

# Application of Integrated Land Use – Economic Models to Hazard Management Strategy and Planning

RESILIENCE  
TO NATURE'S  
CHALLENGES

Kia manawaroa  
– Ngā Ākina o  
Te Ao Tūroa

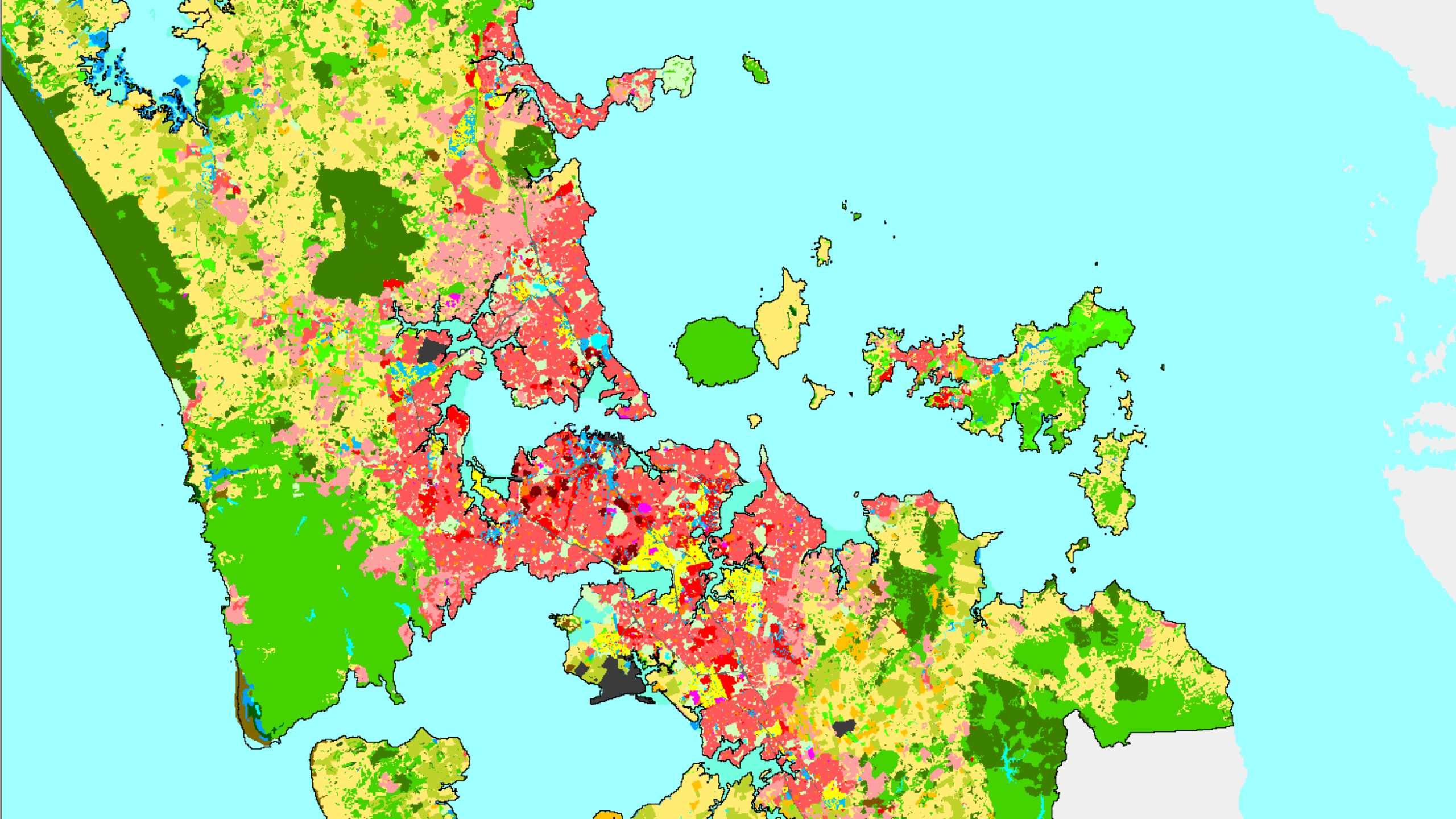
National  
**SCIENCE**  
Challenges

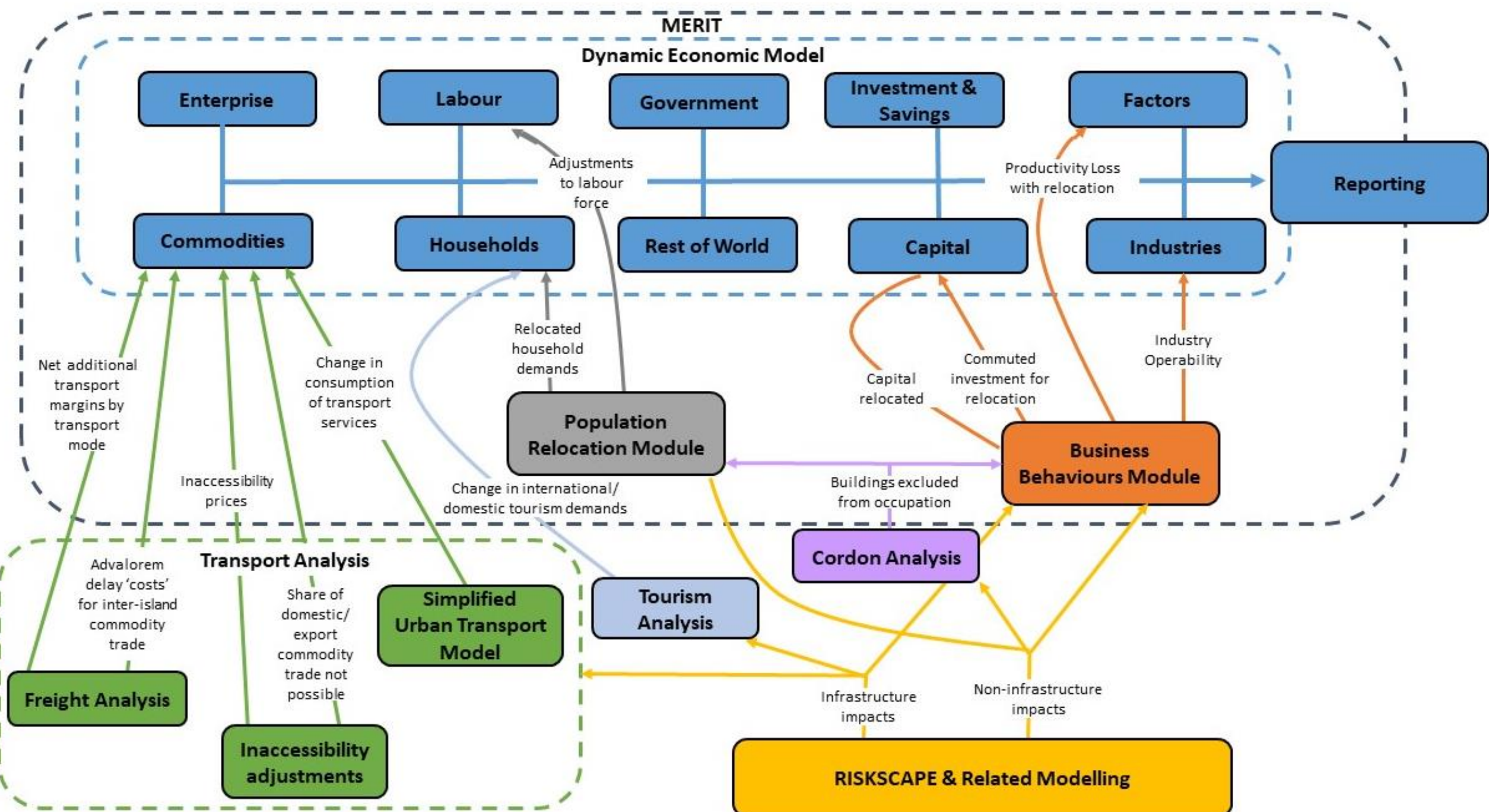


**m.e** market economics  
environment • spatial



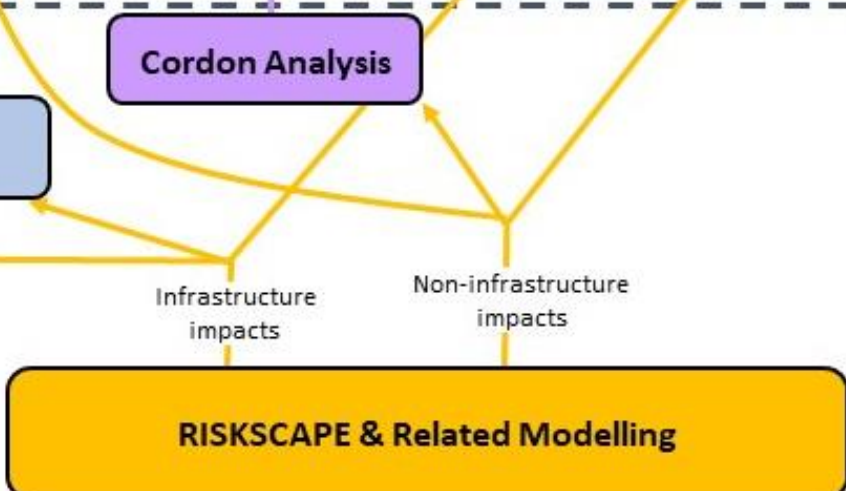
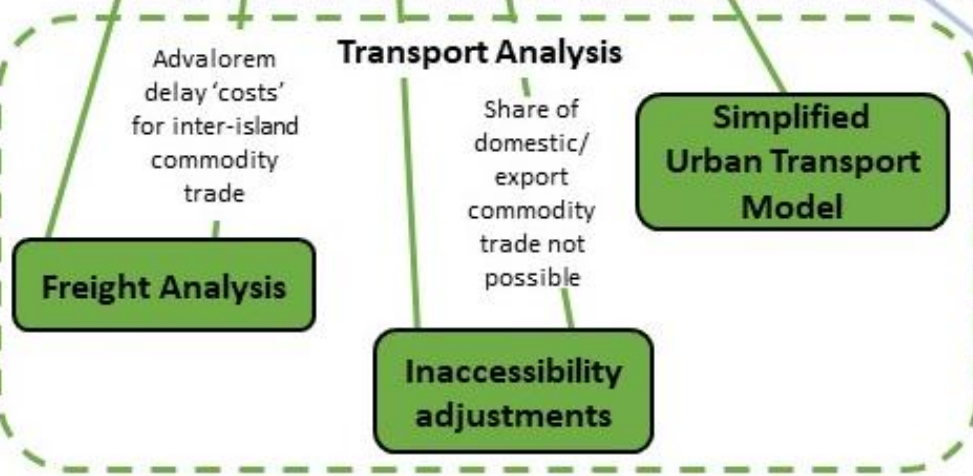
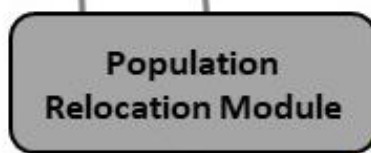
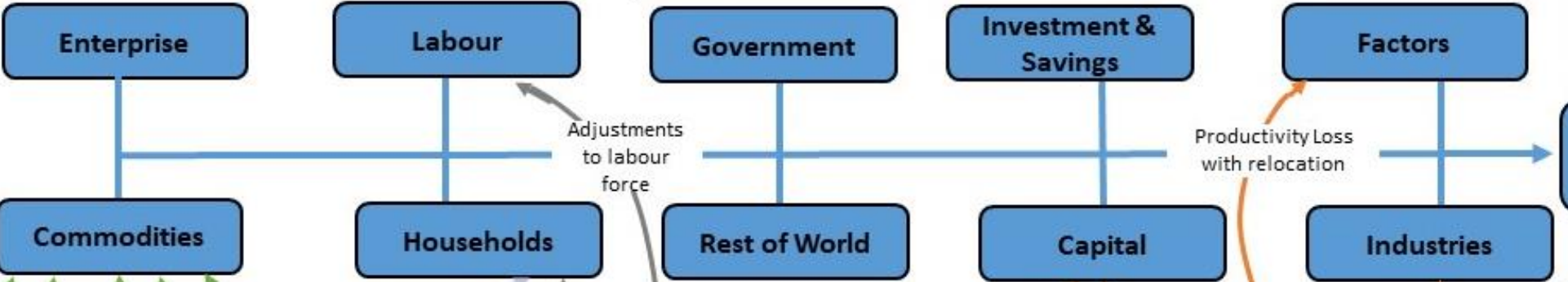
THE UNIVERSITY OF  
**AUCKLAND**  
NEW ZEALAND

