

# Creating Futures

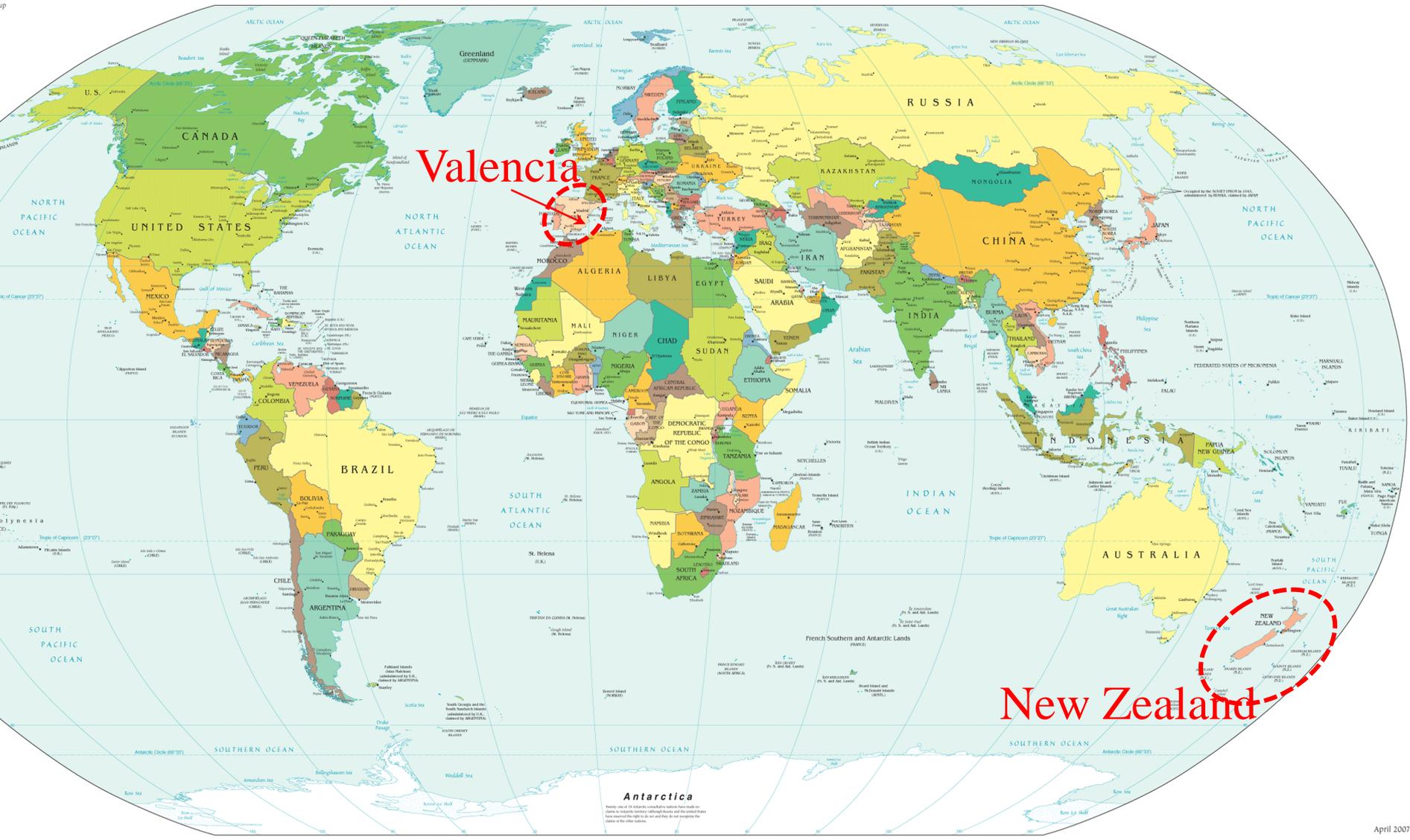
Dr Beat Huser  
Waikato Regional Council  
New Zealand

*Wellington*

A satellite image of New Zealand is shown from a high angle. The North Island is on the right, and the South Island is on the left. A white dashed circle with a line pointing to it is labeled 'Wellington'. A larger red dashed oval encircles the central part of the North Island, with a label 'Waikato Region' inside it. A black dashed circle with a line pointing to it is labeled 'Auckland'. The background is the blue and white of the Earth's atmosphere and clouds.

*Auckland*

*Waikato Region*



Valencia

New Zealand

Creating  
Futures



# Pressures NZ faces...

- Sustainability of agriculture
- Water quality and availability
- Loss of biodiversity and natural areas
- Urban expansion and sprawl



# ***Creating futures: combining techniques for a spatial vision from local level***

## **Outline**

- 1. New Zealand's Governance**
- 2. Regional scenarios**
- 3. Integrated spatial model (*WISE*)**
- 4. Case studies and user interactions**
- 5. Lessons learnt and future directions**

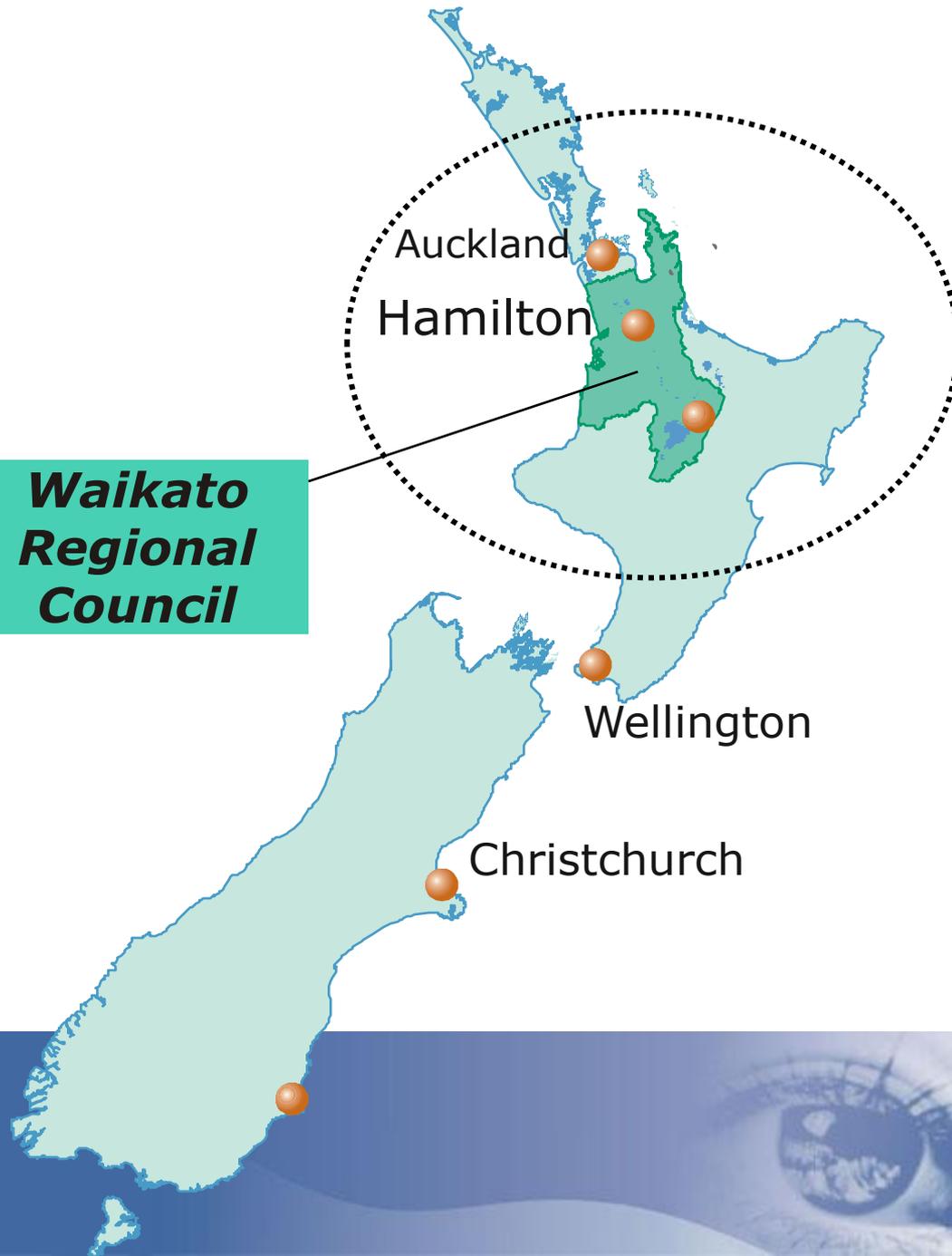


***Dr Beat Huser, Waikato Regional Council***

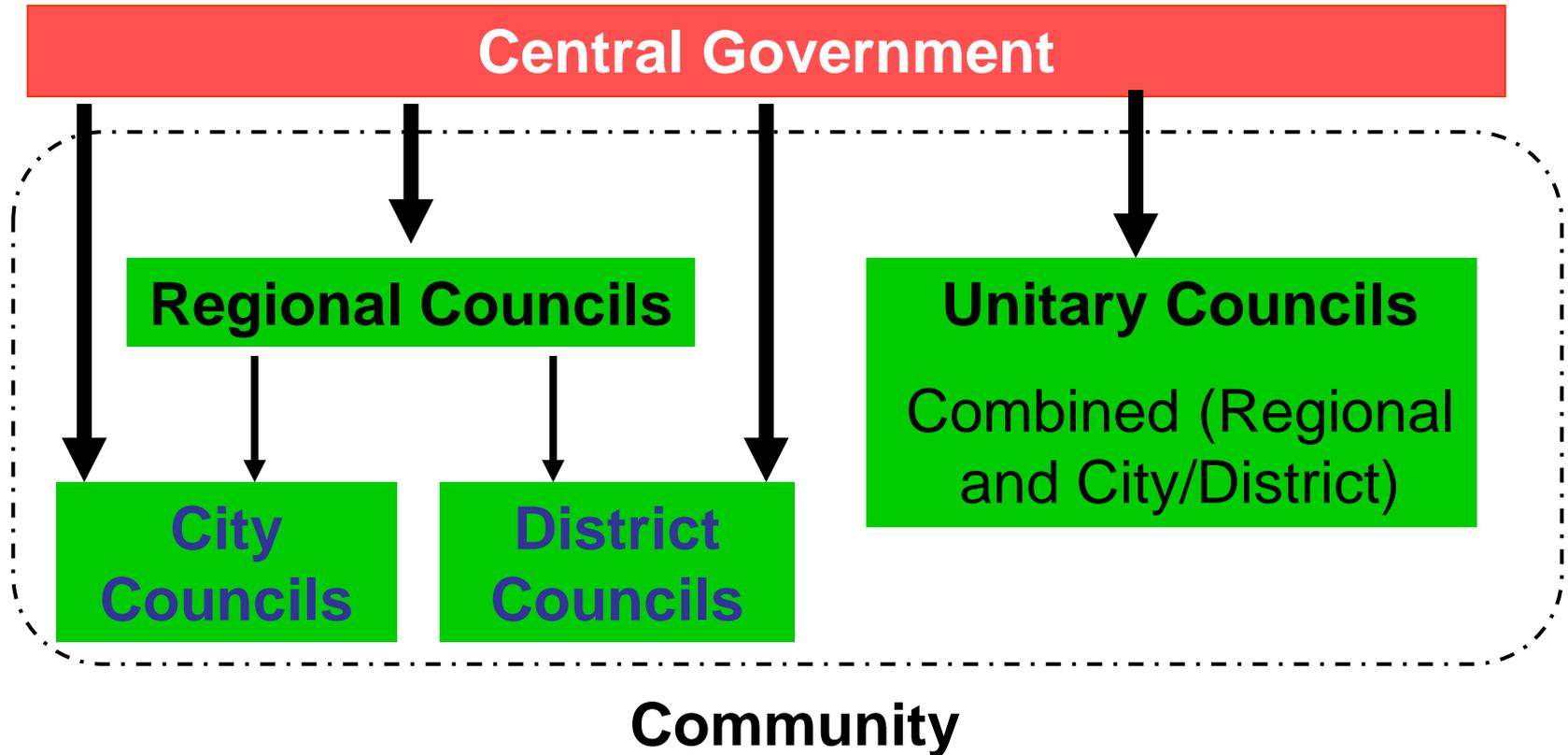
# Waikato Region



***Waikato  
Regional  
Council***



# *The structure of government*





# Local Government

## Regional and City/District Councils

### **Regional Councils (11) – e.g. *Waikato Region***

- Natural boundary based on watersheds
- Core business – environmental management, spatial planning
  - air, land, water, coast

### **District / City Councils (54/13) – e.g. *Hamilton City***

- Boundary based on community of interest
- Core business - land use, economic development, service delivery
  - water supply, sewerage, refuse collection, roads, parks



# Waikato Regional Council **What we do**



- **Planning and policies**
- **Investigations, research and monitoring**
- **Regulation and enforcement**
- **Communication and education**
- **Physical works**

(conservation work, pest control, soil conservation, river and flood control, emergency management and civil defence)

[WRC Promotional Video](#)

Creating  
Futures



# ***Waikato Region - what we manage***

- 25,000 km<sup>2</sup> total area
- 1,150 km coastline
- Longest river, largest lake
- 400,000 people (10% of NZ)
- \$10 Billion GDP (10% of NZ)
- \$ 6 Billion Agriculture Export



# *Local Government Act 2002*

*...working with the community*

## **Purpose of local government (LGA 2002)**

- To promote the **social, economic, environmental and cultural wellbeing of communities**, in the present and for the future (*known as the 4 well-beings*).



