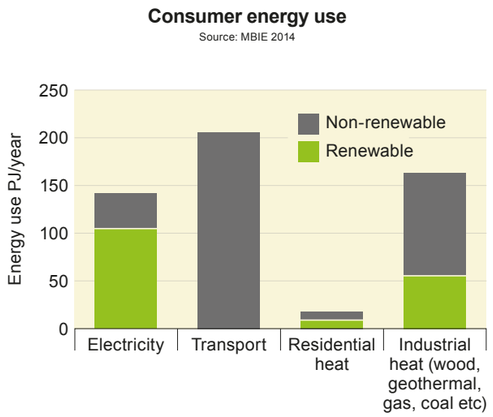
SCION
NZBiofuelsRoadmap

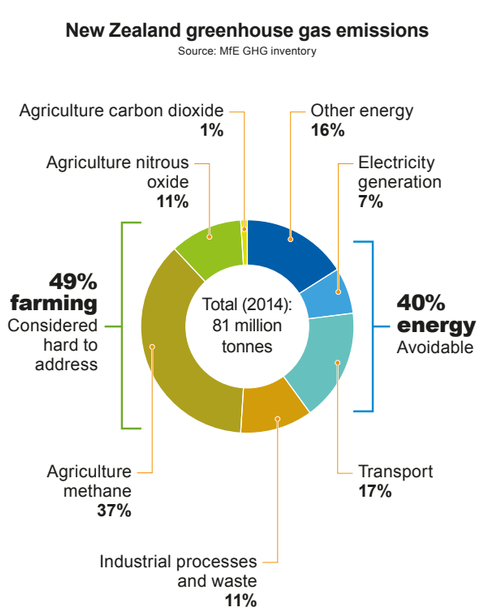
Biofuels in New Zealand

Biofuel use promotes cleaner environments, stronger economies and employment.

The need for liquid biofuels

The transport sector is the single largest energy consuming sector in New Zealand and is a major contributor to the country's greenhouse gas (GHG) emissions. If New Zealand is to achieve its Paris COP21 commitment on GHG emission reduction (30% reduction by 2030) to fight climate change, reducing emissions from energy use will be critical.





Benefits of biofuels

- Reduced GHG emissions in the transport sector. One of few options to reduce emissions in sectors where the use of electrical engines is not an option, such as aviation and long-haul marine.
- Greater security of fuel supply. Using locally made fuels reduces reliance on oil imports. As New Zealand's crude oil purchases cost about $6 billion per year this also improves the balance of trade.
- Economic and employment growth, largely in regions. It is anticipated that a new, large biofuels industry would be distributed around the country, located close to available feedstocks.
- New business opportunities. The manufacturing and use of biofuels is likely to energise New Zealand's bio-economy.
- Improved environmental footprint for New Zealand goods and services.

Macro-economic analysis

A study done by the NZ Bioenergy Association[1] shows the potential macro-economic benefits for New Zealand, assuming that bioenergy supplies more that 25% of the country's energy needs, including 30% of the country's transport fuel, by 2040:

	Gain in 2040 over BAU scenario	
National GDP	$6.1 billion	+1.2%
Household consumption	$2.6 billion	+0.9%
Export volumes	$2.2 billion	+1.5%
Trade balance	$1.9 billion	+0.2% of GDP
Employment	27,000	+1.1%

[1] http://www.bioenergy.org.nz/resource/op-16-preliminary-analysis-economic-impact-nz-bioenergy-strategy

New Zealand Biofuels Roadmap

The large scale deployment of biofuels would be positive for New Zealand, but *how do we get there?*

The key objective of New Zealand Biofuels Roadmap project is to create a New Zealand-specific biofuel implementation roadmap that defines the optimum pathways for large scale production and use of liquid biofuels. We are evaluating entire new value chain(s), supporting our results with quantitative scenario analysis (modelling), and engaging with key stakeholders across the value chain(s).

We will model a range of different scenarios (e.g. biofuels substitution levels, fuel type demands, etc.) and identify the optimum biofuel value chains based on either lowest cost, or maximum CO_2 mitigation. These results will be used to understand the most likely biofuel value chains in New Zealand, including identifying which feedstocks and which technologies are most suitable for, and likely to be used, in New Zealand.

