

Project: Regional Plan

To: WRSE PMB

Subject: Scoping an investment model for the
WRMP 24 regional plan

Created by: Meyrick Gough

Purpose: For review at PMB meeting on 4th June

Version, Date: Version 2

1. Summary

The purpose of this document is to invite bids to develop a scope of works for the development of the next investment model for the Water Resources in the South East of England alliance. This phase of the work will also test a proof of concept, using existing modelling results, to see if we can combine an adaptive planning technique with real options. In addition a review the consultants will be expected to review and recommend potential modelling platforms that could be used to hold the relevant data and run the investment model; outline visualisation methods that could be used to summarise the results; recommend the model architecture and optimisation tool to be used for the future regional model.

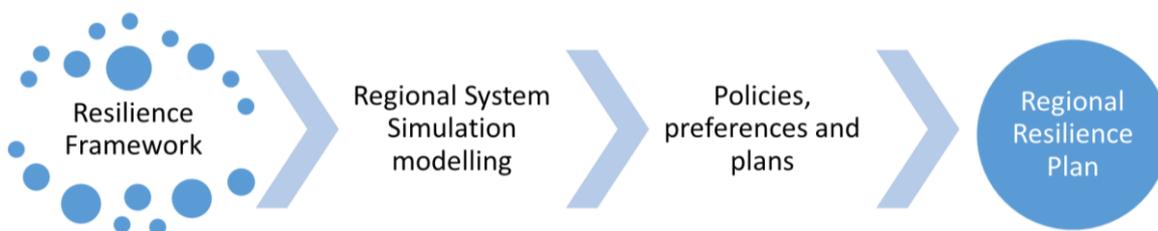
2. Introduction

The six companies in the South East of England are seeking to develop a resilient regional water resources plan. These companies currently supply water to approximately 19 million people across 31 water resource zones which have some, but limited transfer capability, as shown in the figure below.



The next regional plan will seek to improve the resilience of the South East across multiple sectors by identifying a range of interventions that help the region meet the projected growths whilst improving its overall resilience.

To derive this plan a staged approach has been developed, as set out in the diagram below. These stages progress from identifying the key risks to water in the South East of England through to modelling these impacts, deriving regional policies and implementing national policies, ending with creating the next regional resilience plan. This aspect of work fits in with the final stage of this process, deriving the next regional plan.



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The development of the investment model will take place over two stages and consequently two pieces of work. These being: an initial review and proof of concept; and then the development of a new investment model for the region.

The purpose of this phase of work is to:

- test a proof of concept (set out below);
- review potential modelling platforms that could be used to run the model;
- outline visualisation methods that could be used to summarise the results;
- recommend the model architecture and optimisation tool to be used for the future regional model.
- Produce a scope of work for the development of the investment model and a draft outline program of work to complete the second phase of the work.

3. Why do we need to develop a new model?

The existing WRSE investment model was developed over 15 years ago. During this time it has evolved to take on board the issues and challenges of that particular AMP period. During this time new advanced decision making methods have evolved and new optimisation algorithms have also been developed which are freely available in the market place.

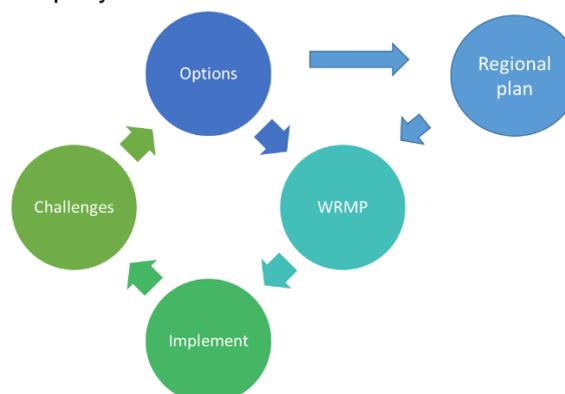
In addition, following the publication of the UKWIR report on WRMP 2019 Methods – Decision Making Process: Guidance a range of new techniques were explored and advised for use if the problem that is trying to be solved is complex.

A review of the six water companies in the South East region shows that three of the companies use advanced methods for their investment planning requirements (Thames Water, Affinity Water, Southern Water), which range from adaptive planning to real options. However, WRSE has recently collated the individual scores into a regional “Problem Characterisation” assessment, using companies WRMP19 assessments. The results of this exercise has resulted in an overall complexity score of 15. This is set out in the table below.

