

Freshwater - Fresh Thinking

Enhancing impact assessment in water management



Thur 28 & Fri 29 Nov 2013 Caccia-Birch House, Palmerston North

The following material is provided courtesy of the author following presentation at the New Zealand Association for Impact Assessment 2013 Annual Conference.

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"Collaborative processes, community partnerships and decision-making" and "The Integrated Freshwater Solutions Project"

Marjan van den Belt, PhD

Vicky Forgie

Heike Schiele



Overview

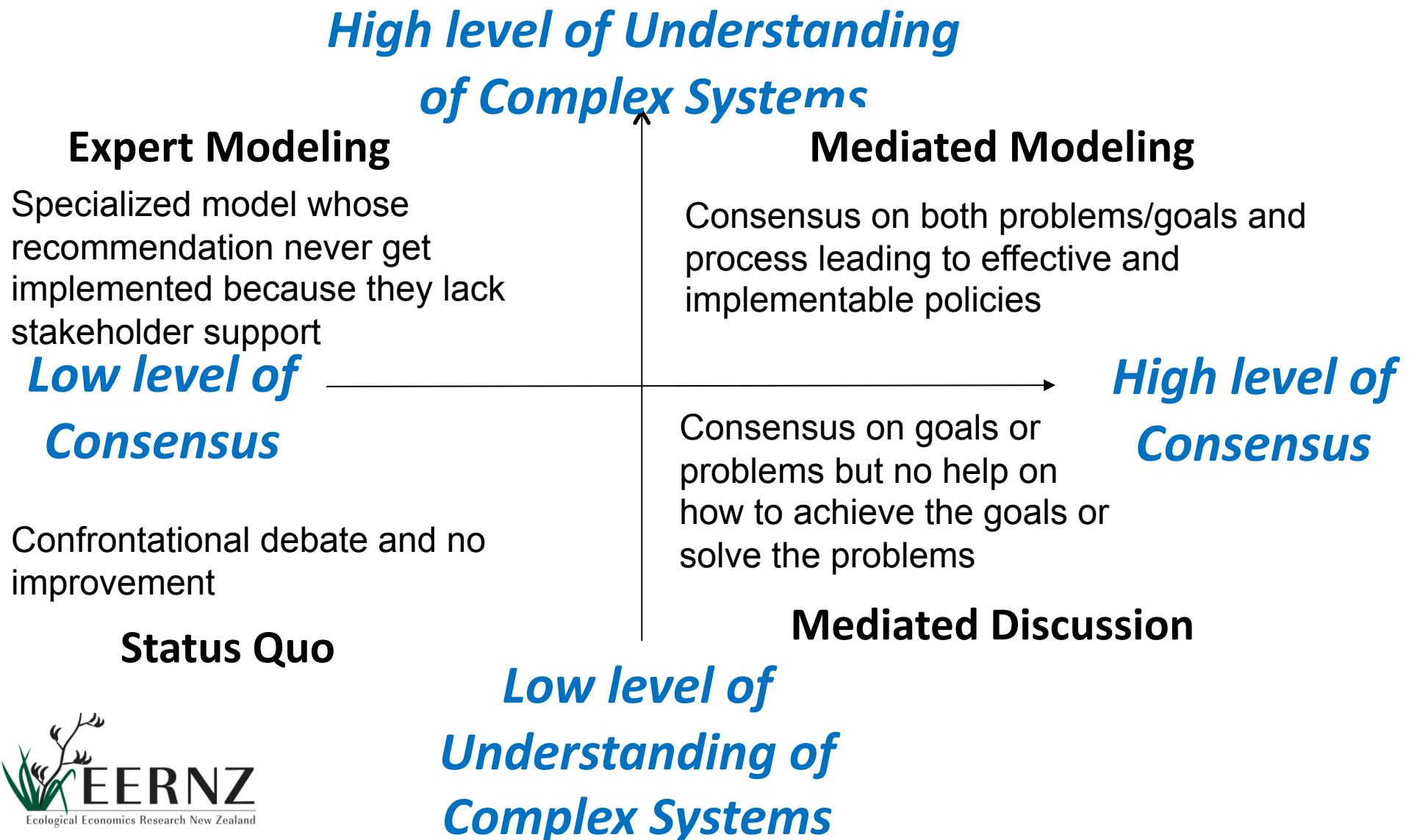
- Stakeholder involvement in the Integrated Freshwater Solutions project and how a similar process could be used for Impact Assessment
- Snapshot (Static) versus changes over time (Dynamic)
- Collaborative and adaptive processes, community partnerships and decision-making

Integrated Freshwater Solutions (IFS)

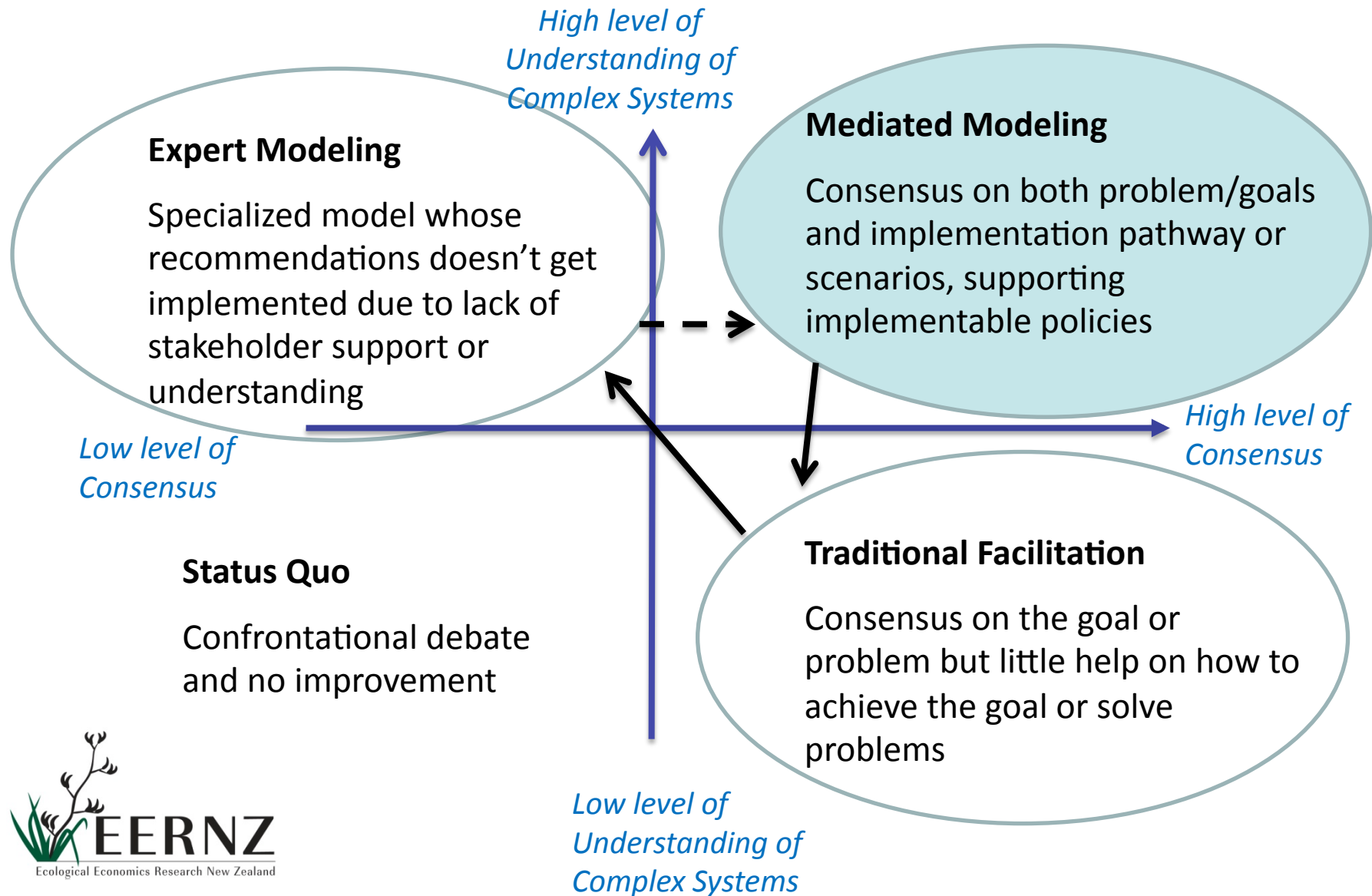
www.ifs.org.nz

- Action research project (2010-2013).
- Collaborative and adaptive management.
- Involving community partnerships and decision-making with the vision of improved water quality in the Manawatu River
- Partly with Manawatu River Leaders Forum; 7 full-day workshops with stakeholders and iwi
- First 4 days of workshops used mediated modelling
- Mediated modelling: “Modelling *with* stakeholders rather than *for* stakeholders”

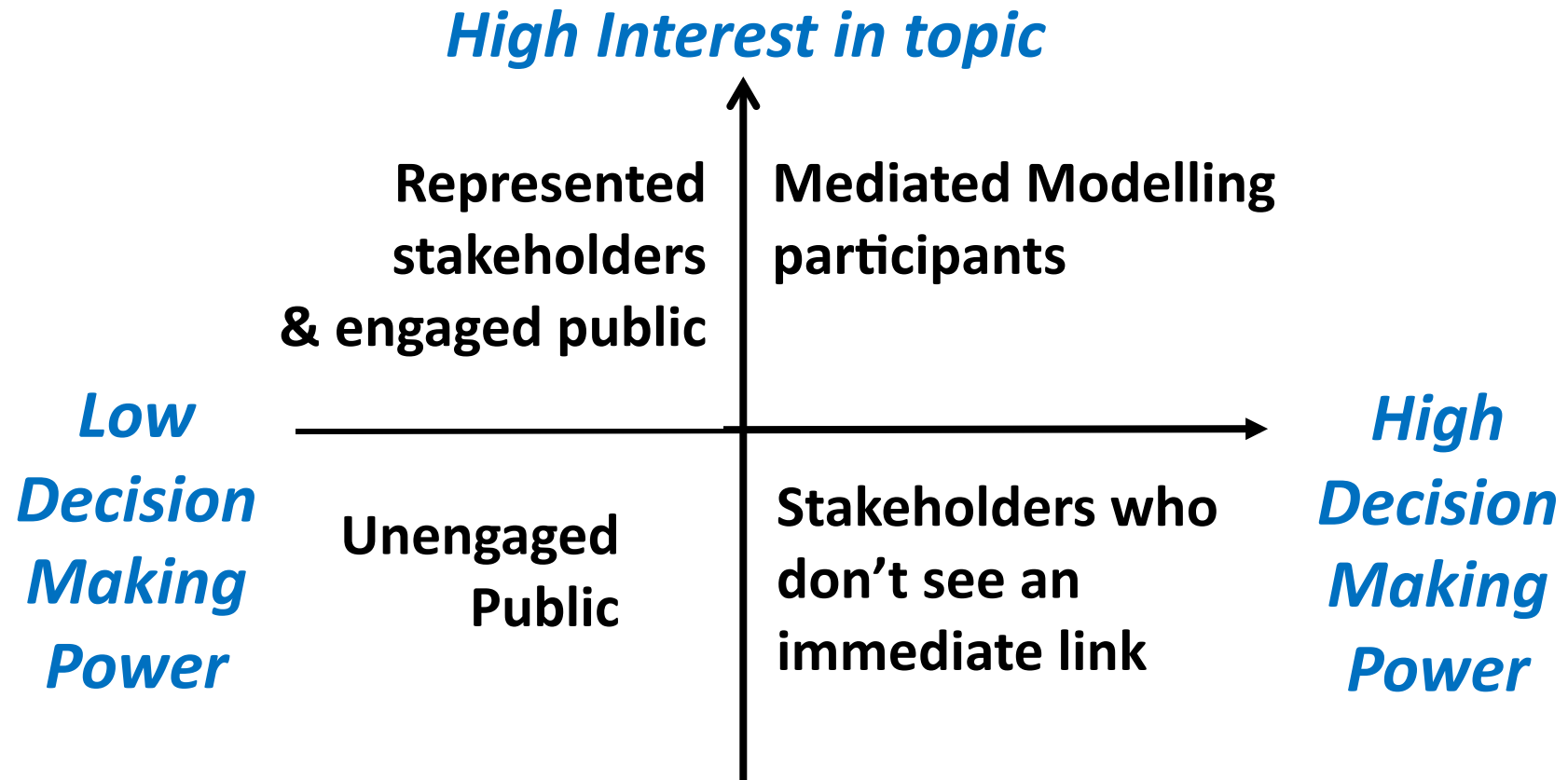
What is Mediated Modelling?



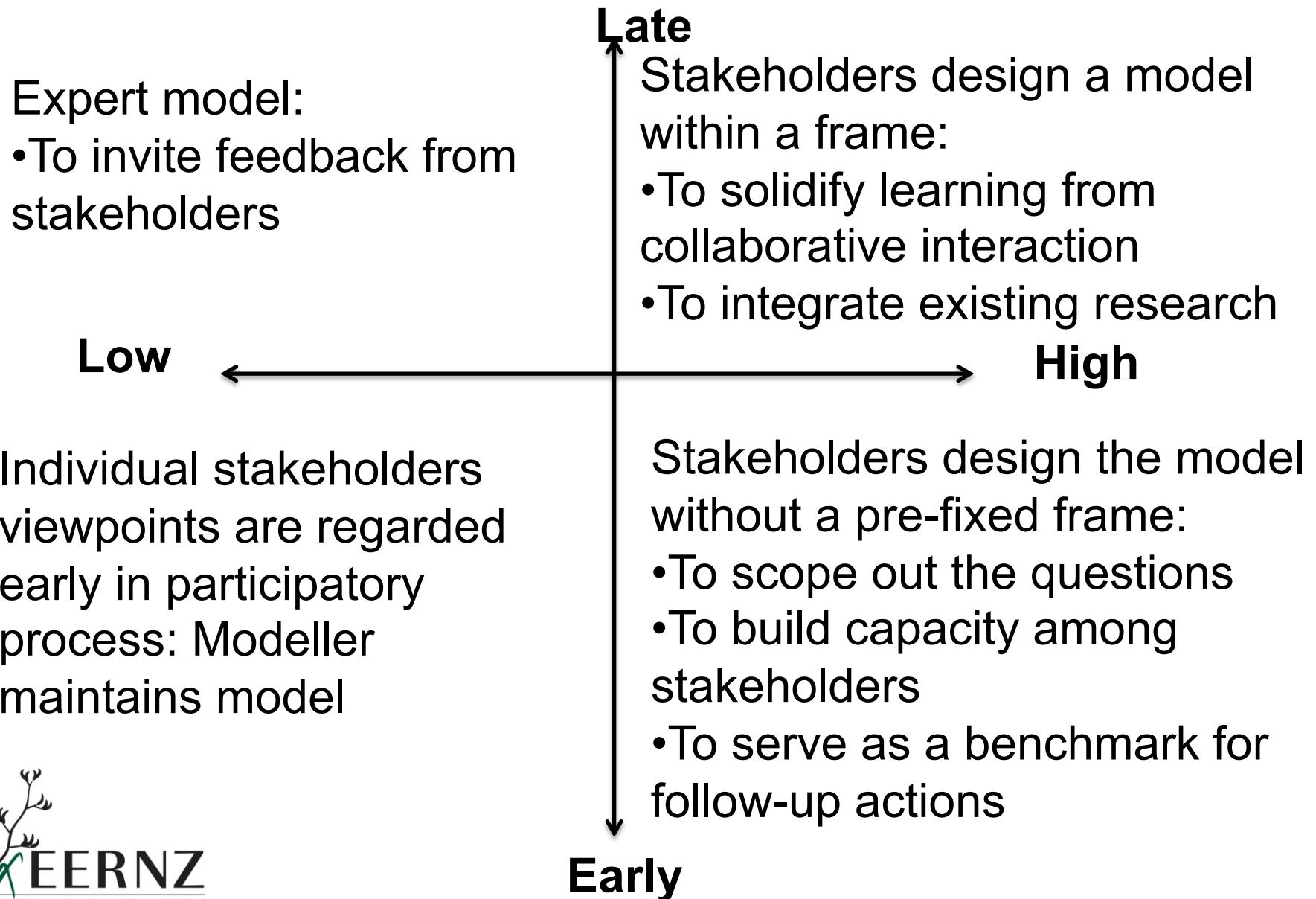
Understanding and Consensus Building



Collaboration: Decision Making Power and Interest



Timing vs Participation



Model building...

