Ministry for the Environment
Manatū Mō Te Taiao

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s 9(2)(a)

18-D-00592

Dear s 9(2)(a)

Thank you for your email of 2 April 2018 requesting the following information under the Official Information Act 1982 (OIA):

> *"All advice MfE has prepared for the Minister for Climate Change regarding the possible financial cost to, or impact on, the economy as a result of the implementation of a "Zero Carbon Act", or policy changes that would see a shift to a net zero carbon economy, since 26 October 2017."*

The interpreted scope of this request is all advice provided by the Ministry for the Environment to the Minister for Climate Change regarding the financial cost to or impact of a proposed Zero Carbon Act and policy changes associated with it between 26 October 2017 and 2 April 2018. This was interpreted to exclude the Emissions Trading Scheme and Carbon Markets work programmes.

There are 5 documents that fall within the scope of this request. We attach a PDF of the relevant documents with necessary redactions. These are under section 9(2)(a) in order to protect the privacy of natural persons and section 9(2)(f)(iv) as they contain information not yet decided on.

It is important to note that given that the Zero Carbon Bill has not yet been consulted on, policy options are still under active consideration. As a result, economic reporting is still early in its commissioning phase.

Under section 28(3) of the OIA, you have the right to ask the Ombudsman to review my response to your request.

Yours sincerely

Roger Lincoln
Director, Climate Change

List of documents

Doc #	Document Title	Date	Decisions	OIA sections applied
1	Extracts- BN 17-B-03965 Draft Cabinet Paper, The 100-Day Plan for Climate Change.pdf	9-Nov-17	In scope material released in full	S 9(2)(f)(iv)- active consideration Rest of document out of scope.
2	17-04020_2050Targetpresentation.pdf	28-Nov-17	Release in full	N/a
3	2017-B-04082_Meeting with Productivity Commissioners on the Low Emissions Economy Inquiry.pdf	8-Dec-17	Release in part	S9(2)(a)-protection of natural persons
4	17-B-04135 Transition Hub Work Programme_2pm version.pdf	20-Dec-17	Release in part	S 9(2)(f)(iv)- active consideration s 9(2)(a)- protection of natural persons
5	Extract-18-B-04322 - Opportunities to build climate resilience and transition to a net zero economy through built and urban policies.pdf	21-Mar-18	In scope material released in full	Rest of document out of scope.

A 2050 target

Objectives

1. The critical objectives to consider when designing the 2050 target are :

   1.0. bringing people along on the journey: a transparent and participative approach to policy-making. This includes, if feasible, cross party consensus.

   1.1. helping people and businesses plan ahead by being clear about what the aspirations are now: investment predictability.

   1.2. ensuring a just and efficient transition.

Recommendations

2. Recommendations are that Cabinet agree in November 2017:

   2.0. that the Zero Carbon Act will define a 2050 target.

   2.1. the process that will be followed to set the 2050 target.

3. Restricting Cabinet's agreement in November 2017 to these two matters allows for consultation during 2018 on the definition of the target that is accompanied by information on the target's required economic transformation. Sharing information on future impacts on the economy as a whole, on sectors, international competitiveness, households and distributional impacts across society will ensure people businesses and Ministerial colleagues understand the implications and are brought on the journey. Cross party consensus on the target will also be more likely with a consultative process.

4. Analysis of the impacts of the target is complex, and so we include information below on the analysis that is underway to estimate impacts of the 2050 target, and the timeframe for delivery of this modelling.

Options for where the 2050 target is defined

5. The proposal: a 2050 target is defined in the Zero Carbon Act.

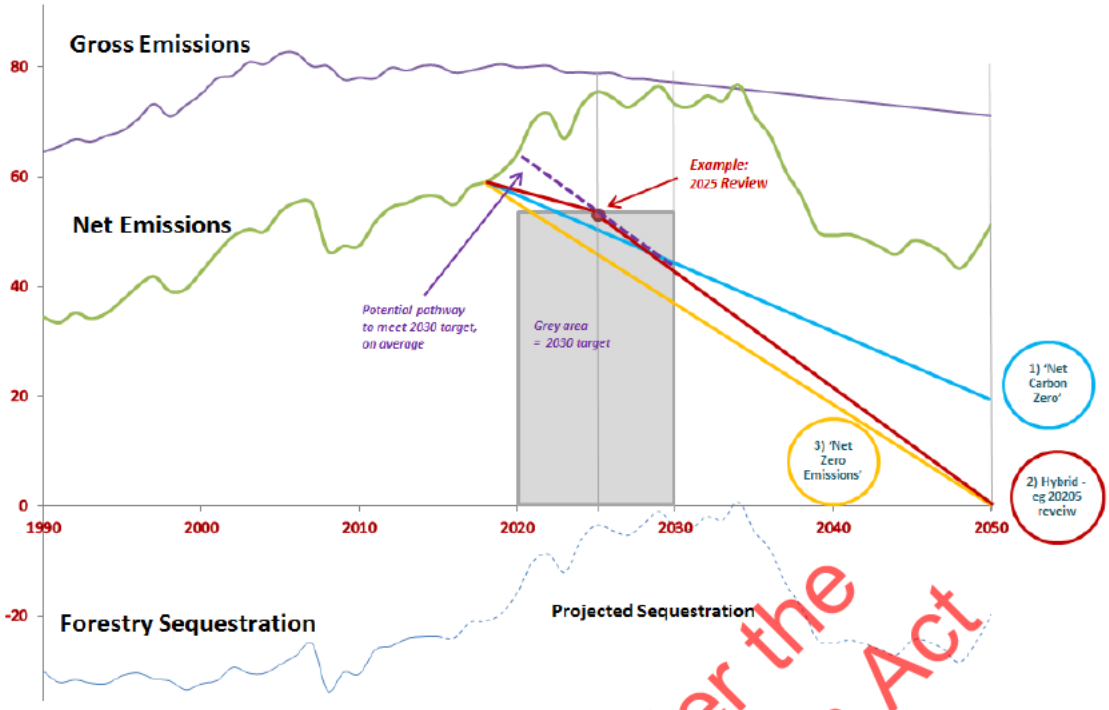
6. Alternative methods to set a target include as set out in the options below:

s9(2)(f)(iv) - Confidentiality of advice

7. Highlighted in a case study later in the paper, the UK Climate Change Act requires that emissions targets are set in legislation. The UK Act requires the Government to develop proposals and policies that will enable emissions to be kept within carbon budgets, and the Committee on Climate Change provides advice on carbon budgets:

   7.0. on the level that a budget must be set at.

Figure 2: Achieving Net Carbon zero or Net Zero Emissions mean different transition pathways



Source: MfE, Gross and Net: MfE for 7th National Communication. Sequestration using UNFCCC reporting rules.

16. Costing the transition pathways to the 2030 target was recently commissioned by the previous government and is underway. The plan for this analysis is being altered to now focus on the proposed 2050 targets as well as the near term 2030 target. We cannot advise, in time for November 2017 Cabinet decisions, on the economic and social impacts of a 2050 target. However understanding the impacts of the 2050 target will be necessary to ensure an efficient and just transition.

17. To illustrate the complexity of the necessary impact analysis:

    17.0. The UK Commission assessment of a target's impacts across the economy took two years and was based on complex modelling of cross-sector abatement curves by McKinsey.

    17.1. The Royal Society; Globe-Vivid; the Productivity Commission and PCE all:

    - focus on potential transition pathways without providing analysis of the economic and distributional impacts
    - highlight the need for better information on the impacts of abatement methods, the cost of abatement and the policy levers that will achieve those abatements.

Work is underway to assess the impact of the potential 2050 targets

18. A Transition Hub has just been established within MfE and is working across government agencies to provide costed options for lowering emissions and transitioning the economy.

19. The Transition Hub is:

    19.0. staffed by economists and includes a wider inter-agency working group: MfE + MPI, MOT, MBIE, Treasury, MFAT.

    19.1. working to generate sector-specific marginal abatement cost curves and assessment of benefits, and whole-of-economy effects by:

19.2. planning and commissioning rigorous analytics on abatement in key sectors: agriculture, energy, transport, industrial processing and forestry.

19.3. commissioning modelling that is more complex than ever undertaken. Similar work took 2 years in UK, based on McKinsey's MACC modelling.

20. Given the increased level of the new government's ambition, the Transition Hub's work stream has been substantially revised.

21. The required transition to achieve either 2050 target will be challenging, and will require a fundamental economic shift. To achieve abatement across key sectors, bolder action on climate change will require further investment, policy intervention and substantial economic transformation.

21.0. As highlighted in a 2017 Vivid Economics report[7]., commissioned by GLOBE-NZ, necessary transformations could include moving towards 100% renewable electricity with fossil generation only called upon in years of hydro shortages, the electrification of low grade industrial heat sources, and potentially some industry closures. Transport would likely need to shift to mostly electric vehicles with more domestic freight carried by rail.

21.1. New methane inhibitors and breeding techniques would also need to be developed to help reduce agricultural emissions, and we can anticipate land use changes accompanied by substantial afforestation.

22. However, the benefits of such transformation will also be substantial, and will enable New Zealand to become a world leader in emissions reduction innovation.

22.0. As countries take steps to reduce their own emissions, global demand is increasing for clean technology, low-emission food, fibre, and other materials.

22.1. Starting the transition today to create a low emissions economy could give New Zealand businesses and producers a competitive advantage to meet the new demand in global markets.

22.2. Diversifying our economy, including having a wider range of high-value land use options, will make New Zealand more able to adapt and manage our risk. It will also put us in a stronger position to show leadership internationally, and materially assist our neighbours.

23. s9(2)(f)(iv) - Confidentiality of advice [redacted]

Analysis undertaken in 2015 on the impacts of the 2030 target

25. New Zealand has an existing target for 2030 under the Paris Agreement, as set by the previous government. This commits to a reduction in emissions to 30 per cent below 2005

[7] Vivid Economics (March 2017). *'Net zero in New Zealand: Scenarios to achieve domestic emissions neutrality in the second half of the century'.* [http://www.vivideconomics.com/publications/net-zero-in-new-zealand]

Land use change/ forestry	• Substantial afforestation	Net Zero Emissions needs 1.1 – 2.35 million hectares, approx 2 billion trees

31. Achieving the transformation envisaged by Vivid will mean significant policy interventions and investments, and the realisation of stretch-assumptions Vivid includes on the pace of technological innovation.

32. s9(2)(f)(iv) - Confidentiality of advice [redacted]

33. Further information will be available following the Productivity Commissions' completion of its draft report and so, if the recommended timeframe is adopted, will be available prior to final policy agreements by Cabinet. More detailed estimates resulting from the Transition Hub's work on sector specific and distributional impacts will also be available prior to final Cabinet decisions later in 2018.

34. New Zealand will be expected to table a new Nationally Determined Contribution target that demonstrates progression on our previous target every five years. So in 2025 New Zealand has an opportunity to set more ambitious targets for after 2030 – towards any desired net zero 2050 goal.

35. Or, the 2030 target can be revised at any point. Aligning any revision with the key timeframes of the Paris Agreement would be the most practical option. We suggest revision in 2020 as part of a review process that will follow a 2018 Facilitative Dialogue, as agreed in Paris at COP21. The Facilitative Dialogue will take stock of countries' collective efforts in reducing emissions in preparation for first NDCs.

