

Creating Futures: Tools for Integrated Planning

Beat Huser
Environment Waikato
New Zealand

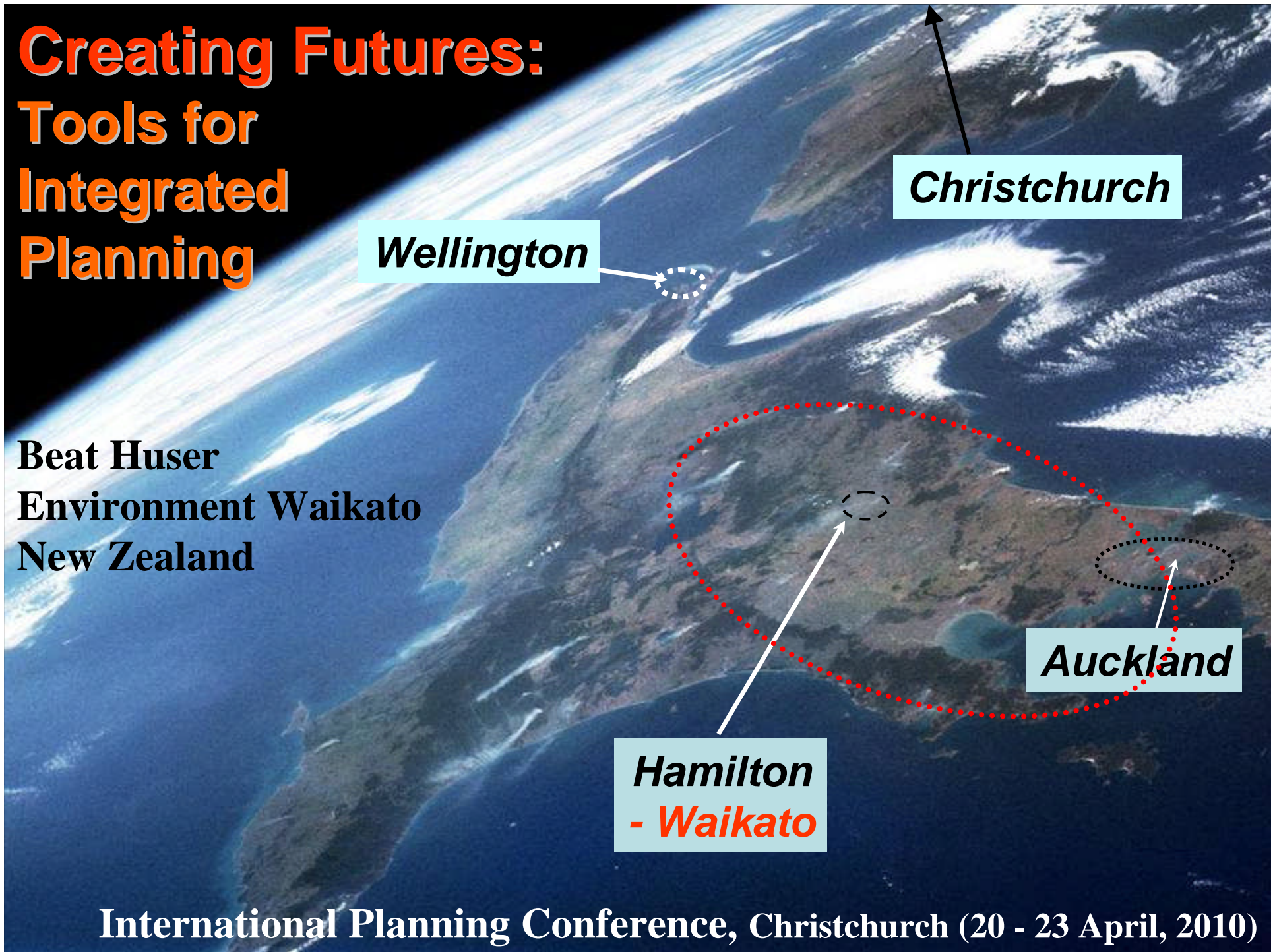
Wellington

Christchurch

Hamilton
- *Waikato*

Auckland

International Planning Conference, Christchurch (20 - 23 April, 2010)

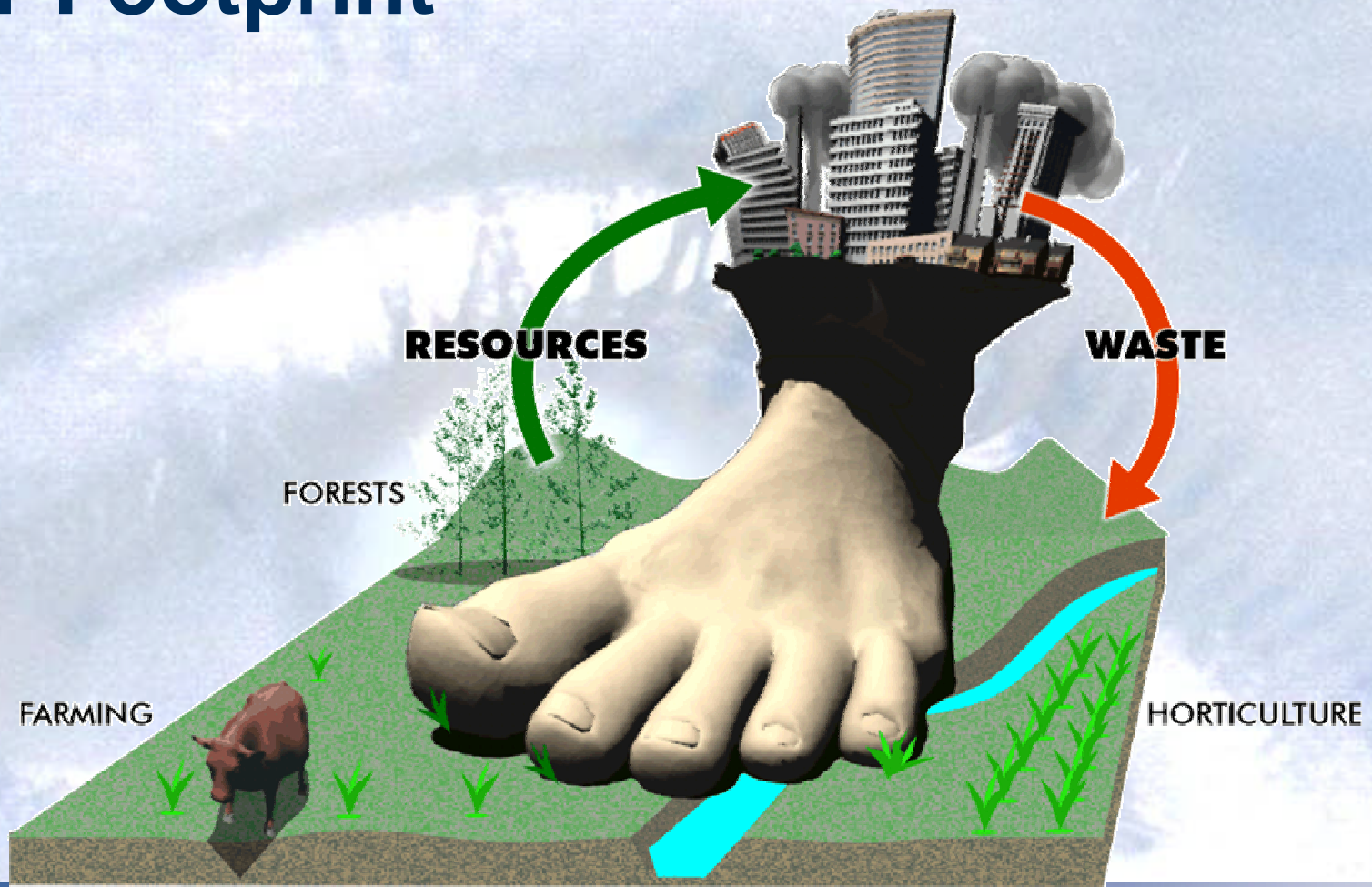




“The future is not some place we are going to, it is a place we are creating.”

(Peter Ellyard)

Our Footprint



Creating
Futures



Stretching our Planet ...



- **3 more planets** would be needed if everyone lived like most New Zealanders currently do

What we will cover

- New Zealand's governance structure
- Creating Futures project
 - Regional Scenarios
 - *WISE* (Waikato Integrated Scenario Explorer) – Spatial Model
 - Case studies
- Lessons learnt & future directions



Waikato Region

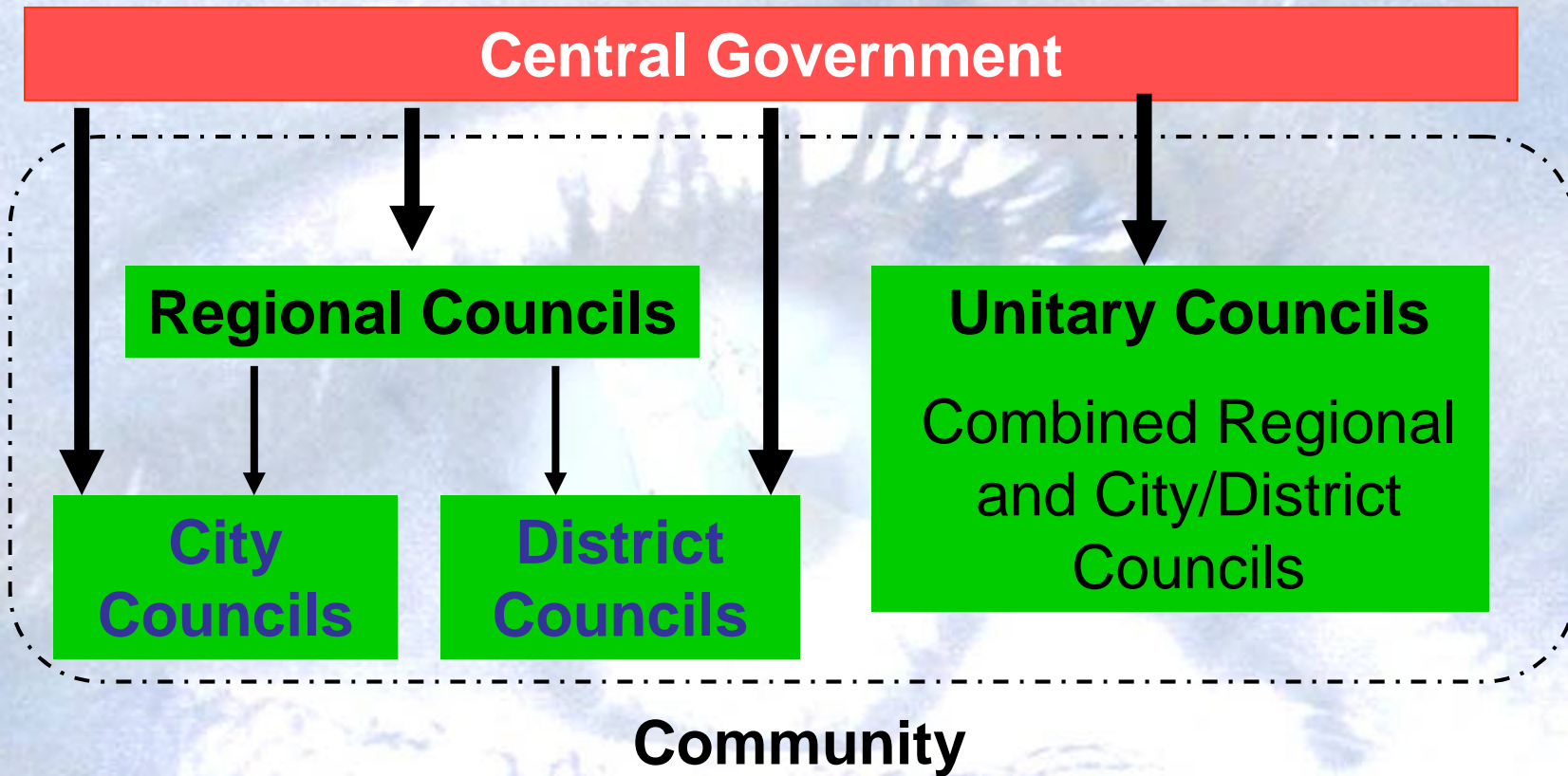
Other regions

*National
- NZ Inc*

Australia

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The Structure of Government



Key Differences – Regional Councils and District/City Councils

Regional Councils

- Natural boundary based on watersheds
- Core business - natural resource management
 - air, land, water, coast

District / City Councils

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

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).



Why 'New' Planning Tools?

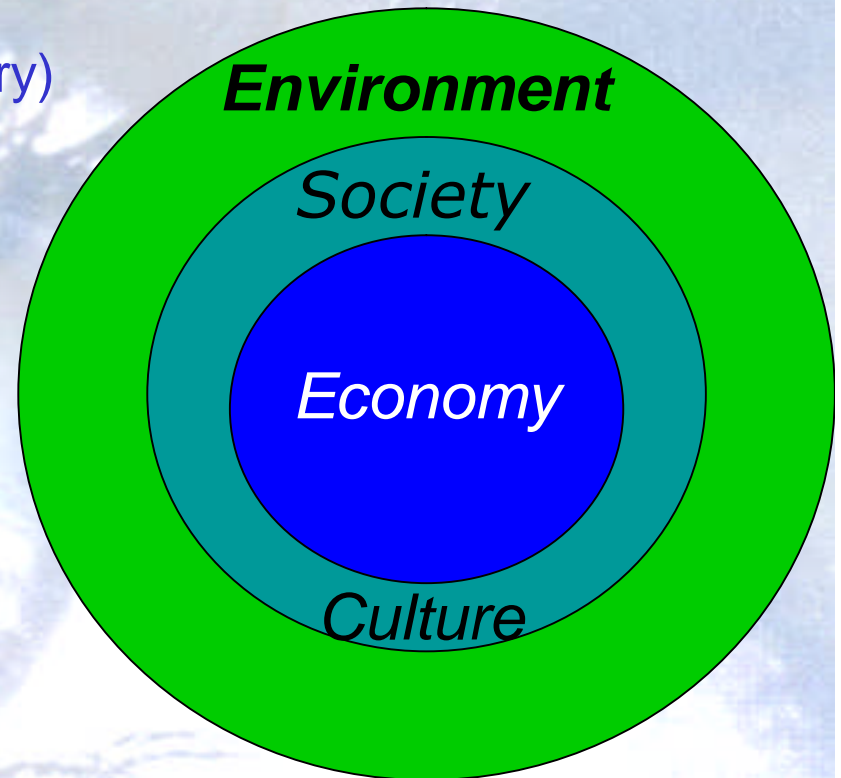
INTEGRATION

- Strategic partnerships (multi-disciplinary)
- Linking the four well-beings

LONG TERM planning and enhanced strategic focus

LINKING Science to Policy

- informed decision-making
- evidence-based



Creating Futures Project

(2006 – 2010)

Aim

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

Creating
Futures

Creating Futures project

Tools for Integrated Planning



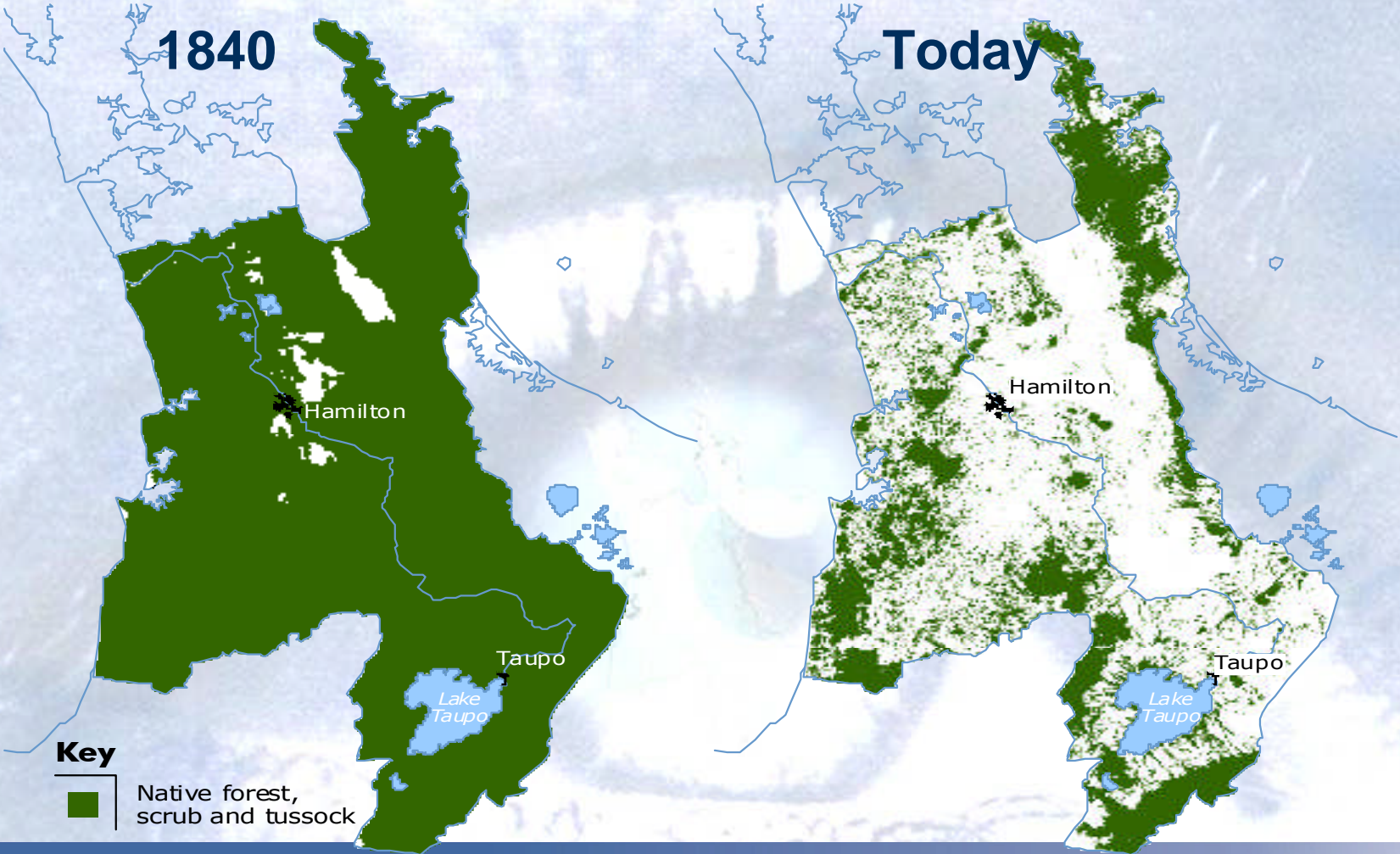
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Waikato Region - what we manage

