

Auckland's transport system for a fast-changing world

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Shared Space to Priority Space

Take the next step – prioritise some streets for pedestrians and cyclists

Shopping streets free of motorised traffic, Haarlem town centre, Netherlands

Service vehicle access 6am-11am only



Vehicle access controlled by moveable bollard & signage (Haarlem, Netherlands)



Herald Square



BEFORE



AFTER



“Shared space”, Hanoi - The rail line doubles up as a pedestrian thoroughfare!



A Ho Chi Minh City-bound train passes through Hanoi, where the line doubles up as a pedestrian thoroughfare

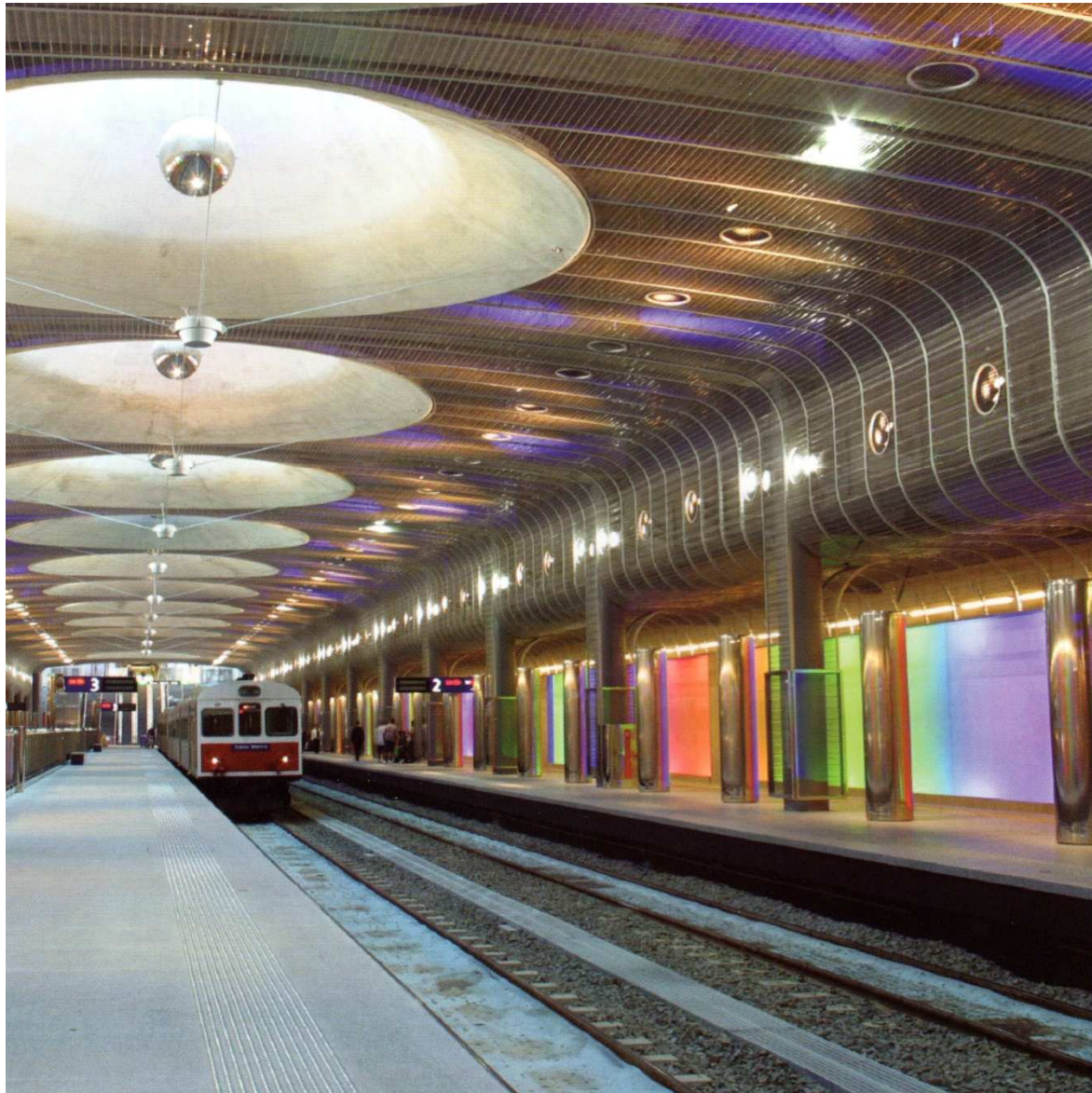
Public Transport

We have come a long way since the
early 1990's

Public Transport post 1970

- Mid 1970s: Rapid rail project abandoned.
- 1989: Transport deregulation based on UK model. Public Transport privatisation encouraged. Subsidies reduced. Around this time the costs of imported cars greatly reduced.
- Between 1986 and 1991 AM weekday peak period public transport modal split fell sharply from 14.7% to 8%.
- 2003 Britomart transport centre opened. