

## Results from Survey to Establish Modelling needs of Councils 2010

Empirical research was undertaken as part of the Sustainable Pathways 2 (SP2) project to explore the degree to which New Zealand's 16 regional authorities<sup>1</sup> use models to support strategic planning and decision-making. The research sought to establish: which models are most used in regional authorities; characteristics that are important to the councils in selecting a model; the barriers they face in using models; and finally to what degree they use the computer-based simulation models most central to the SP2 project. All regional authorities in New Zealand were surveyed by mail or face-to face where practical, on the use of models within their organisation. Respondents were asked to complete the survey in consultation with other staff to add to the robustness of the results, however, in some cases the survey was completed by a single knowledgeable individual, and could potentially be biased toward their perspective. As a quasi-Likert scale was used, results are subject to the standard difficulties associated with these scales; such as whether an individual is more disposed to giving high scores, than more moderate scales. Largely, however, there was found to be a degree of consistency across the authorities, lending credence to the survey outcomes.

Authorities were first asked to list the computer based models they currently use to assist decision-making. The responses indicate authorities predominantly utilise models to answer specific questions. All councils use GIS models. Other commonly used models are: (i) transport , (ii) input-output, (iii) hydrological, (iv) and, nutrient run-off. A number of characteristics are common across the currently models used by regional authorities. Firstly, the models have a clearly demonstrable value in that they are directly linked to a specific issue providing evidential support. Secondly, models are generally produced externally, by consultants or crown research institutes, primarily because regional authorities rarely have the capacity in-house (in terms of skills or staff time) to produce such models, and potentially also to demonstrate some separation between those producing the model-based 'evidence' and the authority who makes the decision. Thirdly, the models are constructed to use data captured for/by the model. Finally, in most cases the model produces a decision-making recommendation 'output.' Policy-makers/end-users are not expected to interact with and manipulate the model; rather they expect to turn to a summary/conclusion which will inform them of the likely outcomes of actions.

Linked to the discussion on models used by regional authorities are the preferences of authorities when deciding whether to employ a model. For this reason respondents were given a list of model characteristics and asked to rank them as 'important' or 'not important'. Respondents' place considerable importance on models that are issue-specific, reinforcing the response already given regarding the types of models in use. Most respondents also recognised that it is important to have a model that helps scope the bigger strategic and integrated picture. These two preferences signal that while current practice places credence on outcomes from issue-specific models, the need for a more integrated approach is recognised. All respondents placed importance on the cost of a model (in financial terms and staff time) when selecting it. They also preferred models with a long shelf-life which also relates to cost. When choosing to use a model, respondents regarded the ability to demonstrate spatial change and temporal change as both important characteristics. Nine respondents had a preference for models to be built with stakeholders while six regarding this as

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<sup>1</sup> Regional authorities include both Regional Councils and Unitary Authorities that combine Regional Council responsibilities with Territorial Authority responsibilities.

unnecessary. There was no clear preference regarding whether it was important for a model to be able to be incorporated into a broader model framework with an equal number of respondents saying it was as those saying it was not.

The Council respondents were provided with a list of potential barriers to model use and asked to rank these. The most frequently cited barriers in order of significance were:

1. Inability to access if the model adds value. This barrier links with the current predominance of issue-specific models used by councils. Such models are designed for a specific purpose, for example, Beachwatch collates data to determine whether or not a beach should be open to the public for swimming. Their value is more easily definable than models designed for exploring the future by means of scenario modelling.
2. The cost in monetary terms. This was a major concern for councils across the user spectrum. Those that did not use models said they could not justify the expense for a small population with a low rating base, while large scale model-users were aware and concerned about the costs of model use.
3. The cost in time. Though not as much of a barrier as cost, this was still significant.
4. The complicated use and maintenance of models was seen as a barrier to use and commented on separately under 'other' by two respondents. Lack of follow-up and maintenance of models when new information comes in or knowledge increases as a result of running the model means they can become 'out-of-date' quickly.
5. Lack of in-house capacity to work with technical models was a barrier even at councils that used models extensively.
6. Misunderstanding of the models application was regarded a significant barrier (though not a very significant barrier).
7. Lack of end user involvement in building models. Understanding how a model works and what applications it is suited to gives end-users greater confidence in their outputs. This can best be achieved by working with end-users when the model is constructed. For large scale integrating models that combine data from a number of sources and take into account feedback loops and lag times, this involvement from the outset is even more important.

For some of the questions there were similar numbers of respondents that regarded the issue as a barrier as did not. These included the questions on: difficulty in communicating the model outcomes; lack of clear connection with policy and management processes; and updating data needs. The variable capacity of regional authorities across New Zealand is a possible explanation for this divergence. Sound model implementation practices would assist overcome difficulties in these areas.

Overall, the majority of the respondents did not see lack of commitment from senior management or the current departmental structure of the organisation as factors that precluded integrated model use though one respondent did cite 'lack of a champion' as a barrier. The 'culture' of councils is therefore less an issue than the need to know there is added value from model use. The lack of synergies between models and poor access to support were barriers to more than half the council's though this was not uniform.

In terms of the more integrated computer based simulation models of interest to the SP2 project GIS and Input-Output were used extensively with Multi-criteria Analysis the third most common in use.

With the exception of Agent Based modelling at least one respondent used each of the model types listed. Agent Based modelling, Bayesian Belief Network, Spatial Systems Dynamics, and Mediated Modelling were all seen as tools having potential to assist with problem solving.