Decoding the Path to Net Zero

The models informing New Zealand's Second Emissions Reduction Plan (ERP2)

NZARES presentation by Yvonne Matthews

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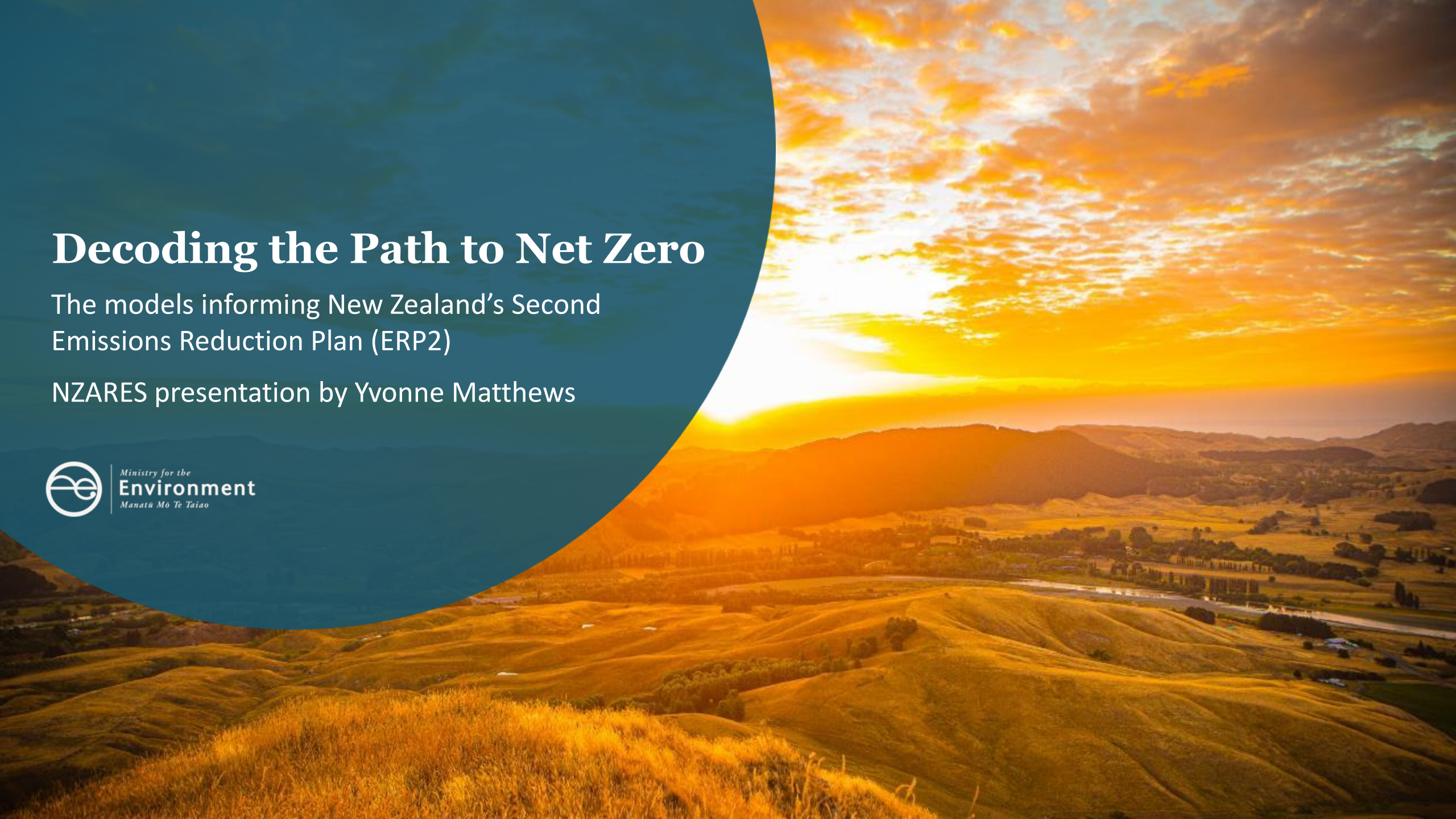


Introduction

What IS the Emissions Reduction Plan?

- The Zero Carbon Act 2019 mandates New Zealand to achieve net-zero carbon emissions by 2050, with specific emissions budgets set for different periods.
- ERP2 is the second Emissions Reduction Plan under the Zero Carbon Act, detailing actions to reduce greenhouse gas emissions during the 2026-2030 period.
- ERP2 was released for public consultation in July and the final version is due in December 2024
- The government has to demonstrate that each Emissions Reduction Plan, including ERP2, is **sufficient** to meet the prescribed emissions budgets and long-term targets.
- How to demonstrate sufficiency? Models!

Other climate data products

And how they relate to the information published in ERP2

Annual Projections:

- Updated each year to forecast future emissions based on current policies and economic trends, helping to track progress toward emissions targets. Provided by agencies.

Inventory Reporting:

- A tier-one statistic serving as the official record of actual emissions. 2 years out-of-date and historicals can be revised!

BTR Reporting:

- Biennial Transparency Reports submitted to the UNFCCC, providing detailed information on emissions, mitigation actions, and support, ensuring international accountability and transparency.

Statistics NZ provisional emissions data

- Uses leading indicators to provide a more up-to-date estimate (6-12 months lag) of actual emissions

Ideally, all 4 information products would tell a consistent story (but they often don't)

Learnings from ERP1

Key Observations

•A coherent policy framework was lacking in the development of ERP1

•Too much emphasis was placed on sector-specific policies rather than a whole-of-economy approach.

