Creating Futures

Project Aim

Develop and apply planning and communication tools to make informed choices for the future

Creating Futures is a four-year (2006-2010) FRST-funded multi-disciplinary research programme led by Environment Waikato and involving a number of partners (see below) with expertise in economic, social, environmental and computer programming and modelling fields.

The project has **two specific objectives**:

1) Developing processes to enable evaluation, deliberation and choice of alternative futures for social, environmental, economic and cultural changes through the use of scenario analysis linked to multi-criteria evaluation frameworks.

2) Developing an integrated spatial decision support system (ISDSS) that links economic, environmental and social components, and quantitatively forecasts plausible future scenarios of regional development as part of long-term integrated spatial planning.

Key Achievements 2009/10

- Completion of WISE (Waikato Integrated Scenario Explorer): Select data and models, integrate models into overall GEONAMICA framework, design and program of Graphical User Interface (GUI). Several draft versions produced for iterative validation, testing and further improvements.
- Design and undertake practical case studies:

  i. Regional Policy Statement (EW)
  ii. Future Proof sub-regional growth strategy

  Achievements: 1) engage end users; 2) successful application of deliberation process and linking it to WISE; 3) assist in validation and testing of WISE and gathering useful end user feedback; 4) demonstrate the usefulness (and limitations) of WISE.
- Ongoing commitments and partnerships: 1) EW approved ongoing funding to apply and further enhance the programme tools ($2.3M, EW Long Term Plan 2009-19); 2) Programme partners entered into service agreements with EW to build council's capability, providing ongoing support and expert advise; 3) Some project partners assist Auckland and Wellington councils to develop similar spatial planning tools (SP2 FRST programme); 4) Landcare Research obtained Envirolink funding to explore council's needs and priorities for integrated planning tools.

Further Information

The project has designed a website to provide information about the project and communicate project achievements. All project outputs are available from the website: www.creatingfutures.org.nz. Appendix 1 lists reports and publications produced by Creating Futures in 2009/10. A summary article about the project can be found here: www.landcareresearch.co.nz/services/sustainablesoc/hatched/documents/hatched_section1.pdf

Project Partners

Environment Waikato Regional Council; Landcare Research Manaaki Whenua; agresearch; RIKS; market economics; EERNZ; NIWA Taihoro Nukurangi; The University of Waikato; SCION

Progress Report Year 4 (2009/10)

This summary note provides an up-date on relevant milestones and activities for the last year of the programme (2009/10), describes key achievements and outlines a way forward. All milestones scheduled for the first three years of the project have been completed (refer to previous annual and quarterly reports). Appendix 1 lists reports and publications produced by Creating Futures.

Objective 1 – Milestones for 2009/10 (as per contract)

Milestone	Description	Outputs	Due Date
1.1.6	Deliberation Matrix was used to evaluate and deliberate scenarios based on information generated by the ISDSS.	1. Stakeholders have identified areas of agreement and conflict of opinion and trade offs required to meet scenarios and have made transparent the assumptions underlying the choice of indicator. 2. Draft paper that examines the difference between the evaluation and deliberation of scenarios pre- and post-ISDSS information has been prepared for submission to a peer-reviewed journal.	31 Dec 2009

Scenario and deliberation tools developed in the programme were applied to policy planning for the Future Proof (FP)[1] project (http://www.futureproof.org.nz/page/5-home) in a way that allowed exploration and validation of the scenarios developed by the FP team for their strategy. Refer to example 2. The linking of qualitative scenarios with quantitative modelling using the WISE tool (see Objective 2) was mediated through the use of the Deliberation Matrix tool and process. Guidelines for scenario development and for use of the Deliberation Matrix and the deliberation process have been developed for use by planners.

1.1.7	Local councils have adopted scenario analysis and the ISDSS into their planning processes.	By 2010, Environment Waikato and at least four district/city councils have been routinely using scenario analysis, the Deliberation Matrix, and the ISDSS pioneered in this project as part of their long-term LTCCPs and statutory planning processes (RPS, Regional/District Plans) and decision-making processes.	30 June 2010

We have been developing scenario planning and deliberation tools and processes throughout the life of the Creating Futures programme. This year we have integrated the use of the tools and processes to address the real life policy framework using the Future Proof project[1] as a case study. Refer also to example 2.