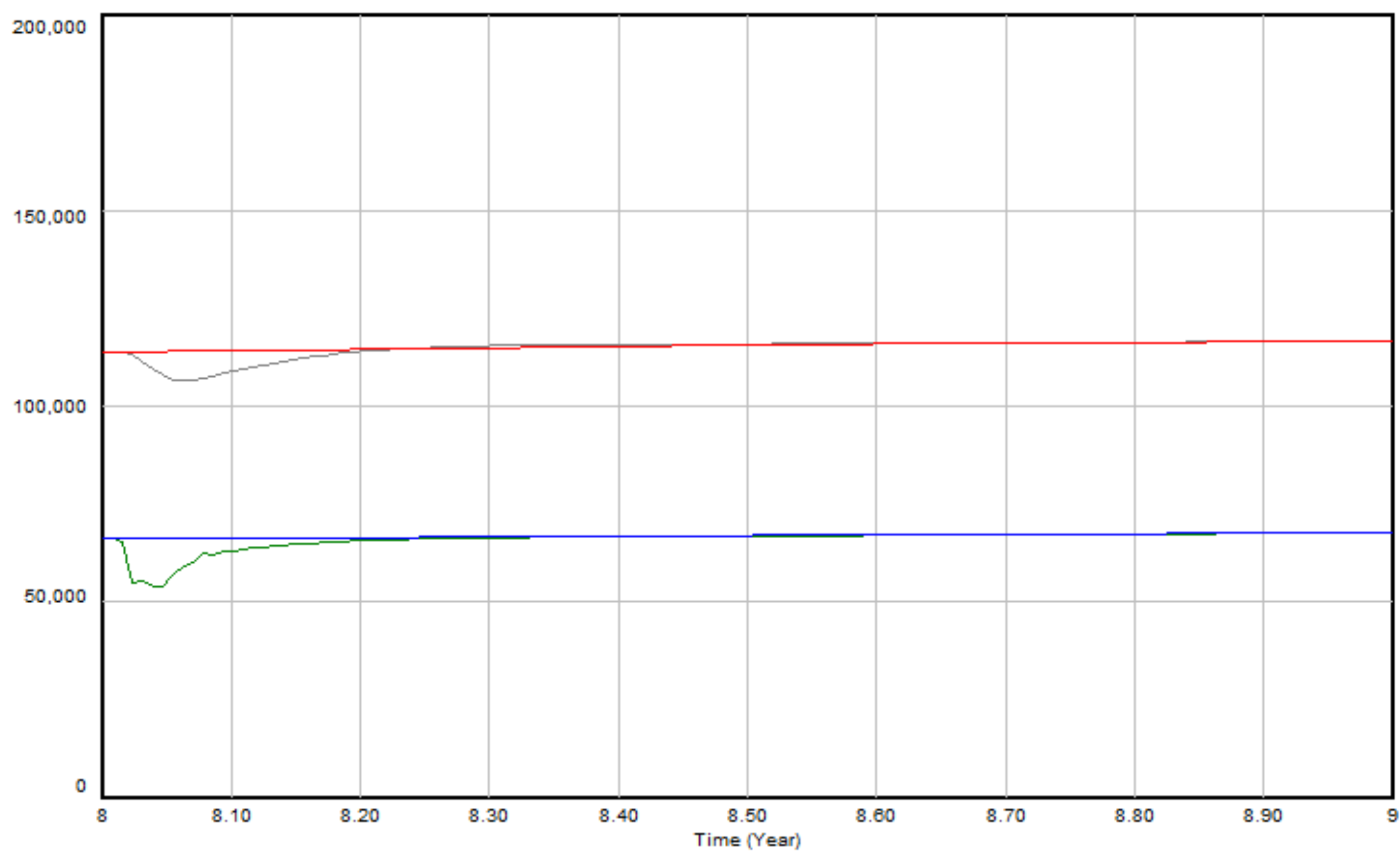




**MERIT**

**Dynamic Economic Model**



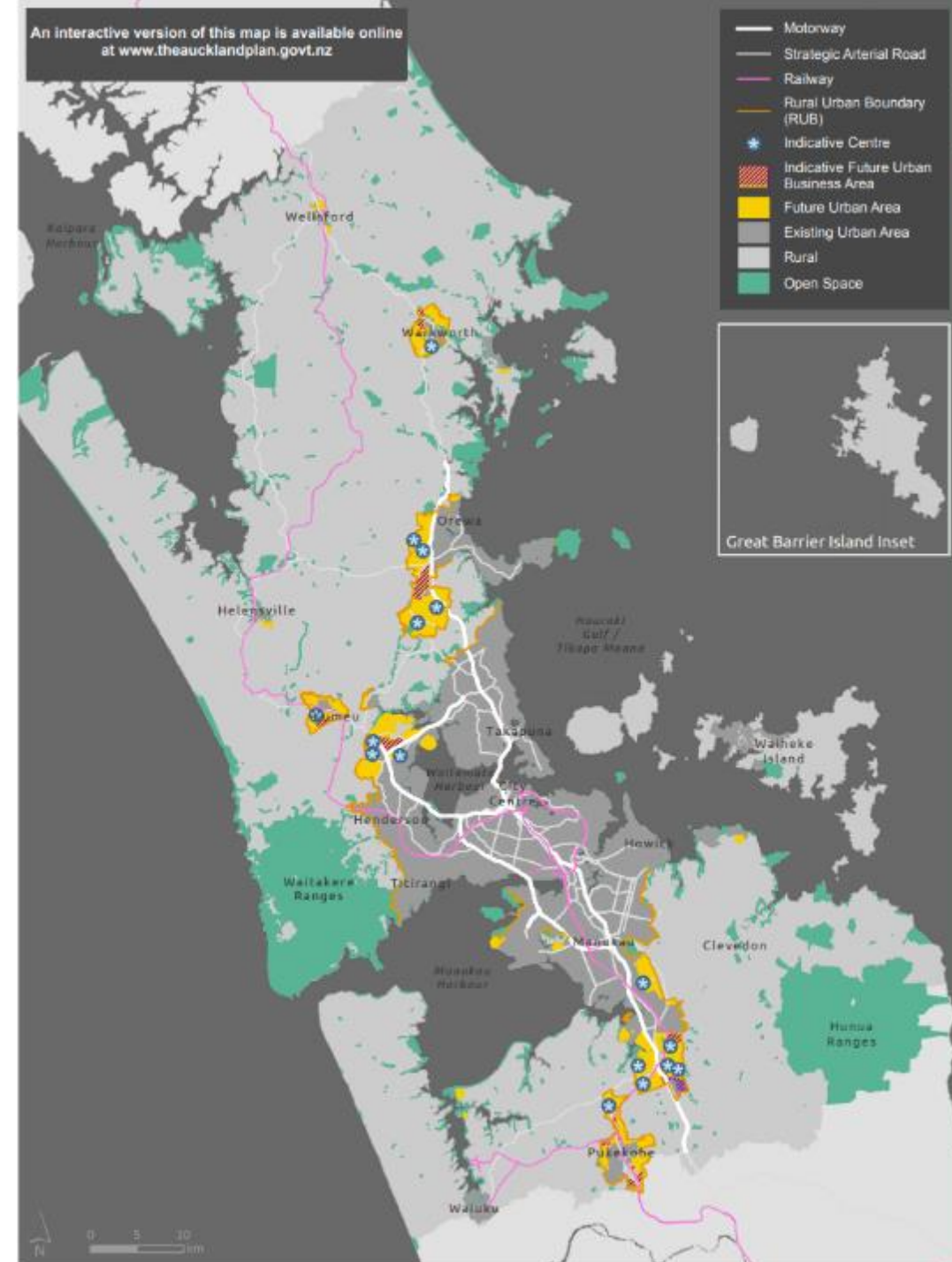
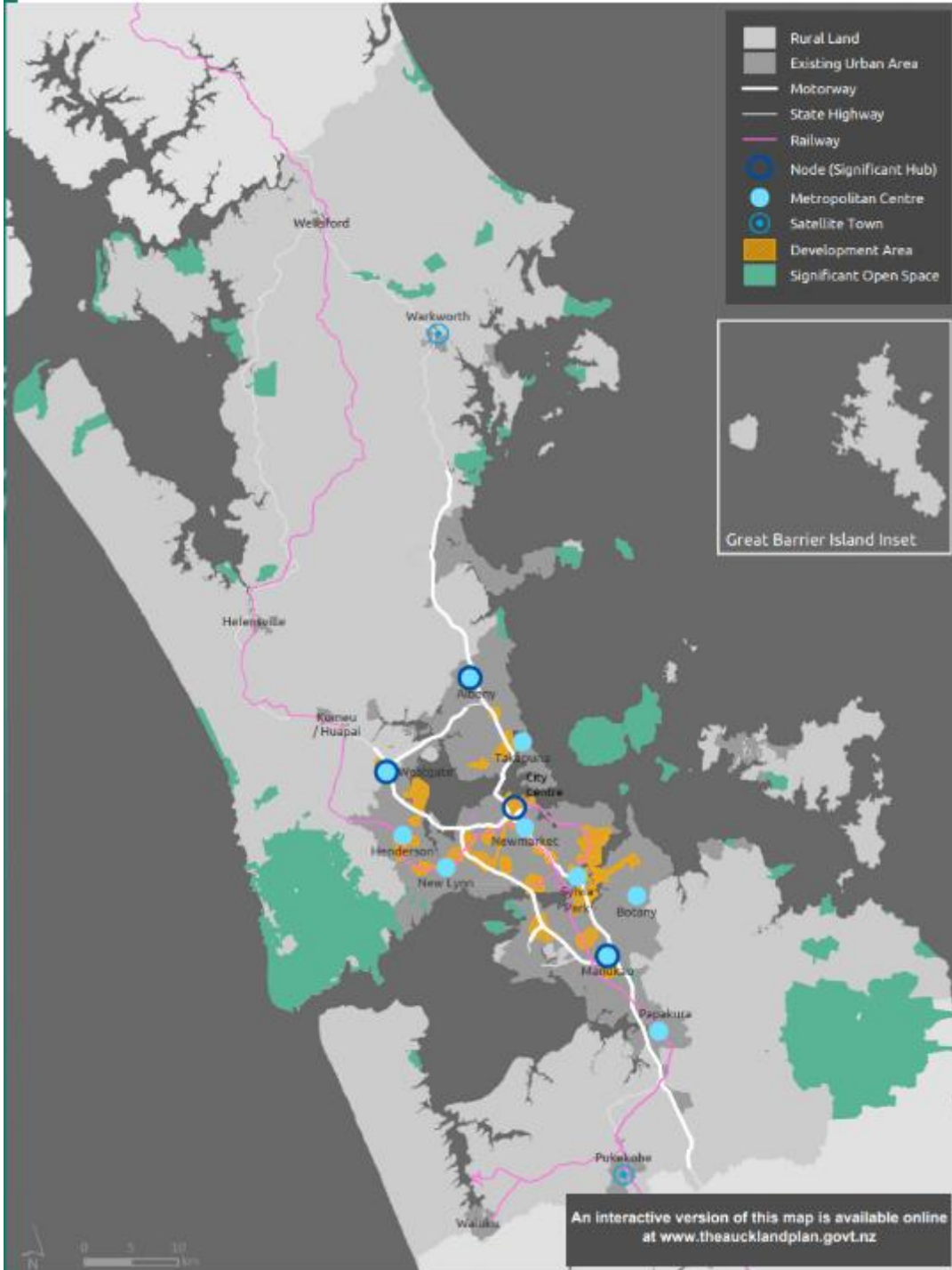


