‘Account-ability of Collaborations’

Integrated Freshwater Solutions (IFS)

9AM-5PM, 6 June 2013, Massey University, Palmerston North, New Zealand

A/P Marjan van den Belt
Vicky Forgie
Heike Schiele
Marc Tadaki

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Massey University

Agenda 6 June 2013

- 8.30 Arrival and coffee
- 9.00 Karakia, Agenda, Introductions, Ground rules and Goals for the Day
- 9.30 Context
- 10.30 Coffee
- 10.45 Framework for Accountable Collaborations - Plenary
- 11.00 Small Groups – What mechanisms exist and might be developed?
- Noon Report from small groups
- 12.30 Lunch
- 1.30 Tools for Accountable Collaborations
- 3.00 Coffee
- 3.15 Small Groups – Recommendations for future integrative tools.
- 4.15 Report from small groups
- 4.45 Summary, Karakia
- 5.00 Close

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Apologies

- Richard Thompson, MRLF, maybe late from Wellington
- Jono Naylor, Palmerston North City Council
- Wally Potts, Horowhenua District Council
- Phillipa Fourie, Fonterra
- Pete Sebborn, Forest and Bird

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Introductions

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Ground rules for the day

- Regular and New Participants
- ‘Common Ground’ statements, ‘Parked Issues’ working toward Recommendations
- Keep contributions short
- Ask questions for clarification and understanding
- Allow ideas to exist and grow, take them in, actively listen, listen for possibilities, allow for the possibility of being inspired, even when you would prefer to immediately shut out the ideas based on your rationale
- Focus on that which is equally good for all
- Disagree without being disagreeable
- Hand-outs available

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Goals for the day

- Exploring the next phase of collaborative and adaptive management of the Manawatu River.
- Defining what account-ability means in a collaborative process.
- Discussing tools to enable accountable processes.
- Establishing if there is common ground regarding 'Account-ability of Collaborations' –> Recommendations.

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Integrated Freshwater Solutions: research objectives in 2010

- To use and test two synergistic modelling approaches, **Mediated Modelling** (MM) and **Bayesian Belief Network** (BBN) Modelling

- Three **iwi** focus on a relevant **local research** question and participate in **regional MM process**

- **Uptake** of the recommended outcomes, action plans and modelling tools that evolve during the MM and BBN

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Action Plan – IFS task 1:

'Continue to build the MM (Mediated Modelling) and BBN (Bayesian Believe Model)'

Status:

(1) The Mediated Model is online at http://www.ifs.org.nz/mediated-modelling-workshop/mediated-model/current-model/. Report in review.

(2) The BBN model has morphed into a Multi-scale Integrated Model for Ecosystem Services (MIMES) model for the Manawatu.

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Action Plan IFS task 2:

'Refine the MM and BBN models informed by:

- **monitoring results**
- **more workshops on Accord goals**
- **on-going Forum activity**

Proposed workshops 2011: 22 June, 21 Sept, 02 Nov.'

- Workshops on Accord Goals :

(1) The Economics of the Manawatu River (Nov 2011) Two reports are available on the website (i) Cost Benefit Analysis of Selected Options to Improve Water Quality in the Manawatū River Catchment (ii) Evaluation of Regional and National Economic Impacts of Mitigation Scenarios

(2) Pan-iwi Kaupapa day (Sep 2012)

(3) Account-ability of Collaboration (June 2013).

(4) Feedback has been presented at MRLF meetings.

(5) Monitoring results

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INTEGRATED FRESHWATER SOLUTIONS

Go

home | about the project | project update | mediated modelling workshop | project outputs | stakeholders area | contacts

- Presentations
- Publications
- Iwi Projects
- MIMES

publications

- van den Belt, M, 2011, Ecological Economics of Estuaries and Coasts. Chapter 1 in Volume 12 of Treatise on Estuaries and Coasts. Eds M.van den Belt and R. Costanza. Elsevier.
- van den Belt, M., V. Forgie and J. Farley, 2011, Valuation of Ecosystem Services from Estuaries and Coasts. Chapter 3 in Volume 12 of Treatise on Estuaries and Coasts. Eds M.van den Belt and R. Costanza. Elsevier.
- Vidalra, N. P. Antunes, R. Santos, M. van den Belt, M, 2011, Integrated Modelling of Ecosystem Services. Chapter 5 in Volume 12 of Treatise on Estuaries and Coasts. Eds M.van den Belt and R. Costanza. Elsevier.
- van den Belt, Marjan. 2012, "Mediated Modeling: a useful tool for a collaborative and integrated assessment of the Galápagos?" In The Role of Science for Conservation, edited by Matthias Wolff and Mark Gardener, 228-239. London: Routledge, 2012.
- Herath, I., Deurer, M., Horne, D., Singh, R., and Clothier, B.E., 2011. The water footprint of hydroelectricity: a methodological comparison from a case study in New Zealand. Journal of Cleaner Production 19 (2011), 1582-1589.
- Bourget, E. C., Langsdale. S.M., van den Belt, M. *In press 2013.* Introduction to the Featured Collection of Journal of American Water Resource Association: Collaborative Modeling for Decision Support as a Tool to Implement Integrated Water Resources Management, Wiley.
- van den Belt, M., H. Schiele and V. Forgie. 2013 Integrated Freshwater Solutions - A New Zealand Application of Mediated Modeling. Special Issue of Journal of American Water Resources Association (JAWRA) on Collaborative Modeling. DOI=10.1111/jawr.12064&ArticleID=1133735
- van den Belt, M., T. Bowen, K. Slee and V. Forgie. 2013. Flood Protection: highlighting an investment trap between built and natural capital. Special Issue of Journal of American Water Resources Association (JAWRA) on Collaborative Modeling, Wiley. DOI=10.1111/jawr.12063& ArticleID=1133734
- van den Belt, M. (2011) Integrated Freshwater Solutions: a case study of the Manawatu River, New Zealand. AWRA 2011 Summer Specialty Conference on Integrated Water Resources Management: The Emperor's New Clothes or Indispensable Process. Proceedings from the June 27-29, Snowbird Conference, Utah, USA.

www.ifs.org.nz

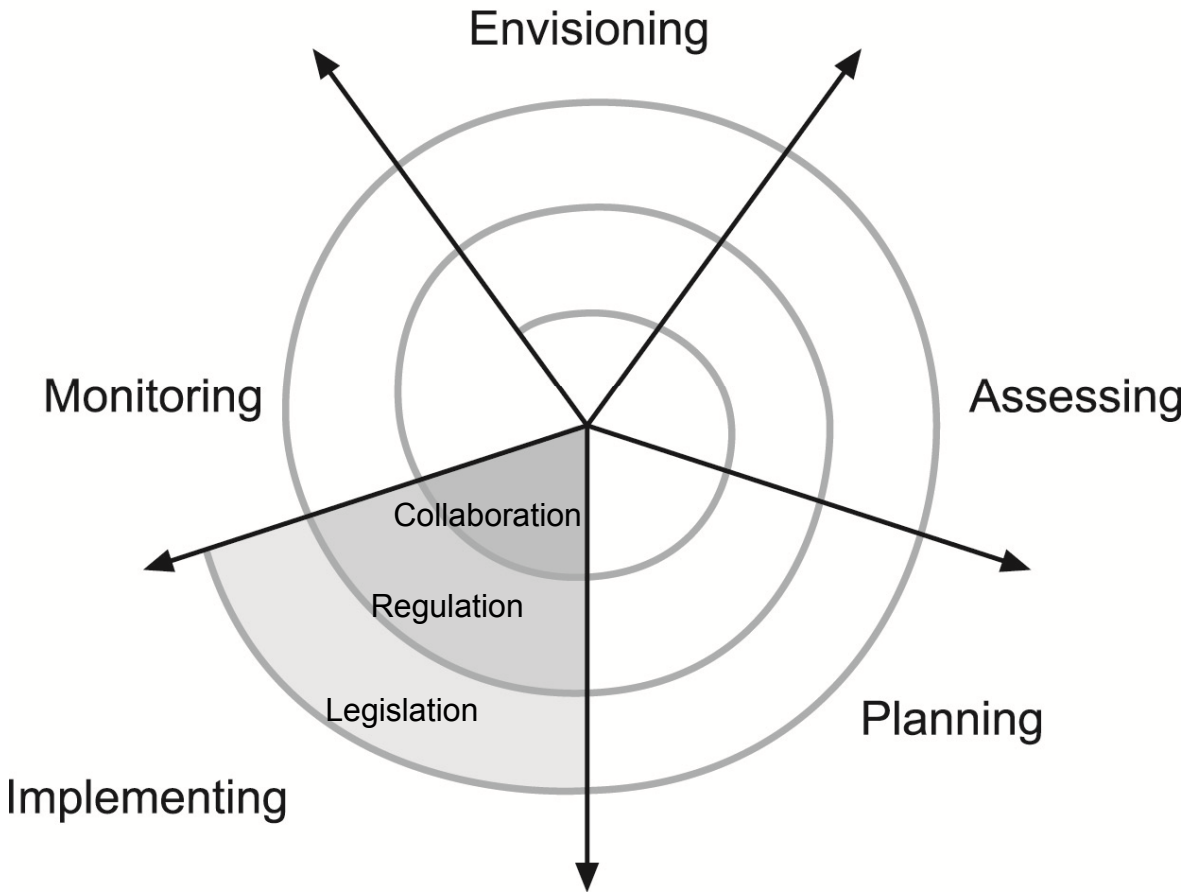
Cost Benefit Analysis of Selected Options to Improve Water Quality in the Manawatu River Catchment

This report provides a CBA for five key actions to improve water quality in the Manawatū River Catchment.

Evaluation of Regional and National Economic Impacts of Mitigation Scenarios

This report by Market Economics provides an Economic Impact Assessment of five

Adaptive Management



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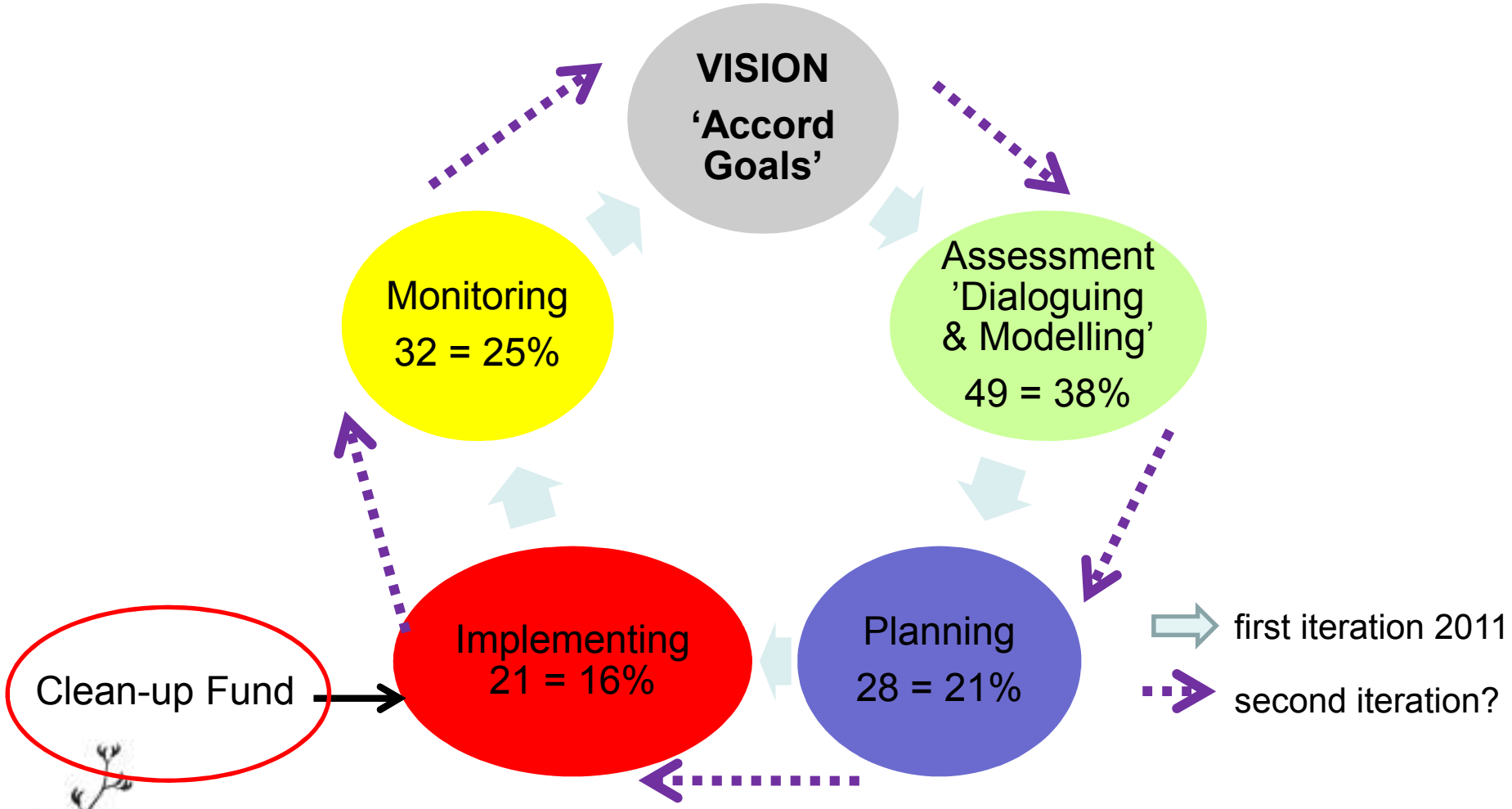
Adaptive Management
Positioning of the 130 Tasks in the Manawatū River Action Plan



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Vision

Leaders' Accord Vision

Kei he ora te wai,
Kei te ora te whenua,
Kei te ora te tangata.

If the water is healthy,
The land and the people
Are nourished

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Goals of Accord (2010)

- The Manawatu River becomes a source of regional pride and mana (dignity and respect).
- Waterways in the Manawatu Catchment are safe, accessible, swimmable, and provide good recreation and food resources.
- The Manawatu Catchment and waterways are returned to a healthy condition.
- Sustainable use of the land and water resources of the Manawatu Catchment continues to underpin the economic prosperity of the Region.

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Does the Vision - Accord Goals require an update?
Characteristics of a vision:

- **Focus on what one really wants**, not what one will settle for.
- A vision should be **judged by the clarity of its goals**, not the clarity of its implementation path. Holding to the vision and being flexible about the path is often the only way to find the path.
- Responsible vision must **acknowledge,** but not get crushed by, the physical and political **constraints** of the real world.
- It is critical for visions to be shared because only **shared visions** can be responsible.
- Vision has to be **flexible and evolving**. Thus the process of envisioning is at least as important as the particular visions themselves.

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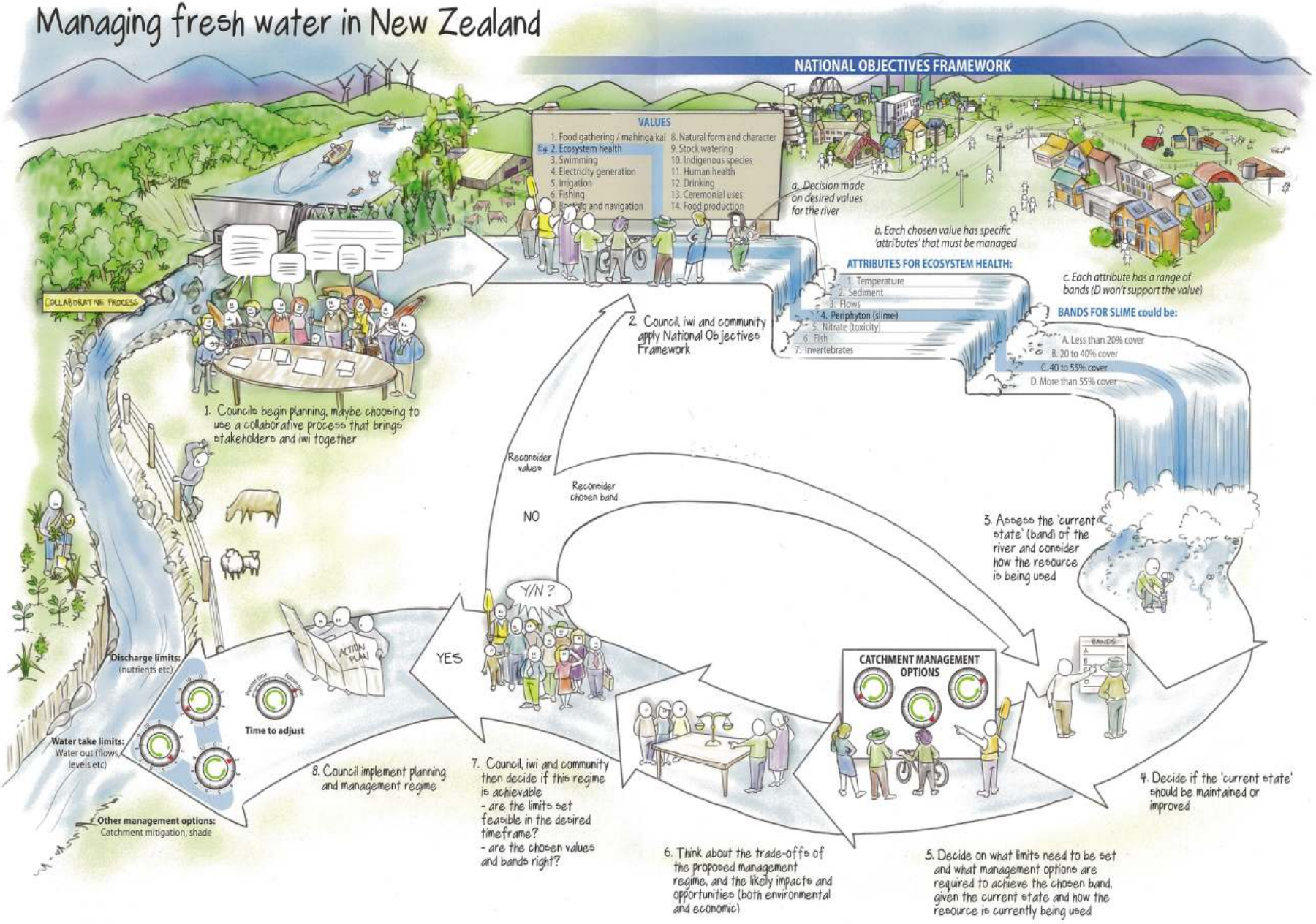
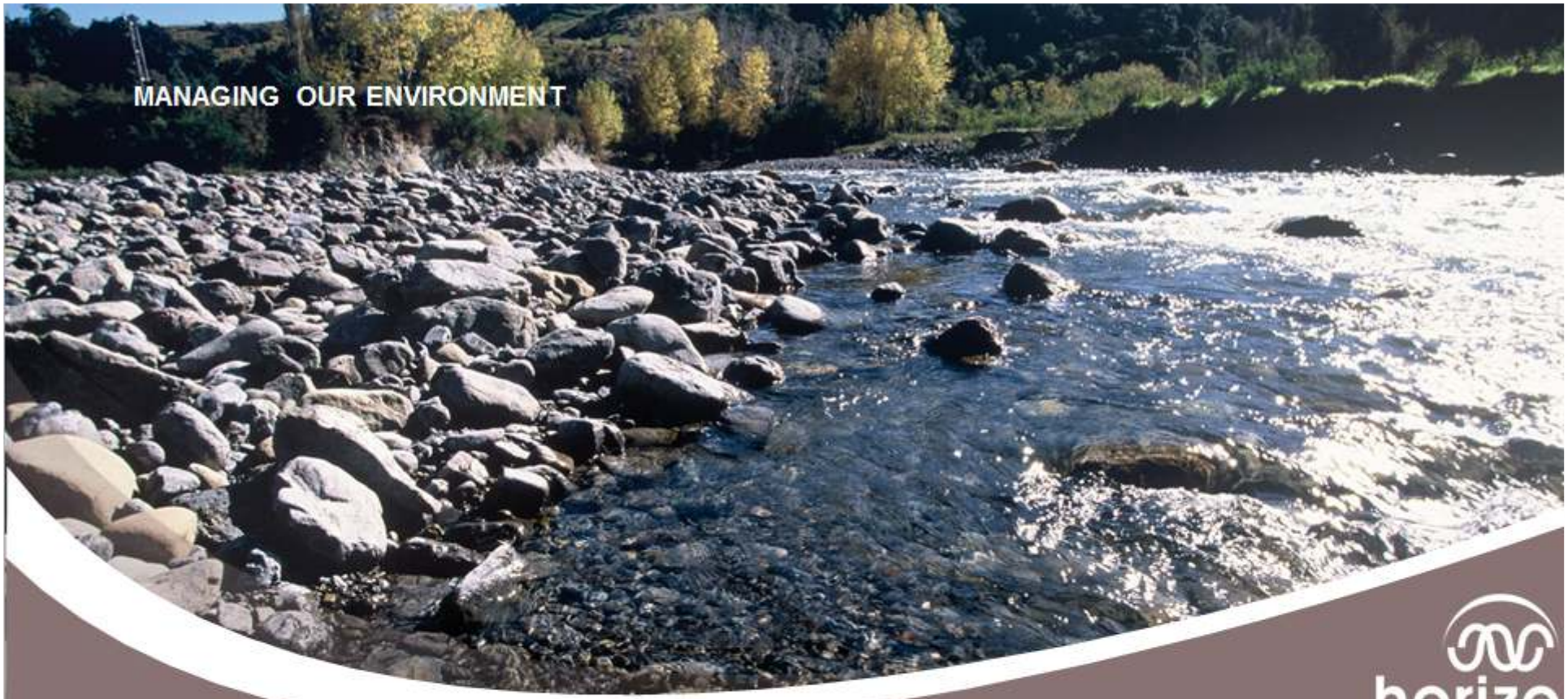
Source: Meadows,



Source: MfE, 2013



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IFS workshop: Clean-up Fund progress

Jon Roygard

Ministry for the Environment
Manatu Mo Te Taiao

Fresh Start for Fresh Water Clean-Up Fund

OURS.
THE MANAWATU RIVER

- Wastewater treatment upgrades
  - Woodville, Dannevirke & Pahiatua (Tararua DC)
  - Feilding & Kimbolton (Manawatu DC)
  - Shannon (Horowhenua DC)

- Stream Fencing
- Native fish and whitebait habitat restoration
- Environmental Farm Plans
- Community involvement




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Clean-up Fund Criteria

- About works (some projects rejected by MfE)
- 50% co-funding required (Horizons, District Councils, DairyNZ)
- Timeframes for delivery – two year project
- Tangible outcomes

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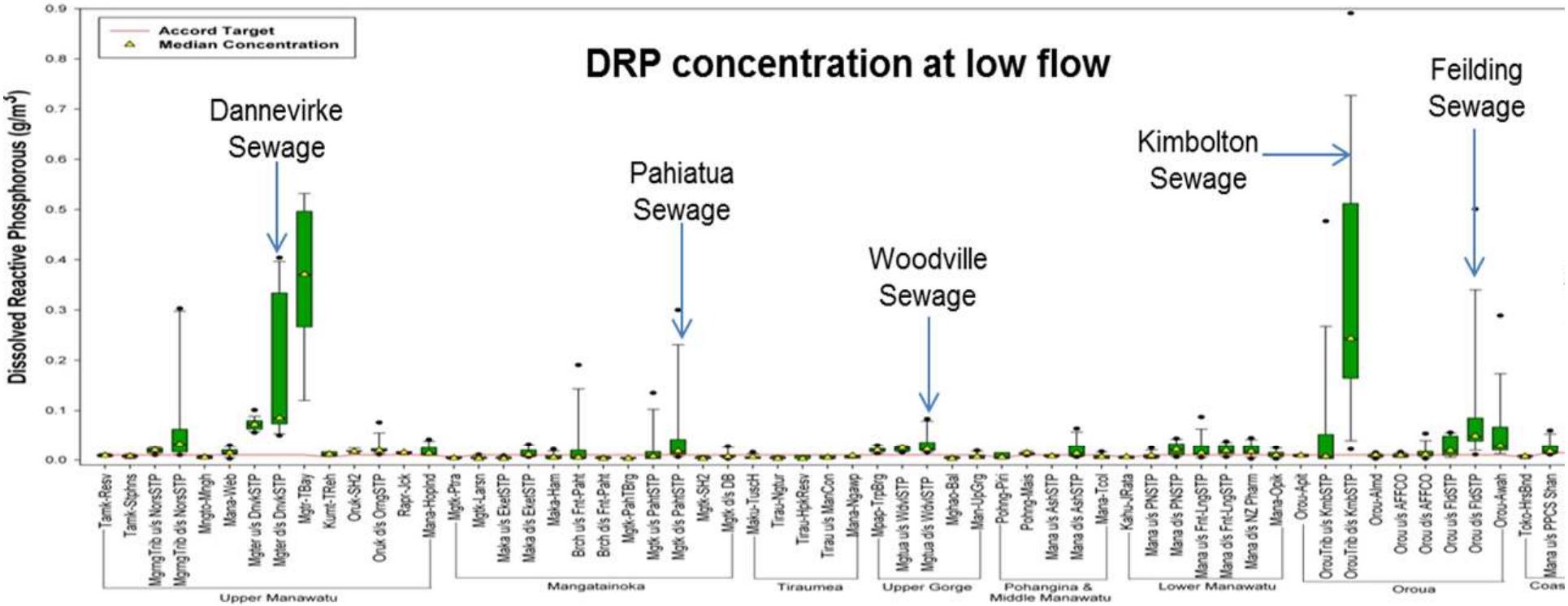
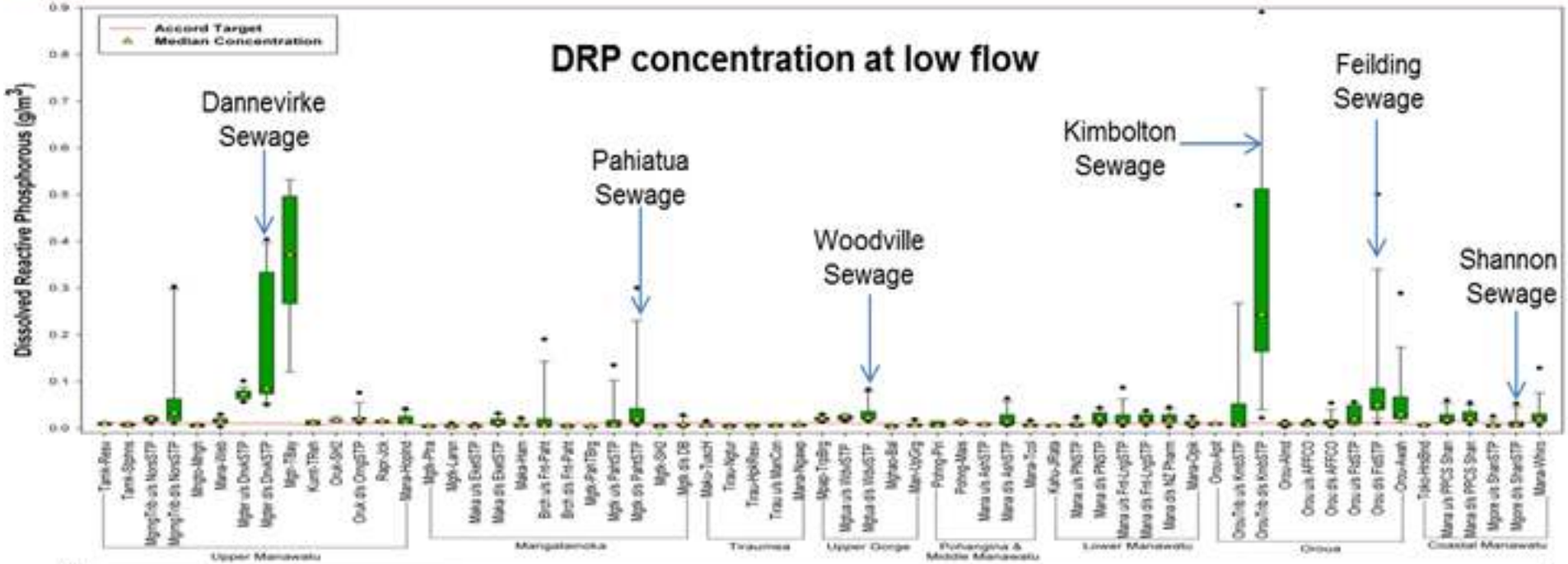
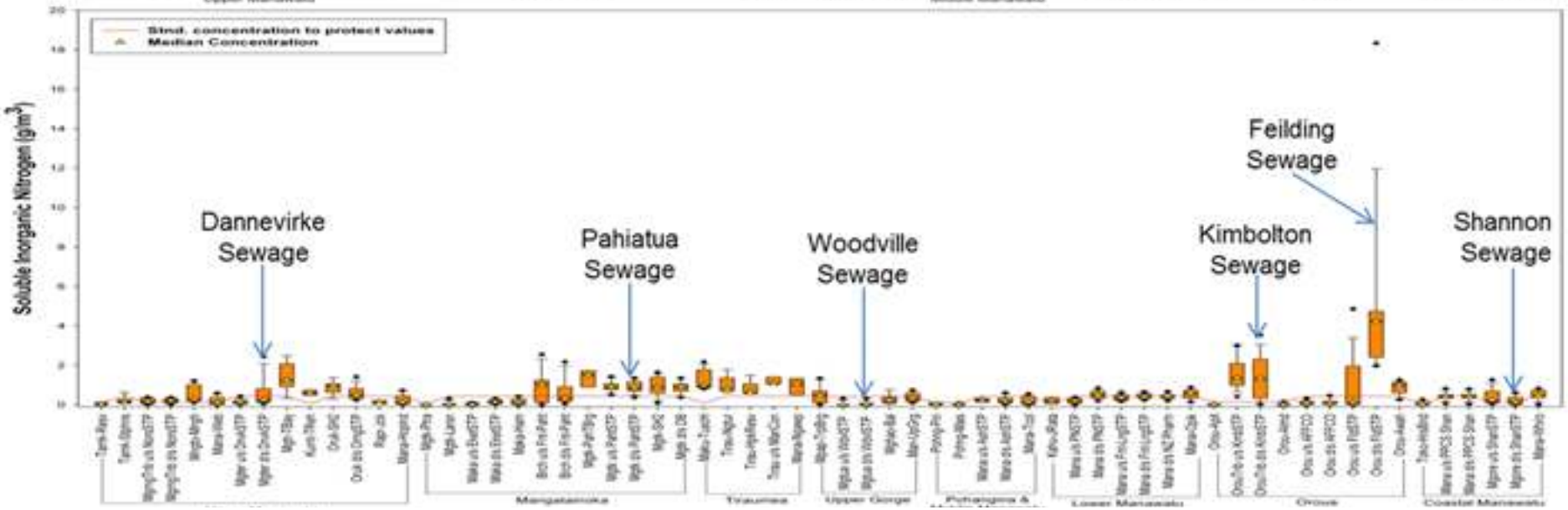
Project selection