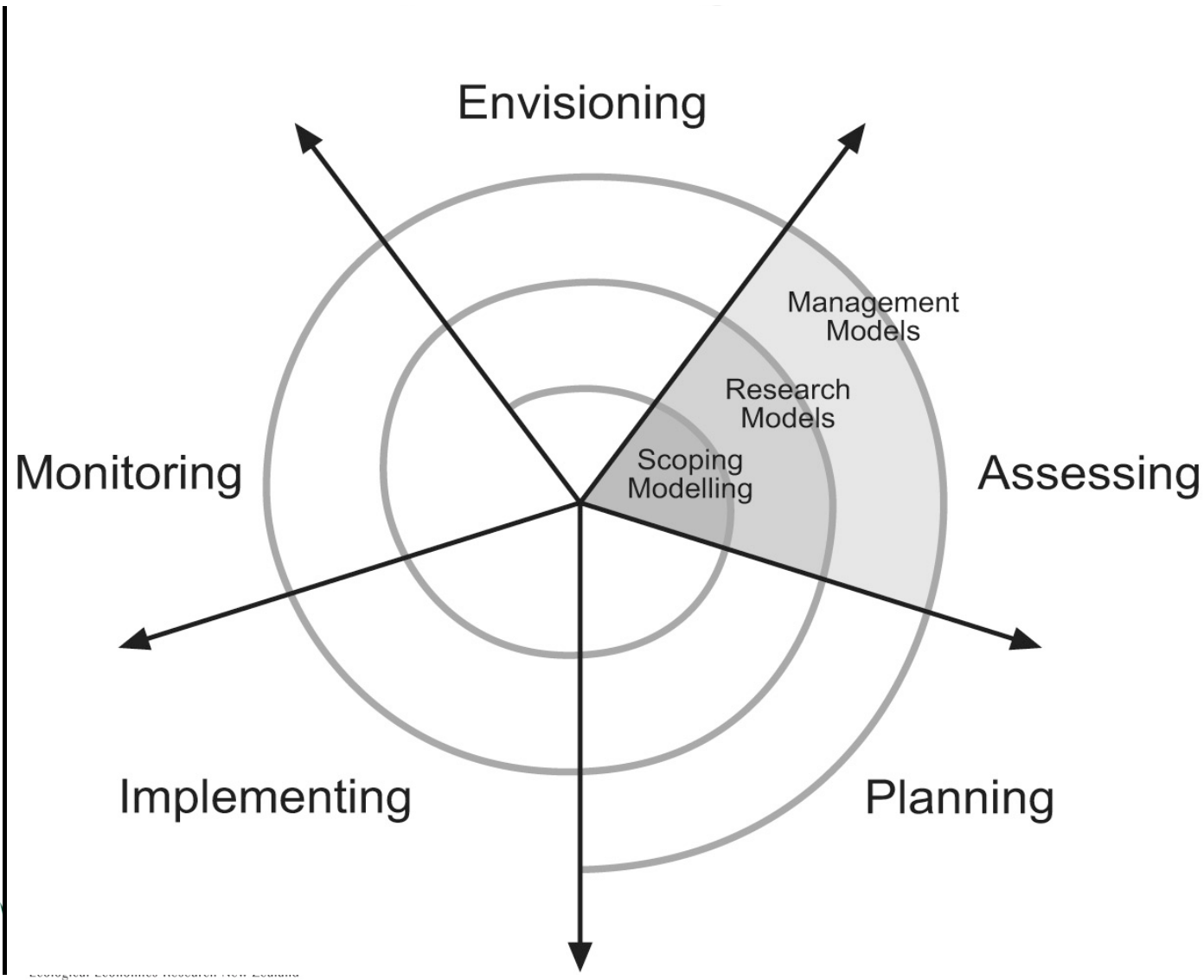
- Structures a complex dialogue
- Provides a space for collaborative learning
- Maintains focus on interlinkages
- Identifies gaps in knowledge
- Integrates existing science (data is used to populate the model between workshops)
- Replicates historic trends and explores future scenarios
- May be part of an adaptive management toolbox

Main steps in Impact Assessment

1. Screening
2. Scoping (Identify issues)
3. Analysis (Develop alternatives and predict impacts)
 - consideration of Alternatives
 - description of the Project
 - description of the Environmental Baseline
 - identify impacts
 - predict impacts
 - assess impacts
4. Mitigation
5. Reporting (Prepare an IA)
6. Review (quality control)
7. Decision-making (Make a decision)
8. Follow-up (Monitoring)

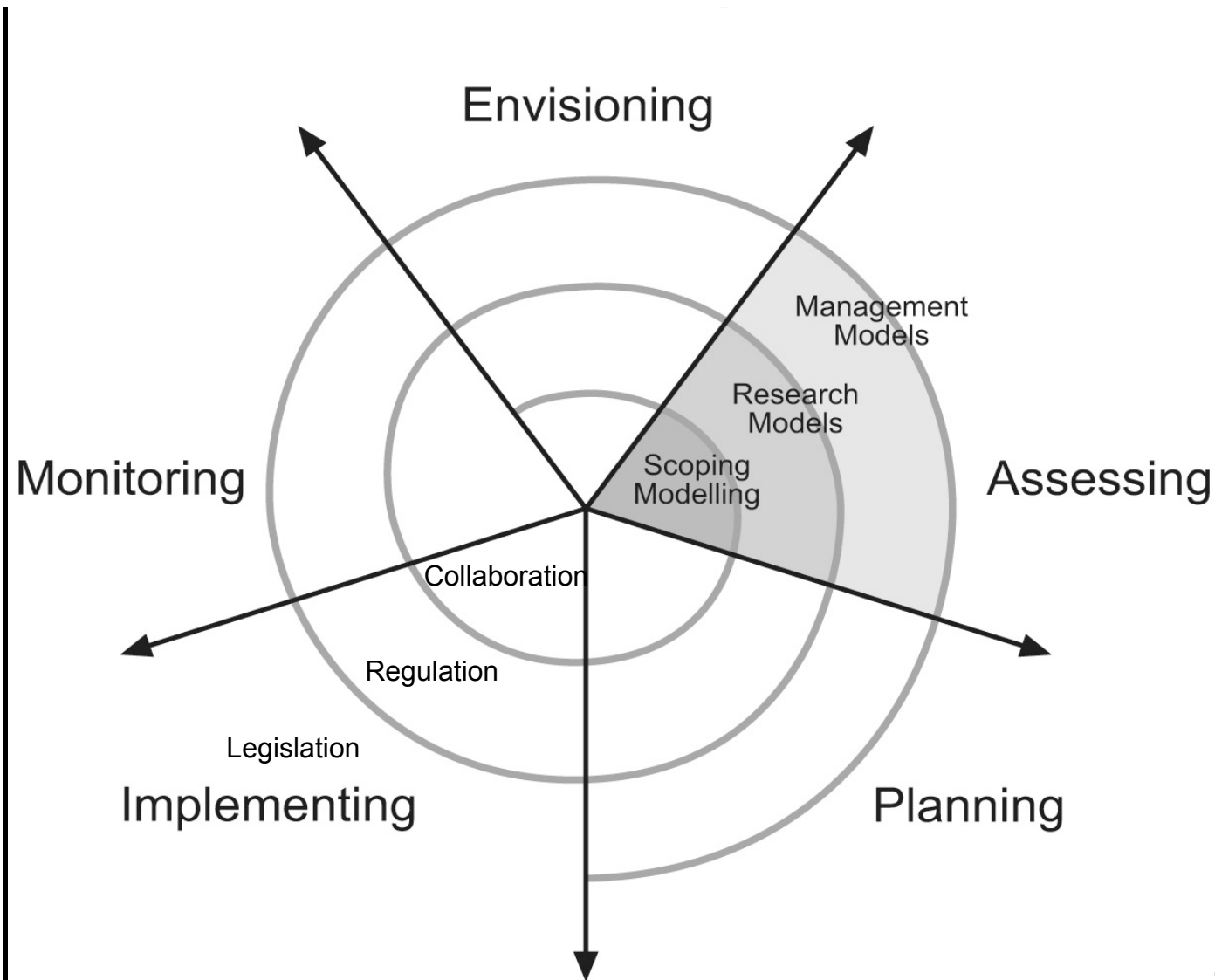
Consultation and Public Participation
Data Management

How do Modelling Tools support Planning and Adaptive Management?

