

The economics of climate change for New Zealand

May 2007

AGENDA

1. Global climate change

- What climate changes are forecast over the next century?

2. What are the direct effects on the New Zealand economy?

- How will climatic variation impact on the primary sector and other climate sensitive areas of the economy?

3. What are the likely indirect economic effects?

- Pricing of emissions
- Changes in consumer and company preferences
- Demand for new technologies

4. Where should business and government be focused?

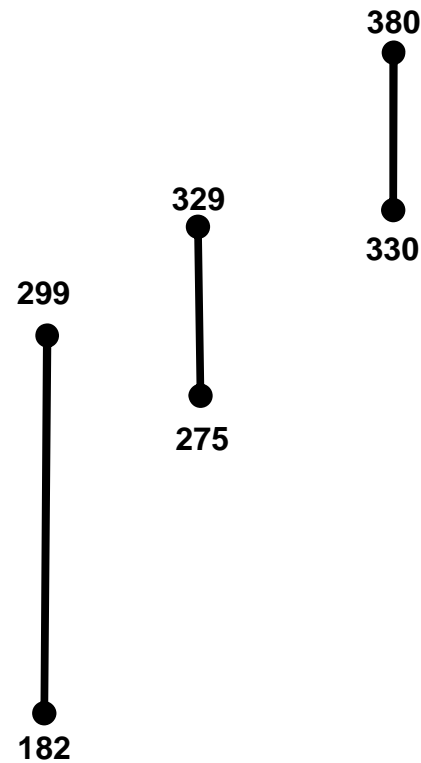
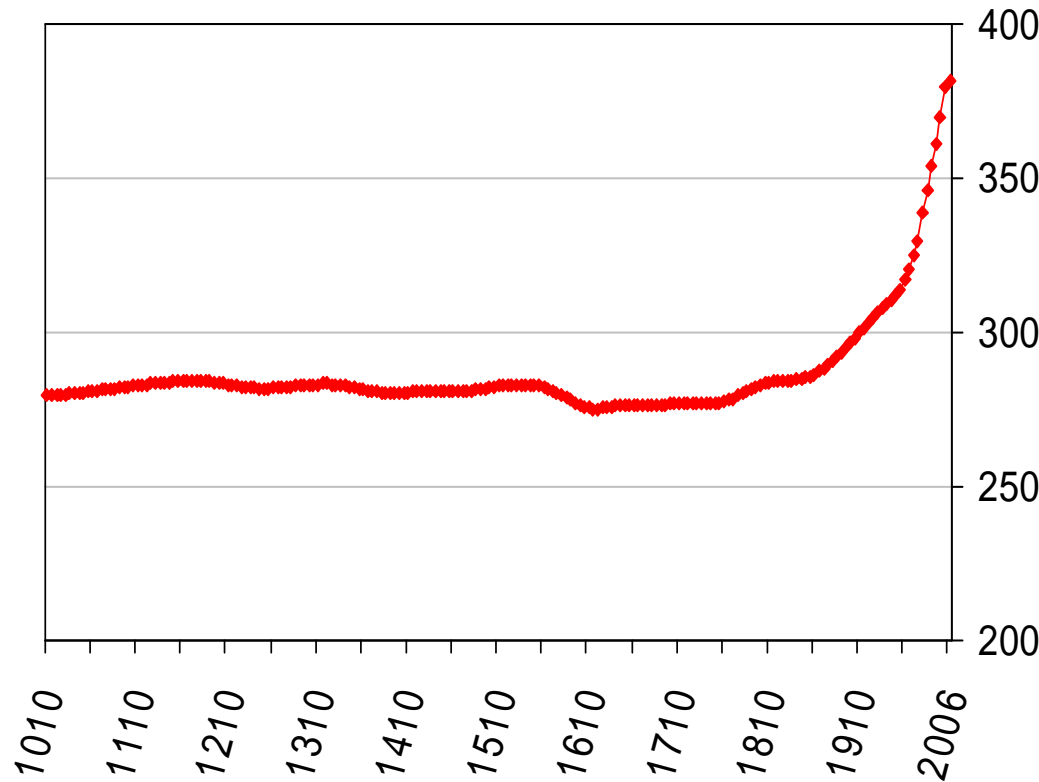
- Do the direct or indirect economic effects of climate change have the more significant impact on New Zealand?

CARBON DIOXIDE LEVELS ARE NOW AT UNPRECEDENTED LEVELS

970
541

CO2 levels (ppm) over the time period:

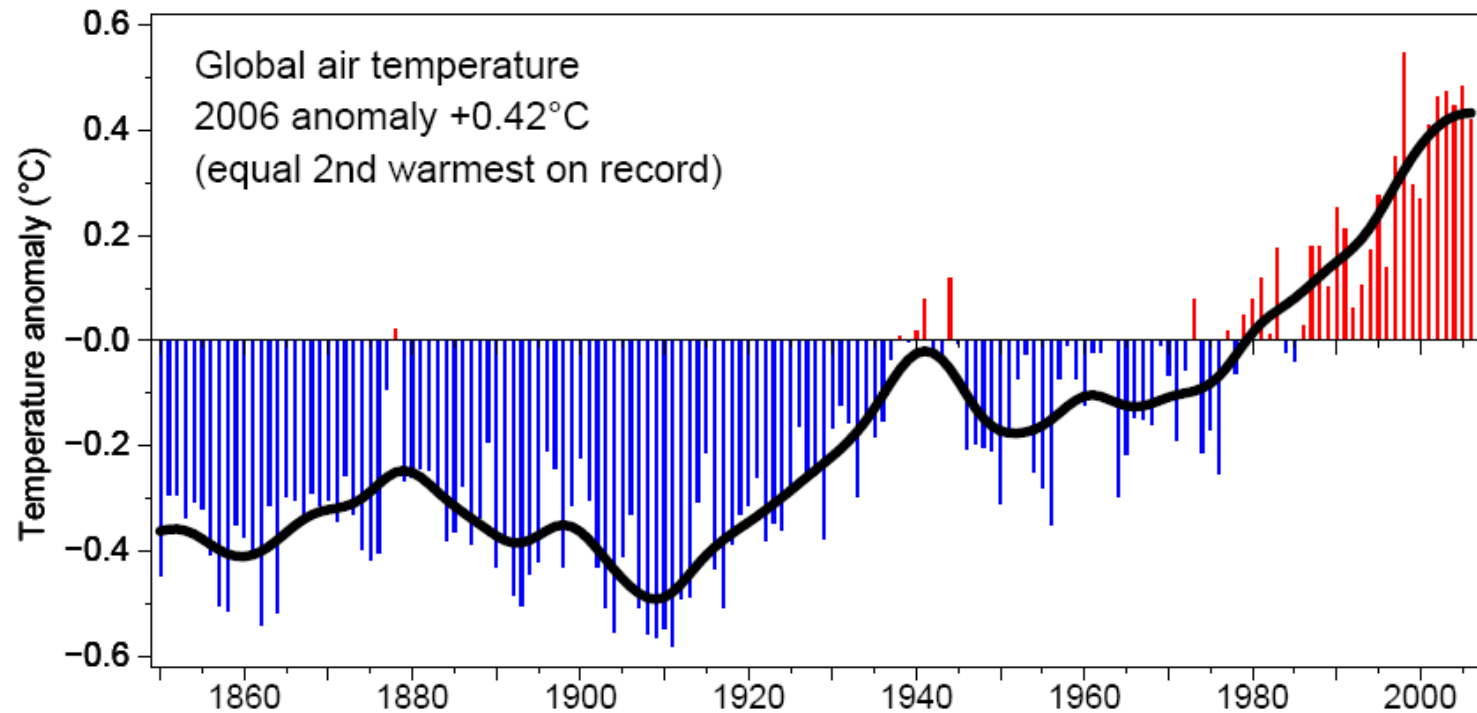
Last 650k years	Last 1k years	Last 25 years	Forecast for 2100
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Source: Carbon Dioxide Information Analysis Center of the US Department of Energy; US National Oceanic and Atmospheric Administration; Intergovernmental Panel on Climate Change.