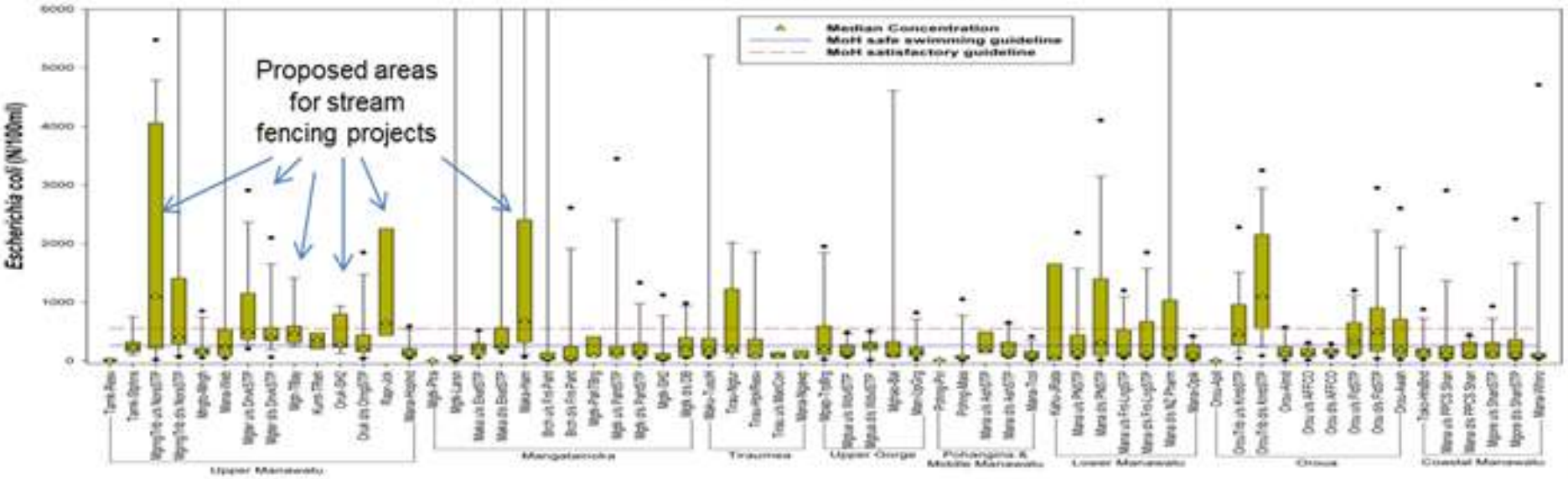


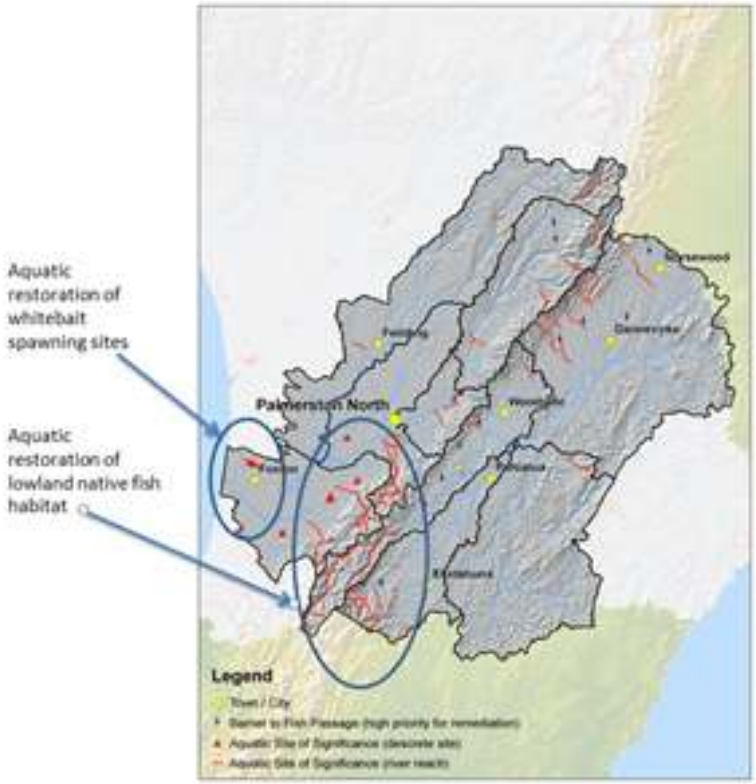
Project selection

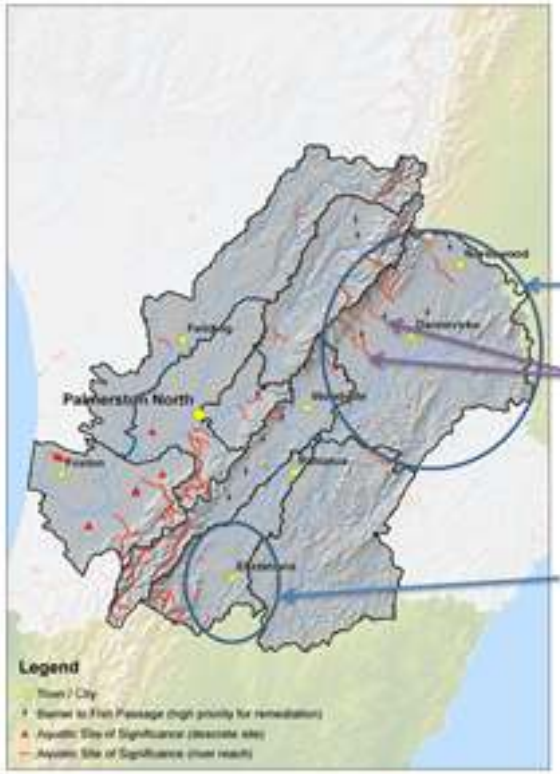




E.coli concentration at low flow







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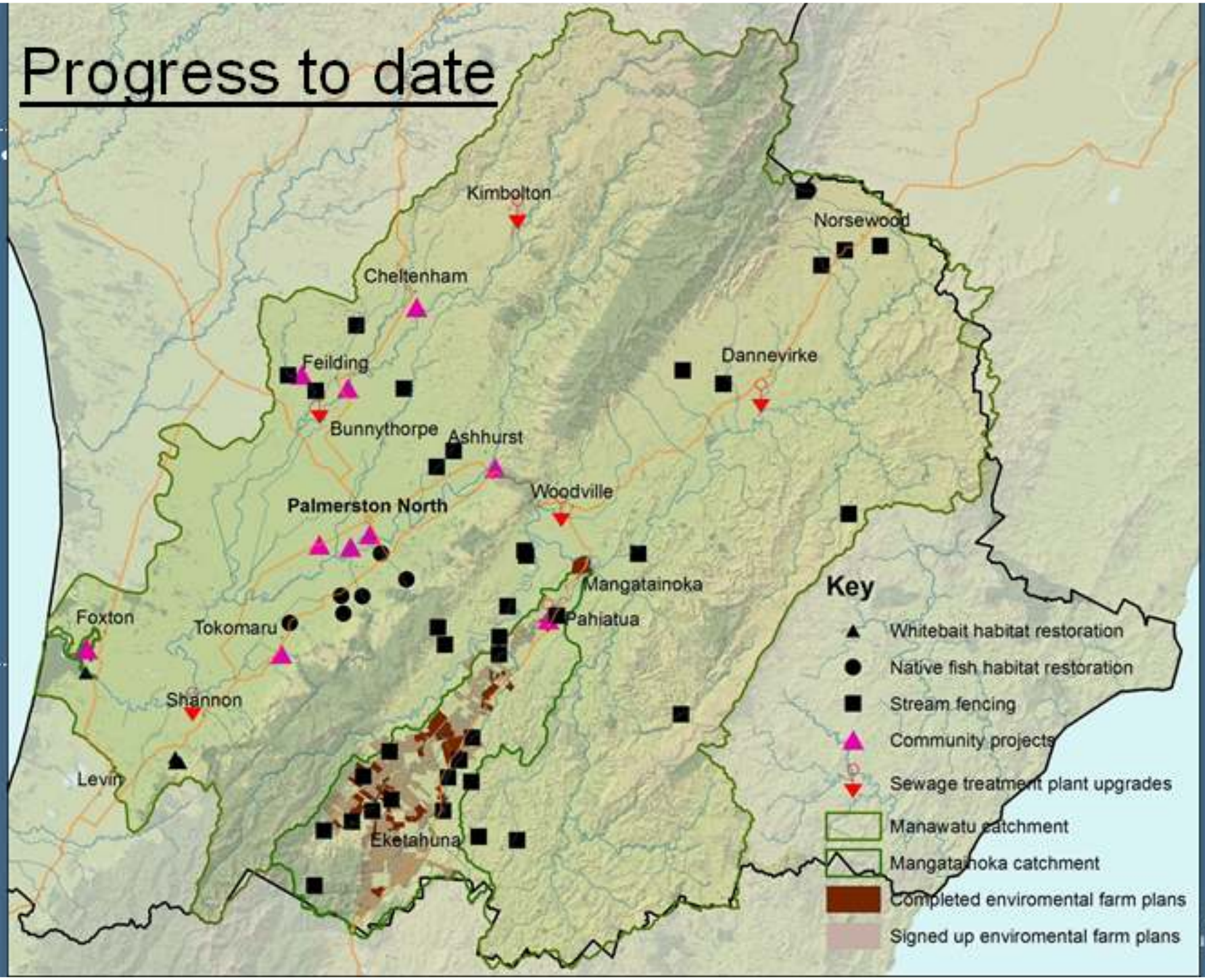
Progress to date



Recent & upcoming events

Project	Who is involved	When & where
Lower Kahuterawa Project Start of 11 year project	Horizons, Massey, NZDF	Official signing of projectstart. Wednesday 29th May, 10 amat The Chalet
Pukemiku Stream Final year fencing and planting on Fonterra leased land	Horizons & Fonterra	First week in July. Employees of Fonterra and Horizons to do planting.
Source of Manawatu Official launch at Rakautatahi Marae and community planting day	Horizons & Tararua District Council, Te Kauru	Official launch 13th July at Rakautatahi Marae 9.30amfollowed by community planting day 10.45-11amend of Manawatu Valley Road Noreswood.
Whitebait Creek Conservation volunteers planting in mid June	Horizons & Landcare Trust	Foxton Beach. Dates to be confirmed. Mid June
Whirokino whitebait spawning site	Horizons, Muaupoko, Rakawa and TMI, HDC, DOC	Stage one of planting starting Tuesday June 4th

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Click to add title

How to read these plots

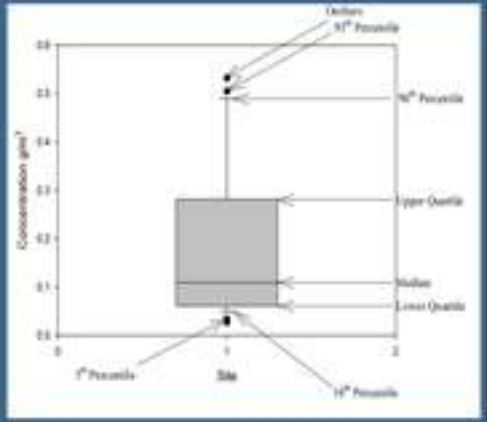
The diagram on the right shows the different statistical values in a box plot

Percentile: x percent of the data (samples collected) are below this value. The 5th and 95th percentiles are the first dots after the error bars

Lower Quartile: a quarter (25%) of all samples are lower than this value

Median: The midpoint in the data exactly half of the samples are lower and half of the samples are higher

Upper Quartile: three quarters (75%) of all samples are lower than this value



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Interviews with Marc Tadaki

see hand-out

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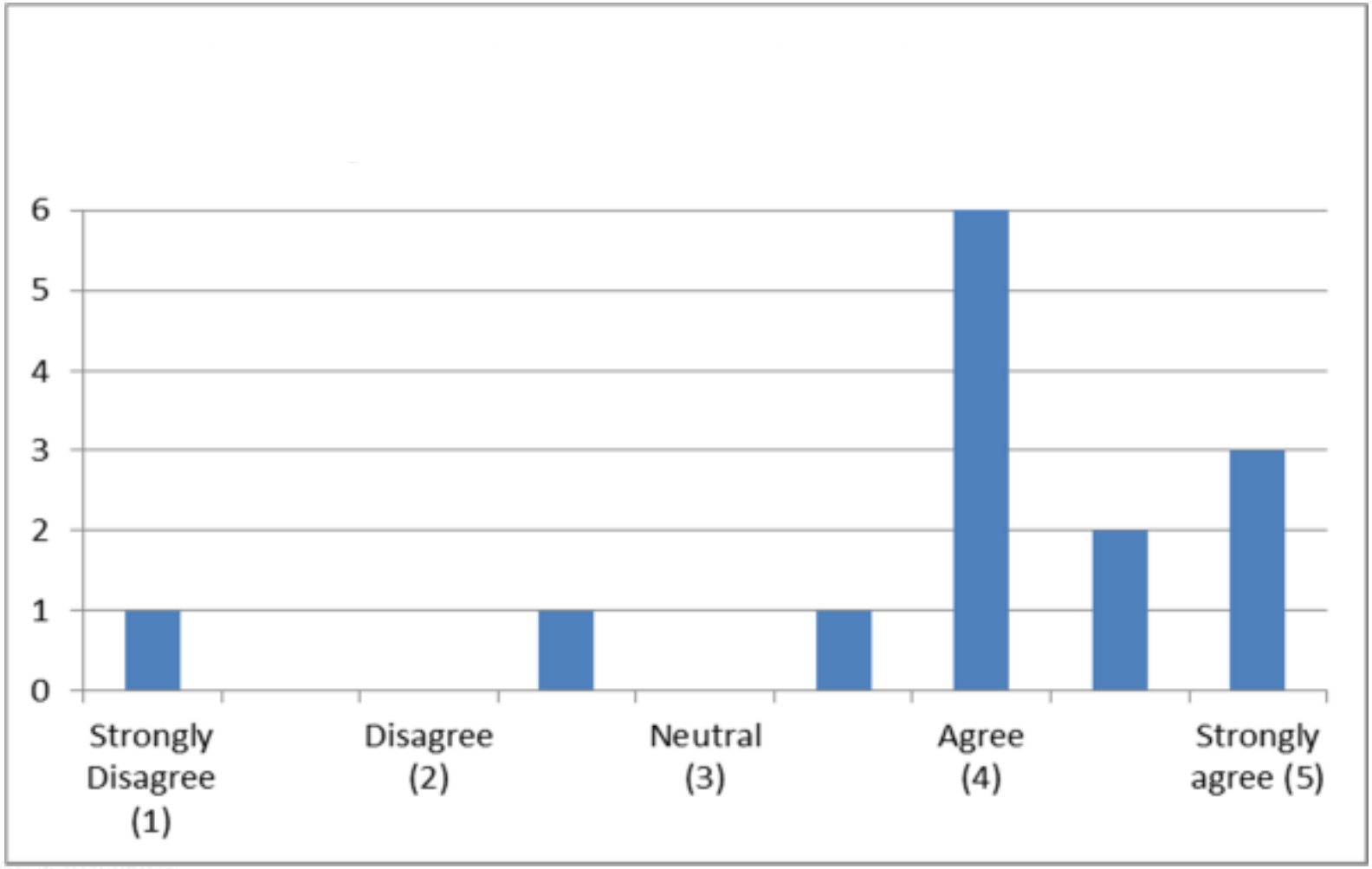
The Action Planning and Implementation process has been successful



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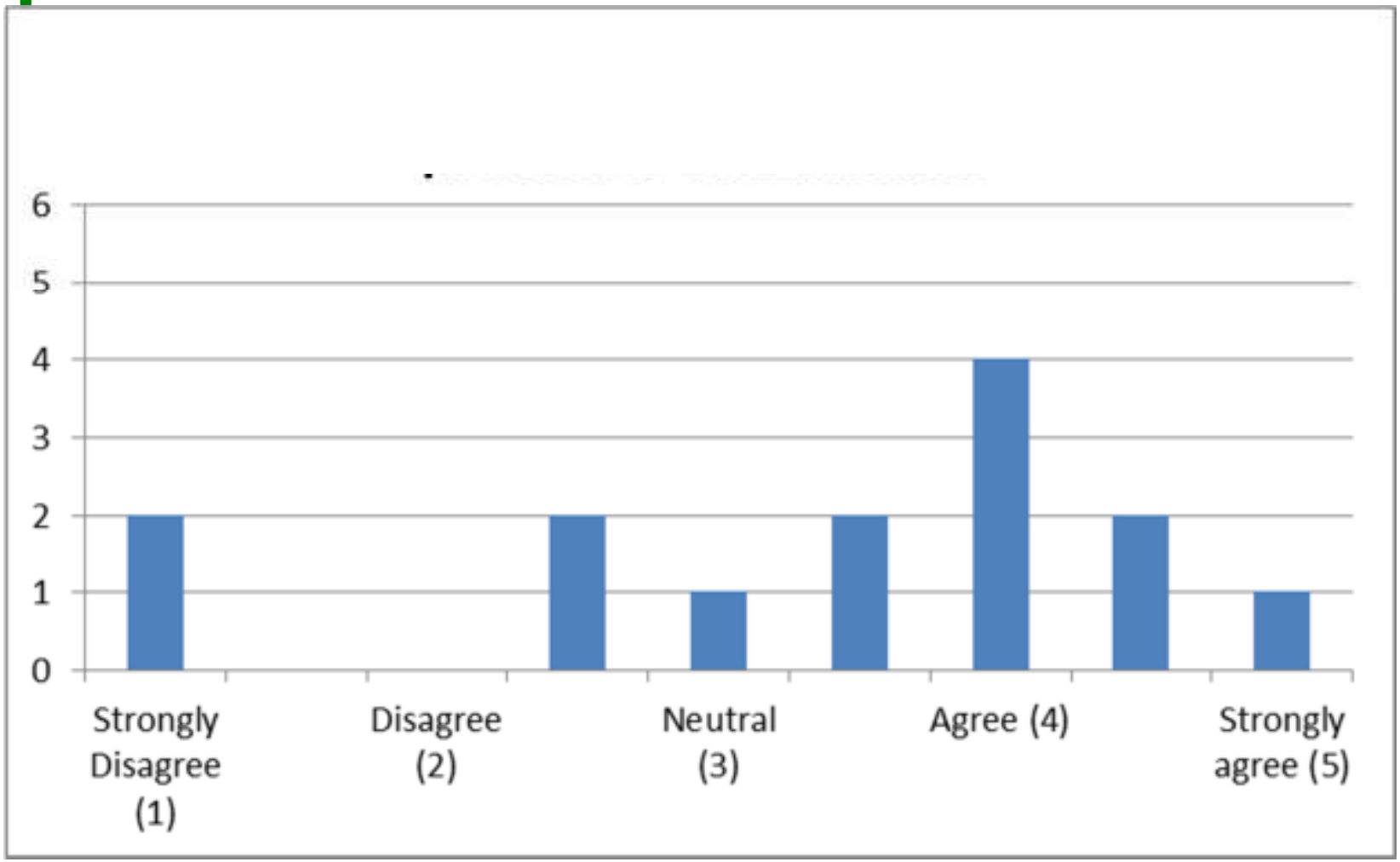
The Action Planning and Implementation is Accountable



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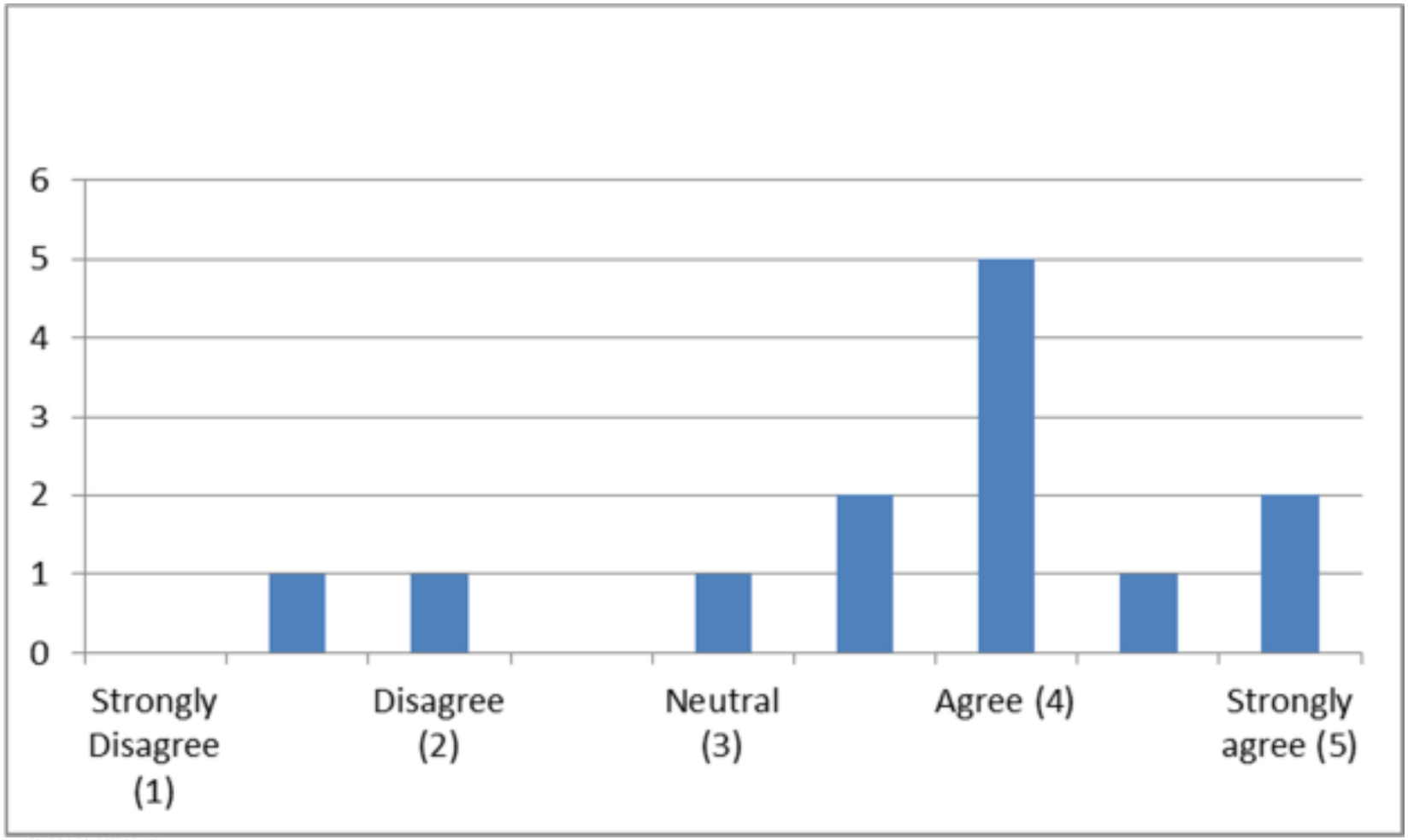
I am confident that relationships built will lead to measurable outcomes in the future



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Themes resulting from Marc's interviews

- Aspects of success
- Implementation process
- Accountability of the Action Planning process
- Adaptive Action Planning
- Measuring outcomes
- Value of modelling process and tools
- Communicating the state of the river
- Preliminary recommendations

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Response to interview outcomes

- How can the interviews and resulting themes be used toward recommendations today?

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10.30 coffee break

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10.45 Framework for account-ability Small Group Questions:

- Reflecting on the context presented this morning are there any additions or observations you would like to make?
- Is there a need to revisit the vision for the river (as in the Accord goals). Should there be future iterations of the action planning process (working through the adaptive management cycle)? If yes, when and how should this happen?
- What mechanisms provide the ability to account for outcomes from the collaborative process?
- What additional mechanisms would strengthen the ability to account for outcomes from the collaborative process?

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Noon – 12.30
Report from Small Groups

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12.30 Lunch at Wharerata

- Start again at 1.30 with ‘common ground’ synthesis based on outcome from the morning

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1.30 Tools for Collaborations and ability to demonstrate progress

- Total Economic Value (TEV)
- Cost Benefit Analysis (CBA)
- Economic Impact Analysis (EIA)
- Mediated Modelling (MM): Regional and Pohangina
- Video documenting
- Flood Protection: an investment trap.
- Multi-scale Integrated Model for Ecosystem Services (MIMES)

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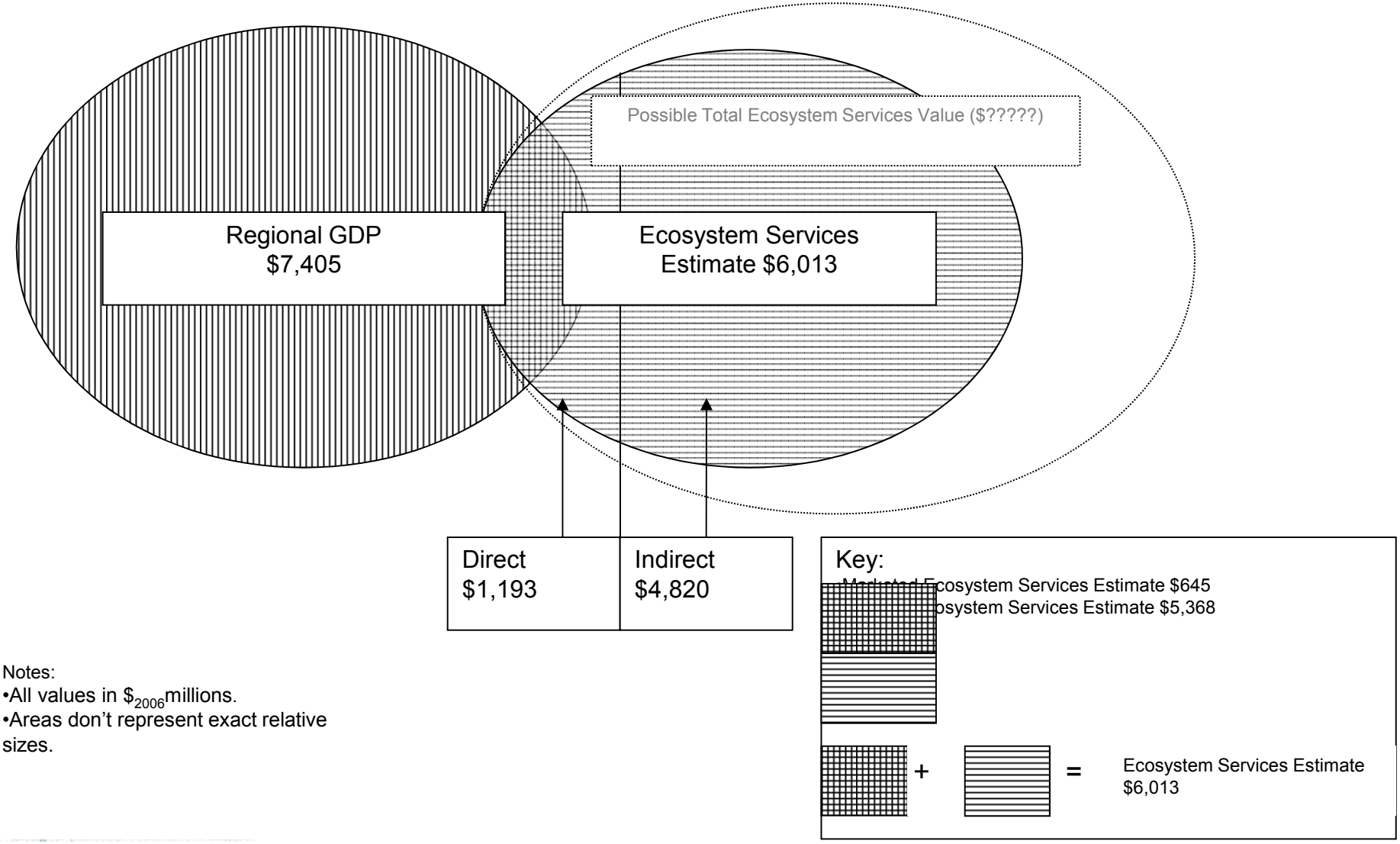
Total Economic Value (TEV)



Notes:
•All values in $\$_{2006}$millions.
•Areas don't represent exact relative sizes.

Cost Benefit Analysis (CBA)

- Options and benefits have to be clear.
- Assumptions have to be clear.
- All-else-is-equal needs to be agreed upon, at least in the short run.
- Are the benefits from a CBA are bigger than the cost of a CBA?
- See CBA report of 5 options from IFS on www.ifs.org.nz

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Economic Impact Analysis (EIA)

- Traces dollars and employment through economic sectors at local and national level.
- Limited to ‘economic’ activities only: price isn’t equal to value.
- What is good for local level isn’t always good for national level.
- See EIA report of 5options from IFS on www.ifs.org

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Cost Effectiveness Analysis

- Determine a specific, measurable, achievable, realistic, time bound goal
- Develop alternative pathways toward that goal
- Calculate the cost toward that goal
- Reveal all assumptions to get to goal

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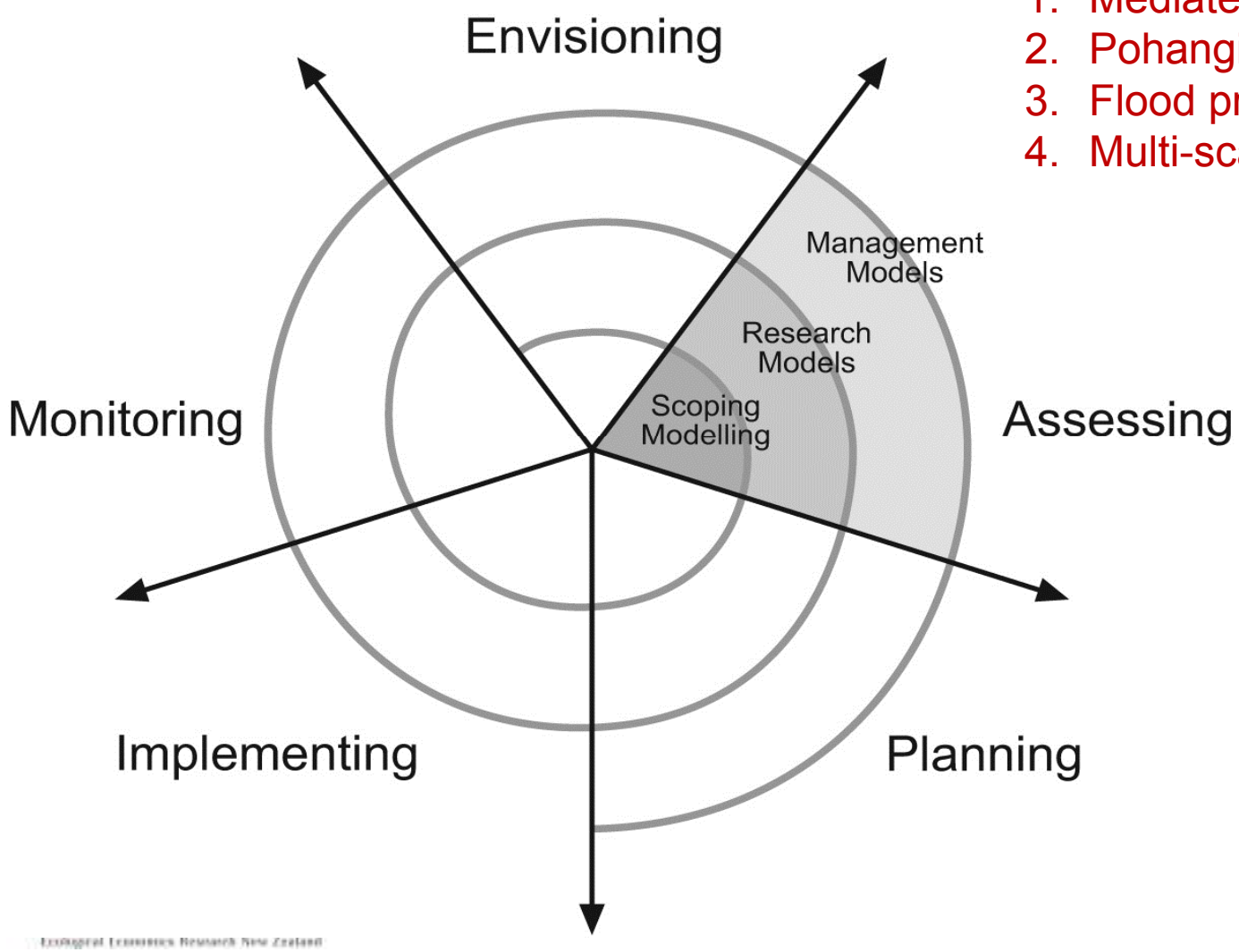
How do Modelling Tools support Planning and Adaptive Management?



Four integrated assessment tools

1. Mediated model
2. Pohangina model
3. Flood protection model
4. Multi-scale model

Source: van den Belt, 2009

Degree of Understanding of the System Dynamics

EXPERT MODELING

~~Typical result:~~
Specialized model whose recommendation never gets implemented because they lack stakeholder support

MEDIATED MODELING

~~Typical result:~~
Consensus on both problems/goals and process - leading to effective and implementable policies

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-

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Degree of Consensus among Stakeholders

STATUS QUO

~~Typical res ult:~~
Confrontational debate and no improvement

MEDIATED DISCUSSION

~~Typical result:~~
Consensus on goals or problems but no help on how to achieve the goals or solve the problems

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Natural Capital (and changes in land use)
- Forest
- Wetlands
- Rivers and Streams
- Estuary and coast
- Dairy
- Beef & Sheep
- Horticulture
- Urban

Ecosystem Services
- Storm protection
- Food
- Habitat provision
- Nutrient cycling
- Climate regulation and carbon cycling
- Recreation

Impacts
- Erosion and sedimentation
- Nutrient runoff and eutrophication
- Aquatic habitat

(E)Valuation
- Stakeholder participation
- National, regional and local funding sources for actions.
- CBA, EIA and CEA.
- Cultural and spiritual values
- Perceived or non-perceived benefits
- Changes over time and time delays

Action Plan
- Fencing of Streams and riparian planting
- SLUI and reforestation
- Wetland restoration
- Nitrogen management and herd homes

Point source reduction

IFS scoping model integrates important drivers, as identified by stakeholders

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

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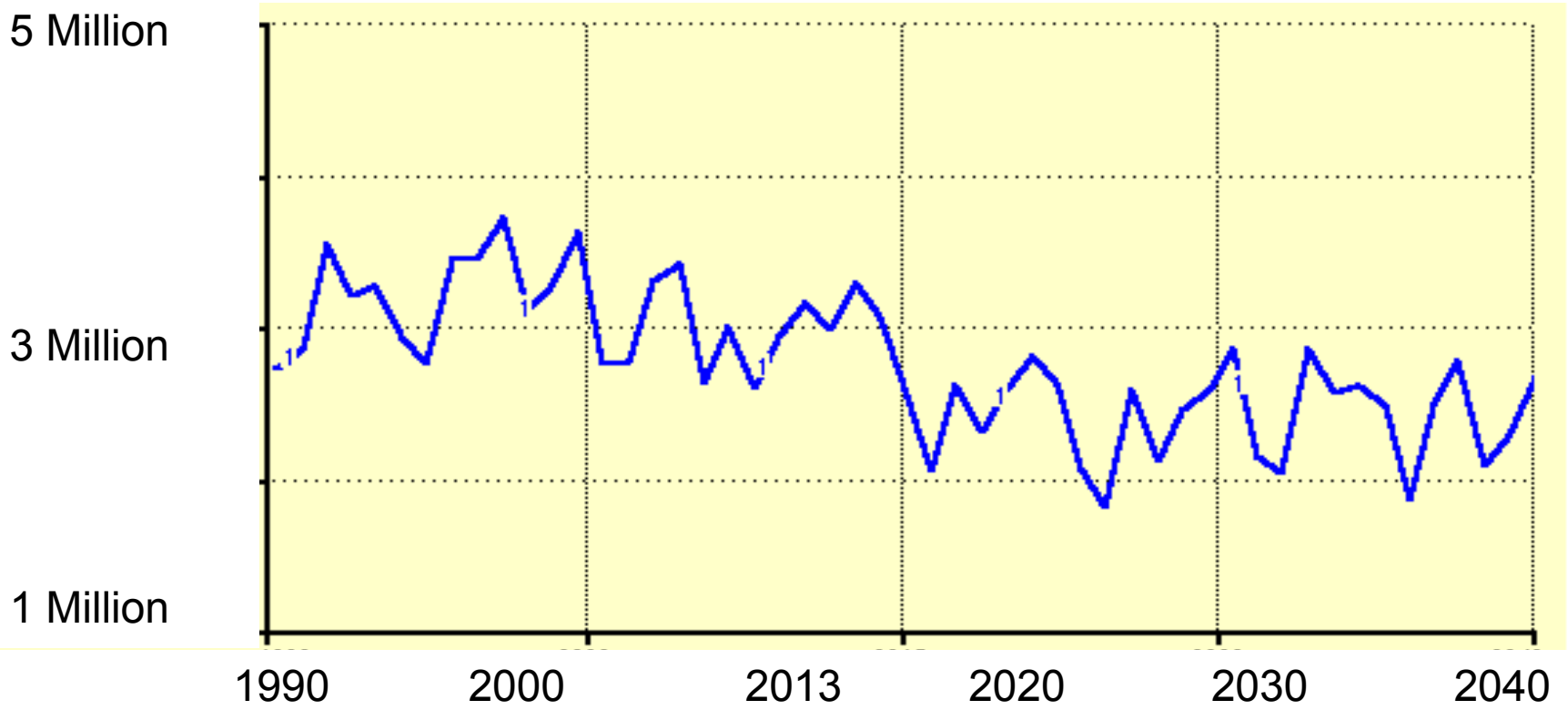
Sediment loading in tonnes per year

