

Securing resilient water resources for South East England – consultation on our resilience framework

June 2020

Water Resources South East



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Section 1: Introduction

Water resources are coming under increasing pressure as we strive to meet the needs of a growing population, adapt to climate change, reduce abstractions to enhance our environment and increase our resilience to droughts.

To meet these challenges, and others which may arise, Water Resources South East (WRSE) is developing a multi-sector, regional resilience plan for the South East.

This plan will take a long-term view, looking ahead to 2100, and consider the water we need to use at home and at work, as well as that required by agriculture, to generate electricity, for industry, recreation, the environment and to support the well-being of society and growth.

It will move us from a focus on securing public water services and managing the risk of droughts, to securing wider resilience across a series of connected water systems.

Our plan will seek to:

- Ensure there is enough water to serve the growing population and support growth in the economy
- Address the impacts of climate change on demand for water and how much is available
- Improve the environment by leaving more water in the region's rivers, streams and underground sources
- Increase the region's resilience to severe drought and other extreme events.

We face increasing uncertainties and the world is becoming ever more complex, so we believe it's time to take a wider view of water services. Water resources don't sit in a self-contained bubble but are part of a complex system, so it's important we understand how our choices affect the resilience of services across the South East.

To make sure our plan is resilient to future shocks and stresses, both the ones we can forecast and those we can't, we're planning to develop and test our plan using a new resilience framework.

This will allow us to appraise choices for our plan in terms of resilience, as well as for cost and impact on the environment. We plan to publish our draft regional plan for consultation in early 2022 and this year we're consulting on our approach.

In this document we're setting out what our resilience framework is, why we chose it and how it will be applied. We'd like to hear what you think so please share your feedback by July 3, 2020.

We have set up a dedicated engagement website where you can find out more about the resilience framework, read a technical overview and answer the questions we pose in this document using our online survey. Visit our engagement site at <https://wrse.uk.engagementhq.com/resilience>.

For more information on WRSE and its members, the development and purpose of the regional plan and how it fits into the national picture, please visit wrse.org.uk.

Section 2: Our move to resilience

The multi-sector, regional resilience plan we are developing to secure water resources for the South East until 2100 will be a step change on our previous approach to planning.

In the past, water resource planning has concentrated on a single ‘hazard’ – a shortage of water caused by droughts – and solutions have been selected based mainly on cost and their impact on the environment.

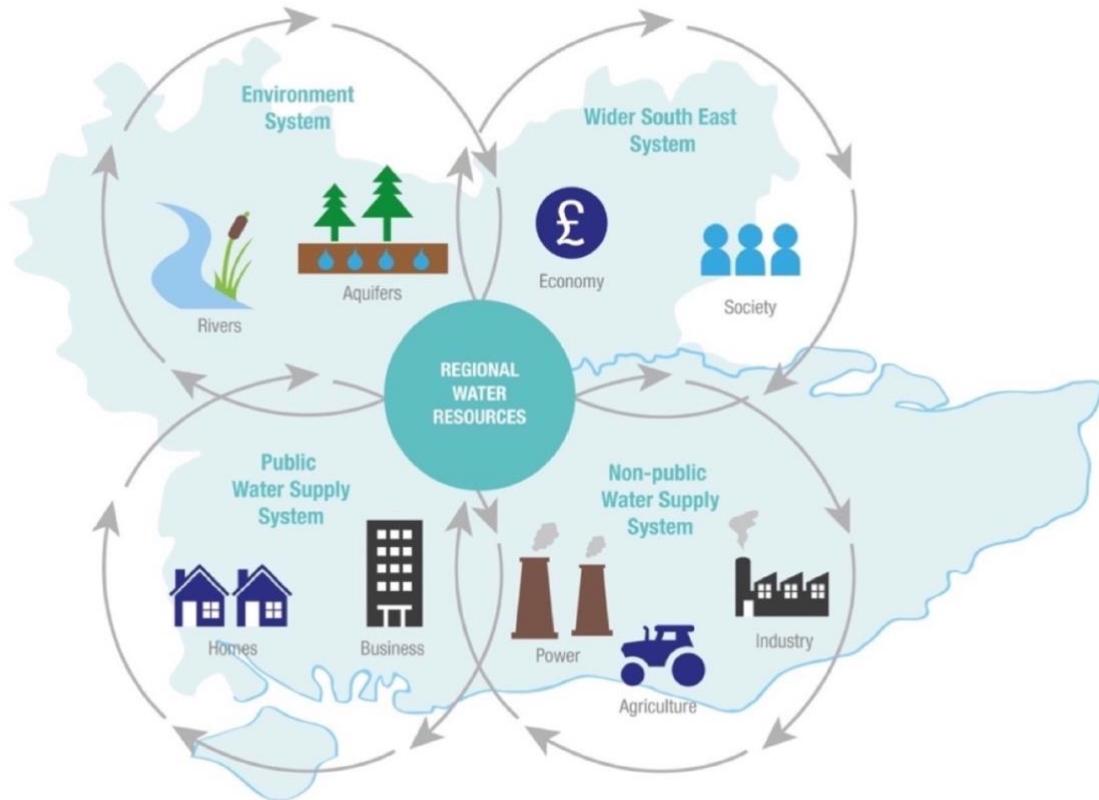
Our proposed new approach will consider not only how public water services would hold up during a range of droughts, but how effectively they could be maintained when faced with other unknown and unplanned for shocks and events.