Policy planners have applied the scenario tools to explore and validate the strategy that they had developed, and to identify key issues of concern and identified strategies to address these issues. They chose a set of values and associated indicators across the four well beings (economic, social, environmental and cultural) and evaluated the performance today and how they thought their strategies would perform. At this point the WISE framework was used to evaluate in a quantitative way the consequences of the strategies in addressing the issues. The learnings that evolved from this were:

1) An increased understanding of the possibilities and limitations of the deliberation process in the context of decision-making, including: providing a means of evaluating competing responsibilities; providing a structure for evaluating multiple scenarios; the possibility of using the process for engaging stakeholders (where time and other constraints allowed).
2) An appreciation of the possibilities and limitations of the WISE model, including: the development of a base level of skills for working with the WISE model; testing the impacts of various scenarios using multiple indicators; demonstrating the impacts of such scenarios over both time and space.
3) A recognition of the significant time and expertise required to effectively employ the deliberation process and test scenarios through WISE.

[1] Future Proof is a sub-regional growth strategy centred on Hamilton with Hamilton City Council, Environment Waikato, Waipa and Waikato District Councils as key partners.

Objective 2 – Milestones for 2009/10 (as per contract)

Milestone	Description	Outputs	Due Date
1.2.6	ISDSS optimisation completed.	1. ISDSS has been modified based on tester feedback and runs robustly in end-user setting (i.e. almost never crashes) 2. End-users testing ISDSS have been interviewed and changes have been made where feasible or noted in list of possible enhancements for future versions. 3. User manual has been revised based on user feedback and is complete. 4. Draft manuscript on ISDSS development has been prepared for submission to peer-reviewed journal.	30 April 2010

All data for The Waikato Integrated Scenario Explorer (WISE) were prepared and collated and the various system components have been linked together, including an economy-environment model, climate, demography, hydrology, water quality, zoning, terrestrial biodiversity and the land use change model. A beta-version was released in November 2009 and was extensively calibrated, validated and tested by the modellers as well as by potential end users in a series of workshops. Feedback was collated (refer to Table 2) and the resulting list of suggested improvements and enhancements was prioritised using a set of agreed criteria. The final version (WISE 1.1.0.) incorporating end-user feedback and comments from the modellers was released in August 2010. A WISE Technical Specifications Report, Validation reports, detailed Metadata Sheets for all model components and a User Manual with examples have been completed.

1.2.7	Application of Spatial Decision Support System	Environment Waikato and at least four district/city councils (in the Waikato and other regions) have successfully tested and trialled the ISDSS and have expressed support for its ongoing use for integrated strategic and statutory planning and decision-making.	30 June 2010

Two case studies engaging potential end users of WISE have been undertaken: 1) Policy development for EW Regional Policy Statement (RPS); 2) Growth options for Hamilton and surrounding councils (Future Proof[1]). The RPS case study involved workshops with staff, councillors and iwi to explore implications of alternative policies to protect high quality soils at the regional scale. The Future Proof case study explored consequences of alternative policies to accommodate population growth, including high density growth, protection of high quality soils, and protection of significant natural areas in Hamilton and surroundings. Both case studies were documented and relevant outputs included in the User Manual as practical examples of how WISE can be applied in a planning and policy context. A document was produced outlining the current policy and decision-making processes used by councils (EW) and identifying how the tools developed by this research programme could be effectively integrated into council processes. The document discusses both opportunities and challenges and makes recommendations for a way forward to successfully apply and use the tools.

A Description of the Creating Futures Tools

This section provides a brief overview of the tools the Creating Futures programme has developed to assist integrated spatial planning. These tools could be used to improve policy development and decision making, e.g. by evaluating the consequences and trade-offs across economic, environmental and social aspects of strategies, policies and proposed actions. Tools include:

1. Scenarios – qualitative stories about plausible futures
2. Deliberation Matrix – structured process to deliberate complex issues with stakeholders
3. WISE (Waikato Integrated Scenario Explorer) – a quantitative regional computer-based systems model that allows simulations over the next 50 years considering economic, demographic, land use and environmental aspects.