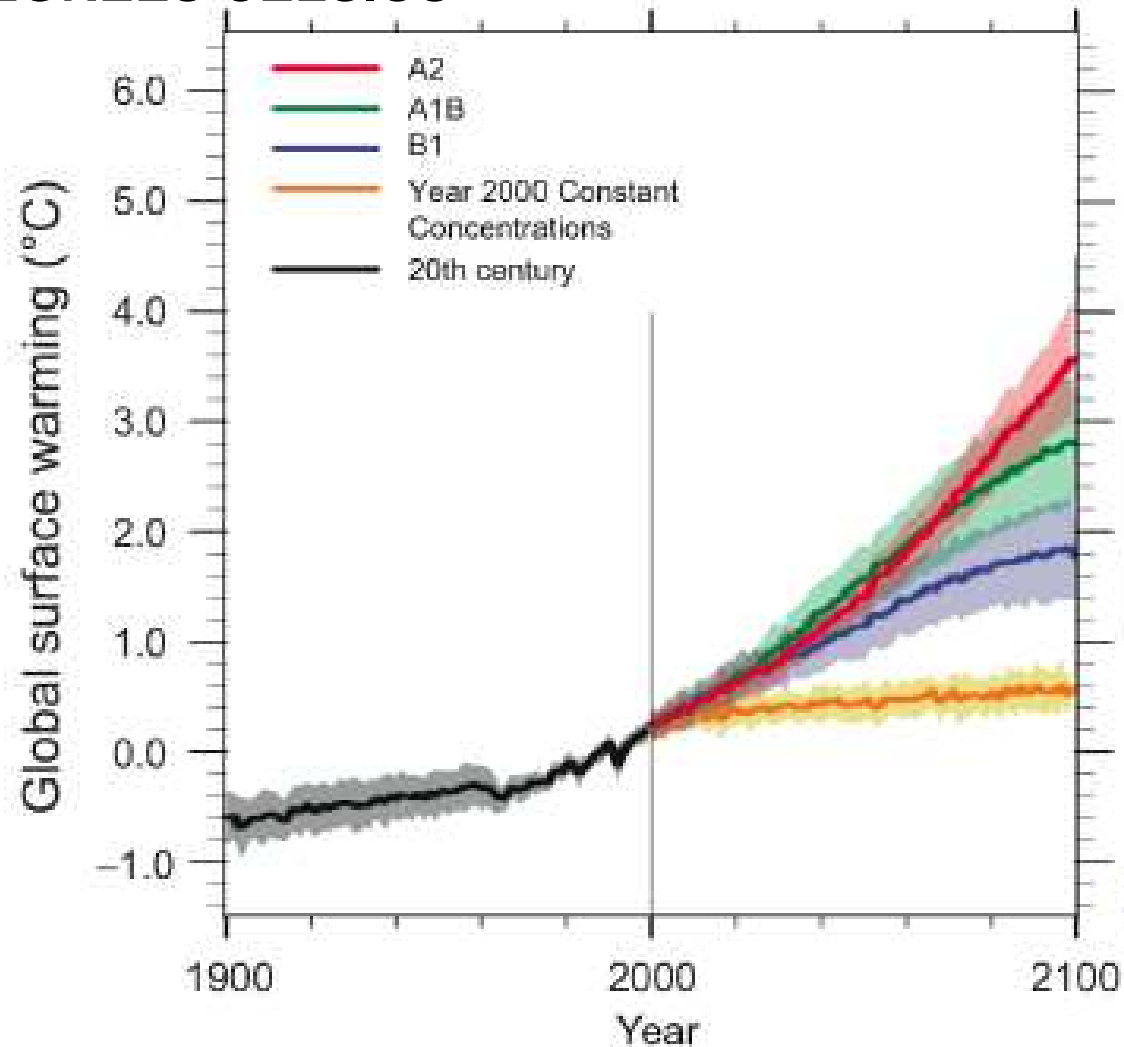
TEMPERATURES ARE RISING GLOBALLY

Global air temperature annual anomaly to 1961-1990 mean



Source: Climatic Research Unit and UK Met Office Hadley Centre.

THE IPCC'S BEST ESTIMATES FOR ALL SCENARIOS RANGE FROM 1.8 TO 4.0 DEGREES CELSIUS



Note: The IPCC has developed best estimates of temperature increase for six scenarios, three are shown here
Source: Intergovernmental Panel on Climate Change Working Group I Summary for Policymakers.

THE IPCC REPORT REVEALS SCIENTIFIC CONSENSUS OF ALTERED ENVIRONMENT DUE TO HUMAN ACTIVITY

Phenomenon and direction of trend	Likelihood that trend occurred in late 20 th century (typically post 1960)	Likelihood of a human contribution to observed trend	Likelihood of future trends based on projections for 21 st century using SRES scenarios
Warmer and fewer cold days and nights over most land areas	<i>Very likely</i>	<i>Likely</i>	<i>Virtually certain</i>
Warmer and more frequent hot days and nights over most land areas	<i>Very likely</i>	<i>Likely (nights)</i>	<i>Virtually certain</i>
Warm spells / heat waves. Frequency increases over most land areas	<i>Likely</i>	<i>More likely than not</i>	<i>Very likely</i>
Heavy precipitation events. Frequency (or proportion of total rainfall from heavy falls) increases over most areas	<i>Likely</i>	<i>More likely than not</i>	<i>Very likely</i>
Area affected by droughts increases	<i>Likely in many regions since 1970s</i>	<i>More likely than not</i>	<i>Likely</i>
Intense tropical cyclone activity increases	<i>Likely in many regions since 1970s</i>	<i>More likely than not</i>	<i>Likely</i>
Increased incidence of extreme high sea level	<i>Likely</i>	<i>More likely than not</i>	<i>Likely</i>

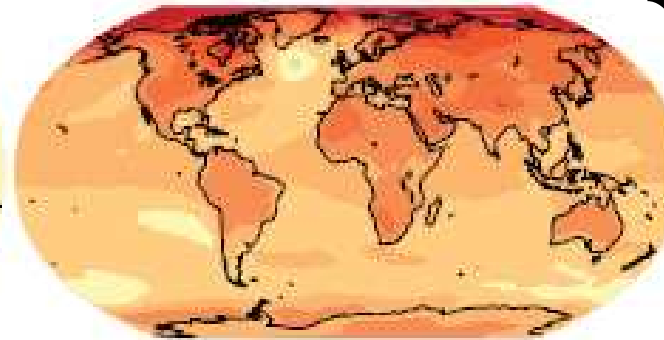
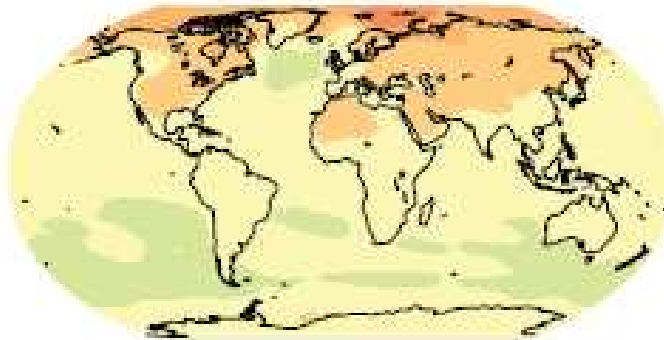
SUBSTANTIAL REGIONAL VARIATION IN TEMPERATURE INCREASES

Scenario: In our lifetime (2020-9)

