Jersey Water

Water Resources and Drought Management Plan

Appendix B. Water Resource Zone Problem Characterisation

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JERSEY WATER
WATER RESOURCES AND DROUGHT MANAGEMENT PLAN

APPENDIX B. WATER RESOURCE ZONE PROBLEM CHARACTERISATION

1. WATER RESOURCE ZONE PROBLEM CHARACTERISATION

1.1. PURPOSE

UKWIR (2016) published its "WRMP 2019 Methods – Decision Making Process: Guidance" for UK water companies which includes guidance on characterising the problems faced by water companies in water resources planning for each Water Resource Zone. This characterisation process helps to understand the complexity of the zone and the strategic planning approaches that may be required in developing a Water Resources Management Plan.

The purpose of this report is to set out the problem characterisation as it relates to Jersey Water's water resource zone and the strategic planning approaches that are likely to be required in developing the company's Water Resources and Drought Management Plan.

1.2. METHODOLOGY AND APPROACH

The problem characterisation approach helps to assess the vulnerability of the water resource zone to various strategic issues, risks and uncertainties, so as to allow the development of a proportional response by Jersey Water to the planning problems faced. The problem characterisation assessment provides a documented and auditable trail to explain the planning approach adopted to the water company Board, its regulators, government and relevant stakeholders.

The assessment examines both current and future needs and planning complexity. 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 any expenditure to maintain a supply-demand balance in the water resource zone
- **Complexity factors** ("How Difficult is it to Solve?") – an assessment of the complexity of issues that affect the need for future expenditure in the water resource zone.

A simple matrix is applied based on the responses (scores) to a series of questions on strategic needs and complexity factors, to help determine the level of effort and decision-making tools required to develop the long-term water resources management plan. This includes consideration of the range of risk-based planning methods that may need to be utilised to assess the future risks and uncertainties for the company's selected planning horizon.

1.2.1. STEP 1 – ASSESS NEEDS

The first part of the problem characterisation stage is an assessment of 'strategic needs'. This entails three simple questions that explore the size of any potential future supply-demand deficit, and the cost (in relative terms) of the supply and demand management options (see Table 1). The left-hand column of Table 1 ("Strategic WRMP risks") considers three types of risk:

S – supply-side risks;
D – demand-side risks; and
I – investment programme risks.

Table B.1 Assessment of the strategic needs for WRMP purposes ("How big is the problem?")

Strategic Water Resource Planning Risks	No significant concerns (Score = 0)	Moderately significant concerns (Score = 1)	Very significant concerns (Score =2)
S. Level of concern that customer service could be significantly affected by current or future supply side risks, without investment			
D. Level of concern that customer service could be significantly affected by current or future demand side risks, without investment			
I. Level of concern over the acceptability of the cost of the likely investment programme, and/or that the likely investment programme contains contentious options (including environmental/planning risks)			

Source: UKWIR (2016)

The supply-demand deficit has been separated into a supply component and a demand component, as it is possible to have a significant deficit that is mainly caused by either increasing demand or reducing source deployable output (e.g. due to climate change or environmental considerations), so only one component may be 'of concern'.

The questions in the strategic needs assessment use a scale of significance to characterise the answer. This is necessarily subjective, but UKWIR has provided general guidance as follows:

- If there is a likely sustained supply deficit caused by a combination of changes in both the supply and the demand elements, then this represents a 'moderately significant' concern for both elements.
- Concerns become 'very significant' where there is a risk that either element could cause a sustained supply deficit by itself or in combination, so that there is a large deficit that is likely to fundamentally change the Level of Service to customers or present an unacceptable risk of failure of the supply system (i.e. rota cuts or standpipes).
- For the investment element, 'moderately significant' relates to a level of cost or a contentious option (in terms of environmental / planning / stakeholder risks) that would be highlighted as a concern (e.g. due to local opposition, some changes to water bills); whilst 'very significant' relates to an investment programme that has components that are potentially controversial with costs that are large enough to have a material impact on customer bills.