Tool 1 - Scenarios: The scenarios provide a set of four alternative futures describing what may happen in the Waikato in the longer term (over next 50 years). Four scenarios for the Waikato have been developed with the input of community representatives' knowledge of key drivers of future change – locally, regionally and nationally.

Table 1: Key trends and drivers affecting the Waikato region over the next 50–100 years

Scale	Key trends and drivers
Global	- Climate change: increased instability, extremes, and spatial variation - Population: migration trends, potential climate refugees - Market changes: number, size, access, consumer preferences & expectations, locations - Globalization: R&D investment
New Zealand	- Population: older, increasing proportion of people from Maori, Pacific Island, and Asian cultures; - Lifestyles: changing expectations, influence of technology - Economy: agricultural intensification, new metrics, bio-economy - Energy: availability, affordability, mix of renewable/non-renewable - Housing: affordability, increasingly urban culture
Waikato	- Land use: intensification; change trends; management and influence on intensity of flooding, erosion, slips - Auckland: urbanization pressures - Economy: agricultural intensification - Governance: continued devolution versus greater central authority

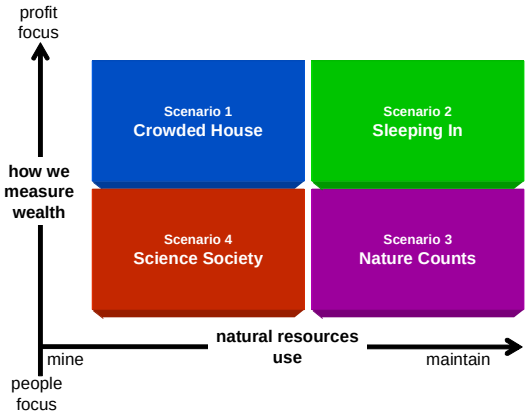

Figure 1 The Waikato Scenarios

The Waikato scenarios explore some of the deepest dilemmas of our times: profit versus people; growth versus the environment; global versus local; and rich versus poor. How these dilemmas are resolved might affect our ability to improve economic, social, cultural and environmental well-being. The scenarios will also help us better recognise and begin to grapple with change and think about how we might respond to it.

Learn more about how to undertake scenarios, about the four Waikato scenarios and how they are used for planning by clicking here.

Tool 2 - Deliberation Matrix: The deliberation process and associated matrix explore and evaluate issues that emerge from exploring the four plausible futures. The Deliberation Matrix gives stakeholders the ability to deliberate the reasons which might influence the choice of particular strategies. This makes for transparent decision making, which takes into account the potential trade offs that may have to occur when a particular option is chosen.

Figure 2: Deliberation Matrix

The deliberation process has been developed and tested with government, business and community representatives using a six-step process, and a suitable Deliberation Matrix has been designed.

A key element of the process is the development of a conceptual model of an issue, i.e. understanding how the system works, and the shared understanding of the system amongst stakeholders, planners and decision-makers.

Learn more about how the deliberation tool, and how to use the deliberation matrix in a multi-stakeholder environment by clicking here.

Tool 3 - WISE (Waikato Integrated Scenario Explorer): The scenarios and the views of the communities about their desired futures were used to assist the design of a computer-based model of the Waikato and to identify the necessary data and model components that need to

be included in the overall system to simulate the future consequences of development scenarios, policies and actions across the economy, populations and the environment.

This quantitative regional computer-based model (WISE) is a multi-scale, spatially explicit, dynamic systems model linking components at three spatial scales: regional, district and local (i.e. 200 x 200 m grid cells). Climate change scenarios and economic assumptions derived from global and national perspectives provide external inputs into WISE. Simulations run for a period of 50 years, striking a balance between shorter (e.g.10 years council's Long Term Plans) or longer (e.g. 100 years) time horizons suitable for a sustainable development context.