Complexity Factors Score		Strategic Needs Score (“How big is the problem?”)			
		0-1 (None)	02-Mar (Small)	04-May (Medium)	6 (Large)
Complexity Factors Score (“How difficult is it to solve?”)	Low (<7)				
	Medium (7-11)				
	High (11+)			WRSE	

This shows that the region is characterised by high complexity and medium strategic needs. At an individual company, sub regional and resource zone level the range of scores are more diverse with some highly complex and large strategic needs to low needs and low complexity. This diverse range also adds to overall complexity of the approach adopted for WRSE to ensure a range of outputs can be produced to provide the answers required at a region, company and zonal level.

Unlike previous plans it will be important for the region to derive a *best value* resilience plan. This is different to previous plans in which a series of strategies were derived for different scenarios. In the past the region has adopted a least cost planning approach for a variety of scenarios. This means that the regional modelling outputs have been used by water companies in developing their company plans as shown in the adjacent figure:



The next regional plan will be based on a best value plan and the starting point for this plan is to derive a least cost plan. The diagram below sets out a very

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broad high level approach of how those elements which are monetised or act as a constraint will go in to the derivation of a least cost plan; whilst those preferences or in combination impacts will be used in the subjective stage of the process. The preferred plan will then be assessed from a programme appraisal perspective to derive a best value plan as set out in the process diagram below.



Whilst this approach provides an insight into regional strategies it makes deriving a cohesive plan very difficult in a region which has a mixture of complexities and uncertainties, as different companies are interested in different scenarios for which least-cost plans have been developed at a regional level. For example, key scenario components for Thames Water are drought protection level and population growth, whereas uncertain sustainability reductions are much more significant for Southern Water.

This means that the region overall has a high level of concern, and as such, extended modelling methods need therefore to be adopted to support the WRSE WRMP24 planning. As set out in the summary above the WRSE approach will be developed through a phased approach of:

- 1) using a resilience framework to identify the key challenges for the region;
- 2) assessing the impact of these challenges through the simulation model and developing options operational and connectivity options to solve as many challenges as possible;
- 3) overlay customer preferences with regional and national policies;
- 4) undertake investment modelling to determine a least cost plan meets the needs of the region; and
- 5) finally derive a best value plan based on the WRSE methodology.

A key part of this work will be to develop a new investment model which is able to develop a least cost complex plan. To complete this development we would like to test a proof of concept first, before constructing the next new investment model.

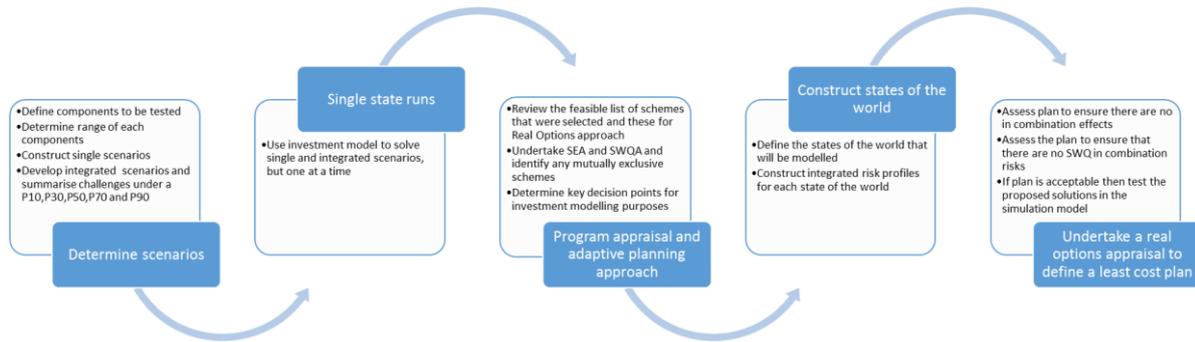
4. Proof of concept

The current method used for the regional investment modelling has some advantages, ranging from being able to describe a simple causal relationship between investment and scenarios through to being assured that the proposed developments are able to cope with a range of uncertainties in the future by testing a range of scenarios.

However, when multiple strategic solutions are selected for a range of scenarios the choice of which strategic scheme becomes more complicated and other techniques are required to make this selection.