•Over-reliance on the Commission's advice limited the consideration of alternative pathways.

Recommendations

•Chief executives should focus on cross-agency decision-making with independent advice and an independent chair.

•Ministers and chief executives should prioritize resourcing for the development of the emissions reduction plan.

•More systematic and consistent modelling of both sector-specific and whole-of-economy pathways is needed.

•A dedicated group should lead consultation with iwi and Māori and feed more directly into analysis and decision-making.

Who does what?

A complex web of dependencies

- **Energy** – MBIE with some input from EECA
- **Transport** – MoT with some inputs from MBIE
- **Industry** excluding F-gases – MBIE
- **F-gases** – MfE but contracted out
- **Agriculture** – MPI with some inputs from MWLR and industry
- **Forestry** – MPI but relies on data from MfE
- **Waste** – MfE with inputs from councils
- **Advice** on targets and settings – CCC
- **Outputs** - MfE

Modeller problems

(Not an exhaustive list)

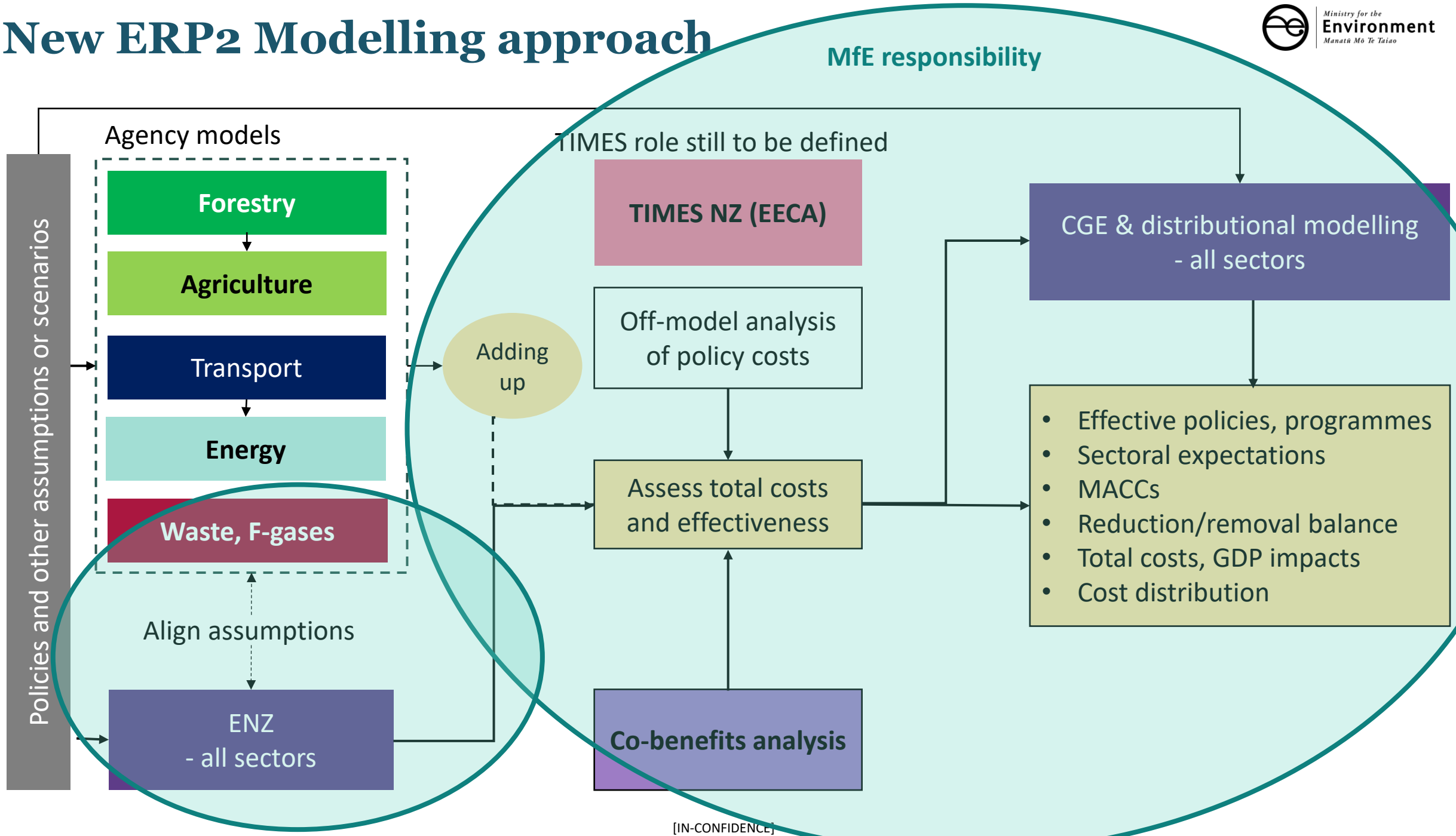
- No single model is capable of modelling every policy or variable that can affect emissions
- Had to adapt existing models for a new purpose
- No single agency has the institutional knowledge to model every sector in detail
- Time lags for sectors to do the modelling, get it signed off, and then integrate by MfE
- Interdependencies
- Tensions between using “best available information” and having consistent data cut-off dates
- Conflicting policy objectives of different ministers/agencies
- Restructures and loss of institutional knowledge
- Policymakers’ frustration with models and volatile results

Why are the numbers so volatile?

