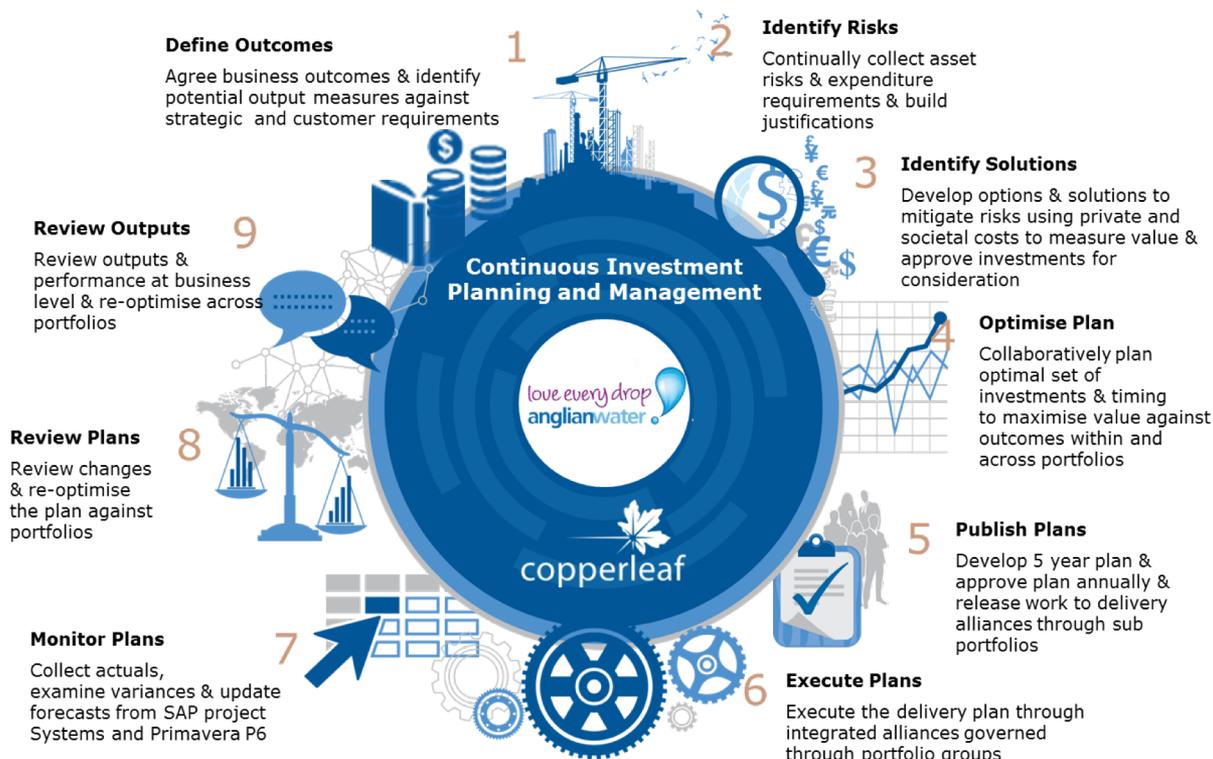


Figure 9. Our asset management systems approach

# CASE STUDIES - SYSTEM RESILIENCE



## BENEFITS FROM THE NORWICH RESILIENCE SCHEME

Early 2010 saw the commissioning of the Norwich resilience scheme. As our first major standalone resilience scheme, the concept was developed in 2005 to provide resilience under average demand conditions should the full output of the Norwich Heigham Water Treatment Work (WTW) fail (72% of required supply for 200,000 population).

The investment of £16.5M delivered a new raw water mains, a new 24 Ml/d Water Treatment works plus trunk main connections from the East Hills WTW to the Norwich water ring main.

The solution included a full automation configuration which enables remote control of WTW output and full pressure control. This has been designed to allow optimisation of all the available groundwater assets should Heigham output be catastrophically lost due to a resilience event such as fire or flood.

The scheme and its operation was underpinned by a regular and full maintenance and testing regime.

The East Hills scheme is designed to be able to ramp up instantly (unlike a more complex solution such as an RO/membrane plant requiring run up time) and the East Hills WTW output can be controlled remotely from Operational Management Centre. It can meet demand by ramping up from its baseline output of 2 to 3 Ml/d to the maximum output of circa 24 Ml/D in short timeframes.

This resilience scheme was used during the 2018 Freeze/thaw event when demand rose in the Norwich Supply from 53.63Ml/d to 73.65Ml/d over the period of 4 to 6 March 2018. The East Hills WTW was used to pick up the majority of this increase with its flows rising from 2.57Ml/d on 3 March to 12.26Ml/d on 5 March and 13.79Ml/d on 6 March.

Without this resilience capability, the ability of the Heigham WTW to meet this increased demand in such a short timescale would have been questionable. This event showed the value of our resilience investment.

## BENEFITS FROM THE GRAFHAM RESILIENCE SCHEMES

Grafham Water Treatment Works (WTW) serves 829,000 people. A resilience event causing a prolonged network outage would rapidly affect 75% of this population – representing a significant risk.

To provide Network resilience, our AMP5 Business Plan included a scheme for the construction of a new storage reservoir and major network resilience scheme, with a new water main from Hannington Reservoir to Grafham WTW.

Our AMP6 Business Plan included completion of this scheme and an additional scheme to secure the power supply to Grafham; Grafham was one of only two water treatment works at the time without sufficient onsite backup generation.

In preparation for our AMP6 Business case for the Power resilience scheme the latest best practice in resilience planning was followed to understand the need and evaluate options.

In doing this we listened to our customers and worked closely with Ofgem, National Grid and the Distribution Network Operators (DNOs).

For the network resilience scheme, instead of a new main we saved cost and carbon by adapting and using an existing asset (which had originally been designed for single directional flow). This resulted in avoiding the need to construct a 36km pipeline. This innovative and ground-breaking approach created an enhanced network with a bi-directional asset and allowed large potable water transfer between supply zones.

This scheme was the first of its kind, globally, to use flow reversal philosophy on the existing asset to ensure resilience in the Grafham system.

We received external validation through recognised and prestigious awards, for example the Capital Project Management Award at the Utility Week Awards where the judges called it a “fantastic exemplar for the industry” using technical innovation to deliver outstanding results while driving massive reductions in cost. It also won the prestigious Carbon Reduction Project of the Year in the British Construction Industry Awards.

# CASE STUDY - KEEP IT CLEAR



Keep it Clear delivers bespoke awareness interventions in response to pipe and pump blockages which can cause customers to experience inconvenience, internal flooding and pollution to the environment.

Keep it Clear works across our network including operating at **24 key locations. It delivers 30% average blockage reduction rising to 52% in areas where the campaign runs for more than a year.**

- **10 formal partnerships** with community organisations in **17 areas.**
- **Doorstep visits** trial in high risk areas - 84% reduction in actual blockages.
- **Food serving establishments (FSE)** - reactive advisory visits as well as new trial in Peterborough of pro-active visits to 600 + premises.
- **Partnerships** with major retailers and manufacturers, local authorities and NGOs leading to influential change.
  - **New livery** (right) in partnership with Marine Conservation Society's 'Monsters' campaign.
  - **100,000** conversations with women and in schools discussing sanitary item disposal,
  - **500** community events attended and **35,000** children and adults engaged in collaborative arts and performance project.



## 4. MITIGATION OF SHOCKS AND STRESSES OPERATIONAL INFRASTRUCTURE

### Mitigation of operational infrastructure challenges



#### **Fire events**

*Fires in assets or wildfire can cause major disruption and impact on the ability to provide critical services. They may have other knock-on impacts like wildfire impacting water quality.*

- Our policies and procedures define all aspects of fire risk control and related processes, and governance includes routine review of system effectiveness, performance monitoring and consideration of process improvement.
- Hot work safe systems include permits, security of the area, fire risk management, equipment maintenance and specific training. Permits are monitored and work areas subject to inspection by managers.
- The Fire Risk Steering Group, chaired by the Director of Water Services, meets regularly to ensure consistency of application of hazard evaluation and installation of appropriate detection and suppression schemes. We are also working with a leading fire authority to achieve a consistent and robust fire risk assessment process for business-wide application.
- Thermography maintenance and electrical testing programmes are embedded across the business.
- Fire safety plans and risk assessments are completed for all premises, monitored and reviewed on a regular basis.
- Evacuation plans are in place for all sites with major office sites supported by offsite dispersal plans.
- All staff receive fire safety training at a level appropriate to their role and are briefed on evacuation procedures during site inductions.
- Those who have a specific role in an emergency receive appropriate and specific training, and regular evacuation drills are carried out, supported by a programme of exercises to test evacuation and dispersal at main offices.
- We also have insurance to cover financial losses arising from loss through fire.