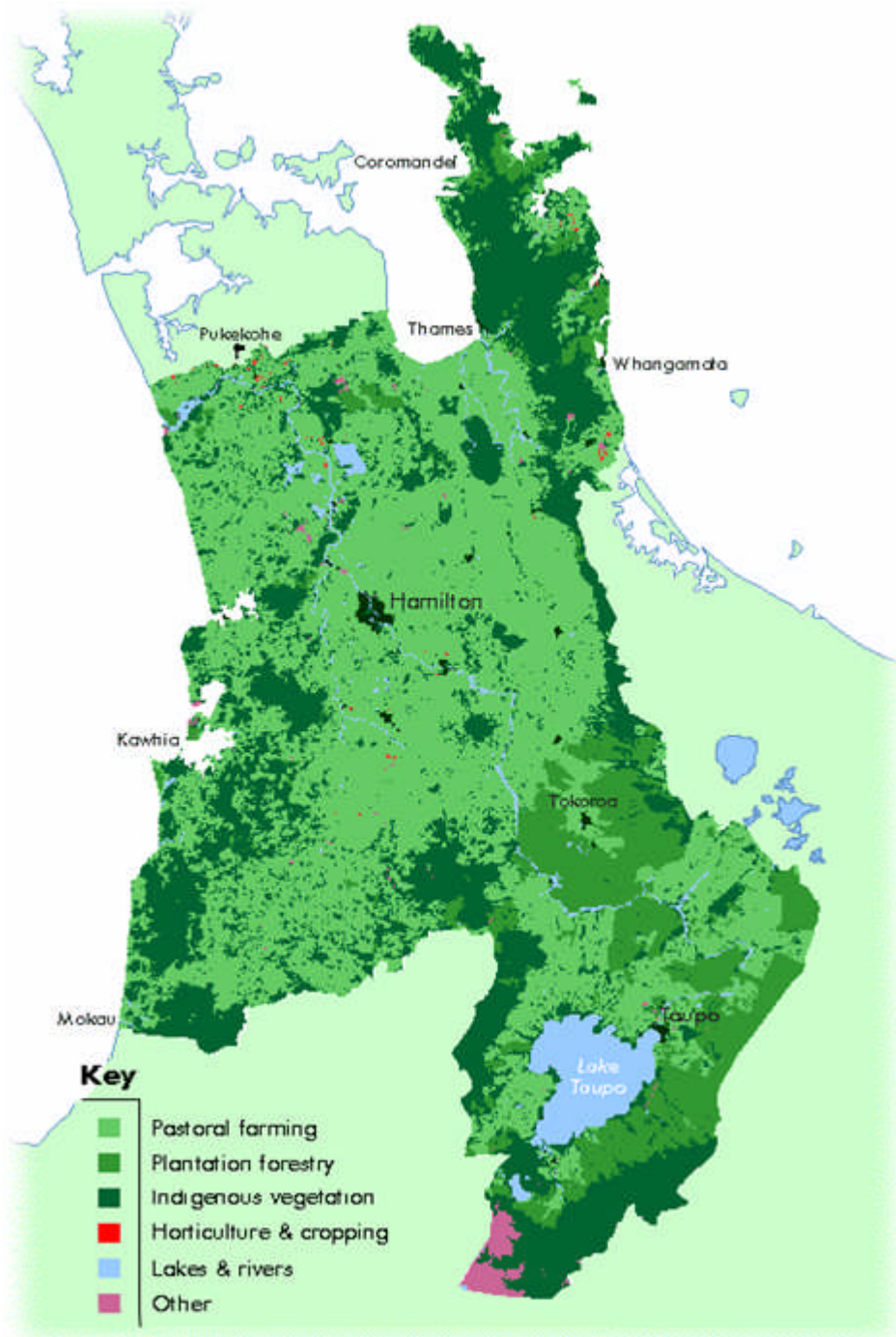
- 25,000 km² total area
- 1,150 km coastline
- Longest river, largest lake
- 400,000 people (10% of NZ)
- \$10 Billion GDP (10% of NZ)
- \$ 6 Billion Agriculture Export



Change in Vegetation Cover – last 170 years



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Land cover data supplied by Terralink NZ Limited (from 1996 Waikato Land Cover Database);
 COPYRIGHT RESERVED.

Land Use - now

- 56% pastoral farming
- 12% plantation forestry
- 28% indigenous vegetation and wetlands
- < 1% horticulture
- < 1% urban uses

Waikato in 2050?

Step 2:
Understand
the past

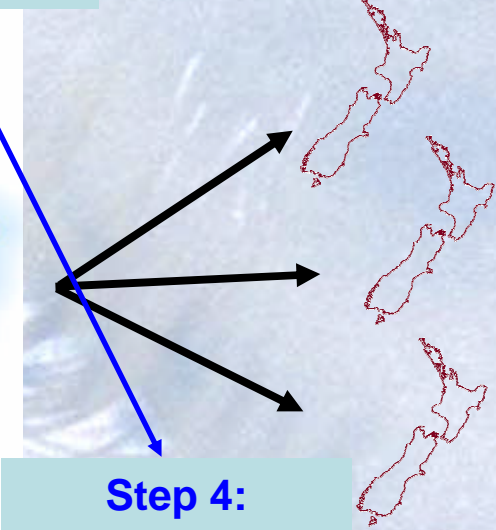
Step 1:
Characterize
the present



Step 3:
Understand
past changes
& trends

Scenarios

Step 5:
Explore
possible futures



Step 4:
Identify
key drivers &
trends and
“model”
possible
future
scenarios

Creating Futures



What We Want to Achieve

Planning tools that inform:

- **Strategic planning (Long Term Plans)**
- **Statutory plans & policies (eg. RPS; RP/DP)**
- **Non-statutory planning & community outcomes processes**
- **Economic development strategies & smart growth**



Project Structure

Project Leader

Dr Beat Huser



Advisory Group

Central and Local Government

OBJECTIVE 1:

Improved communication & deliberation tools



NZ\$1.5M



OBJECTIVE 2:

Spatial decision support system (WISE)



Landcare Research
Manaaki Whenua



THE UNIVERSITY OF
WAIKATO
Te Whare Wānanga o Waikato

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Objective 1 - Qualitative Tools

- Scenario planning
- Deliberation processes

*We can't predict
the future*

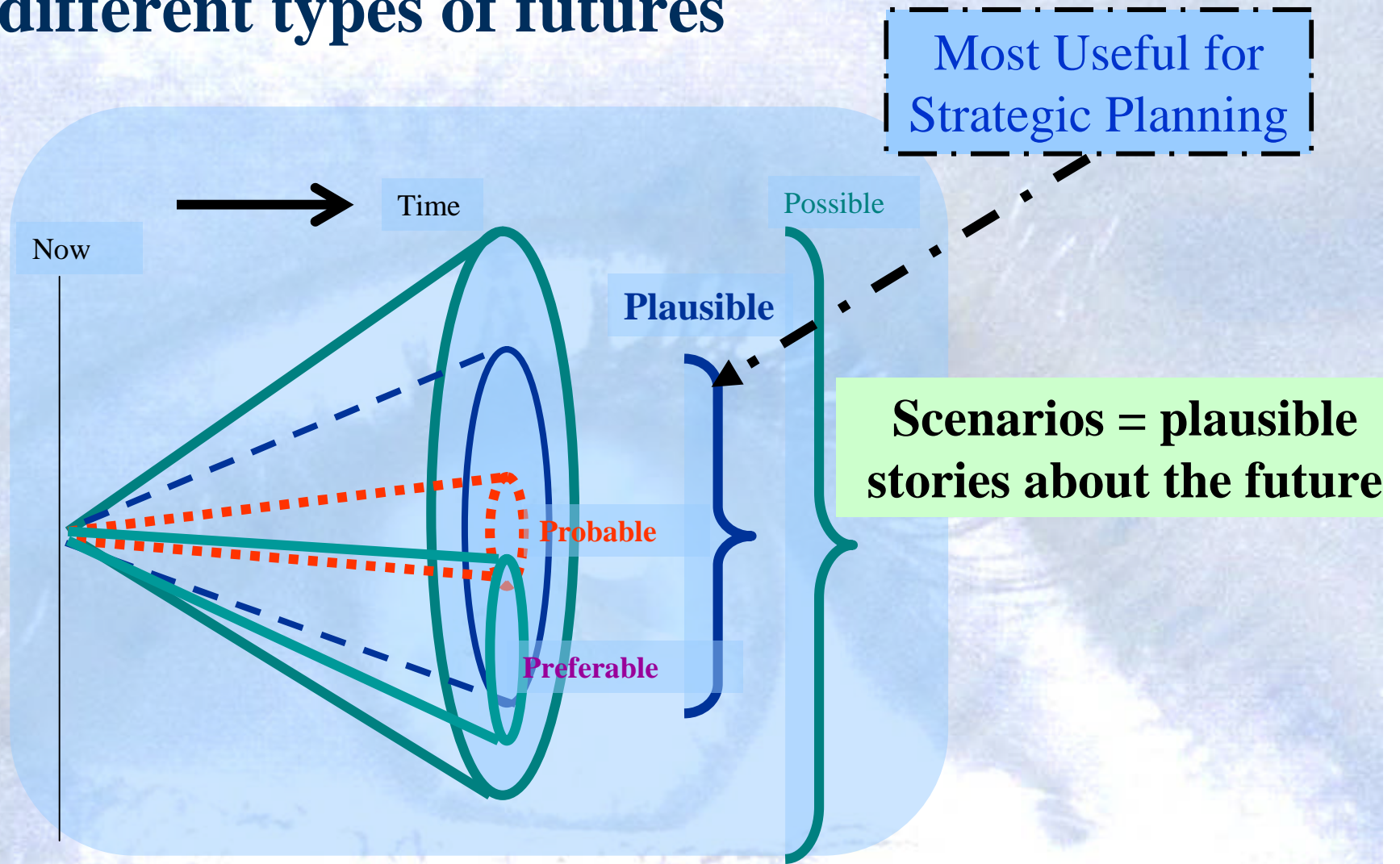
The 'futures landscape'
is one of shifting sands

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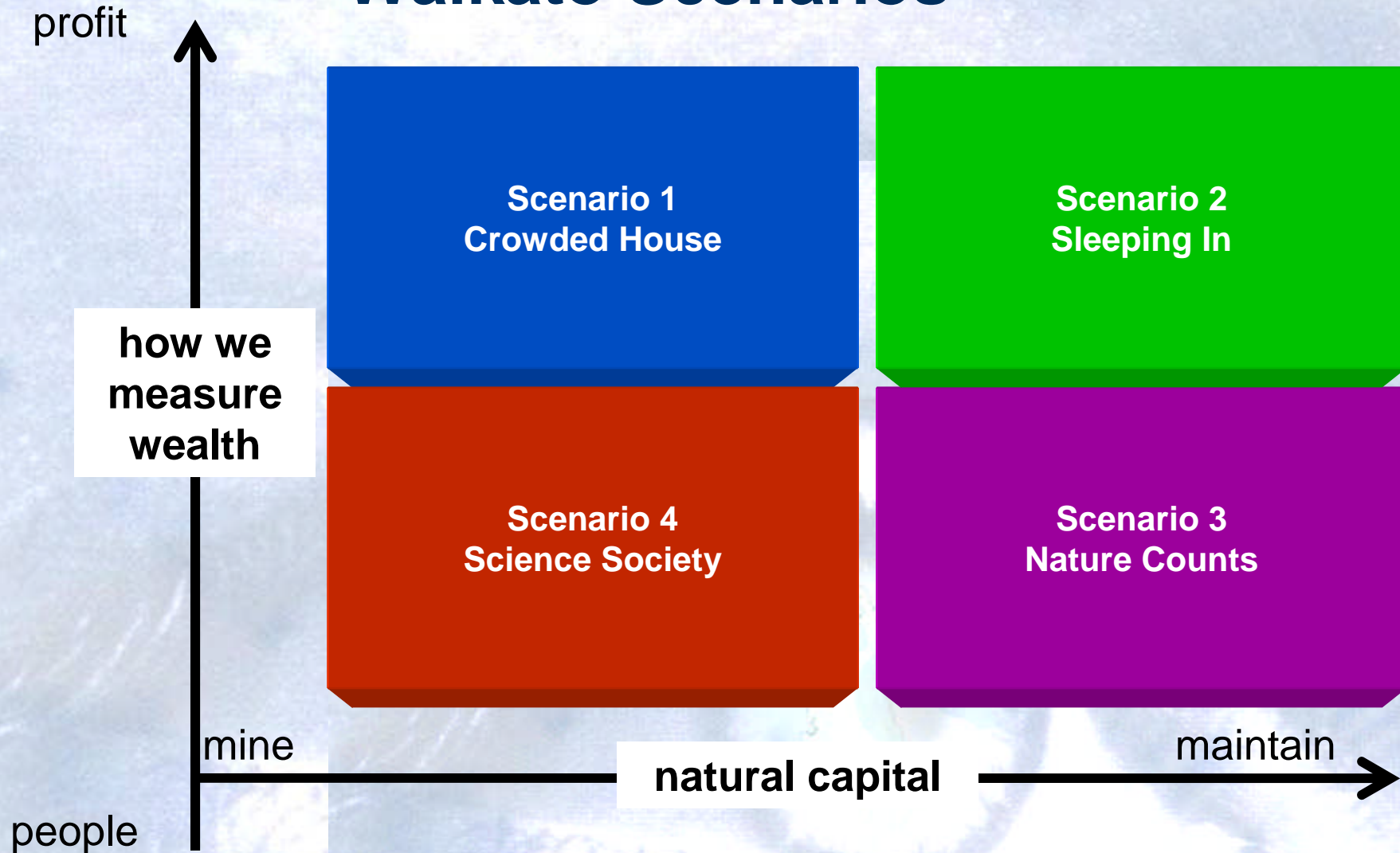
Source: MSD

