

# Barriers and challenges of the use of wood-based liquid biofuel in New Zealand: perspective from the transport industry sector

**Grace B. Villamor, Peter Hall, Muthasim Fahmy and Paul Bennett**



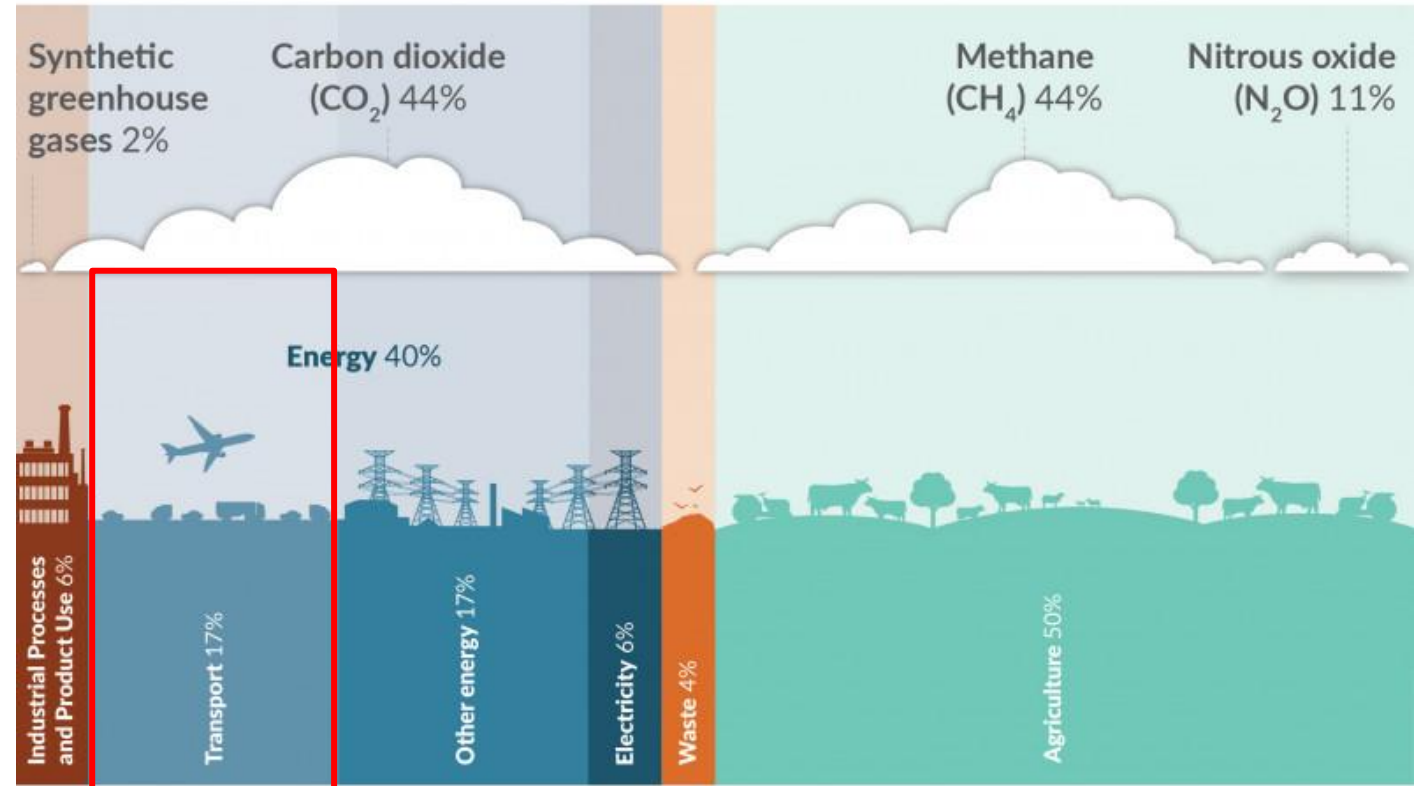
# Outline

- Wood-based liquid biofuel: opportunities and challenges
- Theoretical framework
- Research method
- Initial results
- Takeaways and what's next?

