

# Biomass Energy Resource Assessment New Zealand

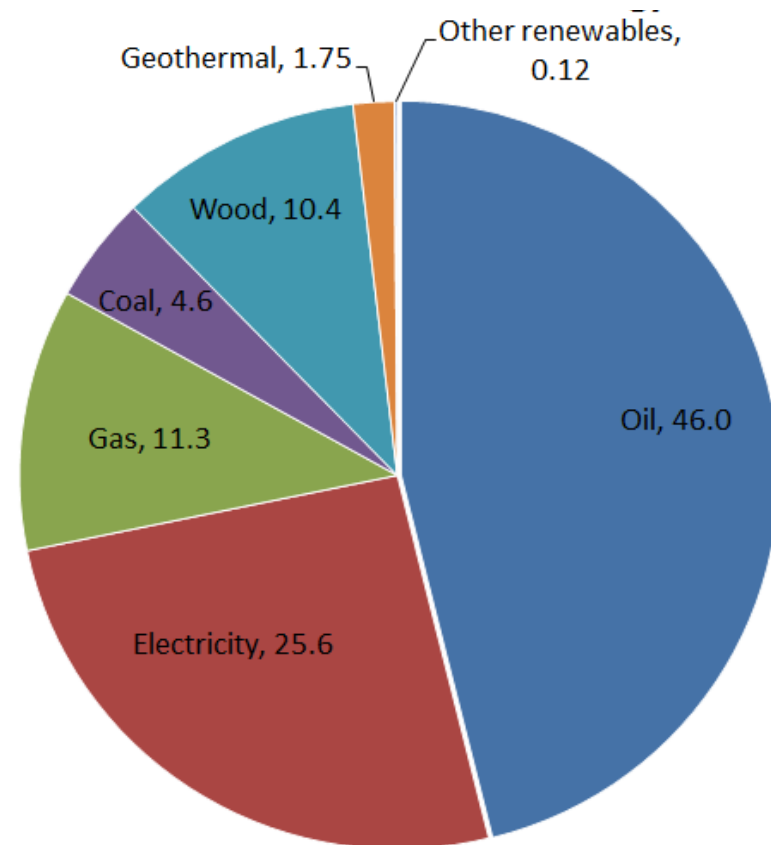
Paul Bennett, Science Leader Clean Technologies



# Introduction to Bioenergy in New Zealand

- **10.4% Consumer Energy from Woody biomass**
  - 58 PJ or 5 Mte (air dried)
  - sourced from commercial plantations (1.7 million hectares). Natural forests largely protected.
  - direct-use heating 91% (black liquor and residues for process heat)
  - heat & power 9%
- **Biofuels <0.1% of total transportation energy**

**Consumer energy, %**



Source: Energy in New Zealand, 2014, Ministry Business Innovation and Employment

# New Zealand's greenhouse gas emissions

Synthetic greenhouse gases  
2%

**43%**  
Carbon dioxide (CO<sub>2</sub>)

**44%**  
Methane (CH<sub>4</sub>)

**11%**  
Nitrous oxide (N<sub>2</sub>O)

New Zealand targeted to reduce emission  
by 5% by 2020 based upon its 1990  
emissions

**Net emissions have increased by 33%**

INDUSTRY

6%

17%

22%

6%

48%





# New Zealand's Climate Change Target

Our contribution to the new international climate change agreement

“Advances in electric vehicles and biofuel technology offer potential to reduce emissions in the transport sector”

“Biofuel technology is also emerging and could provide an alternative source to oil”

“Depending on the scale of production, there may also be potential to export biofuels overseas.”

“Investing \$42million in biofuel research.”

“Encouraging and supporting permanent afforestation such as through the Permanent Forest Sink Initiative.”