In the context of this assessment, the term 'risk' relates to either uncertainties in the current estimates of supply and/or demand forecasts (i.e. evaluation of supply capability or level of customer demand under drought conditions) that could present a problem to maintaining the supply-demand balance, or the potential size and impact of forecast changes (e.g. due to climate change, growth).

1.2.2. STEP 2 – ASSESS COMPLEXITY FACTORS

The purpose of the assessment of complexity factors is to explore the nature of the risks and vulnerabilities that exist within the water resource zone to help determine the level of detail and sophistication of the assessment approaches that may be required to develop the Water Resources and Drought Management Plan.

All of the questions in the complexity factors assessment use a scale of significance to characterise the answer. This is subjective, but the following general guidelines have been

provided by UKWIR:

- If a particular factor has the potential to notably change the composition of the company's expenditure programme, then the factor is likely to be 'moderately significant'.
- If a factor means that it potentially generates major uncertainty in the overall nature of the preferred expenditure programme, and/or could cause conflict with major stakeholders/regulators/government, then it should be considered to be 'very significant'.
- The following three tables present the complexity factors for the supply side (Table 2), the demand side (Table 3), and the expenditure programme (Table 4).

Table B.2 Assessment of supply side complexity

Supply Side Complexity Factors	No significant concerns (Score = 0)	Moderately significant concerns (Score = 1)	Very significant concerns (Score =2)
S(a). Are there concerns about reliability of existing sources in the short term (due to actual problems or uncertainty about reliability in severe drought beyond the historic record)?			
S(b). Are there concerns about future performance of the water supply system due to climate change or water quality deterioration?			
S(c). Are there potential step changes in available water resources (e.g. loss of a source, environmental requirements, etc.)?			
S(d). Is the reliability of the available resources affected by other factors? (e.g. resilience factors, dependencies on other parties, etc.)?			

Table adapted from UKWIR (2016)

Table B.3 Assessment of demand-side complexity

Demand Side Complexity Factors	No significant concerns (Score = 0)	Moderately significant concerns (Score = 1)	Very significant concerns (Score =2)
D(a). Are there concerns about changes in demand in the short term?			
D(b). Is the uncertainty in future population, property and consumer behaviour forecasts likely to materially affect expenditure requirements?			
D(c). Is there a high sensitivity of demand to drought?			

Table adapted from UKWIR (2016)

Table B.4 Expenditure programme complexity

Expenditure Programme Complexity Factors	No significant concerns (Score = 0)	Moderately significant concerns (Score = 1)	Very significant concerns (Score =2)
I(a). Are there concerns that investment uncertainty (e.g. new or untested methods) could compromise the company's ability to select the best value programme of measures?			
I(b). Are construction lead times and/or promotability of supply schemes a major driver for the choices of the investment programme?			
I(c). Are there concerns that trade-offs between costs and non-monetised considerations (e.g. social, environmental) are so complex that sophisticated analytical approaches will be required to justify expenditure decisions?			
I(d). Is the expenditure programme sensitive to the assumptions about future utilisation of any new water sources due to large differences in operating costs between options?			

Table adapted from UKWIR (2016)

1.2.3. STEP 3 – ASSESS LEVEL OF CONCERN

Having carried out the assessments for each of the four tables, the scores obtained are combined into a simple matrix (Table 5) to characterise the scale of the problems faced and the potential choice of decision-making approaches for water resources planning:

Green = Low Level of Concern: likely to be no need for sophisticated decision-making approaches

Amber = Moderate Level of Concern: consider the need for more sophisticated, but existing modelling and decision-making approaches

Red = High Level of Concern: consider whether it would be useful to apply more 'complex' approaches, as these could add considerably to the company's understanding, noting that such conceptually complex methods need to be developed and tested for the UK water resources context.