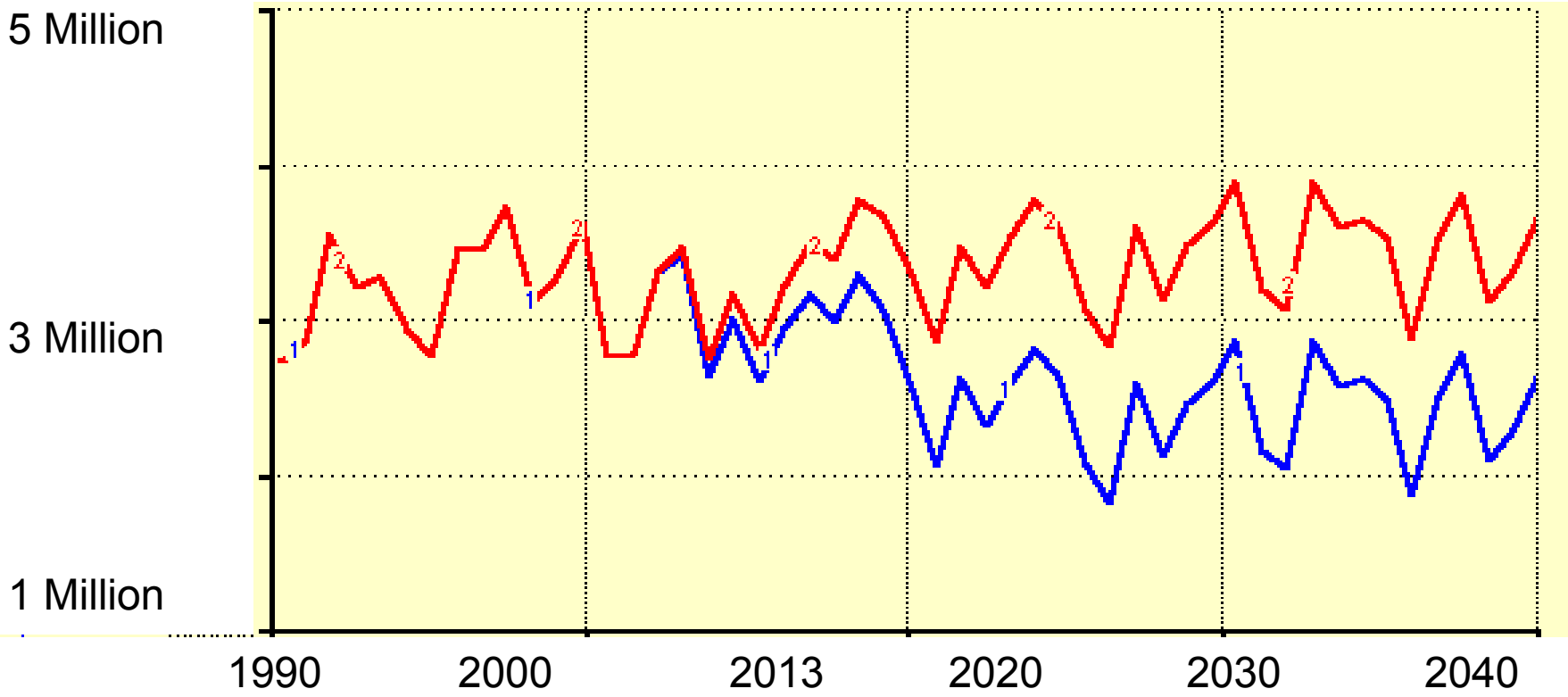


Base case (blue line – 1): sediment loading in tonnes per year WITH SLUI

SLUI abandoned

SLUI expedient

Sediment loading in tonnes per year



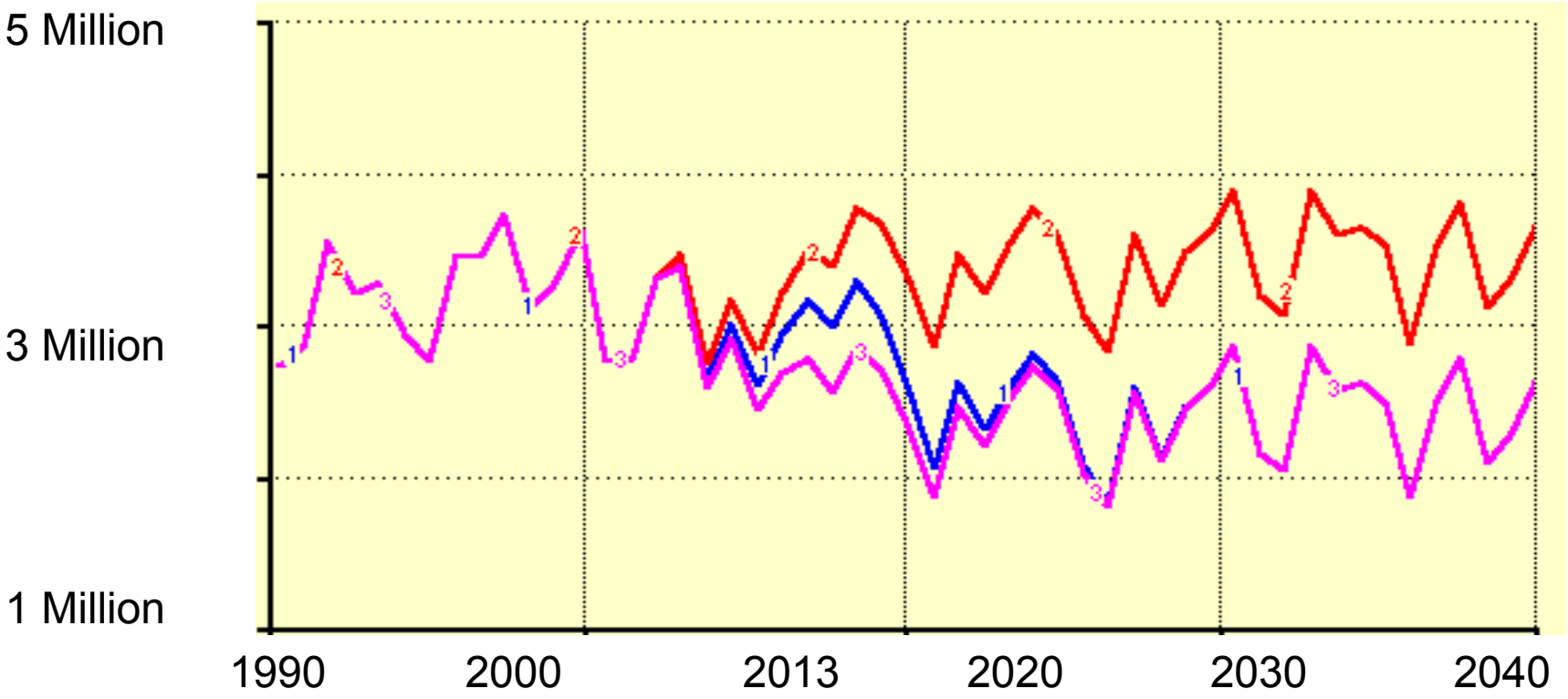
Blue line – 1: WITH SLUI

Red line – 2: WITHOUT SLUI

SLUI abandoned

SLUI expedient

Sediment loading in tonnes per year



Blue line – 1: WITH SLUI

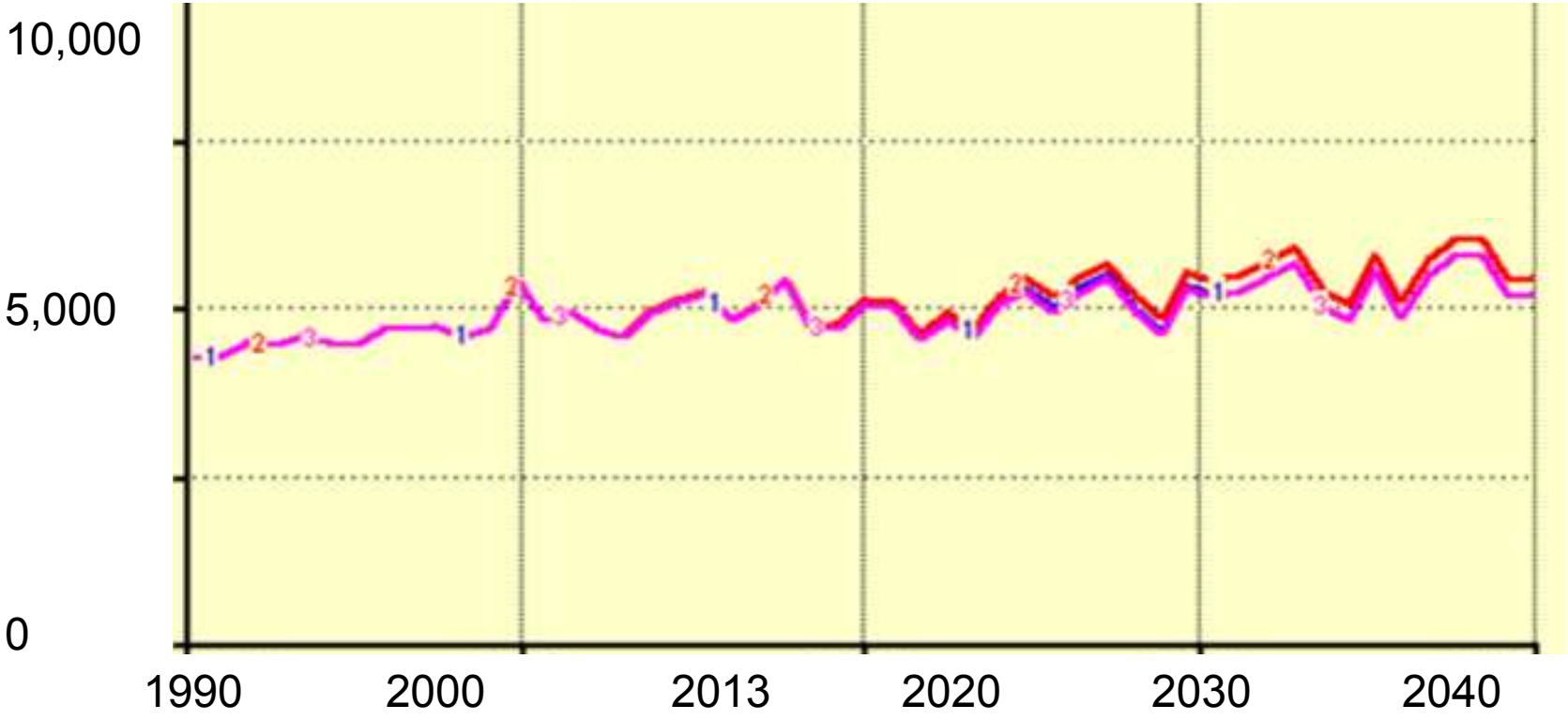
Red line – 2: WITHOUT SLUI

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

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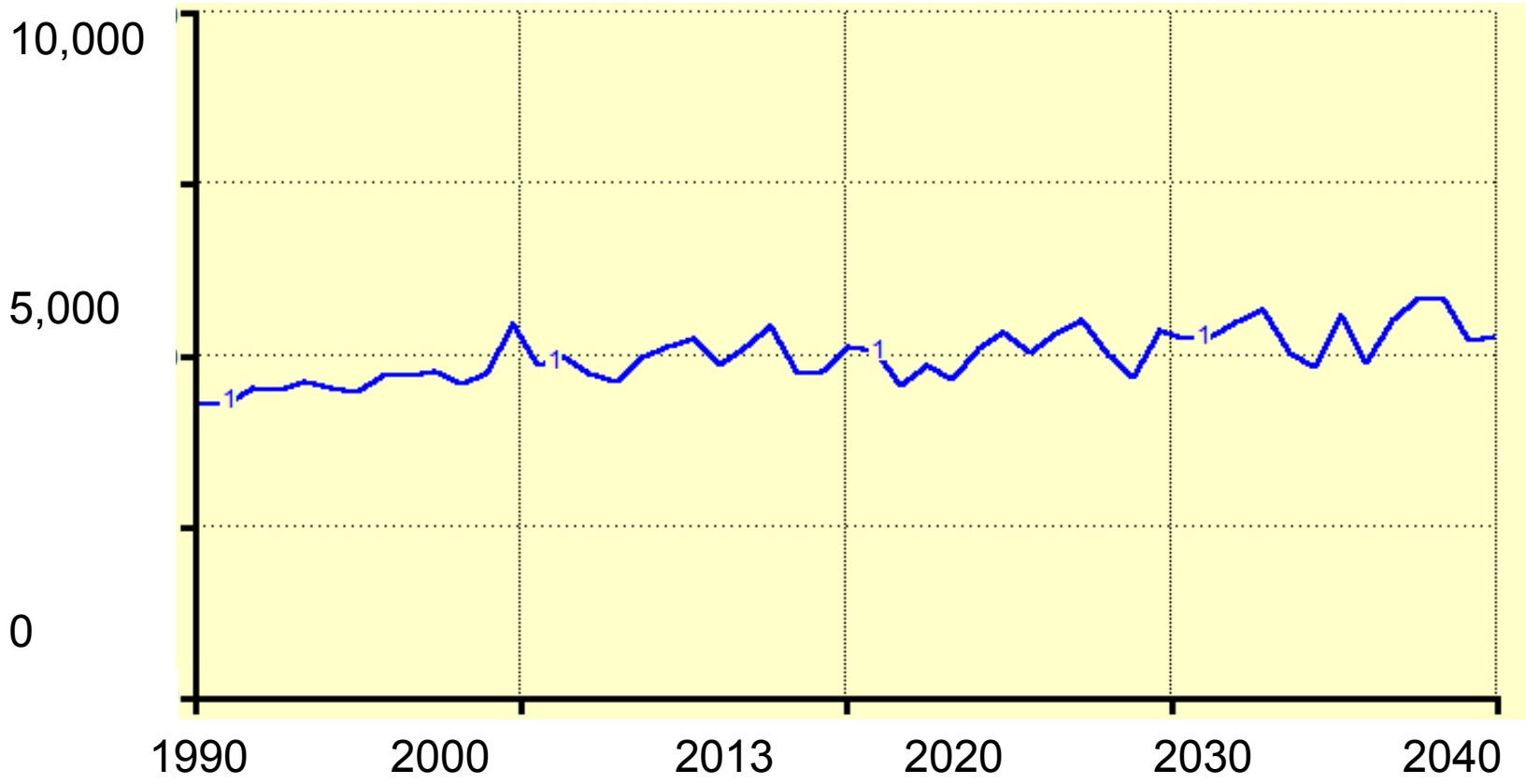
Nitrogen loading in tonnes per year



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

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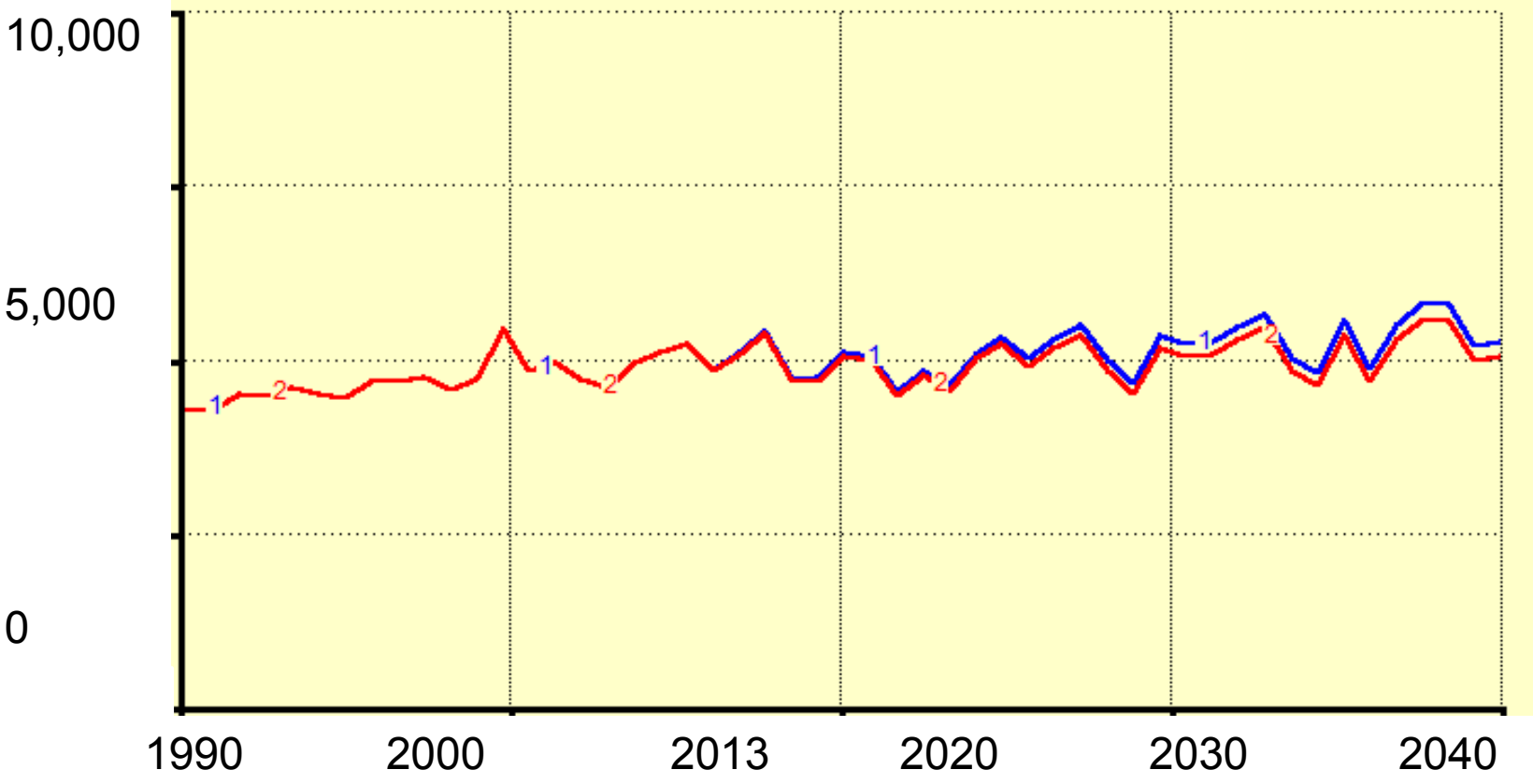
Nitrogen loading in tonnes per year



Blue line- 1: base line under business-as-usual
Red line- 2: stock exclusion $300,000

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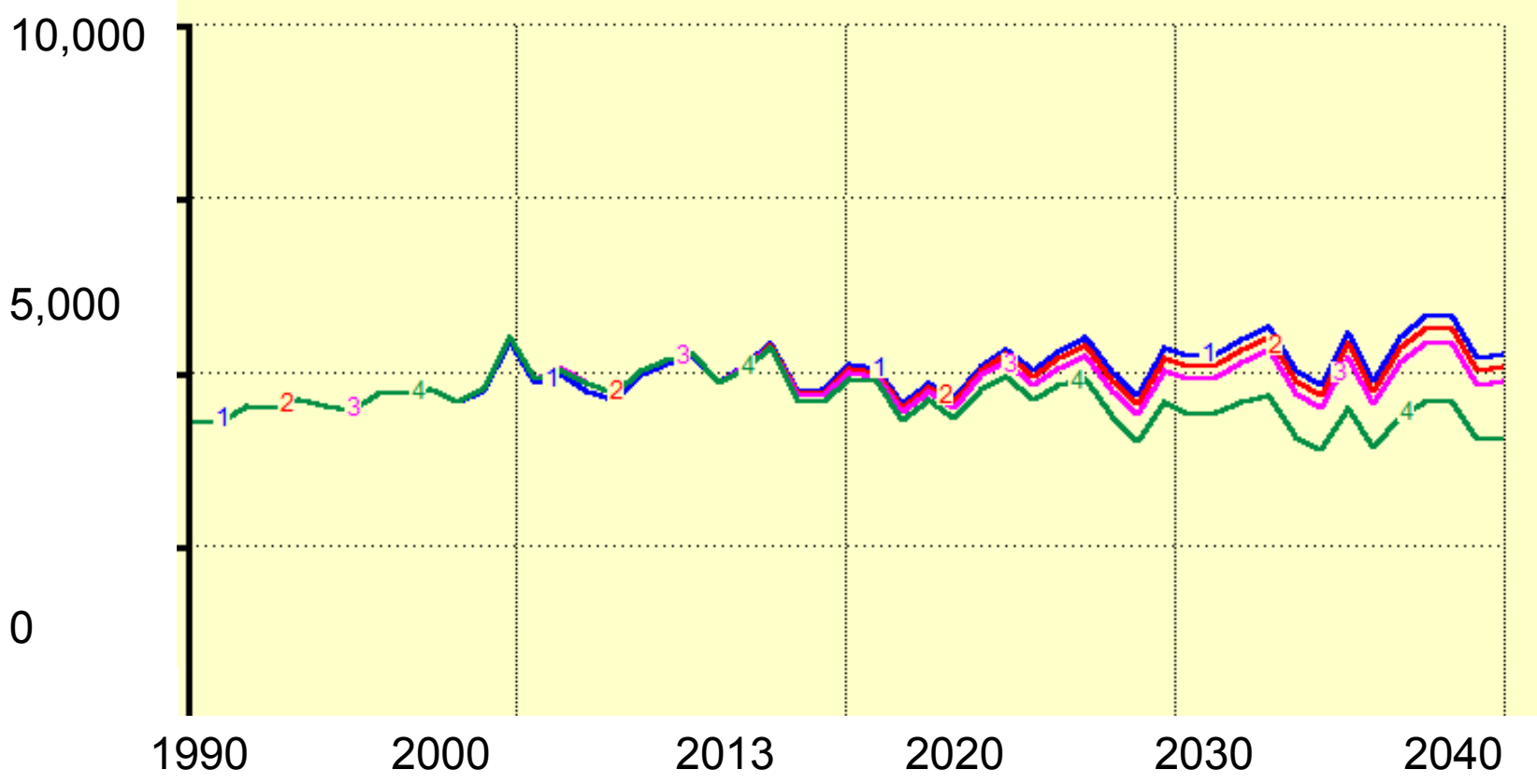
Nitrogen loading in tonnes per year



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)

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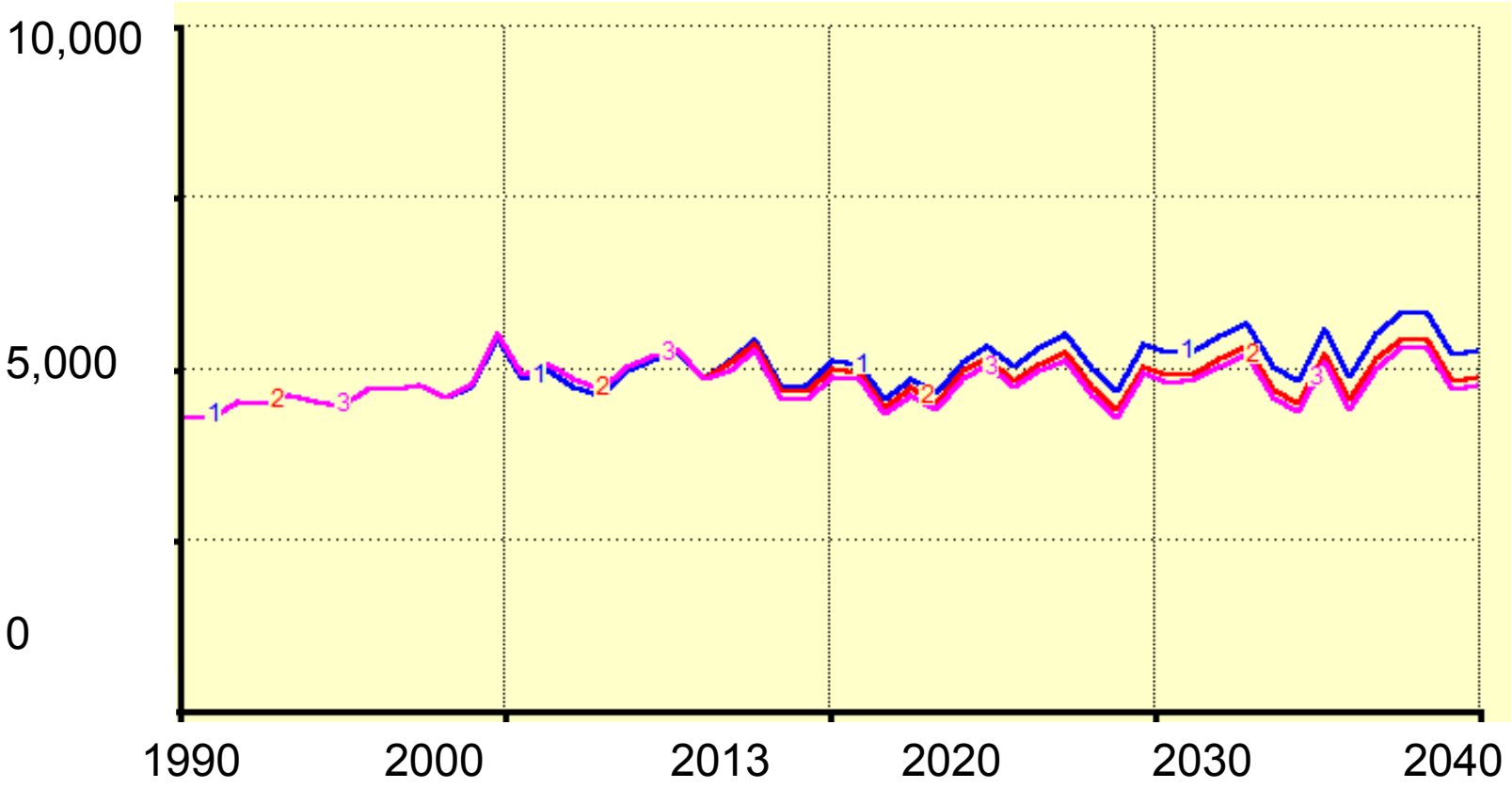
Nitrogen loading in tonnes per year



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

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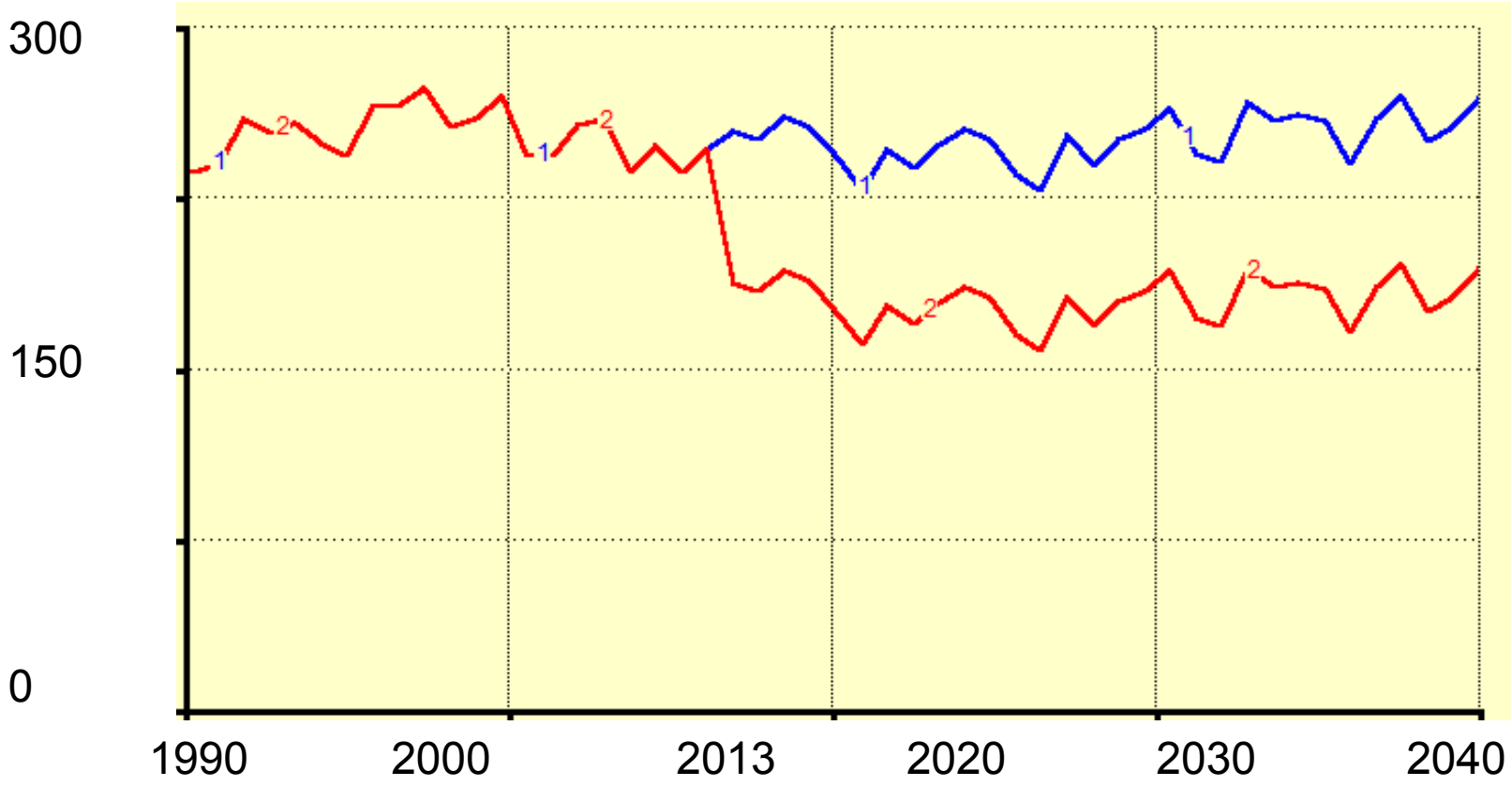
Phosphorus loading in tonnes per year



Blue 1: Base line under business-as-usual
Red 2: 50% reduction in Point Source waste water

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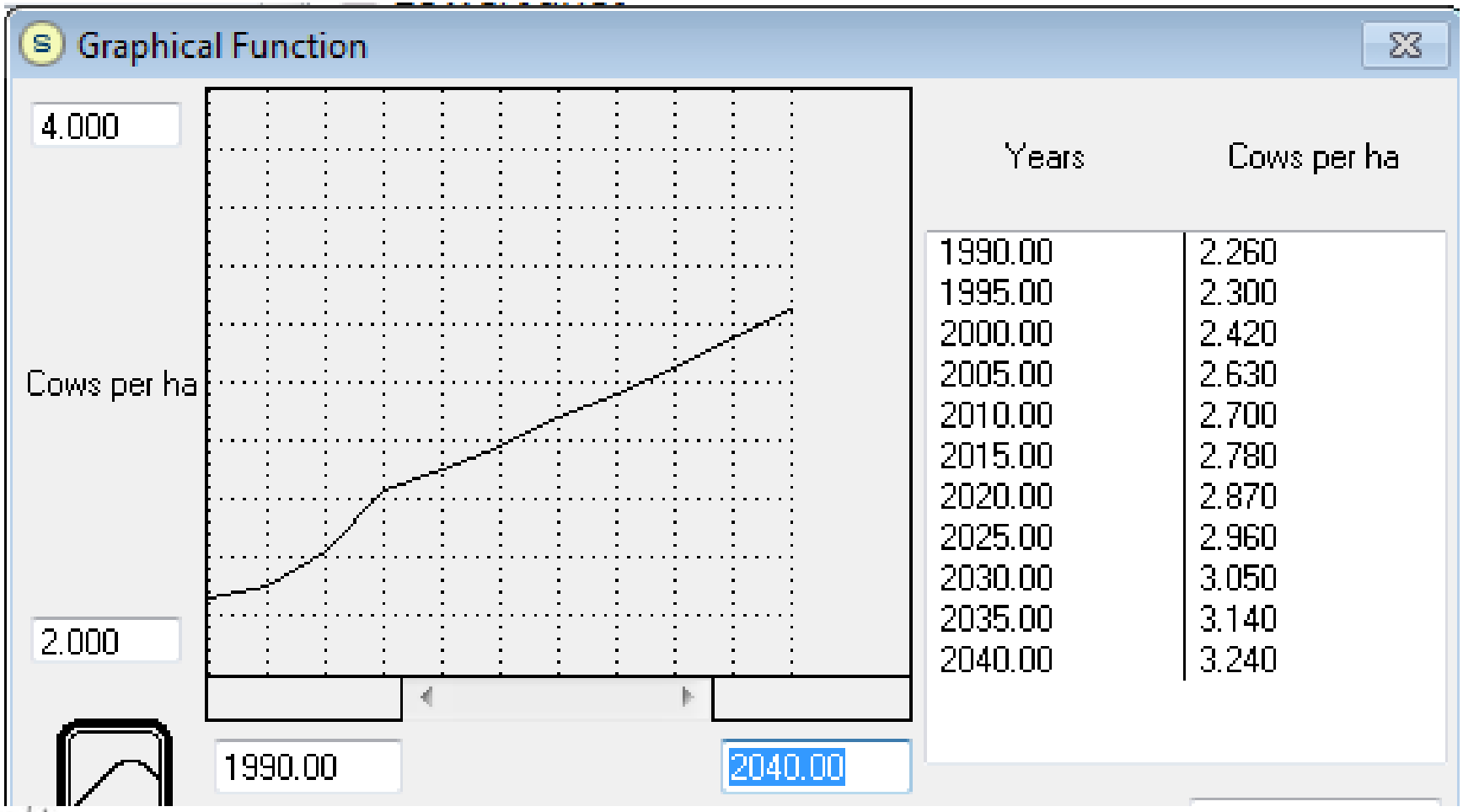
Cows per hectare (1990 – 2040)



Years	Cows per ha
1990.00	2.260
1995.00	2.300
2000.00	2.420
2005.00	2.630
2010.00	2.700
2015.00	2.780
2020.00	2.870
2025.00	2.960
2030.00	3.050
2035.00	3.140
2040.00	3.240

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Why export when you can milk it abroad?

New Zealand smarts are helping to grow Kiwi dairy farms in China, writes Simon Day.

HUNDREDS OF plump cows line their concrete stalls like rows of dominoes at Fonterra's Yutian 2 farm, 120 kilometres east of Beijing.

The cows push their heads through the steel bars of their confinements to eat imported alfalfa feed off the floor. Fans line the roof of the long barns, cooling the herd on a hot China day.

There is no grass in sight.

These are Kiwi cows, shipped to China or bred locally from New Zealand genetics. But this looks nothing like New Zealand farming.

Fonterra's China feed-lot farms have around 135 cows per hectare. This land-use efficiency is impossible in the fields of New Zealand, where pastoral farms have about three per hectare.

And the cows can be farmed so intensively in China because of New Zealand agriculture skills passed on to the Chinese staff.

"It's the same if you are in a paddock in Hamilton or a barn in Yutian. It is how well you look after that animal, it's the people way

This is the first in a series of stories by Simon Day, who is in China to report on the growing relationship with our number-one trading partner.

herd is closely guarded.

Not only is land use maximised but also milk production. In confinement, heifers are producing 32 litres a day – in New Zealand the same animal would be milked for 17 litres.

Completed in November 2012, Yutian 2 is the most recent of Fonterra China's three farms. By the end of the year two more farms will be built to complete the Yutian

Next generation: The three current farms in Yutian hold enough calves to populate the next two farms in a bid to produce 150 million litres of milk each year.

> Now we have the model right, you can cookie cut and roll it out at scale.
> – Kelvin Wickham

times at predicted levels would give Fonterra a 2 per share of the domestic milk m

It is a commercial enterpri Fonterra also works with Chinese Ministry of Agricult offer student scholarships, su mer training programmes refining veterinary science.

The three farms employ Chinese.

"It is helpful for provincia central government to de strate that you are bringing expertise to the market pro employment, improving the ity of local milk and supporti food safety goals of the g ment," says Wickham.

Currently, the farms sell milk at the gate and do not g any into Fonterra products. highly competitive Chinese m the product is protected from otage with specially leased locked tankers and a tr keeping system that ensure milk's traceability.

The brand's reputation they can charge a premiu their quality and transparenc country paranoid about safety.

But with China's milk con tion increasing 7 per cent ann there are plans for China milk to be turned into Fo products within the next two

"We are not building far China not to have a farm in

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Sunday Star Times, 26 May 2013

Stakeholder validation: parameter changes or structural changes?

- Do parameters need to be adjusted?
- Is the underlying structure and drivers still relevant?
- Comparing new information with previous information

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Pohangina: down-scaled sub catchment model

- Paul Horton worked with Hendrik Stouten, Heike Schiele and Marjan van den Belt

- Stripped scoping model from redundant elements; changed the initial values of the parameters and adjusted the rates of change

- Added potential impact of co-management

- Resulted in: relevant data gathering and understanding an important story from an iwi perspective.

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Video documenting as a tool

- Muaupoko and Ngati Kauwhata are working on video documenting capacity to document and tell their story.

Flood Protection: an investment trap between built and natural capital?

