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Next generation biomaterials

Bioenergy Options

Peter Hall

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Available residual resources

Type / source	2005	2030	2050
Forest Residues	14.6	34.4	29.5
Wood Process Residues	7.0	9.1	18.4
Municipal wood waste	3.5	2.2	2.9
Horticultural wood residues	0.3	0.3	0.3
Straw	7.3	7.3	7.3
Stover	3.0	3.0	3.1
Fruit and Vegetation Culls	1.2	1.2	1.2
Municipal Biosolids	0.6	0.7	0.7
Municipal solid waste, putrescible	2.2	2.3	2.3
Municipal solid waste , landfill gas	1.9	2.0	2.0
Farm Dairy	1.2	1.2	1.3
Farm Piggery	0.1	0.1	0.1
Farm Poultry	0.0	0.0	0.0
Dairy Industry	0.4	0.4	0.5
Meat Industry (effluent only)	0.5	0.5	0.6
Waste oil	0.2	0.2	0.2
Tallow	3.6	3.6	3.6
Total	**47.8**	**68.5**	**74.0**
Available Biomass as % of consumer energy	8.9	9.5	8.4
Available Biomass as % of Primary Energy	6.9	7.7	6.8

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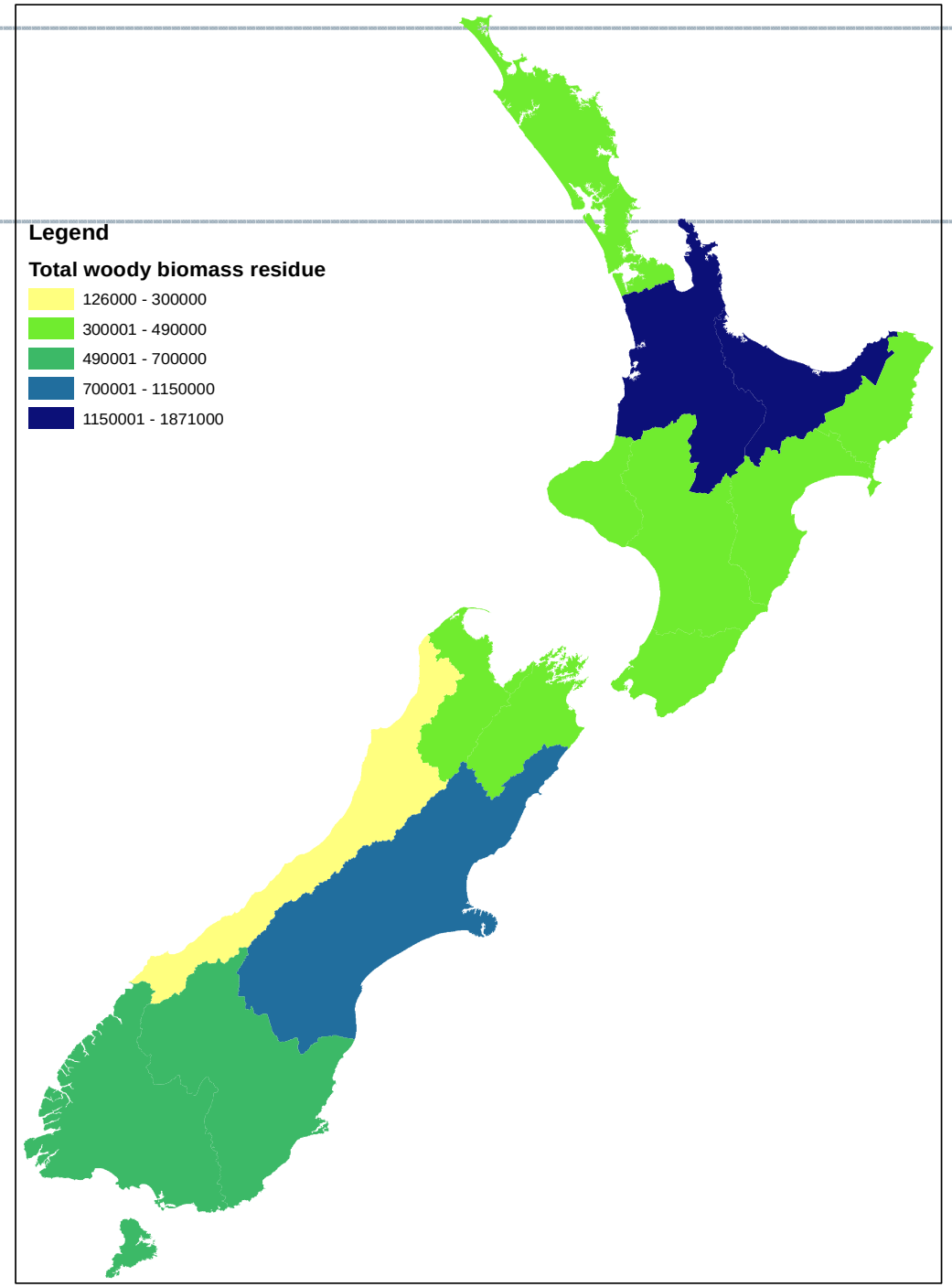
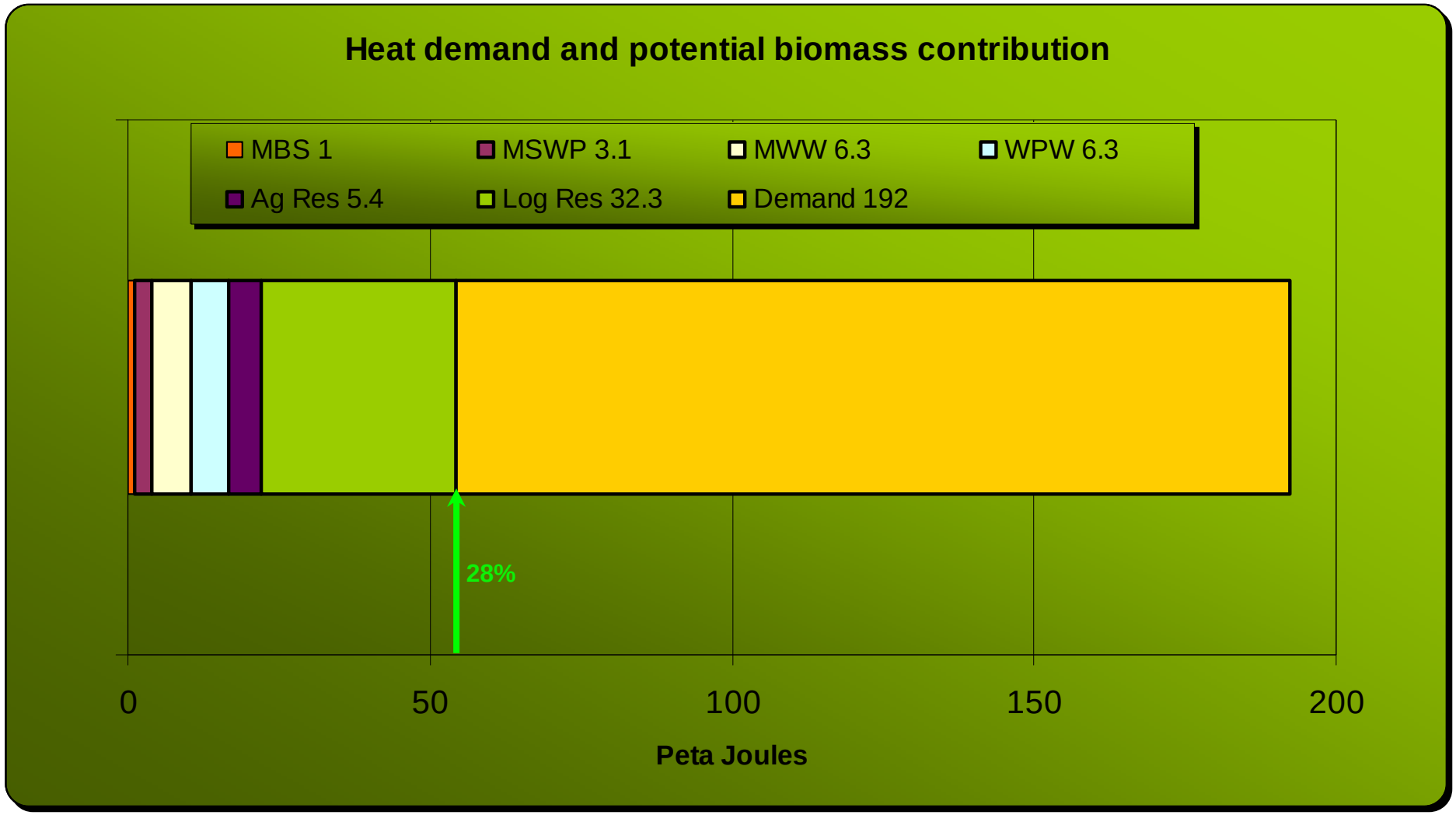
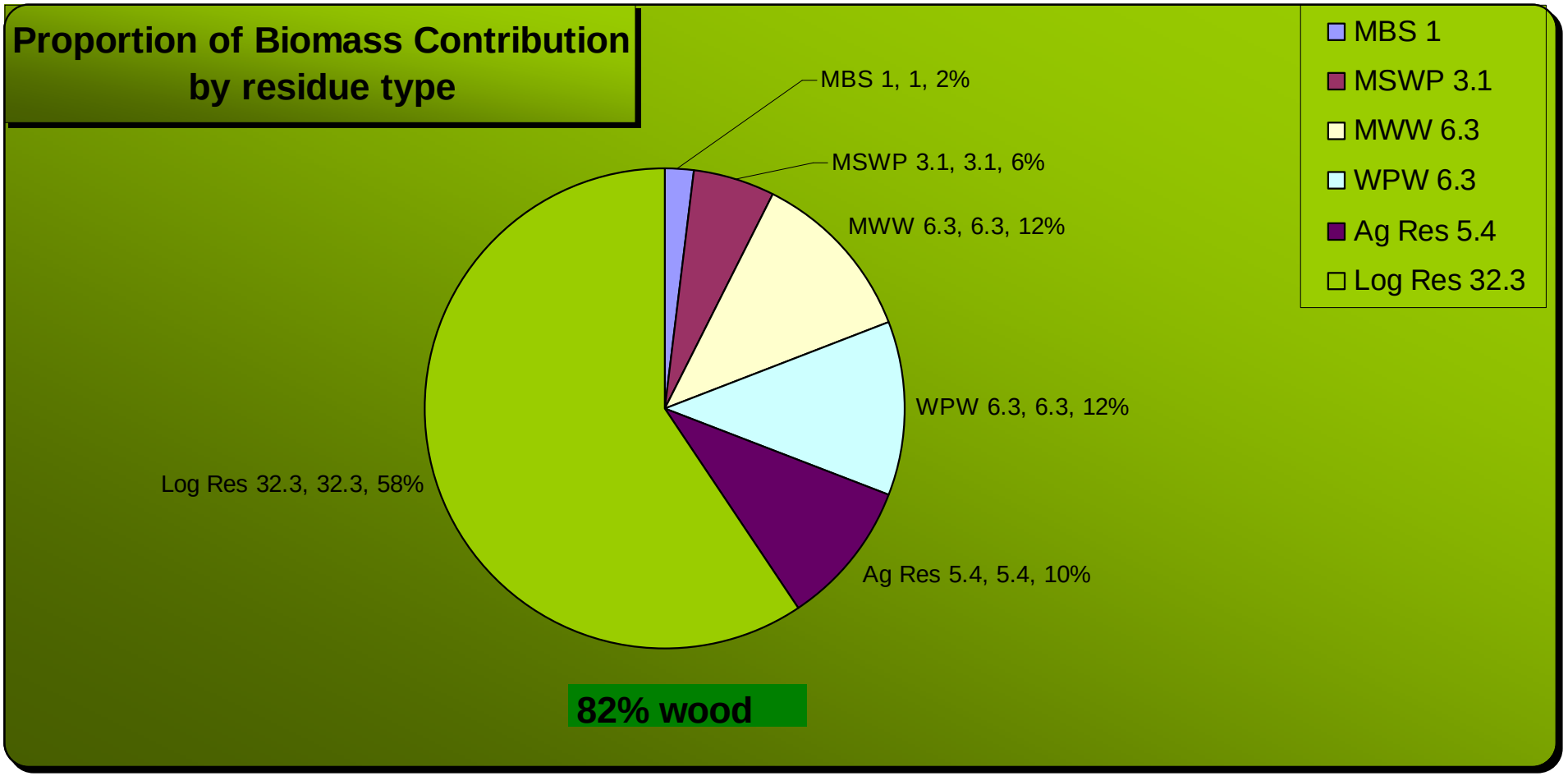
Mapping resource location