# Background

## Context:

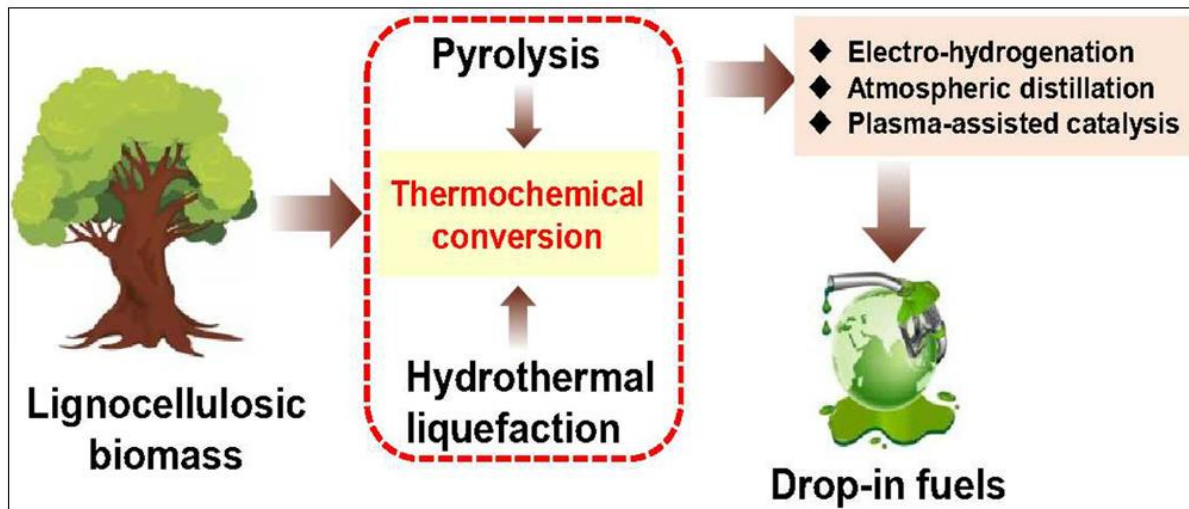
- Transport is one of NZ's largest sources of GHG emissions (17% of gross emissions)
- Highly dependent on imported fossil fuel
- Growing demand for liquid fuels: **7-8 billion litres** (petrol, diesel, jet fuel and fuel oil)
- Very little biofuel use
- NZ's target of the 2050 carbon neutral: “**renewable energy**”



New Zealand's emissions profile in 2020  
(Source: MPI 2022)

# Wood-based liquid biofuel and opportunities

- **Liquid biofuels** are renewable, low-emissions fuels that can be blended with petrol and diesel to reduce greenhouse gas emissions from transport.



Source: Liu and Yu (2022)

- **Opportunities:**

- 7.2% of primary energy (currently supplied from wood)
- Residual wood resources: 12 PJ unused for energy
- 1 to 2 million ha of marginal land can be used for energy

Source: Hall (2012)


*“The largest opportunity for increased use of bioenergy in New Zealand is therefore as a replacement for imported fossil transport fuels, particularly diesel and aviation fuels where there are no current replacements for liquid fuels.”*

# Growing plantation forest for energy

- **Radiata pine** – model species
  - Management regime of 833 stems pa ha (initial stockings)
  - No thinning or pruning
  - Final stocking ~670 stems/ha (at age 25 and annual biomass increment of ~37m<sup>3</sup>)
  - Total volume: ~900 m<sup>3</sup>/ha

## Liquid Biofuel Research Report

By assessing biofuels carefully on their emissions reduction potential, technological readiness and their best-use applications, we can ensure they play an effective role in New Zealand's net-zero transition.

[READ SAPERE'S LIQUID BIOFUEL RESEARCH REPORT](#) 



<https://www.eeca.govt.nz/insights/eeca-insights/liquid-biofuels-insights-summary/>

# Liquid biofuel: the challenge

## Social acceptance

- a powerful barrier of wood-based biofuel
- receives little attention or is missing in a lot of renewable energy reports

## Why it matters?

- Market demand – crucial for the success of implementation and commercialisation
- Policy support
- Realising environmental benefits and social benefits

<https://naturalenergyhub.com/>



# Liquid biofuel: the challenge

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## Overall research aim:

