

# **SUSTAINABLE PATHWAYS 2**

## **Wellington Region Mediated Modelling**

*Pre-report supporting Action Research and Integrated Assessment*

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## 1. INTRODUCTION

The Sustainable Pathways 2 (SP2) project (MAUX0906) is funded by the New Zealand Ministry for Science and Innovation (MSI). It is a six-year action research programme (2009 – 2015) for a value of NZ\$3.9M. The project focuses on developing processes and tools to support dynamic, integrated, spatially explicit, strategic decision-making.

This report is a pre-assessment for Objectives 1 of the SP2 project developed during the preparation phase for the Mediated Modelling (MM) process in the Wellington Region. A pre- and post participant questionnaire allows a more reflective evaluation of the MM process. It is envisioned that some members of the National Advisory Group and international advisors will assist in the SP2 evaluation based on pre- and post assessments to provide independent perspectives.

### *Spatial Planning as the emerging paradigm in New Zealand*

The Local Government (Auckland Council) Amendment Act 2010 requires Auckland to produce a Spatial Plan. The requirement indicates a conceptual move from the effects-based planning of the RMA towards an integrated form of planning. “The purpose of the spatial plan is to contribute to Auckland’s social, economic, environmental, and cultural well-being through a comprehensive and effective long-term (20- to 30-year) strategy for Auckland’s growth and development” (Part 6, 79(2) Local Government (Auckland Council) Amendment Act 2010). Spatial Planning is used extensively in other developed countries to prepare for rapid change, population growth and urban development. The Auckland experience in developing its spatial plan may have ramifications for all local authorities in New Zealand, for many central government agencies, and for the way central and local government work together in the future. The Wellington Region is not mandated to develop a Spatial Plan. Nevertheless, in anticipation of what is to come, the Wellington Region has great interest in developing the type of tools used in spatial planning.

## ***System Dynamics and Integrated Decision-making***

System dynamics is a method to enhance learning about complex systems. For system dynamics the world is a complex system where everything is connected to everything else. Therefore, before you change a high leverage point in any system you need to understand the system, identify the linkages, feedbacks and time lags so consequences (intended and unintended) of the projected change are anticipated. While systems can be broken down into their component parts for understanding it is the interaction of the component parts that make the system, not the parts themselves.

The four well-beings have interrelationships that influence and impact on each other, with significant time-lags, and with feedback loops that may produce unintended or unexpected outcomes. Understanding these ‘dynamics’ within and among systems is an important part of making effective integrated strategic decisions.

A wide range of stakeholders in the public, private and NGO sectors are involved in delivering economic, social, cultural and environmental outcomes. The decision-making processes for each are shaped by legislative and regulatory frameworks, institutional settings, and even organisational cultures. This poses significant challenges for developing an integrated strategic plan that involves multiple stakeholders.

### ***The Sustainable Pathways 2 (SP2) project ([www.sp2.org.nz](http://www.sp2.org.nz))***

The SP2 project focuses on developing processes and tools to support integrated, spatially explicit, strategic decision-making. It is currently listed as a key tool in the Auckland spatial planning process (Clelland, 2009). A key output of SP2 will be the development of Spatial Decision Support System (SDSS) for Auckland and Wellington. This is a data intensive computer simulation model, used to develop future scenarios and show the spatial impacts on land and resources. Such a model has already been developed for Environment Waikato, as part of the Creating Futures project ([www.creatingfutures.org.nz](http://www.creatingfutures.org.nz)) and provides visual outputs for future scenarios. SP2 has three objectives which are interdependent: (1) Mediated Modelling –

which refers to model building WITH stakeholders rather than FOR stakeholders. This participatory form of model building results in a non-spatial system dynamics model emphasizing the linkages between the 4 aspects of well-being; (2) Spatially Dynamic Decision Support (SDSS) – which is a data intense form of spatially explicit modelling interlinking multiple models and databases; (3) Council involvement to ensure the developing tools are both usable and used.

### ***Mediated Modelling***

The Mediated Modelling (MM) component of SP2 will provide a process for multiple stakeholders to combine their expertise, experience, and even intuition to inform the development of SDSS models in Auckland and Wellington. In the MM workshops representative stakeholders are brought together for several workshops to interactively build a conceptual model for a particular topic. This is a scoping model, not spatially explicit. Stakeholders identify and build their understanding and mutual appreciation of the key model attributes, (such as population density and land use, amongst others) and the dynamic interaction between these variables. The model with linkages and feedbacks can then be run over-time to illustrate long-term intended and unintended consequences of decisions. The participatory process, and the collaborative learning that takes place, are intended to facilitate buy-in for the development of and guide the more complex and data-intensive SDSS models. MM is a tool that offers a consensus building process in a short timeframe with fewer resources than many participatory processes as well as a transparent way to identify strategic opportunities and constraints (van den Belt, 2004). The MM methodology is highlighted as an integrative tool by the European Union Water Framework Directive ([http://ec.europa.eu/environment/water/water-framework/index\\_en.html](http://ec.europa.eu/environment/water/water-framework/index_en.html)) and by the US Environmental Protection Agency (<http://www.epa.gov>).

### ***SDSS Model***

A key output of SP2 will be the development of a Spatial Decision Support System (SDSS) for Wellington. This is a data intensive computer simulation model, used to develop future scenarios and show the spatial impacts on land and resources. Such a model has already been

developed for Environment Waikato, as part of the Creating Futures project ([www.creatingfutures.org.nz](http://www.creatingfutures.org.nz)).

The *spatial dynamic modelling* puts the economy-environment regional models into a spatial framework. Other critical models will also be integrated and a process of continuous improvements to existing models and maintenance and up-dating of key datasets undertaken. The output ‘spatial decision support system’ (SDSS) has a strong emphasis on the linkage and feedback loops between different components (as identified in the Mediated Modelling workshops). It will be an important advance in New Zealand urban planning, as planners will be able to explore spatial patterns of development.

This SDSS model for the Wellington region will:

- Captures dynamic feedbacks between existing population demographics, economics, labour, transport, land use, energy and environmental (energy, water etc) models
- Presents dynamic changes in a two-dimensional spatial manner

### ***National Advisory Group***

As part of the SP2 project a national advisory group is established to provide input and guidance for integrated models to support planning in New Zealand. This group aims to achieve coordination and consistency in tools and approaches, build capability and capacity and coordinate and disseminate information about modelling tools. The advisory group is also intended to keep the SP2 project in step with changes to resource management regulations and processes. These changes are required to meet future needs and enable New Zealand cities to be internationally competitive (Ministry for the Environment, 2010). Spatial planning holds opportunities for other cities, towns and regions in New Zealand and the SP2 programme aims to deliver a blueprint describing the support tools developing under SP2. A submission was made to the ‘Building competitive cities – reform of the urban and infrastructure planning system’ discussion document by the SP2 team on the importance of integration of issues at an early stage of the spatial planning process by engaging stakeholders. A sub-set of the National Advisory

Group will be requested to evaluate and critique the MM process based on pre- and post assessments.

### ***Next steps Wellington***

While Wellington is not required to develop a Spatial Plan, the SP2 project provides the opportunity for Wellington stakeholders to pro-actively undertake the steps involved. Three workshops are planned for Wellington (7 April 2011, 19 May 2011 and 18 August 2011) with the option to expand to a full MM process (5-10 workshops). Stakeholders from a range of organizations will be involved (see participant list Appendix 1). Participants will jointly create a computer-based simulation model to scope for broad inter-linkages between social, cultural, economic and environment considerations and how they change over time, to identify strategic opportunities and constraints for the region's future development. The topics of interest will be decided by the participants during the MM workshops. Organisations involved will benefit from participating through learning, understanding, integration, long term thinking and exposure to a new integrative process. SP2 through MSI funding provides international and national expertise in a process new to New Zealand. MM provides a tool to effectively utilize stakeholder expertise in Wellington to identify strategic opportunities and constraints.

## **2. COMPONENTS OF ACTION RESEARCH: CONTEXT, CONTENT AND PROCESS**

### ***Context***

The context that the mediated modelling workshops operate within is analyzed from a governance perspective; what laws, rules, drivers, changes, issues of scale, history and political/strategic decision-makers/players are at work? Context should ideally relate integrated elements of built, natural, human and social capital relevant to the specific topic of choice and make issue and choices of scale clear.



## **Introduction context analysis**

This context analysis for the Wellington Region aims to inform and update the Sustainable Pathways 2 project team of the current policy and planning context for the region. It is based on a contribution by Melanie Thornton from the Greater Wellington Regional Council (GWRC). The information contained in this segment of the report has been assembled from various strategy and discussion documents per February 2011.

The Wellington region comprises eight local authorities and a regional council. Until 2004 all councils were working in relative isolation regarding planning and development activities across the region. In 2004-2005, projections for the Wellington region revealed that certain factors relating to the ongoing prosperity and development of the region out to 2025 weren't looking as positive as in other regions. These factors were mostly in terms of a projected shortage of 25-45 year olds, stagnant regional GDP, the number of jobs not predicted to grow as strongly as in many other regions, and significant changes to the traditional manufacturing and industrial base of the region.