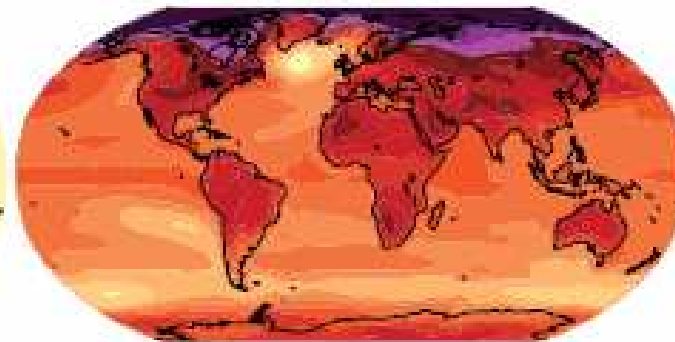
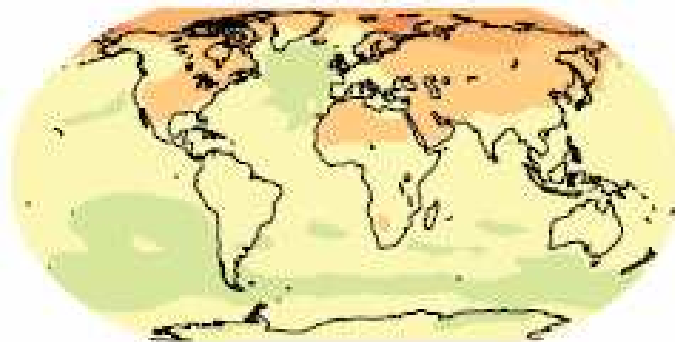
For our grandchildren (2090-9)

Outcomes:

B1



A2



Regional variation of up to 6 degrees

Temperature rises greatest at the poles

Northern Hemisphere effects appear greater than in the Southern Hemisphere

Projected surface

temperature change (C)



0 0.5 1 1.5 2 2.5 3 3.5 4 4.5 5 5.5 6 6.5 7 7.5

THE RESULTING CHANGES ARE NOT DISTRIBUTED EVENLY ACROSS THE WORLD

Relative vulnerability to climate change:

Least vulnerable countries:

1. Norway
2. Finland
3. Sweden
4. Switzerland
5. Canada
6. Japan
7. Austria
8. France
9. USA
10. Denmark
16. New Zealand

Most vulnerable countries:

90. Senegal
91. Kenya
92. Angola
93. Yemen
94. Benin
95. Rwanda
96. Ethiopia
97. Mozambique
98. Somalia
99. Bangladesh
100. Sierra Leone

2. NEW ZEALAND CAN EXPECT CHANGES IN ITS CLIMATE BUT LESS THAN IN OTHER COUNTRIES

New Zealand will be warmer with more precipitation in the west and less in the east

New Zealand appears to be better off than many other countries

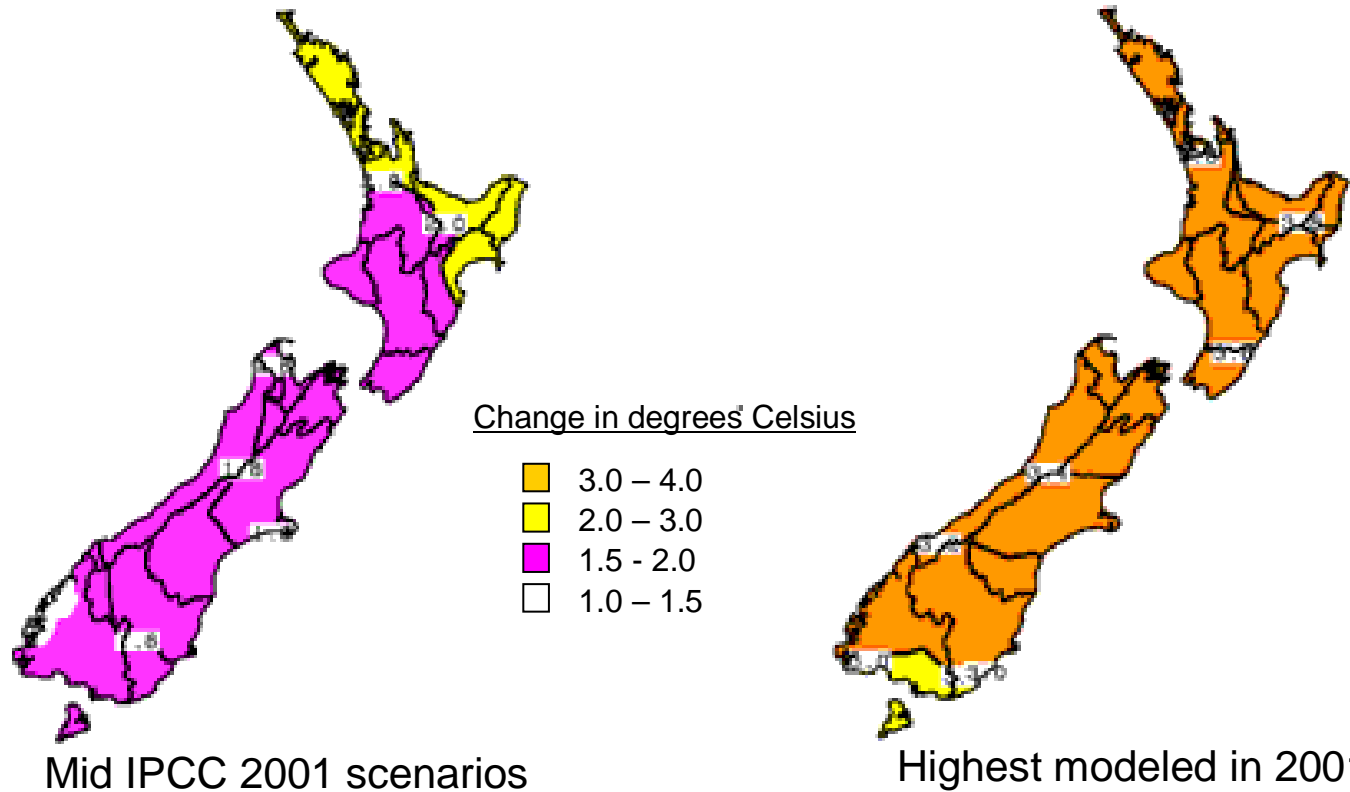
- Australia likely to experience severe drought in many agricultural regions
- New Zealand's crop productivity increases while Latin American countries like Chile expected to have decreased crop productivity

New Zealand may also experience

- Increased risk of invasion by pests, threatening native environments and agricultural industries
- Sea level increases and resulting coastal erosion

