WRMP24 Problem Characterisation Assessment

Wessex Water

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Wessex Water
YTL GROUP

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Executive summary

The first step in developing Water Resources Management Plan 2024 is to understand the scale and complexity of the planning problem so that appropriate methods can be selected.

Environment Agency guidance requires that the problem characterisation step of UKWIR's Decision Making Process Guidance is used to identify the scale and complexity of the planning problem and the vulnerability to various strategic issues, risks and uncertainties.

The information produced from the problem characterisation is then used, alongside UKWIR's Risk Based Planning Method guidance, to inform the choice of methods so they are proportional in terms of effort, complexity and cost.

Whilst the problem characterisation stage of the UKWIR guidance needs to be followed, the decision on modelling methods to use for planning also requires consideration of the new WRMP24 planning requirements around best-value and adaptive planning.

The problem characterisation has been written with focus on Wessex Water; however, we have also undertaken a problem characterisation as a regional group – the West Country Water Resources Group (WCWRG) – and this information has fed into the assessment presented here.

The overall assessment has identified a **moderate level of concern** for the Wessex Water planning problem for WRMP24, consistent with the level of concern identified for the WCWRG planning problem, and primarily driven by new planning requirements for a move to 1 in 500 system level response drought resilience and the scale and extent of licence reductions expected by 2050, as indicated by the Environment Agency's environmental destination in the supply area.

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1. Introduction

The first step in developing Water Resources Management Plan 2024 is to understand the scale and complexity of the planning problem so that appropriate methods can be selected. Environment Agency (EA) guidance[1] requires that the Problem Characterisation step of UKWIR Decision Making Methods[2] is used to identify the scale and complexity of the planning problem, and the vulnerability to various strategic issues, risks and uncertainties.

The information produced from the problem characterisation is then used, alongside UKWIR's Risk Based Planning guidance[3], to inform the choice of methods so they are proportional in terms of effort, complexity and cost.

1.1 Method overview

There are two elements to the problem characterisation assessment:

- **Strategic Needs ("How big is the problem?")** – a high-level assessment of the scale of need for new water resources and/or demand management strategies; and
- **Complexity factors ("How difficult is it to solve?")** – an assessment of the complexity issues that affect investment in a particular water resource zone or area.

A series of questions for strategic needs and complexity factors are answered and scored; these scores are then combined into a simple additive matrix to derive the **level of planning concern** (low, moderate or high).

To answer the questions, the method requires expert judgement from within the water company, and the results presented to regulators.

The level of concern then maps to a set of potential **decision-making methods** described in the UKWIR Decision Making Methods – current, extended and complex methods.

In addition, the problem characterisation also informs the appropriate level of drought risk – the **risk composition** - to consider when developing data inputs to the decision-making tools. Finally, this leads to the development of **method statements** that clearly describe the methods used in the WRMP.

Since the development of the UKWIR guidance in 2016, new WRMP24 planning requirements require a move to 1 in 500 system level response drought resilience, and the need to produce a best-value (multi-objective) and potentially adaptive plan. There is therefore a requirement to adopt more complex planning methods to an extent, and as per the risk-based planning guidance, risk composition 1 therefore cannot be selected.
The guidance states that the assessment may only need to be carried out based on their own needs for an individual company. However, given inter- and intra- regional planning, the assessment needs to account for potential future water trading arrangements.

[1] EA Water Resources Planning Guideline (Version 9: For Publishing)
[2] UKWIR (2016) WRMP 2019 Methods - Decision-Making Process: Guidance (Report Ref: 16/WR/02/10)
[3] UKWIR (2016) WRMP 2019 Methods – Risk Based Planning (Report Ref: 16/WR/02/11)

The problem characterisation has been written with focus on Wessex Water; however, we have also undertaken a problem characterisation as a regional group – the West Country Water Resources Group – and this information has fed into the assessment relating to the potential future water trading arrangements.

It is acknowledged in the guidance that the assessment is likely to be iterative as the supporting case for the classification of vulnerability is developed. The characterisation has been developed incorporating new evidence that has come through from regional planning and methods developed over the course of WRMP24 development.

