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Policy Implications of Moving Towards a More Electric and Carbon Neutral Transportation Future

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The NZ Context :

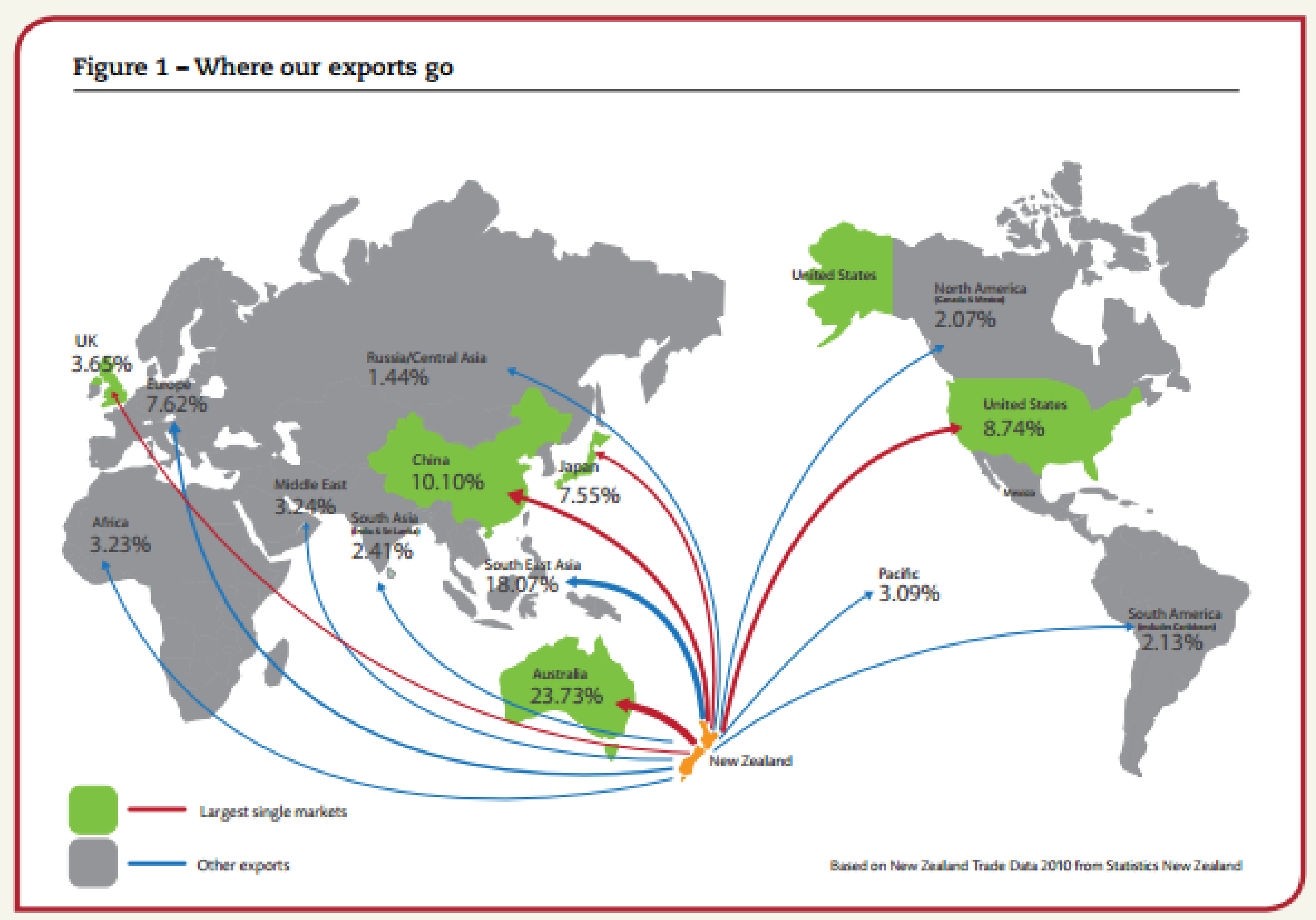
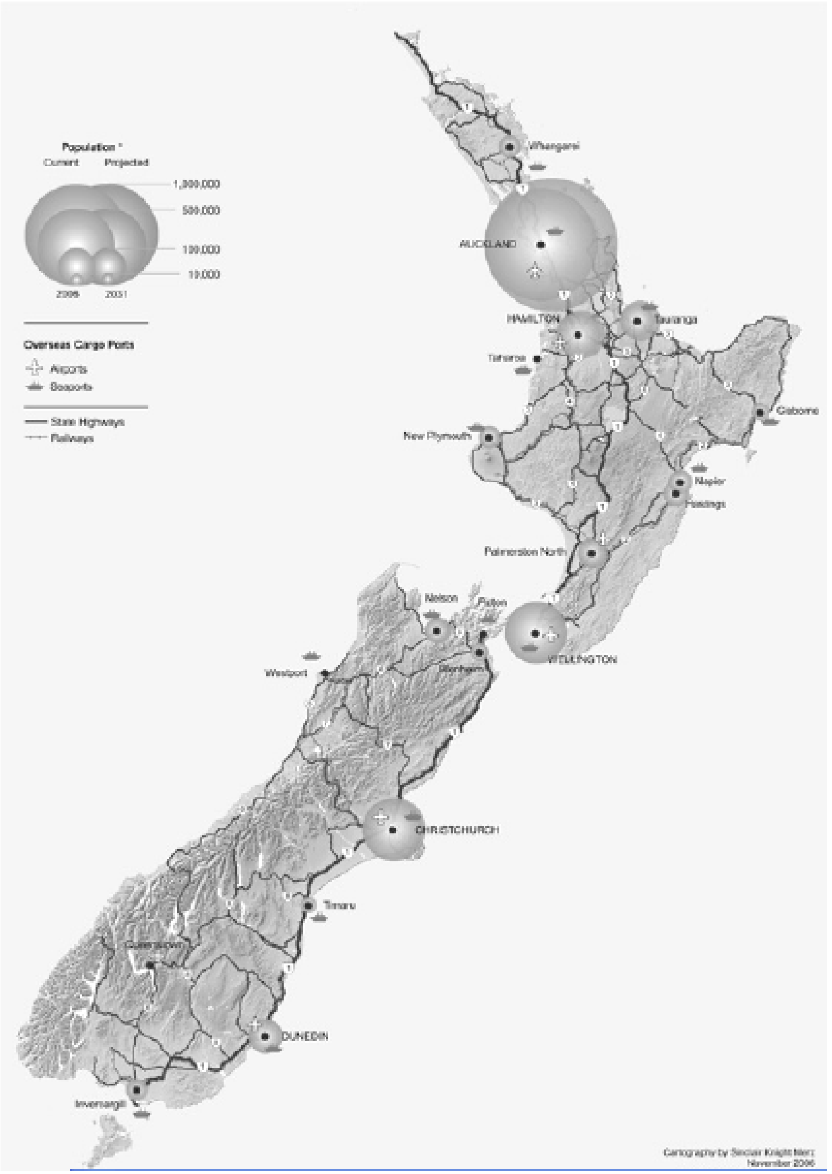


