

The Role of Infrastructure in Developing New Zealand's Economy

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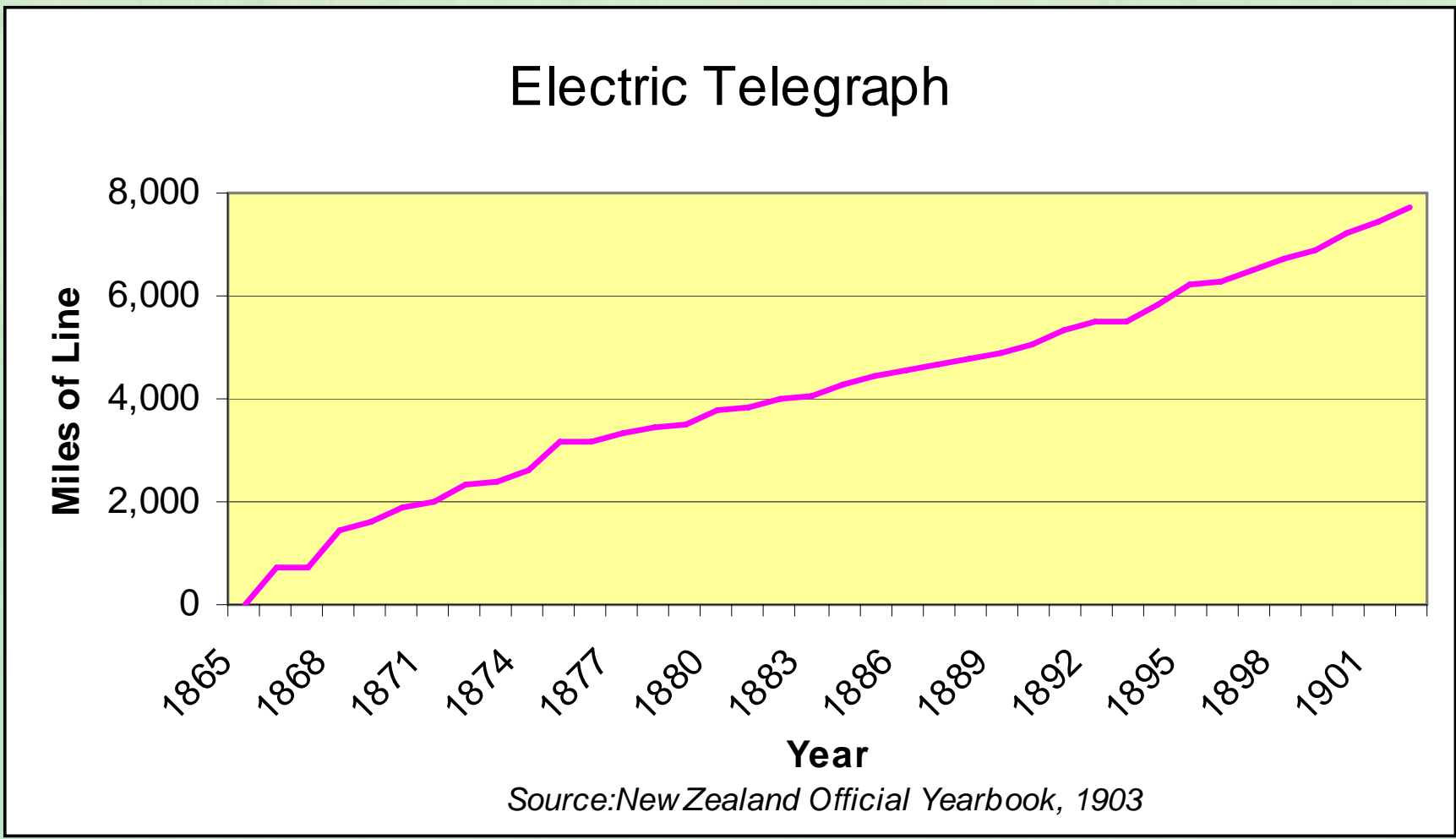
Outline

- **Historical infrastructure examples**
(New Zealand Official Yearbook 1903)
- **New Zealand's infrastructure record**
(Economic Development Indicators 2007)
- **Measuring infrastructure effectiveness**
 - Example 1: Auckland Northern Motorway
 - Example 2: Auckland's Metropolitan Urban Limit
 - Example 3: Canterbury water (irrigation)
- **Lessons for future infrastructure planning**

