Summary of questions

Q1: How can the Commission add the most value in this inquiry?

New Zealand's GHG net greenhouse gas emissions are projected to grow between now and 2030 and 2050. To meet the 2030 (only 13 years away) target agreed to in the Paris Agreement will require immediate action, and meeting the 2050 targets will require a major shift in New Zealand's emissions performance (50% reduction from now) and profile. There are a small number of large contributors that require specific focus, eg agriculture, transport and industrial heat. Despite this there have been little concerned effort in addressing these significant challenges. The Productivity Commission needs to identify key recommendations that can be or must be adhered to on a cross-party, multi-election cycle basis on greenhouse gas emissions, but also identify and quantify the co-benefits of any actions, eg energy security, ecosystem services, employment, etc.

Also, in addition to considering the mitigations costs, the commission should consider the risk and cost of not tackling climate change. For instance, the impact on our export markets if either the carbon footprint of products results in our product not being competitive vs international competitors, or we can't provide low carbon international transport route to get the products to market.

Can we shift the discussion away from costs to opportunities? Are there any opportunities for New Zealand, given our abundant resources and expertise, to provide carbon credits to the world?

This review, and any actions following it need to co-ordinated and communicated. The Commission needs to lead this as well as any plans / actions following the enquiry.

Q2: Chapter 3 of this issues paper mostly looks at ways to reduce emissions directly at their source. What other approaches would help identify

It is clear that to progress towards 2050 target, and Paris needs to consider a step on this trajectory, emissions from both the agricultural sector need to be actively and aggressively targeted. From the energy sector, fuel switching (coal to biomass or electricity), EVs for the light duty sector and biofuels for the heavy duty and international transportation all need to be considered as alternatives. In these considerations, the impact of New Zealand's declining oil and gas production on energy security needs to be factored in. The public funding into the fossil fuel industry now needs to be diverted towards alternatives.

Afforestation offers a short to medium term solution to carbon sequestration; and with careful management, and new bio-product development, the biomass resource can accelerate the bio-economy in New Zealand.

Carbon capture from large single point source heat plants with CO2 storage in deleted gas fields offers New Zealand an alternative to emission reduction in some of the more difficult and costly to de-carbonise sectors.

Managing energy demand also needs to considered eg behavioural change such improved public transport, remote working etc.

Q3: To what extent is it technically and economically feasible to reliably measure biological emissions at a farm level?

It is viable now to sample farms sites (soil, water air, compare these to benchmark levels and compare / extrapolate based on MPI and LINZ data, along with data from Agresearch.

Q4: What are the main opportunities and barriers to reducing emissions in agriculture?

Greenhouse gas emissions from agricultural sources have exactly the same behaviour and impact in the atmosphere, they should be treated identically to emissions from other sources. As a first instance, they should be included in New Zealand's Emissions Trading Scheme.

A key opportunity is around reducing intensity (stock units per ha) - there is strong evidence to suggest that doing so does not impact on returns to the farmer - they may produce less, but they spend less. The implication being that some farms have got to the point of diminishing returns for the extra inputs.

The use of agricultural residues to replace fossil fuels has a double effect as it removes the methane emissions and displaces fossil fuels.

Riparian plantings as a means to improve water ways / water quality and sequester carbon.

Q5: What are the issues for government to consider in encouraging alternative low-emissions land uses?

Afforestation for CO2 sequestration, dedicated bioenergy/biorefinery to support bio-economy. Agriculture must be included in the ETS otherwise there is no incentive for change.

Equitable treatment for forestry in the ETS to put afforestation on a level playing field in terms of land use.

Remove the $25 / t cap on CO2, or raise it substantially

Ban the use of off-shore credits

Encouragement will require both incentivising the behaviours they want to see (e.g. afforestation) and removing the incentives to carry on with the behaviours that have a negative effect. That includes challenging the perception that agriculture is "untouchable" and that farmers will be looked after with grandparenting etc that will leave them better off than early adopters.

Q6: What are the main barriers to sequestering carbon in forests in New Zealand?