- Feedback forms at the end ☺

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Linear Thinking

Development on river banks → Flood risk → Flood protection

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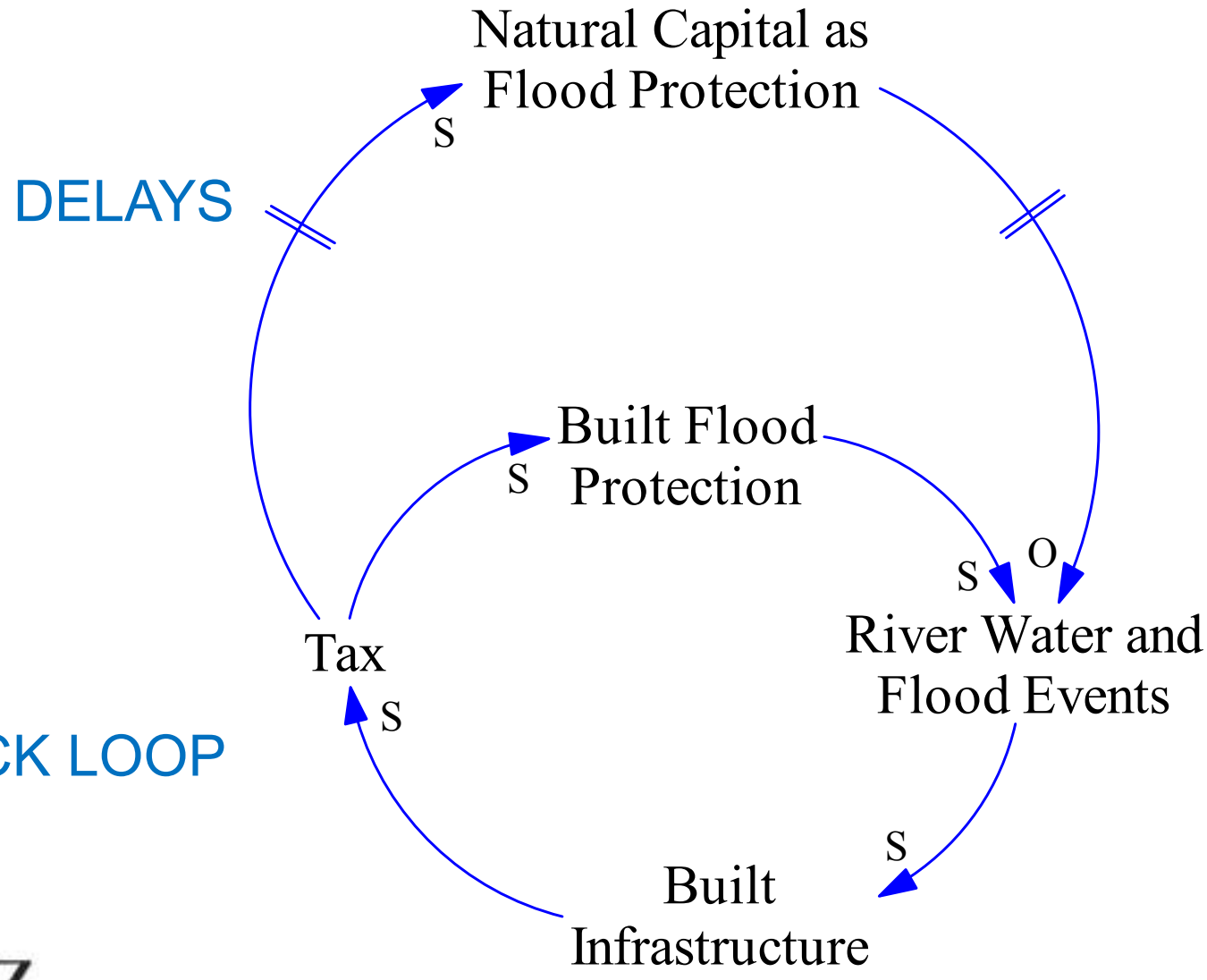
Systems Thinking
'Limits to Growth'



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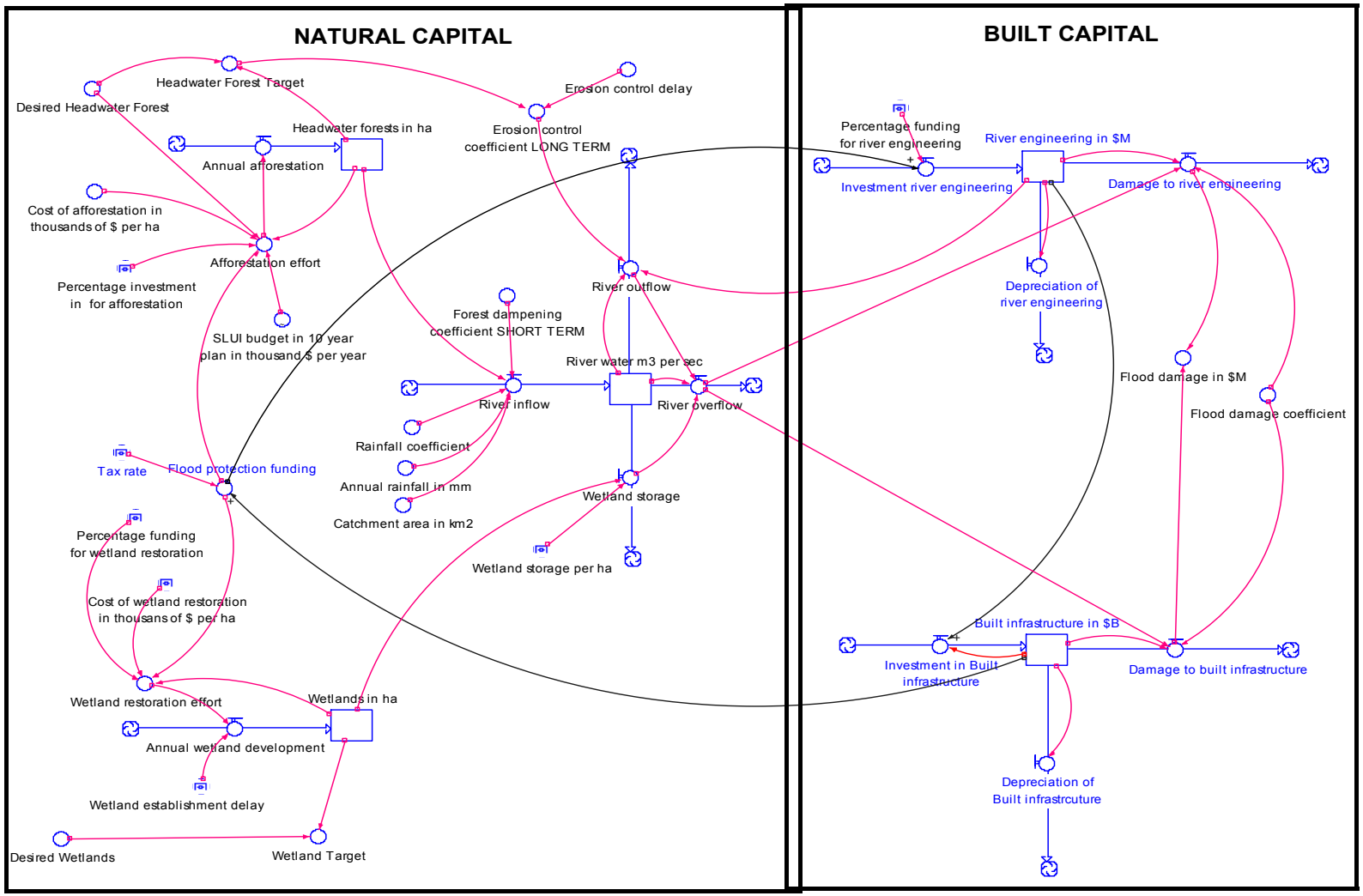
Story telling with models in STELLA



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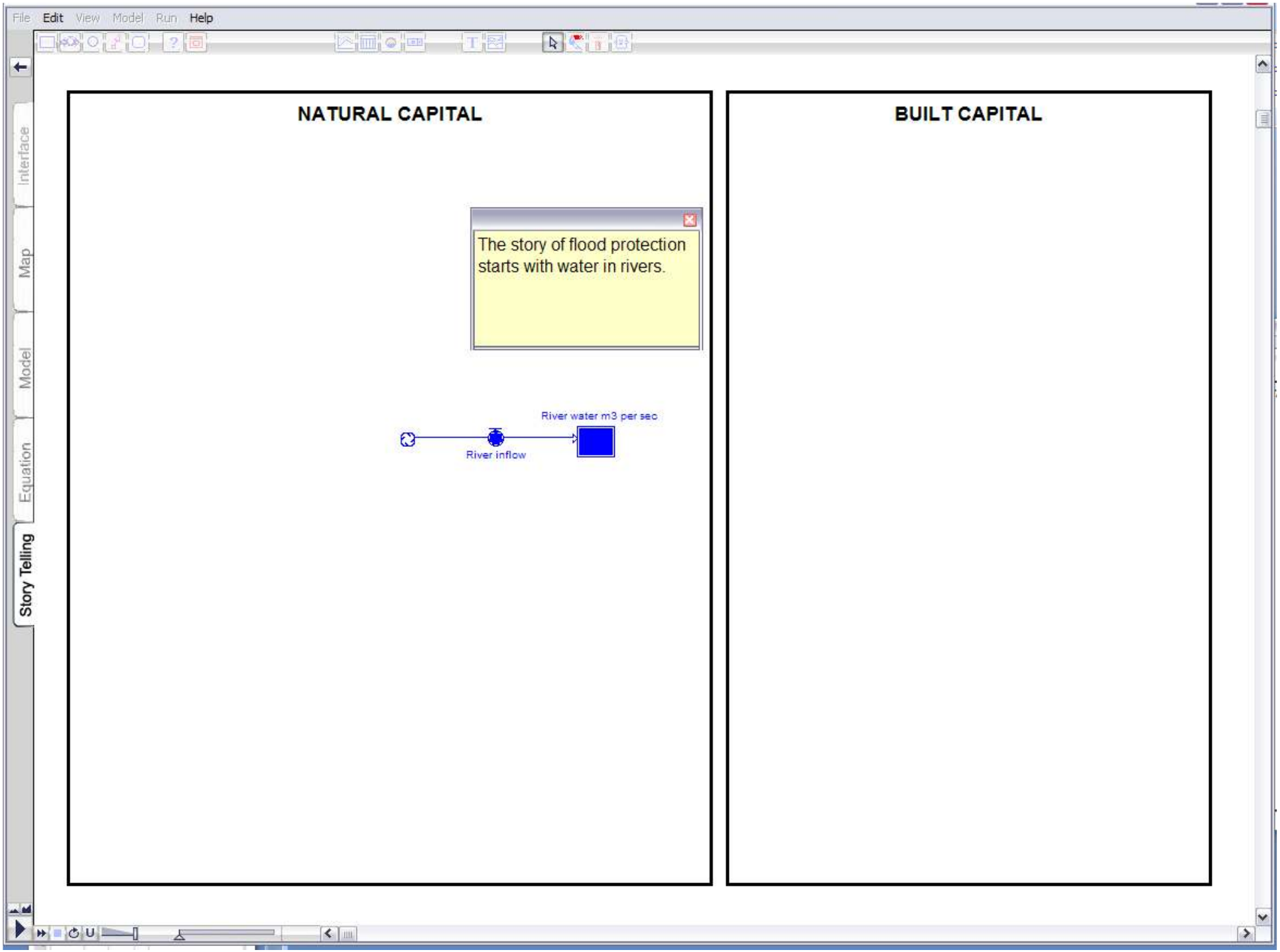
Interface
Map
Model
Equation
Story Telling

NATURAL CAPITAL	BUILT CAPITAL


File Edit View Model Run Help
Interface
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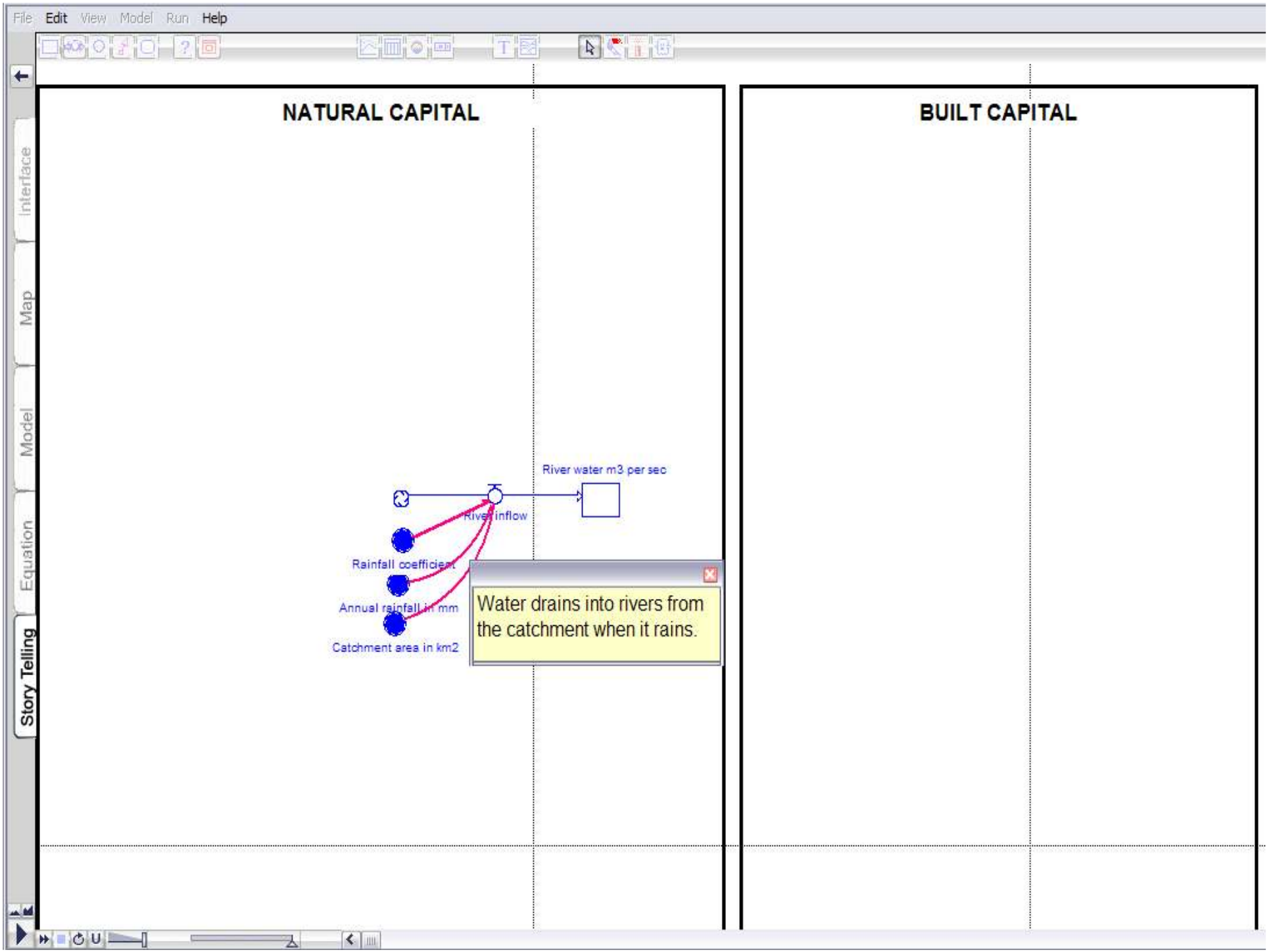
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
The story of flood protection starts with water in rivers.
River water m3 per sec
River inflow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Interface
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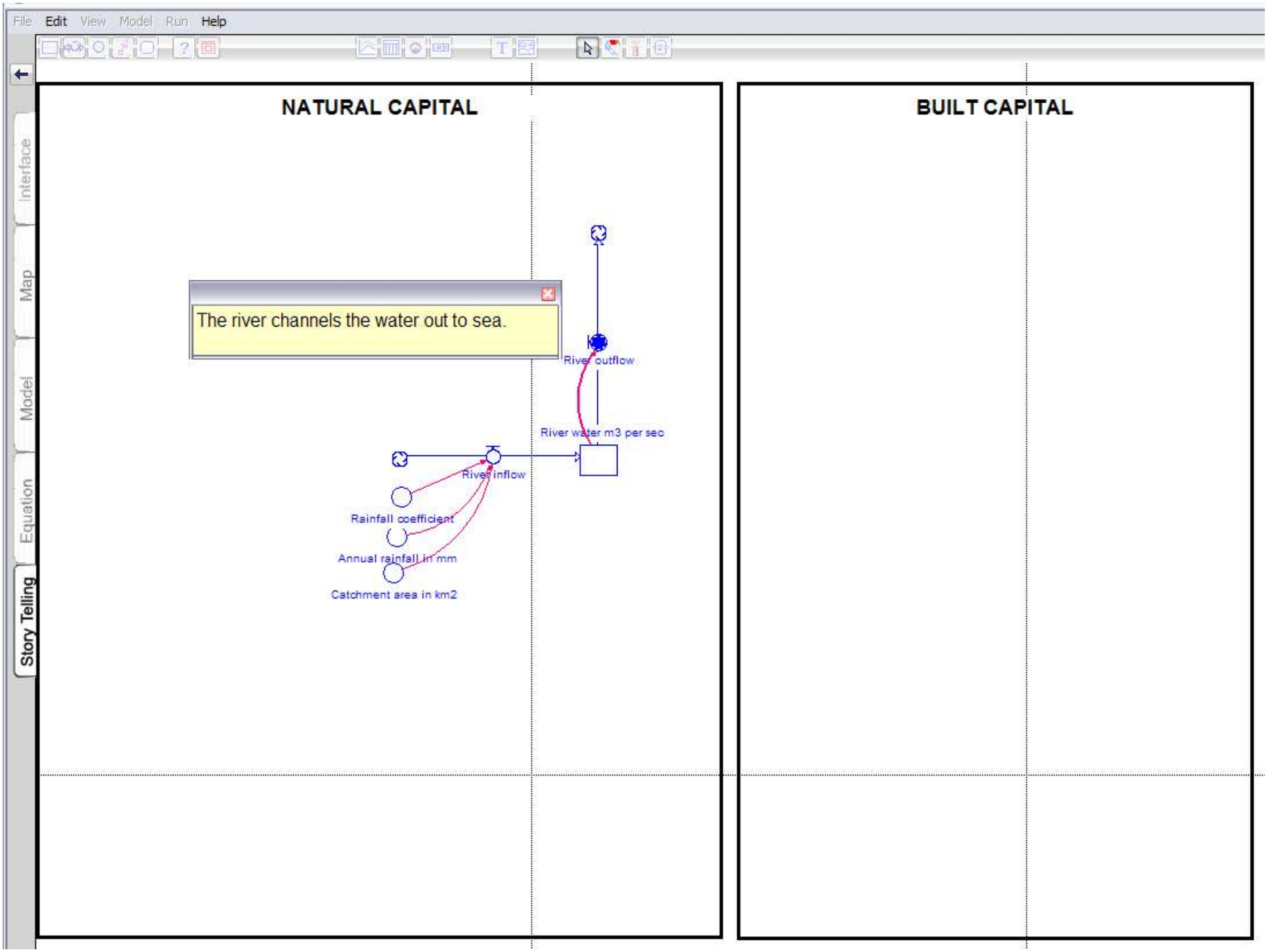
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
River water m3 per sec
River inflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Water drains into rivers from the catchment when it rains.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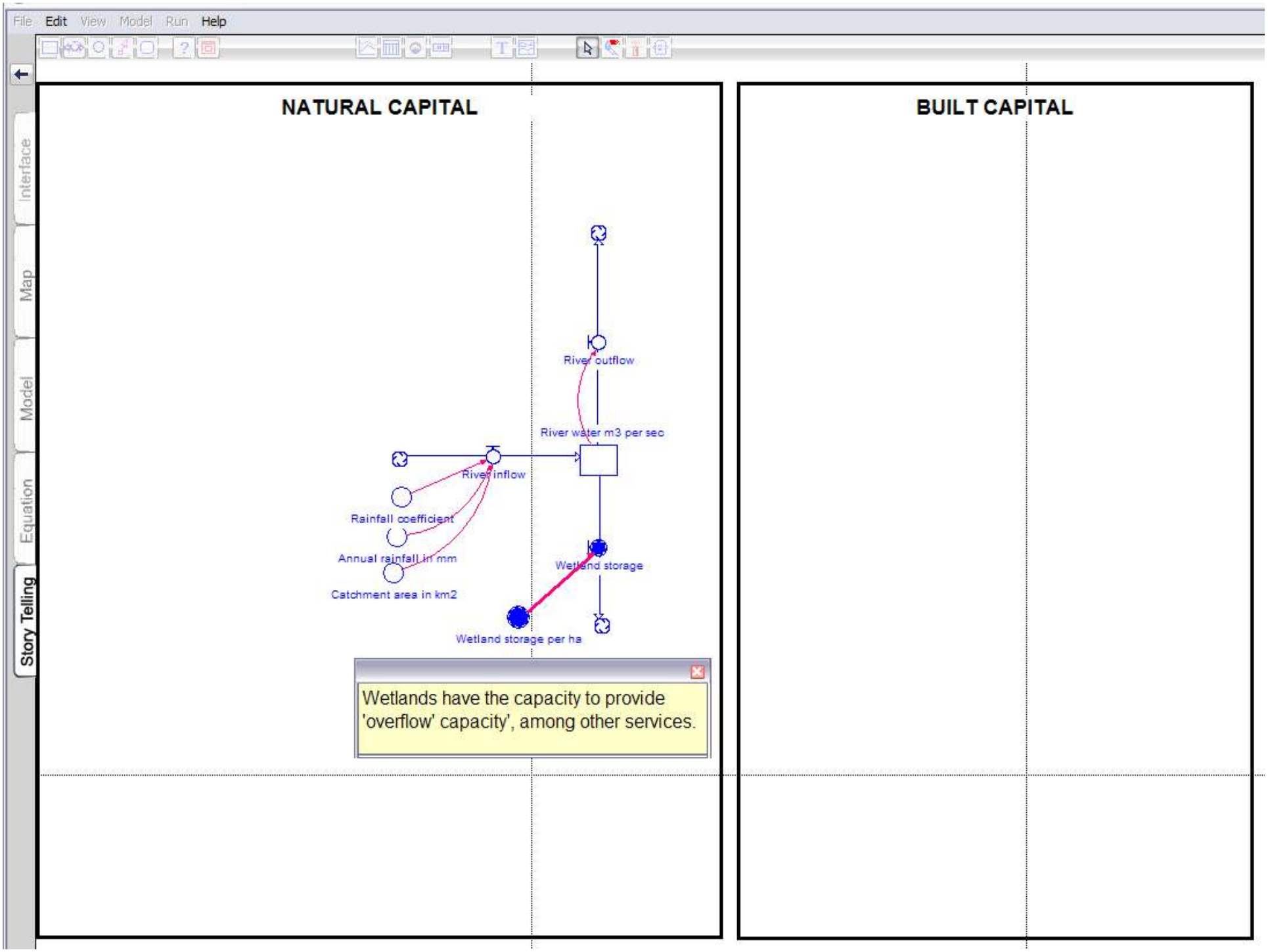
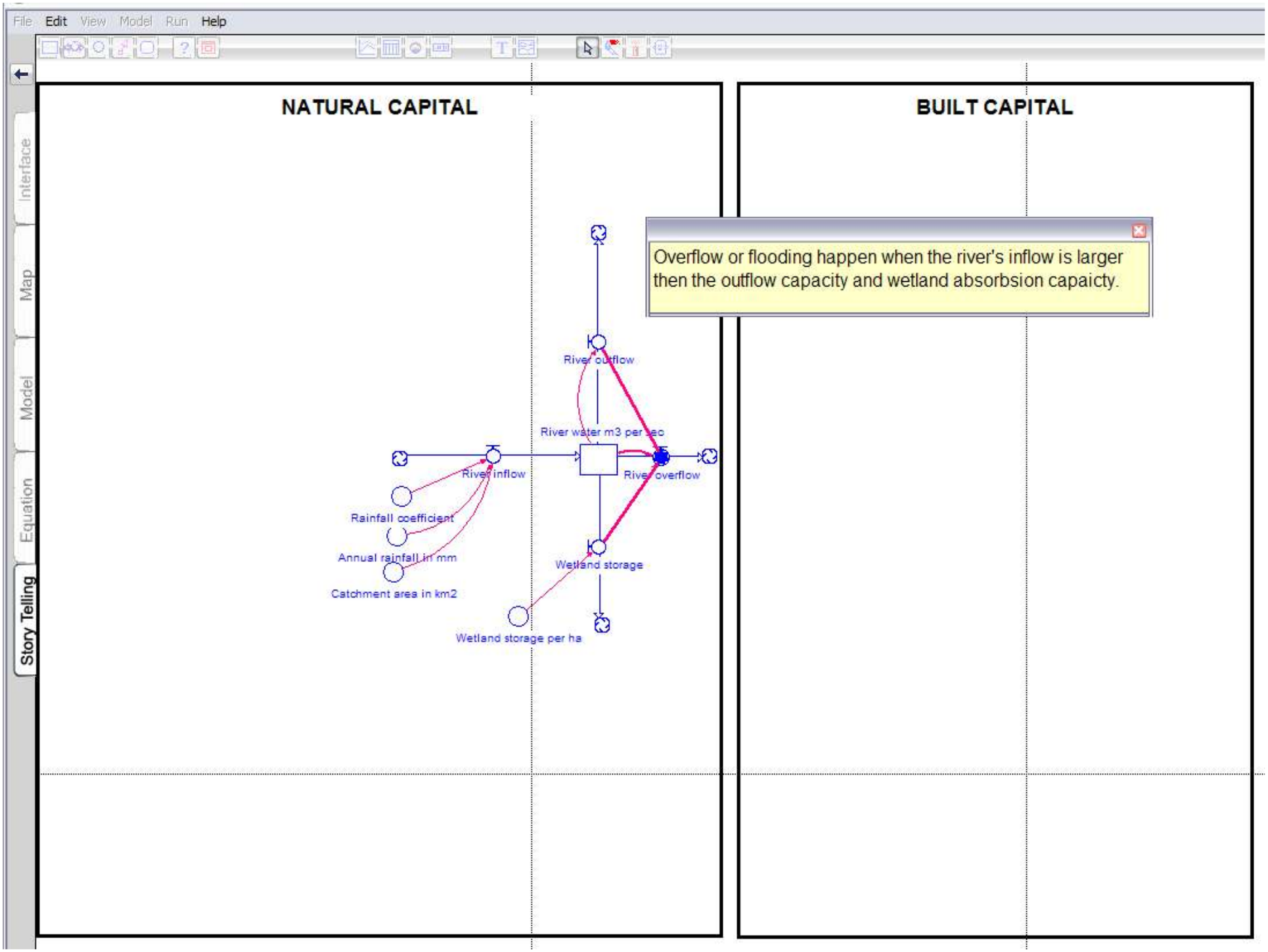
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
The river channels the water out to sea.
River outflow
River water m3 per sec
River inflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2


File Edit View Model Run Help
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
River outflow
River water m3 per sec
River inflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Wetland storage
Wetland storage per ha
Wetlands have the capacity to provide 'overflow' capacity', among other services.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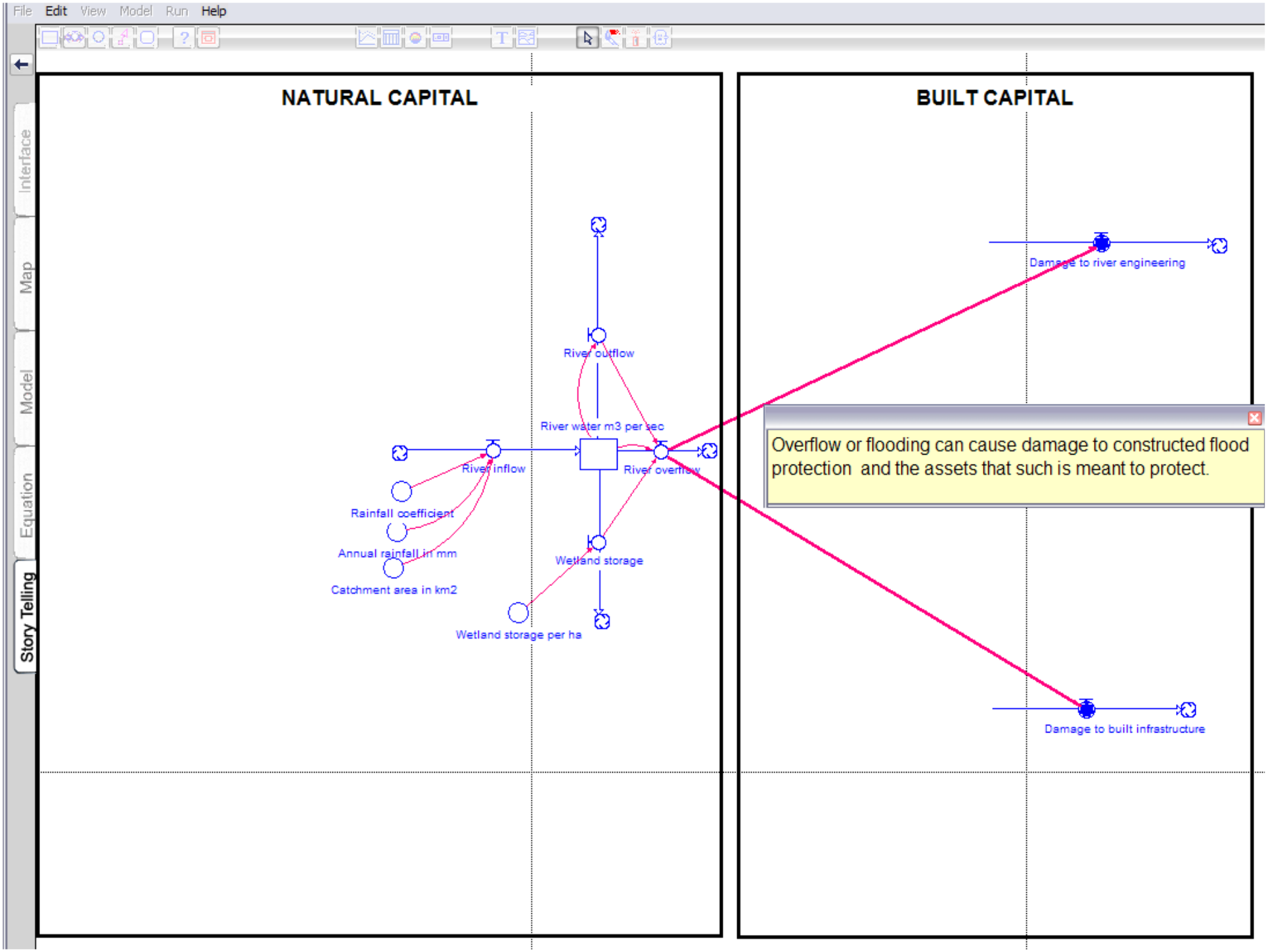
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
Overflow or flooding happen when the river's inflow is larger then the outflow capacity and wetland absorbsion capaicty.
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Wetland storage
Wetland storage per ha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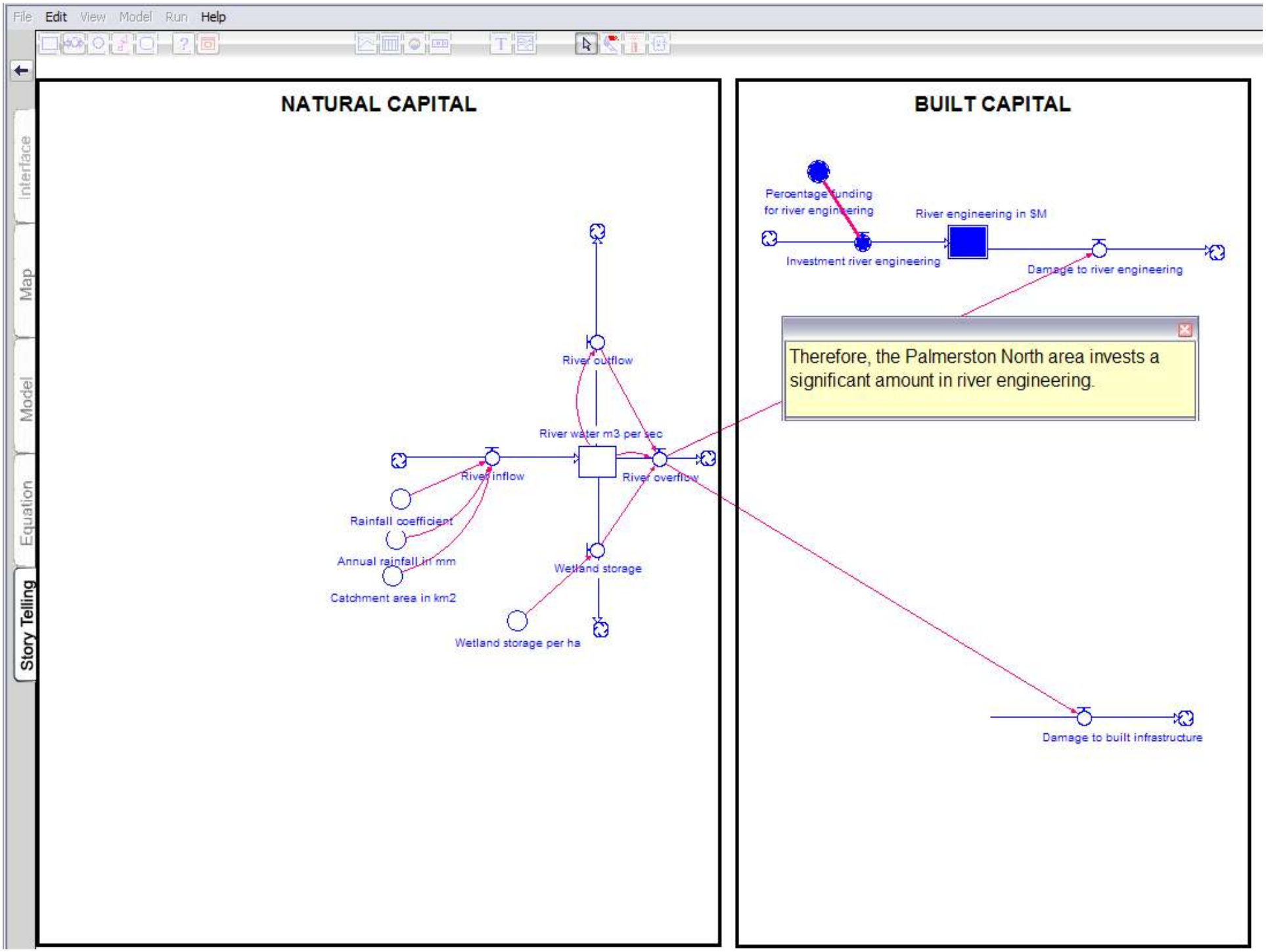
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Wetland storage
Wetland storage per ha
Damage to river engineering
Damage to built infrastructure
Overflow or flooding can cause damage to constructed flood protection and the assets that such is meant to protect.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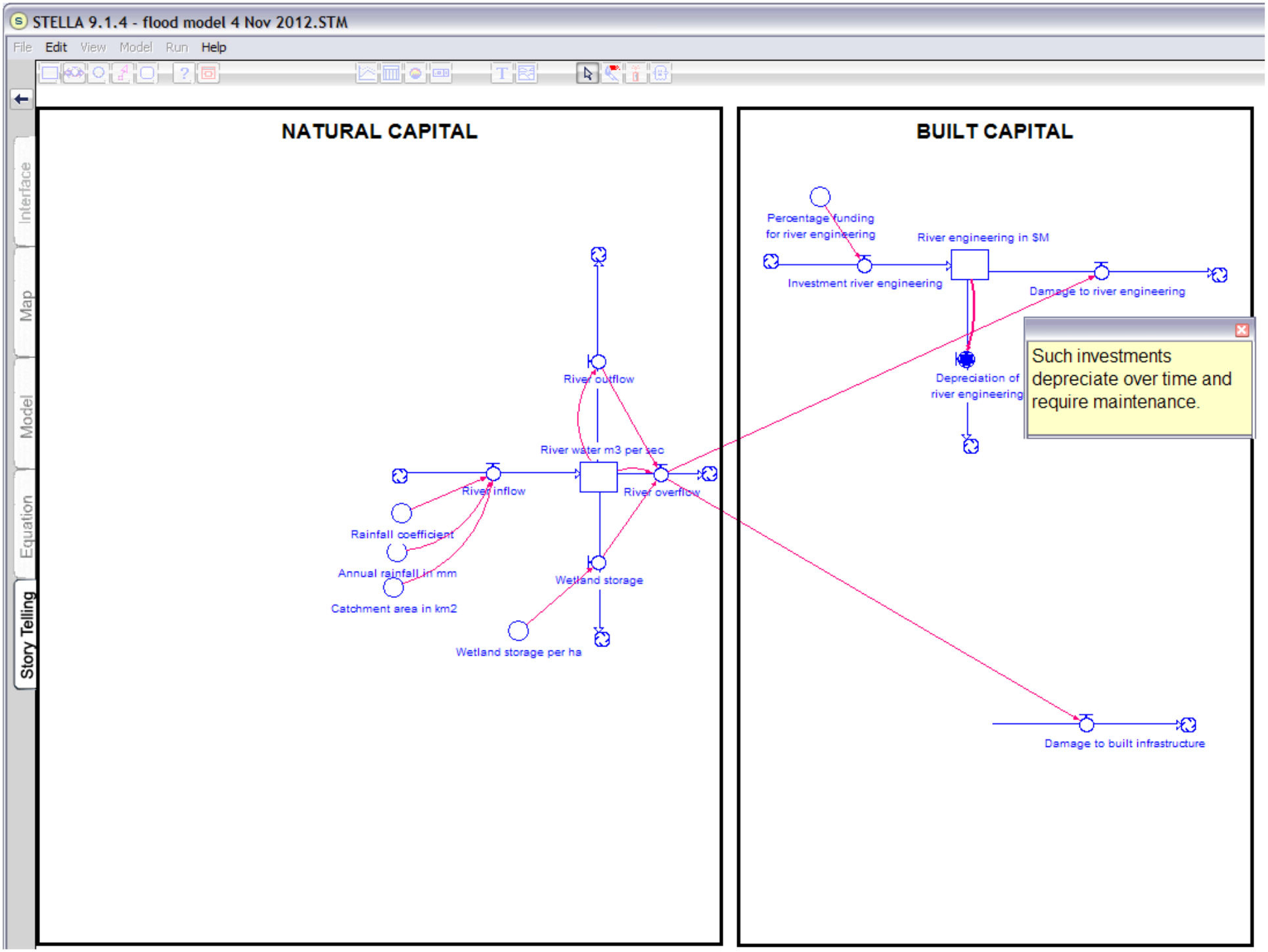
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Wetland storage
Wetland storage per ha
BUILT CAPITAL
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
Therefore, the Palmerston North area invests a significant amount in river engineering.
Damage to built infrastructure