Consequently the Wellington Regional Strategy (WRS) was developed between 2005 and 2007 and signed off by all partners in 2007. The Strategy aimed to provide some solutions to those anticipated projections. The Strategy is a sustainable economic growth strategy and contains a range of initiatives to realise the region's economic potential. A regional economic development agency (Grow Wellington) is responsible for driving the economic development projects identified in the strategy.

The Strategy also aims to enhance "regional form" by addressing such issues as transport, housing, urban design and open spaces, which are all things that contribute to our quality of life. The 'good regional form' projects are the responsibility of the councils in the region working together under the overall responsibility of the Senior Officers Resource Team (SORT). This team reports to the regional Chief Executives Group which in turn reports to the Wellington Regional Strategy Committee. This committee comprises the region's mayors (the three Wairarapa councils are represented by one mayor) and four independent appointees. It is currently chaired by Sir John Anderson.

This comprehensive regional strategy and the strong reporting mechanisms that are built into it are effective and all councils have been collaborating successfully on the projects identified. Though it is a voluntary strategy many of the projects and goals are underpinned by the policies and imperatives of the Regional Policy Statement which gives the WRS statutory teeth in some areas.

The Regional Long Term Strategy (RLTS) has been developed in parallel with the WRS, indeed, it was delayed to take account of WRS conclusions. The two documents have a close strategic relationship and therefore consistency between them is vital.

Transport has been identified as an issue in both the WRS and RLTS. Transport network resilience is a chronic problem in every corridor of our region. Our geography, history and urban form make for a strong public transport network that can be improved further. A future demand on the region's transport network is the predicted growth in forestry in Wairarapa and the associated increase in log freight volumes. This is predicted to create additional pressure on the region's strategic transport network between Wairarapa and Centre Port in Wellington City.

## **Wellington Governance**

With the recent amalgamation of the Auckland region's councils, Wellington region's mayors and the Greater Wellington chair have begun conversations around future governance of the region. A report on governance issues in the region was recently commissioned from Price Waterhouse Coopers.

The Wellington Regional Strategy is one of several mechanisms for the mayors in the region to work together. Others include the Mayoral Forum and the Regional Land Transport Committee. The region's chief executives are responsible for a programme exploring shared services across the region which includes exploring shared opportunities around emergency management, waste management, procurement and building controls.

During the development of the Wellington Regional Strategy the potential benefits for doing a regional spatial plan were identified but not shared by all councils, so the decision was made to

not progress this. Because of the recent discussion document published by the Ministry for the Environment on Building Competitive Cities, the issue of spatial plans is being more widely discussed.

### **Existing planning framework**

The planning framework emanates largely from (although not exclusively); the Local Government Act, 2002; and the Resource Management Act, 1991.

The existing planning system within the Wellington Region is complex with the nine long term council community plans and corresponding community outcomes. A number of Resource Management Act (RMA) plans are in place including the Regional Policy Statement (RPS). There are a number of regional plans and each council has its own district plans (some with multiple parts). There are a multitude of growth strategies and other local planning documents. Regional plans in place or pending are:

- Regional Coastal Plan
- Regional Freshwater Plan
- Regional Air Quality Management Plan
- Regional Soil Plan
- Regional Plan for Discharges to Land
- The Regional Land Transport Strategy
- Regional Travel Demand Management Plan 2007 -2016
- A new Natural Resources Plan is to replace many of the above plans
- A new Parks Plan

There are two legislative reviews that are likely to impact on the Wellington region's planning framework. These are the:

- Resource Management Act review Phase two (RMII).
- Local Government Act 2002 review.

The RMII follows on from the enactment of the Resource Management (Simplifying & Streamlining) Amendment Act 2009 and consists of ten related work streams. The potential impacts of RMII on the Wellington region planning framework are:

- The establishment and development of the scope, functions and structure of the proposed Environmental Protection Authority which may impact on existing unitary (regional) functions.
- The management of aquaculture, infrastructure and water.
- Urban planning including examining land supply and affordability issues and better coordination of urban development projects.

The likely impacts from the Local Government Act 2002 review concerning the Long Term Plan (previously long-term council community plans - LTCCP) are likely to simplify the development of these plans, in particular with regards to the community outcomes process.

### **Key issues for Wellington Region**

The region has a very strong corridor pattern, starting from the airport to the south, proceeding to the Wellington City Central Business District and then branching into a 'Y'. The two branches are the western corridor through Porirua to the Kapiti Coast, and the eastern corridor up the Hutt Valley and through the Wairarapa. Many of the region's centres are located on or close to these corridors. This form is a real strength for the region. It reinforces local centres and supports passenger transport. It reduces the costs of energy use and makes services more accessible.

However, there are limited east/west transport linkages, which focus freight and commuter movements along the north/south corridors. The result is increasing congestion on some major routes. Traffic congestion affects freight and commuter reliability and therefore the economy as a whole. It also affects perceptions of quality of life in the region. Second, the strong corridor pattern starts to break down in some of the flatter areas, especially the Kapiti Coast district. This reduces transport efficiency, the strength of some centres and their potential to grow as employment areas.

Changes in our economy are also having an effect. There has been a decline in the traditional manufacturing and industrial base in the region. A process of change in the specialised nature of manufacturing is under way. Many industrial manufacturers are moving north due to land prices. The recent recession is still having an impact on the region and proposed further cuts to the government sector may mean more people will be unemployed in the region.

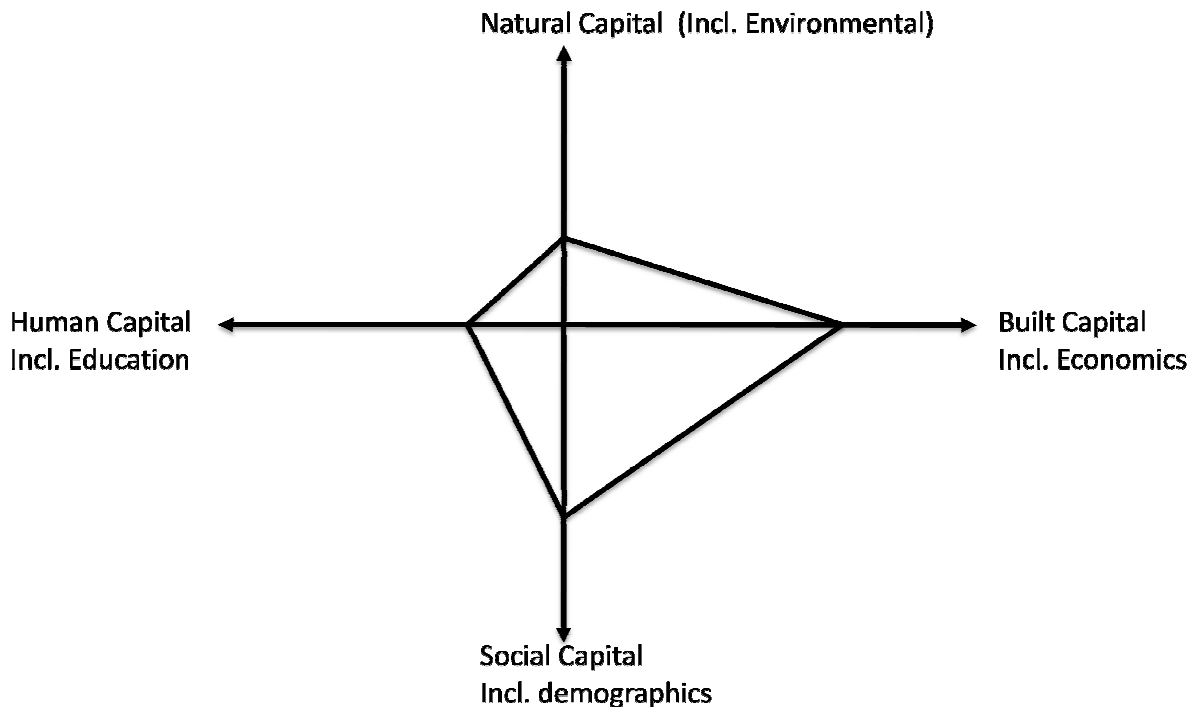
The issue of office vacancies is affecting both the CBD and other key regional centres. Understanding the key drivers of this and ensuring the heart of centres isn't eroding is important. Smart planning and targeted interventions are needed to unlock development opportunities around the region. We need to understand how our economy relates to land-use issues and have the right tools and systems in place to achieve this. We need to ensure that growth does not erode or dilute the heart and soul of our cities, towns or rural areas. We need to be clear what makes for the 'sense of place' within different parts of the region.

## ***Content analysis***

The content is analyzed from a data, information and modelling perspective; what is available and who holds the data and how easy is it to be used? What is missing? Under Objective 2, any and all relevant models and databases have been identified that could be considered for the SDSS model. The project team has evaluated the overall availability of these models and databases from an ecological economics perspective, i.e. whether the elements of built, natural, human and social capital relevant to the specific topic of choice or policy questions are adequately covered.