S 9(2)(f)(iv)-Active ministerial consideration [redacted]

37. s9(2)(f)(iv) - Confidentiality of advice [redacted]

55.1. s9(2)(f)(iv) - Confidentiality of advice

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IN CONFIDENCE
17-B-04020

2050 Target

Discussion with the Minister for Climate Change, Hon James Shaw
28 November 2017

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Focus of the meeting

Purpose: *outline our current targets and the options available for a 2050 target*

1. Context
2. Setting a 2050 target
    - Key considerations
    - How to define the target
    - Process
3. Where to from here?
4. Key takeaways

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Context

Making Aotearoa New Zealand the most liveable place in the world
Aotearoa – he whenua mana kura mō te tangata

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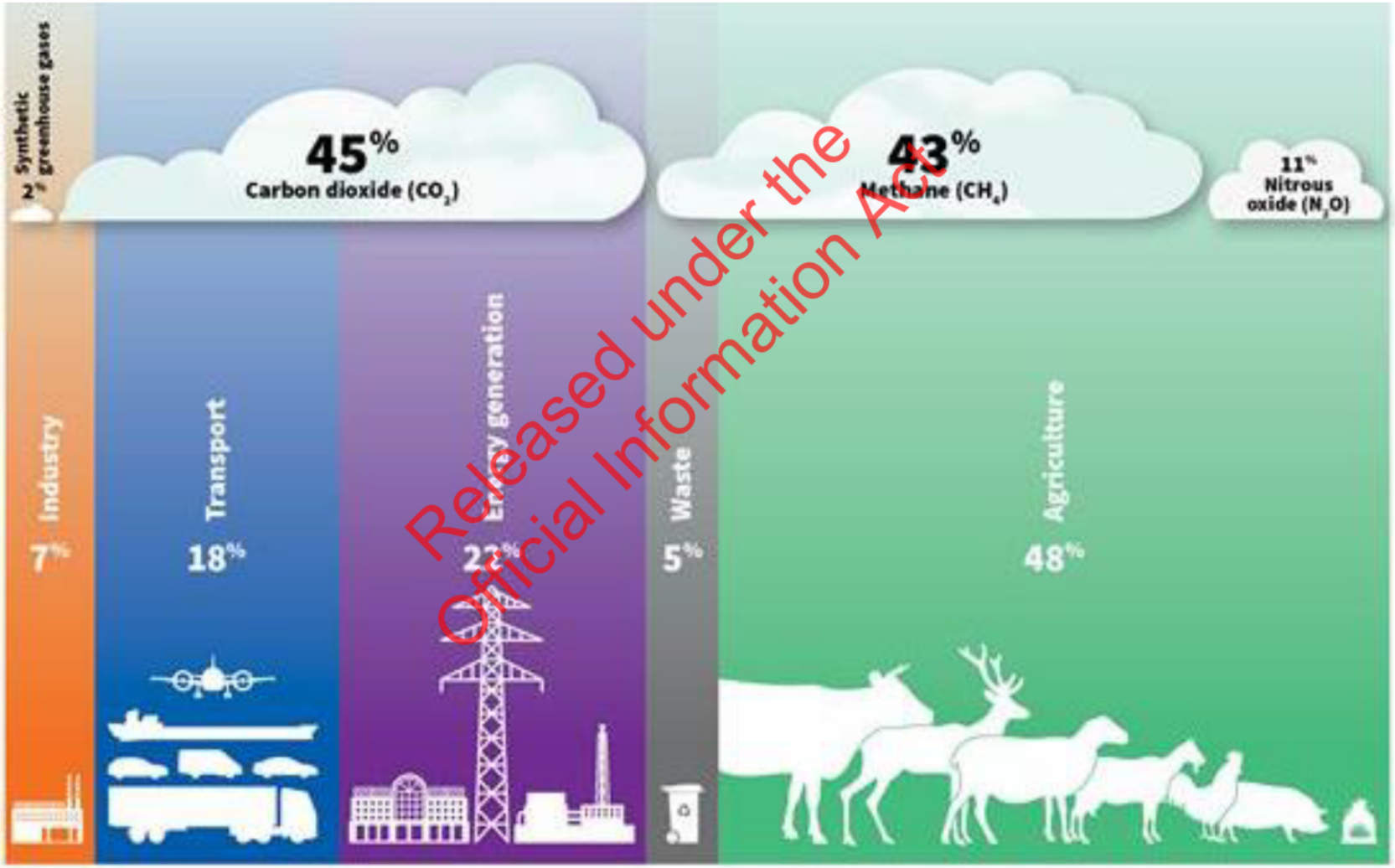
Context - New Zealand's current emissions profile



Source: New Zealand's Greenhouse Gas Inventory 1990-2015, Ministry for the Environment

Note: Percentages may not add up to 100%, as they are rounded to the nearest percent.

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Context - Our current targets

2013-2020 target	2021-2030 Nationally Determined Contribution	2050 Gazetted target
• - 5% on 1990 levels by 2020 • Multiple year Carbon Budget • All gases, economy-wide target • Responsibility target	• -30% on 2005 levels by 2030 • This is -11% on 1990 levels by 2030 • Multiple year Carbon Budget • All gases, economy-wide target • Responsibility target	• -50% on 1990 levels by 2050 • Single year target • All gases, economy-wide target

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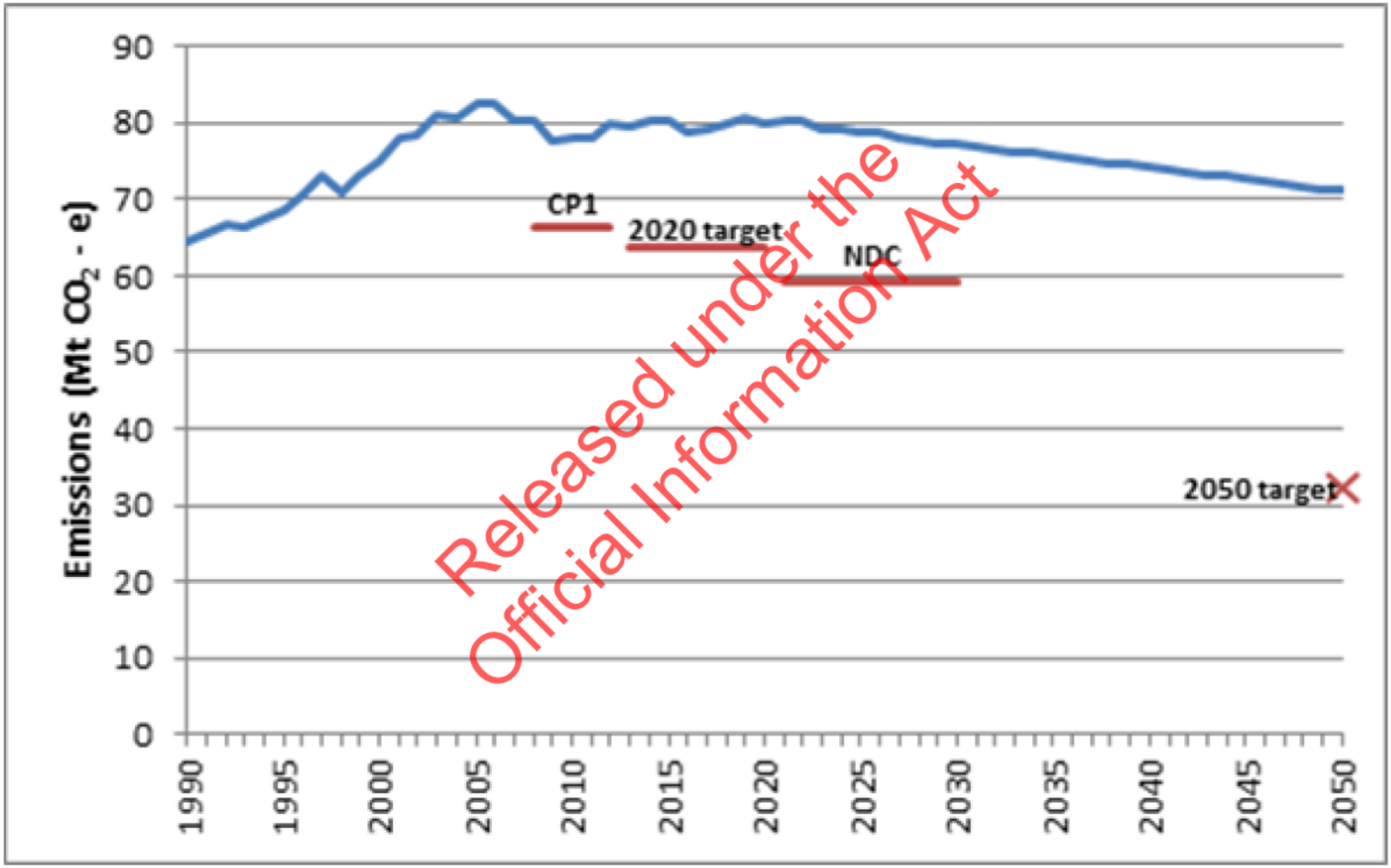
Context - Our current targets



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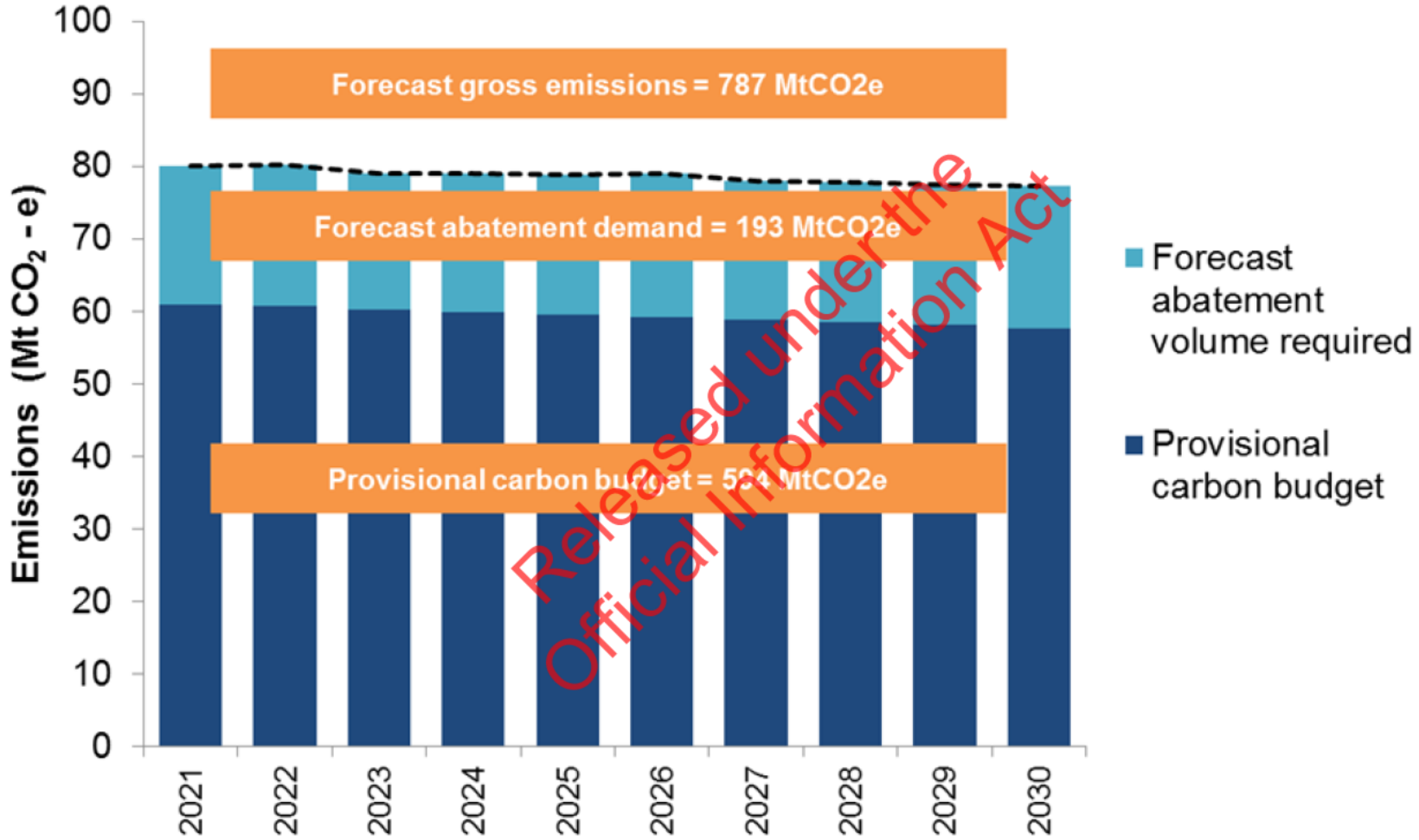
Context – Our Nationally Determined Contribution



