New Zealand/Aotearoa: *Land of the Long White Cloud*

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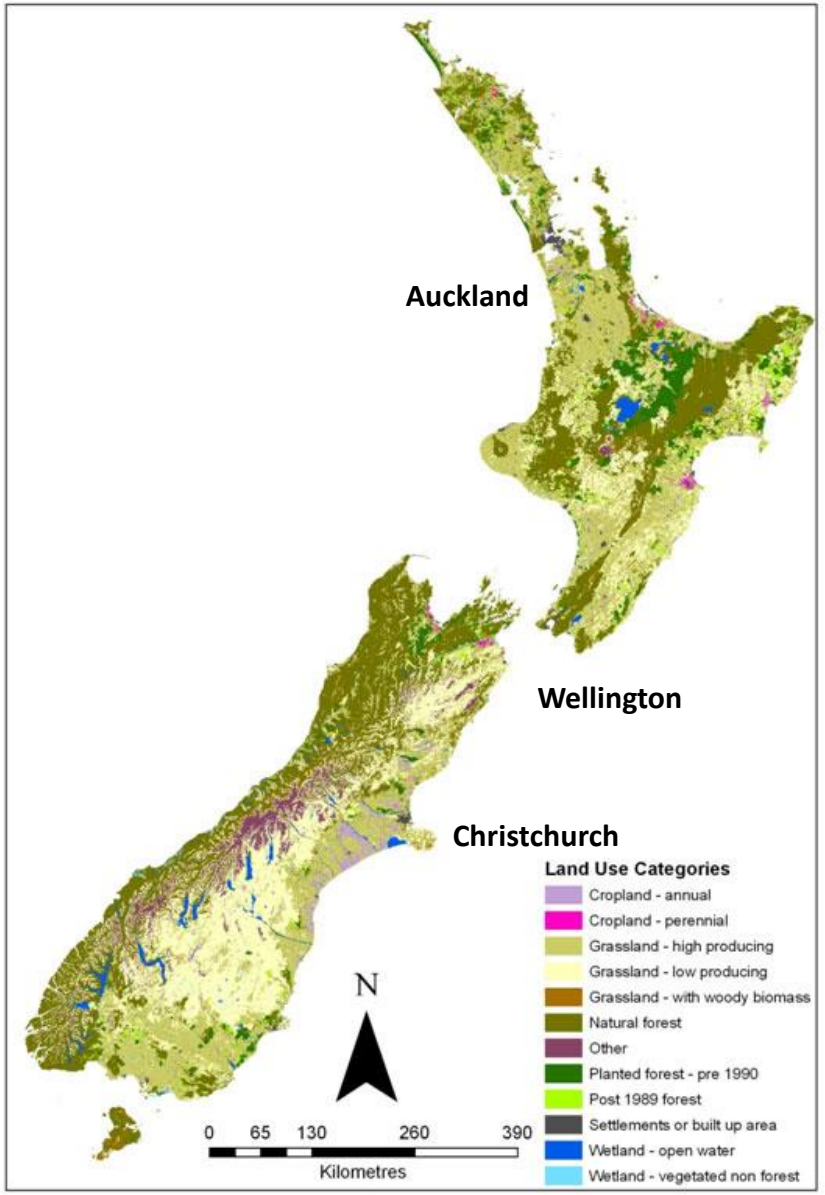
New Zealand Overview



- 4.5 million (m) people
- Land area of 27 m ha, similar to Italy
- 29 m sheep, 10 m cattle
- Ag & forestry = 15% of NZ GDP
- 95% of meat and dairy exported
- 60%+ harvested logs directly exported
- Ag GHGs almost 50% of NZ total emissions
- Forests offset about 35% of total emissions
- Diffuse sources often 90%+ of nutrient and sediment losses in watersheds

Find New Zealand on this map…

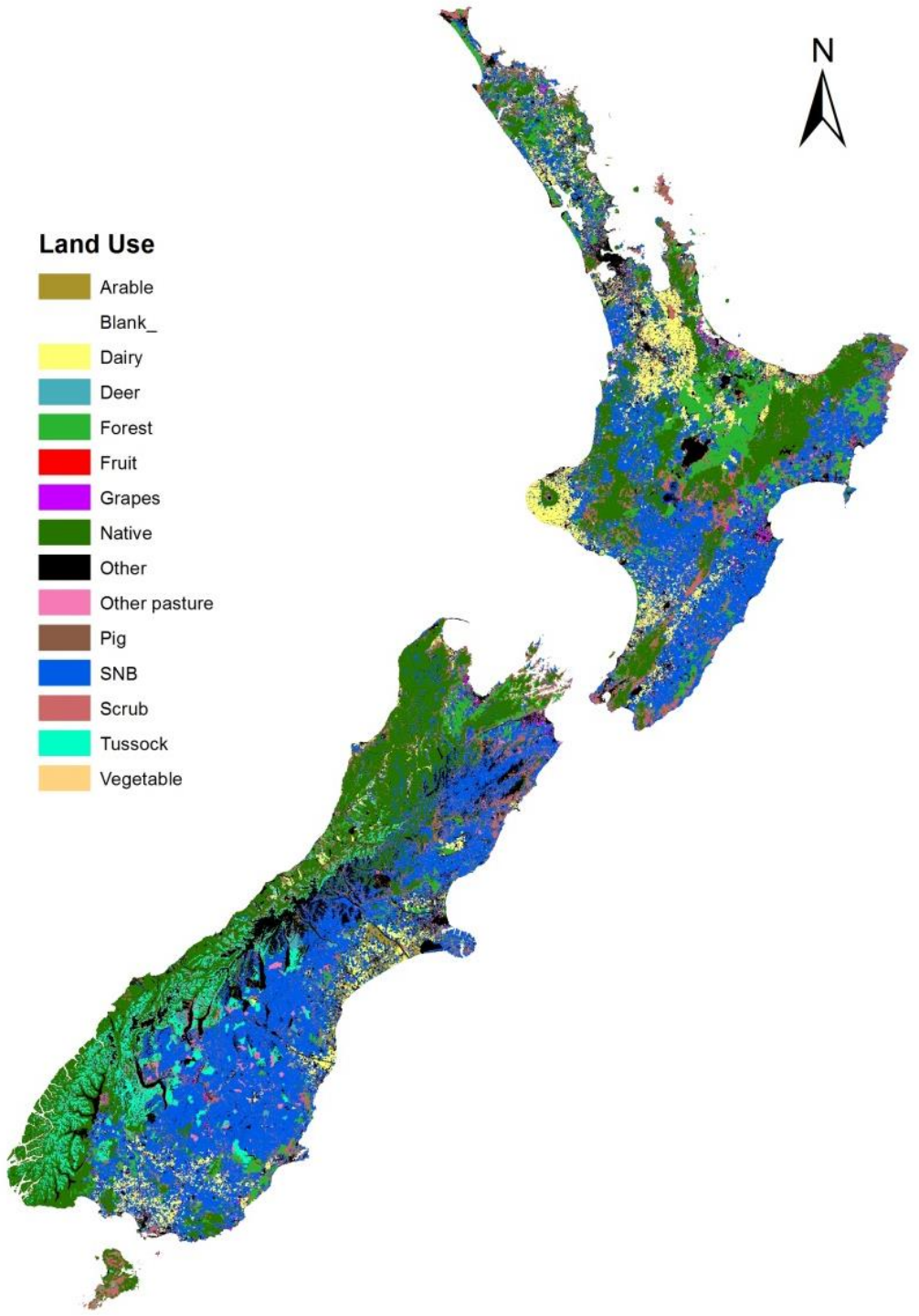

THE WORLD IN UNION

NEW ZEALAND LAND USE

39% of the country is covered in grass
25% is native bush
19% is tussock and scrub,
7% is rivers, ice and snow
7% is exotic forest
2% is horticulture
1% is urban area and roads

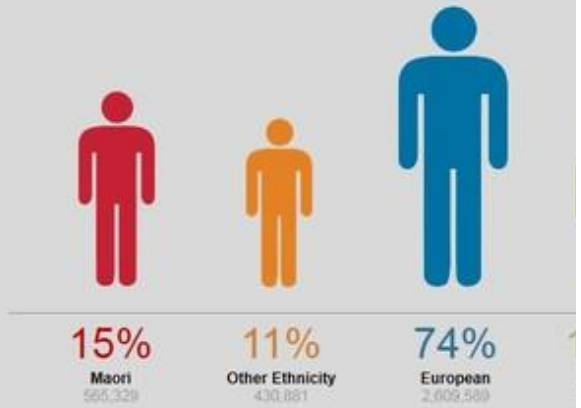
New Zealand Land Use

Enterprise	Area (ha)	% Total
Dairy	1,751,847	7%
Sheep & Beef	8,639,242	32%
Other Pasture	1,179,259	4%
Arable	202,188	1%
Fruit	132,738	0%
Vegetables	18,643	0%
Exotic Forest	2,040,310	8%
Native	10,172,842	38%
Other	2,726,095	10%
Total	**26,863,164**	**100%**