Figure 1 – Where our exports go



- NZ emits 0.17% of Annex 1 (43 Countries) World's emissions BUT emissions per capita is 6th highest at 17.4T CO_{2e} per year, 80.9 MT for NZ
- NZ Gross emissions have increased 23.2% and Net emissions by 64.9% since 1990 (difference largely due to Forestry Harvesting)

Why is NZ so dependent on Road Transport

– and will remain so for a very long time !

Country	No.Vehs	GNI	Travel	Road	Rail	Air	Goods	Road	Rail	Air	Water
	/capita	US$/cap	(km/cap)	(%)	(%)	(%)	(t-km / capita)	(%)	(%)	(%)	(%)
Poland	0.493	12440	4500	52	46	2	4600	22	77	<1	<1
Netherlands	0.523	49050	8100	86	6	8	3250	33	6	<1	60
UK	0.525	38370	8500	86	8	6	2100	81	18	<1	<1
Belgium	0.558	45910	8400	85	12	3	2300	46	30	2	22
France	0.575	42390	8700	85	10	5	3150	53	39	<1	7
Japan	0.593	41850	6500	51	45	4	1500	73	26	<1	<1
NZ	0.733	28770	11200	85	2	13	3250	64	33	2	<1
USA	0.808	47390	15900	93	1	6	10900	27	41	<1	31

In NZ, 93% of all freight delivery (in tonnes) is transported by Road – 75% of tonne kms for all freight delivery (50% - EU, 42% - US and 30% in Australia)