*Natural capital* is one of the production factors; a production factor that provides us with services, i.e. ecosystem services. Ecosystems provide us with the source of raw materials used in production and assimilate the wastes produced by society. *Built capital* refers to infrastructure and technology. *Social capital* refers to social structures and institutions. *Human capital* gives a sense of the capability of people to deal with complex situations and changes. From an Ecological Economics (EE) perspective there is limited substitutability among the four capitals them. For example, a levee is not a perfect substitute for a functioning flood plain, coastal wetland or mangrove forest. An informal reflection on the databases and models gathered to date for the Wellington Region by the SP2 project team is summarized in Figure 1. It is clear that most data is available on Built Capital and economics, followed by Social Capital and demographics. Less data was available on Natural and Human Capital.

**Figure 1** A qualitative analysis of existing databases and models for the Wellington Region



See Appendix 2 for a list of database and models collated for use by the SDSS.

### ***Mediated Modelling (process)***

Considerable effort was required to persuade the Territorial Authorities and relevant stakeholders in the Wellington region to commit to a MM process. The reluctance was due to the absence of a clear topic of focus that would suit the end-users and was connected to existing programmes and could add value. Two information pamphlets were produced to communicate the value of participation and the proposal for the MM workshops was discussed at several meetings. To encourage participation the following decisions were made:

- The topic was left open (rather than being pre-determined by GWRC) and the pre-workshop questionnaire informed the SP2 team of specific areas of interest to participants.

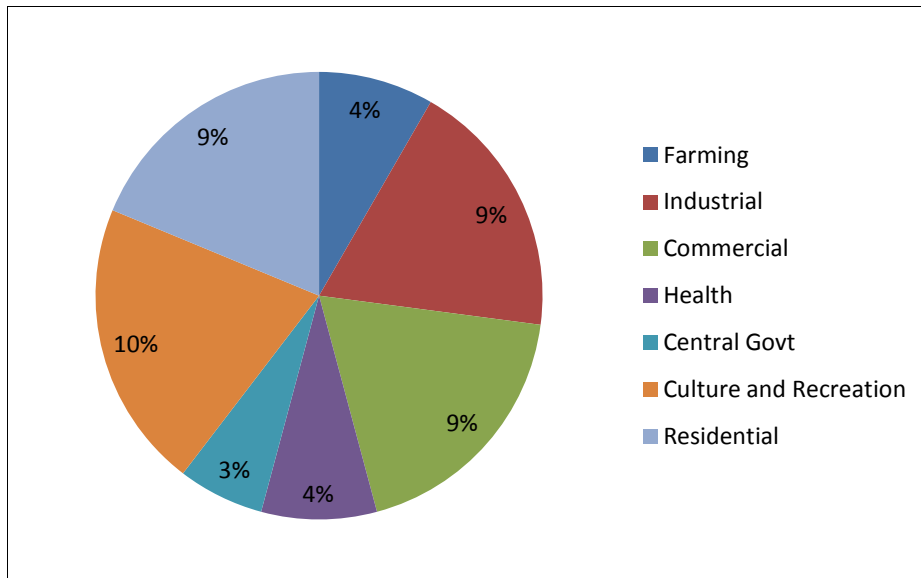
- GWRC advised to limit the number of workshops to 3 in order to give the participants a chance to find out for themselves whether the MM approach was useful for them and if so, provide the opportunity to continue.
- A letter of invitation to possible participants was sent out by Mr David Benham the Chief Executive of Greater Wellington.
- In order to keep the MM process concrete and connected to the SDSS modelling and due to the limited number of workshops, the project team decided to develop a preliminary model based on the existing linkages between Land Use, Economics and Demographics in the SDSS model. The MM process will explore what other linkages this participant group deems relevant.
- An introductory letter to participants was sent on February 21, 2011 from Ecological Economics Research New Zealand (EERNZ). This letter provided detailed information for the confirmed participants on how the workshops would be run (Appendix 3).

## **Stakeholder Analysis**

The stakeholder selection was done by GWRC based on a general guideline provided by EERNZ for stakeholder selection for participatory processes. In the absence of a commitment to a distinct topic, the stakeholder selection was inspired by inclusiveness of all TA's as well as broadness of cover with participants sought from social, economic, environmental and cultural areas. The participants and the organizations they represent are listed in Appendix 1. A "cluster analysis" to consider the more dominant sectors for the spatial model for Auckland was done by Market Economics (REF). We compared the Auckland "cluster analysis" with the stakeholder representation in the Wellington case. For our MM participant analysis some of the 27 clusters were combined, for example low, medium and high density of residential area, became "residential" in the MM context. The project team assigned a binary "interest or no interest" to each of the categories to anticipate the topical interest of the participants. Results are shown in figure 2.



**Figure 2** Expected topical interests of participating stakeholders



Participant's interests could cover more than one category of interest. For example, Statistics NZ applies to all categories. Infrastructure which is an important interest for planning is not represented. The emphasis among this stakeholder group may well be on the "function" of the region rather than the "features". The functions are highly relevant from an outcome perspective in non-spatial systems thinking, whereas the features enable the "functions" and can be considered the inputs into the systems thinking. The spatially dynamic model will naturally lift feature aspect. Making this difference explicit may be important for the dialogue between MM and the spatially explicit dynamic model as well as understanding the connection between the end-users and the spatial model as the link between function and features needs to be understood.

### **Participant pre- surveys**

After the participants informally confirmed their interest (via Melanie Thornton, GWRC) a letter was sent (Appendix 3) to those participants (listed in Appendix 1) including a pre-questionnaire (Appendix 4). The analysis of the pre-questionnaire showed the predominant issues for participants to be those set out in table 1.

**Table 1 Cause and effect of predominant issues (unlinked, without order)**

<b>Predominant issues</b>	<b>Caused by:</b>	<b>Leading to:</b>
Economic activity/jobs	Competition for skills/talent, NZ earning power	Wellington CBD decline/static economy
Population growth	Population demographics (lack growth, ageing)	Declining pop impacts economy
Transport & infrastructure	Public transport integration with land use	Transport impacts on people, economy
Regional form/vision	Land use planning	Limited understanding of how a city works
Housing affordability	Price and affordability of housing	Infrastructure investment and affordability
Community resilience	Inability to assign value to intangibles	Loss of social cohesion/resilience
	Lack of education	Increased inequality
	Recession	Limited skills pool
	Changing public sector/central govt	Ad hoc decision-making
	Business growth	
	Appeal of city/QoL	Environmental degradation
	Lack of coordinated, integrated decision-making	
	Inequality	Increased health risks
	Consumerism	

Most people considered their issue to be neutral to bad (2.4)<sup>1</sup>. Without any intervention it was felt things would get to be bad to very bad by 2050 (1.7). In addition, the actions underway were not considered sufficient to make an overall improvement and were expected to instead maintain the status quo (2.4), that is, if currently planned actions continue, the “issues” would not improve or deteriorate. It was generally felt that the wider community shared the concerns raised and were aware of these issues.

<sup>1</sup> All following results reported in brackets are mean values on a scale of 1 to 5.

The group was on average relatively neutral with respect to:

- Inclusiveness of different perspectives = neutral (3.0)
- Strategic, long term emphasis of participants = neutral (3.3)
- Ability to show leadership and implement ideas generated = neutral (2.9)
- Ability of group to generate innovative ideas =neutral (3.0)

The neutrality was in part dictated by the fact that the group was predominantly made up of people who didn't know each other well. Two people knew between 5-10 participants. Six people knew between 3-5 participants and seven people knew between 0-2 participants. The groups missing, in order of number of times mentioned were: Iwi/Maori, Community, Non-governmental organizations, Ministry for the Environment, Businesses, Department of Conservation, older persons, Youth, Education, Transport. The project team approached organizations to cover these gaps and added a representative from an umbrella group for non-governmental organizations. This person was able to cover, Community, Non-governmental organizations and older persons' interests.

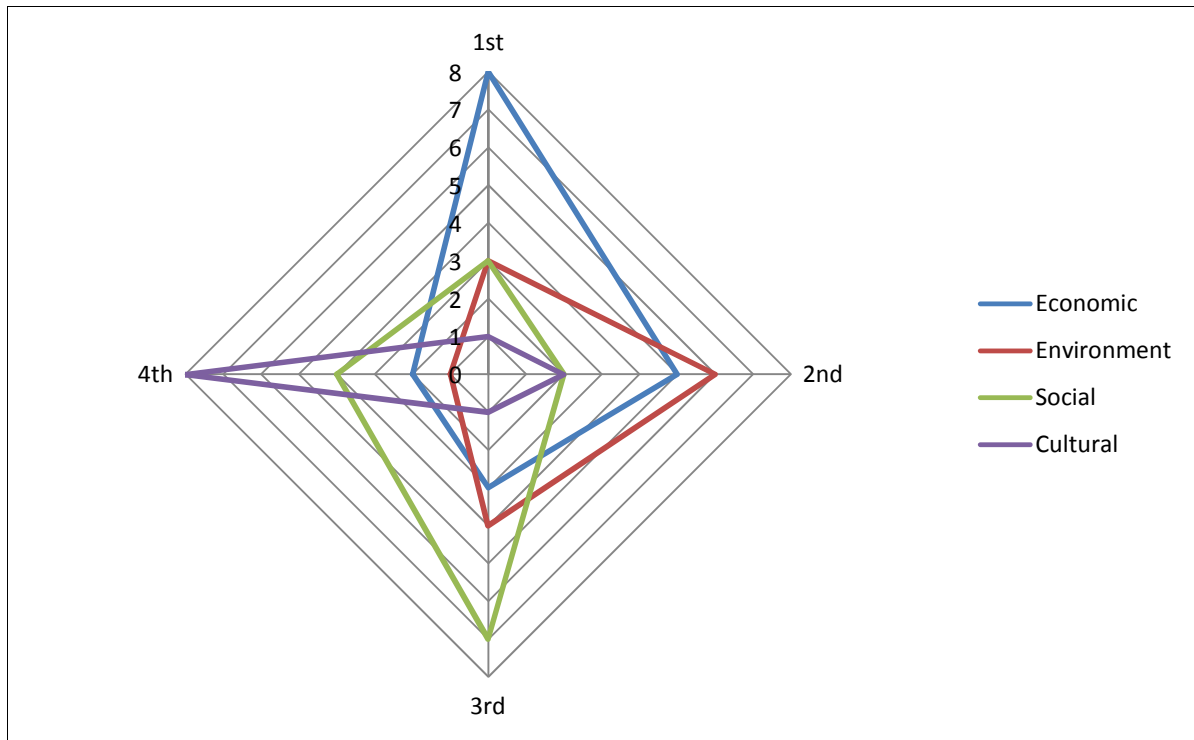
Based on the fact that most participants didn't know this group, they were generally neutral on whether they thought there would be a consensus on:

- An appropriate topic for the Wellington region
- A long term goal/vision for the Wellington region
- Implementation toward future goals/vision for the Wellington region

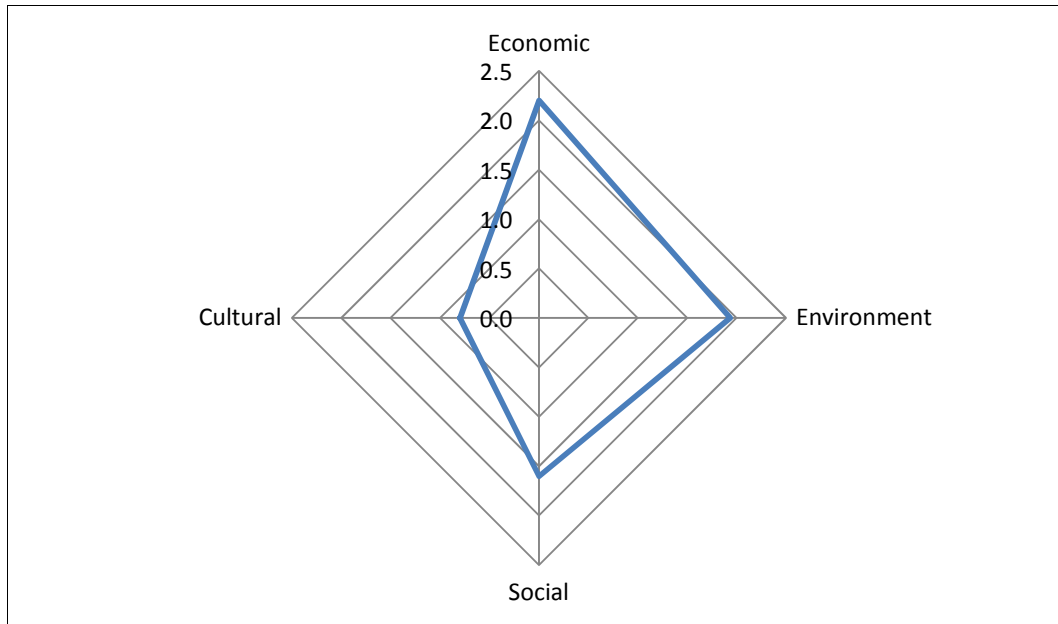
Figure 3 shows how participants ranked each of the 4 aspects of well-being in terms of importance to them and their organisations.

Figure 4 ranks the 4 aspects of well-being when the overall rankings were averaged for each participant. It shows a predominant economics and environment interest, followed by social aspects with cultural aspects lagging.

**Figure 3: How participants ranked each of the 4 aspects of well being**



**Figure 4: How the 4 aspects of well-being were ranked when responses were averaged for each participant**



The desired outcome from the MM workshops for these participants was:

- Aspects of well-being are given appropriate weighting
- Intensification nodes for the region are identified
- A useful plan is produced to show drivers of change, solutions and get buy-in
- Consensus on regional priorities is reached
- There is increased awareness of issues/linkages/gaps

While the worst outcome would be:

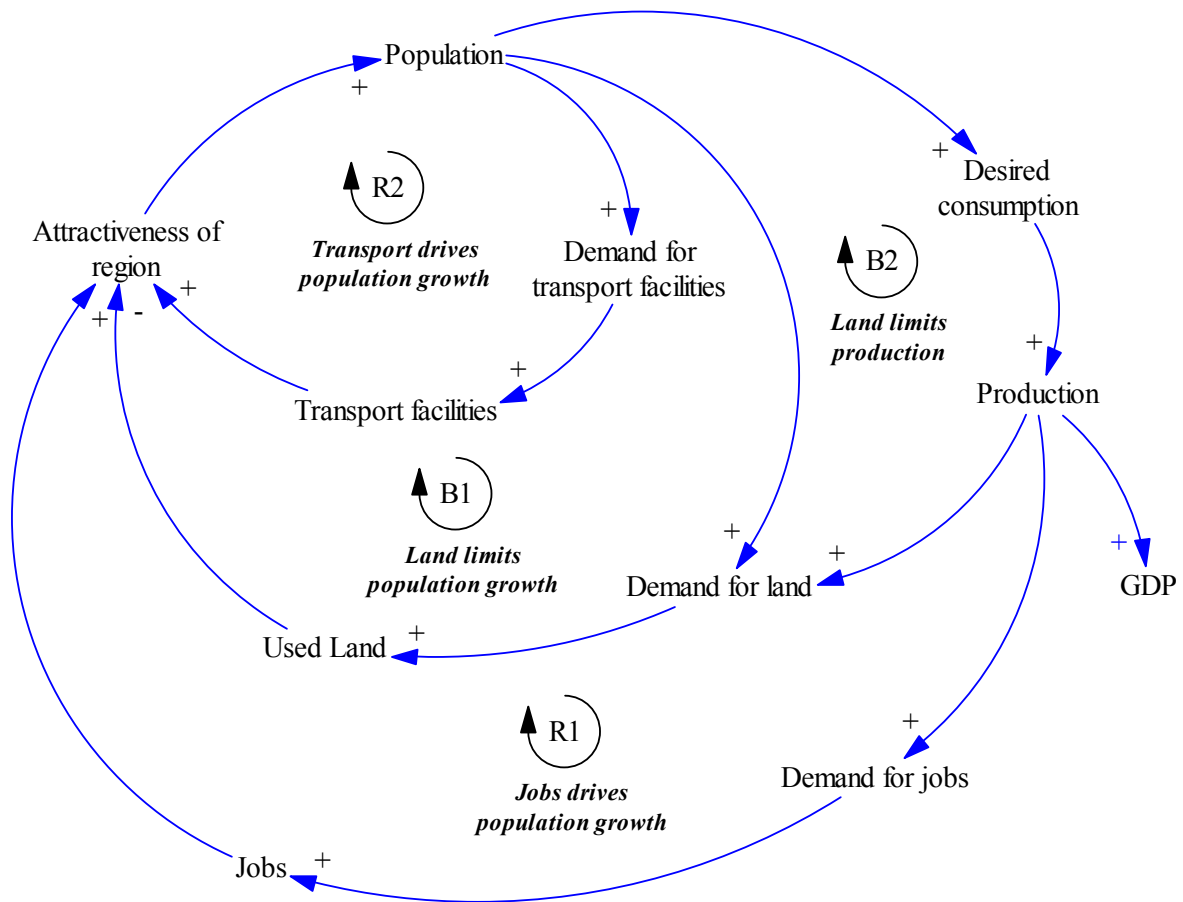
- Talk fest/waste of time
- Black box/mechanics of modelling
- Model with no flexibility or adaptability
- Not practical/usable
- Transport and growth issues are not covered
- Reinforcement of current planning paradigm

With respect to other questions: No one has used Stella before. Six people have used computer modelling tools; 9 have not. Everyone was ok to use the questionnaire outputs for research purposes. Most people (11) have visited the website. Four people wanted more information.

### **Preliminary model**

A preliminary model can function as a starting point for dialogue in MM workshops. In the Wellington case, we chose to summarize the interlinkages currently in the spatial model between Land Use, Economics and Population in a Vensim structure as presented in figure 5.

**Figure 5** Casual loop diagram of preliminary model



The summarised message is Population has an appetite for consumption, which drives production (measured in GDP). Production increases a demand for jobs and jobs make the region attractive. A preliminary model in STELLA was also developed along the lines of this causal loop diagram to function as an example of a system dynamics model. The project team chose to NOT provide the preliminary model as a starting point but rather build a model from scratch with participants to increase understanding.