This analysis will provide authoritative information on the potential for large scale implementation that will provide policy makers the clarity to develop a policy landscape that encourages biofuels implementation, de-risks commercial investment into the sector and identifies where research and development efforts should be focussed.

Stakeholder involvement

Large-scale deployment of biofuels in New Zealand will need the creation of new value chain(s). Involving the stakeholders of this new value chain is crucial to ensuring the roadmap fits New Zealand's requirements and make the future deployment of biofuels a reality.

We have interviewed more than 25 key stakeholders to understand their perspectives, drivers and barriers towards using biofuels. The information gathered will be used to define the scenarios that will be modelled (what does New Zealand's future look like), and to apply a qualitative evaluation layer to ensure the results fit with stakeholder drivers and motivations.

Furthermore, key stakeholders are continuously involved within the project via workshops, consultation, data validation, etc. During this process, stakeholders not only interact with the project, but also among themselves already aligning their incentives and interests to ease the establishment of the future biofuels value chain.

Bioenergy Value Chain Model

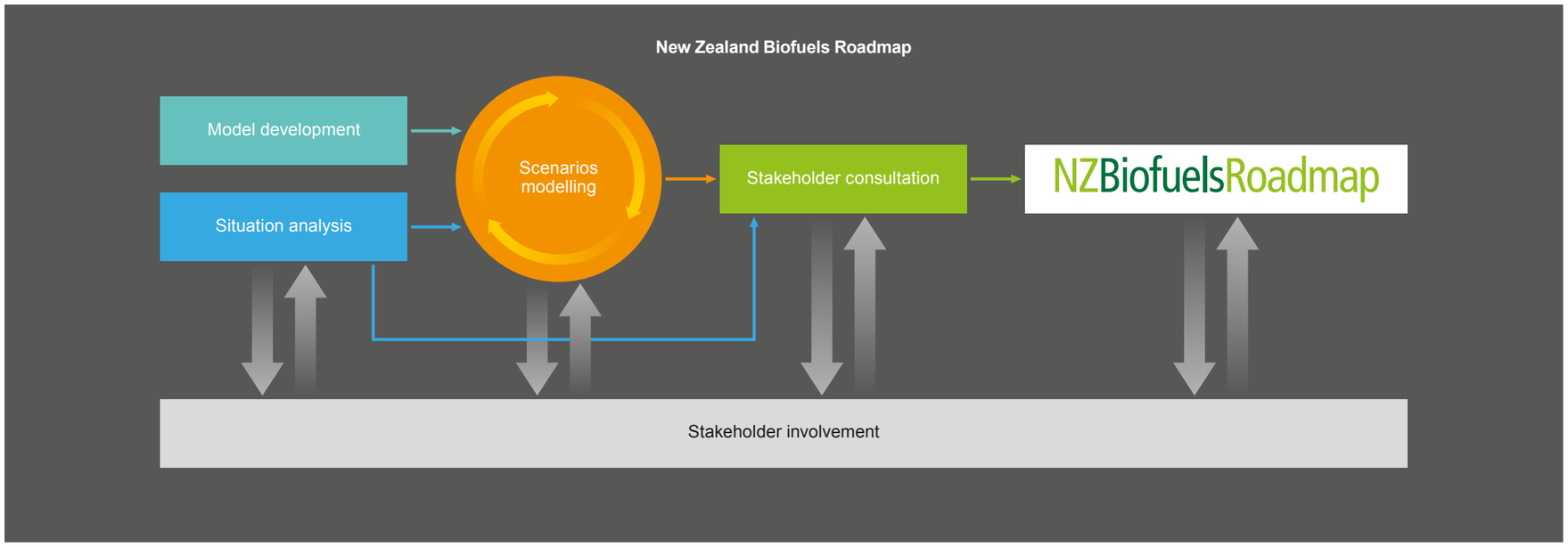
The Bioenergy Value Chain Model (BVCM) was developed by the Energy Technologies Institute (ETI) in the United Kingdom[2]. It was originally used to evaluate the different possible bioenergy/biofuel options to reduce carbon emissions in UK's energy sector and guide the government in possible policy interventions and/or targeted investments.