## 4. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL INFRASTRUCTURE

#### Mitigation of operational infrastructure challenges



##### **Supply Chain Failure**

*Many companies are reliant on global supply chains, with some materials limited to specific suppliers. Global resource scarcity or disruptions to supply chains may prevent critical products or services reaching their required designations.*

- As part of our EU compliant strategic sourcing process, suppliers are assessed in terms of their business resilience and this also includes assessment of criticality to our organisation in relation to the goods and services supplied to us including the upstream supply chain. Where suppliers are identified as medium or high risk against our documented supplier business resilience assessment procedure, they are required to provide details of resilience and continuity arrangements as part of the tender process. If successful in being awarded a framework these are reviewed on a regular basis as part of active framework management and mitigation plans are put in place, some of which are contractually obligated.
- Dependant on the size of the contract, we will seek differing levels of financial resilience measured through creditworthiness, e.g. for our principle electricity contract we require a credit rating from the main credit rating agencies of A1.
- We have portfolio managers in place for all key spend areas. Core to portfolio management is the development and management of their supplier relationships and building an in-depth knowledge of their portfolio's supply chain. In identified areas of critical spend such as chemicals, there is at least one additional colleague with knowledge of the supply chain and suppliers.
- Where global supply chains are involved or suppliers have been identified as a business resilience risk within our frameworks, we work to understand the potential bottlenecks, risks and opportunities within those supply chains to ensure that mitigation plans are in place and ownership is clear to all parties.
- One mitigation where global supply chain criticality is highlighted is to contract with multiple suppliers for key goods and chemicals which allows us to ensure that we maintain deliveries for our sites. However, we acknowledge that this is only the first level of the supply chain and that bottlenecks and risks can be further up the supply chain. Long term relationships are key to transparency through the entire upstream supply chain.
- Across our Integrated Supply Chain team we have decades of experience balanced across the portfolios of spend. This stability within the team supports and maintains the strong, collaborative and proactive relationships with our key and critical suppliers. For strategic portfolios category plans are developed to ensure the in-depth knowledge of the supply chain is captured.
- As part of active framework management, where appropriate, a robust audit programme is in place, particularly for example with the chemical portfolio to ensure we maintain an understanding of our Supply Chain's resilience to disruptions, scarcity of supply and impact of Brexit.
- We regularly review our policies to ensure water treatment chemical supply resilience is sufficient, including input from the operational teams.
- Any contingencies in place are outlined in the Process Recovery Plans and detail if suppliers can or should be able to support critical activities.

## 4. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL INFRASTRUCTURE

#### Mitigation of operational infrastructure challenges



##### **Leakage**

*Loss of treated water through faulty or ageing infrastructure. Knock on impacts include wasted water, reduced pipe pressure, and supply issues.*

##### **Strategy**

- Leakage is one of our key priorities as a business and a clear priority for our customers. Our Water Resources Management Planning identifies that demand management is key to offset the pressure of future growth in our region and maintain resilient future supplies to our customers. Our demand management plan includes leakage, smart metering (allowing us to identify customer side leakage and plumbing losses) and promoting water efficiency and customer behavioural change. Leakage reduction has always been a key part of managing demand and is one of our customers highest priorities as they see it as an 'emblematic' issue.

##### **Governance**

- We have clear governance and control processes in place to monitor leakage performance and gain assurance of achievement of target this includes our Leakage Board where performance is reviewed monthly by relevant Directors.
- Our annual water balance is fully audited by Jacobs as part of leakage data verification process.
- Leakage targets are set on a 3 year rolling average, with recovery plans in place should the target be in jeopardy.

##### **Optimised Water Networks**

- In a water stressed area with significant anticipated future growth, leakage is and will remain a key priority for us. As the frontier performer in the UK water industry we continue to explore and adopt innovative approaches to prevention and detection of leaks. Rather than being solely reliant on traditional leak detection and repair techniques we have a multi AMP overarching leakage and optimisation strategy, focussed on establishing our long term goal of a calm and controlled network across the whole of the region. As part of this we have a pressure calming programme to reduce leakage, reduce pressure transients and prevent mains bursts.
- We also have our Smart Water Systems programme looking at the use of new technology to identify and mitigate leakage faster and promote solutions to maximise the life of our assets. We utilise our industry leading Shop Window area to develop and prove the benefits of emergent technological advances such as near real time predictive modelling, acoustic noise logging, drones and satellite imagery and analytics before wider utilisation across our region.
- We actively collaborate across the industry, all parts of the business and our wider supply chain to develop innovative new solutions to drive frontier performance in leakage management. Through participation in national and international forums we share our experiences and best practice approaches.

##### **Data**

- As we have evolved our leakage strategy, data fusion and analytics play increasingly key roles in our leakage process. We have invested extensively in flow and pressure monitoring across our network. This is fully integrated into our Telemetry system which interfaces with our bespoke leakage management system, Integrated Leakage and Pressure Management (ILPM). ILPM integrates all of our corporate systems, providing a visualisation platform for all relevant information.
- ILPM manages the whole leakage process, from effective targeting of high areas of leakage, deployment of field resources and resolution. This also provides near real time system performance reporting and is used to provide accurate and timely performance reporting to governance forums.
- In readiness for achieving our AMP6 targets a predictive forecast model was developed in collaboration with Cranfield University, providing a prediction of volume and areas where burst water mains are likely to be observed based on environmental data science modelling of weather, soil, and infrastructure variables. This allows us to proactively predict likely work volumes and manage our repair team resources to best effect. We are continuing to develop and refine this forecasting model.

## 4. MITIGATION OF SHOCKS AND STRESSES OPERATIONAL INFRASTRUCTURE, LEAKAGE



### CASE STUDY – SMART WATER SYSTEMS

We have established a dedicated project team to deliver leakage savings through exploiting the benefits of new technologies. The project team work collaboratively with key technology suppliers (such as Claval and I2O) developing new innovative processes in areas such as:

- Pressure transient identification and mitigation
- Sensoring of the network through pressure and fixed correlating noise loggers
- Near real time modelling
- Dynamic DMA operation.

As part of our overall leakage and optimisation strategy they proactively identify and prevent failure, maintain customer supplies and reduce leakage.

#### Peterborough Network Optimisation

The Peterborough network optimisation project involved optimising 42 separate fed closed DMAs across the city through strategic pressure management utilising intelligent control valves allowing remote control of the full network. Since commissioning the first phase in 2015 a further 5 phases have been completed. Aside from creating greater resilience to customers through multiple supplies the following benefits have been realised;

- Distribution input reduced by 8.26 MI/d
- Leakage reduced by 4.35 MI/d
- 44% reduction in burst mains
- Reduced operating costs



### CASE STUDY – USE OF DRONES TO PINPOINT LEAKAGE

In this historically high leakage area we approached the challenge differently.

We knew that there was a leak in the overgrowth highlighted above but knew that there were Health and Safety as well as logistical challenges to overcome.

In order to identify the source of the leak we flew a drone with thermal imaging to help pinpoint the location.

By using this technique we were able to surgically identify and fix the leak instead of undertaking more costly solutions like a complete service renewal



Thermal imaging drones used in fight against water leaks. Picture: File: IR\_056.jpg Photo Date: 14/03/2017

Anglian Water has become the first water company to trial thermal imaging drones to detect leaking water pipes.

## 4. MITIGATION OF SHOCKS AND STRESSES

### MITIGATION OF OPERATIONAL INFRASTRUCTURE CHALLENGES



#### CASE STUDY – ENHANCED METERING, SMART METERING



##### Enhanced metering

Domestic metering is key to maintaining a resilient supply demand balance by reducing customer demand and incentivising water efficiency. Under our enhanced metering scheme we fit the meter compulsorily, then provide customers with information on whether they will be better off being charged on a meter and give them support through our water efficiency programmes to save water, energy and money. We then give the customer the option of switching to measured charges.