Furthermore, the resilience of public water services will also be considered as part of a bigger picture of resilience – in terms of its impact on the resilience of other related and connected systems – non-public water supply, the environment and the wider South East (in terms of society and its economy).

Our approach will also open the doors to involve other sectors in the water resource planning process and support them to make informed choices about priorities for the future, including any trade-offs between increasing resilience, the environment and keeping bills affordable.

We have identified four key systems to assess for resilience to inform our multi-sector resilience plan, all of which are interrelated and interconnected, as listed below and shown in the diagram on the next page.

- Public water supplies, as supplied by water companies to domestic and business customers
- Non-public water supplies, e.g. for industry, agriculture, generation of power and recreation
- Our environment, e.g. rivers, aquifers, streams
- The wider South East and its economy, society, prosperity.



Question 1. Are the four systems we've suggested the right systems for a regional, multi-sector resilience plan? If not, which other systems should we consider?

"As the world gets increasingly complex and challenging, with new threats from pandemics to human caused climate change, it is more important than ever that we rethink how resilient our critical systems are, especially those that provide us with safe, reliable, and affordable water. These new planning efforts, and the actions taken as a result, can help us meet these new threats in a timely and effective manner." Peter Gleick, founder of Pacific Institute

Risk management v resilience

Risk management tends to look at specific threats and challenges where we have a good idea of the probability of it happening and we have a good knowledge of the system facing that challenge. For example, considering how reservoirs or desalination plants could operate in a range of droughts.

Resilience builds on risk management and better prepares us to face more of the unknown pressures in the future that we may face because it looks at combinations of risks rather than single ones. Improving resilience increases our ability to withstand other events that we're not prepared for, such as Freeze Thaw in winter 2018 and the heat wave driven peak demands in summer 2018, or multiple events happening at the same time. It allows us to adapt and evolve to become even more resilient in the future.

Section 3: Our approach to developing a resilience framework

Our starting point for considering resilience in our plan was to consider the services we want to provide under a range of shocks and stresses. We then looked at the factors that would affect the ability of the core systems – public water supply, non-public water supply and the environment – to provide these services.

The next step was to develop a resilience assessment framework which could measure how the options we're considering could support these when we're faced with unexpected challenges.

We already assess some levels of service in water resource planning, i.e. those driven by licence requirements or Levels of Service* commitments to customers, but there are many we don't and it's these we want to assess through the new resilience framework.

