

A Framework for Resilience: PR19 and Beyond



1. Introduction

Anglian Water recently published its Strategic Direction Statement 2020-2045. Water is a long-term business. Our ability to provide excellent services for our customers now and in the future depends on making the right choices now.

No one can know what the world will be like in 25 years' time: how the needs of customers and society more broadly will develop; what future technology will look like; exactly how the climate and environment will change; or what new challenges will emerge.

Our biggest challenges are climate change, growth and the need to protect the environment. As well as being able to cope with these particular long-term challenges, we need to be resilient to shocks and stresses, now and in the future, that can impact on our ability to maintain services for our customers and protect the environment.

So, working with Arup, we have developed a framework to help us think about how we manage risks over the short-term alongside longer-term trends and lower likelihood risks. The framework builds on Ofwat's approach to 'Resilience in the Round' and best-practice resilience frameworks, for example, the City Resilience Index - CRI (Arup for the Rockefeller Foundation 2016) and the Cabinet Office's definition of resilience. We are publishing this paper as a contribution to the thinking about how we deliver 'Resilience in the Round' for customers and the environment.

We will use this framework to test our current and future plans, to empower us to become a truly resilient water company.



Jean Spencer,
Executive Director of Strategic Growth and Resilience

Developing a Resilience Framework

Arup was commissioned to develop a framework to enable Anglian Water to apply 'Resilience in the Round' thinking at a practical level. To do this, current objectives and resilience practices were analysed against Anglian Water's current initiatives and future resilience investment. The framework was developed on the basis of:

- Arup's knowledge of best-practice resilience frameworks and approaches, for example, the City Resilience Index - CRI (Arup for the Rockefeller Foundation, 2016) and the Cabinet Office's definition of resilience. In particular, the CRI identified resilience qualities, which are true of any resilient system (see figure 1);
- Anglian Water's objectives and way of working, which Arup gained through a review of key plans and strategies, such as the draft Strategic Direction Statement (SDS), the Corporate Risk Register, and the Business Guide to AMP6;
- The key shocks, stresses and risks that Anglian Water might face, drawn predominantly from the Corporate Risk Register, the draft Strategic Direction Statement, and other key documents and sources on risks and megatrends, such as the National Risk Register and the World Economic Forum's Global Risks Report 2017;
- Ofwat's resilience planning principles and guidance, including Delivering Water 2020: Consulting on our methodology for the 2019 price review, and Resilience in the Round (see figure 3 overleaf).

With support from financial, corporate and operational resilience experts from around Arup, the holistic resilience framework incorporates Ofwat's 'Resilience in the Round' concept, with sub-themes to explore activities within the three themes in more detail.

The framework is presented in Figure 4, page 7, and an overview of the sub-themes in Tables 2-4 on the following pages.

The next step will be to carry out an assessment of Anglian Water's approach and maturity using the resilience framework. The assessment will include a rating 0 to 4 against each sub-theme, based on a Maturity Matrix approach where:

- 0 is unaware;
- 1 is aware but no response developed;
- 2 is a response has been developed but no action undertaken;
- 3 is a response has been developed and is in use; and
- 4 is leading edge performance. Areas of strength and areas for improvement can be identified.



Figure 1: Resilience qualities or characteristics, from Arup, City Resilience Index / 100RC

2. Towards a definition of resilience

2.1 Resilience background

What do we mean by resilience?

Overview

Resilience reflects the overall 'capacity of individuals, communities, institutions, businesses and systems to survive, adapt and thrive no matter what kinds of chronic stresses or acute shocks they experience' (adapted from Rockefeller Foundation, 2013)

In the 21st century, pressures that happen at scale – such as climate change, disease pandemics, economic fluctuations, and terrorism – pose new challenges (Arup, 2013). Risk is increasingly unpredictable due to the complexity and interdependencies between systems and the uncertainty associated with many hazards – notably climate change.