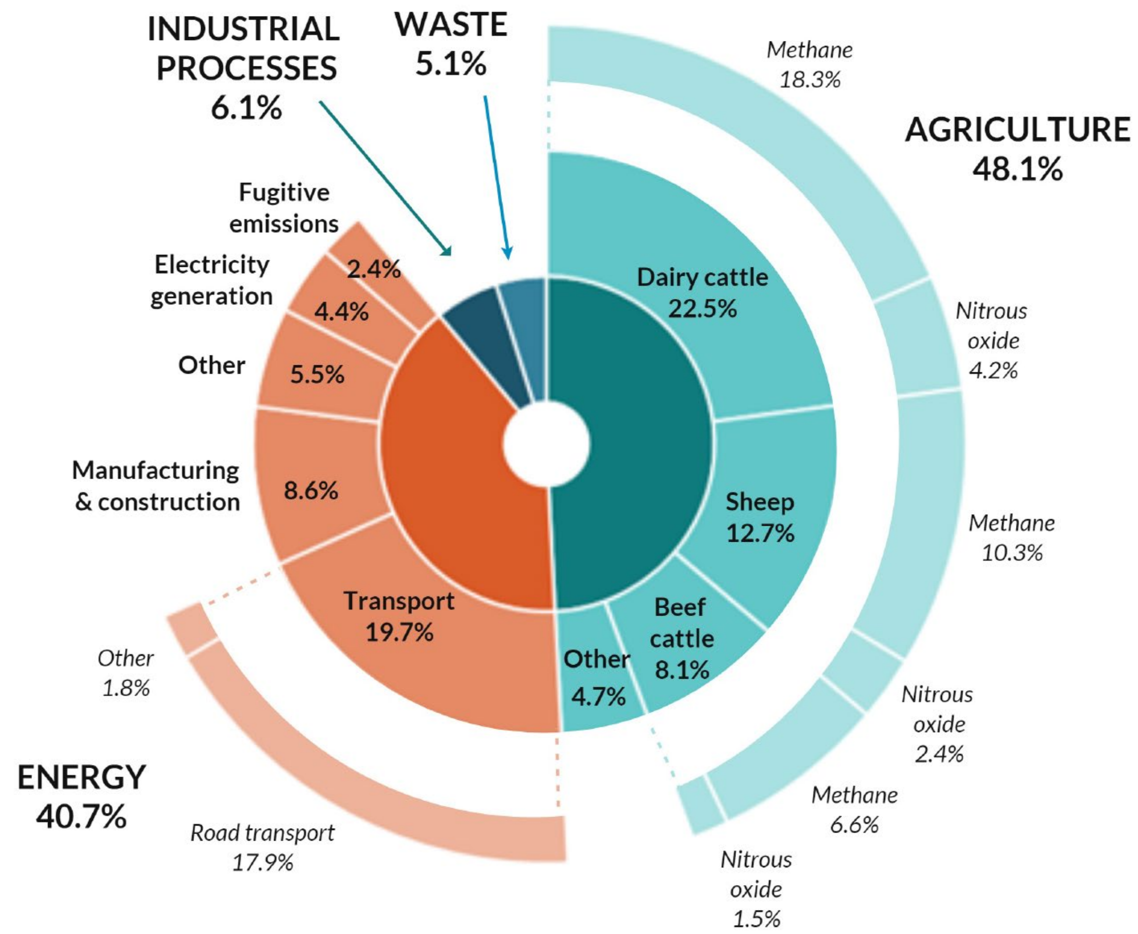
The New Zealand Context – The Why?

WHY IT MAKES SENSE FOR NZ'S TRANSPORT SYSTEM TO GO ELECTRIC QUICKLY

- NZ is unusual as almost 50% of CO_{2e} comes from Agriculture (c.f.12.1% average for Annex 1 countries)
- Many other Annex 1 countries have lowered gross emissions since 1990 (e.g. UK and Germany)
- Road Transport emissions increased 93.4% since 1990
- Globally 22% of CO_{2e} by sector due to Transport (2015)
- NZ Transport emissions (19.7% - 2nd largest)
- LV= 67% of CO_{2e} and HV = 24.2% but only 7% of VKT
- 256 Premature deaths (Social costs of $934M) annually from harmful vehicle emissions
- NZ power generation is > 80% renewable
- NZ ratified Paris Agreement (2016) and has established a Climate Change Commission who are currently setting ambitious targets
- Towards Net Zero emissions by 2050 in NZ