dtotalvalueadded[DR1] : baseline

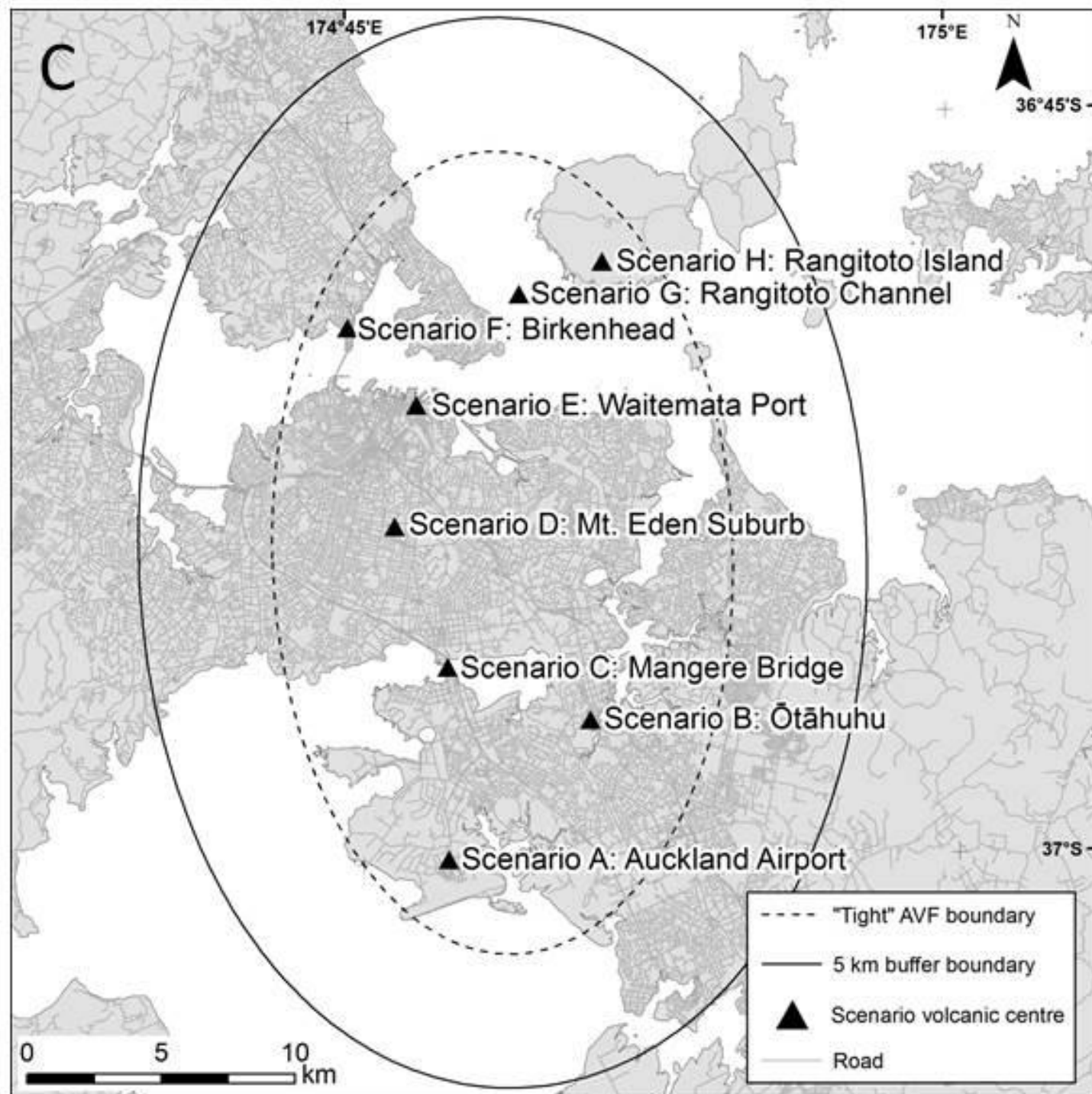
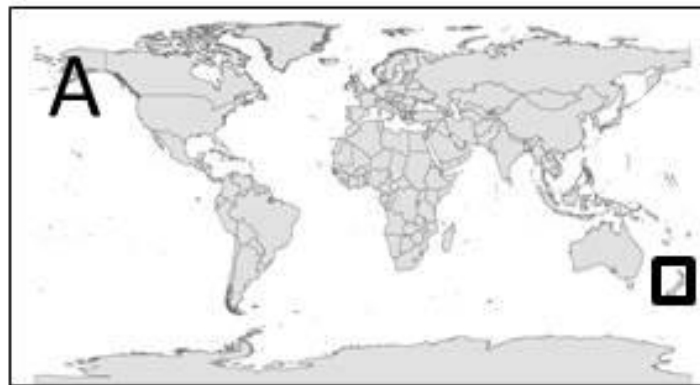
dtotalvalueadded[DR2] : baseline

dtotalvalueadded[DR1] : water outage

dtotalvalueadded[DR2] : water outage





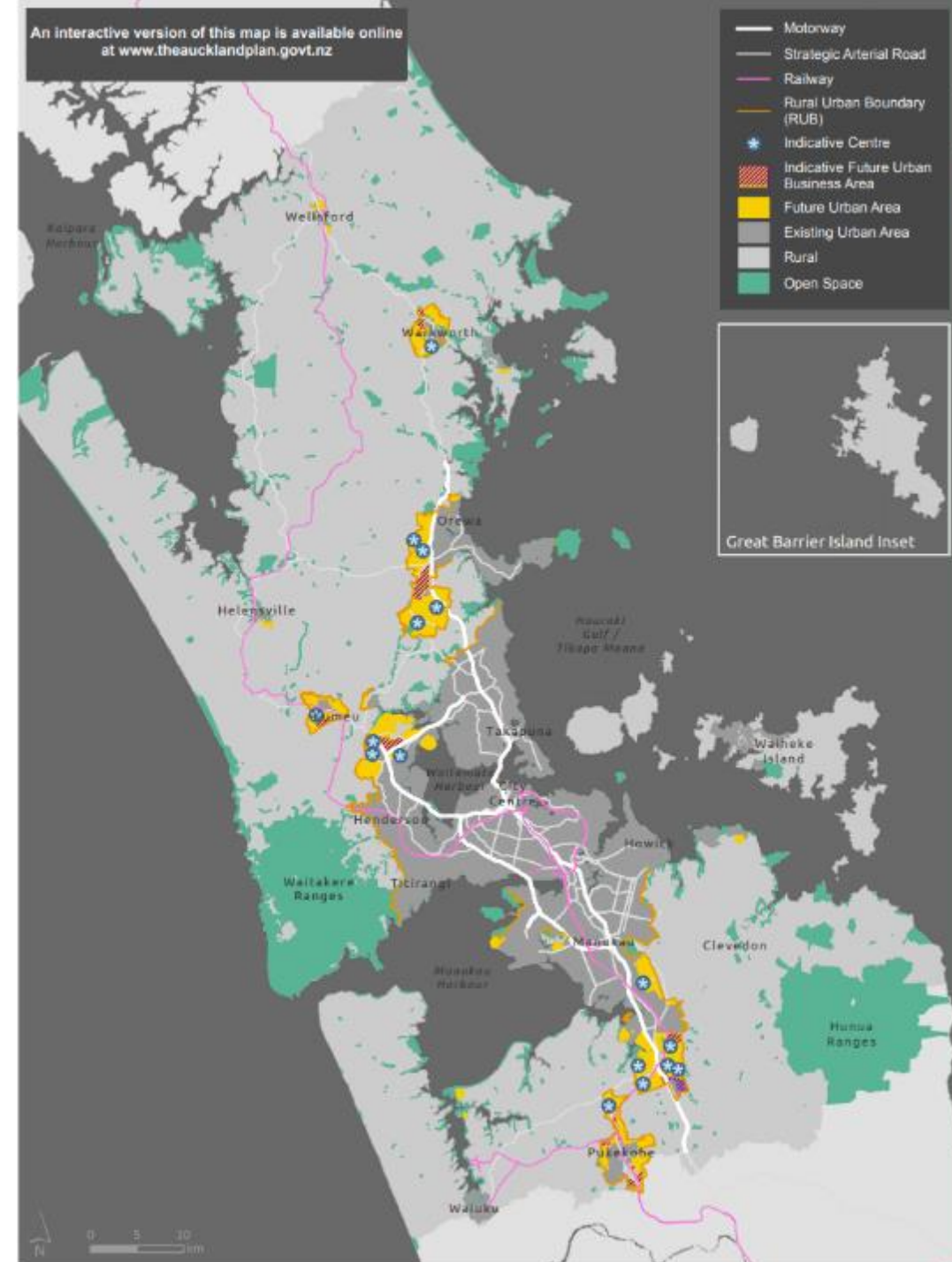
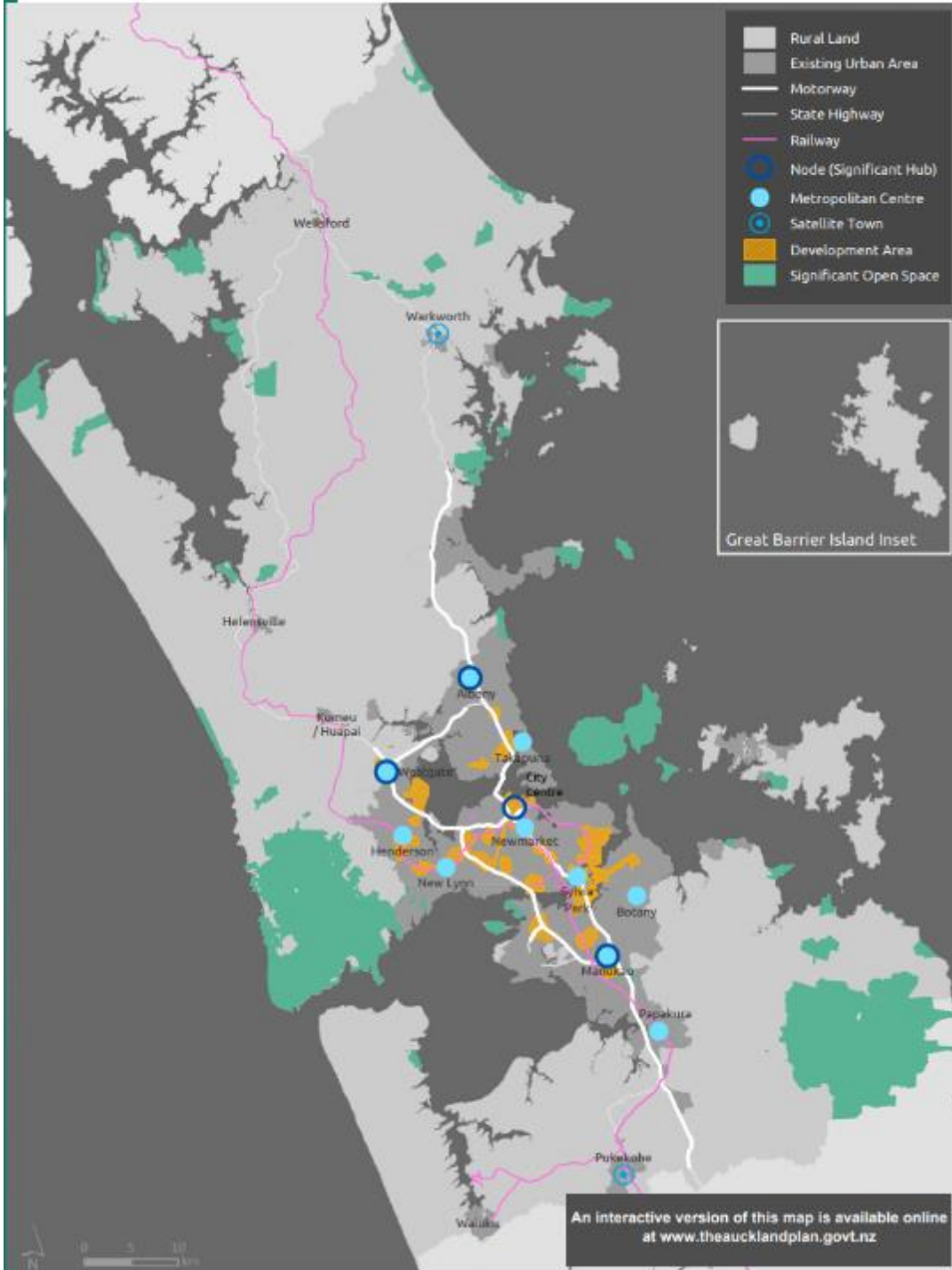