The diagram below shows three of the systems we're assessing, the services they provide and measures which could reduce the risk of failure:

SYSTEM	Public water supply	Other sectors	Water environment
SERVICE	Secure supplies that maintain capability irrespective of hazards that affect resource availability	Predictable availability of water to support social and economic activities	A healthy water environment that reduces the impact of naturally occurring stress events on aquatic ecology
GENERIC MEASURES THAT CAN MITIGATE OR AVOID SERVICE FAILURE	<ul style="list-style-type: none">Ensure Emergency Drought Orders are used no more than the required frequencyPlan resources so that the frequency, timing and management of other drought interventions is predictable and reliableReduce the risk of infrastructure failure due to other hazards during events (such as drought or freeze/thaw) which limit resource availabilityMinimise the duration and impact of water resource-led restrictions and failures	<ul style="list-style-type: none">Minimise the use and impacts of water company drought interventions on other sectorsReduce the occurrence of flow or level conditions that limit water availability for other sectorsEnhance monitoring and warning of flow or groundwater conditions that could lead to restrictions (providing time to adapt during shock events)Enhance storage and promote rapid trading to improve persistence and flexibility	<ul style="list-style-type: none">Support flow regimes and habitats that allow aquatic ecology to persist and recover rapidly from stress or shock eventsPromote management regimes that provide support to aquatic ecology during shocks/stressesEnsure that abstraction during drought events remains within planned limits as much as possible (reduce reliance on Drought Orders and Permits)

* All customers of water companies are entitled to guaranteed minimum standards of service, as laid down by the Government.

How we fit into the national picture on resilience

Our move to a wider resilience plan aligns with the recent publication of the [National Infrastructure Commission's Framework for Resilience 'Anticipate, React and Recover'](#). The Commission's report is an important step towards greater resilience in the UK and we've worked hard to make sure our approach supports their three key recommendations:

- The Government should publish a full set of resilience standards – our multi-sector regional resilience plan will provide vital information to help Government develop evidenced-based resilience standards, not just for public water supply but for all sectors which rely on this vital but vulnerable natural resource.
- Infrastructure operators should carry out regular and proportionate stress tests – our plan will use stress testing, particularly for sectors with limited data and information. It will also provide analysis to inform stress testing for a wide range of shocks and stresses.
- Infrastructure operators should develop and maintain long-term resilience strategies – our plan will be the sector's first regional resilience strategy and will directly inform investment decisions for security of supply and environmental delivery.

Our multi-sector regional resilience plan is being developed as one of a number of regional plans in England and in line with the Environment Agency's [National Framework for Water Resources 2020](#) – which sets an ambition to improve resilience to drought by reducing the need for rota cuts and standpipes to a probability of 1 in 500 (a 5% chance every 25 years).

"WRSE's work on securing safe water supplies over the long term aligns well with the Commission's recent report on infrastructure resilience. Disruption to vital infrastructure can create untold problems for families and businesses – and we know that these risks will be exacerbated by climate and other changes. The whole sector needs to work together to embed clear resilience standards, supported by stress testing and long-term planning, to prepare for an uncertain future."

