



# WRSE Problem Characterisation Assessment

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## Table of Contents

EXEC	UTIVE SUMMARY	1
1	METHOD	2
2	UNDERSTANDING THE WRSE REGION	4
3	PROBLEM CHARACTERISATION	7
Re	GIONAL PROBLEM CHARACTERISATION	7
Su	B-REGIONAL PROBLEM CHARACTERISATION	8
Af	FINITY WATER	9
Pc	rtsmouth Water	10
SE	S Water	10
So	uth East Water	11
So	UTHERN WATER	11
Тн	AMES WATER	12
ANN	EX 1	13



## **Executive Summary**

Problem characterisation is a way of summarising the overall risk to supply across the water companies that comprise WRSE. It is used to ensure that the methods and decision support tools used to resolve supply and demand deficits, are commensurate with the potential level of risk.

This report updates the initial problem characterisation assessments carried out in 2019, to be consistent with the 2022 Draft Regional Plan. The assessment results indicate that the WRSE region has both a 'large' strategic need and a 'high' solution complexity, which together continues to result in overall high risk to supplies over the planning period.

Complexity Factors Score ("How difficult is it to solve")	Strategic Needs Score ("How big is the problem?")				
	0-1 (None)	2 to 3 (Small)	4 to 5 (Medium)	6 (Large)	
Low (<7)					
Medium (7-11)					
High (11+)				WRSE	

Figure 1: Problem characterisation modelling complexity matrix for the WRSE region

At a sub-regional level, the results of the problem characterisation assessments have indicated that many of the WRSE areas will face significant water supply issues in the near future, with the Thames Water London WRZ, Affinity Water 1-6 area and Southern Water's Eastern, Western and Central areas are highlighted as zones of particular concern. Some areas, in contrast, are shown to be largely resilient in terms of public water supply, including Thames Henley WRZ.

As a result of the high-risk assessment for the region, WRSE continue to adopt advanced methods of programme appraisal, such as multi-objective optimisation and adaptive, best value planning in order provide solutions to the challenges faced.



## 1 Method

- 1.1 Water Resources South East (WRSE) aims to develop a sustainable and resilient approach to water resource management that delivers for customers, society and the environment. In 2022, each water company within the WRSE group reviewed the problem characterisation assessments originally conducted to inform the development of their draft 2019 water resource management plans (WRMP19). The amendments to the problem characterisation assessments scores comprise the contents of this report.
- 1.2 The problem characterisation assessment process was developed by UKWIR as a tool for assessing the vulnerability of water companies to strategic issues, risks and uncertainties. It requires water companies to evaluate potential issues on two levels: a high-level assessment of 'how big the problem is', i.e. the scale of need for a new water resource and/or demand management strategy, defined as the strategic need; and 'how difficult the problem is to solve', an assessment of the complexity of issues that affect investment in a particular area, defined as the complexity factor.
- 1.3 The assessment of strategic need and complexity can then be placed in a problem characterisation matrix, in order to define whether an area has an overall low (green), medium (yellow) or high (purple) risk.

Complexity Factors Score	Strategic Needs Score ("How big is the problem?")				
("How difficult is it to solve?")	0-1 (None)	2 to 3 (Small)	4 to 5 (Medium)	6 (Large)	
Low (<7)	1867 - 26	32 - N.			
Medium (7-11)					
High (11+)					

Figure 2: The problem characterisation matrix

- 1.4 Scoring of strategic need will be based on how quickly a zone goes into deficit and how large that deficit becomes over the planning period. Complexity scores reflect the combined complexities of the supply-, demand- and investment-related problems within a given area. As such, the score may reflect the number and novelty of the solutions available, the number and types of solution that will be required and investment challenges this may cause.
- 1.5 Although the assessment of strategic needs and complexity factors are necessarily subjective, the guidance for the problem characterisation assessment provides detailed "scales of significance" to maximise consistency of problem characterisation between water companies.



1.6 This report details the results of the problem characterisation assessments undertaken by each water company within the WRSE group. Each company has applied the problem characterisation process at an appropriate scale, grouping water resource zones (WRZs) into "areas" where there is existing significant connectivity and/or a high potential for additional transfers to be used to satisfy the supply demand balance.



## 2 Understanding the WRSE Region

- 2.1 The WRSE region is comprised of six water companies, namely: Affinity Water, Portsmouth Water, South East Water, Southern Water, SES Water and Thames Water.
- 2.2 The South East is home to 20 million people, spans 21,000 km<sup>2</sup> of South East England and is divided into 37 water WRZs. The grouping of these WRZs into 21 areas for the purpose of the problem characterisation assessment is shown in Error! Reference source not found..