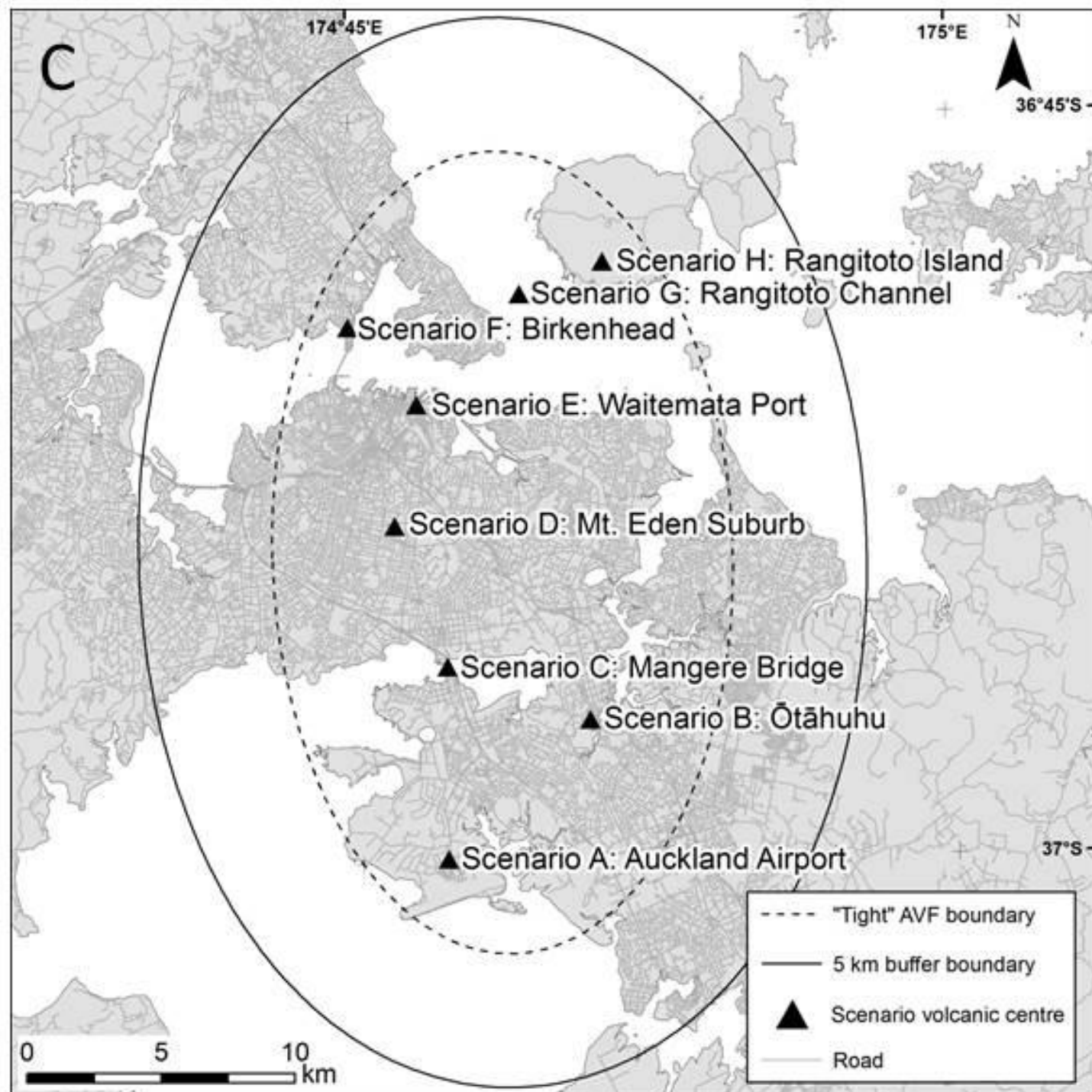
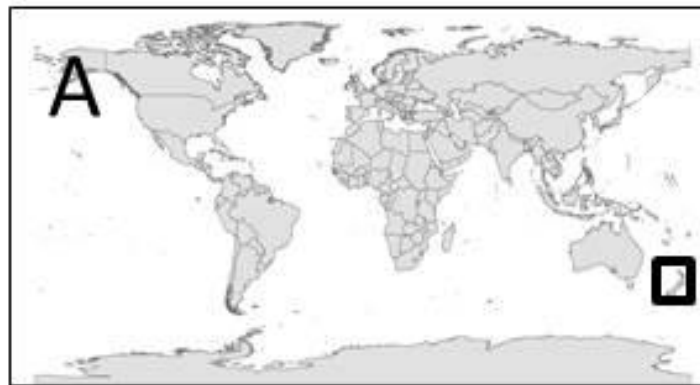
# Objectives

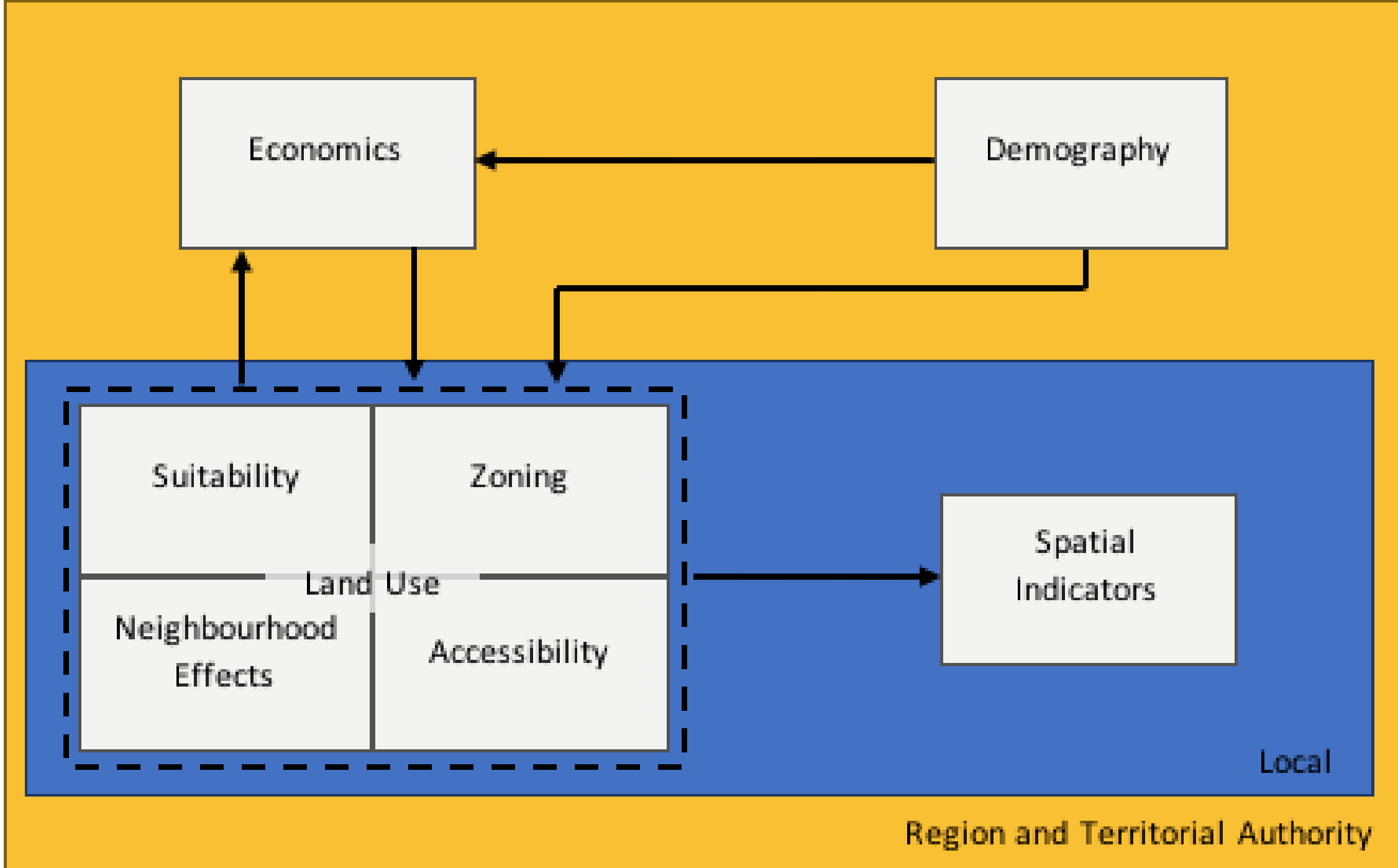
Investigate how volcanic hazards can affect urban and economic development

- Before the event occurs – how does risk (potential impact) change over time?
- How might urban development post hazard event be affected?
  - Displacement of land use
  - Suitability of whole areas affected by infrastructure disruptions
- Illustrate the links between technical design decisions with overall well-being of society.
- Note we are starting with a very basic analysis → gradually build up the level of detail and complexity of problems / questions explored









