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Reducing New Zealand Transportation Emissions

Carbon Emissions

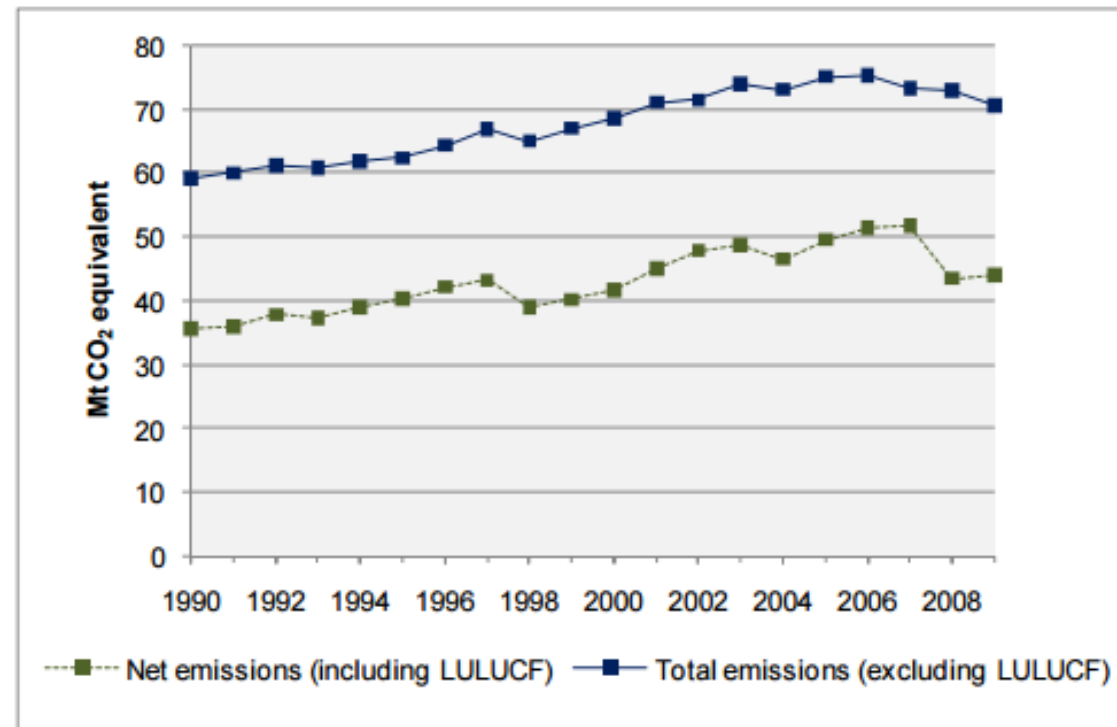
- Total Emissions: 70.6 megatons
- Transportation
 - 20% of total emissions – 14.12 megatons
 - 40% of the energy sector – 12.56 megatons from energy sector

Table 1: Total emissions (excluding LULUCF) by sector in 2009

Description	Mt CO ₂ -e	%
Agriculture	32.8	46.5
Energy	31.4	44.4
Industrial processes	4.3	6.2
Waste	2.0	2.9
Solvent and other product use	0.03	0.04
Total	70.6	100.0

Carbon Emissions cont.

Figure 1: New Zealand's total (gross) greenhouse gas emissions and net emissions under the UNFCCC from 1990 to 2009