Lack of equitable treatment of forestry in the ETS.

Cheap off shore credits

The $25 cap on CO2e

Multiple party ownership of Maori land and its consequences for accessing capital is limiting the development of forestry on underutilised Maori land.

Both a lack of forestry pull and a lack of farming-push:
- lack of forestry knowledge within the agriculture sector (farmers and farm consultants, + Lincoln and Massey Uni)
- lack of specific knowledge of carbon forestry options – ETS, AGS etc.
- Lack of finance - cashflow issues with traditional forestry as investment is upfront but returns are delayed.
- tax issues associated with timing of cashflows
- Lack of suitable land at a suitable price
- Perceptions of high risk and low profitability
- Carbon market and government policy risk
- Lack of liquidity in forest market – investment tied up too long, inflexible

- Loss of income from current land use
- loss of flexibility – options value
- Practical farm management issues posed by trees (e.g. irrigation, line-of-sight).
- limited knowledge of species other than radiata pine.
- sheep/beef farming is a lifestyle choice subsidised by taxpayers – they have no incentive or desire to change.

Q7: What policies, including adjustments to the New Zealand Emissions Trading Scheme, will encourage more sequestering of carbon in forests?

Equitable treatment of forestry in the ETS.
Remove the $25 /t cap.
Ban off-shore credits
Put agriculture in the ETS

It's all about removing barriers and creating incentives and disincentives.
Forestry extension officers offering free advice and not directly profiting.
Level the playing field – eg. ag into ETS, NES-Farming etc.

Q8: What are the main barriers to the uptake of electric vehicles in New Zealand?

Range anxiety coupled with New Zealand's low population density and large distances between major conurbations will result in EVs playing a role only in our major cities mainly with commuters. New Zealander's want a multipurpose vehicle and EVs do not currently offer this flexibility.

An old fleet with low turnover, with a high proportion of 2nd hand imports - based on these historical trends it is likely that we will import a lot of the fleet as second hand - the availability of 2nd hand EVs will have an effect on the uptake. There is still uncertainty about battery life and replacement cost - which is critical when trying to value a 2nd hand EV.

Q9: What policies would best encourage the uptake of electric vehicles in New Zealand?

Current barriers are price and performance - with an EV currently you pay more for less, until this changes there will slow uptake. This is not about policy per se - but about the characteristics of the EVs. Until there is significant cultural shift people will want a family vehicle that has the flexibility to commute and undertake longer trips with heavy loads.

Q10: In addition to encouraging the use of electric vehicles, what are the main opportunities and barriers to reducing emissions in transport?

EVs have a specific role in future transportation in New Zealand, they are best suited to the light duty fleet, whilst liquid fuels will still be the dominant energy vector for heavy duty diesel, marine and aviation fuels. Any measures used to encourage EVs should be equally applied to other low Carbon transportation options, especially biofuels

Liquid biofuels for aviation and shipping; possibly encouraged by a subsidy or feed in tariff. The current paradigm is that Jet sells for the same or less than petrol or diesel, but is harder to make from biomass. It is therefore very challenging for a biofuels producer to make bio-jet and be financially viable. Jet and marine are areas where EVs are not going to have a significant impact in the near future.

Q11: What are the main opportunities and barriers to reducing emissions from the use of fossil fuels to generate energy in manufacturing?

Consistency. There are no measures or incentives to encourage the replacement of fossil energy.

Existing fossil fuel supply chains are mature and therefore low cost. For new supply chains to compete against these without some intervention would be difficult. Carbon pricing is inadequate, variations in the carbon price has left investors lacking trust in the scheme. Introducing a carbon tax or uncapping the price of CO2 might be a more consistent signal to the market.

Improving the quality, through the introduction of standards for biomass (eg ash and moisture content) may allow more tradeable grades of wood residues to exist and provide security of supply to investors developing biomass boilers.

Coal is very cheap at $5 to $6 per GJ to industrial users, with a low CO2 price there is little drive to get biomass a replacement. There is sufficient biomass in New Zealand to replace in the order of 15PJ of coal consumption with its associated GHG emissions reductions. An increase in the cost of coal to users in the order of $2 to $3 per GJ would make solid biofuels much more competitive.