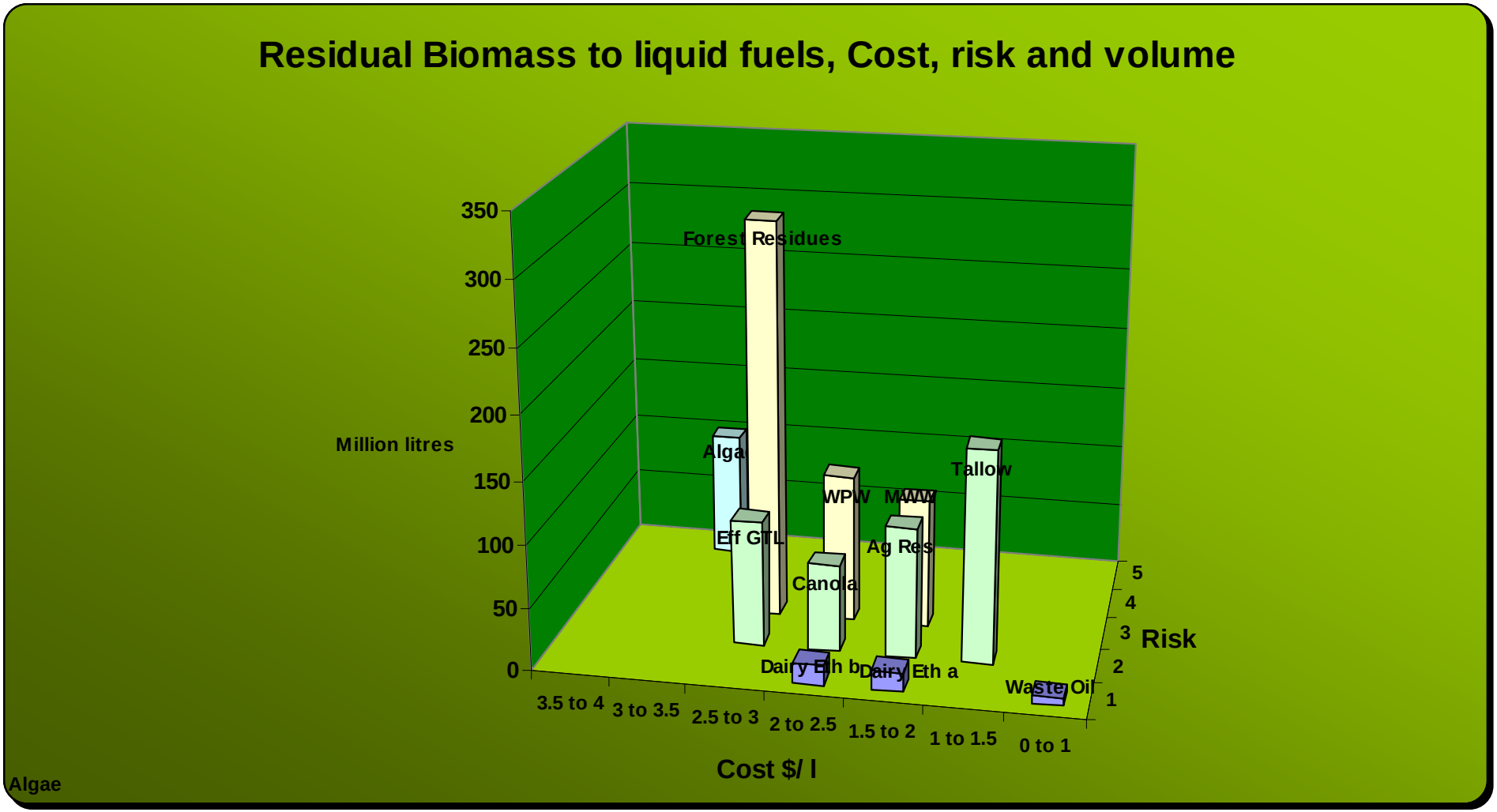
Resource information



Resource information



Data gathering on all Biomass resources



Pathways – focus in stages 2/3

Raw Material	Conversion	Energy Product
Wood Residues	Combustion	Heat Combined heat and power
	Enzymes	Ethanol Biobutanol
	Gasification	Combined heat and power
	Gasification + Fischer Tropsch	Biodiesel
	Pyrolysis / Oil	Combined heat and power
Effluents, Industrial, Farm waste effluent Municipal Biosolids	Anaerobic Digestion / Gas	Combined heat and power Gas for transport Liquid Fuels
	+ Algae Anaerobic Digestion / gas	Combined heat and power
	+ Algae Chemical Mechanical	Biodiesel
	+ Algae / supercritical water	Liquid fuels
Agricultural Residues (straws)	Combustion	Heat Combined heat and power
	Gasification + Fischer Tropsch	Biodiesel
Horticulture Residues (fruit wastes)	Anaerobic Digestion / Gas	Combined heat and power
	Enzymes	Ethanol
Agricultural Crops (canola)	Chemical Mechanical	Biodiesel
Waste Oil	Chemical Mechanical	Biodiesel
Landfill Gas	Capture	Heat and Power
Tallow	Chemical Mechanical	Biodiesel

Land use and strategy

NZ has

- 2.0 millon ha of cropping land
- 8.7 million ha of moderate to low productivity grazing land

- Agricultural crops to fuel, off arable land, at large scale is not possible, especially if you want to eat. (4.0 million ha)

- Forests for energy can do all of our heat and liquid fuels off 3.5 million ha of moderate to low productivity grazing land.