STELLA 9.1.4 - flood model 4 Nov 2012.STM
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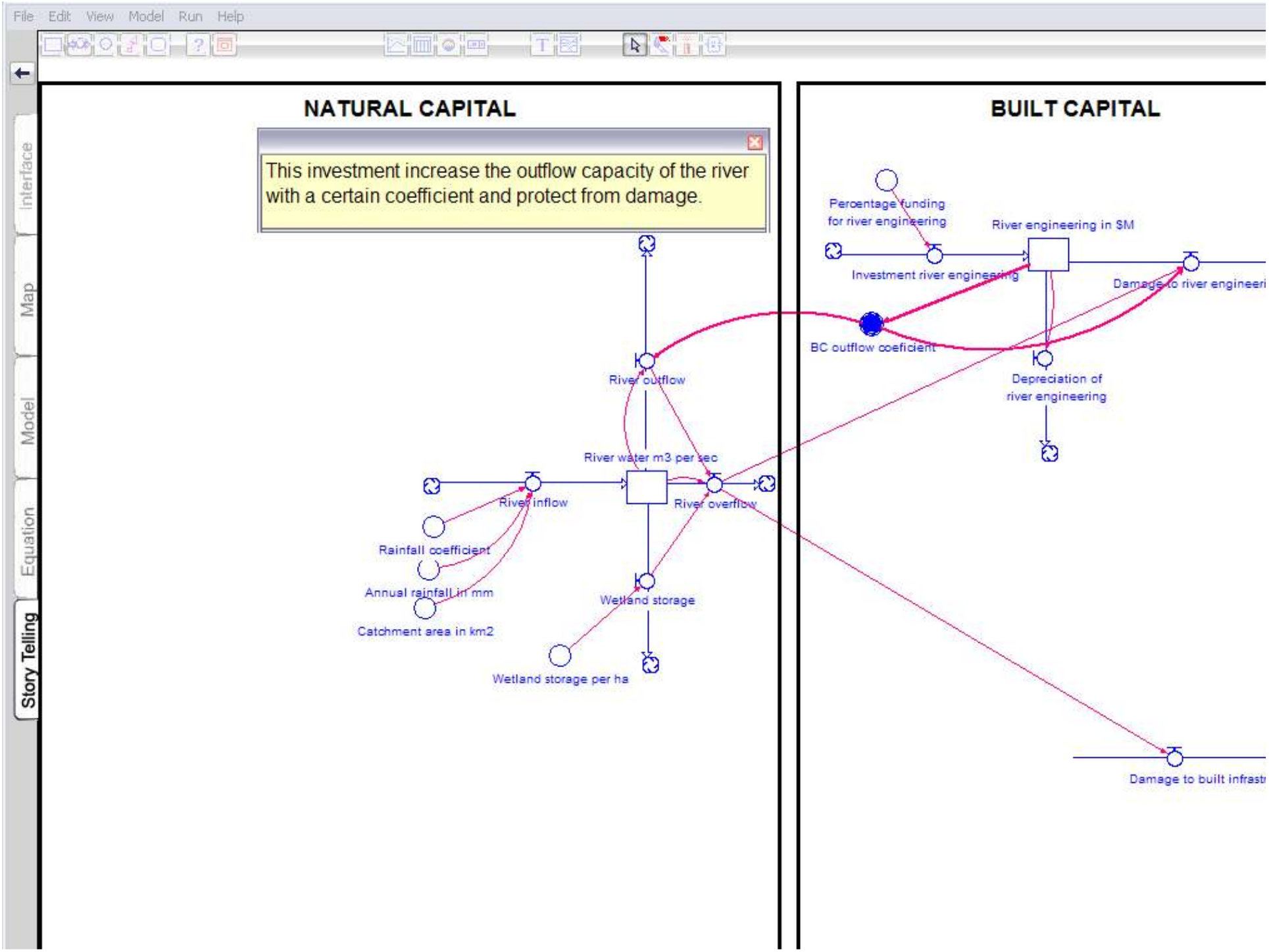
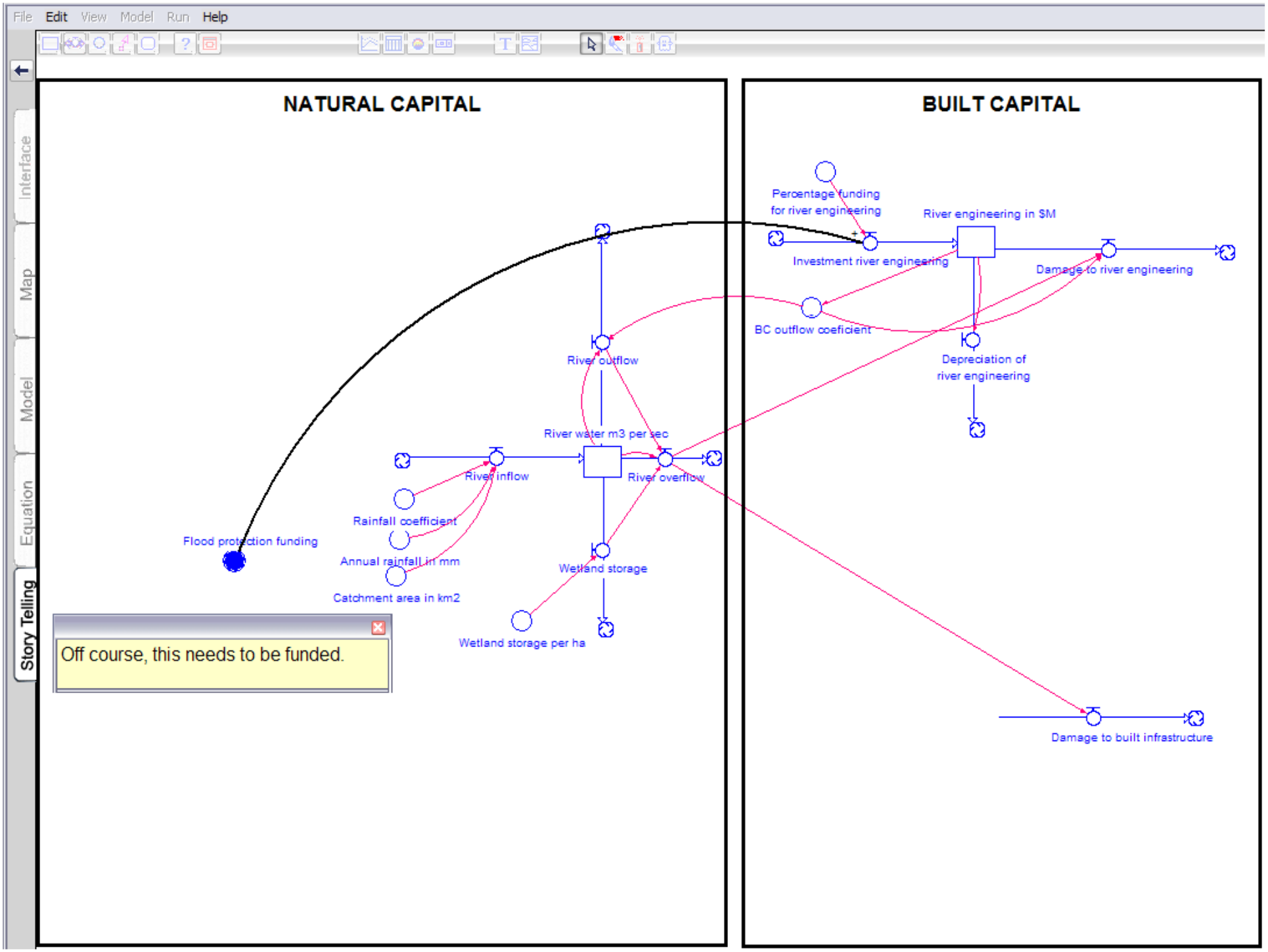
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Wetland storage
Wetland storage per ha
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
Depreciation of river engineering
Such investments depreciate over time and require maintenance.
Damage to built infrastructure


File Edit View Model Run Help
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
This investment increase the outflow capacity of the river with a certain coefficient and protect from damage.
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineeri
BC outflow coeficient
Depreciation of river engineering
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Wetland storage
Wetland storage per ha
Damage to built infrastr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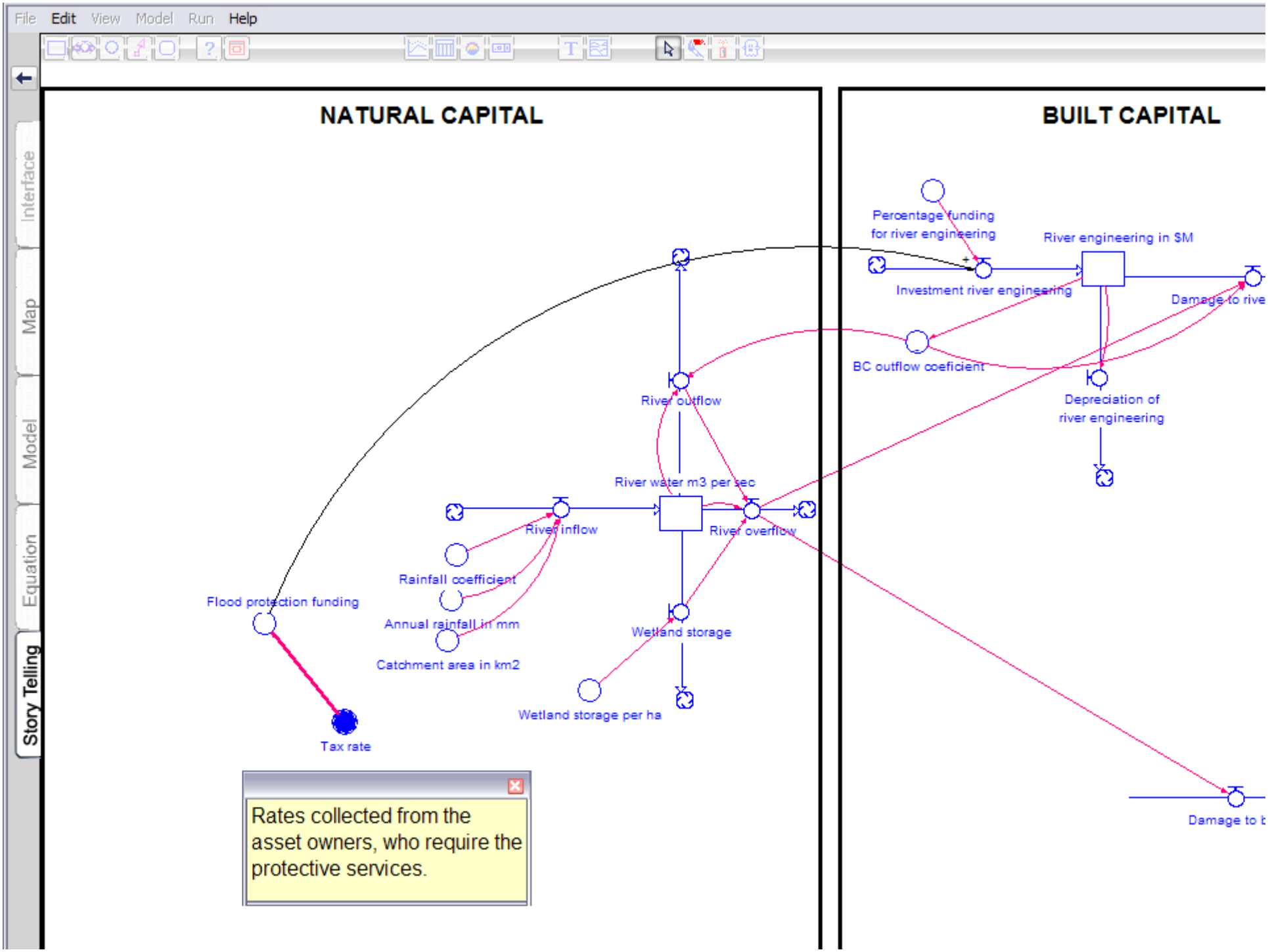
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Flood protection funding
Annual rainfall in mm
Catchment area in km2
Wetland storage
Wetland storage per ha
Damage to built infrastructure
Off course, this needs to be funded.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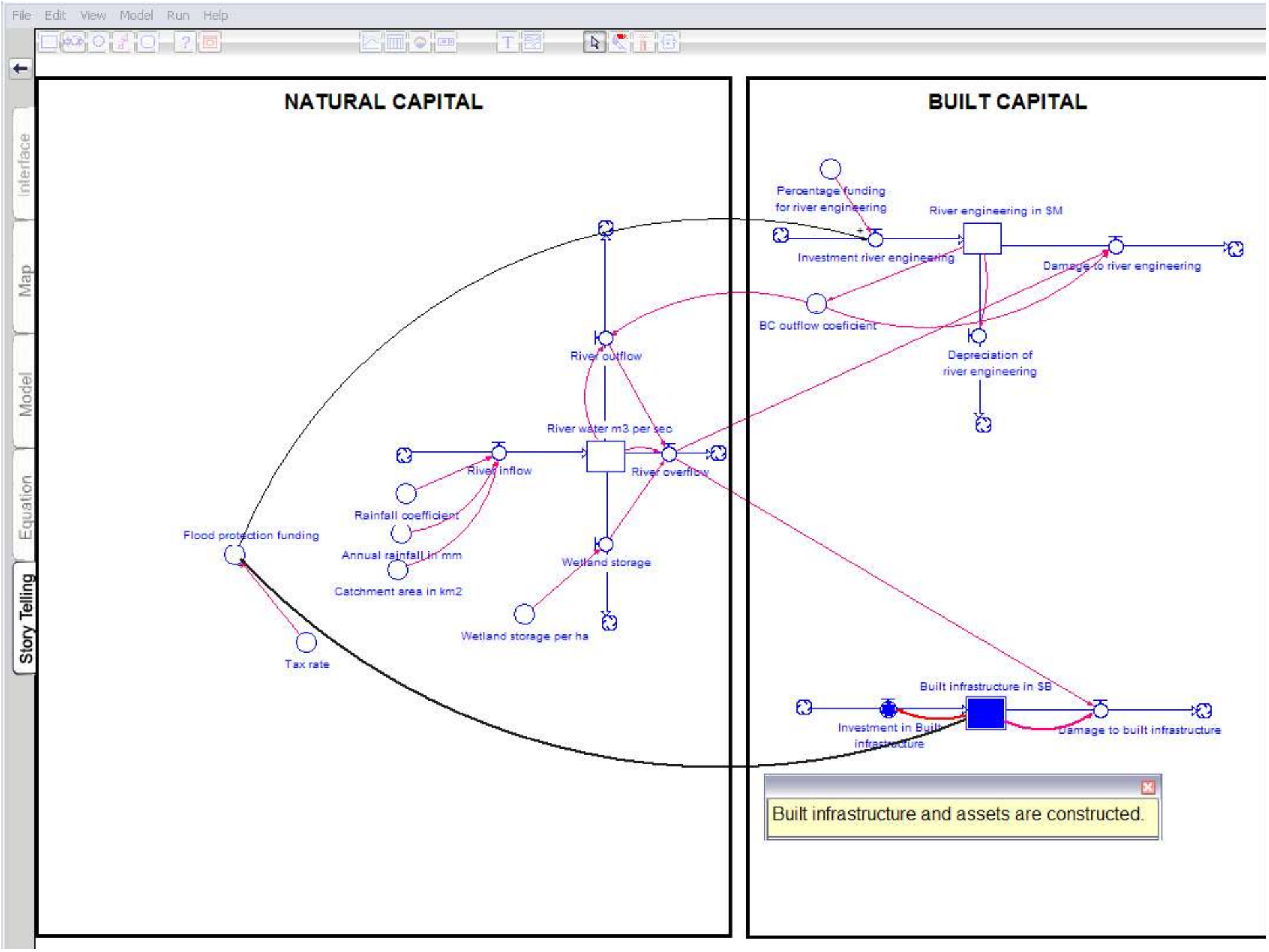
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to rive
BC outflow coeficient
Depreciation of river engineering
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Flood protection funding
Wetland storage
Wetland storage per ha
Tax rate
Damage to b
Rates collected from the asset owners, who require the protective services.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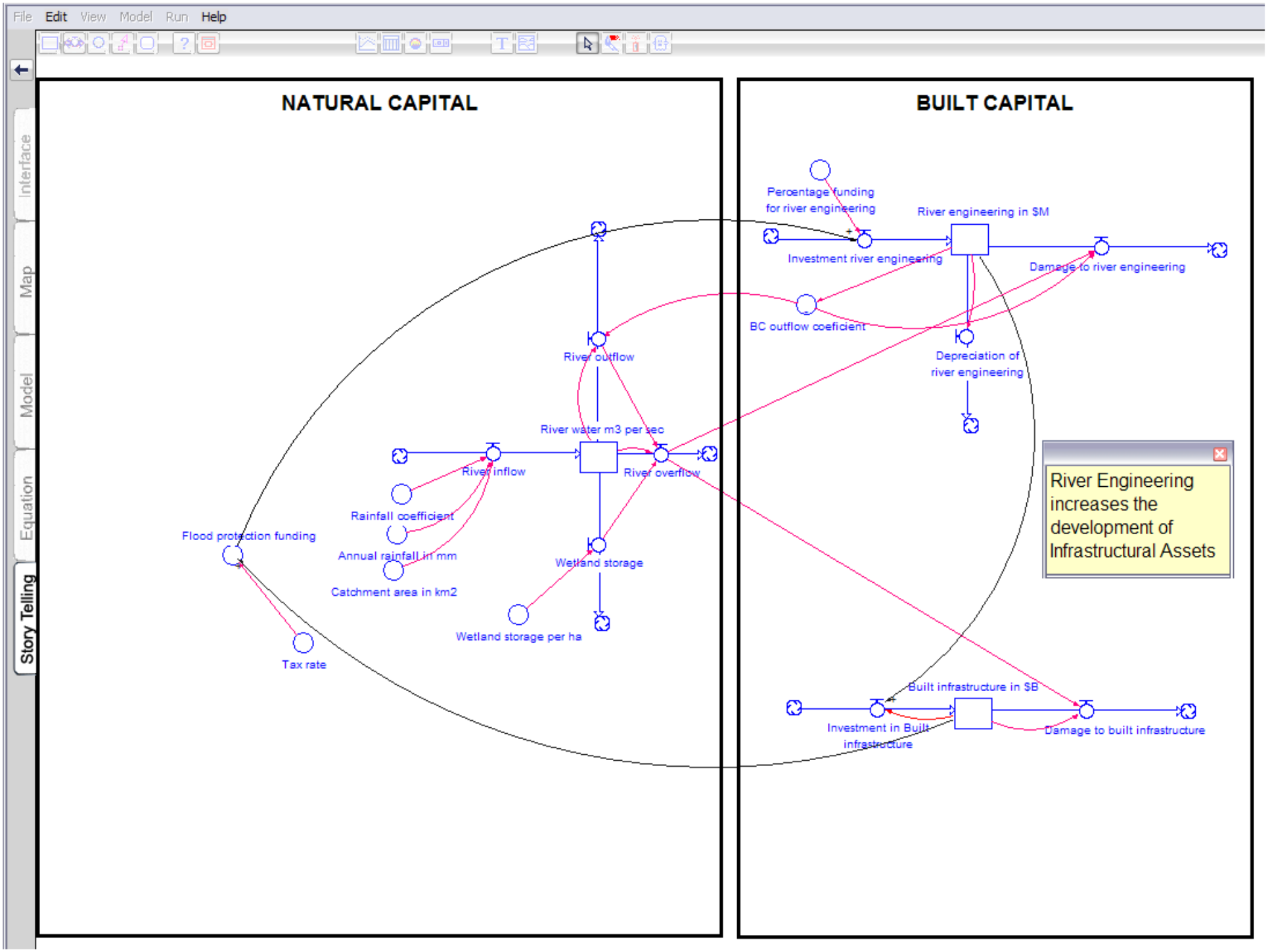
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Flood protection funding
Wetland storage
Wetland storage per ha
Tax rate
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
Built infrastructure and assets are constructed.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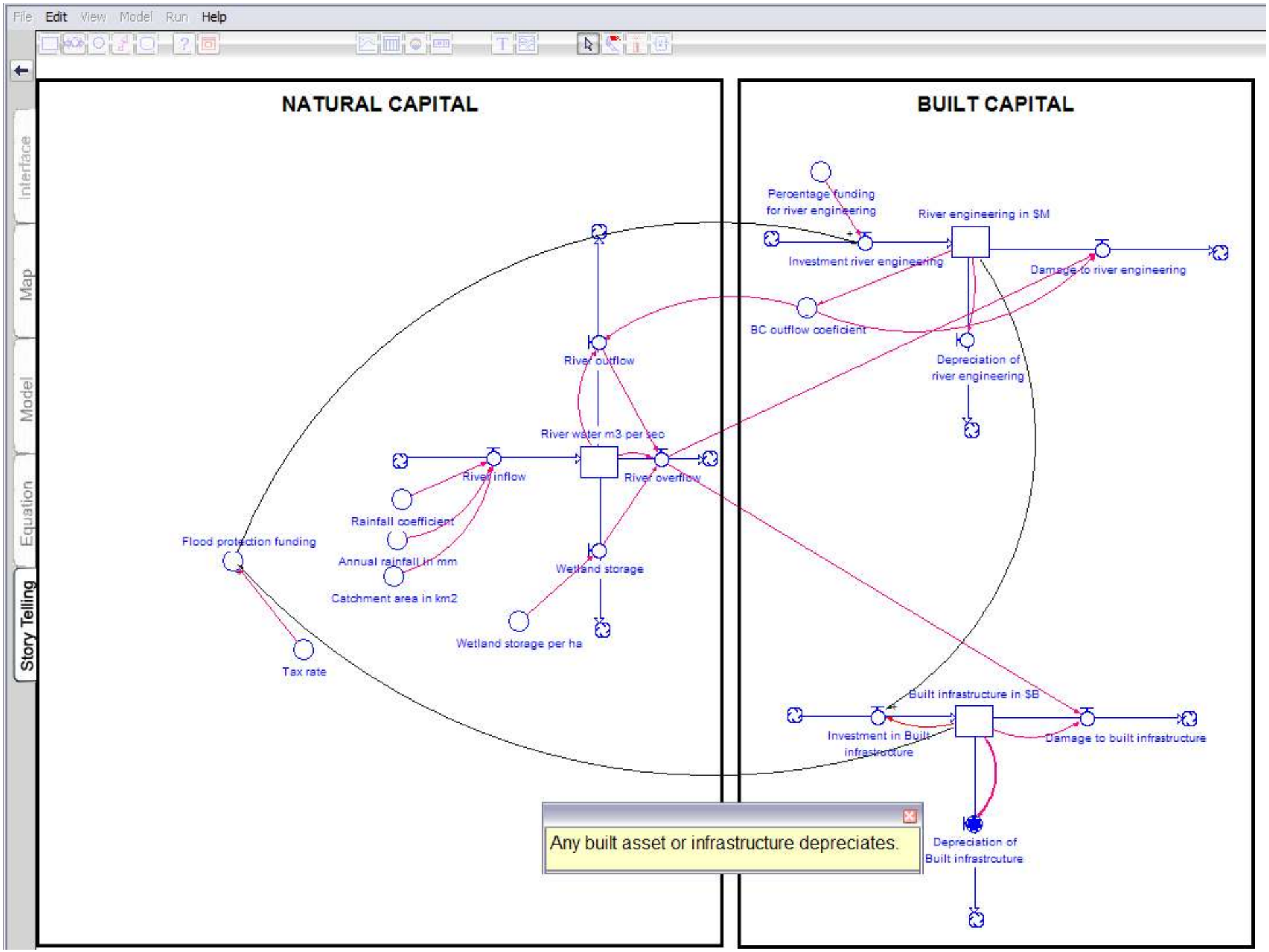
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Flood protection funding
Annual rainfall in mm
Wetland storage
Catchment area in km2
Wetland storage per ha
Tax rate
River Engineering increases the development of Infrastructural Assets
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure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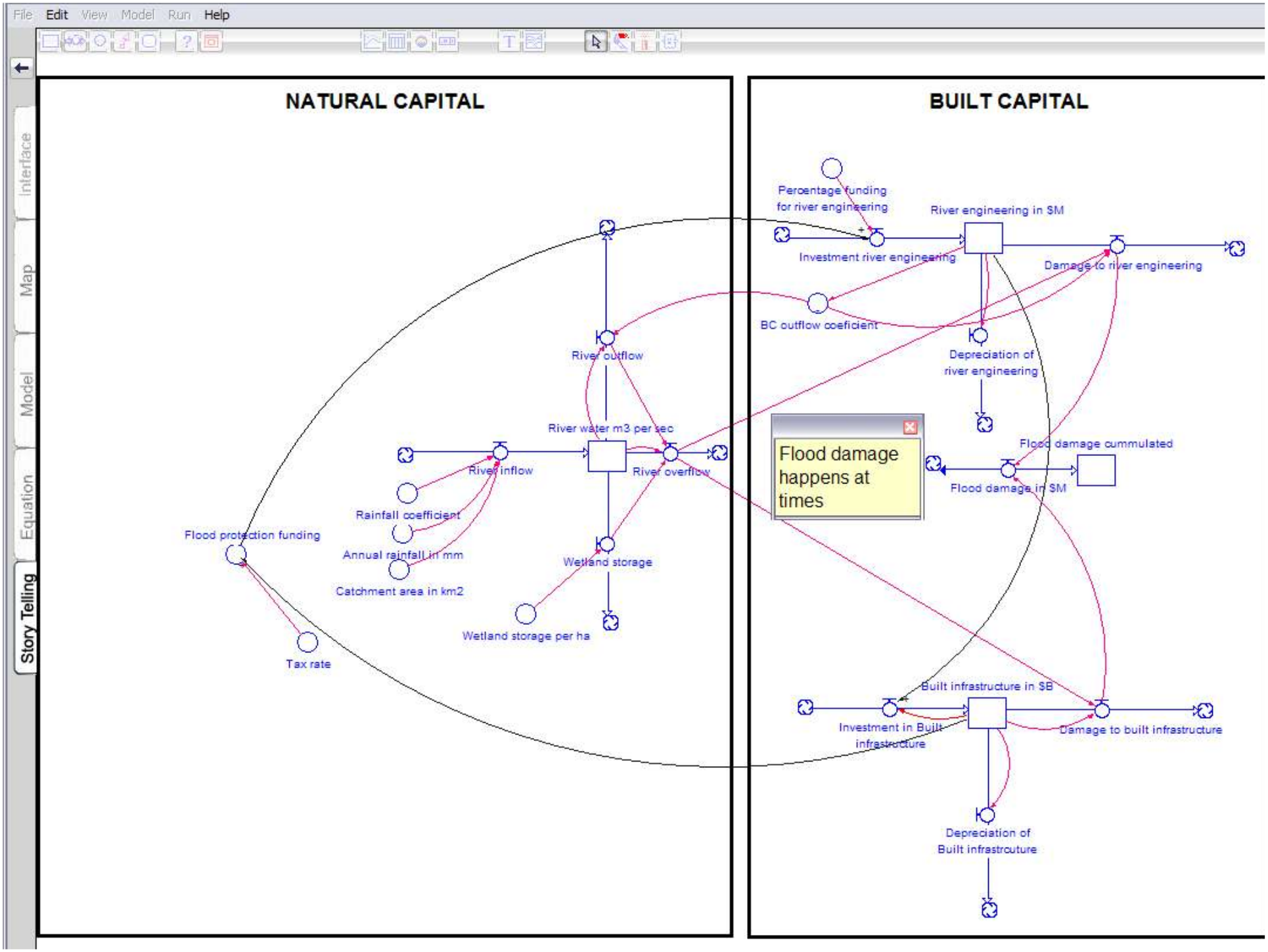
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Flood protection funding
Annual rainfall in mm
Wetland storage
Catchment area in km2
Wetland storage per ha
Tax rate
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
Depreciation of Built infrastrcuture
Any built asset or infrastructure depreciates.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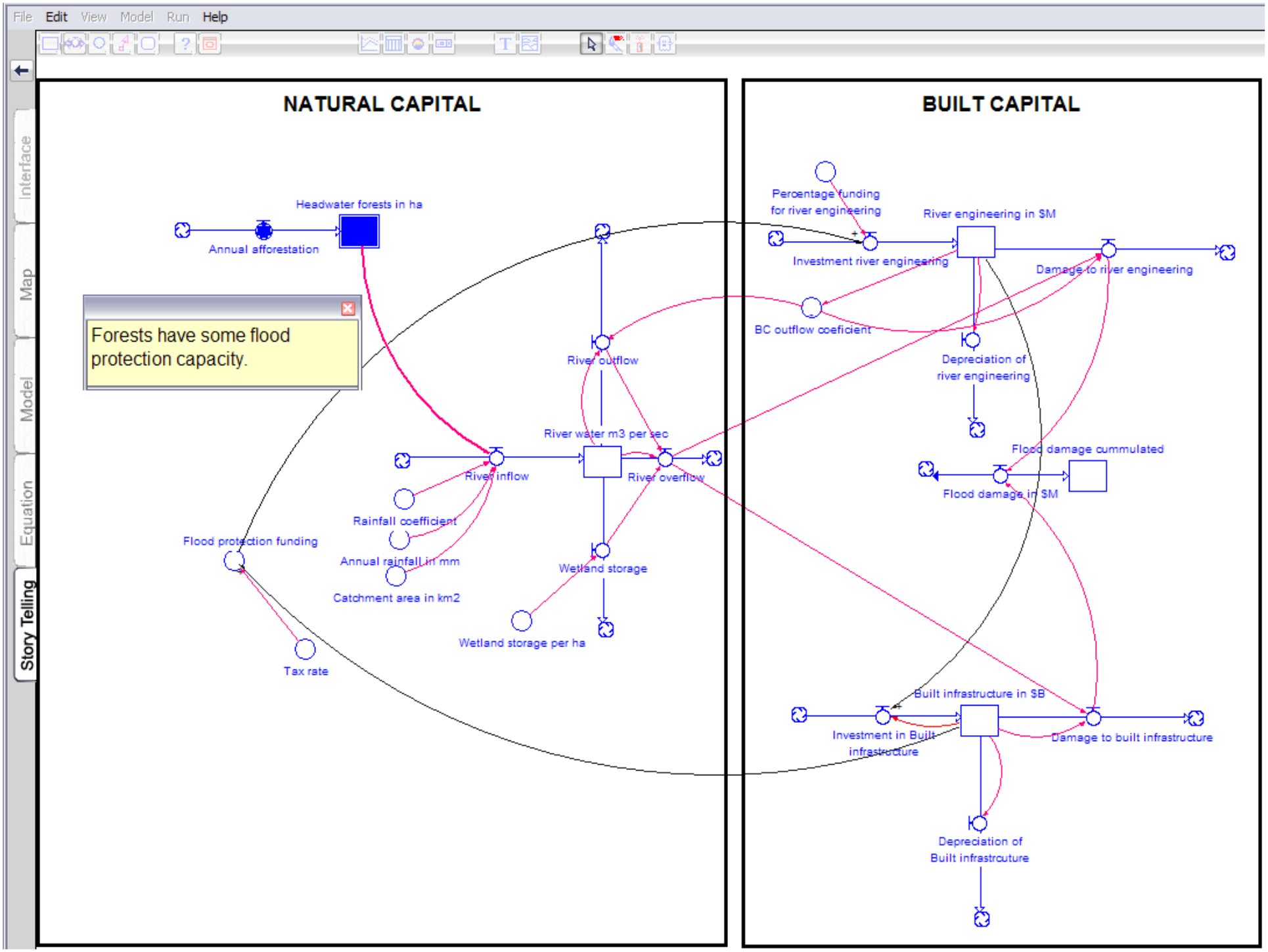
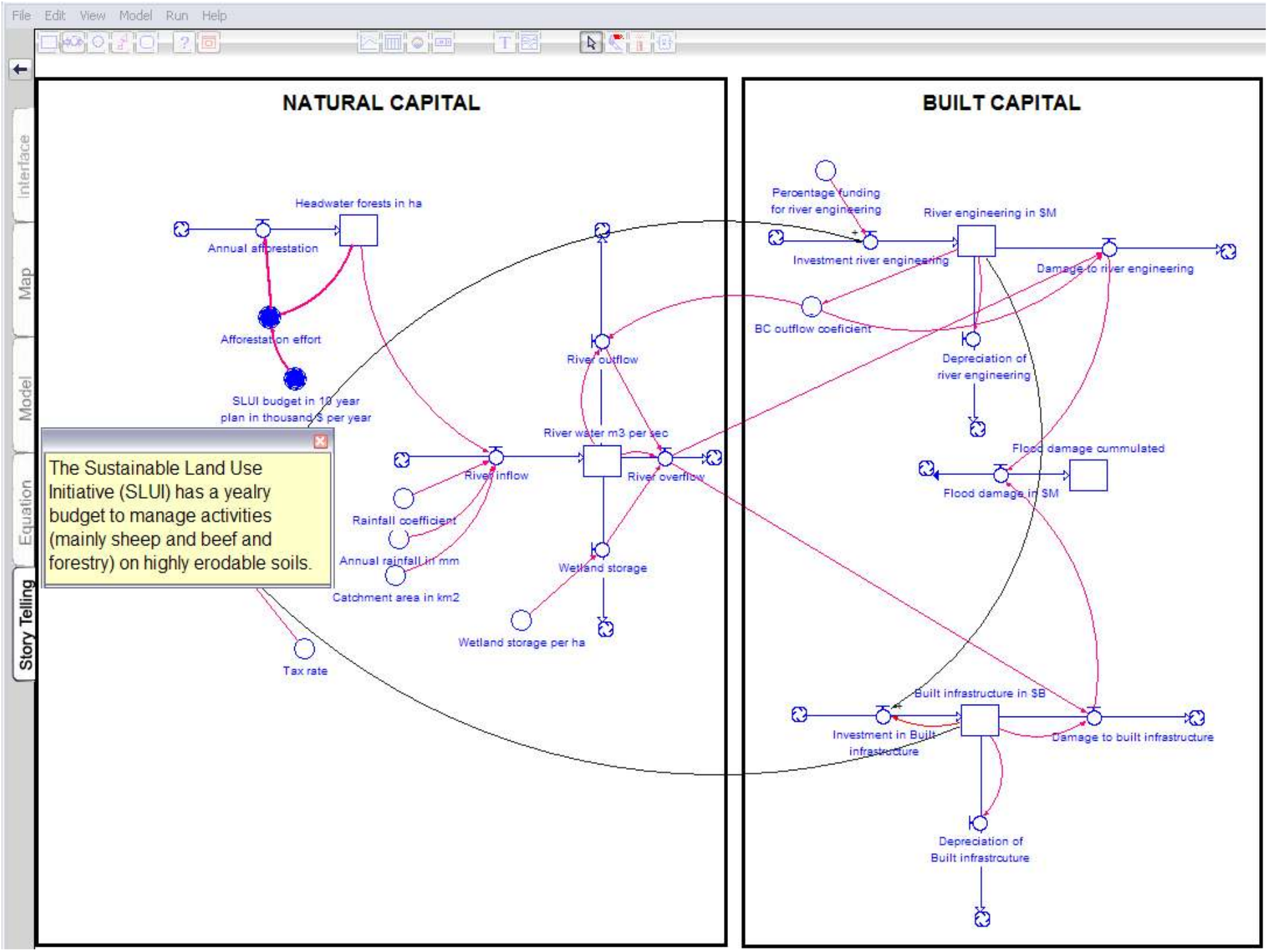
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
River outflow
River water m3 per sec
River inflow
River overflow
Flood damage happens at times
Flood damage cummulated
Flood damage in $M
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Flood protection funding
Wetland storage
Wetland storage per ha
Tax rate
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
Depreciation of Built infrastrcuture