1.2 Scale of analysis

The decision-making guidance requires a decision to be made about the area over which the problem characterisation is to be assessed – which should be undertaken at an appropriate level, potentially grouping water resource zones into “areas” of assessment with significant connectivity, and/or high level potential for transfers so that the same decision making approach is applied to the whole area.

Wessex Water currently plans on the basis of a single water resource zone following completion of the integrated supply grid in 2018. The problem characterisation is therefore undertaken at the company level.

2. Strategic Needs Assessment

The first part of the problem characterisation is the assessment of strategic needs under three simple headline questions that explore the potential supply demand deficit, and the cost of the supply and demand management options. Table 2-1 addresses the questions, using a scale of significance to characterise the answer: no significant concerns, moderate significant concerns, or very significant concerns.

The answer to these questions is necessarily subjective, but if there is a sustained deficit caused by a combination of changes in both supply and demand elements then this represents a moderately significant concern. Concerns become very significant where there is a risk that either element causes a sustained deficit by itself or in combination, so that there is likely to be a change in Levels of Service to customers or an unacceptable risk of failure of the supply system.

The main drivers affecting the supply-demand balance in comparison to WRMP19 are the move to 1 in 500 system level response and the long-term Environmental Destination driven changes to the supply demand balance by 2050. Based on our early work in developing the initial Regional Plan for the WCWRG region, we anticipate these changes will lead to a supply-demand deficit, which in particular is focussed in the south of our supply system. The change in Levels of Service to customers that leads to a very significant concern is not driven by an exterior factor such as climate change, but by guidance/policy expectations. The location of the anticipated deficit, the likely lack of new supply options nearby to protect the environment, climate drivers and peak demand vulnerability, means larger scale schemes and transfers to store water in the winter where feasible to help meet peak demands during the summer, in particular in Chalk catchments, are likely to be required,

adding to the complexity of the investment solution. Given the potential costs of these solutions and material impact on customer bills, there is a very significant concern on investment.

Table 2-1 Assessment of strategic needs ("How big is the problem?")

Strategic WRMP risks	No significant concerns (0)	Moderately significant concerns (1)	Very significant concerns (2)	Comments
Supply: Level of concern that customer service could be significantly affected by current or future supply side risks, without investment.			2	Whilst our WRMP19 forecast a surplus resource position, two key changes to planning requirements affect the likely supply availability in the future. First, the need to move to a 1 in 500 system level response drought resilience by 2039 at the latest. Whilst we have forecast a surplus under the calculation of 1 in 500 drought in WRMP19, this was a 1 in 500 drought based on a weather metric. Initial analysis of the stochastic dataset using point groundwater models implies that the system-level response 1 in 500 level of service will require additional resource. Second, initial work on the Environmental Destination work provided by the EA shows that under the Business As Usual scenario (BAU) – where the policy and regulatory approach to environmental protection remains the same – a significant amount of abstraction licence may be lost (of the order of 60-70Mld) by 2050. Based on our current forecast supply-demand balance (in 2045; 54Ml/d critical period and 31Ml/d annual average), this would lead to a deficit in supply. This is notwithstanding potential requirements for an enhanced environmental scenario which is required to be considered under one of the investment programmes ("best environment") in the WRMP guidance. The "enhanced" environmental destination scenario currently indicates a need for ~81Ml/d for this scenario. The location of the deficit is also spatially focussed in the Chalk catchments of our supply region, primarily in the Stour, Frome and Piddle catchments. This will potentially create a more localised deficit.

Demand: Level of concern that customer service could be significantly affected by current or future demand side risks, without investment	0	There is low level of concern in relation to future demand. Currently the company is meeting the performance commitment requirements to deliver the required leakage reductions by 2025. The impacts of Covid-19 has had an impact on delivery of water efficiency and metering programme from WRMP19, but we expect this interruption to be temporary. The expected long-term changes from Covid-19 over the planning horizon relate mainly to an increased number of people home working, and the impact this will have on demand, and the split of demand between non-household and PCC. Whilst this may switch some demand from work to home, at this stage we do not anticipate this will have a significant difference on overall demand in the region. There may be a small uplift in demand associated with more people working in the region as opposed to commuting to nearby cities (e.g. to Bristol and from the M4 corridor towns in the north of our region to London), but this is likely to be relatively small. The EA National Framework compared WRMP19 forecasts to high, medium and low scenarios forecast by Cambridge Econometrics, and found that WRMP19 forecasts match closely to the high scenario, suggesting that future demand is unlikely to be higher than forecast already.
Investment: Level of concern over the acceptability of the cost of the likely investment programme, or that the likely investment programme contains contentious options (including environmental/planning risks)	2	The expected scale of the supply-demand balance deficit (above), and its location in the chalk in particular means there is significant concern over investment. It is unlikely there will be new nearby schemes in the catchments where licence reductions are required. It is these areas that are also critical period constrained. It is therefore likely schemes will be required to store water in the winter to help meet peak demands in the summer – reflecting also climate change drivers. This will require new storage schemes that are likely contentious, and new transfers which combined may bring large carbon costs. There may be local options relating to water recycling but these are likely to be controversial to customer acceptability.
Total score	**4**	

3. Complexity Factors Assessment

Table 3-1 Supply side complexity factors

Supply side complexity factors	No significant concerns (0)	Moderately significant concerns	Very significant concerns (2)	Comments
S(a): Are there concerns about near term supply system performance, either because of recent Level of Service failures or because of poor understanding of system reliability /resilience under different or more severe droughts than those contained in the historic record? Is this exacerbated by uncertainties about the benefits of operational interventions contained in the Drought Plan?		1		Supply-system performance under more severe droughts has been explored as part of WRMP19, and more recently as part of the draft drought plan submission. There is moderate concern over the near-term supply system performance given the need to move to a 1 in 500 system level response. There is always uncertainty over the benefit of drought interventions – the new draft drought plan has increased the number of drought permit options to secure supply resilience.
S(b): Are there concerns about future supply system performance, primarily due to uncertain impacts of climate change on vulnerable supply systems, including associated source deterioration (water quality, catchments etc.), or poor understanding?	0			WRMP19 identified that deployable output for Wessex Water has a low vulnerability to climate change. The need to increase available supplies from surface water systems benefitting from winter storage (increased winter rain in future) to protect chalk environments may change vulnerability to climate change in future.
S(c): Are there concerns about the potential for 'stepped' changes in supply (e.g. sustainability reductions, bulk imports etc.) in the near or medium term that are currently very uncertain?		1		Sustainability reductions in future, as documented in WRMP19 relating to investigations in the 2020-25 period, could lead to reductions of up to ~13Mld. The exact timing of when these will be required to be met is uncertain.
S(d): Are there concerns that the 'DO' metric might fail to reflect resilience aspects that influence the choice of investment options (e.g. duration of failure), or are there conjunctive dependencies between new options (i.e. the amount of benefit from one option depends on the construction of another option). These can both be considered as non-linear problems.		1		The solution to the new planning problems is likely to require new transfers and new storage schemes that will interact. E.g. new transfers/restructuring the grid may be supported by different supply-side schemes.

Total score	**3**

Table 3-2 Demand-side complexity factors

Demand side complexity factors	No significant concerns (0)	Moderately significant concerns (1)	Very significant concerns (2)	Comments
D(a): Are there concerns about changes in current or near-term demand, e.g. in terms of demand profile, total demand, or changes in economics/demographics or customer characteristics?	0			Overall demand in the Wessex Water region has been falling since the mid-1990s despite population growth owing to the reduction in leakage, reduced commercial demands and the increasingly efficient use of water by our customers largely driven by metering. There has been a growth in demand in recent years (since 2014) but has fallen in recent years reflecting in part increased leakage reduction. Given the rurality of our supply zone in which over 69% of households are now metered, the dominance of established agricultural businesses and (low water using) service industries, it is unlikely we will experience any sudden and/or unexpected changes in demand in the near term. We do not expect any sudden near-term significant changes relating to Covid-19 impacts.
D(b): Does uncertainty associated with forecasts of demographic / economic / behavioural changes over the planning period cause concerns over the level of investment that may be required?	0			There is always some uncertainty about future growth, however as shown in the National Framework it is expected that our current forecasts are consistent with the high scenarios based on work undertaken by Cambridge Econometrics.
D(c): Are there concerns that a simple 'dry year/normal year' assessment of demand is not adequate, e.g. because of high sensitivity of demand to drought (so demand under severe events needs to be understood), or because demand		1		There is moderate concern as we are critical period constrained and there is uncertainty as to what the critical period demand may be – in terms of both timing with low groundwater levels – but also in terms of actual volume. We have seen high summer "heat-wave" demands in 2018 which were similar to our critical period forecasts from WRMP19. However, this "heat-wave" driven demand did not follow a dry winter period that may also lead to additional peak demands as a related driver.