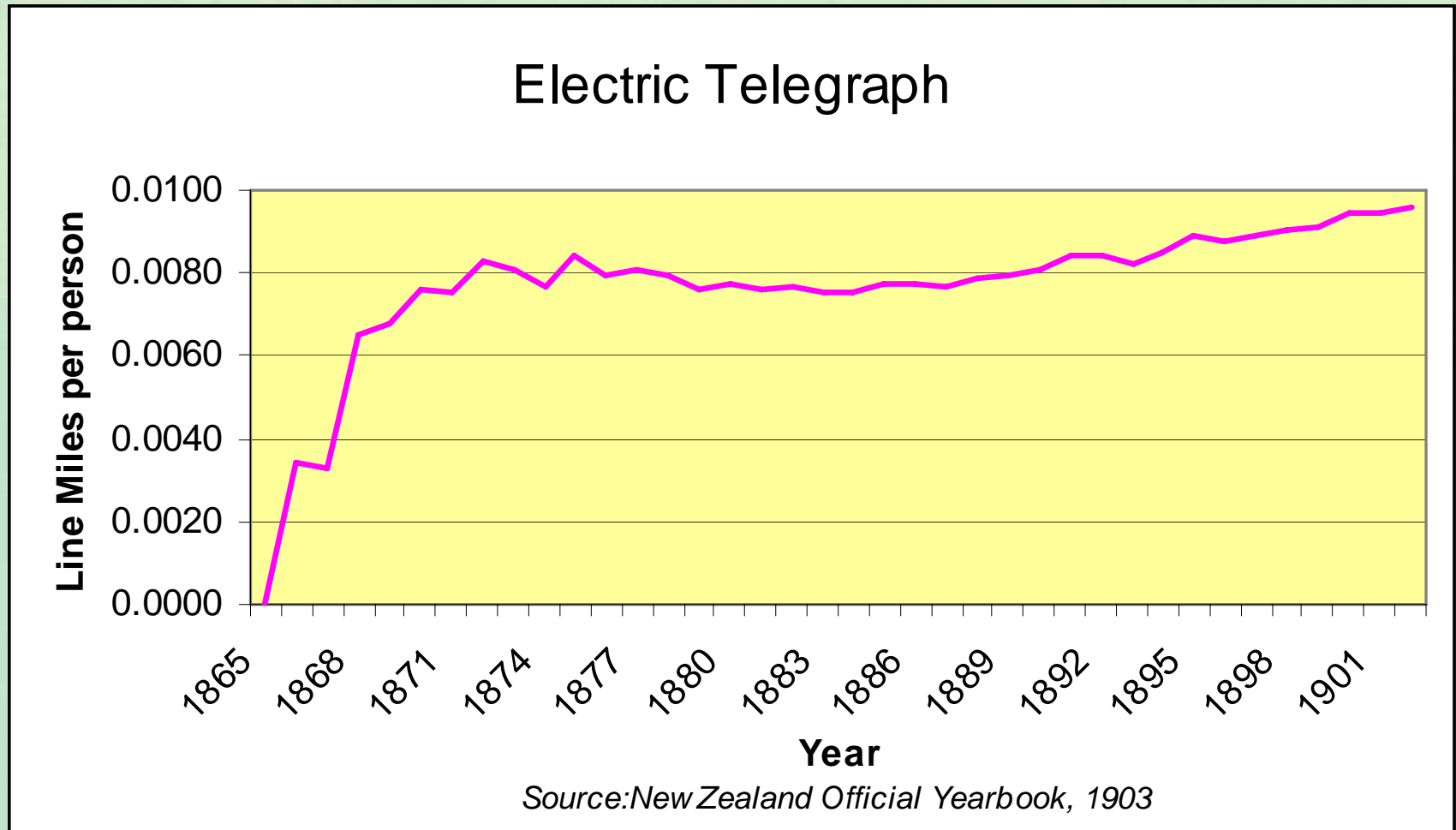
Some History

- Julius Vogel 1870s:
 - 1,600 kms of rail
 - 6,400 kms of telegraph
 - Undersea cable to Australia
 - Shipping service to San Francisco
- Provinces & industries opened up around rail
 - E.g. Taranaki
 - 97 dairy factories + 1 freezing works by 1903