NEW ZEALAND TEMPERATURES ARE EXPECTED TO RISE

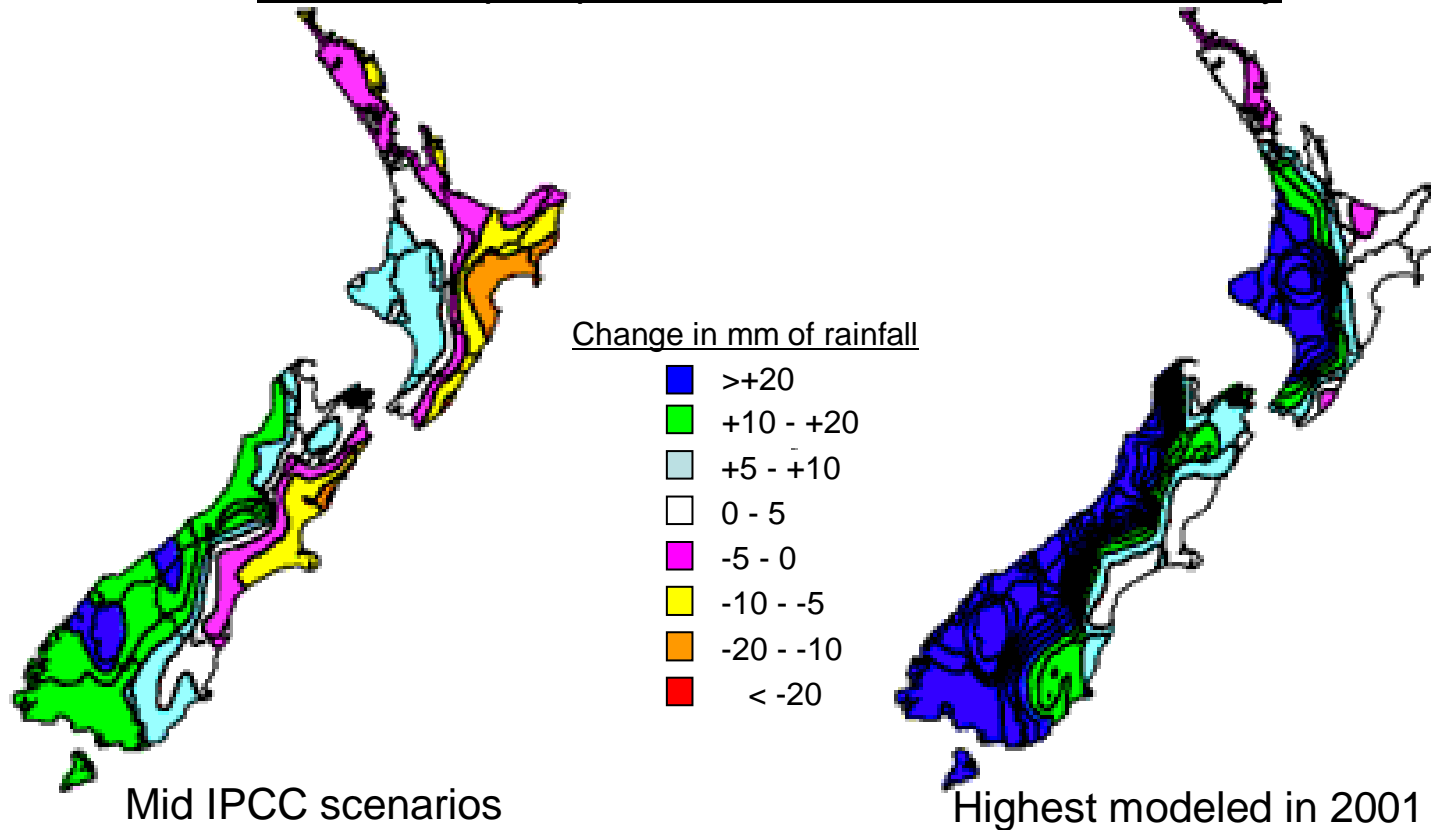
Mean Annual Temperature variation for the end of the 21st century



**Greater increase in the North (+2.0)
But increased temperatures across the country (Fiordland +1.5)
Winter temperatures will increase more than summer temperatures**

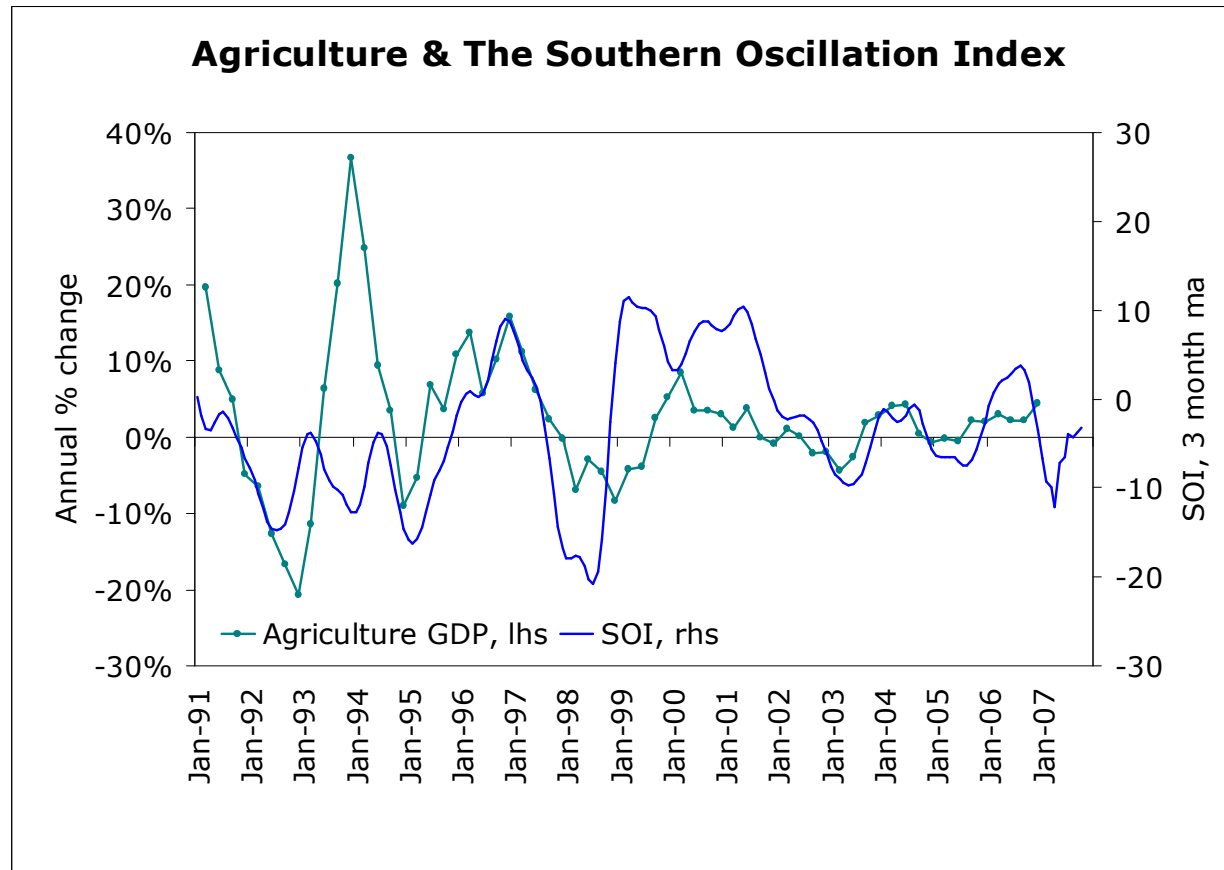
CHANGES IN RAINFALL MAY HAVE A MORE SIGNIFICANT ECONOMIC IMPACT

Variation in precipitation for the end of the 21st century



Drier in the North and East, increased rainfall in the West
The increased potential for drought likely to have significant economic costs
Hydro capacity more likely to increase than decrease

CLIMATE CHANGE WILL HAVE A DIRECT IMPACT ON THE NEW ZEALAND ECONOMY



Reduced rainfall in New Zealand reduces agricultural output and increases reliance on expensive thermal power generation

This has significant economic effects

- An El Nino event could reduce 2007 GDP growth from 1.5% to 1.0%.