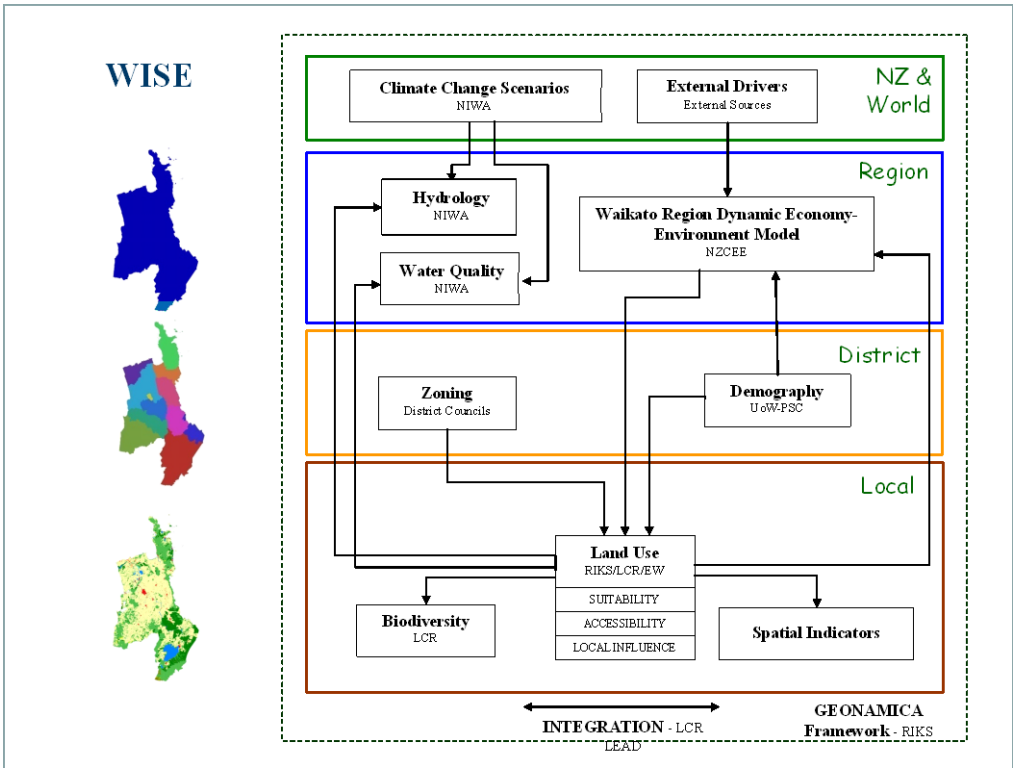

Figure 3: WISE system design

EW= Environment Waikato; ME = Market Economics; MW = Manaaki Whenua; NIWA = National Institute of Water and Atmospheric Research; NZCEE = NZ Centre for Ecological Economics; RIKS = Research Institute for Knowledge Systems; UoW = University of Waikato.

WISE is made-up of a number of model components that are linked together to simulate interactions between them: economy-environment model, climate, demography, hydrology, water quality, terrestrial biodiversity, and a land use change model, which includes land use, land suitability, accessibility, zoning. The WISE Technical Specification document provides the information on system design, integration and linkages between the individual model component descriptions for WISE. Case studies were undertaken to provide an initial assessment of the ability of WISE to deliver information relevant to policy and planning.

Learn more about how integrated spatial decision support systems, what models are incorporated in WISE, how they work and what sort of questions WISE can address by clicking here.

Following are a couple of **examples of using WISE** for long term integrated spatial planning.

Example 1

This depicts three alternative development scenarios for future land use change in the Waikato region (to 2050). Assumptions: (1) Dairy Expansion – 4% per annum increase in demand for dairying land, from 320,000 ha (2001) to 895,000 ha (2050); (2) Dairy Decline – initial increase in demand for dairying land to 2010 (max 370,000 ha), followed by gradual decline to 2050 (71,000 ha); (3) Village Life: 7-fold increase in demand for residential land from 5,000 ha (2001) to 37,000 (2050) with preference for living in smaller towns. *Note: this was undertaken with an early prototype of WISE including the land use change model only.*