Risk assessments and mitigation continue to play an important role in responding to business challenges. However, in order to create truly resilient organisations in the face of growing uncertainty, this will need to be supplemented with a broader consideration of resilient systems. Hollnagel (2014) describes a Safety-II approach, providing a focus on success, and how systems function when 'things go right', as well as risk which focuses on when 'things go wrong'.

Cabinet Office guidance

The Civil Contingencies Act (2004) sets an important framing for resilience in the UK. The Cabinet Office (2011) describes Infrastructure resilience as "the ability of assets and networks to anticipate, absorb, adapt to and recover from disruption". Resilience is secured through a combination of the principal components shown in Figure 2:

- Resistance: Concerns direct physical protection, e.g. the erection of flood defences;
- Reliability: The capability of infrastructure to maintain operations under a range of conditions, e.g. electrical cabling is able to operate in extremes of heat and cold;
- Redundancy: The adaptability of an asset or network, e.g. the installation of back-up data centres; and
- Response and Recovery: An organisation's ability to respond to and recover from disruption.



Figure 2: Infrastructure Resilience Components (Cabinet Office, 2011)

These four components align with the seven characteristics of resilience described by the CRI.

Ofwat guidance

'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's definition of resilience

Ofwat has published guidance on resilience in their PR19 final methodology (Ofwat, Delivering Water 2020: methodology for the 2019 price review). This includes the concept of 'Resilience in the Round' shown in Figure 3 (below), which recommends that customers should be the focus of the business and three themes of resilience should be considered:

- 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.

In addition, Ofwat published a report Resilience in the Round (Ofwat, 2017). Ofwat's report advises 'Resilience in the Round' should be at the core of how companies approach the resilience challenge, but they should create their own approach to resilience planning.

Ofwat has provided an illustration of what resilience might look like, which includes subjects such as systems thinking, an environmental foundation, customers at the heart of resilience, smart approaches to resilience, and monitoring and measuring resilience. It is worth noting that Anglian Water appear as examples of resilience that other companies should follow including the 'Keep it Clear' campaign, and the 'Slug it Out' initiative.

Figure 3: Resilience in the Round from Ofwat, Delivering Water 2020



2. Towards a definition of resilience

2.2 Shocks and stresses

The Ofwat guidance is directing water companies to be resilient to short-term shocks and long-term stresses. Table 1 sets out a range of shocks and stresses that we have identified that may be relevant to Anglian Water.

Stresses

In the Strategic Direction Statement 2020-2045, Anglian Water has identified the particular challenges to their business from long-term stresses. These are population change, environmental protection and the impacts of climate change which will be acutely felt in their area, including sea level rise and increased water stress.

Arup reviewed the work that Anglian Water has done with PWC to identify megatrends that might impact on the business as part of this study.

Shocks

Anglian Water identify and manage shorter-term shocks, through the Strategic Business Risk Map (the AWS Corporate Risk Register). Anglian Water takes an all risks approach, mapping risks from the

National Risk Register, to understand the potential impact on their business.

The business risks identified are wide-ranging and include potential cyber attacks, legal risks and toxic gas leaks.

Uncertainty

As much as an organisation can review and assess both short and long-term risks, it is widely accepted that within today's dynamic environment, these shocks and stresses are increasing in frequency and diversity, requiring successful businesses to adapt their operations beyond risk management of likely and understood shocks.

The Ofwat guidance recognises that resilience as well as risk management is needed to overcome short-term disruptive shocks and chronic long-term stresses, especially when these are uncertain and unknown. Therefore, the characteristics of the organisation, as well as the mitigation plans they have in place, are important in developing resilience.