...different types of futures



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Waikato Scenarios



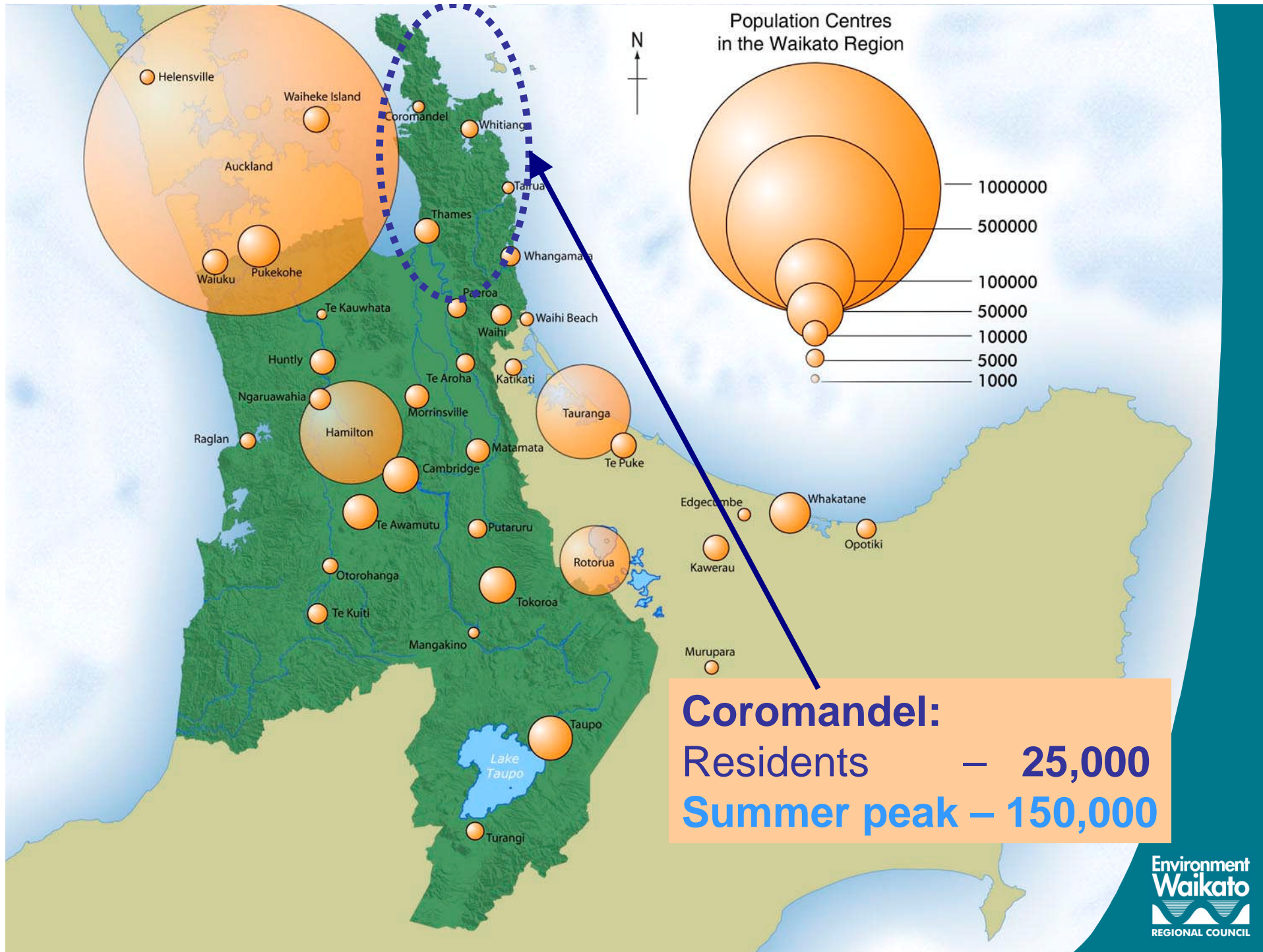
Creating
Futures

www.creatingfutures.org.nz

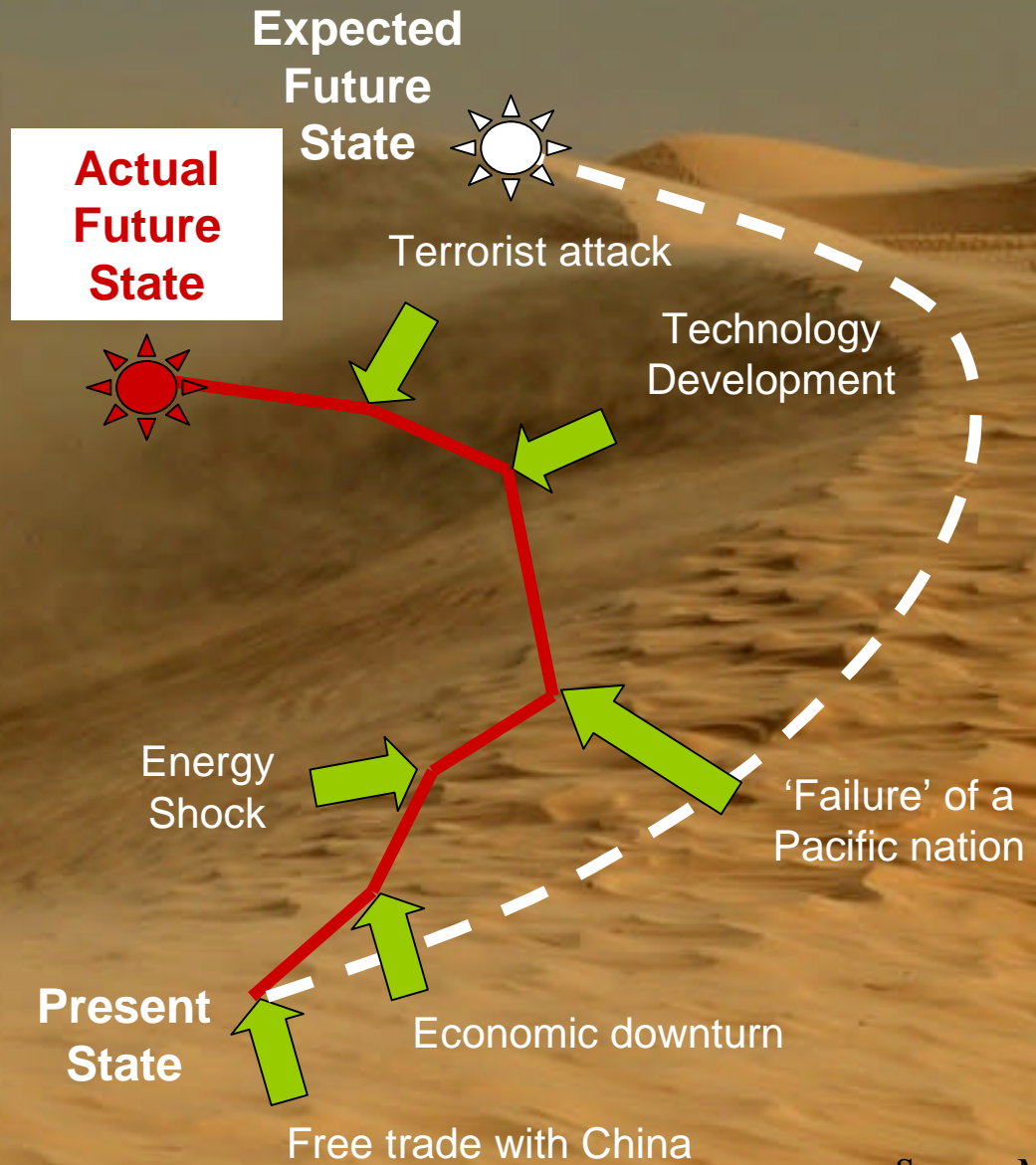
30% Population Increase North of Taupo by 2026

679,100

Source: Statistics NZ 2006



The path between the present and the future is not clear and direct



Key Drivers

World

- Climate Change
- Population
- Market changes
- Globalisation

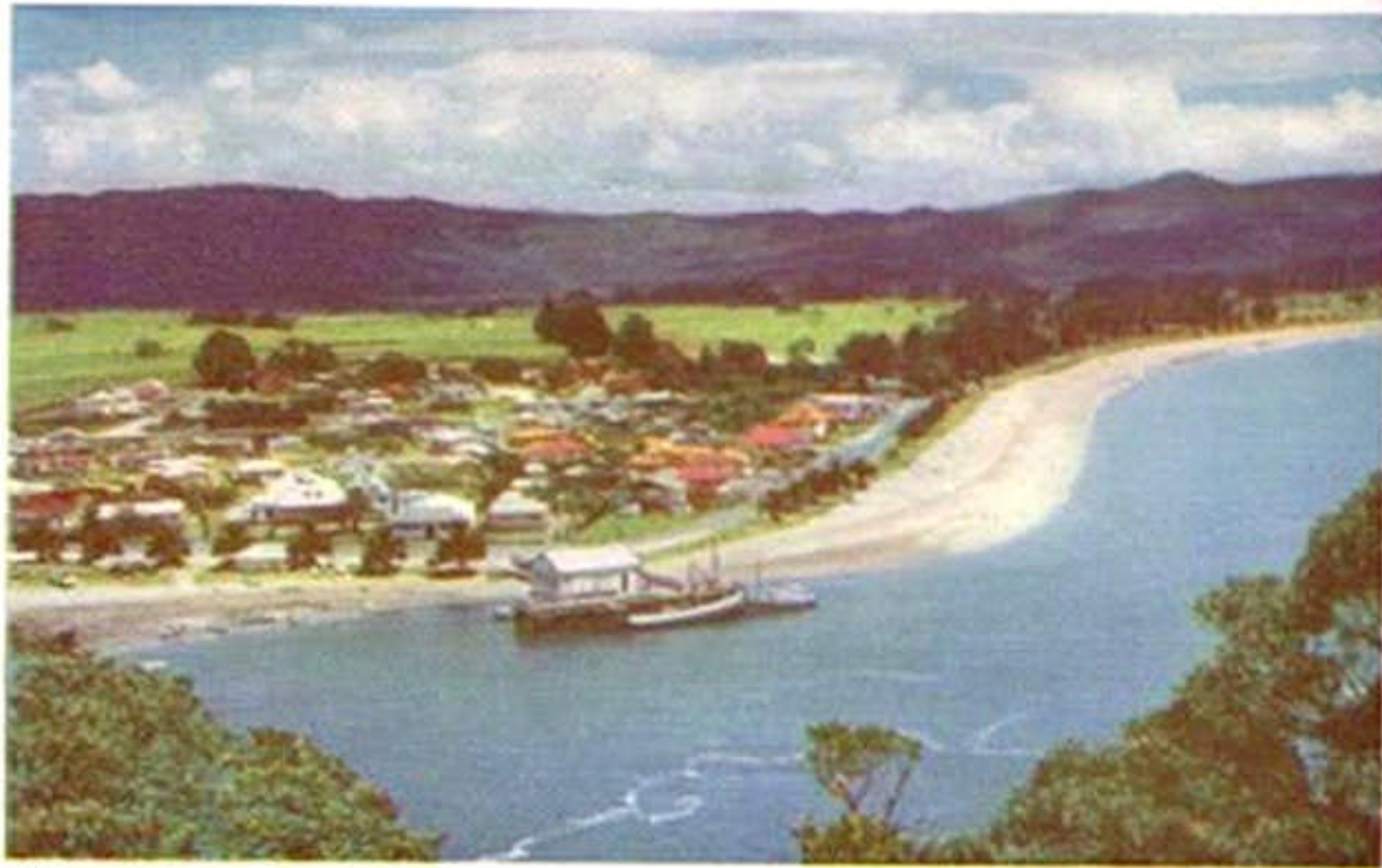
New Zealand

- Population
- Lifestyles
- Economy
- Housing
- Energy

Waikato Region

- Land use
- Auckland
- Economy
- Governance

Whitianga in 1950s



Whitianga, Mercury Bay. Buffalo Beach, right, named after H.M.S. Buffalo, wrecked there, 27th July, 1840

Now - 2007



Future - 2030



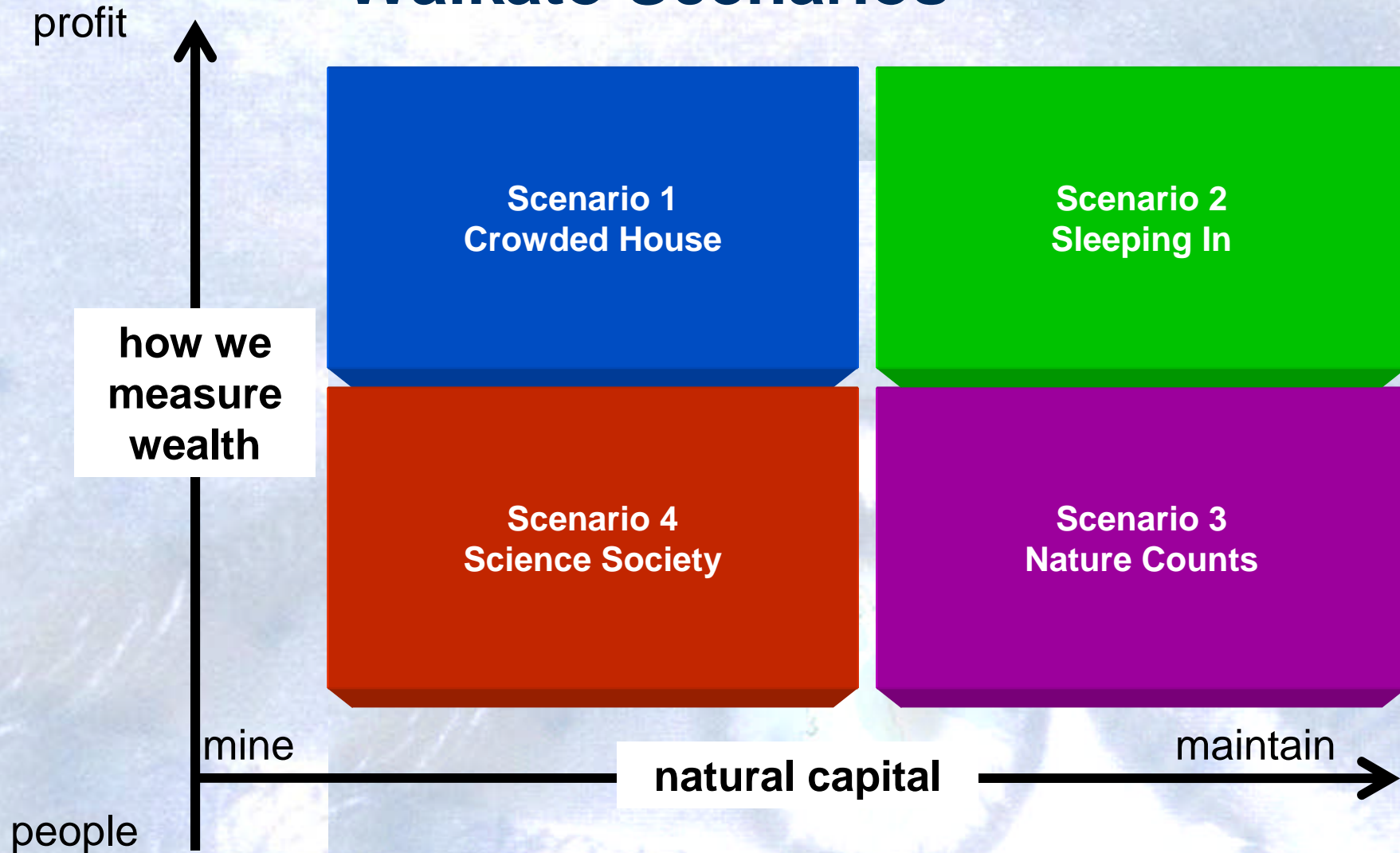
Future - in 500 years ...

➤ *Whitianga 2500?*

*What people value:
“The natural
environment and
lifestyle the
Coromandel offers”*



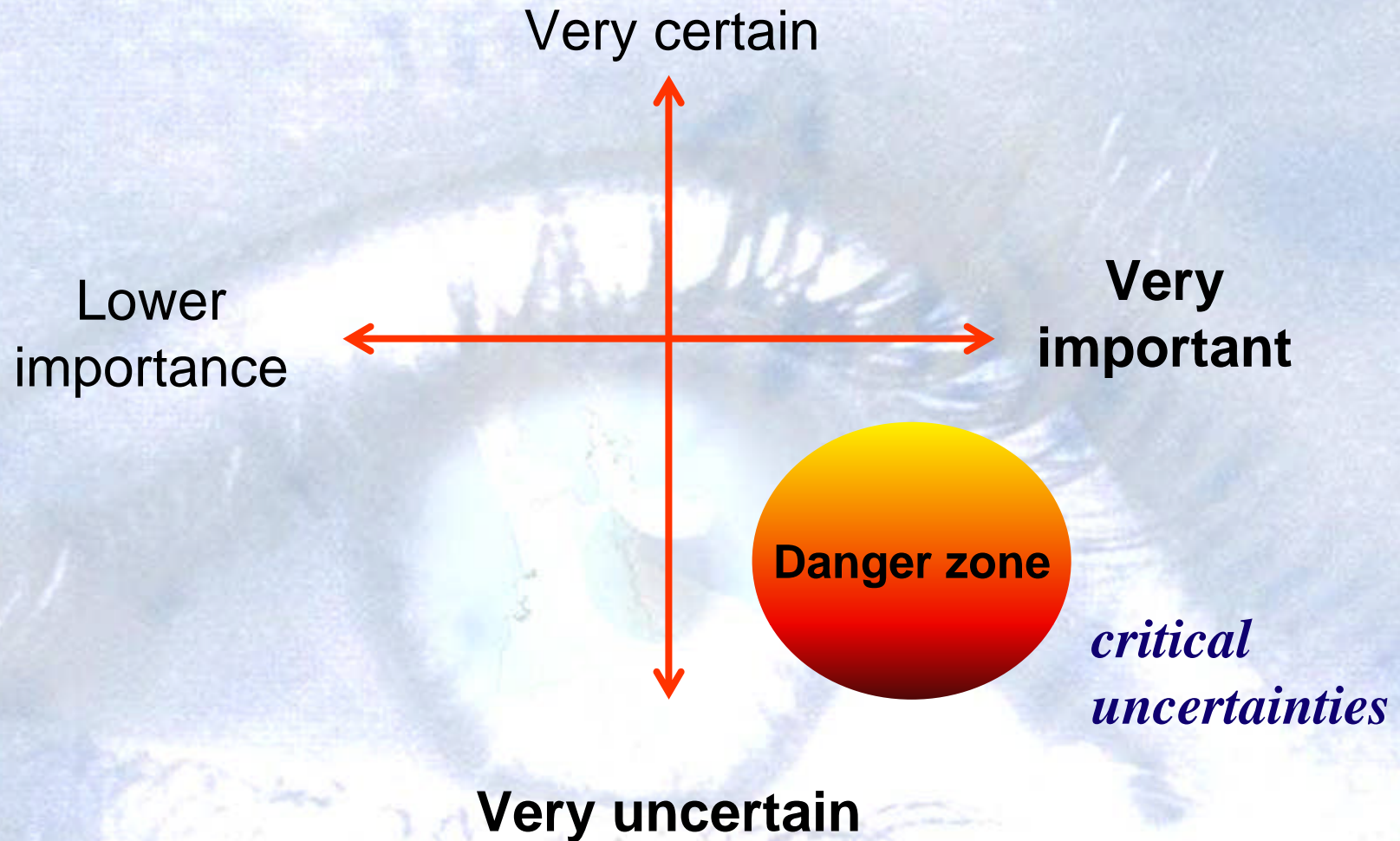
Waikato Scenarios



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Uncertainty / Importance Grid