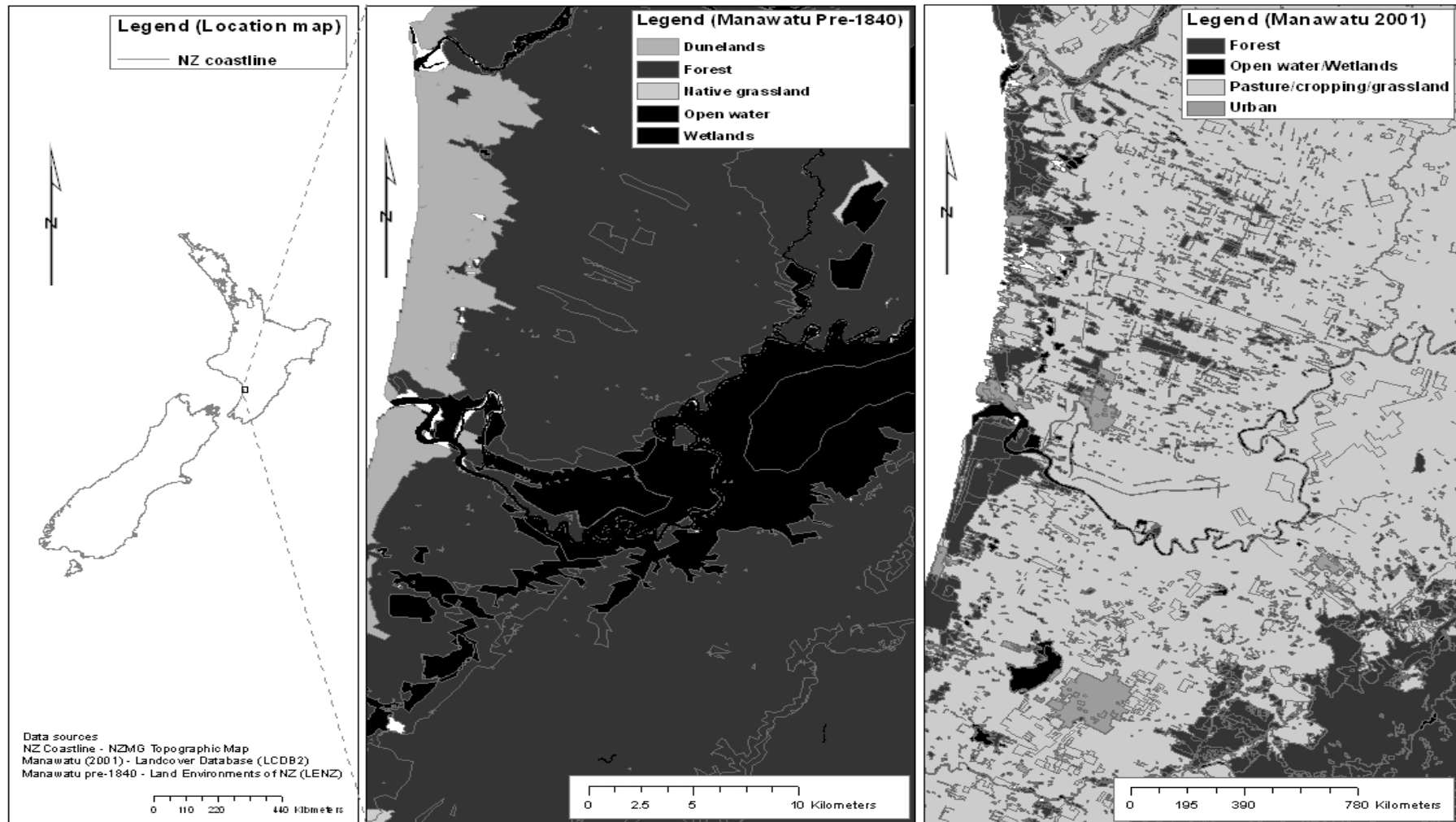


Source: van den Belt, 2009

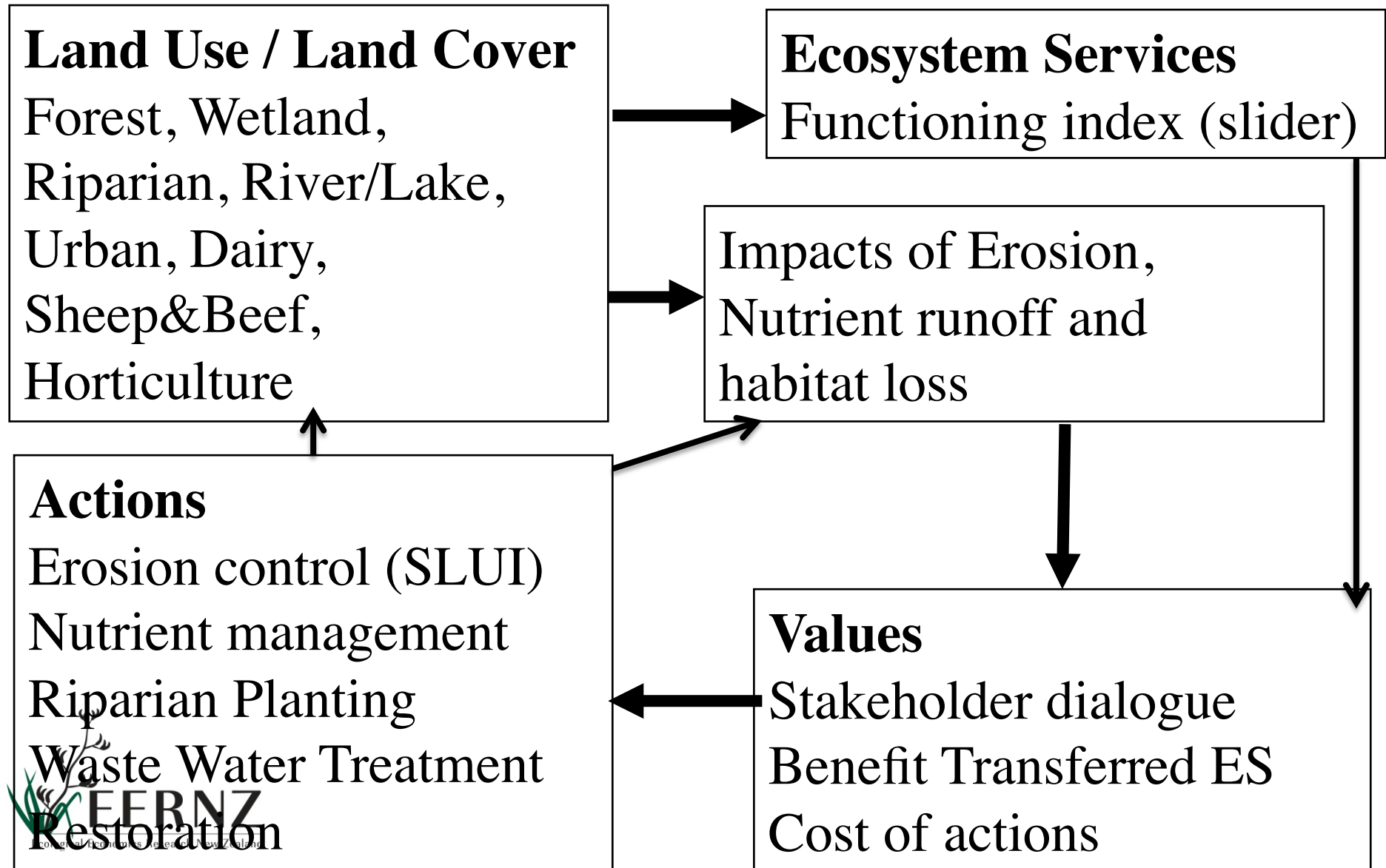
How do modelling tools support planning and adaptive management?



Manawatu land cover: Pre- and Post Settlement



IFS-MM Result



Key challenges

- Erosion and sedimentation
- Nitrogen runoff/leaching and eutrophication
- Habitat and biodiversity

WHAT'S HAPPENING AND WHERE?

The Manawatū Catchment is broken down into nine areas we call sub-catchments. Refer to the action points detailed on the map below to see a summary of what we are planning to do.

KEY ACTION POINTS



REDUCE THE NUTRIENT AND PATHOGENS FROM POINT SOURCE DISCHARGES THROUGH:

- resolving outstanding resource consent applications
- ensuring discharges meet regional water quality standards
- meeting resource consent conditions, compliance monitoring and enforcement
- requiring resource consents for stormwater discharges



REDUCE THE RUN-OFF OF SEDIMENT, NUTRIENTS AND PATHOGENS FROM INTENSIVE LAND-USE SUCH AS DAIRYING AND CROPPING THROUGH:

- meeting resource consent conditions, compliance monitoring and enforcement
- achieving the Dairying and Clean Stream Accord targets
- adoption of Nutrient Management Plans and promotion of nutrient use efficiency

MILESTONES

1990

Manawatū Catchment Water Quality Plan:

Removes dairy effluent discharge from water

Sets standards on phosphate levels for point source discharge

2000

Horizons launches Sustainable Land Use Initiative to address erosion of hill-country land

Palmerston North City Council upgrades sewage treatment plant

All major water takes in the Catchment meet agreed standards

2010

Manawatū River Leaders Accord signed and action plan agreed

2012 Dairy and Clean Streams Accord targets met

All major consent applications resolved

Horizons Regional Council One Plan becomes operative

All high value bush and wetlands protected

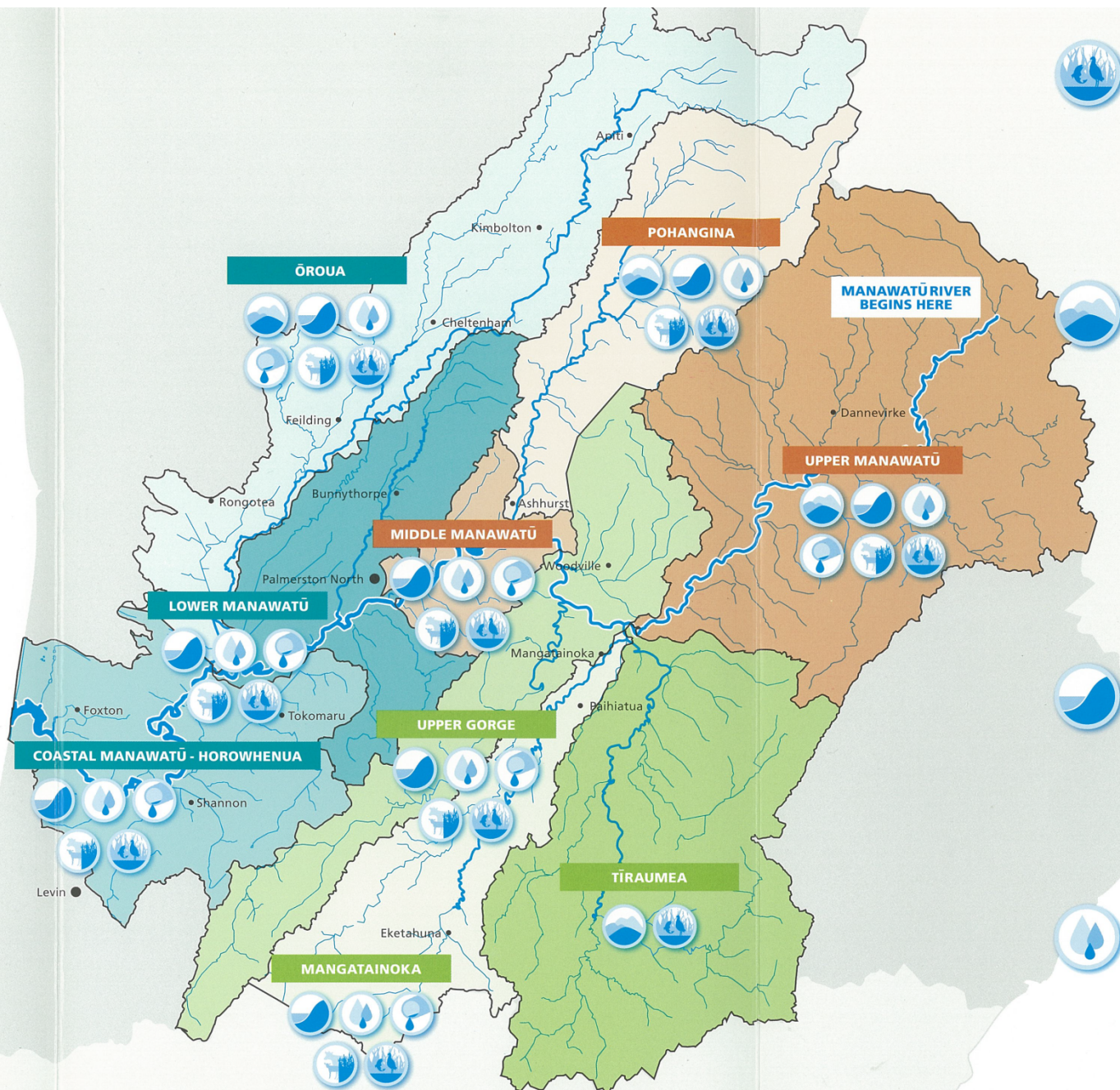
2020+

Waterways in the Catchment are safe, accessible and provide for recreation and food sources

Sustainable land and water resources of the Catchment continue to underpin the economic prosperity of the Region

Waterways are returned to a healthy condition

The River becomes a source of regional pride and mana



PROTECT AREAS OF HABITAT FOR NATIVE FISH AND BIRDS BY:

- fencing and planting streams and bush/wetland areas, and pest control
- removing fish barriers
- meeting resource consent conditions, compliance monitoring and enforcement



REDUCE SEDIMENT RUN-OFF FROM EROSION PRONE FARMLAND, THE RURAL ROAD NETWORK AND AREAS OF MAJOR EARTHWORKS THROUGH:

- continuation of Horizons Regional Council's Sustainable Land Use Initiative
- adoption of road maintenance and earthworks best practice management practices
- meeting resource consent conditions, compliance monitoring and enforcement
- adoption of best practice management for earthworks



REDUCE THE IMPACT OF FLOOD CONTROL AND DRAINAGE SCHEMES BY:

- ensuring all works are undertaken in accordance with Codes of Practice
- meeting resource consent conditions, compliance monitoring and enforcement
- making greater use of plants on river banks



PREVENT OVER-USE OF WATER BY:

- ensuring consents meet regional standards
- meeting resource consent conditions, compliance monitoring and enforcement
- ensuring metering of all major water takes

Modelling *with* stakeholders: Dynamic but Non-Spatial

Natural Capital



Ecosystem Services



Policy, Management



(E)Valuation



Solution Portfolios

Sedimentation - SLUI (tentative)

This scenario simulates the impact of SLUI on sediment reduction. In the base scenario, SLUI is "on" but can be switched off to simulate where the sediment loading would be without this programme. Additional resources could go toward an expedient SLUI; this can be simulated by switching "on" the "SLUI expedient". Page 1 - shows the impact over 1990 - 2040.

SLUI abandoned



SLUI expedient



Sedimentation - Riparian planting (tentative)

This scenario simulates the impact of riparian zones on sedimentation.

Riparian planting



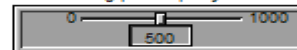
Percentage of Riparian in native plantings



Native Riparian SS trapping capacity in kg per ha per year

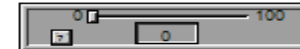


Non native Riparian SS trapping capacity in kg per ha per year



PS - Wastewater Management

Improved Town WW mgt
% reduction in discharge volume



Improved Town WW mgt Enhanced Nutrient Removal



Improved Industry WW mgt
% reduction in discharge volume



Improved Industry WW mgt Enhanced Nutrient Removal



Sedimentation - restoration of natural capital: forest and wetlands (very tentative)

Reforestation to reduce erosion from highlands



Restoration of wetlands



Nitrification - Sustainable Farm Nutrient Management (SFNM)

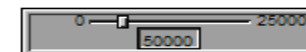
Dairy Effluent Compliance Expedient



Stock exclusion



Cost of stock exclusion



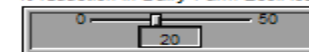
Herd homes winter cow housing



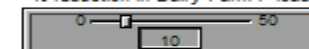
Herd home impact



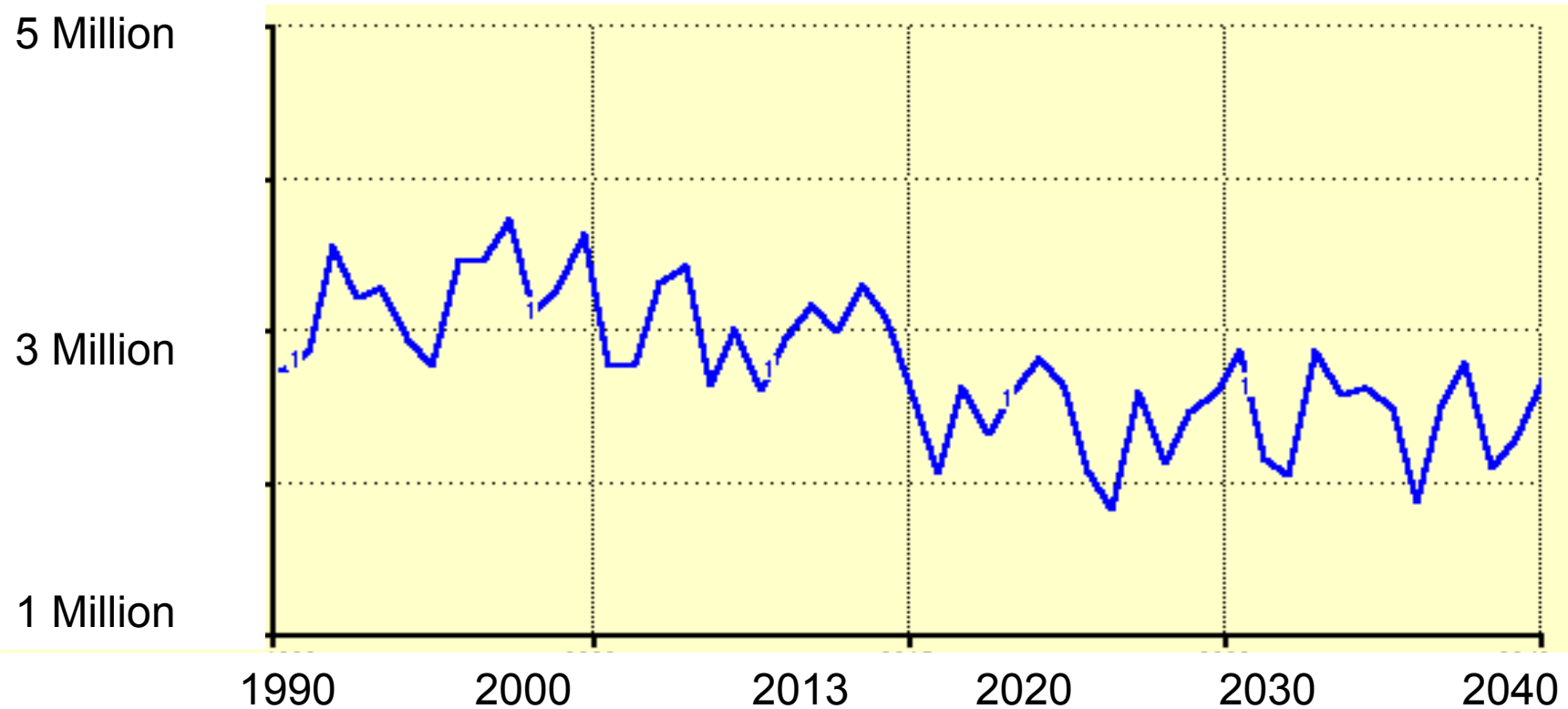
Herd home impact
% reduction in Dairy Farm Ecoli load



