How Our Models Work: C-PLAN & DIM-E

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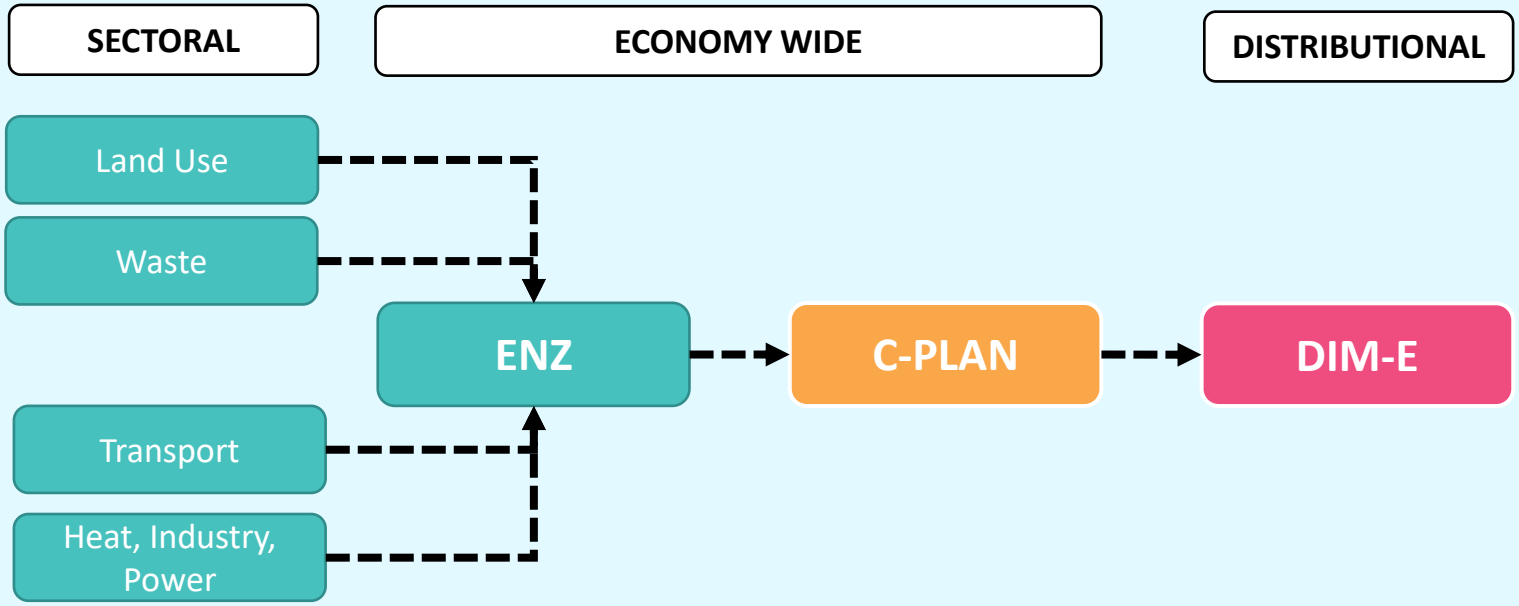
- Our Modelling System
- C-PLAN: A whole-of-economy CGE Model
- DIM-E: A distribution model focussing on employment