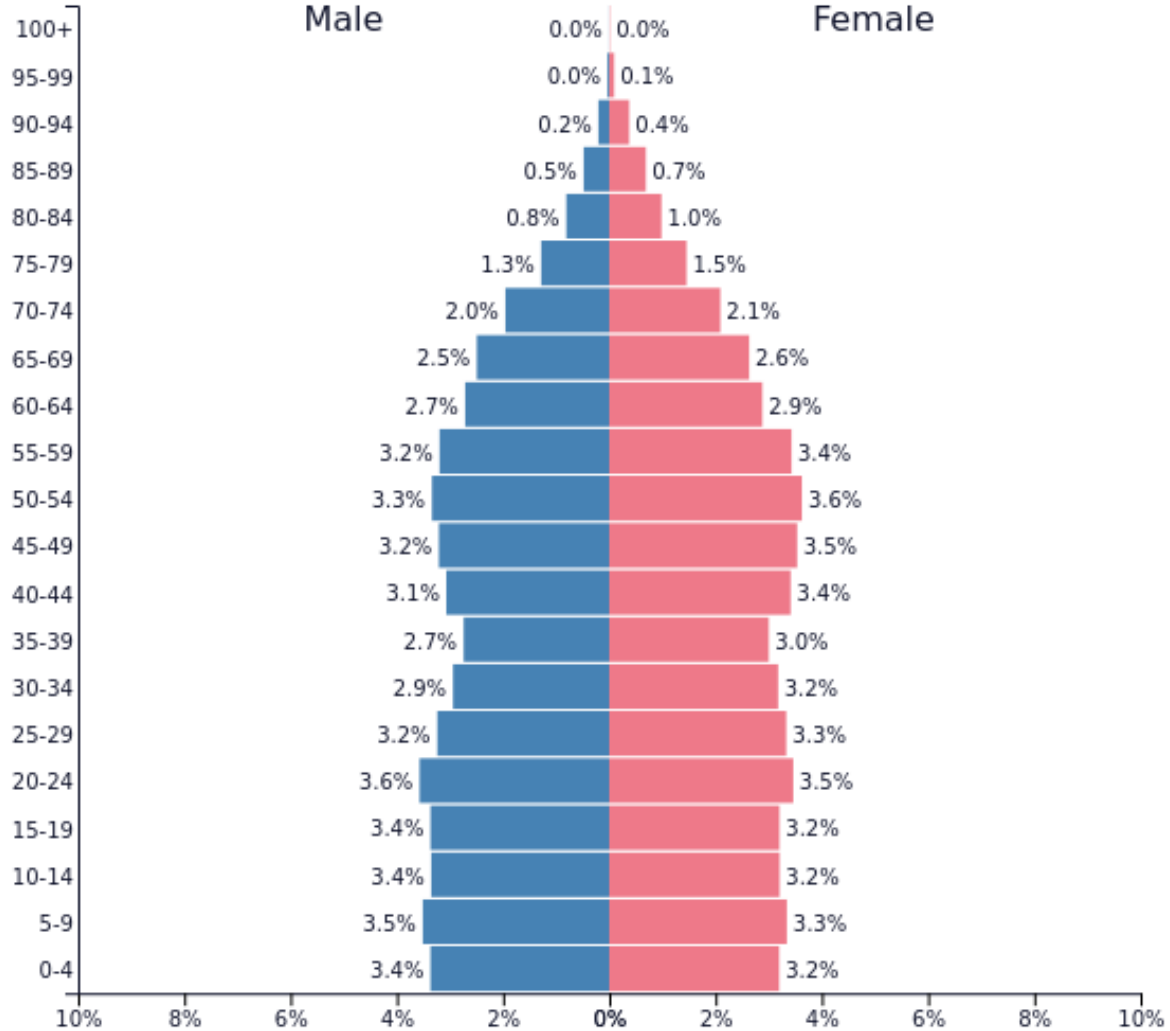


Ethnic Composition of New Zealand

2013 census data



Source: Statistics New Zealand Census 2013. Total is more than 100% because some people re

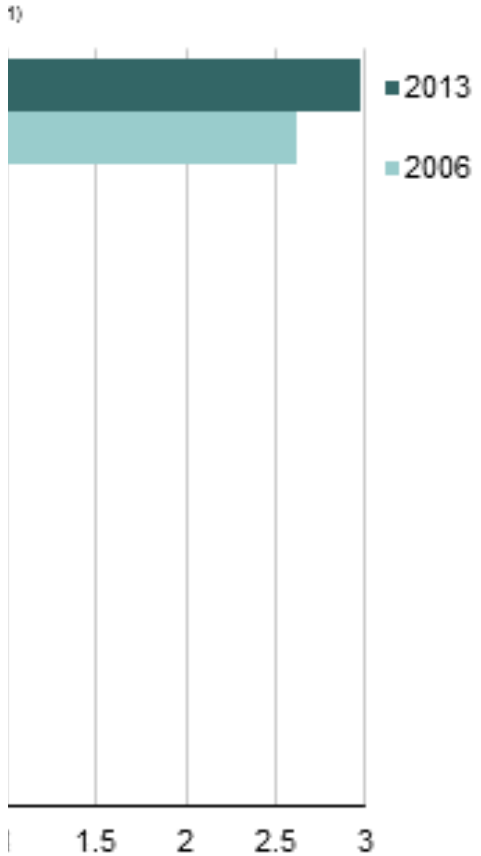


PopulationPyramid.net

New Zealand - 2017
Population: **4,604,871**

f major ethnic groups

ıd 2013 Censuses



lumber (million)

more than one ethnic group.
ıer of small ethnic groups and for New
uded as a new category for the 2006 Census

Source: Statistics New Zealand

NEW ZEALAND: TOURISM

- 6% of international visitors (150,000 people) cite The Lord of the Rings as one of the main reasons that they visited New Zealand in 2004
- 1% cited the film as their only reason
- This 1% spend $32.8 million

NEW ZEALAND: TOURISM

NEW ZEALAND: TOURISM

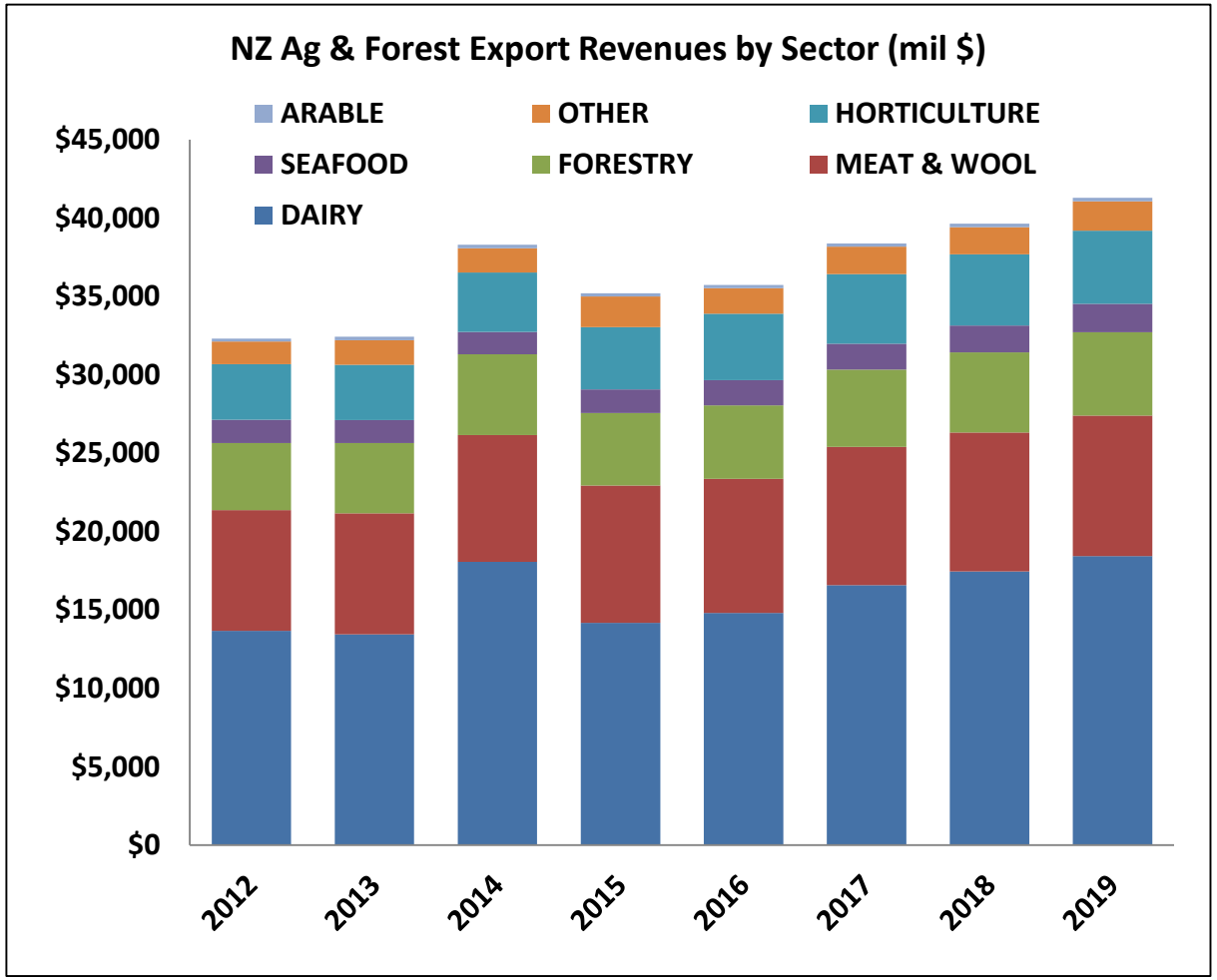
- $24 billion, 6% of workforce
- “clean, green” image
- hiking, adventure sports, sightseeing
- birdwatching

RECREATION TOURISM: 9 GREAT WALKS

NZ’S PRIMARY INDUSTRIES

Ag & Forestry in New Zealand

- 2012 NZ Government goal for primary industries to double the "value" of their exports by 2025
- Landowners actively seeking new access to irrigation via wells and collective schemes
- Sheep population less than half of peak in 1970s
- Dairy cows population recently surpassed 6 million



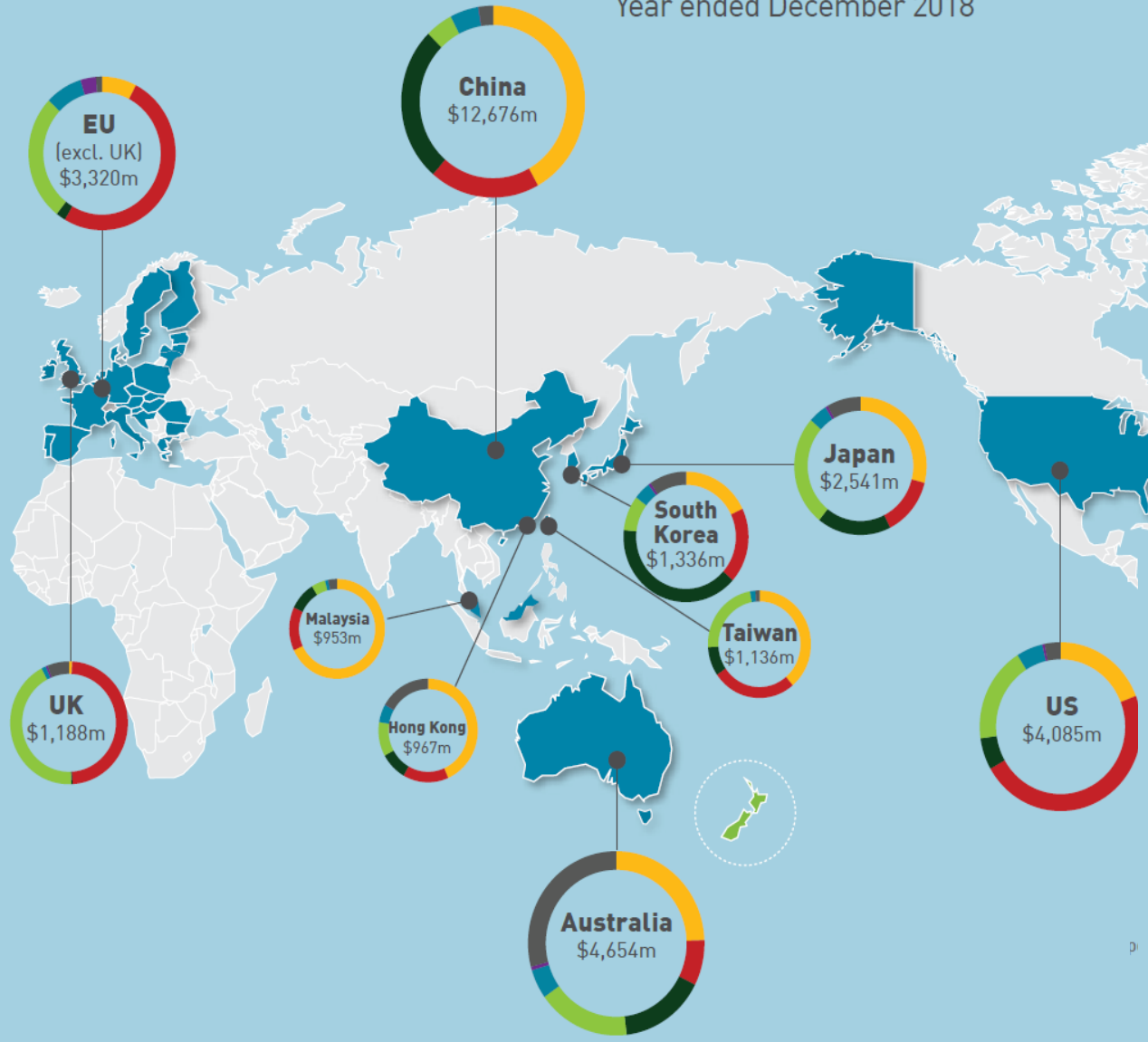
NEW ZEALAND: PRIMARY INDUSTRY

15% of GDP

50% of exports

Top 10 Export Destinations

Year ended December 2018

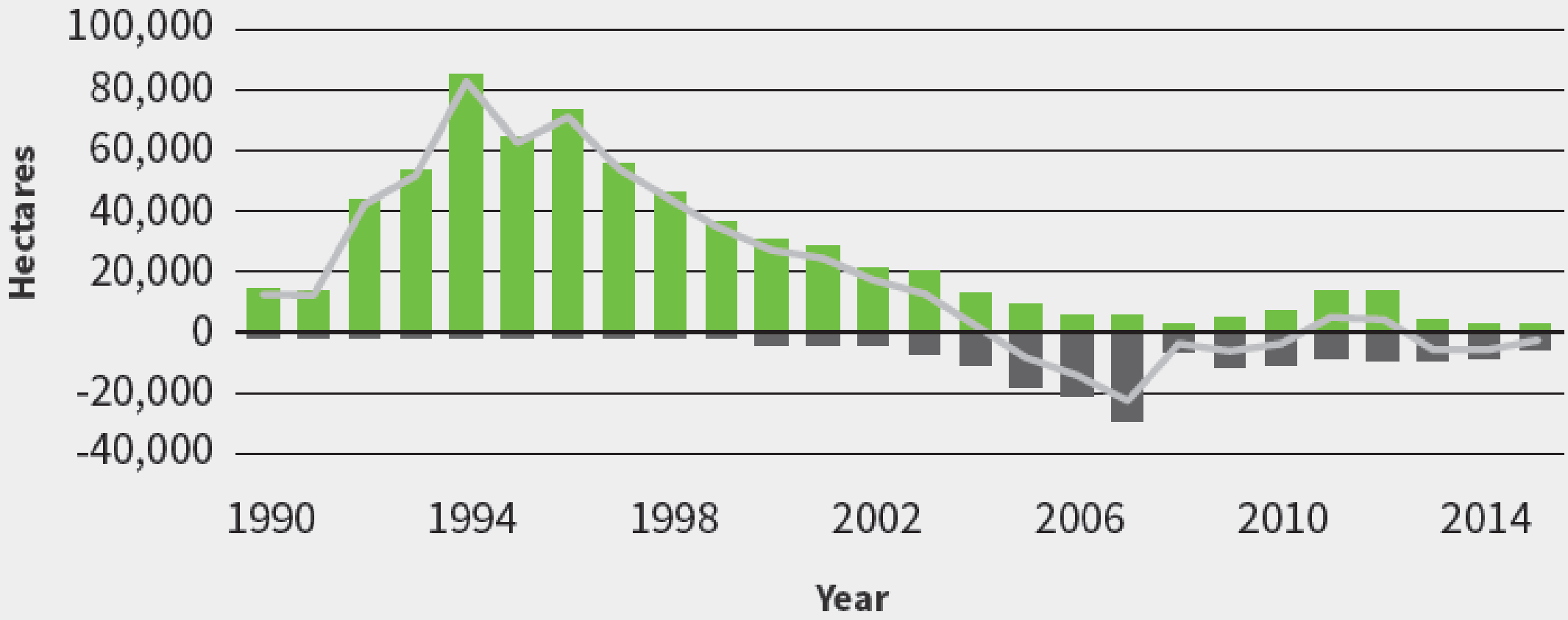


Product	Total export revenue $ million (December 2018)	% of Total
Dairy	16,974	38%
Meat and Wool	10,054	23%
Forestry	6,714	15%
Horticulture	5,745	13%
Seafood	1,810	4%
Arable	213	0%
Other primary sector	2,668	6%
Total primary industries	**44,174**	**100%**

New Zealand Forestry

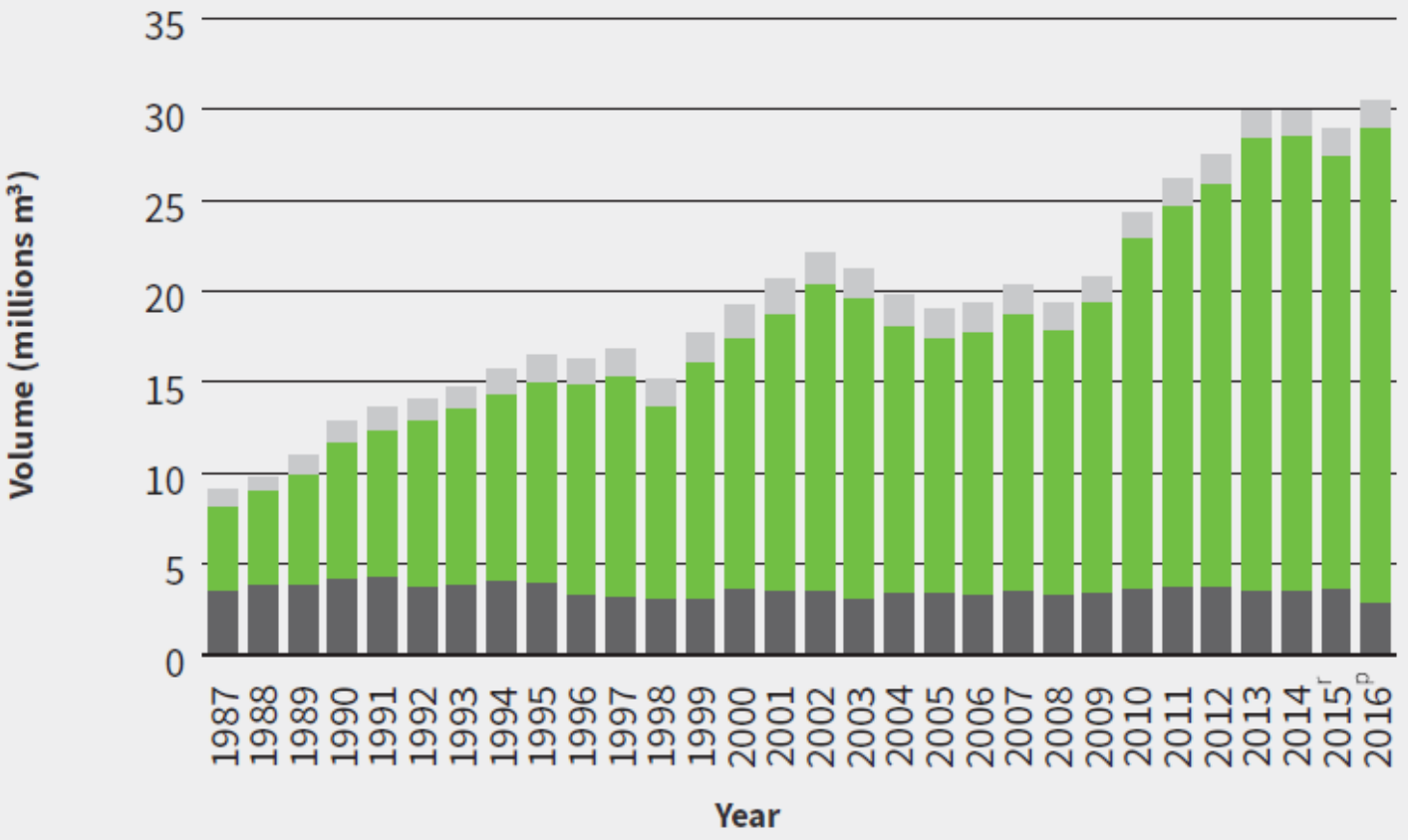
- More than 8 m ha of forests
- 6.4 m ha of indigenous/native bush
- 1.7 m ha exotic plantations
  - 90%+ radiata pine, 30-year rotations,
  - MAI of 21 m3/ha

Afforestation and Deforestation in New Zealand, 1990–2015[1]



Plantation Forest Harvest

for Year Ended 31 Dec 2016



rRevised pProvisional

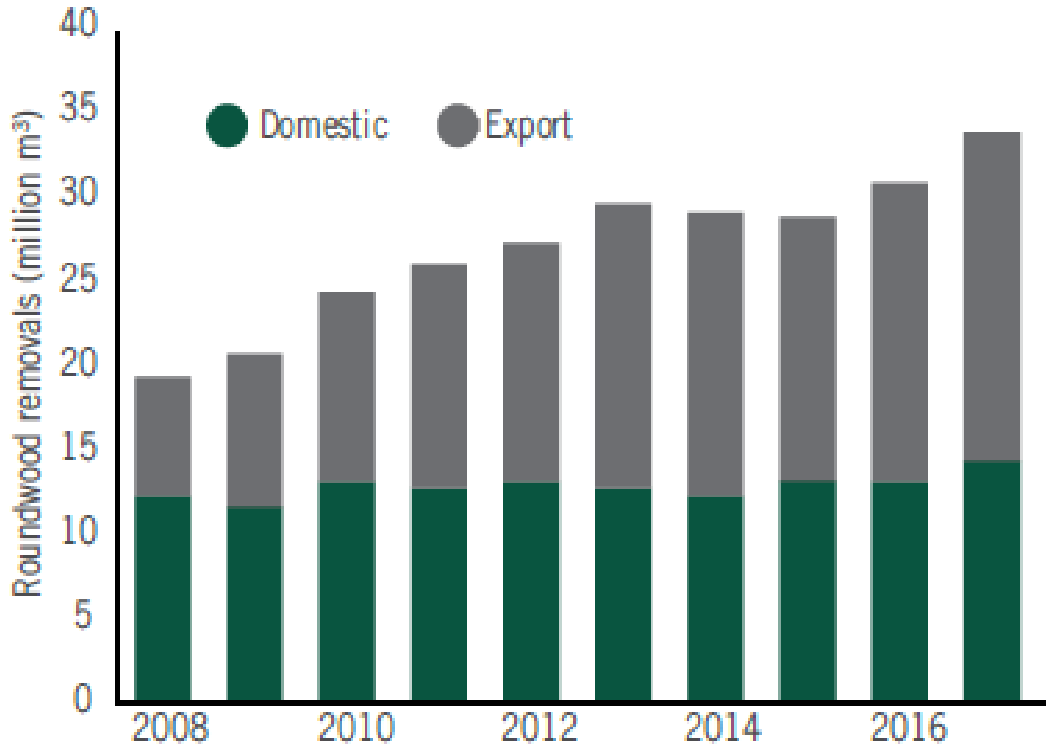
Forest Industry Highlights 2018

1,706,429 ha is the estimated net stocked plantation forest area at 1 April 2017. This is an increase in the plantation forest area of 1,682 ha from 1 April 2016. [1]

$6.38 billion, was the export value of forest products to June 2018, comprising $3.3 b of logs and $3 b of other forest products.