Scenario 1 - Crowded House



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Crowded House

Global warming

Climate refugees

Economic centres shift

Fewer markets

Influx of people

Fiscal pressures exacerbated

Less investment

Economic difficulties

Agriculture intensifies

35 hour work week

High energy costs

Housing affordability issues

Multi-culturalism abandoned

Why did we Develop Scenarios

- Enhance collective understanding of issues shaping the future
- Learning tool
- Inform decision-making

How we used the scenarios

- **Input into regional policy and strategies (LTP/RPS)**
- **Guide the design and development of the Waikato Model (WISE) – Project Objective 2**

Deliberation – informing decisions

Improved deliberation processes for multi-stakeholder process

- Diagnose stakeholder interests and specify issues
- Analyse underlying system and identify indicators
- Evaluate different scenarios
- Deliberate on information, e.g. from simulations
- Revisit issues, assumptions and indicators

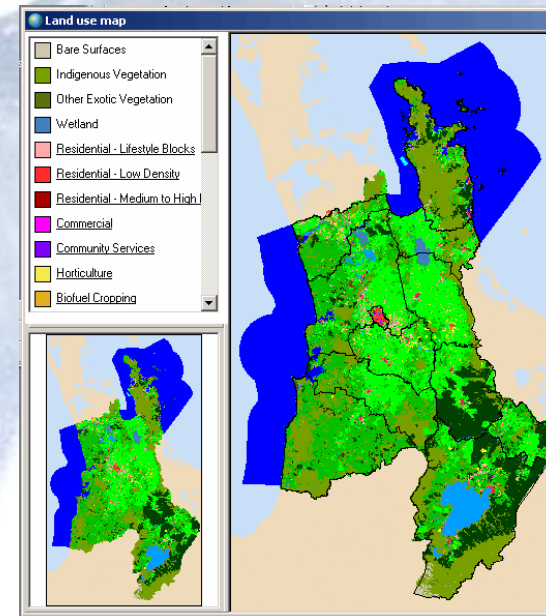
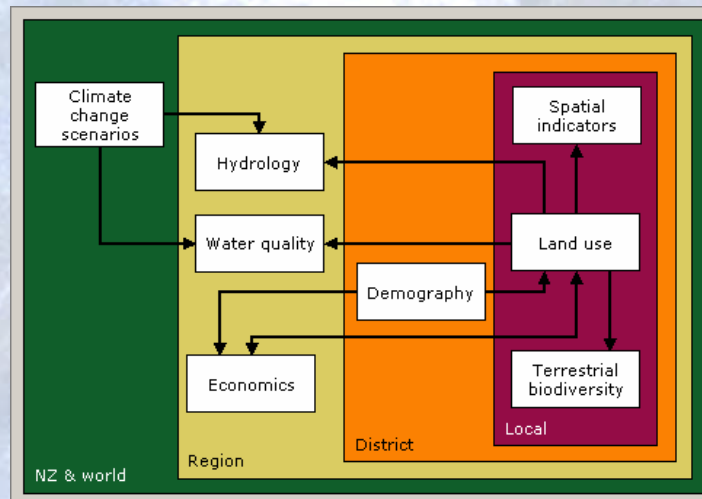


Objective 2

- Development of a dynamic, integrated and spatial Decision Support System to support long-term, integrated planning **(WISE)**

What is **WISE**?

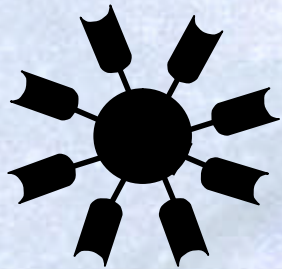
- Stand-alone software application
- System of interacting models



Dynamic and Spatial Modelling

Source: RIKS 2006









Basic Framework

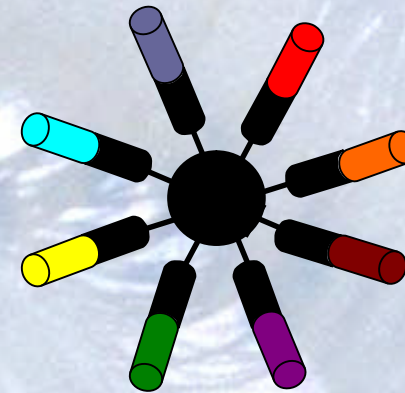


Geonamica



Model library:

-  Land use local level
-  Regional interaction
-  Transport
-  Population (Age cohort)
-  Plant growth
-  Climate
-  Hydrology
-  Input – Output (Economy-Environment)



Product

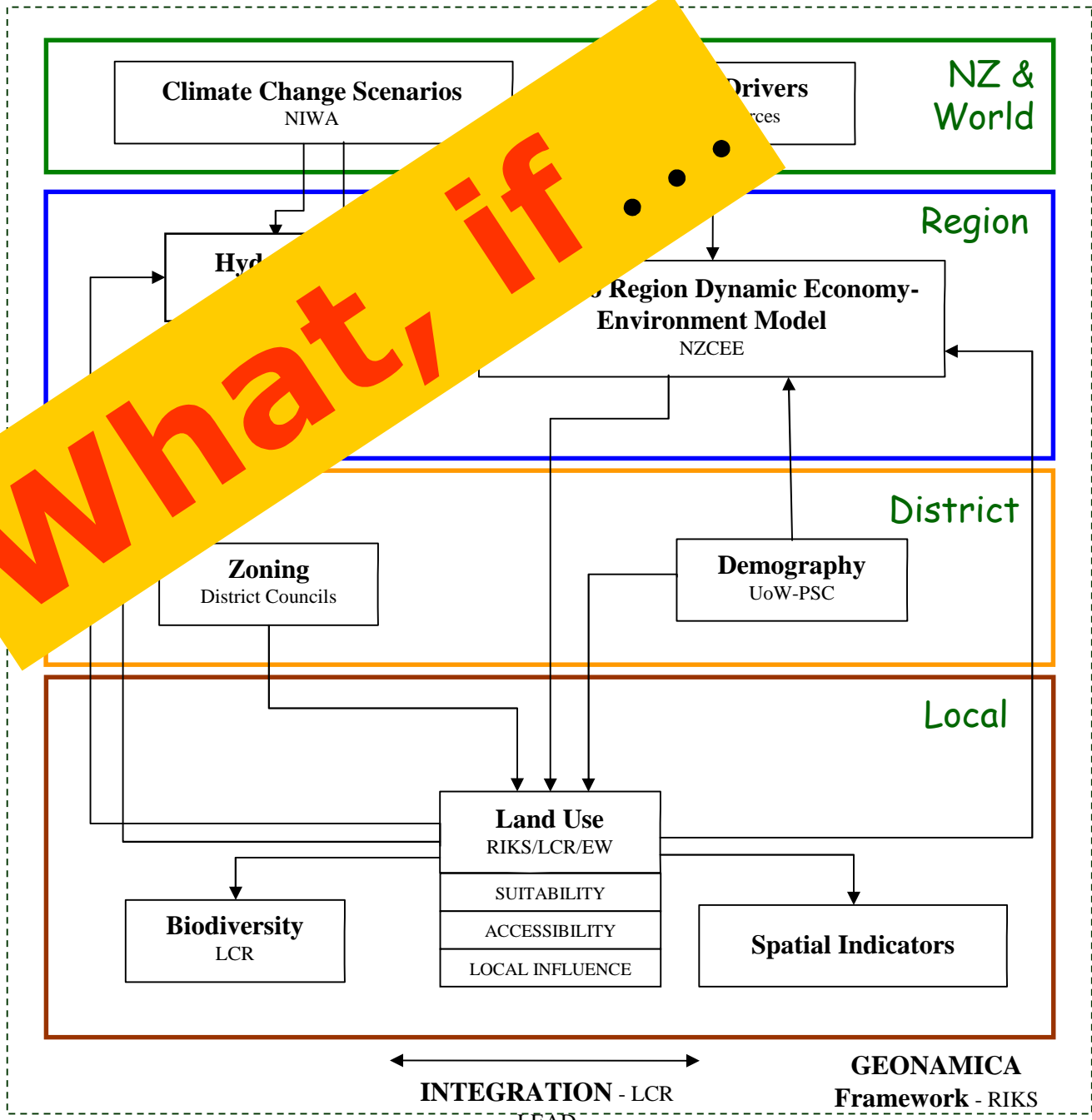
WISE

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WISE Beta System Design



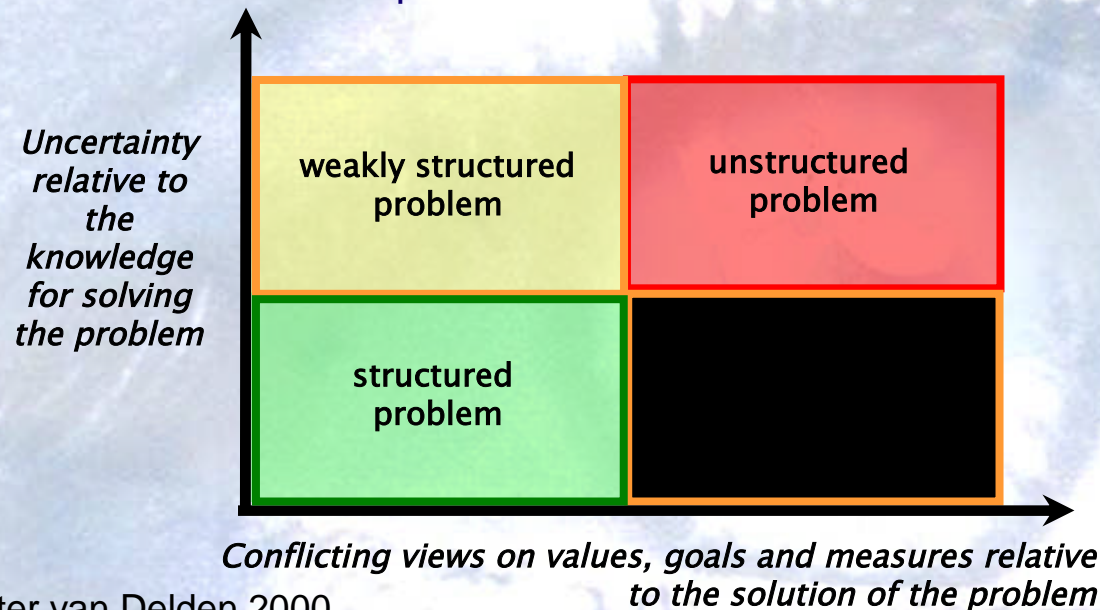
What, if ...



WISE is an Integrated Spatial Decision Support System

An ISDSS:

- Helps to explore “wicked” or unstructured problems
- Integrates society, economy, and environment (systems approach)
- Identifies links & feedbacks
- Sets limits explicitly (e.g., only so much land, water, soil)
- Demonstrate importance of “where” in addition to “what” and “how much”



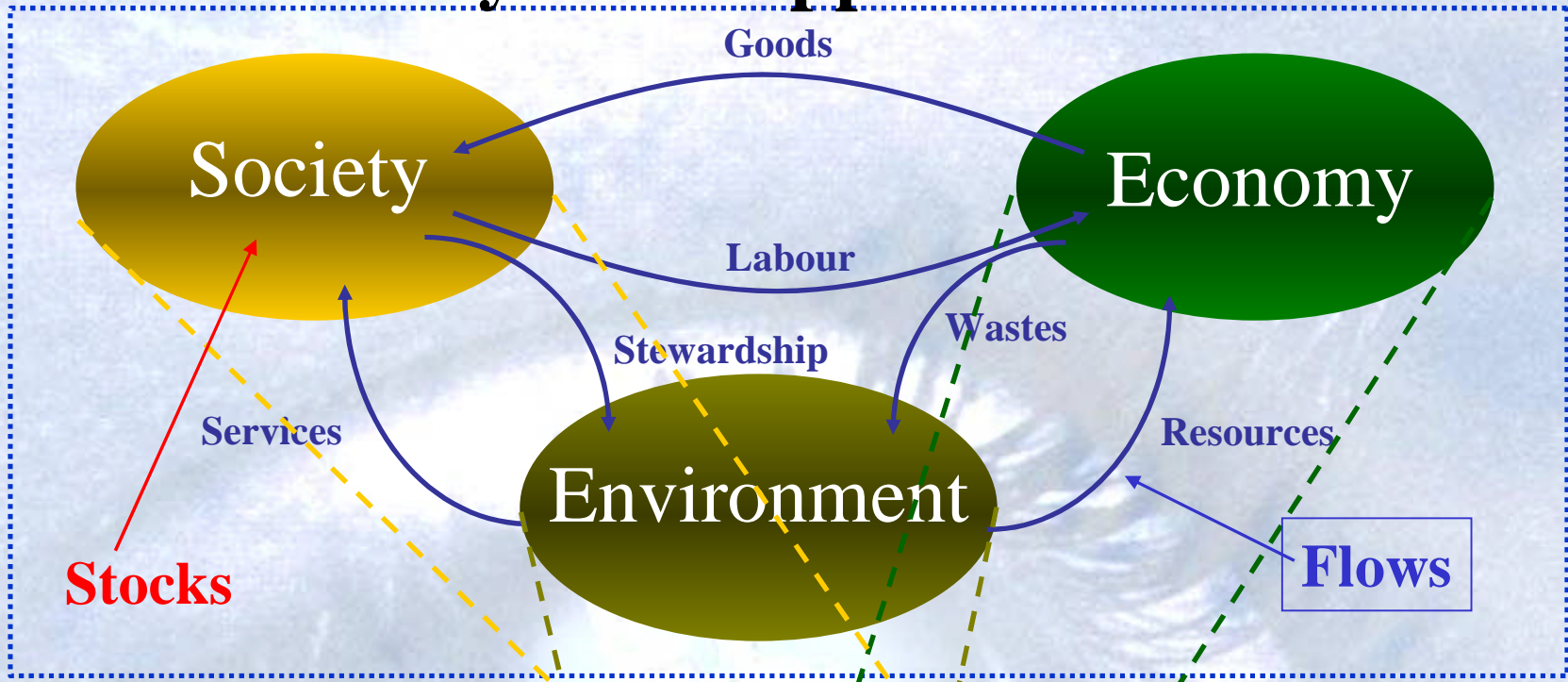
Unstructured issues are characterised by:

- Multiple actors
- Multiple values & views
- Multiple outcomes possible
- High uncertainty