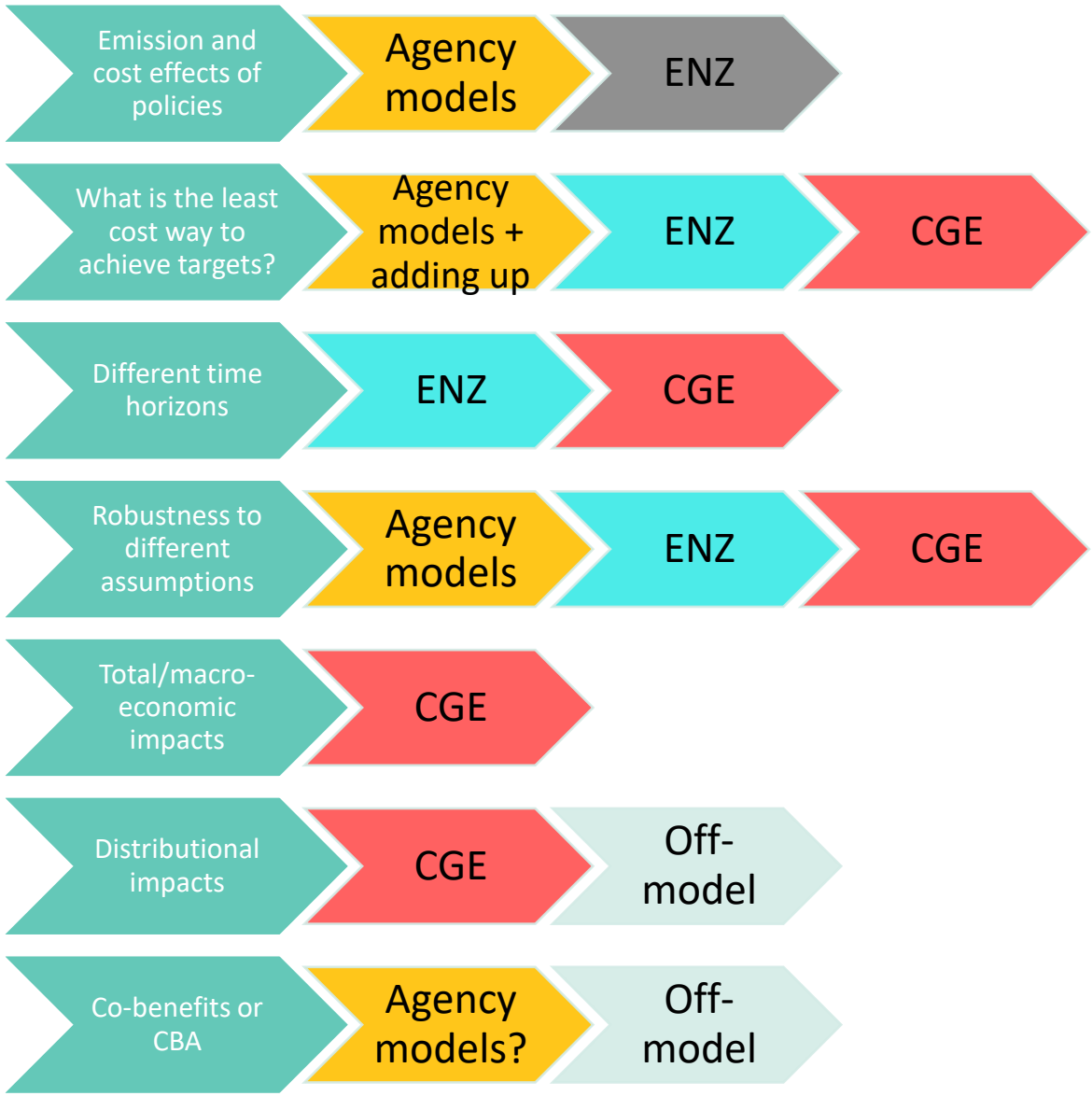
(And why the data cut-off dates are so important)

- Methodology improvements in how emissions are estimated
- Livestock populations are a LOT more volatile than human populations
- Drought/wet years have a big effect on energy emissions
- Forestry projections depend critically on ETS price expectations
- Covid-19 caused structural changes
- A decision by a single big industrial firm can make or break the budget

New ERP2 Modelling approach



Summary of policy questions and model applicability



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The models

(or some of them anyway)