Herd home impact
% reduction in Dairy Farm P load



Sediment loading in tonnes per year



Base case (blue line – 1): sediment loading in tonnes per year WITH SLUI

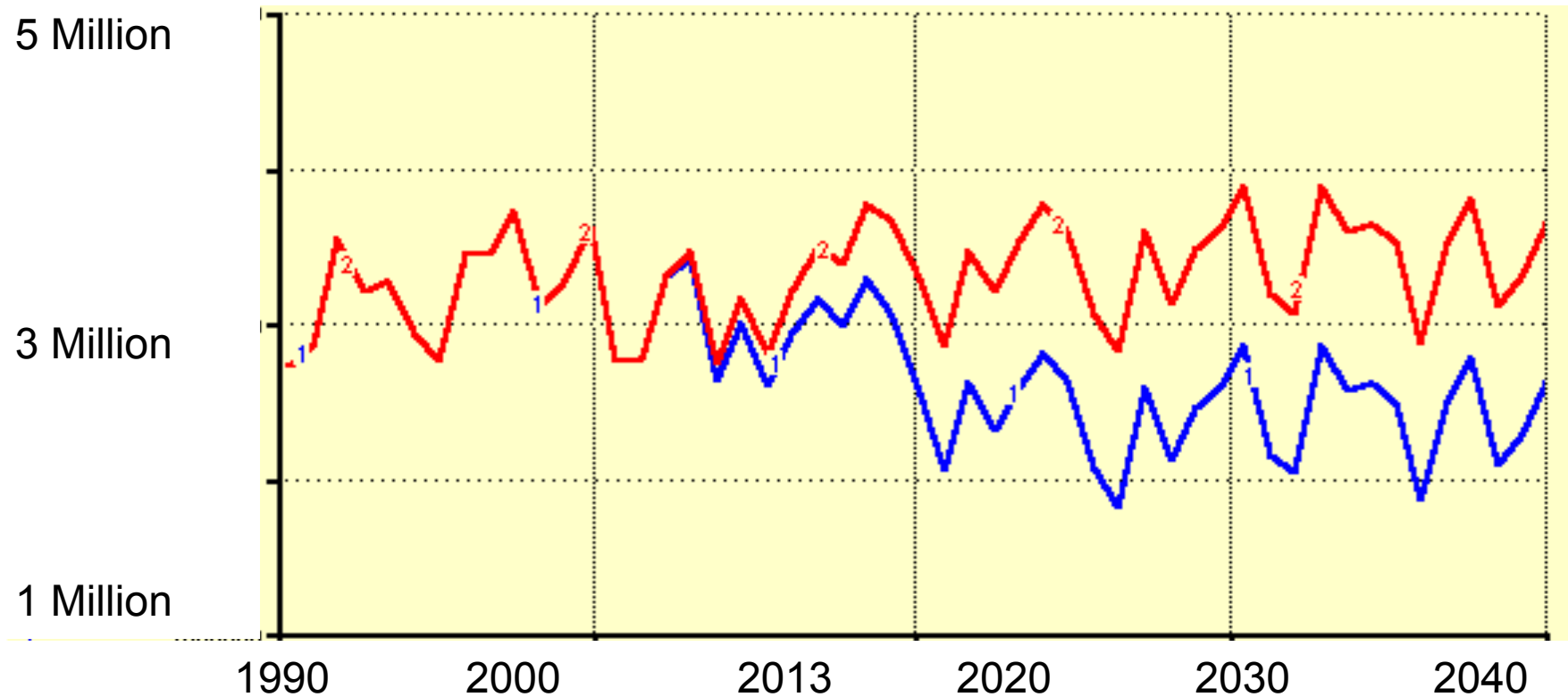
SLUI abandoned



SLUI expedient



Sediment loading in tonnes per year



Blue line – 1: WITH SLUI

Red line – 2: WITHOUT SLUI

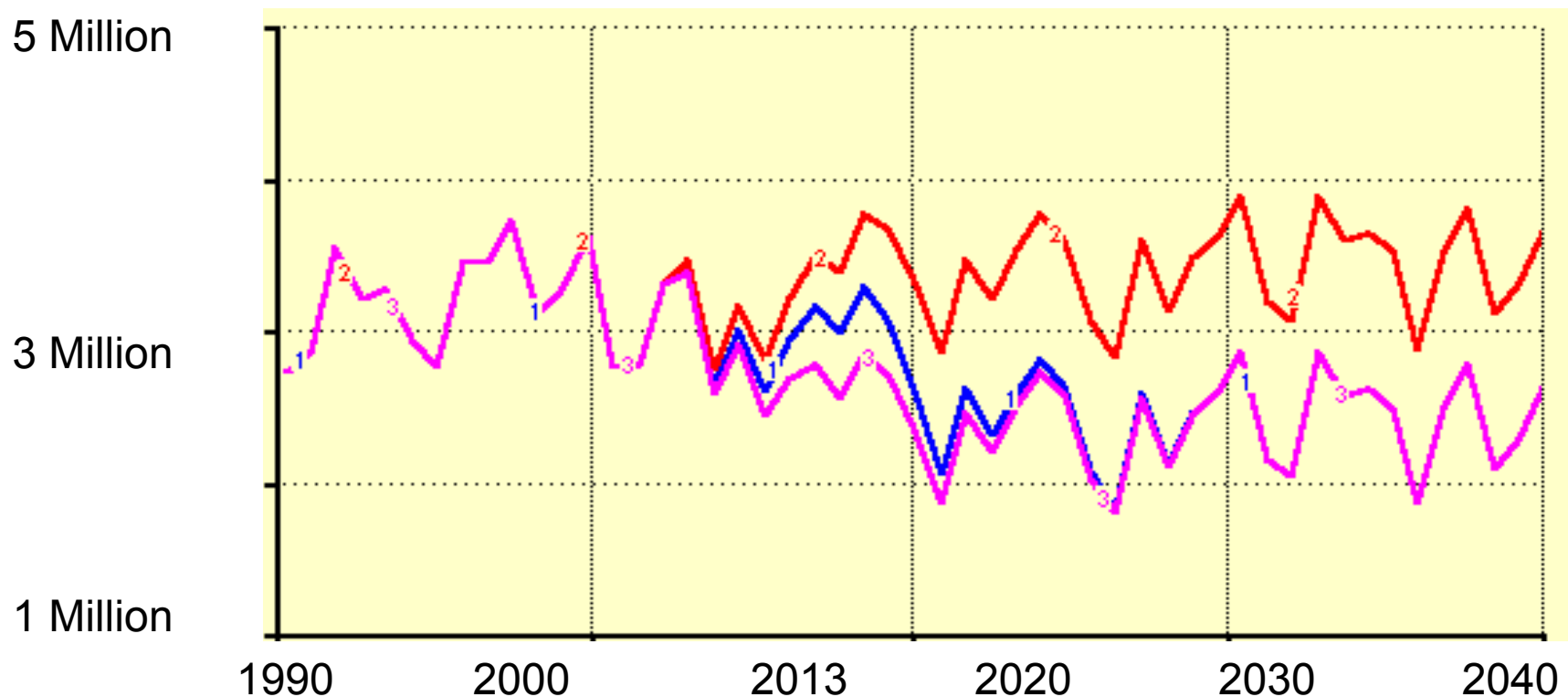
SLUI abandoned



SLUI expedient



Sediment loading in tonnes per year



Blue line – 1: WITH SLUI

Red line – 2: WITHOUT SLUI

Pink line – 3: Reaching SLUI goals in 2020 instead of 2030

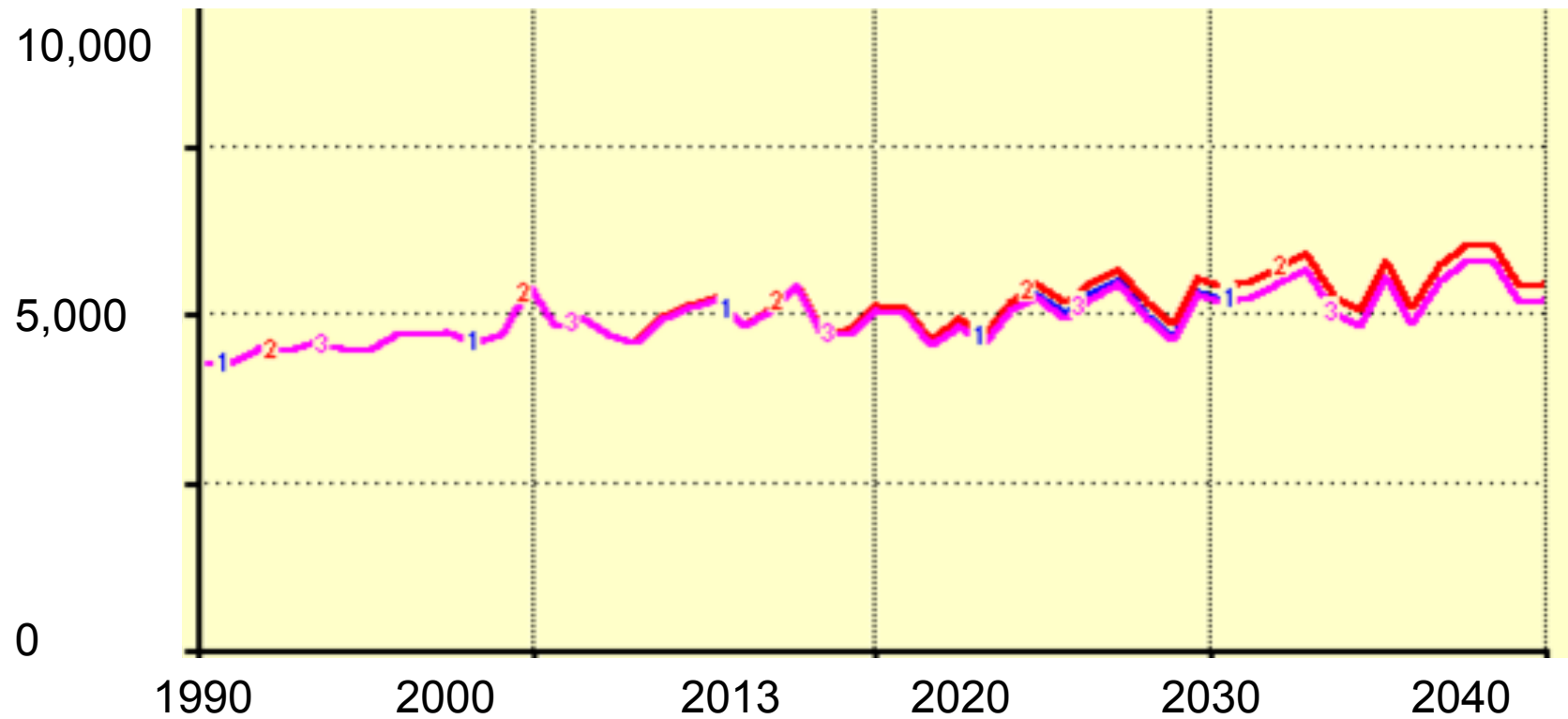
SLUI abandoned



SLUI expedient



Nitrogen loading in tonnes per year



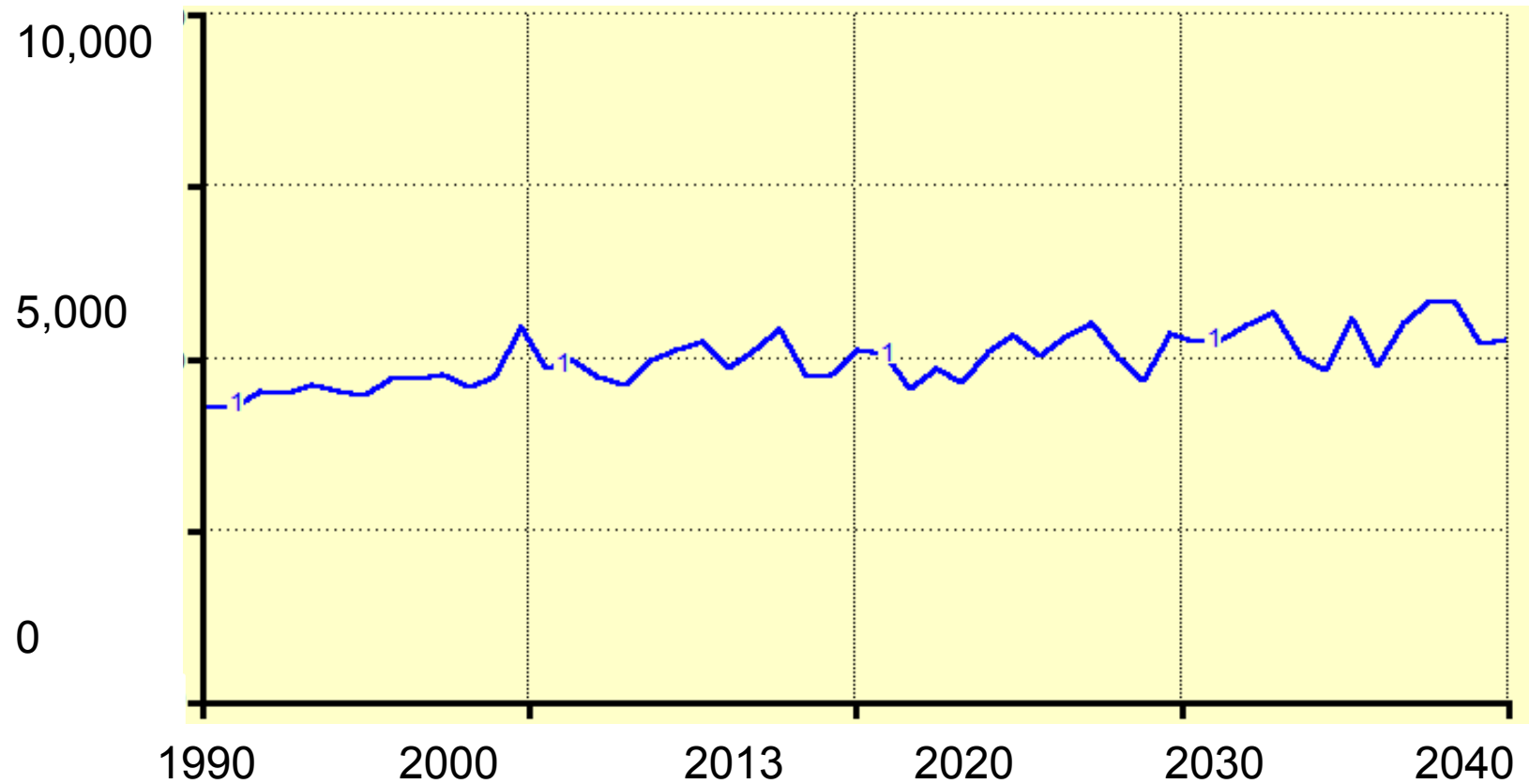
Impact of SLUI on Nitrogen loading smaller than on Sediment loading