Shocks		Stresses	
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.		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.	
Terrorist attack	Failure of climate change mitigation and adaptation	Demographic change	Land use change
Civil unrest	Temperature extremes	Urban creep	Coastal erosion
Extreme vandalism	Infectious diseases	Migration	Environmental change inc. invasive species
Hoax calls	Environmental pollution	Skills shortages	Inequality and increasing income disparity
Cyber attacks	Fire events	Unemployment and underemployment	Growth vs recession
Power outages	Nuclear incident	Lifestyle change	Financial crisis
Asset failure	Flooding	Rising chronic and lifestyle diseases	Unmanageable inflation
Telecommunication failure	Severe energy price change	Shortage of skilled labour	Bad debt
Data fraud/theft	State collapse or crisis	Rising urbanisation	Resource scarcity (inc. fuel)
Dam failure	Industrial disputes	Leakage	Increased cost of borrowing
Power cuts	Supply chain failure	Ageing infrastructure	Structural change
False positive alarms	Abstraction licences change	Digital revolution	Macro industry change
Water supply contamination	Failure of regional, national or global governance and planning	Climate change (inc. drought and sea level rise)	Changing regulation, policy and international governance
		State provision of services	Legal structures

Table 1: The shocks and stresses that may impact Anglian Water

Towards a definition of Resilience: Resilience framework

A resilient water company for customers and the environment

A scoping study provided the underpinning theory for our approach for a resilience framework, which considers what a well-functioning system will look like, comprising corporate, financial and operational resilience.

This framework is designed to enable Anglian Water to think about short-term management of risks, alongside longer-term trends and lower likelihood risks. The framework is designed to help Anglian Water to become a truly resilient water company for the benefit of their customers and the environment.