$3.55 billion is the total contribution of the forest industry to New Zealand's GDP; $1.39b from forestry and logging and $2.16b from downstream activity. [4]

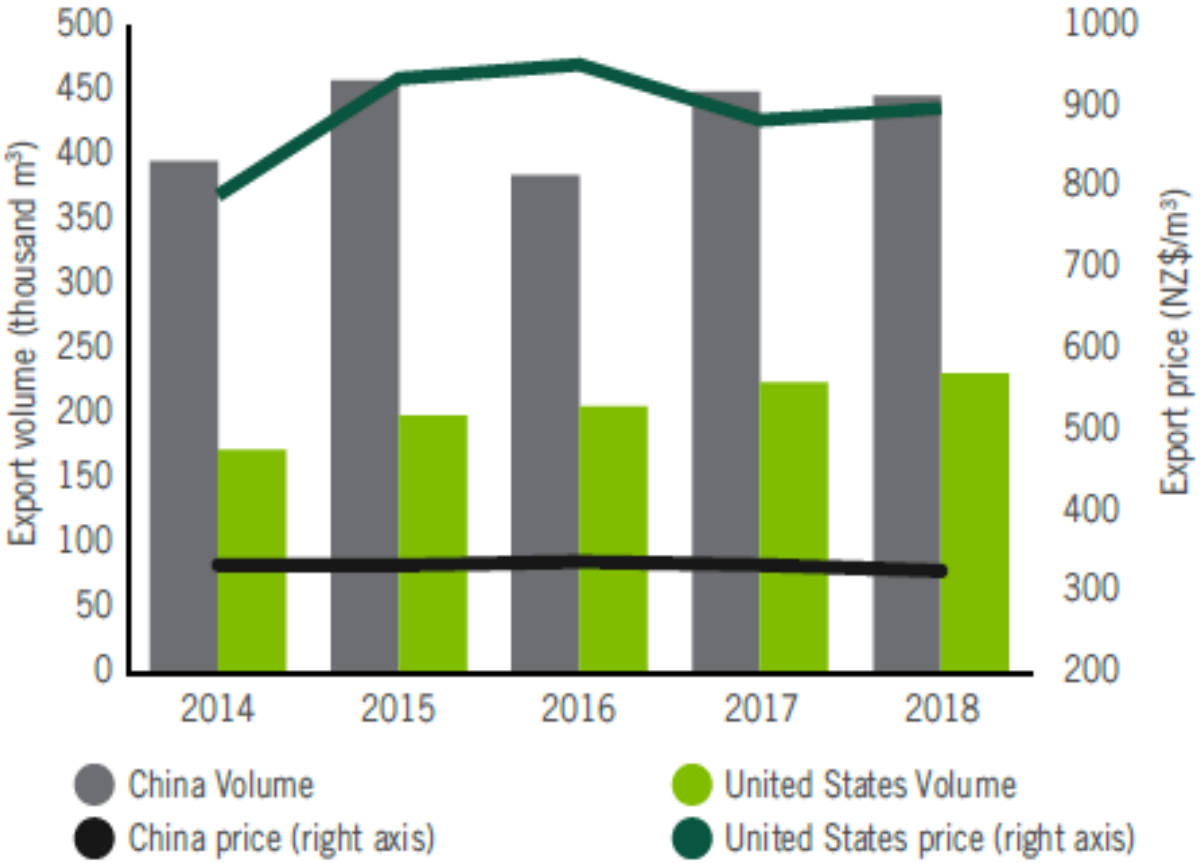
Figure 14: Log exports account for majority of volumes this decade



Harvest volume by domestic use or export, year ended Decen

Source: MPI and Stats NZ.

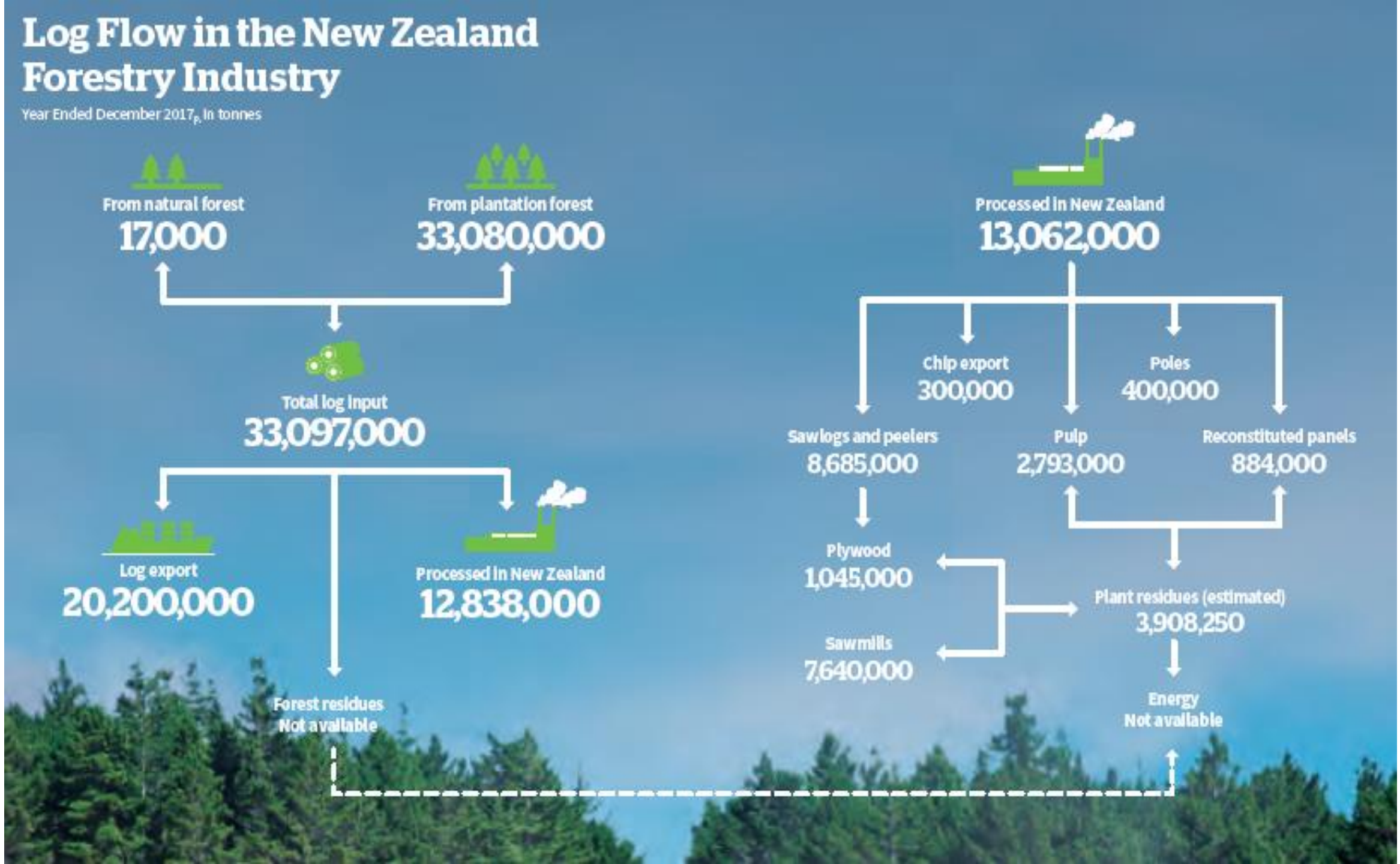
Figure 16: For sawn timber China ranks first for volume, but the US is first for total value



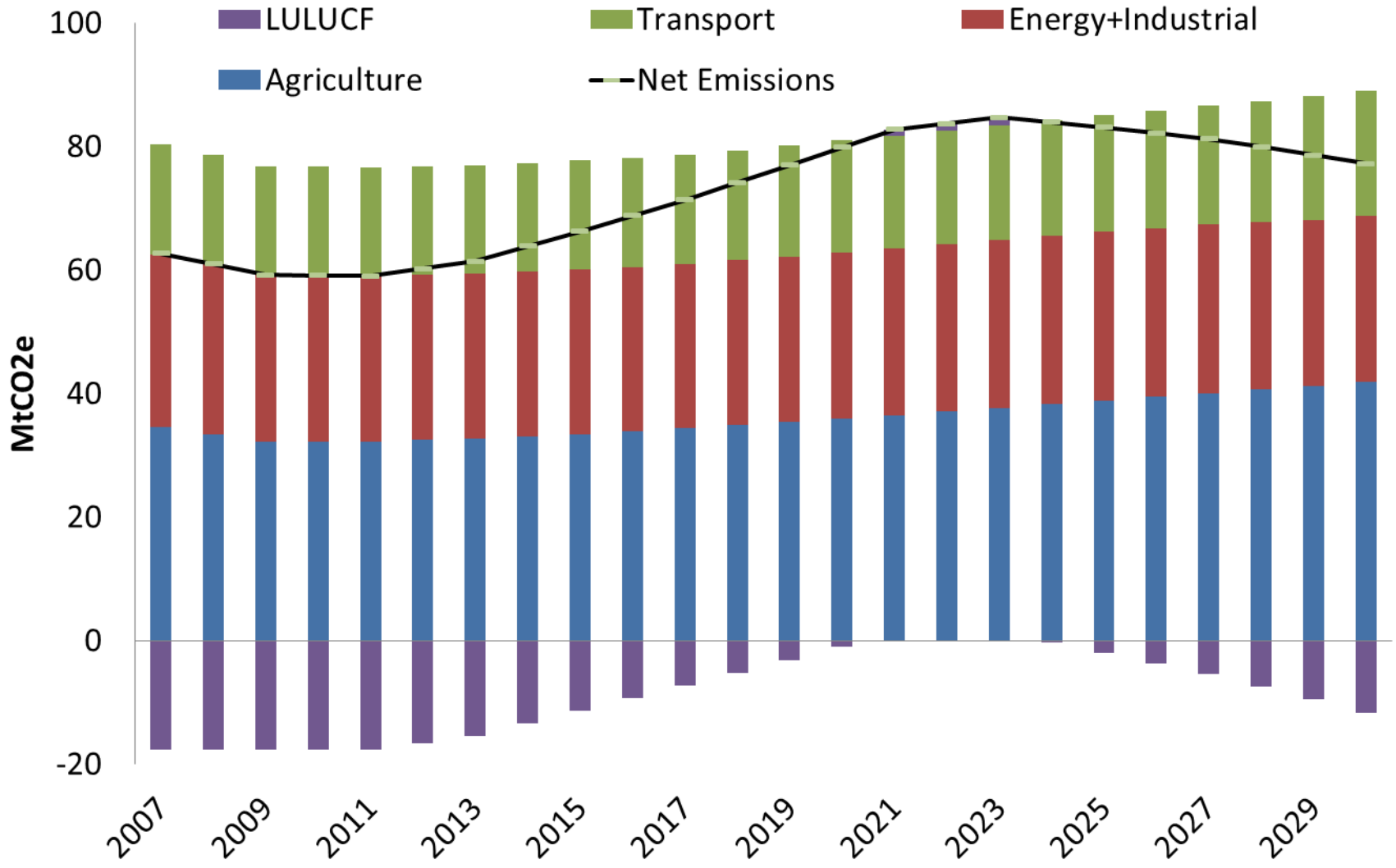
Market comparison of volume and value of sawn timber exports, December year end, top two markets (China and US). Source: Stats NZ.