Table B.5 Problem characterisation assessment matrix to identify complexity of decision-making approach to adopt for water resources planning

		Strategic Needs Score (How Big is the Problem?)			
		0-1 (None)	2-3 (small)	4-5 (medium)	6 (large)
Complexity Factor Aggregate Score (How difficult is it to solve the problem?)	Low (<7)				
	Medium (7-11)				
	High (11+)				

Source: UKWIR (2016)

2. JERSEY WATER: PROBLEM CHARACTERISATION ASSESSMENT

2.1. STEP 1 – STRATEGIC NEEDS ASSESSMENT

Table 6 summarises the assessment of the risks faced by Jersey Water, which leads to a **Strategic Needs Score of 4**. The main risks relate to supply-side and population growth uncertainties and the consequent potential need for future expenditure requirements to address a potential supply-demand deficit.

Table B.6 Assessment of the strategic needs for WRMP purposes ("How big is the problem?") for the Jersey Water resource zone

Strategic Water Resource Planning Risks	No significant concerns (Score = 0)	Moderately significant concerns (Score = 1)	Very significant concerns (Score =2)
S. Level of concern that customer service could be significantly affected by current or future supply side risks, without investment		**YES.** There are concerns due to climate change, water quality risks and hydrological data uncertainties	
D. Level of concern that customer service could be significantly affected by current or future demand side risks, without investment		**YES.** There are concerns due to potential population increases.	
I. Level of concern over the acceptability of the cost of the likely investment programme, and/or that the likely investment programme contains contentious options (including environmental/planning risks)			**YES.** If a supply-demand deficit is forecast, the available options are limited and may have water bill implications. Also, the acceptability of any new water supply schemes on Jersey would be sensitive to stakeholder opinions and media interest, so

			there may be significant opposition if the scheme is considered contentious.
TOTAL SCORE	**4**		

2.2. STEP 2 – COMPLEXITY FACTORS ASSESSMENT

Tables 7 to 9 provide the results of the assessment of the supply-side, demand-side and expenditure programme complexity factors, respectively.

Table B.7 Assessment of supply-side complexity for the Jersey Water resource zone

Supply Side Complexity Factors	No significant concerns (Score = 0)	Moderately significant concerns (Score = 1)	Very significant concerns (Score =2)
S(a). Are there concerns about reliability of existing sources in the short term (due to actual problems or uncertainty about reliability in severe drought beyond the historic record)?		**YES.** There are concerns about reliability in severe drought beyond historic record	
S(b). Are there concerns about future performance of the water supply system due to climate change or water quality deterioration?		**YES.** There are concerns about the impact of climate change and water quality issues on water source deployable output (reliable yield).	
S(c). Are there potential step changes in available water resources (e.g. loss of a source, environmental requirements, etc.)?	There are no significant concerns		
S(d). Is the reliability of the available resources affected by other factors? (e.g. resilience	No other material factors affect source reliability		

factors, dependencies on other parties, etc.)?			
TOTAL SCORE	**2**		

Table adapted from UKWIR (2016)

Table B.8 Assessment of demand-side complexity for the Jersey Water resource zone

Demand Side Complexity Factors	No significant concerns (Score = 0)	Moderately significant concerns (Score = 1)	Very significant concerns (Score =2)
D(a). Are there concerns about changes in demand in the short term?	There are no material concerns in the short-term		
D(b). Is the uncertainty in future population, property and consumer behaviour forecasts likely to materially affect expenditure requirements?			**YES.** The wide range of population projections leads to substantial uncertainty in demand forecasts that could affect future expenditure requirements
D(c). Is there a high sensitivity of demand to drought?	Drought demand peaking factors are expected to be within UK norms		
TOTAL SCORE	**2**		

Table adapted from UKWIR (2016)

Table B.9 Expenditure programme complexity for the Jersey Water resource zone

Expenditure Programme Complexity Factors	No significant concerns (Score = 0)	Moderately significant concerns (Score = 1)	Very significant concerns (Score =2)
I(a). Are there concerns that investment uncertainty (e.g. new or untested methods) could compromise the company's ability to select the best value programme of measures?			**YES.** If a supply deficit is forecast, new solutions may be needed, **and/or** complex planning issues may arise if new storage is required, **and/or** the preferred composition of projects could be sensitive to modest changes in forecast supply-demand balances.
I(b). Are construction lead times and/or promotability of supply schemes a major driver for the choices of the investment programme?		**YES.** Promotability of supply schemes (e.g. any new storage requirement) could influence the choice of investment programme.	
I(c). Are there concerns that trade-offs between costs and non-monetised considerations (e.g. social, environmental) are so complex that sophisticated analytical approaches will be required to justify expenditure decisions?		**YES.** There may be sensitive social and environmental issues if additional water storage is required, requiring assessment by extended methods such as multi-criteria analysis and scenario testing in addition to least cost methods. But it is unlikely that	

		complex analytical approaches will be needed for the decision making.	
I(d). Is the expenditure programme sensitive to the assumptions about future utilisation of any new water sources due to large differences in operating costs between options?		**YES.** Utilisation of new water sources could impact operational decisions, but additional supply capacity would only be needed in drought conditions	
TOTAL SCORE	**5**		

Table adapted from UKWIR (2016)

2.3. STEP 3 - LEVEL OF CONCERN ASSESSMENT

The scores derived in Tables 6 to 9 can be summarised as follows:

- **Strategic Needs Score = 4**
- **Complexity Factors Score = 9**
  (2 for supply-side + 2 for demand-side + 5 for expenditure programme)

Table 10 sets out where the Jersey Water resource zone sits in relation to the UKWIR problem characterisation assessment matrix. The assessment indicates an overall **MEDIUM LEVEL OF CONCERN.**

In accordance with the UKWIR methodology, this indicates that the existing water resource planning decision-making tools and methods (e.g. least-cost optimisation tools) supported by extended methods (e.g. multi-criteria analysis and scenario analysis) can be utilised to evaluate alternative programmes should a supply-demand deficit be forecast over the planning horizon. Such methods enable the Company to show the pros and cons of alternative solutions and demonstrate to stakeholders the reasons for choosing a particular programme of options. It is not anticipated that complex, new investment modelling techniques are needed.

Table B.10 Problem characterisation assessment matrix for Jersey Water resource zone

		Strategic Needs Score (How Big is the Problem?)			
		0-1 (None)	2-3 (small)	4-5 (medium)	6 (large)
Complexity Factor Aggregate Score (How difficult is it to solve the problem?)	Low (<7)				
	Medium (7-11)			**JERSEY WATER**	
	High (11+)				

Table from UKWIR (2016)

3. CONCLUSIONS

Using the 2016 UKWIR methodology in the WRMP 2019 water resources planning decision-making guidance, a Problem Characterisation assessment of the Jersey Water resource zone has been carried out based on a review of the supply-side and demand-side data available for the Water Resources and Drought Management Plan.

The assessment has concluded that (in a UK-wide context), the issues and challenges faced by Jersey Water are characterised as being of a **MEDIUM LEVEL OF CONCERN**. This indicates that existing tools and techniques developed by the UK water industry for water resources planning should be adequate to support Jersey Water's decision-making processes, and that the development of more complex tools is unlikely to be warranted.

This conclusion does NOT imply that there are no material risks or uncertainty to consider, but that existing and tested methodologies to assess them are available and should be appropriate to the problems faced by Jersey Water.

The assessment highlights that:

- The possible effects of climate change, water quality deterioration and population growth are the more uncertain elements of the supply-demand balance projections over the planning horizon.
- There are potentially significant environmental and planning sensitivities about any new water supply schemes (particularly new water storage if needed) so that robust and transparent decision-making approaches are needed.
- Options to address any identified future supply deficit would carry a level of risk and uncertainty (e.g. the potential need to adopt new technologies for the island and possible planning and/or land availability constraints).
- Extended decision making techniques such as multi-criteria analysis and scenario testing are likely to be needed in addition to least cost optimisation methods. These will enable the Company to provide transparent demonstration to stakeholders of the reasons for choosing a particular programme of options instead of an alternative programme.

REFERENCE

UKWIR (2016), WRMP 2019 Methods – Decision Making Process: Guidance (UKWIR Report Ref. No. 16/WR/02/10)