blue line- 1: WITH SLUI

red line -2: Without SLUI

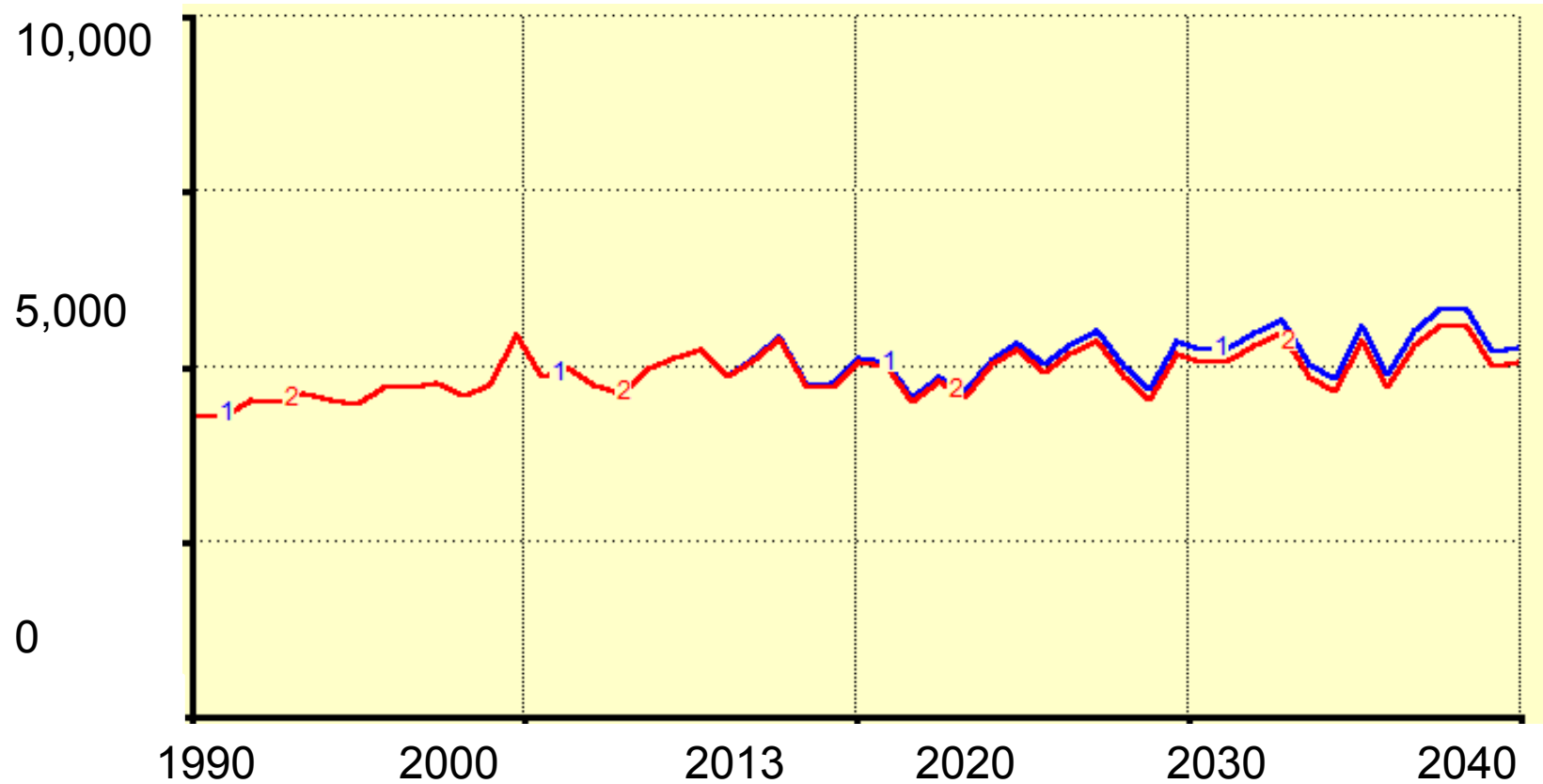
pink line -3: Reaching SLUI goals in 2020 instead of 2030

Nitrogen loading in tonnes per year



blue line- 1: base line under business-as-usual

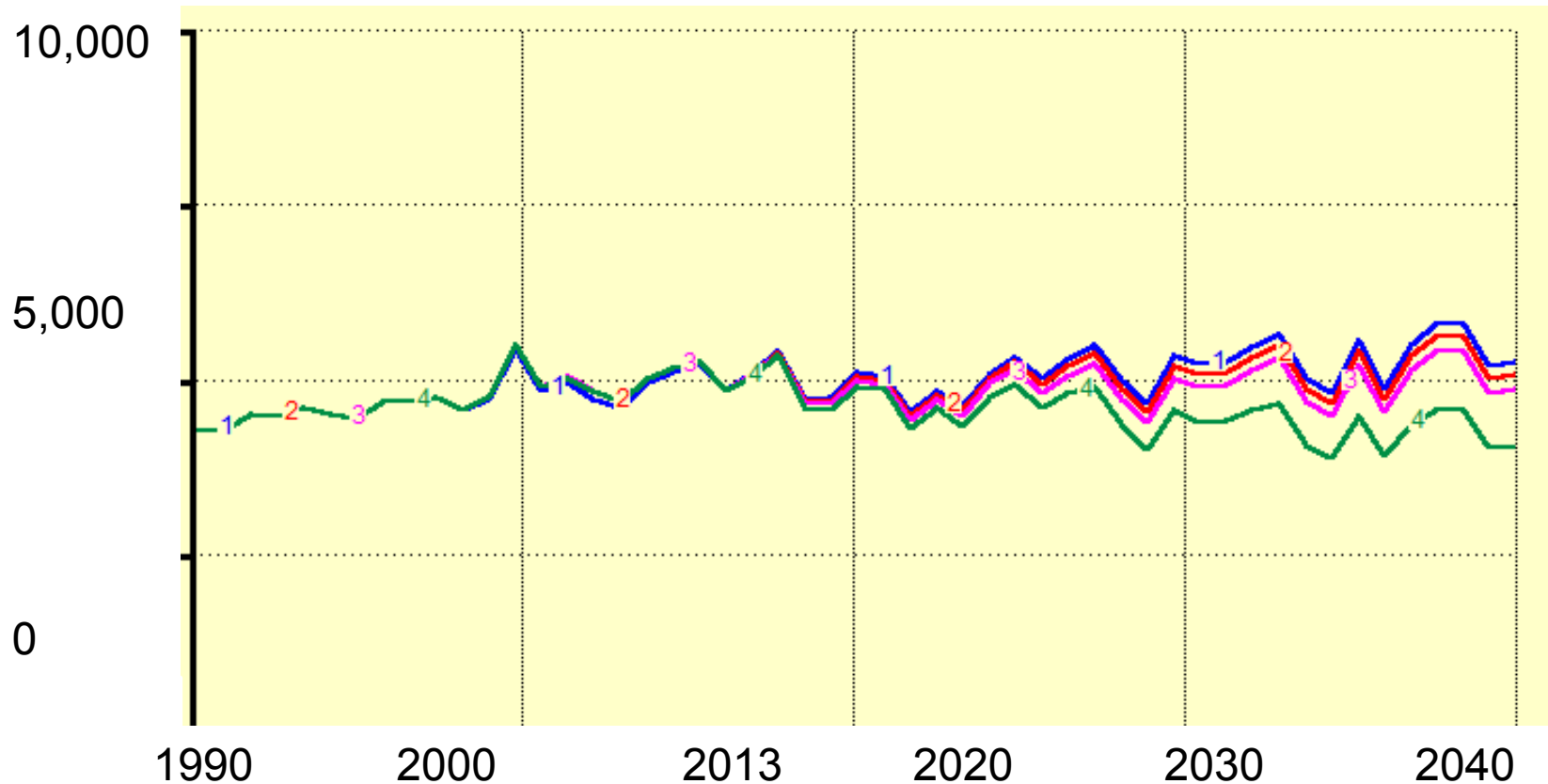
Nitrogen loading in tonnes per year



Blue line- 1: base line under business-as-usual

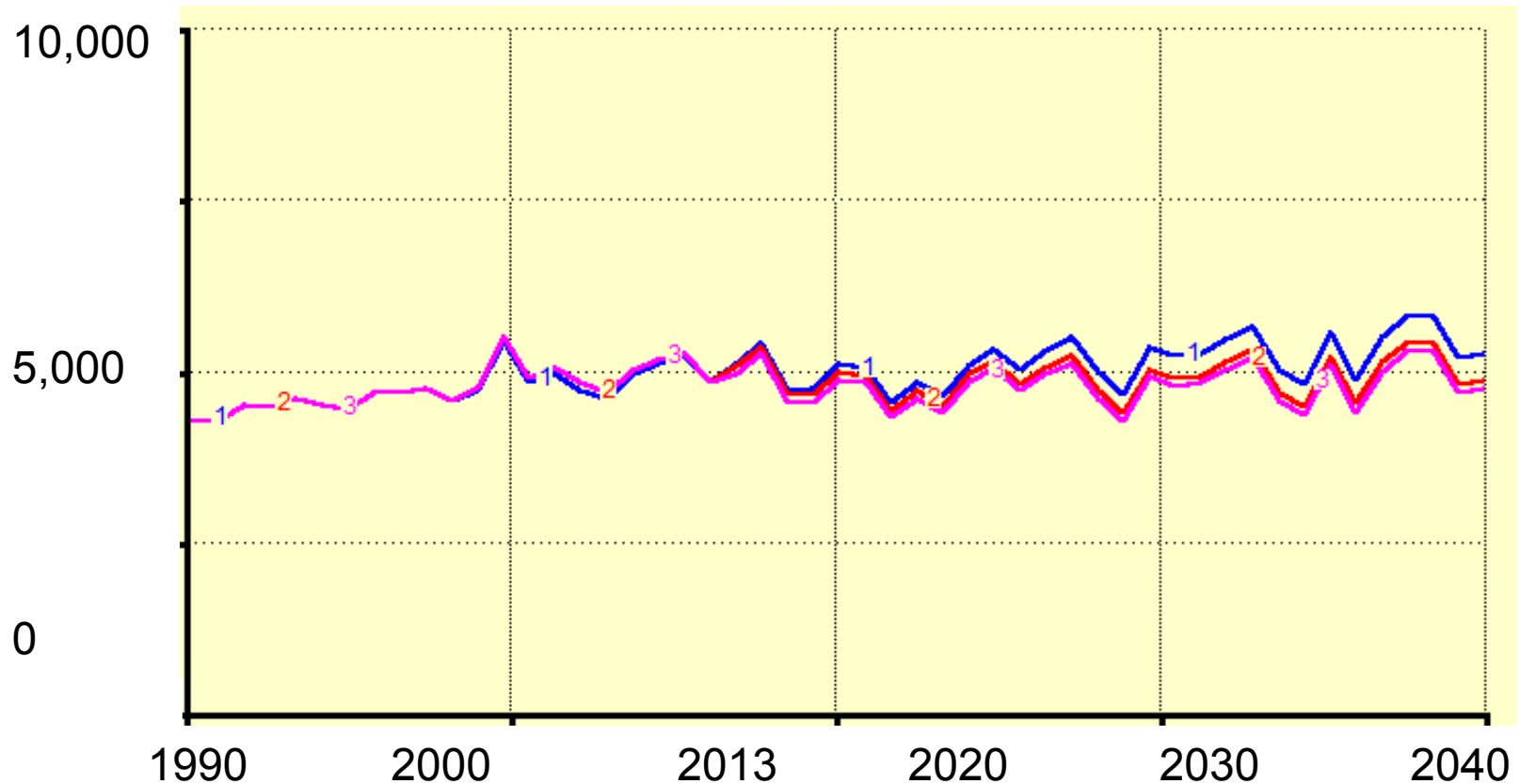
Red line- 2: stock exclusion \$300,000

Nitrogen loading in tonnes per year



- Blue 1: Base line under business-as-usual
- Red 2: Full effluent management
- Pink 3: Stock exclusion / fencing (\$300,000)
- Green 4: Herd homes (40% N reduction)