Transport Emissions

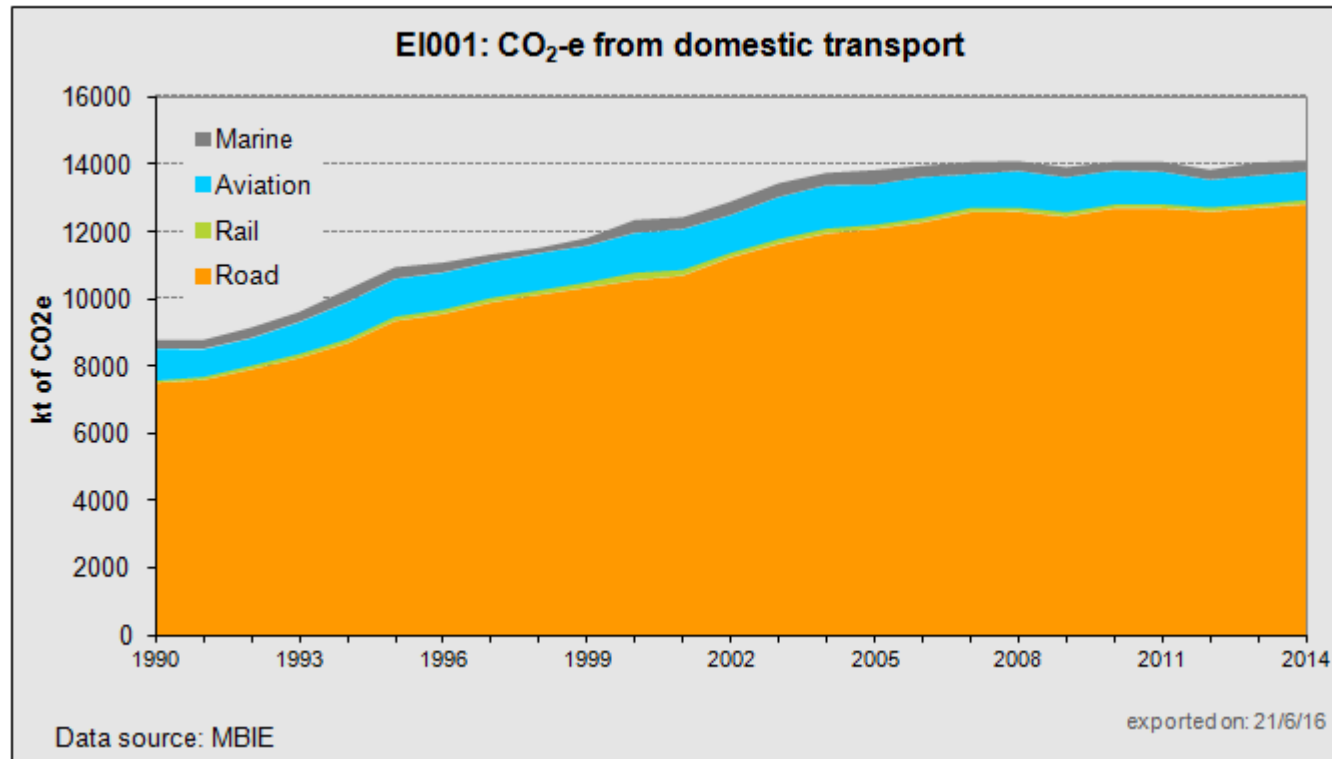
- Road transport: 90.6% of transport emissions (2014)

EI001 Carbon dioxide equivalent emissions (kt of CO₂-e) from domestic transport (road, rail, maritime, aviation)

	2009	2010	2011	2012	2013	2014
Road	12432	12677	12677	12578	12688	12797
Rail	166	145	155	156	150	159
Aviation	1037	1014	967	825	855	853
Marine	298	259	295	297	382	322
Total	13933	14095	14094	13856	14075	14131
Population (June)	4302.6	4350.7	4384	4408.1	4442.1	4510
Transport emissions/capita	3.24	3.24	3.21	3.14	3.17	3.13
Growth in emissions/capita from 1990	28%	28%	27%	24%	25%	23%