Cultural

Social

Economic

Environmental

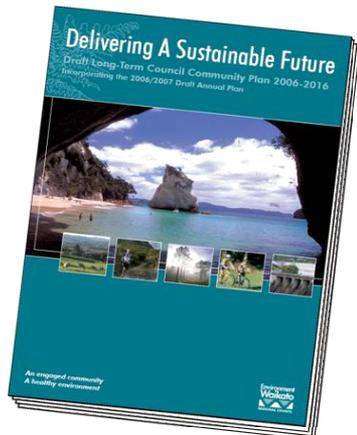
**WELL-BEINGS**

Social

Economic

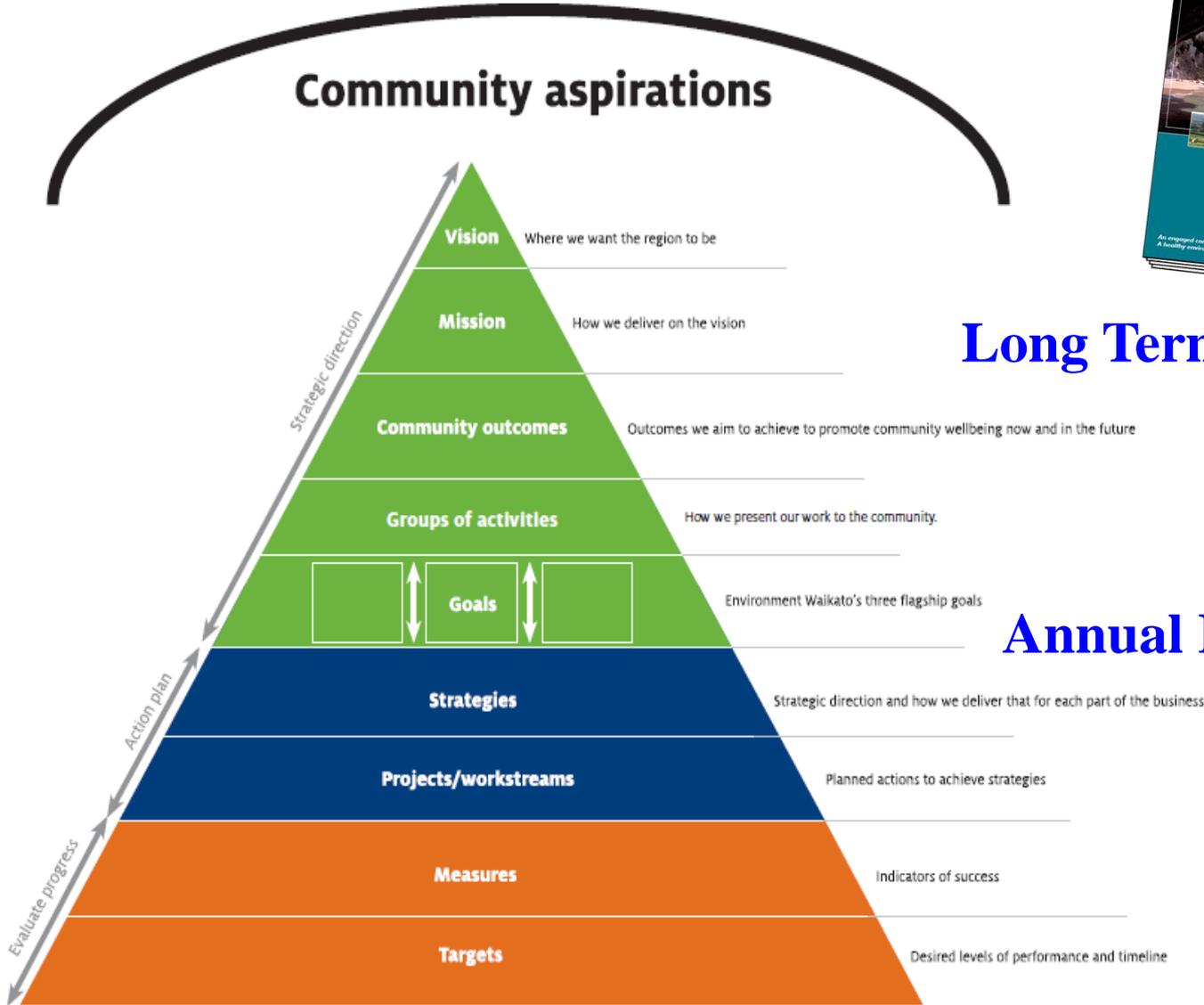


# Council's Strategic Framework



Long Term Plan – 10 yrs

Annual Plan and Report



# Community Vision

- Regional themes:
  - Sustainable **environment**
  - Sustainable **economy**
  - **Quality of life**
  - Culture and **identity**
  - **Participation** and **equity**
- **75 indicators** identified:
  - Regular **analysis and reporting**
  - [www.choosingfutures.co.nz/MARCO-indicators/](http://www.choosingfutures.co.nz/MARCO-indicators/)



Delivering A Sustainable Future

Draft Long-term Council Community Plan 2006-2016



## **Sustainable economy**

Economic prosperity  
Land-based industries  
Maori economic prosperity  
Regional planning  
Research and innovation  
Sustainable development  
Tourism  
Transport, infrastructure and services



## **Sustainable environment**

Air, land, water quality and biodiversity  
Coastal environment  
Energy  
Environmental attitudes and behaviours  
Kaitiakitanga  
Rural environment  
Solid waste



## **Quality of life**

Community participation  
Community safety  
Education  
Family and community cohesion  
Health  
Housing  
Sport and leisure  
Youth and older people



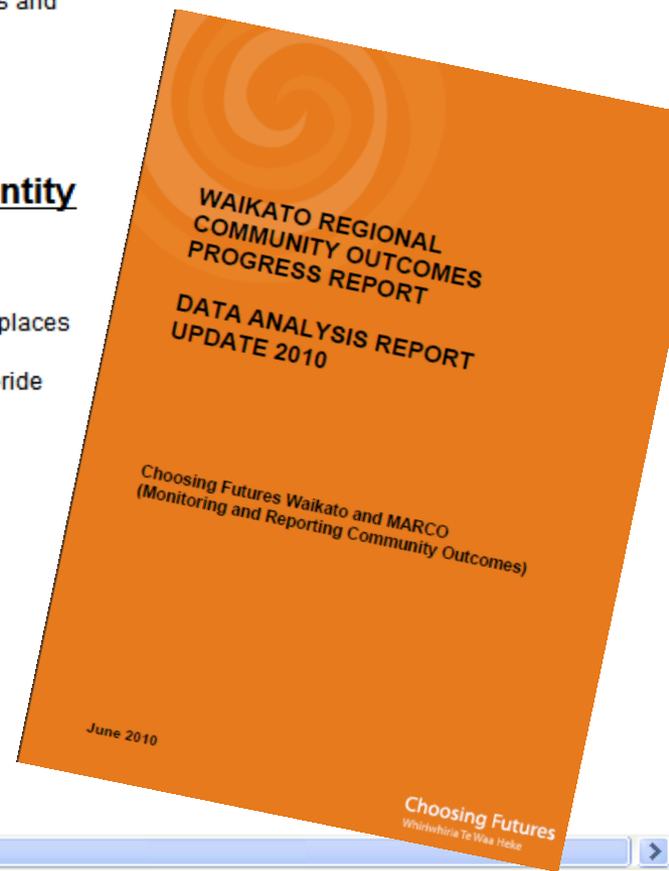
## **Culture and identity**

Creativity  
Culture and recreation  
Historic buildings and places  
Maori heritage  
Regional identity and pride



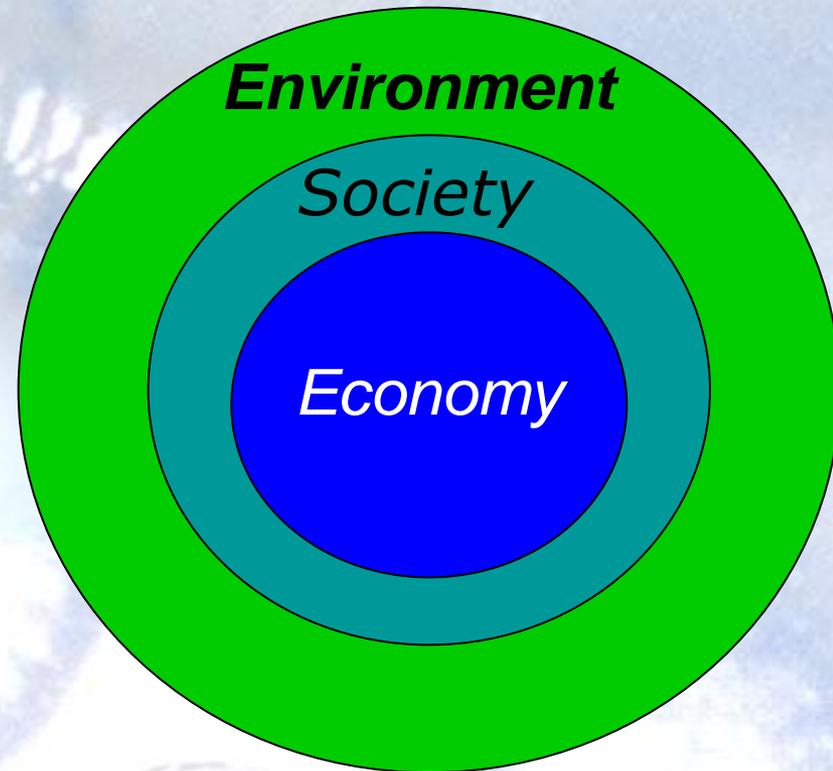
## **Participation and equity**

Civic participation  
Cultural well-being



# Why 'Creating Futures' project?

1. **LONG TERM** planning and enhanced strategic focus
2. **LINKING SCIENCE** to Policy
  - evidence-based
  - informed decision-making
3. **NEW TOOLS** to support planning and decision-making
4. **INTEGRATION**
  - Strategic partnerships
  - Linking the four well-beings



# Project Aim

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

## Key Tools

Scenarios

Deliberation  
Process

Spatial Model  
(WISE)



# Project Structure

Programme Leader



Dr Beat Huser

Advisory Group

Central, regional and local government

Dr Daniel Rutledge

**OBJECTIVE 1:**

Scenarios,  
communication &  
deliberation tools



SCION



Euro 0.9 m

FOUNDATION FOR  
RESEARCH  
SCIENCE &  
TECHNOLOGY

Tūhapa Rangahau Pūtaiao



Dr Liz Wedderburn

**OBJECTIVE 2:**

Spatial DSS development -  
**WISE**



research institute for knowledge systems



THE UNIVERSITY OF  
WAIKATO  
*Te Kōwhiri Whangai o Waikato*

# Sustainable Futures for the Waikato workshop

Thursday, March 10, 2005 from 12.30 to 4.30pm  
The Narrows Landing, 431 Airport Road, Tamahere, Hamilton

## Purpose

To introduce stakeholders to current research being undertaken in the Waikato. The research focuses on integrated scenario analysis (see overleaf) for sustainable development and its application to long-term planning for a range of stakeholders.

## The workshop will consist of three parts

1. Presentations by selected research providers.
2. Presentations by selected stakeholders representative of Central Government, local government and business.
3. Discussion on the relevance and usefulness of scenario analysis to various stakeholders.

## Desired Workshop Outcomes

- Introduce stakeholders to the concept of scenario analysis.
- Inform stakeholders about the range of research in scenario analysis and sustainable development being undertaken in the Waikato Region.
- Determine the value of scenario analysis to meet stakeholder needs.
- Identify steps to better co-ordinate research and align it to stakeholder needs.

## For more information

Lunch (from 12.30) and afternoon tea will be provided for all participants.

For more information or to **RSVP (by March 7)** please call Beat Huser on **Environment Waikato's Freephone 0800 800 401** or e-mail [beat.huser@ew.govt.nz](mailto:beat.huser@ew.govt.nz)

## Invited groups

Advisory Committee for Regional Environment  
AgResearch  
Carter Holt Harvey  
Department of Conservation  
Dexcel  
District Councils  
Environment Waikato  
Federated Farmers of NZ  
Fonterra  
Forest Research Institute  
Gallagher Group of Companies  
Hamilton City Council  
Innovation Park  
Landcare Research  
Landcare Trust  
MAF Policy  
Mighty River Power  
Ministry for the Environment  
Ministry of Economic Development  
Ministry of Research, Science and Technology  
NIWA  
NZ Institute of Ecological Economics  
Statistics NZ  
Tainui Maori Trust Board  
Tourism Waikato  
Transit New Zealand  
University of Waikato  
Waikato Biodiversity Forum  
Waikato Chamber of Commerce  
Waikato District Health Board  
Waikato Economic Development  
Waikato Raupatu Lands Trust  
WEL Networks

# What We Want to Achieve

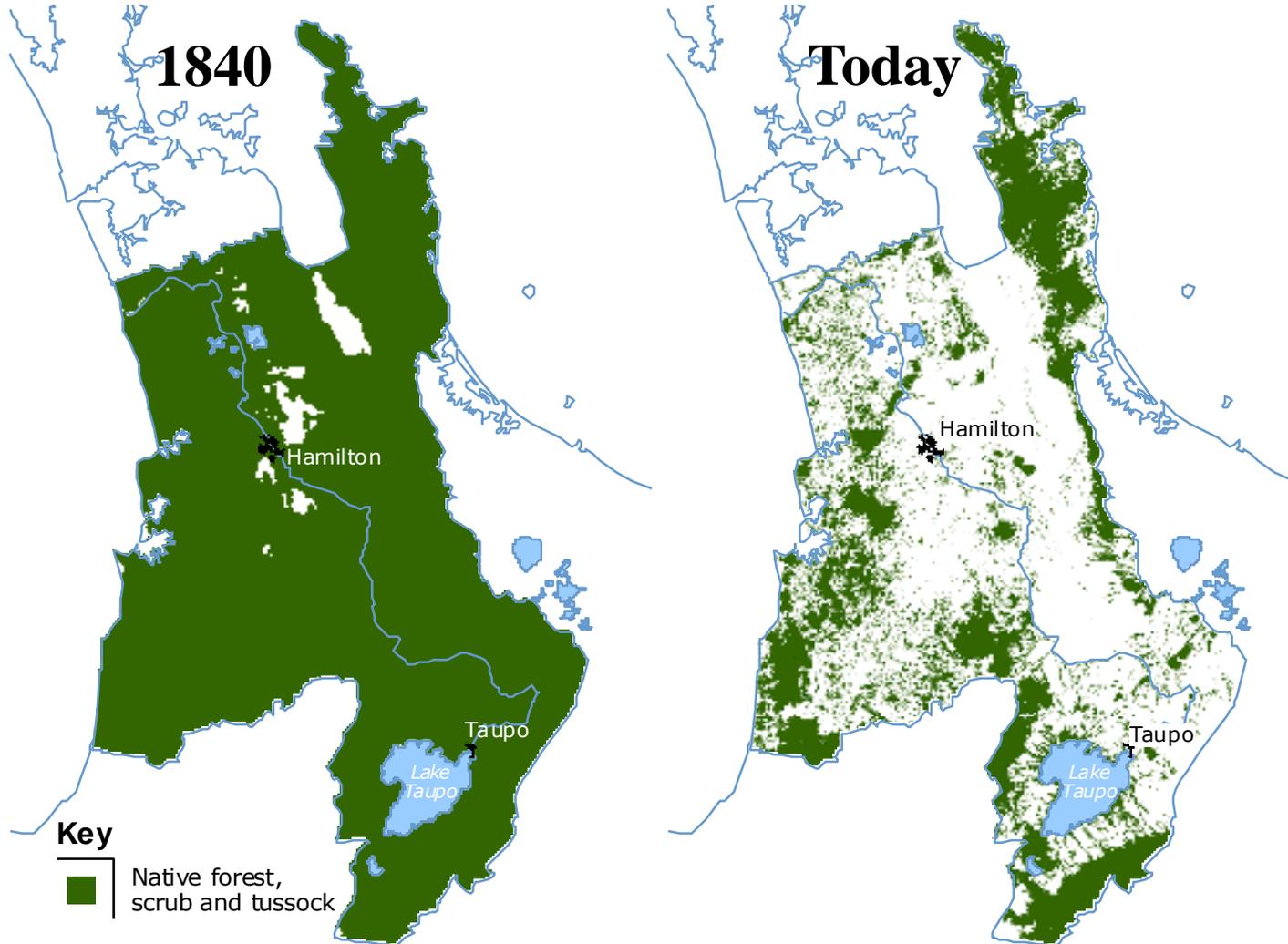
## Planning tools that inform:

- **Strategic planning (Long Term Plan)**
- **Regional plans and policies (statutory)**
- **Non-statutory planning community plans**
- **Economic development & smart growth**