Nitrogen loading in tonnes per year

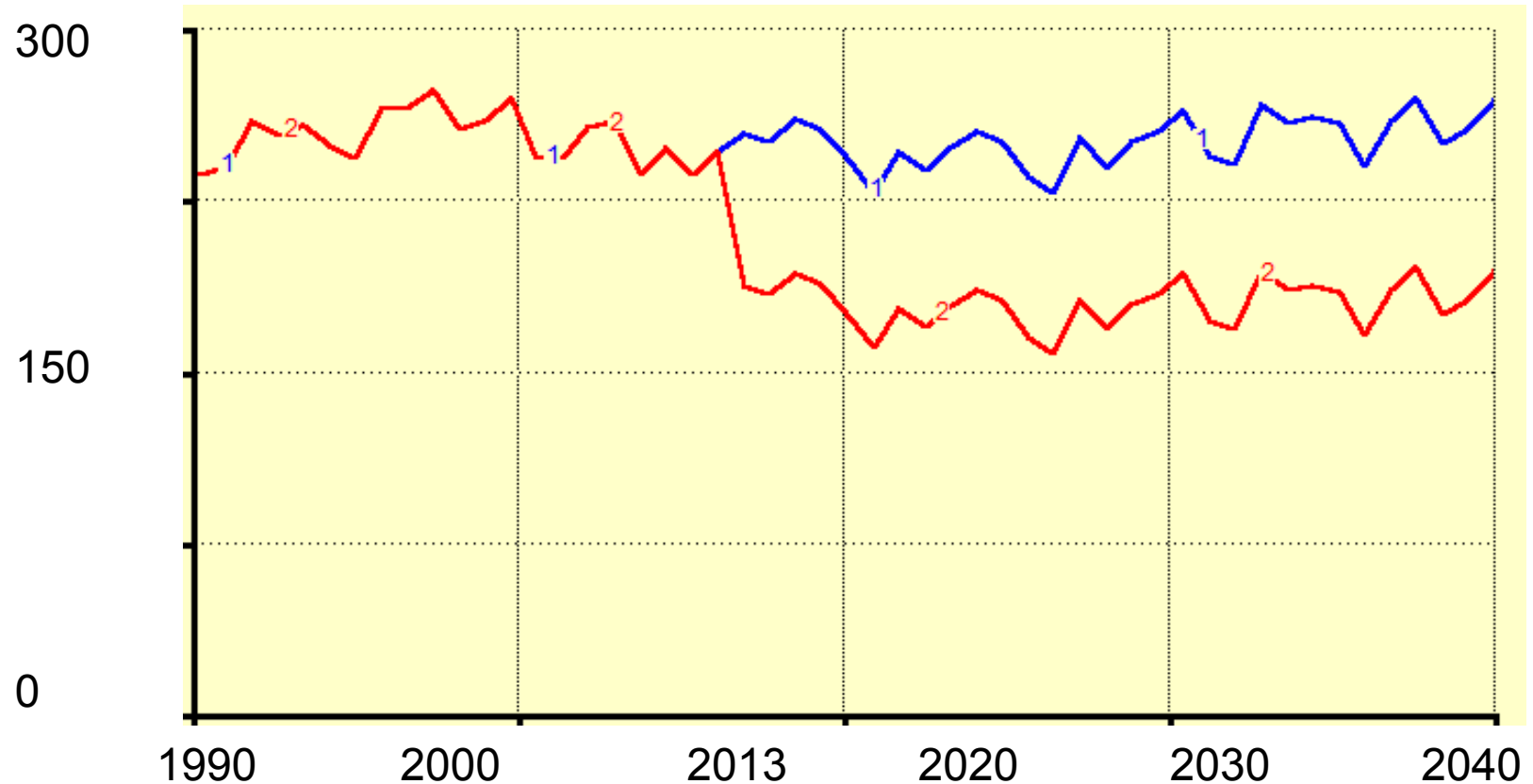


Blue 1: Base line under business-as-usual

Red 2: Currently funded and implemented Non-Point Source measures

Pink: 25% reduction in Point Source waste water

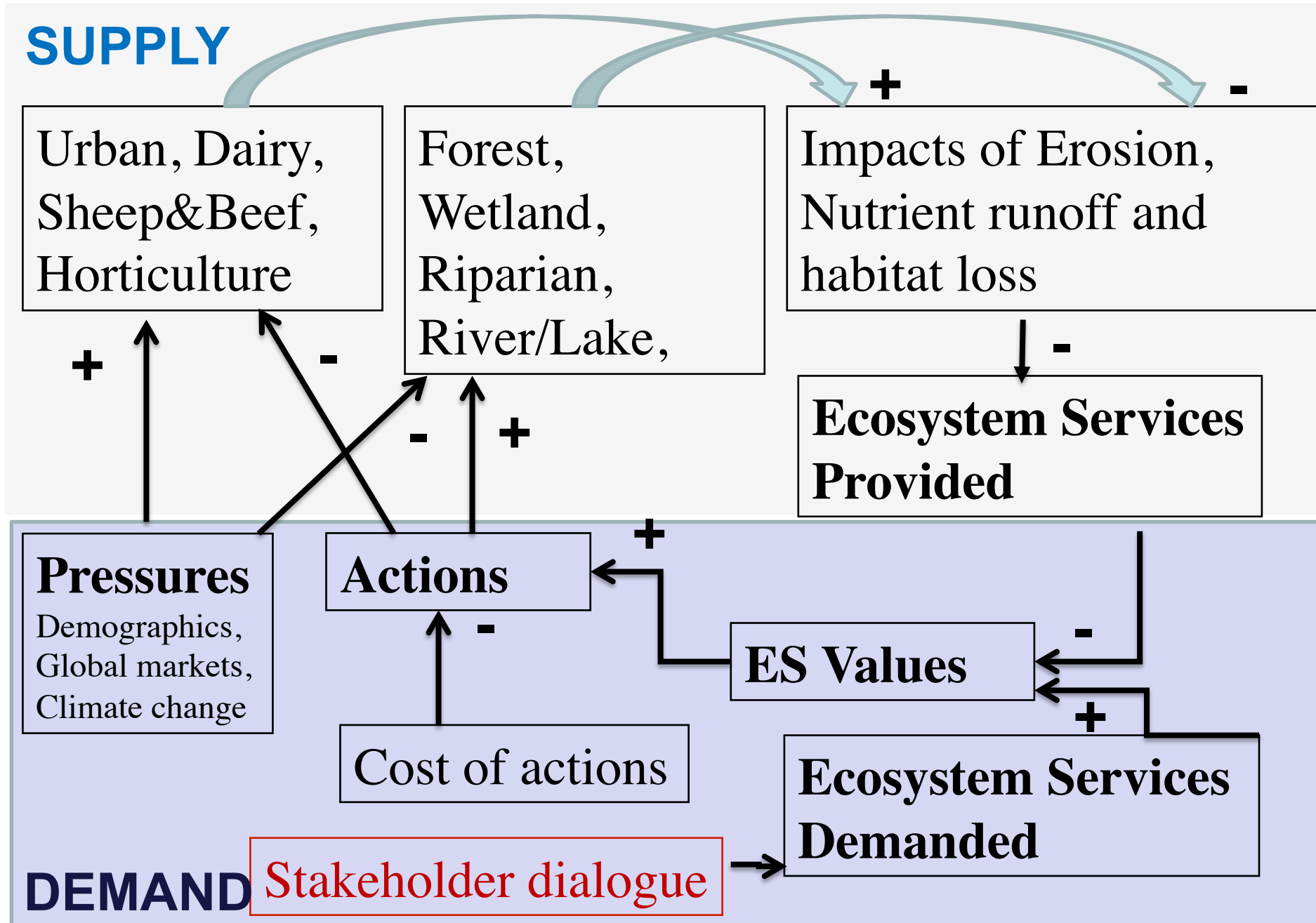
Phosphorus loading in tonnes per year



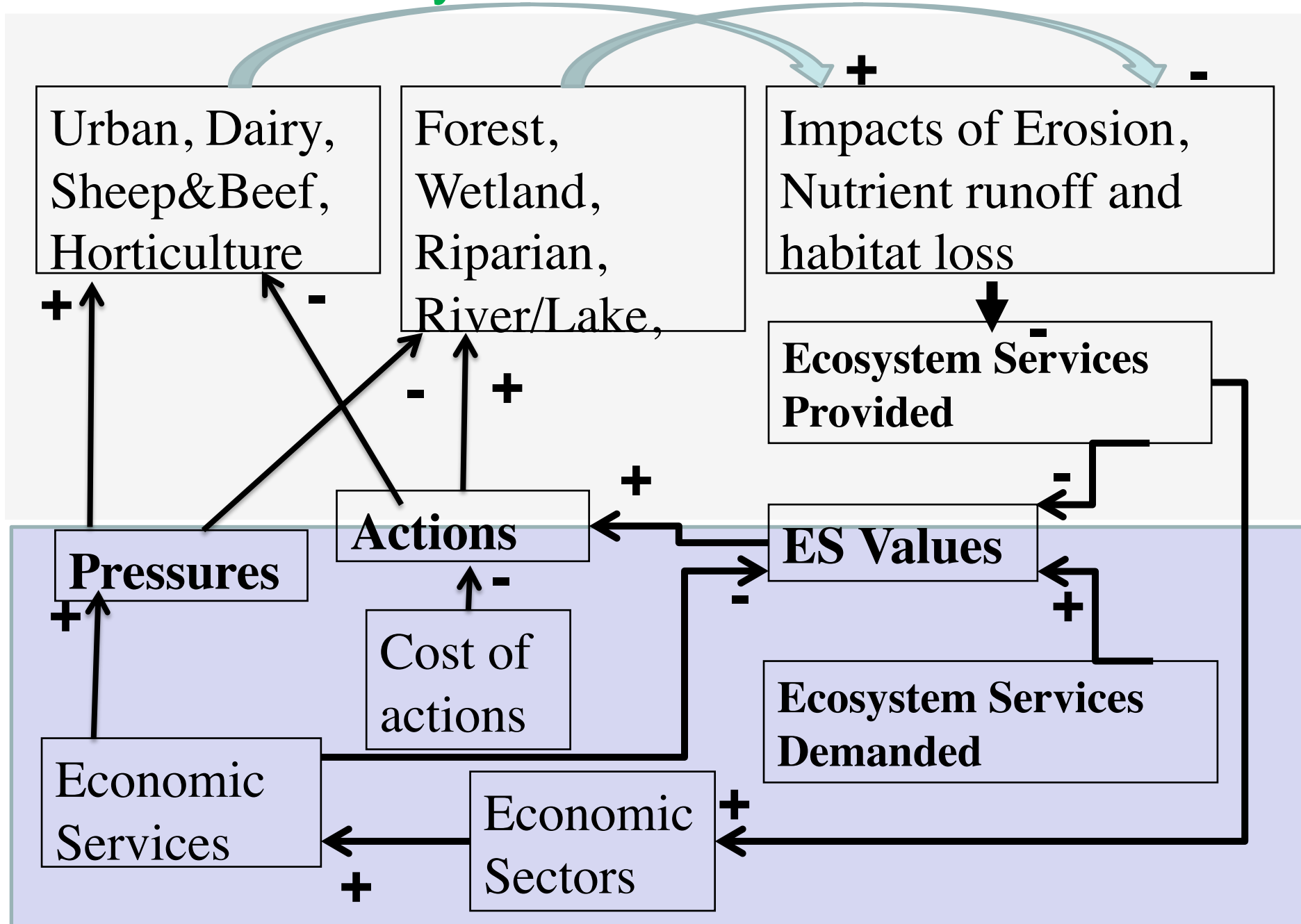
Blue 1: Base line under business-as-usual

Red 2: 50% reduction in Point Source waste water

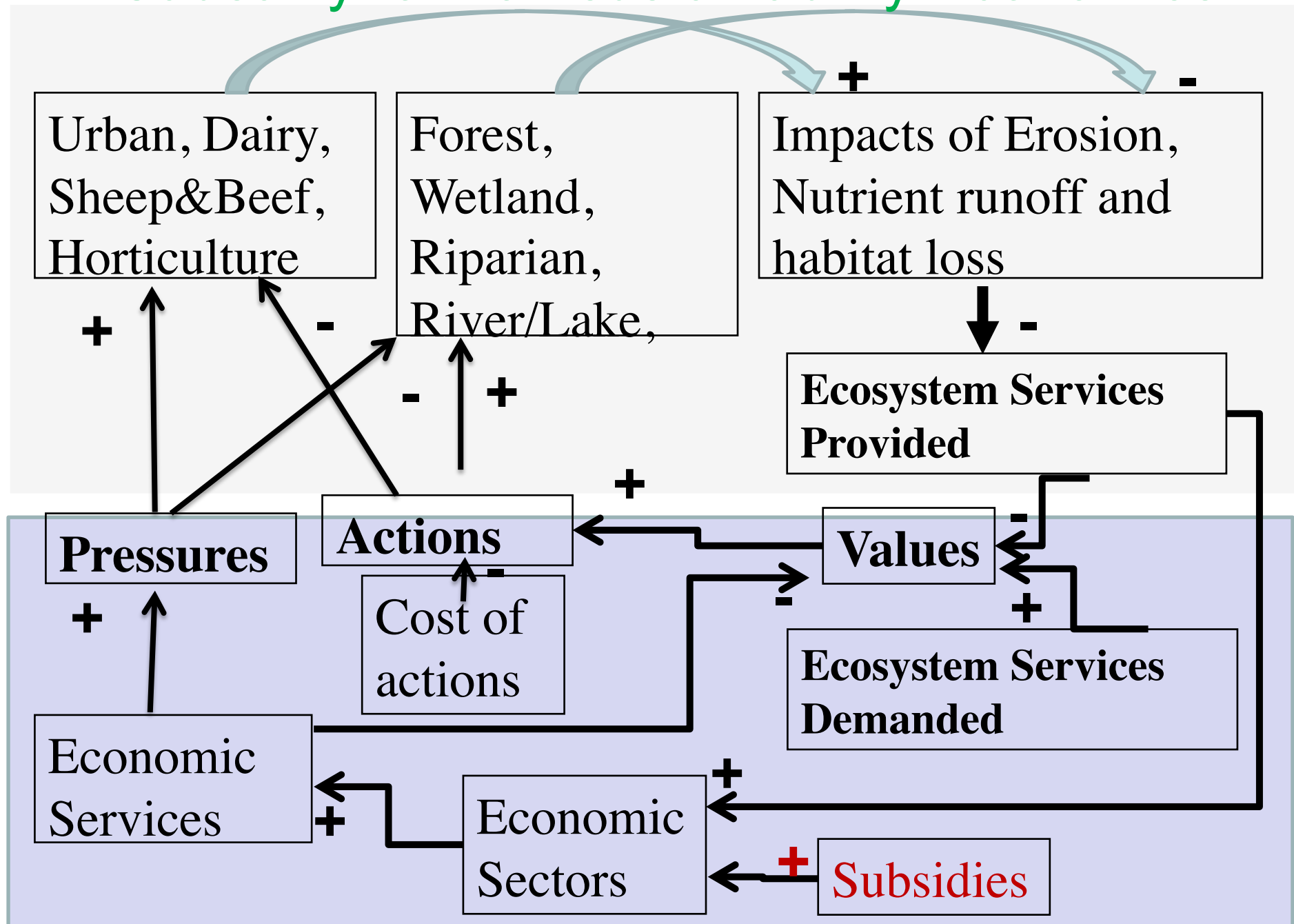
Causality within the sustainability loop



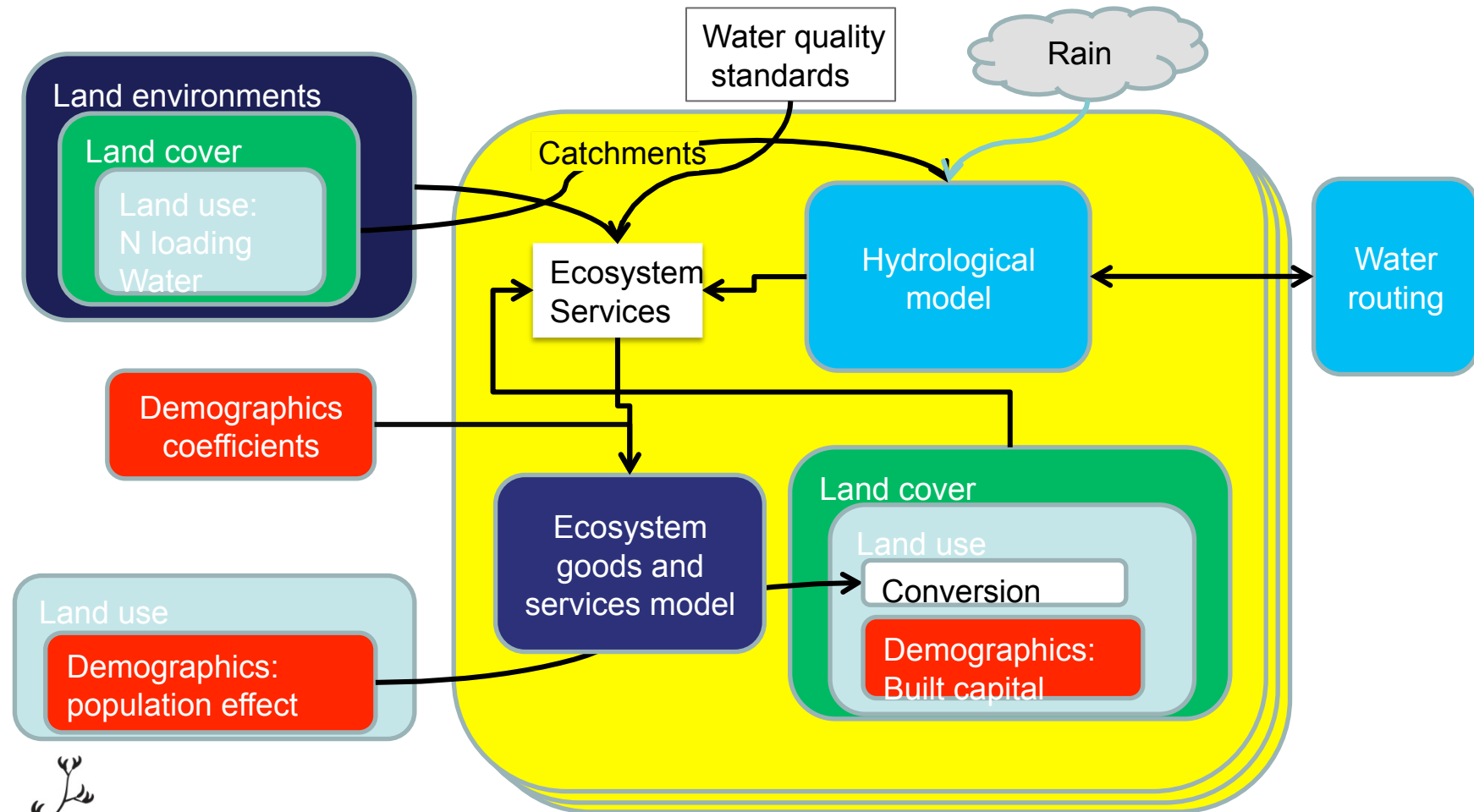
Causality for sustainable economies



Causality for non-sustainability Economies



Manawatu MIMES - Qualitative overview



Manawatu MIMES – Data base links

Land Environments of New Zealand
(LENZ)