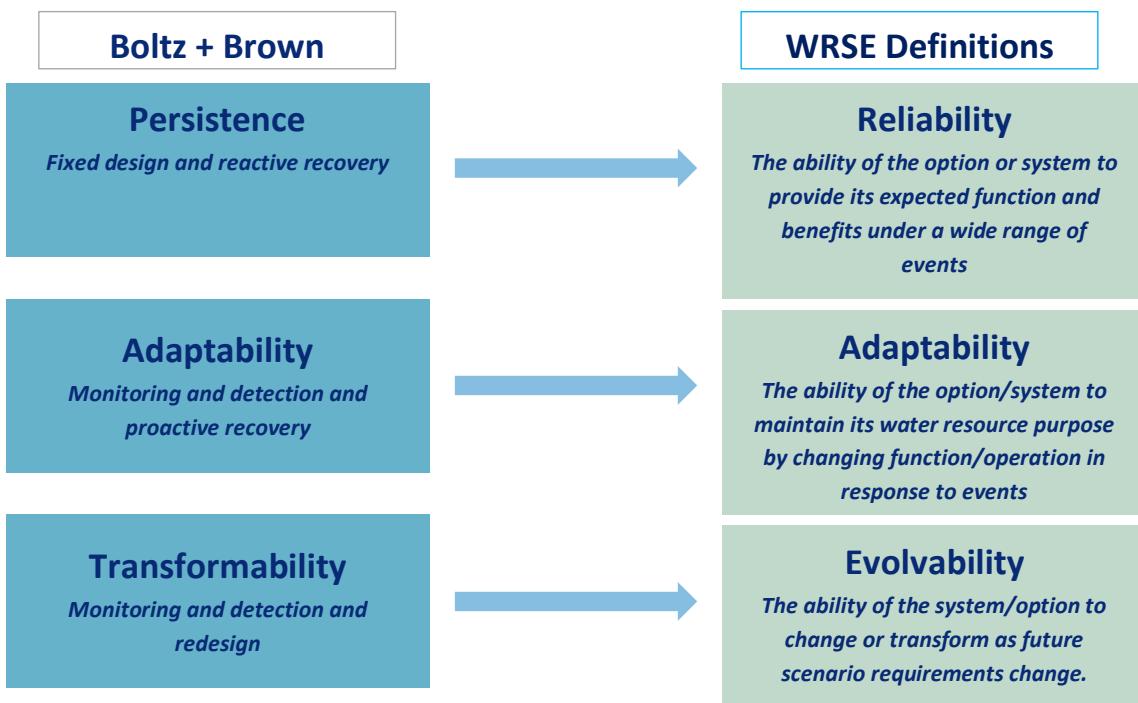
Sir John Armitt, Chair of the National Infrastructure Commission

Section 4: Our chosen resilience framework

We reviewed a number of existing resilience frameworks to find the one we think is the best fit with our work to develop a best value, multi-sector regional resilience plan. This included reviewing best practice in the water sector and other sectors, both in the UK and further afield.

Following our review, we chose [Boltz and Brown's Resilience by Design](#) as the best approach to tailor for our needs. This was because its three tests consider the aspects we think are most important for water resources.

The diagram below shows the three tests of the Boltz and Brown system and how we have refined these for our multi-sector regional resilience plan.



This resilience framework will help us to look at resource options and systems to evaluate how reliable they will be in the face of challenges, how they could adapt and how they could evolve to become more resilient.

Reliability is the capability of something or someone to do what you want them to during challenges or shock events (e.g. supply water or save water).

Example: The simpler a resource is the more reliable and less vulnerable it is. Groundwater in the South East tends to be more reliable than surface water (rivers) during a drought and a reservoir might be more reliable than a complex desalination plant.

Adaptability is the ability of something or someone to change so they can still do what you want them to.

Example: A water supply network with good interconnectivity and a good mix of supply types (abstractions, storage, water recycling, catchment solutions) is more likely to be able to be used differently to maintain supplies under a wider range of shocks and stresses than an independent network which relies on one source of supply.

Evolvability is the ability of something or someone to transform so it can continue to do what you want it to do, even when your requirements of it change.

Example: Water demand management and the way people use water can evolve through behaviour change and water-saving equipment. A reservoir cannot change its design and is not easy to increase in size, whereas a desalination plant could have another module added or change its treatment.

Question 2. Do the core characteristics of our framework – Reliability, Adaptability and Evolvability – cover the key elements of resilience? If not, what other characteristics should we consider?

Why did we choose this approach?

We chose this approach because it's quite generic and can be easily applied to water resource options and systems, as well as those in other sectors. It's also:

- a practical way to assess a large number of options
- practical to apply to combinations of options and their impact on water systems
- a simple way to undertake assessments and generate scores
- easy to align with uncertainties of future events and wider systems in the South East
- a good way to apply existing metrics and information into the assessments.