EVs and the Net Zero Emissions Challenge

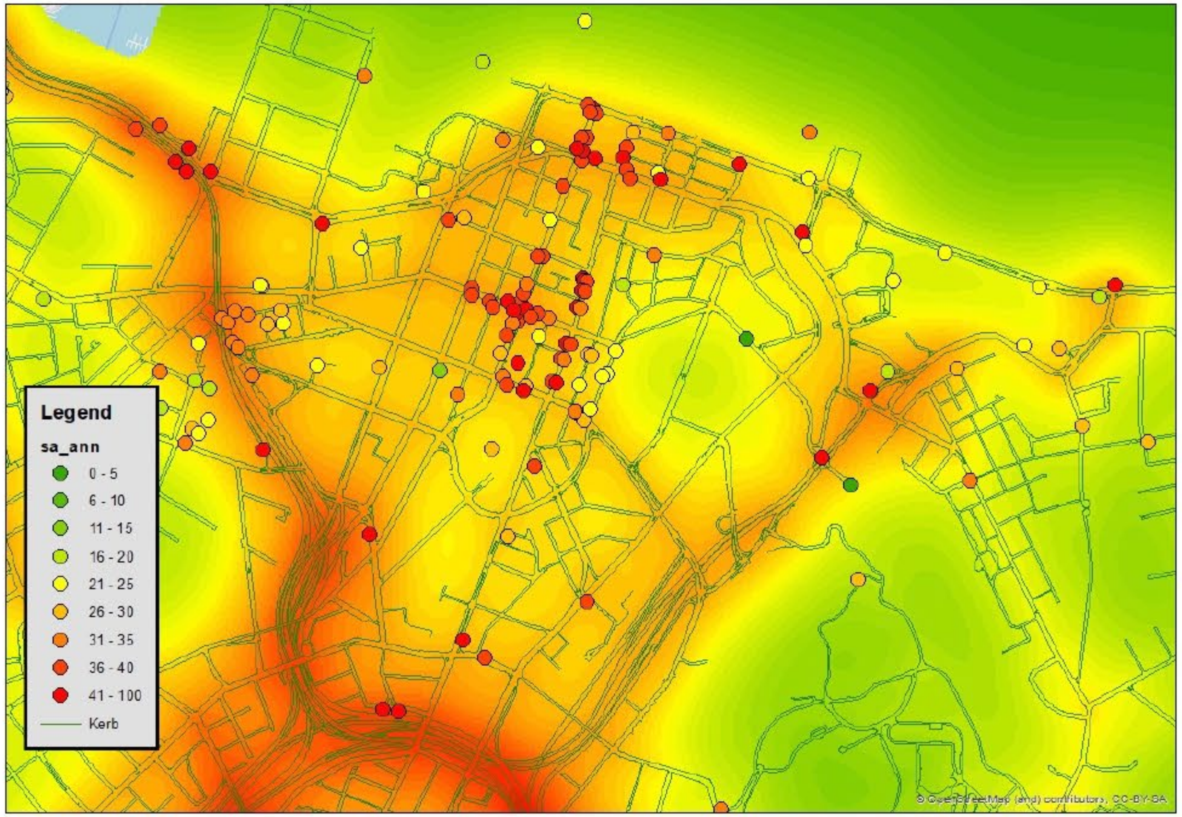
ELECTRIC VEHICLE
DRIVING AN EV FUTURE

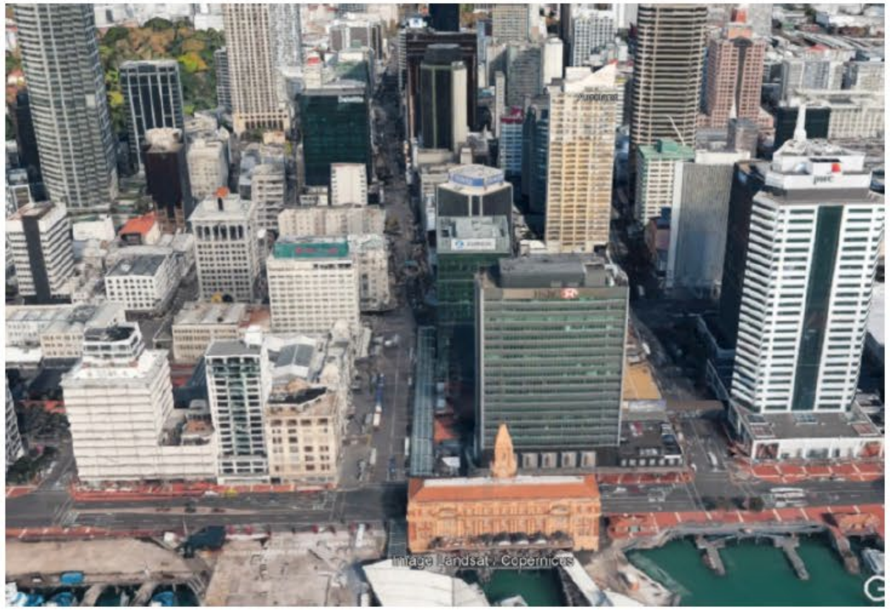


Note: Percentages in the graph may not add up to 100 due to rounding.

Air Quality Monitoring in Auckland, NZ (NO_2)