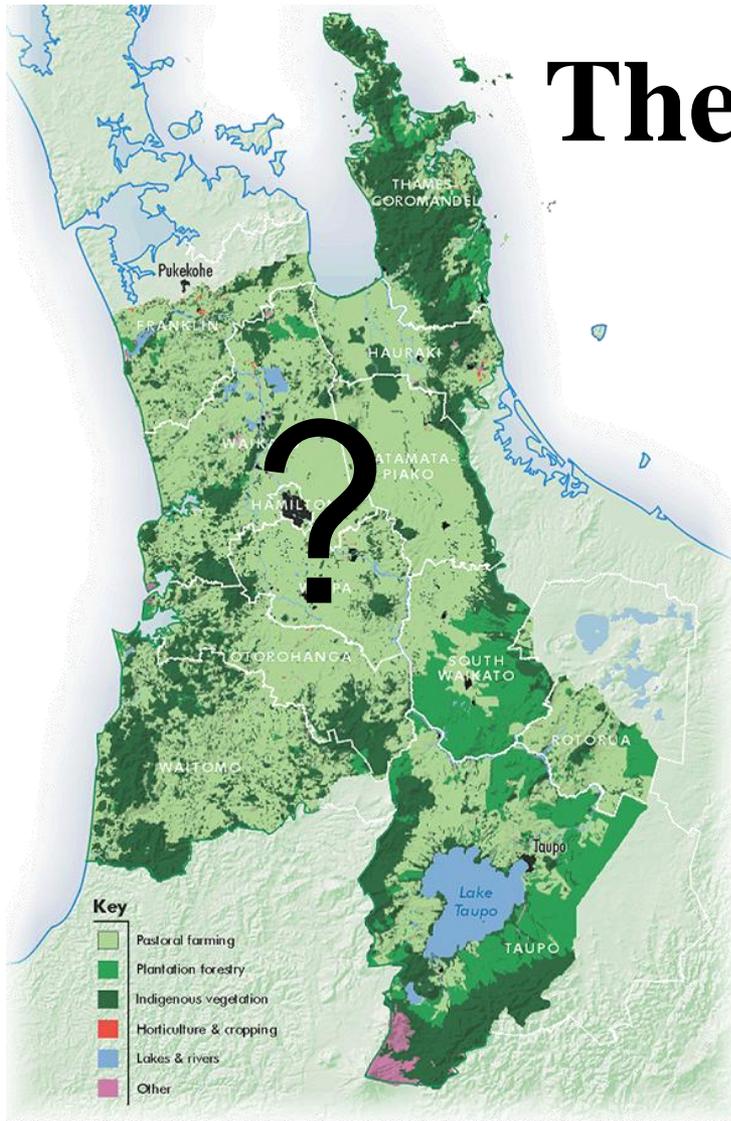
### And also:

1. **Communicate** and inform stakeholders & community
2. Identify links between well-beings and expose **trade-offs**
3. Build local government **capability and capacity** for integrated planning and decision-making

# Land Use / Cover



# The Future of Waikato?

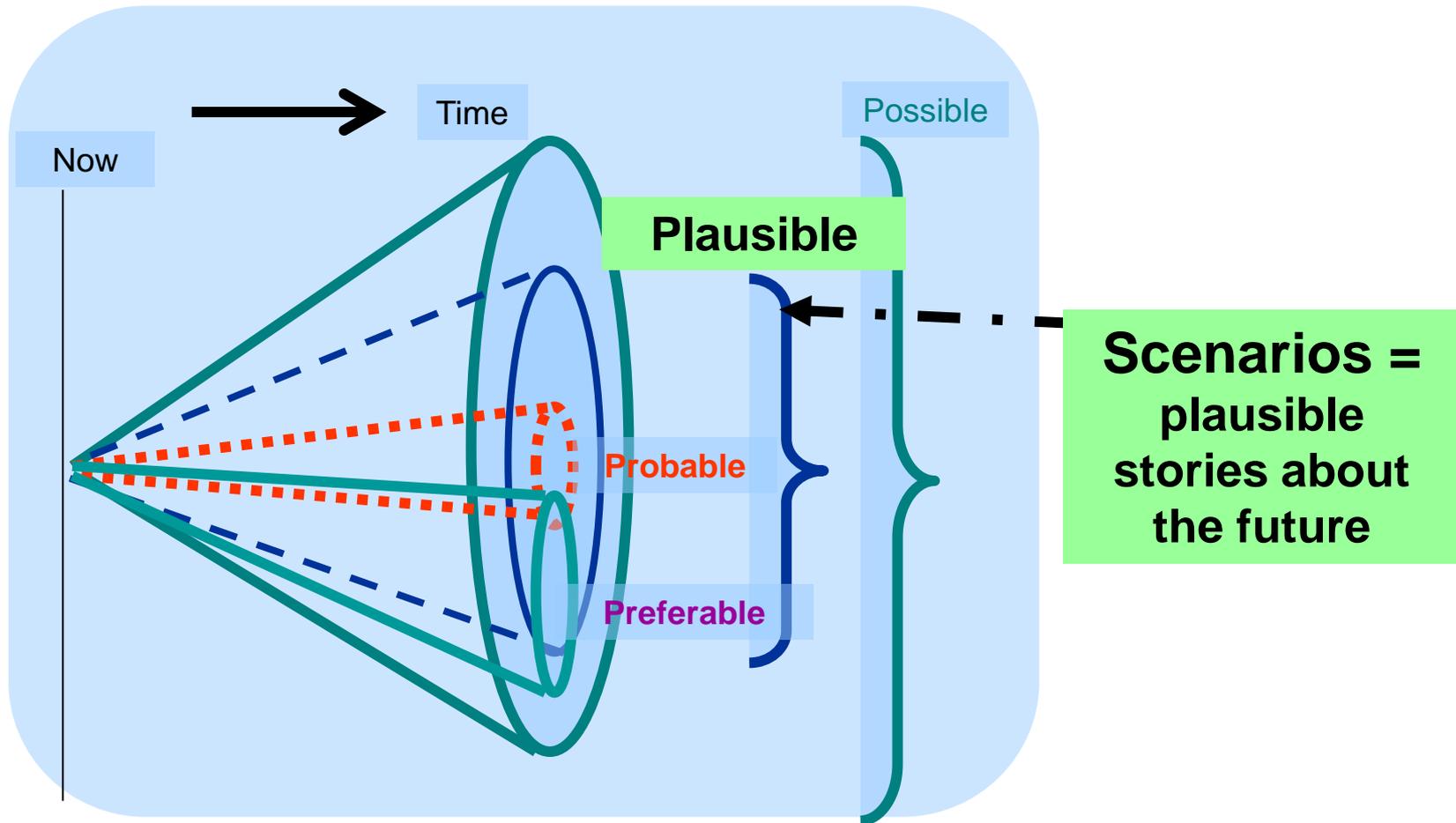


## Key Tools

- Scenarios
- Deliberation
- **Spatial Model**  
(Decision Support Systems)



# ... different types of futures

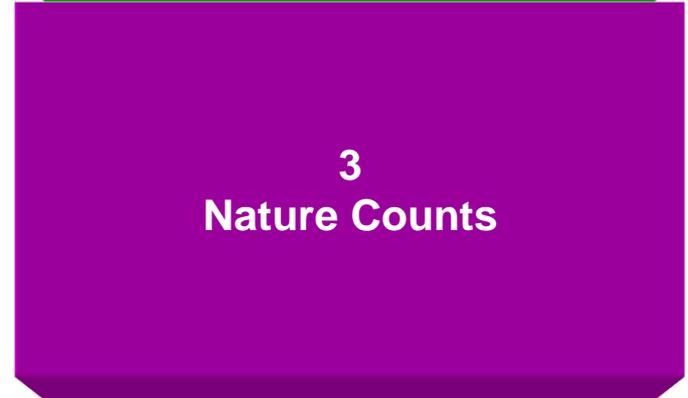
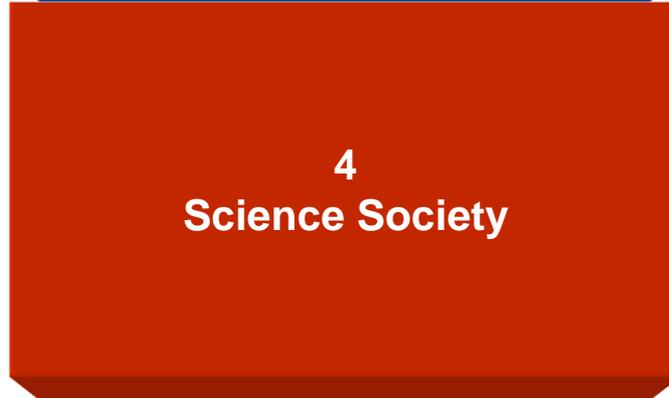
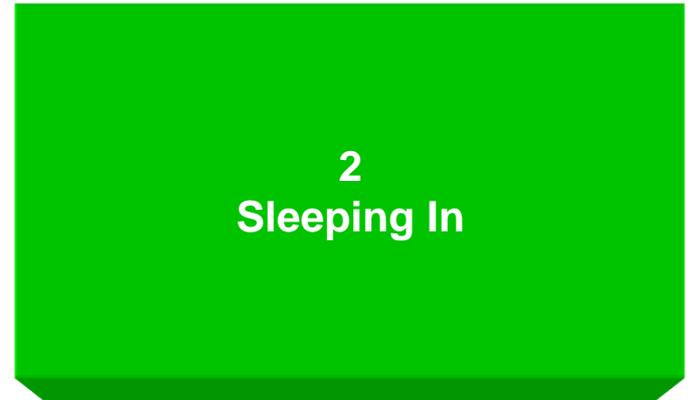


# Waikato Scenarios

profit  
(GDP)



how we  
measure  
wealth



People  
(GPI)

mine



natural capital



maintain



# The Waikato Scenarios

- **Crowded House**
  - Massive international movement of people and changes in agriculture and energy production
- **Sleeping In**
  - Keep on talking about climate change until it really hits home
- **Nature Counts**
  - A bio-economy where we value land much differently using resource productivity as a key economic indicator
- **Science Society**
  - A society where science takes off and supports a knowledge-based and technology-driven society

*more:*

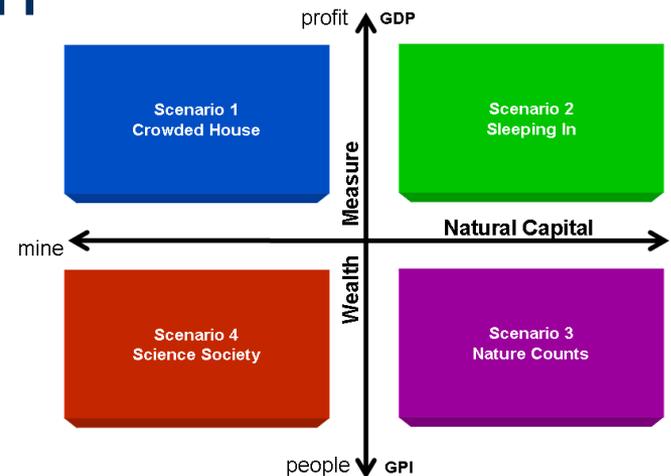
[www.creatingfutures.org.nz](http://www.creatingfutures.org.nz)

# How we developed the 'Waikato Scenarios'

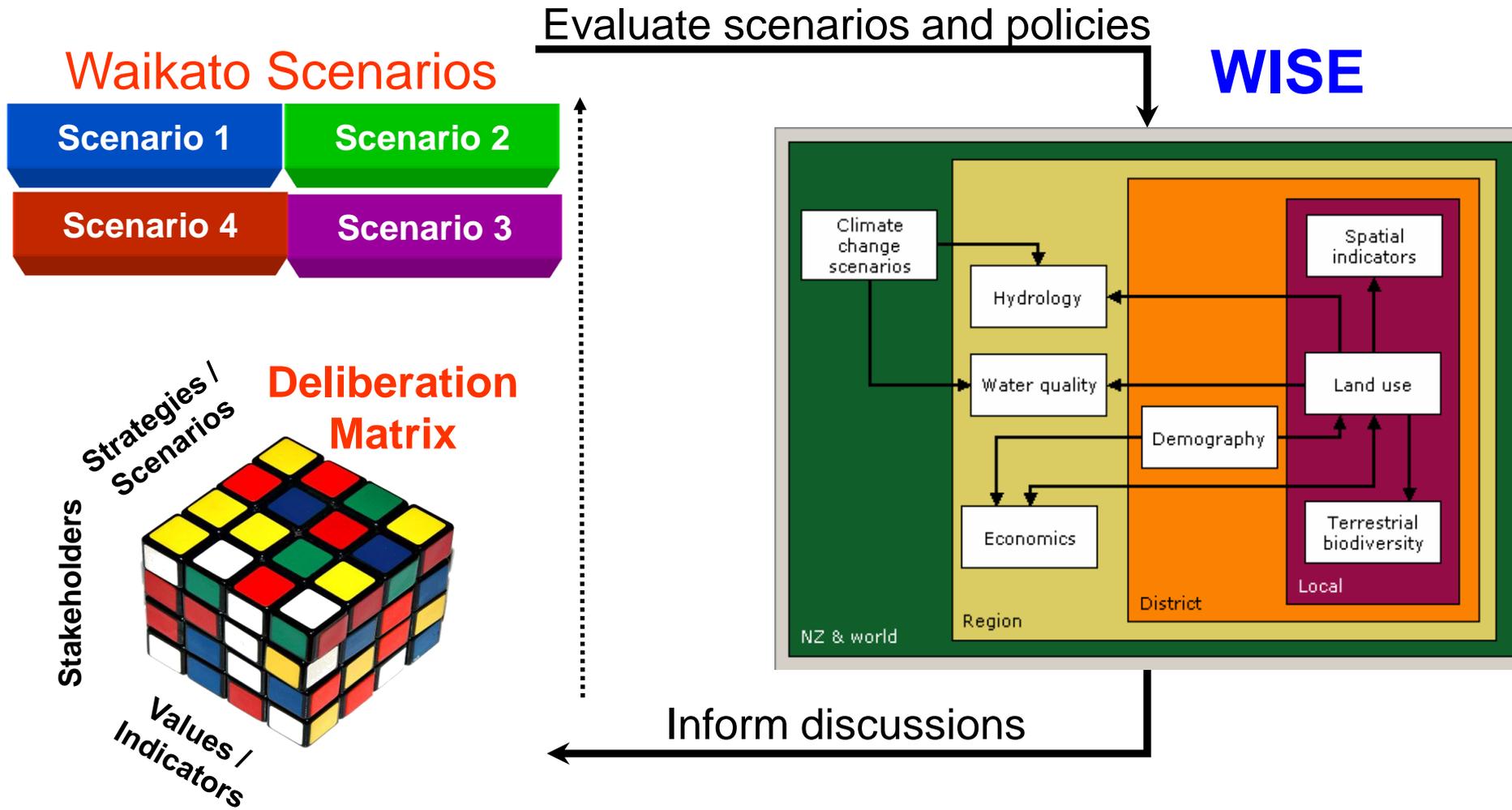
1. Review other Scenarios around world and in NZ
2. Review literature about major factors shaping world, New Zealand, Waikato
3. Insights from Project Partners and Community
4. Survey of regional strategic thinkers
5. Workshops – Government, Business, NGOs, Community  
➔ **Key Drivers** and Draft Scenarios
6. Test and Validation of Scenarios
7. Review and Update Scenarios