These techniques could be adaptive planning or real options. It is believed that these approaches could be joined up to provide a robust process for developing a least cost plan for the region which will be used as the basis for the best value plan by overlaying the no monetised aspects of the plan. This proof of concept approach is set out in the diagram below:

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The steps required for this approach are therefore:

- 1) Defining a range of scenarios.
- 2) Completing a simple EBSD approach to eliminate options which are never selected for any scenario and so limit the optimisation space to the remaining ‘feasible selected options’.
- 3) Review the EBSD results from the scenarios and apply an adaptive plan technique to determine the key influences and “branch points” for planning
- 4) Combine the scenarios using an integrated risk approach to generate a range of supply demand balances in the future for each year/ AMP of the planning horizon;
- 5) Use real option analysis to determine the best value adaptive plan from the “feasible selected options” for the range of scenarios at suitable branch points in order to determine the options to develop over the short, medium- and long-term futures.

Typically, feasible options will have several points along their programme of delivery where decisions are made, such as whether to proceed (or not) with the scheme / feasible option. For example decisions may include:

- Defer
- Abandon
- Mothball
- Continue
- Expand
- Downsize

For the investment modelling purpose these stages can be considered as dependent/ phased options, as later stages can only proceed after a preceding stage has been completed. This approach has also been used in Ofwat’s “gated process” in order to progress schemes going forward. In this context the term scheme is a programme of work which develops a large-scale systematic plan or arrangement for attaining some particular benefit to meet the overall objective of the plan.

It is intended that the schemes that are put into the investment model are made up of dependent phased feasible options to allow the full benefit of the real options approach to be utilised.

5. Scope of Work

The purpose of this piece of work is to appraise whether the above approach would work, and assess whether it represents an optimal solution for tackling the complex planning problem in the South East appropriate to the results of the regional problem characterisation assessment and in line with the UKWIR guidance.

The appraisal should include a review of the existing company investment modelling approaches, plus interviews with companies as required to help inform a recommended approach. The approach that is recommended should consider the need for zones (and companies) within the region to exit the investment modelling process at a stage that is appropriate to its level of concern (as identified in the problem characterisation assessment).

The work should also include any suggested alternative approaches or improvements that could be made to enhance or streamline the process without compromising the integrity of the results or exceeding the required timescales.

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The output tasks required for this work are:

- test a proof of concept (set out below) using existing results from phase 5 modelling work;
- review potential modelling platforms that could be used to hold data from companies and run the model;
- outline visualisation methods that could be used to summarise the results to allow users to understand the results of an investment model run;
- recommend the model architecture and optimisation tool that should be used for the future regional investment model;
- Produce a scope of work for the development of the investment model and a draft outline program of work to complete the second phase of the work.
- Present the findings and the recommendations with WRSE & PMB in a half day workshop

6. Timescales

A timescale for the production of the next regional plan is still evolving but it is anticipated that the next regional plan will be produced by August 2021.

In order to achieve these timescales and leave sufficient time to undertake the investment modelling work, scheme costing and multi-sectorial engagement it will require **all of the investment modelling development work to be completed by 1 March 2020.**

Therefore, the timescale for this aspect of the work: modelling approach is as follows:

- a) Scope tender sent out on the 17 June;
- b) Tenders received for the review and recommendation of the modelling approach by the 12 July;
- c) Award by the 26 July;
- d) Final report by 31st September.

All bids will be assessed on quality of the bid submission, quality of the proposal, experience and ability to stick to deadlines. In your bid you should make a provision to interview the various companies and understand their existing models, and break down the cost and timeframe required for each element of the overall process. Other useful sources of information such as notes on the previous model review will be made available to the successful bidder.

7. Invitation:

You are invited to send in your bid for this work by midnight on the 28th June to:
Meyrick.Gough@WRSE.org.uk

Your submissions should include:

- 1) a description of the work you are proposing to undertake;
- 2) the staff you will use;
- 3) the cost for the proposed piece of work;
- 4) dates when you will need to see the six water companies;
- 5) a programme of work and a
- 6) quality assurance plan

The report to WRSE must set out:

- 1) your recommended approach and the reasons for its selection;
- 2) your considered view of a forward work plan to execute the recommended approach, given the timescales that need to be achieved;
- 3) the risks and potential mitigation measures that would have to be put in place when developing the recommended approach.