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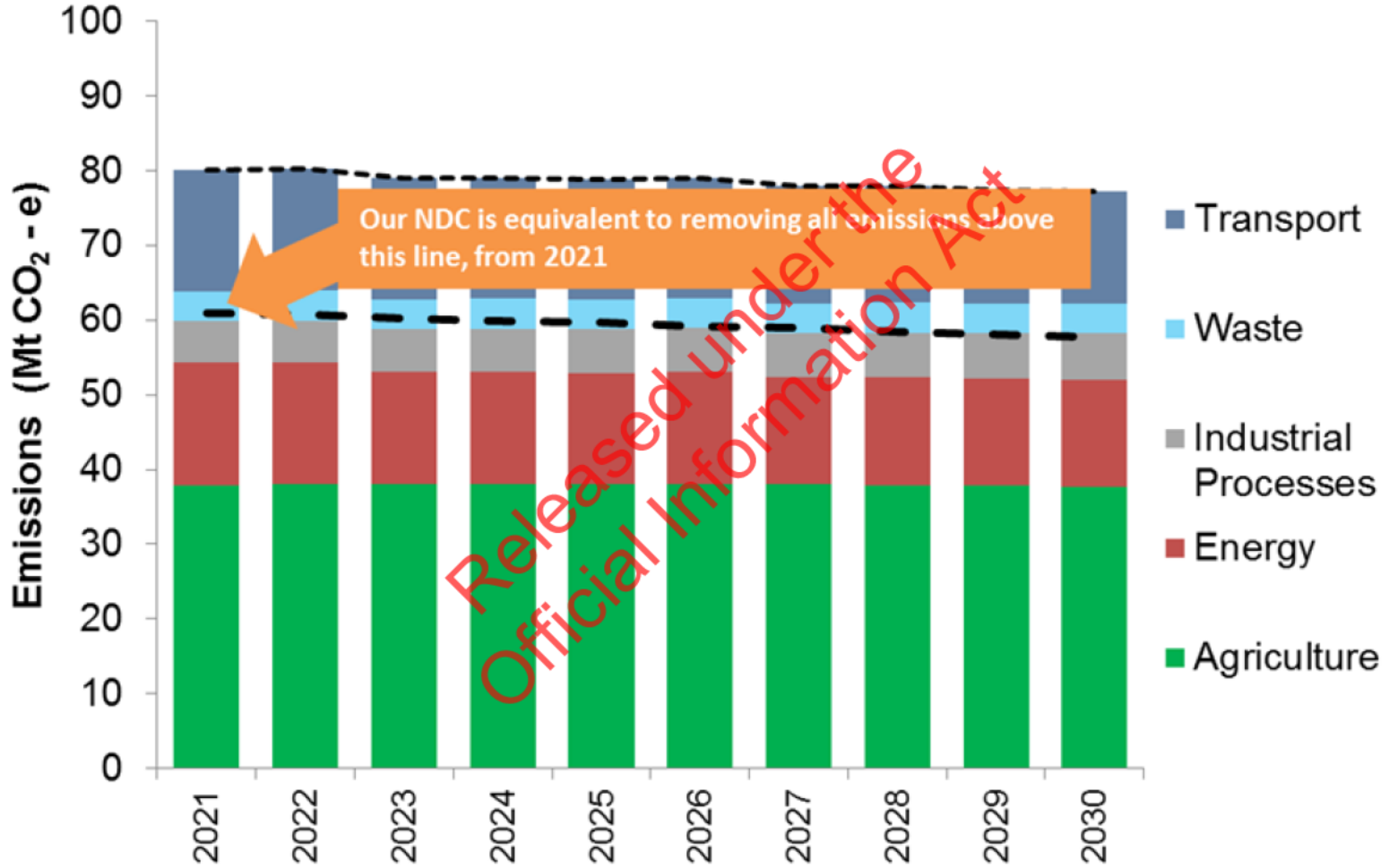
Context – Our Nationally Determined Contribution and sectoral emissions



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Setting a 2050 target

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Setting a 2050 target – key considerations

Setting a target

- Headline objective (e.g. net zero emissions)
- How we define our target (e.g. scope, coverage etc)
- Impact (determined by volume of emissions reduction, where reductions come from etc.)

Process

- How to put a target in place (e.g. through legislation)
- Implications of this (e.g. impact on Govt. books)

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Setting a 2050 target – Headline objective

You have stated a goal of a zero carbon *or* zero emissions by 2050

- "becoming a net-zero emissions economy by 2050 is not going to be easy" (Hon James Shaw, speech during COP23)
- "introduce a Zero Carbon Act" (Confidence and Supply Agreement between New Zealand Labour Party and the Green Party of Aotearoa New Zealand)

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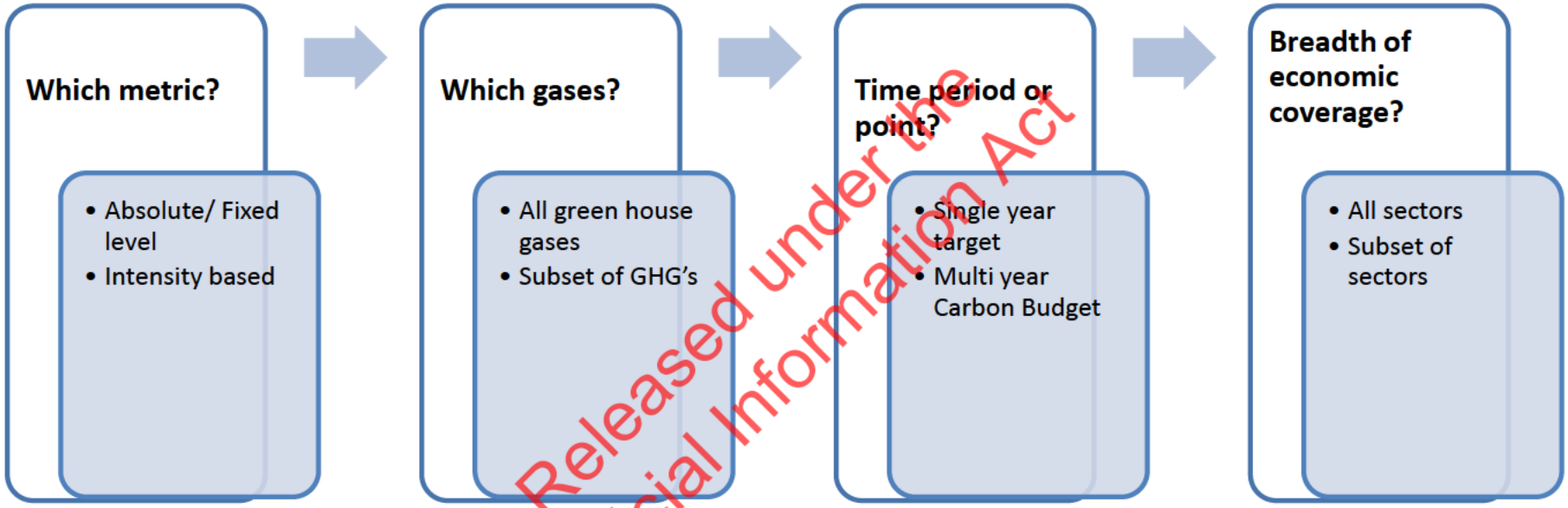
Setting a 2050 target – How we define our target



Alignment with international commitments – under the Paris Agreement:

- Countries are expected to communicate a long-term low emissions development strategy
- Countries are required to update nationally determined contributions (every 5 years)
- Aim is to reach net zero global emissions in the second half of the century

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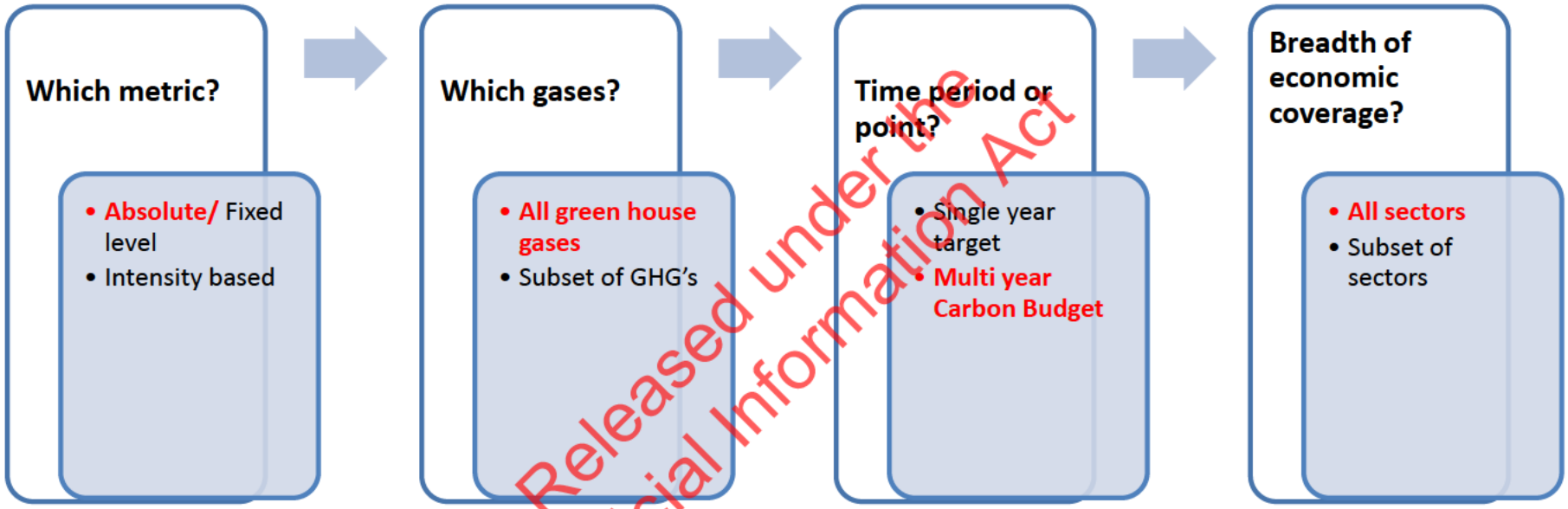
How we defined our 2030 target



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Setting a 2050 target – How we define our target

Forestry is a source of emissions and carbon removals

- Important source of removal, but forests will eventually release CO2 back into the atmosphere if harvested

Accounting for forestry is complex and can have a large impact on the ambition of our target

There is no single "right" way to account for forestry:

- NZ's nationally-determined approach is based on modified Kyoto Protocol approach to recognize long term changes in the carbon stored in the forests. It is well supported internationally, and similar to the approach used by the EU.
- The "2050 zero" work by Vivid and Generation Zero included the impact NZ forests calculated in a different way to how NZ accounts internationally, and also increased the afforestation rate substantively.

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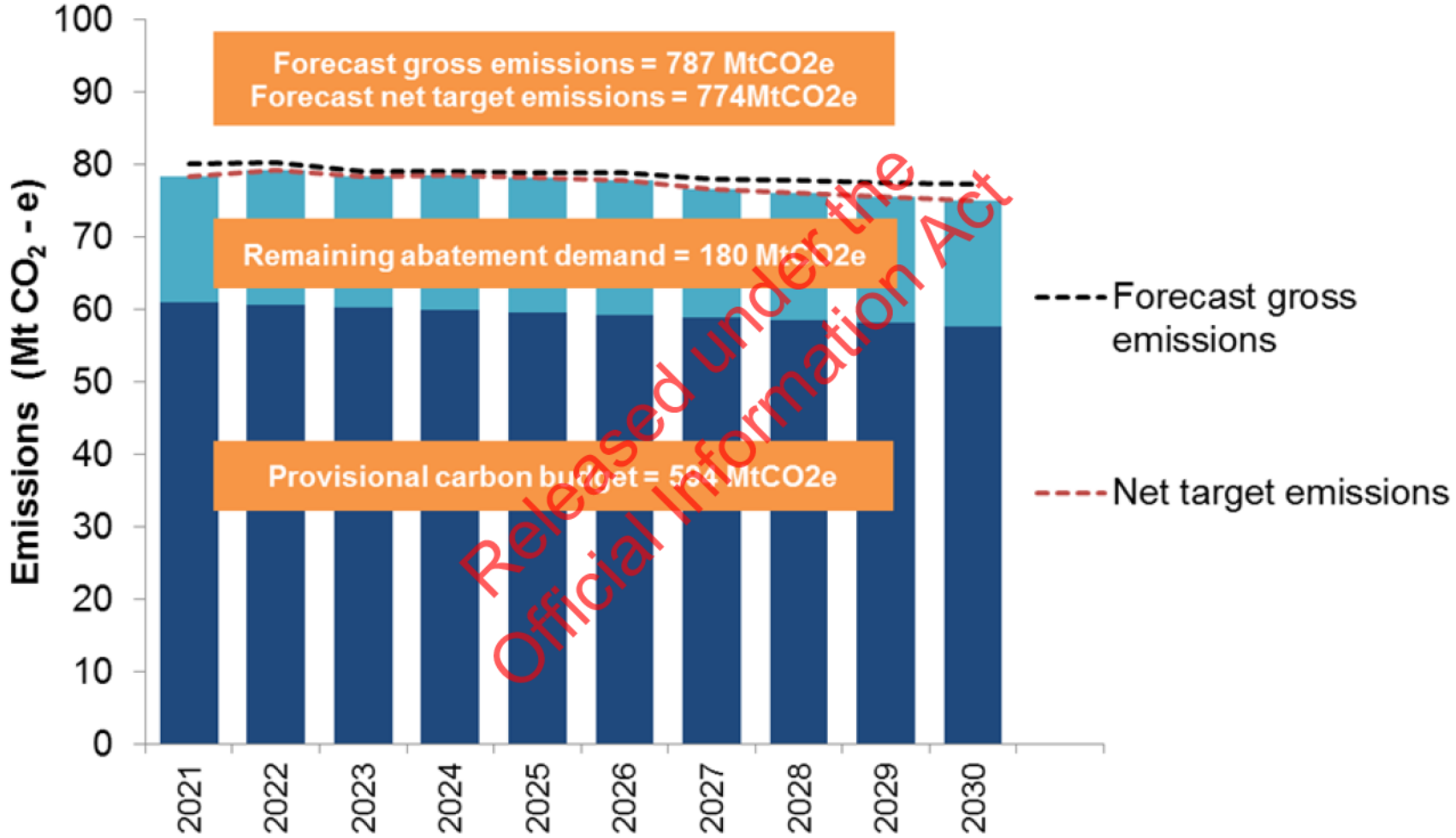
Setting a target – How we define our target