 - Indicates good inter-regional transport links (dairying worthwhile)
 - But poor intra-regional transport links (plethora of factories)

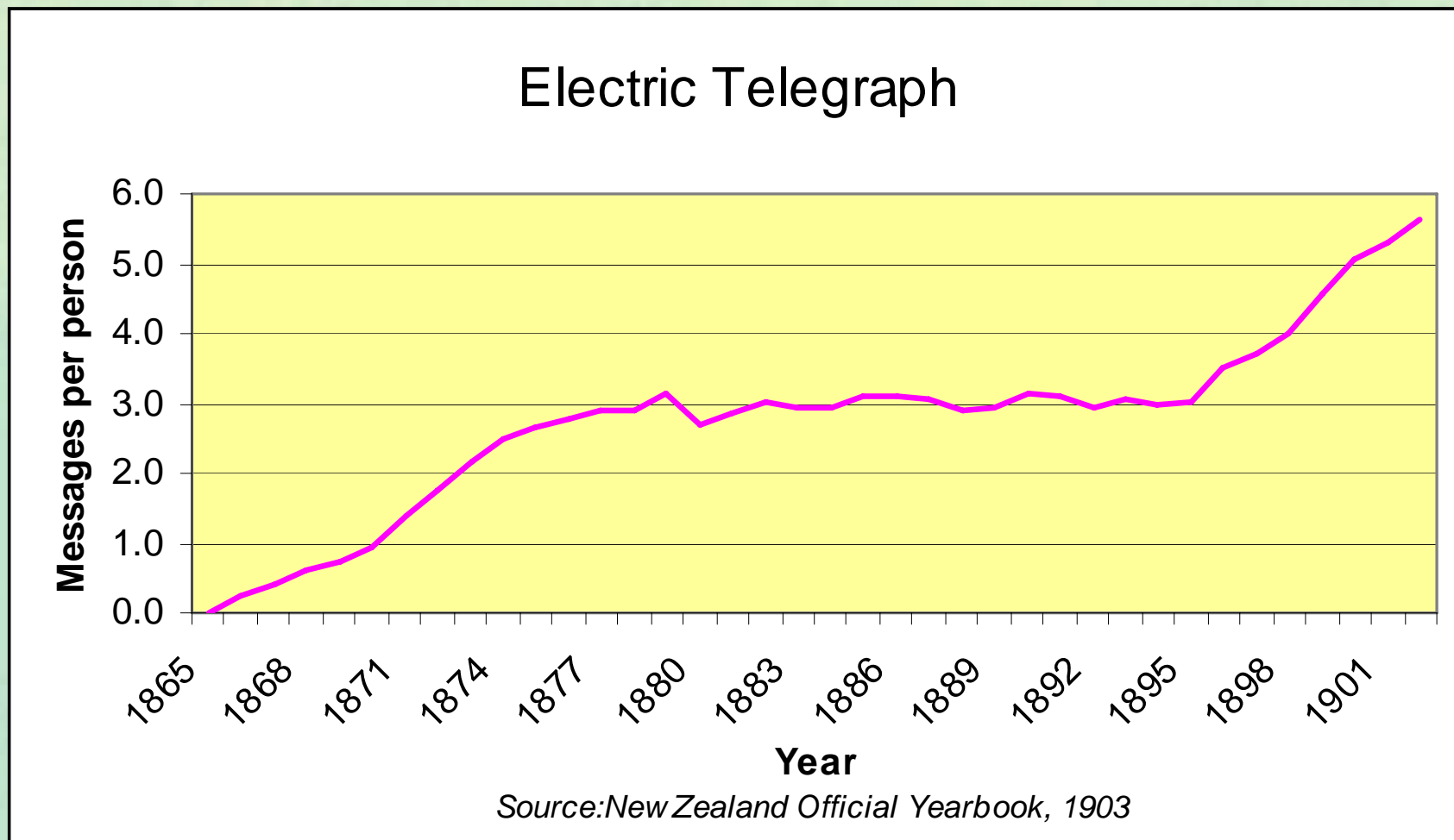
Long Time Horizons: to build



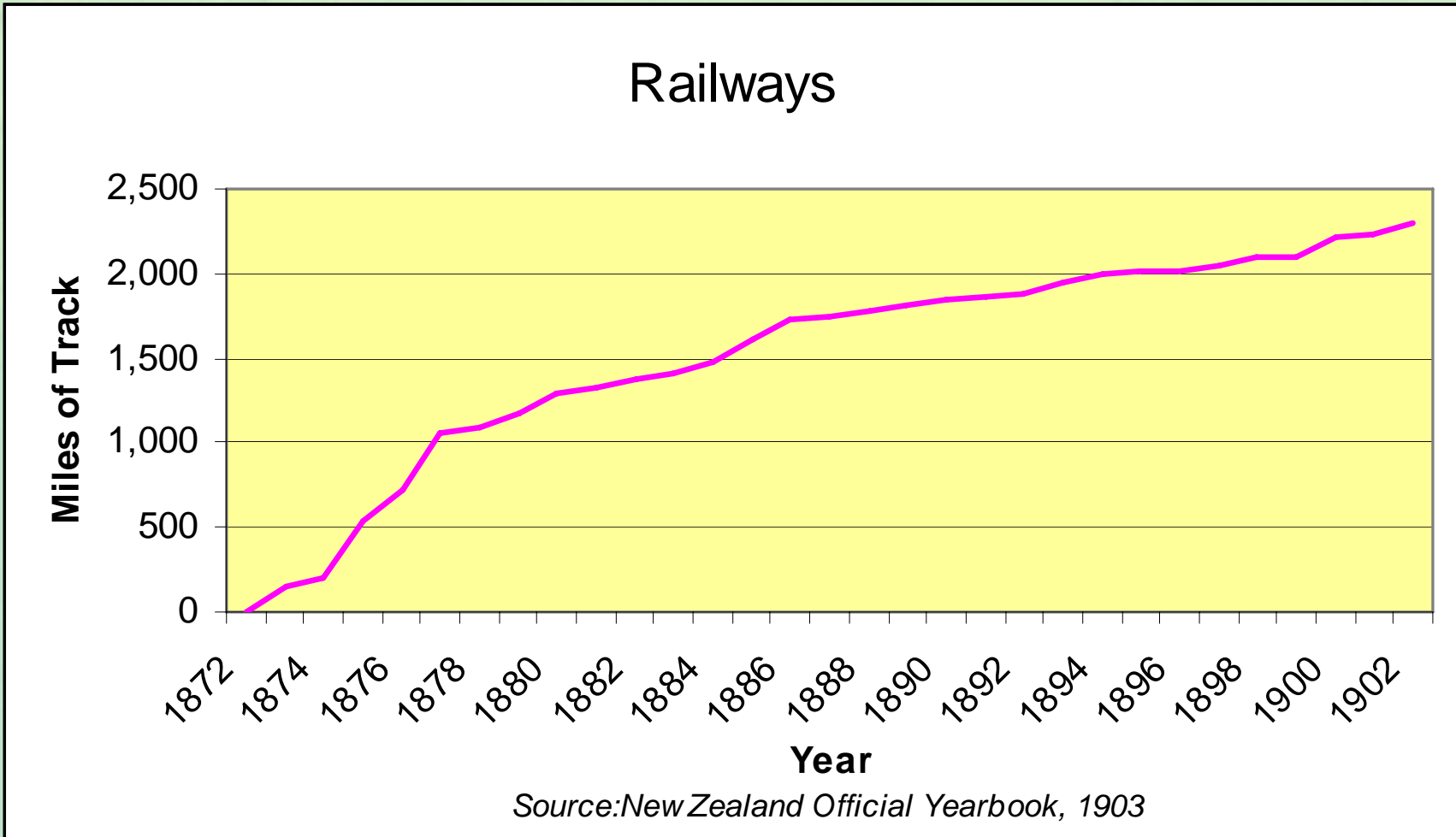
Long Time Horizons: to keep up with population