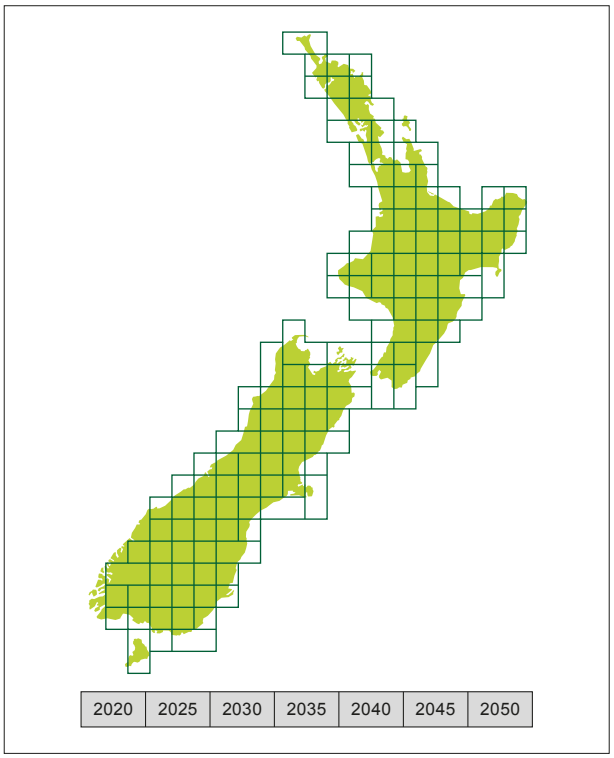
For Scion's New Zealand Biofuels Roadmap, we have modified this model to suit local requirements and adapted it to country-specific data. The model will tell us which feedstocks to grow where and when, and which biofuel conversion technologies to use to reach a given level of biofuel production. The results will be shown in five year periods out to 2050.

The model divides New Zealand into 132 cells. Each cell is classified into multiple land classes with different land values. Only certain types of feedstock can be planted in each class. For example, it is not possible to plant canola in very steep terrain.

For a given level of biofuel substitution, the model optimises between more than 20 feedstocks, three modes of feedstock

[2] http://www.eti.co.uk/insights/bioenergy-insights-into-the-future-uk- bioenergy-sector-gained-using-the-etis-bioenergy-value-chain-model-bvcm/





transport and 25 conversion technologies. The fuel demand is set for each of four main fuel families:

- **Petrol:** bioethanol, drop-in petrol, etc.
- **Diesel:** biodiesel, FT diesel, etc.
- **Aviation:** hydrotreated vegetable oil, etc.
- **Marine:** upgraded pyrolysis oil, etc.

20+ Feedstocks
(e.g. tallow, trees, miscanthus)

3+ Feedstocks transport
(e.g. truck, ship)

25+ Conversion technologies
(e.g. chipping, fermentation, gasification)

4 Fuel families
(e.g. diesel equivalent)

Current status of the project

As of May 2017, the BVCM has been completely adapted to New Zealand requirements and all New Zealand-specific data are included in the model (e.g. land classes, feedstock growth rates, transport network, technology costs, GHG contributions, etc.). The first results have been discussed in a stakeholder workshop.

Contact information

Ian Suckling
Research Leader – Bioenergy
Email ian.suckling@scionresearch.com

Paul Bennett
Science Leader – Clean Technologies
Email paul.bennett@scionresearch.com

Ferran de Miguel Mercader
Scientist – Clean Technologies
Email ferran@scionresearch.com

About Scion

Scion is the Crown research institute that specialises in research, science and technology development for the forestry, wood and wood-derived materials and other bio-material sectors.

Scion's purpose is to create economic value across the entire value forestry chain, and contribute to beneficial environmental and social outcomes for New Zealand.

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Te Papa Tipu Innovation Park,
49 Sala Street, Rotorua
Private Bag 3020, Rotorua 3046,
New Zealand

Telephone +64 7 343 5899
Facsimile +64 7 348 0952
Email enquiries@scionresearch.com
www.scionresearch.com

Prosperity from trees *Mai i te ngahere oranga*

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