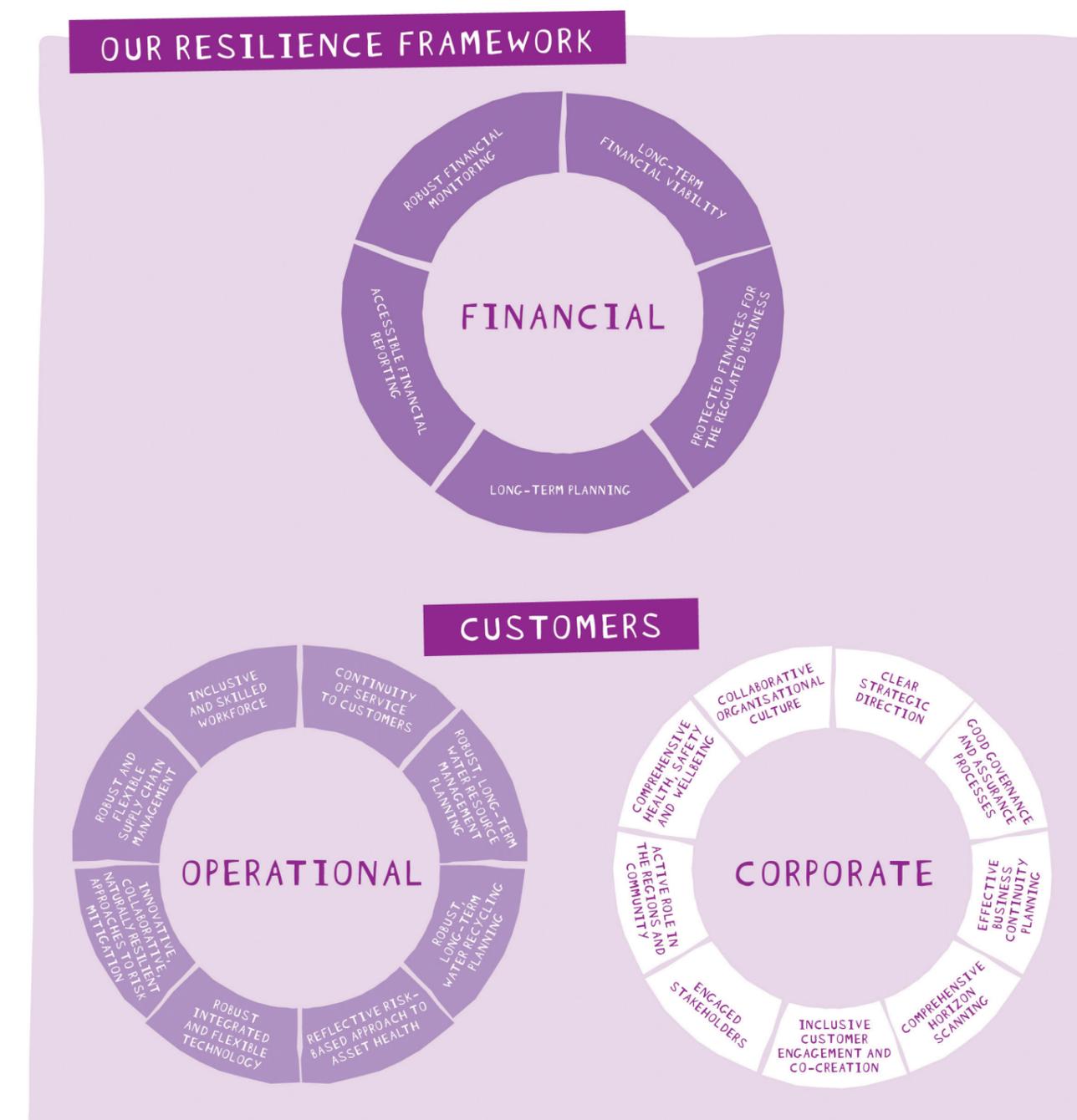


Figure 4: The Anglian Water resilience framework

Resilience framework: Financial

Theme	Description	Sub-theme	Description
Financial resilience	An organisation's ability to avoid, cope with, and recover from, disruption to its finances	Long-term financial viability	The company should consider their long-term financial viability, in light of key long-term trends (or stresses). The Directors shall review the longer-term viability of the company as an extension of their business planning process, which includes financial forecasting, robust risk management assessment, regular budget reviews and scenario planning. These activities are to make sure that operations are resilient and finances are sustainable and robust.
		Protected finances for the regulated business	The company should ring-fence finances of regulated activity to protect the interests of customers. In the event of a shock to the company's finances, this should provide enough flexibility to keep the core of the company operating.
		Long-term planning	25 year expenditure plans linked to the strategic direction of the company shall be approved by the Board and regularly reviewed. Base operating and maintenance expenditure together with any additional enhancement expenditure to meet customer and regulatory requirements shall be identified.
		Accessible financial reporting	In order to be transparent and inclusive, the company should publically report on its financial performance using non-technical language.
		Robust financial monitoring	In order to provide a continued check and balance that the company is continuing to support its long-term viability and protect the finances of the regulated business, regular monitoring to track trends and scenario test the potential risk of these is critical. This should be reported and discussed at Board level.

Table 2: The financial resilience sub-themes within the resilience framework

Resilience framework: Corporate

Theme	Description	Sub-theme	Description
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.	Clear strategic direction	There should be one clear company aim and strategy which is well communicated and is recognised by all, both internally and externally. All plans and decisions should be based on how they will work towards this strategy.
		Effective governance and assurance processes	There should be a reliable and well disseminated process, roles, governance and reporting covering all aspects of the business. There is a clear process for assurance, approval and Board sign-off.
		Effective business continuity planning	There should be an all hazards approach to resilience planning linked to the National Risk Register and the likely impact on service to customers. A business continuity plan should be in place to prepare for, respond to and recover from the potential impact. This plan and the associated controls should be regularly trained and exercised. All critical assets should have emergency response plans and all critical teams should be able to recover to minimise impact on service. These approaches should follow recognised best practice as in ISO 22301.
		Comprehensive horizon scanning	Plans, strategies and actions should all be based on the outcome of comprehensive and robust horizon scanning which takes into account future shocks and stresses that may impact any area of the business. This should be regularly reviewed.
		Inclusive customer engagement and co-creation	There should be a clear two way dialogue with customers to ensure that customers are included and to improve transparency, cooperation and collaboration on current performance and future direction for the business. Customer policy and practices shall be established to meet the needs of customers in vulnerable circumstances. The company shall aim to establish trust, confidence and legitimacy.
		Engaged stakeholders	There should be regular and clear communication with stakeholder groups and organisations. Collaboration should be demonstrated through multi-agency participation with tangible outputs that improve the resilience to customers and the business.
		Active role in the regions and community	The company should undertake activities which have wider benefits to the communities that are served, enable these communities to grow and develop through enabling sustainable growth both at a regional and local level, demonstrating corporate citizenship in the process. The company shall establish goals to meet the carbon challenge contributing to the global and local impact.
		Comprehensive health, safety and wellbeing	There should be reliable and robust plans for health, safety and wellbeing which should make significant and measurable improvements to the lives of the workforce.
		Collaborative organisational culture	There should be an organisational culture that puts customers and a naturally resilient environment at the heart of all that they do. This is apparent in the practices and values of all employees.