Greater support for waste-to-energy schemes

Q12: What changes will be required to New Zealand's regulatory, institutional and infrastructural arrangements for the electricity market, to facilitate greater reliance on renewable sources of energy across the economy?

Fair Feed-in-Tariffs for decentralised and small scale power generation should be developed. This would allow the more efficient recovery of the energy content of waste material, such as sawdust and other wood processing residues, and the better utilisation of low grade waste heat.

Support for waste to energy; e.g landfill gas, anaerobic digestion of municipal biosolids and organic MSW.

Q13: What evidence is there on the possible physical effects of future climate change on sources of renewable energy in New Zealand, such as wind, solar and hydro power?

Impact of climate change on feedstock growth rates??
Watt et al 2009. **The effect of climate change on New Zealand's planted forests: Impacts, risks and opportunities.** Client Report No. CC MAF POL_2008-07 (106-1) –No. 1.

Major results

Climate change

The mean annual temperature for all of New Zealand is projected to increase by around 2°C from 1990 to 2090. Annual rainfall projections indicate a likely difference in trends, with the western side of both islands trending towards increasing rainfall while the eastern side trends towards decreasing rainfall. The projected increase in temperature is likely to lead to a significant reduction of frost days, an increase in hot days and an increase in the intensity of heavy rainfall events. Drought risk is likely to increase in currently drought-prone areas where reductions in rainfall and increases in evaporation are anticipated. There are indications that the annual mean westerly wind component may increase by about 10% by 2090, and that high winds (wind speeds exceeded 1% of the time) may increase by around on average 2–3%.

Climate change and tree growth

Climate change is likely to have a significant impact on the future growth of trees in planted forests because tree growth responds directly to changes in CO2 concentration, temperature and nutrient and water availability. There are direct responses to these drivers and indirect interactions and feedback processes.

Increasing CO2 concentration is generally beneficial for the growth of plants, but the magnitude of the response varies with species and growth stage and is affected by interactions with other environmental factors that can limit (e.g. lack of essential nutrients) or enhance (e.g. warmer and drier conditions) the 'CO2 fertilisation effect'. CO2 fertilisation is likely to be most beneficial in the drier parts of the country, such as Otago, Canterbury, Hawke's Bay and East Cape. Nutrient limitations (especially nitrogen) are

unlikely to limit the CO2 response provided that the nutrient levels, which are currently sufficient in most of New Zealand's plantations, can be maintained into the future. Increasing temperatures can also stimulate decomposition of soil organic matter and mineralise more nitrogen to further boost the nutritional status of trees.

Increases in air temperature expected with climate change are likely to have a predominantly positive effect on plantation growth, as increasing temperature is likely to lengthen the growing season.
While radiata pine is New Zealand's most important plantation species, there has not yet been a comprehensive modelling study to investigate the likely growth response of radiata pine to the combination of likely climatic changes over the short or longer term. Comprehensive models that include these processes exist and are available, but they need to be tested in New Zealand before being used to quantify the forest growth response across the wide edaphic and climatic range over which plantations are grown in New Zealand.

Climate change is also likely to affect many abiotic and biotic factors, which may in turn affect plantation growth and productivity. The main factors which we have considered here include weeds, insects, pathogens and the risks from wind and fire. All of these factors currently cause significant economic losses in planted forests.

Changes in risk from fire and wind

Climate change is likely to increase fire risk and the incidence of damaging winds. Previous research has shown that fire danger is likely to increase significantly in most areas of New Zealand, and that the length of the fire season will probably increase. Increases in fire risk are likely to result in an increase in the incidence of fires and plantation area burned.

