Resilience Action Plan

Wessex Water

YTL GROUP

FOR YOU. FOR LIFE.

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Contents

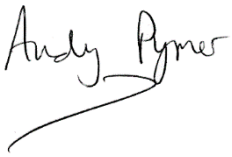
Foreword

We are proud of our strong record of resilience. It has been over 40 years since we had a hosepipe ban and we are recognised for our industry-leading resilient services and environmental stewardship. In the last few years, we have had to deal with various shocks and stresses, including the 'Beast from the East' in 2018, the dry summer that followed, and storms in early 2020. In the current year, we were able to react quickly and change our working practices to mitigate the impacts of Covid-19 during one of the driest periods on record. We met all of these challenges with no loss of supply to our customers.

Despite our track record of performance, recent experiences have shown that more extreme shocks and stresses appear to be occurring more frequently. We must both learn from our and others' experiences and continue to improve our integrated resilience framework.

This document is our first annual update of our action plan for the continuing development and implementation of a systems-based approach to resilience that underpins our operations and future plans. It includes our progress to date, our next steps and case studies to demonstrate how we will develop our integrated resilience framework in the future.

Our customers can trust us to always act responsibly in their best interests and to continue to provide industry leading services and environmental stewardship now and for the future.



Andy Pymer
Finance and Regulation Director
Wessex Water

Executive Summary

Our business plan ‘For you, for life’ recognises the important responsibility we have in providing essential public services to customers and in managing the natural environment, both now and for future generations. Maintaining and strengthening our resilience is critical to ensuring we can continue to deliver reliable and trustworthy services to customers and support the long-term prosperity of our society and environment, particularly against a landscape of on-going change coupled with strategic pressures. To be truly resilient and fit for the future, we recognise we must take a long-term view in our plans and procedures, with an aim to anticipate likely changes and actively respond or adapt as they occur.

Following the submission of our PR19 Business Plan to Ofwat in 2018, this Action Plan provides our response to Ofwat’s initial assessment of plans (IAP):

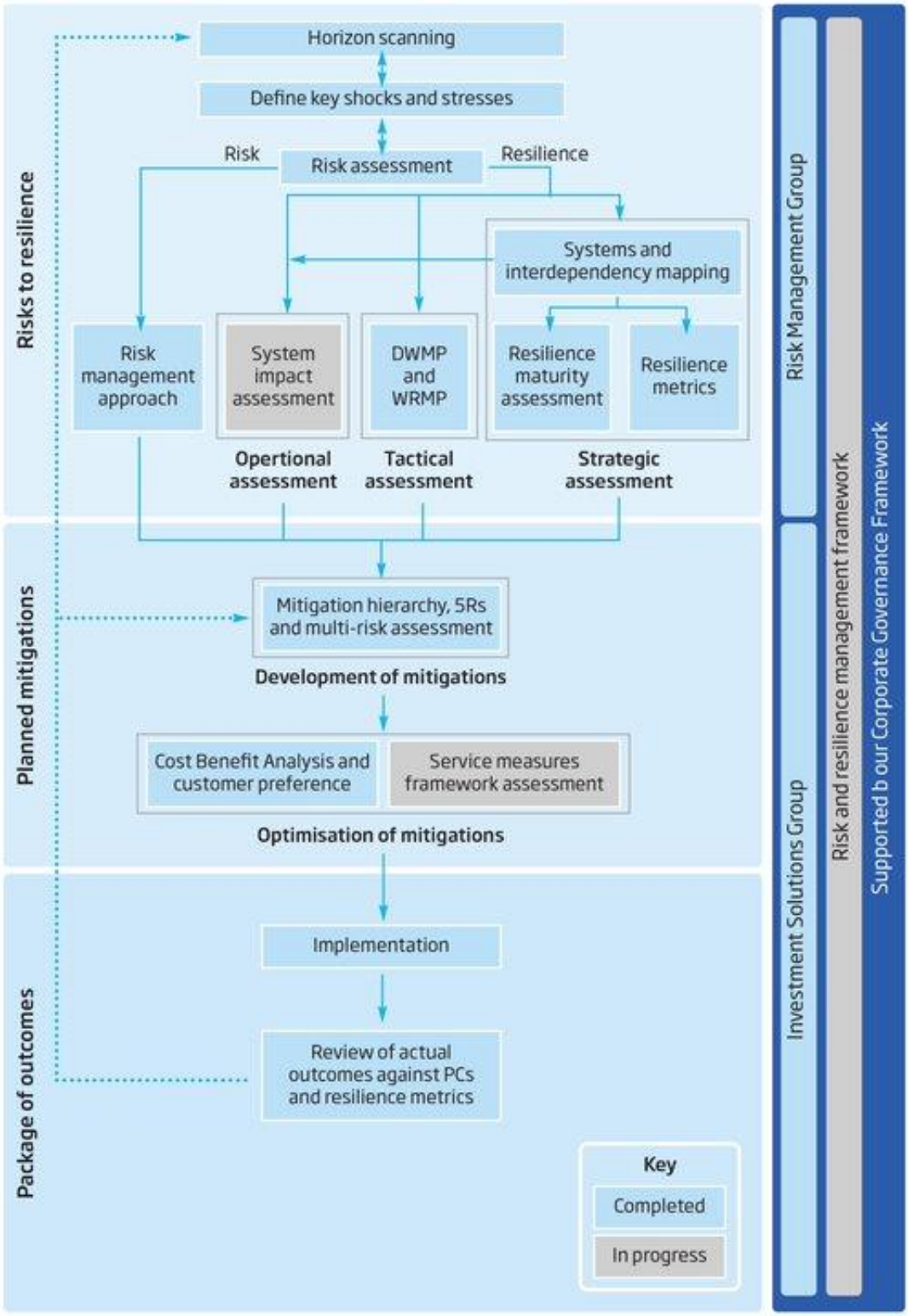
> ‘WSX.LR.A2: The company should provide a commitment that it will, by 22 August 2019, prepare and provide to us an action plan to develop and implement a systems based approach to resilience in the round and ensure that the company can demonstrate in the future an integrated resilience framework that underpins the company’s operations and future plans showing a line of sight between risks to resilience, planned mitigations, package of outcomes and corporate governance framework’
> (Ofwat, 2019)

This Action Plan outlines our approach to risk-management and how we will develop and embed a systems-based approach to resilience, and an integrated resilience framework, into our existing risk management procedures.

Review
This is the first update to our Resilience Action Plan, which includes addressing comments from Ofwat. This plan has been approved by our Audit & Risk Committee on behalf of the Board and audited by Mott MacDonald.

Approach
We are developing a system-based resilience framework with the aim of embedding resilience thinking into our business and ensuring a line of sight from risk to our package of outcomes.

Figure 1: Our system-based resilience framework



The key elements of this framework are:

Risk to resilience

It is important that our systems-based resilience framework complements our current risk management approach and is integrated into existing processes. Horizon scanning is in place to support the identification of emerging shocks and stresses, ensuring that we are always responding and planning for the most informed and relevant list of shocks and stresses. Our existing risk management process manages risk at three levels – strategic, tactical and operational levels. To complement this, we have developed resilience assessments at three levels:

- *Strategic:* We have categorised our business activities into 16 individual corporate, financial and operational systems. A resilience maturity assessment is being undertaken on these systems and quantitative resilience metrics are being developed to understand our baseline resilience and identify opportunities for improvement at a strategic level.
- *Tactical:* Our Water Resource Management Plan (WRMP) and Drainage and Wastewater Management Plan (DWMP) will allow us to manage and respond to shocks and stresses (e.g. population growth, extreme weather events) at an asset portfolio level.
- *Operational*: We will use interdependency mapping to highlight and prioritise low likelihood, high impact risks against which improvement may be required at an asset level.

Our approach aligns with Ofwat's concept of 'Resilience in the Round' and considers the resilience of our operational, corporate and financial systems. Our resilience approach will allow us to focus our effort on the areas where improvement is needed to maintain or strengthen our resilience.

Planned mitigations

We have a hierarchy of interventions to systematically encourage the development of mitigations which (1) tolerate the risk, (2) improve operations, (3) collaborate with stakeholders and customers to address the root causes (4) optimise existing assets using new technologies or (5) build smarter solutions (TOCOB). To inform the optimisation of mitigations, we propose to evaluate the mitigations using the 5 qualities of resilience (5Rs) and a multiple risk assessment as well as a framework of capitals-based service measures (SMF), which we are developing, to capture the value of investing to our customers, environment and operations.

Package of outcomes

Our integrated risk and resilience management approach and the optimisation of mitigations through the 5Rs and a capitals-based SMF will ensure that our investment decisions can deliver against our Performance Commitments and resilience metrics. We have incorporated a review process to evaluate the outcomes delivered by our mitigations after implementation and on an annual basis. Any learning will feed back into our risk and resilience assessments and the development of mitigations.

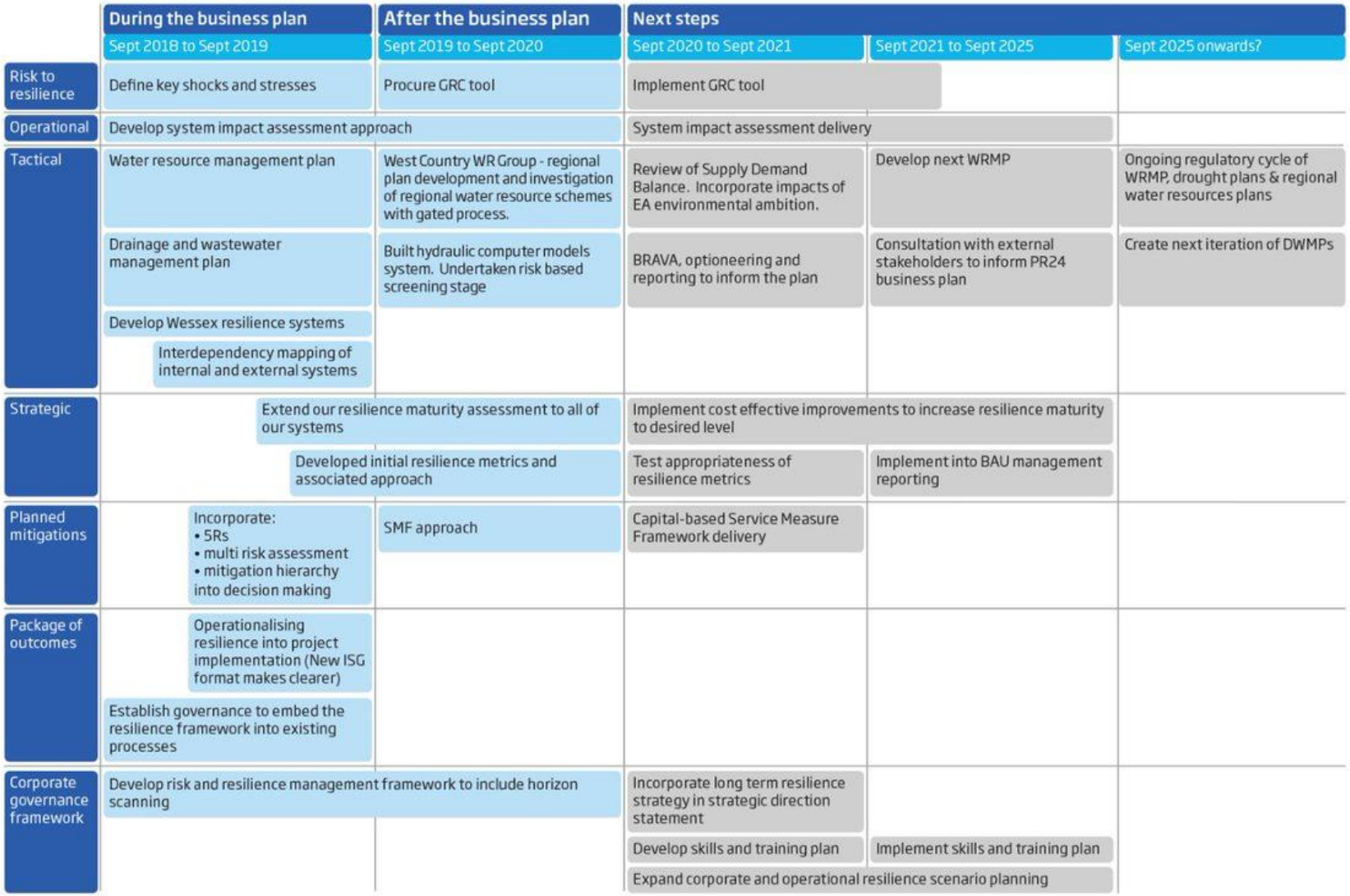
Corporate Governance Framework

Our Framework will be incorporated into our governance by expanding our risk management process to cover resilience – ensuring an aligned approach between these closely related activities. Our Board is ultimately responsible for our risk and the Audit & Risk Committee of Non-Executive Directors is responsible for the review and challenge to our assurance arrangements. The Director of Risk & Investment manages our systems-based resilience framework with two committees: 'Risk Management Group (RMG)'' who manage the overall risk and resilience process; and the Investment Solutions Group (ISG) who review and approve mitigations to ensure we we cotinue to improving our resilience.

Action plan and Programme of Activities

Having substantially completed our systems-based resilience framework we are now focused on developing and rolling out the components of the framework. This is timed to coincide with the rollout of our new risk and resilience framework with the approach, software platform and training being delivered as part of a single coordinated programme.

Figure 2: Resilience action plan



With a substantial portion of our framework in place we are now focusing on completing the following activities over the coming months:

Table 1: Actions in progress

Actions in progress		
1	Developing system impact assessment approach	*We have developed our approach to defining critical sites*
2	Drainage and Wastewater Management Plan delivery	*We are making good progress in developing our Drainage and Wastewater Management Plans (DWMP) and are on track to draft our DWMP by June 2022.*
3	Strategic water resource planning	*We are now undertaking work to revise our supply demand balance for the next WRMP and other plans*
4	Extending our resilience assessment to all our systems	*We have completed our initial resilience maturity assessments. We have a defined approach for determining what a level 4 Resilience Maturity would look like for each shock and stress. We will then determine requirement for gap analysis to raise needs.*
5	Develop resilience metrics	*We have defined out initial resilience metrics and will be undertaking a period of review before implementing in to BAU.*
6	Develop a capitals-based Service Measure Framework	*We have completed the process of compiling our service measures (financial, natural, social, human). We are currently plan to start integrating the use of the service measure framework into intervention selection/decision making*
7	Develop risk and resilience management framework	*We have committed to a service provider for a digital GRC tool and are developing the system to roll out across the business. As part of this framework we are working to embed this framework into our BAU activities.*

In 2020-2021, we will review our strategic direction statement based on the activities in this Action Plan.

Action Plan Implementation

The responsibility for delivering the action plan is with the Director of Risk and Investment, the project implementation structure is defined as follows:

Figure 3: Project Implementation Structure

1. Introduction

‘We believe in stewardship; a responsible long-term commitment to the businesses we own and the communities we serve.’
(Wessex Water, Business Plan 2020-2025)

Our business plan ‘For you, for life’ recognises the important responsibility we have in providing essential public services to customers and in managing the natural environment, both now and for future generations. Our activities are fundamental to the health and well-being of our communities, environment and economy. As such, maintaining and strengthening our resilience is critical to ensuring we can continue to deliver high-quality and reliable services to customers and enhance the environment, particularly in the face of acute shocks and chronic stresses.

1.1 Resilience at Wessex Water

Our understanding of resilience aligns with Ofwat’s ‘Resilience in the Round’ – our resilience relies on the resilience of our corporate, financial and operational systems, and understanding the interdependencies between our internal and external systems. We recognise that our resilience affects our ability to maintain high-quality and reliable services for our customers, protect the natural environment and ensure the long-term viability of our services.

‘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’
(Resilience in the Round, Ofwat, 2017)

We are planning now for the next 30 years, with a focus on developing holistic solutions to the multiple challenges we face. Our existing risk management framework and systems-based resilience approach will help us to manage and respond to shocks such as extreme weather and understand stresses that will affect our ability to deliver in the future, such as climate change. We recognise that we cannot rely on building ever bigger assets to protect ourselves from these challenges; therefore, we are using operational, nature-based, community-focused and innovative solutions to respond to these challenges and deliver the best whole-life value for our customers and the environment. We also realise that a number of challenges cannot be tackled alone, and that working collaboratively can deliver multiple benefits including wider social and environmental benefits. As such, our resilience activities will aim to deliver collaborative interventions which address multiple risks, with an emphasis on adopting best whole-life value options.

We have robust risk management framework and governance procedures, which manages risk at three levels (strategic, tactical and operational). Hence, this Action Plan looks to build on our present risk management and resilience activities. Through applying ‘Resilience in the Round’ and systems-based thinking to our processes, we aim to take a more integrated approach to strengthening our networks of services and functions to shocks (e.g. cyber-attacks) and stresses (e.g. climate change). And by maintaining flexibility and mechanisms to accommodate uncertainty, we will be able to adapt and respond to emerging and evolving challenges. Our Action Plan will ensure our approach embeds resilience across our activities company wide.

1.2 Objectives of this Action Plan

Following the submission of our PR19 Business Plan to Ofwat in 2018, this Action Plan provides our response to Ofwat's initial assessment of plans (IAP) with respect to resilience:

> "WSX.LR.A2: The company should provide a commitment that it will, by 22 August 2019, prepare and provide to us an action plan to develop and implement a systems based approach to resilience in the round and ensure that the company can demonstrate in the future an integrated resilience framework that underpins the company's operations and future plans showing a line of sight between risks to resilience, planned mitigations, package of outcomes and corporate governance framework' (Ofwat, 2019)

This Action Plan builds on our existing risk management framework. It outlines our current approach to risk-management and how we will develop and embed a systems-based approach to resilience, and integrated resilience framework, into our business-as-usual risk processes. The structure of the Action Plan is outlined below:

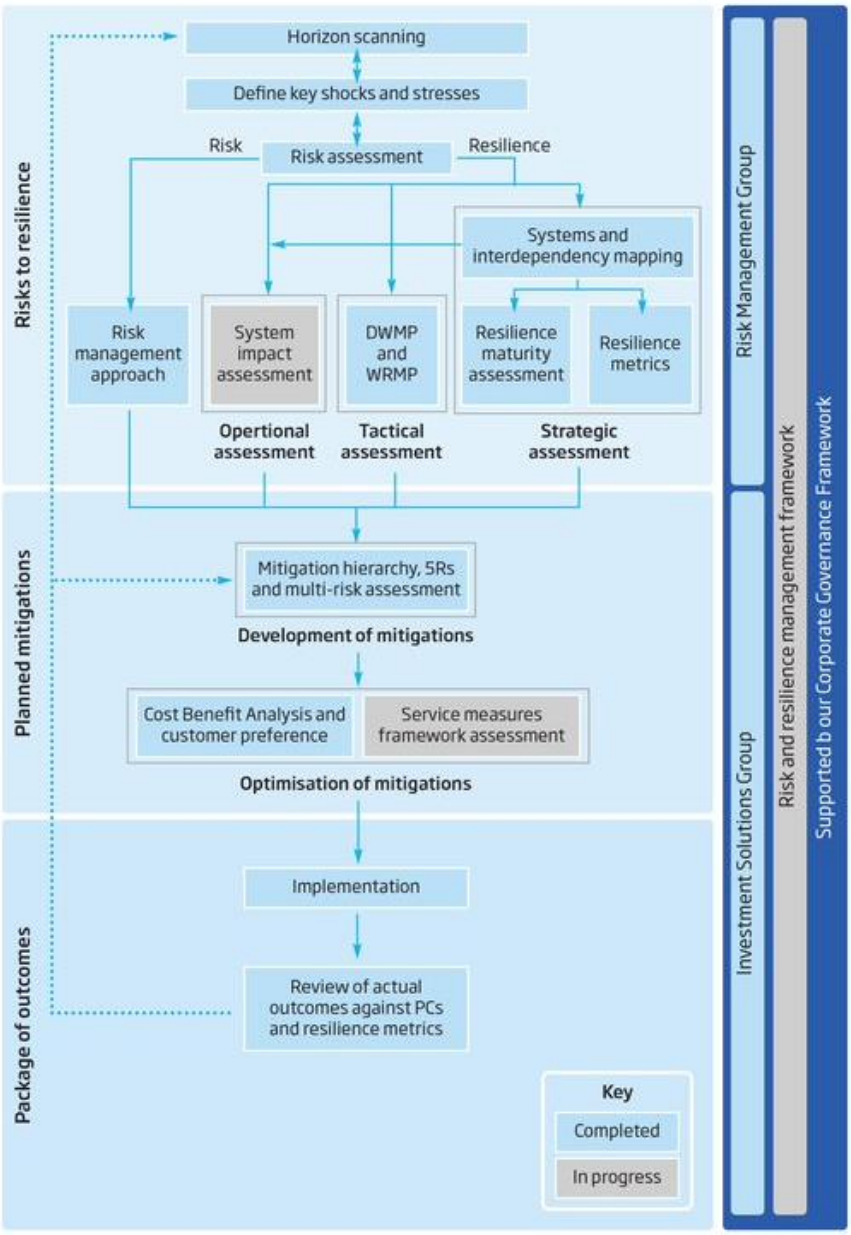
- Section 2: Our Approach to Resilience outlines our current approach to risk management and our system-based approach to resilience.
- Section 3: Our Future planning 2020 onward outlines how we have used our systems-based resilience approach to inform our business plan for 2020-2025 and onward.
- Section 4: Our Action Plan provides details of the activities we will be undertaking to complete the development of our systems resilience approach. This section also includes the next steps for review and revision of the systems approach to resilience as best practice evolves.
- Section 5: Implementation of our Action Plan provides a plan for the implementation of the remaining actions including the owners of the outstanding actions, the timescales for completion and the audit process for checking that they have been completed.

2. Our Approach to Resilience

Our approach to resilience is focused on responding to shocks and anticipating trends, whilst delivering value for the long-term and in the round, creating societal and environmental value whilst driving industry excellence and innovation. We have invested in our infrastructure, processes, and people over the years to improve our ability to withstand, respond to and recover from the impact of sudden disruptions and long-term trends.

The diagram below shows our overall approach to resilience, which brings together our existing (blue) and ongoing activities (grey) into a system-based resilience framework. This approach looks to embed 'resilience thinking' into our operations and governance ensuring line of sight from risk to our package of outcomes. Our approach aligns with Ofwat's concept of 'Resilience in the Round' and holistically considers our operational, corporate and financial resilience. The activities are outlined in further detail in Section 2.1.

Figure 4: Our system-based resilience framework



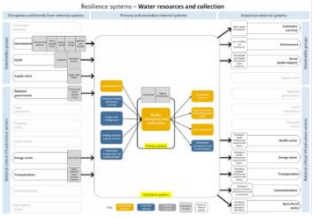
2.1 A system-based approach

Our systems-based resilience framework will help us to evaluate the resilience of our activities through a robust, evidence-based framework to inform our decision making. The framework builds on our existing resilience activities and is tailored to complement our risk management approach. It builds on water industry and international best practice, including:

- Ofwat's latest guidance on resilience, including PR19 Final Methodology and 'Resilience in the Round'
- UK Water Industry Research (UKWIR) Good Practice Guide on Resilience Planning
- UKWIR Framework for Expenditure Decision Making
- Rockefeller Foundation, The Resilience Shift, Arup and SIWI, City Water Resilience Approach
- Arup City Resilience Index
- Cabinet Office guidance on Critical Infrastructure Resilience.
- British Standard for Organisational Resilience
- University of Cambridge Centre for Risk Studies taxonomy of threats

In the following sections we will demonstrate how our approach builds on the existing activities we have outlined. The following case study outlines some of the broader industry approaches to resilience which we have drawn on and adapted.

Example Approach Case Study
Learning from others: United Utilities, Yorkshire Water, Welsh Water & Arup



In developing our systems-based resilience framework we have completed a review of resilience approaches in the water industry, including:

- United Utilities – For low likelihood, high impact risks, they have adopted an approach to their asset resilience that prioritises risks based on the criticality of each site and the impact that a failure would have on their customers, environment and other systems rather than a traditional risk based (likelihood x consequences) approach.
- Yorkshire Water – Their approach to resilience takes key internal systems and external systems and assess the interdependencies between the systems when shocks and stresses occur. For each system, a resilience maturity assessment was undertaken based on British Standards Institute for organisational resilience.
- Welsh Water – Welsh Water used a Resilience Framework to complete a resilience maturity assessment of their operational, corporate and financial resilience. The strengths and areas for improvement have informed Welsh Water 2050, Welsh Water's 30-year resilience strategy.