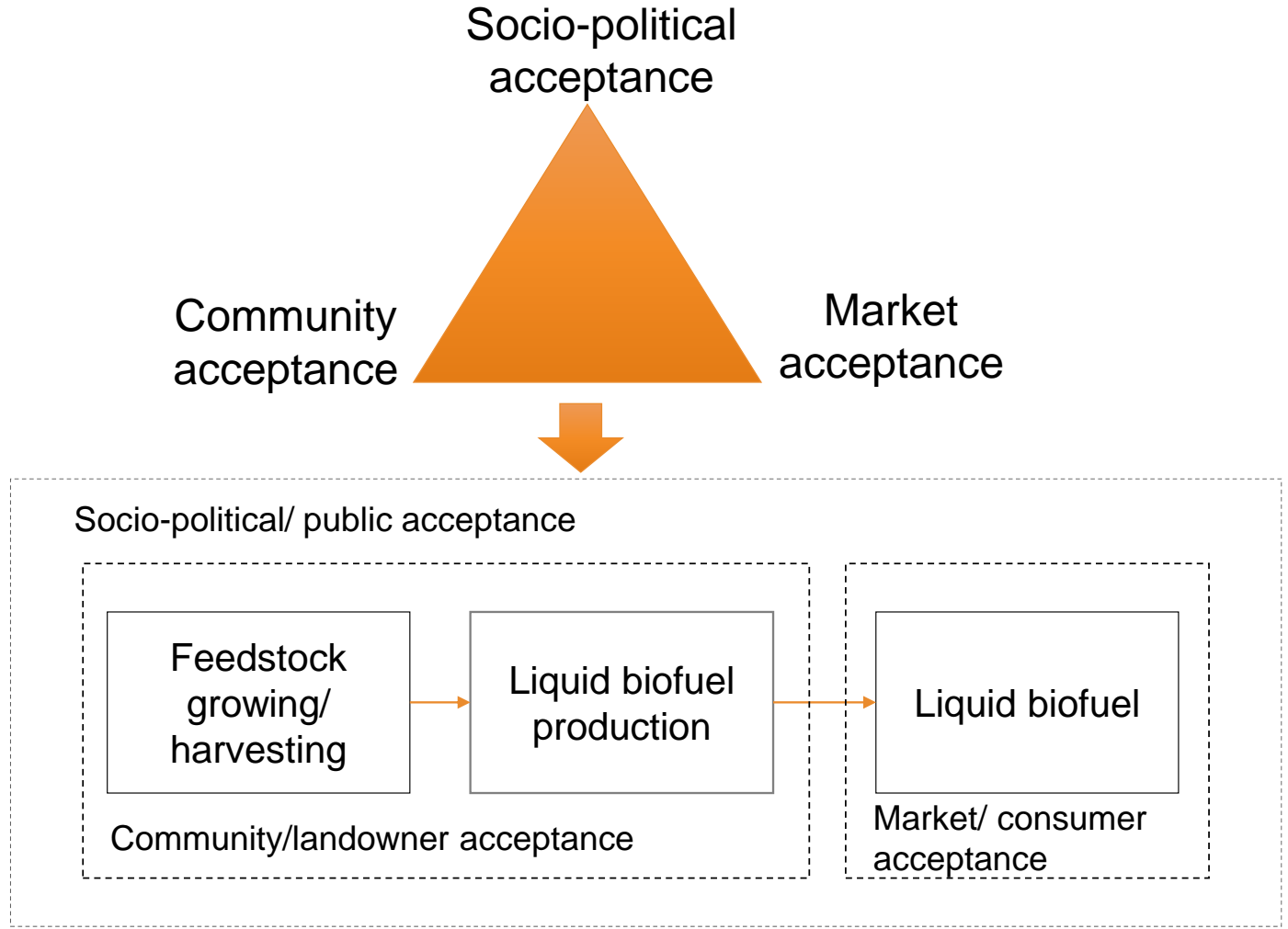
- To provide a better discussion and understanding of social acceptance issues in the liquid biofuel context.
- Acceptance framework based on life cycle biofuel production

<https://naturalenergyhub.com/>



# Triangular model of acceptance (TMA) framework

- TMA was conceptualised and applied in wind energy technology (Wüstenhagen et al. 2007)
- Social acceptance can be explained within three (3) dimensions:
  - Socio-political – indicates (general) public opinion
  - Community (landowners) – focused on the production
  - Market/ consumer – market uptake