Log Flow in the New Zealand Forestry Industry

Year Ended December 2017$_p$, in tonnes



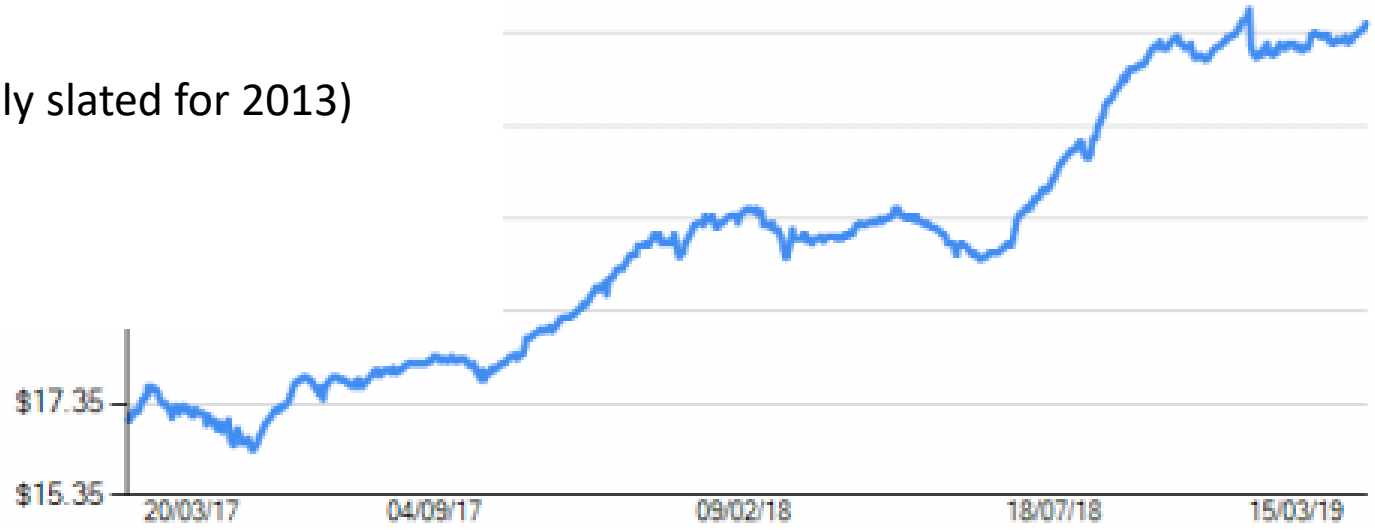
New Zealand GHG Emissions



Source: Daigneault and Fernandez (2015), MfE (2015)

NZ Climate Change Policy

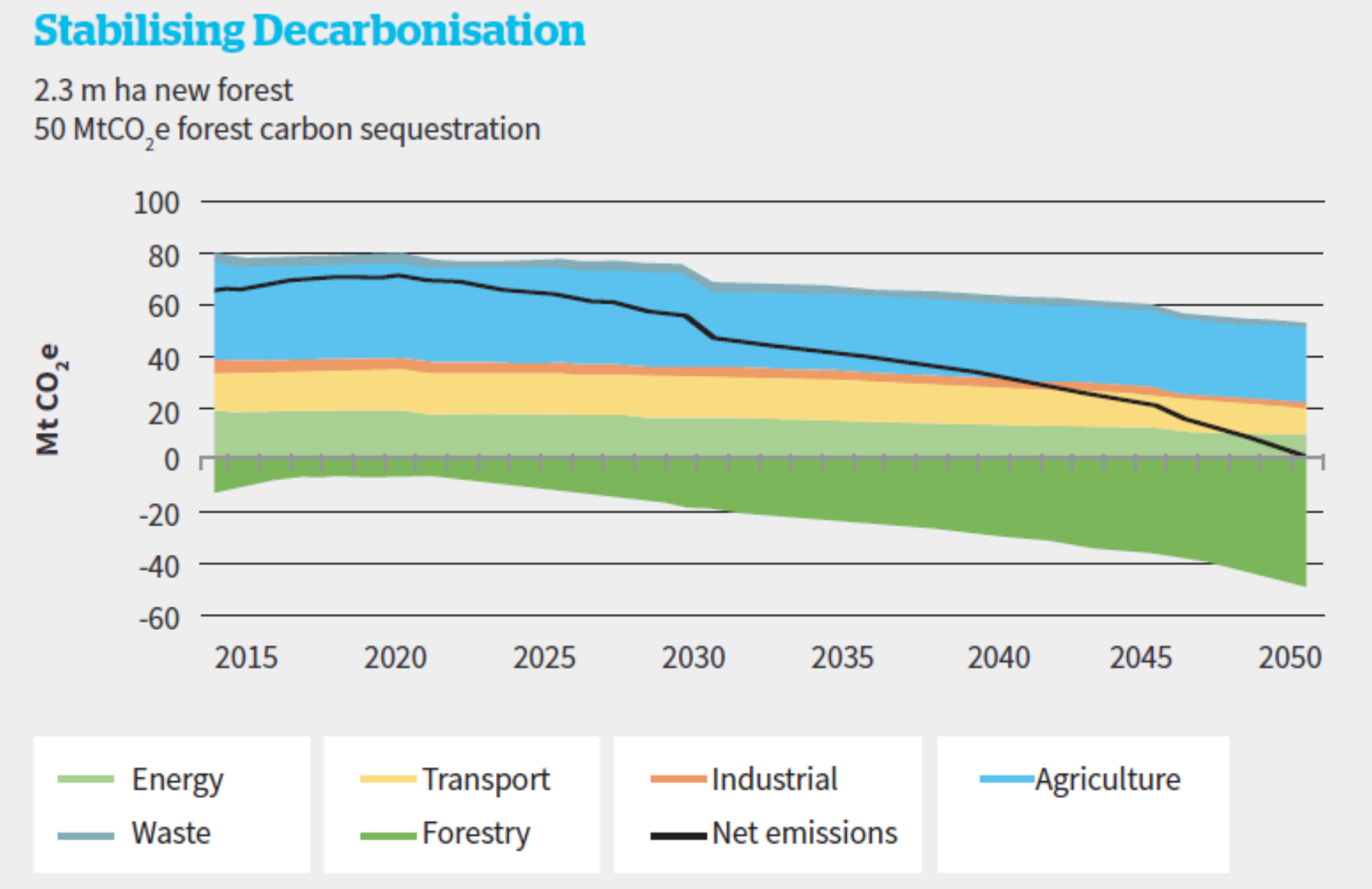
- Emissions Reduction Target(s):
  - Paris Agreement: 11% below 1990 levels by 2030
  - Long-term: **50% to 100%** reduction below 1990 levels by 2050
- Policy Mechanism:
  - NZ Emissions Trading Scheme under Climate Change Response Act (2002)
  - Timeline for sector coverage (2008 onwards)
    - 2008: Forestry (pre-1990 liable for emissions, post-1989 voluntary)
    - 2010: Transport fuels, electricity production & industrial processes
    - 2013: Synthetic gases & waste
    - Postponed indefinitely: Agriculture (initially slated for 2013)
- Current price: ~$25/tCO2e