Table 3: The corporate resilience sub-themes within the resilience framework

Resilience framework: Operational

Theme	Description	Sub-theme	Description
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 performance.	Continuity of service to customers	Operations should focus on providing a continuity of service to customers and avoiding critical service failures, such as supply interruptions and internal sewer flooding. It should take into account the different needs of customers, particularly those who are vulnerable. It should also focus on delivering value for money for customers so that their service is tailored to those in vulnerable circumstances.
		Robust long-term water resource management planning	Water resource management planning and drought planning should be undertaken for the long-term and integrated into business planning to ensure that water companies can meet their supply obligations and facilitating sustainable growth. They should be produced collaboratively with the EA and regional planning groups to ensure best value for customers with respect to cross-company, regional and national supply options.
		Flexible, long-term water recycling planning	Water recycling planning should be undertaken for the long-term, enabling sustainable growth in the region without impacting existing customers. Water recycling plans should be developed with stakeholders and integrated into their business plans. They should focus on critical service failures such as internal sewer flooding and pollution incidents.
		Reflective risk-based approach to asset health	There should be a comprehensive assessment of asset risk, including long-term low-likelihood risks, having detailed and accurate information on the state of assets, the way they are configured and the way they are operated. The focus should be on criticality; protecting customers and the natural environment from exposure to known risks, and reducing vulnerability to future uncertainties. There should be a region wide asset strategy which is adaptive, regularly reviewed and has considered the changing requirements into the long-term (25 years). They should follow recognised best practice for asset management, such as ISO 55000.
		Innovative, collaborative, naturally-resilient approaches to risk mitigation	There should be a robust consideration of the approaches to risk mitigation. These approaches should be collaborative, innovative, and embrace technological change and the role of the natural environment. Collaboration should be integrated into business plans, working with customers, other companies, and wider stakeholders (such as Local Resilience Forums, local councils, landowners, and other utilities and highways agencies). Approaches to be considered include encouraging customers behavioural change through smart customer engagement, and use of smart technologies to improve asset performance, customer information, leakage management and water efficiency, natural solutions, such as catchment management to improve raw water quality, and blue-green infrastructure to manage storm water and reduce flooding and pollution incidents.
		Robust and flexible supply chain management	Companies should consider the impact of their energy, resource and skills supply chains on their operations and ensure diverse and competitive supply chains that deliver the best outcomes for their customers. They should also consider the flexibility of their supply chains, particularly during shock events. Companies should also consider how they can effectively utilize options beyond their boundaries to mitigate their risks, for example, the use of water trading and bioresource trading markets.
		Inclusive and skilled workforce	Companies need to identify and plan to fulfil the requirements of their future workforce. They should ensure they have workforce continuity plans to identify skills gaps between their current and future workforce, and ensure that these can be filled through training and development, succession planning and increasing diversity. Companies should work across the water industry and utility sector to address these skill gaps.
		Robust, integrated and flexible technology	Technology should be used intelligently to deliver real operational gains. Integration should happen across systems, including Operational Technology and Information Technology systems. Independent elements should be transformed into a more cohesive network, and interoperability and integrated with systems in other sectors should be considered. Cyber security should be paramount. Technology should be designed with end users in mind.

Table 4: The operational resilience sub-themes within the resilience framework



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