#### Figure 3: The WRSE Region, with the areas used for problem characterisation outlined

2.3 With almost as many businesses in the region as the rest of the country put together, it currently makes up 37% of the national economy. Add to this the 28 million annual tourists and total demand can tot up to six billion litres of drinking water a day. Longer term, four million extra



people are expected to be living here which is why the South East is expected to account for around 50% of the UK's future need for public water supplies alone. So even based on conservative estimates, the region will need to find at least an extra 1 billion litres a day to keep up over the next 30 years – and possibly even more in the future.

- 2.4 In March 2020 we published our projected future water resource requirements the additional water needed for the region looking ahead to 2100 to address the planning challenges that we face.
- 2.5 Our March 2020 document was largely based on data used by the six member companies in their 2019 Water Resources Management Plans (WRMP19) and analysis carried out by the Environment Agency as part of its National Framework for Water Resources2. It was subject to public consultation, and we produced a summary of the responses we received.
- 2.6 Since then, we have carried out further work on the important building blocks for our regional plan and have updated the information, methodologies, and systems we will use. In March 2021 we published an updated future water resource requirements document and in January 2022 we publish our WRSE emerging plan.
- 2.7 This updated problem characterisation report uses this updated sets of data to help characterise the problems in the Southeast. The population served, and average demands of each water company are presented in Table 1.

Water Company	Population served (million)	Current average demand in a dry year (MI/d)
Affinity Water	3.9	890
Portsmouth Water	0.8	173
South East Water	2.3	510
Southern Water	2.6	600
SES Water	0.7	165
Thames Water	10.3	2,607
Total	20.6	4,945

Table 1: Summary details for the WRSE water companies; Numbers taken from water companies draft regional plan data.

Source: Draft Regional Plan<sup>1</sup>

<sup>&</sup>lt;sup>1</sup> H\_Plan growth forecast 2022.



- 2.8 As set out in our consultation documents beforehand the WRSE region possesses characteristics that make water resource management and planning arguably more challenging than in other parts of the country. Most notably, the level of uncertainty and wide diverse range of population growth, climate change and sustainability reductions are higher than other regions and the national average, whilst rainfall amounts are relatively low.
- 2.9 Furthermore, the already high population levels are predicted to increase, resulting in growing pressure on the already highly intensive use of water resources in the region. Due to these challenges, the Environment Agency has classified a large part of the area covered by the WRSE region as being seriously water-stressed.



## 3 Problem Characterisation

- 3.1 For each WRSE area outlined in Figure 3, the problem characterisation assessment requires the responsible water company to amalgamate the strategic needs score and the complexity factors score to determine where in the problem characterisation matrix the area falls within the modelling complexity matrix for problem characterisation, shown in Figure 2.
- 3.2 For the purpose of informing the WRSE 2022 Draft Regional Plan, the problem characterisation process was based on the baseline planning position, which accounts for expected changes in the supply demand balance up to 2025, including new transfer schemes and leakage reductions.

### **Regional Problem Characterisation**

3.3 The results of the WRSE-level, regional problem characterisation assessment across the WRSE region are displayed Figure 4, with supporting scores in Table 2.

Complexity Factors Score ("How difficult is it to solve")	Strategic Needs Score ("How big is the problem?")				
	0-1 (None)	2 to 3 (Small)	4 to 5 (Medium)	6 (Large)	
Low (<7)					
Medium (7-11)					
High (11+)				WRSE	

Figure 3: Problem characterisation modelling complexity matrix for the WRSE region

#### Table 2: Results of the problem characterisation assessment across WRSE

Problem Characterisation Scores: Average across the WRSE region

Strategic Needs	5.5
Complexity Factors (total)	17.4
Supply complexity factors	6.3
Demand complexity factors	4.8
Investment Programme complexity factors	6.3



- 3.4 The assessment results indicate that the WRSE region has both a 'large' strategic need and a 'high' solution complexity, which together continues to result in overall high risk to supplies over the planning period.
- 3.5 As a result of the high-risk assessment for the region, WRSE continue to adopt advanced methods of programme appraisal, such as multi-objective optimisation and adaptive, best value planning in order provide solutions to the challenges faced.

### Sub-regional Problem Characterisation

- Ν Thames Water SV Southern Water Services Eastern Area Thames Water, Kennet Thames Water, Henley South East Zone 4 S Water Water Guildford South East Wate ater Zone one) Southern Water Southern Wate Services Eastern Area Western Area 50 Miles HERE, Garmin, (c) OpenStreetMap contributors, and the GIS us er
- 3.6 A spatial view of the sub-regional breakdown is provided in Figure 5 below.

Figure 4: Sub-regional problem characterisation status

- 3.7 Areas highlighted in green are characterised by low strategic needs scores and low complexity factors scores and include Thames Water Henley, South East Water Zone 5 and Affinity Water Zone 7.
- 3.8 Areas highlighted in yellow are characterised by a combination of low strategic needs scores and high complexity factors scores or high strategic needs scores and low complexity factors scores.