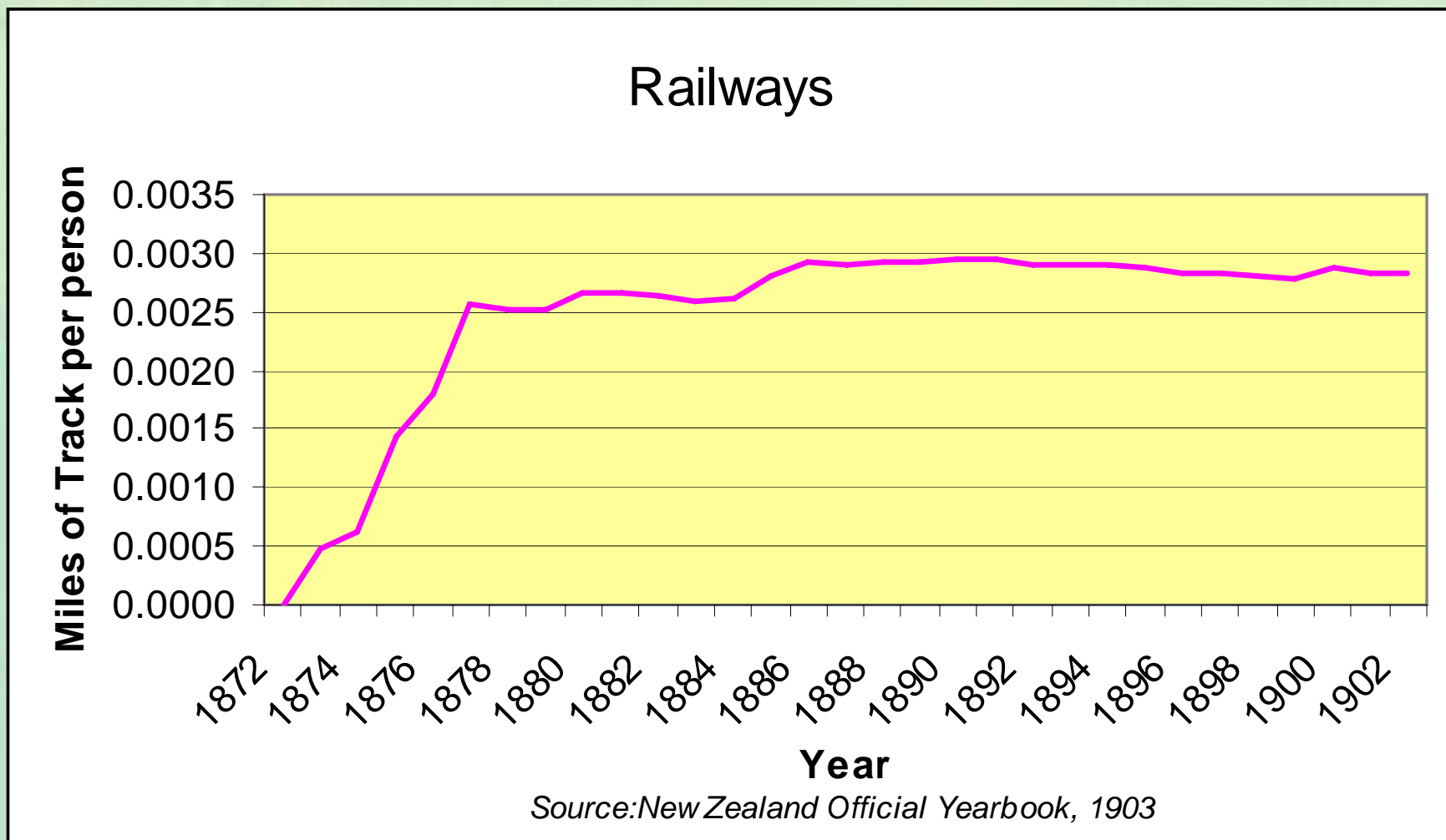
Long Time Horizons: to use fully



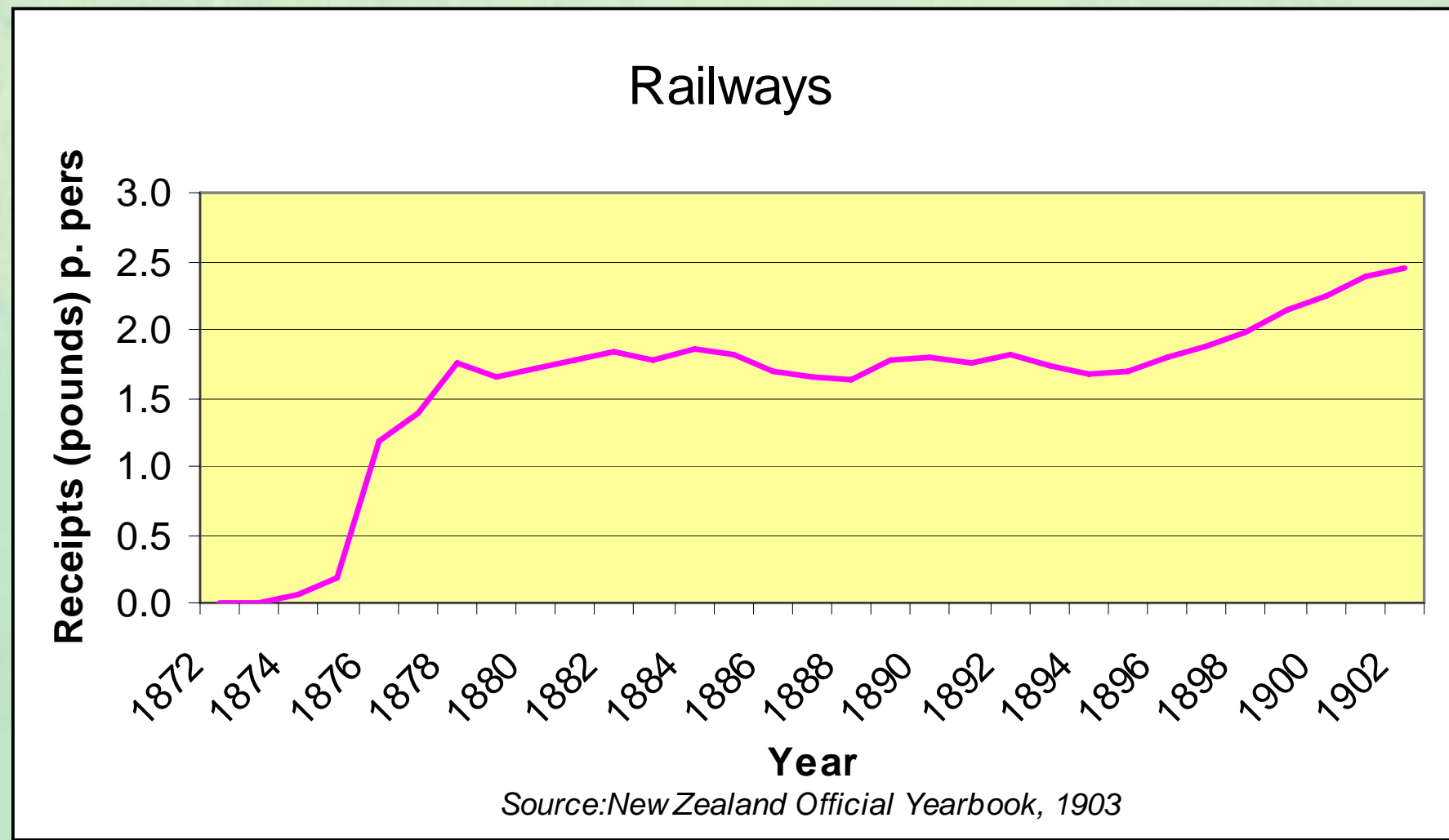
Long Time Horizons: to build



Long Time Horizons: to keep up with population



Long Time Horizons: to use fully



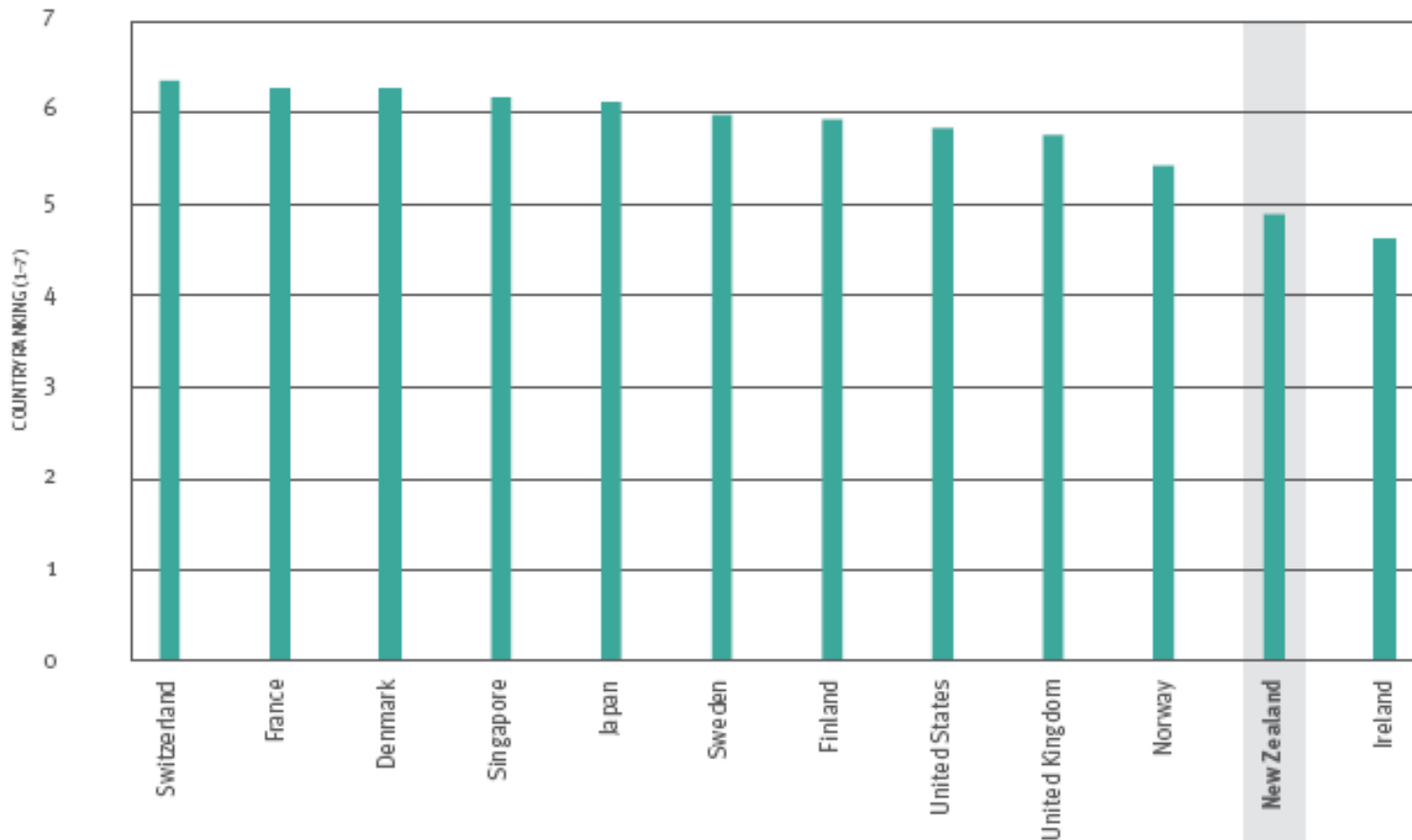
Why focus on infrastructure?

- One of few ways govt exp may raise productivity
(Nijkamp & Poot, 2004; Bassanini, 2001)
- NZ spends relatively little on infrastructure
(Grimes, 2003; Sanderson 2004)
- OECD concerned about NZ infrastructure deficit
 - Land transport, telecommunications, electricity
- Policies now focused on infrastructure
 - But expensive
 - Are the right things being built, & in the right order?