Economics

Demography

Suitability

Zoning

Land Use

Neighbourhood  
Effects

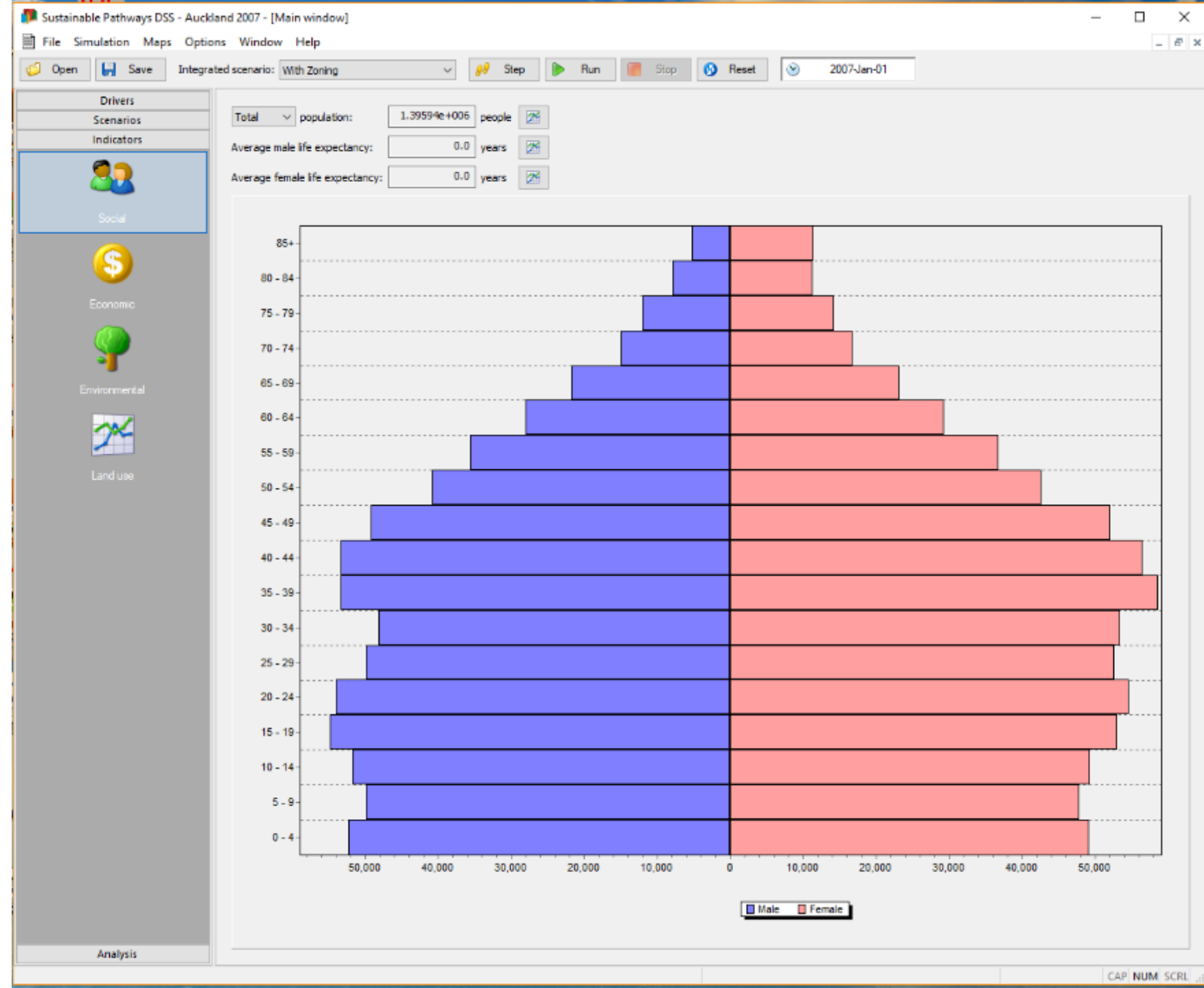
Accessibility

Spatial  
Indicators

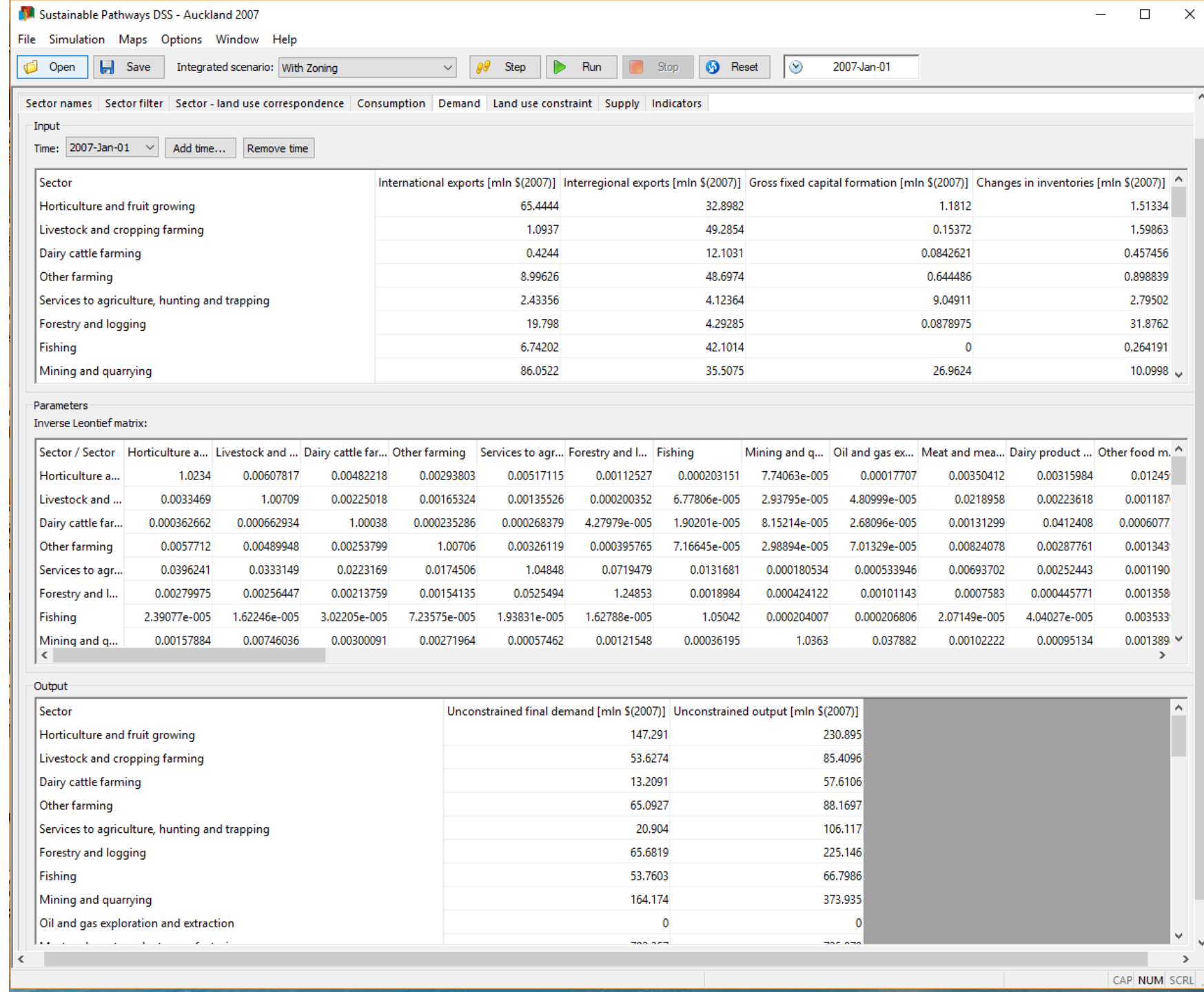
Local

Region and Territorial Authority

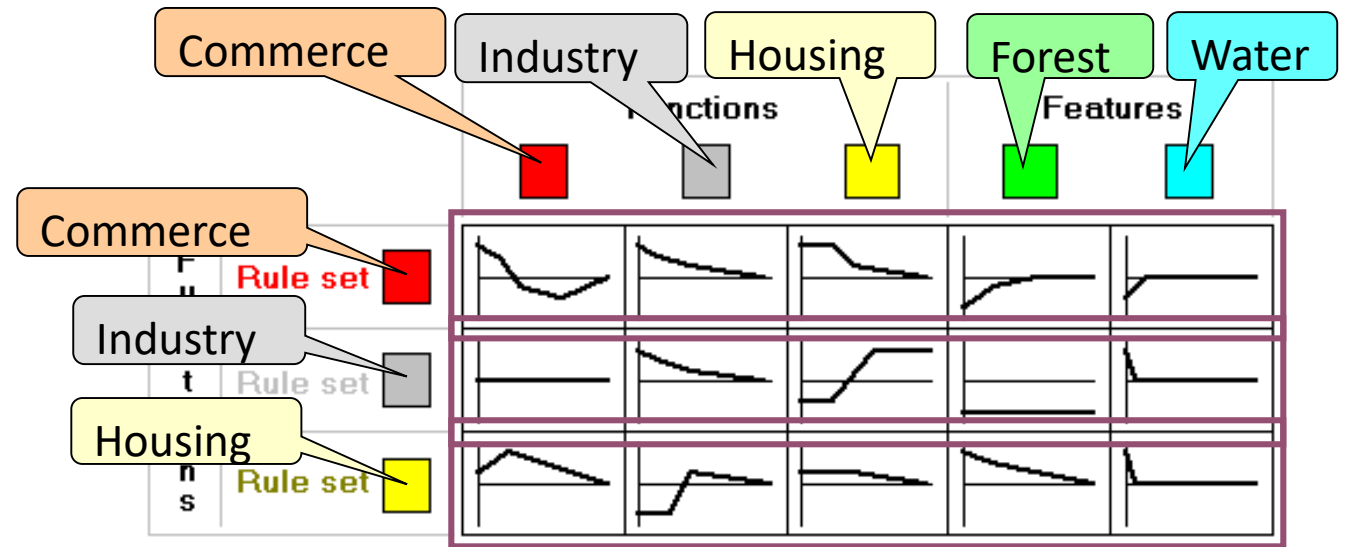
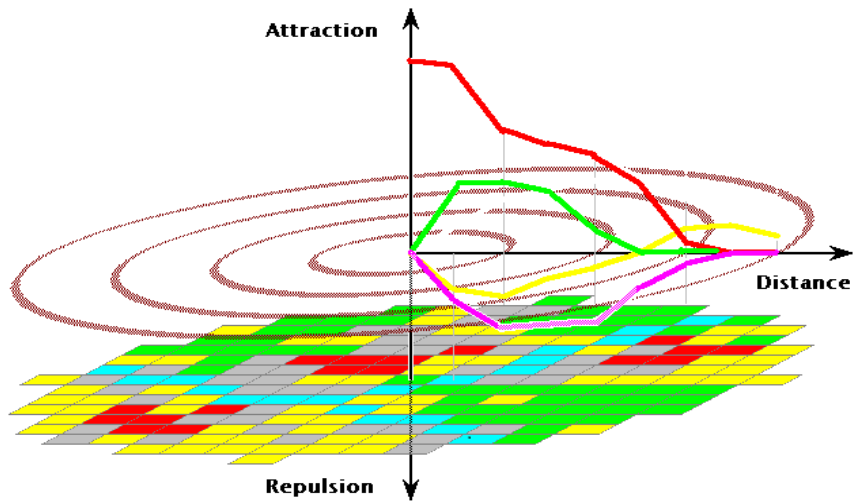
# Population