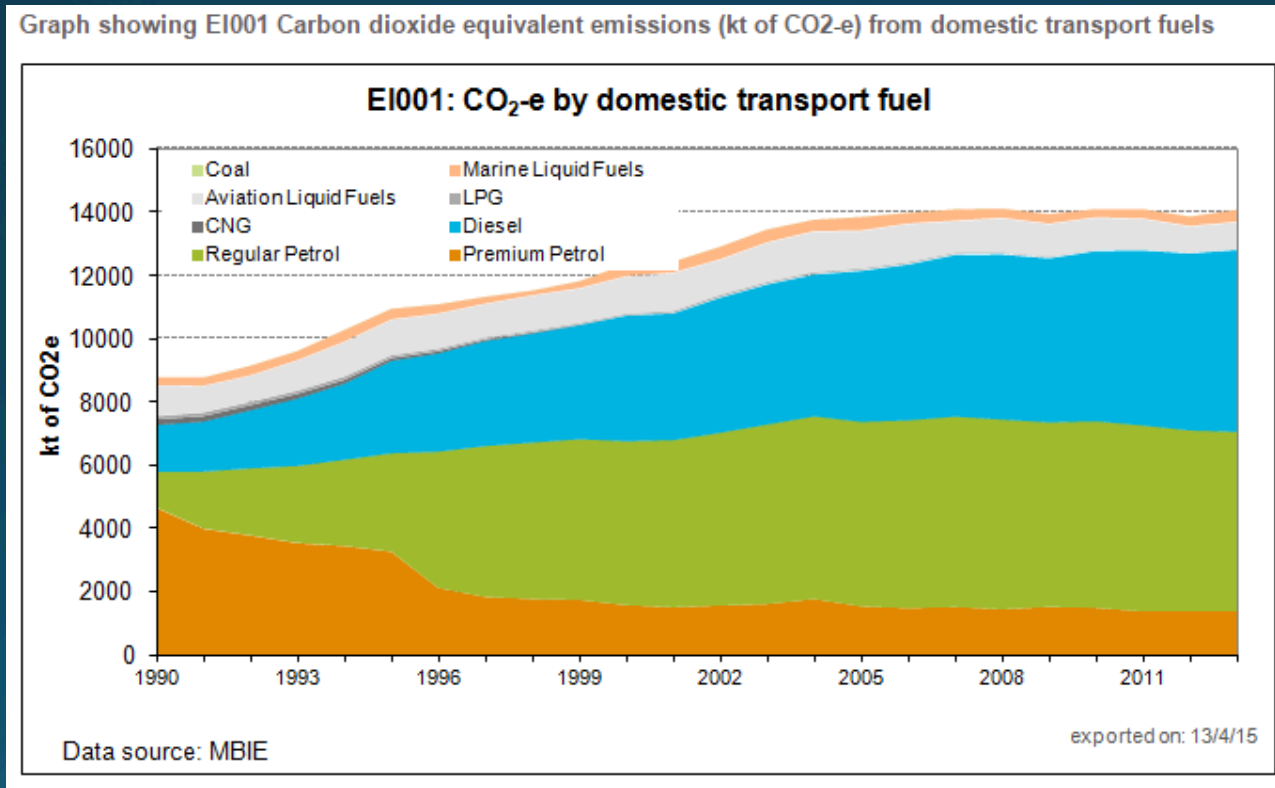
Transport Emissions

Graph showing EI001 Carbon dioxide equivalent emissions (kt of CO₂-e) from domestic transport (road, rail, maritime, aviation)



Transport Emissions by Fuel

- Personal vehicles (Petrol): 7,055 kt of CO₂ emissions
 - 50.1% of transport emissions



Transport Emission Problems

- Harm to environment and human health
- 256 premature deaths/year contributed to vehicle emissions
- Social cost of \$934 million NZD
- Vehicle emissions review timeline built around Australian timeline

Reduction Strategies

- Emissions Trading Scheme
 - Price on carbon emissions
- Electric Vehicles
- Alternative Fuels/Technologies
 - Biomass & landfill gas
- Heavy Vehicle Fuel Efficiency Program
- Fuel Economy

Electric Vehicles Program

- 64,000 vehicles by 2021 – double amount
- \$1 million annually for a nation-wide electric vehicle information and promotion campaign over five years
- A contestable fund of up to \$6 million per year to encourage and support innovative low emission vehicle projects
- Road User Charge exemption until 2% of vehicles
- Special vehicle lanes
- Beneficial tax depreciation rates on vehicles

New Zealand Well Suited?

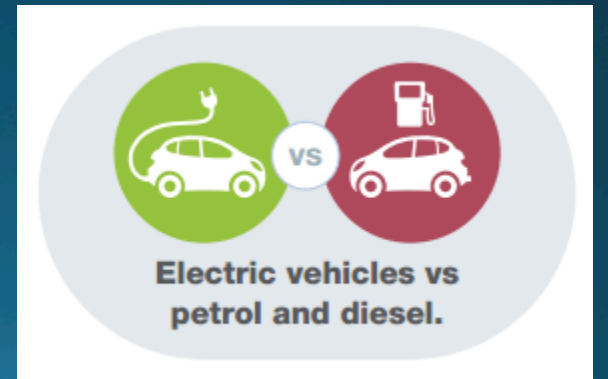
- 80% of electricity is generated from renewable sources
- Target of 90 percent renewable electricity generation by 2025
 - Greater demand of vehicle emission reductions
- 230 volt system – faster charging
- 85% population has off street parking – overnight charging
- Low average commute distances
 - Well within the typical 150 km/charge for EV