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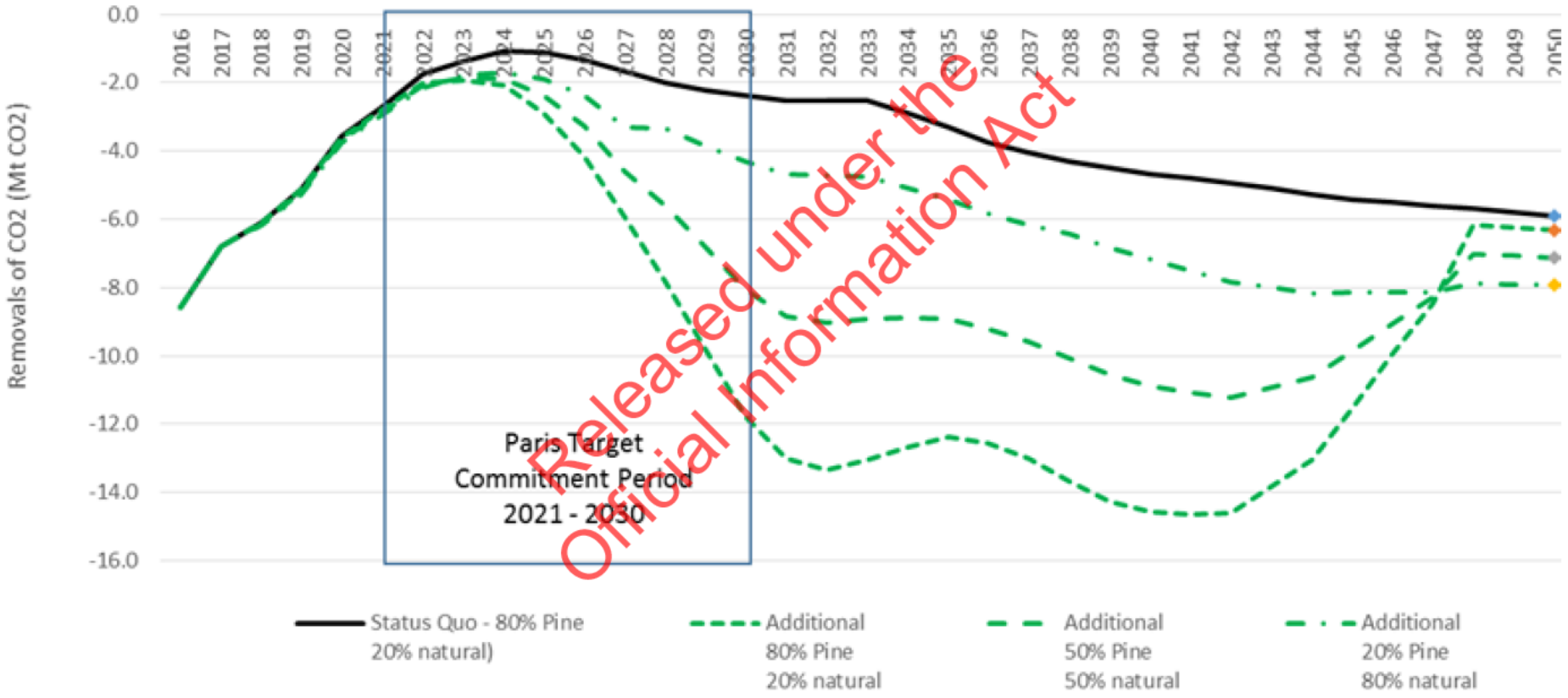
Setting a target – Contribution of 1 billion trees (forecast)



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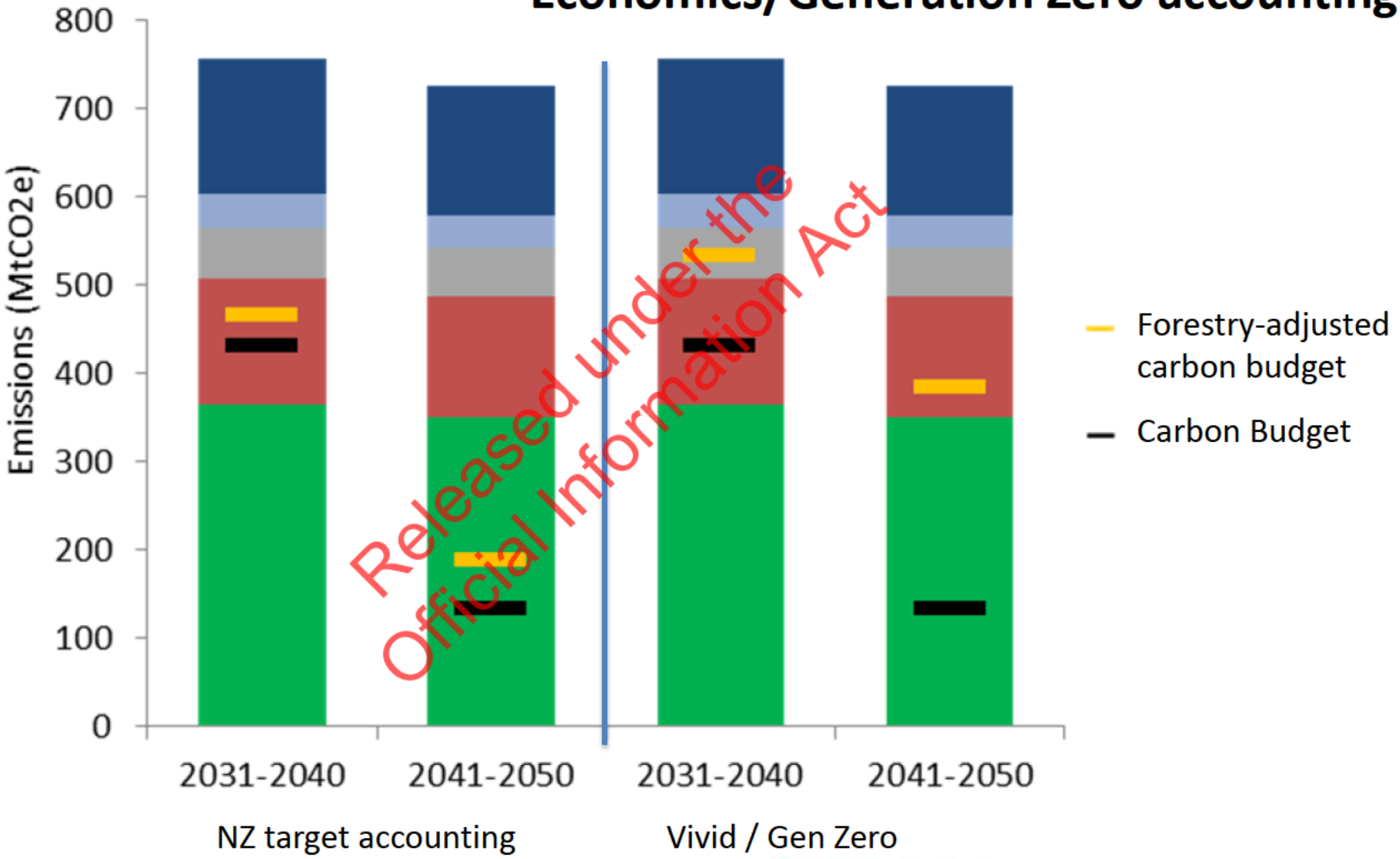
Setting a target - NZ target accounting vs Vivid Economics/Generation Zero accounting



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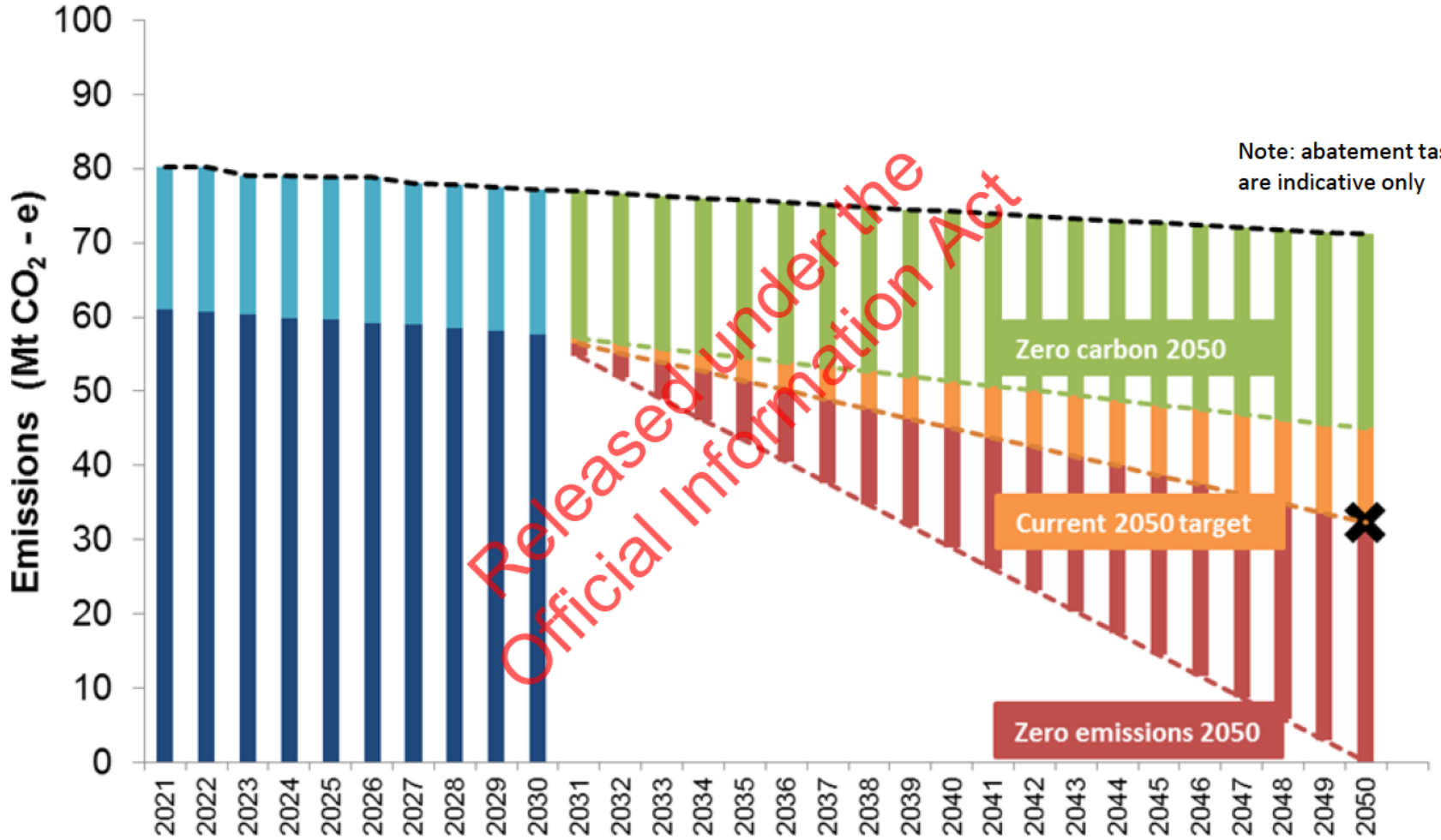
Setting a target – impact (volume)



Note: abatement tasks shown are indicative only

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Setting a target – impact of target vs status quo

Projections are produced for each sector

Key assumptions: Economic and population inputs, exchange rates, commodity prices, oil price, assumed carbon price, assumed afforestation/harvest/deforestation ages/area, vehicle fleet sizes