File Edit View Model Run Help
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
Headwater forests in ha
Annual afforestation
Forests have some flood protection capacity.
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Flood protection funding
Tax rate
Wetland storage
Wetland storage per ha
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
Flood damage cummulated
Flood damage in $M
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
Depreciation of Built infrastrcuture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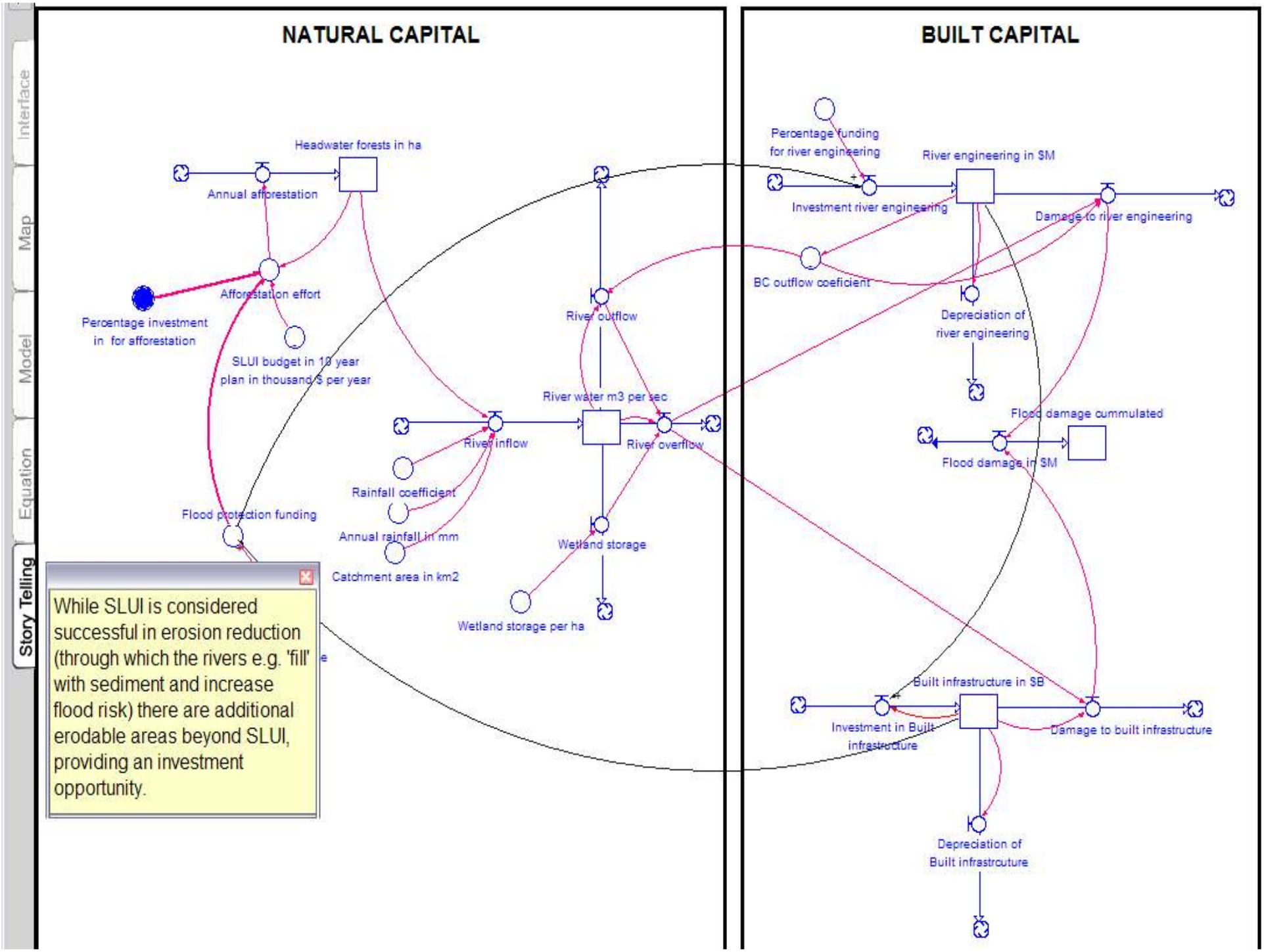
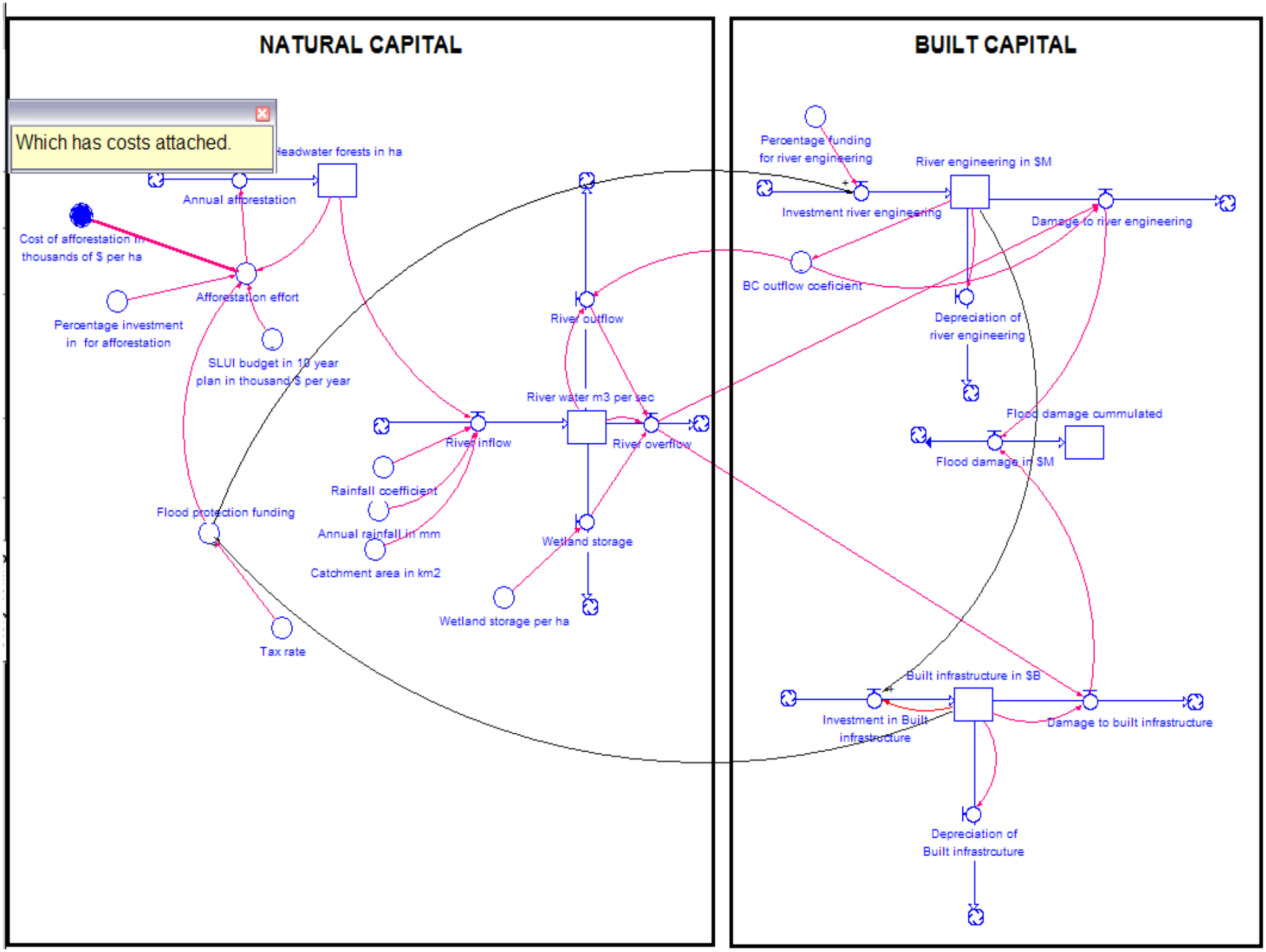
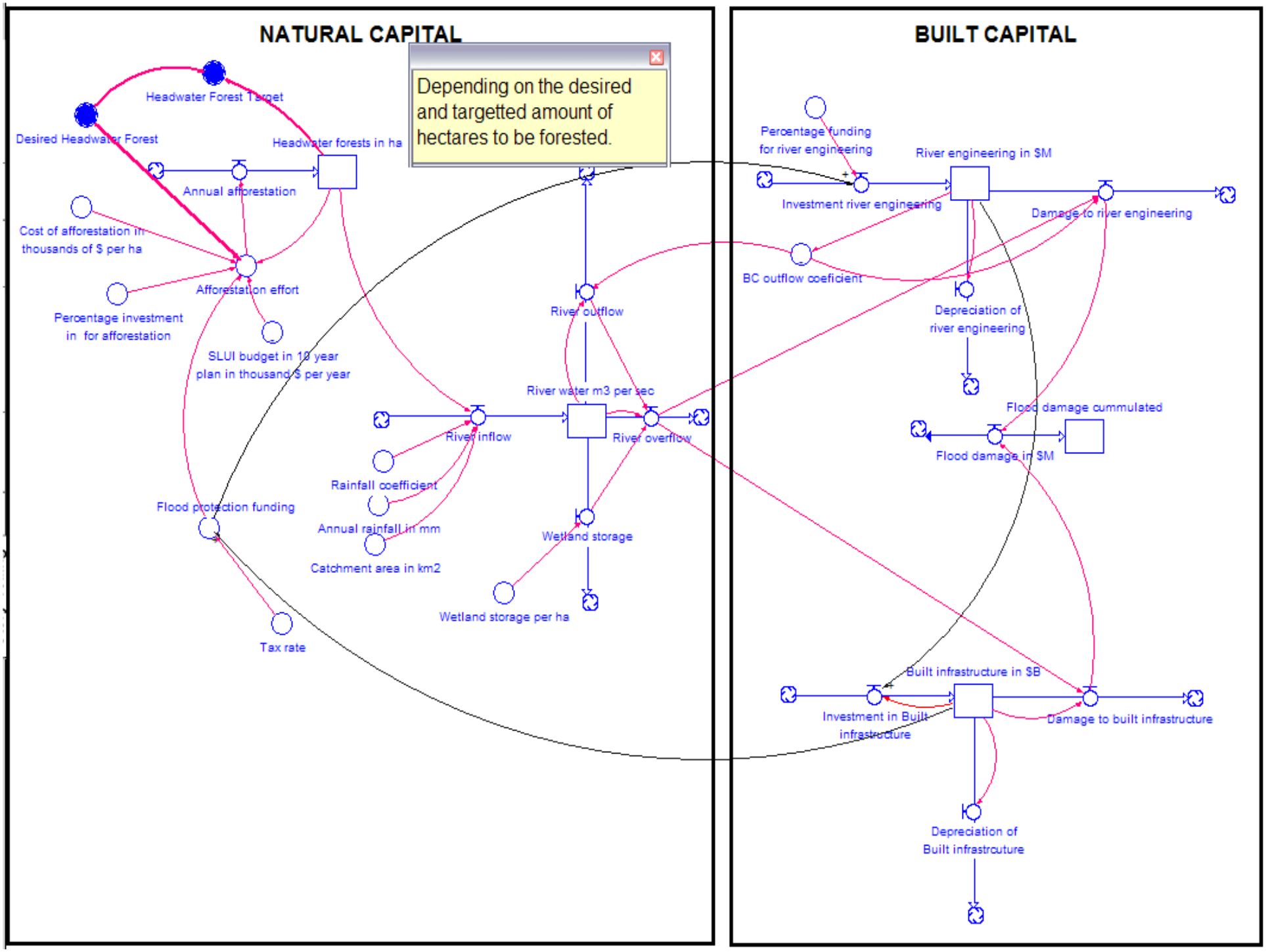
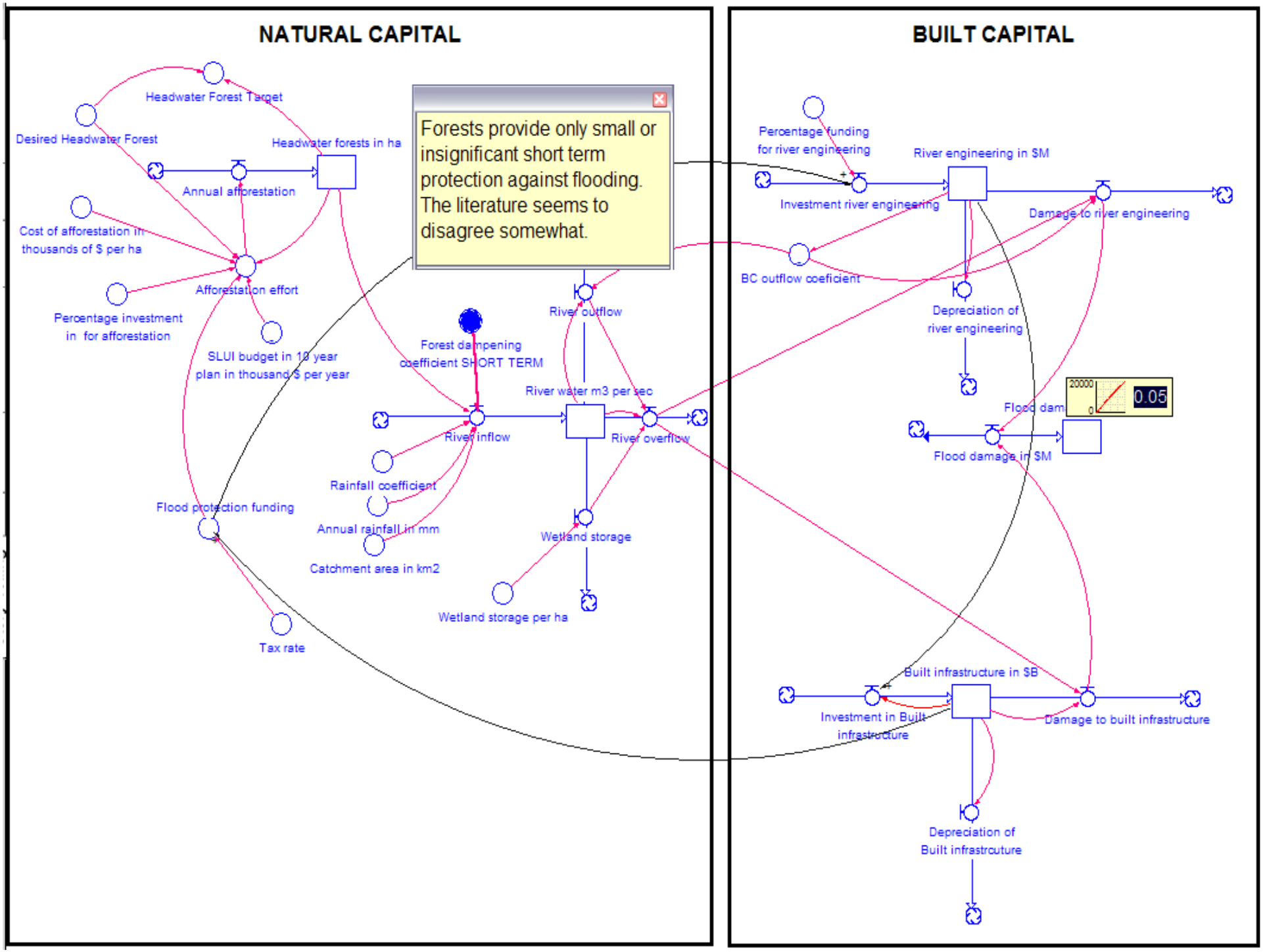
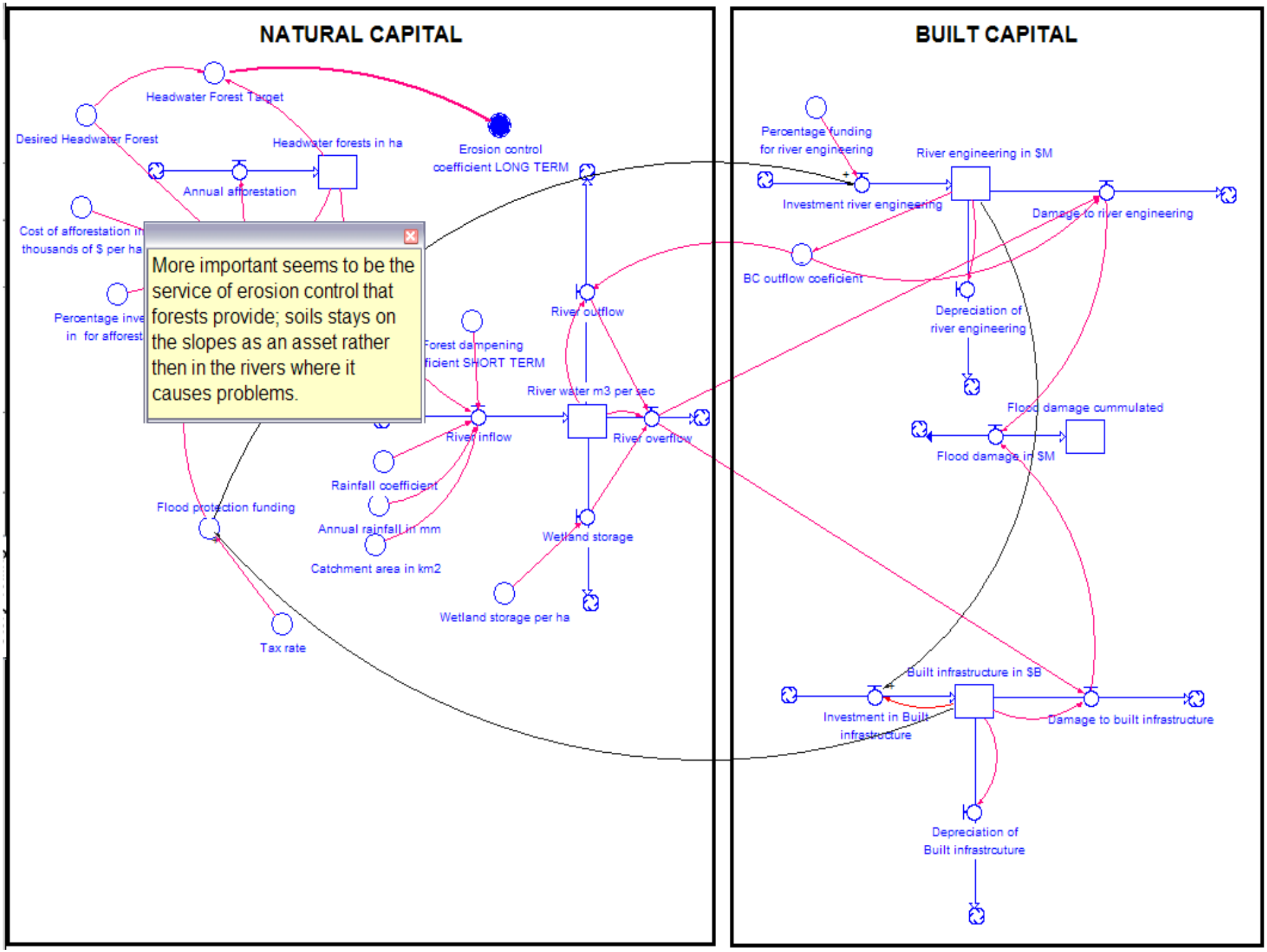
Interface
Map
Model
Equation
Story Telling
NATURAL CAPITAL
BUILT CAPITAL
Headwater forests in ha
Annual afforestation
Afforestation effort
SLUI budget in 10 year plan in thousand $ per year
The Sustainable Land Use Initiative (SLUI) has a yearly budget to manage activities (mainly sheep and beef and forestry) on highly erodable soils.
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Wetland storage
Wetland storage per ha
Tax rate
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
Flood damage cummulated
Flood damage in $M
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
Depreciation of Built infrastrcuture

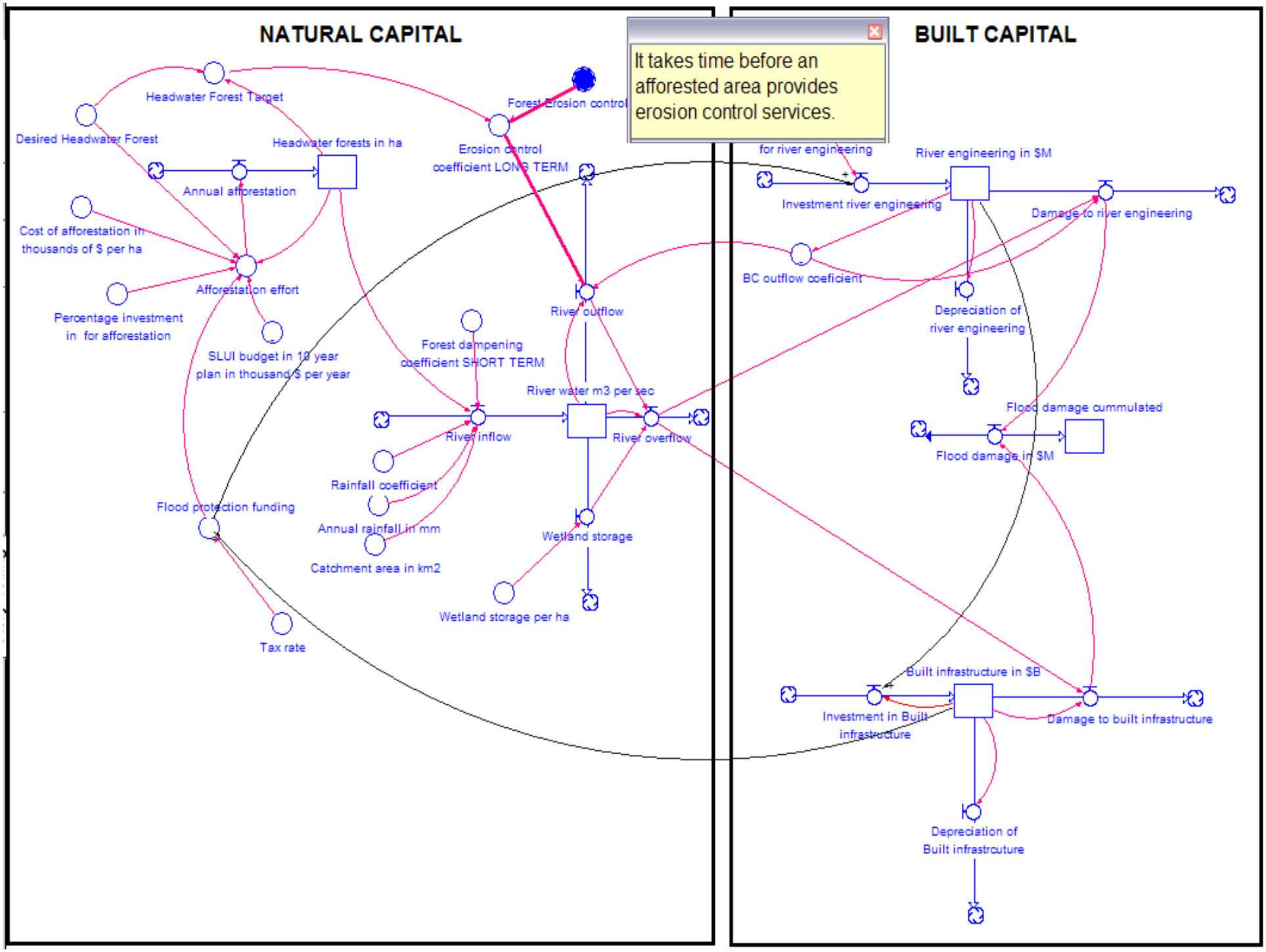

NATURAL CAPITAL
BUILT CAPITAL
Headwater forests in ha
Annual afforestation
Afforestation effort
Percentage investment in for afforestation
SLUI budget in 10 year plan in thousand $ per year
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Flood protection funding
Wetland storage
Wetland storage per ha
While SLUI is considered successful in erosion reduction (through which the rivers e.g. 'fill' with sediment and increase flood risk) there are additional erodable areas beyond SLUI, providing an investment opportunity.
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
Flood damage cummulated
Flood damage in $M
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
Depreciation of Built infrastrcuture
Interface
Map
Model
Equation
Story Telling


NATURAL CAPITAL
BUILT CAPITAL
Which has costs attached.
Headwater forests in ha
Annual afforestation
Cost of afforestation in thousands of $ per ha
Afforestation effort
Percentage investment in for afforestation
SLUI budget in 10 year plan in thousand $ per year
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Flood protection funding
Wetland storage
Wetland storage per ha
Tax rate
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
Flood damage cummulated
Flood damage in $M
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
Depreciation of Built infrastrcuture


NATURAL CAPITAL
BUILT CAPITAL
Depending on the desired and targetted amount of hectares to be forested.
Headwater Forest Target
Desired Headwater Forest
Headwater forests in ha
Annual afforestation
Cost of afforestation in thousands of $ per ha
Afforestation effort
Percentage investment in for afforestation
SLUI budget in 10 year plan in thousand $ per year
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Flood protection funding
Wetland storage
Wetland storage per ha
Tax rate
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
Flood damage cummulated
Flood damage in $M
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
Depreciation of Built infrastrcuture


NATURAL CAPITAL
BUILT CAPITAL
Forests provide only small or insignificant short term protection against flooding. The literature seems to disagree somewhat.
Headwater Forest Target
Desired Headwater Forest
Headwater forests in ha
Annual afforestation
Cost of afforestation in thousands of $ per ha
Afforestation effort
Percentage investment in for afforestation
SLUI budget in 10 year plan in thousand $ per year
Forest dampening coefficient SHORT TERM
River outflow
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Wetland storage
Wetland storage per ha
Flood protection funding
Tax rate
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
Flood dam
Flood damage in $M
20000
0
0.05
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
Depreciation of Built infrastrcuture


NATURAL CAPITAL
BUILT CAPITAL
Headwater Forest Target
Desired Headwater Forest
Headwater forests in ha
Annual afforestation
Erosion control coefficient LONG TERM
Cost of afforestation in thousands of $ per ha
Percentage inve in for afforest
More important seems to be the service of erosion control that forests provide; soils stays on the slopes as an asset rather then in the rivers where it causes problems.
River outflow
Forest dampening ficient SHORT TERM
River water m3 per sec
River inflow
River overflow
Rainfall coefficient
Annual rainfall in mm
Catchment area in km2
Flood protection funding
Wetland storage
Wetland storage per ha
Tax rate
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
Flood damage cummulated
Flood damage in $M
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
Depreciation of Built infrastrcuture


NATURAL CAPITAL
BUILT CAPITAL
It takes time before an afforested area provides erosion control services.
Headwater Forest Target
Desired Headwater Forest
Headwater forests in ha
Annual afforestation
Forest Erosion control
Erosion control coefficient LONG TERM
Cost of afforestation in thousands of $ per ha
Afforestation effort
Percentage investment in for afforestation
SLUI budget in 10 year plan in thousand $ per year
Forest dampening coefficient SHORT TERM
River outflow
River water m3 per sec
River inflow
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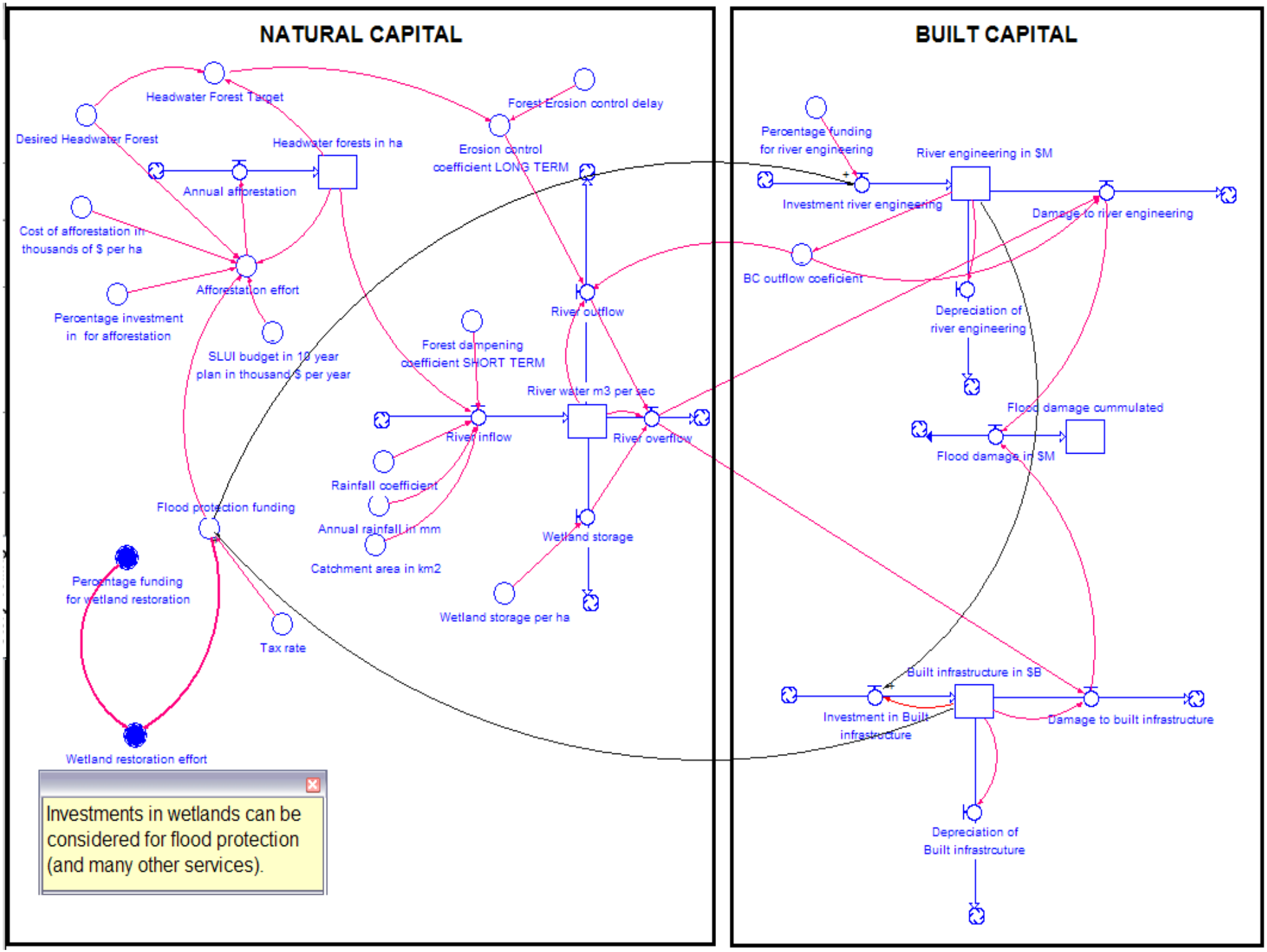
NATURAL CAPITAL
BUILT CAPITAL
Headwater Forest Target
Forest Erosion control delay
Desired Headwater Forest
Headwater forests in ha
Erosion control coefficient LONG TERM
Annual afforestation
Cost of afforestation in thousands of $ per ha
Afforestation effort
Percentage investment in for afforestation
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Wetland storage per ha
Percentage funding for wetland restoration
Tax rate
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Percentage funding for river engineering
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Built infrastructure in $B
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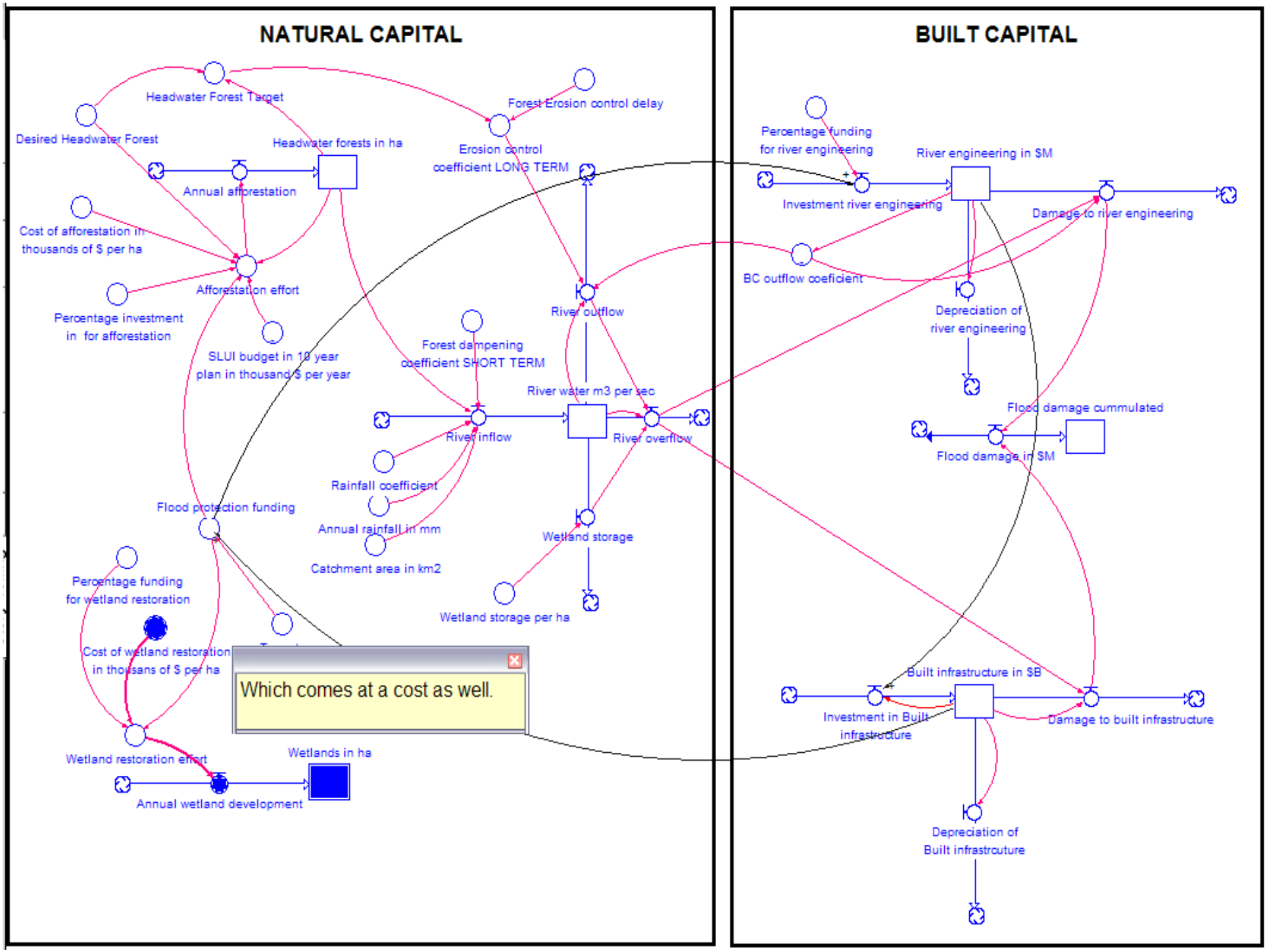
Damage to built infrastructure
Depreciation of Built infrastrcuture
Investments in wetlands can be considered for flood protection (and many other services).