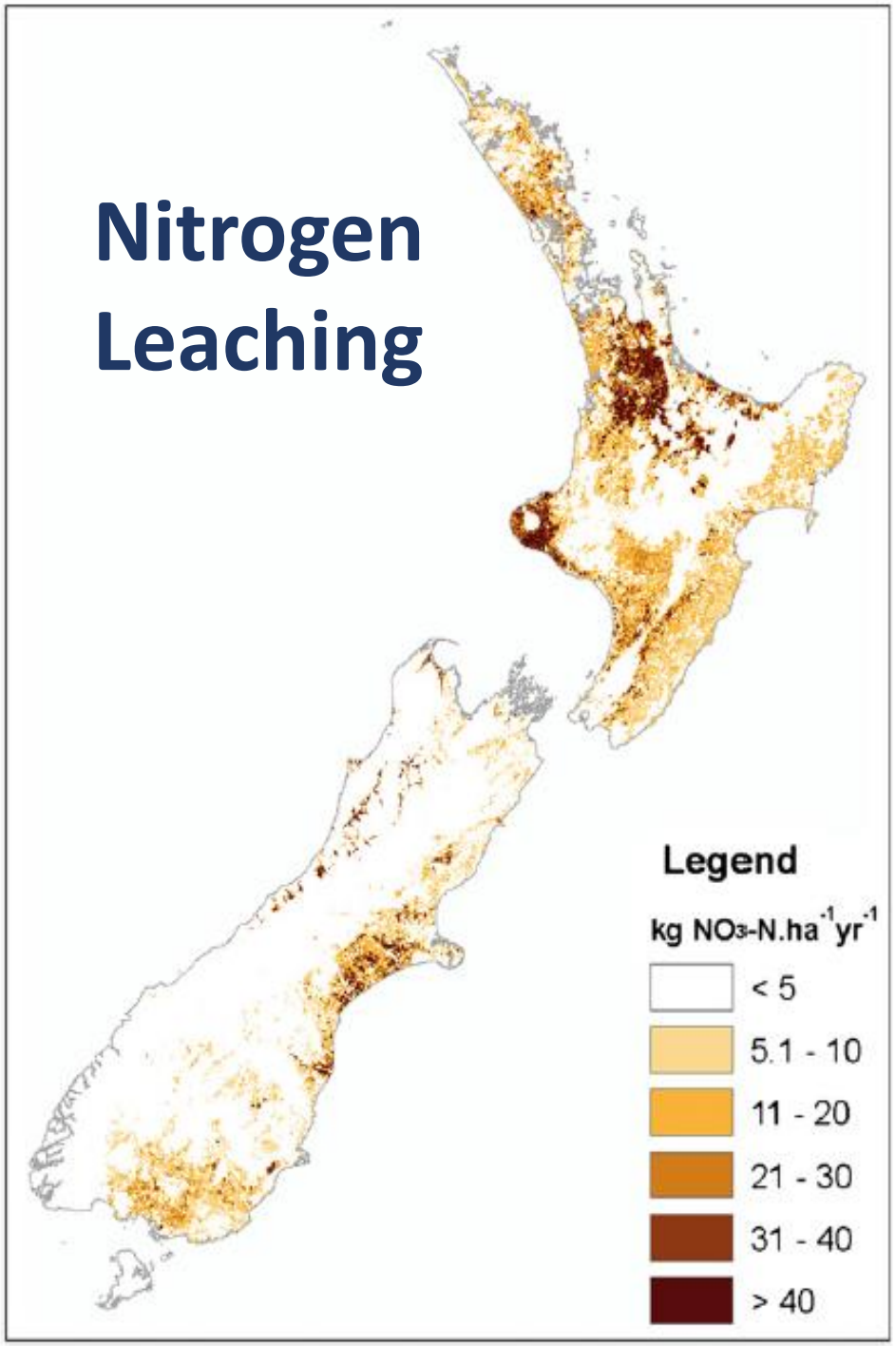
Climate Policy and Land Use

- **Agricultural emissions**
  - Fuel, electricity, and fertiliser emissions: energy companies and fertiliser manufacturers responsible for obligation and pass on the price directly to consumers
  - Animal emissions: 2 options (still TBD)
    - processors responsible for obligation and levy a price per kg of meat or milksolid
    - directly measure on-farm emissions from livestock and crop production
- **Forestry emissions**
  - Forestry: mandatory for pre-1990, opt-in for post-1989 plantations
    - Measurement: lookup tables or field measurements
    - Harvest liability, max of $25/tCO2e
    - 2012 Amendment: pre-1990 able to offset emissions by replanting elsewhere

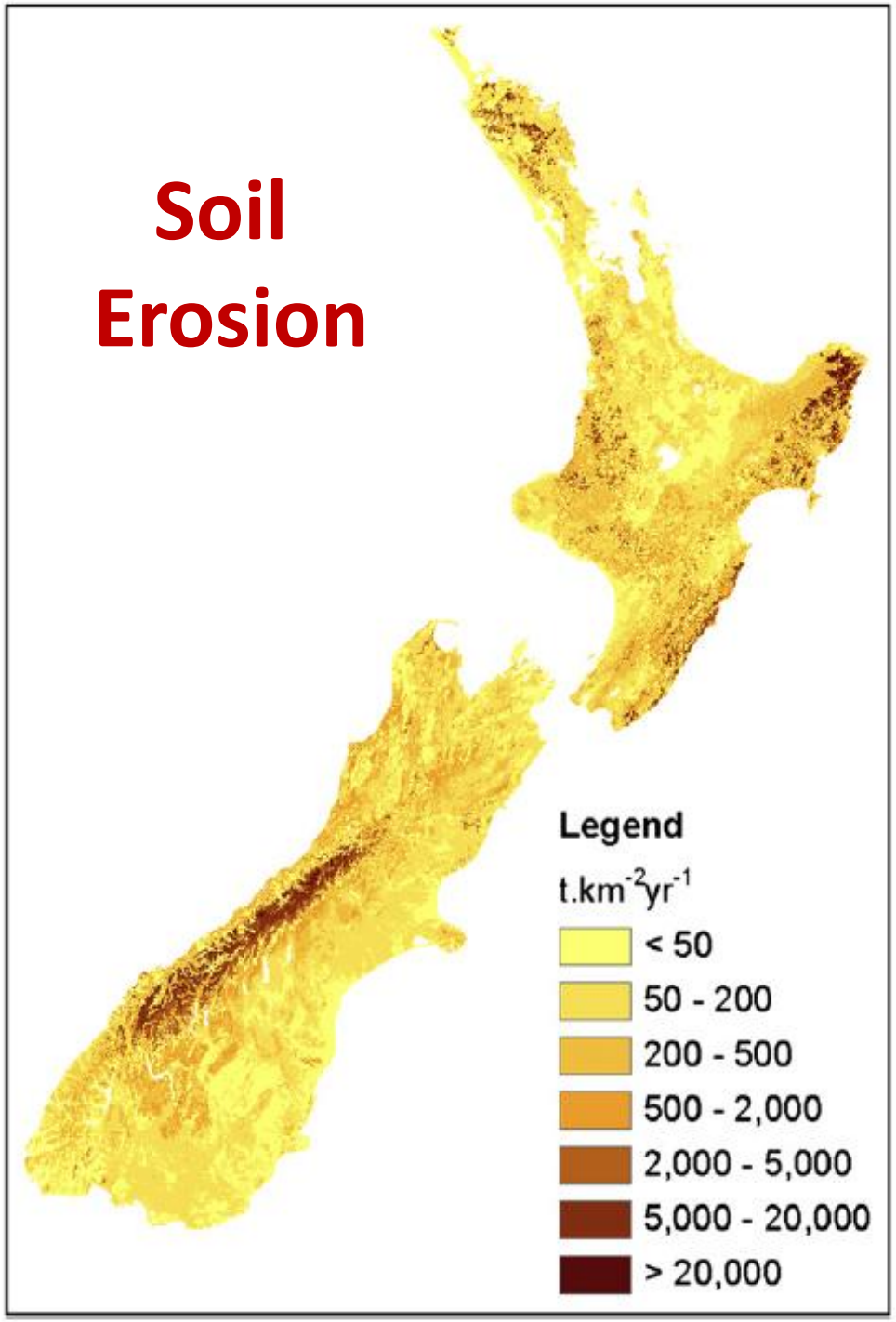
Forestry projected to play a major role in reducing NZ's GHGs by 2050…



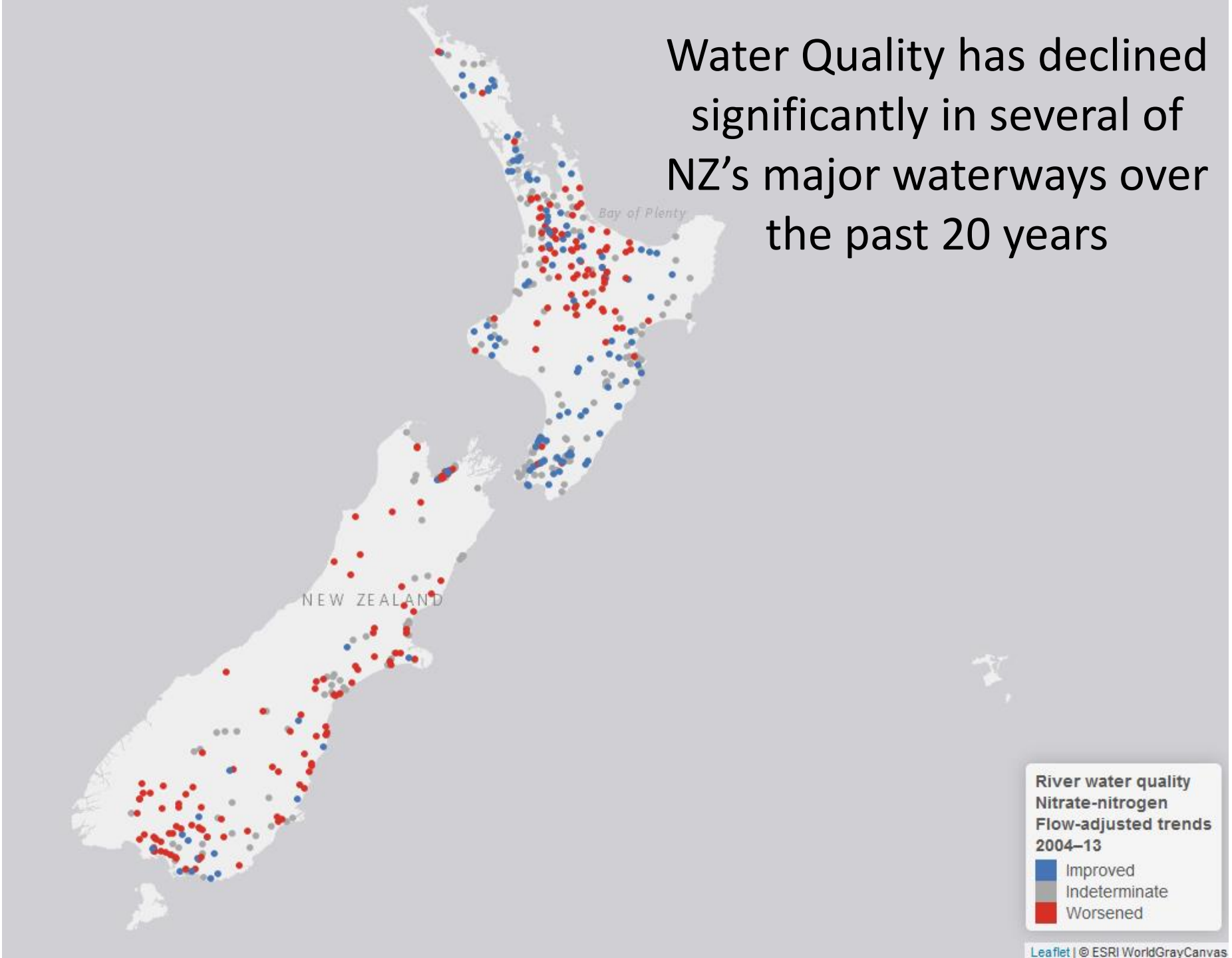
Nitrogen Leaching



Soil Erosion



Water Quality has declined significantly in several of NZ's major waterways over the past 20 years