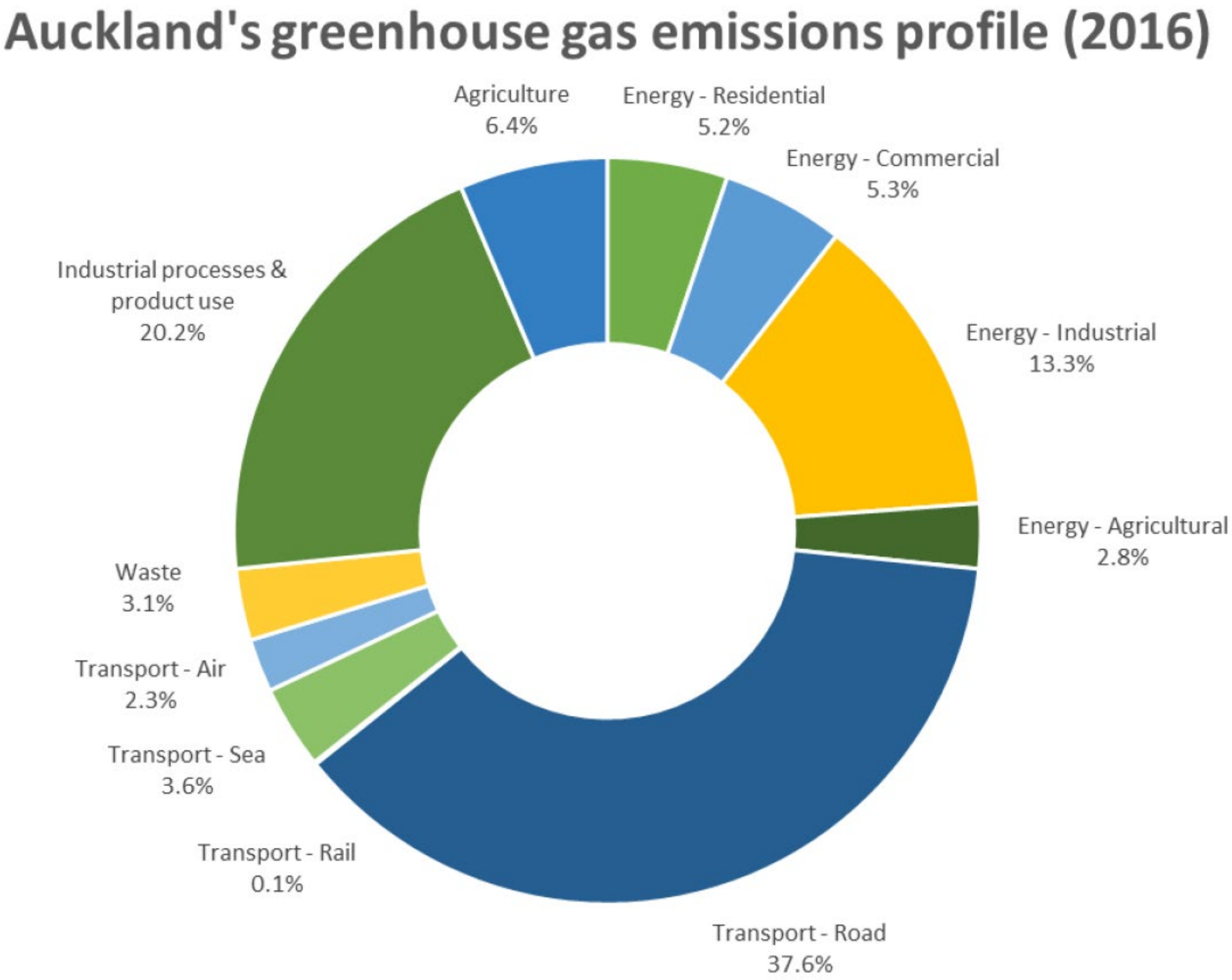
Central Business Districts





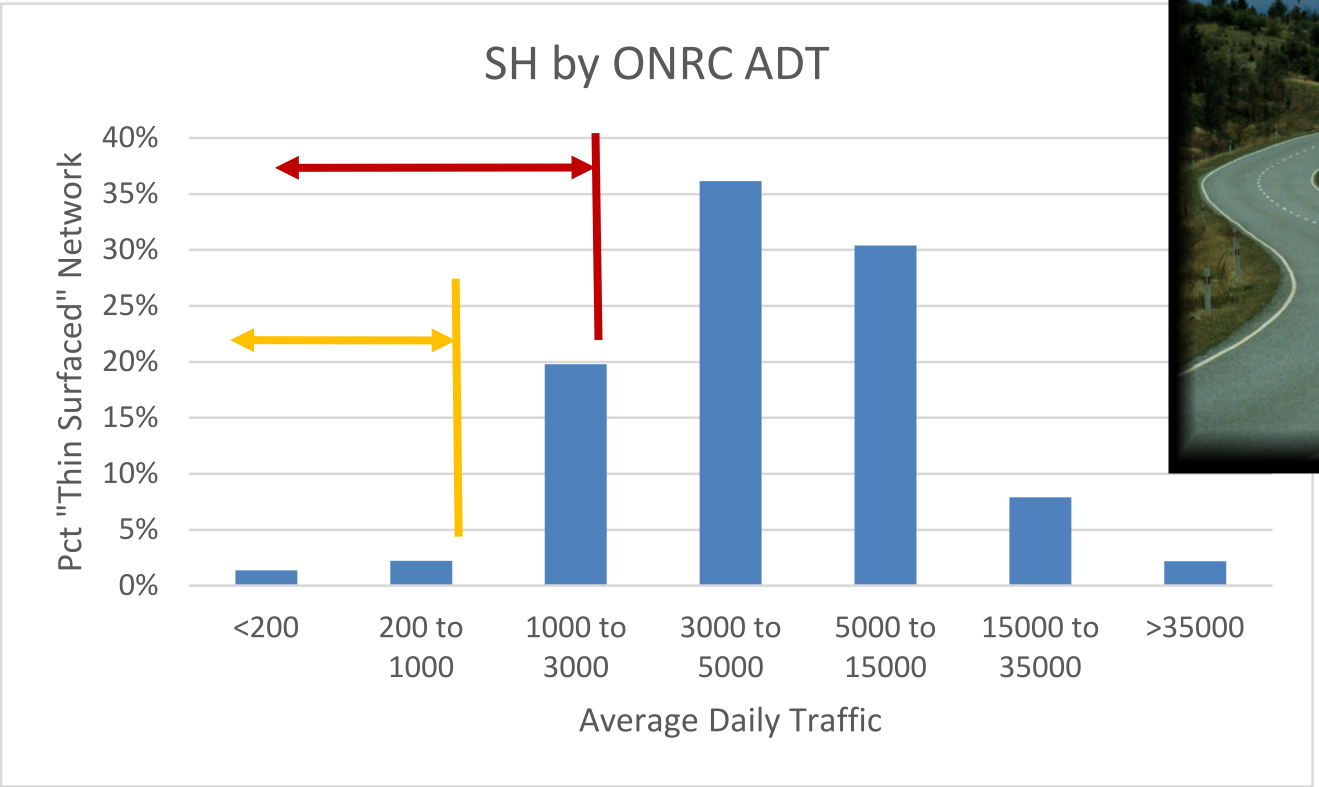
Model does not (yet) account for poor dispersion in street canyons