Arup is a technical specialist on resilience and have previously worked with a number of water utility providers on developing their resilience approaches including the three referred to above. With their support, we incorporated best practice from these approaches into our systems-based Resilience Framework.

We took this information and held challenge sessions with subject matter experts, the output of which resulted in the definition of the sixteen systems. These systems are comparable with other water companies and there are also systems which are common to all businesses.

2.2 Corporate governance framework

Whilst our Board set the strategy and risk appetite, the Audit & Risk Committee of Non-Executive Directors is responsible for governance and the review and challenge to our assurance arrangements which involve the three lines of defence approach. The Executive Leadership Team have set up three senior management committees, focusing on risk assessment and management, performance delivery and financial and technical governance. Together these provide the detailed oversight reporting and escalating issues to the Executive Leadership.

The Board is ultimately responsible for risk. The Board reviews the Company's risk identification and management policy annually and reviews the principal risks bi-annually. To assist the Board in its responsibilities, the Audit and Risk Committee is responsible for reviewing the company's internal control systems and processes for managing risk.

Our existing risk management process manages risk at three levels:

Table 2: Existing risk management levels

Risk Level	Risk Level Definition	Ownership
1. Strategic Risks	Strategic risks would impact multiple systems within the organisation or cause widespread disruption to customers that could not be mitigated by operational means, for example, a widespread power outage that would impact a large number of water and wastewater sites.	The Risk Advisory Group (RAG), comprises Executive Directors, and reviews our risk management processes and makes recommendations to the Board.
2. Tactical Risks	Tactical risks would impact on a system or potential catchment.	Risk Management Group (RMG), comprised of our senior managers, maintains and reviews all business risks and is responsible for our Corporate Risk Register.
3. Operational Risks	Operational risks would impact one site and can be mitigated by operational or asset means. Where applicable, local emergency and consequence management plans are prepared to mitigate these risks as a last line of defence.	Operational staff and senior management review, assess and record asset and operational risk on a monthly basis.

The identification and management of risk is delivered through a hierarchy of risk management reviews. All our emerging and strategic risks are managed in our corporate risk register. Every six months the Risk Management Group (RMG) reports the risk position and any changes in principal risks to the Executive Leadership Team (ELT) and then the WWSL Board who scrutinise and challenge the risks included within the register. Any significant

emergent risks or material changes in existing risks are reported to ELT and the WWSL Board as they arise, our risk management process is as follows.

Figure 5: Existing risk management structure

2.2.1 Establishing a governance structure to ensure the resilience framework is embedded into existing processes

The systems resilience approach aligns with our existing corporate governance structure. It will be overseen by the Board of Directors, who has responsibility for ensuring that the approach is fit-for-purpose and is being widely adopted across the company. The Audit and Risk Committee are responsible for ensuring the appropriate governance is in place and the

system resilience approach is reviewed as part of the internal audit schedule agreed for each year.

Our resilience framework is managed by the Director of Risk & Investment reporting to the Executive Leadership. They are supported by three committees, each responsible for a key part of the framework as detailed below:

Figure 6: Governance Structure

- Risk to resilience: is managed by the Head of Risk Management and overseen by the Risk Management Group (**RMG). RMG** comprises senior managers from each part of the business. The group meets monthly to review the shocks and stresses facing Wessex Water and the prioritisation of the risks for mitigation. On an annual basis, the group will also review the resilience metrics and on a biannual basis they will review the resilience maturity assessment to assess the company's progress and assess whether there are any emerging resilience gaps or the need to accelerate any mitigations.
- Planned mitigations: are developed through the Solutions Groups that comprise of managers from the delivery teams, such as operations, catchment management, engineering and construction as well as support functions such as procurement and finance. The Groups meets monthly to review the proposed mitigations to prioritised risks.
- Package of outcomes: is managed by the Head of Capital Investment and overseen by the Investment Solutions Group (**ISG**). ISG meet monthly to review and approve the mitigations to prioritised risks to ensure that they achieve the resilience value required prior to implementation. They are also responsible for reviewing the project outcomes against the original objectives and the performance commitments and determining whether any additional action is required.

RMG also review our systems-based resilience framework every five years and will incorporate any changes from best practice in the water industry.

2.2.2 Stakeholder mapping and prioritisation of opportunities for collaborative working

We realise that we cannot solve all of our problems in isolation and that working collaboratively can help us deliver wider benefits for our customers, and the environment, and realise efficiencies. Hence, partnerships, collaborations and new ways of working are required to implement sustainable long-term solutions; this includes working with Local Authorities, regulators, the charity and voluntary sectors, communities and academia.

We have mapped our stakeholders and identified those which we can work to address specific risks or strengthen our activities. We aim to develop collaborative mitigation measures which offer responses to multiple risks and bring wider social and environmental benefits to our customers.

Recognising the above, we are already promoting a partnership approach to enhancing the natural environmental resilience within our region, primarily delivered through:

- Catchment Partnerships
  - Bristol Avon Catchment Partnership
  - Hampshire Avon Partnership
  - Somerset Catchment Partnership
  - Stour Catchment Initiative
  - Poole Harbour Catchment Initiative
- Biodiversity Action Plan (Partners Programme)
- Bathing Water engagement.
- Local Nature Partnerships
- Research Partnerships
- Catchment Panel

These include working with a range of partners and communities to increase awareness and deliver natural capital and strengthen eco-systems services. We have highlighted some of these examples in further detail below.

Wessex Water Case Study
Catchment Partnerships

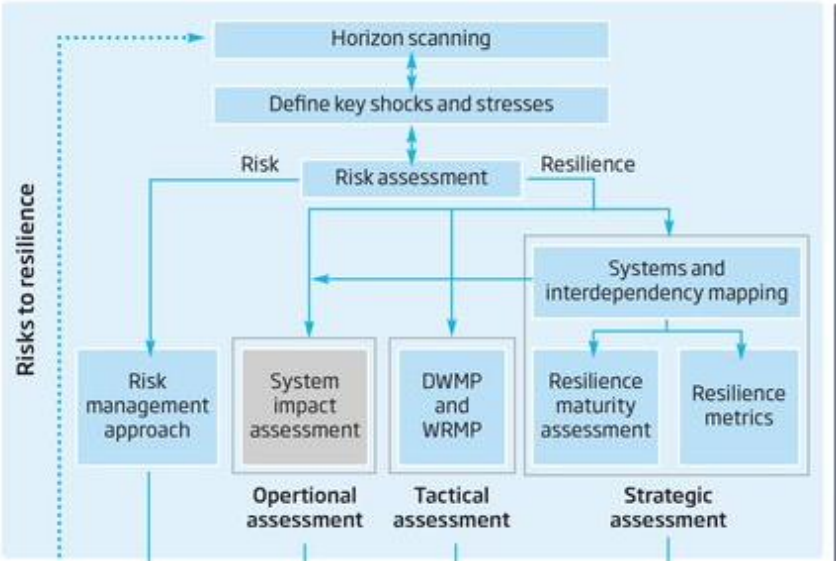
We're working in partnership with organisations and individuals across our region to protect and restore the water environment as a part of the catchment-based approach (CaBA). We work with the five catchment partnerships in the region and host two catchment partnerships: Bristol Avon and Poole Harbour, and co-host the Stour Catchment. Through these partnerships we aim to, amongst other outcomes, collaboratively manage climate change and enhance catchments

Wessex Water Case Study
Biodiversity Action Plan - Partners Programme

Our programme provides funding to projects carried out by wildlife organisations. The programme funds biodiversity projects which focus on species or survey work; habitat creation or restoration work; or more strategic work focused on enhancing existing biodiversity, water quality or promoting wider conservation. Running since 1998, the programme has led to some notable conservation successes and has helped to contribute to the goal of conserving and enhancing wildlife in our region.

2.3 Risks to resilience

Figure 7: Risks to resilience framework approach



2.3.1 Risk management approach

It is important that the emerging resilience framework complements our current risk management approach and is integrated into existing processes. Figure 7 details our proposed approach of aligning risk and resilience. The majority of operational risks will be managed through our existing risk management approach, however aspects of resilience (i.e. high impact, low likelihood shocks and significant shocks and stresses) will be assessed and managed through our resilience approach with different pathways at a *strategic, tactical and operational level.* Each of the components are described further below. Collectively, these activities form our approach to risk prioritisation.

2.3.2 Horizon scanning

To ensure we are resilient and fit for the future, we aim to anticipate likely changes and actively respond as they occur. Our existing horizon scanning considers emerging shocks

and stresses from economic, social and environmental perspectives – considering both issues specific to the water sector and those beyond our influence. Our Futures Report (2019) describes this process and is supported by the Wessex Water Futures Panel. We use the quarterly Emerging Risk Report from Gartner to review emerging risks and potential shocks & stresses.

Wessex Water Case Study
Futures Reports

For the benefit of our customers and communities, the environment, our employees and investors, it is crucial that as a long-term business we consider the future carefully. With this long-term perspective plus the rapid pace of change we are experiencing, we have gathered our views together in our Futures Reports (2019) which covers some of the future challenges we are facing. Our 2019 Futures report discusses how we are looking at emerging challenges and opportunities, planning potential courses of action and testing options.

Wessex Water Case Study
Futures Panel

FUTURES PANEL

Our Futures Panel is a key part of our strategic thinking. They are a group of experts (including two non-executive and executive Directors of Wessex Water) who help us to consider a range of social, environmental and economic issues that are likely to be a bigger part of our work, post-2020. The group provides a horizon scanning role, is a place of constructive debate, and offers guidance on a range of long-term challenges and opportunities.

We utilise a number of tools to help support our horizon scanning processes:

- *Identification of emerging trends:* One method is to identify emerging phenomena and the things driving change or trends. We look at a range of sources as part of our horizon scanning, including the National Risk Register. This information is collated by our Futures Panel into our Futures report (see **Appendix B** for an extract of our Futures Report, 2019).
- *Scenario planning:* This method involves looking at more than one possible future, often considering very different outcomes and the resulting strategies that might be needed.
- *Visioning:* Visioning involves us defining an ideal future state for an organisation or wider society, based on common objectives. This approach informs our Strategic Direction Statement.

Planning for uncertainty in our activities is difficult. As such, we are exploring opportunities to address uncertainty in our decision-making. Two techniques that we are exploring are scenario planning and adaptive pathways. Scenario planning allows for the combining

effects of shocks and stresses to be explored and adaptive pathways sequences a set of possible actions over time, which can be implemented under changing conditions to prevent 'no or least regrets' decisions. An example of how scenario planning has been implemented in practice is detailed in the case study below.

Example Approach Case Study
Bristol Resilience

The City of Bristol published its resilience strategy in 2016 as part of the 100 Resilient Cities (100RC) programme. It used scenario planning to support this work, particularly in relation to horizon scanning, with four selected resilience scenarios out to 2066. Four resilience scenarios were developed through workshops to feed into Bristol's resilience strategy. Using scenario planning as a policy analysis or decision-making tool can be very helpful with regards to ensuring that decisions help to build, not erode resilience.

Overall, our approach supports the identification of the shocks and stresses, which are then assessed, as outlined further below.

2.3.3 Shocks and stresses

We recognise that the world is becoming increasingly dynamic, complex and uncertain. We therefore continuously review the shocks and stresses we face using our risk registers and through our horizon scanning approach. This takes place at a strategic, tactical and operational level by our Executive Leadership Team and our Board, our integrated risk management team and our business management team leaders, respectively.

Defining our key shocks and stresses

To support our resilience assessment, we have developed a series of key shocks (i.e. disruptions) and stresses (i.e. trends) that will affect our ability to deliver a high quality service to our customers and enhance the natural environment. We consider that planning for both short term shocks and long-term stresses is equally important. We use the following definitions to understand and identify these challenges:

Shocks: We have defined these as disruptive events that impact our ability to provide a high-quality service to our customers. These acute shocks include sudden events like fires, floods or cyber-attacks.

Stresses: We have defined these as chronic conditions that weaken our ability in the long term to provide an effective service. These include population growth, climate change or skills shortages.

Our key shocks and stresses were developed from a long list of shocks and stresses based on:

- Wessex Water's Corporate Risk Register;
- Wessex Water Future Report (2019);
- UKWIR Resilience Planning: Good Practice Guide; and
- Those developed by domain experts, including Arup and the World Economic Forum.

Based on the above, we undertook a detailed screening process to create our final list of 16 shocks and 11 stresses, which are key to ensuring that we can continue to provide a robust service to our customers in the long term. Working with the business sector leads, we have identified the key shocks and stresses which could impact on each our functions, and upon which the interdependency mapping and maturity assessment is based.

Figure 8: Identified shocks and stresses

Shocks	Stresses
Financial crisis	Bad debt
Industrial and trade dispute	Cost increase
Supply chain failure	Recession
Power failure	Environmental change
Telecommunication failure	Climate change
Environmental pollution	Customer behaviours/ expectations
Extreme Weather/ natural disasters	Land use change
Flooding	Demographic change
Space weather	Skills shortage
Political and macro industry change	Ageing infrastructure
Infectious disease	
Political instability and terrorism	
Vandalism/ theft	
Asset failure	
Cyber attacks	
Major industrial/ transport incidents	

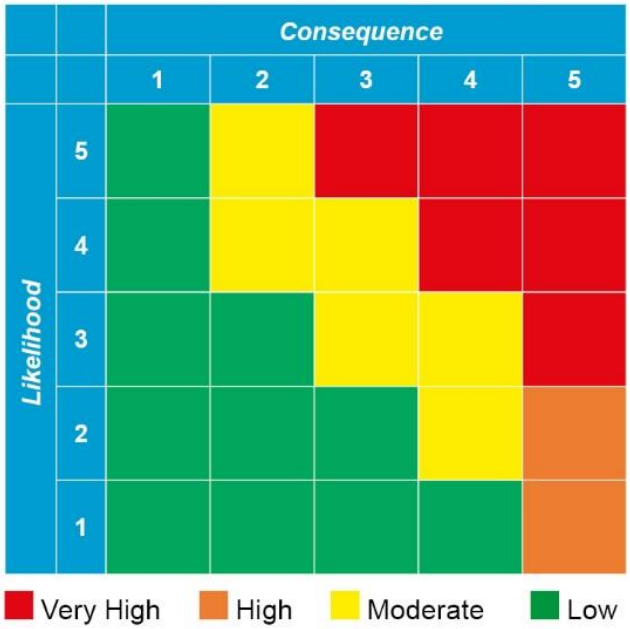
Refer to Appendix C for full definitions of the Shocks and Stresses identified.

2.3.4 Risk assessment

Each existing risk and emergent risk are assigned an owner which at the corporate risk level is a member of the Executive Leadership Team. The functional manager responsible will

assess their risks based on financial, social and environmental impacts; with further scrutiny by the risk and investment team to ensure consistency and appropriateness of the risk assessment**.** All risks are assessed on a 5 x 5, basis for likelihood and consequence, with emergent risks also having a velocity assessment, identifying the pace of approach of the risk to the business.

Figure 9: 5x5 risk matrix



Risks are prioritised and assessed for response based on their risk score. Risk mitigation plans are recorded and implemented, where appropriate, and pre- and post-mitigation scores are monitored. Risks above our tolerance levels will have additional measures to reduce the risk exposure. Our processes ensure that we have comprehensively classified and assessed our risks within our corporate risk register and have appropriate mitigation methods in place. As highlighted above, these are scrutinised by the Risk Advisory Group. Additionally, for low likelihood, high impact risks, which are highlighted in orange in Figure 9, a resilience assessment is undertaken as detailed in 2.3.5. The ambition to improve our resilience maturity will provide more options to proactively mitigate risks and reduce the impact of shocks and stresses.

2.3.5 Operational resilience assessment

We understand that for high impact, low likelihood risks (such as loss of power), prioritisation based on a product of likelihood and consequence can be inadequate. Therefore, at an operational level we propose to use interdependency mapping for low likelihood, high impact risks to highlight the cascading impacts on the risks with other internal and external systems. This exercise will use the system interdependency mapping to inform the impact of the risk. The low likelihood, high impact risks will then be prioritised based on impact only allowing for more robust prioritisation.

2.3.6 Tactical resilience assessment

At a tactical level, our Water Resource Management Plan (WRMP), Drought Plan and Drainage and Wastewater Management Plan (DWMP) will be used, at an asset portfolio level, to allow us to manage and respond to shocks and stresses, such as population growth and extreme weather events.

Water Resources Management Plan and Drought Plan:

- Our WRMP (2019) takes a long-term view over the next 25 years as to how we will balance water supplies with water demands to ensure adequate water supply for our customers, whilst protecting the environment. It focuses on redundancy and resistance.

- Our Drought Plan (2018) takes a shorter-term tactical view and outlines the actions we will take during extended periods of dry weather. It focuses on response and recovery.

Our WRMP forecasts that, given the investments we have made, we have access to enough water to meet the needs of our customers for next 25 years without the need to for new water sources. As detailed in the case study below, we are furthering our WRMP activities to consider water resources at a regional level through the West Country Water Resources Group. As part of this group, we are working with the Environment Agency and other water companies to develop Strategic water resource planning proposals exploring cross-sector solutions, including new trading opportunities, and region wide optimisation. We are aiming for this group to be widened to include non-water company sectors.

Wessex Water Case Study
West Country Water Resources Group

In 2017 we became a founding member of the West Country Water Resources Group. Through this group we are undertaking regional planning to identify best value solutions for the region and use of water for both customers and the environment. This work will enable us to explore how achieve greater connectivity (e.g. the cross-border resilience transfer agreement with South West Water in the Poole-Bournemouth area) to strengthen resilience of the region and for customers.

Drainage and wastewater management plan (DWMP):

Our DWMP will take a 25-year view of how we will manage our assets and networks in response to future challenges, such as population growth and climate change. An action plan is in place to deliver our DWMP by summer 2022 and we have already made significant progress in its development; for example:

- We are actively involved in the national DWMP steering and implementation group.
- This summer we held a series of workshops to disseminate the DWMP requirements and discuss network issues in over 30 water recycling centre catchments.
- We are on track to deliver foul/combined models by March 2020 and surface water models by 2021.

We are looking to work in partnership with wider risk management authorities to deliver holistic, efficient solutions.

2.3.7 Strategic resilience assessment

At strategic level, our resilience assessment is three-fold, which consists of **systems and interdependency mapping**, **resilience maturity assessment**, and **resilience metrics**. Our assessment aligns with Ofwat's concept of 'Resilience in the Round' and considers each of our operational, corporate and financial resilience. We have used resilience maturity assessment and resilience metrics to help us manage the shocks and stresses that may impact on our business and identify opportunities for improvement. The resilience maturity assessment uses a set of criteria we have developed based on BS65000 Organisation Resilience Standards to assess the resilience of our internal systems against the five qualities of resilience (Cabinet Office 4Rs plus Re-evaluate). The resilience metrics are leading and lagging quantitative indicators we are in the process of developing to help us track the resilience performance of our systems. Each of the three components of our strategic resilience assessment is further discussed below.

Systems and interdependency mapping:

As part of our strategic resilience assessment, we have defined the individual systems that make up our business. To develop a clear line of sight of the risks to the resilience of a system and resulting external impacts, we have completed interdependency mapping based on each of the systems. These activities are outlined further below.

Development of Wessex Water's Systems

Aligning with the Ofwat concept of 'Resilience in the Round' and British Standard on Organisational Resilience (BS65000), we have defined 16 individual systems, within Wessex Water.

A **system** is 'a unit of our operations (including the people, programmes, processes and technologies), which are responsible for delivering a business function. A primary resilience system is the system under assessment and the secondary system is a system, upstream or downstream of the primary system, which impact on or are impacted by the primary system.

The following tables present Wessex Water's systems. We have defined each system using a 'service orientated' approach in consultation with our business sectors and their key actors. The systems identified aim to cover the entirety of our activities, in an appropriate level of granularity (i.e. neither too detailed or too global), to support the resilience assessment. Each of the systems have been allocated into one of the Ofwat resilience in the round groups to ensure a holistic approach to resilience assessment.

Table 3. Forms of Resilience

	Forms of Resilience
Operational	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.
Corporate	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 all aspects of risk to the delivery of services.
Financial	The extent to which an organisation's financial arrangements enable it to avoid, cope with and recover from disruption.

Table 4. Definitions of our systems

Systems	System Definition	Forms of resilience
Catchment management	This system covers the land and property operations, including any catchment management programme.	Operational
Water resources	Activities related to the identification of new raw water sources, management of licences and schemes in accordance with legal obligations and water abstraction infrastructure. Includes abstraction activities with third parties and charges.	Operational
Water treatment	This system includes all activities related to: Raw water transport (including to treatment works, raw water storage or customers and utilities providers); Raw water storage (including construction, operation and maintenance activities); and Water treatment.	Operational
Water networks	Activities related to transporting treated water from the treatment works to the customer. This includes network construction, repair and maintenance activities, storage facilities and ancillaries (e.g. pumps, air valves etc.).	Operational
Customer service	The assistance and advice we provide to its customers (e.g. call centres).	Operational
Wastewater networks	Activities related sewage and surface water collection from customers' properties and development, repair and maintenance of the sewage and surface water collection infrastructure and ancillaries.	Operational
Wastewater treatment	Sewage treatment and disposal activities – including collection and treatment processes to support wastewater discharge to watercourses, sludge liquor treatment and disposal of sewage sludge for onward treatment.	Operational
Bioresources	This system includes all activities related to sludge transport, treatment and disposal (including collection and onward transport and disposal to landfill, agricultural land, land reclamation sites and other end users)	Operational
Energy generation	Activities associated with the self-generation of renewable energy (e.g. anaerobic digestion and solar).	Operational
Supply chain management	System includes the management of the flow of goods and services. Involves the movement and storage of raw materials to finished goods.	Corporate
Governance, strategy, planning and risk management	System covers top management, company vision and strategy planning, and risk management processes.	Corporate
Inclusive and skilled workforce	System includes human resources planning, training and development.	Corporate
Customer and stakeholder engagement	System covers external communication, marketing, community engagement, stakeholder management.	Corporate
Supporting services	System covers IT, security, facilities, compliance (EQHS).	Corporate
Business financeability and long-term viability	Activities which enable us to fulfil our financing duty and ensure we can finance our functions; and enable the organisation to have a reasonable expectation that the we will be able to continue in operation and meet its liabilities over a longer-term period.	Financial
Financial monitoring and reporting	System covers activities which enable transparency and engagement on our financial structures.	Financial

Interdependencies mapping of external and internal systems

We have undertaken an interdependency mapping exercise on our internal systems to highlight the connectivity amongst the systems, through workshops with the system owners. The assessment highlights the complex relationships between the systems, helping to provide a greater understanding of where a reduction or strengthening in the resilience of one system may impact upon the resilience of another. In the first instance, we have mapped the interdependencies and influences between each of the 16 internal systems using the following criteria:

0	No connection (no impact)
1	Weak connection (small impact)
2	Medium strength connection (medium impact)
3	Disproportionately strong connection (strong impact)

The results of the assessment are outlined in the **Appendix D**. Based on the interdependencies and the influences, we have computed the influence strength of each of our internal systems. The influence strength is measured by:

- Active Score: the sum of all *outbound* influences. It reflects the quantum of the impact of a system on our other systems (Active Score = horizontal summation of values in Appendix D)
- Passive Score: the sum of all *inbound* influences. It reflects the quantum of the other systems impact on a system (Passive Score = vertical summation of values in Appendix D)

Figure 10 outlines the results of this assessment.