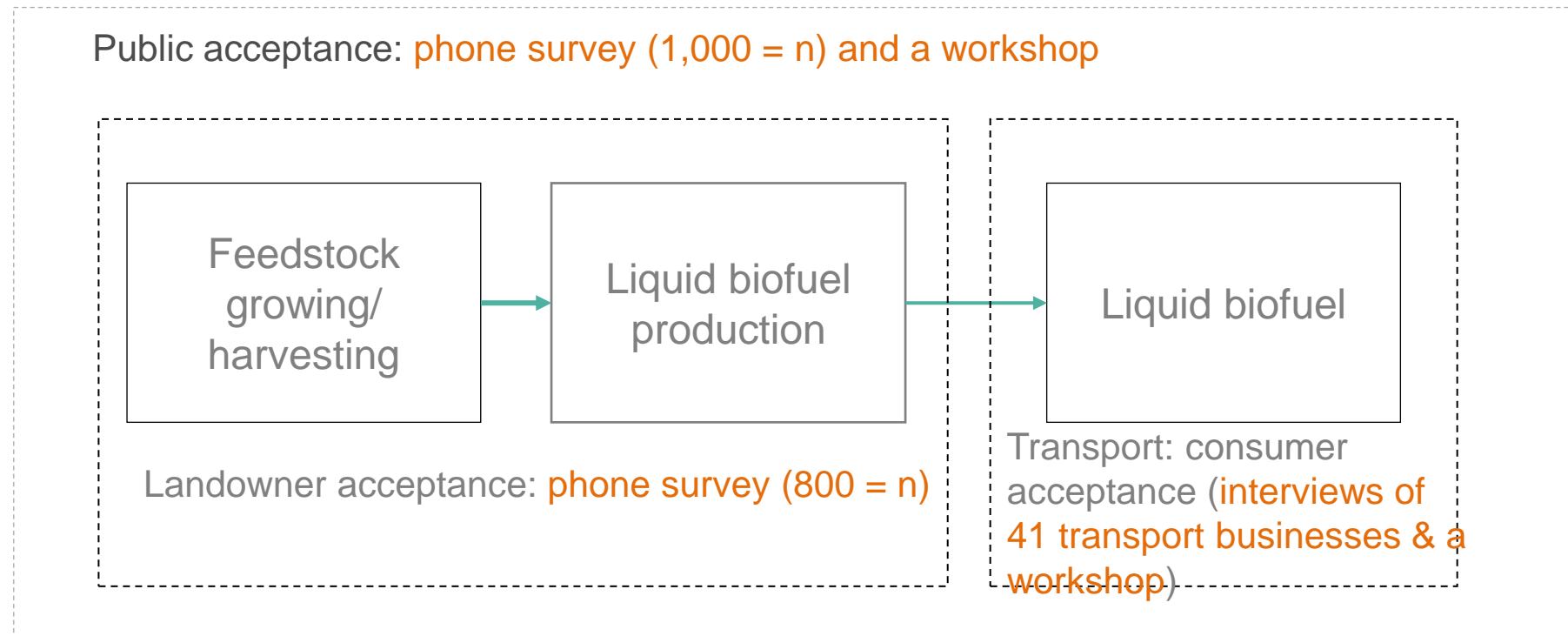


Adapted from Chin et al. 2014



# Methods

- Mixed method approach: surveys (online and phone) and workshops



- Data collection: June 2022 – June 2023

# Methods

## Respondents

**Table 1. List of participants**

Role/sub-sector	Number (#)
<b>Role: Fleet managers (land, water, air)</b>	<b>7</b>
<b>Role: Transport company managers (land, water, air)</b>	<b>3</b>
<b>Sub-sector: Scenic transport tourism (land, water, air)</b>	<b>9</b>
<b>Sub-sector: Road freight</b>	<b>9</b>
<b>Sub-sector: Bus (urban and rural)</b>	<b>6</b>
<b>Sub-sector: Water passenger</b>	<b>1</b>
<b>Sub-sector: Passenger car rental/ hire</b>	<b>1</b>
<b>Sub-total</b>	<b>36</b>
<b>Pre-test:</b>	<b>5</b>
<b>Total</b>	<b>41</b>

### **Businesses in the transport industry**

In-depth interviews (qualitative)

- Attitude towards liquid biofuel/ Awareness
- Decision factors and barriers to the uptake
- Responses to ways of sourcing and producing

# Initial results: Transport businesses

## Awareness

- Many stated that they knew very little about biofuels, and biofuels were not on their radar.
- Most were not actively searching for information, and only a few were incidentally seeing anything about biofuels.