Infrastructure Quality Ranked 34th in world (GCR, WEF)

FIG.
4.15

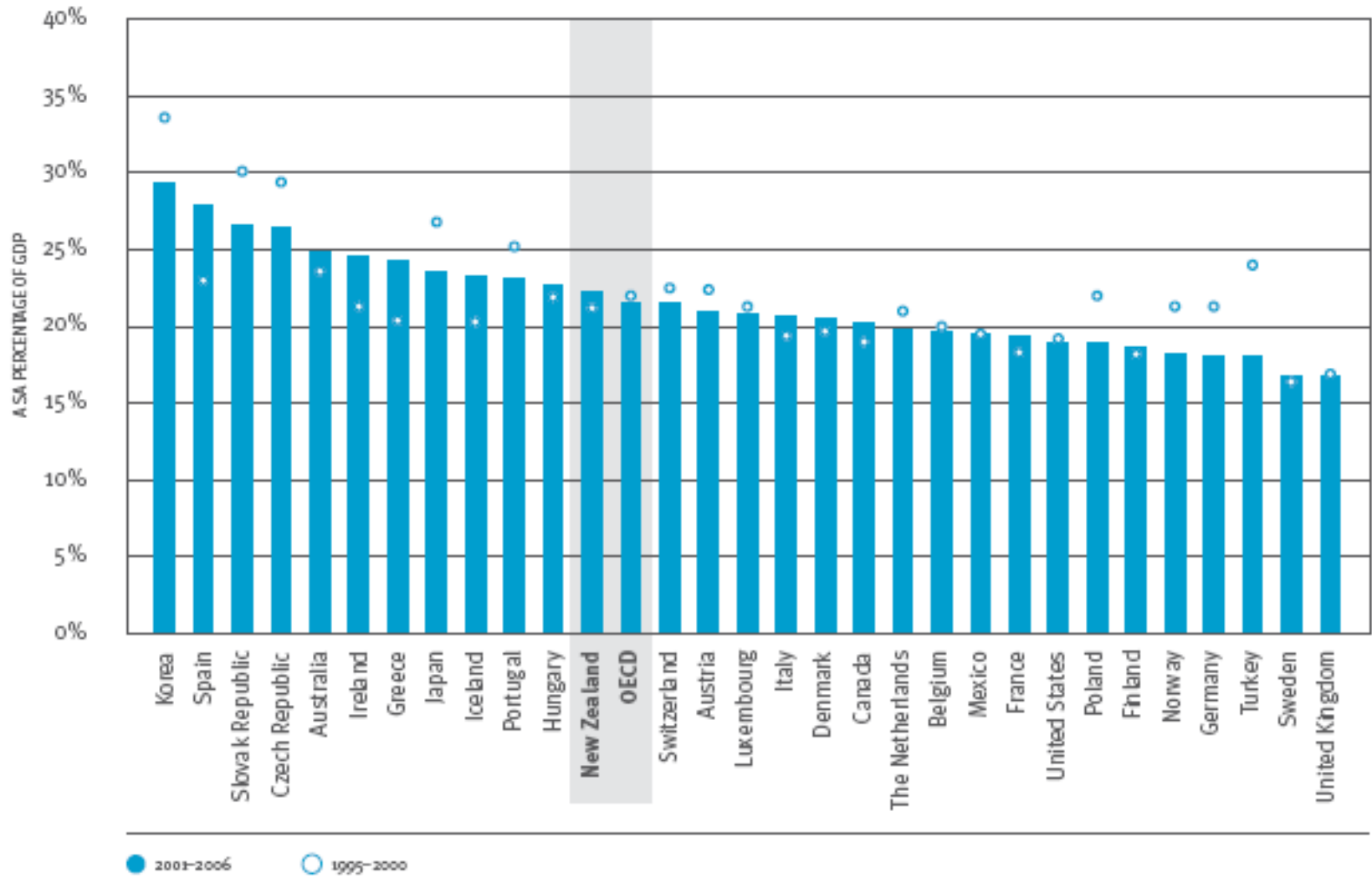
Perceived overall infrastructure quality, 2006



Total investment at OECD average

FIG. 3.1

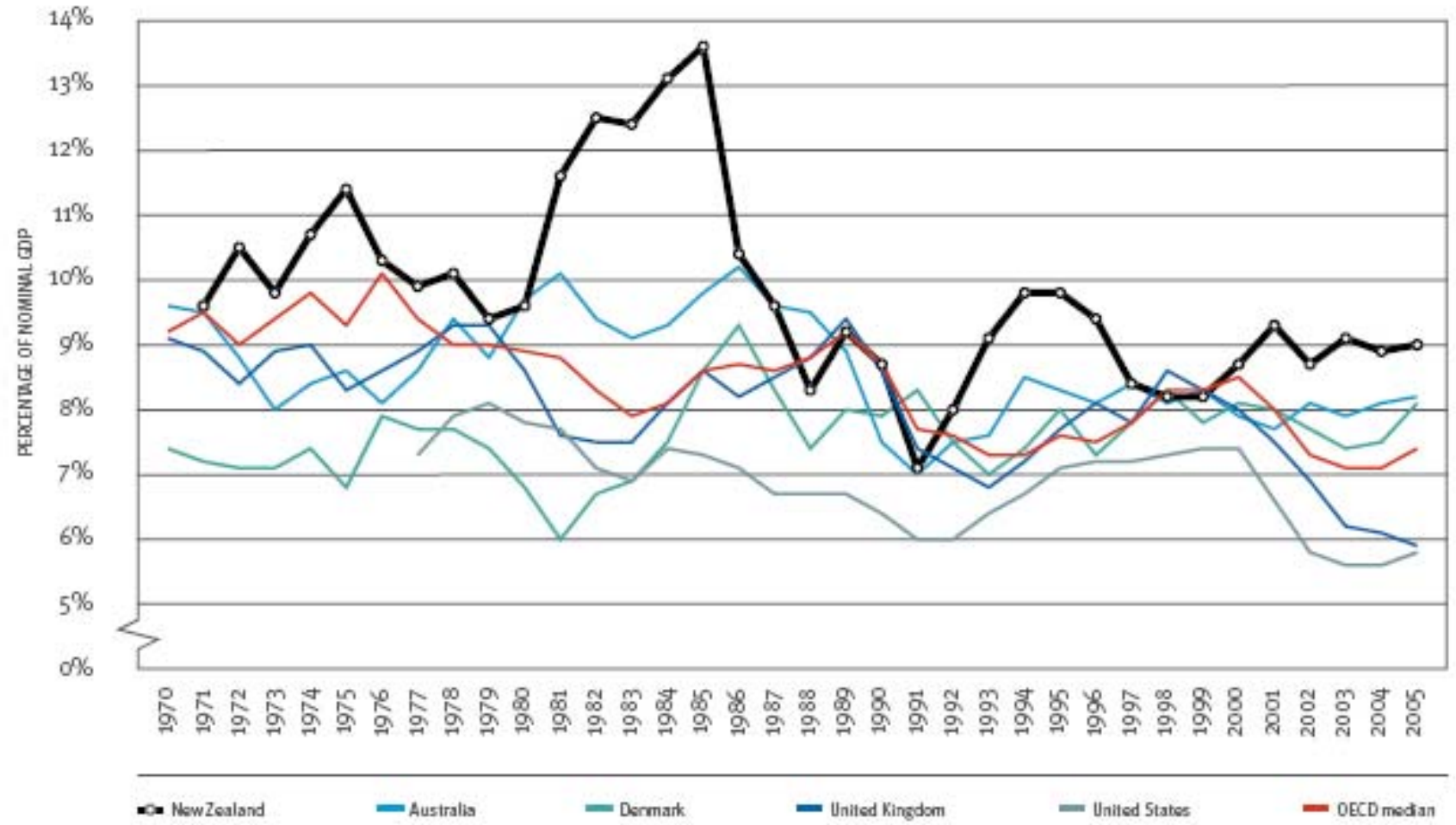
Total fixed investment as a percentage of GDP