After van Delden 2000

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Systems Approach

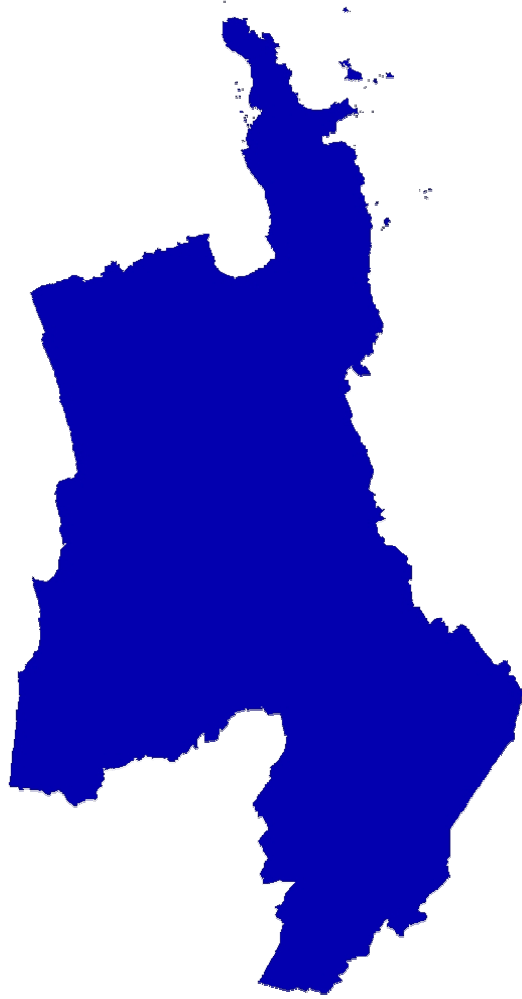


Spatially-Explicit

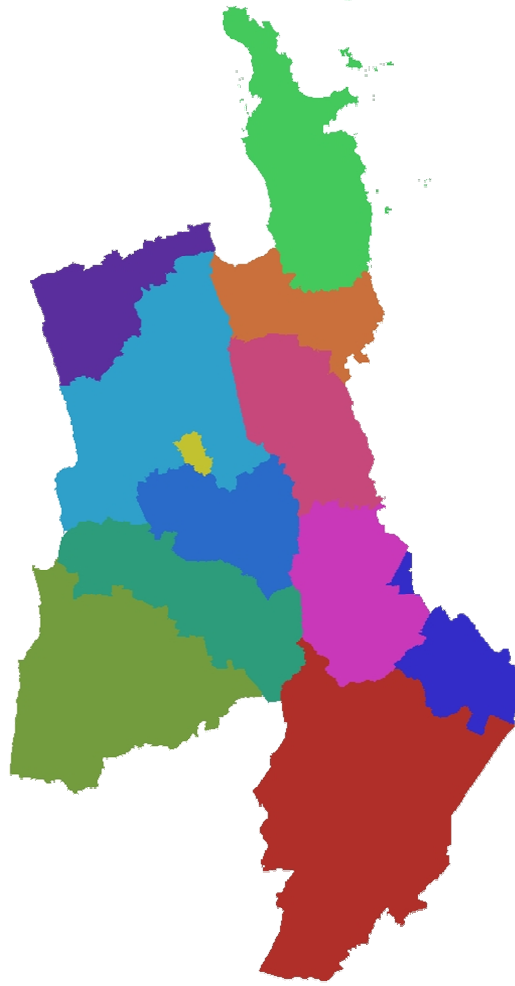
Dynamic

**Creating
Futures**

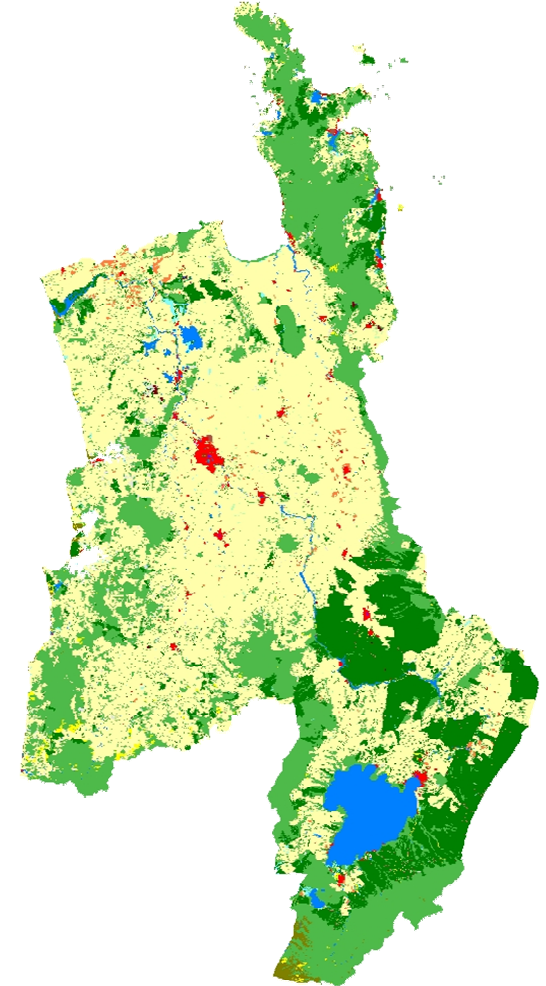
Multi-scale



Region



District



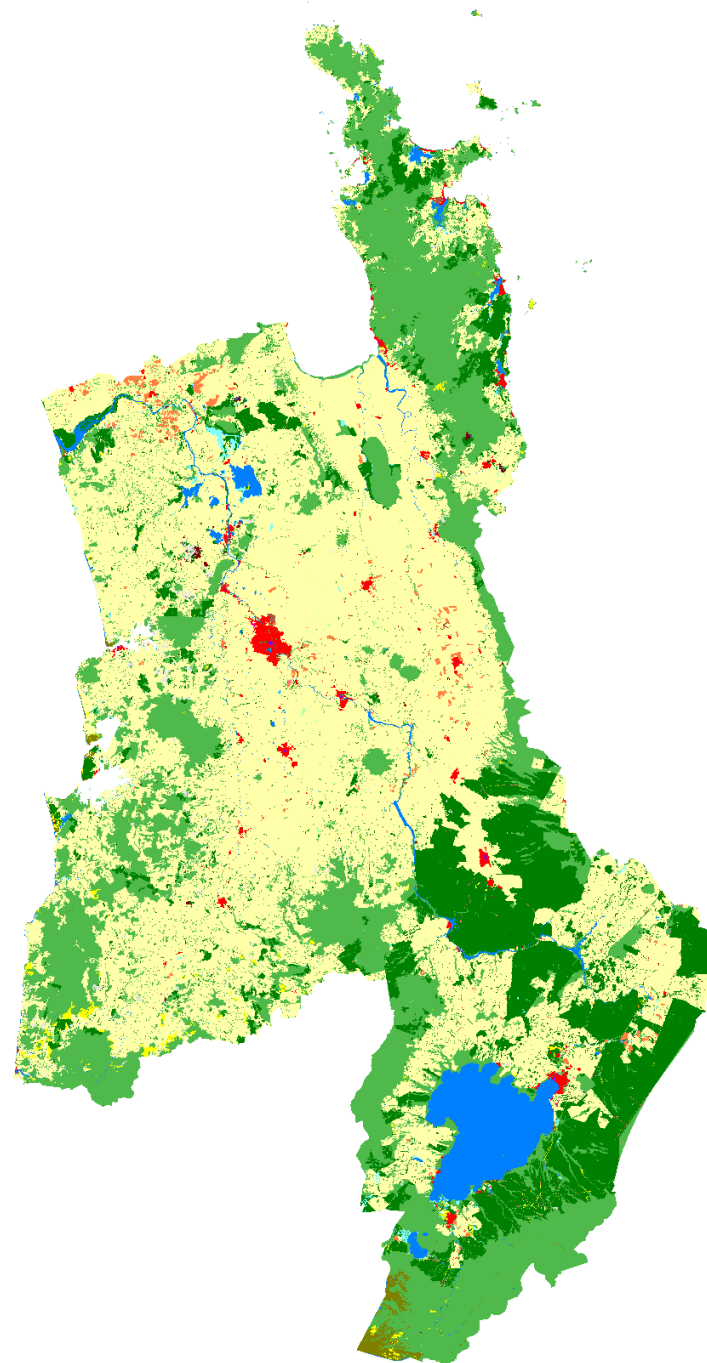
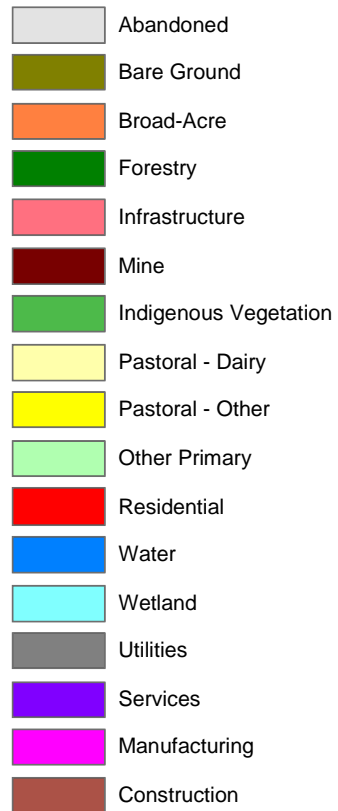
Local
(200 x 200 m cells)

Waikato in 2050 – *what/if?* (based on WISE Prototype)

Dairy Expansion

Land for dairying
increases ~4% annually

Land Use



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

(based on WISE Prototype)

1-Dairy Expansion

Land for dairying increases ~4% annually

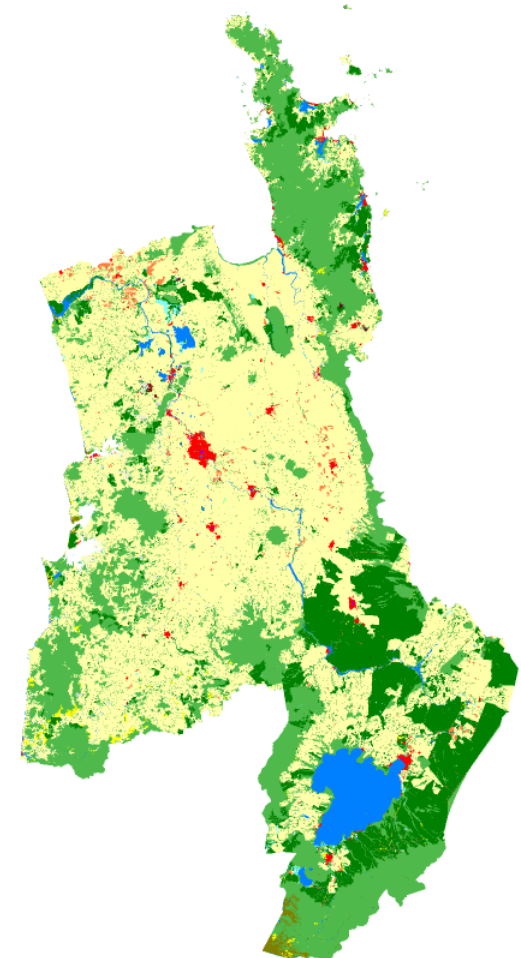
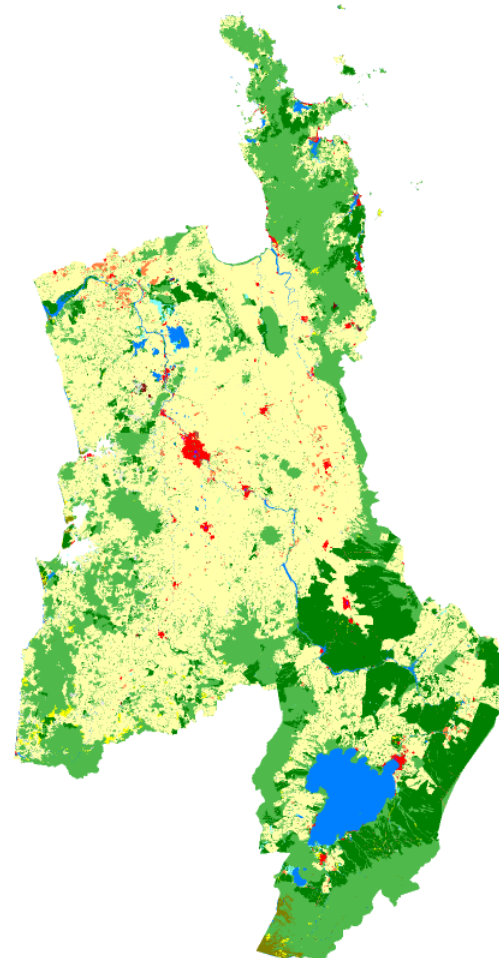
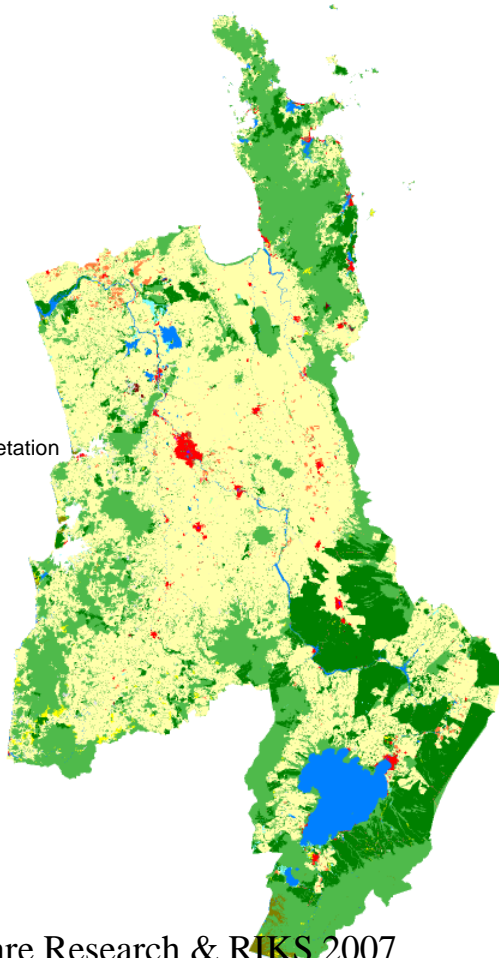
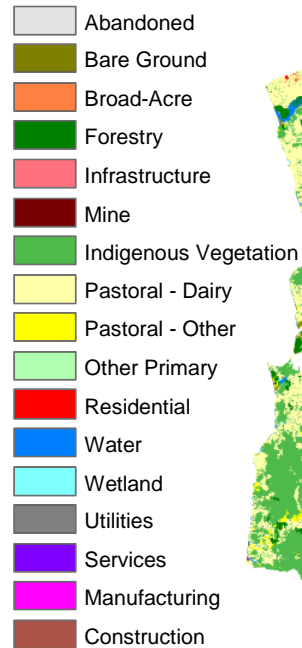
2-Diversification

Demand for non-dairy primary production land increases

3-Village Life

Residential land increases 7-fold

Land Use



WISE User Interface (GUI)

Caters for two types of users:

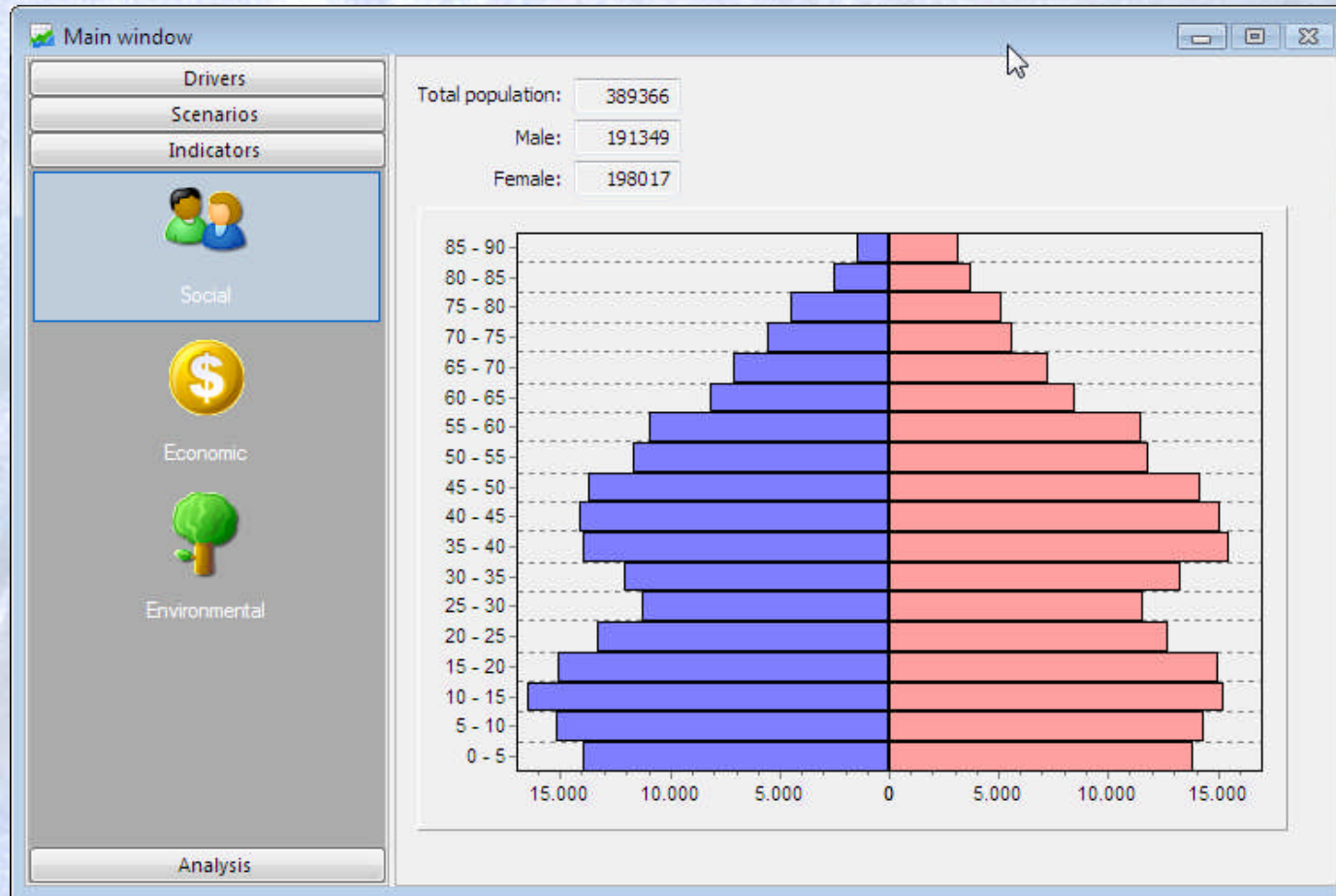
1. Policy Users (“planners”)