Figure 10: Influence strength of Wessex resilience systems

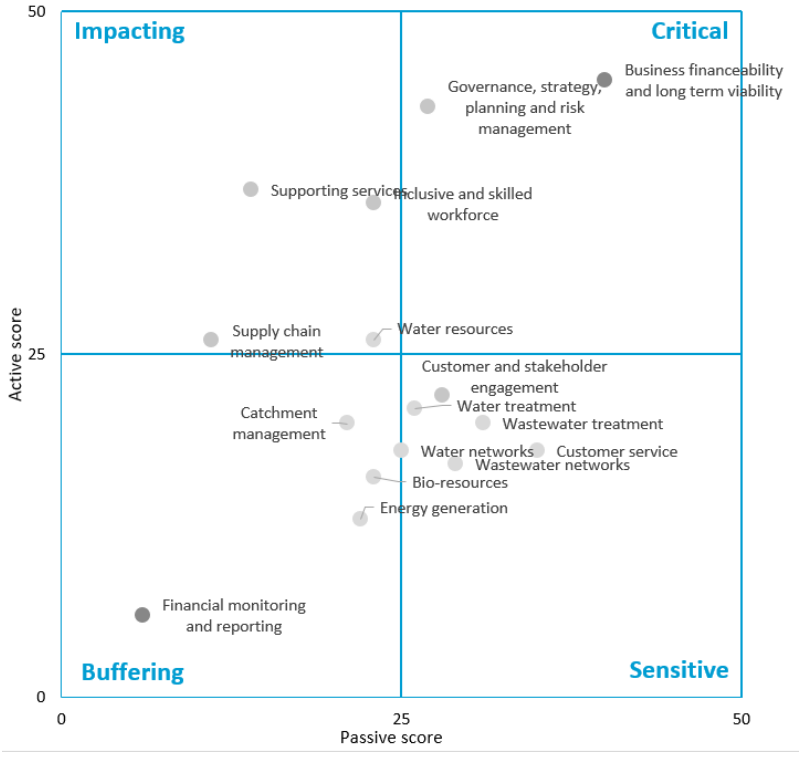
Passive Score	Wessex Water resilience systems	Active Score	Form of resilience
21	Catchment management	20	Operational
23	Water resources	26	Operational
26	Water treatment	21	Operational
25	Water networks	18	Operational
35	Customer service	18	Operational
29	Wastewater networks	17	Operational
31	Wastewater treatment	20	Operational
23	Bio-resources	16	Operational
22	Energy generation	13	Operational
11	Supply chain management	26	Corporate
27	Governance, strategy, planning and risk management	43	Corporate
23	Inclusive and skilled workforce	36	Corporate
28	Customer and stakeholder engagement	22	Corporate
14	Supporting services	37	Corporate
40	Business financeability and long term viability	45	Financial
6	Financial monitoring and reporting	6	Financial

The pair of active and passive scores for each system represent the role of each system within the organisation, as visualised in Figure 11. Depending on the ratio of active and passive scores, the systems can be distinguished into four types, impacting, critical, sensitive and buffering. The four types of systems are further explained below:

- **Impacting systems** have a strong influence on other systems. From a simple cause and effect perspective, the identification of these systems helps us to understand the systems that are likely to have cascading impacts on other systems. For example, in Wessex Water, the outage of a supporting services such as Information Technology / Operational Technology would impact many other systems.
- **Critical systems** have an organisation-wide influence on other systems and a high level of sensitivity to the impacts of other systems and therefore, it is difficult to consider critical systems in isolation. For example, in Wessex Water, the long-term financial viability of the company is impacted by the cost of their operations and impacts the budget available for operational and capital improvements.
- **Sensitive systems** are highly sensitive to the impacts of other systems. Typically, we would expect to find sensitive systems in the final-demand or consumption end of the process chain. They can also play an important signalling function for the overall performance of the business. In Wessex Water, the number of customer complaints received is an indication of the overall performance of the business.
- **Buffering systems** have the capacity to absorb change without drastically altering their own state or that of others in the organisation. Buffering systems provide room to absorb the impact from external change. For example, the process of financial monitoring and reporting is not directly dependent on many of the other systems.

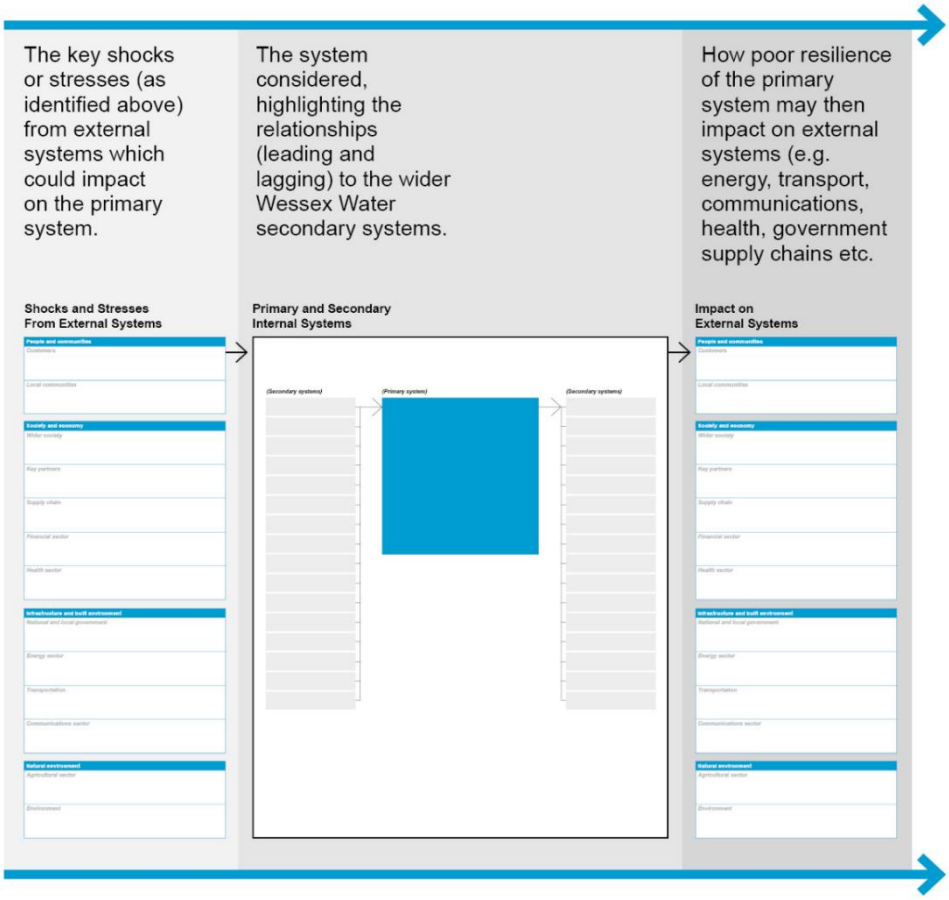
This assessment looks to deepen our understanding of the interconnections between our systems, which will help us to prioritise and focus on systems and associated mitigations for strengthening our resilience.

Figure 11: The different roles of Wessex resilience systems



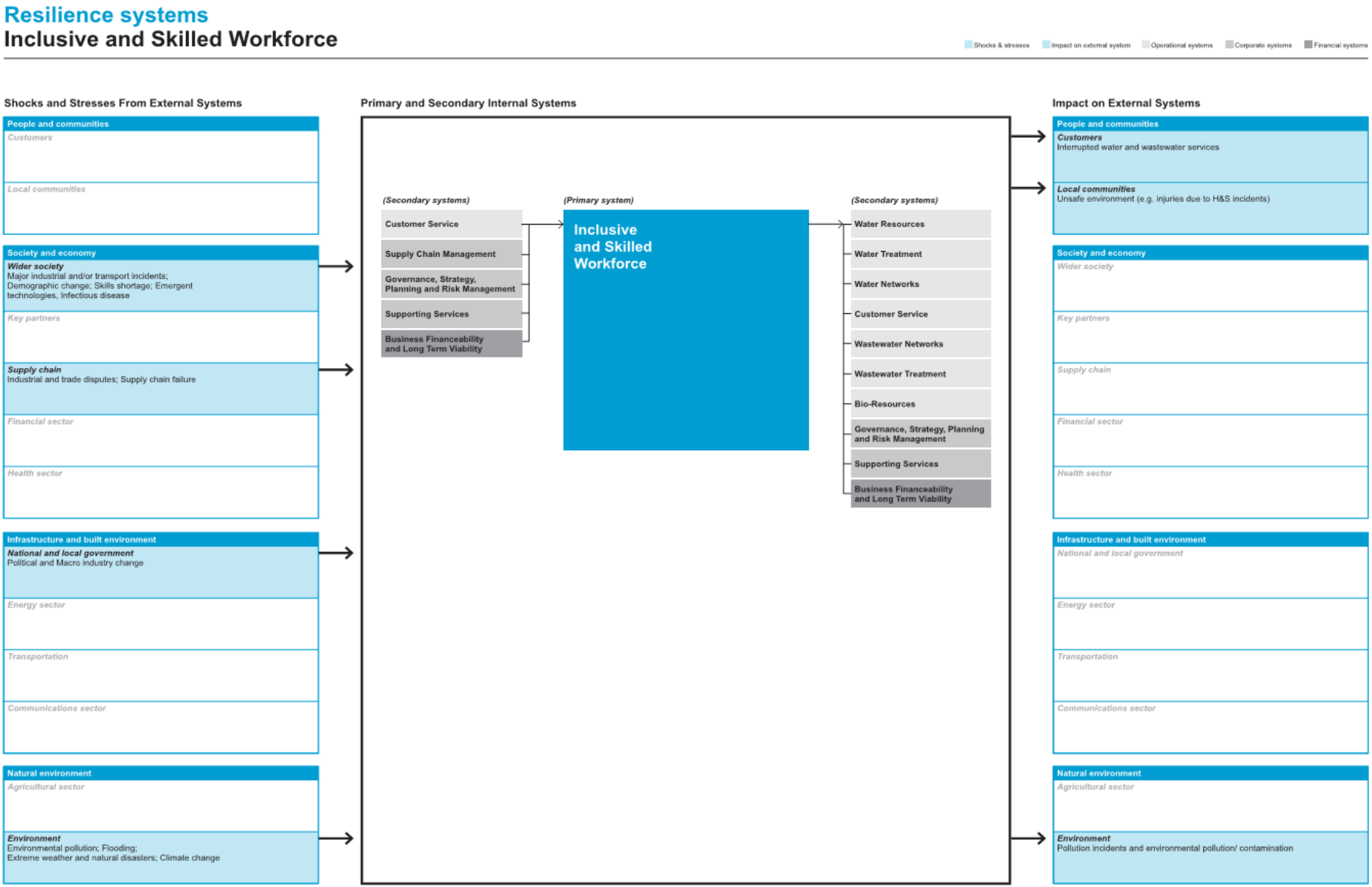
We have then mapped each of the 16 systems to understand the cascading impacts of the shocks and stresses from external systems onto Wessex Water's systems and the failure of Wessex Water's systems onto external systems. Each system has been mapped identifying:

Figure 12: Guide to the resilience system maps



An example of the interdependency mapping of our Inclusive and Skills Workforce system is provided below with the remaining system maps contained in **Appendix E**. To develop these, we undertook an initial mapping exercise to facilitate discussions with area leads and subsequently revised the maps to reflect their input. Developing the mapping in conjunction with the system leads has enabled us to develop a clear picture of the potential risks to a system, through multiple pathways, and how these could result in impacts on external systems (e.g. environment, communities etc).

Figure 13: Resilience system map



Resilience maturity assessment

We have undertaken our resilience maturity assessment to determine the operational, corporate and financial resilience of Wessex Water, in line with Ofwat's 'Resilience in the Round' concept. It has provided a holistic assessment of our systems and is now enabling us to identify gaps and opportunities for gaps and opportunities for resilience improvement.

Resilience Maturity Assessment: The resilience maturity assessment uses a set of criteria we have developed based on BS65000 Organisation Resilience Standards to assess the resilience of our internal systems to withstand and recover from the most relevant shocks and stresses to each system. The maturity criteria are set out against five qualities of resilience (Resistance, Reliability, Redundancy, Response & recovery, and Re-evaluate), and have six levels of maturity, immature (score 0), basic (score 1), managed (score 2), established (score 3), predictable (score 4), and optimising (score 5). The maturity assessment is carried out at the shocks and stresses level for each system, and an overall resilience score for the system is calculated by averaging all scores at shocks and stresses level.

The maturity assessment is based on the impact mapping and considers the resilience maturity of each system against the most relevant shocks and stresses. The assessment scoring aligns with the Organisational Resilience British Standard (BS65000) scale. A level of resilience is assigned against each key shock and stress based on the interventions identified, resulting in an overall grade of maturity for the system. Interventions in this context relate to activities, initiatives, projects and measures which eliminate or reduce the risk of a shock/stress occurring and/or the impact of a shock or stress both internally and externally. A temporal aspect has been incorporated into the assessment, with maturity scoring undertaken for the end of AMP6 and estimated for the end of AMP7, providing a 'direction of travel' for the resilience of each system.

Table 5. Maturity Assessment Scale

Score	Maturity	Definitions
0	**Immature**	Few measures implemented to strengthen the system. No coherent framework and no management direction. No encouragement of innovation or flexibility.
1	**Basic**	System strengthened through specific disciplines. No formal communication on resilience across the system.
2	**Managed**	Activities are controlled and maintained with results specified. Limited coordination between related activities. Improvements made in isolation.
3	**Established**	Management has set direction and understands the internal and external environment and how it is changing. Steps and programmes undertaken to bring coherence to resilience and to strengthen the operations. Programme to strengthen the system in operation.
4	**Predictable**	Resilience activities being executed consistently over several years, aligned with corporate strategy. Coherent approach working. Strengthening measures implemented and agreed, continual improvement ongoing.

5	**Optimising**	Activities are repeated, measured, evaluated and continuously improved to meet current and projected business goals. Divisions are proactively cooperating for improvement. Collaboration with other organisations, as appropriate. Demonstrated application of innovation and flexibility throughout the system.

The assessment has involved extensive consultation with our key stakeholders including over 20 workshops and corresponding interviews identifying existing (AMP6) and future interventions (AMP7) which contribute to the resilience of a system. The raw data (i.e. interventions and the system they belong to) has been collected into a database to facilitate the assessment of the maturity of each system and enable us to make future updates to the assessment as resilience develops. Each intervention is mapped against:

- The five components of resilience (re-evaluate, resistance, reliability, redundancy and response & recovery).
- The Wessex Water system they are influencing.
- The shocks and stresses that they address.

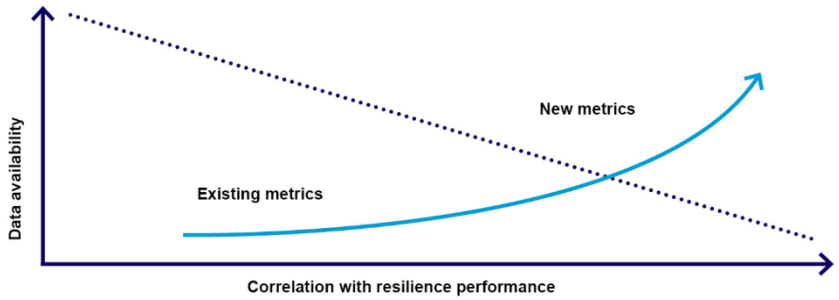
We have completed our resilience maturity assessment and an example of this is located in Appendix F. Over AMP7 we will implement cost effective improvements to increase resilience maturity to a desired level.

Resilience metrics

Over the last few months we have reviewed a long-list of 200 separate leading and lagging measures to determine whether they are appropriate to be used as resilience metrics.

We understand that in selecting the right metrics, there are sometimes trade-offs to be made between existing ones where data are readily available and the most effective metrics which best reflect the areas of underperformance / opportunities in our systems. Therefore, we are taking an evolutionary view to the development of our resilience metrics, starting with the areas where data are readily available, whilst working to develop the most effective metrics and improve their data availability.

Figure 14: Approach to developing resilience metrics



To screen existing metrics for their suitability to become resilience indicators, we have developed a set of criteria, which are based on the following considerations:

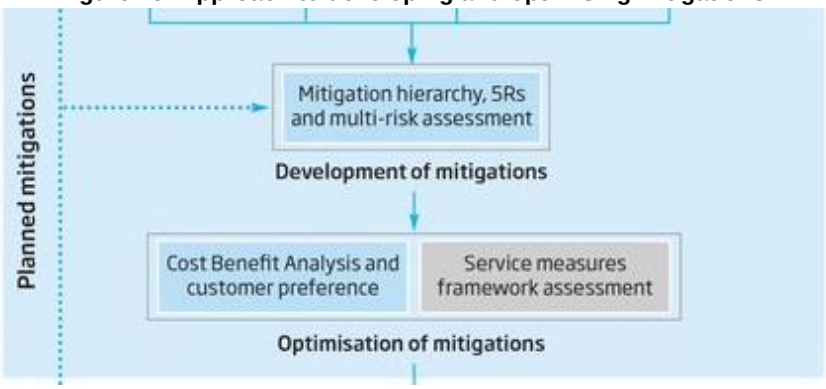
- **Relevance to resilience**: is the metric a good reflection of the system's performance against the five resilience qualities of re-evaluation, resistance, reliability, redundancy, response & recovery;
- **Materiality**: does the metric relate to multiple internal systems, how directly linked is it to the system being monitored;
- **Targeted**: is the metric targeted to the areas of underperformances / opportunities in our systems;
- **Preventative or corrective**: is the metric a 'leading indicator' i.e. indicative of our state of preparedness for future shocks and stresses, or a 'lagging measure' i.e. captures the scale and significance of the impacts that have materialised from past shocks and stresses.
- **Is the metric currently being calculating now**.
- **There should be at least one metric for each of the 16 systems**.

The outcome of the review is a list of 49 metrics that have been agreed to form the initial resilience metrics. Over the remainder of the 2020-21 year we will be assessing whether these metrics do help inform and incentivise resilience related decision making. We will also continue to look at those measures on the long-list that are not currently measured and determine whether any of these should be added or replace existing measures on the list.

This review process will mean we will evolve to a set of resilience metrics to apply for the full year 2021-22 onward.

Planned mitigations

Figure 15: Approach to developing and optimising mitigations



2.3.8 Development of mitigations

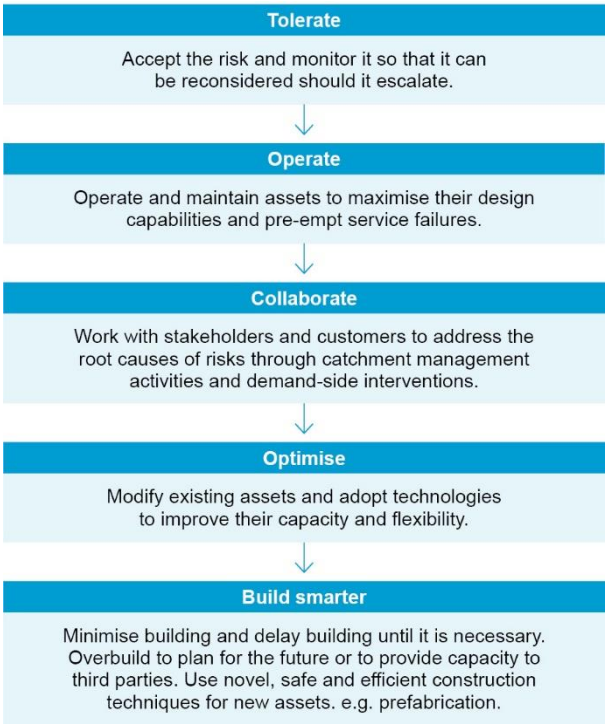
The risk management and prioritisation approach described above will allow us to focus our effort on the areas where improvement is needed to strengthen our resilience.

Mitigation Hierarchy

Where we identify vulnerabilities in our resilience, we will develop a long-list of mitigations to improve our ability to respond and recover from shocks and stresses. Options for risk mitigation are developed based on our mitigation hierarchy in Figure 16 from 'tolerate'

through ‘operate’, ‘collaborate’ and ‘optimise’ to ‘build smarter’. We have been following our mitigation hierarchy throughout AMP6 and will continue to use it in AMP7.

Figure 16: Mitigation hierarchy



Our mitigation hierarchy defines building new manufactured capital solutions as the ‘last resort’ to be considered after operational, collaborative and optimisation solutions. Building a mitigation hierarchy mindset into options appraisal has helped us to direct our interventions closer to the root causes of issues and identify the most efficient and valuable ways of improving resilience. For example, to respond to deteriorating raw water quality, rather than solely focusing on end-of-pipe solutions, we are proactively working with catchment partners to create catchment solutions, deploying natural and social capitals, to reduce diffuse pollutions at source. The following are examples of projects that have taken an alternative approach to building new capital solutions to respond to resilience challenges.

Wessex Water Case Study
Tolerate: Water Industry National Environment Programme

In the process of developing the Water Industry National Environment Programme (WINEP) we work closely with the EA to agree appropriate modifications and additions to our sewage treatment works permits. Often this involves us conducting investigations over a period of time to understand whether improvement is needed, or whether we can tolerate the existing discharge loads. An example of this is the Burnham Jetty Bathing Water investigation. where after conducting an investigation over two years the results concluded in agreement with the Environment Agency that no improvements were required to our sites.

Wessex Water Case Study
Operate: Energy Efficiency Programme

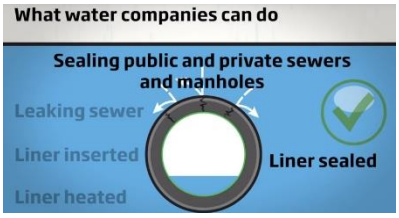
Energy efficiency has been a focus of the company for well over ten years, operating our assets more efficiently to reduce energy consumption or avoid high tariffs. For example, we have extensive programmes to avoid using energy during the peak tariff periods, often reducing the cost of a kWh by up to 700%. We also conduct extensive energy audits to understand site operation and reduce wasted energy, such as reviewing pump efficiency curved, identifying overrunning assets and working with staff to develop their energy awareness.

Wessex Water Case Study
Collaborate: Market-based approaches

We have adopted two market-based approaches to encourage collaborative solutions to address our risks.

1. The Marketplace presents challenges we are looking to solve, and any data associated with them, inviting customers, partners, academia, the supply chain and the rest of the industry to offer potential solutions.
2. EnTRADE is a market-based tool to incentivise changes in farming practice (e.g. reducing pollution at source). Our innovative trading platform enables framers to bid for funding. By delivering multiple benefits, we can improve resilient, make cost savings and attract investment.

Wessex Water Case Study
Optimise: Cerne Abbas sewer sealing



We used non-intrusive techniques to sewer seal 550m of sewer for £100k. These activities enabled us to avoid an extension to the WRC storm tanks, saving an estimated £2m. We used state of the art technology to fix the sewers – i.e. remote-controlled robots, avoiding the need for excavating the highway and saving disruptions to local communities.

Wessex Water Case Study
Build Smarter: Integrated Supply Grid

Our new water supply grid is a £230 million project which will enable us to meet demand for water over the next 25 years without the need to develop new resources. It comprised more than 50 individual schemes across Somerset, Wiltshire and Dorset and will allow us now to redistribute surplus water as required. As part of the scheme, we have built more 200km of trunk mains, 24 refurbished or new pumping stations and 12 new storage tanks.

5Rs assessment

The Cabinet Office defines resilience as the ability of assets, networks and systems to anticipate, absorb, adapt to and/or rapidly recover from a disruptive event and has identified four principal components of resilience (4Rs), as shown in Figure 17. We have added a fifth R, 'Re-evaluate' to include the ability of the organisation to continually evaluate the changing world in which it operates including the risks it faces and the new, innovative mitigations available. It also includes the ability of the organisation to re-evaluate their performance and learn from their past experiences to inform their future decisions.

Figure 17: Cabinet Office four principal components of resilience with additional component, re-evaluate

Re-evaluate	Resistance	Reliability	Redundancy	Response & recovery
The ability to evaluate the risks our systems face in a changing world and the effectivness of new, innovative mitigations available.	The ability to prevent damage or disruption by providing the strength or protection to resist the hazard or its primary impact.	The ability of infrastructure components to operate under a range of conditions, and hence mitigate damage or loss from an event.	The availability of backup installations or spare capacity will enable operations to be switched or diverted to alternative parts of the network in the event of disruptions to ensure continuity of services.	The ability to enable a fast and effective response to, and recovery from, disruptive events. The effectiveness of this element is determined by the thoroughness of efforts to plan, prepare and exercise in advance of events.

To inform the development of mitigations, we assess proposed mitigations against the 5Rs to identify which of the resilience components the mitigations possess. The objective is that our mitigations have a broad range of 5R resilience components and therefore, provide multiple lines of defence to the shock or stress and provide robust and comprehensive mitigation.

Multi-risk assessment

Some of the proposed mitigations will respond to or pre-empt multiple shocks and stresses and therefore bring greater resilience value to Wessex Water; for example, developing a water supply grid provided redundancy in case of a power failure and drought in each catchment. Therefore, in addition to evaluating the mitigations against the qualities of resilience defined by the Cabinet Office, we will also evaluate them against the risks that the mitigations address, to assist with prioritisation.

The proposed mitigations are evaluated against the 5Rs and shocks and stresses that Wessex Water faces to prioritise those which possess multiple resilience qualities and respond to multiple shocks and stresses. At a programme level, we also review the coverage of the mitigations across the components of resilience and alignment with the shocks and stresses.