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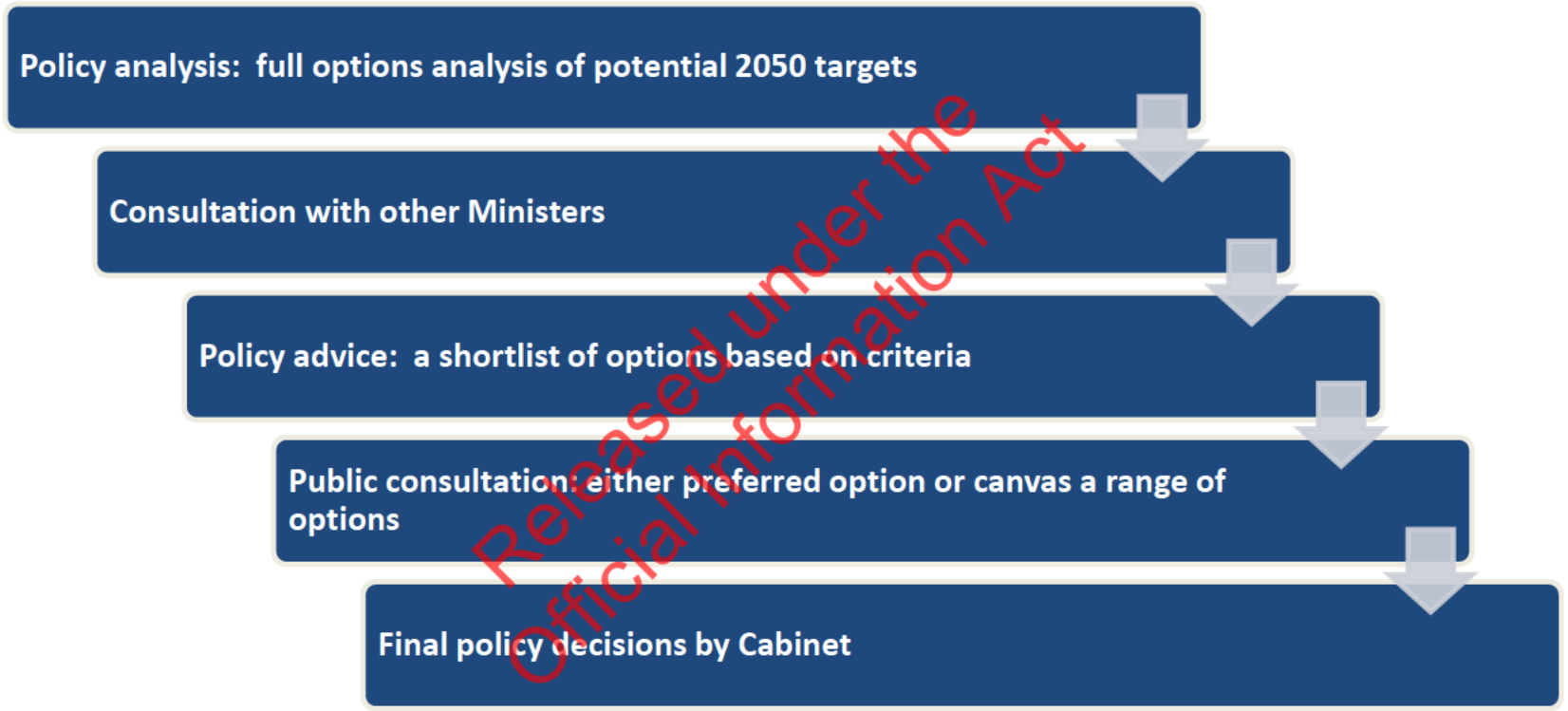
Process – how to put a target in place (policy process)



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Process – guiding principles

GUIDING PRINCIPLES FOR POLICY DEVELOPMENT

- **Bringing people along on the journey**: a transparent and participative approach to policy-making so that our strategy resonates with citizens
- **Investment predictability**: helping people plan ahead by being clear about what the aspirations are now
- **Adaptability to a changing environment**: with complex problems and systems, policy responses may need to change and adapt through time
- **Governance:** enduring institutional arrangements for climate change and strong environmental governance
- **Ensuring a just and efficient transition**
- **Sound data and evidence:** having the right information to make good decisions

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Process – how to put a target in place (instrument)

Regulatory instrument?

- Primary legislation (Act of Parliament)
- Secondary legislation (regulation)
- Gazette notice
- No regulatory instrument (e.g. public statement)

Role of interim targets?

- Interim targets between 2030 and 2050?

Built in reviews?

- Following the Paris Agreement framework – every 5 years, starting in 2023
- Update based on availability of more recent projections
- Update following recommendations from the Climate Change Commission

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Process – how to put a target in place (implications)

Your choice of instrument will have implications - for example fiscals

Whether the target has fiscal implications depends on how the Government is planning to meet the target (including who bears the cost of doing so, and how/whether the costs of meeting the target can be calculated) and when the Government is obligated to incur those costs.

- Reporting depends on the detail known on the fiscal implications, and the existence of an obligation that the government has little or no discretion to avoid.

Specific Fiscal Risk	Fiscal Liability
Reported when costs or obligations are under policy consideration, and there is a risk in excess of $100 million is more than 20% likely to occur.	Forecast (and reported) if the fiscal costs and obligations and their timing are known in enough detail.

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Process – how to put a target in place (comparisons)

EU	•80% reduction in *gross* greenhouse gas emissions by 2050 compared to 1990 levels through domestic measures only •80-95% reduction with international emission reductions	Not in legislation
UK	•at least 80% reduction in *gross* greenhouse gas by 2050, relative to 1990 levels	In legislation
Germany	•80 to 95% cut in *gross* greenhouse gas emissions by 2050 compared to 1990	Action Plan approved by Cabinet
Norway	• *net* greenhouse gas emissions to zero by 2050 (note net is different to NZ net) •conditional aim to meet this target earlier by 2030 through EU emissions trading/purchasing international emissions reductions	Parliament approval
California	•80% reduction in all emissions by 2050 below 1990 levels	Not in legislation
Canada	•80% reduction in all emissions by 2050 below 2005 levels	Not in legislation
China, India, Brazil Australia, South Korea	•Currently only 2030 targets - no 2050 target	

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Where to from here?

Evidence base, analysis, consultation and next steps

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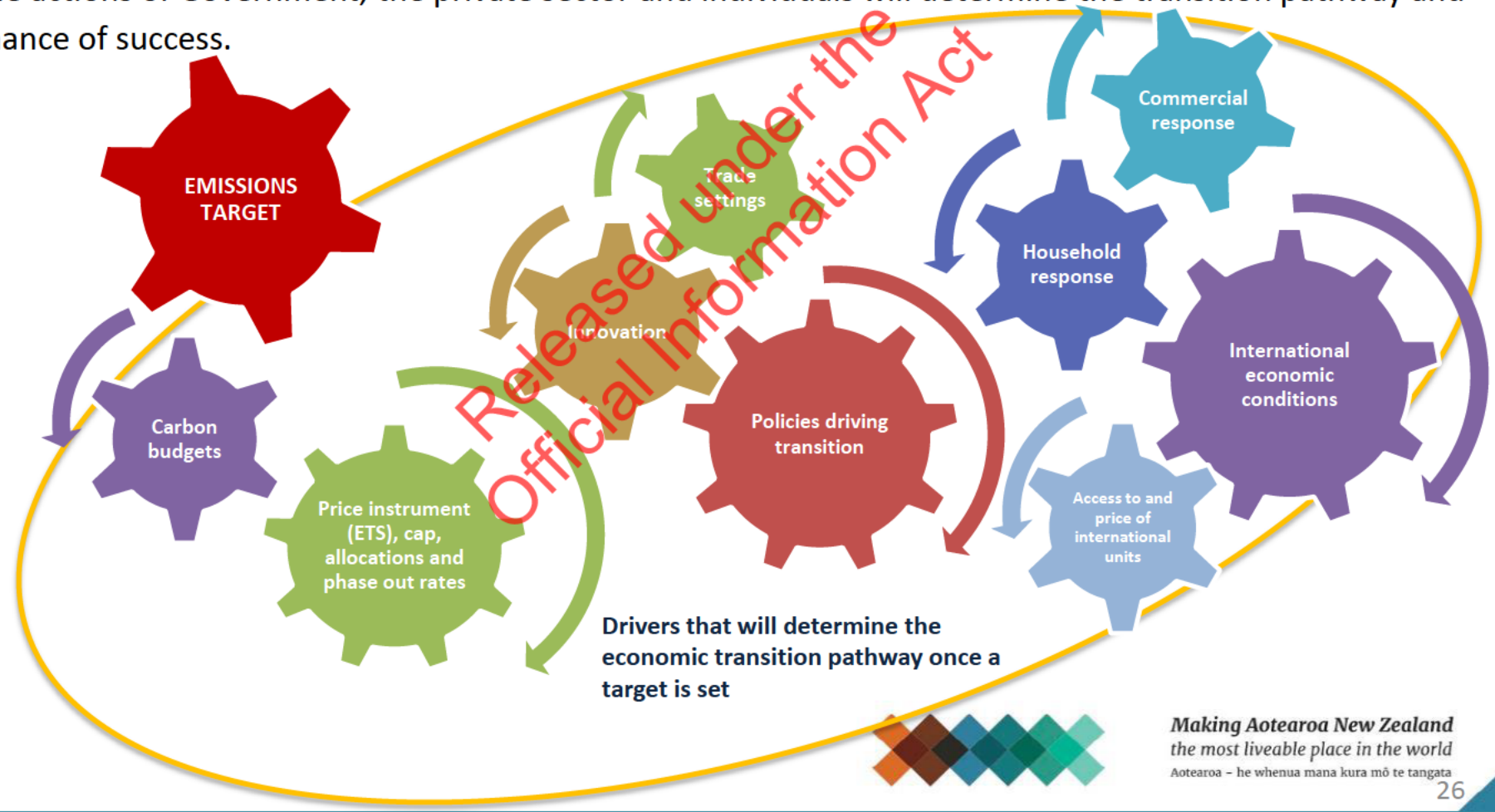
Evidence base: impact of targets

- A target forms part of a wider regulatory system, including a Climate Commission and government policy decisions on the ETS and other policies to shift the economy to low emissions.
- The actions of Government, the private sector and individuals will determine the transition pathway and chance of success.



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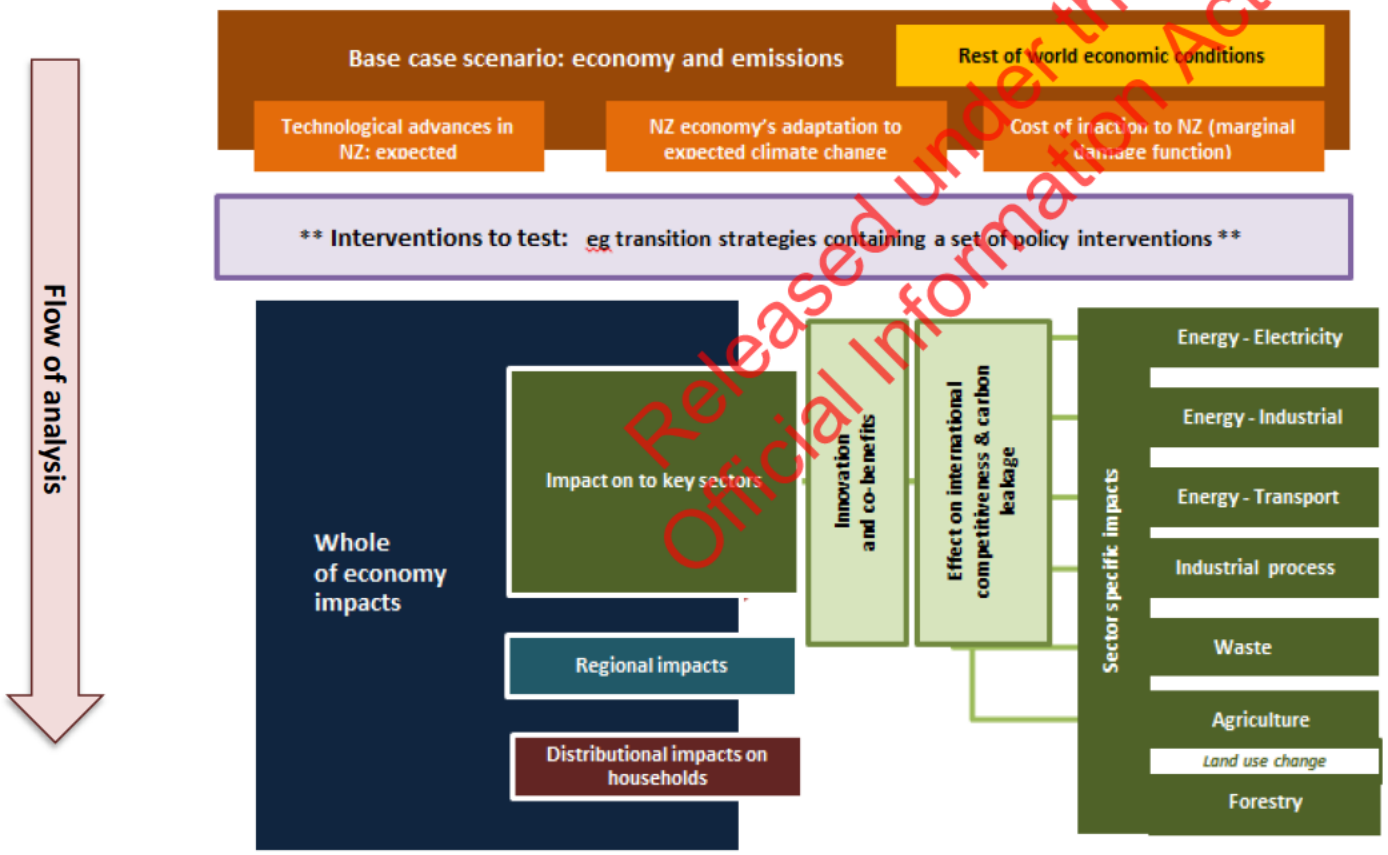
An evidence base on impacts of target choices

To assess merits of different target options, we are aiming to provide you with

- **whole of economy impacts (benefits & costs, incl. innovation benefits and effects on international competitiveness),**
- **sector specific, regional and distributional impacts**