In AMP6 enhanced metering is installing water meters in water stressed areas. We aim to install 53,534 meters in Fenland, Norwich, the Broads and Ruthamford South WRZs (Water Resource Zones) as well as Norfolk Rural, North Norfolk Coast, March and Ely. This programme aims to have 53,534 meters fitted in AMP6, resulting in 90% of all Anglian Water customers having a meter and 84% paying measured charges by the end of the AMP.

##### Smart Metering

In our pilot Shop Window area of Newmarket and our follow up rollout in Norwich we have been proving the benefits that come from the installation of smart domestic meters in providing usage information for customers, identifying customer side leakage and plumbing losses.

AMP 7 we will install smart meters across the region to enable a step change in customer communications, the use of behavioural economics techniques, and supporting our water efficiency initiatives. The programme also has significant benefits for optimising our networks and supporting the delivery of our leakage strategy

#### CASE STUDY – SHOP WINDOW



Our Shop Window innovation hub, located in the Suffolk town of Newmarket, is helping us to answer some of the biggest challenges facing our industry. By focussing innovation activities in a single catchment and working in collaboration with our employees, customers, supply chain and communities, we are accelerating our learning and building the microcosm of a future water company, today.

We are always looking to continuously move closer to achieving our aspirational goals. As we continue to focus our attention in these ways, technological development and its affordability will play a role in how close we can get to achieving these. They will continue to provide a clear direction for our business and inspire our people and partners about what can be achieved.

The Shop Window is a long-term initiative aiming to deliver benefits to our customers and our business over AMP7, AMP 8 and beyond – a microcosm of our business in 30 years time. As we build this microcosm we will take the learning from successes and failures in order to deliver benefits to our customer and our business by rolling them across our region. We have achieved this success to date by growing the Shop Window and intend to continue it this way through AMP7.



# 3. MITIGATION OF SHOCKS AND STRESSES

## MITIGATION OF OPERATIONAL INFRASTRUCTURE CHALLENGES



“What is really impressive is how everything is interconnected”

### SHOP WINDOW FEEDBACK

“I thought the Shop Window was a fantastic concept which really brought innovative thinking into tangible action, through mutually beneficial, collaborative partnerships.”



BERNARD CRUMP  
CONSUMER COUNCIL FOR WATER



“Anglian Water’s Smarter Drop campaign is an extremely rewarding and interesting experience.”

Emma Bailey,  
Newmarket Customer

“This is exactly the sort of ambition that we want to see from water companies”

“The most impressive thing was how Anglian is engaging and motivating real people.”



John Russell – OFWAT Senior Director, Strategy and Planning



## 4. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL INFRASTRUCTURE

#### Mitigation of operational infrastructure challenges



##### **Power outages/ power cuts**

*Unexpected loss of energy supply caused by an external network issue, from extreme events, causing a issue for continuation of services.*

As with many other sectors we are reliant on power to operate both our process assets but also those which distribute water and our major office sites. Investment in back up generation and the associated fuel stocks has been critical in developing our resilience to power outages both internally and via our Distribution Network Operators (DNOs). Our Energy Team also invests significant time and effort to secure resilient power supplies and monitor the effectiveness of our generators. We work closely with the DNOs and National Grid and exercise power outages at a regional level through our Multi Agency Support Group and at a National level through Water UK and the LRF Chairs Forum. We are one of the largest energy users in the east of England. This is a big cost to us as well as having an adverse effect on the environment through the resulting greenhouse gas emissions. This is why we put the Energy Initiative in place which focuses on saving both energy costs and energy usage. Examples of how we ensure resilience to power outages/cuts are detailed below:

- Power failures and their impact are monitored and reported on a monthly basis.
- National Grid's latest report indicates supply margins are improving in part thanks to instruments such as the Capacity Market in which Anglian Water participates.
- Through collaboration with the Business Resilience Team, Energy Team, Operational teams & external stakeholders (e.g. Distribution Network Operators) our electricity supply resilience plans are being developed. The Head of Carbon and Energy is responsible for provision of information progress and status.
- Incident management and recovery plans are in place including availability of generator and fuel supplies; joint response and recovery plans with Distribution Network Operators.
- Critical assets are protected by standby generation and dual power feeds. Schemes to improve power resilience at our critical water treatments works (Grafham and Wing) are in progress and due to be completed this year. Funding has also been secured to improve the power resilience for some of our office buildings e.g. Enterprise House replacing the existing generator with 2 sets capable of running all equipment in the building for 10 days. This will improve the resilience of this site in addition to our Work Place Recovery Centre which provides critical operational and customer services.
- Risk of power failure is fully considered as part of procurement resilience planning criteria, including collaborative work with Distribution Network Operators to identify overlaps and potential process gaps. Significant mitigation is provided by back-up diesel generators and multiple supplies to critical assets.
- The Energy Team continually reviews and assesses this risk and provides the Resilience Steering Group reports in line with data and intelligence received including Government reports.
- A winter action plan has been developed in response to increased risk of voltage reductions and rota disconnections.
- Anglian Water is one of the founding members of Multiagency Support Group for the East of England (MASG). As part of this group, regional power outage scenarios have been exercised to identify the interdependencies between power and telecoms and the impact of our business.

## 4. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL TECHNOLOGY

#### Mitigation of operational technology challenges



##### **Telecommunications failure/Loss of Telemetry**

*Outage of critical information infrastructure (e.g. Internet, satellites, etc.) and networks, causing widespread disruption.*

- We have invested in world leading telemetry systems such as IRIS and ILPM providing operational insight to our Operational Management Centre and in the field. Our telemetry systems use a number of communications links including IDSN lines, UHF radio signals, mobile networks and microwave links to transmit information to IRIS.
- Our 24/7 Tactical Operations team continually monitors information from our telemetry system and can initiate processes to run critical operational sites manually if required, or to prioritise and manage 'milk round' visits to critical sites should widespread failure of IT or mobile networks occur.
- Scanning equipment is regularly calibrated to ensure that readings are accurate.
- IS and telephony incidents are managed through the CapGemini Major Incident Management process and escalated to our IS incident management team through set triggers. Alerts are sent through email and text message to employees giving updates to provide information and updates.
- Telecoms circuits supplying our major offices are resilient and our contact centre call management system is hosted in data centres certificated to ISO27001 (information security), and our internal telecoms infrastructure supporting contact centres is hosted in secure environments protected by generator backup and UPS. Should any failures occur calls can be routed direct to contact centre agents, and this is further protected by PSTN landline telephones for 24/7 roles in case of local network failure.
- Additional resources are in place to be able to answer customer queries via our webchat channel and social media networks.
- In the event that our major offices are affected but the wider network remains online, we have pre-allocated seating for critical teams at internal and external Workplace Recovery Centres and dispersal to these sites is regularly tested.

## 4. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL RESILIENCE

#### Mitigation of operational resilience challenges



##### **Water supply contamination**

*Where there is contamination of a drinking water source. This may include chemical, metal, drugs, or microbiological contaminants and may be incidental or malicious.*



##### **Nuclear incident**

*A event where radiation source has led to significant consequences to people, the environment or the facility (defined by the International Atomic Energy Agency).*

- We have a mature Drinking Water Safety Planning approach which meets regulatory requirements, underpinned by our extremely robust Policies and Standards for Water Supply Hygiene (POSWSH). These ensure that we manage water quality from source, through our water treatment works and water storage points and our network of pipes into customers' premises.
- We have a significant AMP6 Capital Maintenance and Quality Enhancement programme to ensure that we maintain and improve our drinking water quality.
- Regular audits are carried out both internally and externally. Water Services processes are externally assessed annually by LRQA to ISO 9001 Quality Management and ISO 22301 Business Continuity management system standards. UKAS audits our laboratory as part of ISO 17025. A comprehensive internal audit programme is signed off each year by the Director of Water Services and his senior leadership team, and is delivered by members of the Water Quality and the Risk and Systems Teams.
- In addition, our senior manager-led Water Services Compliance Monitoring Group and Water Quality and Environmental Compliance Group regularly review performance against key water quality parameters. Our Board of Directors also regularly review key targets and quality standards.
- Numerous sub-groups track progress with key water quality programmes of work, for example monthly Storage Point Delivery Group and weekly senior manager-led conference calls track the progress of external and internal water storage point inspection programmes, an area where we have seen significant improvement in performance.
- We also ensure that operational and scientific employees are trained and assessed as competent. Our industry-leading Licence to Operate programme sets benchmarks and expectations for competency and is being further enhanced by a drive towards professional registration such as Chartership through professional bodies such as the Institute of Water.
- Following some potentially serious incidents resulting from the quality of chemicals obtained from third party suppliers, as part of the 2017/18 Water Quality Internal Audit Programme all suppliers of potable water treatment chemicals were audited. Audits were conducted in collaboration with the Water Quality team, Integrated Supply Chain, Risk and Systems and LRQA. Generally good compliance was witnessed, with corrective actions successfully progressed to closure. The output from these audits is being used to inform the future internal audit programme.
- We carry out gap analysis of other water companies' post-incident reports to ensure key lessons learnt from significant water supply events are embedded into the our business.
- We engage with Nuclear power plants in our region both directly and via the Local Resilience Forums to ensure there are agreed plans in place for a response to a nuclear event or incident.

