# Meeting note 2nd Dec 2014 - Joseph, Baihua

The aim of the meeting is to scope the Namoi scenario paper in more details. Focus has been on designing the scenario analysis and visualisation. In particular we discussed:

* What are the issues that need to be addressed for the type of analyses we want to do as specified in the abstract.
* What types of results we can present in the paper and how.

The main purpose of the paper is to investigate the **importance** of various sources of uncertainty (parameters or model components) in identifying trade-offs among different scenarios. A parameter/model component is considered important when within their plausible uncertainty ranges, the trade-off outputs (illustrated in a radar plot) for a scenario are significantly different. This is to say, due to uncertainty we cannot have a consistent story in the trade-off outputs.

While we can qualitatively identify which parameters/model components are important, we cannot rank the relative importance of the different parameters/model components. There is no obvious criteria for ranking the size of changes in *trade-offs* between scenarios, particularly as the number of indicators increases. Sensitivity also varies depending on the scenario, so ranking becomes more difficult as the number of scenarios considered increases. Additionally, sensitivity of a given parameter depends on the value of other parameters, such that a definitive ranking of importance would effectively require all parameters to be perfectly known.

The issues we need to address for the Namoi case study include:

* What types of scenarios we may explore in the paper? – while many scenarios can be developed through formal scenario development techniques, in this paper we will focus on a few ‘interesting’ scenarios picked by the authors. For example,
  + Baseline/current/business as usual
  + Climate (rainfall change)
  + Change in groundwater rules
  + Crop price
  + Land use change
* How can we deal with the correlation between scenarios? We have to avoid comparing results from different model realisations – we can restructure the visualisation approach: instead of plotting multiple model realisations in one radar plot, we can plot multiple scenarios of one realisation in one radar plot.
* Which parameters to vary? – There will be a large number of parameters we can test. But in this paper we will pick some ‘interesting’ parameters and focus first on one-at-a-time sensitivity analysis. Uncertainty in ecology model cannot be specified by ‘range’, but rather is specified in a set of rules and is set up in the code using UTIM. Therefore, we will lump the uncertainty in ecology model as a whole, rather than looking at individual parameters in the ecology model. We could include one example of changing multiple parameters simultaneously, e.g. by changing ecology and a farm decision model parameter
* How to identify parameter range? – the authors will make the judgement on identifying possible parameter range. For simplicity, we can restrict the analysis to parameters for which specifying a parameter is possible.
* How to deal with parameters that only affect part of the model? – for example, the trade-off plot for uncertainty in ecology model will only change the result in ecology while all other indicator output will be the same. This result might have limited use. Potentially we could couple ecology uncertainty with other parameters such as flow.

In discussing the types of output we can produce from the analysis, potentially we can analyse three types of outputs:

1. we investigate how the trade-off (i.e. the shape of the radar plot) changes when we vary one parameter at a time. The uncertainty of that parameter is important when the shape of the radar plot changes dramatically when we vary that parameter within its plausible range. This result can be visualised as:

|  |  |
| --- | --- |
| Parameter | Value of parameters (e.g. as it move from low (left) to high (right). |
| Par1 | … |
| Par2 | … |
| … | … |

Note: each line within the radar plot represents a scenario.

The limitation of this approach is we can only investigate one parameter at a time.

1. we compare two scenarios, and can look at combination of the scenarios or model components. In this case, instead of using the range of parameter values in the columns as in method1, we can use optimisation to explore parameter value that produce e.g. minimum/maximum area within the line (implying minimum/maximum collective outputs from all indicators), most centred (all five indicators reasonably balanced hence no real trade-offs) and most skewed (one indicator is notably better than other indicators). The interpretation is that if the shapes change dramatically for this parameter, then the uncertainty in this parameter is important in terms of generating consistent trade-offs for a scenario.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter/  model components | Min area | Max area | Most centred | Most skewed |
| Par1 |  |  |  |  |
| Ecology |  |  |  |  |
| … | … |  |  |  |

Note: the line within the radar plot represents the difference between two scenarios.

The limitation of this approach is no multiple scenarios (i.e. a single shape)

1. The third approach is to obtain a large number of model realisations (e.g. through random sampling of all different parameters and model components). Then we use cluster analysis to select radar plots that are most different relative to each other. The interpretation is that if the shapes change dramatically for this parameter, then the uncertainty in this parameter is important in terms of generating consistent trade-offs for a scenario.

|  |  |
| --- | --- |
| Parameter/  model components | Realisations that are most different in the radar plot |
| Par1 |  |
| Ecology |  |
| … | … |

Note: the line within the radar plot represents one realisation of a scenario.

# Namoi scenario paper milestones

|  |  |  |
| --- | --- | --- |
| When | Tasks | Who |
| Mid Feb 2015 | Complete the construction and testing of the integrated model | Mainly Mike |
| Mid Feb | Identify 1) types of scenarios to run, 2) what parameters/model components to vary and 3) what are the ranges of parameters | Baihua, Bec, Jen, Rachel, Tony |
| Mid Mar | Finalise analysis methods, complete model code for the analyses and visualisations | Baihua, Joseph |
| Mid Apr | Complete all necessary model runs. Analyse results. | Baihua, Joseph |
| Mid May | Complete the first draft of the paper | All, Baihua to lead |
| 1st June 2015 | Edit, review and submit paper | All |