# How we used the Scenarios

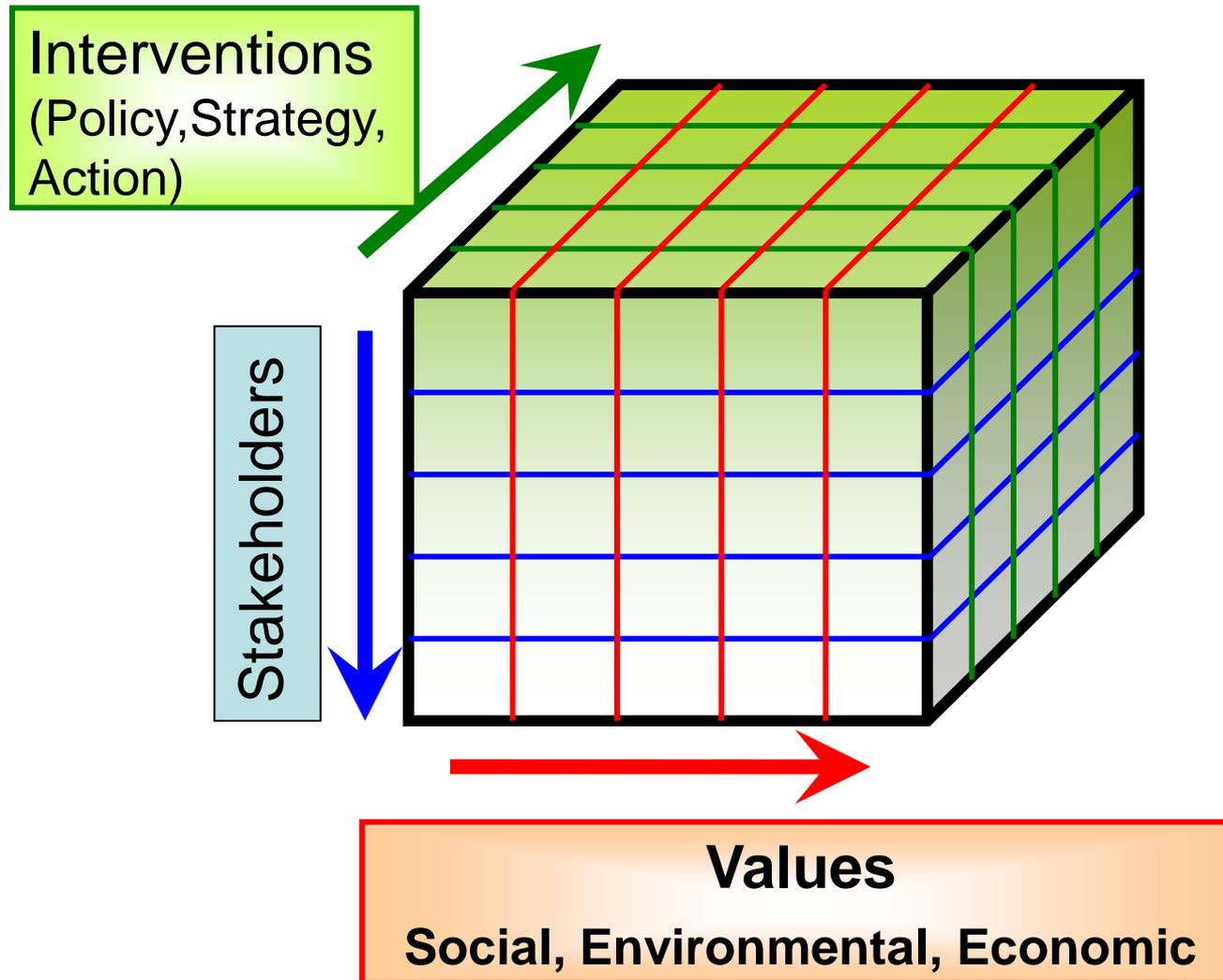
- Enhance collective understanding of issues shaping the Region
- Learning tool
- Inform decision-making
- Input into regional policy and strategies
- Help guide development of WISE model



# Linking Qualitative and Quantitative Tools



# Organising the Deliberation



*Adapted from AgResearch*

# Quantitative Tools

- Development of an Integrated Spatial Decision Support Systems (ISDSS) to support long-term, integrated planning

**WISE**

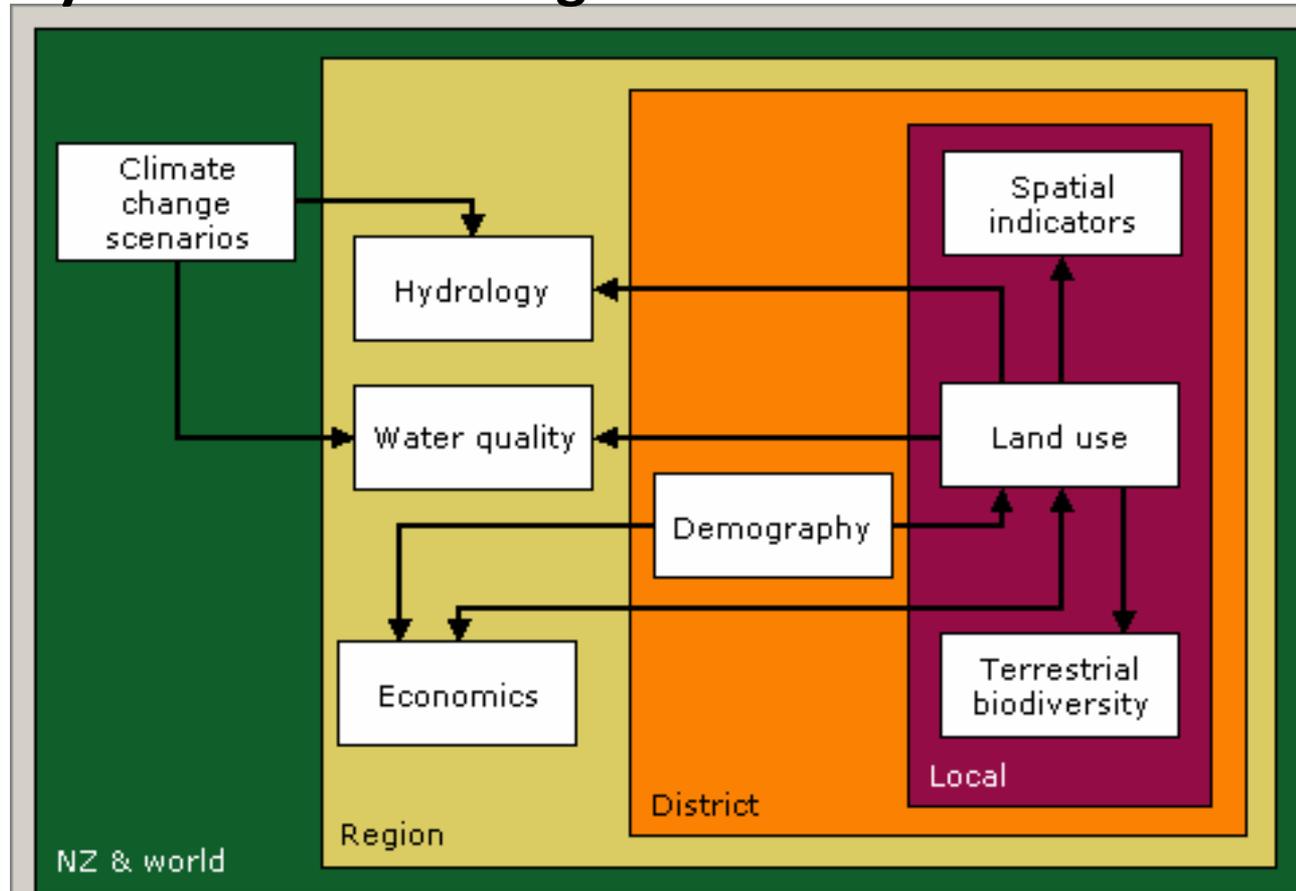
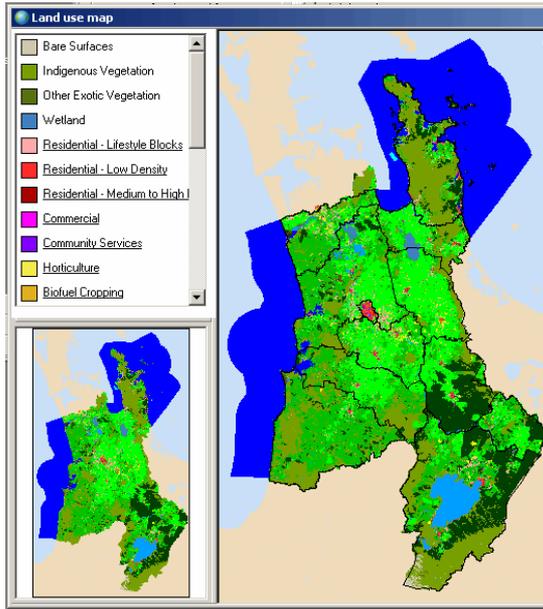
Waikato Integrated Scenario Explorer



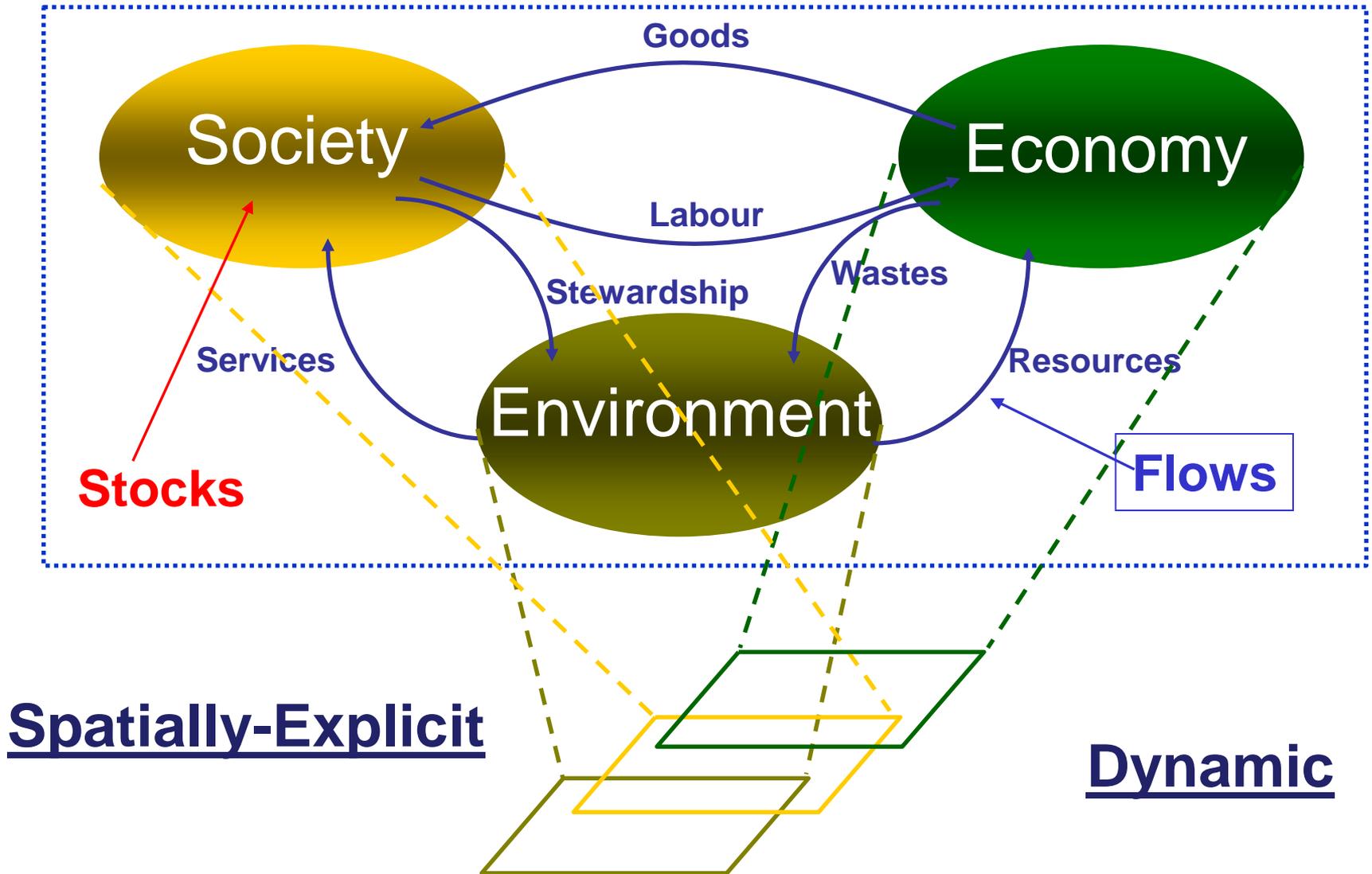
# What is WISE?

- **WISE** = [Waikato Integrated Scenario Explorer – YouTube video here](#)

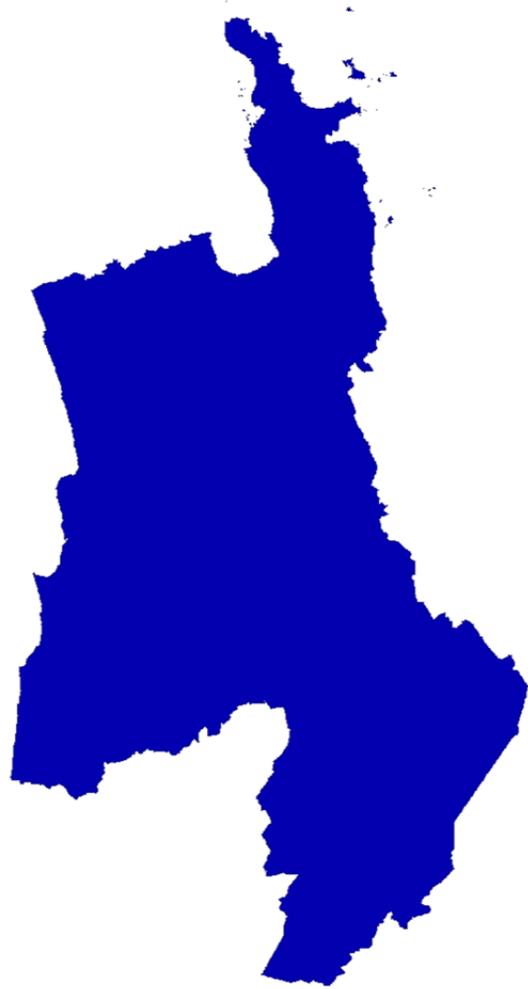
- **Stand-alone software application**
- **System of interacting models**