Table 8: Indicative example of evaluation of mitigations

Intervention	Resilience Components					Shocks and Stresses (examples)							Mitigation Prioritisation
	Re-evaluate	Resistance	Reliability	Redundancy	Response & recovery	Flood	Drought	Telecom failure	Power failure	Climate change	Ageing infrastructure	Demographic change	
Mitigation A													
Mitigation B													
Mitigation C													
Overarching Assessment	Review of overall coverage of interventions					Re-evaluate resilience to shocks and stresses							

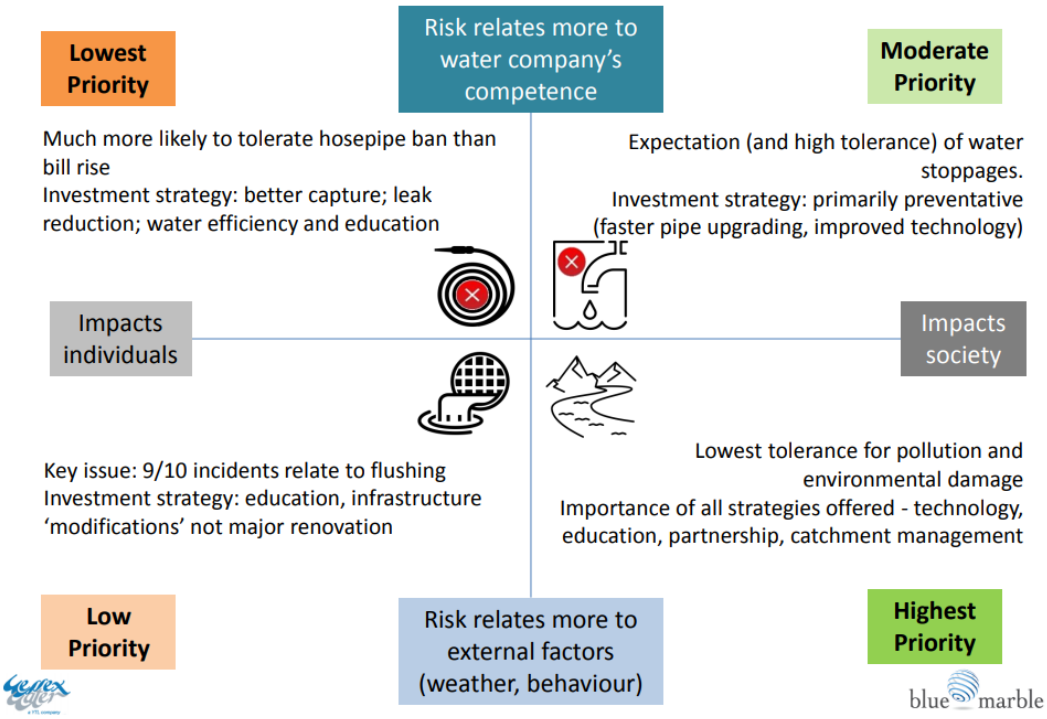
2.3.9 Optimisation of mitigations

Our primary approach to optimising our mitigations is through the use of customer preference information and internal cost information to set the parameters of our cost benefit analysis (CBA).

Cost-benefit analysis and customer priorities

Our research has shown support amongst customers for partnership and community delivery of environmental projects. This focus on environmental improvements was confirmed by our customers when we engaged with them on their priorities for resilience as summarised in the following diagram. Preventing pollution and environmental damage were our customers' highest priority. Our plan to protect and improve the environment was set out in our PR19 submission in September 2018. Customers' next priority was to reduce supply interruptions. They had an expectation and a reasonably high tolerance of short-term water interruptions but expected us to be investing in upgrading plant and infrastructure and employing new technology to reduce longer service outages. Our plan to maintain our asset base and improve our supply performance was set out in PR19 submission in September 2018 and updated with further evidence in our IAP response in April 2019.

Figure 18: Summary of our customer engagement on resilience



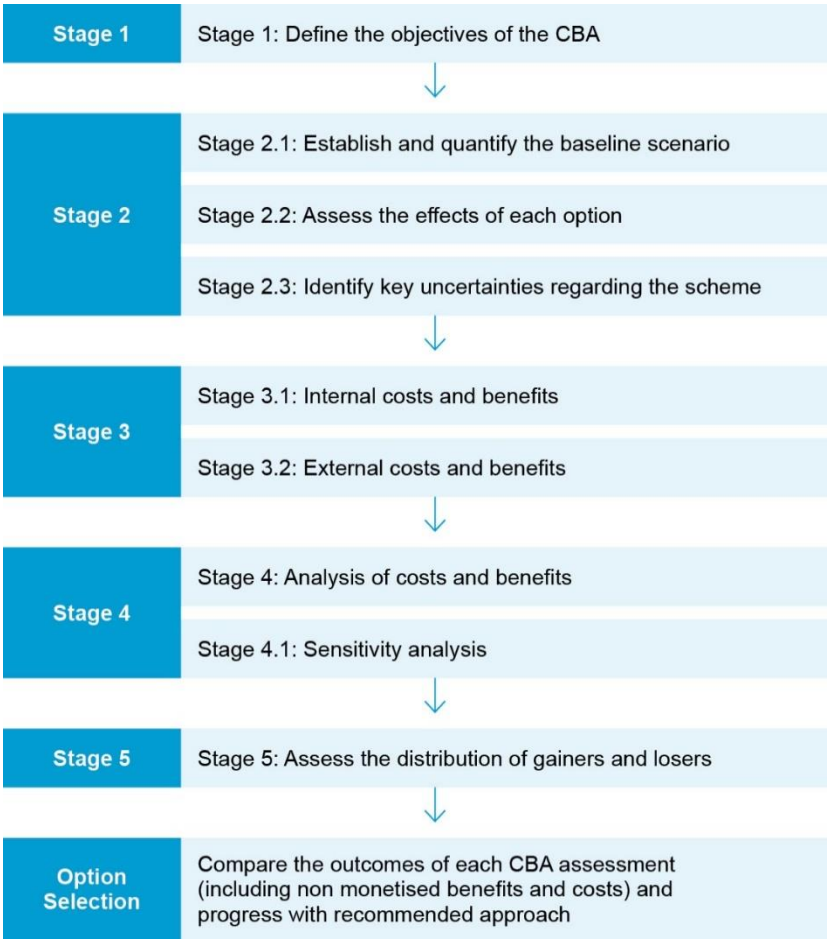
The stages of our CBA follow the UKWIR five key stage approach (2007) and we have used it for over 10 years in the optimisation of our investment plans. The approach has been recognised by environmental regulators as industry leading and has been shared with other companies.

In overview, the CBA approach is as follows:

- **Stage 1:** The starting point for any CBA must be a clear definition of the problem (or opportunity) to be assessed (justification for investment), and the target outcome.
- **Stage 2:** Establish the baseline over the assessment period and how the investment(s) may affect the baseline.
- **Stage 3:** Assess the costs and benefits of the investment over the assessment period, this includes internal costs and benefits (incurred and avoided costs) and external costs and benefits (to the environment and society). External costs and benefits are assessed against an ecosystem services framework to ensure the full range of wider benefits and costs are considered. Valuation data was provided via Customer Research such as willingness to pay (WTP) data and benefit transfer.
- **Stage 4:** Analyse the costs and benefits including sensitivity analysis to determine the level of certainty that the scheme is cost-beneficial.
- **Stage 5:** Assess the winners and losers from the scheme (i.e. those who benefit or lose from the scheme).

The final step is option selection which uses the outputs of the CBA but also qualitative and quantitative assessments where a scheme may have benefits that cannot be monetised.

Figure 19: Overview to CBA approach



Capitals based SMF assessment

We recognise that we have a role as stewards of the water system and natural environment, both now and for future generations, and maximising the value that we provide our customers and communities. Hence, to ensure that we deliver the most value for our customers, and building on our Sustainability Vision (2016), we are developing a capitals-based investment optimisation approach.

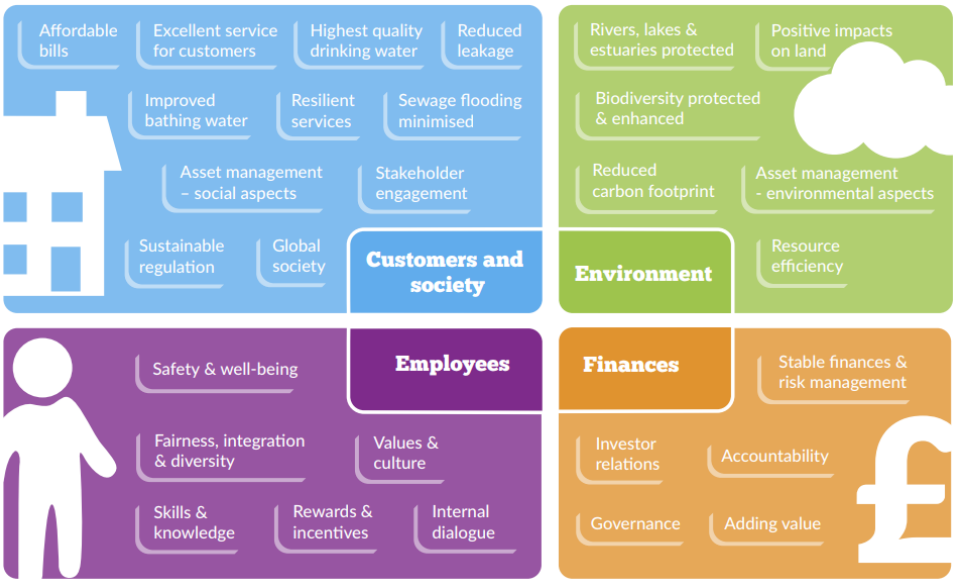
Wessex Water Case Study
Sustainability Vision 2016

Our 2016 sustainability vision is based on the 'capitals' model of sustainable development which describes the resources used by society and the value those resources provide. In particular, our vision is based on four capitals: customers and society (social capital); environment (natural capital); employees (human capital); and finances (financial capital). These reflect our company aims to provide customers with excellent affordable services and contribute to wider society; to protect and improve the environment; to be a great place to work in which all employees can work safely and reach their full potential; and to deliver the best possible

returns to investors. For each capital, we have a series of outcomes that we want to achieve and mechanisms to achieve those outcomes, and indicators to track progress.

Our capitals-based approach will measure the benefits of our investment against the four capitals outlined in our sustainability strategy: financial, natural, social and human.

Figure 20: Wessex Water's Four Capitals (Customers and society – social, environment – natural, employees – human, and finances – financial)



The benefits will be monetised in a service measure framework based on best-practice, for example, the Framework for Expenditure Decision Making (UKWIR, 2016). Our framework of service measures (Service Measure Framework, or SMF) will help us to:

- align our proposed expenditure with organisational objectives and understand the wider benefits of our expenditure and activities;
- understand the potential impact of the risks we face in terms of service performance and how investment can maintain and improve that, now and over time; and
- adopt a common language for use in expenditure planning and decision-making and stakeholder conversations (including customers).

A **Service Measure Framework** is an agreed set of metrics and units which provides a means of consistently and objectively articulating

- the objectives of an organisation and our stakeholders,
- the current and future risks to achieving those objectives, and
- the benefits of interventions to manage those risks over time.

These metrics are intended to cover the majority of services provided by the company's activities and include, among others:

- service to customers,
- asset performance ('asset health'),
- societal and environmental effects (e.g. nuisance, land management, carbon),
- compliance (quality, Health & Safety),
- resilience.

The current 'state of the art' is to articulate SMF values using the Capitals.

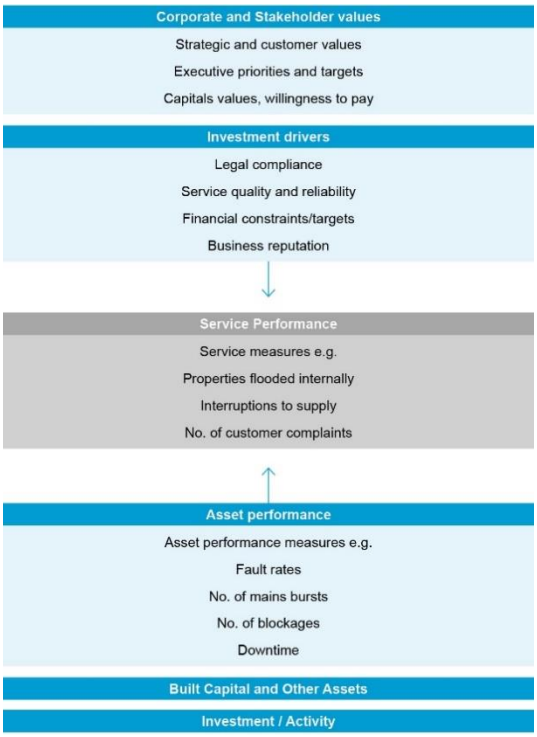


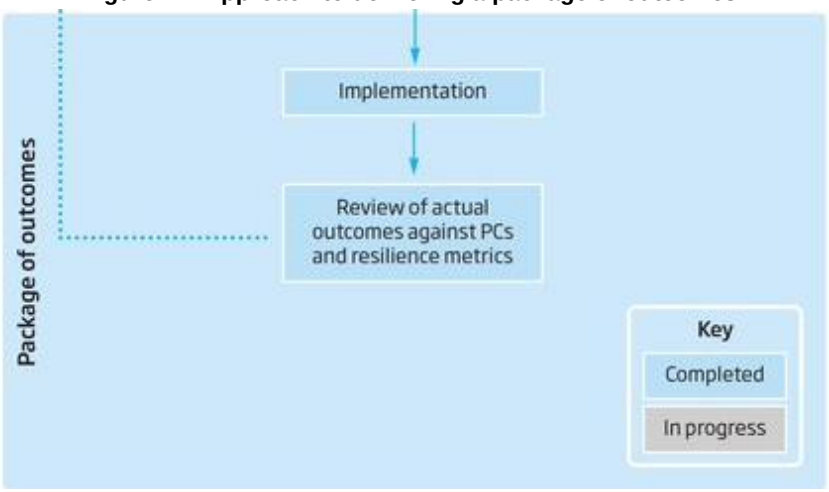
Figure 21: SMF Framework

We have completed the process of compiling our service measures based on our performance commitments, strategic objectives and a review of service measure frameworks from across the UK Water Industry and aligning them against the four capitals that we use in our sustainability strategy (financial, natural, social, human).

We are currently in the process of developing and finalising values for each of the service measures and plan to start integrating the use of the service measure framework into intervention selection/decision making to enable more optimised investments, recognising the additional value which interventions provide across their whole life compared to the TOTEX of the investment. While there is already a strong link between performance commitments, resilience metrics and the SMF, over the next period we will be seeking to make the line of sight even more defined.

2.4 Package of outcomes

Figure 22: Approach to delivering a package of outcomes



Our integrated systems-based resilience approach will ensure that our investment decisions and mitigations can deliver against a range of desired outcomes, including the improvement of the resilience of our internal systems, our performance commitments, and positive contributions across all four Capitals, including wider benefits for our customers and the environment.

2.4.1 Operationalising resilience

Although we have integrated resilience thinking into our investment decision-making, we are aware that we need to incorporate it into the implementation of our projects and programmes and operations of our systems. This will ensure that we maximise the value of our projects and programmes and that their resilience qualities are not lost during project implementation and operation.

Project and programme implementation

At the start of a project or programme, the need and objective of the project and programme is defined along with resilience metrics and performance commitments that it influences. Throughout the implementation of our projects and programmes, ISG undertake 'Gateway Reviews' at defined stages: before the commencement of feasibility studies, outline design, detailed design, implementation/construction and handover to operations. During these meetings the project or programme will be reviewed against the original need and objective to ensure it continues to deliver them in the most effective way. If it will not deliver against the need and objective, the project or programme may be re-developed or alternative options explored.

Building resilience into our operations

Customers, communities and the environment have continued to be at the heart of our decision-making. This can be seen in our strategic decisions to adopt a partnership

approach and to create an integrated supply grid. However, it is also strongly embedded in our daily operations.

We have developed response and recovery plans for our critical functions, from supply chain management and IT and OT systems to water treatment. Our approach is to have a number of generic plans (i.e. consequence management plans), and some specific plans (i.e. local emergency plans) in place to respond to a range of possible incidents. Our employees are trained on the emergency response plans and our field teams are trained in multiple roles so that we can re-deploy colleagues in an incident. There is also a planned exercise programme with nine live play exercises per year, including one strategic exercise across multiple systems and two exercises with the Local Resilience Forum (LRFs) in our region of whom we engage regularly with.

To pre-empt service failures, our asset reliability team meet monthly with our delivery departments to consider issues such as common failures across asset types and high failure rates on specific assets. In the event of an incident, it is categorised into one of three levels (strategic, tactical or operational) with corresponding management command control.

Following an incident, we complete a post-incident review. In the case of operational incidents, this is carried out by the team that the incident occurred within. In the case of tactical or strategic incidents, this is chaired by the Business Resilience Advisor. Lessons learnt relating to the cause of the incident, the response and recovery are discussed and recommendations for the future are made, which are shared and implemented into business-as-usual.

Wessex Water Case Study
Learning from external incidents: Franklaw

We take every opportunity to learn from incidents including those experienced across the industry. In August 2015 United Utilities (UU) issued boil notices to 320,000 properties (712,000 customers) following the detection of cryptosporidium in water supplied from the company's Franklaw water treatment works. Following the event, workshop sessions were held by UU to share the learning from this event with the wider industry. We fully engaged in the workshops, using UUs findings to assess our position, resulting in updates to our incident management procedures and consequence management plans.

2.4.2 Review of our resilience performance

At the completion of the implementation of a project or programme, ISG review the project or programme against its original objectives and the resilience metrics and performance commitments that it is expected to contribute towards. If the project does not deliver the anticipated resilience benefits, the remaining risk will be evaluated to determine whether it is at an unacceptable level and if so, additional development of mitigations will occur. In

addition, they identify any lessons learned on the project that relate to the effectiveness of the mitigation, which are recorded centrally, and used to inform the execution of future projects and programmes.

In addition to reviewing the success of our individual projects and programmes at the completion of their implementation, we will also review our resilience at a strategic level on a regular basis.

We will review our resilience at a strategic level in three ways:

1. A review of our performance against our resilience performance commitments, which primarily cover our operational resilience and our corporate, financial and operational resilience metrics on an annual basis;
2. A review of the resilience maturity assessment of our corporate, financial and operational systems every two years; and
3. A review of our systems-based resilience framework every five years.

These reviews will highlight the strengths and gaps in our resilience approach and whether we need to change our resilience approach or accelerate our mitigations to improve our resilience.

The reviews will be coordinated by ISG and reported to the Executive Leadership Team and Board with process and governance improvements agreed with the Audit & Risk Committee.

3. Our Future Planning 2020 onward

This section explains how our resilience approach has informed the development of our Business Plan 2020 – 2025 and onward.

3.1 Our completed actions supporting our Business Plan

As part of our preparations for the PR19 business plan submission, the following elements of our systems-based resilience framework were completed in addition to our pre-existing risk and resilience management processes.

Table 9: Completed actions

Completed actions		
1	Horizon Scanning	*Considered emerging shocks and stresses from economic, social and environmental perspectives.*
2	Resilience maturity assessment for our critical operational systems	*Prior to the PR19 submission, we undertook a resilience maturity assessment for three of our critical operational functions: asset strategy and planning, asset creation and maintenance and operations and service delivery.*
3	Development of an intervention hierarchy	*Options for risk mitigation were developed based on our intervention's hierarchy.*
4	Stakeholder mapping	*We undertook stakeholder mapping to support the identification and prioritisation of opportunities for collaborative working.*
5	Development of resilience performance commitments	*Developed seven resilience performance commitments, against which our interventions are reviewed.*

3.2 How our resilience approach informed our Business Plan

We are very proud of our unmatched record of resilience, with over 40 years of uninterrupted industry leading resilient services and environmental stewardship. In this period, we have had to deal with various shocks and stresses and our success has been as a result of forward planning, working with the community and always focusing on protecting the environment. Recognising this, we are now planning for our next 25 to 50 years, focusing on strategic and holistic solutions to the challenges we face.

Our integrated resilience strategy pulls together three of the core facets of our business:

- Forward planning and development of multi-AMP overlap programmes to achieve long-term improvements;
- Working in partnership with our community and environmental stakeholders to find the lowest impact solutions such as catchment management and catchment nutrient balancing; and
- Providing industry leading services to our customers while protecting the natural environment for the future. We have set ourselves one of the most challenging packages of performance commitments aimed at environmental improvement.

3.2.1 2020-25 resilience proposals

Our systems-based resilience approach was used in the assessment of our investment proposals for our PR19 business plan. As part of our submission, we identified several specific resilience mitigation proposals required for implementation in 2020-2025. Our Cost Benefit assessment was applied across each of these proposals before inclusion in our business plan.

Table 10: Our PR19 proposed resilience investments

<table>
<tr><th>Forms of resilience</th><th>Proposals</th></tr>
<tr><td>Operational resilience</td><td>Continuous improvement of our processes and policies, based on a systems-based maturity assessment of our critical operational systems against the six guidelines in BS65000: British standard for Organisational Resilience.

Based on the detailed assessments described in the business plan and further evidenced in our IAP response, we proposed very focused investments to improve resilience, as detailed below. We considered a series of potential hazards and the most cost beneficial investments to address residual risks to service.

Table 11: Focused investment on operational resilience
<table><tr><th>Hazard</th><th>Proposed Investment</th><th>Benefit</th><th>Cost £m</th></tr><tr><td>Flooding</td><td>Reinforcement of sea wall</td><td>Protection of sewage works from flooding - mitigating risk of pollution of the Bristol channel</td><td>2.6</td></tr><tr><td>Stand-alone water treatment works failure at Maundown</td><td>Improvements to resilience of the existing treatment works by removing single points of failure; study of other long-term options to minimise the risk</td><td>Reduce the probability of prolonged supply interruptions to 42,000 properties</td><td>5.3</td></tr><tr><td>Operational technology security</td><td>Improvement to our operational technology systems – network hardening and segregation against cyber-attack; key re-suiting</td><td>Reduce the risk of prolonged supply interruptions across the region</td><td>11.3</td></tr><tr><td>Total</td><td></td><td></td><td>19.2</td></tr></table>We have industry leading service levels for hosepipe bans and drought restrictions, and sewer flooding.

We are committed to catchment partnerships in Stour and Bristol Avon. We will continue using catchment management approaches to tackle water quality at source, including:
Nitrates in catchments to our drinking water sources
Catchment interventions and catchment wide permitting to deliver phosphorus reductions in rivers
Catchment management to offset nitrogen in the Dorset Stour.
We will undertake enhanced community engagement to encourage efficient use of water and avoid sewer misuse.</td></tr>
<tr><td>Corporate resilience</td><td>Regular review of governance, accountability and assurance processes. Further develop well established processes for the identification and management of risk.
Progress our People Programme to address the long-term risk around people and shortfall in STEM skills.</td></tr>
<tr><td>Financial resilience</td><td>Annual stress-testing for our long-term financial viability statement, with assurance by the board and review from an independent third party.
Ensure corporate structure is consistent with the guidelines and principles for board leadership, transparency and governance.</td></tr>
</table>

Ofwat in its final determination allowed the majority of our requested funding particularly for Flooding and Operational technology security. However, as our proposals relate to risks to the business that our Board will not tolerate, we will be progressing all of our resilience improvements irrespective of whether Ofwat funded them or not. This will be accommodated within our risk-based prioritisation of our investments across our business.

In the period since the PR19 business plan was prepared, there have been a number of shocks/stresses on our business. In each case we have been able to maintain our high levels of service and performance due to the approach to resilience management. Information gained from the experiences of managing against a shock or stress is used to re-assess our appetite and tolerance levels as well as our future planning.

From the start of this current period in April 2020, we have all been managing against the conditions created by the Covid-19 pandemic. We were able to adjust rapidly to these conditions with all essential services unaffected and only those that involve direct contact with customers continuing to be managed under specific government guidance.

Our changes in working practices included transferring practically all office staff to home working and implementing social distancing arrangements on our construction sites and operational locations. We have all of our office teams operating on a rota between office and home working and we continue to add all further lessons learned globally to our resilience management.

Looking forwards, the change in working practices and different use of technology will create opportunities for how we can manage against future shocks and stresses which will be reflected in future updates to our action plan.