It is also predicted that the westerly wind speed component will increase during the winter and spring periods, leading to an increase in the mean and extreme wind speeds for many regions of New Zealand. For the central and upper regions of the North Island, which contain a large proportion of the plantation estate, extreme wind speeds are predicted to decrease. However, the upper and eastern parts of the North Island may be subject to more severe extra-tropical cyclones. In those regions where there is a predicted increase in the severe wind climate, it is likely that the annual frequency of winds sufficient in magnitude to cause widespread damage to forests could increase substantially. Previous research and simulations indicate that the impacts from these projected increases in extreme wind speeds will vary widely, both within and between regions due to differences in the underlying vulnerability of forests in these regions. These impacts are likely to range from little or no change, to a significant increase in the risk of wind damage to planted forests.

Changes in risk from exotic pests

Biotic factors are also likely to be strongly influenced by climate change. As the distribution of weeds, insects and pathogens is strongly determined by climatic conditions, changes in these conditions are likely to result in shifts in the geographic range of many species. Under climate change, global regions from which future invasions might occur are also likely to shift. Simulations suggest that the global areas that pose an invasion risk for New Zealand could expand, and this report highlights the new areas that might currently harbour potential future invaders.

Plant pests - Climate change is likely to result in range expansion within New Zealand of a number of native Australian tree species, such as *Eucalyptus* and *Acacia* spp. and the proliferation of currently ornamental and potentially invasive weed species such as *Melaleuca quinquenervia* (broad-leaved paperbark) and *Pueraria montana* (kudzu). Climate change is also likely to affect growth rates of weeds through changes in CO2 concentration, root-zone water storage, temperature and changing length of the growing season. These changes to weed composition and growth rates resulting from climate change are likely to have a detrimental effect on tree growth.

Insect pests - Because of our limited knowledge of climate effects on forest insects in New Zealand, it is difficult to make any generalised assessment about likely climate-change effects on their abundance and distribution. However, it is likely that climate change will increase the risk of establishment of new species from warm-temperate or subtropical regions and generally result in greater abundance of insect pests due to their better survival over winter. Without further research it is difficult to determine how changes in insect abundance and distribution will influence plantation productivity.

Pathogens - Climate change is unlikely to greatly influence the distribution of the main needle-cast diseases of radiata pine in New Zealand as these are already found throughout the country. Climate change is, however, likely to change the regional incidence and severity of some fungal diseases. It is likely that Dothistroma needle blight will remain rare in dry east coast regions, which are projected to become even more arid under climate change. The severity of Swiss needle cast, caused by *Phaeocryptopus gaeumannii*, which is the most widespread disease of Douglas-fir is likely to increase with climate change throughout the country as pathogen abundance is strongly correlated with winter air temperature. For the major diseases of radiata pine, changes to pathogen distribution and abundance will need to be quantified before the influence of these on plantation productivity can be determined.

Under climate change, there are also a number of interactions between abiotic and biotic factors, which need to be considered in order to gain a full understanding of likely climate change effects on productivity. These are described fully in the report.

Q14: Apart from the regulation and operation of the electricity market, what are the main opportunities and barriers to reducing emissions in electricity generation?

With New Zealand's contribution of renewable power in the overall power generation sector being high, there is limited opportunity for significant improvement. Couple bioenergy with carbon capture and storage allows the production of negative carbon emissions, which in the longer term as carbon prices rise, will become a valuable product in their own right.

Bio-electricity is a possibility in some regions - biomass can be stored so is not intermittent. It has potential to displace diesel generation.

Q15: What are the main opportunities and barriers to reducing emissions in industrial processes (such as the production of steel, aluminium and cement) and in product use (such as the use of hydrofluorocarbons in refrigeration and air conditioning equipment)?

Cost – Coal is cheap.
Exiting security of supply for fossil fuels due to existing mature supply chains.

There is a risk that as gas supplies from existing fields run down (as per MBIE projections) that coal is used more extensively in the production of industrial heat. Biomass for industrial heat has the potential to displace coal and gas in some instances. Co-firing with coal is also an option in large scale coal facilities.

The use of biomass for industrial heat needs continued support and development to achieve its potential.

Q16: What policies and initiatives would best promote the design and use of buildings that produce low greenhouse gas emissions?