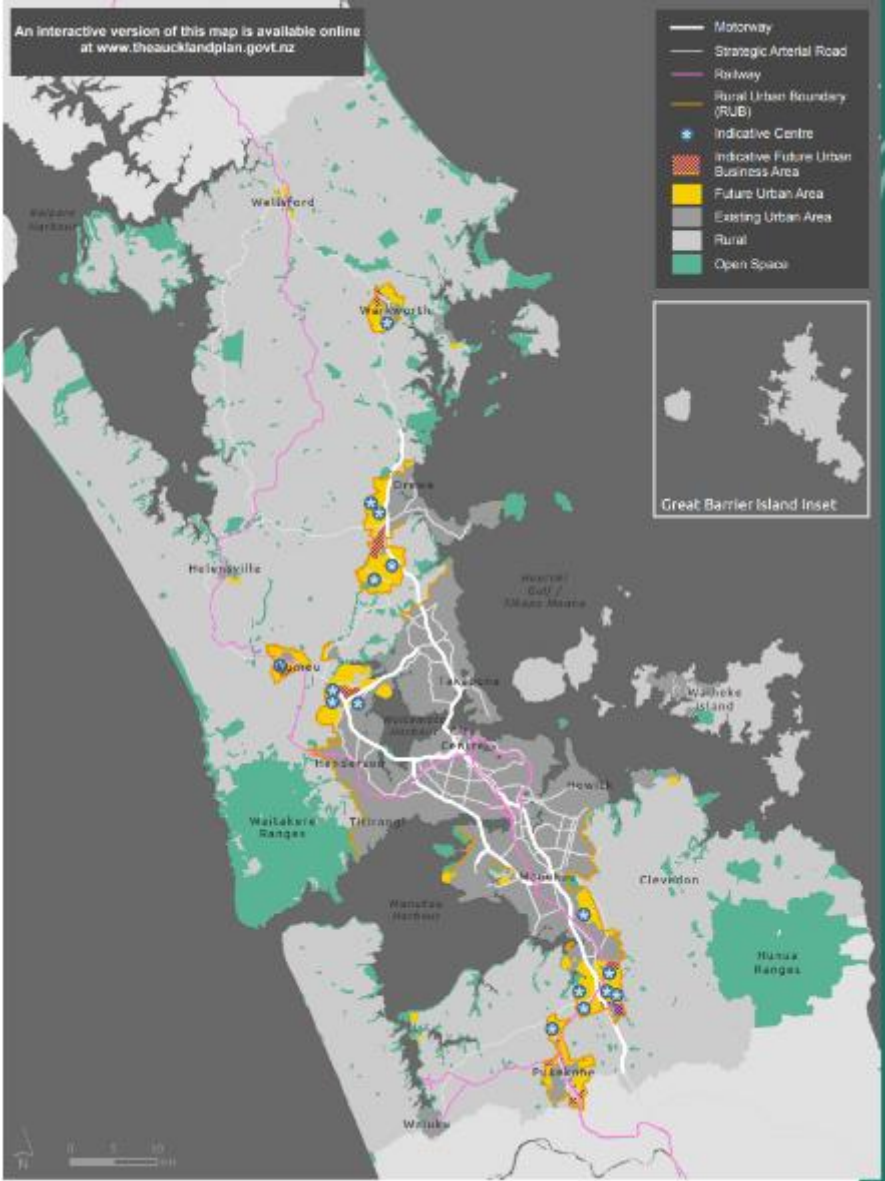
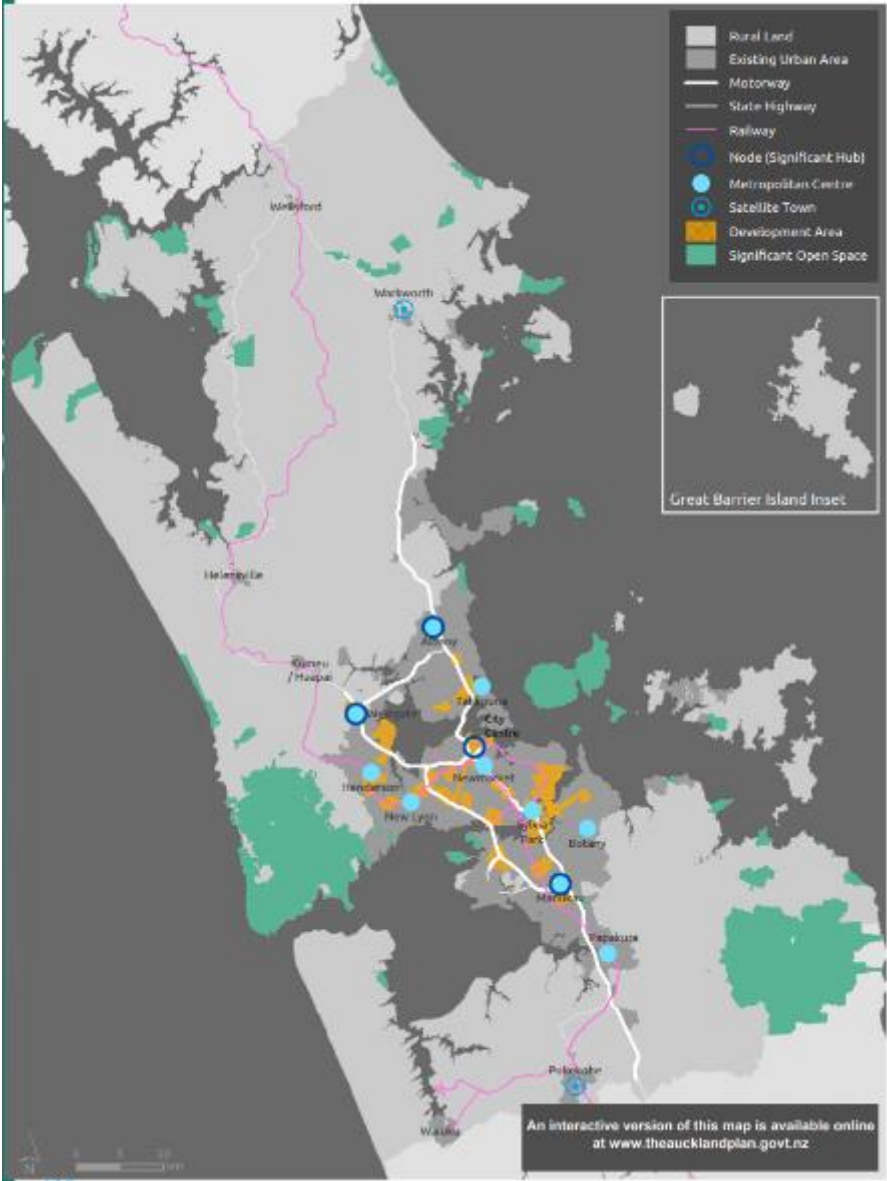
# Economic Activity