Plant & machinery investment very high

FIG. 3.4

Plant and machinery investment (current prices) as a percentage of nominal GDP

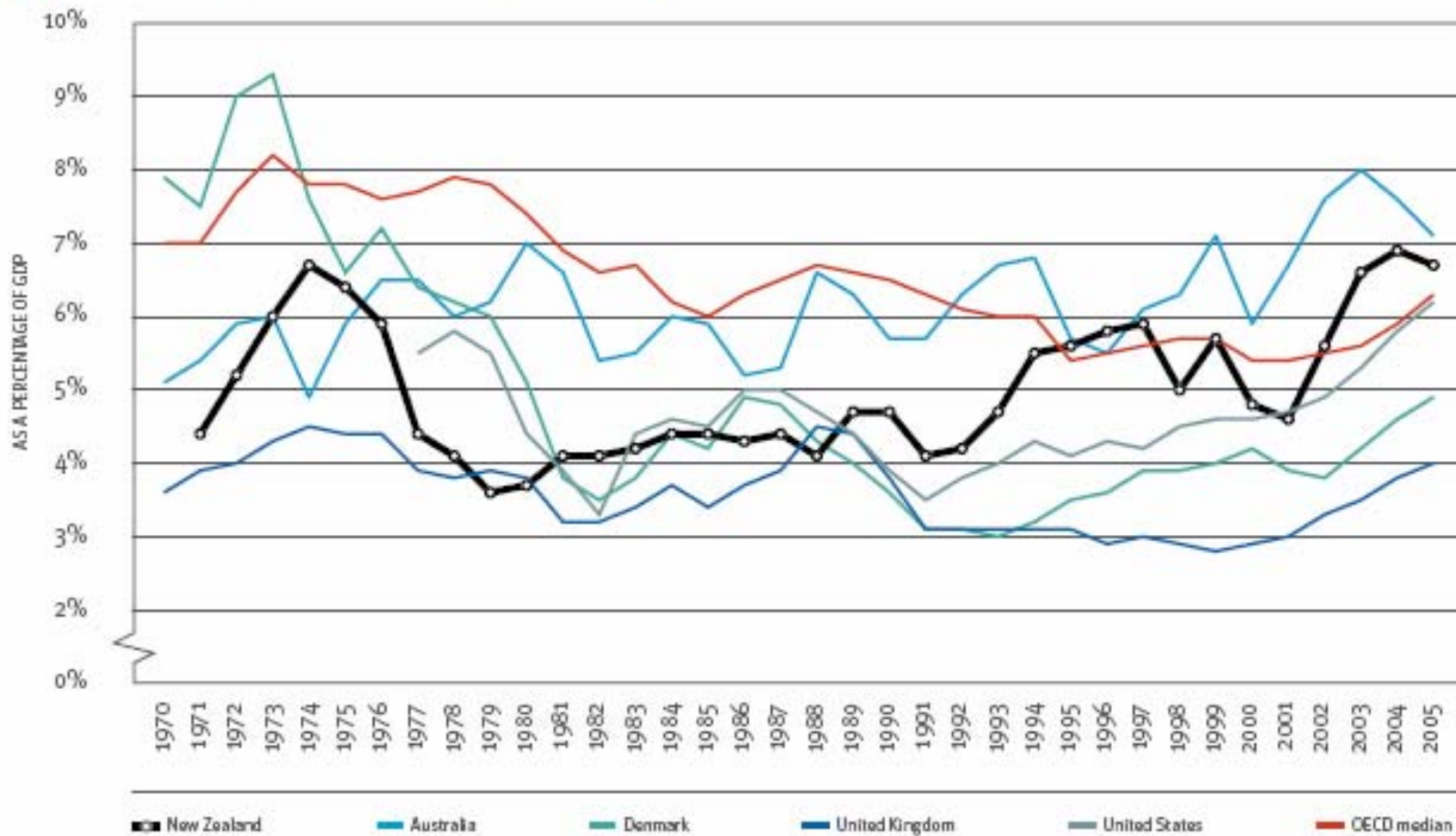


Source OECD Economic Outlook No 80

Housing investment below/about average

FIG. 3.5

Housing investment as a percentage of GDP



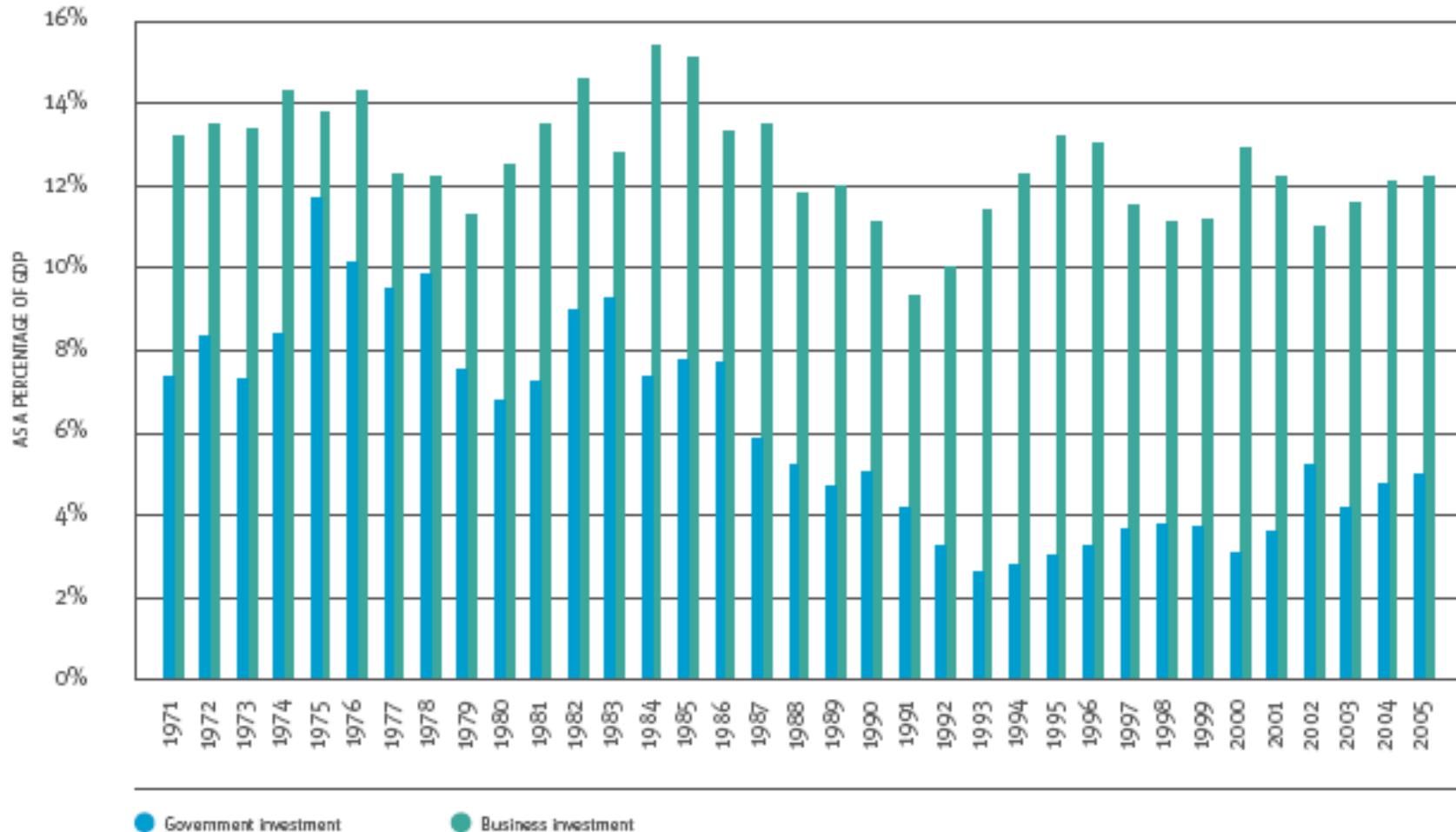
Source OECD Factbook 2007

Government investment plunged post-1986

FIG.