According to United Nations Environment Programme (UNEP) "Buildings use about 40% of global energy, 25% of global water, 40% of global resources, and they emit approximately 1/3 of Greenhouse gas (GHG) emission." http://staging.unep.org/sbci/AboutSBCI/Background.asp. Greenhouse gas emissions from buildings are generated throughout the buildings full life cycle from the production of building materials, to the operational energy consumption of a building (heating, cooling, hot water heating, lighting, appliances and electrical equipment), building maintenance and end-of-life disposal. To achieve the greatest GHG emission reductions, policies and initiatives should target those emissions from the whole building life-cycle.

Existing policies and initiatives that aim to address buildings GHG emissions' minimisation are strongly focused on minimising building's overall operational energy demand whilst maintaining or improving the quality of life of the building users through design and construction strategies. Policies and initiatives fostering the selection of materials and products with lower embodied carbon and local production of energy from renewable sources also exist. Existing policies and initiatives are implemented both at a national, local or city governance level (e.g. European Union Energy Performance of Buildings

Directive (EPBD), Brussels Regional Authority's BatEx program and Passive House Standard requirement) and/or promoted by private organisations (i.e. Passive House Standard Certification, Green Building Council, BREEAM and living building Challenge Certifications, etc..) and can enforced either in a mandatory or voluntary basis with or without incentives. The European commission aims to lower the operational emissions from houses and office buildings by around 90% by 2050 through improving energy performance through by incorporating passive housing technologies in new buildings, refurbishing old buildings to improve energy efficiency, substituting electricity and renewables for fossil fuels in heating, cooling & cooking. https://ec.europa.eu/clima/policies/strategies/2050_en. These financial investments can be recovered over time through reduced energy bills and financial incentives such as tax rebates linked to third party certified energy performance thresholds achievements.

Reduction of embodied energy in building materials can be achieved by production efficiencies during the manufacturing phase. However, materials and products selection during the building design and construction phase play an important role in GHG emission minimisation. This is fostered and promoted by many building sustainability rating schemes (e.g. International Green Building Council, BREEAM and International Living Future Institute Certifications) and by local councils and authorities such as Rotorua Lakes Council "Wood First Policy". Wood has lower embodied energy compared with alternative structural construction materials, and in addition to this provides carbon sequestration and storage benefits. Canada, France, Finland, Slovenia and the UK, have recognised the benefits of building with wood for tackling climate change and have introduced policies, legislation, and incentives aimed at increasing the use of wood in construction projects.

Q17: What are the main opportunities and barriers to reducing emissions in waste?

Waste materials can be a useful feedstock for other processes, resulting in new bioproducts and/or energy use (see Bioresource Processing Alliance). This requires applied research and investment.

Also, energy from waste plants, whether through combustion and power generation, or smaller scale anaerobic digestion plants with combined heat and power plants are not currently economically feasible due to the unattractive rates paid for electricity exported to the grid. However, such operations would reduce landfill operations, reduce methane emissions from waste, and offer further low-C power into the grid.

Feed in tariffs, legislation on reducing biomass / organics going to landfill.

Q18: Policies to lower emissions from particular sources, technologies and processes can have interactions with emission sources in other parts of the economy. What are the most important interactions to consider for a transition to a low emission economy?

Whilst the recently published New Zealand Energy Efficiency and Conservation Strategy (NZEECS) recognises the contribution transport and industrial heat as mitigation opportunities, the targets are very weak and inadequate. Transport targets are only focused on increasing EVs by 2022, and the heat target is linked to GDP.

Attaining 64,000 EVs in the fleet, only addresses a portion of the overall fleet and only allows 8 years for other measures, eg reductions in the heavy duty, domestic marine and aviation sectors to contribute towards Paris.

The heat target requires a 1% reduction in GHGs pa (linked to GDP). Therefore, an increase in GDP of 1%, would would mean emissions could remain constant and the NZEECS target is still met.

Both targets are inadequate.

Q19: What type of direct regulation would best help New Zealand transition to a low-emissions economy?