Auckland GHG Emissions & Future Technologies



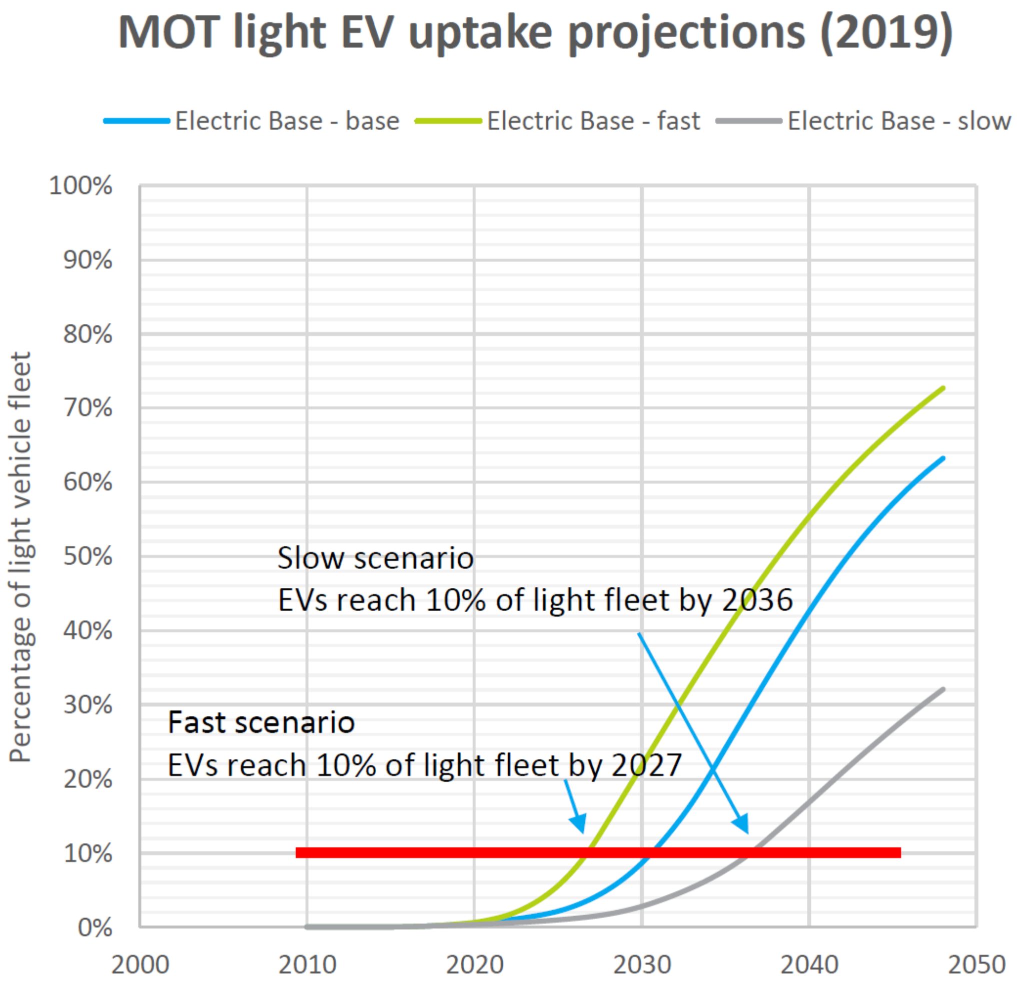
Sealed State Highway Road Network and Demand

- State highways (thin-surfaced)
- Length: 11,400 km
- 4% of length<1000 vpd
  - 400 km
- 30% of length < 3000 vpd
  - 2,600 km



Predicting LV EV fleet uptakes

- It is very hard to predict the likely uptake of EVs over the longer term
- They might reach 10% of the fleet as soon as 2027 or late as 2036 under our modelling scenarios
- The law says that EVs will pay the full rate of RUC for light vehicles ($72/$1000) after exemption ends at the end of 2021 = no loss of revenue
- If EVs grow at base case rate, but didn't pay any RUC after exemption ends at the end of 2021, we would have a 2% revenue loss by 2025
- This would be a long term concern, but not a short term one