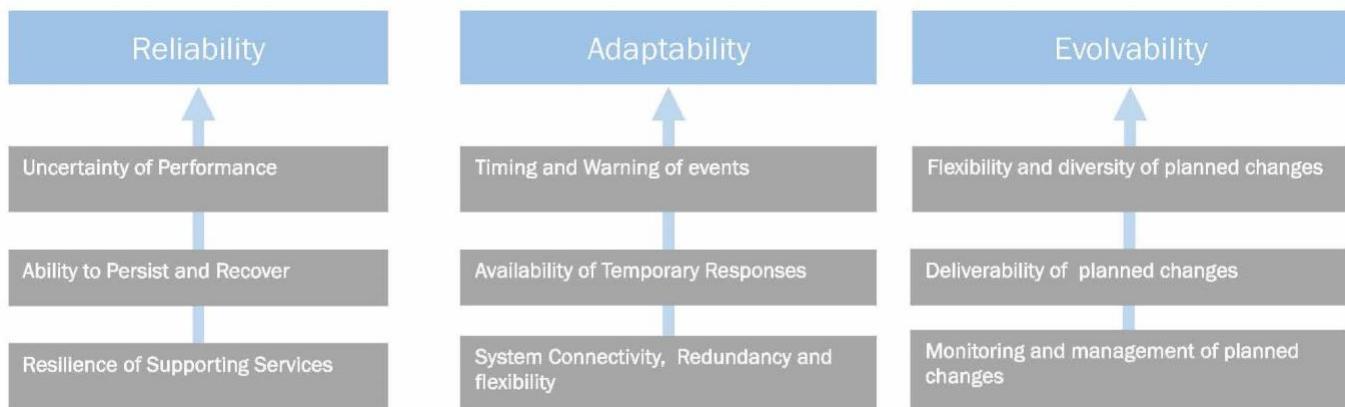
Question 3. Do you think looking at testing the resilience of options and systems in this way will help deliver a more comprehensive plan?

Section 5: How will we score resilience?

Each option and system will be evaluated for Reliability, Adaptability and Evolvability through a further set of sub-tests, so we can develop an objective and rounded view of their overall resilience.

These sub-tests were developed from analysis of the factors that support resilience across the public water supply, non-public water supply and environment systems.

We call these *metrics*, and the ones we propose to use are outlined at a high level below:

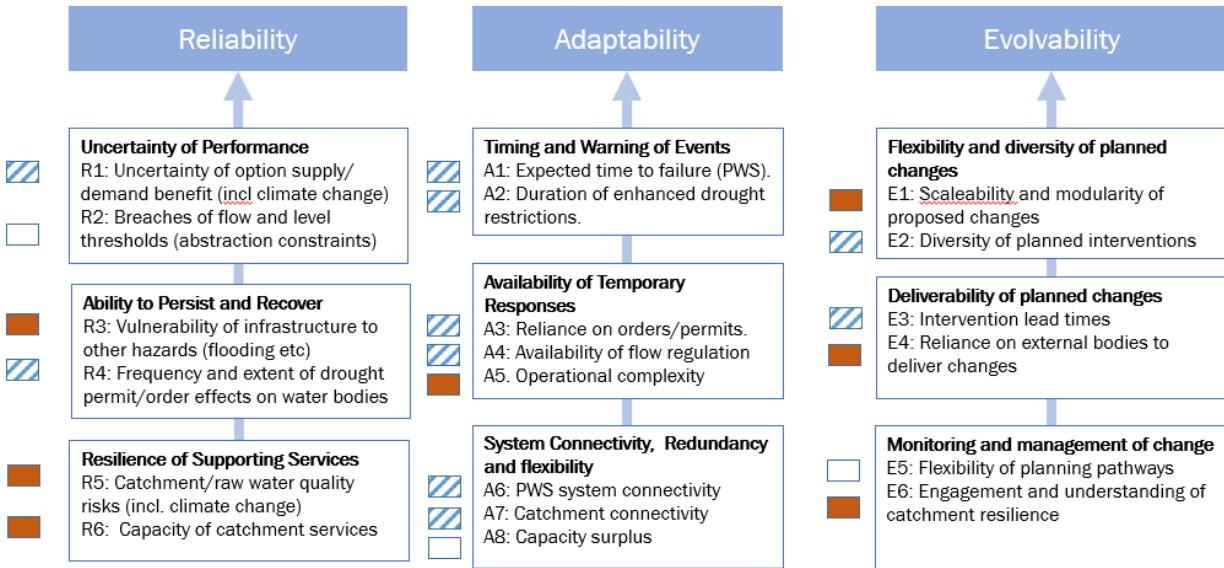


In reality, we need something more specific to measure against these metrics, so we've identified 20 potential *sub-metrics* to help us quantify the effect on resilience of each scheme, strategy and overall investment portfolio.