3.3

Investment as a percentage of nominal GDP



Motu's current & proposed research on infrastructure effectiveness

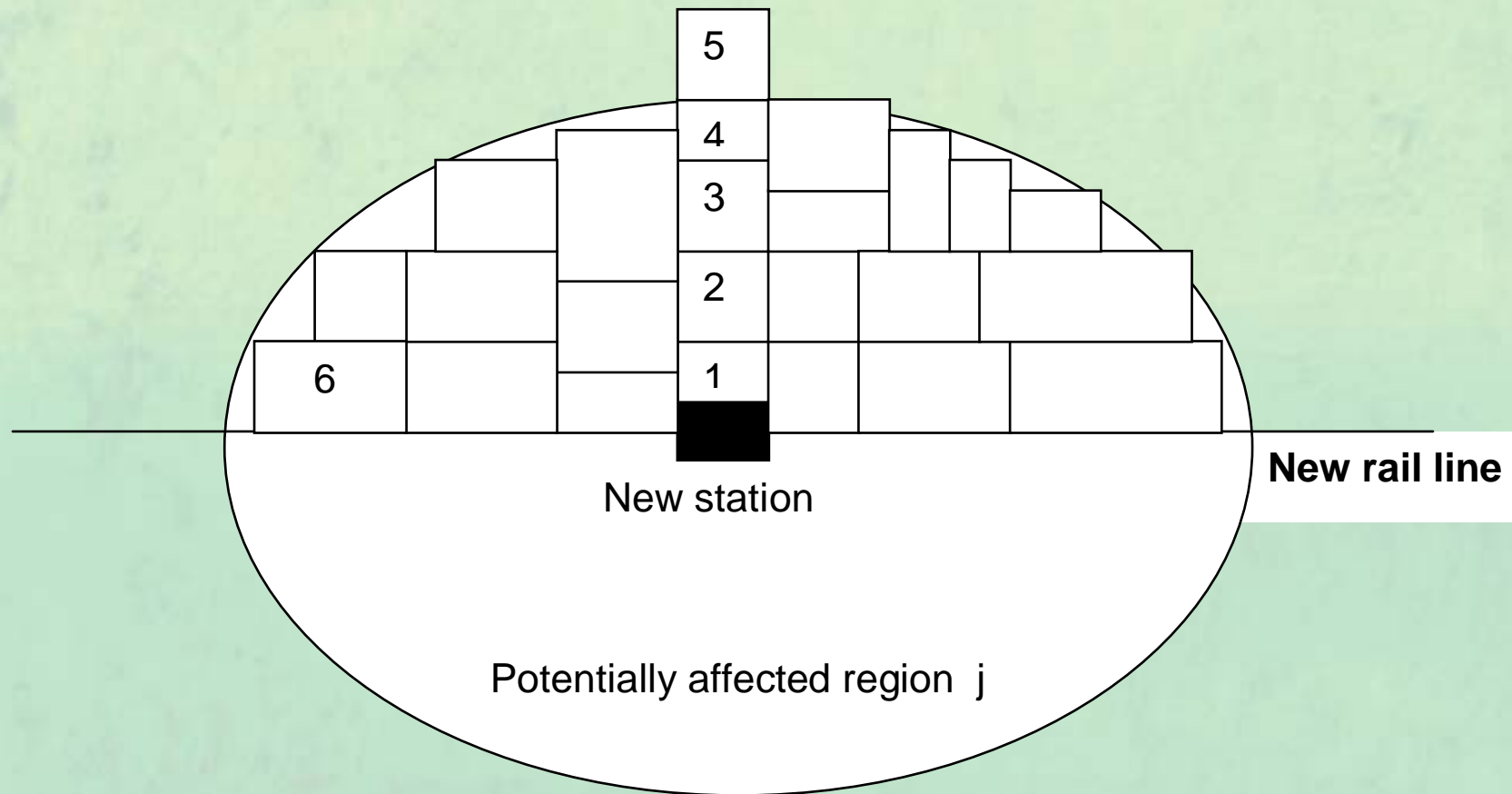
- Highways: Auckland Northern Motorway
- Planning rules: Auckland MUL
- Irrigation: South Canterbury
- Broadband: Effect on NZ firm performances
- Urban accessibility: Effects on Auckland firms
- Rural services: Emergency services
- Urban rail: Auckland upgrades
- Export infrastructure: Port/airport impacts on exporters
- Local amenities: E.g. Waitakere
- Education services: E.g. Southland polytechnic

Measuring effectiveness



- Productive infrastructure increases local productivity
 - Also affects ‘amenity’ values
- Land prices reflect local productivity & amenities
 - Infrastructure benefits reflected in land prices (Ricardo)
- Examine prices (or rents) before & after infrastructure
 - Difference (after controls) reflects value of infrastructure
- Also examine effects on:
 - wages, employment, population, economic activity
 - firm productivity, profitability & firm growth

Illustration



$i=1$ has greatest price rise, followed by 2,3,4; no effect on 5, price drop in 6

Example 1: Bridge to Somewhere



Auckland Northern Motorway

- Estimate benefits of Auckland's Northern Motorway extensions post-1990 to Orewa
- Use change in land values (after controlling for other factors) as summary indicator of value
- Also examine popⁿ, employment, income Δ s
- 3 waves: 1992, 1998, 2004
- Compare estimated benefits with project costs to measure net benefit (& B:C)