3.2.2 Our partnership working

A core part of our approach to resilience management is to only apply traditional engineering point mitigations as a last resort. As outlined in Section 2.2.2, we aim to develop collaborative responses to multiple risks and realise wider social and environmental benefits. Our approach aligns with Defra guidance included in the 25 Year Environment Plan and the Catchment Based Approach. These activities relate to three performance commitments:

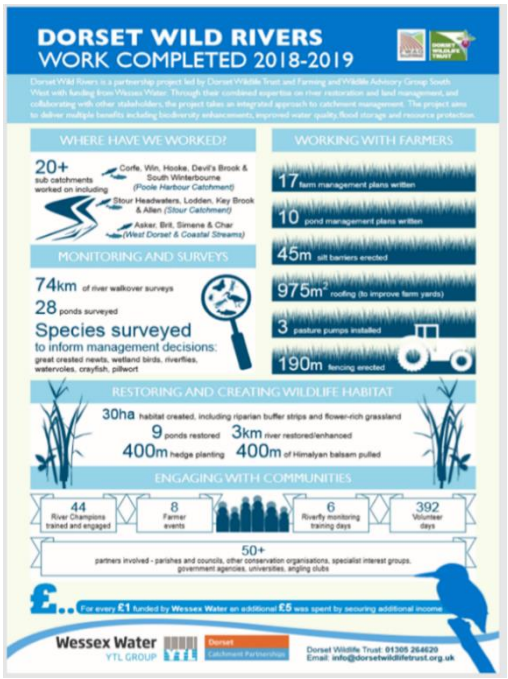
- Working in partnership to improve Sites of Special Scientific Interest
- Working in partnership to deliver natural capital benefits
- Community projects to deliver bathing water amenity.

Below is an example of how our partnership working implemented in AMP6 has benefited our customers, as well as the environment.

Wessex Water Case Study:
Dorset Catchment Partnership and BAP Partners Programme

Ofwat's emerging strategy encourages water companies to work in partnership to deliver longer term targets to achieve the ecological status of rivers through innovative and sustainable approaches. Our work within our Catchment Partnerships (of which we host two) is consistent with Ofwat's view and enables us to deliver

greater benefits, more efficiently. These partnerships enable a blending of funding from public and private sources to deliver common outcomes; without this approach many of the outcomes delivered are beyond our core expertise and reach.



2018-19 outcomes delivered through one of the four BAP Partners Programme projects (£20k/yr) in the Dorset ssCatchment

The Dorset catchment has three unique catchments: Poole Harbour, Stour and the West Dorset Rivers and Coastal Streams. Each has a delivery group dedicated to working together to improve the water environment. The Dorset strategy group oversees the delivery groups, including the Poole Harbour and Stour catchment initiatives. The data below highlights the funding and outcomes delivered by the Dorset Catchment Partnership, as reported to CaBA:

Funding (2018-19)	**£**
Public / private	£628,000
Match	£57,000
Contributions	£181,000
Total	**£865,000**

This includes £50k from Wessex Water to host the Catchment Partnership in the public/private line.

The following outcomes have been achieved:

Outcome (2018-19)	**Number**
People engaged	1,850
Farmers engaged	1,469
Volunteers	1,116
Km rivers enhanced	69
Number of projects	40
Partners	40

4. Our Action Plan

4.1 Action plan

We have been continuing to evolve our resilience framework and have made positive steps forward. The action plan identifies those areas that we want to make further improvements to develop and implement a systems-based resilience framework. The plan shown in Figure 23 below summarises our actions, a programme to deliver them and the progress made to date.

Our overall objective is to implement of the framework into business-as-usual in 2020-21 in coordination with the rollout of our new Governance, Risk Management and Compliance application. The actions in progress and next steps are listed below.

Table 12: Actions in progress

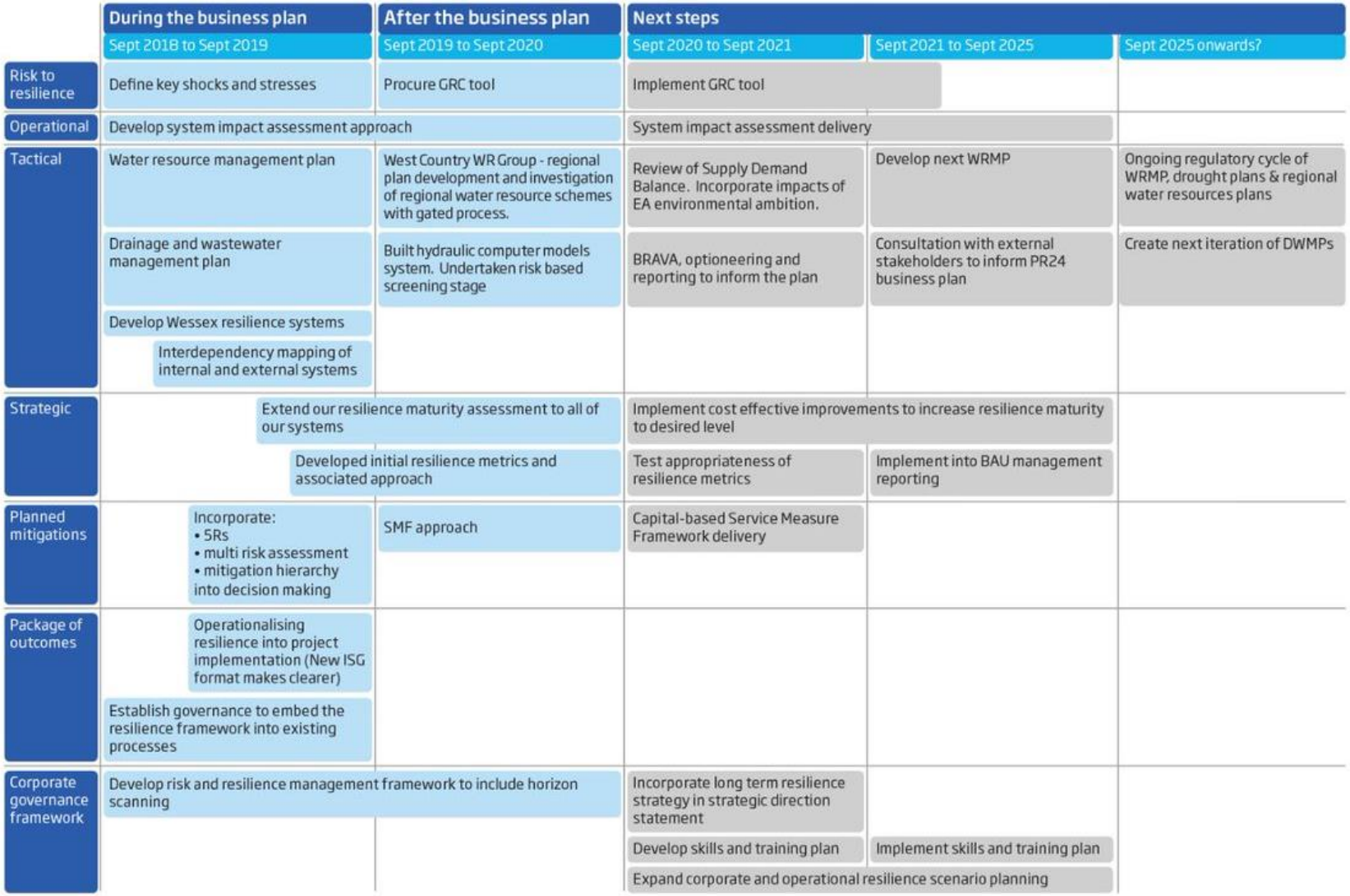
	ACTIONS TO SEPT 2021	OUTCOMES			
		Integrated systems	**Process improvement**	**Quality of information**	**Improved decision making**
1	System impact assessment Delivery	✕	✕	✕	✕
2	Review of Supply Demand Balance. Incorporate impacts of EA environmental ambition.	✕	✕		✕
3	Water Resource Planning BRAVA, optioneering and reporting to inform the plan	✕	✕		✕
4	Implement cost effective improvements to increase resilience maturity to desired level			✕	✕
5	Test appropriateness of resilience metrics			✕	✕
6	Capital-based Service Measure Framework delivery			✕	✕
7	Incorporate long term resilience strategy in strategic direction statement	✕	✕		✕
8	Develop skills and training plan	✕	✕		
9	Expand corporate and operational resilience scenario planning	✕	✕	✕	✕

In 2020, we will review our strategic direction statement. Our strategic direction statement will reflect our response to the shocks and stresses identified in the horizon scanning and the resilience gaps identified in the resilience maturity assessment. We will learn from the work of others, such as Welsh Water below, to define our approach.

Example Approach Case Study
Welsh Water, 2050

Welsh Water 2050 sets out a long-term vision which responds to many of the stresses they face - from climate and demographic change to the pace of technological change and also to increasing customer expectations. The document details 18 strategic responses to respond to these challenges. The vision is set within the policy context of the Welsh Government's Wellbeing of Future Generations Act (Wales) 2015 and Environment Act (Wales) 2015.

Figure 23: Resilience implementation plan



4.2 Next Steps

Our next step is to continue our current pace in developing and implementing the remaining tasks in the action plan. This will embed the process of line of sight between risks to resilience, planned mitigations and a package of outcomes. The remaining tasks, including actions in progress and actions to be completed, are outlined below. Best practice case studies are provided to illustrate our thinking in terms of next steps.

4.2.1 Actions in progress

1. System impact assessment Delivery

We have developed our approach to defining critical sites as shown below. We will endeavour to deliver the System Impact Assessment in the forthcoming year to feed into the SMF.

1. Develop list of shocks and stresses or scenarios
2. Identify critical assets based on set criteria, this includes identification of pinch points and single points of failure.
3. In workshops undertake what-if or failure modes effects and criticality analysis (FMECA) to determine what would be the consequence of failure of the asset
4. Use system interdependency maps to determine the cascading impacts throughout the water system and in other systems
5. Quantify the impacts using the SMF and prioritise
6. This will create a line of sight between shocks & stresses, the impact they have on systems and the resulting mitigation/actions required.

We have investigated the use of digital solutions as part of our design work in advance of Durleigh refurbishment scheme. In addition, we have used an optimiser to look at scenario planning across our supply grid. We will adopt digital approaches as appropriate as part of our System Impact Assessment.

2. Delivering our Drainage and Wastewater Management Plans

We are making good progress in developing our Drainage and Wastewater Management Plans (DWMP) and are on track to draft our DWMP by June 2022.

Over the past couple of years, we have completed our hydraulic computer model library, so we now have almost complete coverage of our foul and combined sewerage network. These models are being used to assess Baseline Risk and Vulnerability Assessment (BRAVA) stage of the DWMP which we will complete by December 2020. This will help us understand the impact of resilience risks such as population growth and extreme rainfall on our wastewater network. We have also undertaken the annual refresh of the Risk Based Screening assessment. A key stage, which we have started, is the optioneering stage which will inform the investment requirement in the short, medium and long term.

3. Strategic water resource planning at a regional level

We have completed our Water Resources Management Plan (WRMP), which forecasts we have access to enough water to meet our customers' needs for next 25 years. As part of our continuing efforts to strengthen the resilience of our water resources, we working as part of the West Country Water Resources Group to develop strategic water resource planning proposals exploring cross-sector solutions at a regional level.

Our last WRMP indicated that we have enough water to meet our customers' needs for next 25 years. We are now undertaking work to revise our supply demand balance for the next WRMP and other plans. As part of this we know that there will be future challenges to our headroom position for example as a result of the EA's environmental ambition which points to large reductions to abstraction licences over the next 30 years.

4. Extend our resilience assessment to all of our systems

The resilience maturity assessment uses a set of criteria we have developed based on BS65000 Organisation Resilience Standards to assess the resilience of our internal systems to withstand and recover from the most relevant shocks and stresses to each system.

We have extended our resilience maturity assessment for all of our 16 systems to determine the operational, corporate and financial resilience of Wessex Water, in line with Ofwat's 'Resilience in the Round' concept. This has provided a holistic assessment of our systems. We reassessed our resilience maturity based on the activities already defined in our business plan to inform our likely position at the end of AMP7. A detailed example of which can be found in Appendix F.

Categories	Systems	AMP6 Resilience Maturity	AMP7 Resilience Maturity
Operational	Catchment management	3.3	3.5
Operational	Water resources	3.7	3.9
Operational	Water treatment	3.3	3.6
Operational	Water networks	3.4	3.4
Operational	Customer service	3.6	3.6
Operational	Wastewater networks	3.0	3.3
Operational	Wastewater treatment	3.1	3.6
Operational	Bioresources	3.1	3.1
Operational	Energy generation	2.9	3.1
Corporate	Supply chain management	3.3	3.7
Corporate	Governance, strategy, planning and risk management	3.4	3.8
Corporate	Inclusive and skilled workforce	2.9	3.1
Corporate	Customer and stakeholder engagement	3.1	3.6
Corporate	Supporting services	2.9	3.4
Financial	Business financeability and long-term viability	4.0	4.0
Financial	Financial monitoring and reporting	4.0	4.0

We have agreed that the long term strategic aim is to understand and strive for a level 4 resilience maturity in response to each shock and stress. We have therefore defined an approach for determining what a level 4 Resilience Maturity would look like for each shock and stress. This will inform risk tolerance and create a line of sight between risk and resilience. The scoring for each shock and stress:

Shocks	AMP6 Resilience Maturity	AM7 Resilience Maturity	Stresses	AMP6 Resilience Maturity	AMP7 Resilience Maturity
Financial crisis	3.7	3.7	Bad debt	4.0	4.0
Industrial and trade dispute	3.3	3.3	Cost increase	3.5	3.7
Supply chain failure	3.3	3.3	Recession	4.0	4.0
Power failure	3.5	3.5	Environmental change	4.0	4.0
Telecommunication failure	3.1	3.6	Climate change	3.0	3.6
Environmental pollution	3.4	3.8	Customer behaviours/ expectations	3.7	3.7
Extreme Weather/ natural disasters	3.3	3.4	Land use change	3.7	3.7
Flooding	3.0	3.4	Demographic change	3.4	3.8
Space weather	3.0	3.0	Skills shortage	3.2	3.3
Political and macro industry change	3.2	3.6	Ageing infrastructure	3.2	3.3
Infectious disease	3.0	3.0			
Political instability and terrorism	3.0	3.0			
Vandalism/ theft	3.3	3.3			
Asset failure	3.3	3.6			
Cyber attacks	3.3	3.9			
Major industrial/ transport incidents	3.3	3.5			

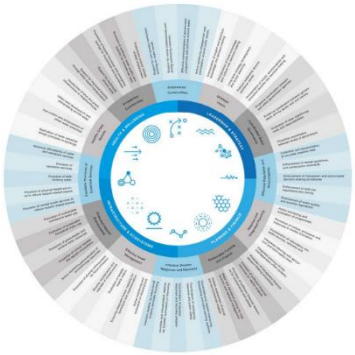
We are now in a position to identify gaps and opportunities for resilience improvements that we can implement over the next period.

5. Develop resilience metrics

Relevant case studies: City Water Resilience Approach

Having reviewed our long-list of potential resilience metrics and identified an initial list of 49 metrics that cover all 16 of our systems we will now test these to verify that they are the most appropriate metrics to use to incentive resilience management in each system. This initial list both leading and lagging indicators. We will update this starting list of metrics through the remainder of 2020-21. The review will include improving the alignment of performance commitments, resilience metrics and SMF and assessing whether additional future looking metrics could be adopted to improve the management information that will inform our decision making. The intention is to have a firm list of resilience metrics from April 2021 which we will then use for the remainder for the remainder of the AMP period to 2025.

Example Approach Case Study
City Water Resilience Approach



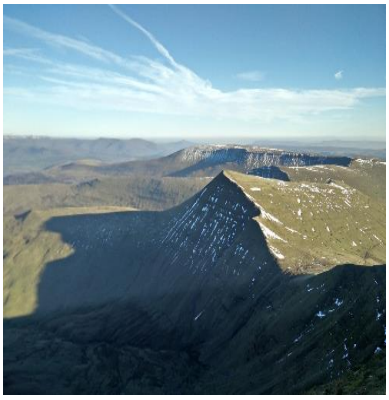
The City Water Resilience Approach (CWRA) responds to a demand for innovative approaches that help cities build water resilience at the urban scale. It includes the City Water Resilience Framework as a tool for assessing and monitoring resilience. Based around four dimensions of resilience: leadership and strategy, planning and finance, infrastructure and the environment and health and wellbeing, the City Water Resilience Framework has 12 goals and 62 qualitative and 56 quantitative indicators to assess the resilience of an urban water system. These are used to assess resilience to inform an action plan and to monitor its effectiveness.

6. Develop a capitals-based Service Measure Framework

Relevant case studies: Valuing Wales' National Parks, Yorkshire Water Six Capitals Approach

Our activities to develop a capitals-based Service Measure Framework to measure the benefits of our investment against the four capitals (financial, natural, social, and human) outlined in our sustainability strategy is underway. We have completed the initial development of the framework and plan to integrate the framework into our existing business operations during the early part of AMP7.

Example Approach Case Study
Valuing Wales' National Parks

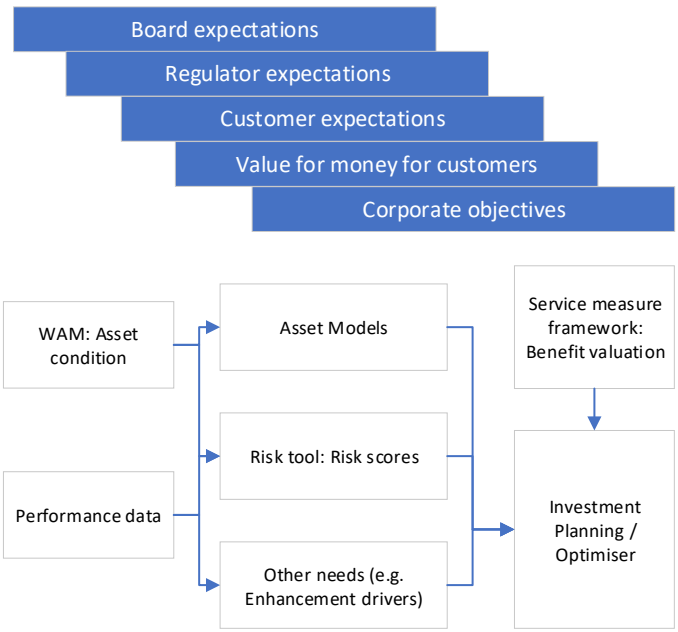


Arup took an innovative approach to capturing the Total Economic Value of Wales' National Parks. This considered the Parks' contribution to the Welsh economy as well as the wider value of the environment in social capital (health and wellbeing, sociocultural value) and natural capital. These impacts were quantified where possible to illustrate the important contribution of the Parks to GDP and to demonstrate the value of the ecosystem services provided by the National Park environments.

Case studies considered the costs of the activities of the National Park Authorities in comparison to their value in helping protect and enhance the environment.

7. Develop integrated risk and resilience management framework

Following our review of the PR19 business planning process and the heightened expectations of our Board in needing to manage more volatile shocks and stresses to the business, we developed the plan to improve our end to end risk and investment process. This plan includes the implementation of the tools and improved processes covering Governance, Risk management and Compliance (GRC), benefit valuation (SMF) and investment planning. This has provided a basis for 'Our System based Resilience Framework'.



There are several improvements which are required to ensure that we make informed business decisions and provide assurance to our Board that we are appropriately managing

risk and maintaining resilience in the volatile environment we find ourselves in, these are summarised below:

- Board determined Business appetite
- Risk assessment that is visible and consistent across the company (GRC)
- Value framework providing a consistent financial benefit valuation for each option/mitigation (SMF)
- Investment planning tool or optimiser to run scenarios and determine the optimal combination of investments (Investment Management System)
- Integrated and consistent assurance to provide confidence to the Board (GRC)

5. Implementation of our Action Plan

The responsibility for delivering the action plan is with the **Director of Risk and Investment**, the project implementation structure is defined below. The action plan identifies that the timing of the rollout of the risk and resilience management framework is timetabled to commence toward the end of this financial year and be completed by March 2021.

Figure 24: Project Implementation Structure

A governance structure for the implementation of the action plan has been set up. The Director of Risk and Investment chairs the **Resilience Action Plan Steering Group**, consisting of other senior managers with responsibility for different areas of resilience management for the regulated business, including the Director of Regulation and Reform and the Director of Asset and Compliance. Progress will be reported regularly to the **Board**, **Audit & Risk Committee** and the **Executive Leadership Team**.

The **Resilience Action Plan Implementation Team** report to the Steering Group and is led by the **Head of Risk Management**. The departmental and functional heads that are the system owners support the **Resilience Action Plan Implementation Team** as subject matter experts who have day-to-day responsibility for assessing and mitigating risks and for the teams of staff involved in the risk and resilience processes.

As well as reporting progress to the Executive, the Board and the Audit & Risk Committee there will be external reviews to ensure we deliver the action plan on time. The first review will be carried out by Mott MacDonald as our regulatory technical auditor for our Annual Performance Report. Progress on our action plan to date was reviewed and our assumptions and the deliverability of the next phase of the action plan were challenged. The outcome findings were reported to our Audit & Risk Committee and the summary letter is included as Appendix G. The Audit and Risk Committee agreed the plan and recognised the findings from Mott MacDonald which will be reviewed in the next plan in 2021.

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Appendix A. Definitions

Glossary	Definition
Resilience	The ability of Wessex Water 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.
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.
Financial resilience	The extent to which an organisation's financial arrangements enable it to avoid, cope with and recover from disruption.
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 all aspects of risk to delivery of services.
Resilience system	A unit of our operations (including the people, programmes, processes and technologies), which are responsible for delivering a business function. A primary resilience system is the system under assessment and the secondary system is a system, upstream or downstream of the primary system, which impact on or are impacted by the primary system.
Resilience maturity assessment	The resilience maturity assessment uses a set of criteria we have developed based on BS65000 Organisation Resilience Standards to assess the resilience of our internal systems to withstand and recover from the most relevant shocks and stresses to each system.
Shock	A sudden event with an important and often negative impact on the vulnerability of a system and its parts.
Stress	A long-term trend, weakening the potential of a given system and increasing its vulnerability.
Resistance	The ability to prevent damage or disruption by providing the strength or protection to resist the hazard or its primary impact.
Reliability	Infrastructure components inherently designed to operate under a range of conditions, and hence mitigate damage or loss from an event.
Redundancy	The availability of backup installations or spare capacity will enable operations to be switched or diverted to alternative parts of the network in the event of disruptions to ensure continuity of services.
Response and recovery	The ability to enable a fast and effective response to, and recovery from, disruptive events. The effectiveness of this element is determined by the thoroughness of efforts to plan, prepare and exercise in advance of events.
Re-evaluate	The ability of an organisation to learn from past experience and critically reflect on their resilience, their impact on others and the changing world around them to leverage this learning to inform future decision-making.

Appendix B. Trends

Extract of 'Trends' from the Wessex Water Futures Report (2019)

Resilience	Water and sewerage services are of strategic importance and their failure would affect the region, its economy, and the environment. So, we are putting in place measures to ensure resilience to systemic shocks as well as more predictable stresses such as population growth.
The long-term health of our assets	We have been entrusted with a vast network of sewers, water mains and other infrastructure constructed over the past 200 years across our region. We need always to be mindful of the legacy we leave to future generations. We have invested significantly in the past 25 years to improve drinking water and environmental standards, and the assets that this has created will also need to be protected for the long-term growth forecasts in the light of the decision to leave the EU. While affordability is a primary issue, our understanding of vulnerability more widely has also improved. We identify where customers are vulnerable and ensure wherever possible that our services are responsive, accessible and appropriately priced.
Changing customer expectations	With the advance of IT, customers have much higher expectations of service delivery. They tend to be very satisfied with our services and do not necessarily expect us to be at the leading edge. However, we must respond to our younger and future customers whose expectations of how they should receive and consume our services will be very different – including the full range of web-based, electronic and social media options.
Trust	Cynicism about corporate behaviour and culture is high and as a private provider of a public service we have a special responsibility to ensure we are accountable and transparent and demonstrate the highest standards of corporate governance and conduct.
Changing legislation	Brexit potentially gives the UK greater choice around environmental standards and how expenditure in water catchments is allocated and timed. We will respond positively to any rethinking about how to balance service resilience, environmental protection and affordability, so that both customers and the water environment benefit from any changes.
Skilled labour	Several factors will challenge our access to high quality, skilled labour in future: an ageing workforce, large scale infrastructure projects within our region that compete for the people with the technical skills we need, and uncertainty over the availability of overseas labour.
Investor confidence	Continued access to low cost finance is essential if we are to continue delivering improvements for customers and the environment. We should not assume that the reduction in financing costs since privatisation can be sustained in the long run; nor that capital providers will always be willing to invest in water assets if there is a better risk/reward balance elsewhere. As we look to take more market-based approaches it is up to us to demonstrate the potential risks and the available rewards to investors.
New technology	Technology is evolving rapidly, with major implications for how we interact with our customers, the environment and our physical assets. While there are many exciting opportunities, we will also need to be smart about how we adopt new technology. For example, we foresee many more sensors monitoring pipework and treatment processes, but we will need to process the huge amount of new data they provide – a task for which other new technology applications will be needed.