Plant SRF, MRF, Traditional forest for Energy and other products and values

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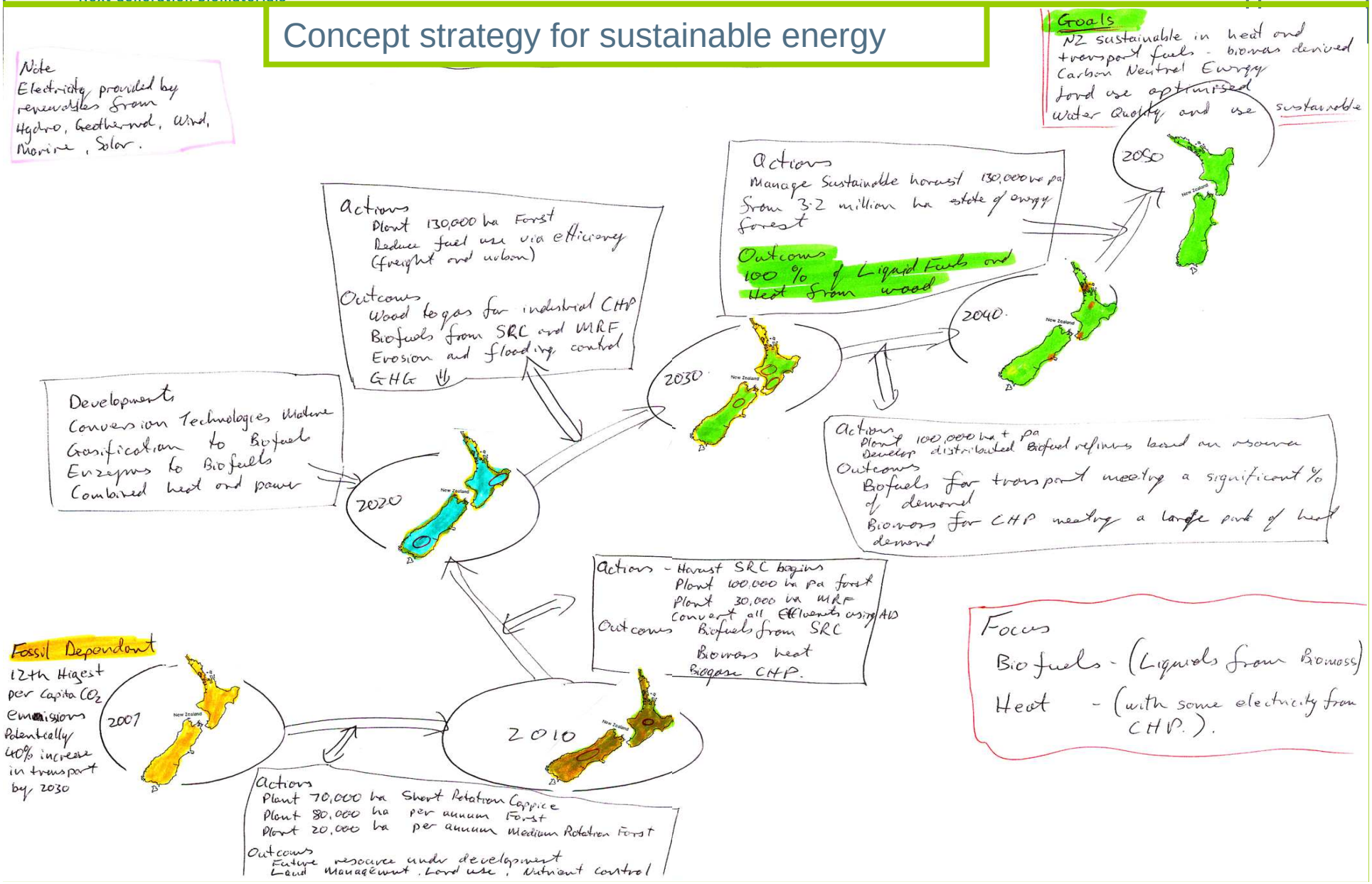
Forests

Concept strategy for sustainable energy



R & D Strategy

1. Develop a resource (stored solar energy) and convert to;

   - Heat (scale, logistics)
   - Biofuels (technology, scale, logistics, crops)
   - Solid wood
   - Chemicals

2. Leverage of biofuels driver (not captured by it)

Government strategy

Step in right direction

Linked to Forestry and ETS policy

Encourages renewable electrcity, needs a focus on waste streams

Will drive renewable investment

Will impact on GHG emmissions, nil effect on Climate change (NZ = 0.3% of global GHG?)