# 4. MITIGATION OF SHOCKS AND STRESSES

## OPERATIONAL RESILIENCE

### Mitigation of operational resilience challenges

Our standard emergency procedures are supported by a business-wide approach to severe weather, outlining a stepped response for weather hazards including snow and ice, storms and gales, heatwave and summer demand, and flooding.

The Severe Weather Matrix provides a tool to implement these procedures and coordinate the business response to manage demand and meet the needs of customers whilst recovering critical people, processes and assets affected by these hazards.



#### Temperature extremes

Major property, infrastructure and/or environmental damage as well as loss of human life caused by extreme temperatures.

- Regular workshops are held with critical teams to understand and identify supply sites which may be at higher risk of summer demand issues.
- Review of all severe weather plans & supporting materials on an annual basis.
- High Demand Planning sessions with operations at the start and end of each summer period.
- Winter awareness campaign is launched annually to promote resilience for all staff including free tyre checks and provide hints and tips.
- Our Drought Plan documents processes to maintain supplies during periods of low rainfall, including options to reduce demand through additional leakage management, water efficiency campaigns and, where appropriate, Level of Service 1 and 2 restrictions. In addition, the drought plan includes operational supply side options developed to increase resilience, including trading options with other water companies.



#### Nuclear incident

A event where radiation source has led to significant consequences to people, the environment or the facility (defined by the International Atomic Energy Agency).

- Severe Weather Matrix contains a flooding section with directions for the business in flooding events, with supporting Severe Weather Plan.
- Our sites are assessed for flood risk.
- Where required flood emergency response plans (FERP) are produced.
- FERPs are regularly exercised to ensure that staff on site are able to quickly respond in the event of flooding.
- Mobile Flood Barrier held with a team trained to deploy to anywhere in the region.
- User of the Environment Agencies 'Targeted Flood Warnings' system to monitor assets real time flood warnings.

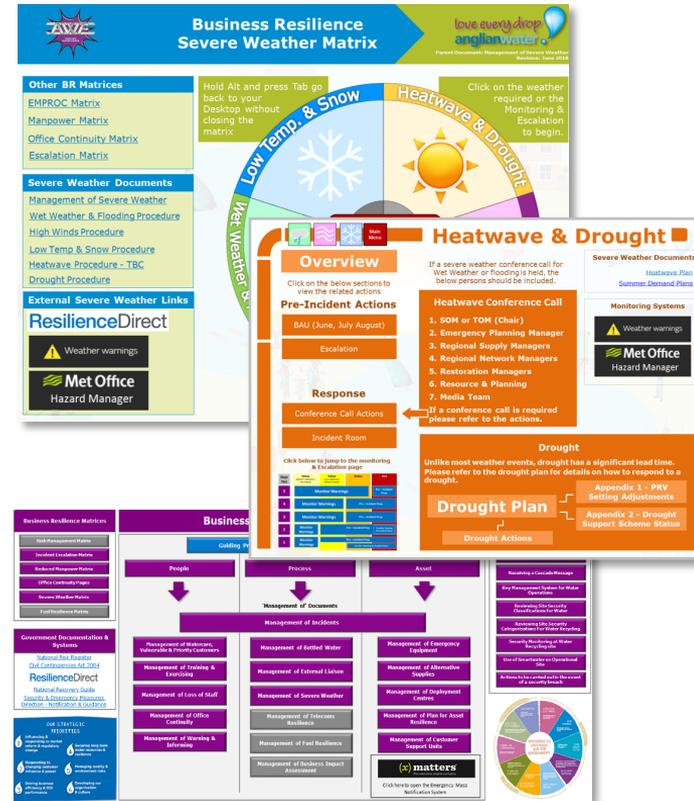


Figure 9: (top) Our severe weather matrix for management. (bottom) our EMPROC Matrix

# FREEZE THAW CASE STUDY



The 2018 Freeze-Thaw event put significant strain on infrastructure across the UK. In the water sector the rapidity of the thaw following an extended freeze caused unavoidable problems with burst mains and leaks from customer pipes and company networks. The combination of freeze and rapid thaw also caused substantial ground movements and resultant mains bursts, particularly in the Fens.

Our emergency response and incident management meant that 99.6% of our customers experienced no impact from this event (a small number of customers in the Fens and on the Norfolk coast were affected with short duration interruptions). Our success in minimising the impact on customers stemmed from a number of factors, including:

- Putting innovation at the heart of what we do: ensuring optimal use of our Dashboard Information System, Telemetry System (IRIS), and our leading Integrated Pressure and Leakage Management System (ILPM), which drove our operational response and ensured we targeted our resources to the areas of greatest need.
- Our industry-leading position on leakage. This means we lose less water from our networks, and so are better placed to cope with spikes in demand that flow from an event like this.
- Our resilience approach, based on ISO22301.
- Our customer-centric approach of 'restore, repair, recharge' to focus first on meeting customer needs rather than fault repairs.
- The quality of our customer and stakeholder communications, both proactive and reactive, across all channels to try to reach the widest range possible.
- The collaborative approach we have pioneered with our unique alliance model which saw us quickly deploy 119 gangs and over 400 people to address problems.
- Investment in resilience schemes, which has reduced the numbers of customers dependent on a single source of supply. This gave us more options to minimise customer impacts.



Figure 1 : Our technician responding to customers during the freeze thaw event



We initiated our incident response before the event to ensure we were prepared. Our incident rooms and incident teams worked 24/7 for 10 consecutive days to respond and recover from this event. An Incident Director was also appointed throughout to ensure strong leadership and direction.

Our operational teams alongside our Anglian Water Force volunteers worked tirelessly in challenging situations to ensure we could minimise any disruption to water supplies and provide excellent customer service.

All of these were combined with strong preparation across the company, to ready ourselves operationally, ensure proactive communications with customers, and execute our resilience planning systems.

All of the above work is in place to ensure we are able to quickly and effectively respond to incidents and events, **ensuring our services are resilient and our customers are unaffected in all but the most serious incidents.**

**But it all comes back to PREPARE, PREPARE THEN ESCALATE – THINK FAST, THINK BIG**

# 4. MITIGATION OF SHOCKS AND STRESSES

## OPERATIONAL RESILIENCE

### Mitigation of operational resilience challenges

**! Infectious diseases**  
*Bacteria, viruses, parasites or fungi that cause uncontrolled spread of infectious diseases (for instance as a result of resistance to antibiotics, antivirals and other treatments) leading to widespread fatalities and economic disruption.*

- Our business impact analysis programme identifies critical business activities and the manpower resource supporting their delivery. Core staffing requirements and contingencies for critical resources are identified and documented in team process recovery plans.
- This is supported by our Reduced Manpower matrix outlining a proportionate and scalable response to manpower reduction across the business.
- We have also worked with Alliance partners to develop a database identifying manpower resources available during incidents, supported by our training and exercising programme.
- To minimise the impact of seasonal influenza, awareness programmes are delivered by Occupational Health and influenza vaccination vouchers are made available to prioritised groups of staff.
- The Resilience Steering Group regularly meets to review performance and progress towards targets.

**! Industrial disputes**  
*A dispute between employees and employers, which may lead to disruption in the continuation of service. E.g. Union organised strikes.*

- Positive employee relations and minimising disputes with the three recognised unions by regular dialogue.
- Regular meetings are in place with full time officers of all three unions.
- A programme of workshops is also under way to develop a framework within which to manage industrial relations risk including dispute avoidance procedures.
- Contingency plans for protecting services are in place and regularly reviewed; these involve redeployment of existing staff/managers, and the use of external contractors to cover essential work. These plans are reviewed as necessary in advance of any negotiation which could conceivably lead to industrial action.
- Regular engagement takes place between Business Resilience and Employee Relations to ensure plans are in place and that these are current.