Appendix C. Shocks and Stresses

Definitions of Key Shocks and Stresses for the Interdependency Mapping and Resilience Assessment

Shocks		Stresses	
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.	Bad debt	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.
Industrial and trade dispute	A dispute between employees and employers, which may lead to disruption in the continuation of service. E.g. Union organised strikes.	Cost increase	Increasing costs of resources or increasing interest rates causing increased financial burdens on individuals and organisations.
Supply chain failure	Global resource scarcity or disruptions to supply chains which prevent critical products or services reaching their required designations.	Recession	A temporary period of reduced economic activity during which industrial and trade are reduced for two consecutive quarters.
Power failure	Unexpected loss of energy supply caused by an external network issue, from extreme events, causing a issue for continuation of services.	Environmental change	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.
Telecommunication failure	Outage of critical information infrastructure (e.g. internet, satellites, etc.) and networks, causing widespread disruption.	Climate change	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.
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, micro/nanomaterials and recreational drugs.	Customer behaviours/ expectations	Changes in the way people live, causing a change in the resources used and expectations of services provision.
Extreme Weather/ natural disasters	Major property, infrastructure, and/or environmental damage as well as loss of human life caused by extreme weather events.	Land use change	Changes in the use of land. This could be from changes in agriculture, land management or urban sprawl.

Flooding	Major property, infrastructure and/or environmental damage as well as loss of human life caused by extreme weather events which cause flooding.	Demographic change	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.
Space weather	Space weather, such as solar flares, impacting radio, satellite and GPS communications as well as impacting electric power transmission.	Skills shortage	A shortage of known specialist skills required for the continued running of businesses, systems and services.
Political and macro industry change	Inability of regional or global institutions to resolve issues of economic, geopolitical or environmental importance, including economic changes causing changes in the sectors of the economy.	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.
Infectious disease	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.	Emergent technologies	Innovation that creates a new market and disrupts the company operations (e.g. digital technologies, fracking, smart metering).
Political instability and terrorism	Major social movements or protests (e.g. street riots, social unrest, etc.) that disrupt political or social stability, negatively impacting populations and economic activity.		
Vandalism/ theft	Major malicious (or wilful) defacement or destruction or illegal removal of private or public property.		
Asset failure	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.		
Cyber attacks	Large-scale cyberattacks or malware causing large economic damages, geopolitical tensions or widespread loss of trust in the internet.		
Major industrial/ transport incidents	Major incident which impacts normal service provision, could be cause by a number of incidents including fire, nuclear, and transport disaster.		

Appendix D. Influence Mapping

We have mapped the influences between each of the 16 internal systems using the following metrics:

0	No connection (no impact)
1	Weak connection (small impact)
2	Medium strength connection (medium impact)
3	Disproportionately strong connection (strong impact)

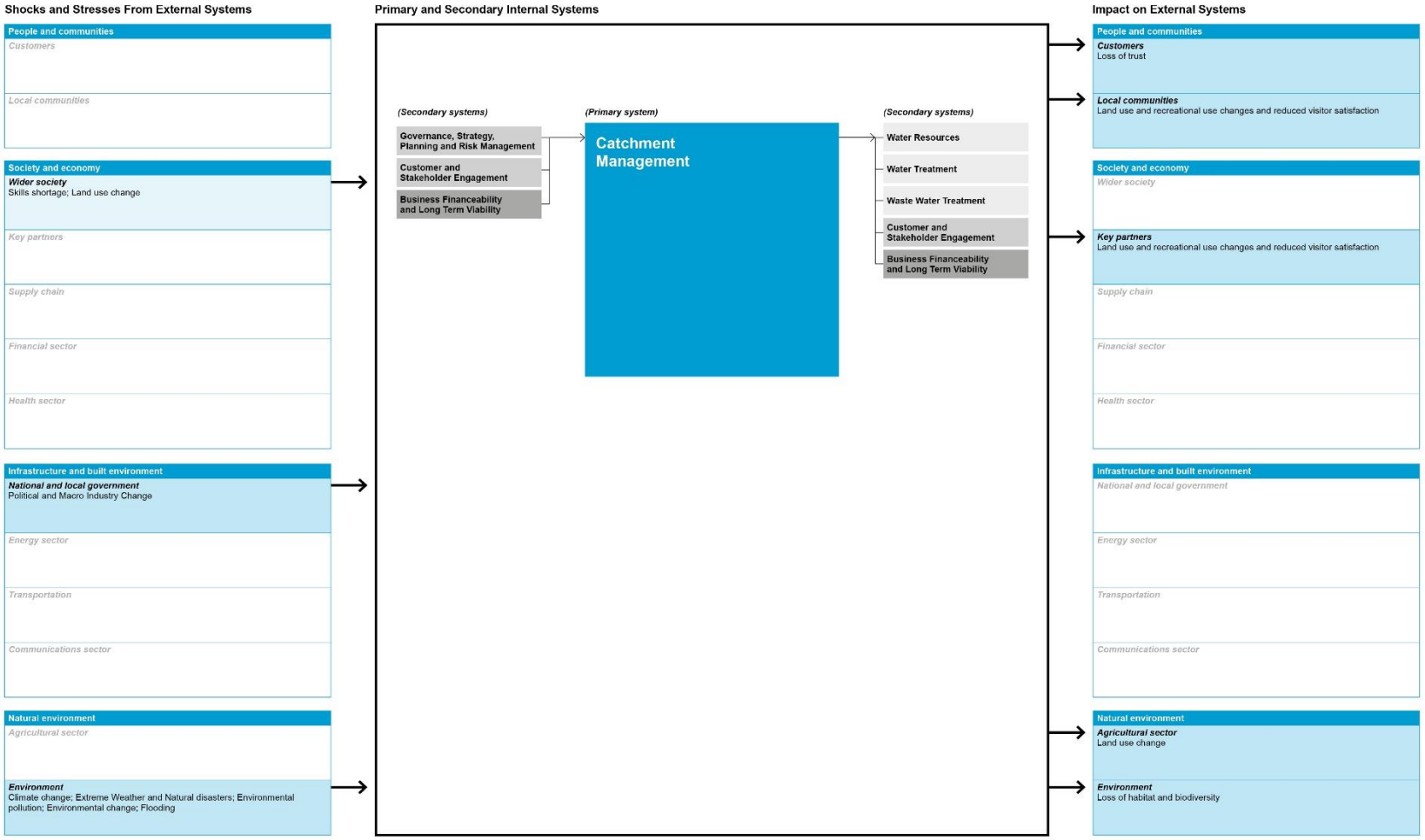
The results of the assessment are outlined below and indicate the influences on and by a system. The matrix highlights the relationships between the systems.

No	Variable	1 Catchment Management	2 Water resources	3 Water treatment	4 Water networks	5 Customer service	6 Wastewater networks	7 Wastewater treatment	8 Bio-Resources	9 Energy Generation	10 Supply chain management	11 Governance, strategy, planning and risk management	12 Inclusive and skilled workforce	13 Customer and stakeholder engagement	14 Supporting Services	15 Business financeability and long term viability	16 Financial monitoring and reporting	Active Score (outbound influences)
1	Catchment Management	X	3	3	2	2	0	3	0	0	0	1	0	3	0	3	0	20
2	Water resources	2	X	3	3	3	3	1	0	1	0	3	1	3	0	3	0	26
3	Water treatment	1	1	X	3	3	3	2	0	1	1	2	1	0	0	3	0	21
4	Water networks	0	2	2	X	3	1	1	0	1	1	1	1	2	0	3	0	18
5	Customer service	0	0	1	1	X	1	1	0	0	0	3	3	3	2	3	0	18
6	Wastewater networks	1	0	0	0	3	X	3	2	1	0	1	1	2	0	3	0	17
7	Wastewater treatment	2	1	0	0	2	3	X	3	2	0	1	1	2	0	3	0	20
8	Bioresources	2	0	0	0	3	0	3	X	3	0	1	1	0	0	3	0	16
9	Energy Generation	0	0	1	1	1	1	1	3	X	0	1	1	0	0	3	0	13
10	Supply chain management	1	1	3	2	0	2	3	2	1	X	1	3	0	3	3	1	26
11	Governance, strategy, planning and risk management	3	3	3	3	3	3	3	3	3	3	X	3	3	3	3	1	43
12	Inclusive and skilled workforce	2	3	3	3	3	3	3	3	2	1	3	X	1	3	3	0	36
13	Customer and stakeholder engagement	3	3	1	1	3	3	1	0	0	0	3	1	X	0	2	1	22
14	Supporting Services	1	3	3	3	3	3	3	3	3	2	2	3	3	X	2	0	37
15	Business financeability and long-term viability	3	3	3	3	3	3	3	3	3	3	3	3	3	3	X	3	45
16	Financial monitoring and reporting	0	0	0	0	0	0	0	1	1	0	1	0	3	0	0	X	6
	Passive Score (inbound influences)	21	21	23	26	25	35	29	31	23	22	11	27	23	28	14	40	6

Appendix E. Systems Mapping

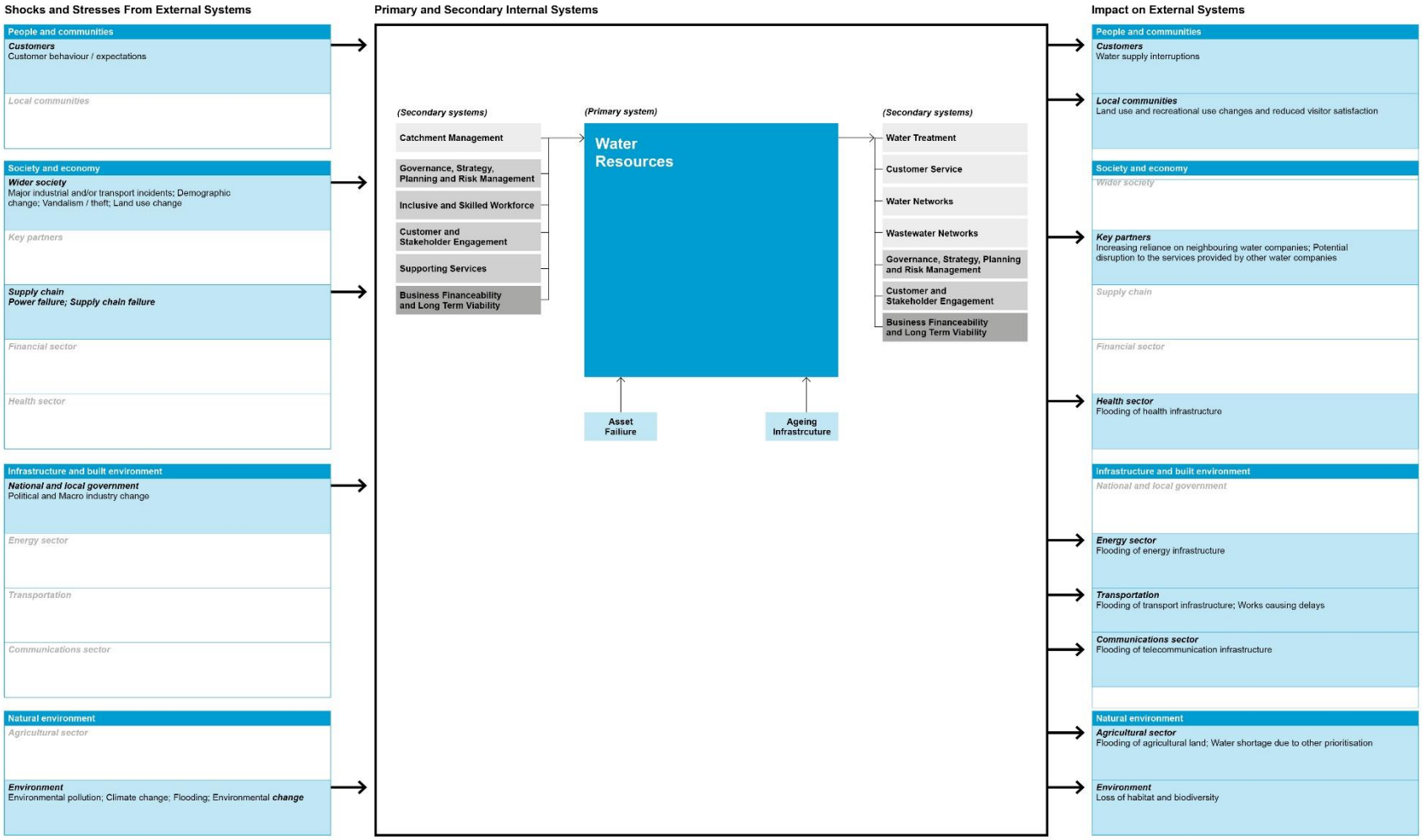
Resilience systems
Catchment Management

Shocks & stresses | Impact on external system | Operational systems | Corporate systems | Financial systems

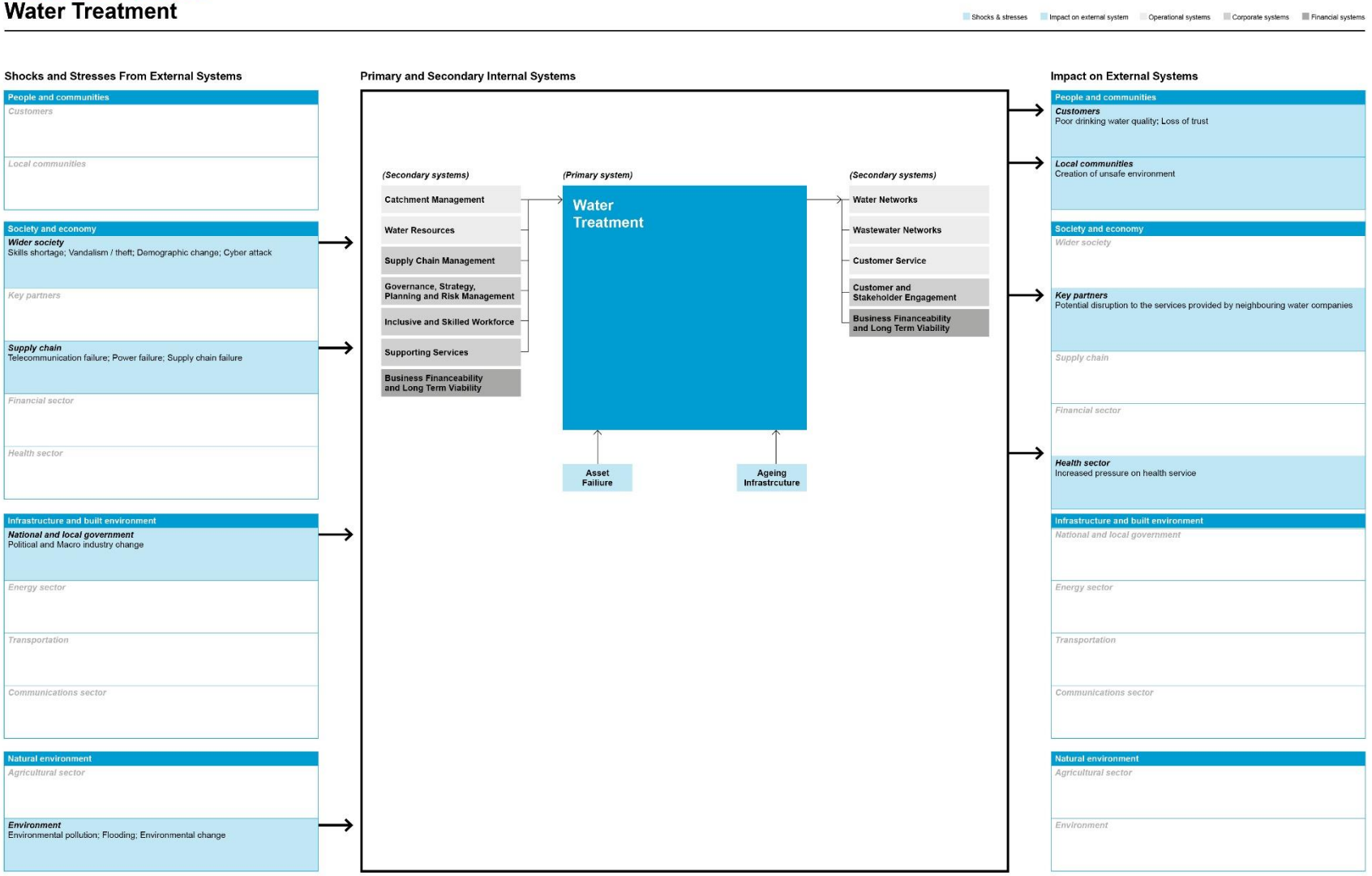


Resilience systems
Water Resources

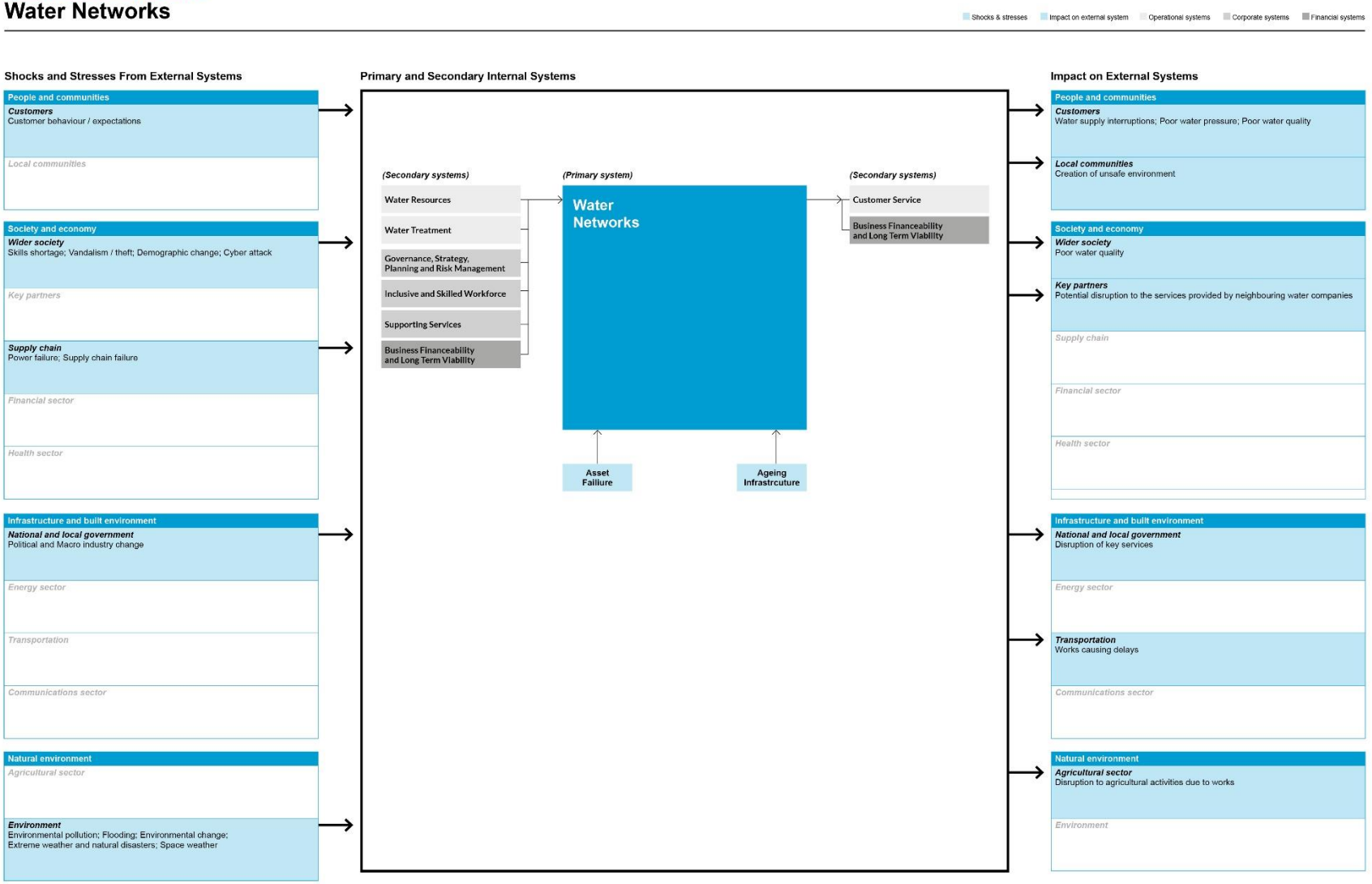
Shocks & stresses | Impact on external system | Operational systems | Corporate systems | Financial systems