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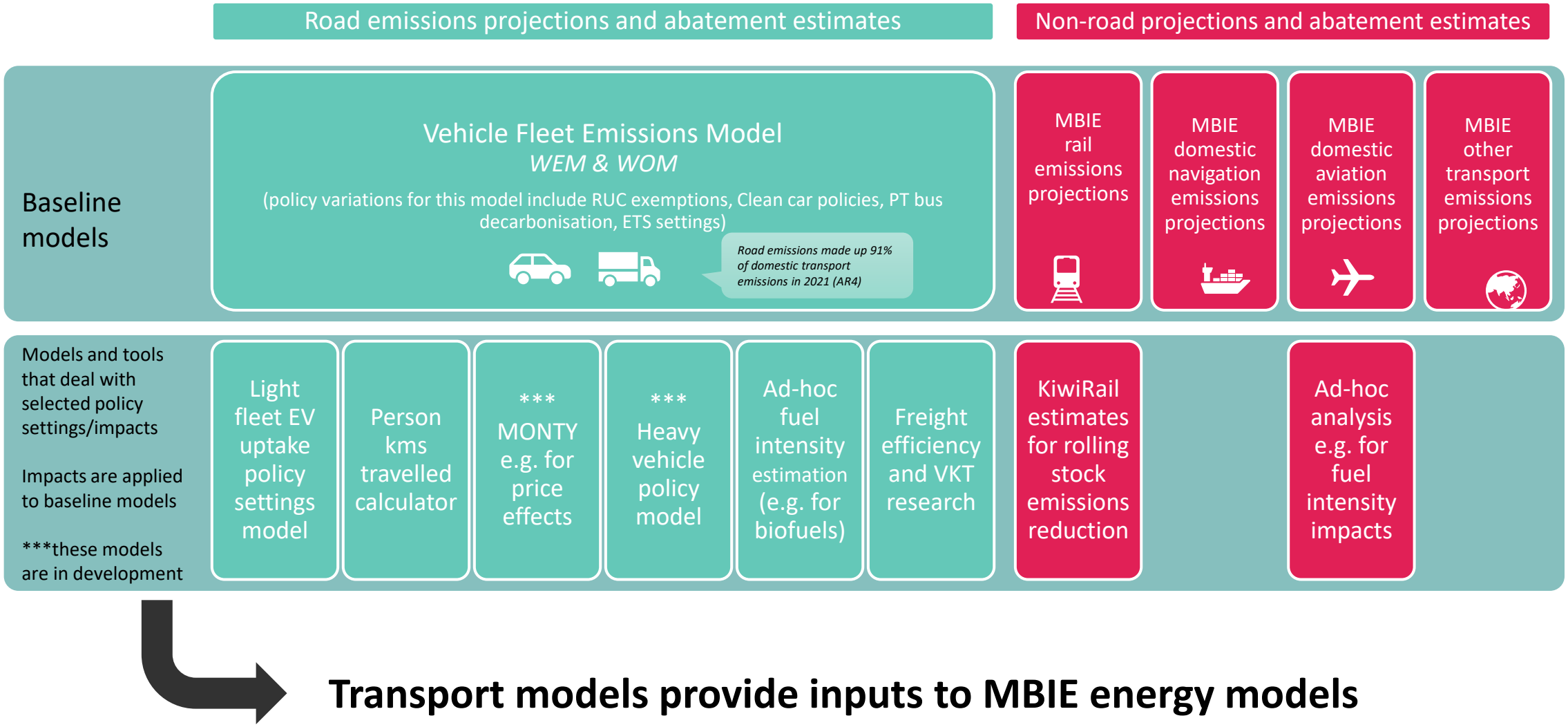
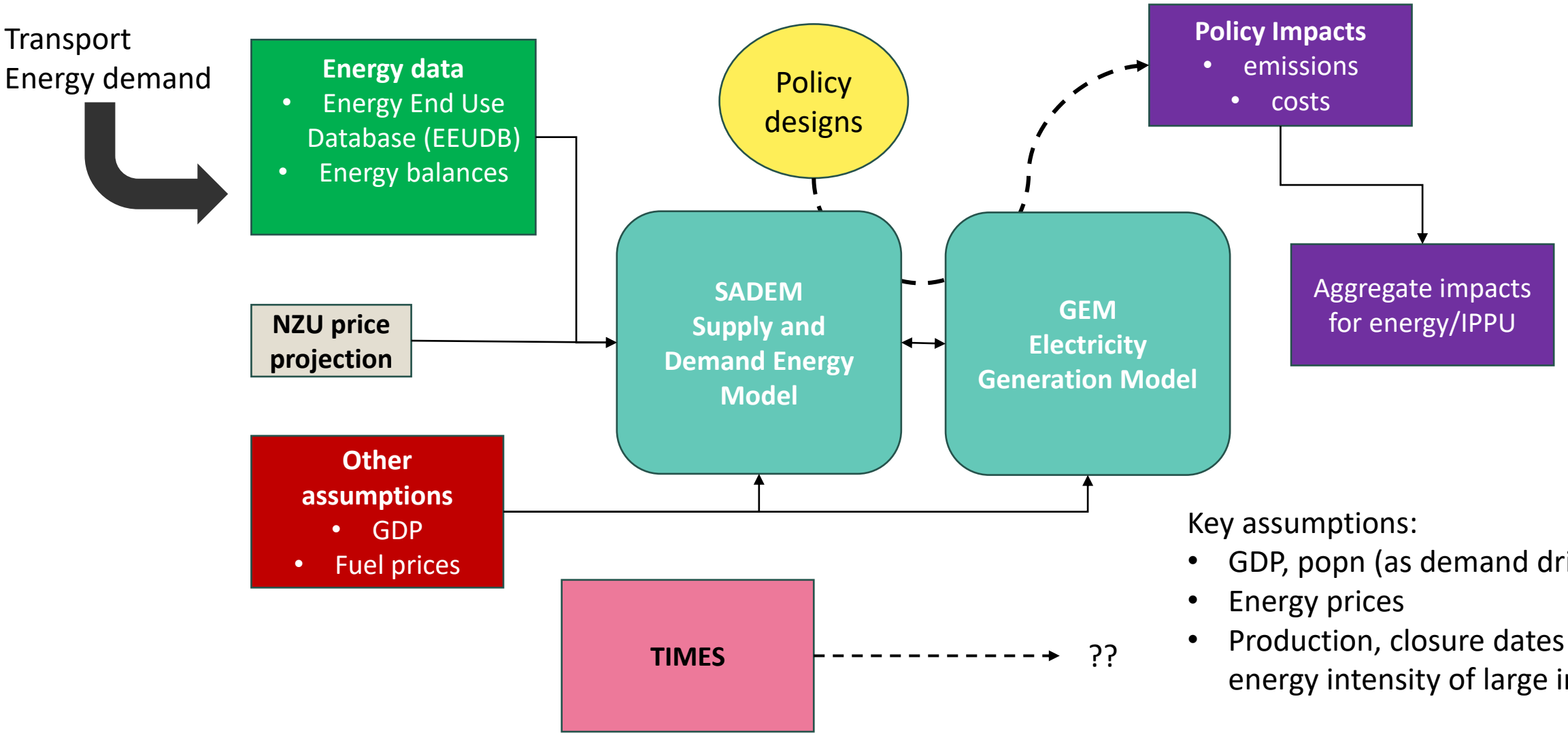
Transport models