The zones highlighted as yellow are Thames Water zones Kennet and Guildford, SES Water and South East Water zones 1, 4 and 7.

- 3.9 Areas highlighted in purple are characterised by high strategic needs scores and high complexity factor scores and include Southern Water Western Area, Central Area and Eastern Area, Affinity Water Zones 1-6, Portsmouth Water, Thames Water SWX, SWA and London, South East Water zones 2, 3, 6 and 8.
- 3.10 This sub-regional assessment indicates that there are areas of lower risk within the WRSE region. However, it is considered appropriate that all areas in the region are treated in the same way, commensurate with the risk level across the whole region.
- 3.11 Further information of the sub-regional assessment is provided in Annex 1, including the scores provided by water companies for each of their areas, broken down into the strategic need and complexity factors. Further spatial plots are also available for these factors.
- 3.12 A summary by water company is provided below.

### Affinity Water

3.13 The problem characterisation assessment for Affinity Water is shown in Figure 6; in the context of the 2022 Draft Regional Plan, Affinity Water plotted in the green and purple areas of the problem characterisation modelling complexity matrix for Zone 7 and zones 1-6, respectively. A strategic needs score of 3 and an overall complexity score of 8 were attributed to Zone 7, with supply identified as the most complex problem and investment and demand identified as the least complex problem. For zones 1-6, the strategic needs score was 6 and the overall complexity score of 18, with supply identified as the most complex problem and demand identified as the least complex problem.

Complexity Factors	Strategic Needs Score ("How big is the problem?")				
score ( How difficult	0-1	2 to 3	4 to 5	6	
IS IT TO SOIVE )	(None)	(Small)	(Medium)	(Large)	
Low (<7)					
Medium (7-11)		Affinity zone 7			
High (11+)				Affinity Zones 1-6	

Figure 5: Problem characterisation modelling complexity matrix for Affinity Water



### Portsmouth Water

3.14 The problem characterisation assessment for Portsmouth Water is shown in Figure 7; in the context of the 2022 Draft Regional Plan, Portsmouth Water plotted in the yellow area of the problem characterisation modelling complexity matrix. A strategic needs score of 5 and an overall complexity score of 15 were attributed, with supply, demand and investment having equal weighting in the complexity factor scores.

Complexity Factors Score	Strategic Needs Score ("How big is the problem?")				
solve")	0-1 (None)	2 to 3 (Small)	4 to 5 (Medium)	6 (Large)	
Low (<7)					
Medium (7-11)					
High (11+)			Portsmouth Water		

Figure 6: Problem characterisation modelling complexity matrix for Portsmouth Water

### SES Water

3.15 The problem characterisation assessment for SES Water is shown in Figure 8 in the context of the 2022 Draft Regional Plan, SES Water plotted in the amber area of the problem characterisation modelling complexity matrix. A strategic needs score of 4 and an overall complexity score of 9 were attributed, with supply, demand and investment scoring equally in the complexity factors scoring.

Complexity Factors	Strategic Needs Score ("How big is the problem?")				
score ("How difficult is it to solve")	0-1 (None)	2 to 3 (Small)	4 to 5 (Medium)	6 (Large)	
Low (<7)					
Medium (7-11)			SES Water		
High (11+)					

Figure 7: Problem characterisation modelling complexity matrix for SES Water



## South East Water

3.16 The problem characterisation assessment for South East Water is shown in Figure 9. in the context of the 2022 Draft Regional Plan, South East Water areas 1, 4, 5 and 7 plotted in the amber area of the problem characterisation modelling complexity matrix, areas 2, 3, 6 and 8 plotted in the purple area of the problem characterisation modelling complexity matrix.

The highest strategic needs score of 6 was attributed to areas 2 and 8, with area 8 also having the highest complexity factor score of 17. Across all 8 South East water areas, the complexity of supply averaged 4.75, complexity of demand averaged 4.25 and complexity of investment averaged 4.13.

Complexity Factors Score	Strategic Needs Score ("How big is the problem?")				
("How difficult is it to solve")	0-1 (None)	2 to 3 (Small)	4 to 5 (Medium)	6 (Large)	
Low (<7)					
Medium (7-11)		SEW 5			
High (11+)		SEW 1, 4, 7	SEW 3, 6	SEW 2, 8	

Figure 8: Problem characterisation modelling complexity matrix for South East Water

### Southern Water

3.17 The problem characterisation assessment for Southern Water is shown in Figure 10; in the context of the 2022 Draft Regional Plan, the Eastern, Western and Central Southern Water areas are all plotted in the purple area of the problem characterisation modelling complexity matrix. All three Southern Water areas produced a maximum strategic needs score of 6. The overall complexity scores were high across all areas, with scores of 16, 18 and 19 given for Eastern, Western and Central areas, respectively. Across all three Southern Water areas, the complexity of supply averaged 6.3, complexity of demand averaged 5 and complexity of investment averaged 6.3.