# NZ National Policies

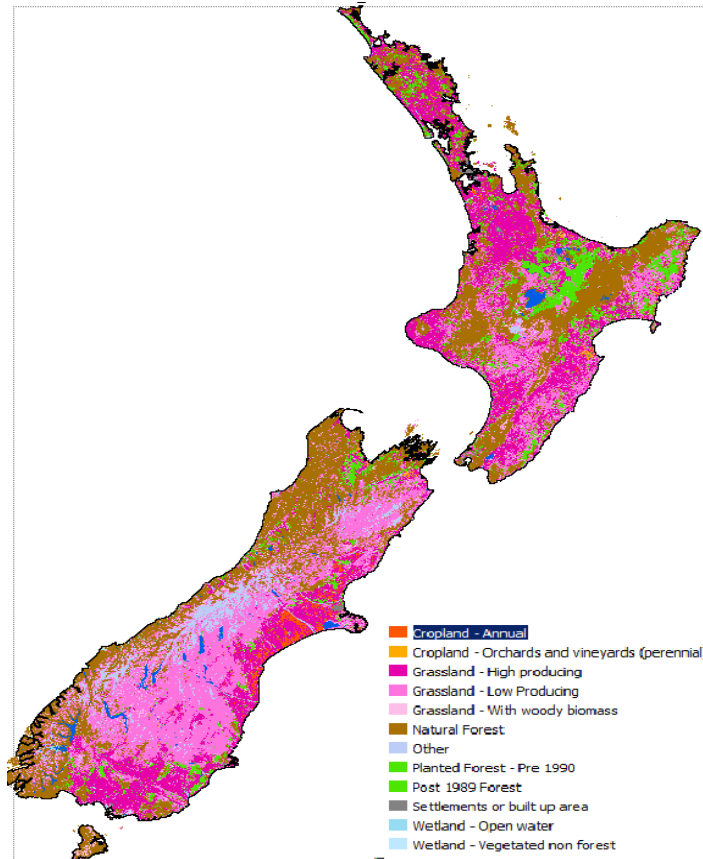
- **Waste Minimisation Strategy / Fund**
  - Municipal wastes / landfill focus
- **Afforestation grants scheme (MPI) - \$1300/ha**
- **Energy Efficiency and Conservation Authority (EECA)**
  - Bioenergy strategy and goals
- **Climate Change Consultation**
- **GIS data maps**

*\* Local Authority actions; Water quality / land use change (2 significant lake catchments; potential for regulated land use change to reduce N and P entering lakes)*

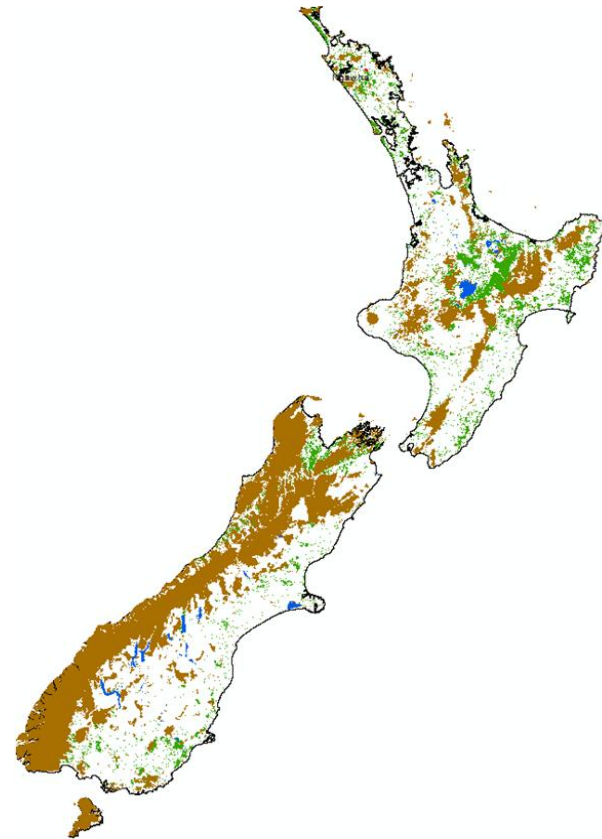
# GIS map layers

**Scion, MPI, Forest Owners, Landcare, LINZ etc.**

Slope, soils, climate (rainfall, temperature) = site productivity surfaces



**Land Cover / Land Use**



**Forest Cover**

Brown = Conservation reserve – Inc. Indigenous forests  
Green = Exotic plantation production forest

