

Modelling for New Zealand's first emissions budgets

22 June 2021



He Pou a Rangi
Climate Change Commission

The Commission's first tasks

New Zealand passed the 'Zero Carbon Act' amendments to the Climate Change Response Act in December 2019. These changes:

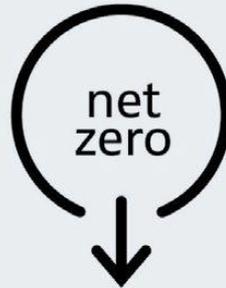
- 1) Set new domestic emissions reduction targets for 2050
- 2) Legislated a system of emissions budgets to help meet the 2050 target
- 3) Established He Pou a Rangi (the Climate Change Commission) to provide independent expert advice on the budgets, the direction of policy to meet them, and to monitor Government's progress
- 4) A framework for adaptation

As the Commission our first advice was on:

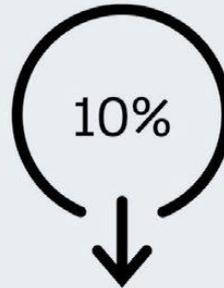
- Level of the first three emissions budgets (2022-2035)
- Direction of policy for the Emissions Reduction Plan

Domestic emissions reduction targets

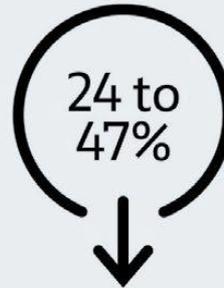
The domestic 2050 target requires at least:



emissions of
all greenhouse
gases other than
biogenic methane
by and beyond
2050

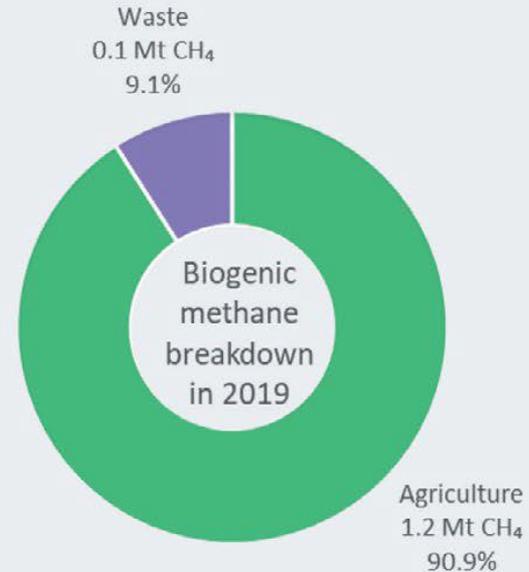
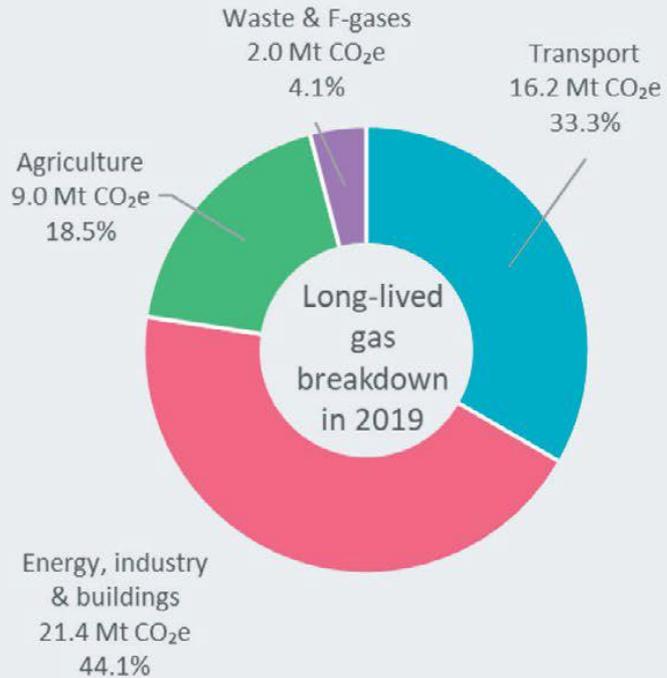