These are summarised on the next page.

Interaction with 'Best Value' decision making and environmental assessment frameworks

It's important to note there are a number of key aspects of resilience, relating to drought severity, the uncertainty of future supply and demand conditions and the environmental impact of proposed investments, which are not specifically covered by the framework described in this report. This is because they are already covered elsewhere within the 'Best Value' decision-making and environmental frameworks. This potential overlap has been mapped out as part of the creation of the resilience framework and the assessment metrics described here have been deliberately designed to ensure there are no gaps between the frameworks, while also avoiding 'double counting' of benefits.



Key:

Metrics that can be quantified objectively

Metric can be objectively quantified for individual options and then in combination at the portfolio level (i.e. investment plan level)

Metric can only be modelled in combination at the portfolio level

Metrics that require subjective assessment

Sub-metric would need to be assessed as part of the option development

Objectivity: **13 out of 20 (65%)** of potential metrics can be fully objectively modelled. The remaining seven require a structured, but somewhat subjective, assessment as they are too complex to fully model.

Note: there are fewer metrics for reliability and evolvability as some of the key aspects are already covered by the 'conventional' best value planning.

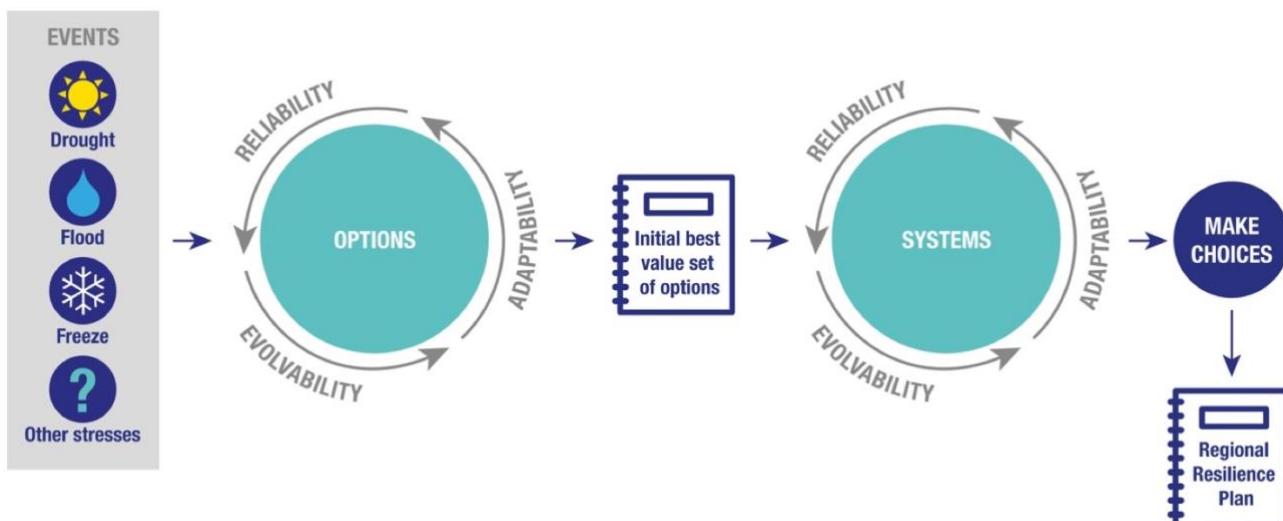
As each option or system is tested against these metrics it will be given a score. Where possible, we'll use objective metrics and these scores will be placed into one of five categories.

In some cases, we'll need to use subjective assessments, to make sure we include key factors which we think are important to maintain and promote the resilience of water resource services. The subjectively assessed metrics will also be in five categories, based on a descriptive guide.