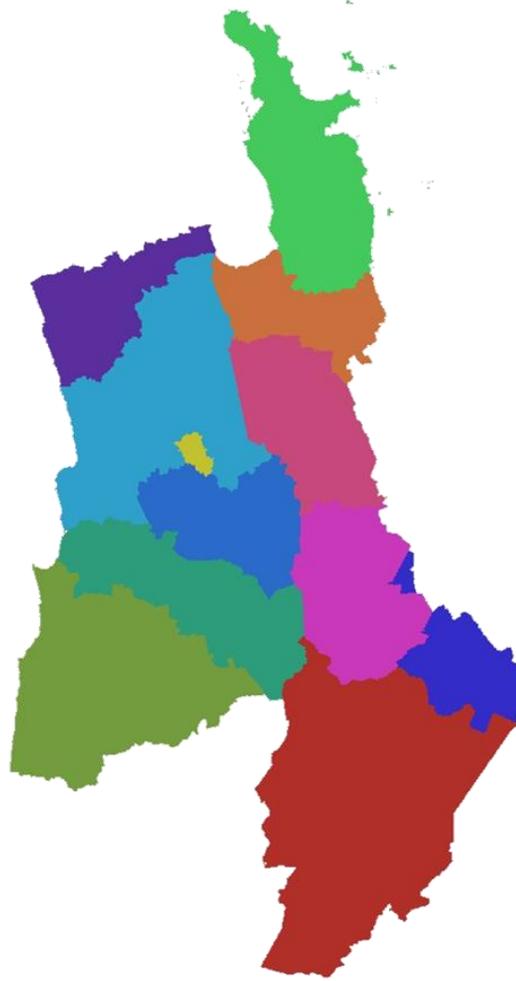
# WISE uses a systems approach



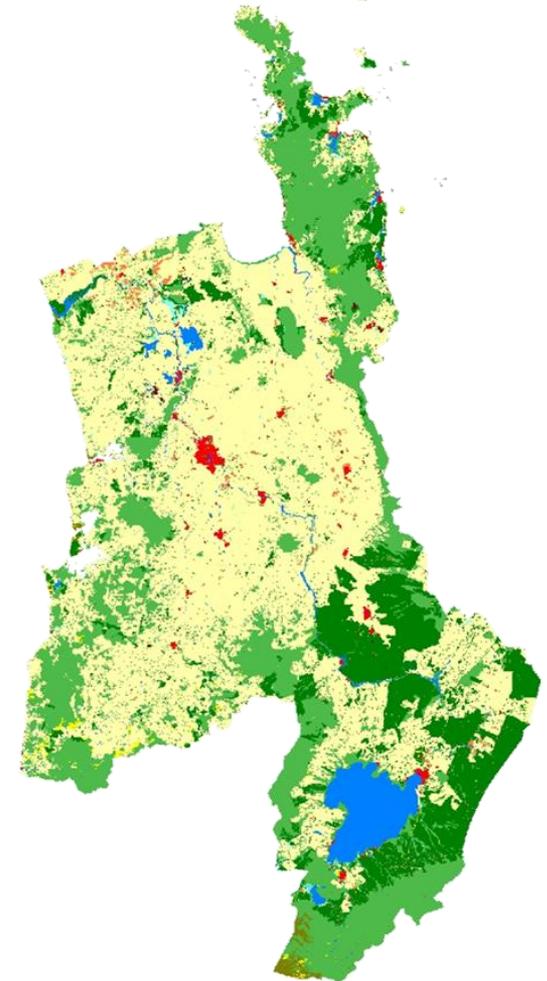
# WISE is multi-scale



Region

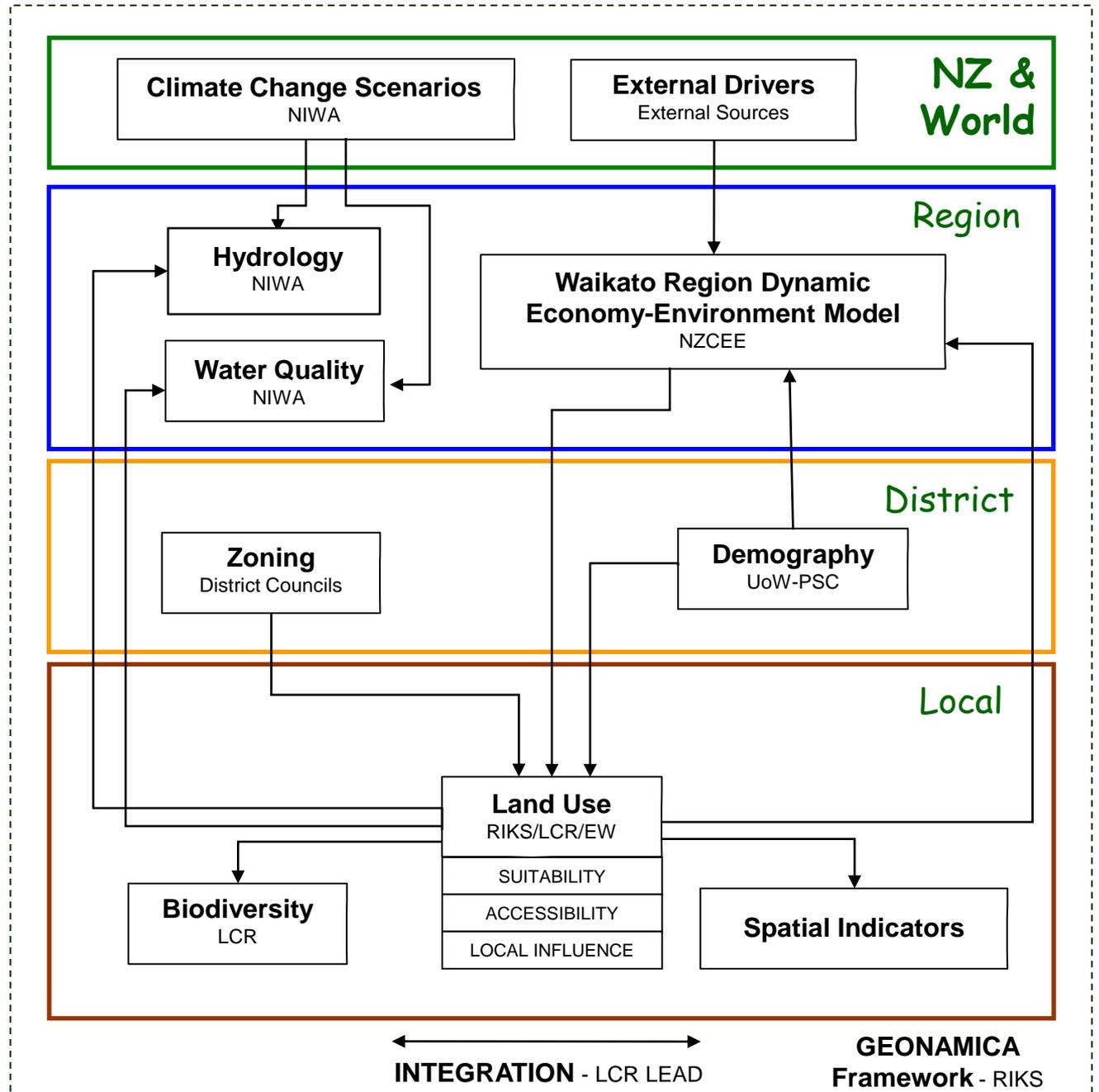


District



Local  
(200 x 200 m cells)

# WISE beta System Design



# WISE User Interface (GUI)

Caters for two types of users:

## 1. Policy Users (“planners”)

- Only variables influenced by policy are available
- Grouped logically to ease construction of scenarios, running simulations, and exploring & comparing outputs

## 2. Scientific Users (e.g., modelers, scientists)

- Access to all sub-models & underlying parameters
- Similar to previous macro-system diagram

## 3. Councillors. Stakeholders and the Public?

## 4. Schools?



Main window

**Drivers**

External factors

Policy measures

Parameters

Scenarios

Indicators

Analysis

Economy

Sector: Horticulture and fruit growing

International exports: min\$ (2004)

Interregional exports: min\$ (2004)

Gross fixed capital formation: min\$ (2004)

Changes in inventories: min\$ (2004)

Population

Fertility lever:

Mortality lever:

Additional net in-m

District / Time

Franklin

Thames-Corom

Hauraki

Waikato

Matamata-Piako

Land use map

- Bare Surfaces
- Indigenous Vegetation
- Other Exotic Vegetation
- Wetland
- Residential - Lifestyle Blocks
- Residential - Low Density
- Residential - Medium to High
- Commercial
- Community Services
- Horticulture
- Biofuel Cropping
- Vegetable Cropping
- Other Cropping
- Dairy Farming
- Sheep, Beef or Deer Farming
- Other Agriculture
- Forestry

District boundaries

Land use map

LayerManager

Zoom tools

Named viewports:

Grid tools

Pen

Flood

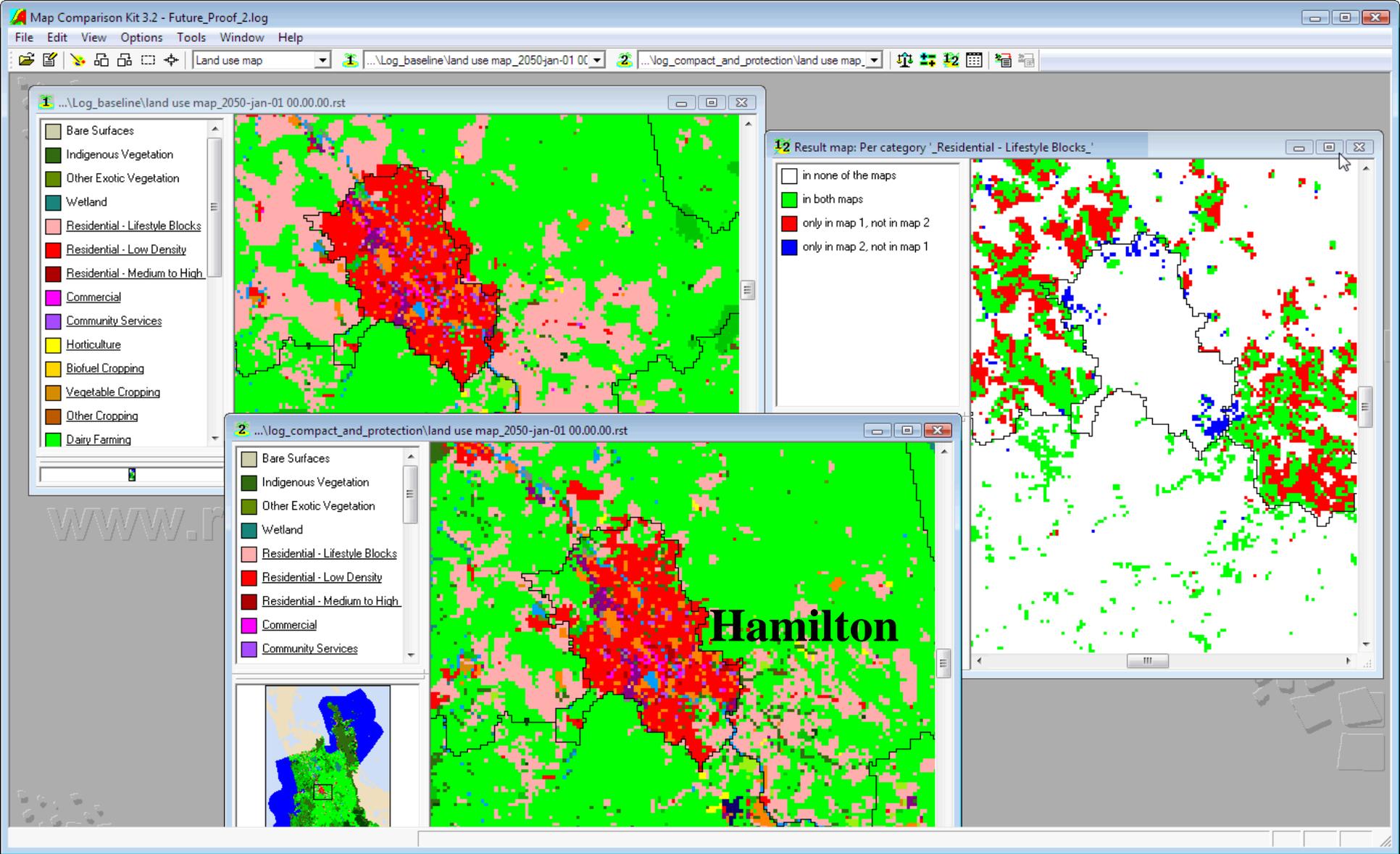
www.ri

# The Four Steps of a Policy Scenario

The image displays a software interface for policy scenario analysis. The main window, titled "Main window", features a left-hand navigation pane with three categories: "Social" (represented by a person icon), "Economic" (represented by a dollar sign icon), and "Environmental" (represented by a tree icon). Below these categories is an "Analysis" button. The main content area of the window is divided into two tabs: "Population" and "Density". Under the "Population" tab, there is a dropdown menu for "Population for district" set to "Whole greater Waikato area" and a text field for "Total population:" showing "394735 people".

A secondary window, also titled "Main window", is overlaid on the main window. It has a similar navigation pane with "Drivers", "Scenarios", "Indicators", and "Analysis" tabs. The "Analysis" tab is selected, showing a globe icon and the label "Analysis". A large blue button labeled "Open Map Comparison Kit" is centered in the main area of this window.

At the bottom of the interface, there is a timeline slider ranging from "2006" to "2050". Below the slider are several controls: an "Options..." button, a "Grid" checkbox, and "OK" and "Cancel" buttons. To the right of the slider, a small window displays a list of numbers: 64, 01, 59, 64, 74, 35, 6.

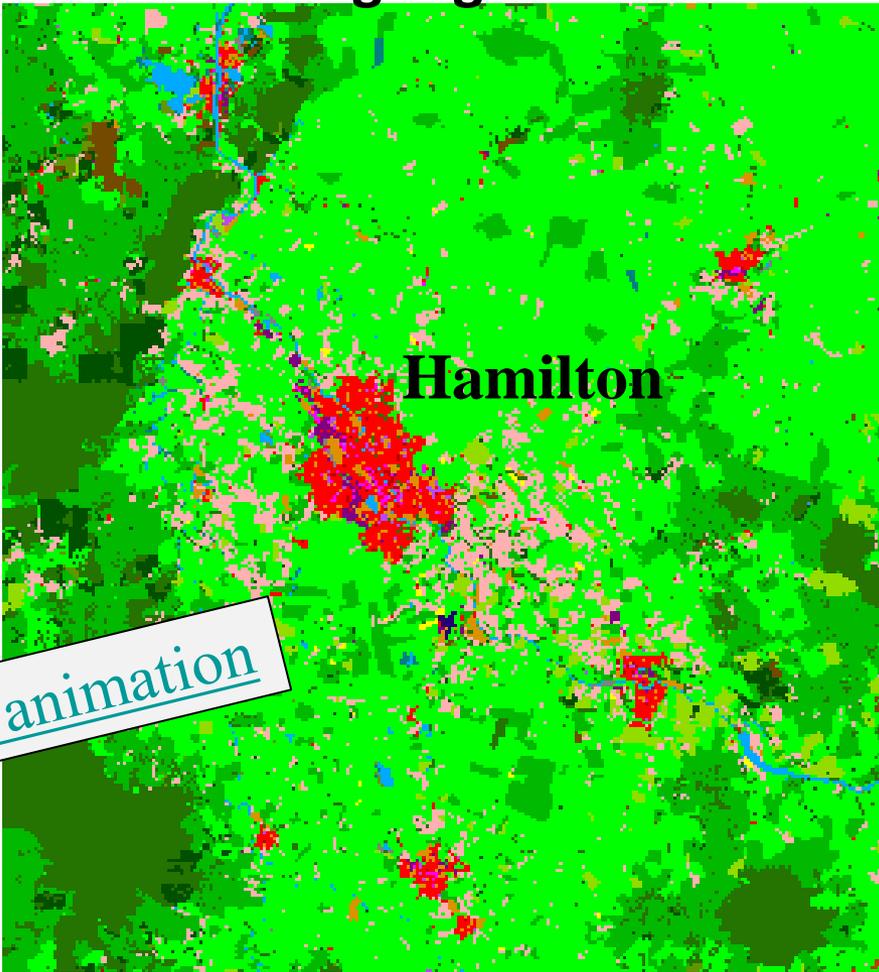


# Land Use Change – 2006 to 2050

Current Zoning



Protecting High Class Soils



This is an animation

# Case Studies

1. [Future Proof](#) – Urban Growth Strategy (website)
2. Regional Development - land use change scenarios
3. [Carbon Strategy](#) – farming trees for carbon & biodiversity
4. Biodiversity – loss of threatened ecosystems



# From qualitative to quantitative a case study using **WISE**

- **Future Proof** (urban growth study for Hamilton and surrounding districts)
- Three “Clues” for quantification (= input to WISE)  
*(from Future Proof policy documents):*
  1. **More compact urban areas**
  2. **Productive rural land protected (high quality soils)**
  3. Sensitive natural environments protected (not shown)