reduction below
2017 biogenic
methane
emissions
by 2030



reduction below
2017 biogenic
methane
emissions by and
beyond 2050

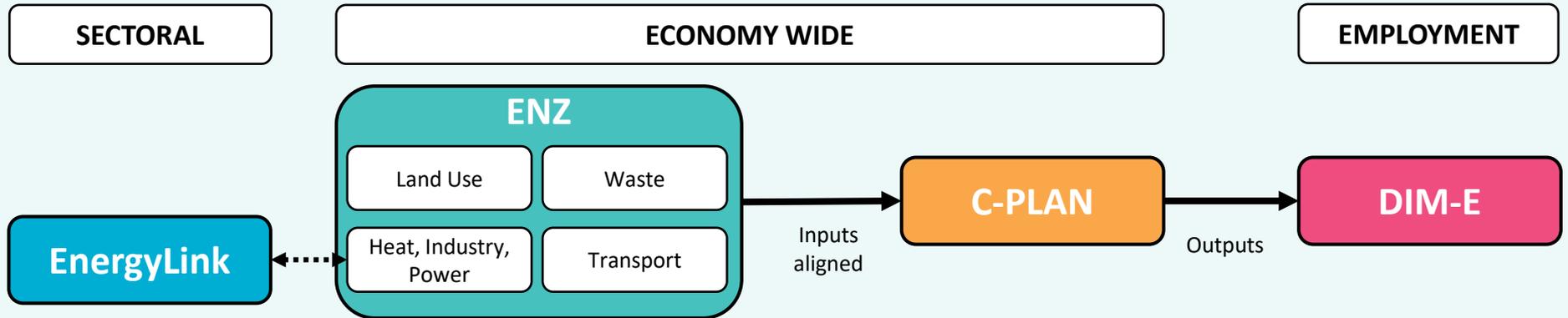
New Zealand's GHG emissions in 2019



Approach to developing modelling

- Modelling a key component of our analysis (but not everything)
- Build models to provide initial advice which could be further developed
- An integrated system of models needed to gain insights across all the considerations we must make
- Need to reflect split-gas nature of 2050 target
- Make models open source

Modelling framework



Energy and Emissions in New Zealand (ENZ)

Transport

Reducing travel demand

Travel mode shifts

Vehicle electrification

Improving fuel efficiency

Low carbon liquid fuels

Energy, Industry and Buildings

Moving to renewable electricity generation

Improving energy efficiency

Switching boilers and heating appliances to biomass and electricity

Land (Agriculture and Forestry)

Changes in farm practices

On-farm technologies

Changes in land use

Waste

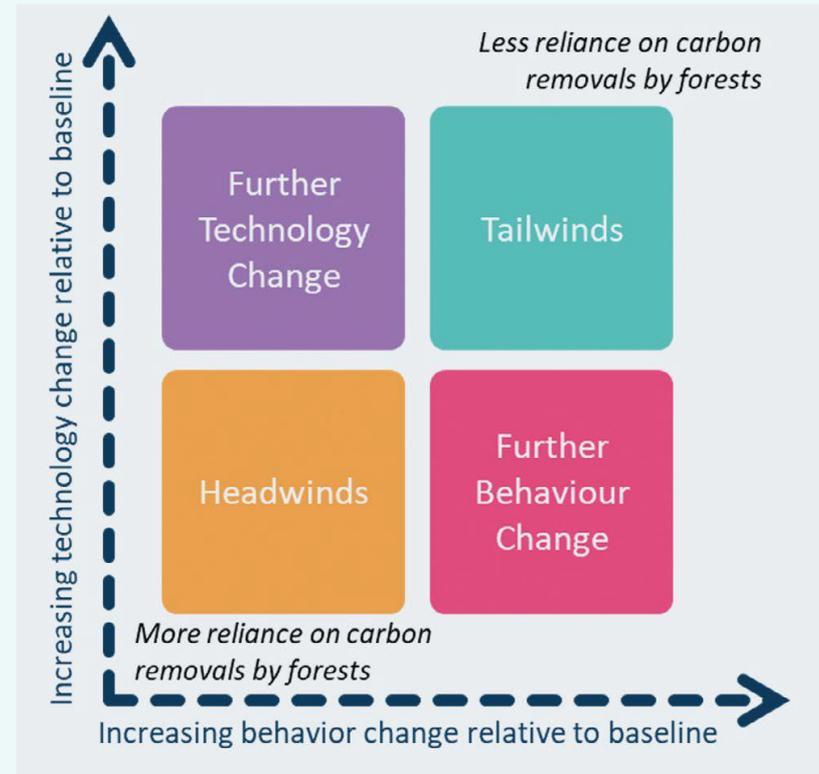
Reducing waste generation

Diverting waste from landfill

Landfill gas capture

Modelling stages for ENZ

- 1) Define the **Current Policy Reference** (baseline)
- 2) Develop a range of **2050 Scenarios** to explore future uncertainty
- 3) Use insights from scenarios and judgements to advise on the **level of emissions budgets to 2035**
- 4) **Test a range of paths** to ensure budgets can be met in a range of possible futures



Climate Policy Analysis (C-PLAN)

- CGE model used to understand total cost and wider economic impacts of different emissions budgets
- Inspired by the Massachusetts Institute of Technology Economic Projection and Policy Analysis (MIT-EPPA) model
- Represents key mitigation technologies:
 - Fuel switching (e.g. coal/gas to wind for electricity generation)
 - Energy efficiency improvements over time, and in response to prices
 - Electric vehicles for private and commercial transport
 - Methane-reducing technology for dairy, beef and sheep agriculture
 - Biomass and electrification for process heat

Distributed Impacts Model – Employment (DIM-E)

- Used to understand how budgets could change level of employment in each sector, and which workers may be most affected
- Statistical micro-simulation model based on Stats NZ micro data and C-PLAN results
- Simulates the changes in worker-jobs gained or lost, based on the characteristics of that sector and its workers (e.g. age, education level, ethnicity, region)

EnergyLink

- Used as a check against the electricity sector results from ENZ
- Existing E-Market and I-Gen models built by EnergyLink which are already widely used in the electricity sector
- Looks at electricity market in detail – simulating generation build and dispatch decisions, emissions, electricity prices and security of supply

christopher.holland@climatecommission.govt.nz



He Pou a Rangi

Climate Change Commission