Database

13 underlying climate,
landform and soil
variables

8 Land covers

7 land uses

8 user
groups

Resource Management Act
1991

cliflo@ni
wa.co.n
z

Freshwater
Ecosystems
of New
Zealand
(FENZ GIS)

FENZ

WATYIELD

Emergent
dynamics in
Ecosystem
Services
(see output
slide 17)

Dynamics in
goods and
service
trade-offs

The New Zealand Land Cover
Database

Land use change as
emergent behavior

Input for local investment
scenarios

Demographics
By ANZSIC 2006
– industry
classification

7x7 Land use change

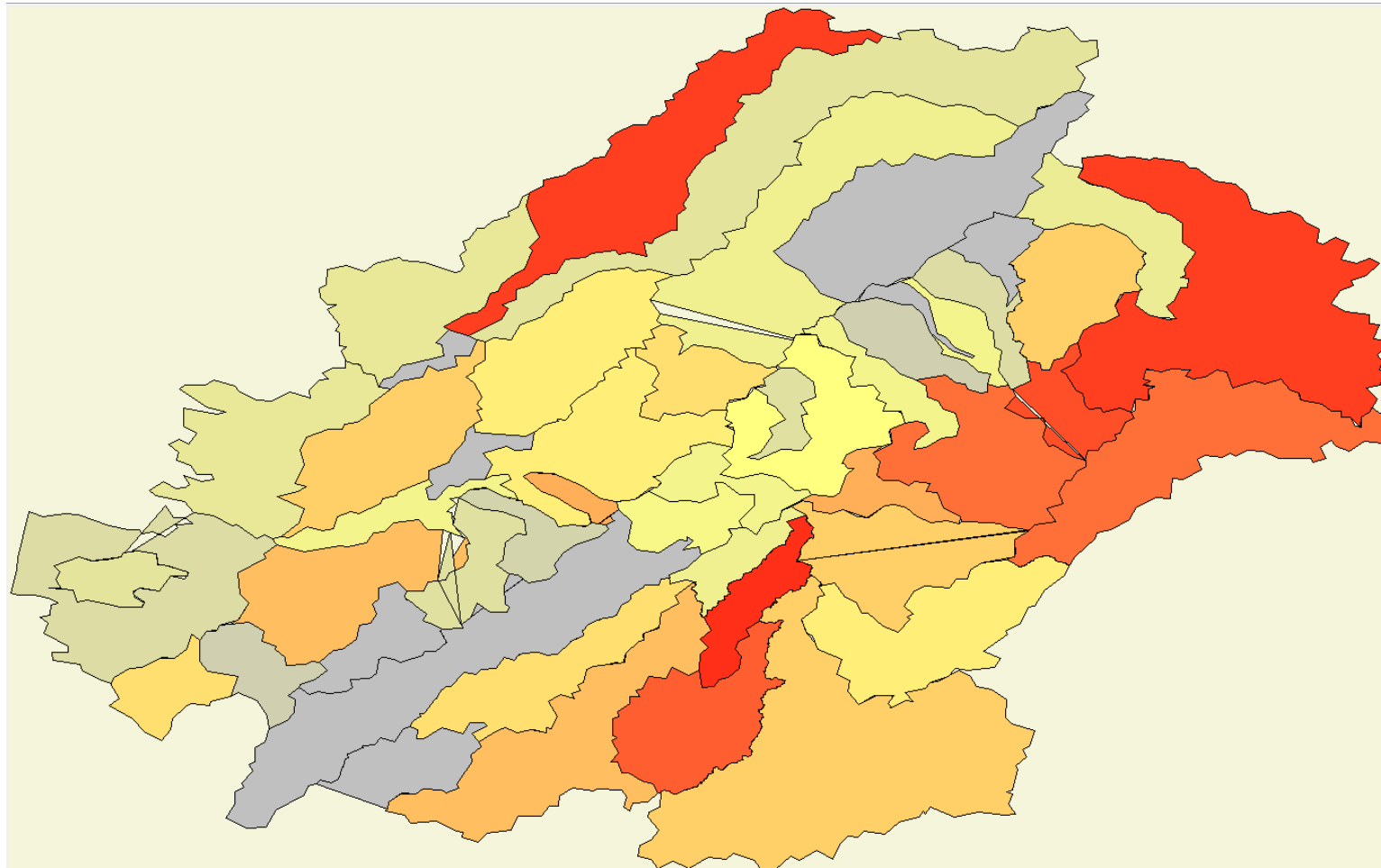
Demographics:
1 Population effect
2 Business as
Usual
3 Restoration

Input for land use change scenarios

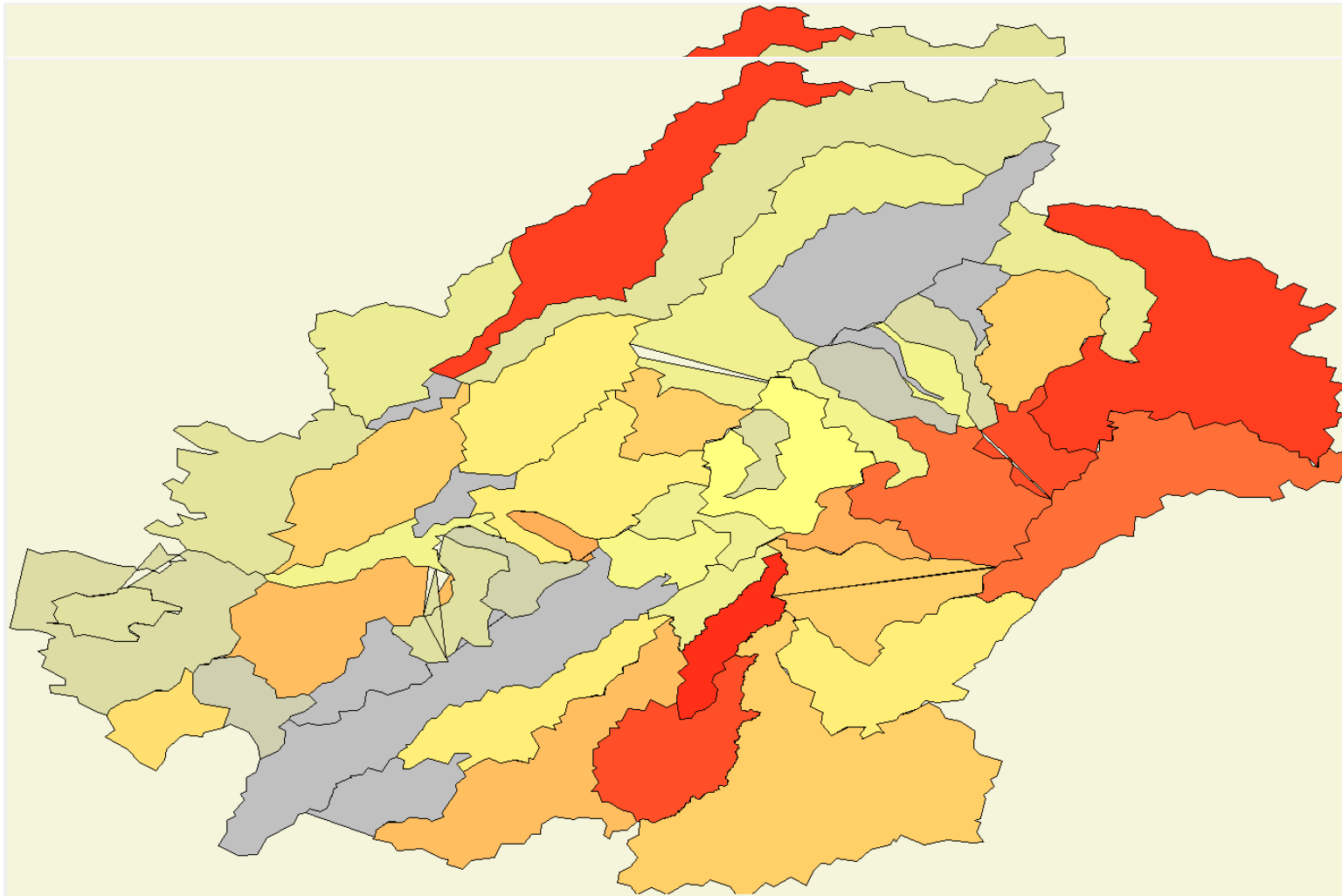


Ecological Economics Research New Zealand

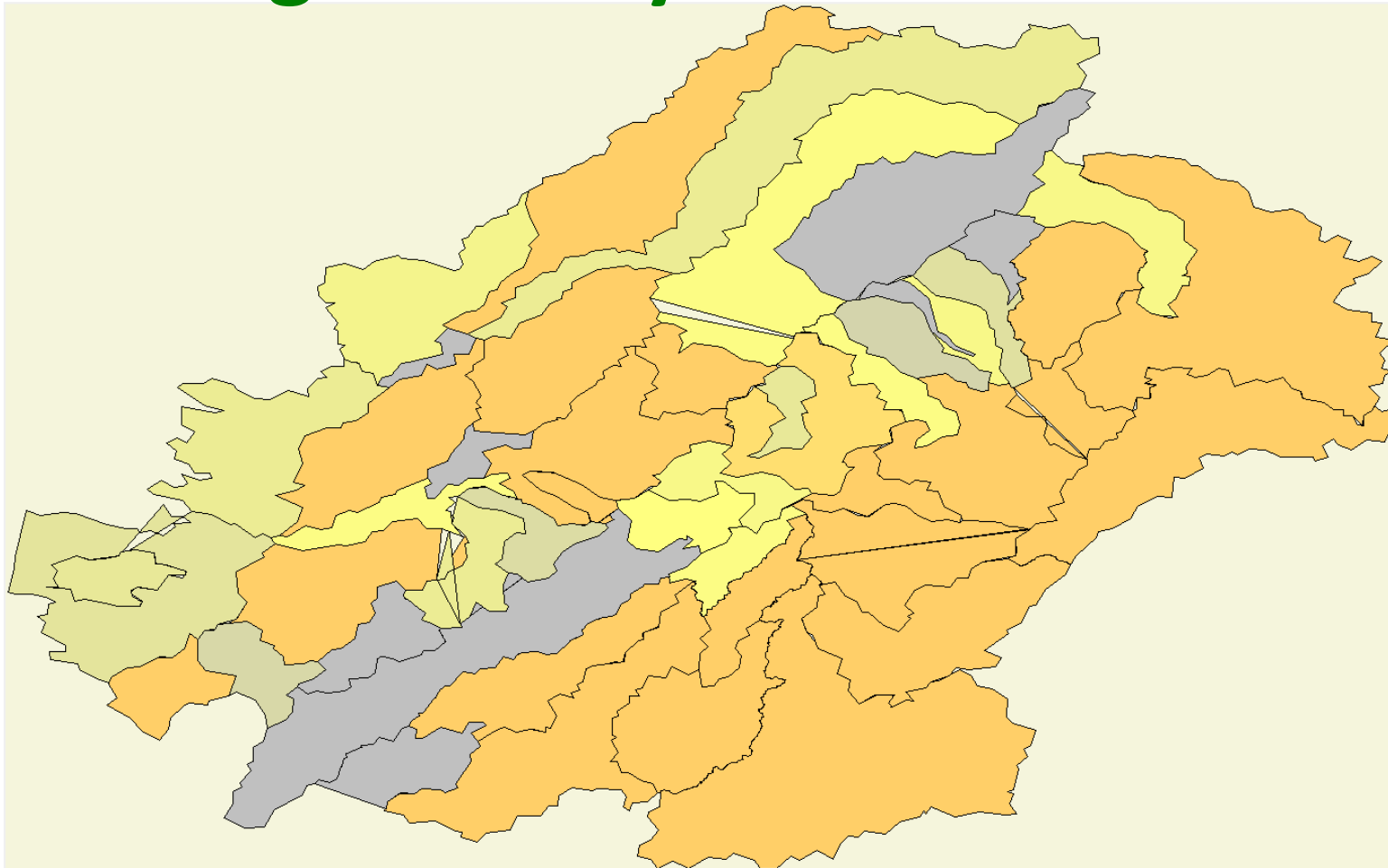
Multi-scale, Spatial, Integrated Modelling of Ecosystem Services



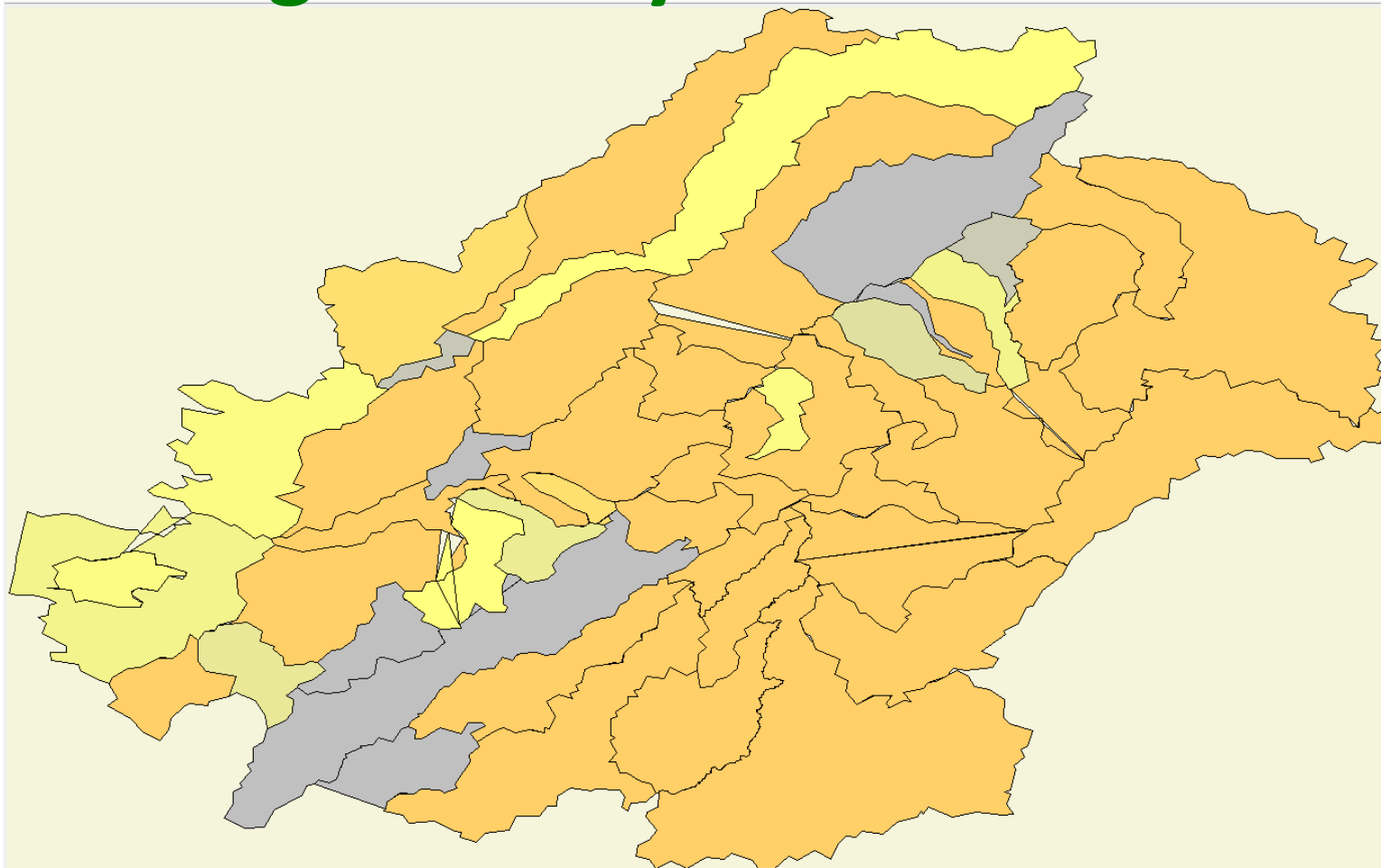
Multi-scale, Spatial, Integrated Modelling of Ecosystem Services