### Mediated Modelling workshops

Based on the participants that are committed (15), the limited number of workshops (3) and a critical connection with the SDSS model, we are making the assumption that the agenda for the

workshops needs to be more concise than when a more free-flowing dialogue about “uncertainty and long term systemic changes” is programmed for. The agenda for the three workshops is:

**Workshop 1 – 7 April:** Participants will learn about System Dynamics as a tool to explore integrated trends.

**Workshop 2 – 19 May:** Participants will develop some basic scenarios to simulate the model at a scoping level and inform spatial model.

**Workshop 3 – 18 August:** The workshops are part of a continuous loop of improving understanding of decision support tool development.

The agendas for workshops 2 and 3 may well change to reflect the learning in preceding workshops. This will be reflected upon in the post-documentation of this project.

### **Participant post-surveys**

Some questions are anticipated for a post-questionnaire which will be developed in order to test the team’s anticipated outcome and compare it with what we learned.

Questions:

1. Was the model used sufficiently in supporting the dialogue (compare the perception of the participants with the perception of the mediated modeller and the workshop agenda/script)?
2. What is the significance of data availability and/or data translation?
3. Was the model the appropriate vehicle to reach the conclusions or address the concerns of the participants?
4. Did the reflection on the group’s make-up change consistently?
5. Did we lose or gain participants? Are the observed gaps in the stakeholder list persistent or changing?
6. Are participants (including those who were unfamiliar with STELLA) willing and able to demonstrate the model to others?
7. Does a significant portion (>50%) of the group want to continue the MM effort?
8. Is the website serving well as a communication tool?



## **Model description and anticipated model evaluation criteria**

The pre-model is described earlier in this report. A model description will be documented after the 3<sup>rd</sup> workshop and compared with the preliminary model. We anticipate the final model description will help inform the linkages workshop for the spatial modelling efforts. Questions we aim to reflect on are:

1. Did the model progress significantly from the preliminary model to the “final” scoping model after 3 workshops?
2. What areas of the four well-beings were consistently included?
3. Did the dominant areas correspond with the areas identified in the questionnaire as priorities?
4. What linkages are strongest and weakest?
5. What was the role of data support/gathering? Is the scoping model predominantly qualitative or does it have merits as a quantitative simulation model?

Generally speaking, current practices of model assessments include validation, verification, confirmation, calibration and sensitivity analysis, among others. The model evaluation will relate to the goal the modelling effort sets out to address as well as the decision making context.

## **3. DISCUSSION**

The following discussion aims to clarify some underlying concepts and assumptions the project team members implicitly work with. We make these explicit because our assumptions guide our hypothesis and design of the research. It is well possible that the decisions we make as a research team are influenced by our assumptions or that members inadvertently have different assumptions or understandings or concepts on issues such as (1) Adaptive Management, (2) Normative goal of Sustainability, (3) Scale and (4) Integration. Furthermore, some questions are raised for contemplation in the anticipation that asking (and making explicit) such additional questions will improve the adaptive capacity of the research project.

### ***Adaptive Management (AM)***

It is our assumption that Action Research works well in conjunction with AM. The SP2 project will follow the AM format and develop ways to assess *vision, integrated assessments tools, planning, implementation and monitoring*. An overview and framework on integrated assessment tools is available (van den Belt et al, 2009). A survey of Regional Councils was undertaken to provide a base line for the integrated assessment tools that the SP2 programme is commissioned to design and the extent to which such tools are being used; and if so why or why not (van den Belt et al, 2011). Since this approach resonated with some Regional Councils, a proposal for the development of a Directory to guide end-users towards case studies and information with regard to Integrated Decision Support tools was submitted to MSI for funding (28 February 2011) and accepted 16 June 2011.

The framework used for the SP2 project is set out in “Integrated Assessments and Adaptive Management” (van den Belt, 2010; van den Belt, in preparation 2011) and the outline for a book on Multi-scale Integrated Assessments for Sustainable and Adaptive Systems.

The Post-Integrated Assessment of the MM workshops will follow as much as possible the developing framework to synthesize and evaluate its strengths and weaknesses.

### ***Normative goal of Sustainability***

The normative goal of “sustainability” is integral to the SP2 programme. “Sustainability” is also considered the normative goal for the trans-disciplinary field of Ecological Economics. As the field moves from concept to implementation, the question of “What is to be sustained” and how tradeoffs are made from a systemic perspective become increasingly relevant; moving away from a win-win assumption in the short term toward a tradeoff situation because sub-principles of sustainable development are often in conflict with each other. Is “sustainability” confused with “staying the same?” and is the concept standing up to the rigor of implementation? If not, what emerges in its place to answer the fundamental needs? See also (van den Belt, 2011). Following the “zeitgeist”, *sustainability* as a concept in the SP2 programme seems to be enhanced or

perhaps replaced by *spatial planning*. At this stage, the concept of “sustainability” seems to be in flux.

### ***Scale***

Scale will be discussed for purposes of vertical and horizontal integration and relevance for geographic, temporal, social and complexity issues. It is our assumption that scale and the manner in which scale presents itself is important in both understanding how decision making can be supported as well as how data is presented as scenarios of interrelated time series.

### ***Integration***

For SP2 the working definition of what we mean by “integration” needs to be both suited to an urban context and embedded in an awareness of ecosystems and the services they provide.

At the outset of the SP2 project “integration” refers at a minimum to the three meanings articulated by Brown (2009). These are:

1. How linkages between social and ecological systems are understood and different types of knowledge brought together.
2. How different actors are brought into governance processes to address concerns. There needs to be mutual consideration of multiple factors such as ecosystem services, property rights, human well-being, laws and the organization of government, incentives for the private sector, and so on.
3. How policies and decisions are implemented at multiple scales.

There are a number of key factors that influence when integration is appropriate and likely to be successful. According to Brown et al. (2005b) cited Brown (2009, 39) these are:

- “The full costs are taken into account
- Capacity exists in government and civil society institutions
- A feasible timescale to achieve objectives is possible
- There is compatibility and no obvious conflict between objectives
- The legal and institutional frameworks supporting the response are already in place

- Relevant and timely information is at hand and extensive new data and research is not necessary”

Brown (2009) goes on to make the point that successful integration is more likely to be achieved when key stakeholders drive the process and have a sense of ownership rather than when imposed by external agencies.

### ***MM and the Spatial Model (SDSS)***

It is perhaps noteworthy to observe that the data gathering for SDSS reveals a dominance in data availability on Built (including economic) and Social capital. However, the participant’s interests score high on Economics but very close or equally important seems to be the Environmental component (Natural capital), followed by Social capital (see Figure 4). Does this have consequences for the way the connection for the participants is made between MM and SDSS?

### ***Stakeholder analysis***

The stakeholder analysis, based on the clustered categories, indicates the transport sector is not represented. The context analysis also indicates transport is important. Participant feedback on who should take part in the MM workshops identified the following groups as absent: Iwi/Maori, Ministry for the Environment, Businesses, Department of Conservation, Youth, Education and Transport. The impact of non-representation from these groups and the impact this will have on the final mediated model and data access is uncertain.

### ***Mediated Modelling as a Neutral Space***

The MM workshops provide the opportunity to combine different perspectives and interests in a model that will ideally be used by all the workshop participants. How useful is it to capture the dialogue in a model for the different organisations that participate?

## **Conclusion**

This report is a pre-assessment considering the context in which the MM project operates. It also documents the content that is gathered and available pre-workshops. The preparation of the MM

process is described, including the pre-survey, pre-model building and collaboration with the GWRC to select and invite the participants. The discussion lays out some assumptions the project team holds. As part of the pre-assessment, we aim to be transparent about the choices we have made in the design of the MM process in order to allow a more in-depth reflection after the MM workshops. The overall purpose is to enhance the team's ability to supply a blue print for development and dissemination of spatial and dynamic decision support tools to regions beyond Wellington (and Auckland) based on a rich, well-documented research process, which we believe enhances the research outcome.

## Appendix 1 Workshop Participant List as of 7 April 2011

<b>Name</b>	<b>Organisation</b>	<b>Position</b>
Anders Crowfoot	Federated Farmers	Wairarapa Provincial President is experienced with GIS
Chris Moller	Custance	Urbanist/Architect
Peter Salter	Ministry Of Social Development	Senior Policy Analyst Medium Term Strategy Unit
Gavin Armstrong	Wellington City Council	Senior Advisor Performance Improvement and Research
Stephen Oakley	Statistics New Zealand (was a member of the Creating Futures Advisory Group)	Project Manager Environment and Sustainable Development Team National Accounts Statistics New Zealand
Kim Kelly	Hutt City Council	Group Admin Manager Development Services
Mitch Lewandowski	Upper Hutt City Council	Planner
Moira Lawler	Porirua City Council	General Manager Strategy and Planning
Dr Steven Palmer	Regional Public Health	Public Health Advisor in Healthy Environments Team
Jeremy Harding	Economist	Wellington Employers Chamber of Commerce
Nicola Shorten	Greater Wellington	Manager Strategic Planning, Strategy & Community Engagement
Anton Ferrari	Grow Wellington	GM Corporate Services
William Woods	Centreport	Planning and Environmental Manager
James Kilbride	Kapiti Coast District Council	Policy Planner
Dave Henderson	Association of Non Governmental Organisations Aotearoa	Co-ordinator

## Appendix 2      Databases and models gathered for “content”

### GIS Layers

#### Land Use and Land Cover

This is a map of the major/dominant land use in each meshblock<sup>2</sup> (or higher resolution polygons) in the Auckland and Wellington Regions. The maps will be generated through the use of the following datasets:

##### *Regional Digital Boundaries*

- *Description:* These vector-based GIS layers provide digital boundaries for the SP2 study regions i.e. Auckland Region (and when available the Auckland Council spatial boundary area) and Greater Wellington.
- *Status:* ARC and GW boundaries are available.
- *Availability:* 2006 Census-based GW and ARC boundaries are available.