3. INDIRECT ECONOMIC EFFECTS OF CLIMATE CHANGE

Pricing of emissions

- Likely that quantity and price constraints will be applied to greenhouse gas emissions
- New Zealand's exposure is linked to the emission intensity of its economy

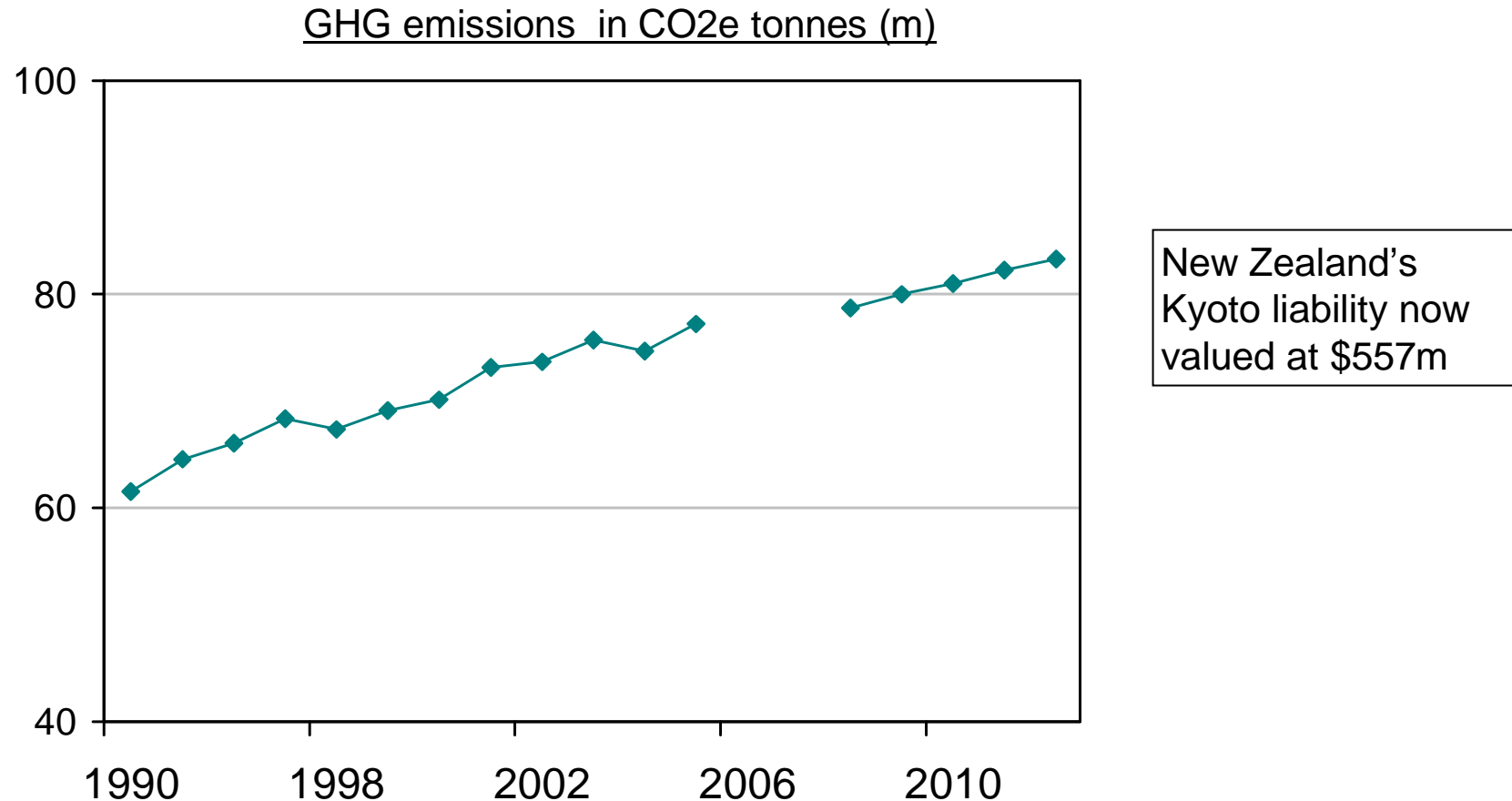
Changing preferences

- Consumer preferences may be changing towards environmentally friendly goods and services and firms need to respond
- These changing preferences may also impact on the location decisions of people and firms e.g. migration, tourism, and investment

New technologies and business models

- Changes in the price of energy and changing consumer preferences will create demand for new technologies, products and services
- This creates new commercial opportunities for firms

NEW ZEALAND'S EMISSIONS HAVE BEEN INCREASING AND ARE FORECAST TO CONTINUE TO INCREASE

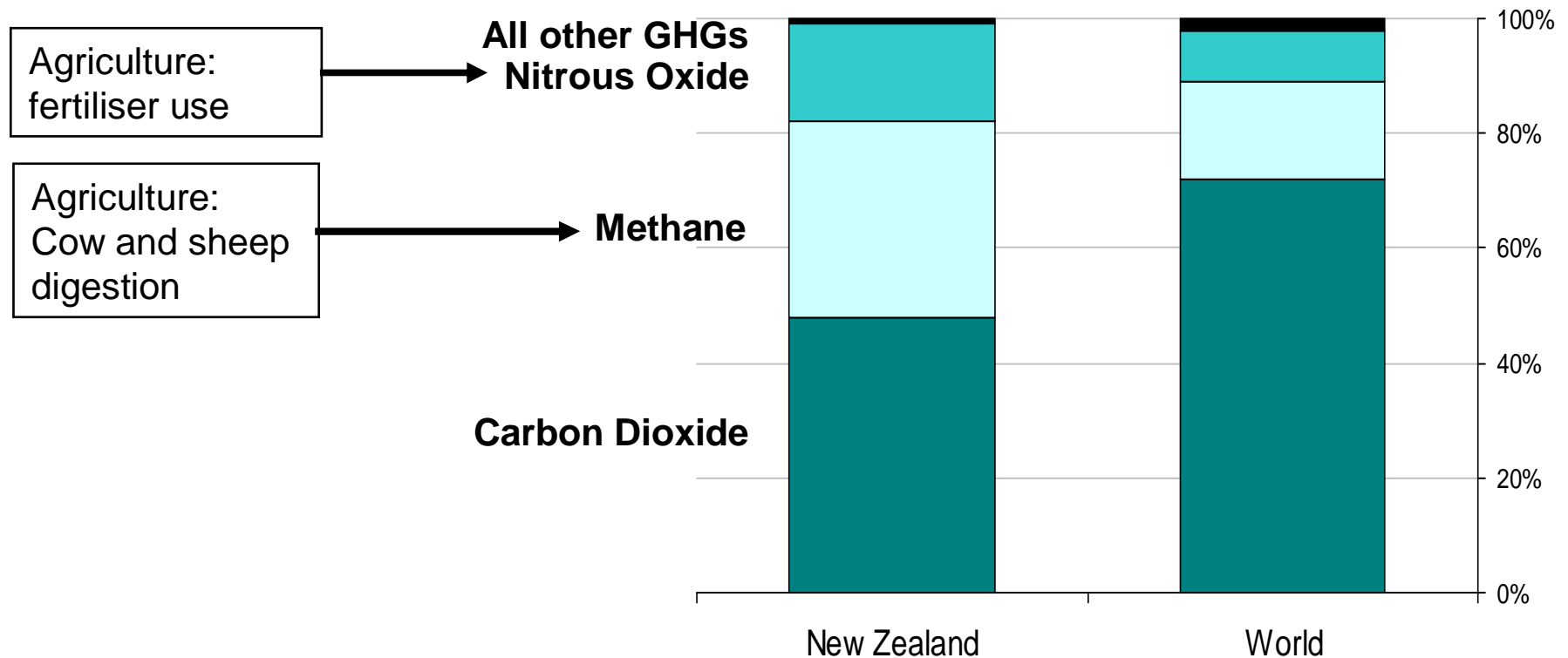


Note: Excludes Land Use, Land Use Change and Forestry. GHG = Greenhouse Gases. CO₂e = all GHG emissions converted to carbon dioxide equivalent tonnes. 2008 to 2012 projected.

Source: United Nations Framework Convention on Climate Change; RBNZ.