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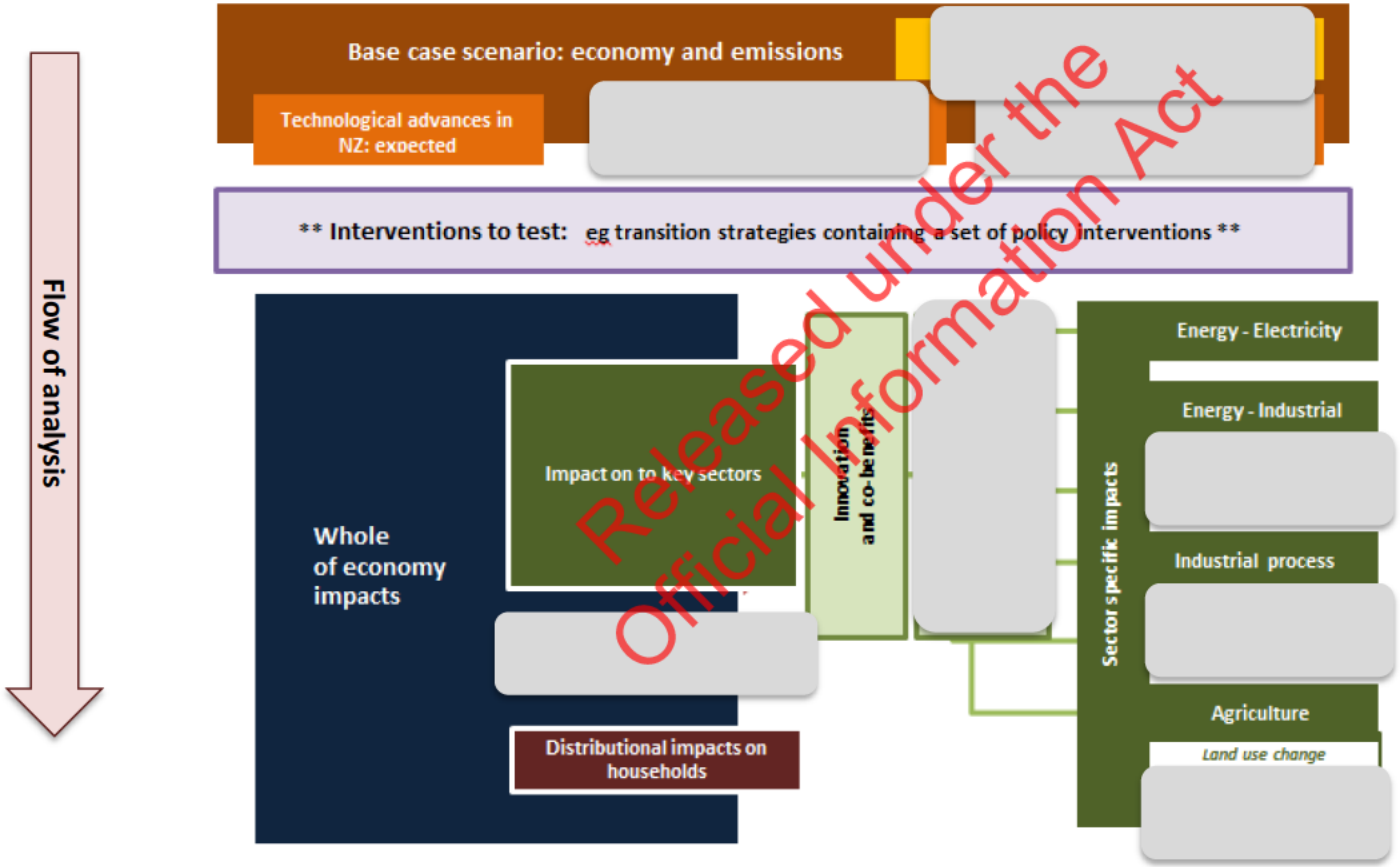
An evidence base on impacts of target choices

Provisional advice is anticipated pre-consultation:



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Evidence base: impact of targets

Scope		Focus	Detail
Whole of economy	Whole of economy effects	Impacts within key sectors	Transition pathways under uncertainty – Vivid modelling
		Impact on GDP and household earnings	Computable General Equilibrium (CGE) modelling (improved)
		Regional & distributional impacts	Output of CGE: impact on income quintiles
		Innovation benefits - study	Input into CGE: productivity and knowledge spillovers in low-e sector
		Trade & carbon leakage	Research & output of CGE: Impact on international competitiveness & carbon leakage.
	Energy sector	Generation	Research: Impact of market design on/for abatement potential
		Electricity demand	Potential to shift demand - tbc
		Transport	Evs – potential and cost: input into CGE Modal shift: research
		Industrial process heat	Energy efficiency, process redesign and fuel substitution
	Land use	Land use	Assessing potential for land use change – Vivid and BERG
		Agriculture mitigation	Mitigation measures and associated costs - tbc
		Forestry sequestration	Forestry accounting, abatement potential, policy levers and land availability – ongoing work

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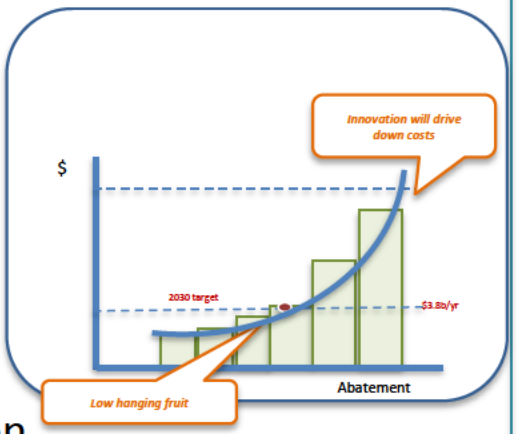
Evidence base: impact of targets

- Abatement costs increase the closer we get to net zero emissions
- Cost effectiveness analysis is expected to tell us:
  - to focus early abatement efforts in energy sector: electricity use and transport.
  - land use change will be important
  - mitigation within existing farm systems may be less cost effective (taking narrow 'cost' focus).
- Marginal benefit curve also highly relevant:
  - Innovation benefits could be high but also uncertain:
    - If expected benefits are not attained, economic costs rise
    - Clearly signaling intent and longevity (cross-party support) are extremely important
    - Need to consider government's role in supporting innovation.
  - Co-benefits of mitigations across industries will also be investigated.



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Where to from here

Next Steps

- Come back to you ahead of public consultation, scheduled for mid-2018
- Will include:
  - policy analysis against target options, and
  - recommended approach to consultation

Consultation options to consider:

1. Full engagement announced post Cabinet decision followed by public stakeholder consultation in mid-2018 (*significant resourcing issues*)
2. Engagement with strategic stakeholders followed post Cabinet decision by public stakeholder consultation in mid-2018
3. No early engagement, public consultation in mid-2018

Consultation:

- Consult on a preferred approach, or
- on a range of options for 2050 target

To discuss: preferred level of complexity at consultation?

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Key takeaways

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Key takeaways

Meeting the current 2021-2030 target will be challenging

A 2050 target is only as good as the actions to implement it

We want to come back to you with a menu of choices for a 2050 target and for your low emissions strategy

To Hon James Shaw, Minister for Climate Change			Tracking #: BN-17-04082
Security Level	Unclassified	Number of Attachments	Nil
Date Submitted:	8 December 2017	Response needed by:	14 December 2017
MfE Priority:	Non-Urgent	Action Sought:	Noting

Meeting with Productivity Commissioners on their Low Emissions Economy Inquiry

Out of scope

Background on the Low Emissions Inquiry

3. The Productivity Commission was asked in May 2017 to conduct an inquiry into the transition to a lower net-emissions economy. The inquiry is framed around two central questions set out in the terms of reference:
   - What opportunities exist for the New Zealand economy to maximise the benefits and minimise the cost that a transition to a lower net emissions economy offers, while continuing to grow incomes and wellbeing?
   - How could New Zealand's regulatory, technological, financial and institutional systems, processes and practices help realise the benefits and minimise the costs and risks of a transition to a lower net emissions economy?
4. The Commission is looking at the opportunities for emissions reductions across different emitting sources, technologies, and processes in the economy, and the potential pathways for transitioning to 2050. The Terms of Reference for the inquiry specifically exclude the Commission commenting on the adequacy or suitability of particular emissions reduction targets.
5. In August the Commission published its issues paper which set out the main issues it is considering under its terms of reference and invited public submissions. The Commission received over 120 submissions in response to its issues paper. The draft final report is due in March, and its final report in June 2018.

6. The Commission is considering the economic institutions and policy tools that would best encourage and incentivise businesses, households, consumers and government agencies to move to a low-emissions future. The Commission has published a detailed research note on the powers and functions of the UK Climate Change Act, including the carbon budgeting process, and the independent Committee on Climate Change. Commission staff recently visited the UK to interview a number of people connected with establishing the Act.

7. The Commission's issues paper did not explicitly consider the question of whether agriculture should to be included in the NZ Emissions Trading Scheme, but did pose questions around the practicality of measuring and reporting emissions at a farm level, and the potential to encourage land use change. The issues paper also set out the case for a 'two baskets' approach which would differentiate between short and long lived greenhouse gases.

Current work with the Transition Hub

8. Officials are working closely with the Productivity Commission to ensure alignment between work programmes and to share analysis and evidence, including a current secondee S 9(2)(a)- Protection of from MfE into the Commission Inquiry.

9. The Productivity Commission and the Transition hub (led by MfE and co-ordinating analysis work across government agencies) have jointly commissioned research into the potential pathways and uncertainties of transitioning to a low emissions economy by 2050. This modelling will form part of the analysis to support the Commission's draft report in March 2018, and provide context for the public engagement on the level of the 2050 target. The research will examine the energy, transport, agriculture and forestry sectors in detail to look at potential changes which might be required to transition to a low emissions economy.

10. The Transition Hub and the Productivity Commission have also jointly supported a number of expert roundtables convened by Motu, to discuss the key issues that need to be resolved in order for New Zealand to transition to low emissions.

Signature

Name: Paul Alexander
Programme Director: Climate Change Transition Hub

Hon James Shaw
Minister for Climate Change **Date**

Ministry for the Environment contacts

Position	Name	Cell phone	1st contact
Principal author	S 9(2)(a)-Protection of natural persons		
Responsible Manager	Paul Alexander	021 243 0685	*
Director	Roger Lincoln	027 290 7625	

Meeting with Productivity Commissioners on their Low Emissions Economy Inquiry

Suggested talking points

1. Where are the main opportunities for emissions reductions in New Zealand, and what are the key decisions we face as we plan for a transition to low emissions?
2. I'm interested in the opportunities and benefits that a transition to low emissions can bring – how is your inquiry considering these?
3. From your discussions with the UK Committee on Climate Change and UK Government, how do you see the lessons of the UK's experience can be transferred to New Zealand?
4. How do you see your inquiry supporting the future work of a Climate Commission, including what opportunities there are to reduce emission in our agriculture sector, and implications for the NZ ETS?
5. What lessons can a future Climate Commission draw from the Productivity's Commission's experience to become a trusted and credible source of independent advice?

To Hon James Shaw, Minister for Climate Change			Tracking #: 17-B-04135
Security Level	IN-CONFIDENCE	Number of Attachments	Two
Date Submitted:		Response needed by:	15 January 2018
MfE Priority:	Non-Urgent	Action Sought:	Decision

Transition Hub's work programme

Key Messages

- In 2017, the Transition Hub was established as an inter-agency group of officials working to provide advice on the choices available to meet our 2030 Paris climate target, set future targets and advise on transition pathways.
- The focus of the Hub is to:
  - join up climate change work across government;
  - coordinate advice on the transition pathways for our domestic economy and the narrative on what a 'just transition' could look like, and
  - assess the economic impact of a new 2050 climate target to support your consultation and Zero Carbon Bill process.

Out of scope

[redacted]

e. **Note** there is likely capacity to pursue 2-3 high profile opportunities from within current resourcing, and the proposed approach is to galvanise other agencies and actors to drive change with some facilitating and connecting to support them.

Signature

Roger Lincoln
Director, Climate Change

Hon James Shaw
Minister for Climate Change **Date**

Ministry for the Environment contacts

Position	Name	Cell phone	1st contact
Principal author	Protection of		
Responsible Manager	Paul Alexander	021 243 0685	X
Director	Roger Lincoln	027 290 7625	

Christmas reading: Transition Hub's work programme

Out of scope

The context of the Transition Hub's work

In 2017 the Transition Hub was set up to coordinate Government work on domestic emissions reduction and transitioning to a low carbon economy

2. Through Budget 2017, the Transition Hub was established as an inter-agency group of officials working to provide advice on the choices available to meet our 2030 Paris climate target, set future targets and advise on transition pathways. It included a budget of $1m which is being used to build in-house economics and policy capability, and consultancy budget to fund modelling, economic analysis, and some selected partnership activity.