##### *Urban Area Boundaries*

- *Description:* These vector-based GIS layers provide digital boundaries for the urban areas contained within the SP study regions i.e. metropolitan Auckland and Wellington.
- *Status:* ARC and GW boundaries are available.
- *Availability:* 2006 GW boundaries are available, 2001 ARC MUL boundaries are available – as previously provided by the ARC. 2006 ARC boundaries are yet to be obtained.

##### *Business Directory*

- *Description:* Employment Counts<sup>3</sup> (ECs), Modified Employment Counts (MECs<sup>4</sup>), Full-Time Equivalents (FTEs), Geographic Units/Business Counts (GUs) by 6 digit ANZSIC codes by meshblock.
- *Status:* BD purchased annually by MEL.
- *Availability:* 1998 to 2004 (FTEs, Opt\_FTEs, GUs), 2000 to 2008 (ECs, MECs, GUs).

##### *LCDB1 and LCDB2*

- *Description:* Land cover database of New Zealand. LCDB1 has 18 land cover types; while the LCDB2, which uses better land cover recognition techniques but for the same satellite imagery as the LCDB1, covers 61 land cover types.
- *Status:* LCDB1 previously purchased by MEL, LCDB2 downloaded from [koordinates.com](http://koordinates.com).
- *Availability:* 2000.

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<sup>2</sup> There are approximately 9,846 meshblocks covering the Auckland Council area (9,853 in Auckland Region), and 4,680 meshblocks covering Wellington Region.

<sup>3</sup> Employment counts are head counts of workers. It is important to note that a person may work in several jobs and, thus, counted several times.

<sup>4</sup> Modified employment counts include working proprietors.

### *Agribase Database*

- *Description:* This dataset covers all land parcels used for agricultural purposes. Each land parcel is coded by 6D ANZSIC, with multiple codes for each land use parcel possible.
- *Status:* Too expensive to purchase from Asure Quality, but available via ARC and GW.
- *Availability:* ARC - 2009 and all previous releases, GW – 2009 not sure on all previous releases.

### *ARC Rural Land Uses*

- *Description:* Mathew Hick's 1 ha sample of rural land uses.
- *Status:* Available from the ARC, Garry to follow up with Amy Taylor.
- *Availability:* Unknown.

### *LUCAS Land use map*

- *Description:* Vector-based GIS layers providing land use classified using Kyoto-compliant land use definitions for GW only. It is currently an interim map (focused on rural rather than urban land uses) and it is generally accepted that it contains numerous errors, but will be continuously updated over the next three years. The objective of LUCAS mapping programme is to ensure data is available on four key land use classes i.e. Natural forest, Pre-1990 Planted Forest, Post-1989 Forest, and Grassland with woody biomass. All other land uses are derived from pre-existing datasets such as the New Zealand Land Cover Database versions 1 & 2 (LCDB) and New Zealand Land Resource Inventory (NZLRI). Also, includes a 1990 and 2008 land use change layer which has undergone considerable quality control to ensure conformity with IPCC Good Practice Guidance (IPCC, 2003). However, no accuracy assessment has been undertaken to date.
- *Status:* Access to this data is provided on the understanding that the dataset held by LUCAS remains the authoritative master copy. Where the Ministry release data to stakeholders with no quality control, assurance and accuracy assessment has not been undertaken, datasets should not to be used for any published research or otherwise, and are not to enter the public domain.
- *Availability:* The LUM data layer includes land use classifications for both 1990 and 2008. The layer can therefore be used to create either a 1990 or a 2008 land use map depending which attribute is symbolised.

## **Public Infrastructure and Networks**

- Road centrelines: 2007 LINZ digital topographic data V14 via [koordinates.com](http://koordinates.com) and council-obtained proprietary layers for both ARC, GW. GW also has DCDB<sup>5</sup>-based detailed road centreline.
- Rail centrelines: 2007 LINZ digital topographic data V14 via [koordinates.com](http://koordinates.com) for both ARC, GW. GW also has DCDB based detailed rail centreline.
- Power transmission lines: 2007 LINZ digital topographic data V14 via [koordinates.com](http://koordinates.com) for both ARC and GW.
- Schools points: Zenbu via [koordinates.com](http://koordinates.com) for both ARC and GW.

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<sup>5</sup> Digital Cadastral Database (DCDB).



- Airports: 2007 LINZ digital topographic data V14 via koordinates.com for both ARC and GW.
- Runways and airstrips: 2007 LINZ digital topographic data V14 via koordinates.com for both ARC and GW.
- Cemeteries: 2007 LINZ digital topographic data V14 via koordinates.com for both ARC and GW.
- Golf courses: 2007 LINZ digital topographic data V14 via koordinates.com for both ARC and GW.
- Landfills: 2007 LINZ digital topographic data V14 via koordinates.com for both ARC and GW.
- Racetracks: 2007 LINZ digital topographic data V14 via koordinates.com for both ARC and GW.
- Open space: 2009 GW regional open spaces matrix.

## **Socio-Economic**

### *1996, 2001 and 2006 Census of Population and Dwellings*

- *Description:* All census variables by meshblock, area unit, territorial local authority, and region. Please see attached spreadsheet which gives details of all of the datasets (by type) available.
- *Status:* Available from MEL.
- *Availability:* 1996, 2001 and 2006. We also have the 1981 and 1991 census data, but significant time costs would be involved to extract time series data.

### *Resource Consents*

- *Description:* Resource consent eastings, northings and IDs.
- *Status:* Available only for GW.
- *Availability:* The data is available for all resource consents (current and historic).

## **Physical Suitability**

- Height map: 2007 LINZ digital topographic data V14 via koordinates.com for both ARC and GW.
- Contours: 20m contours via NZ topographic maps on GIS machine for both ARC and GW.
- Slope, Soil, and others: LENZ Levels 1, 2 and 4 polygons and grids (six downloads) via koordinates.com for both ARC and GW.
- River centrelines: 2007 LINZ digital topographic data V14 via koordinates.com for both ARC and GW.
- River polygons: 2007 LINZ digital topographic data V14 via koordinates.com for both ARC and GW.
- Lakes: 2007 LINZ digital topographic data V14 via koordinates.com for both ARC and GW.

- Reservoirs: 2007 LINZ digital topographic data V14 via koordinates.com for both ARC and GW.
- Hillshade relief: 200? 20m digital elevation model at 20m resolution for GW.
- Elevation: 200? digital elevation model at 20m resolution for GW.
- Slope angles: 200? Slope map for GW.
- Key native ecosystems: 2008-09 layer that includes all of the key native ecosystem sites that have been assessed by the GW Biosecurity staff.

## **Zoning**

- *Auckland Region*: MEL has previously developed in liaison with ARC staff a concordance that takes 2006 detailed zoning information for Auckland City Council (ACC), North Shore City Council (NSCC), Waitakere City Council (WCC), Manukau City Council (MCC), Rodney District Council (RDC), Papakura District Council (PDC) and Franklin District Council (FDC) to 11 land use classes. My initial investigation into ARC databases was undertaken prior the new Auckland Council spatial boundaries being determined. Further investigations are required to determine what GIS zoning data is available from the ARC for the Auckland Council spatial boundaries once (which may be now) they have been determined.
- *Wellington Region*: 2007 zoning layers have been made available from GW for Wellington City Council (WCC), Hutt City Council (HCC), Porirua City Council (PCC), Upper Hutt City Council (UHCC), Kapiti Coast District Council (KCDC), and for the draft Wairarapa district plan zones.

## **Models**

### **Population and demographic**

#### *Wellington Population, Household and Labour Force Model*

- *Description*: Provides demographic projections for the region by Census Area Units (CAU). Used as an input into the GW transport model. Current population land required coded by suburb-types (high density residential, high growth greenfield, low growth greenfield, shrinking, developed and normal) with future demand allocated based on historic market preferences. Suburb capacity (vacant, residential, infill, greenfield) with future capacity determined by analysis of land parcel data.
- *Status*: Proprietary model developed by James Newell at Monitoring and Evaluation Research Associated (MERA) in conjunction with Business and Economic Research Ltd (BERL).
- *Availability*: Unknown at this stage.

## **Economic, Environment-Economy Interface**

### *Economic Futures Model*

- *Description:* A multi-regional input-output scenario projection model for GW and ARC. Covers the study region, rest of North Island and the South Island. Covers 48 economic sectors, population by 5 yearly age-sex cohorts, numerous socio-economic variables (GRP, value added, employment, occupations, skills, imports, exports, multi-factor productivity), numerous environmental resources (land use, energy use by 11 delivered energy types (aviation fuel, diesel, coal, petrol, fuel oil, geothermal, etc), ecosystem service appropriation (measured in \$ terms) and numerous residuals (energy, industrial and biogenic CO<sub>2</sub>, NO<sub>2</sub>, CH<sub>4</sub>, Nitrates, Phosphates and so on). Produces projections under various scenarios out to 2031 for the years 2006, 2007, 2011, 2016, 2021, 2026 and 2031. Includes a BAU scenario with low, medium and high projections, but can (as per ARC Horizon's 2031 project) incorporate other scenarios.
- *Status:* Proprietary model developed by Market Economics Ltd.
- *Availability:* 2007 base year.