Figure 10: Our Reduced Manpower Matrix.

## 3. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL ENVIRONMENTAL

#### Mitigation of operational environmental challenges



##### **Environmental pollution**

*Deterioration in the quality of air, soil and water from ambient concentrations of pollutants and other activities and processes. In the case of water, this includes emerging contaminants, such as human pharmaceuticals and hormones, nanomaterials and recreational drugs.*

- Anglian Water is already susceptible to a deterioration in the quality of water available for drinking water purposes. Increasing levels of nitrate in raw water have been monitored for many years and action is taken to blend or invest in treatment processes to ensure that drinking water meets all of the necessary standards.
- More recently metaldehyde (used by farmers to kill slugs) has been an increasing risk. We have been at the forefront of understanding and developing approaches to mitigating the risk – in particular through our Slug It Out campaigns. We have also been working with Defra on the introduction of a targeted ban to mitigate the risk where voluntary measures are not sufficient. Where necessary we have also implemented treatment processes so that all drinking water standards are met.
- Emerging contaminants, such as pharmaceuticals and hormones have been subject to a number of pilots that we have actively participated in over recent years. We continue to monitor potential impacts and take part in developing research programmes.
- Nanomaterials are likewise being studied to understand potential impacts on drinking water quality.
- We are also conscious of the impact of our own operations on the wider environment and Anglian Water has set a goal of no pollutions. To achieve this a number of mitigants are in place:
  - All pollution incidents, the associated response, mitigation and preventative actions are reported to and monitored by senior management. We have a wide programme of activities to reduce pollution incidents and improve our understanding of their causes. This includes:
  - Spending of around £6 million in the last financial year on planned preventative maintenance to reduce blockages and consequent pollutions.
  - A priority, 'blue light' or fast response for areas with historical pollution risk and/or significant environmental sensitivity.
  - Investment in new technology for remote monitoring of discharges. This has been installed at key points on the network, both inland and coastal. More than 800 locations are now monitored around the clock.
  - Continuing to develop our systems to achieve real-time monitoring and reporting of pollution incidents and to provide a one-stop shop for pollution information, including a reporting app to improve the quality and consistency of information from the field.
  - Aligning our internal processes and procedures to meet changes to Environment Agency guidance.
  - Extension of our 'pollution watch' campaign targeted at the public and river users to encourage earlier engagement with resolution of any potential incident.
  - Investment in flow monitoring on rising mains and smart pump control across 250 high priority pumping stations
  - Making a step change in pollution management by attempting to predict where incidents could occur in our network, with proactive inspections of high-risk assets.

## 4. MITIGATION OF SHOCKS AND STRESSES OPERATIONAL ENVIRONMENTAL

### Mitigation of operational environmental challenges



#### Environmental change inc. invasive species

*Changes in habitats, ecosystems and biodiversity from pollution, habitat destruction and climate change. This includes invasive alien species arriving and outperforming and replacing the native species.*

Invasive species are a risk to our ability to move water to where it is needed and is a key consideration in developing new options in our WRMP, in particular in assessing the ability to import water from other regions.

The potential impact is assessed as part of our option appraisal process.

We are also conscious of the potential impact of our wider activities in spreading non-native species. We have produced an invasive and non-native species and biosecurity information booklet to share knowledge on what invasive species are and how they cause impacts to Anglian Water and the wider economic, societal and environmental impacts.

Our Biodiversity team helps to manage some of these issues by:

- Actively managing some of the land we're responsible for to maintain its conservation value and address invasive species.
- Working with colleagues and contractors to influence the management of other land for wildlife.
- Making staff aware of the problem of invasive species and providing guidance on what to do when we find them.
- Working with others in the industry and beyond to understand (e.g. through research) the pressures on our region's environment and working in partnership to get better outcomes, e.g. Water for Wildlife, RiverCare and BeachCare.



Figure 11: An excerpt of our invasive species information booklet

## 4. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL ENVIRONMENTAL

#### Mitigation of operational environmental challenges



#### Failure of climate change mitigation and adaptation

*The failure of governments and businesses to enforce or enact effective measures to mitigate climate change, protect populations and help businesses impacted by climate change to adapt*



#### Climate change (inc. drought and sea level rise)

*Change of climate, which is attributed directly or indirectly to human activity, that alters the composition of the global atmosphere, in addition to natural climate variability.*



#### Coastal erosion

*Increasing coastal erosion is likely in part due to increased sea levels, causing damage to infrastructure.*

Water crisis and the failure of climate-change mitigation and adaptation remain amongst the top risks in The Global Risks Report 2018 published by the World Economic Forum. These global risks align closely with our local risks. Our region is low lying, with a long coastline and low rainfall. Hotter, drier weather can cause water scarcity and drought. We also expect climate change to mean more intense rainfall and rising sea levels, meaning a bigger risk of flooding. The development of our business plan has been based on the application of the latest UK Climate Projections (UKCP09) - the leading source of climate information for the UK and its regions. The next version of the UK Climate Projections (UKCP18) will be published later this year and these will be used to inform the delivery of our business plan.

- The success of climate change mitigation and adaptation depends on leadership and collaboration. As such we are working nationally and internationally with government, policy makers and others to raise the ambition on climate change. For example we are founding members of the Corporate Leaders Group on Climate Change who are an international group of companies from a range of industries committed to limit global temperature rise to well below 2°C. We are also members of the Green Construction Board, a consultative forum for government and the UK design, construction, property and infrastructure industry who have been successful at reducing carbon, reducing cost and increasing value. In response to the global and local mitigation needs we have set ourselves a long term goal of being carbon neutral by 2050. In line with this goal, by the end of AMP7 our target is to reduce net carbon emissions by 48% against our 2010 baseline. Our track record in reducing carbon gives us the confidence that we will achieve this goal. For example, we remain certified to CEMARS GOLD (ISO-14064) and are one of only 28 UK companies to deliver seven years of continual emissions reduction against this standard.
- Climate change is a constant theme on the Board's agenda and leadership on climate change adaptation continues to be provided by our Climate Change Steering Group working alongside our Resilience Steering Group. The risk and steps we are taking to adapt to climate change are laid out more fully in our Adaptation Report that is published in response to the Climate Change Act 2008. We will publish our next Adaptation Report between 2019-2021 in line with the timescales of the third-round of the Adaptation Reporting Power (ARP). Responding to climate change also forms a vital part of our Strategic Direction Statement which sets out the risks and objectives for the whole business over the 25 years from 2020 to 2045. This long term strategy is guided by the things our customers have told us are important to them including the need to protect their service and the environment in the face of disruptive events and climate change. National risk assessments support our experience and understanding of the risks.
- The Committee on Climate Change's Adaptation Sub-Committee 'UK Climate Change Risk Assessment 2017 Evidence Report' identified flooding risk to infrastructure, including sewers as one of the highest priorities. Our long term strategy for Waste Water Networks Plus also supports the objective to meet growth, climate change and resilience needs in a sustainable way. In AMP7 community flood risk management will replace our previous flooding programme which focused on delivering traditional 1:30 standards of protection to customers at risk of flooding from hydraulically overloaded systems. Our planned level of spend on these traditional solutions in AMP7 has reduced as we increase investment in sustainable, long term surface water strategies and increased partnership working. For an example of our partnership work on flooding, see our case study of Clacton-on-Sea coastal defences. These strategies are expected to improve the affordability of delivering protection to a standard of 1:30 plus climate change to currently unfunded schemes over the next 25 years whilst offering improved levels of service in the short term. This will be achieved by managing storm flows within the wider catchment and therefore reducing the residual storage required.

Continued on next page...