- “ It is on our radar, but only I mean we just wait for news releases really, we’re passive, we don’t actively look for it.” (Bus – urban and rural)
- “ It’s not something I’ve heard about in the jet-boating industry, the only thing I know is some people are talking about going down the electric route, but they haven’t got a boat that’s properly operational yet.” (Scenic transport tourism – water)
- “ I’ve not heard of biofuels but there was a guy who was converting water into hydrogen and oxygen, and apparently he ran a mini off it.” (Scenic transport tourism – land)

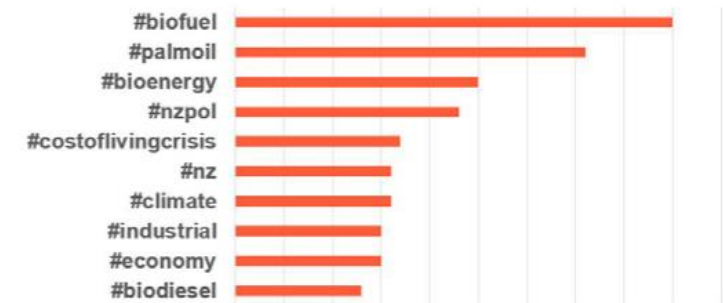
### Biofuels Overview

- The top trending keywords were “news” and “information”, indicating that conversation was concentrated around news stories such as the announcement by the government
- Also frequently mentioned were other keywords related to the energy market, such as emissions.
- The top trending hashtag was #biofuel, followed by #palmoil, which was predominantly related to environmentalism.
- Also popular was #bioenergy, as well as #nzpol and #costoflivingcrisis, showing the connection between the topic of biofuels and current political trends.