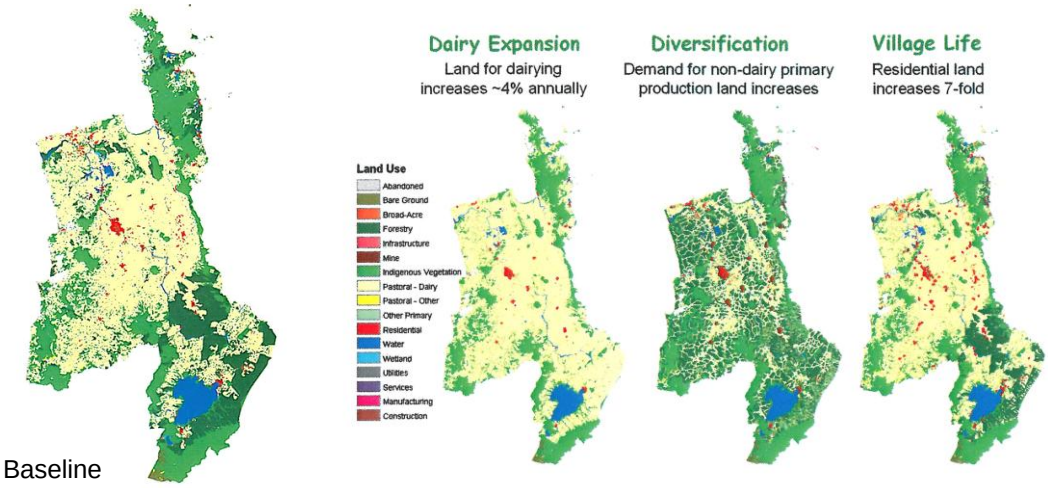

Figure 4: Three 'Mock Scenarios' for the Waikato Region (based on WISE Prototype).

Example 2

This example applies WISE to explore urban sprawl scenarios for the Future Proof project (FP) centred on Hamilton and surrounding districts. Predicted population growth and infrastructure (Waikato Expressway) served as model input assumptions and the consequences of two alternative policies were explored to identify residential growth patterns: no control of development versus the use of zoning to protect high quality soils.

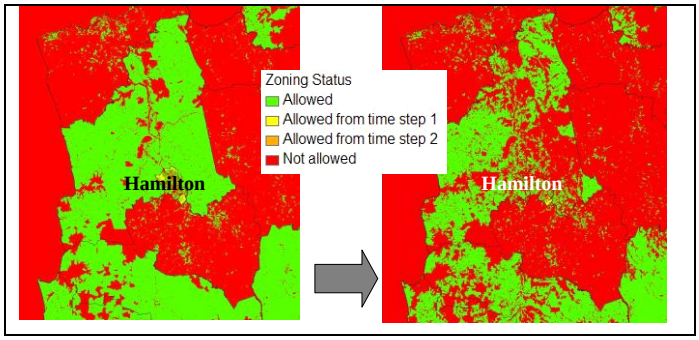

Figure 5: Two scenarios for Hamilton and surrounding districts using zoning to control growth patterns.