Resilience systems
Water Treatment

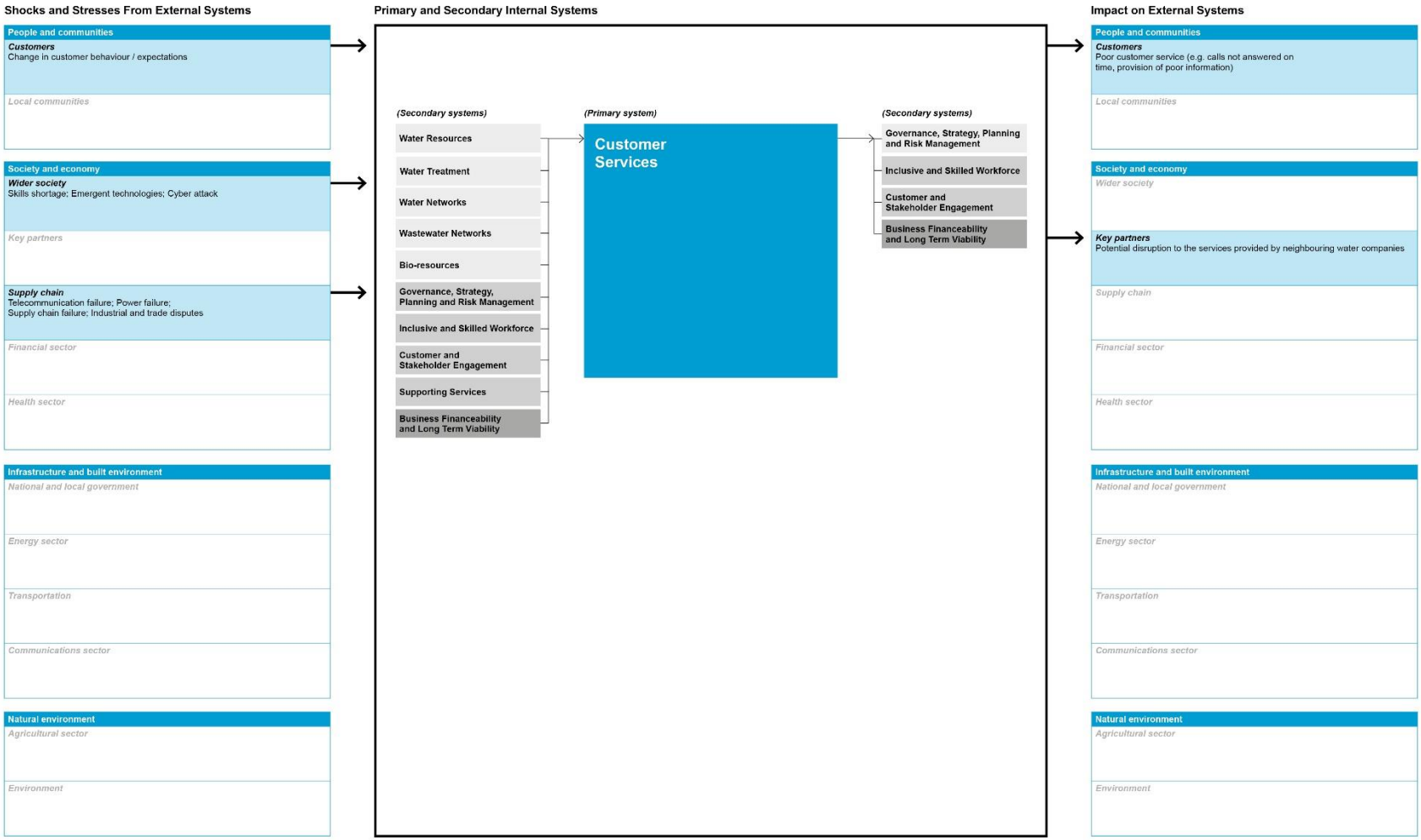


Resilience systems
Water Networks

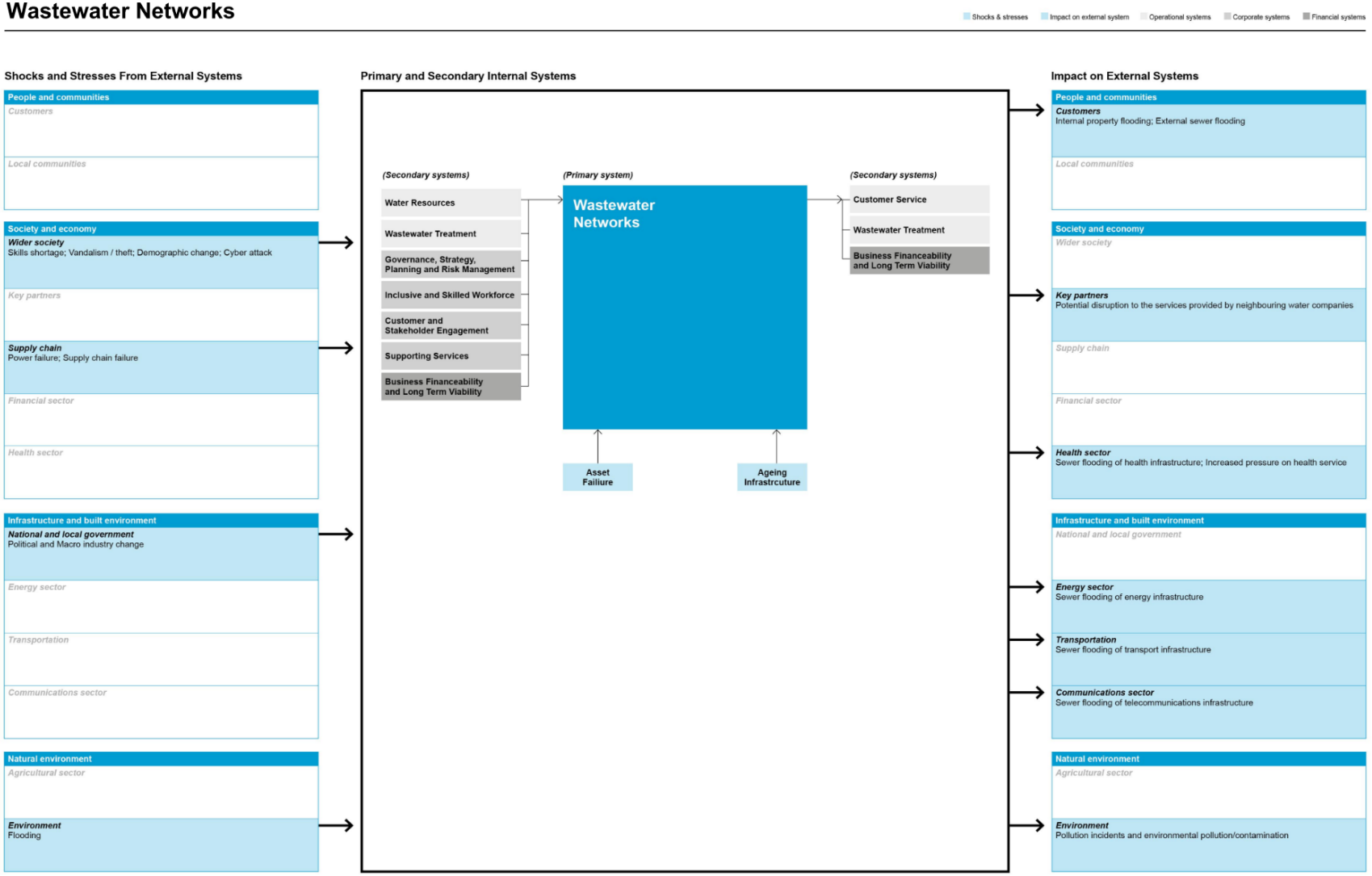


Resilience systems
Customer Services

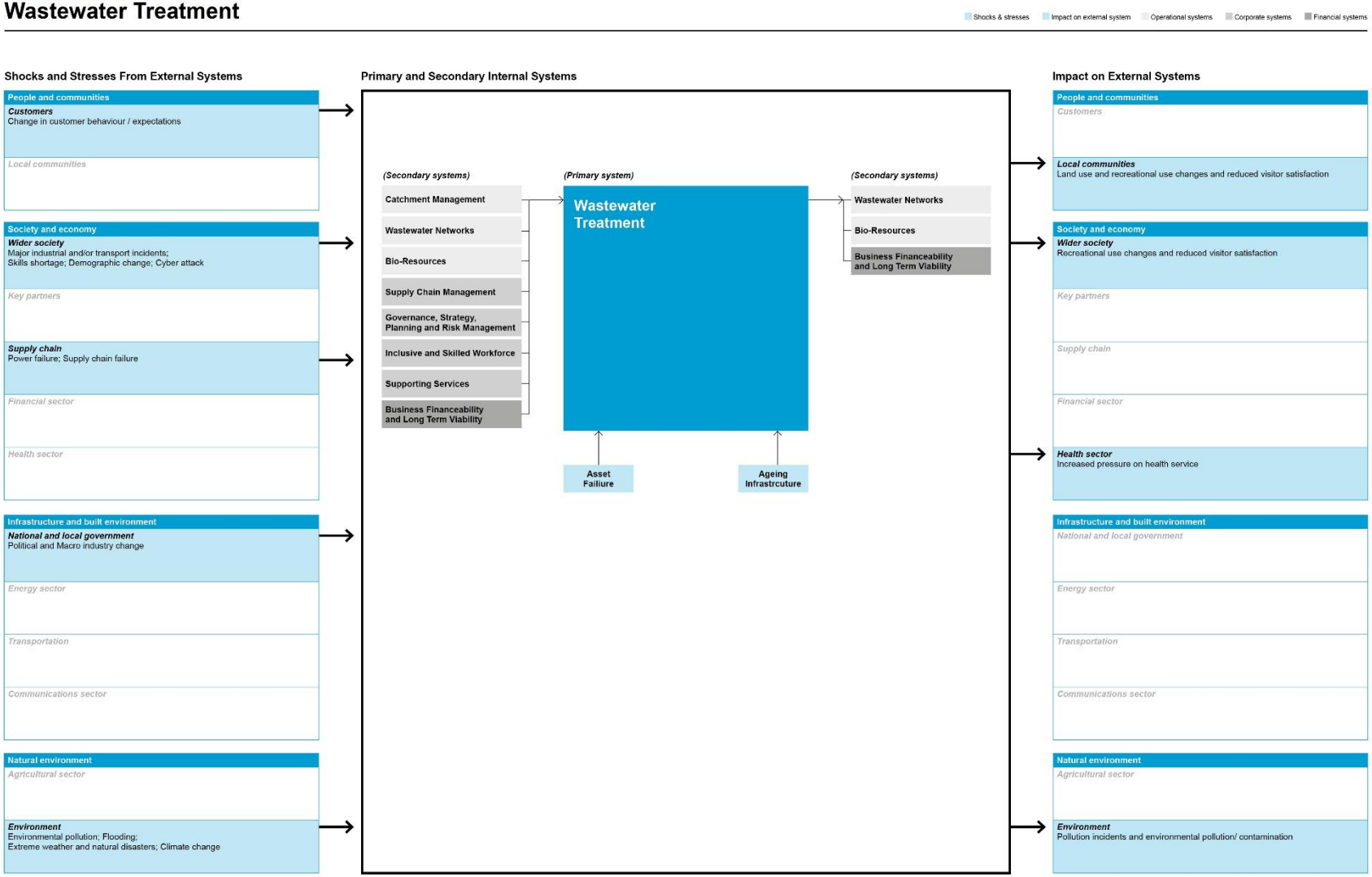
Shocks & stresses | Impact on external system | Operational systems | Corporate systems | Financial systems



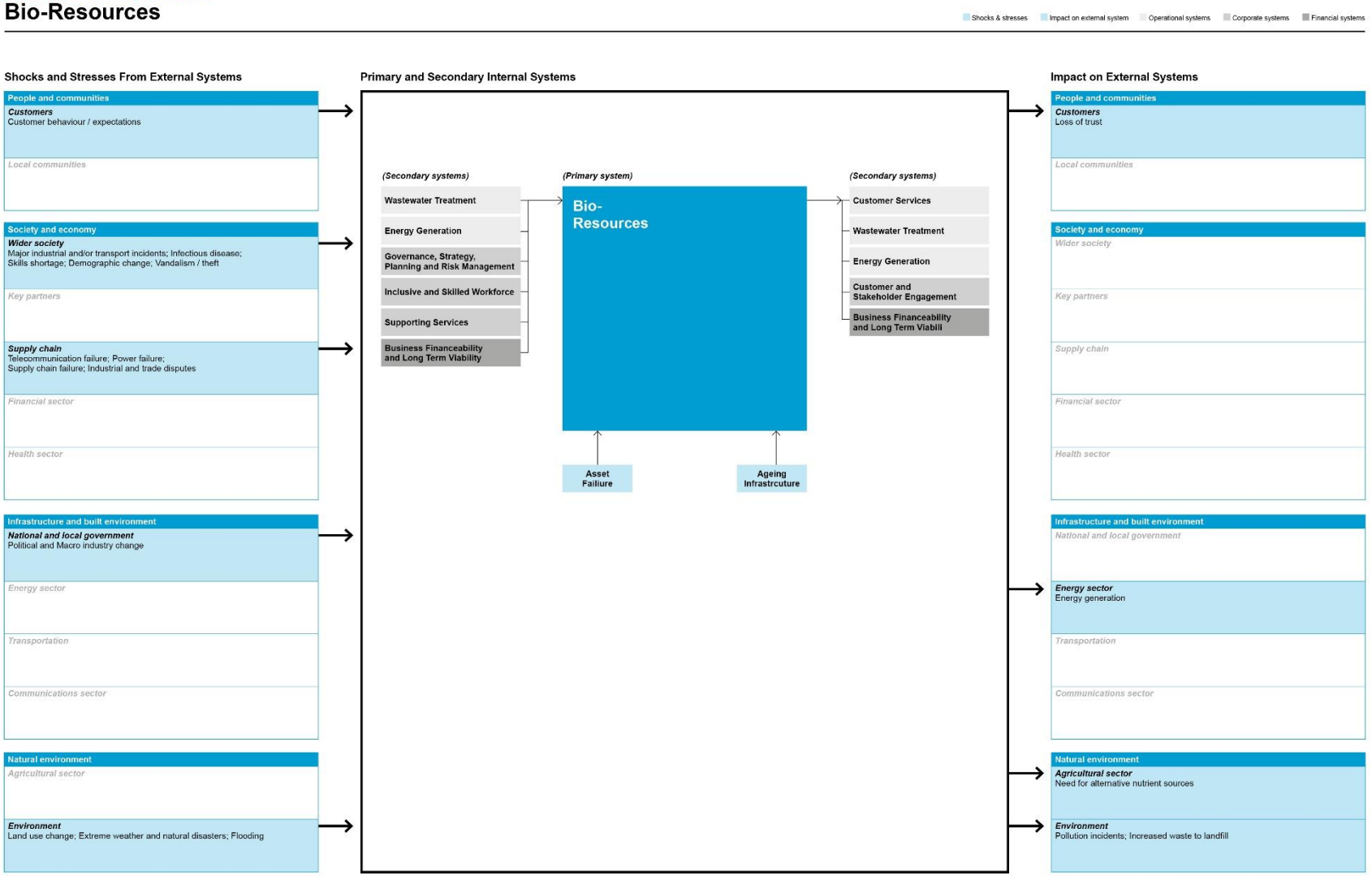
Resilience systems
Wastewater Networks



Resilience systems
Wastewater Treatment

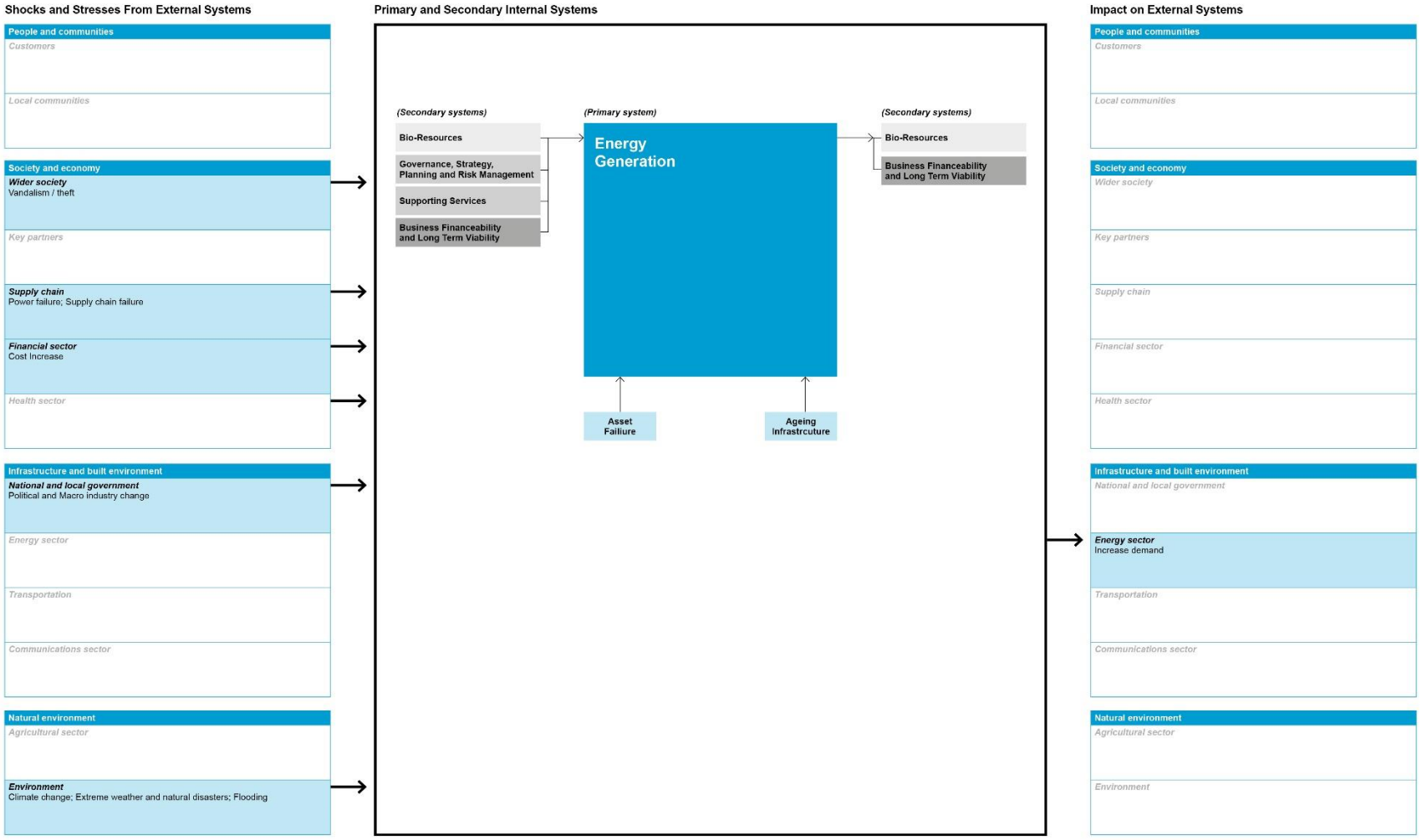


Resilience systems
Bio-Resources

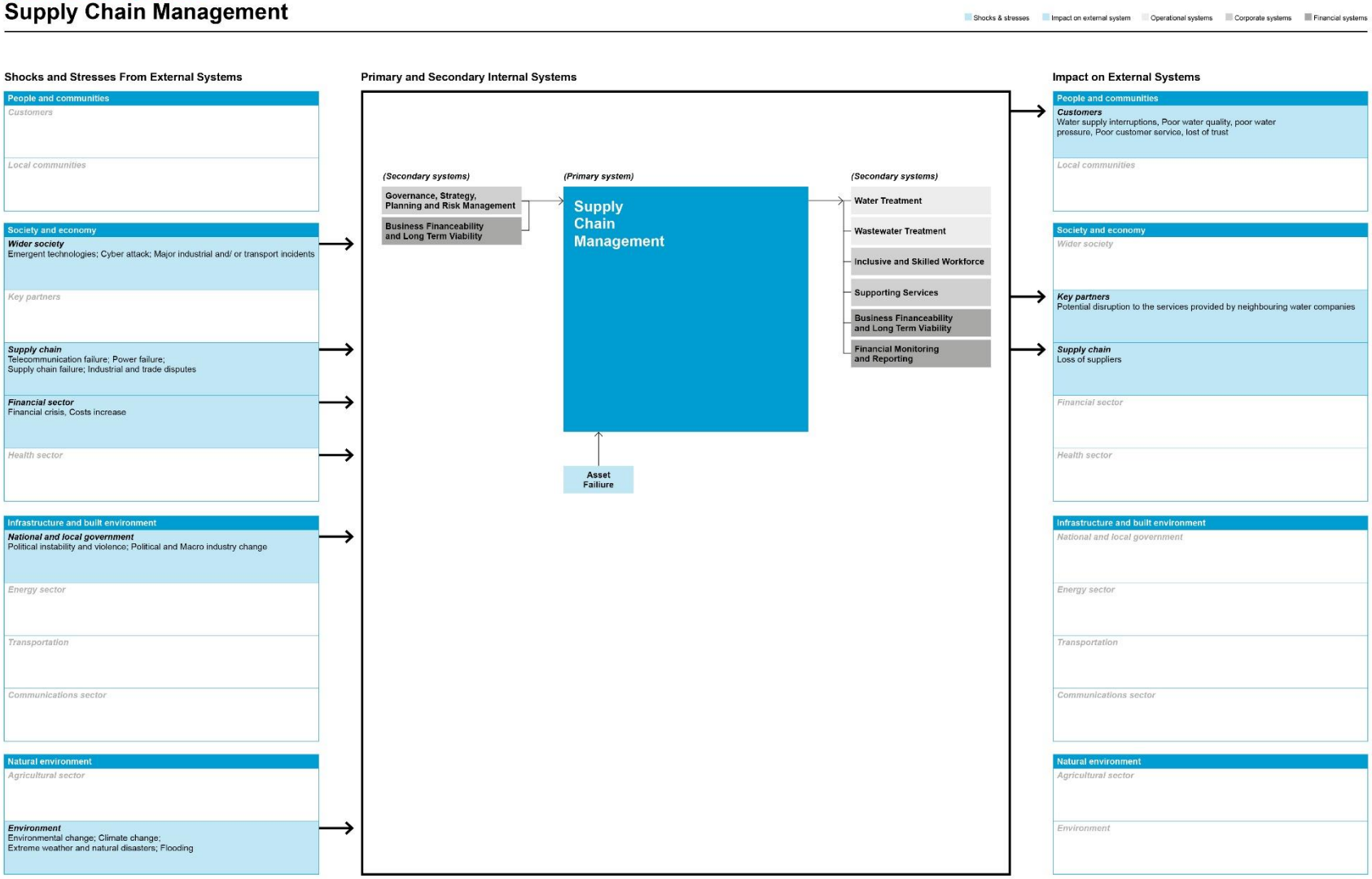


Resilience systems
Energy Generation

Shocks & stresses | Impact on external system | Operational systems | Corporate systems | Financial systems