NATURAL CAPITAL
BUILT CAPITAL
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Annual rainfall in mm
Catchment area in km2
Flood protection funding
Wetland storage
Wetland storage per ha
Percentage funding for wetland restoration
Cost of wetland restoration in thousans of $ per ha
Which comes at a cost as well.
Wetland restoration effort
Wetlands in ha
Annual wetland development
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
Flood damage cummulated
Flood damage in $M
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
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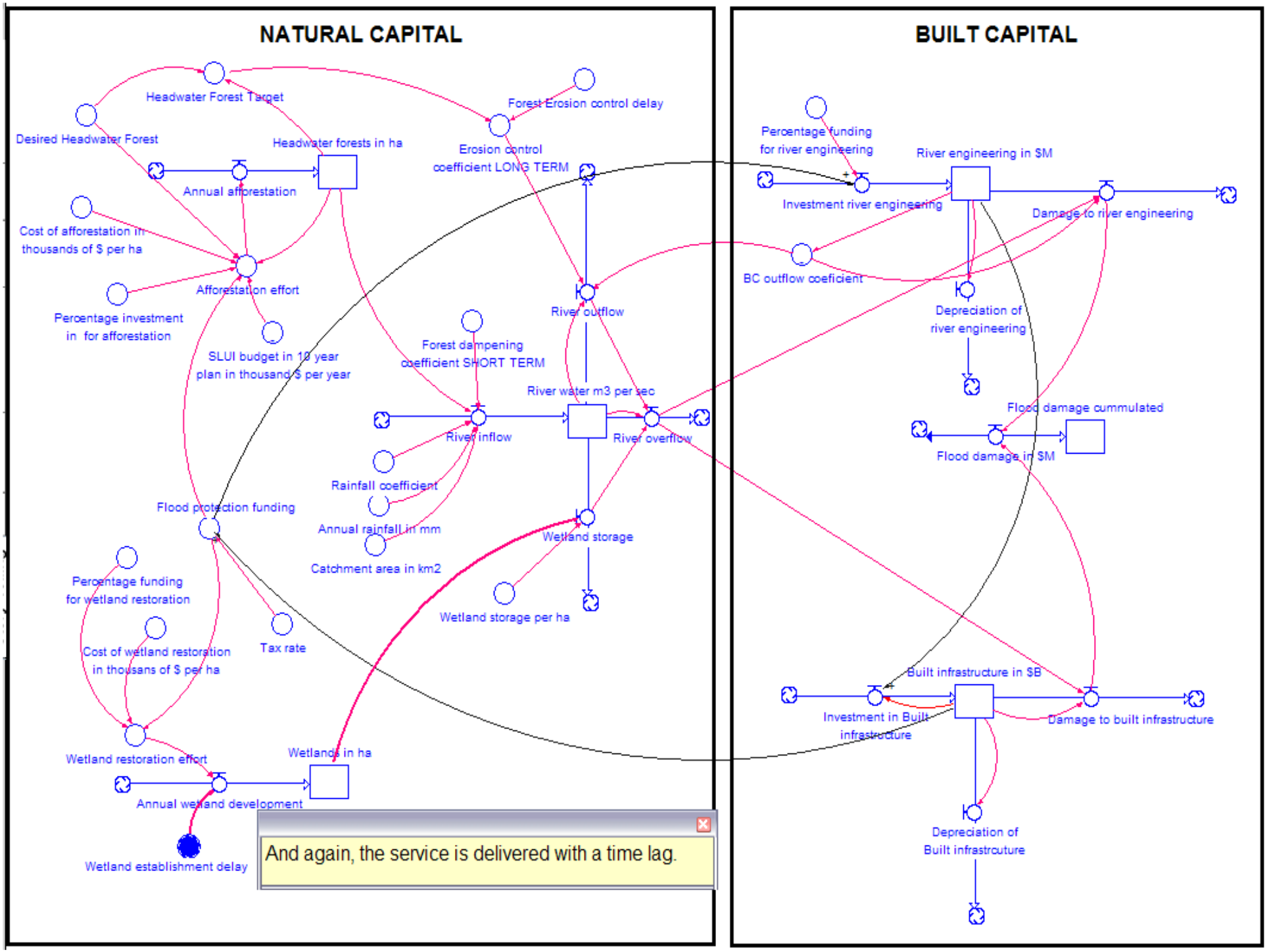
NATURAL CAPITAL
BUILT CAPITAL
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Headwater forests in ha
Erosion control coefficient LONG TERM
Annual afforestation
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Percentage investment in for afforestation
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Flood protection funding
Wetland storage
Wetland storage per ha
Percentage funding for wetland restoration
Cost of wetland restoration in thousans of $ per ha
Tax rate
Wetland restoration effort
Wetlands in ha
Annual wetland development
Wetland establishment delay
And again, the service is delivered with a time lag.
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
Flood damage cummulated
Flood damage in $M
Built infrastructure in $B
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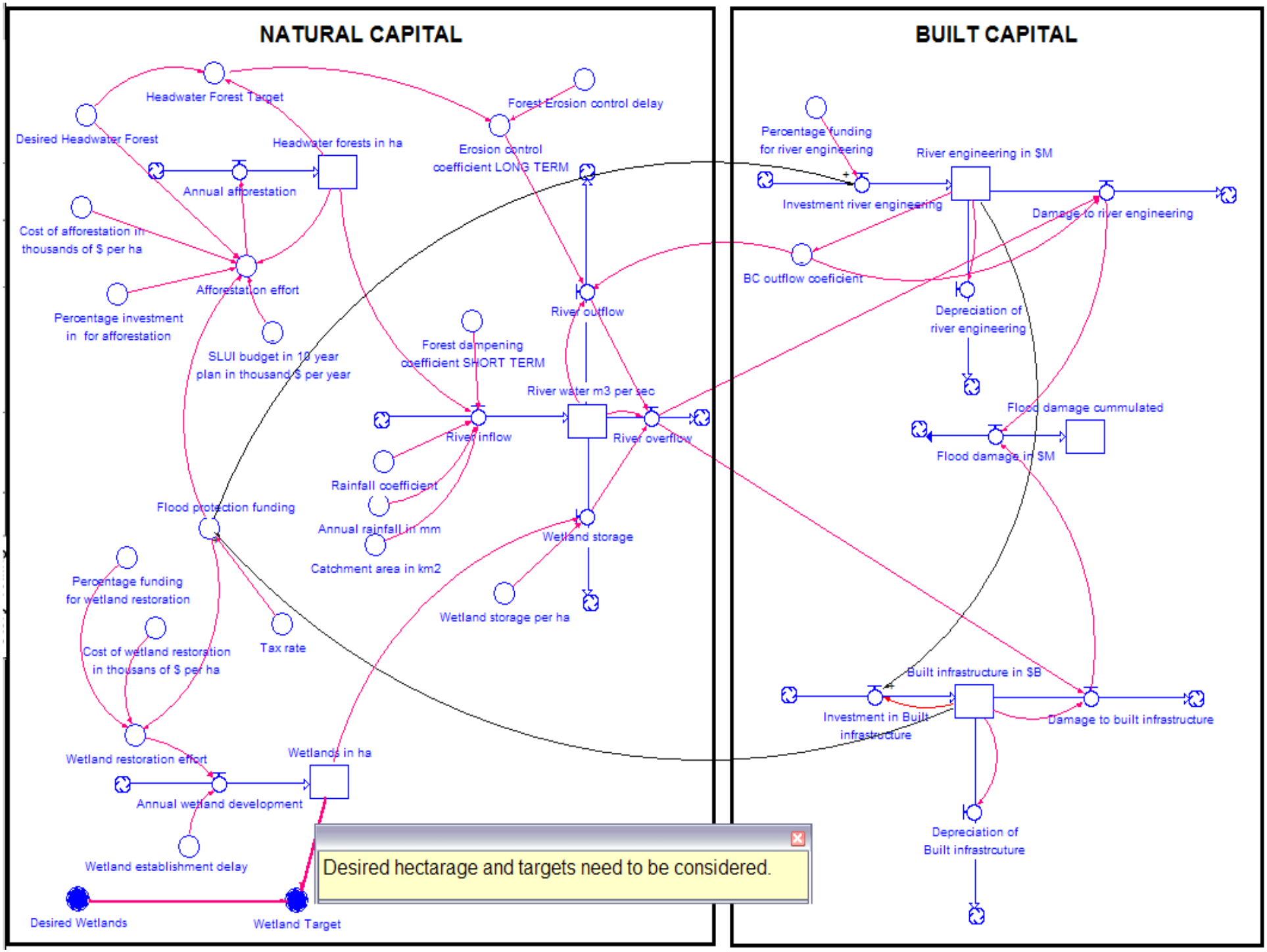
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Wetland storage per ha
Percentage funding for wetland restoration
Cost of wetland restoration in thousans of $ per ha
Tax rate
Wetland restoration effort
Wetlands in ha
Annual wetland development
Wetland establishment delay
Desired Wetlands
Wetland Target
Desired hectarage and targets need to be considered.
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
Flood damage cummulated
Flood damage in $M
Built infrastructure in $B
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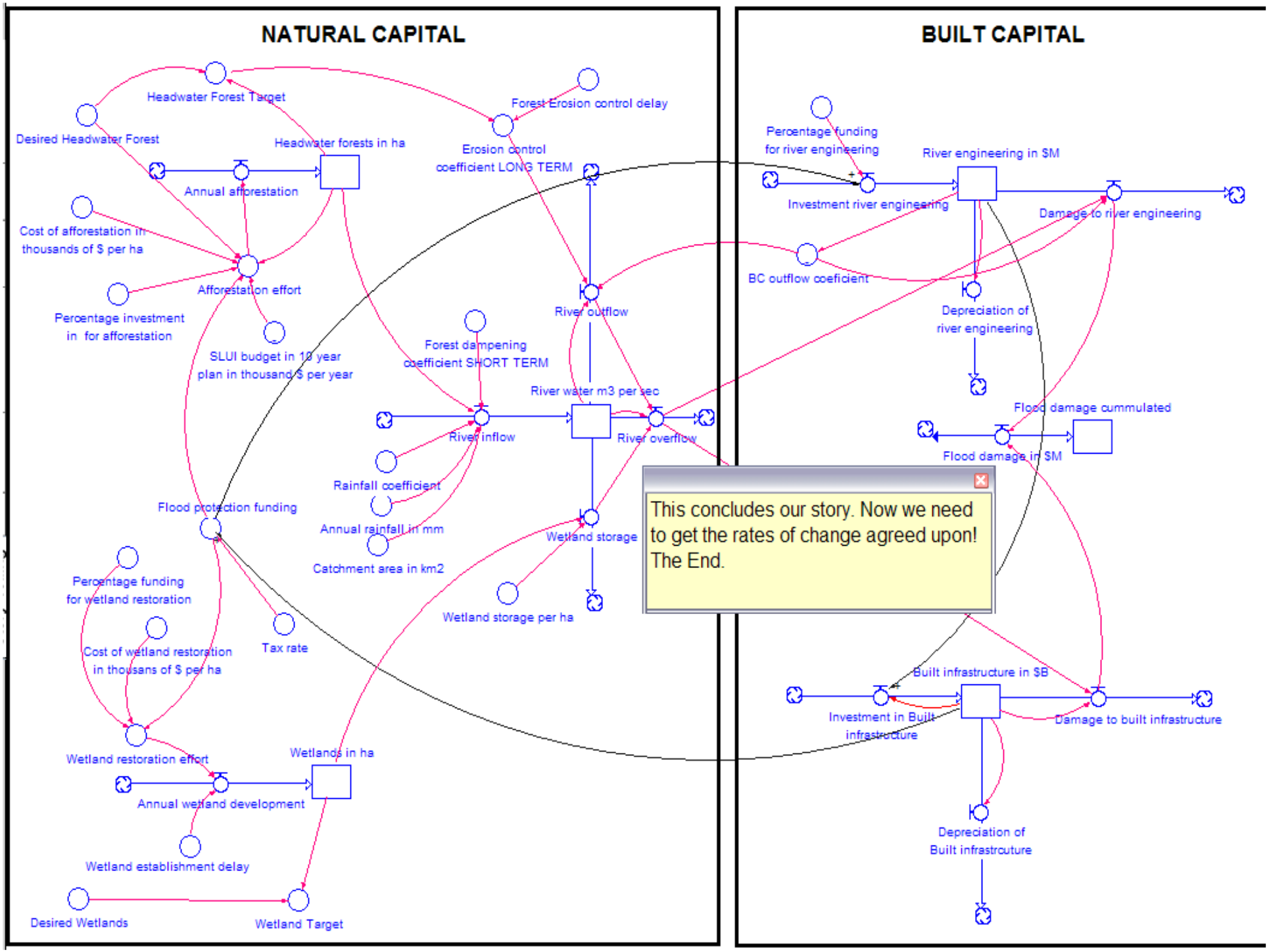
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Wetland Target
Percentage funding for river engineering
River engineering in $M
Investment river engineering
Damage to river engineering
BC outflow coeficient
Depreciation of river engineering
Flood damage cummulated
Flood damage in $M
This concludes our story. Now we need to get the rates of change agreed upon! The End.
Built infrastructure in $B
Investment in Built infrastructure
Damage to built infrastructure
Depreciation of Built infrastrcuture

Scenarios Natural vs Built Capital

Natural Capital

High

Scenario 2:
Back to pre- or early settlement

Scenario 3:
Balance between Built and Natural Capital
Production of goods and services in harmony with production of ecosystem benefits
Understanding inter-dependencies and 'tipping points'

Built Capital
Low

Built Capital
High

Post overshoot when eroded natural capital and loss of ecosystem benefits erode the basis for built capital

Scenario 1:
Costly flood protection and loss of benefits derived from ecosystems.

Low

Natural Capital

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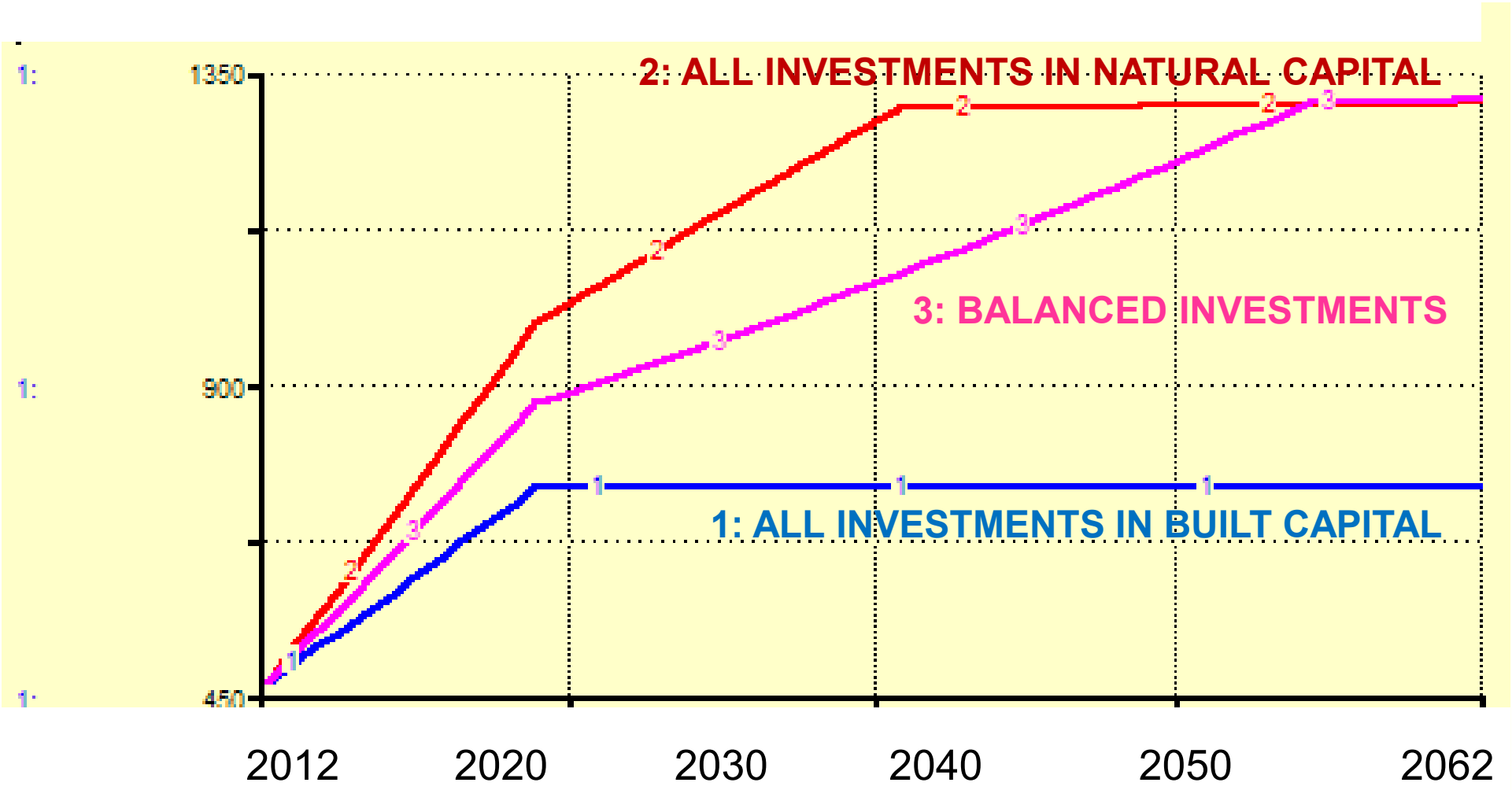
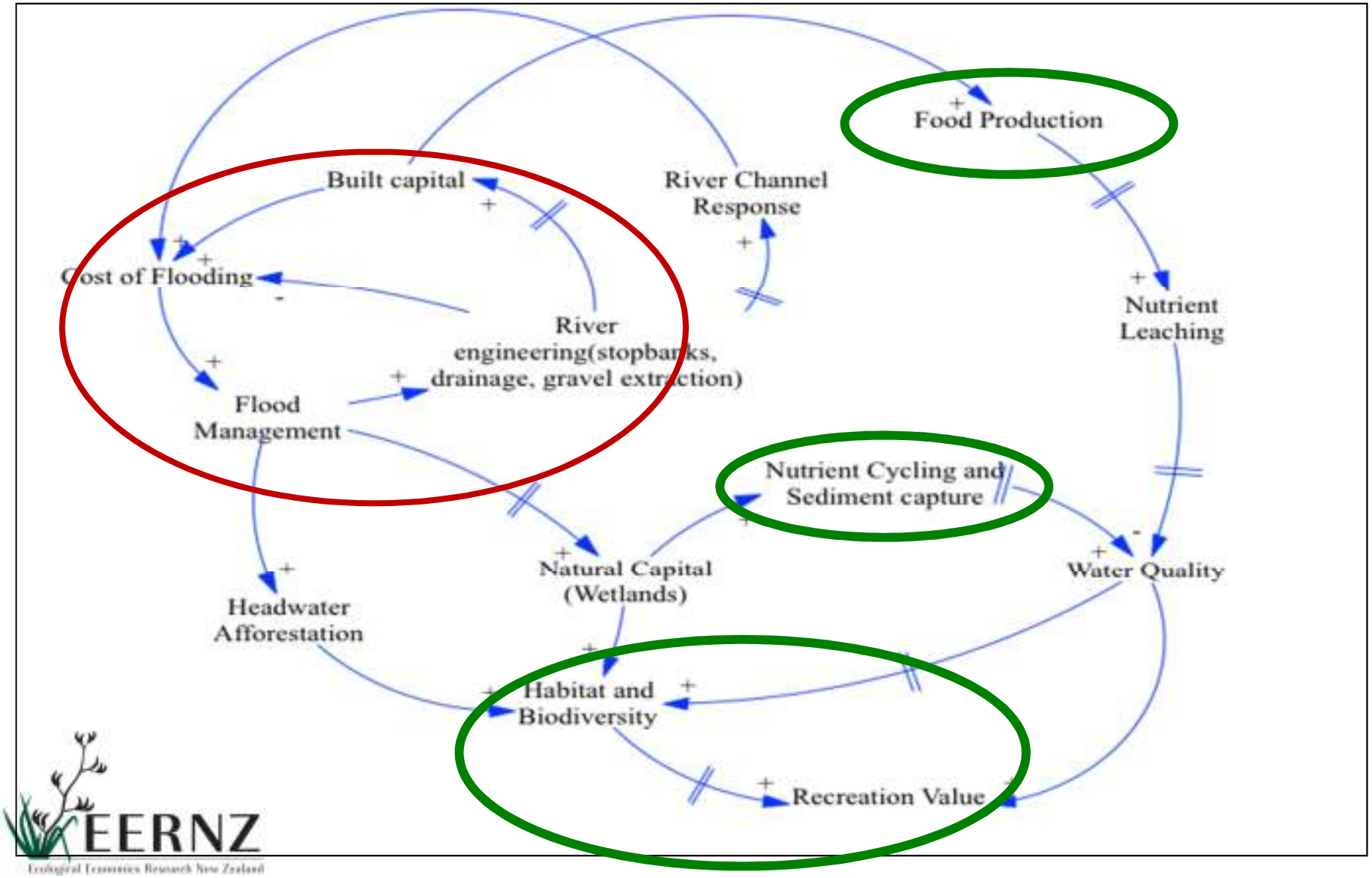
Ecosystem Service Value



Ecosystem services



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Feedback to Flood Protection, 'investment trap' model

- In the Flood Protection model story credible?
- Should the Flood Protection model be developed further?
- Should the Flood Protection model be included in the IFS MM model?
- In your view, can the Flood Protection be used to inform a dialogue with interested parties on this topic?

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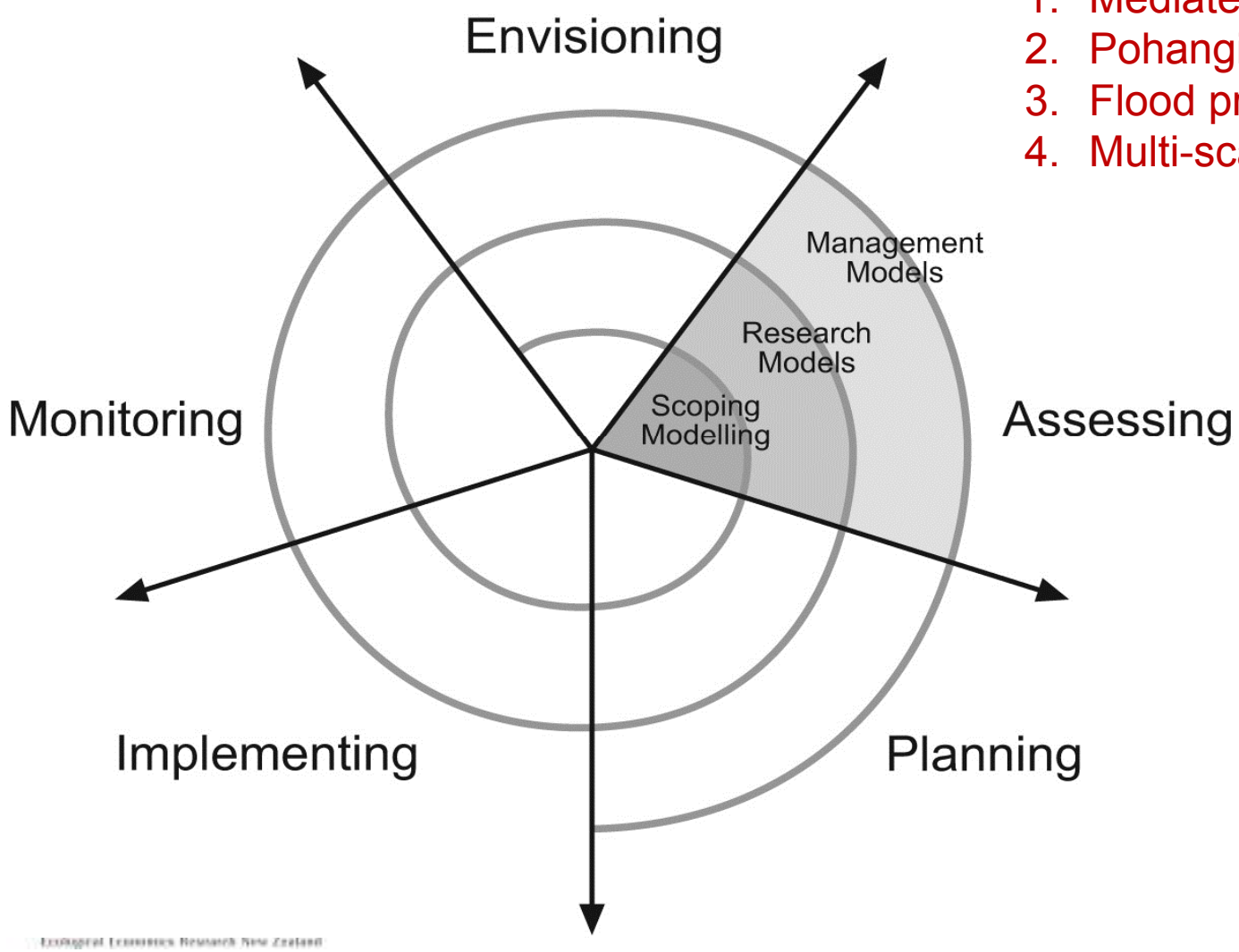
How do Modelling Tools support Planning and Adaptive Management?



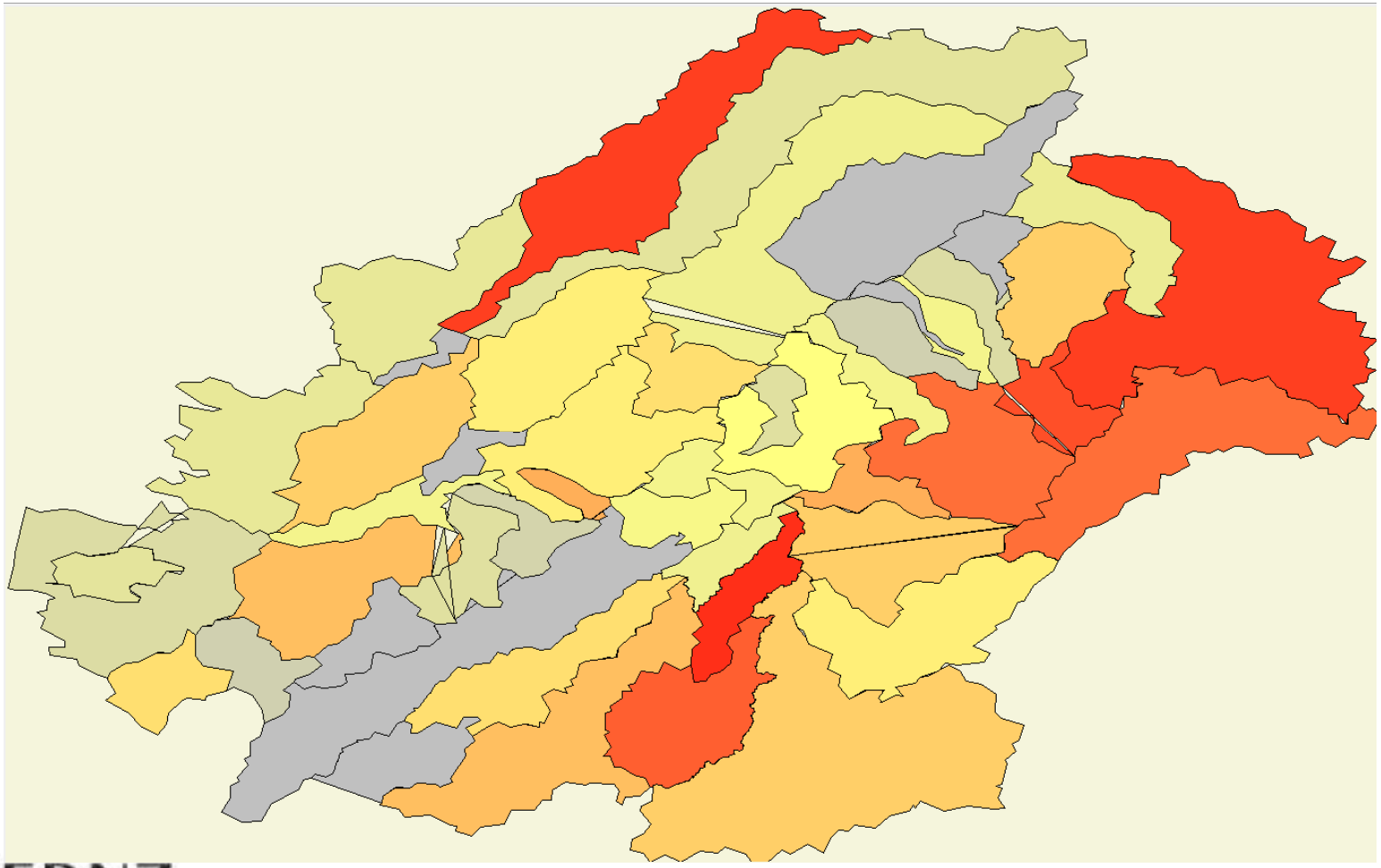
Four integrated assessment tools

1. Mediated model
2. Pohangina model
3. Flood protection model
4. Multi-scale model

Source: van den Belt, 2009

Multi-scale Model for Ecosystem Services (MIMES)

Erosion/SLUI - 2000



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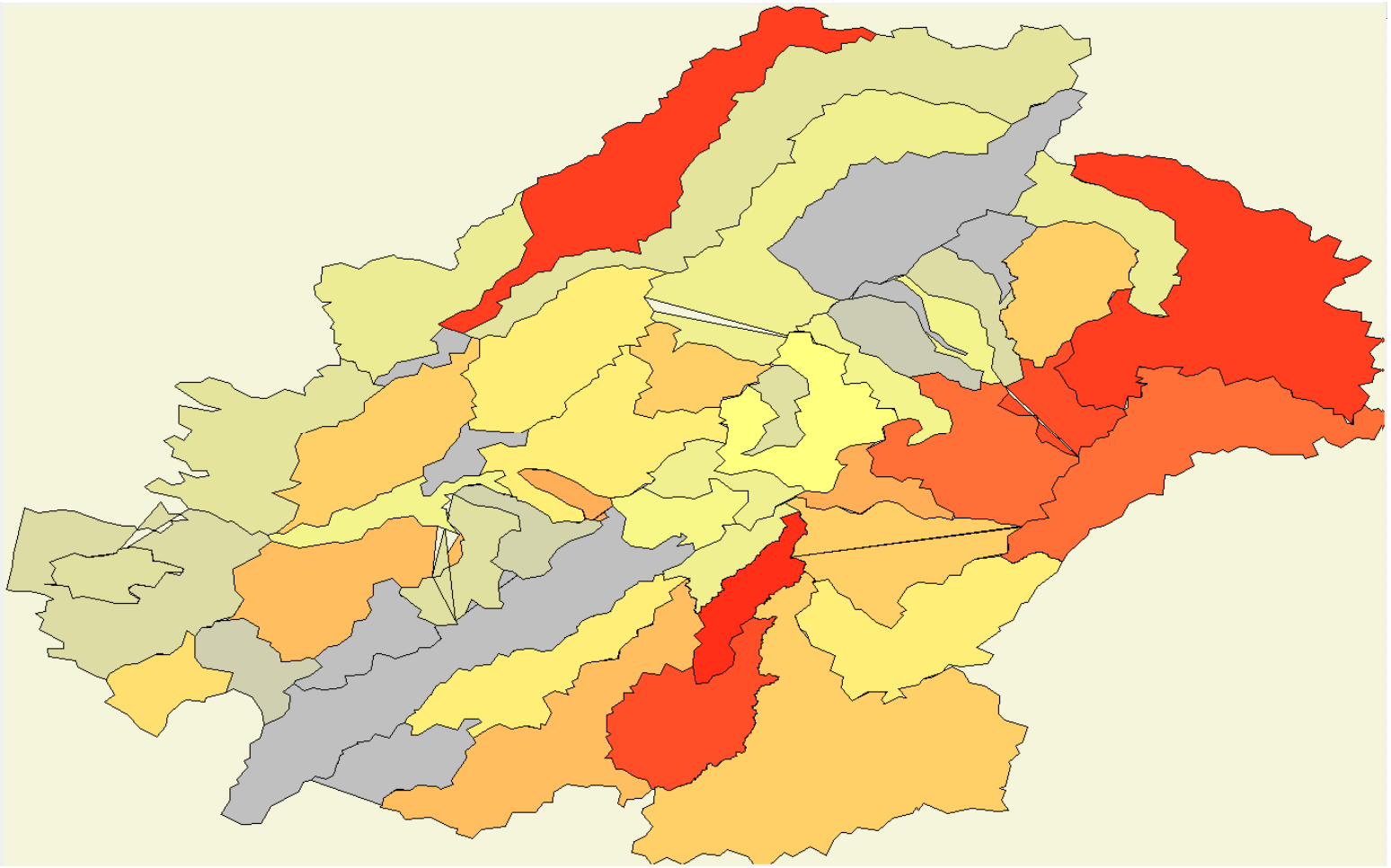
Erosion/SLUI - 2013