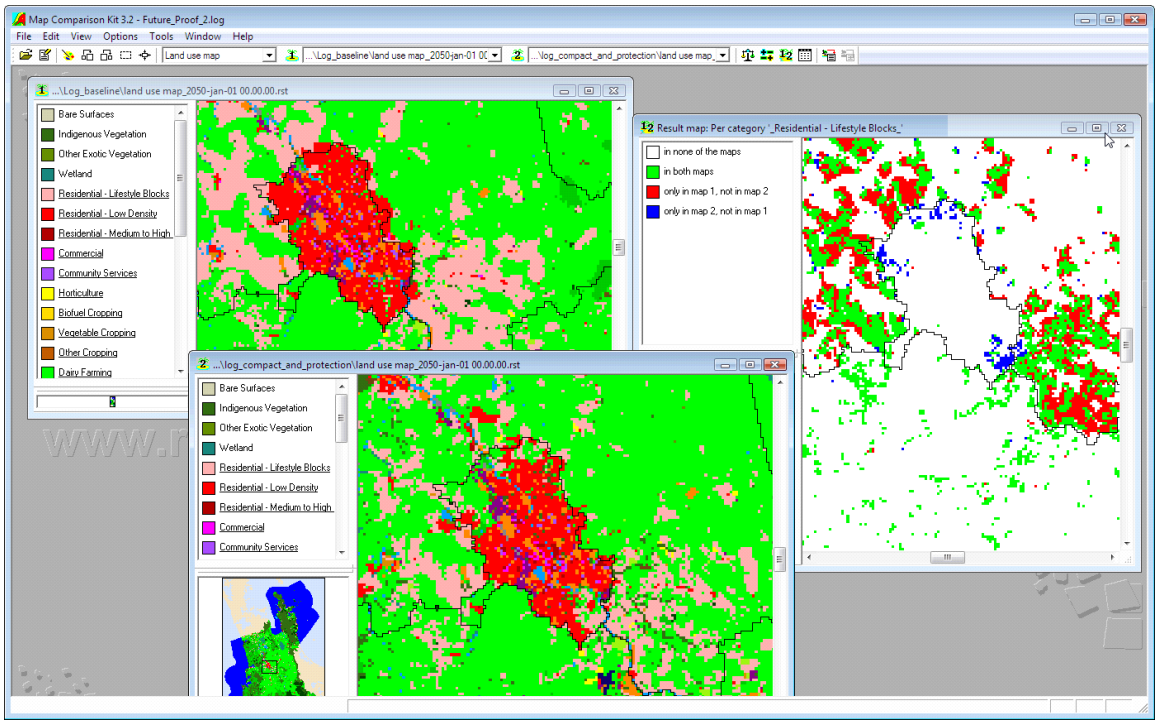

Figure 6: Use of the Map Comparison Kit to easily identify differences between scenarios.

User Engagement

Engagement of potential users of the tools is crucial to connect to the policy context and to build ownership and support for the uptake and use of the tools. Potential end users, mainly staff from regional, city and district councils, have been engaged throughout the project to provide valuable input and feedback to improve early draft versions of the various tools.

A survey of workshop participants to test and evaluate earlier versions of WISE showed enthusiastic support, but also revealed the importance of striking the right balance between simplicity and complexity.

Table 2 User Feedback (Workshops November 2008 and Nov/Dec 2009)

QUESTION	FIRST PROTOTYPE		SECOND PROTOTYPE	
	Agree	Disagree	Agree	Disagree
My organisation would benefit from using WISE	26	3	21	2
WISE enables communication among planners and decision makers	29	0	24	0
WISE is an easy to use and intuitive tool	17	5	19	5
I have the impression that in order to use WISE, I need a lot of specific knowledge	21	11	17	7
I think learning to use WISE is worthwhile, considering the results I can obtain	27	0	20	1
I would prefer a simpler tool, even if that means less control on the parameters	6	19	6	15
I would prefer a more complex tool, even if that requires more parameters to deal with	9	13	8	15

A **Project Advisory Group** has been established to provide a "touchstone" for the project outputs and to assist in the dissemination and application of the project tools. Creating futures also has a high-level Governance Group (CE/Senior Managers of project partner organisations) to provide strategic guidance and direction.

National Advisory Board: To provide an ongoing 'voice' we propose to establish a *'National Advisory Board for the Development and Use of Integrated Planning Tools'*. This would build on the current Creating Futures Advisory Group and link closely with the end user needs for the Sustainable Pathway 2 (and possibly other) projects). The purpose is to provide a coordinated approach to the development and application of tools for integrated, long term, spatial planning in the New Zealand public sector. A draft Terms of Reference can be found here: http://www.sustainablepathways.org.nz/about-the-project/advisory-group/

Where to from here

Project completion: Additional funding has been obtained from FRST ($100k) and Environment Waikato (50k) to extend the project for another three months to 30 September 2010. The project team identified the following priorities, and work has started on these tasks:

1. Incorporate a new Zoning Tool into WISE (contract signed, completion 31 July 2010, done)
2. Scoping study to investigate links between the Hydrology and the Economic-Environment models (contract signed, completion 31 Sept 2010).
3. WISE GUI improvement package (Help function etc.) based on end user feedback from workshops, (contract signed -completion 31 July 2010, done).
4. EW Regional Policy Statement - support by project partners to explore use of WISE for policy development and implementation (work brief in prep).
5. Advice and training by project partners in the use of the tools (work brief in prep).
6. Strategy development: this will explore options for the dissemination and further development of the CF tools to other regions, as well as identifying future research needs and opportunities (work brief in prep).