## 4. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL ENVIRONMENTAL

#### Mitigation of operational environmental challenges



#### **Failure of climate change mitigation and adaptation**

*The failure of governments and businesses to enforce or enact effective measures to mitigate climate change, protect populations and help businesses impacted by climate change to adapt*



#### **Climate change (inc. drought and sea level rise)**

*Change of climate, which is attributed directly or indirectly to human activity, that alters the composition of the global atmosphere, in addition to natural climate variability.*



#### **Coastal erosion**

*Increasing coastal erosion is likely in part due to increased sea levels, causing damage to infrastructure.*

#### **Continued from previous page**

- The 'UK Climate Change Risk Assessment 2017 Evidence Report' also identifies the risk of shortages in water supply as a priority area where more action is needed. As part of our leadership of Water Resources East and as part of our Water Resource Management Plan process, we undertook a climate change vulnerability assessment to confirm the impact of climate change on the amount of water we have available for supply. We closely followed the Environment Agency's new guidance for completing this assessment, which states that companies must take account of the fact that the climate has changed and will continue to change, encouraging companies to take account of climate change that has already happened as quickly as possible. The adoption of this new approach has driven a step reduction in the amount of water available from our sources which are impacted by climate change. Our Drought Plan also details the operational response to drought triggers being hit and is supported by summer demand activities taking place each year.
- In July 2018 the Department for Environment, Food & Rural Affairs published The National Adaptation Programme and the third strategy for climate adaptation reporting. This report sets out what government and others will be doing over the next 5 years to be ready for the challenges of climate change. Our business plan supports the key actions identified in that report. Our business systems and our business plan also include other wide-ranging interventions that will improve our climate resilience. For example, we already experience extreme weather which impacts the operation of our assets. As such we have effective extreme weather processes and tools and are investing to increase the connectivity and resilience of our water networks.

A case study, on the next page, sets out our actions to protect Clacton-on-Sea from the threat of coastal erosion.

# CASE STUDY



## CLACTON-ON-SEA COASTAL DEFENCES – BUILDING RESILIENCE THROUGH WORKING COLLABORATIVELY

When we asked our customers about how to best respond to the challenges of disruptive events and increasingly severe weather, we heard that they wanted us to take preventative action, engage in long-term planning to build resilience and work in partnership with others.

Supported by the increased flexibility of Totex funding, that is the approach we are taking for flood alleviation projects across our region. It is a move supported by our independent CEF, where it delivers value for money for customers.

A good example is Clacton-on-Sea where coastal erosion threatens the sewer network. This includes a 2.8m diameter strategic sewer that runs along the coast relying on the coastal defences to protect it. If this was to fail it would cause sewer flooding to any properties still standing, as well as pollution to the environment and bathing waters popular with tourists.

Tendring District Council is responsible for the defences and had received 70% of the £37m needed to enhance them from Defra. However contributions from other partners were still needed to secure the full funding, so they approached us for support.

Our assessment showed it would cost £27.4m to redesign and relocate sections of the strategic sewer. Such work would also cause significant disruption to for the local community.

Contributing £3m to the council's partnership scheme as an alternative way of achieving the same outcomes was therefore a clear benefit for customers, saving over £23m.

It also supports an important resilience scheme with wider benefits for the community, businesses and future of tourism in Clacton-on-Sea.



## 4. MITIGATION OF SHOCKS AND STRESSES

### OPERATIONAL ENVIRONMENTAL

#### Mitigation of operational environmental challenges



##### Urban creep

*Rising number of people living in urban areas resulting in physical growth of cities.*



##### Rising urbanisation

*Urbanisation concentrates populations, potentially making them more vulnerable to the effects of natural disasters, disease and deliberate acts of violence*



##### Land use change

*Changes in the use of land. This could be from changes in agriculture, land management or urban creep.*

- We have identified growth as one of the key challenges facing our business over the next 25 years and beyond. One of the four key themes in our 25 year Strategic Direction Statement is to “Enable Sustainable Economic and Housing Growth in the UK’s fastest growing region”.
- Both our 25 year Water Resources Management Plan and Long Term Water Recycling Plan include the latest forecasts of population growth over the next 25 years, with detailed spatial plans developed to ensure that we are able to plan for and meet the future needs of our growing region. The investment needs to sustain future growth are included in our investment plans. Strategic Business Plan assumptions are regularly reviewed to ensure they are up to date with current growth predictions.
- We have created a Market Insight Team to better understand growth in our region so we can build the right infrastructure, at the right time, in the right location. Market Insight intelligence has to be at the forefront of our function to support growth. The team will develop and enable geo-spatial understanding of growth and investment. This is a step change in how we have historically approached growth and moves Development Services from site-reacting to catchment-delivering.
- We work closely with Local Authorities and Developers to understand the phasing of potential new developments, build rates and phase projections so that infrastructure is built to support development during each phase of developments. As part of the early engagement with developers we have enlarged our Growth Management function to build relationships and look for ways to promote developer self-build options.
- To ensure that we are able to support growth needs on a timely basis, we are planning and designing schemes in AMP6, ready for AMP7 start. There are a number of particularly major new developments (5,000 houses or more) that are expected to come on stream in AMP7, including Waterbeach, Biggleswade and Great Haddon; early engagement with stakeholders on identifying and managing risks associated with these sites is crucial.
- Ensuring that future schemes are sustainable and able to adapt to changing needs has driven us to working in partnership with other bodies including Lead Local Flood Authorities and Local Authorities; we are looking at sustainable drainage options wherever possible as well as traditional construction. This includes our innovative approach to “Make Rain Happy”, which will involve the planting of a million trees over the next 25 years. We are also working with land and housing developers on Green Water - ‘A Greener, Cheaper Water’ to promote the re-use of rain water for toilet flushing and gardening.
- Our plan for rolling out smart meters over the next ten years will enable us to reduce current demand and provide the water needed by a growing population. We are also working with Defra, Waterwise and other companies, to develop a water standard, similar to the energy efficiency standard, that can be used by white goods manufacturers and trade associations to help customers make the best choices to help them save water, supporting messages from our Drop 20 campaign.
- Our catchment-based work, including through our sponsorship of the CamElyOuse catchment (CamEO) enables us to work across sectors to understand and mitigate the impacts of changes of land use. Our learning from this catchment will help us to manage risks across our region. Water Resources East will also be instrumental in aiding our understanding and management of changes in land use.
- Potential changes in land use are also a potential risk to our ability to dispose of nutrient (bioresources) to land – we keep this risk under regular review and have sought to mitigate the risk by ensuring that our product is of the highest quality. The development of BAS (Biosolids Assurance Scheme) is a key risk mitigant, and benefits the industry as a whole by providing a dependable quality standard trusted by farmers.

## 4. MITIGATION OF SHOCKS AND STRESSES

### POLITICAL, LEGAL OR REGULATORY

#### Mitigation of political, legal or regulatory challenges



##### State collapse or crisis

State collapse of geopolitical importance due to internal violence, regional or global instability, military coup, civil conflict, failed states, etc. (e.g. civil conflict, military coup, failed states).



##### Failure of regional, national or global governance and planning

Inability of regional or global institutions to resolve issues of economic, geopolitical or environmental importance



##### State provision of services

Governments may become less able to provide critical services, meaning other organisations may have to take over this role.



##### Abstraction licences change

A change in legal abstraction allowances causing less water to be allowed to be taken from water sources.



##### Legal structures

Legal changes in frameworks or obligations may occur that transfers responsibilities or enables processes. This may include legal duties like abstraction licenses or biodiversity duties.



##### Changing regulation, policy and international governance

Changing landscape of local, regional or global policy, legislation and regulation.

A collapse of the State and its ability to govern is considered a remote risk and outside the control of Anglian Water. Nevertheless, key to mitigating such a risk is the robustness of our financial controls and liquid cash available to run our operations for at least twelve months. Other elements of our plan include mitigations to deal with the risk of people being unavailable, fuel being in short supply, a breakdown in telecommunications – all of which might be an outcome from a collapse of the state.

Changes in legal structures and our obligations are nothing new and we have a good track record of working with Government and regulators to inform direction of travel to help shape their plans and to implement policy changes. For example, we continue to be actively involved in the development of market reform across our industry - we have been extensively involved at all levels of the Non-household Market Programme to support the design and development of the retail market. We took the strategic decision to legally separate our Non-Household Business and to create a Wholesale Service Centre (WSC) within our Wholesale Services business unit that provides a single point of contact for all non-household retailers into Anglian Water Services, ensuring fair treatment for all retailers and compliance with market codes.

There is a particular heightened risk at the moment with the potential for re-nationalisation in the event of a change in government, together with the current regulatory actions in response to a debate about legitimacy and trust. These risks, as well as the potential impacts on the business from Brexit, are considered separately on the next page.

# 4. MITIGATION OF SHOCKS AND STRESSES

## POLITICAL, LEGAL OR REGULATORY

### Mitigation of political, legal or regulatory challenges



#### Change of Government

*Change in the controlling party of the UK following a general election*



#### Regulatory Changes

*Change in regulation in response to questions about trust and legitimacy*



#### Brexit

*The unknown impact of Britain's decision to leave the EU.*

Anglian Water has no control over the risk of a change of government and has little ability to directly influence the philosophical disposition of the current labour leadership towards re-nationalisation of privatised services.