versus drought timing is critical.				
Total score	**1**			

Table 3-3 Investment programme complexity factors

Investment programme complexity factors	No significant concerns (0)	Moderately significant concerns (1)	Very significant concerns (2)	Comments
I(a): Are there concerns that capex uncertainty (particularly in relation to new or untested technologies) could compromise the company's ability to select a 'best value' portfolio over the planning period?	0			The schemes that may need to be promoted in the long-term are increased reservoir storage and water recycling. There are no significant concerns around these scheme capex uncertainties affecting decision-making. These uncertainties can be built into an adaptive plan.
I(b): Does the nature of feasible options mean that construction lead time or scheme promotability are a major driver of the choice of investment portfolio?		1		Construction lead time may be a significant driver of investment portfolio selection, but this does not necessarily make the decision-making problem more complex to solve.
I(c): Are there concerns that trade-offs between costs and non-monetised 'best value' considerations (social, environment) are so complex that they require quantified analysis (beyond SEA) to justify final investment decisions.		1		Given the new planning drivers in best-value planning as part of WRMP24 guidance to explicitly consider Natural Capital and Biodiversity Net Gain amongst other best-value considerations including Carbon emissions, this will increase the complexity of the decision-making problem.
I(d): Is the investment programme sensitive to assumptions about the utilisation of new resources, mainly because of large differences in variable opex between investment options?			2	At this planning stage it is too early to understand this, but utilisation will be an issue given the change in source mix to more surface water schemes and transfers. This is complicated also by needs in neighbouring companies too (South West Water-Bournemouth) and other region's needs.
Total score	**4**			

4. Level of concern and modelling complexity

The overall assessment leads to the following overall scores:

	Score
Strategic Needs Score	**4**
Complexity Factors Score	**8**
Supply Complexity Factors	3
Demand Complexity Factors	1
Investment Complexity Factors	4

As per the methodology, the strategic needs score and complexity factors score are combined into the matrix shown in Table 4-1. This results in a **moderate level of concern**.

Table 4-1 Model complexity matrix

		Strategic Needs Score ("How big is the problem")			
		0 (none)	**2 (small)**	**4 (medium)**	**6 (large)**
Complexity Factors Score ("how difficult is the problem")	**Low (<7)**	X			
	Medium (7-11)			X	
	High (11+)				

The guidance states that given this level of vulnerability, "extended" modelling approaches may add considerably to the company's understanding.

There is inevitable uncertainty given the need for expert judgement in the scoring of each question/factor, meaning it is worth considering how sensitive the level of concern is to the scoring applied. The complexity factors score could increase from 8 to 11 and as per the method we would still identify as a moderate level of concern.

A moderate level of concern was also identified in the April 2020 update to the West Country Water Resources Group problem characterisation, which as above, reflects the need to move to 1-in-500 levels of service for drought resilience and complexity factors relating to Environmental Destination requirements and uncertainty relating to strategic schemes, their utilisation and inter- as well as intra- regional need.

The purpose of the matrix shown in Table 4-1 is to identify whether additional decision-making modelling over and above current EBSD approaches may be justified, and if so, to identify the complexity of modelling method that is appropriate.

The outputs of this problem characterisation assessment will be used to inform the choice of decision-making modelling method applied, and the development of appropriate risk-based inputs ("Stage 4: Select appropriate modelling method" of the UKWIR Decision-making guidance).