Feed in tariffs for bioenergy (especially where sourced of wastes and residues)
Increased carbon price or a direct tax on coal used in industrial heat
Increase the price of carbon (uncap it in the ETS).

A significant review of the NZ heat plant database - giving better quality data (and analysis of trends) on what is being used where would assist with setting policy and regulation.

Q20: Acknowledging the current review, what changes to the New Zealand Emissions Trading Scheme are needed if it is to play an important part of New Zealand's transition to a low-emissions future?

Agricultural emissions need to be included, and the ceiling price of $25/te needs to be removed.

New Zealand should no longer rely on meeting its commitments using discredited international credits.

Q21: What type of market-based instruments would best help New Zealand transition to a low-emissions economy?

Carbon taxation or an ETS scheme with a floor price (not a ceiling) would provide more certainty for investors into low carbon technologies, and help de-risk their investments.

Q22: What type of support for innovation and technology would best help New Zealand transition to a low-emissions economy?

Direct investment into R&D in low carbon technologies and resources would enable New Zealand to become a market leader in the sector, allowing export of new technologies and export of carbon credits

Q23: How can New Zealand harness the power of financial institutions to support a low-emissions transition?

Q24: What type of alternative approaches (such as voluntary agreements or support for green infrastructure) would best help New Zealand transition to a low-emissions economy?

Feed in tariffs for bio-electricity, and support for bio-jet and bio-marine.

Q25: In addition to "core" climate policies and institutions, what other changes to policy settings or institutional frameworks are required to effectively transition New Zealand to a low-emissions economy?

Increased afforestation is a must. This is recognised internationally as essential to sequester carbon and create feedstocks for bioenergy; with spin-off benefits of erosion reduction and water quality improvement. Forests can be managed on a sustained yield basis and if looked at as a national estate a national allowable cut can be implemented. Our standing stock of carbon can be increased substantially, with a small % turning over each year. New Zealand has the land and expertise for afforestation to be a significant contributor to a net zero emissions future.

Q26: What are the main uncertainties affecting New Zealand businesses and households in considering investments relevant to a low-emissions future? What policies and institutions would provide greater confidence for investors?

Consistent long-term and cross-party policies on carbon are required, and minimum carbon price to encourage investment.

Q27: What approaches, such as regulatory frameworks or policy settings, would help embed wide support among New Zealanders for effective reduction of domestic greenhouse gas emissions?

An authority to regulate and monitor New Zealand's progress towards it 2030 and 2050 emissions commitments should be set up as suggested by Parliamentary Commissioner for the Environment. This could be modelled on the UK Climate Change Commission.

Legislated hard targets on GHG emissions (not GDP related).

Anything that stops us going backwards (as we are at the moment).

Q28: Is New Zealand's current statutory framework to deal with climate change adequate? What other types of legislation might be needed to effectively transition towards a low-emissions economy?

No. See answer to Q27

Remove $25 cap.
Ban purchase of offshore credits.
Targets for renewable heat + renewable transport fuels
Include agriculture in the ETS
Feed in tariffs for bioenergy from wastes.

Q29: Does New Zealand need an independent body to oversee New Zealand's domestic and international climate change commitments?
Yes
What overseas examples offer useful models for New Zealand to consider?

Absolutely, see Parliamentary Commissioner for the Environment report (July 2017). An independent Climate Change commission is set up to adequate carbon budgets set are several years in advance and adhere to by the incumbent Government. The role needs to have support from all political parties, has a long term outlook and supported by law.

Any structure set up needs to be substantially funded, with mandates and powers to make things happen.

Q30: How can adaptability best be incorporated into the system supporting New Zealand's low-emissions transition?

Forestry; is a hugely flexible opportunity; decisions made today are not irrevocable;

- Plant for sequestration but it could be harvested
- Energy forests could be used for sequestration, or as a fibre source for wood processing.
- Harvest windows can be a decade or more.

Q31: What types of analysis and underlying data would add the greatest value to this inquiry?

Improving the capture and public availability of emissions data from the key emitting sectors would enhance analysis and ensure the correct actions are taken.