Anglian Water's approach to mitigating this risk and responding to the expectations of the Government and Ofwat to the need for action to secure trust and legitimacy is to:

- Listen to our customers and others to understand expectations and to take action quickly. For example, in response to Ofwat's challenges in the spring of 2018, we immediately:
  - Improved the transparency and clarity of our financial structures by removing our Cayman Islands subsidiary and repaying an inter-company loan to simplify the presentation of in our accounts (particularly around real dividends). These actions have been completed.
  - Placing public interest at the heart of the business - working with Ofwat on proposals to ensure we can be held to account for acting in the public interest
  - Changing the composition of the Anglian Water Services Board so that Independent Non-Executive Directors are in the majority, and not just the largest group
  - Making an additional investment commitment to 2020 - investing an extra £65m in resilience schemes not included in the company's original plan. This will improve the region's ability to deal with drought and flooding and will be paid for through a reduction in dividends to shareholders.
  - Reducing dividends and borrowings through to 2025 - resulting in a significant reduction in the company's level of debt and gearing
- Always aim to deliver a brilliant service for customers. The ability to promote a positive image depends upon the continual delivery of quality and critical service across the entire business. A recent example of this being our response to the 'Beast from the East' in which, during a period of heavy stress on the water network, only a limited number of our customers were affected. When nationally the response from some water companies was brought into question, our planning, response and customer communication was singled out for praise by the Water Minister.
- Be a responsible business – Anglian Water was BITC's Responsible Business of the Year in 2017.
- To innovate and be seen as leading internationally as well as nationally – Anglian Water has been recognised as a Leading Utility of the World.

The potential impacts of Brexit have been discussed at the AWS Board since the referendum with a detailed Brexit matrix being kept up to date and reviewed by the Board. Key potential impacts include:

- stress on the supply chain and the impact of worsening exchange rates; we are exploring sourcing opportunities outside of the EU and constantly reviewing fluctuations in commodity process and where possible locking in long terms agreements to pass on the exchange rate risk.
- loss of access to secure and lower cost EIB financing; Anglian Water was the first public utility to issue Green Bonds as a new source of finance on terms not dissimilar to those offered by the European Investment Bank
- loss of access to people and skills from European countries; our involvement in the regional skills agenda continues to grow, through the Greater Peterborough University Technical College, College of West Anglia and our own Community Education Team, as we seek to address the skills gap with home-grown talent. Additionally, our graduate and apprenticeship programme continue to grow to meet the skills challenge.

We also see some opportunities arising from Brexit, in particular with the replacement of the Common Agricultural Payments with a new approach that incentivises farmers to change farming practices that would benefit the environment and protect our water sources. We have been working with environmental groups and Defra on the future of CAP reform.

## 4. MITIGATION OF SHOCKS AND STRESSES TECHNOLOGICAL CHANGE

### Mitigation technological challenges



#### **Digital revolution**

*Intended or unintended adverse consequences of technological advances such as artificial intelligence, geo-engineering and synthetic biology causing human, environmental and economic damage.*

We see Digital Revolution as an opportunity for the business; our challenge is to stay abreast of the rapidly changing pace, innovation and application of technological advances. Through our Digital Transformation programme and other business initiatives we are:

- Working with Global Technology partners who are at the forefront of technology applications
- Working with key academic organisations to monitor innovative technologies
- Ensuring we link with key forums in order to keep abreast of emerging trends and to grow our digital network. We look outside of the water industry to learn from companies who are further along their digital transformation journey or who are inherently digital-first and bring this learning back to our own company.
- Investing in our technology platform to ensure we can exploit opportunities, such as process robotics, machine learning, data analytics and AI
- Building a digital capability with our people, both internal and externally. This includes our partner ecosystem, which in turn includes a number of academic organisations to ensure our people keep abreast of cutting edge capabilities and to help develop a talent pipeline.
- Developing easy access to relevant information and data; this is critical to future performance in our business. Future investment in our technology platform is premised on improving performance.

As our customers experience greater digital capability they will expect us to provide digital services that meet their expectations. Smart metering will be a key element of being able to meet these expectations.

Developers also expect to interact digitally with us - we have already delivered pioneering digital services.

# 4. MITIGATION OF SHOCKS AND STRESSES

## SOCIAL

### Mitigation of social challenges

 <p><b>Demographic change</b> Global population growth is predicted, the location of these population is expected to change. This also includes ageing populations in developed and developing countries driven by declining fertility and decrease of middle- and old-age mortality.</p>	 <p><b>Migration</b> Large-scale movement of people voluntarily or involuntarily induced by conflict, disasters, environmental social or economic reasons.</p>	 <p><b>Lifestyle change</b> Changes in the way people live, causing a change in the resources used and expectations of services provision.</p>	 <p><b>Inequality and increasing income disparity</b> Increasing socioeconomic gap between rich and poor in major countries or regions.</p>	 <p><b>Rising chronic and lifestyle diseases</b> Increasing rates of non-communicable diseases, also known as "chronic diseases", leading to rising costs of long-term treatment and threatening recent societal gains in life expectancy and quality.</p>
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The potential impact on our services of a growing population and the effects of migration are dealt with as part of our 25-year long term planning of water resources and water recycling. These are dealt with extensively in our plan.

We are aware of the risk and impact of an ageing population and a rise in customers with vulnerabilities as a result of chronic and lifestyle diseases. We also recognise that some customers struggle to afford their water bills. The section of our plan "Customer bills, affordability and supporting customers in vulnerable circumstances" sets out our analysis of the challenges and our plans for ensuring that all customers, whatever their circumstances, get the services they need.

As well as impacting on our customers, rising chronic and lifestyle diseases have the potential to impact on our workforce. The health and safety of our people and our partners is a key priority. We are committed to looking after our employees' safety and also believe that work should have a positive impact on their health & wellbeing. The Management Board reviews health and safety performance and associated actions monthly, immediately reporting any significant incidents to the Board. Performance is also monitored through our OHSAS 18001 accredited Safe and Well Management System, with six monthly external reviews by LRQA as well as through our internal audit program. In addition:

- Our management systems track near misses and actions from audits, inspections, and accident/incident investigations as well as providing access to current policies and procedures and safe systems of work. Throughout the business we have a series of health, safety & Wellbeing Networks that report into the Director-led Company Health, Safety & Wellbeing Network, so that best practice is shared & any issues or concerns can be effectively managed.
- Underpinning our approach to health and safety is LIFE, which focuses on health, safety and wellbeing and our vision of happier, healthier and safer employees. LIFE is about moving from a traditional compliance based approach to a culture where we take responsibility for our health, safety & wellbeing and that of our colleagues. It will create a culture of care and concern where we look out for each other and make the right choices. This is a long term commitment, to date we have run numerous health & wellbeing campaigns focusing on the happier & healthier pillars of LIFE, which includes mental and physical health. We have also held LIFE sessions where over 3000 people, including Alliance personnel, have attended focusing on the safer element.
- We launched a three year health, safety & wellbeing plan which has been developed with stakeholders across the business, initiatives from outside the business such as Water UK and the HSE and our own H&S information ensuring we are focusing on current and relevant areas and potential high risks. Performance and progress will be monitored at Management Board.

Diversity and Inclusion is also essential for our people to thrive and we have established a cross-business programme which focuses on ensuring the way we operate the business is fully inclusive irrespective of gender, ethnicity, age or many other factors. This is working towards ensuring we attract a workforce with greater diversity and representative of the community we serve.

## 4. MITIGATION OF SHOCKS AND STRESSES

### PEOPLE

#### Mitigation of people challenges



##### **Shortage of skilled labour**

*A shortage of unknown or emerging specialist skills required for the continued running of businesses, systems and services.*



##### **Skills shortages**

*A shortage of known specialist skills required for the continued running of businesses, systems and services.*



##### **Unemployment or underemployment**

*A sustained high level of unemployment or underutilisation of the productive capacity of the employed population.*

Our succession-planning processes are fully embedded, with rigorous analysis to check the quality and depth of succession pipelines for key posts. We look 10 years ahead, identifying and developing candidates for these posts, with external market mapping used where appropriate.

Extensive development programmes are in place, building future talent at graduate, middle and senior management levels, and we continue to invest in career development support for graduates and apprentices to maximise retention and progression. There is also a Diversity Action Plan in place to keep the promotion and retention rate of talented female managers under review.