### Top Trending Keywords

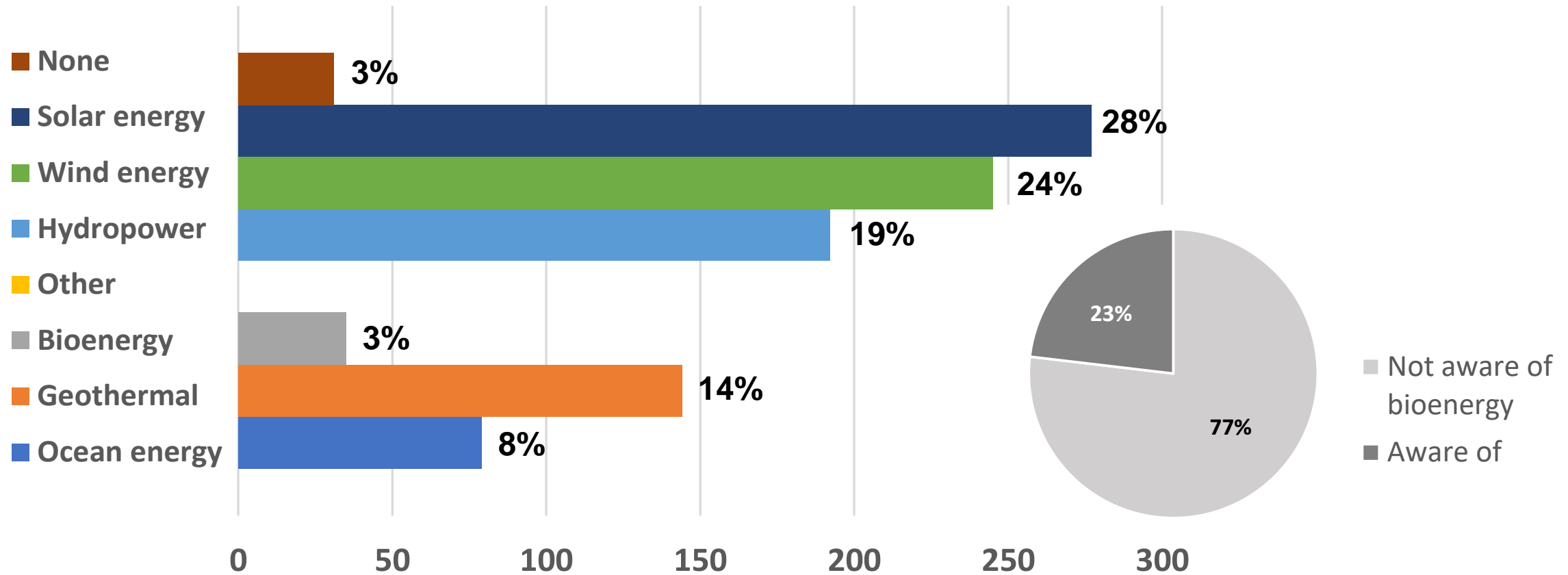


### Top Trending Hashtags



Source: Panorama social media analysis

# Awareness of renewable energy/bioenergy (public)



# Initial results: Transport businesses

**Overall attitude:** Most participants were generally positive about biofuels.

## Drivers (of use)

- Their concerns about climate change, pollution, exhaust fumes, and the destruction of habitat.
- They wanted native forests restored, and they felt that farmers were good caretakers of productive land.
- The need for transportation businesses to present a **responsible image** to customers as a business that is doing the right things for the climate
- Fuel independence/ self-sufficiency

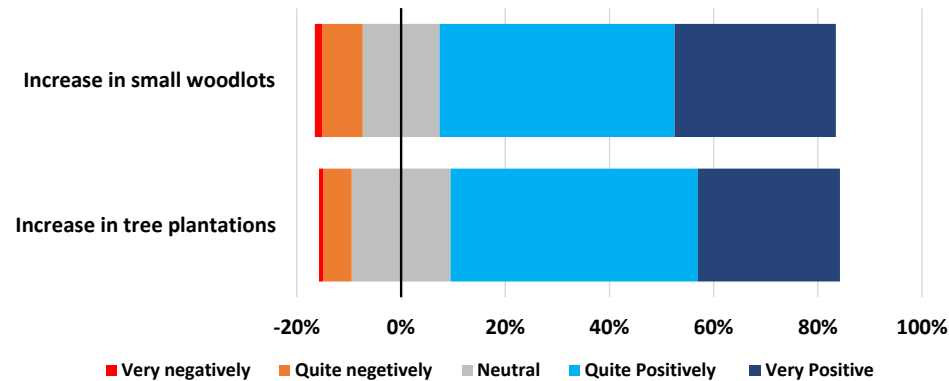
## Concerns/ issues

- Engine performance, maintenance and reliability (incl. safety of use)
  - Direct cost of purchase
- “There’s no getting away from it, if we want to be green there’s a cost, but as I understand it there’s a far greater cost coming down the road – climate change.” (Fleet manager – land).
- “As long as it’s only a small increase, the tradeoff in price is fine to help meet the carbon reduction targets.” (Road freight)

# Initial results

## Raw materials sourcing

- **Very supportive** of producing biofuels within the country



- The order of preference (feedstock):
  - forestry slash
  - woodlots
  - plantations
  - imported ethanol

## Forestry slash

- “ It’s a waste of resource if you leave it lying around. I noticed the other day that there are huge piles of wasted off-cuts that we are paying to be milled.” (Transport company manager – land)
- “ You’re using waste, and you’re creating jobs, and that’s a fuel source for the country.” (Road freight)
- “ Ultimately it’s rotten, and it’s releasing carbon into the air, so you are just hastening that, and it just seems more sensible to me to be doing it here.” (Bus – urban and rural)

## Forests for energy:

- “ I think this country has a lot of areas that are unusable, a lot of New Zealand is quite steep, and those places should be planted in trees.” (Road freight)
- “ Absolutely fine as long as it does not replace usable land.” (Scenic transport tourism – air)
- “ As long as it’s not displacing, I presume you can use marginal land to produce biofuels, I wouldn’t want it to be good arable land that is being converted into biofuels.” (Bus – urban and rural)

# Takeaways

## Positives

- Biofuels are accepted as part of the solution to climate change
- There are perceived gains for the NZ economy and fuel independence is valued
- Local production is a source of pride
- Putting forest waste to good use
- It is expected that biofuels might cost more but there is a willingness to accept this

## Negatives

- No one is talking about them
- The biofuels mandate was a surprise
- Reassurance is needed around the safety of use in engines

# Conclusion

- Most participants were generally positive about biofuels.
- There was very little evidence of any strong reluctance to use biofuels.
- Most participants welcomed biofuels as a way of taking concrete climate action, progressing the economy, and showing that kiwis can do anything

## What's next?

- On-going analysis of the landowners' acceptance (feedstock supply using short rotation plantation).
- Integrate the landowners' and the public acceptance with transport businesses.



# Thank you!

Email: [grace.villamor@scionresearch.com](mailto:grace.villamor@scionresearch.com)

[www.scionresearch.com](http://www.scionresearch.com)



Prosperity from trees *Mai i te ngahere oranga*

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