# Using **WISE** to explore Future Proof

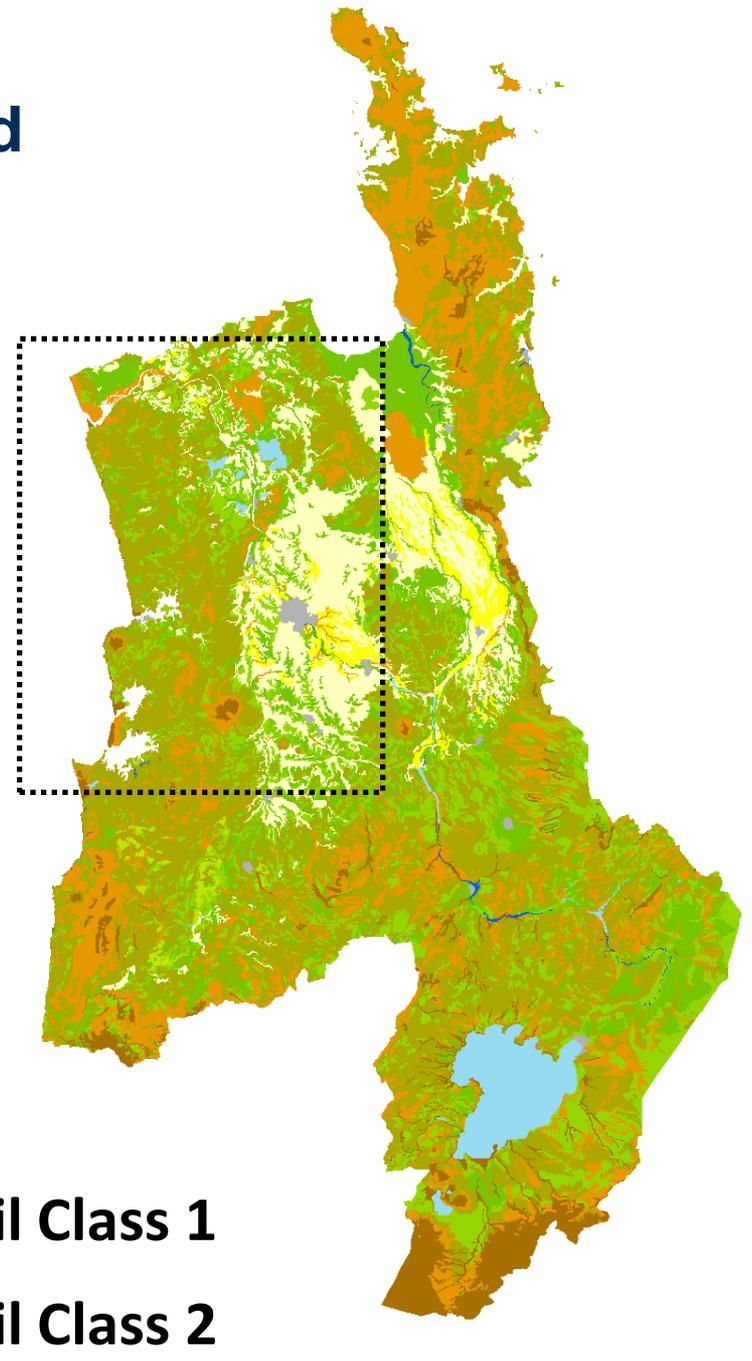
- Input assumptions
  - Population projections
  - Update infrastructure network
- Run Future Proof scenarios
  - Extrapolate current trends (BAU)
  - Compact development and protection of high quality soils



# Productive rural areas protected (high quality soils)

No urban development on  
Class 1 and 2 soils:

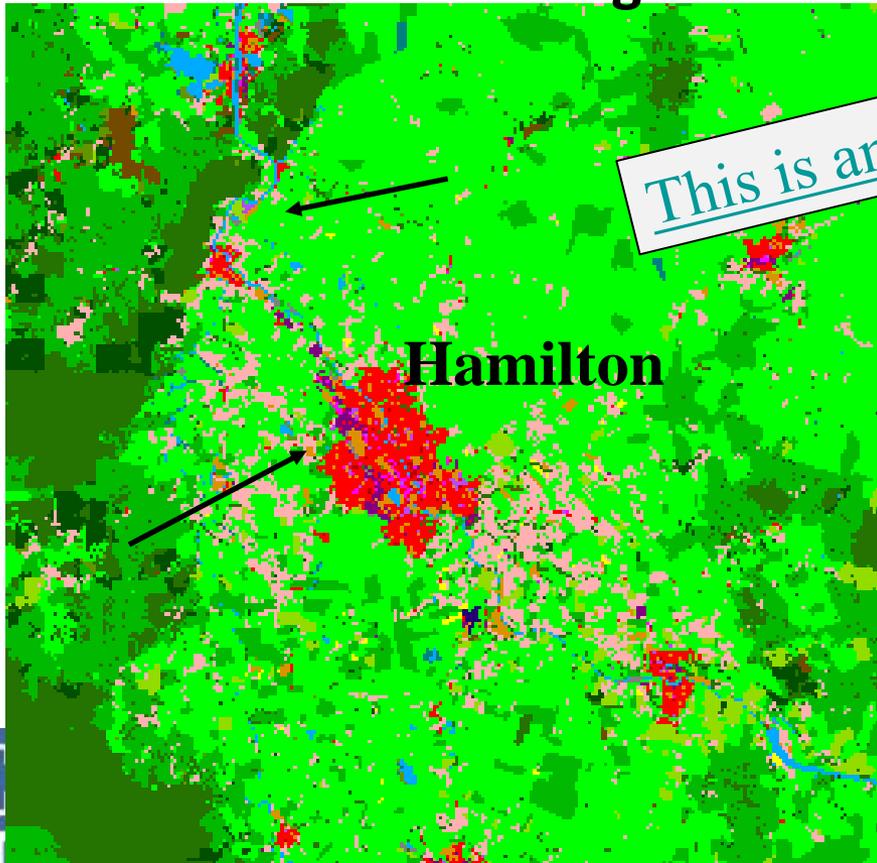
- **Residential – Lifestyle**
- **Residential – Low Density**
- **Residential – Medium to High Density**
- Commercial
- Community Service
- Manufacturing



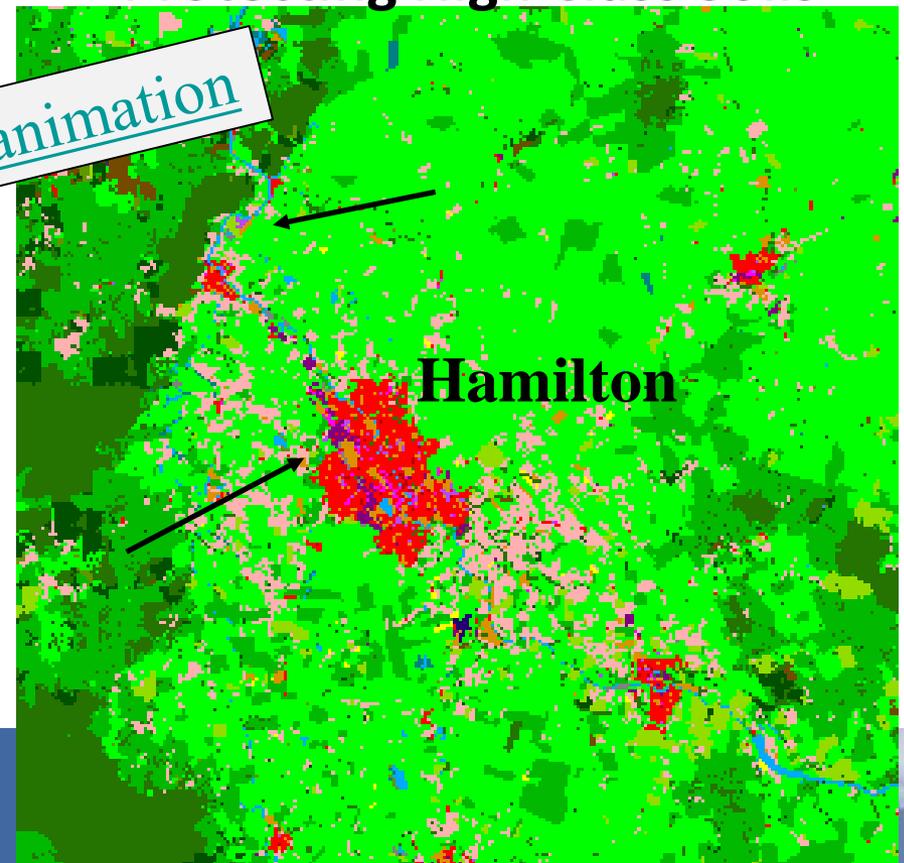
# Policy: More compact growth and high quality soils protected

Model input: Rural and urban land uses are zoned as “prohibited” in areas of Class 1 and 2 soils (high quality)

**Current Zoning**



**Protecting High Class Soils**



*This is an animation*

**Land Use Change – 2006 to 2050**

# Case Study 2:

## Three Mock Scenarios for Waikato's Future 2001-2050 based on SDSS Prototype

### Dairy Expansion

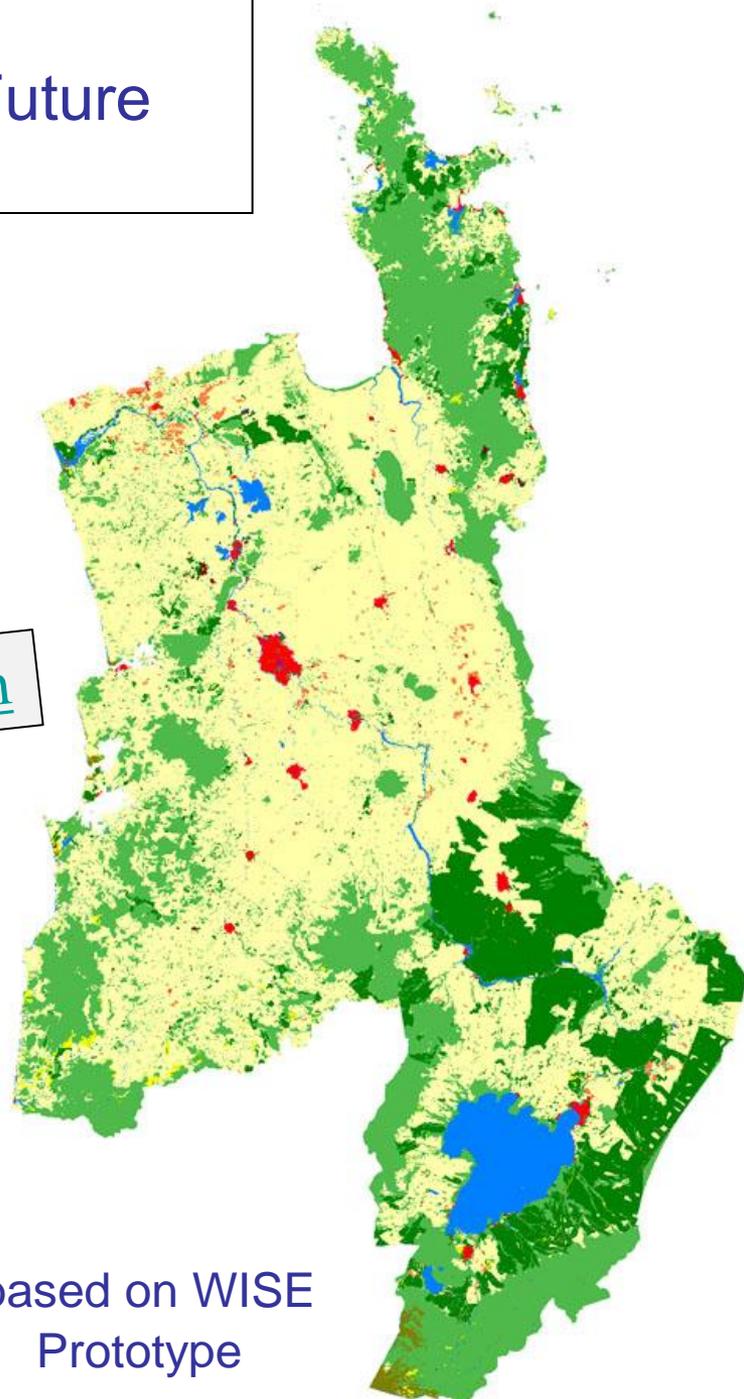
*What/If?* Land for dairying  
increases ~4% annually

#### Land Use

	Abandoned
	Bare Ground
	Broad-Acre
	Forestry
	Infrastructure
	Mine
	Indigenous Vegetation
	Pastoral - Dairy
	Pastoral - Other
	Other Primary
	Residential
	Water
	Wetland
	Utilities
	Services
	Manufacturing
	Construction

This is an animation

based on WISE  
Prototype



# Case Study 2: Waikato in 2050?

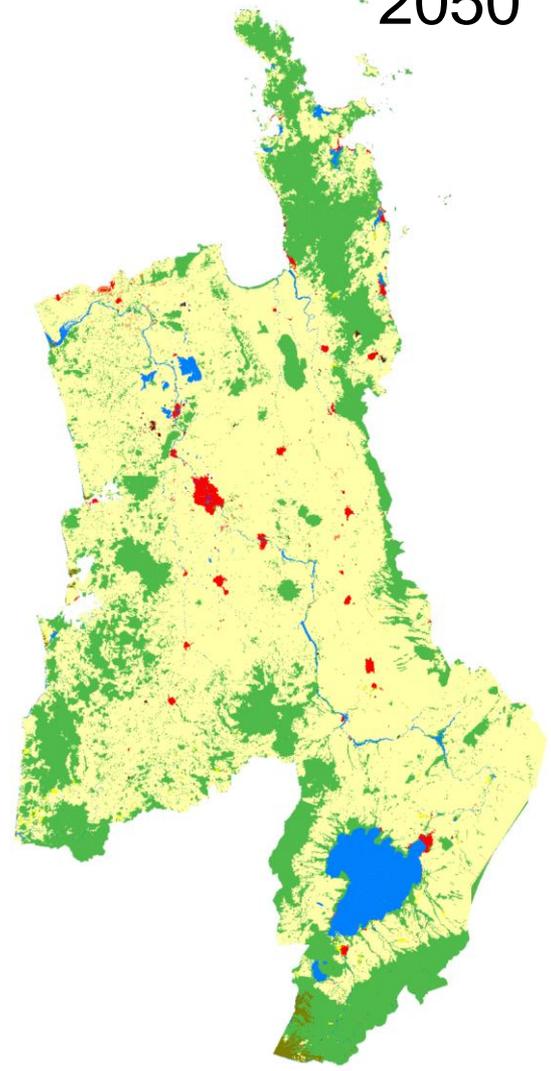
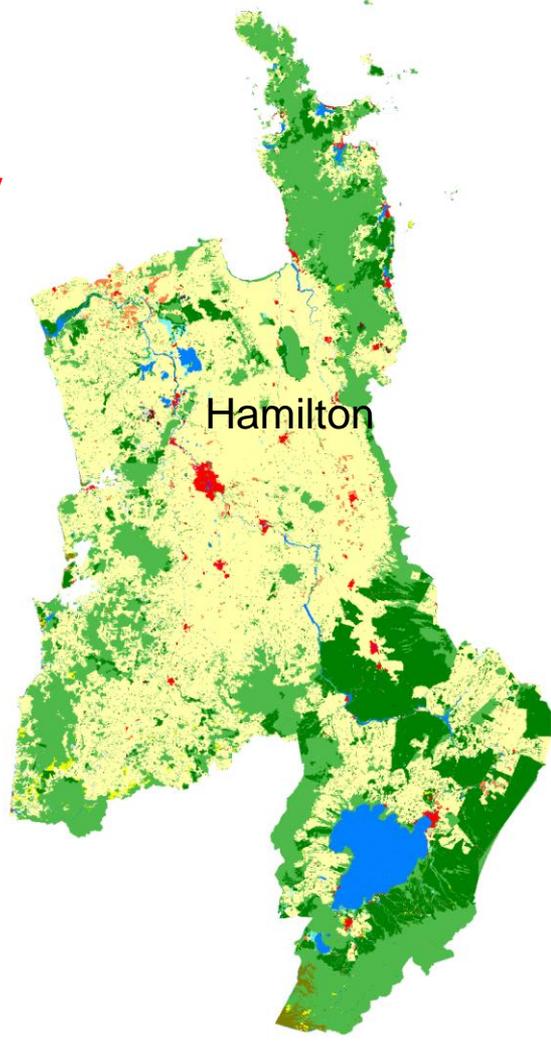
*what/if ?*