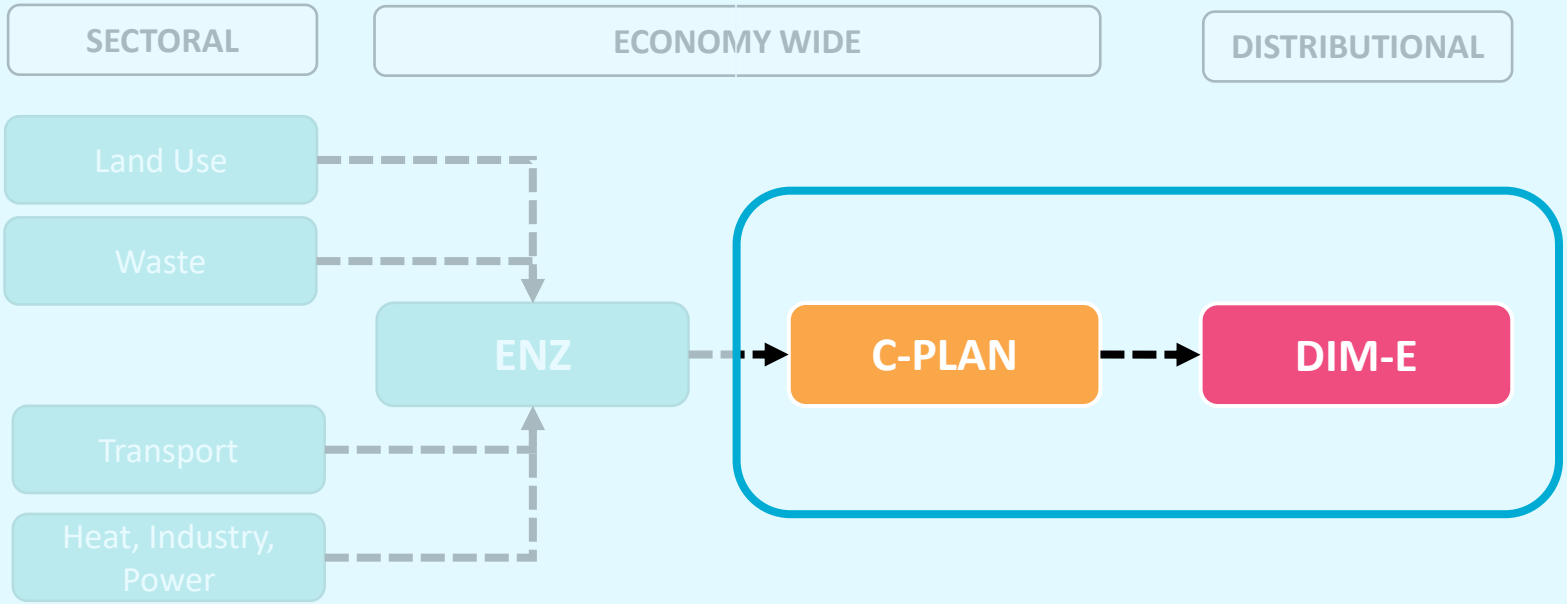
Our Modelling System

The Commission’s models, and how we use them

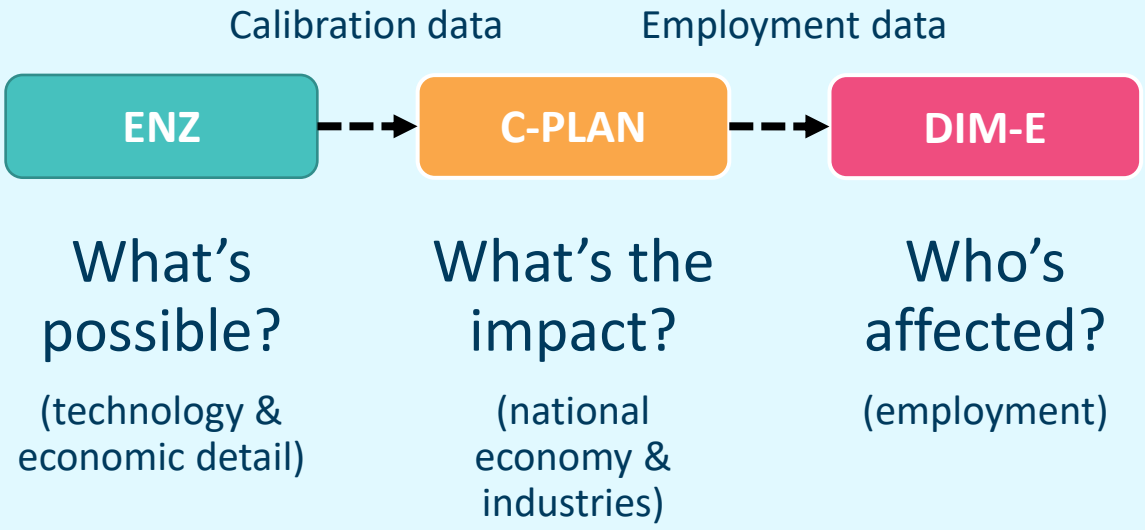
Commission in-house models



Today's focus



How we use our models



Models

- Models give the logical results of our assumptions
- Value is as much **how** we got the answer, as **what** answer we got

- Models simplify reality
- Feature, not a bug!

How we use C-PLAN & DIM-E

- First, we decide our scenarios/budgets
- Next, we put them in C-PLAN & DIM-E as constraints
- Then, we see what the implications are using C-PLAN, DIM-E, and other analysis
- Finally, we feed this back into our budget decisions

- These models are new, so we're only just learning how to make best use of them

Data Sources

- Our data comes from a wide variety of sources
- We try to use publicly-available data wherever we can
- But sometimes we can’t:
  - The self-consistent input-output data set for NZ and international used in C-PLAN is purchased from GTAP
  - Microdata for distribution modelling including DIM-E is held in the Stats NZ data lab and subject to confidentiality requirements

C-PLAN

How CGE models in general, and C-PLAN in particular, work

What is a CGE Model?

- **C**omputable **G**eneral **E**quilibrium
- Aka Applied General Equilibrium (AGE)

- Economy-wide model
- Shows flow-on effects of changes
- Used for “what if”, not forecasting

The Simplest CGE

- A “representative household”:
  - Sells labour
  - Rents out capital
  - Buys goods
  - Maximise utility
- Two sectors:
  - Buy labour
  - Hire capital
  - Sells goods
  - Maximise profits

- A Market mediates to find the price where there’s nothing left over

C-PLAN – Climate Policy Analysis

- Recursive dynamic, 2014-2050
- Multi-region, NZ & ROW
- More than 30 sectors
- Labour, capital, land, resources used for production

- Built by Niven Winchester of Motu/Auckland University of Technology
- CGE model coded in GAMS