NEW ZEALAND'S EMISSIONS CONTAIN MORE METHANE AND LESS CARBON THAN MOST OTHER COUNTRIES

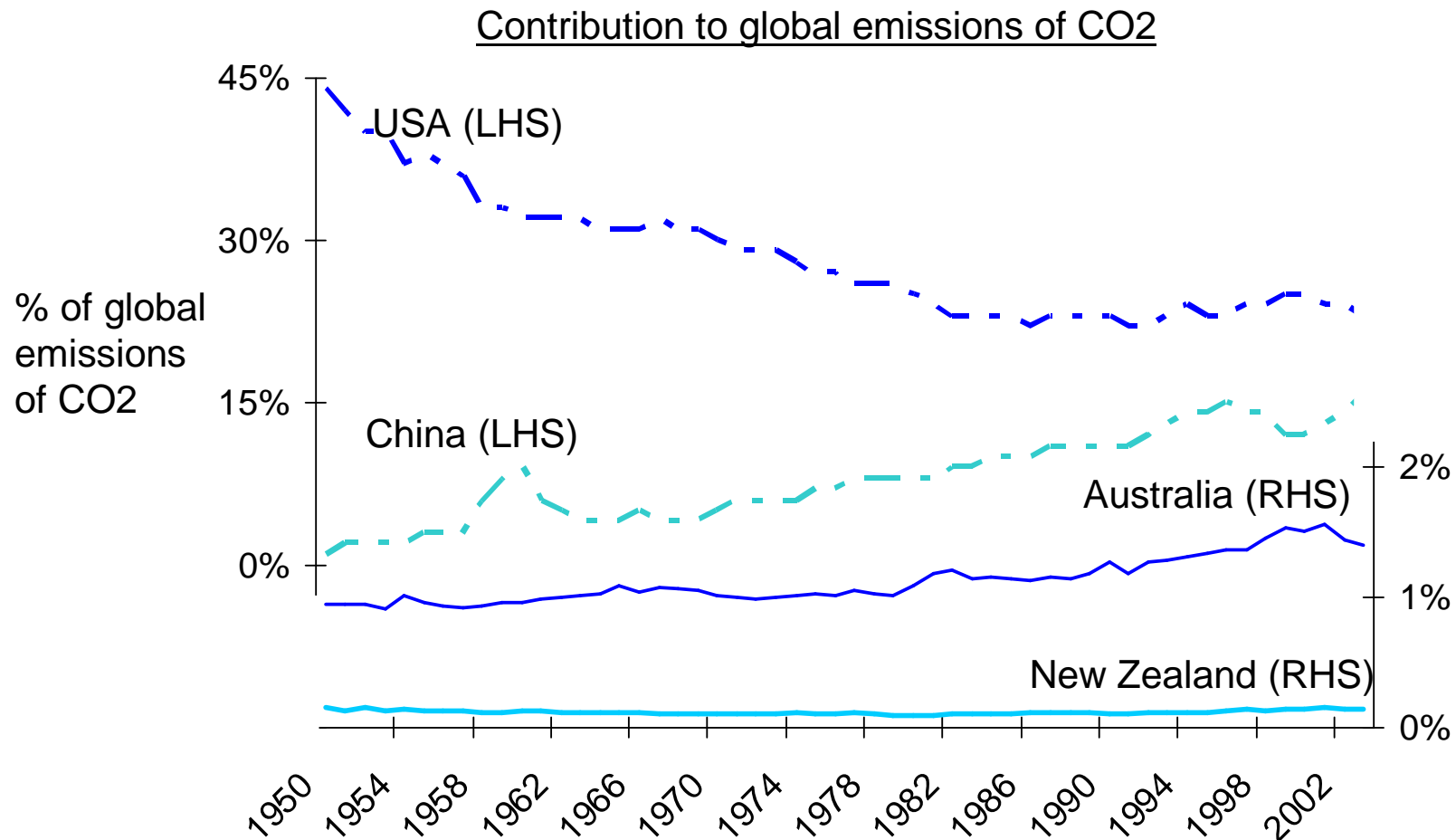
GHG by type of emission, 2002



Note: GHG = Greenhouse Gases.

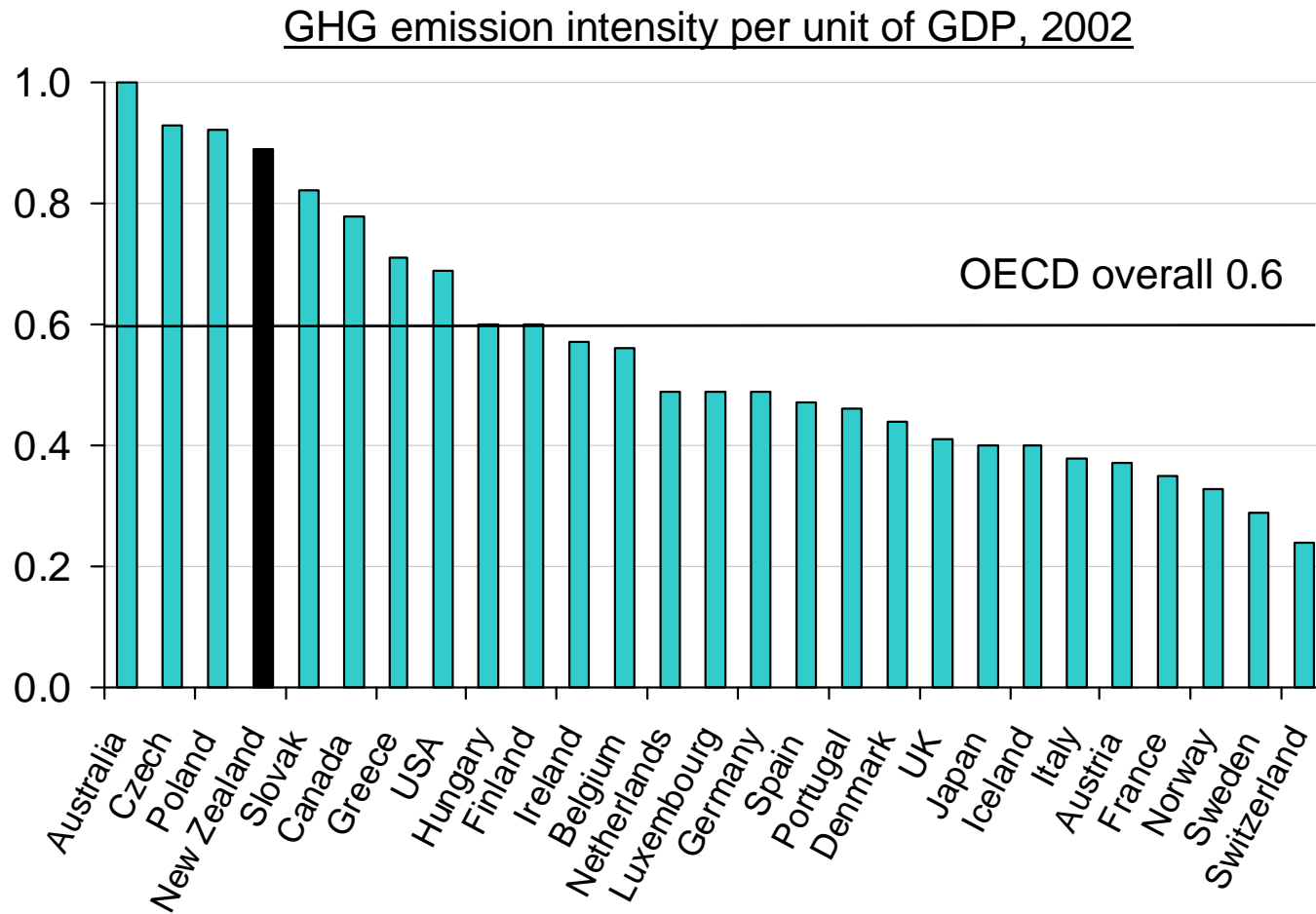
Source: United Nations Framework Convention on Climate Change.

NEW ZEALAND IS A MINOR CONTRIBUTOR TO GLOBAL EMISSIONS



Source: Carbon Dioxide Information Analysis Center of the US Department of Energy.