## **Transport**

Both GW and the ARC have standard four-stage transport optimisation models developed in EMME. The ARC model, known as ART model, has just over 500 zones, while the GW model has just over 200 zones. In both cases the zones may be matched spatially to Area Units (CAUs, amalgams of several meshblocks). The ART model, however, is more complicated as it incorporates important feedbacks between land use change and transportation via a link between ART and Auckland Strategic Planning Model (ASP or "Delta<sup>6</sup>"). When used together these models are known as the ATM2 (Auckland Transport Models 2).

## **Hydrology**

### *Wellington Sustainable Yield Model*

- *Description:* Planning tool for assessing bulk water supply system reliability to compare against our one in fifty year shortfall. Linear programming optimisation model, uses monte carlo analysis to determine the annual shortfall probability. Uses 115 year dataset of demand and river flows derived from climate records. Based on WATHNET software.
- *Status:* Proprietary model developed by NIWA.
- *Availability:* Unknown, yet to determine.

### *Wellington Demand Model*

- *Description:* Used in conjunction with the Sustainable Yield Model to predict daily per capita water demand using climate variables. Uses climate data based to 1890 or 1980???. Output is per capita demand, calculated using statistical relationships (regressions) between climate and water demand variables.
- *Status:* Proprietary model developed by NIWA.

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<sup>6</sup> It is sometimes known by Delta – the software package which it is programmed in.

- *Availability:* Unknown, yet to determine.

## ***Databases***

### *Resource Consents Databases*

- *Description:* These databases are available for both Regional Councils. Given the confidential nature of these databases it is unlikely that the data contained with these databases (the most useful of which is information of maximum water use allocations by volumetric unit per time period) will be incorporated into the SDSS. These databases may however provide valuable data for context setting.
- *Status:* Unknown.
- *Availability:* Continuously updated.

### *ARC Air Emissions Inventory*

- *Description:* Covers transport (vehicles, ships, rail, off-road, pleasure crafts, bitumen laying and road dust), industry (consented industry, solvent use, surface coating and thinners, dry cleaning, service stations, small combustion, commercial gas combustion), biogenic (based on LCDB III land cover and standard value emissions factors of NZ), and miscellaneous sources (domestic fires, outdoor burning, gas leakage, LPG use, natural gas use, lawn mowing). Where possible data is made available, or modelled, at either a meshblock level or at relevant spatial units for the variable being considered.
- *Status:* Available, but many variables are still under construction.
- *Availability:* 2006 base year, updated annually – some seasonal based data is however available.

### *ARC Energy Database*

- ARC Energy database peer review.

## **Appendix 3      Introductory Letter to participants**

February 21, 2011

Re: Mediated Modelling Workshops for the Wellington Region - Sustainable Pathways 2

Dear participant,

Thank you for your interest in being involved in the Sustainable Pathways 2 (SP2) project ([www.sp2.org.nz](http://www.sp2.org.nz)). The SP2 project is a 6-year (2009-2015) MSI (formerly FoRST) funded (\$3.9m) project that focuses on developing processes and tools to support integrated, spatially explicit, strategic decision-making. Your involvement in SP2 through the Mediated Modelling (MM) component will provide a process for multiple stakeholders to combine their expertise, experience, and even intuition to inform the development of Spatial Decision Support System (SDSS) models in Wellington.

In the MM workshops, representative stakeholders are brought together for several workshops to interactively build a simulation model at scoping level for a regionally relevant topic (to be determined based on the attached questionnaire and before the first workshop). Stakeholders will identify and build their understanding and mutual appreciation of the key model attributes, (such as population density, economics and land use, amongst others) and the dynamic interaction between these variables. The model with linkages and feedbacks will then be constructed to run over-time to illustrate long-term intended and unintended consequences of policy decisions. The participatory process, and the collaborative learning that takes place, are intended to facilitate buy-in for, and guide the development of the more complex, data-intensive and spatially explicit SDSS model for the Wellington Region.

The mediated modelling format involves facilitated discussions, for the purposes of developing a continuously evolving modelling framework. The evolving model will be visible at all times during the workshops and available on the SP2 website ([www.SP2.org.nz](http://www.SP2.org.nz)) after each workshop. The process is about synchronizing the assumptions, clarifying definitions and communicating inter-linkages between social, economic, ecological and cultural aspects in a simple yet meaningful way.

For project timing reasons, the workshop dates have been changed to 7 April, 19 May and 18 August.

Attached is the list of confirmed participants. We believe this is a unique group able to take a broad perspective on a wide range of current issues and potential future scenarios.

We request the following time investment from participants:

1. An individual meeting of one hour with myself and/or Vicky Forgie during March to answer any questions you may have with regard to the project or workshops. Attached is the questionnaire that will guide the conversation during our meeting. An important part of the questionnaire is your views on specific topics that the workshops should focus on. This will help us to prepare the preliminary model for the first workshop on 7 April.
2. A similar questionnaire will be undertaken after the last workshop in August. This post-workshop questionnaire is anticipated to take up to 15 minutes and may be completed per phone or mail.
3. Full day workshops on 7 April, 19 May and 18 August from 9 AM – 5 PM. Lunch will be provided.
4. Assistance with data gathering as needed; this may be in the form of forwarding a specific request to the right person or some collation of data. When new subject matters arise, additional data gathering and data interpretation to support the dialogue may be required. Meetings with individuals or sub-groups between workshops may be organized if needed to follow up on workshop issues and/or prepare for subsequent workshops.

The proposed structure for the MM workshops is as follows:

**Workshop 1:** Presentation of a preliminary model based on the linkages currently in the prototype of the SDSS model and enhanced by the results from the interviews with each of the participants before the workshop. Participants will learn about System Dynamics as a tool to explore integrated trends.

**Workshop 2:** An updated version of the evolving model will provide more depth and address aspects of data translation and data gaps. We will also discuss the type of questions participants would like to see answered. We will compare the wish-list with realistic model capabilities and the level of transparency participants want to see in order to confidently use a model or its outputs. Participants will develop some basic scenarios to simulate the model at a scoping level.

**Workshop 3:** The model will be polished (at scoping level), whereby able to run the scenarios requested and/or a narrative will be provided to explain the gaps in order to do so. The findings for next steps will be established. This could include abandoning, changing or enhancing the mediated modelling efforts. It is envisioned that the MM provides a way to increase the transparency of, and confirm (or expand) the assumptions used in the proto-type for SDSS model for Wellington as part of the Sustainable Pathways 2 programme. The workshops are part of a continuous loop of improving understanding of decision support tool development.

Unless we hear otherwise from you, you will be contacted shortly by Vicky Forgie to schedule an individual meeting of one hour at a place of your convenience.

I am looking forward to meeting you and work together on this exciting project.

Yours sincerely,

Marjan van den Belt

## Appendix 4      Pre-questionnaire

### PRE- QUESTIONNAIRE TO GUIDE INTRODUCTORY INTERVIEWS (MARCH 2011) SUSTAINABLE PATHWAYS 2 – MEDIATED MODELLING

**Marjan van den Belt, PhD**

*Science Leader SP2 and Objective Leader Mediated Modelling*

*Email: [m.vandenbelt@massey.ac.nz](mailto:m.vandenbelt@massey.ac.nz)*

*Phone 06 – 356 9099 Ext. 81512*

#### **Introduction:**

The following questions will help us with the preparation for the three Mediated Modelling workshops that will run in Wellington from April 2011 to August 2011. The information requested is required to establish a baseline, which will be used to prepare for the workshops and also evaluate change after the workshops. We will use some of the answers for research purposes, but we assure you that no respondent will be identifiable in any research publication<sup>7</sup>.