We call this a *hybrid* approach and we're developing guidance on how to apply the framework and determine the scores. We'll share this with water companies and other suppliers and sectors to ensure we all take a consistent approach. The final scores will be summarised and used to evaluate the resilience benefits of the potential range of options for the best value plan.

Those benefits will then be mapped onto the four systems to allow customers and stakeholders to understand the scale and relevance of the impacts on resilience.

The diagram below shows how the resilience framework scoring will be applied:



Question 4: Are the sub-metrics we've chosen appropriate and, if not, which others should we consider? Do you think we should include metrics which can't be fully objective?

How this could work in practice (theoretical example)

An option such as recycling treated wastewater for drinking water might gain a high *reliability* and *evolvability* score. It's relatively reliable, as there is constant flow and it's potentially able to evolve rapidly with extra capacity or new treatment. However, the reliability could suffer if it is difficult to stop and re-start in the face of asset failure or other hazards, and the framework has been designed so people developing the option have to explicitly consider such issues. Such benefits would also need to be set against other decision-making factors, such as the operational complexity that is introduced, alongside its impact on the environment, cost to build and operate, CO₂ emissions and acceptability to customers, where it may score less well than other options.

Section 6: Where and when the resilience framework will be applied

We plan to apply the ‘resilience framework’ at two critical points in the development of our best value multi-sector plan.

The aim is to introduce resilience as part of our core assessments to develop an initial ‘best value’ plan, alongside other appraisals, including cost and environmental assessments, so it can be considered in a comparable way. In practical terms, the framework will be applied in steps four and five of our planning process:

Step one: Set out the policies the plan must deliver on and customers’ preferences

Step two: Define the challenges we need to meet

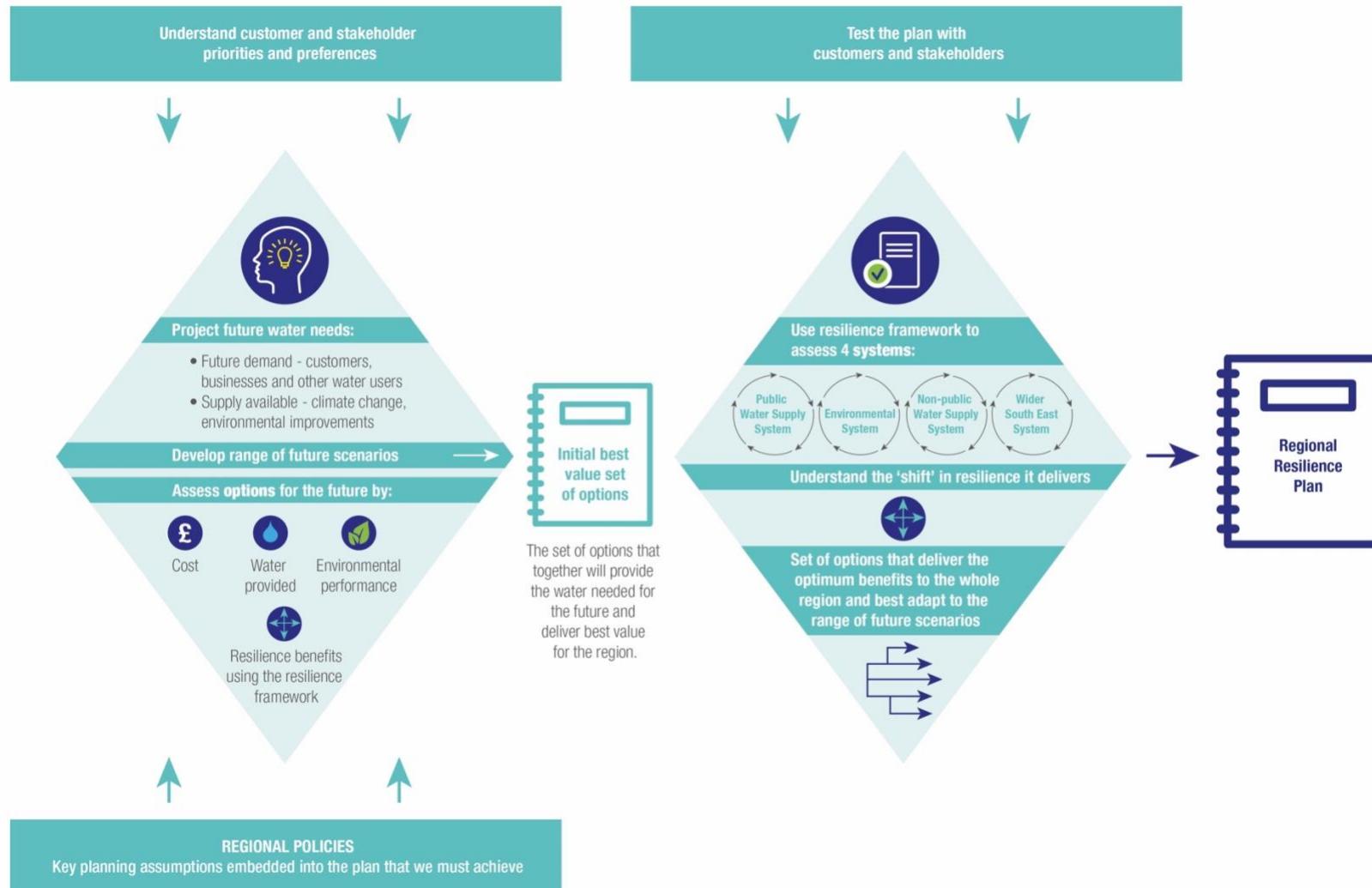
Step three: Consider a wide range of options which can help meet these challenges and choose which ones are feasible to take forward