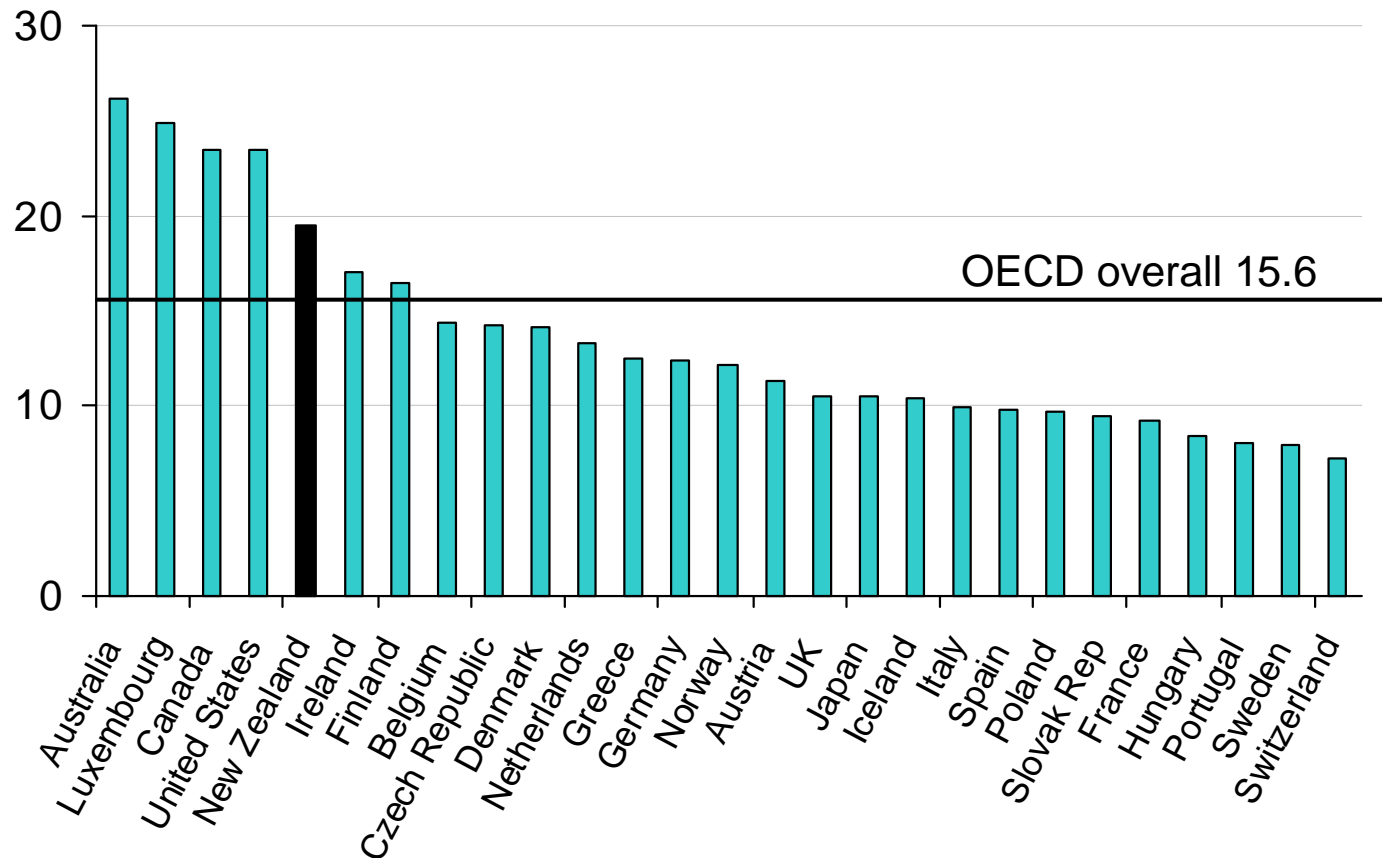
NEW ZEALAND'S ECONOMY IS EMISSION INTENSIVE



Note: Data not available for Turkey, Korea, or Mexico. GHG = Greenhouse Gases.
 Source: OECD.

NEW ZEALAND'S EMISSIONS PER CAPITA COMPARATIVELY HIGH

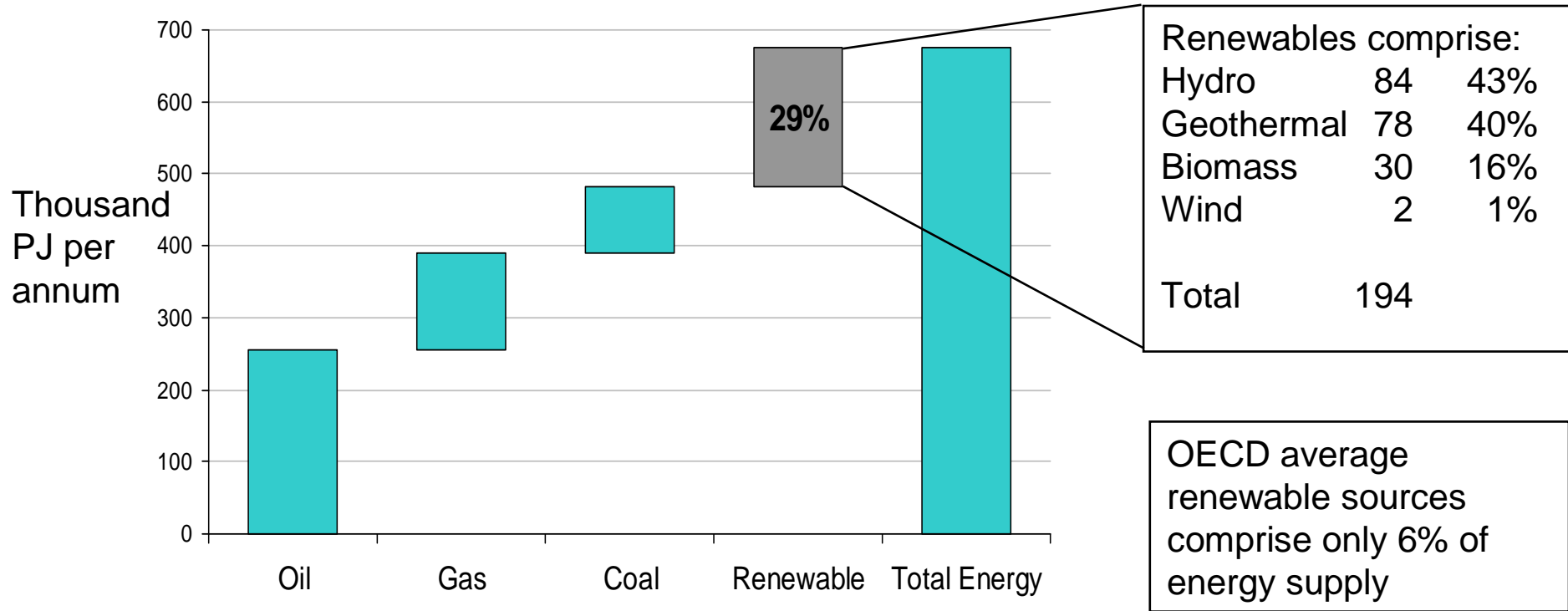
Total GHG emissions per capita, 2003



Note: Data not available for Turkey, Korea, or Mexico. UK, Poland, Slovak Republic, and OECD overall data 2002. GHG = Greenhouse Gases.
Source: OECD.

SOURCES OF ENERGY IN NEW ZEALAND

Primary energy supply by fuel type, 2005



Source: Ministry of Economic Development.