Links to other projects: A number of the Creating Futures project partners (EW, RIKS, MEL, EERNZ/Massey University) are also involved in the 6-year FRST programme Sustainable Futures 2 (SP2) led by Marjam van den Belt (EERNZ/Massey University, see http://www.sustainablepathways.org.nz/). This research programme started in October 2009 and aims to develop integrated spatial decision support systems for urban areas working with Auckland and Wellington councils[2].

Ongoing Environment Waikato (EW) commitment: EW's Long Term Plan 2009-2119 has approved funding totalling $2.3M over the next ten years to ensure ongoing maintenance, up-dating, further improvement and appropriate use of the project tools, including WISE. Processes for regular up-dating of data and models underpinning WISE will be agreed with data and knowledge providers. It also includes staff training in the use of the tools and building capability and capacity. While this is primarily targeted to the Waikato region, options to transfer the project tools to other regions for the benefit of all councils and other potential users will be investigated, for example:

- Feasibility and funding options to transfer WISE to other regions (and other users), e.g. through Envirolink funding
- Ongoing maintenance and up-date of key national/regional datasets underpinning WISE
- Ongoing research to improve the current tools (e.g. further FRST funding)
- Enhancing the capability and capacity of local and central government for integrated spatial planning.

Service Agreement with project partners: EW has developed agreements with the Creating Futures project partners to provide ongoing services, including up-dating of data and models, training, advise and consultancy support, further enhancements of WISE, relevant research etc. These agreements will be of a general nature with specific and agreed work briefs added as Schedules.

[2] The Local Government (Auckland Council) Amendment Act 2010 requires the new Auckland Council to develop a Spatial Plan.

Appendix 1 Creating Futures Reports and Publications (2009/10)

All programme outputs (reports, presentations, workshop notes, meeting minutes) are available from the programme website (www.creatingfutures.org.nz).

Non Peer-reviewed Articles and Reports

- Susan Bates: Creating Futures Scenarios: A user guide (June 2010), EW doc #1734491
- Steven Kelly; M.E. Wedderburn: Informing decision-making through deliberative approaches: A procedural guideline (June 2010)
- Bruce Small, Steven Kelly, M.E. Wedderburn: Developing context specific indicators for deliberative approaches (June 2010)
- Daniel Rutledge et al.: WISE: Waikato Integrated Scenario Explorer, Version 1.1. Technical Specification Report (June 2010), EW doc #1686550
- Daniel Rutledge: Translating the qualitative Waikato Scenarios into quantitative input for WISE
- Hedwig van Delden et al.: WISE User Manual (June 2010), EW doc #1583896
- Valerie Snow: Review of Dairy Model (June 2010), EW doc #1703651
- Kate Delaney: Refresher on horizon scanning and scenario analysis for Environment Waikato (March 2010), EW doc #1861833
- Environmental Management Services: Waikato Region Land Use / Zoning Matrix (November 2009), EW doc #1589639
- Tony Fenton: Creating Futures: Regional Policy Development Processes - Opportunities for Use of Creating Futures Tools. Alchemists Ltd, March 2010, co-funding, EW doc#1626965
- Hedwig van Delden: Examples of scenario development – international best practice and lessons learnt (in prep)
- Derek Phyn: Guidelines for Quantification and Exploration of Scenarios Using WISE (in prep).