Transport models provide inputs to MBIE energy models

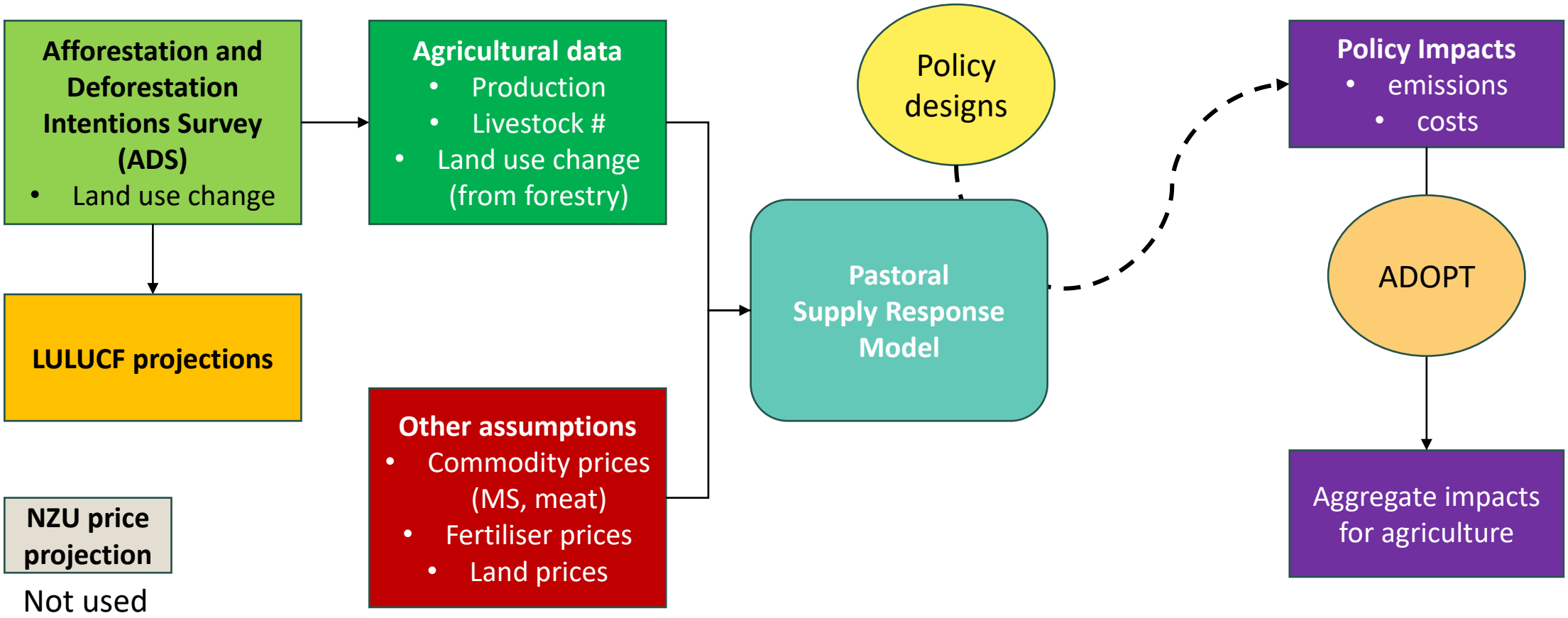
Energy & industry models



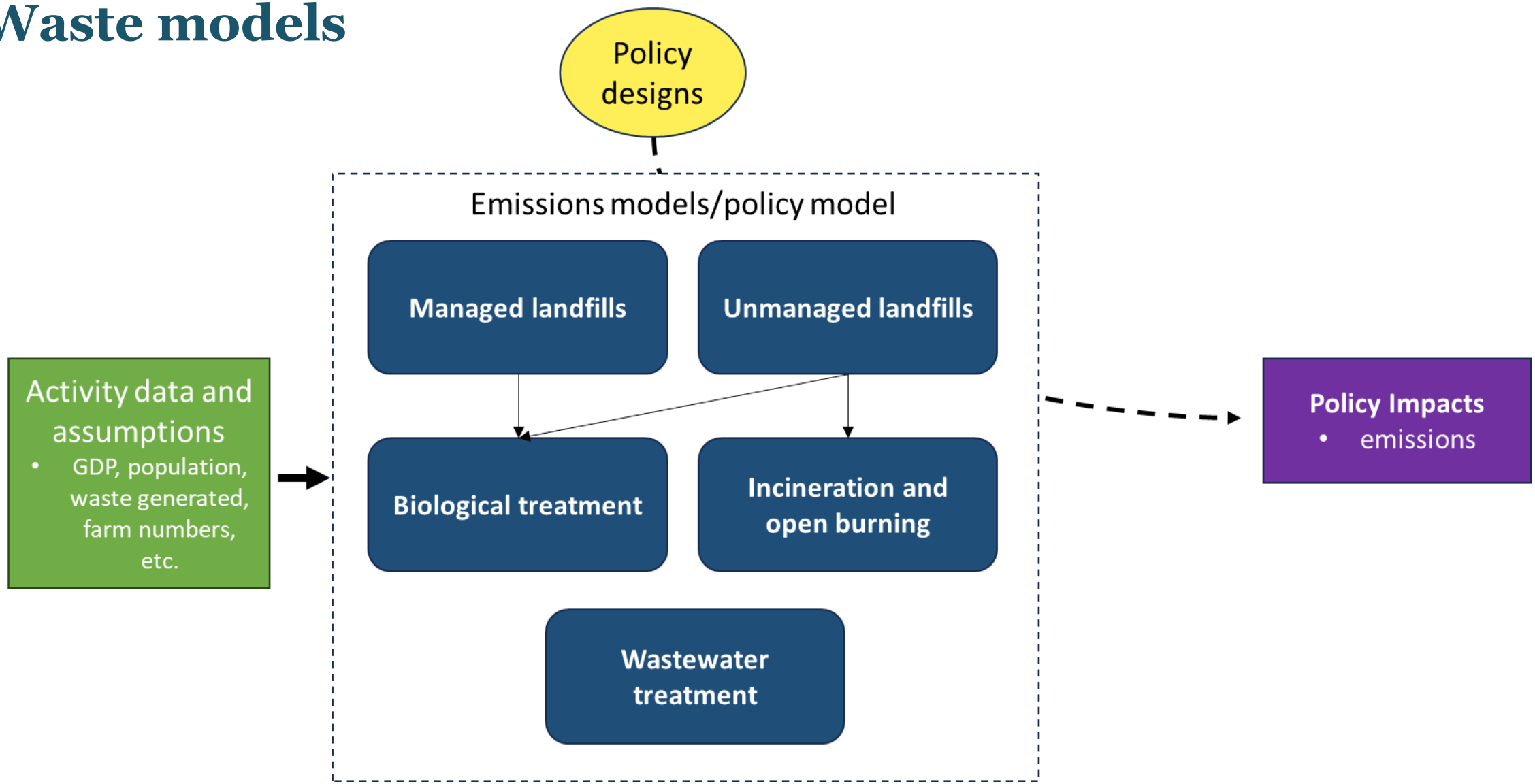
Key assumptions:

- GDP, popn (as demand drivers)
- Energy prices
- Production, closure dates & energy intensity of large industrials