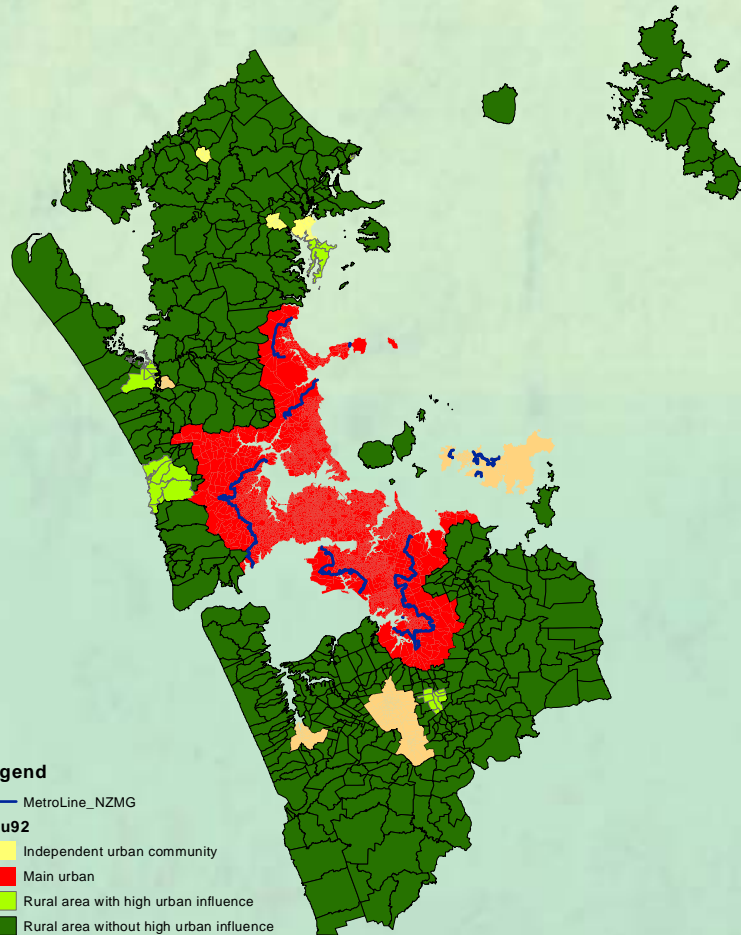
North Shore & Rodney



Results

- Population & employment rose strongly near new exits & around Warkworth
 - Growth strongly exceeded Auckland region growth
- Most conservative calculation gives a benefit of \$2.3 billion (in 2004 \$'s)
- cf estimated discounted costs of \$0.37 billion
- Implies B:C > 6 (even after cost over-runs)
- Some estimates give B:C near 20
 - Much higher than ex ante B:C's
 - Because responses to infrastructure under-estimated(?)

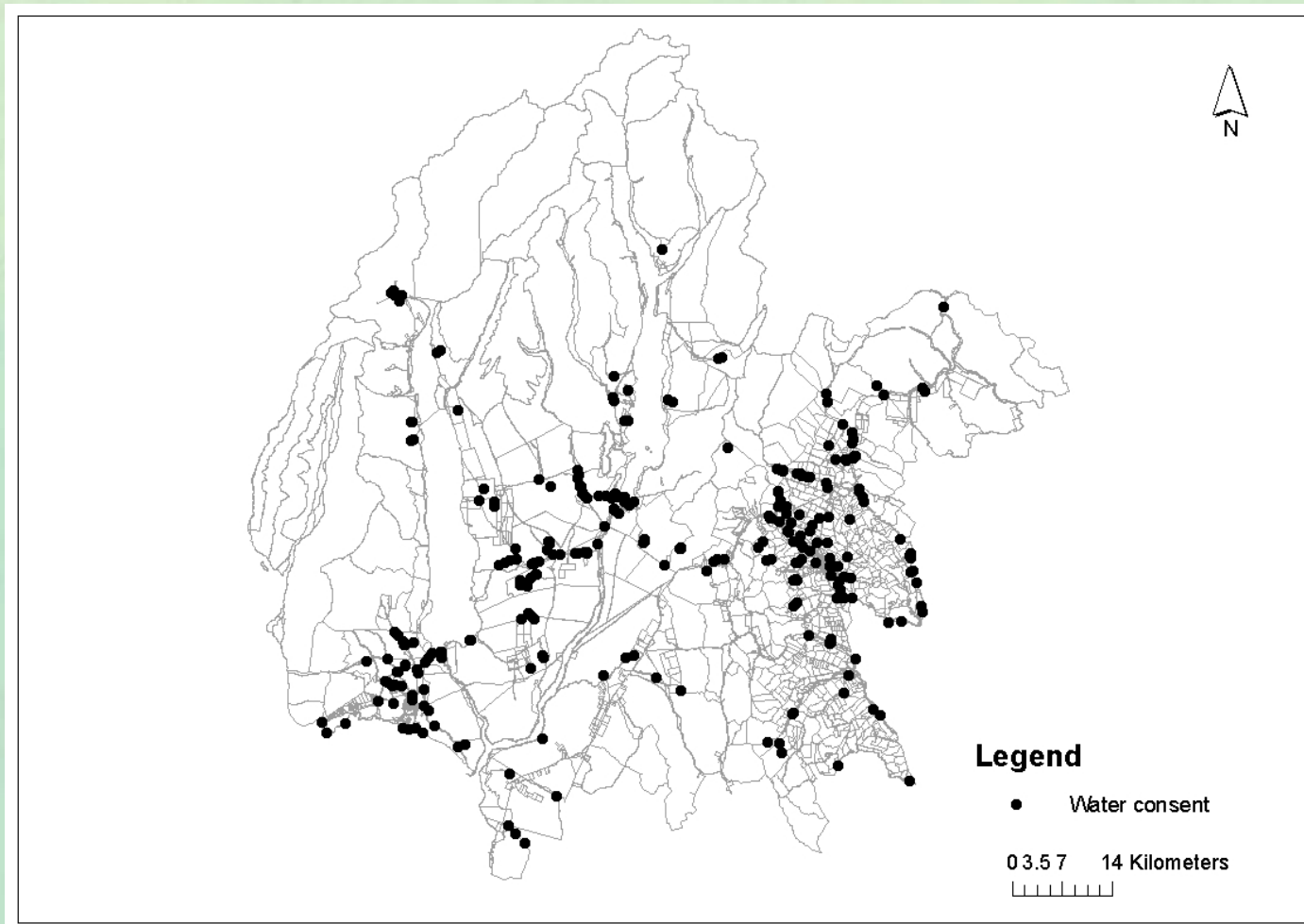
Example 2: Auckland's Metropolitan Urban Limit



- Land values vary by factor of 10 across MUL border
- I.e. zoning has huge impact on land use
- Affects payoffs to infrastructure investment
- Little attention given to measuring whether costs outweigh MUL's benefits

Example 3: Water, Water Somewhere

Location of Irrigation Consents: Mackenzie District



Source: Environment Canterbury

Mackenzie District Water Consents

- Estimate benefits of water consents for farms
- Change in land values indicate water's value
 - after controlling for other factors
- Annual data: 1988-2006 for every farm in district
 - Sales price data & valuation data
 - Individual farm water consent data (incl flow-rates etc)
 - Individual farm data on area, location, rainfall, slope, soil type
- Examine interactions of characteristics & consents

Key Findings

- On average, significant positive benefits of water
- But benefits differ enormously depending on:
 - Location (more valuable near towns)
 - Farm rainfall, slope & soil
- Raises issues of water allocation & trading
 - Water given away free to farmers ...
 - ... who can't sell to someone who has higher use-value
- Water's value to the farm is reflected in farm price
 - But this may be less than its full economic value

Planning Demand for Infrastructure: Contextual issues - national & regional

- Population growth
 - exogenous &
 - endogenous; i.e. driven by infrastructure investment
- New technologies
 - can take a long time to adjust
 - can supplant earlier investments
- Industry changes
 - exogenous & endogenous
- Climate change issues
 - can supplant earlier investments
- Regional disparities
 - exogenous & endogenous

Planning Implications: General

- New infrastructure is costly
 - Benefits firm productivity &/or consumption
 - Constraints will delay what can be built in near term
 - Not all infrastructure is worthwhile (Japan)
- New infrastructure leads to major wealth transfers
 - Also large regional effects (absolute & relative)
- Decide on value of short-run vs long-run benefits
 - Discount rate vitally important
 - Impacts on priorities as well as absolute B:C
- Consider who benefits & who should pay
 - And whether to borrow or pay out of current income

Planning Implications: Energy

- Can't take industry structure as independent of energy investments
- Investment decisions will inevitably favour certain regions/industries
 - Should be explicitly considered
 - What regional/industry role for paying for new investments?
 - Noting that local existing landowners benefit from new investments
- Flexibility (redundancy) useful in light of technology changes & climate change reactions
- Planning horizons must be long
 - Low discount rate for infrastructure investments