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

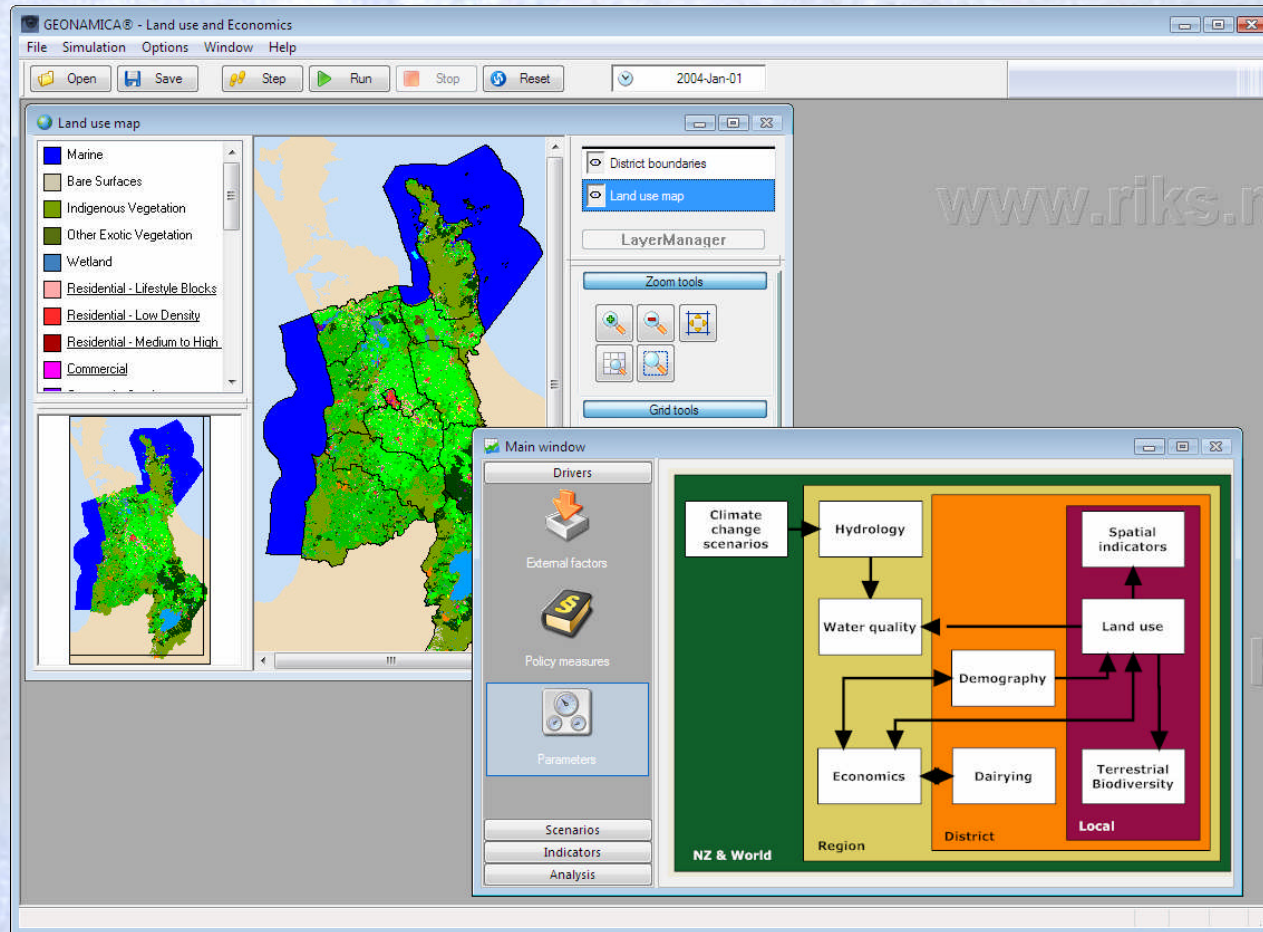
2. Scientific Users (e.g., modelers, scientists)

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

WISE Policy Interface - Indicators

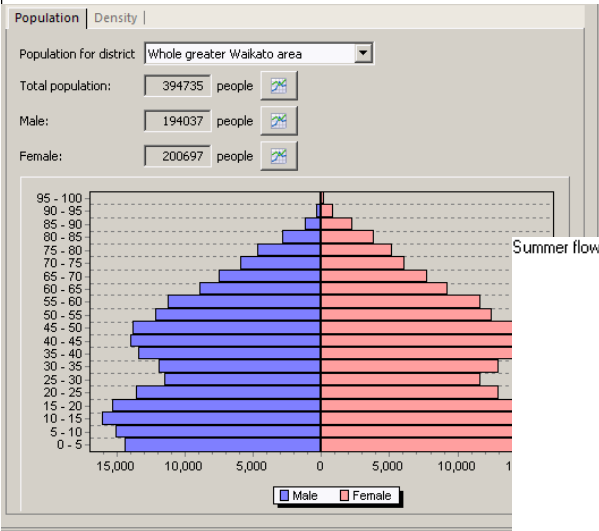


WISE Scientific Interface

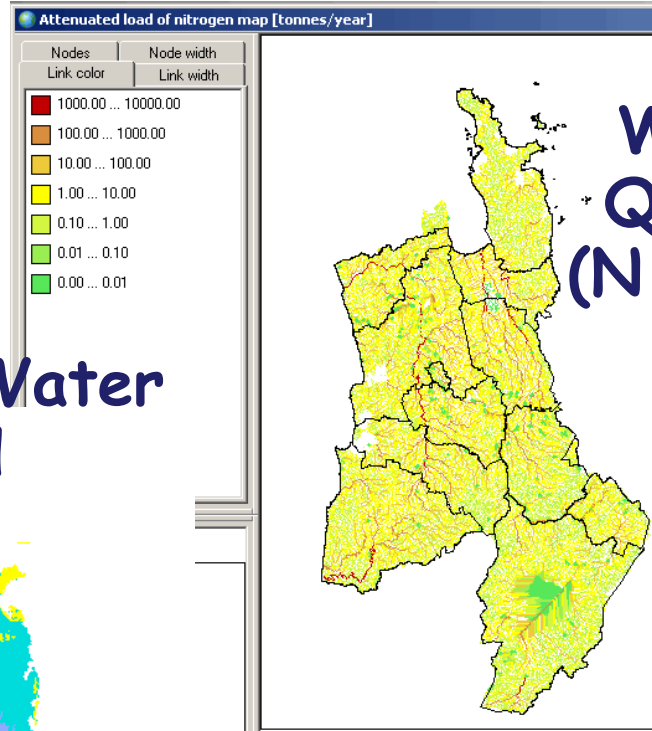
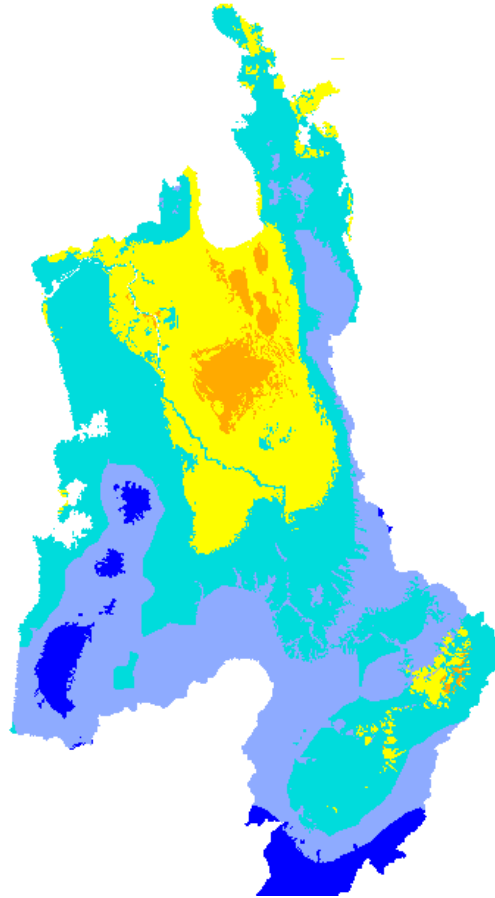


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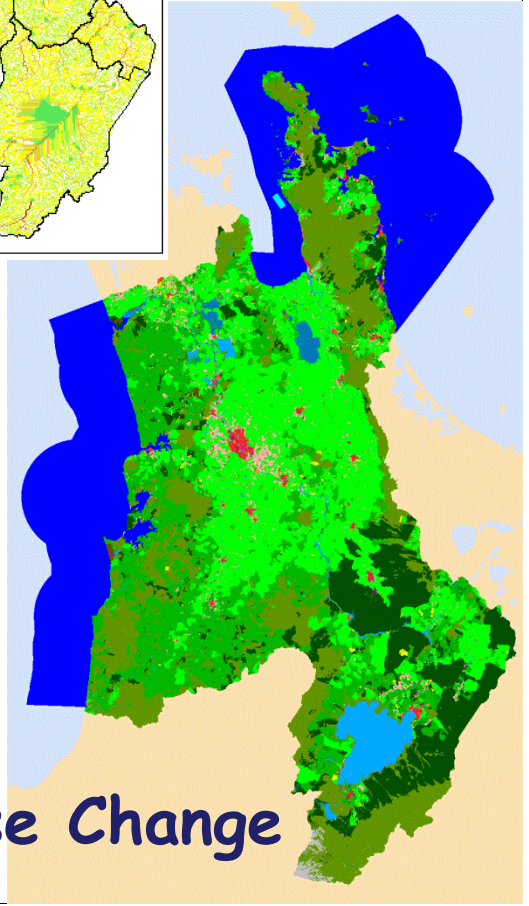
Examples of Outputs



Summer Water Yield



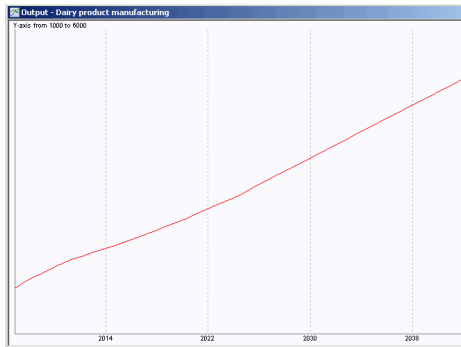
Water Quality (N Loads)



Land Use Change

Population

Economics



How WISE helps Environment Waikato

- Explore alternative policy options for regional planning, assess **trade-offs** and prioritise issues
- **Cumulative** effects of policy and permits (over space/time)
- Up-to-date data and information
- Access to expert knowledge from all disciplines
- **Regional** development and **sub-regional** strategies (non-statutory) - **FutureProof project (refer case study)**

Creating
Futures

Linking Qualitative and Quantitative Tools

Evaluating actions and policies

WISE

Waikato **Scenarios**

Scenario 1

Scenario 2

Scenario 4

Scenario 3

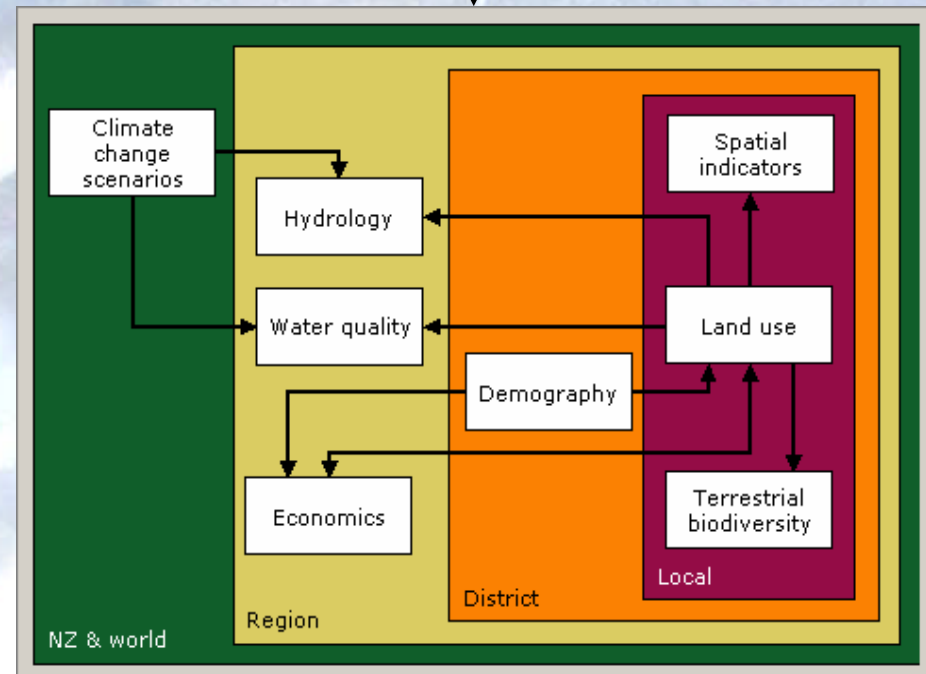
Stakeholders

Strategies /
Scenarios

**Deliberation
Matrix**



Values /
Indicators



Inform issues and debate

Creating
Futures

Policy:
Soil Disturbance –
no intensive land
use on erosive soils

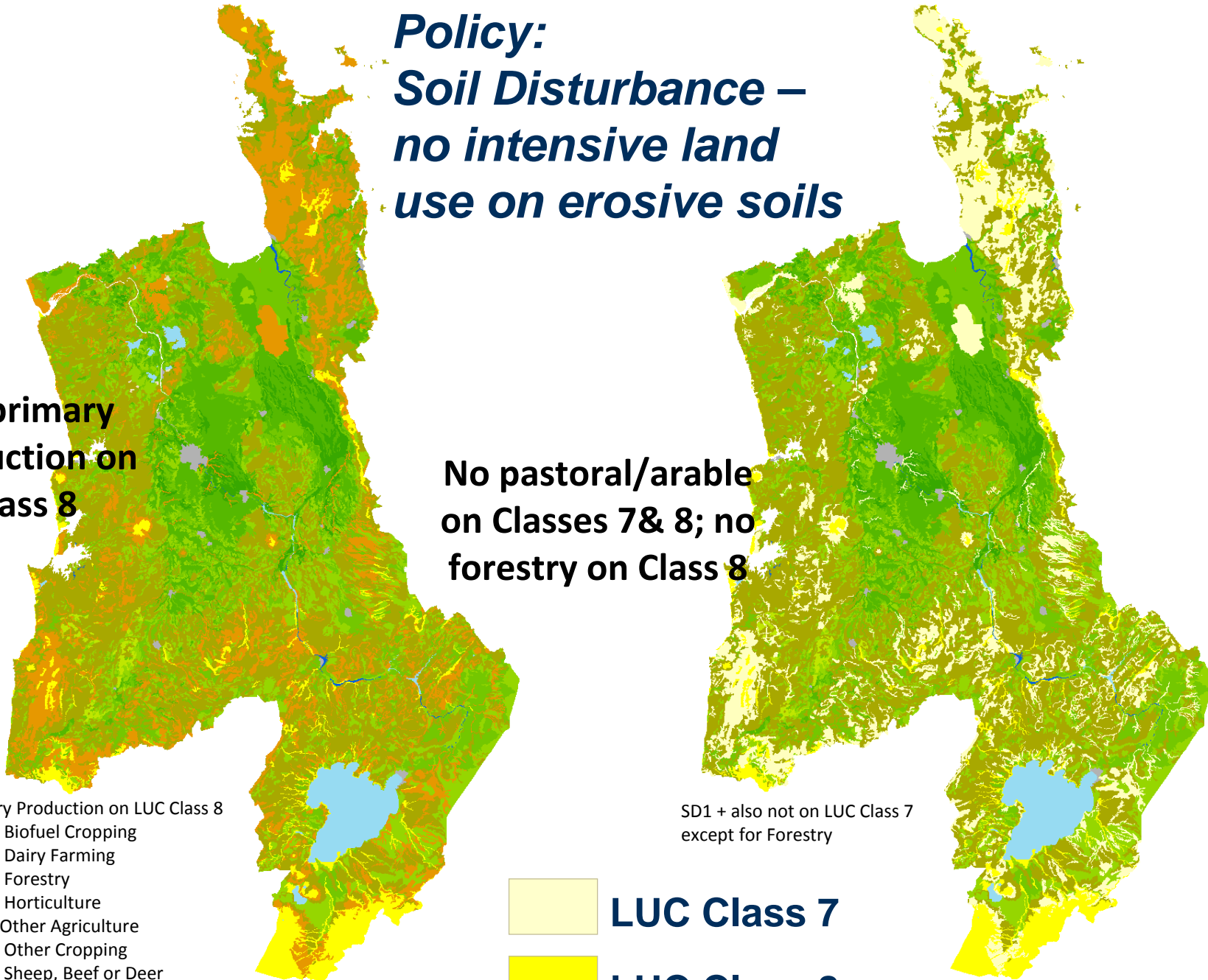
**No primary
production on
Class 8**

**No pastoral/arable
on Classes 7& 8; no
forestry on Class 8**

No Primary Production on LUC Class 8

- Biofuel Cropping
- Dairy Farming
- Forestry
- Horticulture
- Other Agriculture
- Other Cropping
- Sheep, Beef or Deer Farming
- Vegetable Cropping

SD1 + also not on LUC Class 7
except for Forestry



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

- **FutureProof** (urban growth study for Hamilton and surrounding districts)
- Three “Clues” for quantification (input to WISE)
(from FutureProof documents):
 1. **More compact urban areas**
 2. **Productive rural land protected**
 3. **Sensitive natural environments protected**

1. More compact urban areas

“Increased densities in new residential developments located in defined and designated areas and more intensive redevelopment of existing residential areas”