Complexity Factors	Strategic Needs Score ("How big is the problem?")				
Score ( How difficult	0-1	2 to 3	4 to 5	6	
is it to solve )	(None)	(Small)	(Medium)	(Large)	
Low (<7)					
Medium (7-11)					
High (11+)				SWS Eastern, Western and Central	

Figure 9: Problem characterisation modelling complexity matrix for Southern Water

### Thames Water

- 3.18 The problem characterisation assessment for Thames Water is shown in Figure 11. in the context of the 2022 Draft Regional Plan, the Thames Water area of Kennet is plotted in the green area of the problem characterisation modelling complexity matrix, whilst the areas of Kennet and Guildford are plotted in the amber area of the problem characterisation modelling complexity matrix. The Thames regions of SWX, SWA and London are plotted in the purple area of the problem characterisation modelling complexity matrix.
- 3.19 The highest strategic needs score of 6 was attributed to the London area, which also received the highest overall complexity score of 20; supply-related problems were identified as the most complex issues, followed by demand-related issues and then investment-related issues in all Thames areas bar London. The areas of SWA and SWX were also high scoring for both strategic needs and overall complexity. The lowest strategic needs score was attributed to the Thames area of Henley, which was also given the lowest overall complexity score of 4 along with the area of Kennet.

Complexity Factors Score ("How difficult is it to solve")	Strategic Needs Score ("How big is the problem?")						
	0-1 (None)	2 to 3 (Small)	4 to 5 (Medium)	6 (Large)			
Low (<7)	Thames Henley						
Medium (7-11)			Thames Kennet, Guildford				
High (11+)			Thames SWX, SWA	Thames London,			

Figure 101: Problem characterisation modelling complexity matrix for Thames Water



## Annex 1

The problem characterisation scoring for each area managed by the individual water companies is presented below.

						-	
		<u> </u>	Complexity			/ Factors Score	
Company	Area	Strategic Needs Score	Supply	Demand	Investment	Overall Complexity Score	
Affinity	Zones 1-6	6	7	5	6	18	
Affinity	Zone 7	3	4	2	2	8	
Portsmouth		5	5	5	5	15	
SES		4	3	3	3	9	
SEW	1	3	5	4	4	13	
SEW	2	6	6	5	4	15	
SEW	3	4	5	4	4	13	
SEW	4	3	4	4	4	12	
SEW	5	2	3	4	3	10	
SEW	6	5	5	4	5	14	
SEW	7	3	4	4	3	11	
SEW	8	6	6	5	6	17	
SWS	Eastern	6	6	5	5	16	
SWS	Western	6	6	5	7	18	
SWS	Central	6	7	5	7	19	
Thames	London	6	7	5	8	20	
Thames	SWX	5	7	5	5	17	
Thames	SWA	5	6	4	4	14	
Thames	Kennet	4	4	4	3	11	
Thames	Guildford	4	4	4	2	10	
Thames	Henley	1	3	3	0	6	
WRSE Averag	е	5.5	6.3	4.8	6.3	17.4	

Table 3: Strategic needs and overall complexity scores for each area within the WRSE region

A spatial plot of the strategic needs scores across the region is shown in Figure 12.





Figure 11: Strategic Needs scores for all areas within the WRSE region

The maximum strategic needs score of 6 was attributed to the Thames Water London area, Affinity Water zones 1-6, South East Water Zones 2 and 8, as well as all three Southern Water zones, Eastern, Western and Central. "Medium" strategic needs scores of 4-5 have been attributed to: Portsmouth, SES, SEW zones 3 and 6, Thames zones SWX, SWA, Kennet and Guildford. "Small" strategic needs scores of 2-3 have been attributed to Affinity zone 7, South East Water zones 1, 4, 5 and 7. The lowest strategic needs scores of 0-1, classified as "None" were attributed to the Thames Water zone of Henley.

A spatial plot of the overall complexity scores across the region is shown in Figure 13.





Figure 12: Overall Complexity Factors scores for all areas within the WRSE region

Complexity Factor Scores ranged from 6 to 20 across the WRSE region. The areas identified as having the most complex problems (=>17/20) were the Affinity Water Area 1-6, Thames Water London and SWX areas, South East Water Area 8 and the Southern Water Western and Central Areas. Conversely, the areas identified as having the least complex problems were Thames Water Henley, Affinity Water Zone 7, area and SES Water, which scored 6, 8 and 9, respectively.

Averaged across the WRSE region, supply-related and investment-related problems were identified as the most complex to solve. However, this trend was not consistent across individual areas.