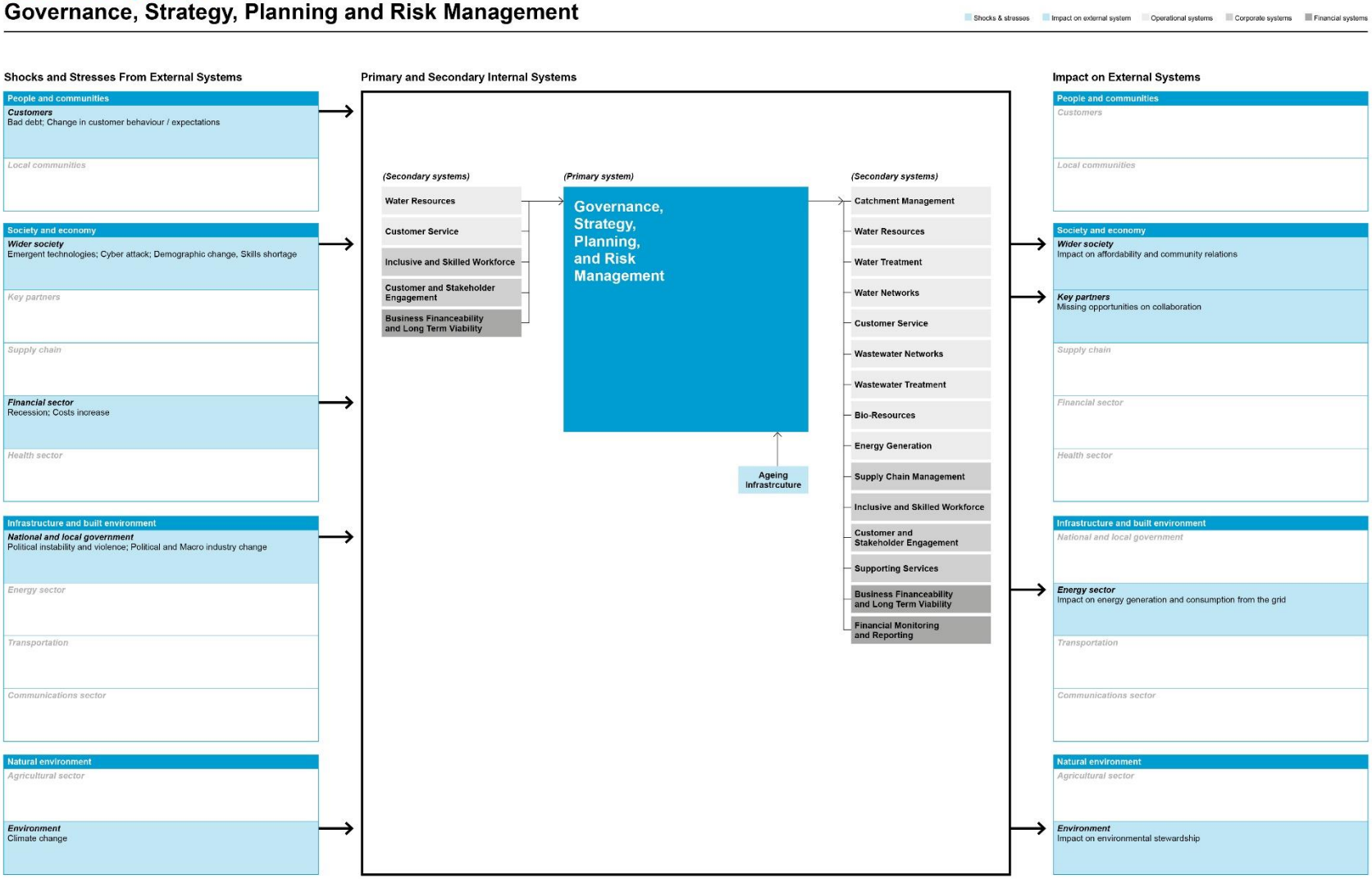


Resilience systems
Supply Chain Management

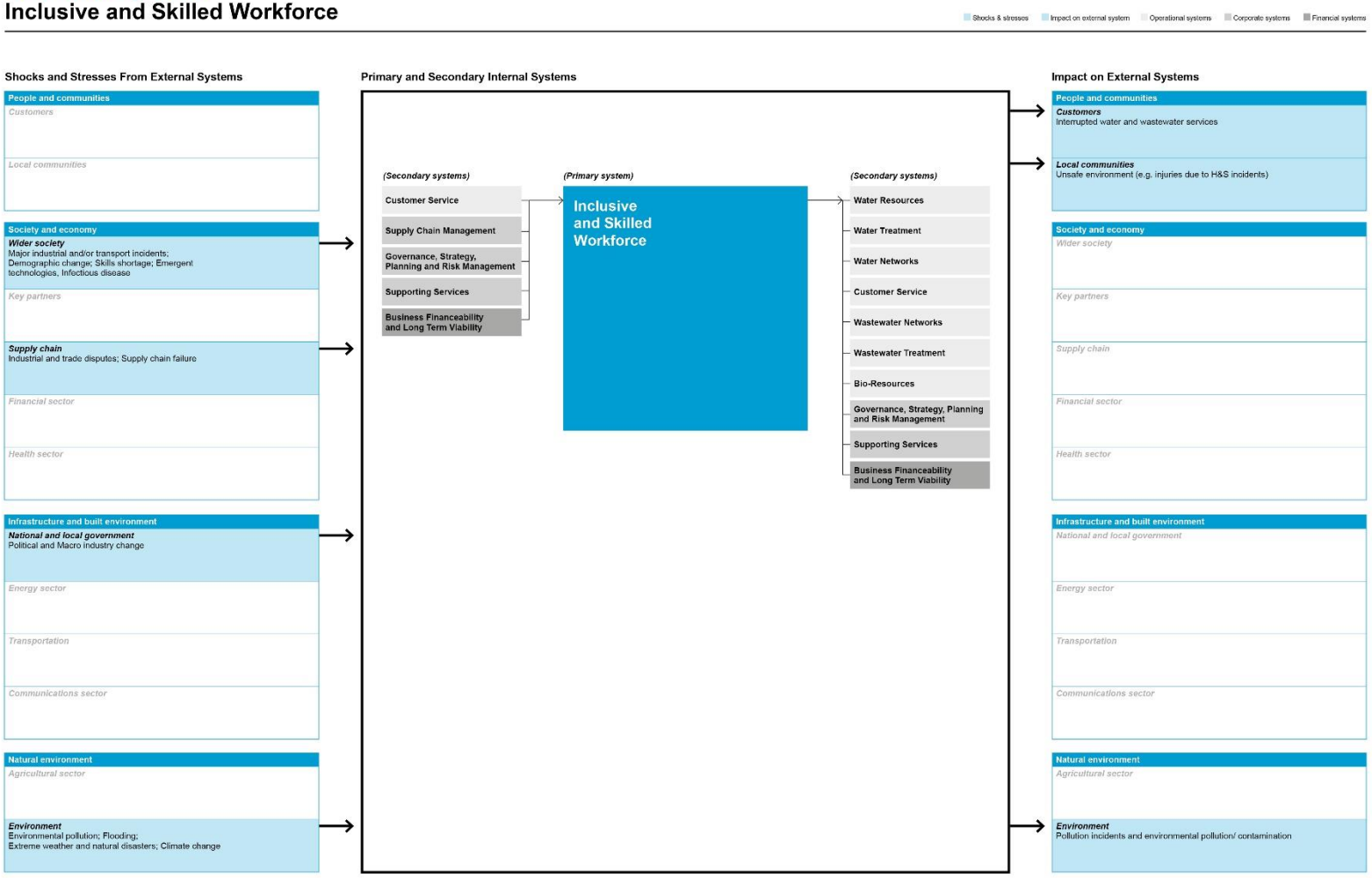


Resilience systems

Governance, Strategy, Planning and Risk Management

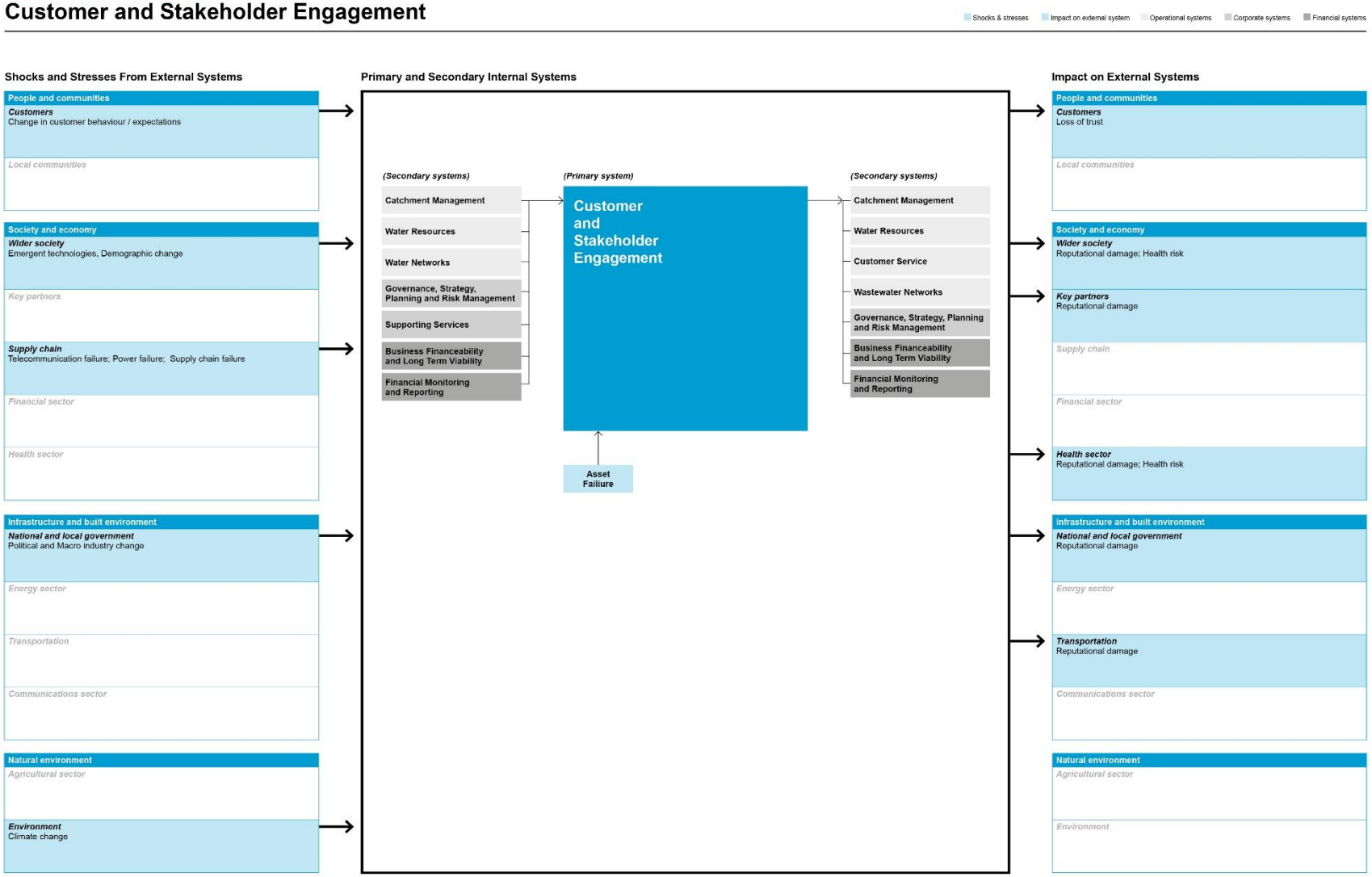


Resilience systems
Inclusive and Skilled Workforce

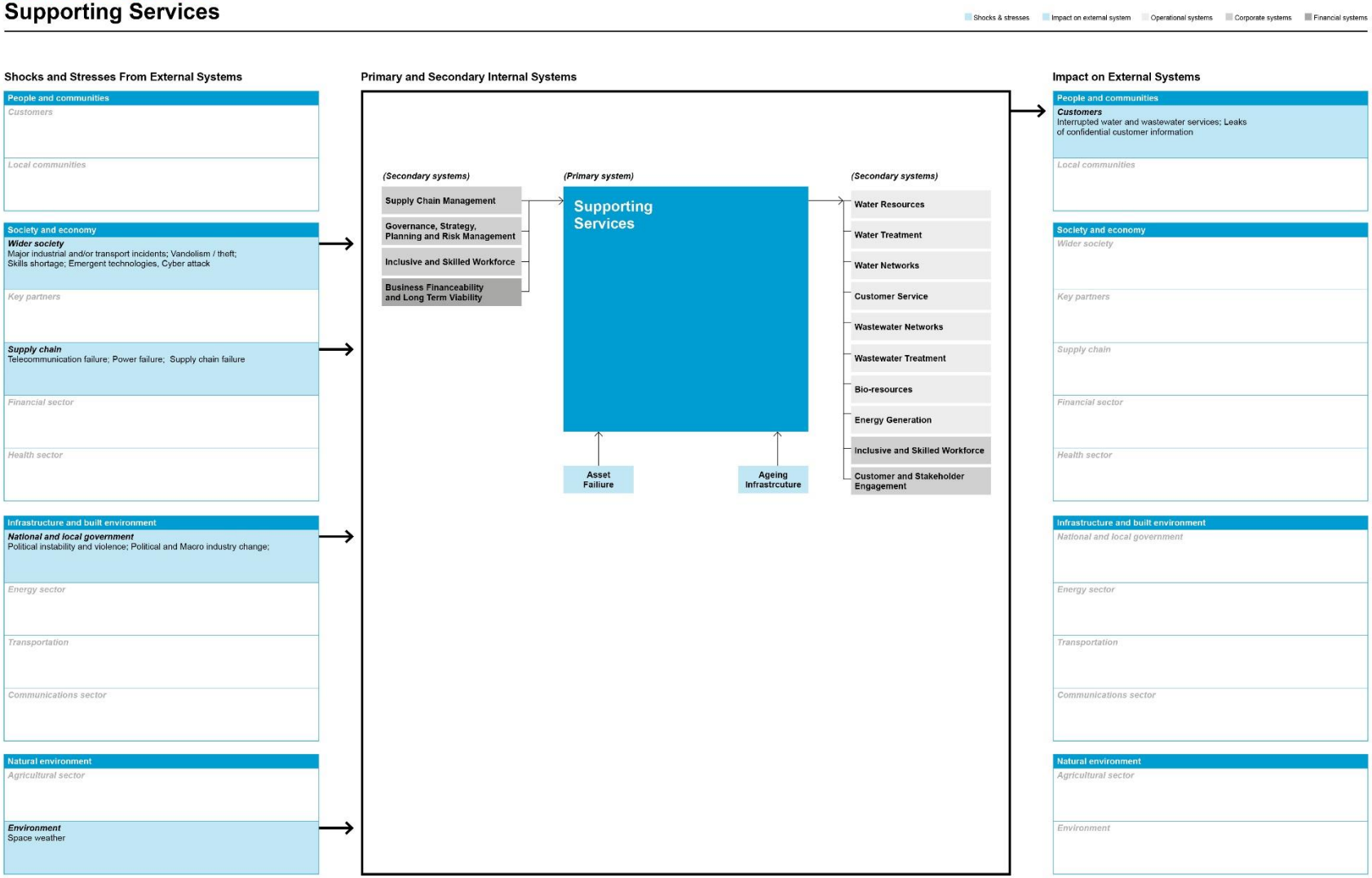


Resilience systems

Customer and Stakeholder Engagement

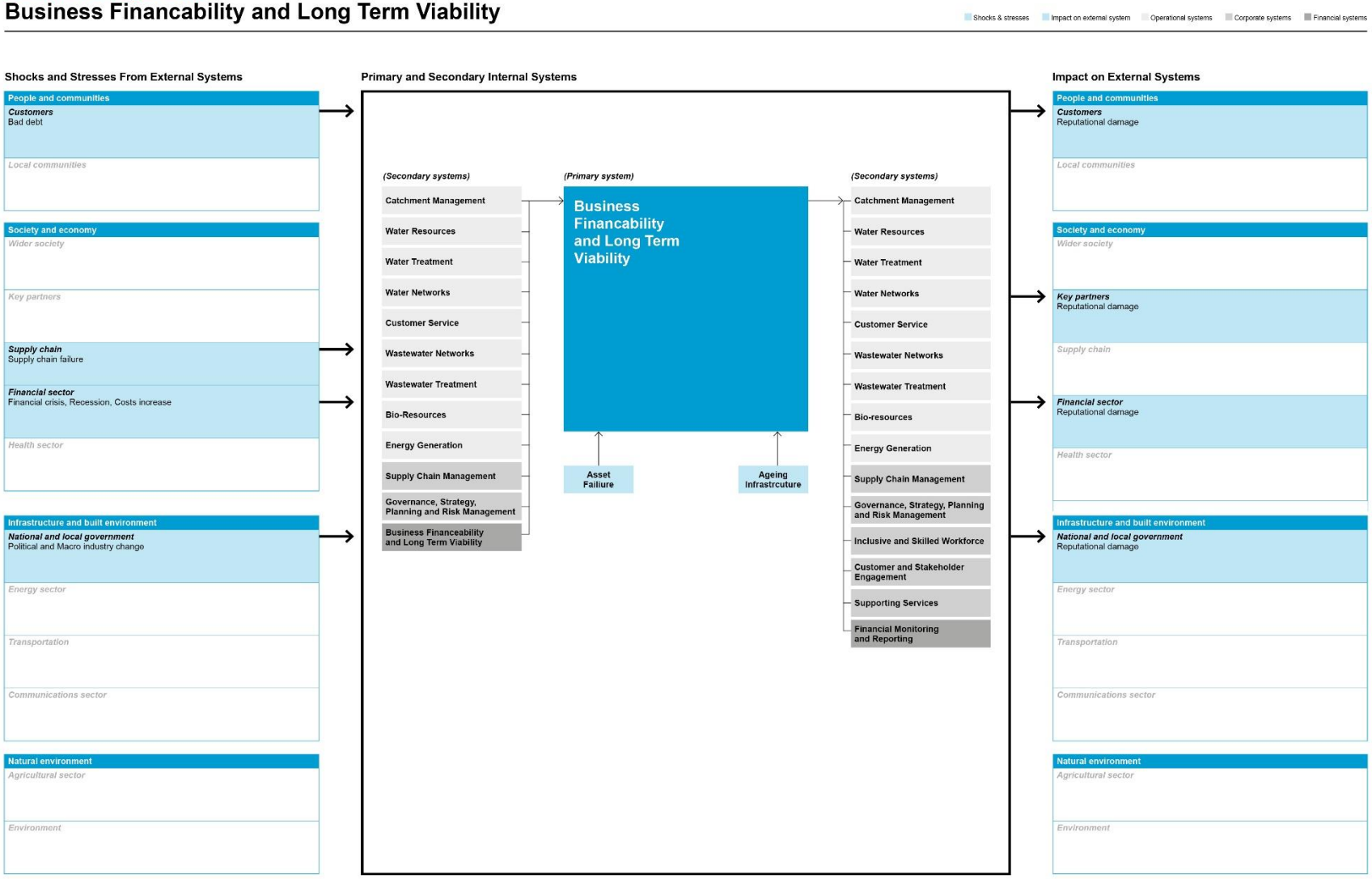


Resilience systems
Supporting Services



Resilience systems

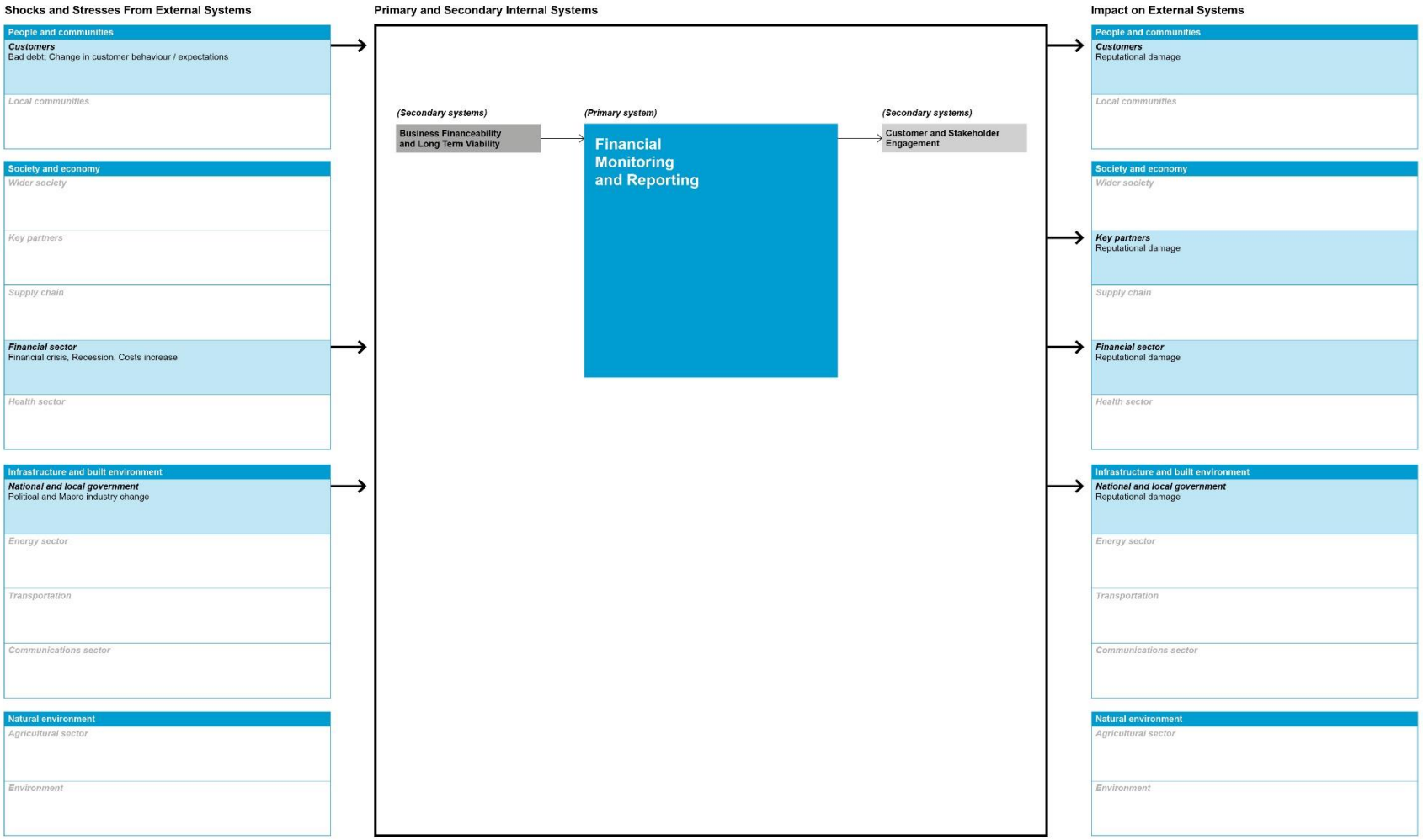
Business Financability and Long Term Viability



Resilience systems

Financial Monitoring and Reporting

Shocks & stresses | Impact on external system | Operational systems | Corporate systems | Financial systems



Appendix F. Resilience Maturity Assessment Example

The resilience maturity assessment is presently ongoing. A draft example of the assessment on our Customer & Stakeholder Engagement system is illustrated below. This is a snapshot of our progress to date.

Status: Work in Progress			
Customer & Stakeholder Engagement:			
Score:	3.1	3.6	
Priority Shocks and Stresses	Now	AMP7	Reason for the score
Political and Macro industry change	3	4	The system has standard level of protection (in line with industry standards) in place against the shock or stress being considered. Wessex Water actively participate in wider groups (including catchment partnerships, futures panel) and undertake stakeholder engagement to pro-actively respond to political and macro industry change. Wessex Water are supporting wider social and environmental programmes (e.g. water use reduction, Water Citizen Project and Wessex Community Foundation) recognising wider industry changes.
Climate change	3	4	The system has standard level of protection (in line with industry standards) in place against the shock or stress being considered. Stakeholder engagement work is undertaken across catchment partners, developers, LAs and customers to promote behavioural change (e.g. water reduction programmes) pro-actively respond to potential implications of climate change. Work with Futures Panel is expected to highlight challenges associated with climate change (amongst others).
Emergent technologies	3	3	Activities implemented consistently over a number of years. Wessex Water use technology like social media to look at customer trends, undertake engagement and monitor social media. Wessex Water are developing improved communication and platforms, including a new app, in response to continued digitalisation. Innovation team collaborate with Universities to remain at forefront of emerging innovations.
`Demographic change	3	4	The system has standard level of protection (in line with industry standards) in place against the shock or stress being considered. Key interventions include a Young Peoples Panel and providing training to customer representatives to deal with older people.

Customer behaviour / expectations	4	4	Activities implemented consistently over a number of years, with a coherent strategy and approach to monitor customer behaviour and expectation change - including stakeholder engagement on long-term strategy, business plans and annual assurance statements, communications strategy and customer participation and behavioural engagement strategy. Your Say Your Future programme enabled nearly 80,000 customers to make their voices heard in the development of the 2020-2025 Business Plan. Approach is reflective - with constant feedback driving plans and programmes. Engagement is undertaken with customers, developers, LAs, landowners. Beyond this, Wessex share updates on Social Media - but rely on staff doing it for their local groups. Customer sentiment tracking is undertaken through major media channels, with a monthly publication of trends. Further measures aim to promote behavioural change including: customer water usage reduction programmes, Money Matters Scheme and Wessex Community Foundation.
Power failure	3	3	Evidence suggests standard protection to this shock - including multiple media platforms and on-going nature of stakeholder engagement. Wessex communicate with customers via SMS to report any incidents.

Appendix G.

MOTT MACDONALD

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Assurance the 2020 Resilience Action Plan

04 September 2020

Dear Neil,

I reviewed your draft 2020 Resilience Action Plan (RAP) that you are required to produce by Ofwat on an annual basis. This is the second version of your plan, following the first publication last year. The revised plan reflects changes made after feedback from Ofwat in its 2019 Final Determination (FD19) and as a result of progress made in the implementation of actions identified in your 2019 RAP.

This letter sets out the scope of my audit, my findings, and my concluding assurance statement.

Scope and approach

My scope was to review the plan to determine if the 2019 FD feedback provided by Ofwat has been adequately addressed and that progress made in the implementation of actions over the last year has been adequately explained.

The review consisted of a desktop familiarisation with the two existing RAP documents and a 2-hour audit in which you provided an overview progress made on implementing actions identified in the 2019 RAP (via a Power Point presentation) and overview of the 2020 RAP contents and changes that have been made since FD19.

I did not conduct a full in-depth review of the RAP to determine its credibility, nor any benchmarking to determine is quality compared to RAPs produced by other England and Wales water companies.

Results and findings

Implementation of 2019 RAP actions

Seven high level actions were identified in your 2019 RAP, including Drinking Water Safety Plans and Water Resource Management Plans, both of which are on-going programmes not implemented directly as the result of the RAP but which contribute to resilience.. Those two plans were not reviewed for this audit.

The remaining five actions will be implemented as a result of the RAP. These include:

- Baseline resilience maturity assessment;
- Service measure framework;
- Resilience metrics;
- System impact assessment approach; and

- Risk and resilience framework

I consider that you have made good progress on the implementation of the five actions. You provided evidence to show that the baseline maturity assessments for all critical systems is now complete, the current and AMP7 expected scores for each system are provided in the RAP. Both the service measure framework and the resilience metrics have been developed, although you may need to ensure that there is sufficient alignment between the two.

The system operational resilience assessment approach is completed, and the assessment tasks have been started (including determining what level 4 maturity looks like, which is the level you are aiming for). You stated that on-site assessments will commence from early next year.

The risk and resilience framework consists of a set of tools to aid decision making leading into the development of the PR24 plan. The majority of the tools are in process of being developed or procured. You showed me a copy of the risk and resilience programme in the audit, which showed that all the tools would be in place by 2022, in time for PR24 planning.

2020 Resilience action plan

The 2020 version of the RAP is an incremental change from the first version released in 2019, the majority of the changes being in Section 4 onwards which describes the current status of action plan and the next steps.

Ofwat identified four key areas where the RAP could be improved:

1. The RAP does not address all of the feedback points from the Initial Assessment of Plans (IAP);
2. Baseline maturity is not complete;
3. Limited evidence of the plan being applied in practice; and
4. Does not address medium to long-term activities.

You stated that you have addressed the first two actions and provided references to place in the RAP where that is documented. You stated some progress has been made against the 3rd feedback point as this is directly related to the implementation of the system impact assessments and the risk and resilience framework, which is on-going, but not yet complete. You also stated that the 4th feedback point will not be addressed until the new Strategic Direction Statement (SDS) is finalised next year, as it will provide direction to the longer-term activities that need to be set out in the RAP. I consider this to be a pragmatic approach, although consideration should be given the development of a long-term resilience strategy to inform the corporate SDS.

Recommendations

I **recommend** that before publication of your 2020 RAP you include a table to clearly set out how Ofwat's FD19 feedback has been addressed.

I **recommend** the following before publication of your 2021 RAP:

1. Review alignment between the Service Measure Framework (SMF) and Resilience Measures

2. Consider development of forward looking (leading) measures, particularly in the area of asset health

3. Further explore the use of digital solutions and tools (such as digital twins) where it is cost effective to do so and is beneficial to improving resilience

4. Consider development of a long-term resilience strategy to inform the corporate SDS

Further minor **recommendations** to the 2020 RAP were made during the course of the audit, communicated separately be email at conclusion of the audit.

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Document record

Issue	Date	Author	Checker	Approver	Purpose
1	04 Sep 20	M Plaha	AIJ Heather	AIJ Heather	First issue

Use of this document