# National Level Data - Past Programmes

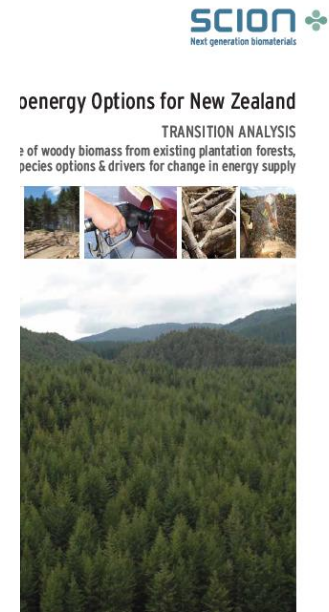
- **Bioenergy Options for New Zealand (Scion) 2007 to 2009**
  - Comprehensive review of biomass resources and derived opportunities for NZ
    - Forests are our largest biomass resource, and the one with the most potential to expand
    - Use of wastes (municipal, industrial, agricultural) is environmentally important, will not make a substantial contribution to meeting energy demand, but a good place to start
- **National Exotic Forest Description – Plantation Forests**
  - NZ has ~1.7 million ha of plantation forests based on introduced species (89% Radiata pine, 6% Douglas Fir and Eucalyptus). Majority FSC cert. Indigenous forest is mostly protected; very small proportion (0.2% of total harvest is indigenous).
- **Wood Supply forecasts based off NEFD (regional wood supply over time (2015 +25 to 30 years >))**
- **EnergyScape (2007 to 2009)**
  - national level review of NZ energy resources and future demand scenarios, covered both renewables (inc. Bioenergy) and fossil resources

# Bioenergy Options Study

- **Bioenergy's role: heat and liquid fuels**
- **Current biomass residues: small contribution**
- **Most significant opportunity:**

Bioenergy from forestry on marginal lands (erodible hill country)

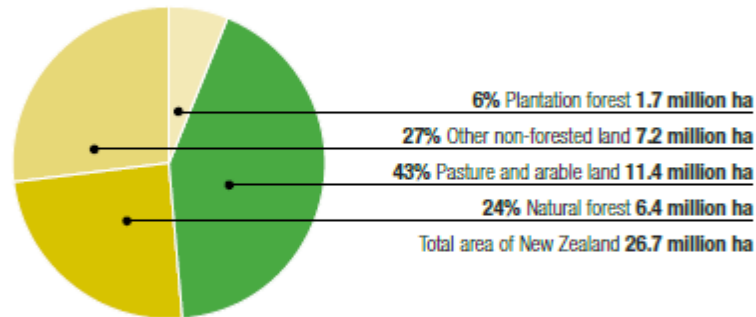
- ◆ Large scale
- ◆ Low environmental impact