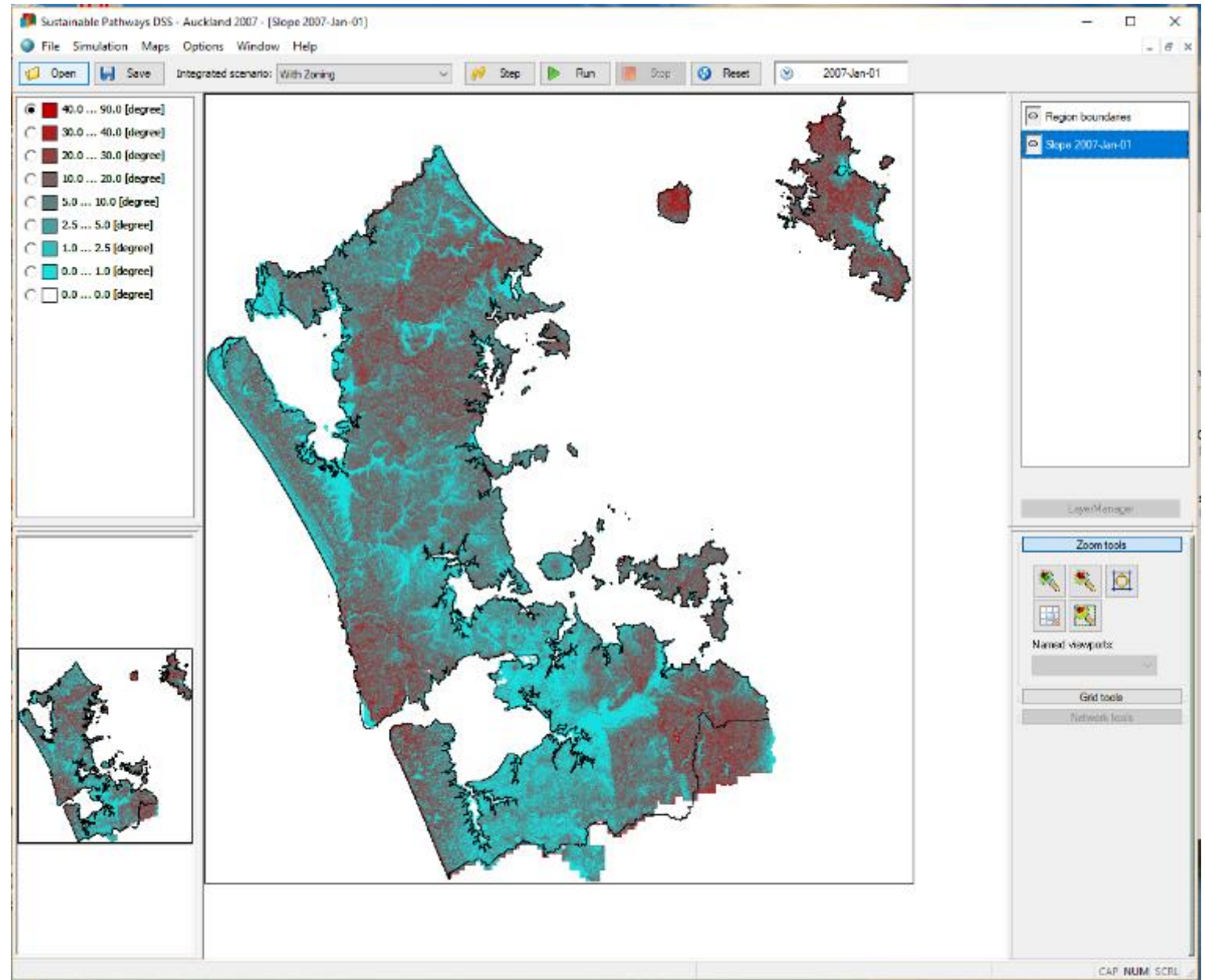
# Neighbourhood Effects



# Zoning



# Suitability





# Accessibility (Transport)



# Indicative Results / Early Outputs

### Legend

- Substation
- ▣ PDC\_NZTM

### Transmission\_Lines designvolt

- 110
- 220
- 400



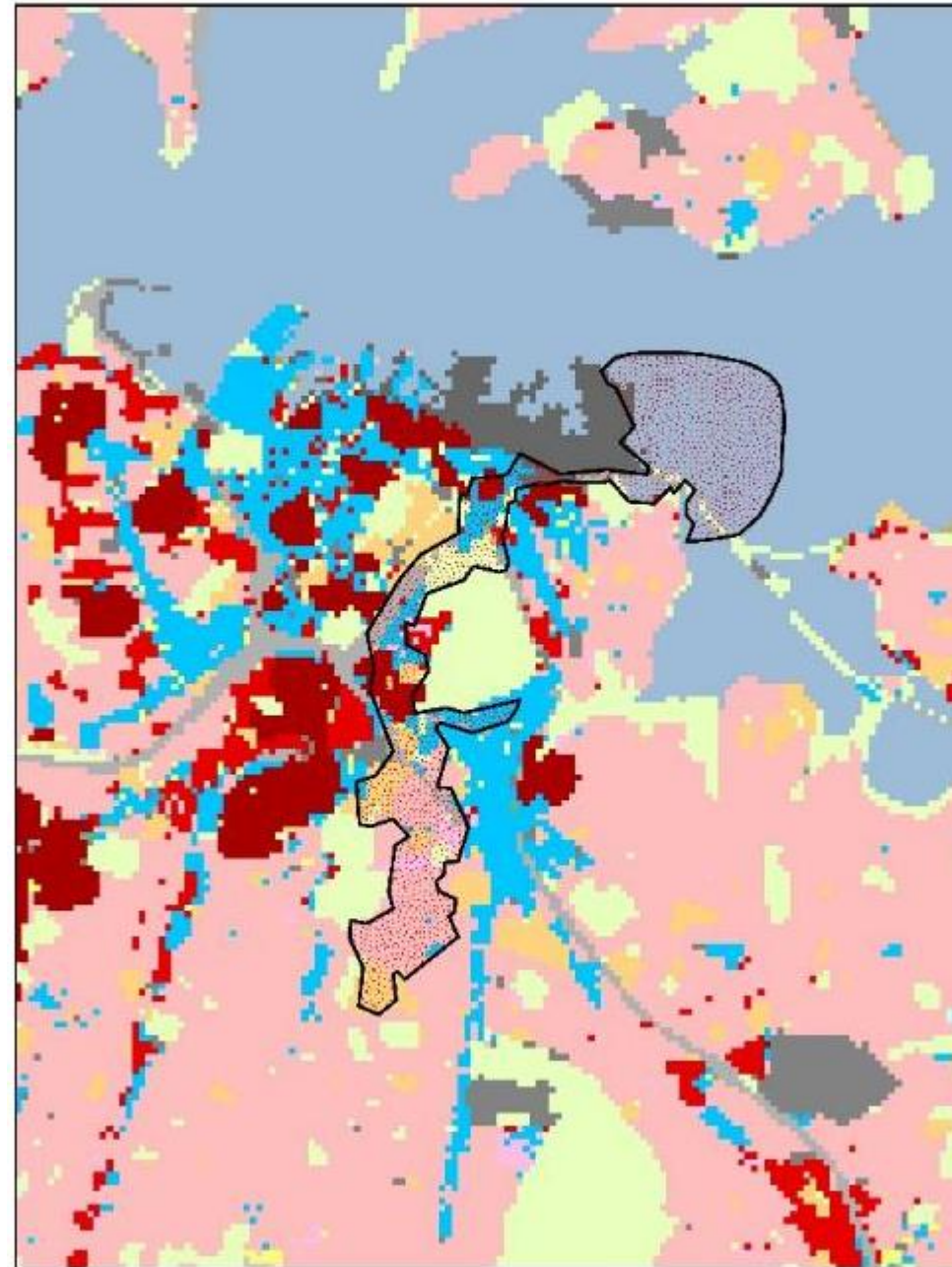
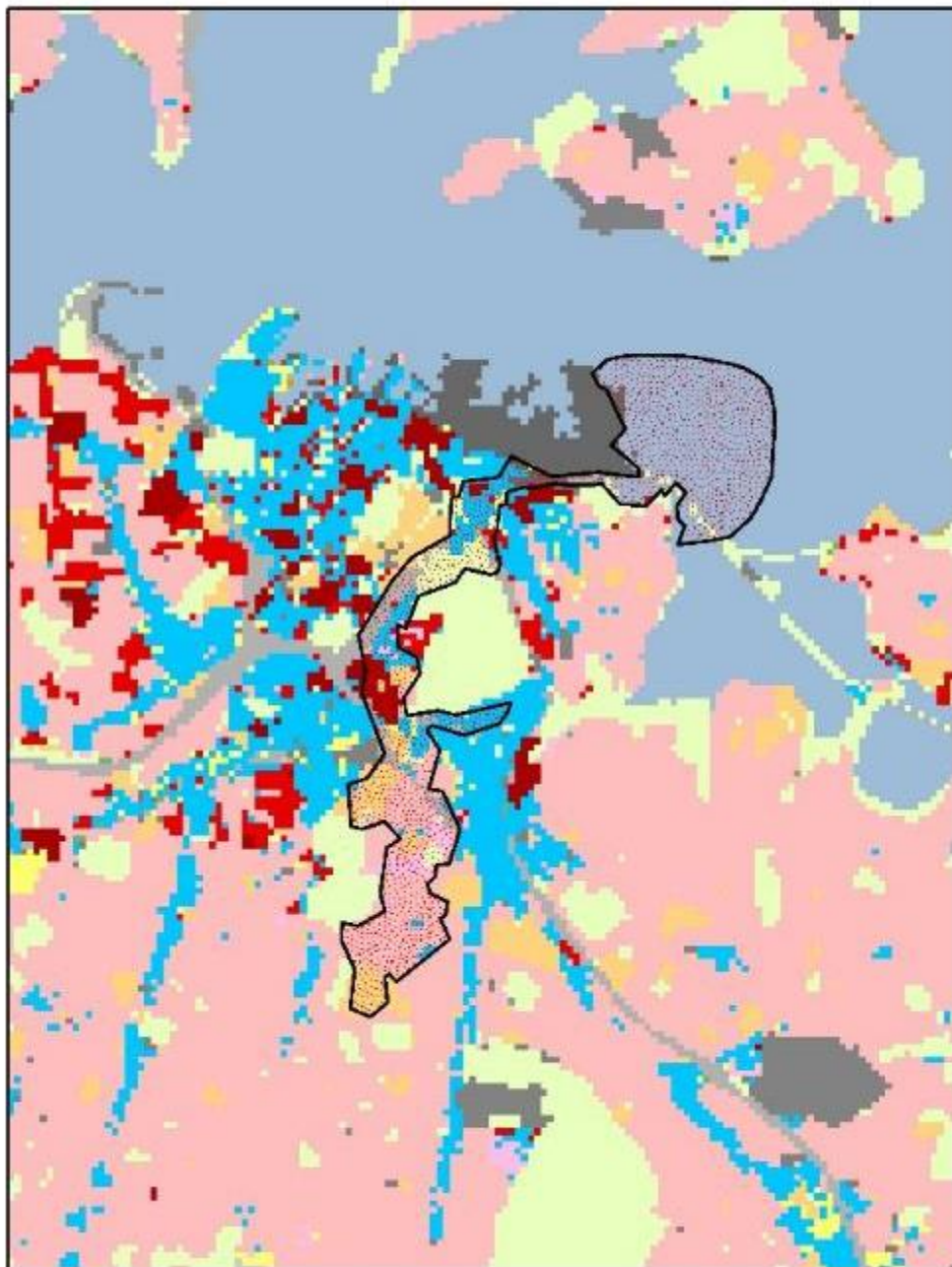
## Legend

Scenario\_D\_MT\_Eden\_suburb\_java\_flow\_Day240

land\_use\_180528

gridcode

- Vacant
- Indigenous Forest and Vegetation
- Other exotic vegetation
- Horticulture and fruit growing
- Livestock and crop farming
- Dairy cattle farming
- Other farming
- Exotic forest
- Industrial
- Commercial
- Residential - low density
- Residential - medium density
- Residential - high density
- Lifestyle blocks
- Education
- Culture, recreation and defence
- Mines, quarries and defense
- Freshwater
- Wetlands
- Airports and ports
- Motorway
- Open space
- Estuaries and mangroves
- Bare land
- Area Outside Region
- Marine