Agriculture & Forestry models

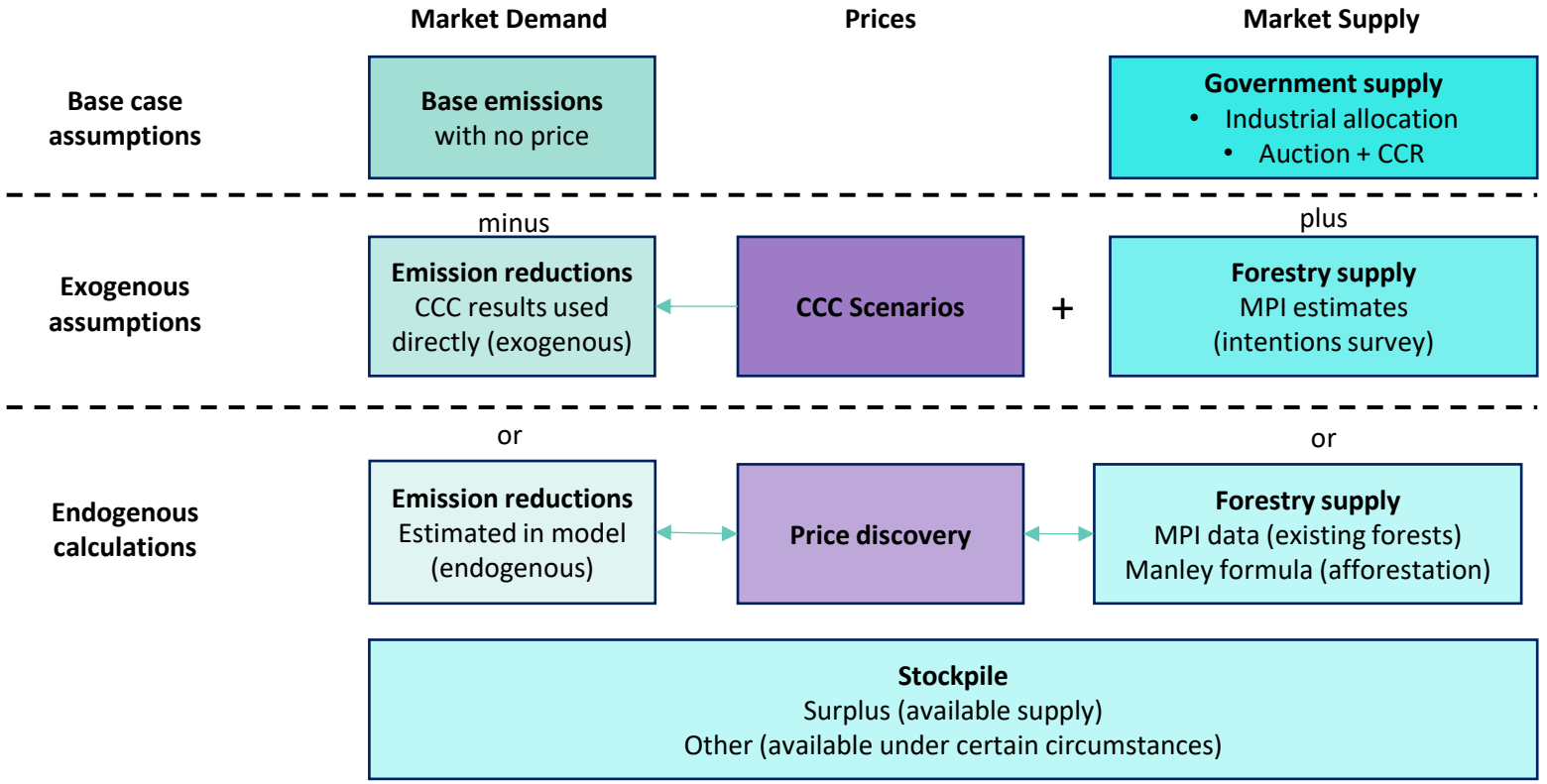


Waste models



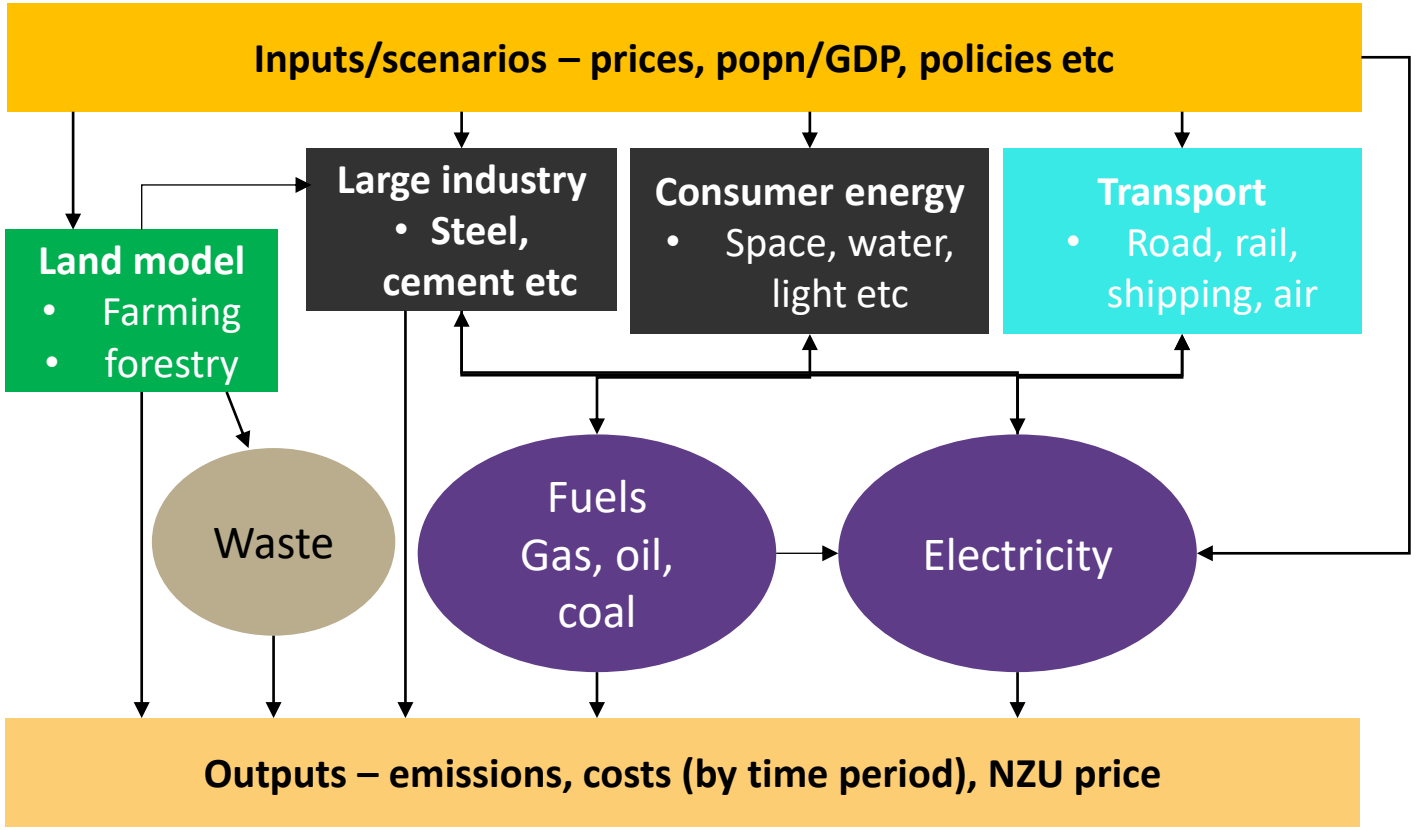
ETS Supply-Demand model

- ETS model has been developed to understand the implications of changes to units supply and forestry price responsiveness on emission prices and the balance between reductions and removals.
- This functionality is now included in the ENZ model