1. Name: \_\_\_\_\_

2. Affiliation: \_\_\_\_\_

3. What is your role within your stakeholder group/organisation?

\_\_\_\_\_

#### **Background:**

The purpose of the Mediated Modelling workshops is to inform the spatially explicit dynamic model (SDSS). It will achieve this by illustrating and exploring the interlinkages between the 4 aspects of well-being (social, cultural, ecology and economics) of the Wellington Region. The proto-type of the SDSS currently interlinks aspects of Economics, Land Use and Population. A preliminary system dynamics model will replicate (in a simplified, non-spatial manner) those linkages to kick off the first Mediated Modelling (MM) workshop. The workshops will be used to expand and scope for additional interlinkages

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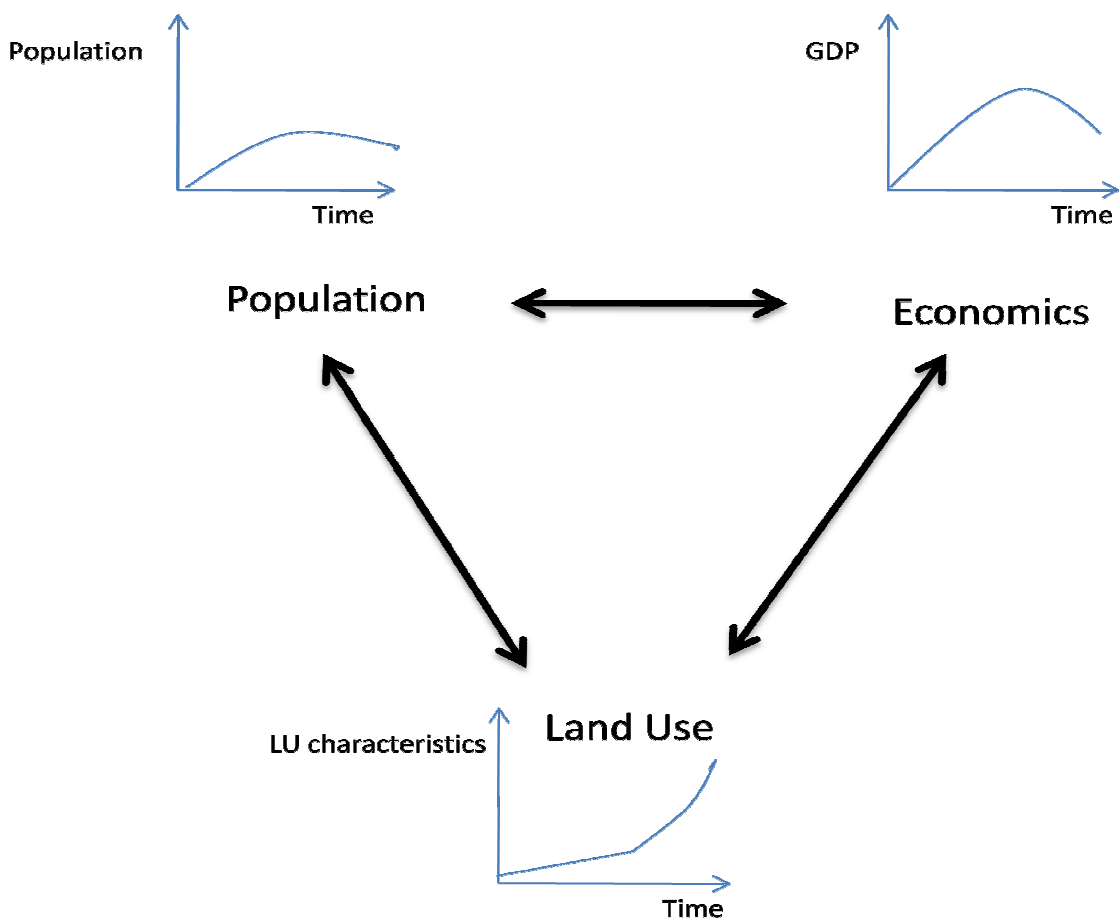
<sup>7</sup> "This project has been evaluated by peer review and judged to be low risk. Consequently, it has not been reviewed by one of the University's Human Ethics Committees. The researcher(s) named above are responsible for the ethical conduct of this research.

If you have any concerns about the conduct of this research that you wish to raise with someone other than the researcher(s), please contact Professor John O'Neill, Director, Research Ethics, telephone 06 350 5249, email [humanethics@massey.ac.nz](mailto:humanethics@massey.ac.nz).

and critical thinking about the system that interlinks the 4 aspects of well-being. We also hope to hear what type of questions you'd like to address using the models in the future and what type of scenarios these two models (MM and SDSS) should ideally run.

To be clear: The integrated spatially explicit model (SDSS) uses existing models and set rules to interlink them based on expert knowledge. The mediated modelling (MM) is used to scope for trends and interlinkages with end-users and stakeholders and identify key areas not covered by existing models. The long-term goal is to foster adaptive capacity among end-users in using and improving these tools in tandem.

A simple schematic overview of interlinking underlying trends could (example only) look as follows:



The dialogue, in this example, would focus on how the Land Use, Population and GDP trends are interconnected and developing a joint understanding of the characteristics of such trends when they are combined.

In order to advance toward a better defined topic for the workshops please, consider the following questions:



The MM workshops would like to identify key linkages for model building with participants. To make this relevant we would like your input on a specific topic to work with during the workshops.

1. From your point of view
  - a. What is the predominant mid to long term issue (i.e. next 10-40 years) for the Wellington Region with regard to integrating the 4 aspects of well-being?
  - b. What are the key factors causing this issue?
  - c. What are the key implications of this issue?

*With the assistance of the interviewer, please create a causal diagram.*

2. Please answer the following question on the state of the issue as you identified under question 1. From your point of view:

- a. How is this situation now?

- |   |   |           |
|---|---|-----------|
| 1 | = | Very bad  |
| 2 | = | Bad       |
| 3 | = | Neutral   |
| 4 | = | Good      |
| 5 | = | Very good |

- b. Where do you think this issue might rate by 2050 under Business As Usual, **excluding** initiatives currently underway?

- |   |   |           |
|---|---|-----------|
| 1 | = | Very bad  |
| 2 | = | Bad       |
| 3 | = | Neutral   |
| 4 | = | Good      |
| 5 | = | Very good |

- c. Where do you think this issue might rate by 2050 under Business As Usual, **including** initiatives currently underway?

- |   |   |           |
|---|---|-----------|
| 1 | = | Very bad  |
| 2 | = | Bad       |
| 3 | = | Neutral   |
| 4 | = | Good      |
| 5 | = | Very good |

3. Even though we realise that the 4 aspects of well-being are inter-linked, please rank the relative importance of the following aspects for the stakeholder group you represent.  
Rank in order of priority for your stakeholder group from 1(highest) to 4 (lowest):

Economic outcome	
Environmental sustainability	
Social impact on the community	
Integrity of cultural values	

4. How **aware** do you perceive the wider community to be (i.e. the people living in the Wellington Region) about the issue you identified in Q1?

- 1 = Very aware  
2 = Somewhat aware  
3 = Not aware

5. How **concerned** do you perceive the wider community to be (i.e. the people living in the Wellington Region) about the issue you identified in Q1?

- 1 = Very concerned  
2 = Somewhat concerned  
3 = Not concerned

6. You have been provided with a **list of confirmed participants** for the workshops. The goal of the mediated modelling workshops is to create an integrated picture of the four aspects of well-being for the Wellington region, based on relevant science information and knowledge/experience of participants. This modelling process and dialoguing is intended to help to inform the SDSS modelling tool and build a systems dynamic model to support longer term adaptive management capacity in the region.

Reflecting on the list of workshop participants, how do you think this group rates overall in terms of the following criteria?

- a. Inclusiveness: i.e. the level of inclusiveness of different perspectives

- 1 = Very low  
2 = Low  
3 = Neutral  
4 = Good  
5 = Excellent

b. Long Term Time Preference: i.e. a strategic, long term emphasis

- 1 = Very low
- 2 = Low
- 3 = Neutral
- 4 = Good
- 5 = Excellent

c. Leadership: i.e. the prospect that ideas developed in this group will be implemented

- 1 = Very low
- 2 = Low
- 3 = Neutral
- 4 = Good
- 5 = Excellent

d. Creativity: i.e. the prospect of this group developing innovative ideas

- 1 = Very low
- 2 = low
- 3 = Neutral
- 4 = Good
- 5 = Excellent

7. With how many of the participants do you interact on a regular basis?

0 – 2 participants \_\_\_\_\_

3 – 5 participants \_\_\_\_\_

5 – 10 participants \_\_\_\_\_

10 – 15 participants \_\_\_\_\_

All participants \_\_\_\_\_

8. Whom, if anyone, should be included in the workshops to achieve the goal of inclusiveness; i.e. which critical stakeholders have we missed?

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9. Based on the participants list do you perceive that within this group there is currently **consensus** on:

a. An appropriate topic for the Wellington Region as identified under Q1.

- 1 = Very low
- 2 = low
- 3 = Neutral
- 4 = Good
- 5 = Excellent

b. a long term goal/vision for the Wellington Region.

- 1 = Very low
- 2 = low
- 3 = Neutral
- 4 = Good
- 5 = Excellent

c. the implementation toward future goals/vision for the Wellington Region:

- 1 = Very low
- 2 = low
- 3 = Neutral
- 4 = Good
- 5 = Excellent

10. Please describe the purpose of the 3 workshops in your own words.

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11. What would be a good outcome from the Mediated Modelling process for you?

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12. What would be the worst possible outcome from the Mediated Modelling process for you?

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13. Have you used STELLA (= the modelling software used in this project) before?

Yes/No

14. Have you used other computer based modelling tools before?

Yes/No

If yes which? \_\_\_\_\_

15. Are you willing to allow answers to the above questions to be used for research purposes? Note: no individual responses will be identifiable in any publications from this research.

Yes/No

16. Have you visited the project website [www.sp2.org.nz](http://www.sp2.org.nz) ?

Yes/No

17. Do you require any further information regarding the process, the model, etc. prior to the workshops?

Yes/No

If yes, please state what additional information you need or questions you would like to have answered.

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THANK YOU!

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