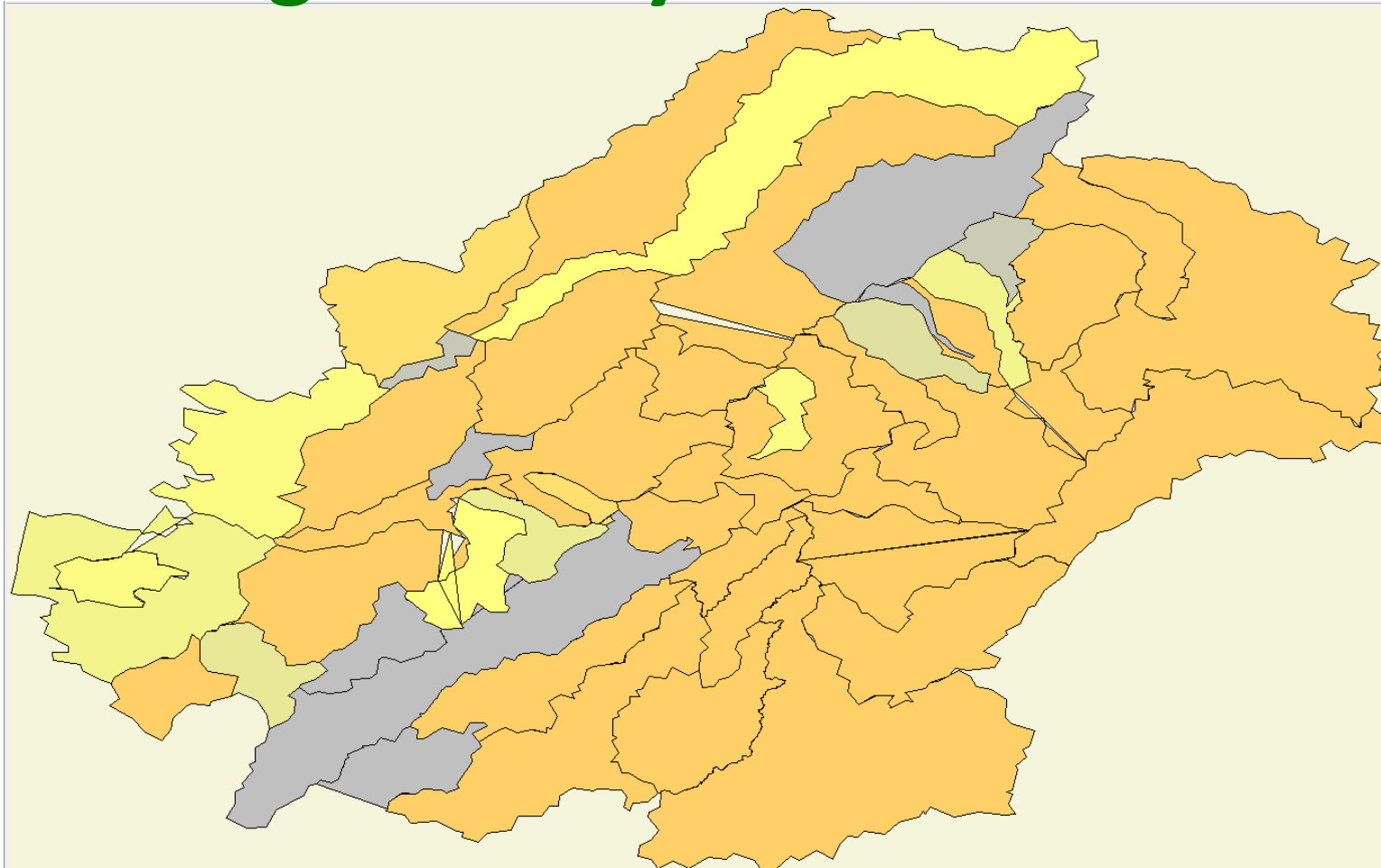
Multi-scale, Spatial, Integrated Modelling of Ecosystem Services



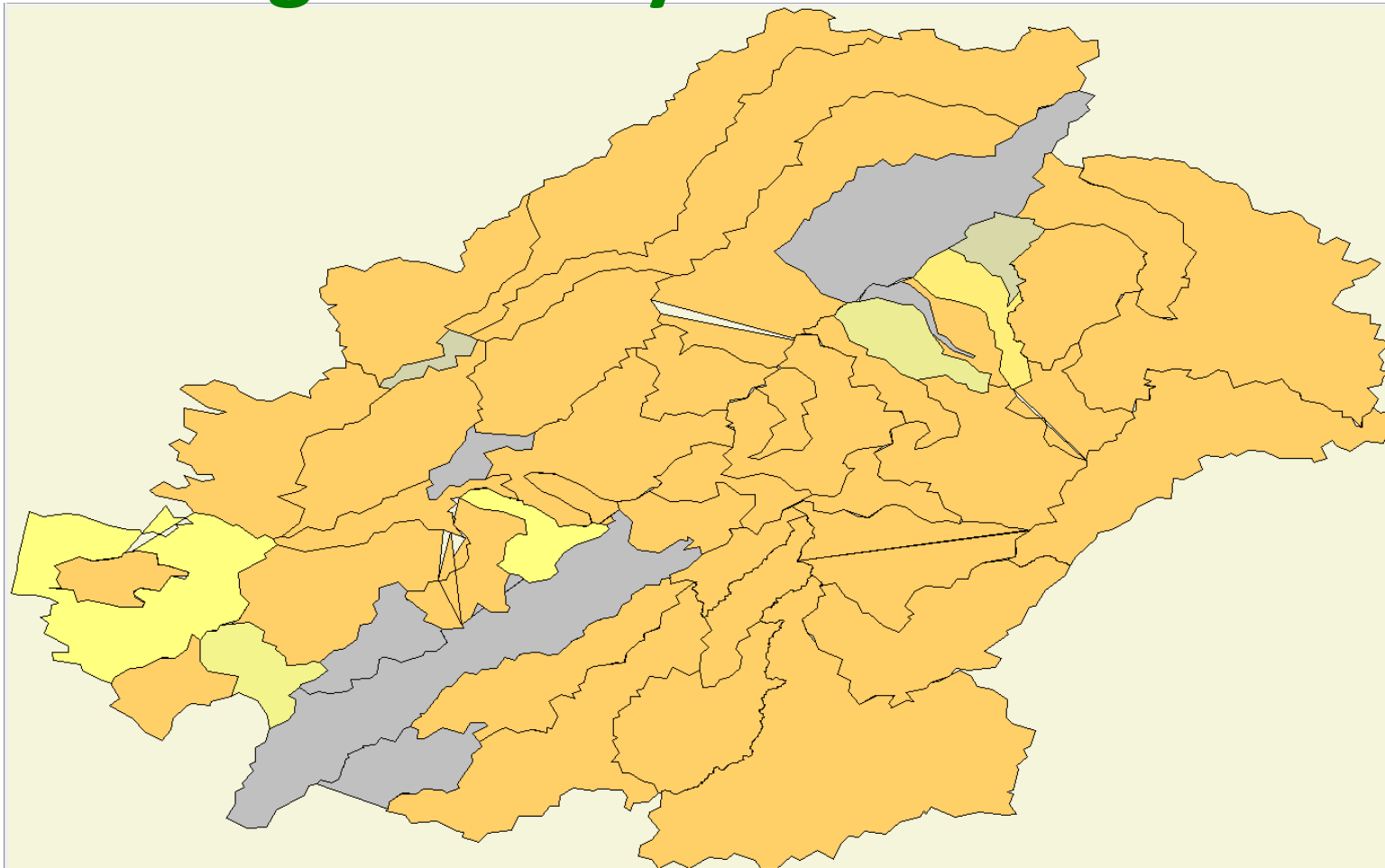
Multi-scale, Spatial, Integrated Modelling of Ecosystem Services



Multi-scale, Spatial, Integrated Modelling of Ecosystem Services



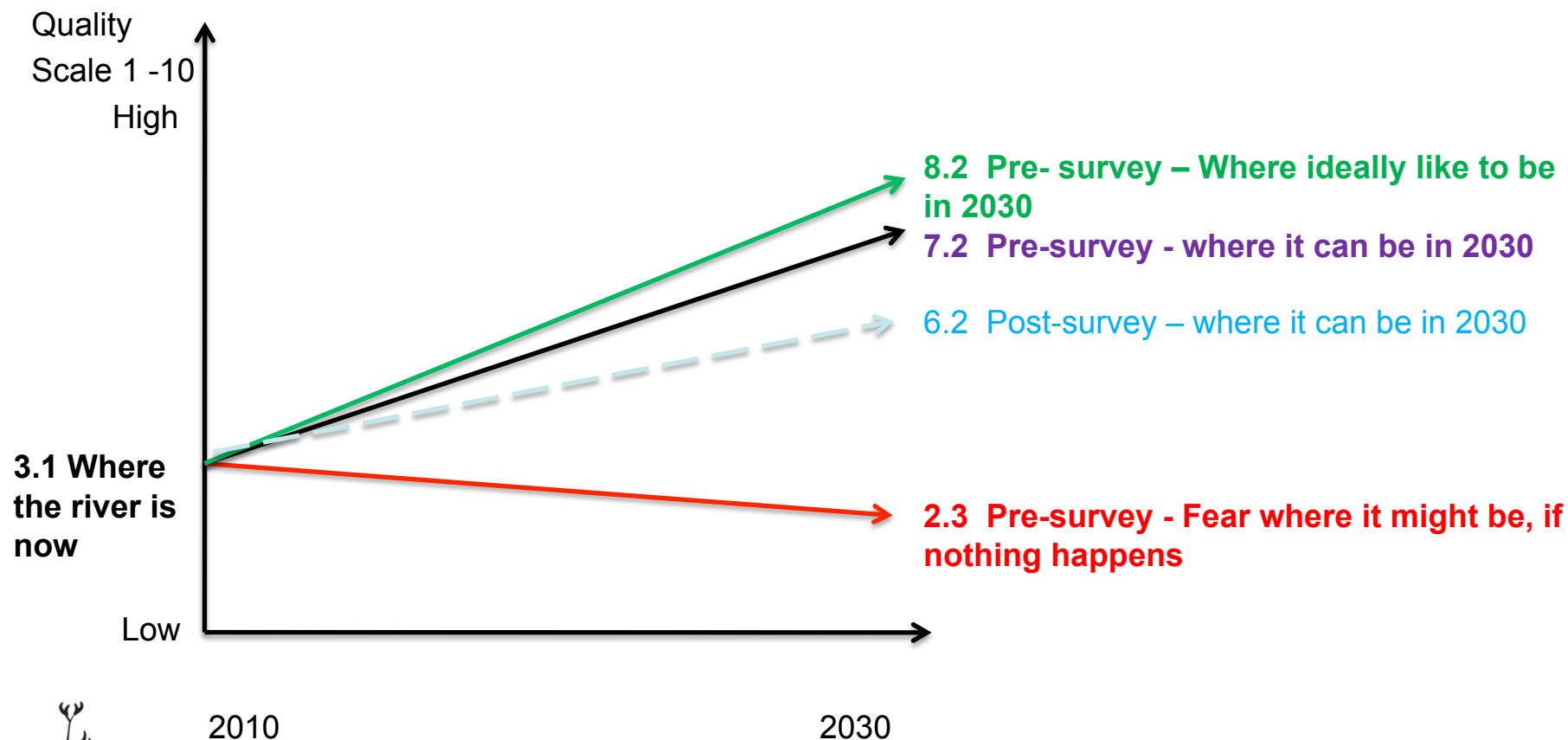
Multi-scale, Spatial, Integrated Modelling of Ecosystem Services



How thinking changed

IFS Survey Results – Pre and Post Workshops

The participants' perception of the quality of the Manawatu River



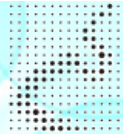
An impact assessor addresses effects:

- Direct
- Indirect
- Cumulative
- Dynamic
- Spatial
- Cultural, social,
economic, ecological



Can Mediated Modelling be useful to Impact Assessors?





The Integrated Freshwater Solutions (IFS) project is led by [Ecological Economics Research New Zealand](#) based at Massey University. Funded by the Ministry of Business, Innovation and Employment the 3-year project is to develop effective tools to address the freshwater management needs of regional councils and local authorities nationwide. Our case study project is the Manawatu River catchment. In September 2010 it was agreed to use the Integrated Freshwater Solutions project to work with stakeholders brought together primarily by the [Manawatu River Leaders Accord](#) to collaboratively define an Action Plan to improve the river's water quality. ['What is happening where'](#) summarises the agreed actions to be undertaken to improve the health of the Manawatu River. [OURS. The Manawatu River Leaders' Accord Action Plan](#) was formally blessed and adopted in ceremonies held on June 22, 2011.

Stakeholders worked together at 7 full-day workshops to come up with the solutions. The [Mediated Modelling Workshop](#) tab allows you to follow the developments and dialogue from these workshops. The current [Mediated Model](#) can be viewed with a free download software.

The IFS project is listed with others on the [Envirolink Decision Support Systems Directory](#). This directory contains a range of relevant models and systems that have been developed or used in New Zealand for supporting decision making.

[Multi-scale Integrated Modelling of Ecosystem Services \(MIMES\)](#) has been developed for the Manawatu Catchment as part of the IFS research project.

[Applied Ecological Economics 132.705](#) will be offered by the Resource and Environmental Planning Programme in Semester 3, 2013. [This is an atelier or workshop paper](#). With this type of paper teaching through lectures is largely replaced by place-based learning through engagement and experience. The Manawatu River will be the case study for the paper this year.



Muaupoko Coastal Research Shellfish Dig



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Thank you!