3. Officials from the Ministries for the Environment; Business, Innovation and Employment; Primary Industries; Foreign and Trade; Transport; and the Treasury have been involved in the setup of the hub. The establishment process also included Protection of Business NZ) and Protection former CE of Climate KIC - Knowledge Innovation Community Europe) to provide input on business and innovation and enterprise.

4. We want to ensure the approach taken going forward sets you up to succeed with your objectives for a 'just', and ambitious transition work programme.

A key tenet is to take a systems approach to drive better outcomes through co-ordinated climate initiatives.

5. We are conscious that for such a significant programme, a traditional agency-driven policy approach won't work. A number of reports, including the Royal Society report on transition, point to the need for a holistic approach, the need to involve changes in behaviour across all sectors of society, and to co-ordinate such initiatives across sectors and domains, supported by strong communications.

6. This will involve approaching policy differently, harnessing expertise across government, but also catalysing innovation and supporting voluntary actions that can reduce emissions at no or minimal fiscal cost.

7. We also need to build a strong evidence base to support decisions on the relative costs and benefits of policy interventions. A primary focus in the last 4 months has been building the capability and work programme to improve the evidence base. More detail is set out in Annex 1.

8. Overall the approach to the transition includes the following principles:

    - adopting a systems approach to derive system benefits where possible, to derive economy-wide benefits and other social and environmental benefits;

- information sharing - operating as a 'hub' across key government agencies to share information, analysis, and policy thinking (this is consistent with the UK 'Clean Growth Directorate' which co-ordinates the policy response to the Climate Change Committee carbon budgets)
- partnering and co-designing solutions where possible (e.g. AirNZ and DairyNZ partnerships) as well as connecting with iwi, business and civil society
- facilitating innovation and enterprise solutions
- open by design – aiming to share and build data platforms, make information readily available (e.g. establishing Memoranda of Understanding that would allow any information to be used by the Interim Climate Committee and the eventual Climate Commission).
- build internal capability where cost effective to do so.

The Transition Hub identified four core areas that will be necessary to help New Zealand transition

9. In line with these core principles, the Transition Hub has a strategy role in the case for, and pathway to, a low emissions economy. It includes four interconnected functions:
    i. Function 1 –Develop a robust **evidence and data** base of the potential impacts of targets and to support policies to reduce transition to a low emissions economy.
    ii. Function 2: Understanding the **policy** choices and impacts to reduce emissions now and in the future
    iii. Function 3 - Accelerating the transition to a low carbon future by connecting and motivating **innovation and enterprise**
    iv. Function 4 – Using **dialogue** and **storytelling** to shift behaviour to support the transition.

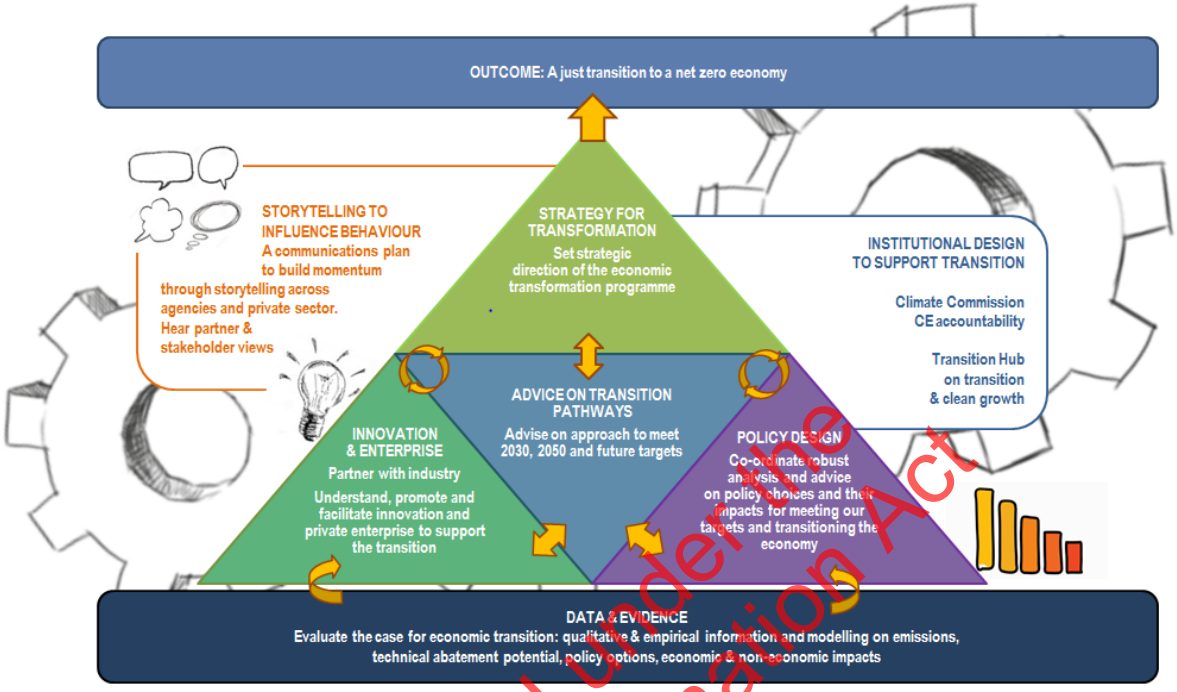
Function 1: Data and Evidence programme of work

Data and evidence will play a crucial role in supporting the transition

10. You have recently announced the process for the Zero Carbon Bill as part of the 100 day policy project. The Transition Hub is helping with this process by coordinating advice on the transition pathways and the narrative on what a 'just transition' could look like, assessing the economic impact of a new 2050 climate target to support your consultation and the Zero Carbon Bill process
11. As a priority, an economic evidence base is required to support:
    - the 100 Days policy project's advice to you and other Ministers on the potential economic impact of 2050 targets
    - the wider cross-agency and future Climate Commission's advice on policies to support transitioning to a net zero emissions economy.
12. Climate policies - such as amending the ETS, decisions on free allocations, developing a widespread afforestation programme or regulatory interventions in the energy, transport, agricultural or waste sectors, or cross-economy tools such as R&D support or climate

finance - will have sector-specific and whole-of-economy impacts at both the regional and national levels.

Figure 1: The Transition Hub's approach across Evidence, Innovation and influencing



13. Bringing together bottom-up cost modelling, whole-of-economy modelling, empirical and qualitative research will contribute to an understanding of the potential direction and magnitude of the impacts of targets under consideration. It will also support wider cross-agency and a future climate commission's advice on policies to support a transition to a net zero emissions economy.

14. Developing this evidence base relies on a multi-method approach. A fuller description of each method is explained in Annex 1. Active consideration- S 9(2)(f)(iv)

[redacted]

A [redacted]

V [redacted]

15. Following the priority work to support the consultation on targets, the next key area of focus is to construct New Zealand's marginal abatement cost curve (MACC) for key sectors; electricity (power), electricity (transport), electricity (industrial processing), agriculture, forestry and waste. This will be critical to understanding the potential for transitioning to low emissions, and the impact of each potential method to abate emissions.

16. The development of an accurate MACC provides insights as to where to achieve emission reductions in an economically efficient manner. A good MACC takes into account benefits as well as costs. Constructing robust MACC curves takes time and is not feasible within the proposed legislative timeframe to setting a new 2050 target.

17. While we recognise that MACC provide a means for the initial framing of potential policy options or measures and their abatement potential, we also recognise their limitations. As such, we are undertaking empirical and qualitative analysis of the key sectors noted in conjunction with MACC development.

Ensuring a platform for future data and evidence needs

18. The UK approach has been to build modelling and economic analysis capability over time, and we hope to emulate that here, including building an evidence base that both agencies and a future Climate Commission can benefit from.

19. Setting future targets as we shift towards a low emissions economy will require ongoing process of building a better evidence base. This will include a regular cycle of updated projections and estimates of emissions reduction possibilities. The Ministry wishes to build in-house capability – *and across agencies* – in preparation for impact analysis of climate action policies considered in future years as the policy and legislative framework for the transition pathway to low emissions is developed.

20. While ensuring we have a robust information base to support choices for Government, future work could look to align cross-agency modelling and research, and investigate the potential wider benefits from government developing open-access data platforms. Shared data platforms and data analytics/modelling could support public and private decision makers investing in low emissions solutions; and support a collective response to climate change. We would be interested in discussing with you opportunities to connect with your Statistics portfolio.

Function 2: Policy

21. We need to understand the policy choices and impacts to reduce emissions now and in the future. The evidence base being developed by the hub, and by individual agencies, will inform those policy choices for you.

22 Active consideration- S 9(2)(f)(iv) [redacted]

Active consideration- S 9(2)(f)(iv)

Out of scope

[redacted]

Out of scope [redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted].

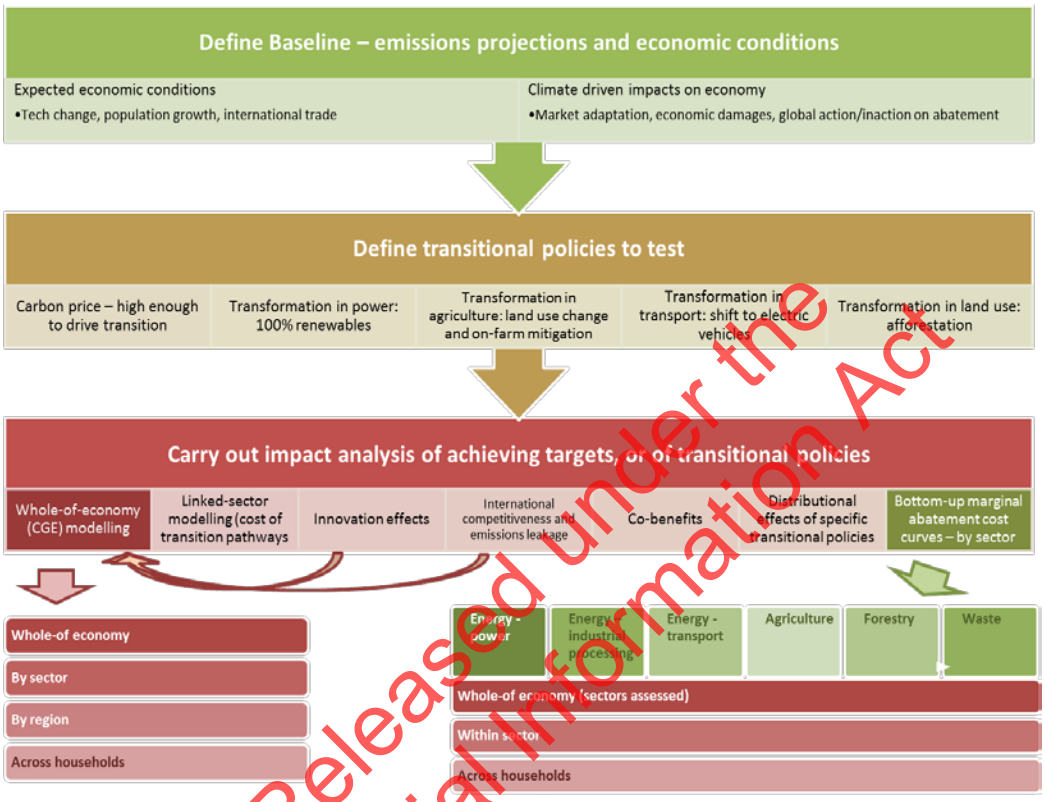
Annex 1. Further Detail on Data and Evidence Workstream

Data and evidence will play a crucial role in supporting the transition

1. Climate policies designed to support transition to a net zero emissions economy - e.g. setting targets, amending the ETS, decisions on free allocations, developing a widespread afforestation programme or regulatory interventions in the energy, transport, agricultural or waste sectors, and also cross-economy tools such as R&D support or climate finance - will have whole-of-economy, sector-specific, regional and distributional impacts.
2. Bringing together bottom-up cost modelling, whole-of-economy modelling, empirical and qualitative research will contribute to an understanding of the potential direction and magnitude of the impacts.
3. Developing this evidence base relies on the multi-method approach illustrated in Figure 2 and described in more detail below. Work currently underway includes:
    - The **linked-sector modelling** by Vivid Economics, Motu and Concept Consulting commissioned by the Productivity Commission (the Transition Hub co-funds this work) and has a staff member on secondment to the Productivity Commission
    - **Whole-of-economy estimation of economic impacts** including
        - research and empirical analysis on the potential for current climate policies and a new 2050 emissions target **to impact on our innovation rate**, especially in low emissions sectors, impact on New Zealand's **international competitiveness**, and the potential for **emissions leakages**
        - **sector, regional and distributional impact modelling** (via computable general equilibrium analysis, commissioning is underway)
        - **considering the wider co-benefits** of a low emissions economy, so a wider lens than 'economic costs and benefits' and
        - **an early assessment of the distributional impact effect** of specific transition policies, and potential tools to mitigate negative distributional impacts.
    - The OECD's **SPINE** project, which models Auckland through a spatially defined CGE model out to 2040 to support the **city's efforts to transition to a low emissions economy through a set of transport and urban densification** policies.
    - **The Biological Emissions Reference Group's** assessment of abatement potential in biological emissions.
4. Further ongoing work includes:
    - Active consideration- S9(2)(f)(iv) [redacted]
    - [redacted]
    - Construction of New Zealand's marginal abatement cost curve (MACC) for key sectors; electricity (power), electricity (transport), electricity (industrial processing), agriculture, forestry and waste. This will be critical to understanding the potential for transitioning to low emissions, and the impact of each potential method to abate emissions

The development of an accurate MACC provides insights as to where to achieve emission reductions in an economically efficient manner. A good MACC takes into account benefits as well as costs. Constructing robust MACC curves takes time and is not feasible within the proposed legislative timeframe to setting a new 2050 target.

Figure 2: Multi-method approach to assess the economic impact of 2050 climate targets



Projects underway to support the development of a 2050 target

5. Delivery, or delivery of early findings, of the research reports or modelling detailed in this section *is expected prior to consultation on the proposed 2050 target*, and so this body of analysis will *form the basis of the discussion document's discourse on the potential impacts of targets* across the economy, and the areas government will focus to ensure a considered and just transition.

Linked-sector modelling (bottom up modelling) of transition pathways – the Vivid, Motu and Concept work in conjunction with the Productivity Commission

6. Linked-sector modelling is being undertaken by Vivid Economics, Motu and Concept Consulting, commissioned by the Productivity Commission. The project will advise on transition pathways towards a low emissions economy under scenarios under uncertainty, including uncertainty of innovation rates, via a bottom-up linked sector analysis across New Zealand's key emitting sectors.

7. The research will deliver estimates of the costs - across key sectors only - of different transition pathways, and will allow us to understand the technologies required to meet a 2050 target, any remaining emissions per sector, total costs of meeting the targets, and implication for future land-use and energy mix.

8. A key focus of the research is decision making under uncertainty. The research will look at three scenarios which explore different approaches to emission reductions, depending on expectations on technology change and structural composition. These are still being developed by the consortium. Initial thinking is for three scenarios based on the below:

Policy driven decarbonisation	Slow, sector-neutral, technological change means that ambitious policy action, specifically a high carbon price, would be required to achieve net zero emissions largely by using currently available mitigation options. This leads to a rapid expansion of the forestry sector and contraction of the emissions intensive pastoral agriculture. In the energy sector, the government supports reduction in emissions from heat through incentives to improve building stocks. In the transport sector the decision to convert electric rail to diesel may be reversed and further incentives provided to support public and active transport.
Disruptive decarbonisation	Rapid technological change causing disruption of current economic structures, with new technologies and products expected to create new markets, destroy demand in traditional industries and accelerate capital stock turnover. The expectation of a shift in global demand patterns away from he consumption of meat supports the expansion of crops and horticulture, while forestry expands but at a slower pace than the scenario above. Expected reductions in the price of renewable generation and battery technologies are reflected in the planned closure of coal generation capacity, the reduction in gas capacity, and grid investment to s pport distributed renewables and the electrification of transport. Aluminium and steel plants may close in response to expected changes in global supply and demand patterns.
Delayed structural change	Rapid technological change is expected to stabilise existing indust y structures through the emergence of new mitigation options, that reduce the need for large shifts in economic activi y. Recent trends to land conversion for dairy continue at a modest rate, which is supported by the use of alternative metrics to apply liabilities in he ETS, to reflect a social preference to focus efforts on long-lived greenhouse gases. In the energy sector minimum requirements are introduced for the use of biofuels in road transport, which prolongs the life of existing transport capital stock, and stimulates investment in new biofuel refining capacity.

9. The Transition Hub co-funds this work and has a staff member on secondment to the Productivity Commission who is ensuring that the modelling outputs will also be useful to the team and be readily incorporated into the Ministry's policy impact analysis.

The impact of climate targets on international competitiveness, the potential for carbon leakage and innovation rates

10. The Transition team is commissioning a study to develop a narrative explanation and empirical evidence base of the potential for a new 2050 emission target to directly impact on:

    - New Zealand's rate of innovation, especially in low emissions sectors
    - New Zealand's international competitiveness, including in trade exposed sectors
    - and/or create potential for emissions leakages.

11. The project comprises two workstreams that use qualitative and quantitative analysis to:

    - determine empirically the impacts of current climate policies on innovation and international competitiveness of New Zealand businesses, including those in trade exposed sectors, and on the potential for emissions leakage
    - to approximately infer the nature, direction and, where possible, magnitude of the impacts of a 2050 emissions target and policies to support that target on the innovation rate and

international competitiveness of New Zealand businesses, including trade exposed sectors, and on the potential for emissions leakage.

12. The findings of this project will enable the provision of qualitative advice on the impact of 2050 targets and also enable fine-tuning of the assumptions on innovation made in the whole-of-economy modelling described in the following paragraphs.

Whole-of-economy estimation of economic impacts – Computable General Equilibrium modelling

13. Economic modelling will estimate the magnitude of the impact of the 2050 target across the whole of the New Zealand economy, taking into account cross-sector effects. The estimated impact can be broken down across sectors and regions, and an assessment made of the distributional impact.

14. The approach relies on computable general equilibrium (CGE) modelling. CGE modelling is sensitive to the quality of data and input assumptions and *should not be relied on in isolation of the proposed other workstreams*. Nonetheless, CGE modelling remains a useful approach to determine whole-of-economy impacts and sector-specific impacts, as CGE models focuses on the economic activity between different sectors and households, and therefore contain a highly detailed micro-description of New Zealand's economy. By using CGE modelling with its explicit representation of the drivers of economic activity, the economic impacts of climate policies can be clearly inferred in a sound and meaningful way. The CGE approach is routinely employed by other governments when projecting the impact of proposed climate targets.

15. A NZ CGE model to assess the whole-of-economy and sector specific impacts of achieving the target allows

    - the model to select the pathway – telling us the carbon price required to meet the target
    - assessing the impact of specific transitional pathways
    - 'add on' modelling approaches to allow assessment of regional and distributional impacts, and the potential to also test the impact of revenue recycling methods to support transition
    - An 'add on' to override endogenous rates of technological change with externally defined rates of innovation in low emissions sectors (as defined by empirical evidence described in the study outlined above)
    - extensions to link in to global trade models.

16. CGE modelling of the economic impacts of the Paris 2030 target, undertaken in 2015, applied the best feasible approach within the time available. The 2015 approach is being extended to include allowing variations in the rate of technological change across sectors and including innovation benefits of policy action. We aim to link into global climate models and trade models so the costs of inaction, the economic conditions in the rest of the world, and effects of NZ action on trade can also be considered. Taking into account the rest of the world's action on climate is also an aim, as the impact of 2050 targets will differ depending on how NZ's actions compare to those of other countries in terms of both level of ambition and timing.

17. The results of modelling out to 2050 will be vastly uncertain. And so modelling the effects of the 2050 target over the shorter time period 2021-2030 will also be undertaken.

The wider co-benefits of transition to a low emissions economy

18. The team will commission research of empirical evidence on the co-benefits expected with the transition to lower emissions. The potential benefits of transition will depend upon the chosen transition pathway – the transitional policies – and on the speed of transition. And so whilst this high level assessment will be initiated, more nuanced analysis will be feasible when assessing specific individual policies designed to shift the economy towards transition.

An early assessment of the distributional impact effect of specific transition policies

19. The team will carry out research of empirical evidence for an early assessment of the distributional impact effect of specific transition policies, and potential tools to mitigate negative distributional impacts. As with wider co-benefits, the potential distributional impacts of transition will depend upon the chosen transition pathway – the transitional policies – and on the speed of transition. As per co-benefits, whilst this high level assessment will be initiated, more nuanced analysis will be feasible when assessing specific individual transitional policies.

Further whole-of-economy modelling of transition policies

20. Wider relevant modelling work that is underway or in planning includes the OECD's **SPINE** project, which models Auckland through a spatially defined CGE model out to 2040 to support the city's efforts to transition to a low emissions economy through a set of transport and urban densification policies. The Evidence team also has a staff member that is closely linked to this work and the OECD.

Marginal abatement costs and benefits

21. The marginal cost of abatement can be calculated for every economic potential. Information on New Zealand's MACC will be critical to assess the optimal transition pathway towards a low emissions economy, or towards the 2030 Paris target and a new 2050 target. This is because a MACC provides an indication of where to achieve emission reductions in an economically efficient manner.

22. A MABC for 2030 (an inversion of a MACC) allows consideration of mitigation options that are economic without a carbon price appear above the axis, and those that require a carbon price greater than zero to be economic, appear below the axis) indicating the abatement potential at least cost for different abatement measures. A MABC shows that many abatement measures have a positive benefit even in narrow financial terms, which become substantially larger and more numerous once multiple co-benefits are included. A number of measures with net costs swing to net benefits when the co-benefits are taken into account.

Annex 2. The Transition Hub: Overview A3

Context: Through Budget 2017, the Transition Hub was established as an inter-agency group of officials working to provide advice on the choices available to meet our international climate targets, set future targets and advise on transition pathways. It included a budget of $1m which is being used to build in-house policy, and economic analysis, and consultancy budget to fund modelling, economic analysis, and some limited partnership activity.

The Opportunity

Understanding the choices for how to meet international targets is a priority, but not the end game. This is an opportunity for a smooth and just transition to a resilient, adaptive and competitive low emissions economy.

Our approach:

The Transition Hub has been designed to drive the transition the economy to a low carbon future.
This requires moving from a sector to system approach.
The Hub will ensure that there is clarity on where we are heading, support better connectivity and highlighting gaps and opportunities.

This is a start of a significant policy journey that will evolve considerably over time, needs effective harnessing of resource within and across all our agencies and outside of government to be successful.

THE TRANSITION HUB

Driving better outcomes for New Zealand through coordinated climate initiatives

Driving whole of economy transformation
- Evaluate the case for economic transition
- Set strategic direction of programme
- Communicate a low emissions strategy to 2050, cross-government & cross-society

STRATEGY FOR TRANSFORMATION

INNOVATION & ENTERPRISE

ADVICE ON TRANSITION PATHWAYS

POLICY DESIGN

INSTITUTIONAL DESIGN TO SUPPORT TRANSITION
- Climate Commission
- CE accountability
- Transition Hub

STORYTELLING TO INFLUENCE BEHAVIOUR
- A communications plan to build momentum through storytelling across agencies and private sector.
- Hear partner & stakeholder views

Accelerating the transition
- Market scans and assessment of current and planned innovation and enterprise activities to feed in to policy options
- Innovation/ Enterprise Framework – map what exists and where there are gaps to enable market take up
- Partnerships and catalysing action e.g. Sustainable Business Council on freight, Dairy NZ Action Plan
- Understand, promote and facilitate innovation

Co-ordinating robust analysis and advice on policy choices and their impacts for meeting our targets and transitioning the economy
- Harness policy expertise across government to coordinate advice on transition pathways and what a 'just transition' could look like
- Coordinate and assess the economic impact of a new 2050 climate target
- Set a foundation for future policy work
- Champion a systems approach to climate action

DATA & EVIDENCE

Evaluate the case for economic transition: qualitative & empirical information and modelling on emissions, technical abatement potential, policy options, economic & non-economic impacts

World class understanding of the domestic abatement choices available, based on robust evidence and capable modelling
- Develop analysis and modelling to provide an indication of whole-of-economy impacts, distributional and sector-specific impacts of the 2050 target
- Develop cross-agency framework to support future research and modelling.
- Longer term: Developing better models, fostering public data platforms, increased understanding of behavioural change, evaluation of existing policies and hub partnerships with business

Who is involved:

- Transition hub acts as a connecting base, leveraging expertise from departments
- Moving from sector to system will require departments across government to play their part. This means the core climate agencies like MPI, MOT, MFAT, MBIE, TSY and those less involved to date e.g. MSD, MOH, and working with change agents outside of government

Our Progress:

- A small group from across the Ministries for the Environment, Business, Innovation and Employment, Primary Industries, Foreign and Trade, Transport and the Treasury have been involved in the setup of the hub and brought in business and innovation experts who input to the set-up of the hub
- We focus on coordinating advice on transition pathways and assessing the economic impact of a new 2050 climate target to support your consultation and Zero Carbon Bill process. Some resource has also been supporting advice on institution arrangements on the Climate Commission.
- We are building an assessment of current and planned innovation and enterprise activities that support a low emissions transition and identifying 2-3 high profile opportunities to partner with others to actively reduce emissions/exemplify a systems approach

Key short term deliverables:

- Impact analysis of 2050 target
- Inform decisions on how we get to zero carbon by 2050
- Create a consistent platform for ongoing advice on transitioning the economy
- Strategic advice on the long term transition (response to Prod Com report)
- Practiced examples of how to support emissions reductions through innovation/enterprise & partnering with others

Document Five

26. Changes to the structure of the economy will also have an impact (e.g. shifting consumer preferences and external shocks which, in the case of cities, are continuously reshaping what firms and people want and need, and where people and firms wish to locate).