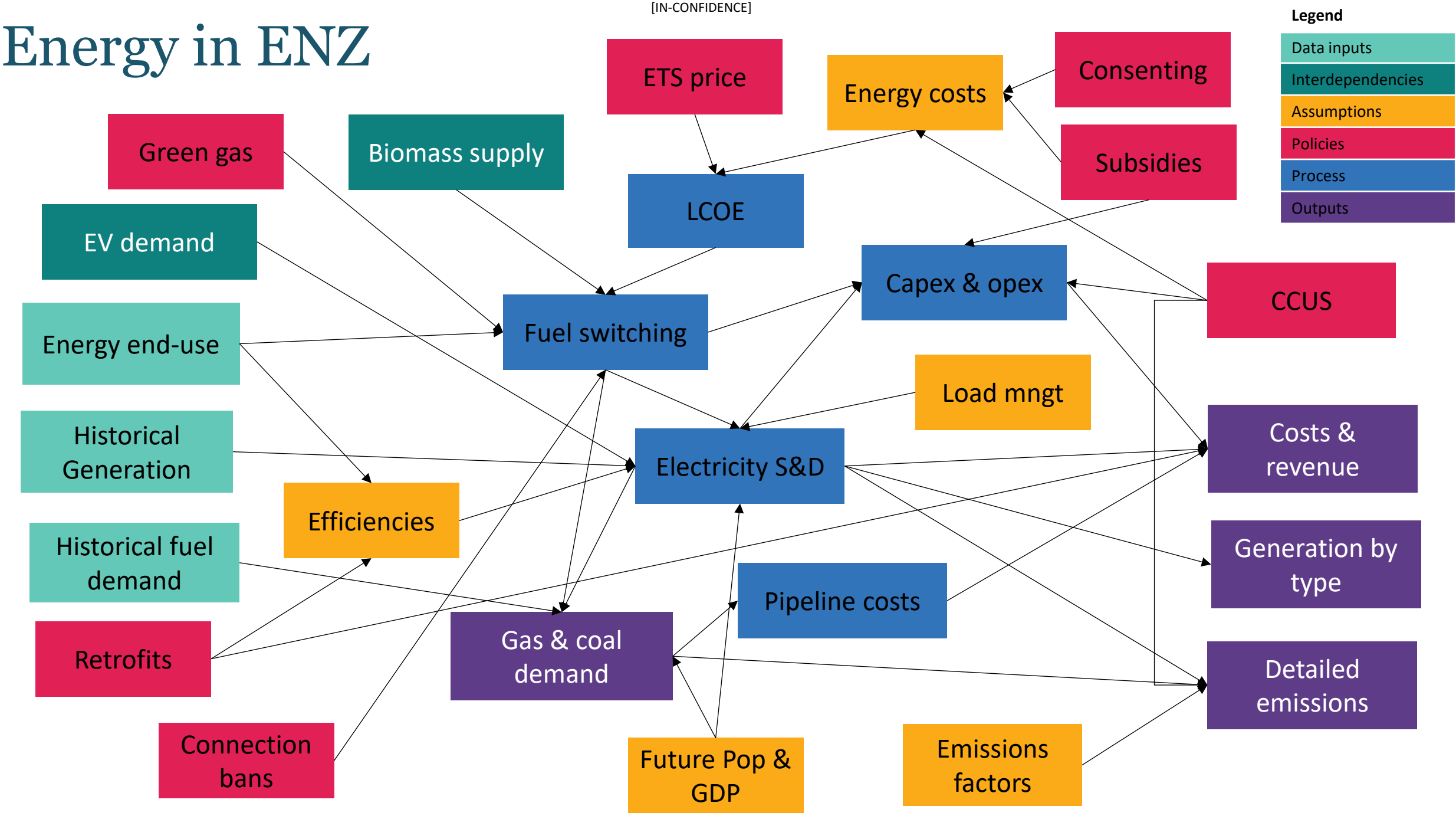


ENZ - Emissions in New Zealand model

- ENZ includes all domestic sectors and the ETS
- Baseline set to equal the current projections With Existing Measures
- Does not replace the need for more detailed sub-sector models – many inputs are exogenous
- Emission prices can be exogenous or endogenous
  - Agency models + adding up does not necessarily produce internally consistent results. ENZ and CGE models equilibrate: prices change so that net emissions just meet budgets



Energy in ENZ



CGE model

(PE-CLIMATE)

- Estimates macroeconomic impacts by modelling the linkages between sectors, and prices
  - GDP
  - Employment - national employment and wages by industry
  - Regional output and employment by industry
  - Household income/expenditure by income group, ethnicity (Māori/non-Māori) and region
  - Business impacts on large single emitters and SMEs

- Key assumptions are:
  - Price elasticities
  - Policy impacts (to be taken from agency model outputs in first instance, otherwise ENZ)

How do we account for uncertainty?

- ENZ is a deterministic model so we need to vary assumptions to get a high and low
- Had high and low activity data for waste and forestry from agencies
- These scenarios do not include the full range factors that contribute to uncertainty
- For the ERP2 consultation document we ended up using an uncertainty range based on historical deviations so that all sectors would be consistent.
    - But this caused problems when people wanted to decompose by gas and sector – variance is probably not independent

How could modelling be improved?

A “wishlist” for future research

- **ETS price expectations** - what are they in each sector, and how are they formed?
- **Carbon price elasticities** - for different sectors and uses
- **Policy marginal impacts** - many policies currently can’t be quantified. E.g:
  - Public transport funding -> mode shift and kms
  - Improve investor confidence -> investment in decarbonisation
  - EV chargers -> EV adoption
  - Indirect policy impacts that currently aren’t counted
- **Better confidence intervals** – analyse variance and covariance in historical emissions for different sectors
- Behavioural analysis of household or firm actions to reduce emissions
- Dynamic Adaptive Policy Pathways analysis of proposed policies

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Conclusion

(Stay tuned for the final ERP2 in December)