# National Level Data – Extensive Plantation Data

## NEW ZEALAND LAND USE

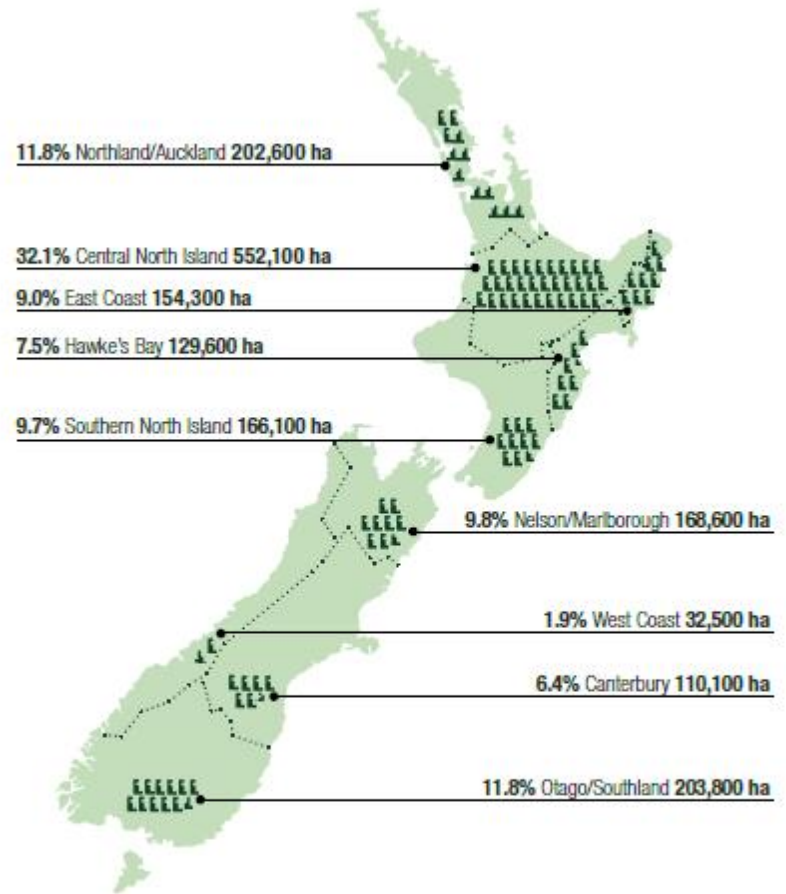
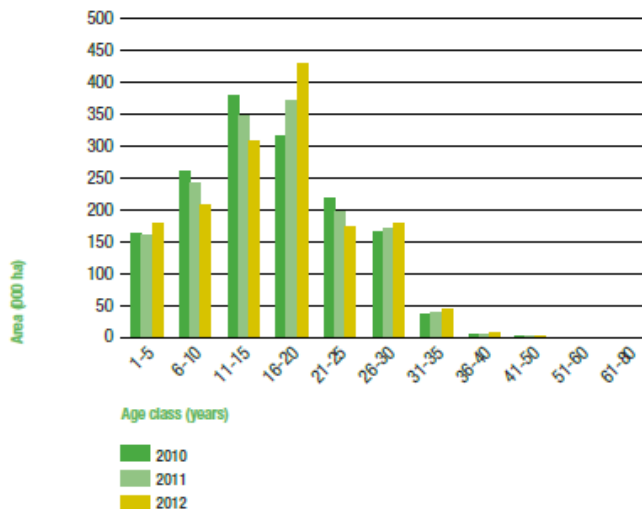
As at 31 March 2011



Source: MAF and Statistics New Zealand  
(Planted forest excludes harvest area  
exclusion contained)

## NET STOCKED AREA OF RADIATA PINE

By age class at 1 April 2012



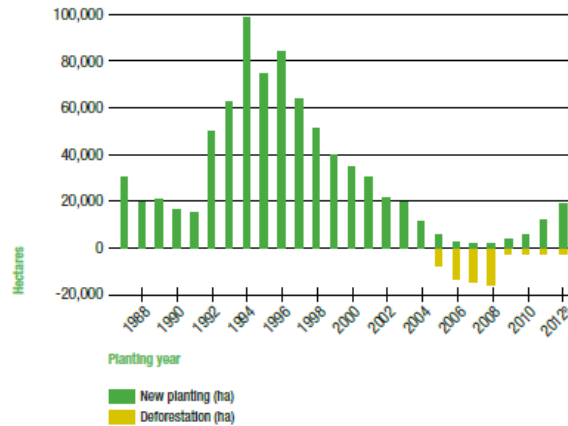
Each complete tree represents 1%

**Total 1,720,000 hectares**

Source: NEFD 2012

# National Level Data – Extensive Plantation Data

## NEW FOREST PLANTING (1987) AND DEFORESTATION (SINCE 2005)



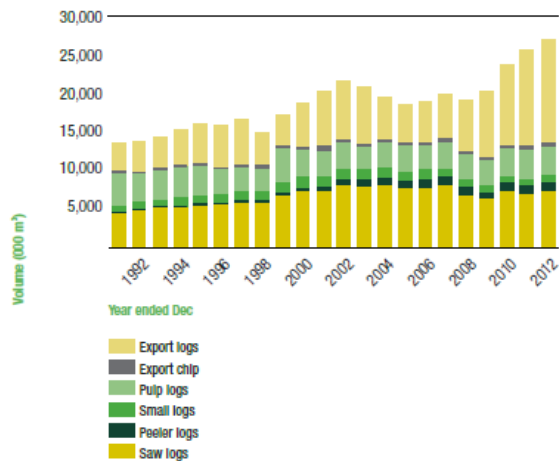
Source: NEFD 2012

Note:

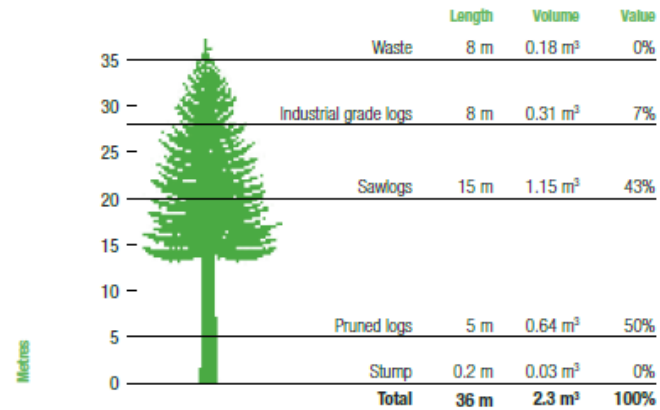
These estimates do not include immature forest cleared for other land uses.

\* Provisional

## PLANTATION FOREST HARVEST



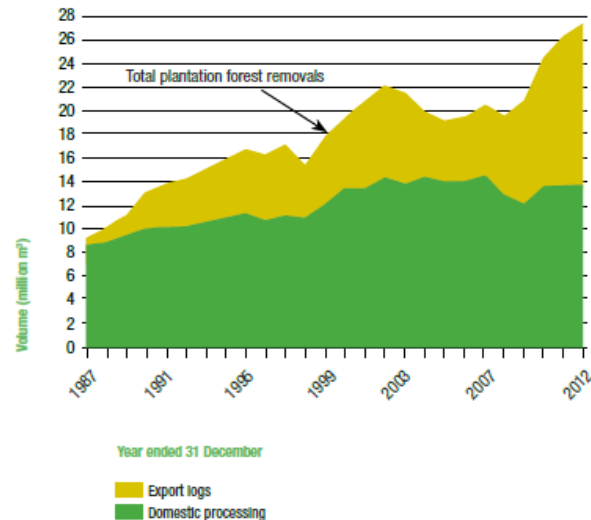
## TYPICAL LOG OUT-TURN



Direct Sawlog Regime

Pruned and thinned to waste. Final Crop Stocking 228 spha.