EV Benefits

- 1,015 EV out of 3.1 million light vehicles
- Doubling purchase rate of EV's over next 25 years can cut transport emissions by 7% by 2040
- Increased energy independence
 - Currently \$9 billion NZD annually spent on oil imports

EV vs Petrol: Life Cycle Analysis

- 60% reduction in emissions for lifecycle
- 80% CO₂ reductions in New Zealand – renewable energy
- 40% less cumulative energy demand
- 50% less photochemical matter pollution
- No tailpipe emissions – traffic pollution reduction



Switch to EV's

- Average battery: 50 kWh charged once per day
- 3.1 million light vehicles
- 55,000 GWh per year for switch of all light vehicles to EV

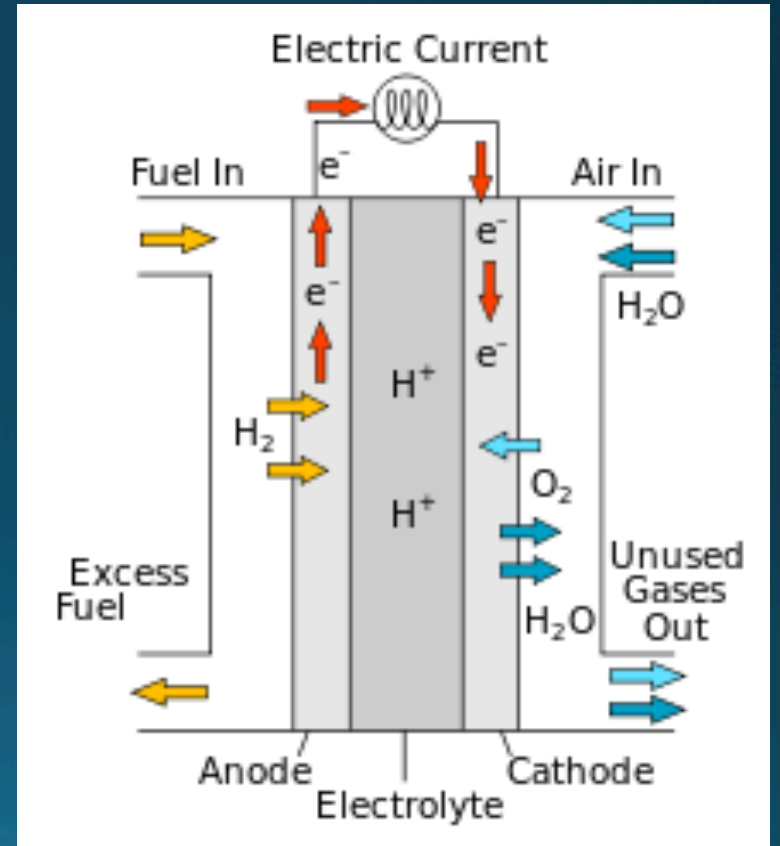


New Zealand Energy Production

- Current Energy Use: 600 PJ
- Electricity Use: 39,000 GWh
- Room for expansion
 - South Island hydropower
 - Wave/tidal/current power
 - North Island geothermal
 - Increased on/off-shore wind installations
 - Hydrogen fuel cells?

Hydrogen Fuel Cell Potential

- Electrolytic production of hydrogen
- Zero vehicle emissions
 - Renewables used for production
- Potential use for heavy vehicles
 - Light vehicles transition to EV
- Use for transport beyond EV range
- Technology still developing and expensive
- Potential for further emissions reductions



Resources

- <http://www.mfe.govt.nz/sites/default/files/greenhouse-gas-inventory-2011-questions-answers.pdf>
- <http://www.transport.govt.nz/ourwork/climatechange/>
- <http://www.transport.govt.nz/assets/Uploads/Our-Work/Documents/NZ-Electric-Vehicles-fact-sheet.pdf>
- <https://www.eeca.govt.nz/assets/Resources-EECA/ev-lca-report-infographic-nov-2015.pdf>
- EGEE 420 – Course Notes