Better data from a substantial update of the EECA heat plant database

Regionalise the EECA Energy end-use database.

Q32: What should be the mix, and relative importance of, different policy approaches (such as emissions pricing, R&D support, or direct regulation) in order to transition to a low-emissions economy?

Externalities of any mitigation actions need to valued and incorporated into the overall financial analysis. Eg the growth in the New Zealand bio-economy will increase employment in the New Zealand, particularly in the regions where feedstock is grown.

1. Carbon tax
2. Direct regulation
3. Research and development to support these (levels and implementation)

Q33: What are the main co-benefits of policies to support a low-emissions transition in New Zealand? How should they be valued and incorporated into decision making?

Approaches towards a low carbon environment have additional benefits associated with Energy security, rural economic development, regional employment.

As an example, BERL calculated the economic impact of the 2011 BANZ proposal for liquid biofuels to contribute 30% of the total New Zealand transport fuels. This equated to 2.4 billion litres. The GDP increase was $6.1 billion, and 27,000 new jobs were created.

Source: Nana et al. Preliminary analysis of the economic impact of the New Zealand Bioenergy Strategy (2011) [http://www.bioenergy.org.nz/documents/Homepage/BERL-report-to-BANZ-Preliminary-EIA-of-NZBioenergy-Strategy.pdf]

Q34: Who are the most important players in driving forward New Zealand's transition to a low-emissions economy?

Leadership from Government is required. A range of other organisations play important roles, such as Scion, BANZ, Large Energy users Group. etc

The "market" may not take a long term view and get us to where we need to be.

Cross party agreement on key targets would be hugely useful to getting industry engaged.

Q35: What measures should exist (and at what scale and duration) to support businesses and households who have limited ability to avoid serious losses as a result of New Zealand's transition to a low-emissions economy?

Afforestation allows short (10 year), a medium term (25 to 35 years) and long term (100+ year) approaches, to capture carbon whilst low carbon technologies for fuels and products are further improved. A significant afforestation programme should be coupled with investment into the research and development of low C technologies.

Q36: What are the essential components of an effective emissions-mitigation strategy for New Zealand that will also be economically and politically sustainable?

All emissions should be included in the strategy, and cost per tonne of CO2 mitigated should be the main measure for evaluating the most efficient route for defining the optimal route for New Zealand to reduce its emissions.

Large -scale afforestation must be a key part of the strategy - get the sequestration underway now and then decide on the end-use of the fibre as time, knowledge, technologies and emissions progress.

Q37: Should New Zealand adopt the two baskets approach? If so, how should it influence New Zealand's emissions reductions policies and long-term vision for the future?

New Zealand's approach should be consistent with IPCC methodologies. If New Zealand goes against IPCC then we will become an outlier, this could put pressure on the potential for us to grow our export products.

Q38: How should the issue of emissions leakage influence New Zealand's strategy in transitioning to a low-emissions economy?

Q39: What do you see as the main benefits and opportunities to New Zealand from a transition to a low-emissions economy?

New Zealand has abundant resources (land, water etc) compared with many other economies. New Zealand needs to start to identify the longer term opportunities of climate change for other International businesses rather than merely focussing on the short term costs. It is time to refocus the narrative around climate change onto the positives for New Zealand.

Q40: What does your long-term vision for a low-emissions economy look like? Could a shared vision for New Zealand be created, and if so, how?

New Zealand can have a prosperous **and** low carbon economy. In fact our aspirations should be zero carbon economy. There are many similarities between New Zealand and Sweden, eg low population density, temporate forests, abundance of hydropower etc. Sweden has set a zero carbon target for 2045, which has complete support by all political parties. This is what New Zealand should be moving towards.

The costs of moving to a low carbon system in heat and electricity are relatively minor; especially in relationship to the projected infrastructural costs (loss / damage) of climate change (sea level rise, storms etc). Liquid biofuels are harder at the moment but technically possible and we have huge potential to sequester carbon in tress in the short term for use later as events and circumstances unfold.