NEW ZEALAND IS EXPOSED TO RESTRICTIONS ON EMISSIONS OF GREENHOUSE GASES

New Zealand is a small emitter of greenhouse gases but it is not a good performer in terms of per capita and per GDP measures

The New Zealand economy is emissions intensive, with a large amount of methane emissions, despite a relatively high contribution from renewable energy sources

This high emissions intensity creates a significant exposure for the New Zealand economy to changes in the pricing of greenhouse gases e.g. a cap and trade system for greenhouse gas emissions

The proportion of New Zealand's energy generated from renewable sources, currently relatively high among developed countries, is likely to reduce – the current incentives are to increase electricity generation using non-renewable sources of energy

The competitiveness of New Zealand's international supply chains may also be reduced if energy prices rise due to the introduction of emissions pricing

CONSUMER PREFERENCES MAY BE CHANGING

Consumers indicate increasing concern about climate change and sustainability issues

- An emerging consumer desire to buy goods and services that do not have a harmful effect on the environment
- The food miles campaign is one indication of these preferences
- While consumers indicate concern, it is not yet clear that they are willing to change behavior or pay a premium to mitigate climate change

As a consequence of this, some companies are responding with new products, new business models, and attempting to develop brands that are consistent with these consumer preferences

- Potential for New Zealand firms to develop such a brand in the marketplace
- Success of such strategies hinges on the extent of consumer change

Developing a national brand may assist companies in this regard e.g. if New Zealand companies receive some consumer preference because of their country of origin

- However, there is little hard quantitative evidence on the benefits to be realised through such a brand

RETAILERS ARE RESPONDING TO PERCEIVED CHANGES IN CONSUMER PREFERENCES

Company	Intentions	Actions
Tesco	Reduce the carbon footprint of existing facilities around the world by 50% per cent by 2020 restrict air transport to less than 1 per cent of products	Halved 2000 carbon footprint by 2008, ahead of 2010 target
Marks & Spencer	Will “change beyond recognition” the way it operates <ul style="list-style-type: none"> • Become carbon neutral, • Only using offsetting as a last resort; Intend to mobilise suppliers to reduce their carbon footprint as well	Has given several New Zealand suppliers 24 months to demonstrate carbon neutrality
Sainsbury	More local sourcing, more seasonal foods and improved energy efficiency Enable customers to make more informed choices	Cancelled order with New Zealand supplier due to air freight
Wal-mart	Declared intentions of 100% renewable energy, zero waste, and sustainable products, with same decade commitments for more than 30% of volume, business, or facilities	Metrics available on website

New Zealand sells about \$1b of primary product into the UK each year

CHANGING PREFERENCES MAY ALSO INFLUENCE LOCATION CHOICES

Changing preferences with respect to the environment may also impact on the short and long-term location choices of firms and people

- For example, the locations that firms choose to invest in, the migration choices that people make, as well as their tourism choices

Can New Zealand become a location of choice for migrants and firms, who value New Zealand's environment and its branding?

Do these considerations outweigh the costs of travelling to New Zealand, which involves emitting CO₂?

- There is a risk to New Zealand's tourism industry if a preference for local tourism becomes widespread

On balance, are these changing preferences a net positive or negative for New Zealand?

COMMERCIAL OPPORTUNITIES AVAILABLE IN DEVELOPING NEW TECHNOLOGIES AND BUSINESS MODELS

New technologies are becoming economic to develop because of changing preferences and the increasing commercial demand for emissions-efficient production methods

- For example, biofuels, windpower, and the like
- There is also scope for new business models e.g. producing closer to the end-consumer in order to economise on transport costs

These developments provide substantial commercial opportunities for companies that can develop leading positions and brands in these sectors

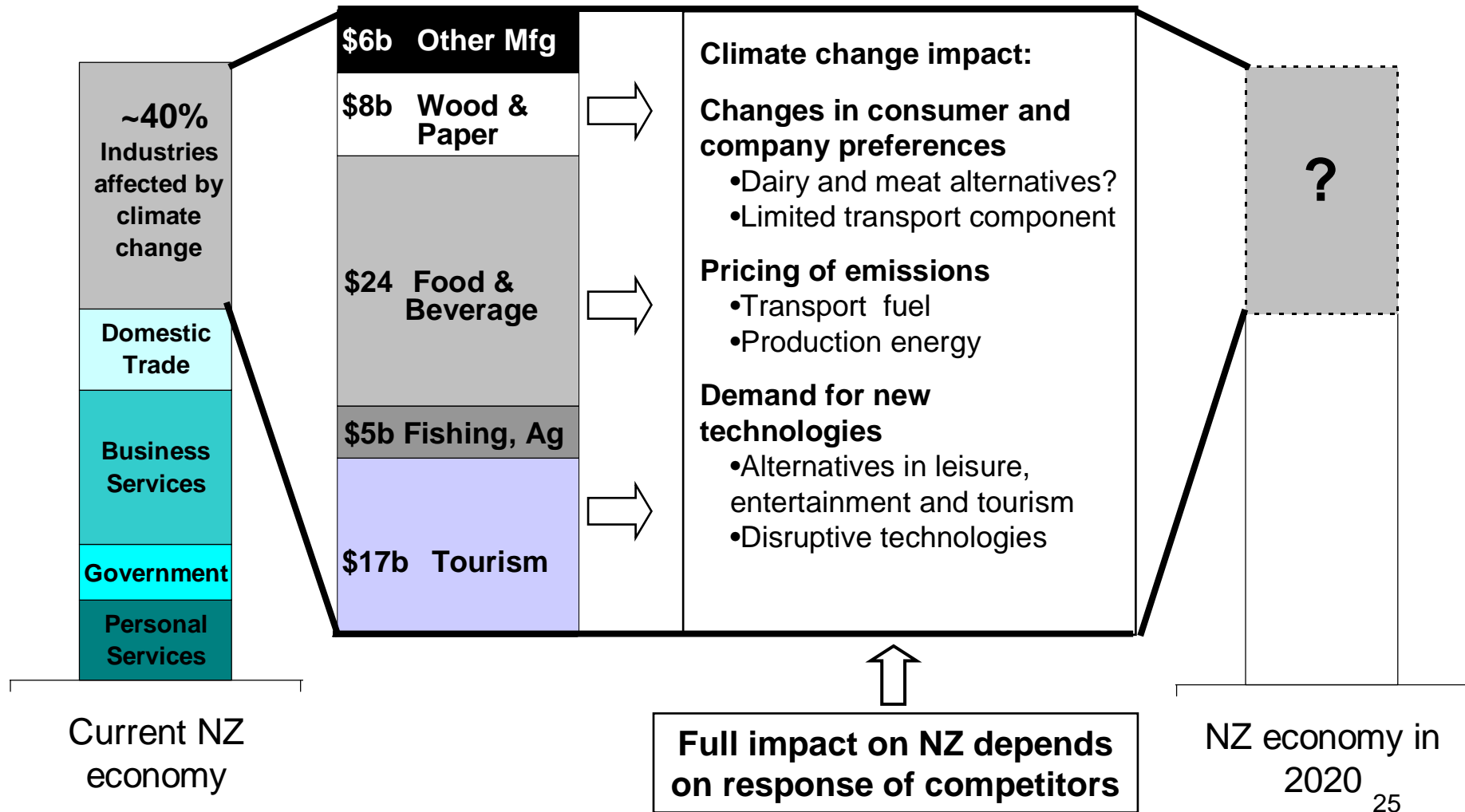
Many global companies are rapidly moving into this space e.g. GE, BP

- Indeed, many firms are moving ahead of governments in responding to changing preferences

Given the small size of the New Zealand market, what is the likely potential for New Zealand firms to develop innovations for the global market?

- What could be done to make this process more likely?

CLIMATE CHANGE RESPONSE CREATES OPPORTUNITIES AND RISKS FOR EXISTING NEW ZEALAND ECONOMY



CONCLUDING REMARKS

The indirect effects of climate change are likely to have a significant impact on the New Zealand economy over the coming decades, with many large sectors of the New Zealand economy exposed to changing preferences or emissions pricing

The direct effects of climate change, however, look to have a less significant impact on the New Zealand economy

- The direct effects will vary by region, but overall New Zealand gets off relatively lightly over the next few decades relative to many other countries

Government policy – as well as business action – should be focused on positioning New Zealand firms to respond to these indirect effects

It is important that New Zealand develops a robust, well-understood strategy to guide and prioritise actions, and which gives a clear sense of how New Zealand is seeking to position itself in the context of considerable uncertainty about the economic impact of climate change