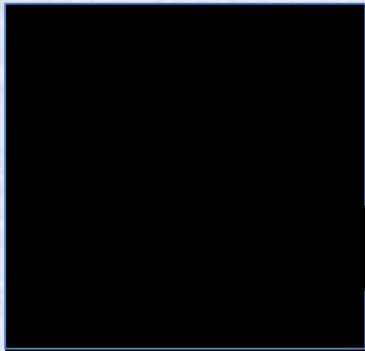
- Model input 1: projected increase in total resident population per district

District	2006	2021	2041	2050
Hamilton	134400	173400	221100*	233370**
Waikato	45400	58900	76900*	94510**
Waipa	43700	55500	67000	70190

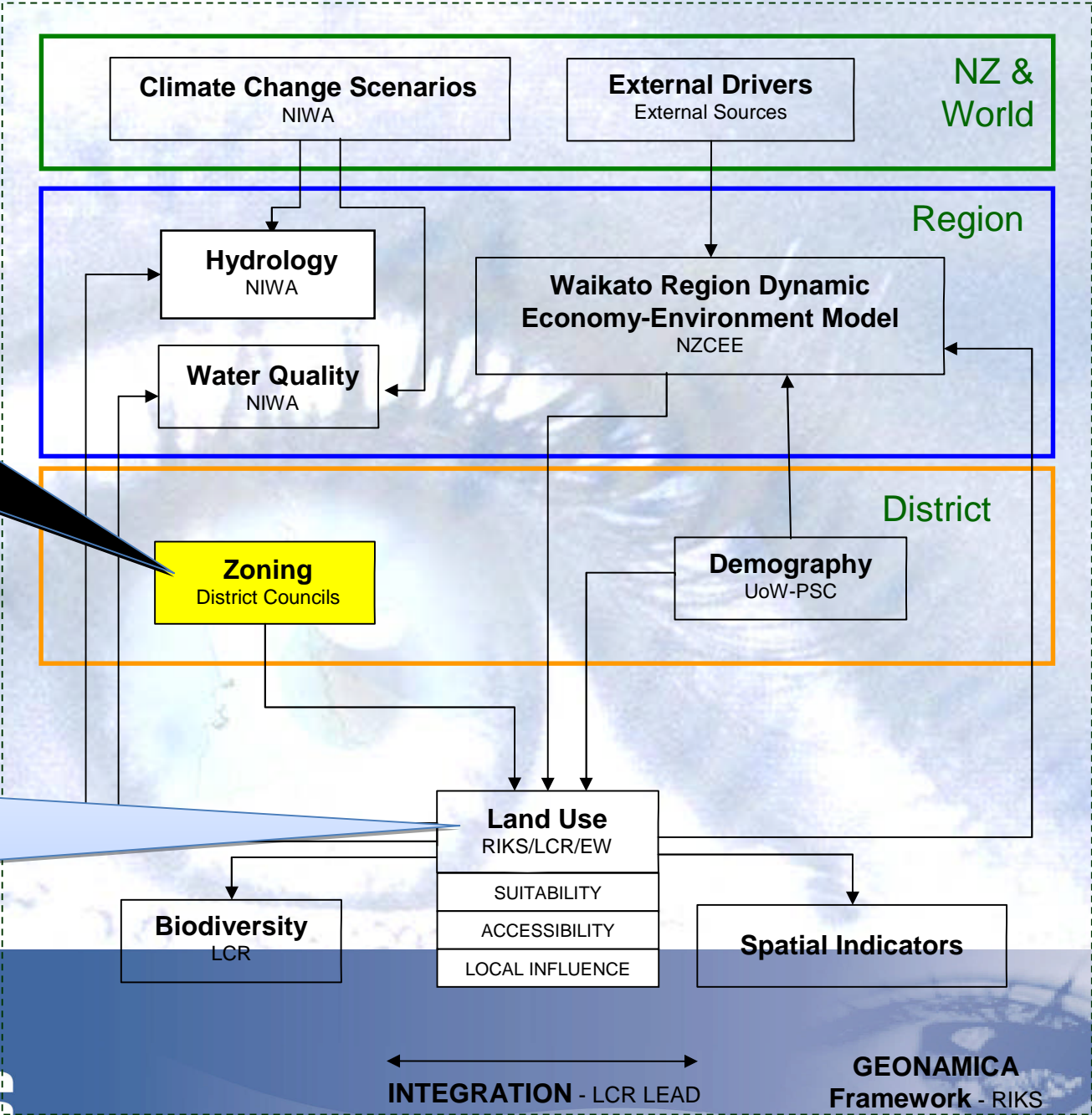
- Model input 2: Change in the proportion of residential populations in various zoning:

- Rural lifestyle
- Residential – low density
- Residential – medium to high

WISE System Design



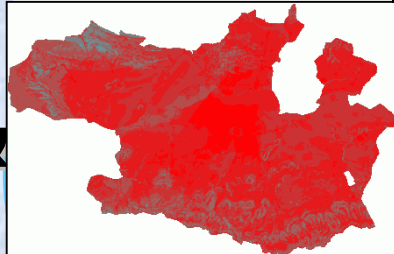
Zoning determines where different land uses may/may not occur



Futures

Land Use Change

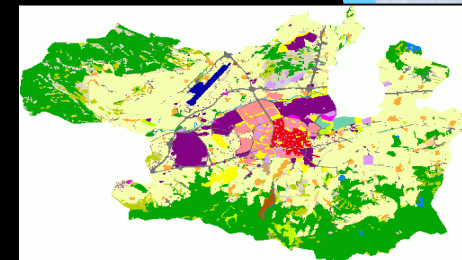
Suitability



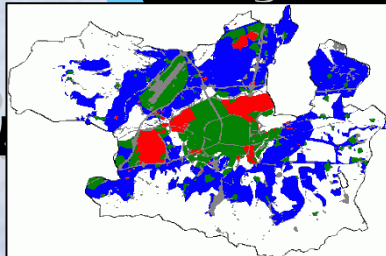
& CA-Rules

		Functions		Features		
		■	■	■	■	■
FUNCTIONS	Rule set ■					
	Rule set ■					
	Rule set ■					

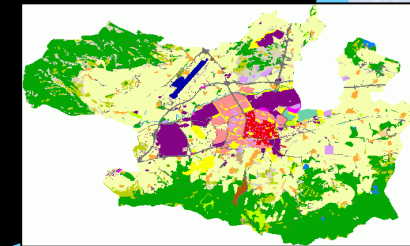
Land use at T_0



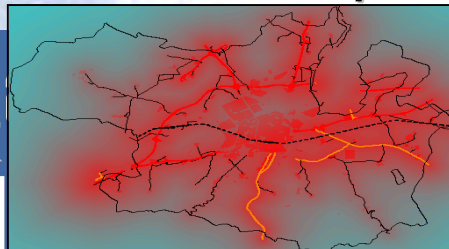
&
Zoning



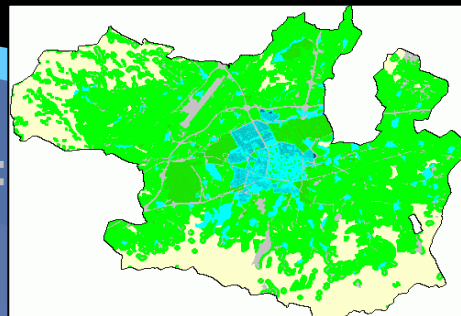
Land use at T_0+1



&
Accessibility



Transition
Potential



=



Geo
Fu
can
cc

***Policy:
No Urban
Development on
High Class Soils***

**Class 1
Soils**

**Class 2
Soils**

No Urbanisation on LUC Class 1

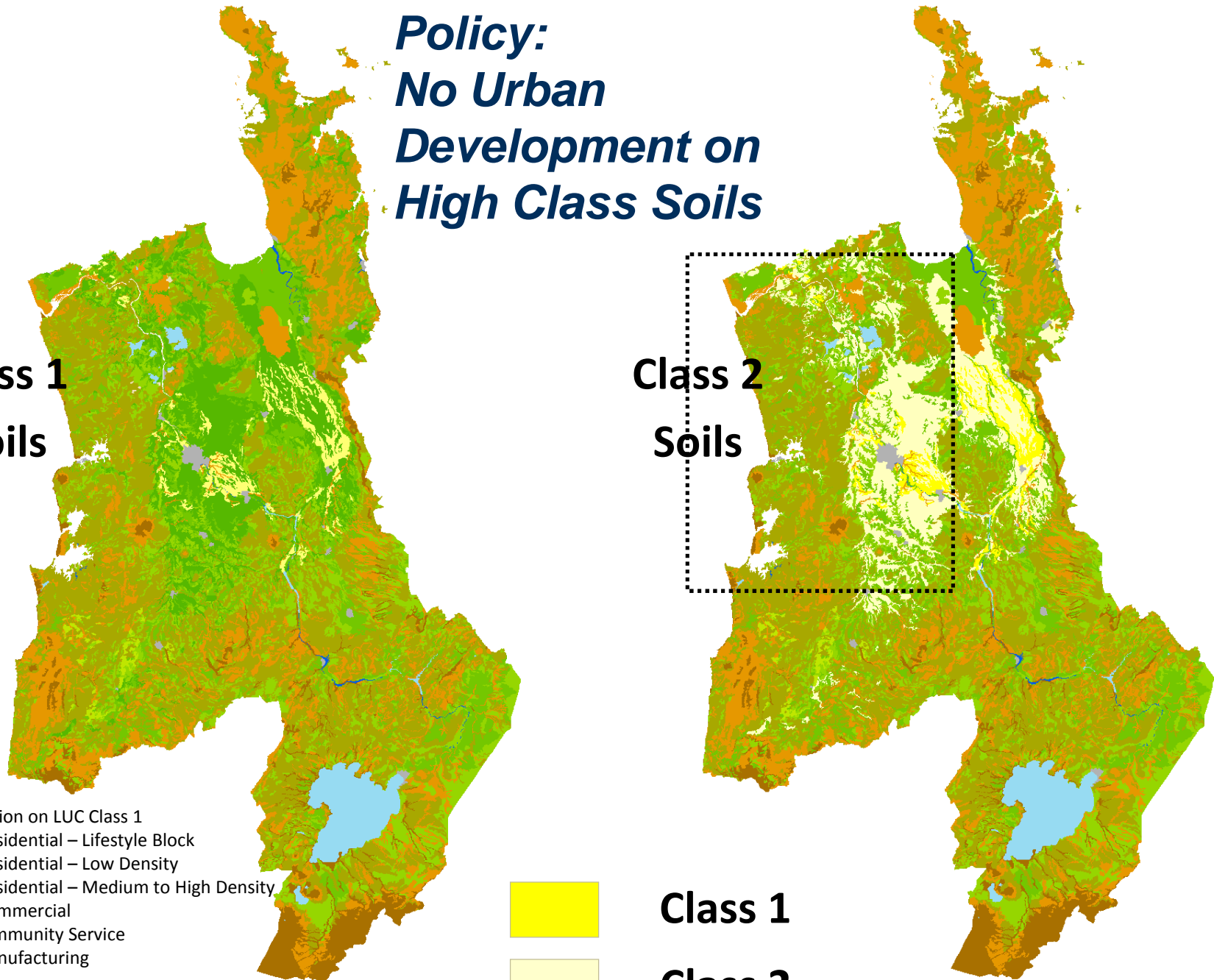
- Residential – Lifestyle Block
- Residential – Low Density
- Residential – Medium to High Density
- Commercial
- Community Service
- Manufacturing



Class 1



Class 2

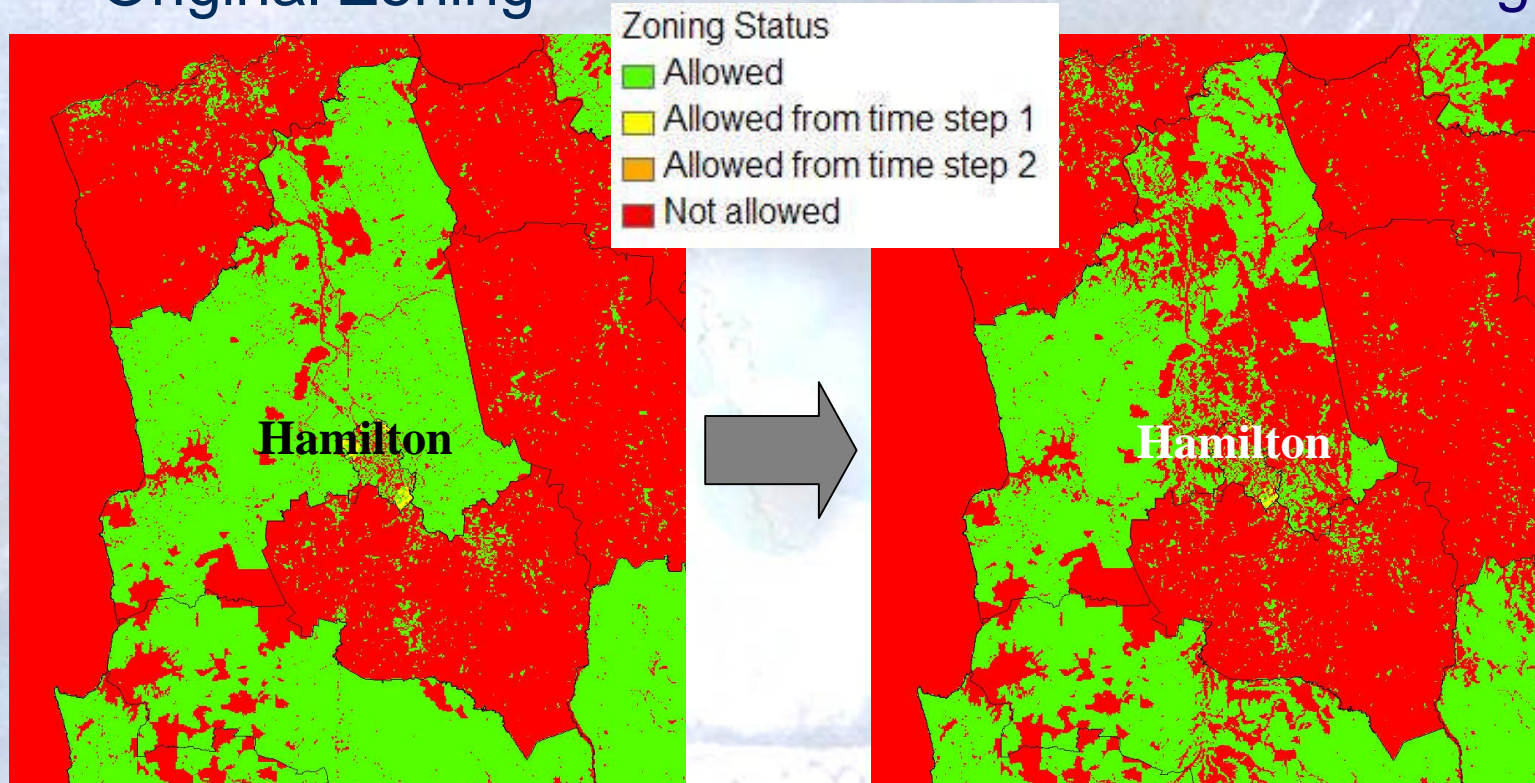


2. Productive rural land protected

Model input: Rural and Urban land uses are zoned as “not allowed” in areas of LUC Class I and II soils

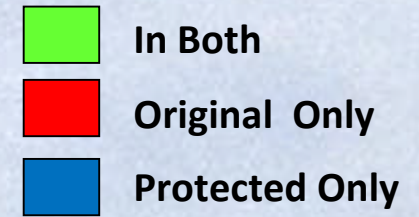
Original Zoning

Soils Protected Zoning

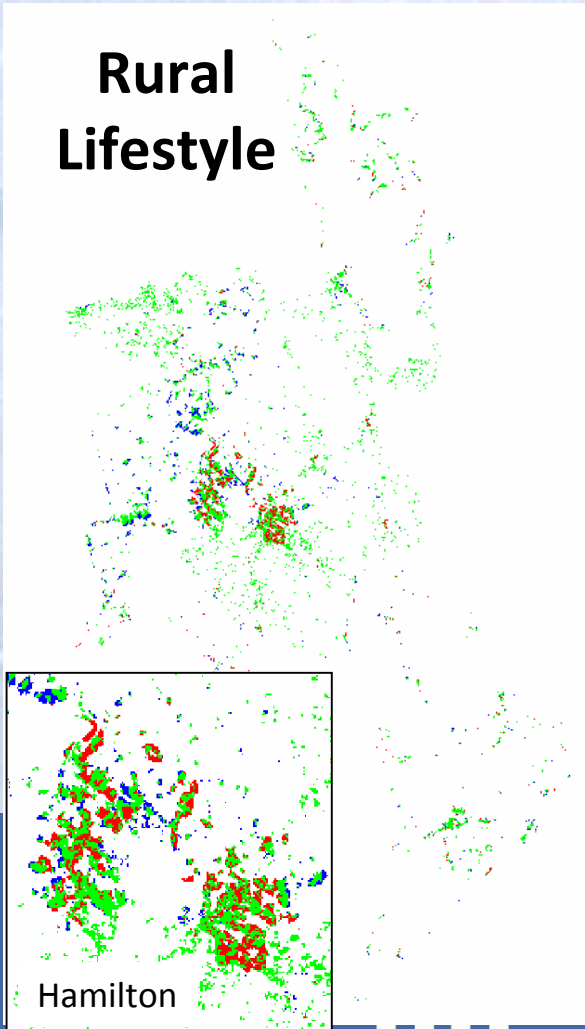


So what is the difference?