Land for dairy farming increases ~4% annually



Now

2050



based on WISE Prototype

# Waikato in 2050 – Three Different Futures (*what/ifs?*)

(based on WISE Prototype)

## 1-Dairy Expansion

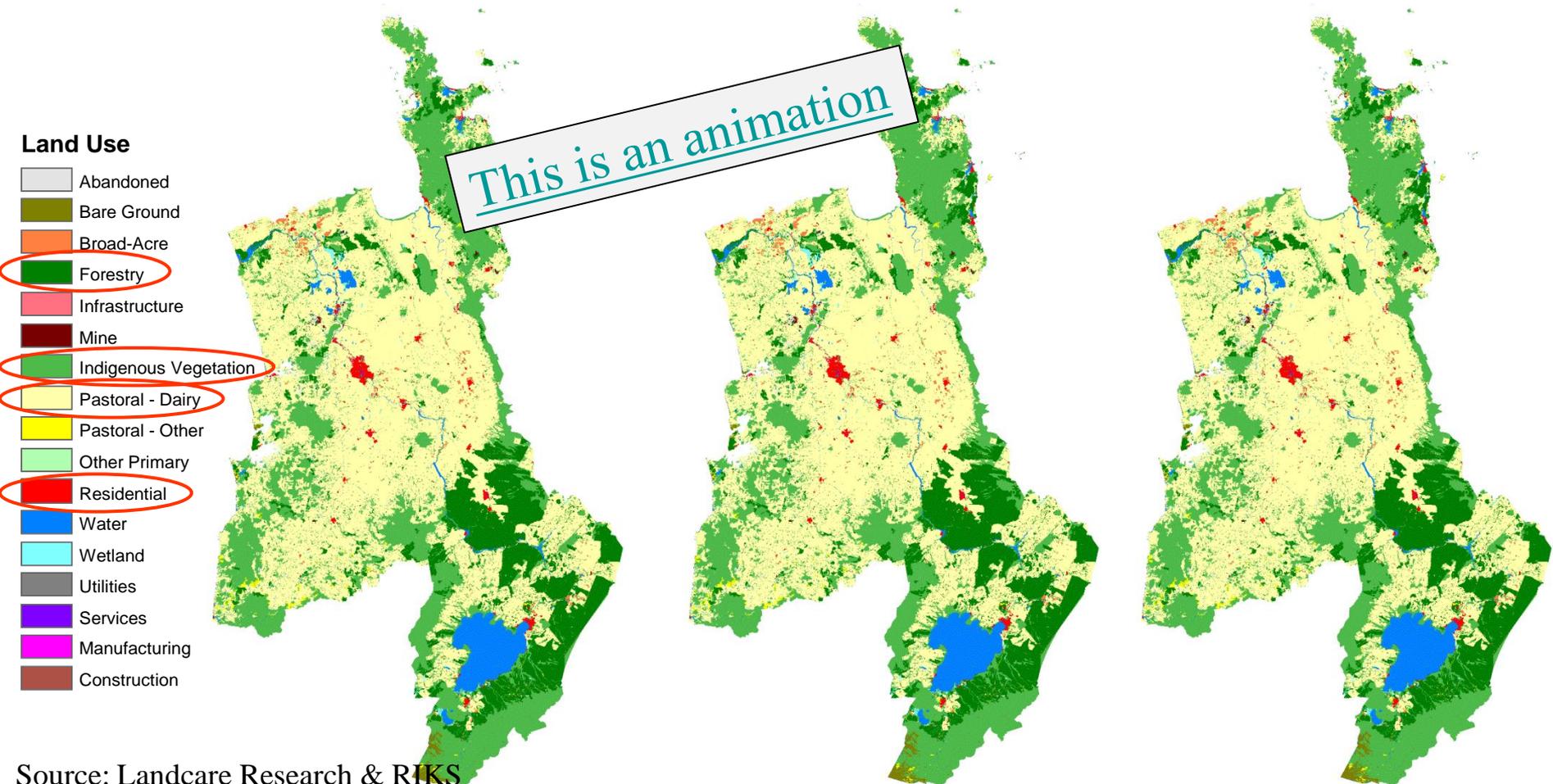
Land for dairying increases ~4% annually

## 2-Diversification

Demand for non-dairy primary production land increases

## 3-Village Life

Residential land increases 7-fold

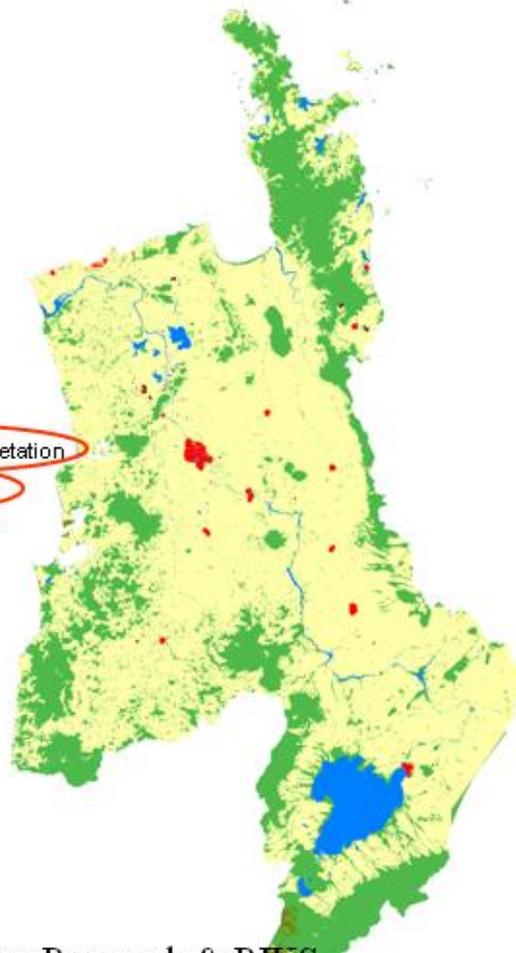


# Waikato in 2050 – Three Different Futures (*what/ifs?*)

(based on WISE Prototype)

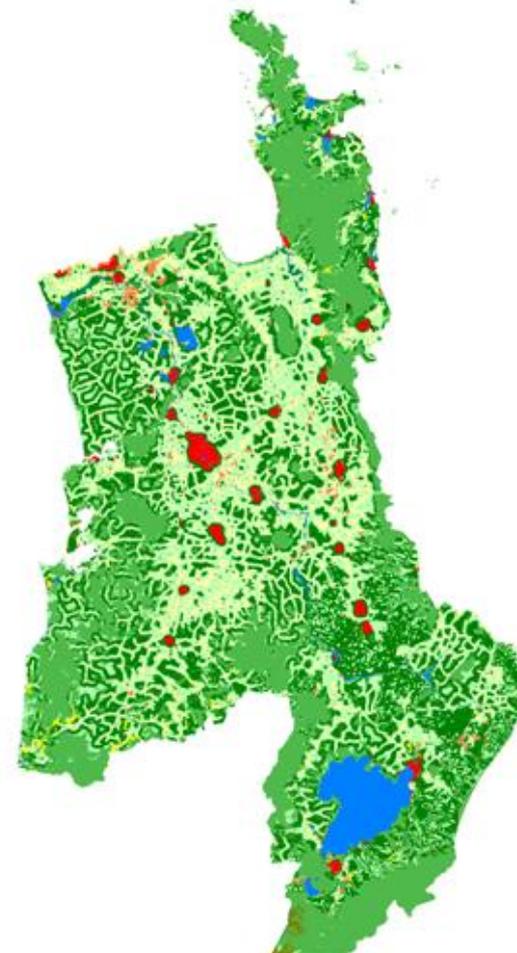
## 1-Dairy Expansion

Land for dairying increases ~4% annually



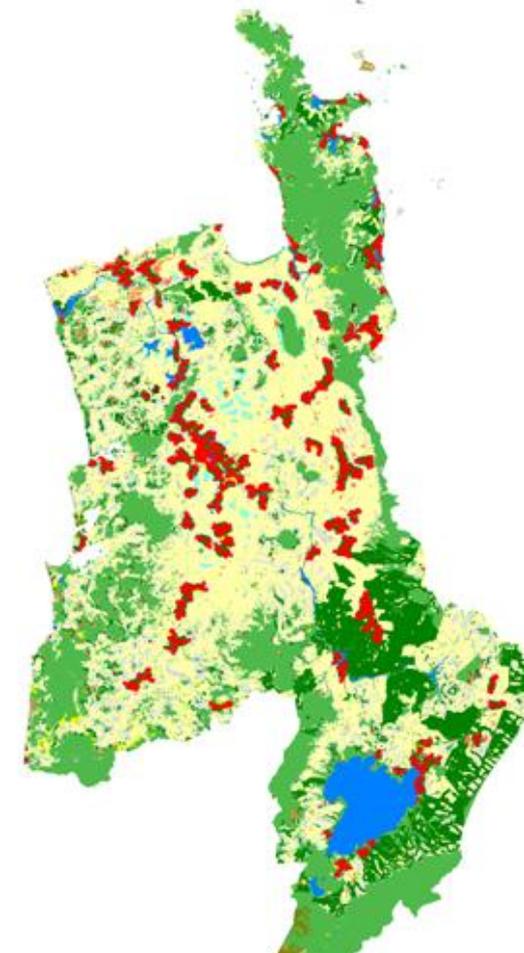
## 2-Diversification

Demand for non-dairy primary production land increases



## 3-Village Life

Residential land increases 7-fold



### Land Use

- Abandoned
- Bare Ground
- Broad-Acre
- Forestry
- Infrastructure
- Mine
- Indigenous Vegetation
- Pastoral - Dairy
- Pastoral - Other
- Other Primary
- Residential
- Water
- Wetland
- Utilities
- Services
- Manufacturing
- Construction

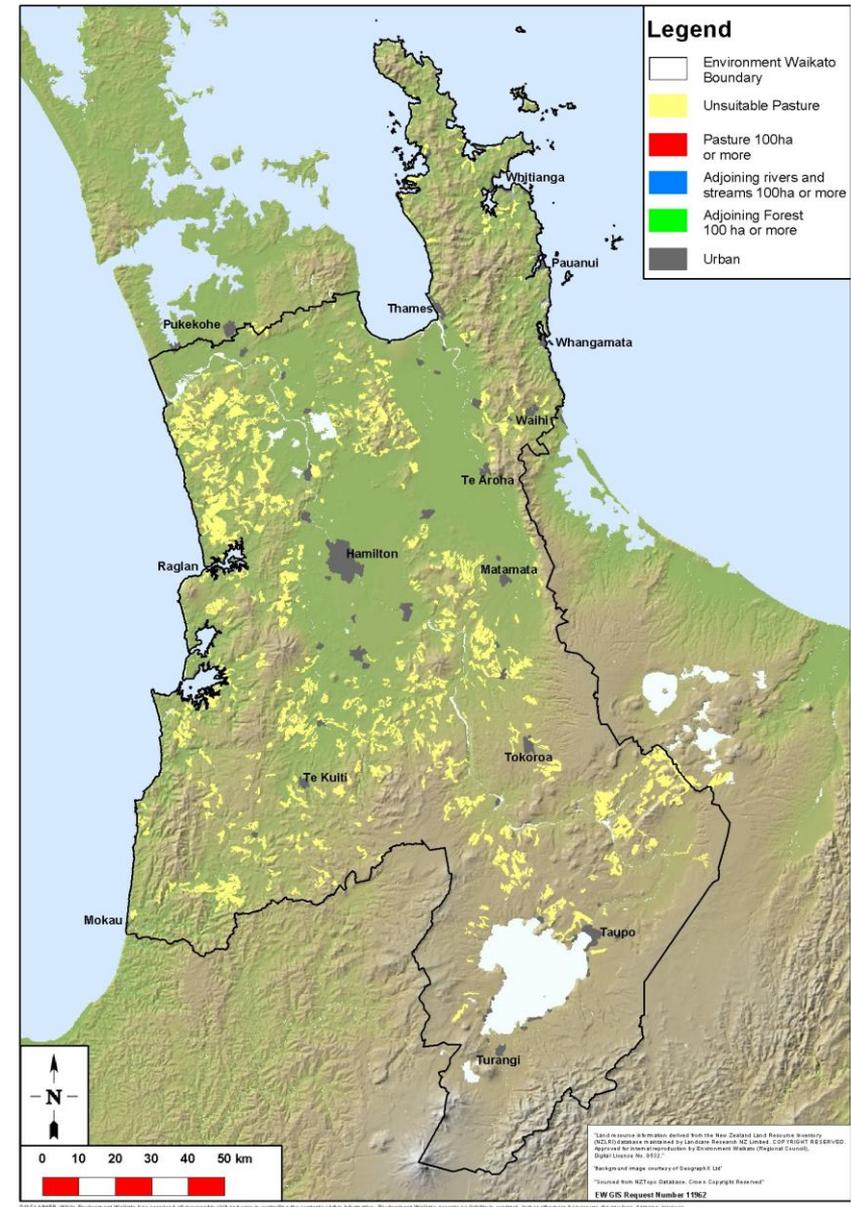
# Case Study 3: Regional Carbon Strategy



# The Issue

- soil erosion
- water quality
- sustainable land use

- ✓ Convert steep, erosion prone farming land to forestry
- ✓ ETS a commercial opportunity
- ✓ Water quality, land management and biodiversity co-benefits



# WISE Model Application:

## Regional scenario of land use change to carbon farming 2012 - 2050

### Modelling impacts of potential land use change on:

- Current sheep and beef farming land
- Phosphate and nitrogen loads into rivers & streams
- Impacts on runoff and stream flows
- Impacts on regional GDP (requires modification to WISE economic model)

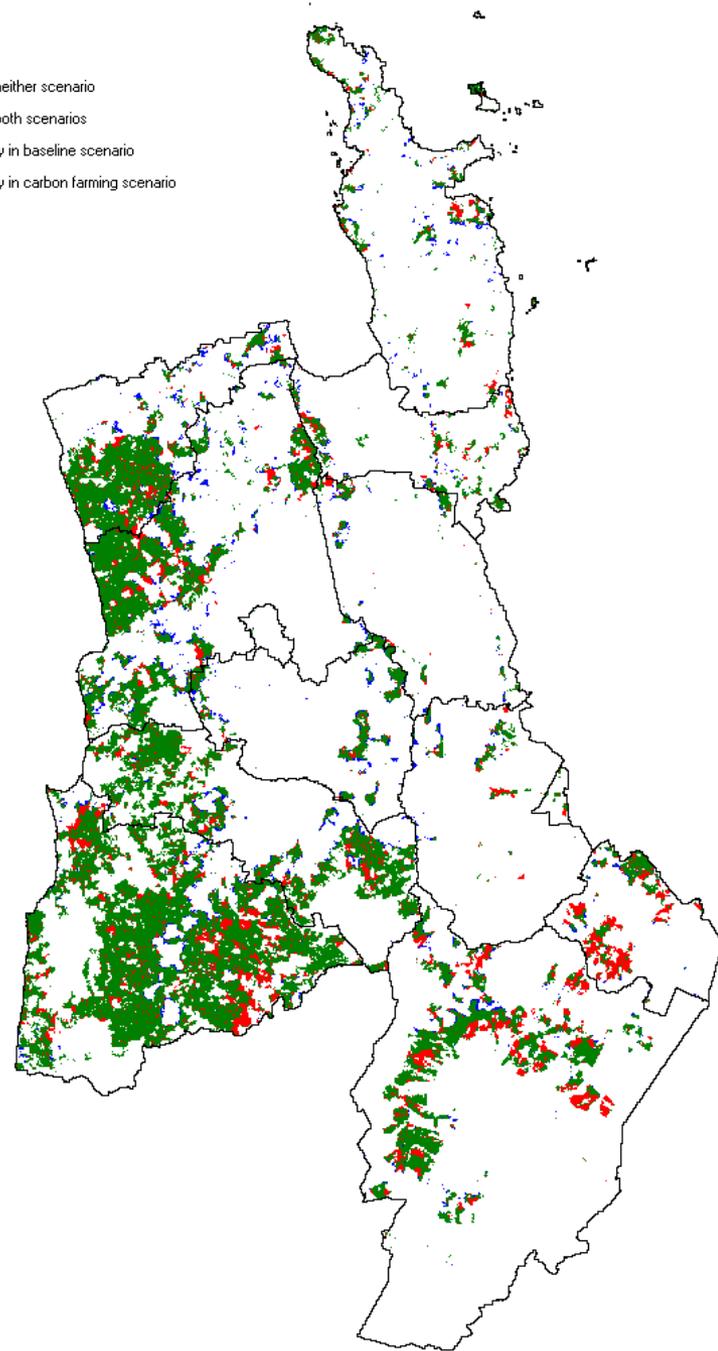
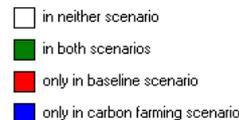