## PROCESSED IN NZ vs LOG EXPORT



# National Level Data - Current and Planned Programmes

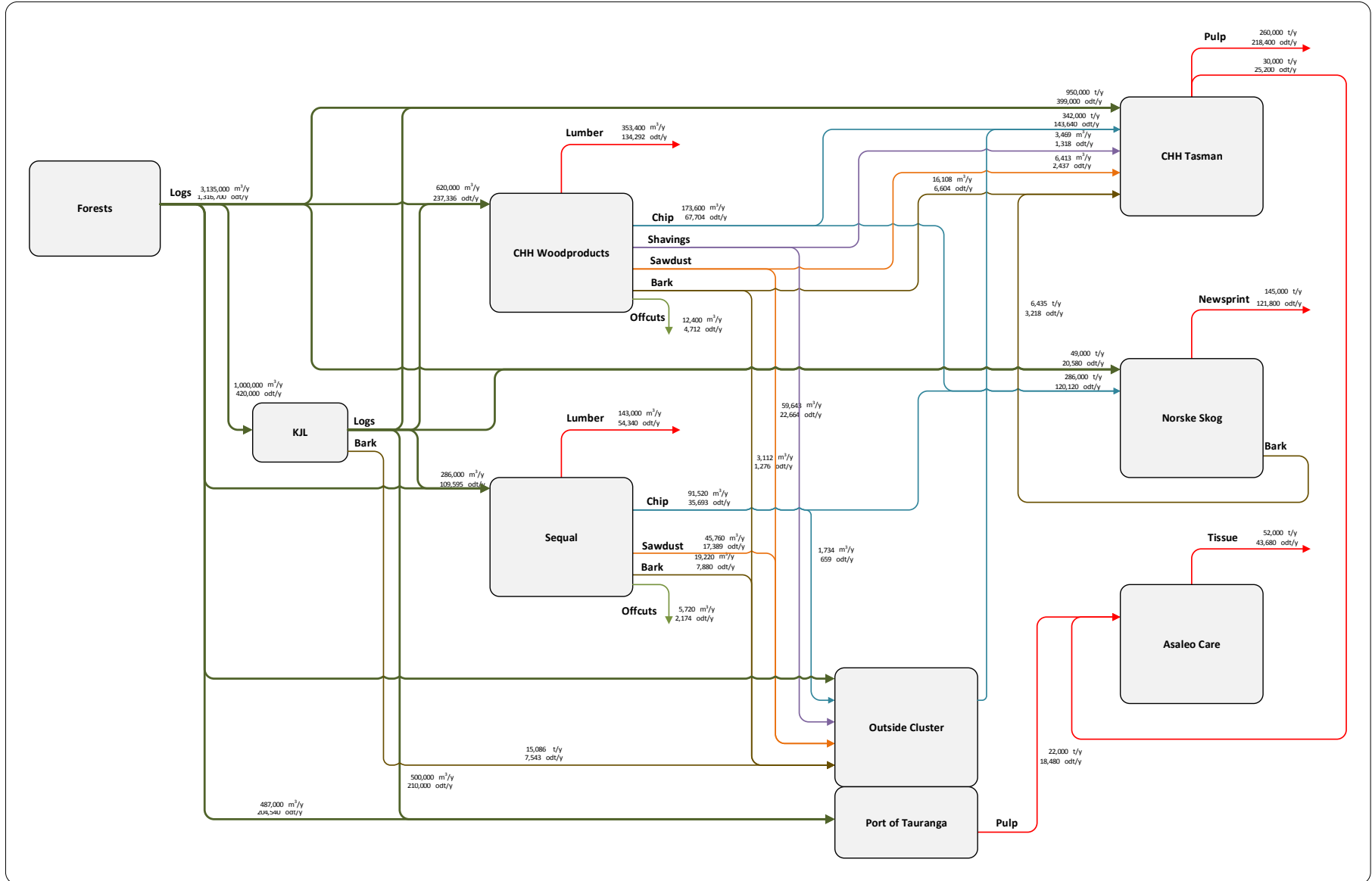
## Current

- **Scion Biofuels and Bioenergy research**
  - Biomass resources mapping and crop modelling
  - Industrial symbiosis – matching biomass resources to demand
- **Land Use and Carbon Analysis System (LUCAS) by MfE**
  - to meet New Zealand's reporting requirements under the Kyoto Protocol
  - Afforestation, reforestation and deforestation
  - Land Use Change – Carbon stocks eg above/below ground biomass, dead wood, litter, soils

## Planned

- **Biofuels (liquid) and Biomass for Heat Roadmaps (Scion)**
- **NZFOA / SCION / MPI – Permanent sample plot system (forestry growth by crop type)**

# Industrial Symbiosis - Maximise the use of resource



## Next Steps - Capacity Building

- **Consistent studies on MSW at regional level (types / volumes)**
- **On-farm wastes (dairy shed / herd home / energy resource potential)**
- **National data sets;**
  - Arable farming residuals
  - On-farm wastes
  - Industrial wastes
- **Updating of data collected in Bioenergy options studies.**
  - Bioenergy and Biofuels roadmaps for New Zealand
  - Alignment of all key stakeholders along new value chains
- **Data improvement – problems due to update frequency or commercial confidentiality**

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

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