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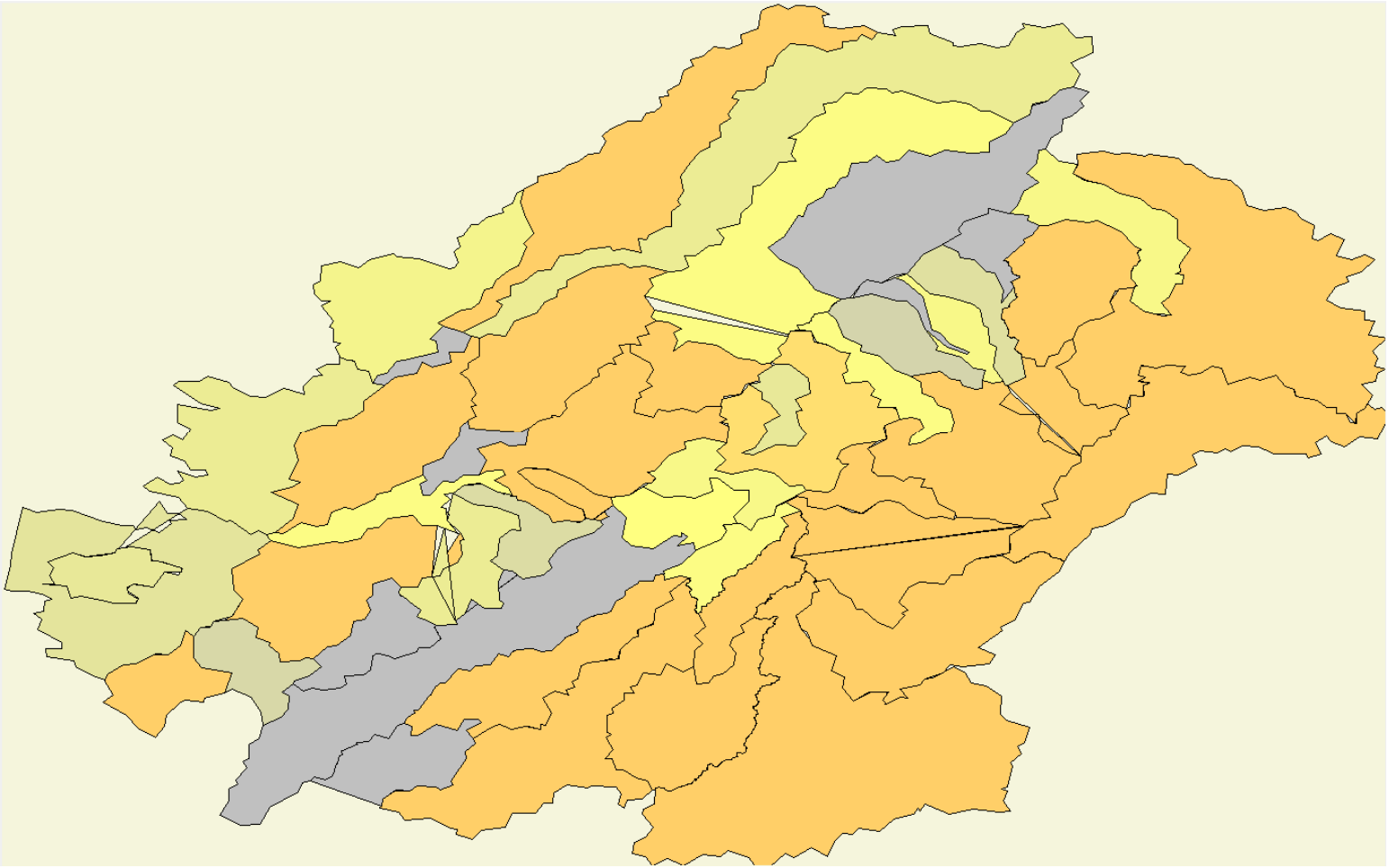
Erosion/SLUI - 2020



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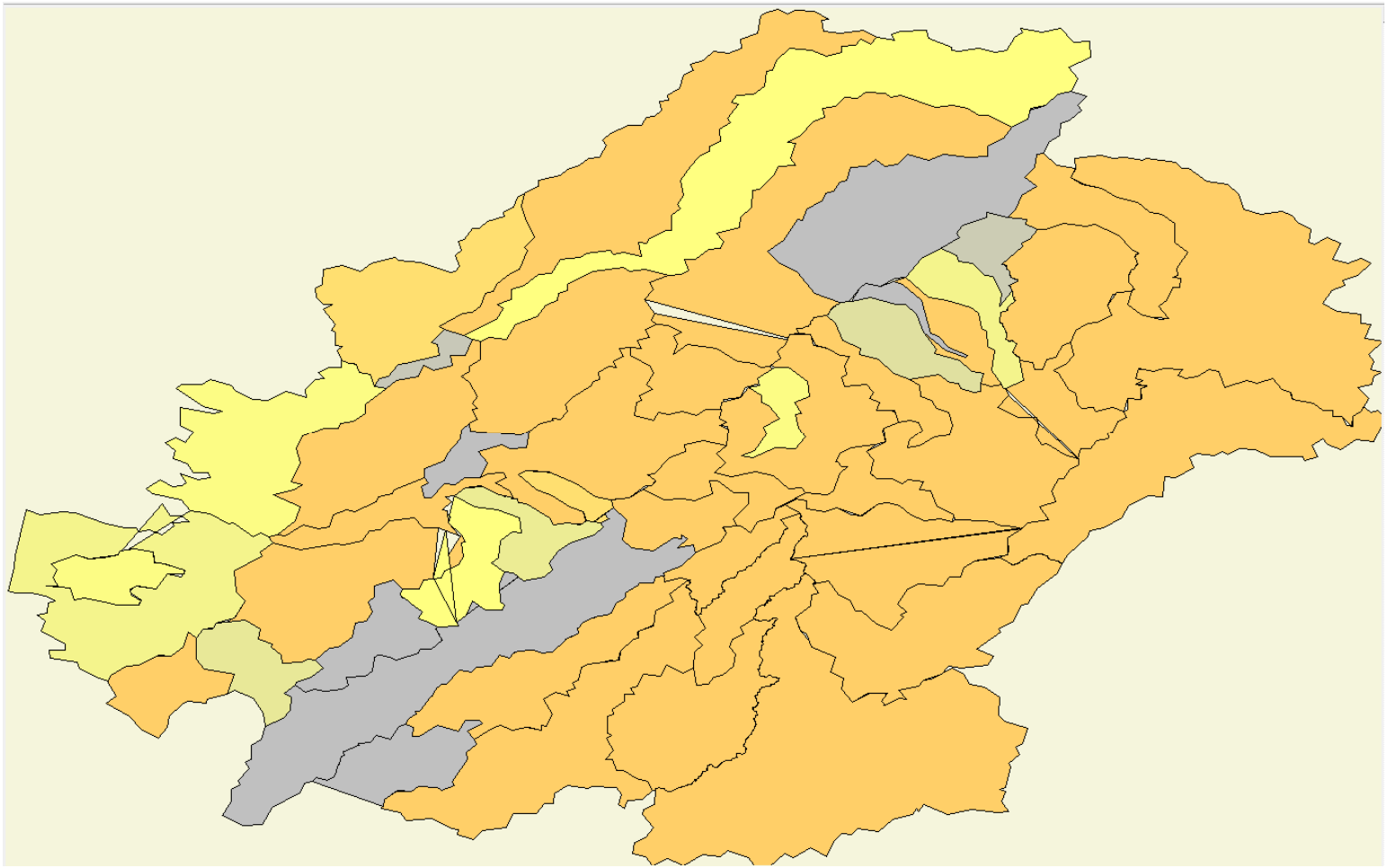
Erosion - 2030



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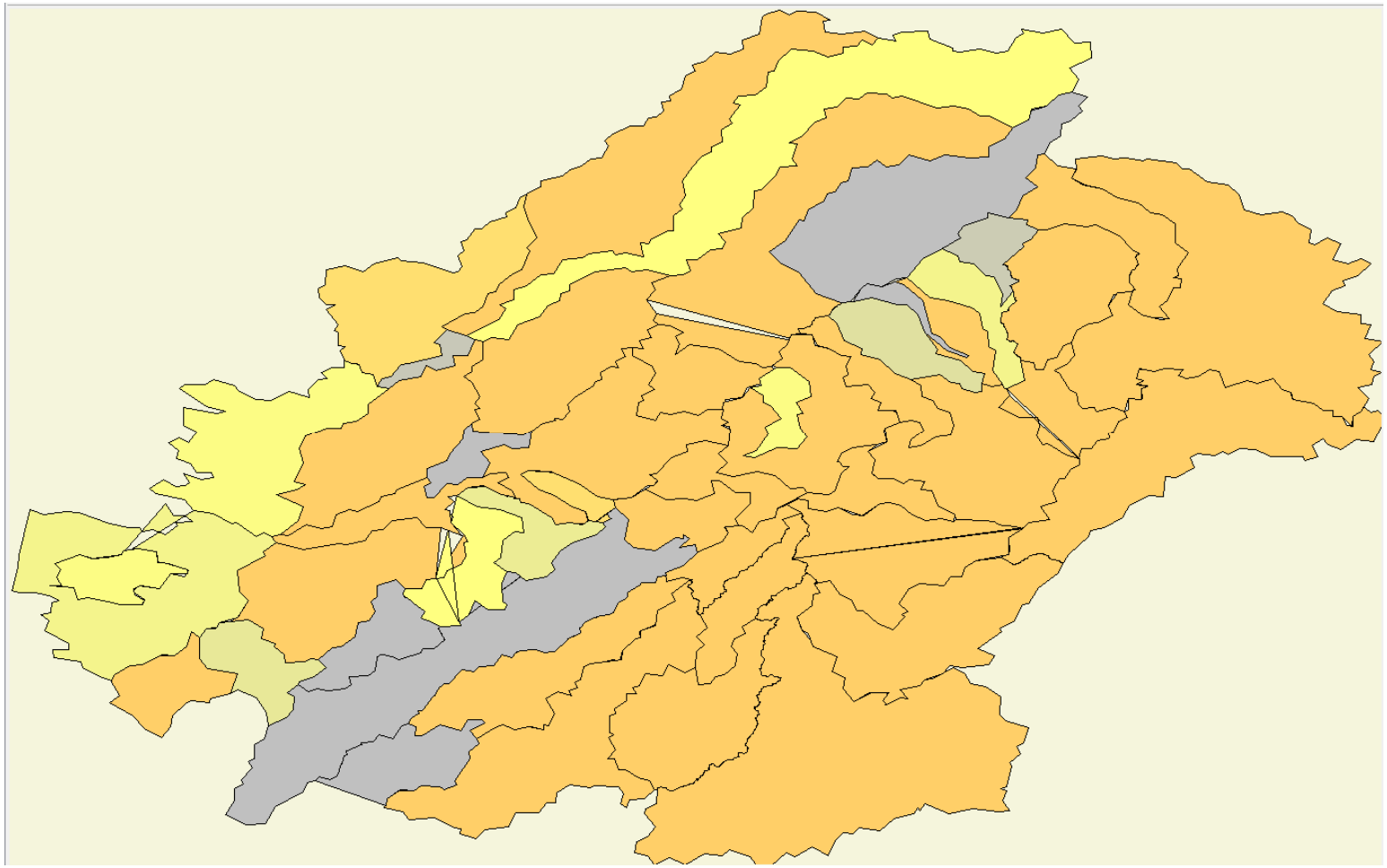
Erosion - 2040



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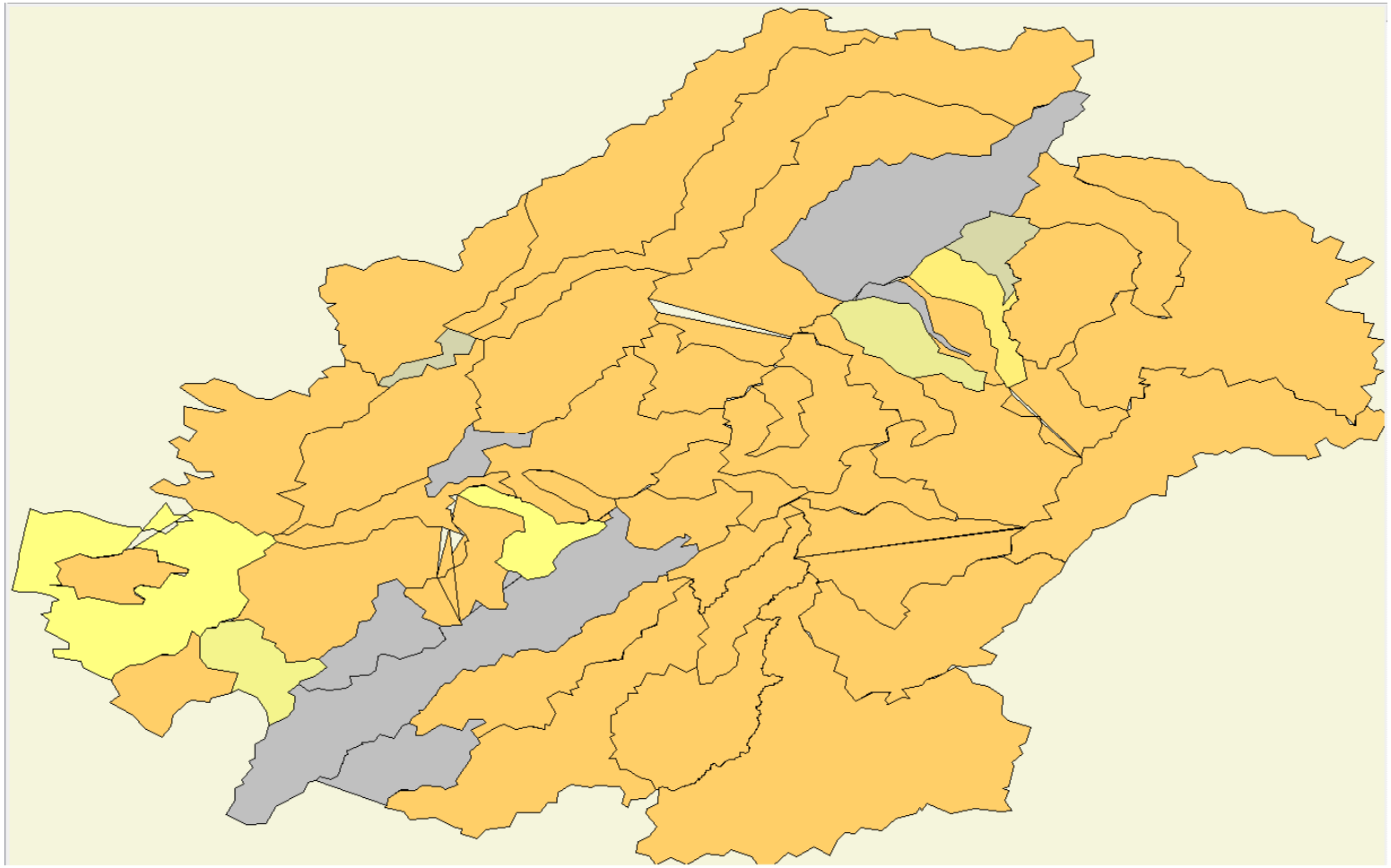
Erosion - 2050



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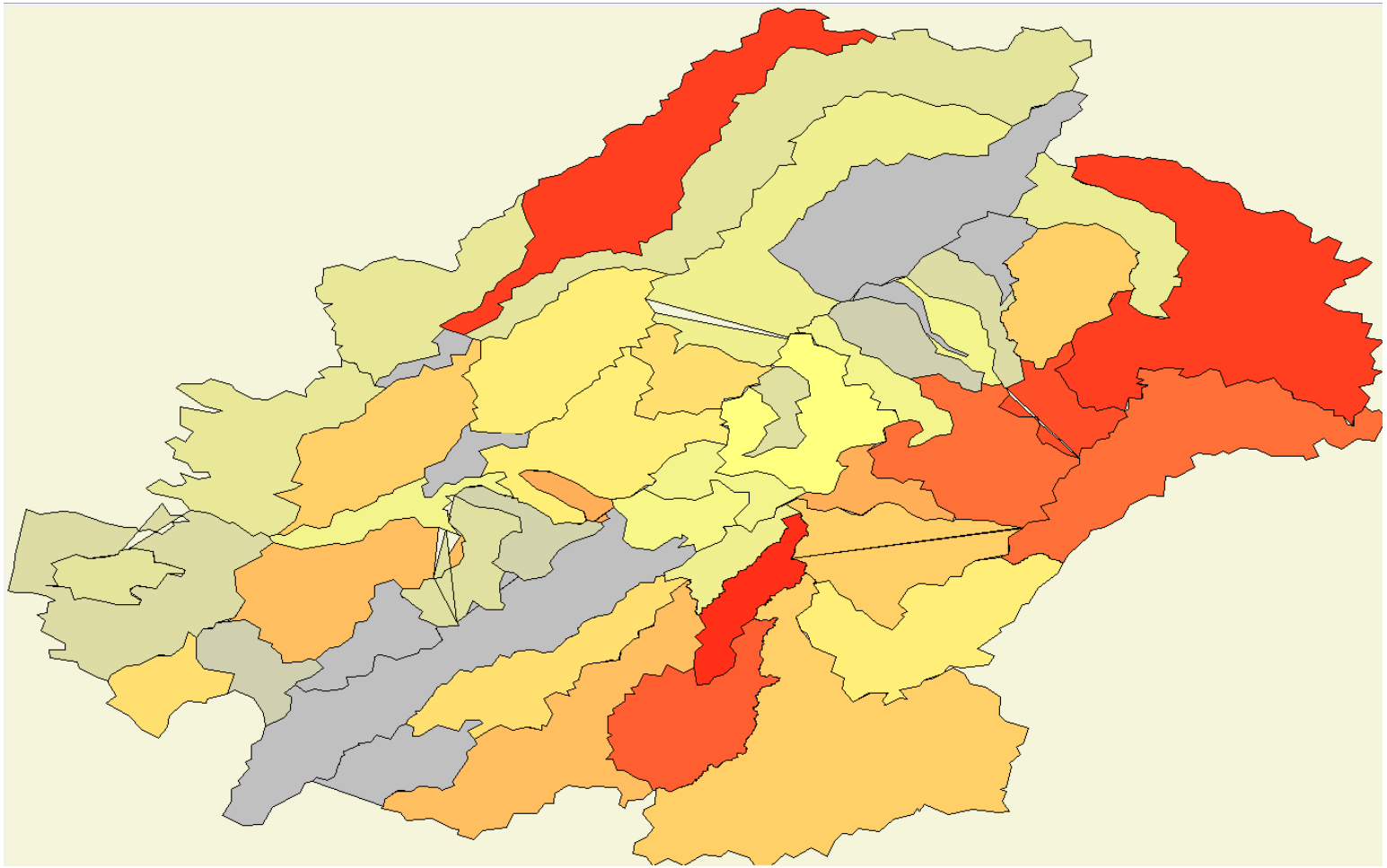
Erosion - 2000



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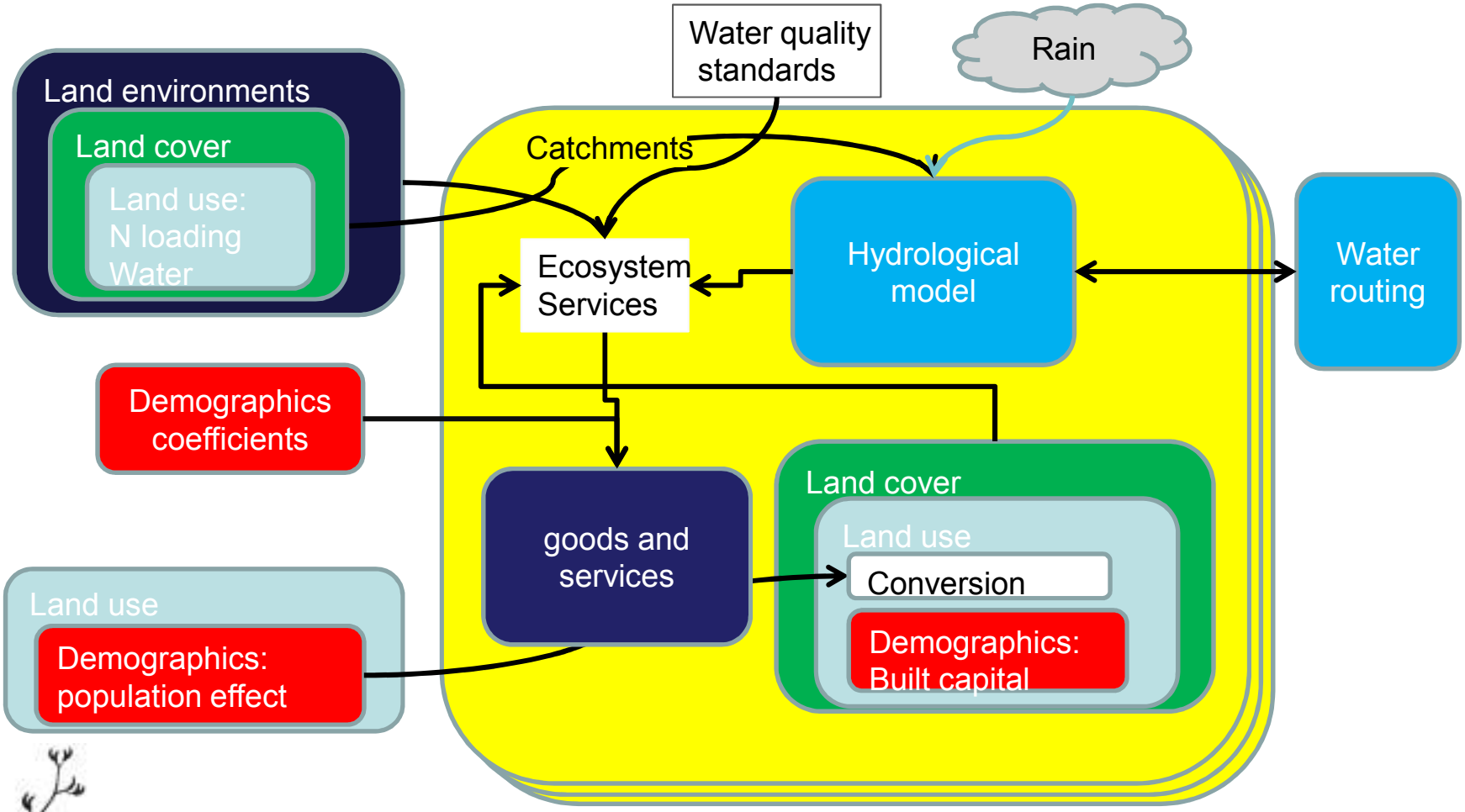
Manawatu MIMES - Qualitative overview



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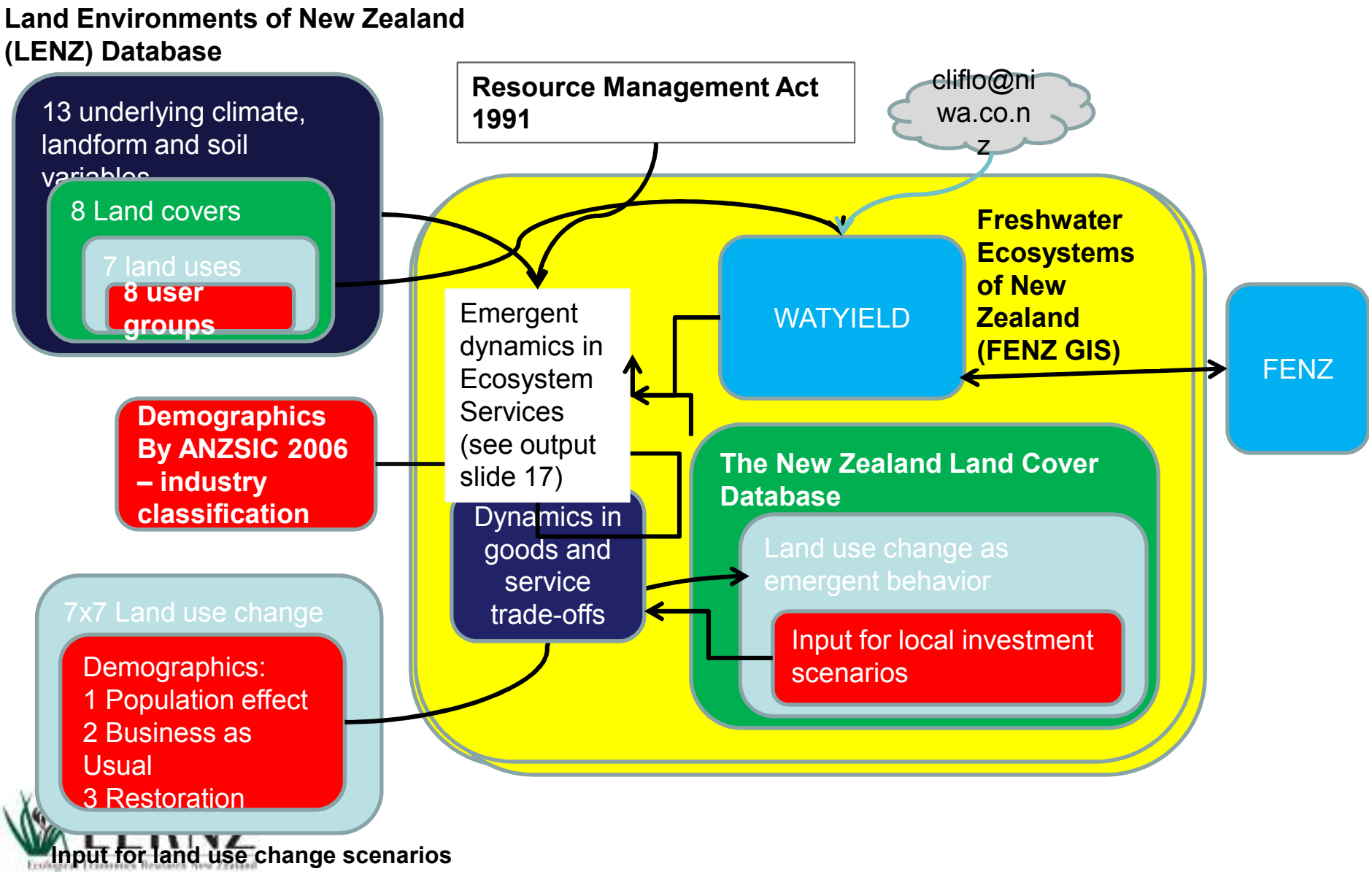
Manawatu MIMES – Data base links



Choices in Scenarios from the Mediated modelling workshops

1)SLUI (Stock exclusion program)

2)Riparian planting,

3)Wastewater management,

4)Urban Storm water Management,

5)Restoration of Forest and wetland,

6)Sustainable Farm Nutrient Management

- Establishing Herd homes

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Summary of future functions / type of scenarios

- Synergies between actions
- Supply and demand for Ecosystem Services – depending on demand profiles (Economic Activities and/or Social/Culturally defined demand profiles)
- Investment priorities in Natural and Built Capital
- MIMES workshop for scientists (12-15 Aug), for policy makers (16 Aug).

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3.00 Coffee Break

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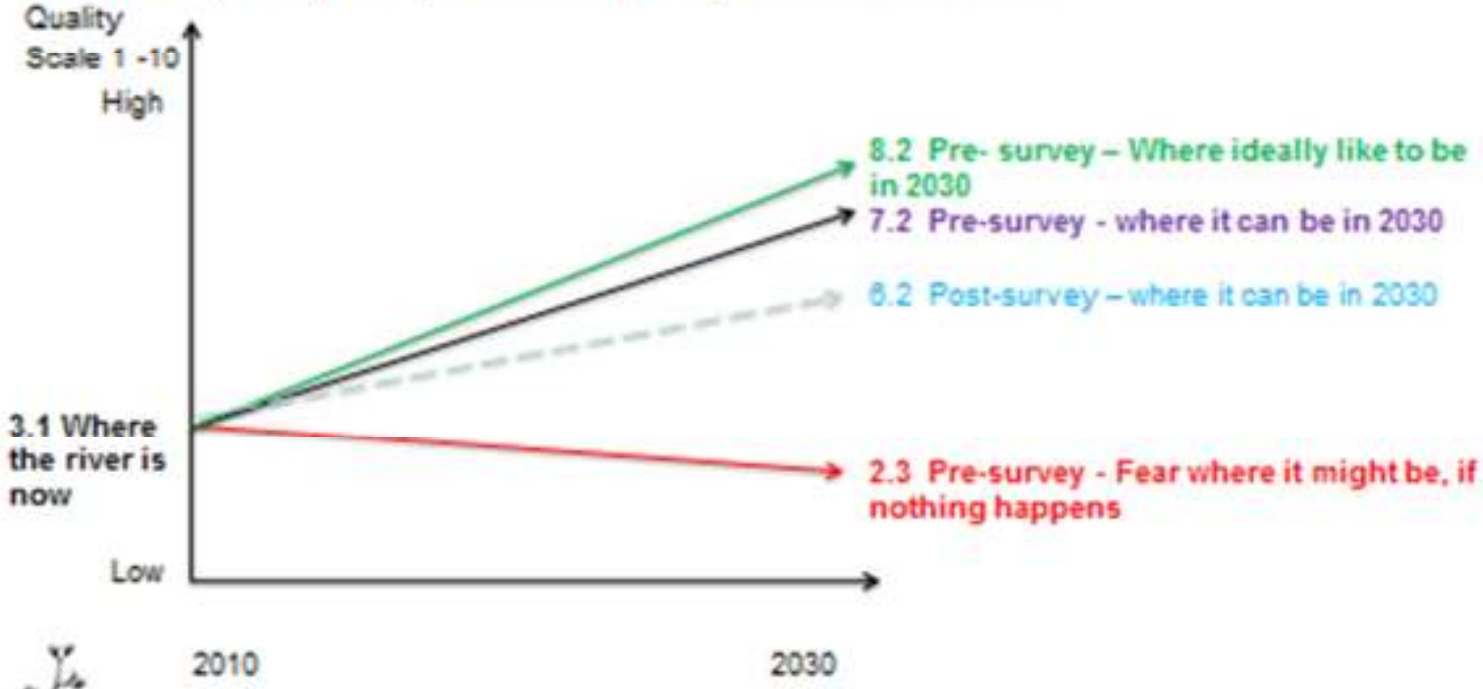
IFS Survey Results – Pre and Post Workshops

The particpants' perception of the quality of the Manawatu River



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3.15 Small Groups

- What ‘tools’ (for information gathering, knowledge creation, visualisation and learning through modelling) would help to adaptively manage river water quality and quantity for the long term?
- How do they help?

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4.15 – 4.45 Report from Groups

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Massey's Applied Ecological Economics paper is a unique 'atelier' paper, giving you place-based learning-by-doing through engagement, use of tools and reflections.

Whether you work in public policy, local government or a corporate organisation, this course will give you a practical insight into this area of growing importance.

The course runs in the Summer Semester from 18 November 2013 to 15 February 2014 with the atelier or workshop component from 15th to 24th January 2014.

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Vicky Forgie
v.e.forgie@massey.ac.nz

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TE KUNENGA KI PŪREHUROA
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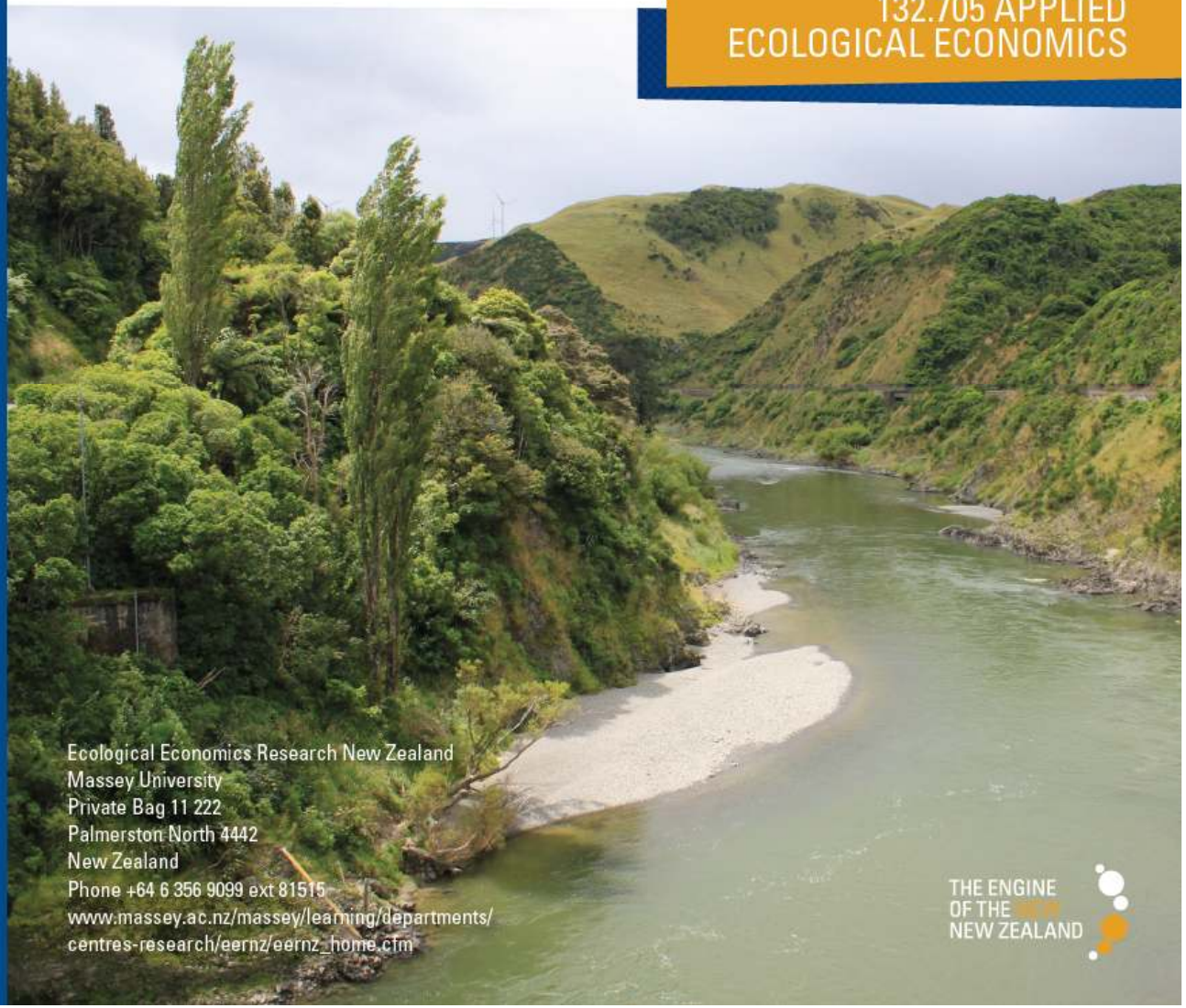
132.705 APPLIED ECOLOGICAL ECONOMICS



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THE ENGINE OF THE NEW ZEALAND

Goals of the day

- Exploring the next phase of collaborative and adaptive management of the Manawatu River.
- Defining what account-ability means in a collaborative process.
- Discussing tools to enable accountable processes.
- Establishing if there is common ground regarding 'Account-ability of Collaborations'.

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4.45 – 5.00 Closing

- Common ground statement and ‘Parked Issues’
- Summary of workshop/report will be circulated for approval by email: No response = Approval
- Participant list and summary published on www.ifs.org.nz
- Karakia

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