Conference Presentations

- Beat Huser, WISE - An integrated spatial decision support system. National Information Forum, Ministry for the Environment and Statistics NZ. Wellington, 11 May 2010. http://www.mfe.govt.nz/environmental-reporting/about/partnerships/forum-2010-05-11/beat-huser-wise.pdf
- Beat Huser. Creating Futures: developing tools and methods to explore regional sustainability. International Planning Conference and NZ Planning Institute, Christchurch, 20-23 April 2010. http://www.planning.org.nz/Category?Action=View&Category_id=360
- Beat Huser, The New Zealand experience. Workshop on Place Based Approaches to Integrated Management: Bringing Place-Based Tools to Policy Development in the Federal Government, Ottawa, Canada 22-23 February 2010. http://policyresearch.gc.ca/page.asp?redir=on&pagenm=ev_pas_index&etime=past#event21103

Peer- reviewed Publications

- Huser, B., D.T. Rutledge, H. van Delden, M.E. Wedderburn, M. Cameron, S. Elliott, T. Fenton, J. Hurkens, G. McBride, G. McDonald, M. O'Connor, D. Phyn, J. Poot, R. Price, B. Small, A. Tait, R. Vanhout and R.A. Woods (2009). Development of an integrated spatial decision support system (ISDSS) for Local Government in New Zealand, In Anderssen, R.S., R.D. Braddock and L.T.H. Newham (eds) 18th World IMACS Congress and MODSIM09 International Congress on Modelling and Simulation. Modelling and Simulation Society of Australia and New Zealand and International Association for Mathematics and Computers in Simulation, July 2009, pp. 2370-2376. ISBN: 978-0-9758400-7-8. http://www.mssanz.org.au/modsim09/F12/kragt.pdf

- Wedderburn, M E, B Small, M O'Connor, T Barnard, D T Rutledge, B Huser, U Trebilco, D Hood and M Butler (2009). Combining systems thinking with a qualitative stakeholder process: a case study in regional fragmentation in New Zealand. Integrated Agricultural Systems: Methodologies, Modelling and Measuring, In: Aspects of Applied Biology 93-98 (2009).

- Rutledge D, Wedderburn L and Huser B (2009). Creating futures: integrated spatial decision support systems for Local Government. In: Hatched : the capacity for sustainable development / edited by Bob Frame, Richard Gordon and Claire Mortimer.ISBN 978-0-473-16123-1 (internet)—ISBN 978-0-473-16124-8 (pbk.), http://www.landcareresearch.co.nz/services/sustainablesoc/hatched/documents/hatched_section1.pdf .

- Van Delden, H. (2009). Lessons learnt in the development, implementation and use of Integrated Spatial Decision Support Systems, In Anderssen, R.S., R.D. Braddock and L.T.H. Newham (eds) 18th World IMACS Congress and MODSIM09 International Congress on Modelling and Simulation. Modelling and Simulation Society of Australia and New Zealand and International Association for Mathematics and Computers in Simulation, July 2009, pp. 2922-2928. ISBN: 978-0-9758400-7-8. http://www.mssanz.org.au/modsim09/H3/vandelden_H3.pdf

- Van Delden, H., D. Phyn, T. Fenton, B. Huser, D.T. Rutledge and L. Wedderburn (2010). User interaction during the development of the Waikato Integrated Scenario Explorer. International Environmental Modelling and Software Society (iEMSs), 2010 International Congress on Environmental Modelling and Software Modelling for Environment's Sake, Fifth Biennial Meeting, Ottawa, Canada David A. Swayne, Wanhong Yang, A. A. Voinov, A. Rizzoli, T. Filatova (Eds.) http://www.riks.nl/papers/vandelden_etal_iEMSs2010.pdf

- Van Delden, H., Seppelt, R., White, R., and Jakeman, A.J. A methodology for the design and development of integrated models for policy support. Environmental Modelling and Software, in press, DOI 10.1016/j.envsoft.2010.03.021. http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6VHC-502WG8D-1&_user=10&_coverDate=05%2F14%2F2010&_rdoc=1&_fmt=high&_orig=search&_sort=d&_docanchor=&view=c&_searchStrId=1417075828&_rerunOrigin=google&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=97b13dcec0a0c529de23d115e12aff91

- Van Delden, H. and G. McDonald (2010).Toward the integration of economic and land use change models. International Environmental Modelling and Software Society (iEMSs), 2010 International Congress on Environmental Modelling and Software Modelling for Environment's Sake, Fifth Biennial Meeting, Ottawa, Canada David A. Swayne, Wanhong Yang, A. A. Voinov, A. Rizzoli, T. Filatova (Eds.) http://www.riks.nl/papers/vandelden_and_mcdonald_iEMSs2010.pdf