ETS in C-PLAN

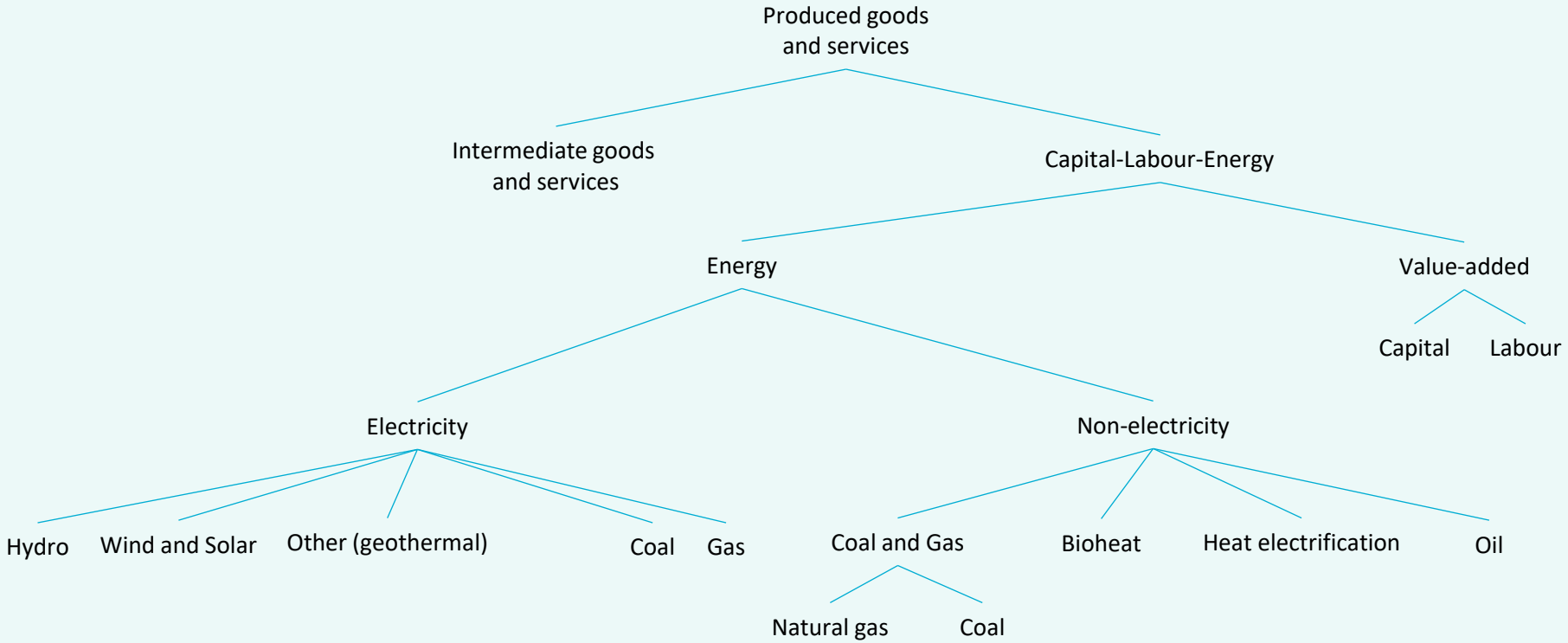
- **NOT** a representation of NZ's real ETS scheme!
- Just a way to find a price that reduces emissions in the model

- One cap for biogenic methane
- Another cap for long-lived gases
- Forestry treated separately
- Free allocation of units is included

C-PLAN Emissions Reductions

- Explicit technologies
  - EVs for private and commercial transport
  - Methane-reducing technology for dairy, beef & sheep agriculture
  - Biomass for process heat
  - Electrification of process heat
  - CCS for geothermal electricity
- Fuel switching
- Price-driven energy efficiency
- Exogenous energy efficiency and emissions intensity improvements
- Reducing output

Typical CPLAN Production Function



DIM-E

How the DIM-E model works

DIM-E – Distributional Impacts on Employment

- Take employment results from C-PLAN, see how labour changes by sector
- Simulate worker-jobs to find out characteristics of affected people, e.g. ethnicity, region, age, education level

- Built by Lynn Riggs of Motu
- Microsimulation model in Stats NZ Data Lab

Part 1: Sector Changes in Employment

- Start with employment changes by sector from C-PLAN
- Convert to ANZSIC 3-digit sectors
- For each year:
  - Is employment in the sector growing or shrinking?
  - Is it changing faster than the Current Policy Reference?
- How many worker-jobs are affected?

Part 2: Simulate Worker-Job Characteristics by Industry

- What do workers in this industry look like?
  - Where do they live?
  - What's their ethnicities?
  - How much do they earn?
  - …
  - How are these characteristics interrelated?

- How many are affected (compared to CPR)?

Part 2: Simulate Worker-Job Characteristics by Industry

- Create a new simulated worker for every worker affected, who looks like a worker in that industry
  - E.g. has a 50% chance of being female, and a 20% chance of being in their forties
- Across all industries, how many of those (simulated) workers:
  - Live in Auckland?
  - Are Māori?
  - Have only secondary school education?
- Repeat 1000 times and average to get better quality results

Thanks

Want to get in touch?
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