Senior managers, key skills and talent are covered by Long-Term Incentive Plan (LTIP) schemes, retention bonuses and non-financial retention arrangements, including active development plans. Executive management carries out regular and formal reviews of our succession-planning process and talent pipelines, using external advisors where appropriate.

Pensions freedoms and the publicity around them may mean that more experienced members of staff with specialist knowledge may consider early or partial retirement. A proactive approach to identifying those staff has been taken, and succession plans are well advanced to mitigate any impact that this may have.

We have very mature recruitment, training and reward packages throughout all levels of the business to ensure staff retention; some of these are detailed below:

- Established In-house skills and training capability - whilst partnering with national training organisations for technical skills, water industry and company specific skills are trained by our in-house training team. This allows us to develop tailored skills training programmes and fully incorporate company specific procedures.
- Licence to operate (LTO) defines skill requirements for operational roles, and the objective is to deliver a highly competent workforce by ensuring that people are assessed and developed on their technical competence and their ability to apply their skills and knowledge, through training and assessment through a series of Operational Qualifications. This route ensures a consistent level of assessment across different roles, which has already been mapped to Competent Operator Scheme standards. The modular nature of the C&G LTO programme also allows for training needs to be addressed very specifically ensuring that employees can continue to work in the areas where they are competent whilst receiving support for additional development. By providing a cross company training standard skills can be easily transferred providing resilience to staffing changes.
- Extensive, industry-leading apprentice programmes across a range of Business Areas (Water, Water Recycling, Maintenance, Groundwater Engineering, Telemetry and Vehicles). Long-term investment in apprentice skills to meet demographic changes within the business. Contracts with apprentice providers is well-established and a strategic approach to maximising Apprentice Levy funding is in place. Collaboration with University Technical Colleges to ensure future flow of essential skills into the business.
- Graduate programme Annual recruitment of high quality graduates to a 2 year development programme. High retention rates and successful careers.
- Boost Benefits – an online benefits platform which brings together all employee benefits in one single place. This makes it easy for employees to understand the total value of all their benefits and enables them to make personal selections to suit their individual needs, therefore driving higher employee engagement and retention.
- Transforming Our Leadership (TOL) programme - externally recognised and award winning leadership development programme for senior and front-line managers to create a common leadership language and practice.
- CPD for key staff - offered for all staff as appropriate for their roles. Funding provided for membership of one professional body for each employee if required. Programmes to support Chartered status across a wider range of career paths. Planning for skills gaps at an individual level is also identified through our Performance Development Review process that sets individual objectives, behavioural frameworks and measures the person in both. Development plans form an integral part of the person's PDR to support and challenge them.
- Glass door award winners of the Best UK Company to work for as voted by employees 2017 along with best UK CEO Award.

## 4. MITIGATION OF SHOCKS AND STRESSES ECONOMIC AND PEOPLE

### Mitigation of economic challenges



#### **Structural change**

*Change in the basic way a market or economy functions, caused by a variety of factors, such as globalisation, labour changes or resource variability.*



#### **Macro industry change**

*Economic changes causing changes in the sectors of the economy. For example a shift from primary and secondary sectors (extraction of raw materials and manufacturing) to tertiary sector (service sector).*



#### **Resource scarcity (inc. fuel)**

*Reduction in resources availability, locally, regionally or globally, this may include water, energy, fuel, chemicals or any finite physical resource.*

Structural changes to the water sector, either by government or the economic regulator are dealt with under the heading political risks.

Wider structural changes in other sectors but which could impact on our business are considered as part of other risks and are covered elsewhere: for example, changes in labour markets, changes affecting key suppliers, changes as a consequence of Brexit and changes in the availability of financing.

- We have robust supply chain agreements in place. For example, the treatment of water relies upon the secure supply of chemicals to set quality standards which is managed through a multisource framework of suppliers.
- We have a Management of Fuel Disruption procedure linked to the National Fuel Plan.
- We ensure an adequate level of stored fuel for generators particularly at our key sites.
- We work closely with Local Resilience Forums and Category 1 responders to ensure we have plans in place.

## 4. MITIGATION OF SHOCKS AND STRESSES

### ECONOMIC

#### Mitigation economic challenges



#### **Severe energy price change**

*Significant energy price increases or decreases that place further economic pressures on highly energy-dependent industries and consumers.*

- We have a comprehensive Energy Procurement Policy in place, overseen at Executive Director level at the Finance, Treasury and Energy Policy Group (FTEPG).
- The Policy is reviewed annually and is signed off at Board level. It clearly defines the parameters within which wholesale energy purchases can be made and by whom and it sets a timeframe for making purchases such that budgets and affordability can be protected. Wholesale purchases can be accelerated or delayed depending upon market conditions.
- FTEPG meets monthly and is updated on the state of forward energy markets and hedge levels on a weekly and ad-hoc basis by Treasury staff. Wholesale prices are obtained from consultants, suppliers and other market participants such as relationship banks.
- FTEPG has formulated the wholesale power hedging strategy for AMP7 and keeps it under constant review.
- We procure our energy contracts well ahead of delivery. We are in the final stages of awarding our next large, half-hourly metered electricity contract which offers more flexibility in how our wholesale power can be purchased. It also allows us to fix the supplier's costs of servicing the contract for five years.
- Non-commodity costs, which are mostly regulated costs, such as taxes, levies and delivery network costs, cannot be hedged in the same way as wholesale energy. Instead we actively seek to minimise these and reduce our overall exposure to volatile energy costs through our Energy Programme
- Our comprehensive Energy Programme includes such initiatives as:
  - energy efficiency of pumps, motors, lighting and heating and efficiency of whole operational delivery and collection systems
  - self generation and self supply of renewable energy from biogas fired CHP, wind and solar
  - on-site storage of electricity, especially that generated by renewables, obtaining savings and generating revenue
  - Demand and Supply Response (DSR) initiatives which both avoid charges and generate revenue through running standby generators and turning demand down.

## 4. MITIGATION OF SHOCKS AND STRESSES

### FINANCIAL

#### Mitigation of financial challenges



##### **Growth vs recession**

*Significant growth or decline in the activity across an economy lasting at least a few months. This recession may be seen negative economic growth.*



##### **Financial crisis**

*The loss in the nominal value of financial assets. For example asset bubbles where unsustainably overpriced assets such as commodities, housing, shares, etc. in a major economy or region.*



##### **Unmanageable inflation**

*Unmanageable increases in the general price levels of goods and services in key economies.*



##### **Bad debt**

*Debt which can not be recovered, often linked to the debtor is insolvent. Risk of bad debt is often linked to the strength of the wider economy.*



##### **Increased cost of borrowing**

*Increased interest rates causing increased financial burdens on individuals and organisations.*

This group of risks all have a financial impact on the business; some in the longer term. Our financial viability statement, covered our business plan details an extensive range of scenarios that cover all of the above potential risks. We are financeable, with mitigating actions identified, even in extreme scenarios. Our financial resilience has been tested by Arup in its maturity assessment, and we score in the top two categories across all areas of financial resilience.

Scenario planning occurs, as a matter of course, twice a year and similarly tests a significant number of downside scenarios. These include lower inflation, costs shocks, interest rate rises, regulatory risks and Group related risks which may impact on the regulated business.

AWS' track record of performance along with our securitised financing structure has helped protect the business during recent financial uncertainty. During the Global Financial Crisis in 2008, availability of debt was severely restricted and various many organisations faced difficulty in raising new or refinancing their existing debt; whereas Anglian Water Services' credit rating remained "stable" and well within the investment grade during that period. In 2009, when the UK economy experienced deflation for the first time in over 500 years, our shareholders injected equity and our Ratings were unaffected by the deflation.

Managing the continuing risk of bad debt is mitigated with sector leading initiatives such as County Court Judgements, Credit Data sharing and close working with credit agencies. Customers who are struggling with affording their bills will be helped through initiatives set out in our plan.

A large part of embedded debt is at fixed rates and not at risk from changes in interest rates. Any rise in interest rate risk is also mitigated to a significant extent as PR19 allows for debt indexation, so rising debt costs will be covered in line with a market index. The timing gap between any interest rate increase and recovery through customer bills will be managed as a business risk, so that customers are not exploited.



SMART COMMUNITIES

SMART BUSINESS

SMART ENVIRONMENT

SMART PEOPLE