# Scenario F PDC

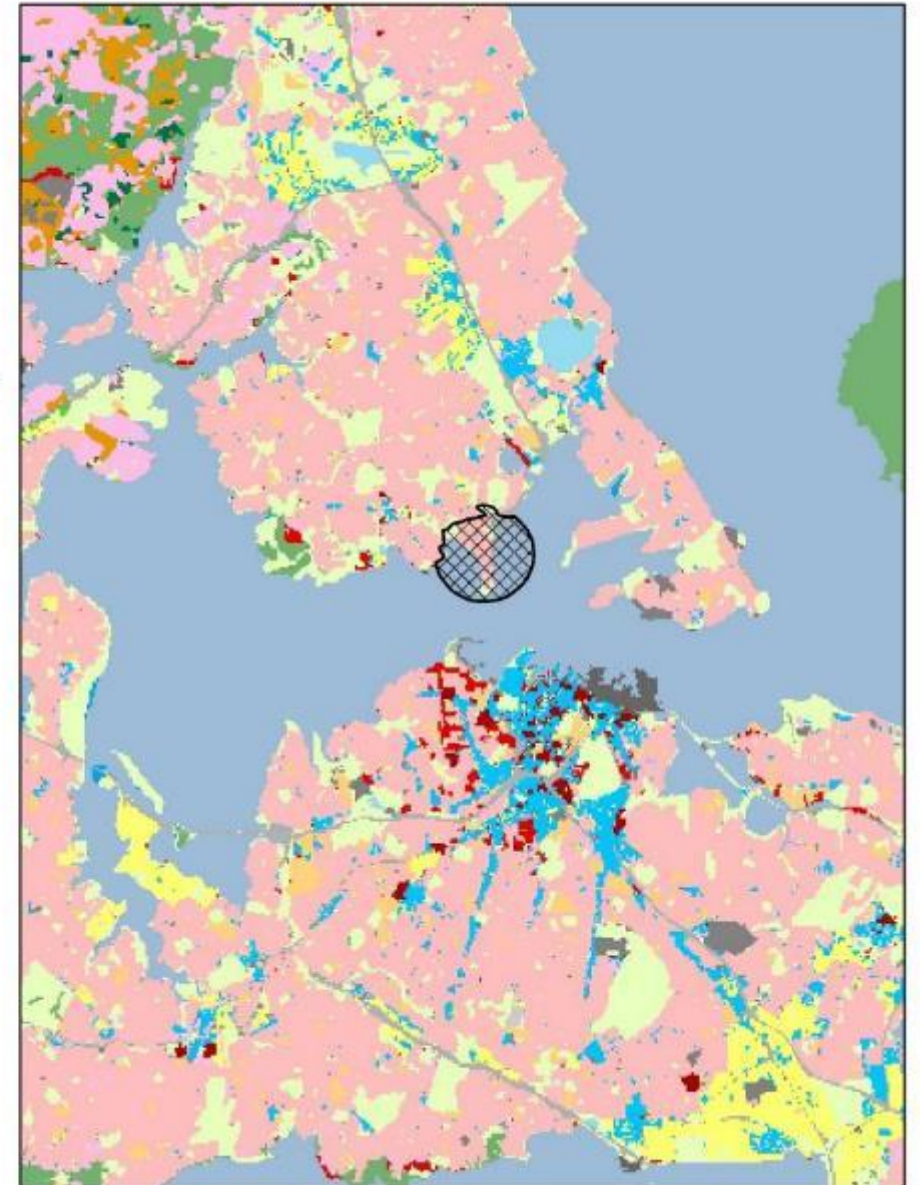
## Legend

 PDC\_NZTM

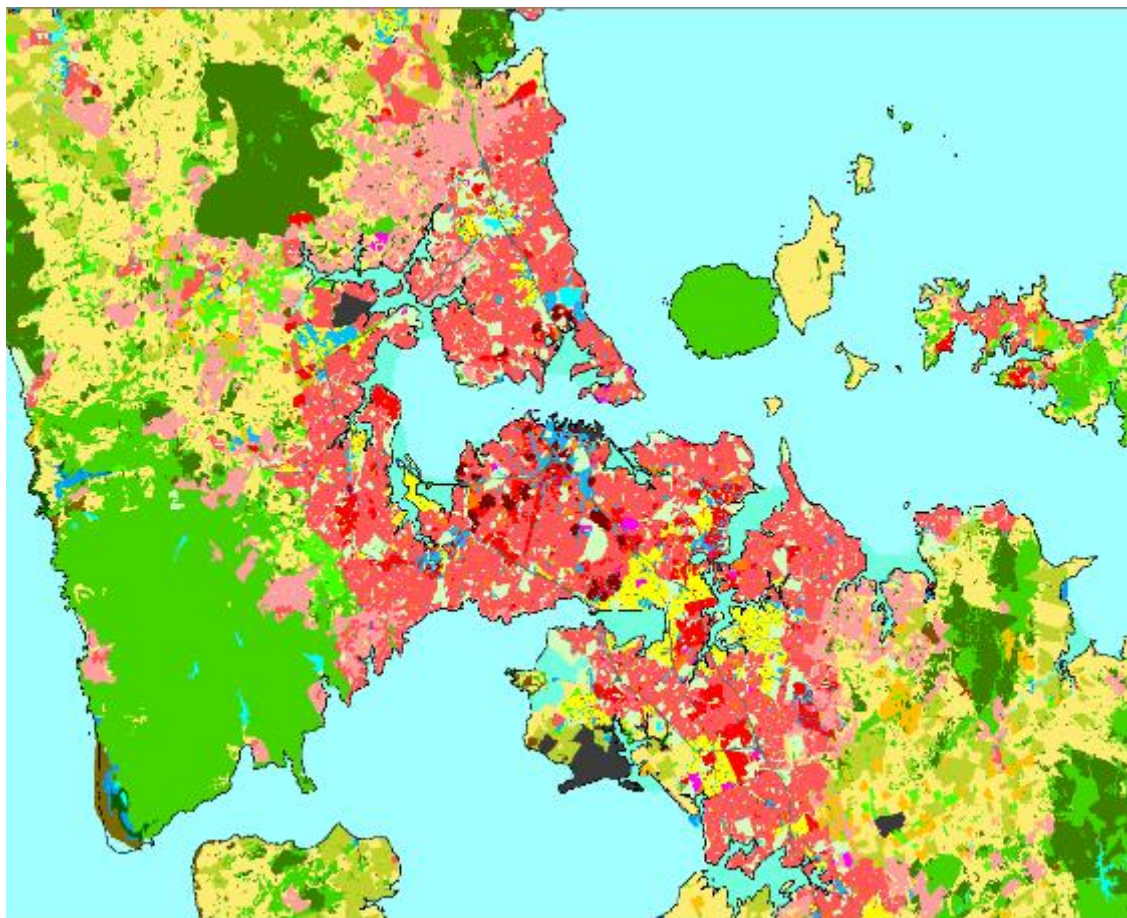
land\_use\_180528

gridcode

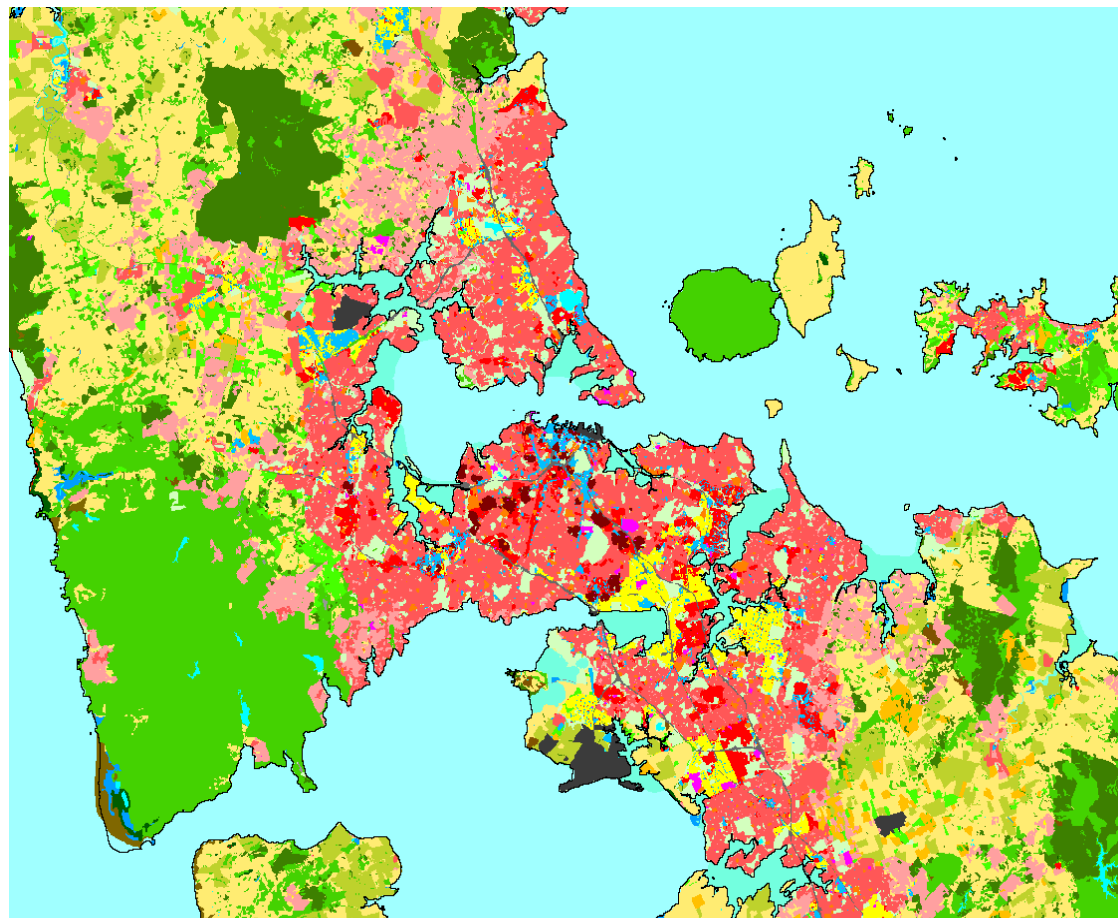
-  Vacant
-  Indigenous Forest and Vegetation
-  Other exotic vegetation
-  Horticulture and fruit growing
-  Livestock and crop farming
-  Dairy cattle farming
-  Other farming
-  Exotic forest
-  Industrial
-  Commercial
-  Residential - low density
-  Residential - medium density
-  Residential - high density
-  Lifestyle blocks
-  Education
-  Culture, recreation and defence
-  Mines, quarries and defence
-  Freshwater
-  Wetlands
-  Airports and ports
-  Motorway
-  Open space
-  Estuaries and mangroves
-  Bare land
-  Area Outside Region
-  Marine



# 2041 With Bridge



# 2041 Without Bridge

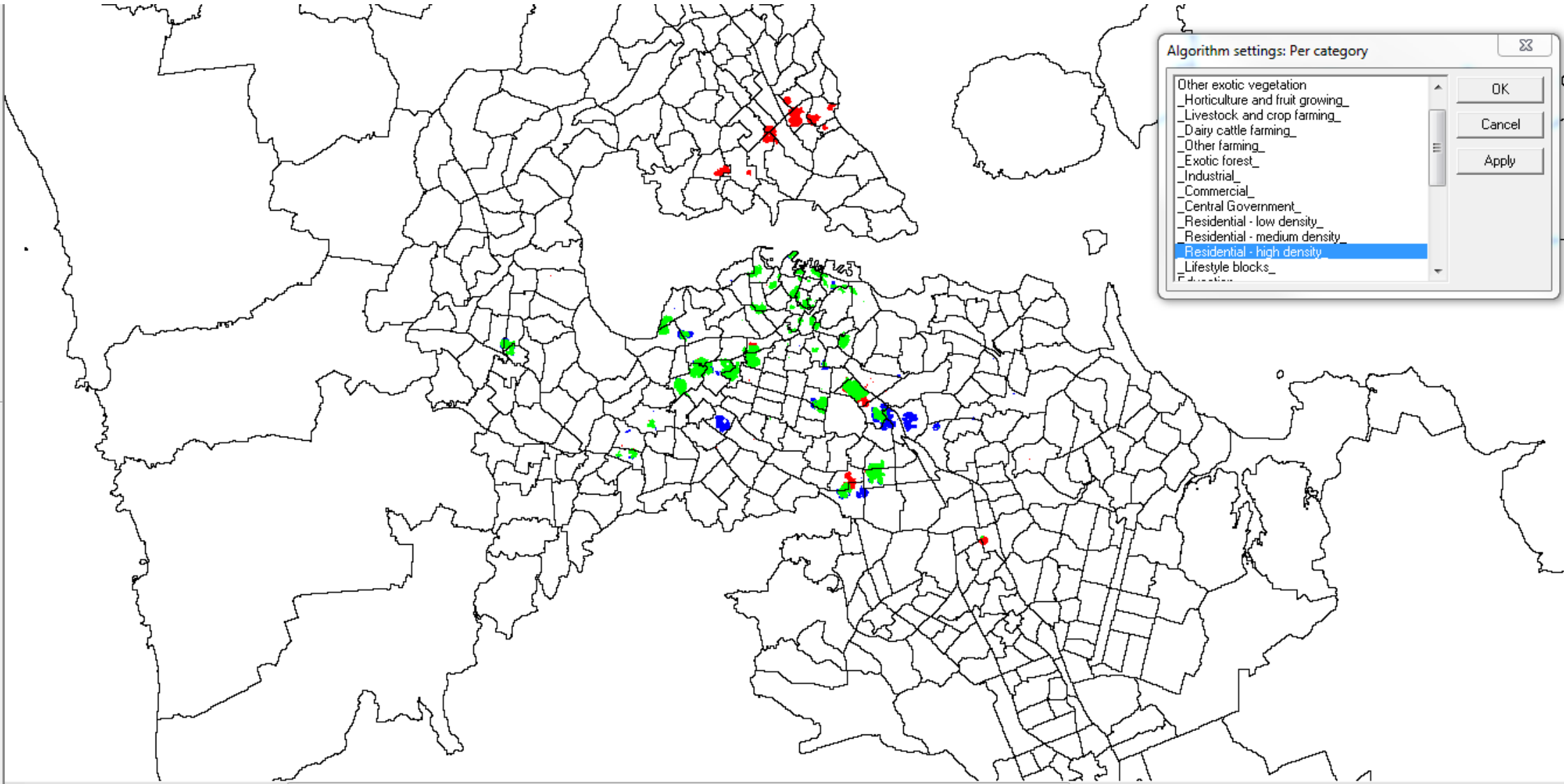


in none of the maps

in both maps

only in map 1, not in map 2

only in map 2, not in map 1



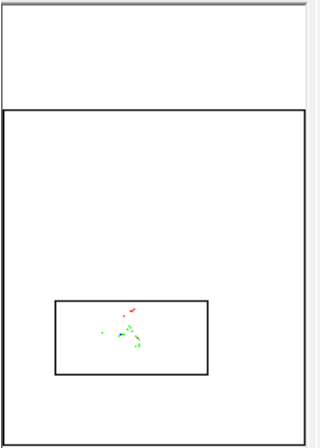
Algorithm settings: Per category

- Other exotic vegetation
- Horticulture and fruit growing
- Livestock and crop farming
- Dairy cattle farming
- Other farming
- Exotic forest
- Industrial
- Commercial
- Central Government
- Residential - low density
- Residential - medium density
- Residential - high density
- Lifestyle blocks
- Education

OK

Cancel

Apply



# Next Steps and Potential Future Research

- High density development versus urban sprawl
- Post hazard urban development
- Post hazard economic impacts and development (using MERIT)
- Assessment and comparison of various pre- and post- hazard management options
- Potential for incorporating cascading infrastructure failures and long-term outage impacts on land use



1 May (Year 1) - 30 April (Year 2)  
Water Supply Level of Service



Figure 12.9 Water supply level of service map for period 1 May–30 April of Year 2. Water balance zones are colour coded according to service level, with blue for potable water, yellow for water restrictions, green for non-potable water and water restrictions, and red for no water.