Increased fuel efficiencies but Increased weight

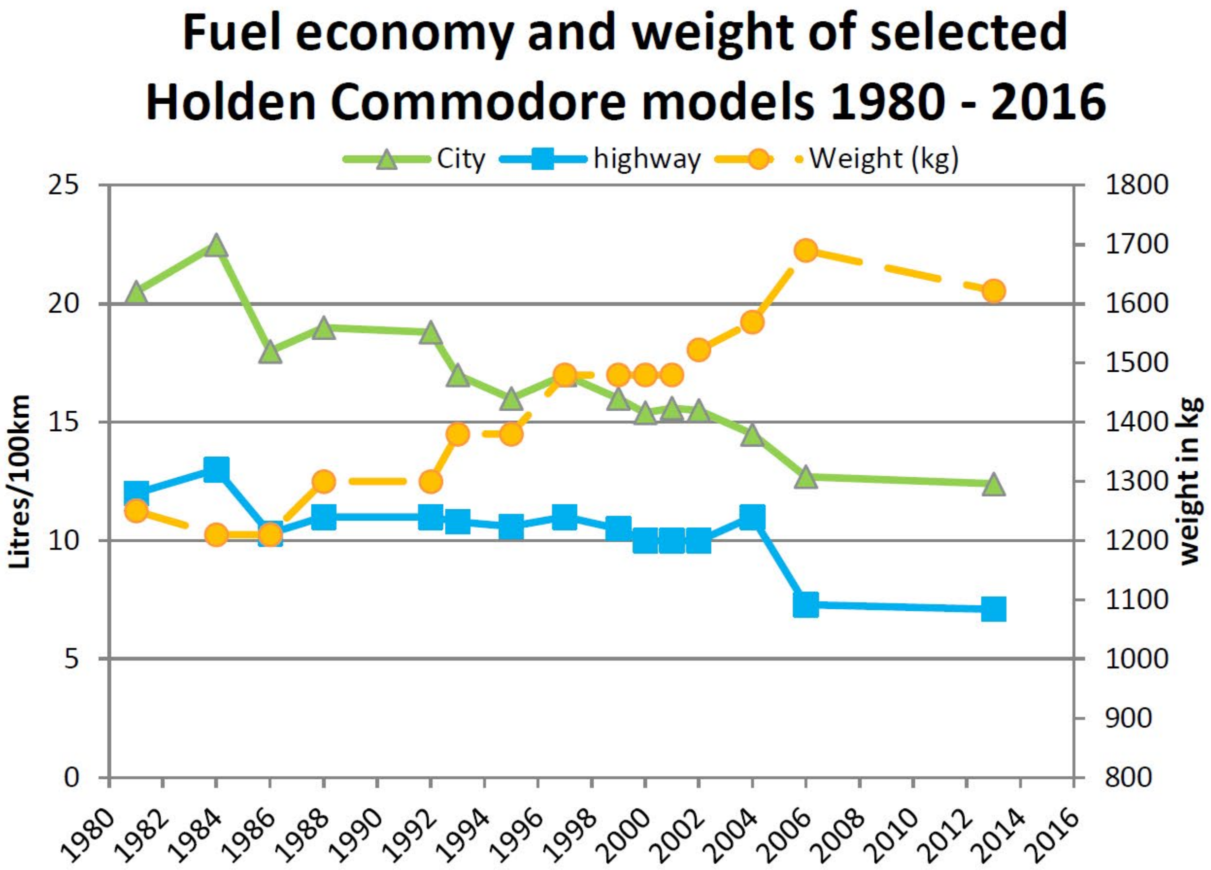
Much of the benefit of increasing technical efficiency has been traded off against weight and increased power

1972 Honda Civic 1.2l
700kg/56kW

2016 Honda Civic 1.8l
1,240 kg/96 kW

1972 Toyota Corolla 1.2l
880kg/52kw

2016 Toyota Corolla 1.8l
1280kg/104kW



Data provided by Australian govt official (pers com). Checked against published figures where possible.

Transport Needs and Significant Change

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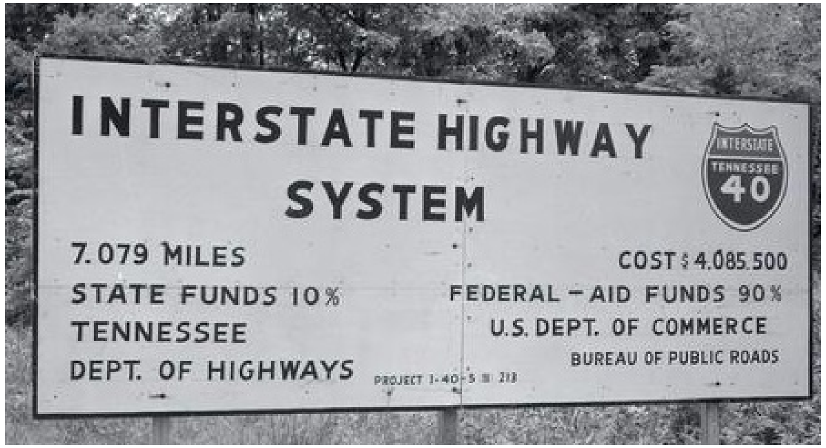
Civil Engineering Transport Assets are Currently not very 'Smart' but they mostly last a very long time.

Cost of infrastructure per mile is a significant barrier to EV take-up and who pays?