# WISE Model

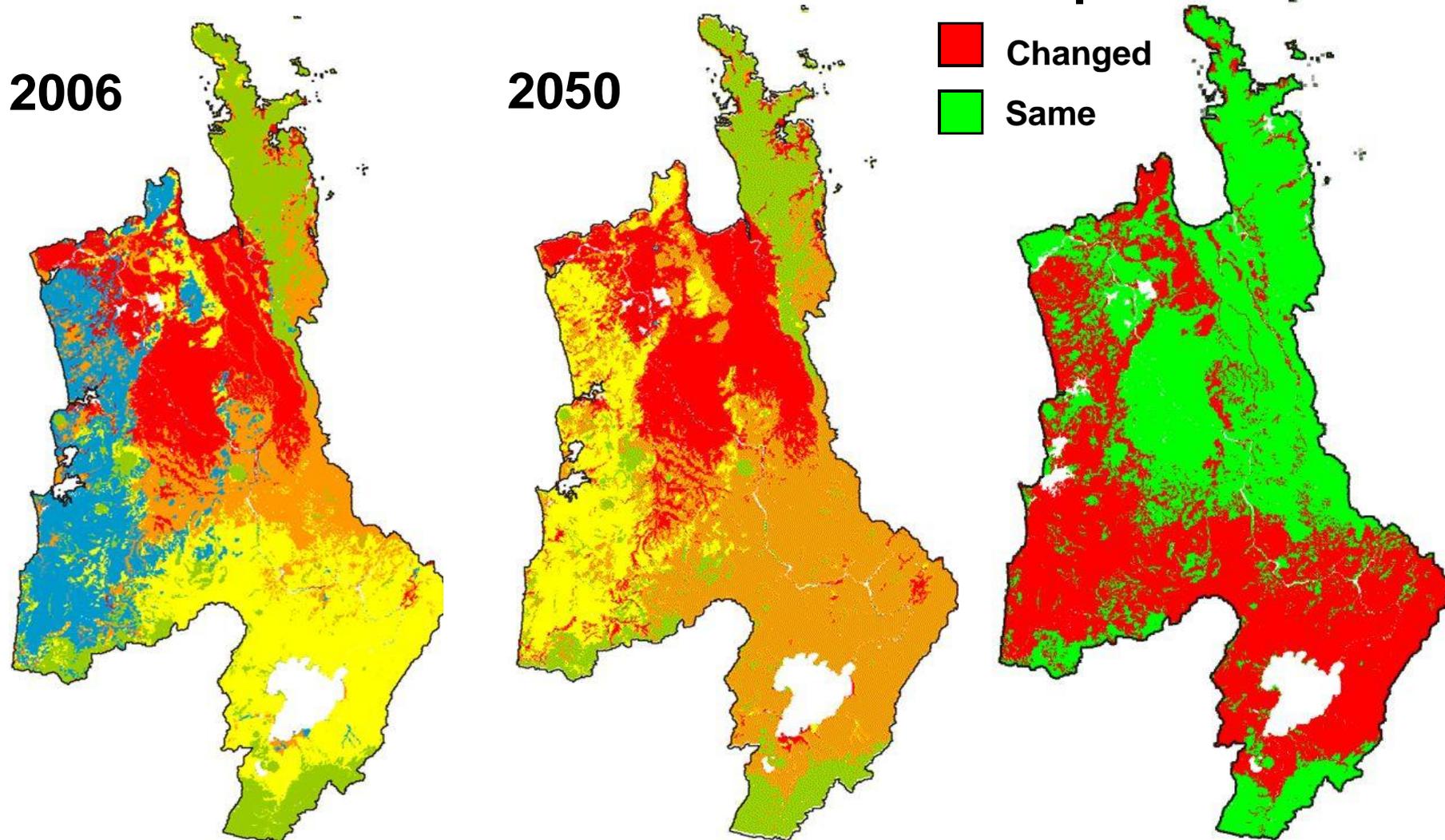
- **Sheep, Beef and Deer (SBD) land use change to carbon farming**

## Assumptions:

- ~65,000ha less SBD by 2050 when compared to the baseline:
  - **Green** = SBD in both scenarios (no change)
  - **Red** = SBD only under baseline (change from SBD to carbon farming)
  - **Blue** = SBD only under carbon farming (carbon farming from other land uses)



# Case Study 4: Biodiversity – Loss of Threatened Ecosystems



# How the Regional Council Uses WISE

- **Linking science to policy** (evidence-based decision-making)
- Explore alternative policy options for regional planning, assess **trade-offs** and prioritise issues
- **Regional** development and **sub-regional** strategies (non-statutory)
- **Cumulative** effects of policy and permits (over space/time)

## **WISE also provides:**

- Up-to-date data and information
- Access to expert knowledge from all disciplines

# Process of Building WISE

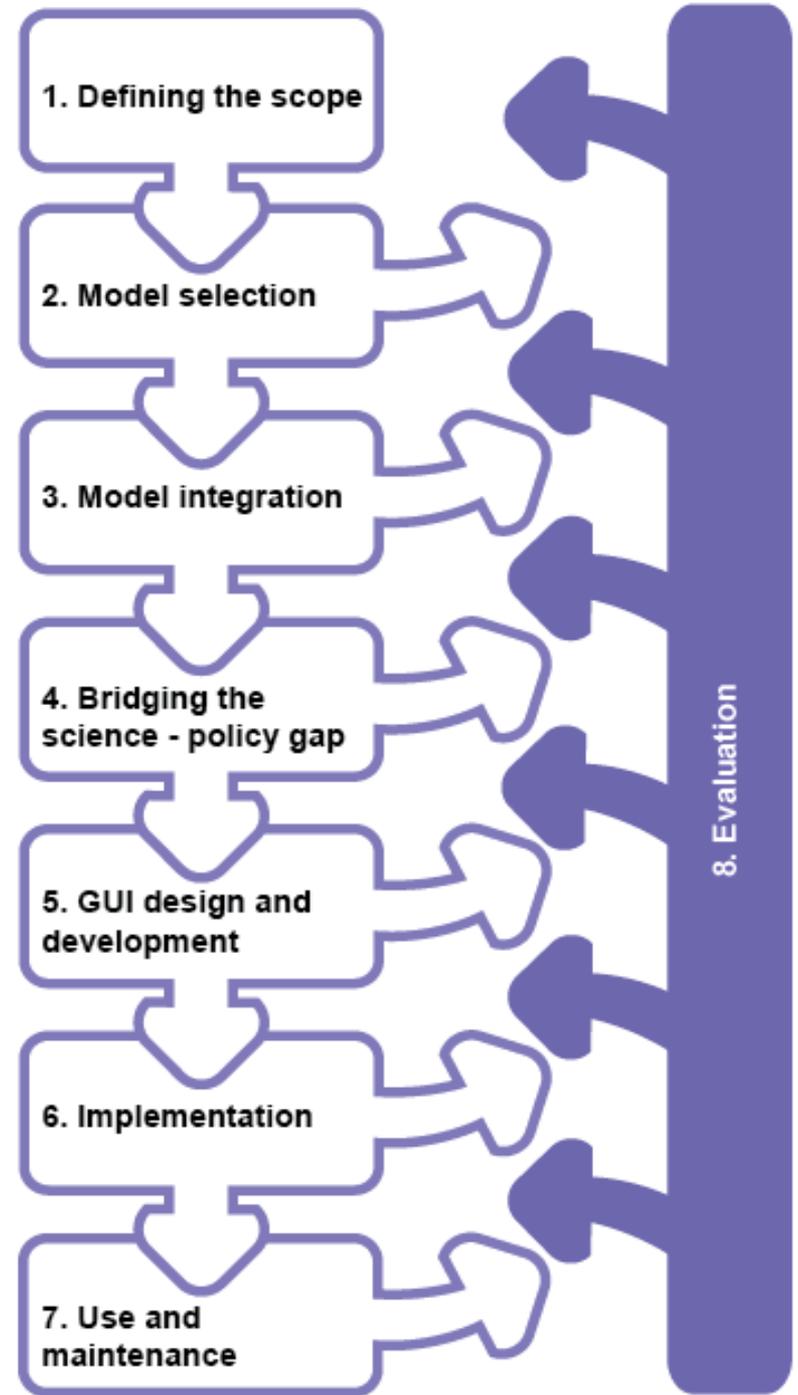
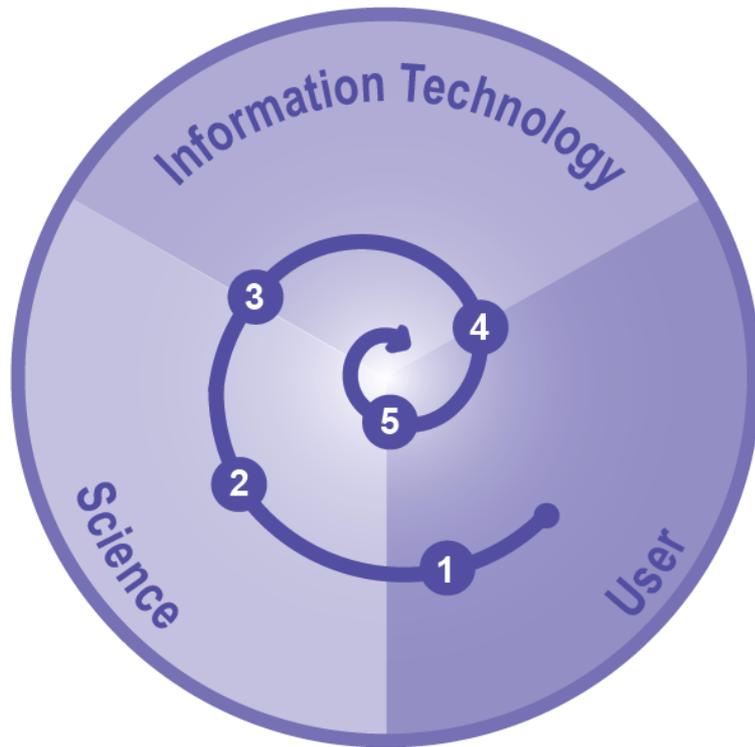
(refer to paper “*User interaction during the development of WISE*”,  
van Delden H, Phyn D, Fenton T, Huser B, Rutledge D and Wedderburn L)

Copy available from: [www.creatingfutures.org.nz](http://www.creatingfutures.org.nz)

1. How we built **WISE**
2. What we learnt
3. What's next



# Iterative Development Process of WISE



# Scoping

- Aim
  - Clarify policy context, functions, models included
- Who?
  - Regional stakeholders, policy analysts, scientists/experts
- **How?**
  - **Collaborative proposal writing users and scientists**
  - **Workshop sessions**
  - **Interviews**
  - **Narrative scenarios (Waikato 2050)**
- Results
  - Strategic decision making / integrated planning
  - Use in participatory sessions
  - Dual user interface (policy/users and scientists/experts)



# 1<sup>st</sup> Prototype: what can be expected?

- Aim
  - Raise awareness and gather user feedback
- **How?**
  - **Series of 1-day workshop sessions with potential users & questionnaire**
- Results
  - Question and answer (Q&A) document for website
  - Trigger for discussion on: inclusion of policy measures; operation of the system in user organisation; and relevance at district or national level.



# 2<sup>nd</sup> Prototype: what needs improving?

- Aim
  - Present progress and gather user feedback
- Who?
  - Users at regional, city/district and national level
- **How?**
  - **Training and testing by key users**
  - **Selection of case studies and preparation of training**
    - **Regional policy statement (statutory)**
    - **Future proof growth strategy (non-statutory)**
  - **Series of 1-day workshop sessions & questionnaires**



# 2<sup>nd</sup> Prototype: what needs improving?

- Results
  - Users better able to identify benefits and improvements
  - Integrative character of WISE seen as both a benefit (reality) and a challenge (complexity)
  - Credibility of results crucial
  - Main expected benefit from users:
    - Explore 'what-if' scenarios in policy development, integrated catchment management and transport network planning
    - Alignment of regional and city/district policies and rules
    - Explore and communicate scenarios in workshops with the public



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

# WISE Feedback

The added value of WISE as seen by our users:

1. Improves understanding of the interaction between economic, social and environmental processes
2. Elucidates the effects of policy interventions
3. Quickly calculates the consequences of alternatives
4. Objectively measures and evaluates the alternatives
5. Improves communication
6. Hands-on experience with practical examples was valued positively by users – library of documented examples
7. Prototyping improves understanding and hence facilitates discussion and builds trust

# Final project version and implementation: *are we successful?*

- Barriers:
  - Existing planning practice needs to be altered
  - Need for training and capacity building
  - Time frames often rushed: political expediency displaces good practice
  - Cost/benefit of a different approach uncertain
  - Statutory processes and proposed policies often legally appealed – reluctance to use new, untested methods
- Initial use in non-statutory processes
- Develop an implementation plan
- Secure long term funding



# Implementation Plan

- Identify suitable champions
- *WISE User Group* (supported by technical experts – modelers, scientists, IT and communication)
- Estimate ongoing costs and secure long term funding
- Continue with collaborative real-life case studies
- Training to build capability and capacity
- Maintain data and model components up-to-date
- Service agreements with data providers & modelers
- Research plan
- Identify and prioritise improvements and modifications



# Lessons Learnt so far...

- **Allow time at the start to develop shared understanding**
- **User interaction crucial during the development (champions)**
  - ✓ Ownership by user organisation (Waikato Regional Council)
  - ✓ Must add value (be useful) and accessible (user-friendly)
  - ✓ Understanding how models work and how they are linked
- **Time and effort for individual model components vs integration**
- **Develop implementation strategy to optimize user buy-in**
  - ✓ Improving and understanding
  - ✓ Making WISE relevant (case studies), build credibility
  - ✓ Provide support: data mgnt, training, User Group, set-up scenarios
  - ✓ Collaboratively identify, prioritise and implement improvements
- **Interdisciplinary multi-agency science/policy collaboration is hard!**

# Thanks

- ✓ **FRST** – NZ Foundation of Research Science & Technology
- ✓ **Waikato Regional Council**
- ✓ Creating Futures **partner organisations**





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