Water Quality Policy

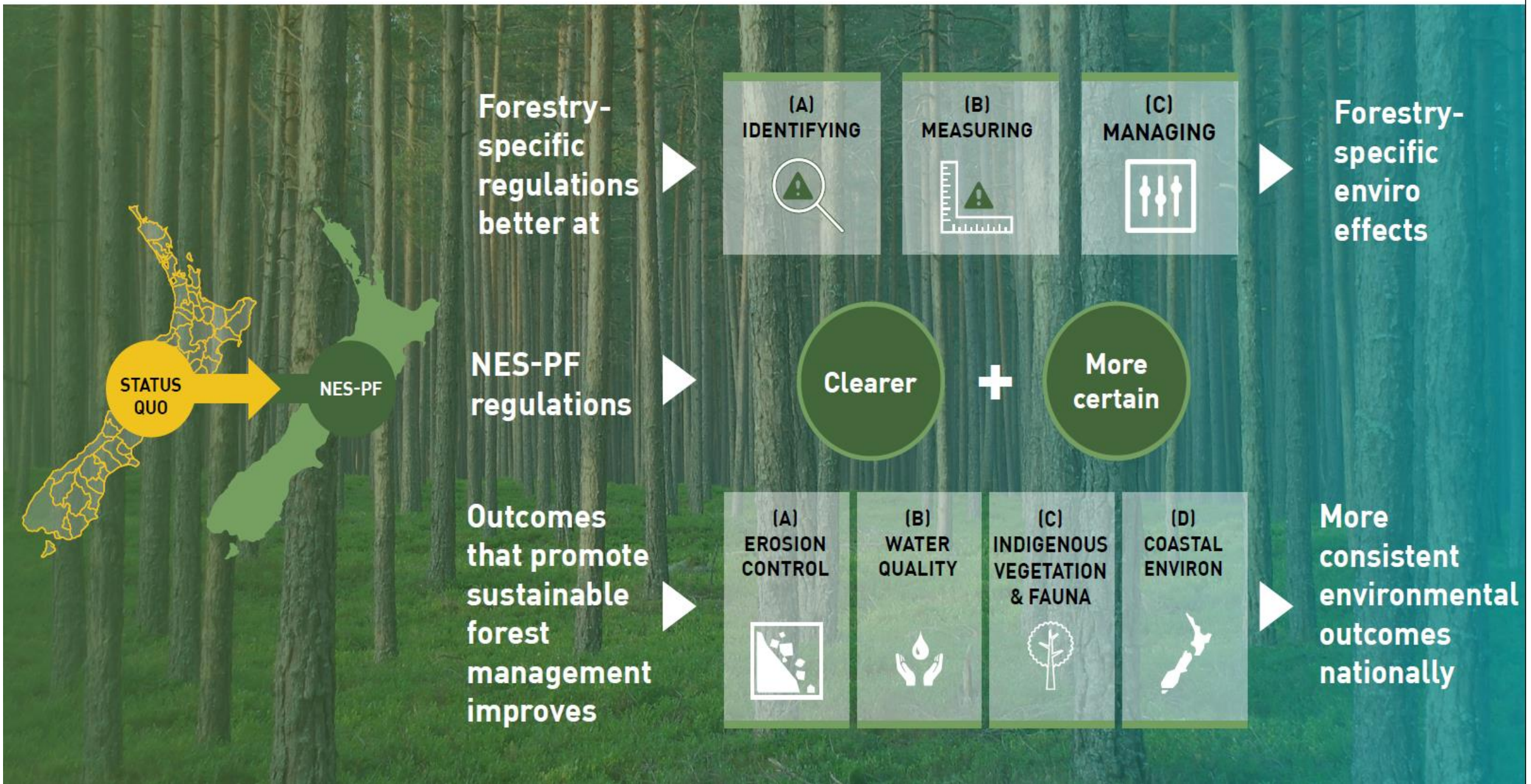
- 2014 National Policy Statement for Freshwater Management (NPS-FM) directs regional councils to:
  - maintain or improve the overall quality of fresh water within a region/catchment
  - set freshwater objectives to meet community values which include the compulsory values of ecosystem health and human health for recreation
  - use a specified set of water quality measures (attributes) to set limits (eg, a total farm or catchment contaminant-load)

- Limits are being set through a “collaborative process”

Afforestation Programs

- One Billion Trees Fund
- Matariki Tu Rākau – memorial planting
- Crown Forestry Joint Ventures
- Emissions Trading Scheme
- Afforestation Grants Scheme
- Erosion Control Funding Program

2017 National Environmental Standards for Plantation Forestry

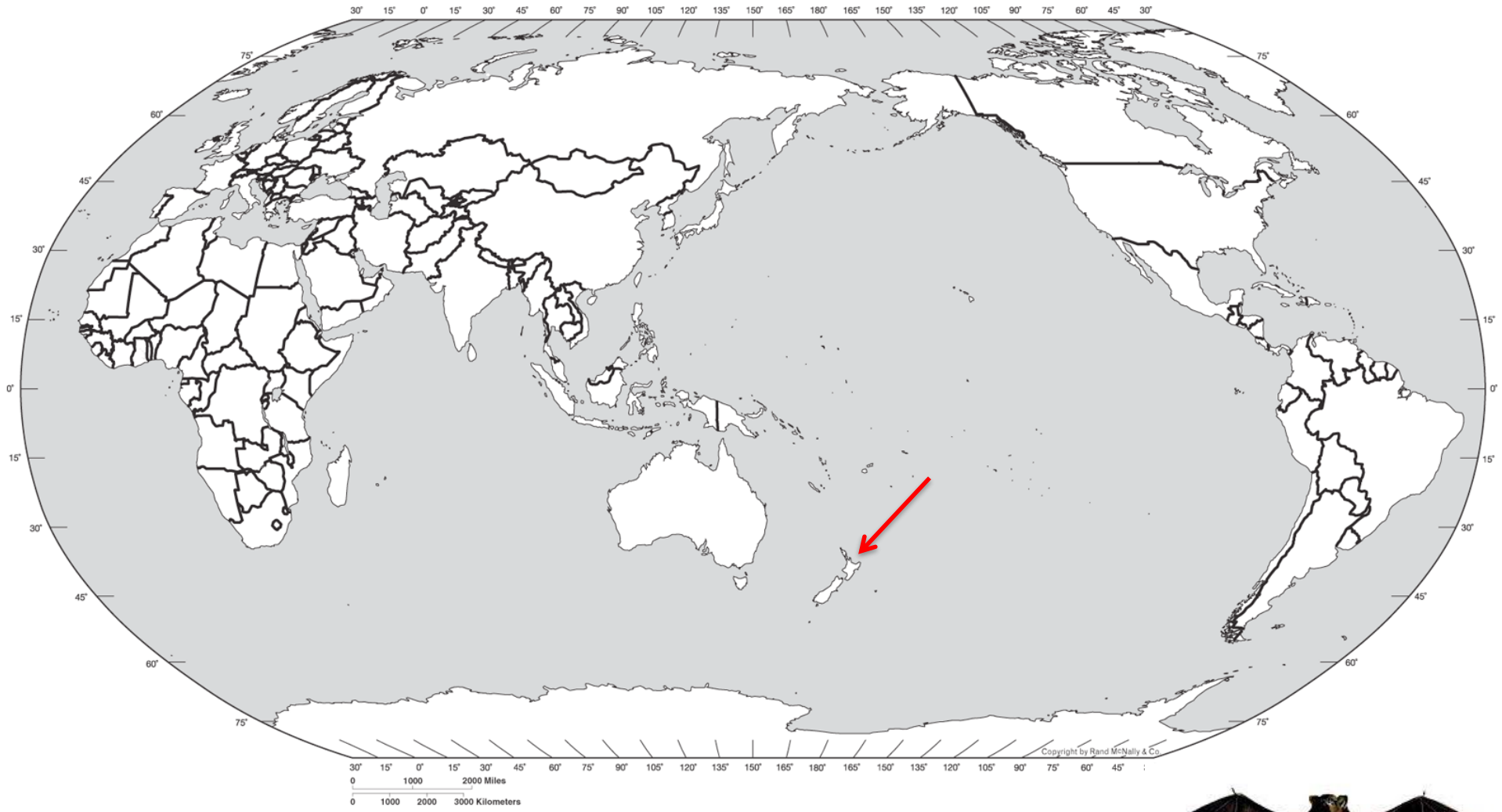


NZ BIODIVERSITY & INVASIVE SPECIES

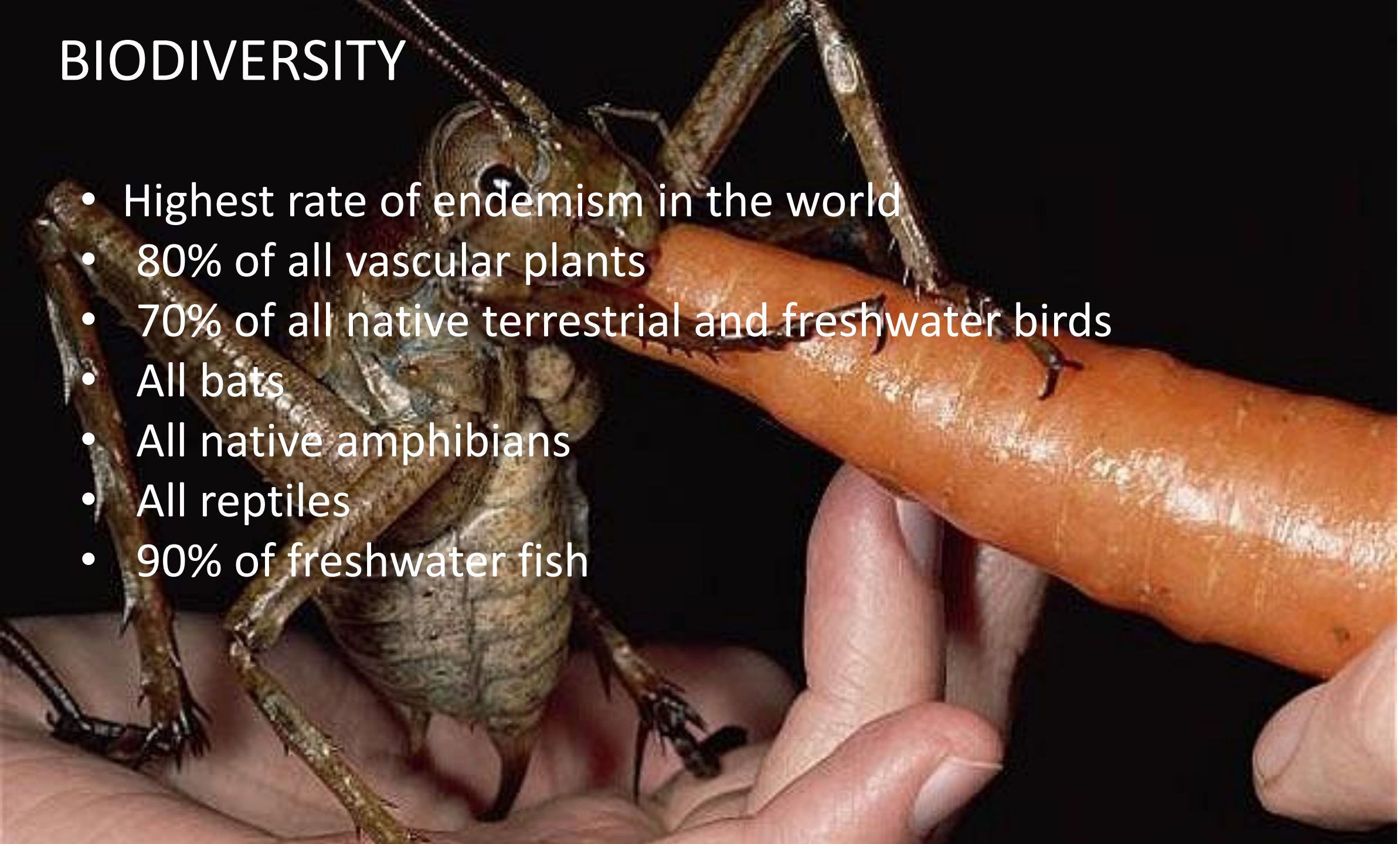
ECONOMIC IMPACTS OF INVASIVES

- Global: $1.4 trillion US per year
  - Compare: New IPCC report estimated climate change impacts at $1.4 trillion per year
- US: $120+ billion US per year
- New Zealand: $3+ billion US per year (2.3% of GDP)