Step four: Evaluate the options - the cost, the benefits, impact on the environment, water quality, how acceptable they are to customers and their resilience and ability to flex for the future

Step five: Apply these evaluations to the four systems and in partnership select the options which will best support the resilience of public water supplies, other sectors, the environment and the wider South East.

This five-step process will allow us to score the resilience of the water systems as they are today and be able to clearly demonstrate where they could get to by 2100.

The diagram on the next page shows how our resilience testing fits into the overall development of the plan.



Question 5. Do you believe changing our planning approach to a regional multi-sector resilience plan will help us plan better for future shocks and stresses

Section 7: Your feedback on our approach to assessing resilience

We've already been discussing this approach to developing a resilience plan with the water industry regulators and interested groups and we'll continue to do so. We've also enlisted an independent panel of experts to review our proposals.

To hear more views, we're consulting on our proposals until July 3, 2020. You can find out more, read our technical support document and share your feedback online on our consultation website at <https://wrse.uk.engagementhq.com/resilience> Or you can email your responses to contact@wrse.org.uk

We're also holding a webinar to share and discuss our resilience framework on Thursday 18 June from 12.15pm to 1.45pm. Please visit our consultation site to register on Zoom for this event.

We'd particularly like you to consider the following questions, so please tell us what you think via the channels outlined above.

Q1. Are the four systems we've suggested the right core systems for a regional multi-sector resilience plan? If not, which systems should we consider?

Q2. Do the three characteristics of our framework – Reliability, Adaptability and Evolvability – cover the key elements of resilience? If not, what other characteristics should we consider?

Q3. Do you think looking at testing the resilience of options and systems in this way will help deliver a more comprehensive plan?

Q4. Are the sub-metrics we've chosen appropriate and, if not, which others should we consider? Do you think we should include metrics which can't be fully objective?

Q5. Do you believe changing our planning approach to a regional multi-sector resilience plan will help us plan better for future shocks and stresses

Next steps for resilience

We'll consider everyone's feedback and refine our resilience framework. The next steps are:

- Produce a summary of the responses we receive on resilience by August 5, 2020
- Publish our final resilience framework online at wrse.org.uk in August 2020
- Carry out a resilience assessment of systems in the South East today in October 2020
- Evaluate the resilience of water systems up to 2100 from November 2020 onwards
- Publish draft multi sector resilience plan for consultation in January 2022.