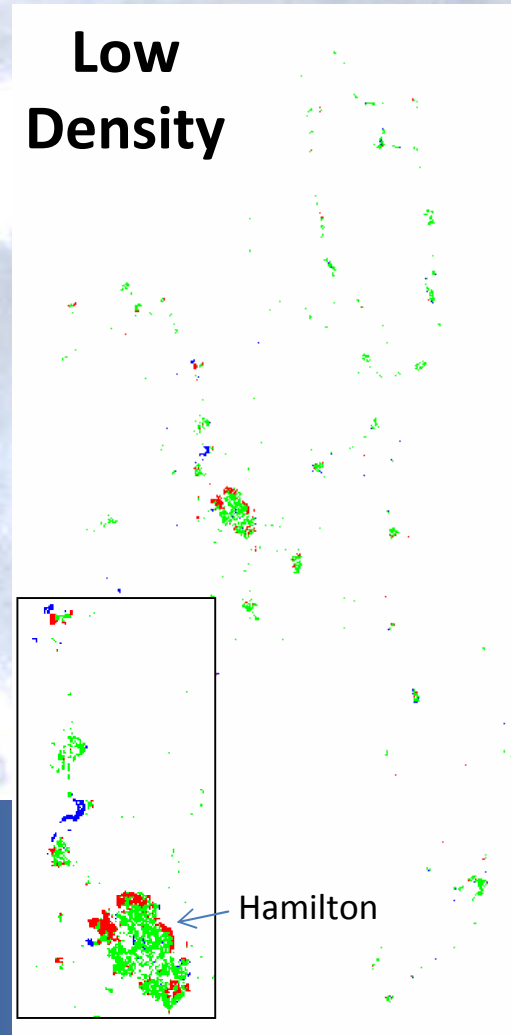
Land Use Map Comparisons –
Original to Protecting Class 1 & 2



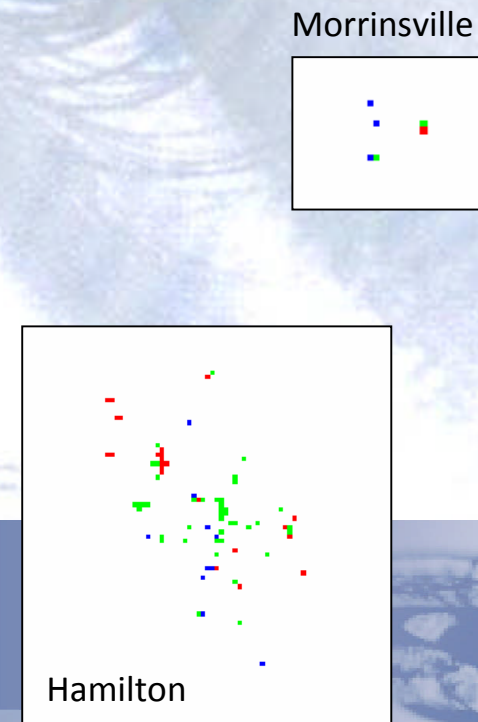
Rural Lifestyle



Low Density



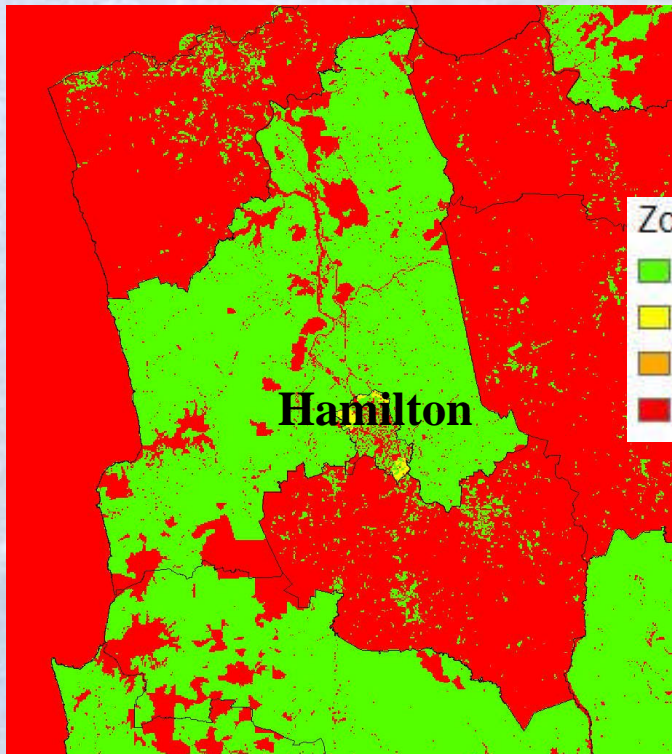
Medium to High Density



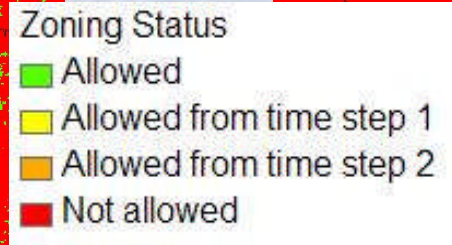
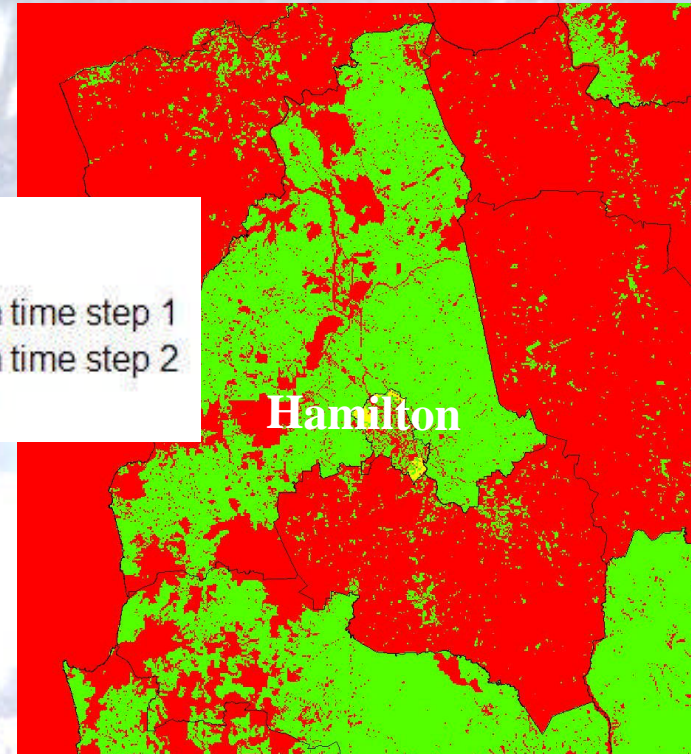
3. Sensitive natural environments protected

Model input: rural land use is allowed to occur where any Indigenous Vegetation or Wetlands occur as at 2006

Original Zoning

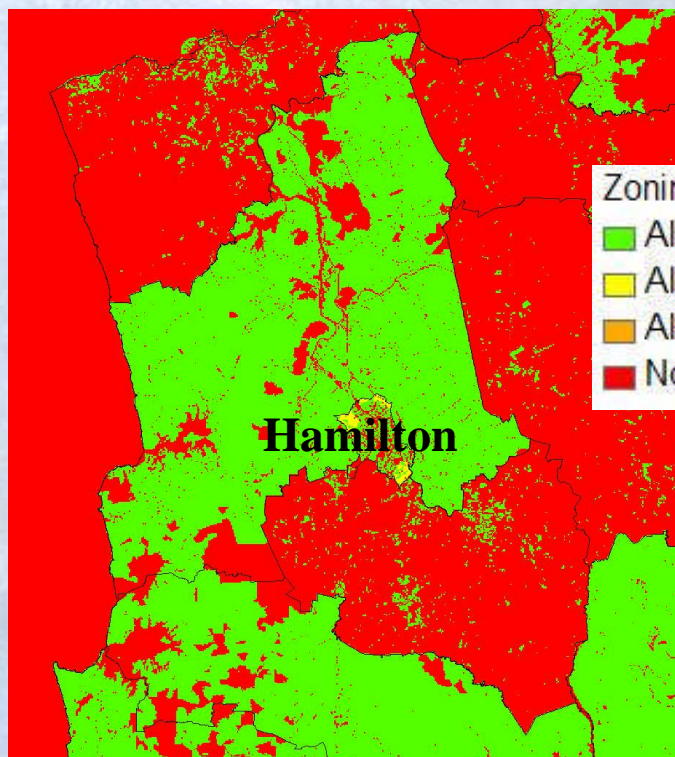


Biodiversity Protected Zoning

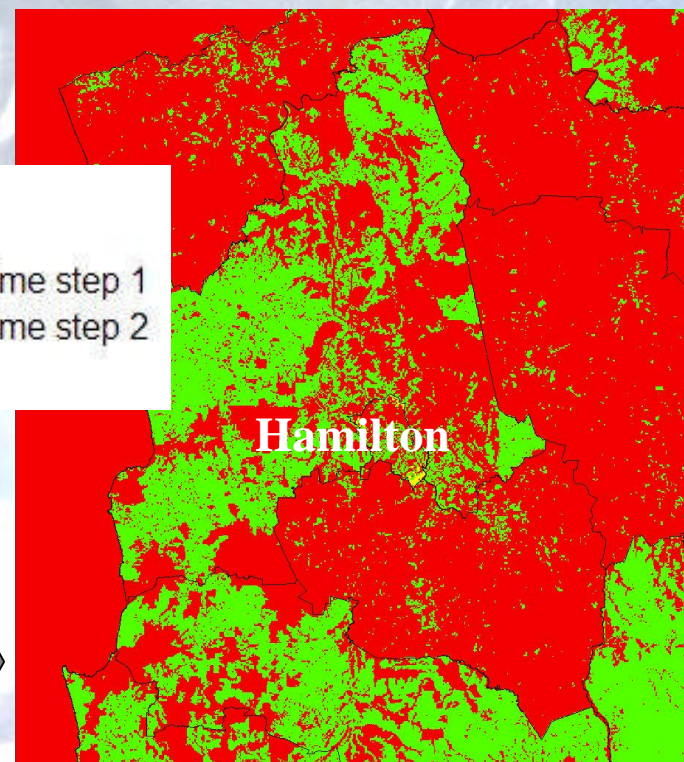


4. Both high quality soils and sensitive natural environments protected

Original Zoning



Both Protected Zoning

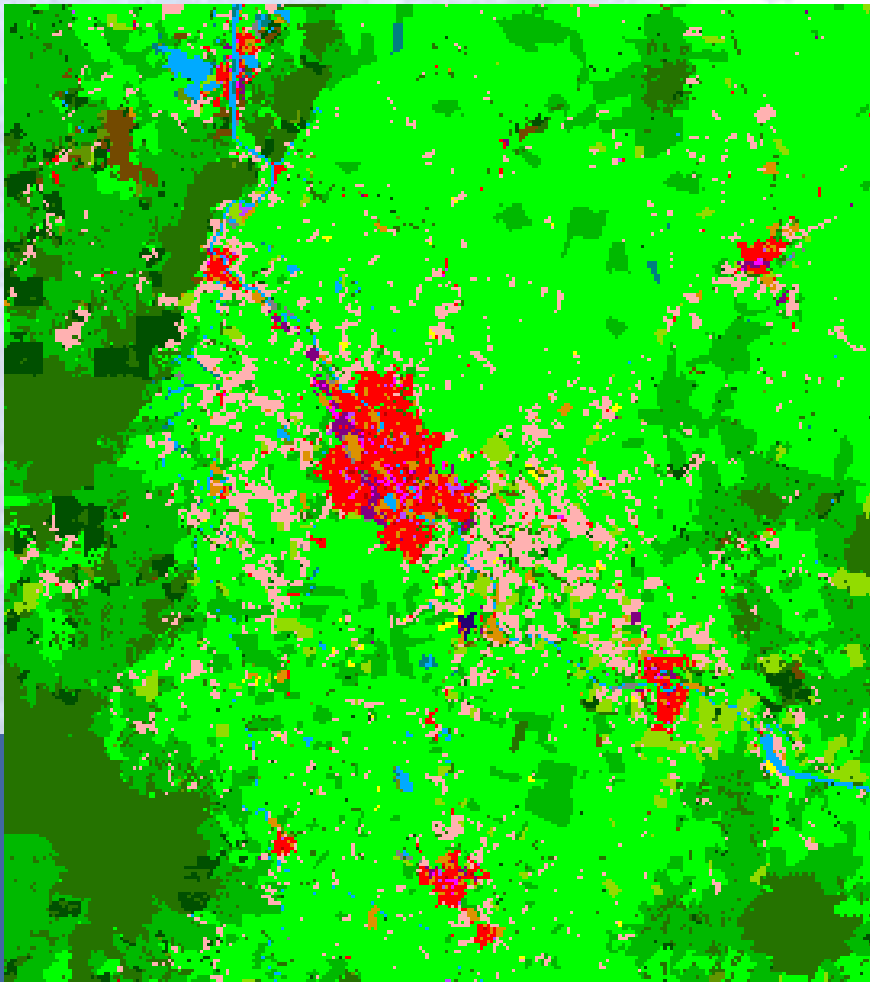


Zoning Status
■ Allowed
■ Allowed from time step 1
■ Allowed from time step 2
■ Not allowed

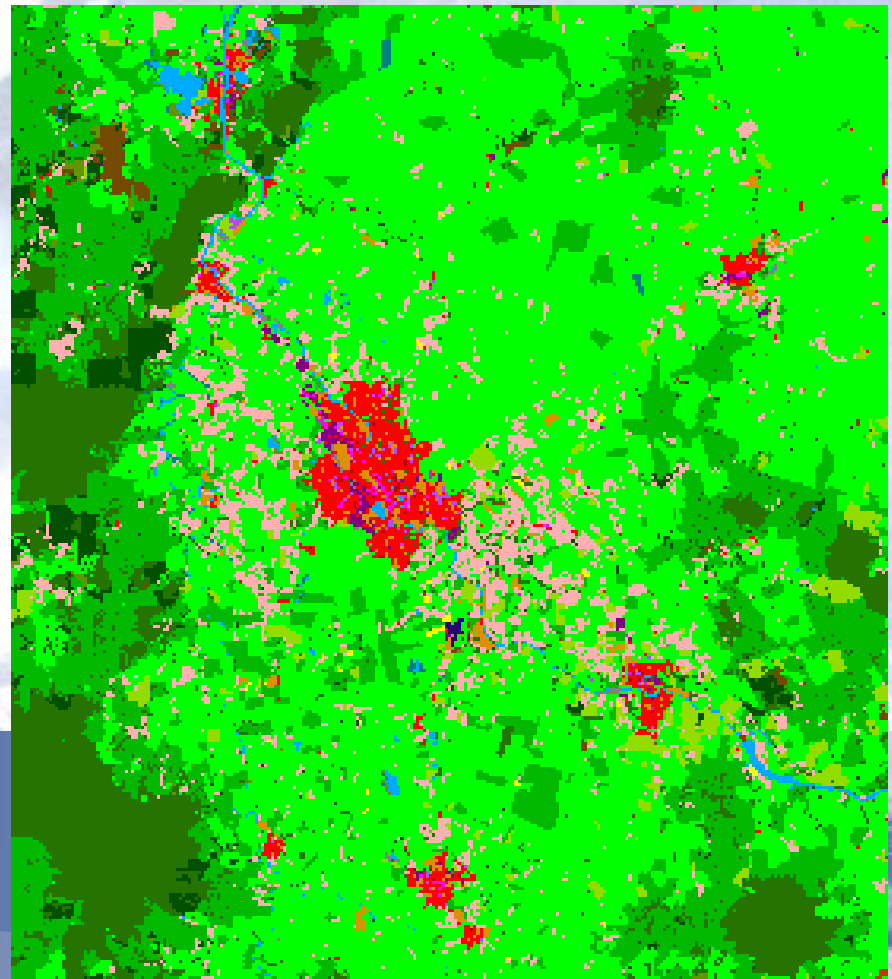
Policy: Protecting High Class Soils

Land Use Change – 2006 to 2050

Business as Usual



High Quality Soils Protected



“Lessons Learnt” so far

- New planning tools and approaches need to be developed with users – but difficult getting input in the early stages
- Qualitative scenarios challenge our thinking and are particularly useful when translated into specific assumptions for quantitative modelling
- WISE is a powerful tool to explore issues and spatially evaluate alternative policy options and associated trade-offs in an integrated way
- This presentation only skimmed the surface, there is much more to learn how WISE can be used for better planning outcomes

Future Directions

- **WISE** development is ongoing:
 - Beta version 1.07 currently tested
 - 'Final' WISE version 1.1 available July 2010
- Integration into council planning processes
- Training and building capability & capacity
- Up-dating information (data management, quality control)
- Enhancements (incorporate other models, new knowledge)
- National Advisory Group “Development and Use of Integrated Planning Tools”.
- Other regions? National Model?

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- ✓ **Environment Waikato** and project partner organisations

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