NEW ZEALAND: BIODIVERSITY



BIODIVERSITY



- Highest rate of endemism in the world
- 80% of all vascular plants
- 70% of all native terrestrial and freshwater birds
- All bats
- All native amphibians
- All reptiles
- 90% of freshwater fish

NEW ZEALAND: BIODIVERSITY

NEW ZEALAND: BIODIVERSITY

Chatham Island Black Robin

Population of birds in 1980:
Population of females in 1980:
Population of birds in 2014:

Pennantia baylisiana

Known population:

KAURI (*AGATHIS AUSTRALIS*)

KEEP KAURI STANDING
STOP KAURI DIEBACK DISEASE SPREADING
KIA TOITU HE KAURI

For all of these reasons…

and many more…

IAS are a major threat to New Zealand

COSTS/IMPACTS: WEEDS

- 25,000 exotic plants
- 2500 are naturalised
- 300 are of conservation concern

- Pastoral weeds are conservatively estimated to cost the economy $1.2 billion per year in lost animal production and control costs

- Weeds pose a threat to 1/3 of nationally threatened plant species

- Could potentially degrade 7% of the conservation estate in next 10 years

COSTS/IMPACTS: INVERTEBRATES

- Direct economic cost of vertebrate pests to the primary sector is $1-$3.3 billion per year
- Annual production losses to aquaculture from a single species of sea squirt were estimated to be $15 million per year in 2005

COSTS/IMPACTS: VERTEBRATE PESTS

- 32 mammals and 35 birds have become established since human arrival
- Vertebrate fauna has been nearly halved
  - 1 bat
  - 3 frogs
  - 3 lizards
  - 1 freshwater fish
  - 4 plant species
  - 51+ birds

- 3 bird extinctions since 1960s

- Uncounted losses of populations and species of invertebrates

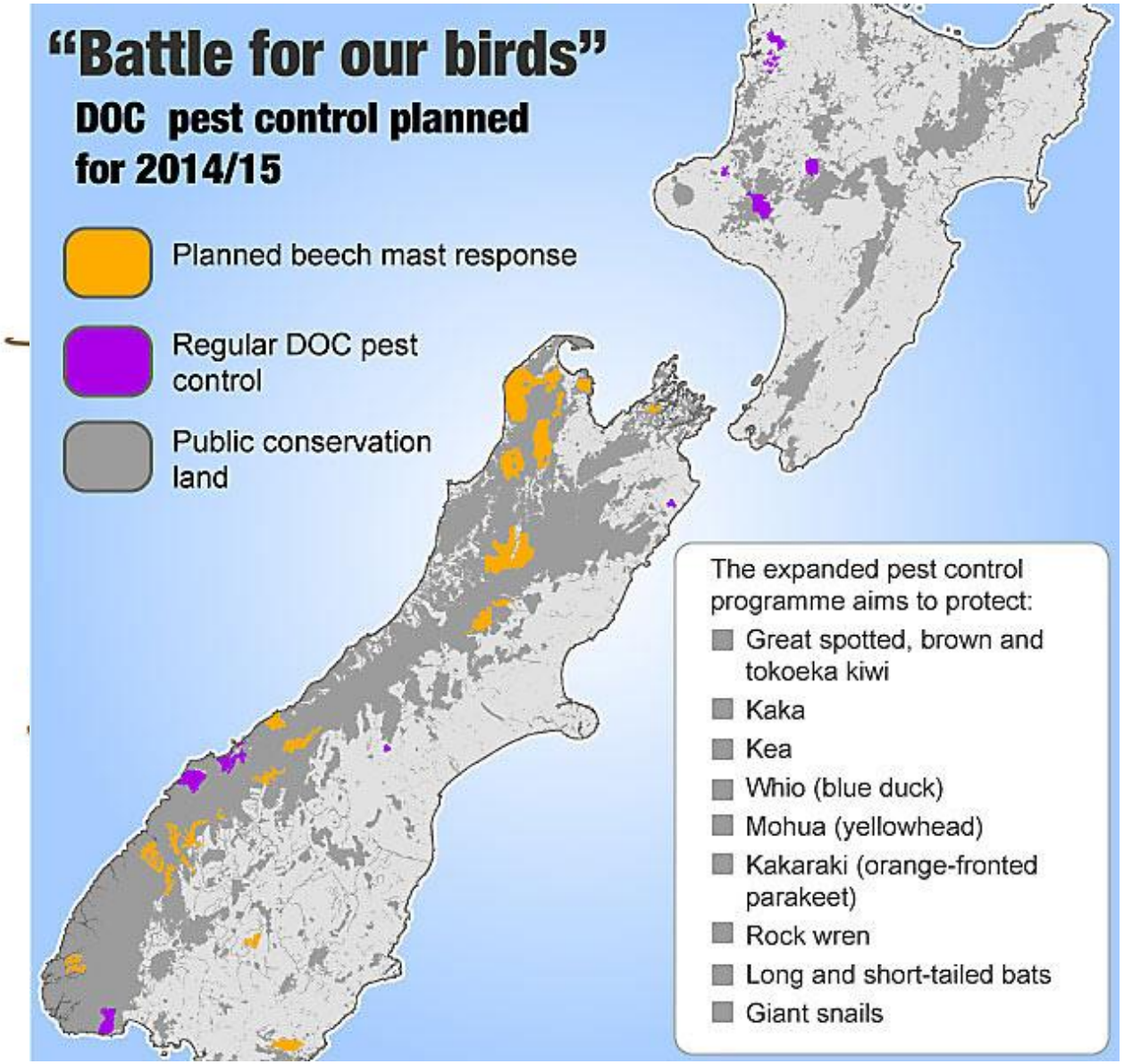
INTERVENTIONS & INVESTMENTS

- $500 million spent annually on biosecurity
  - 65% response
  - 13% prevention
  - 11% surveillance
  - 5% research
- Bertram (1999): *NZ's experience on border controls and quarantine systems are akin to payment of insurance premiums for catastrophic events.*"

BIOSECURITY NEW ZEALAND

INTERVENTIONS & INVESTMENTS

- In 2014, New Zealand faced a 1-in-15 year beech mast, that dropped a million tons of seed
- Triggered a plague of an additional 30 million rats and 10,000s of stoats, which can potentially annihilate endangered bird populations
- Department of Conservation spent more than $20 million on control



INTERVENTIONS & INVESTMENTS

- Public education campaigns to prevent spread of aquatic weeds
- Bans on felt-soled waders

BETWEEN WATERWAYS

INTERVENTIONS & INVESTMENTS

- Predator-free islands
  - 11,200 hectare Campbell Island
- Inland “island” preserves
  - 47 km of predator-proof fencing
  - 3400 hectares

INTERVENTIONS & INVESTMENTS

- Deer introduced for sport in the mid 19th century

- The environment proved ideal and wild populations grew uncontrolled, becoming a pest by 1950

- Export of venison from wild deer started
- in 1960s, turning this pest into an export

- In the 1970s, DOC caught live deer from the wild to begin farms

- A new industry was born

- Today, there are 1.1 million farmed deer on nearly 1 million acres of land

INTERVENTIONS & INVESTMENTS

- NZ is world's largest user of sodium fluroacetate (1080)
- DOC pioneered helicopter hunting of ungulates
- DOC developed traps used throughout Pacific
- NZ has developed traps that achieve same effectiveness as 1080

FUTURE DIRECTIONS

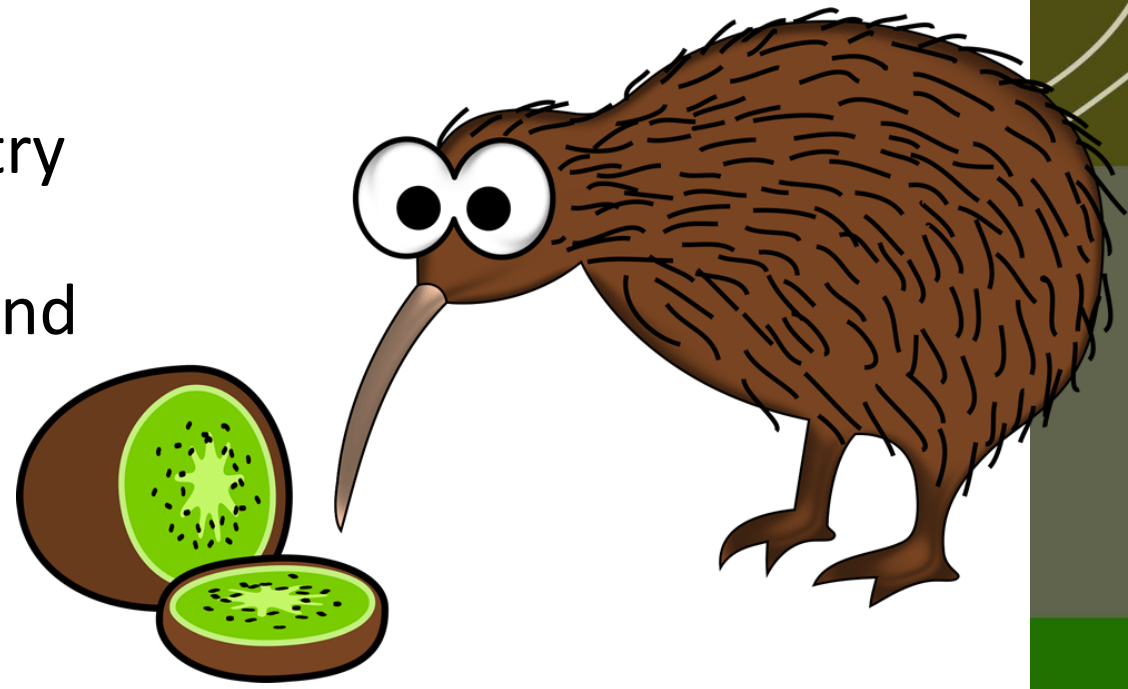
- Games and social media to raise awareness & find solutions to problems

FUTURE DIRECTIONS

- Biocontrol of plants
  - Wide-host-range bioherbicide fungi
  - herbivorous insects

IN SUMMARY…

- NZ much more than a small, diverse country in the corner of the world that's good at playing rugby and growing grass
- Significant primary industry, including forestry
- Focus on improving environmental quality and mitigating climate change, but faces challenges
- Invasive species pose a serious threat, but many programs in place to deal with risks



THANKS &
NGĀ MIHI NUI!

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