17th / 18th Century – Sea ports and shipping
19th Century – Steam and Rail
20th Century – Motor Vehicle, Air & Space
21st Century – Electrification and Automation of Land Transport

Barriers to EV Adoption:

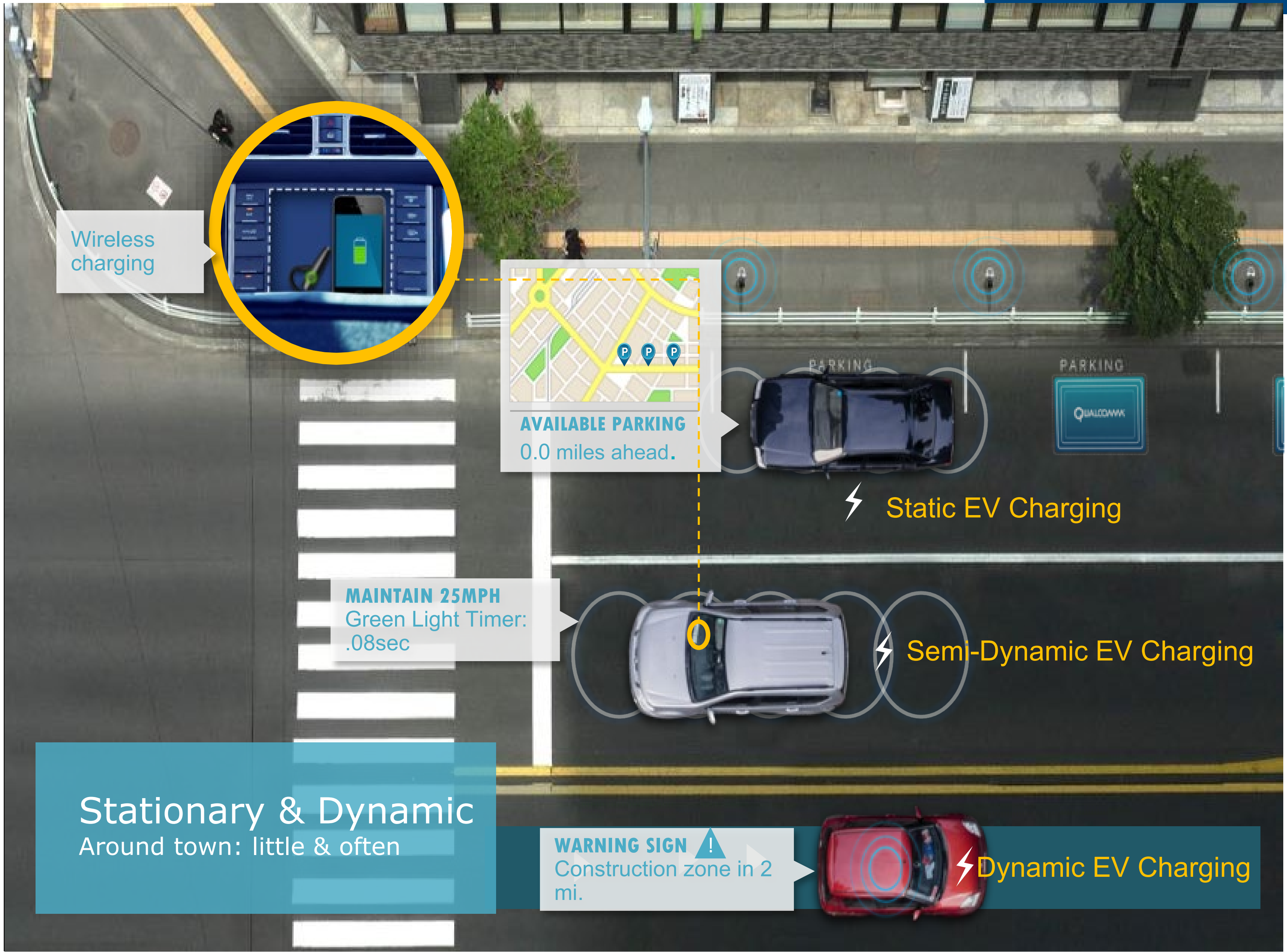
Key Policy issues / constraints:

- Current Transportation Assets are vast & in poor asset condition (D to D-)
- Transportation Assets - long life & require significant maintenance throughout life cycle – differ significantly to electrical systems
- Complex socio-political and economic markers of dynamics – peer pressure
- Who pays & who gains? – future funding scenarios (eg. RUC > eRUC)
- Current price of Carbon and Emission Trading Schemes – carrot and stick
- Power & Transportation Integration & Access to Road Reserve
- Age of vehicle fleets and how long it takes for turnover of vehicles
- Battery charging – recharging & range anxiety
- One size or type does not fit all (eg IPT stationary, semi-dynamic and fully dynamic systems)
- Standardisation – terminology – user preferences
- Low / high cost scalability & complex systems
- Sustainability & environmental concerns of materials (eg. Batteries, cobalt, nickel, lithium)
- System efficiency and optimisation.

International IPT Vision

Some Final Policy thoughts:

- Need some high profile demonstration projects
- Get some wins on the board
- Gov'ts and Transport Agencies need to work with academia and industry collaboratively
- Selecting initially sites where everyone agree it makes sense
- Encouraging a faster turnover of the EV fleet
- Ensuring equity in policy
- Need new multi-disciplinary skills



Thank you
Any questions?

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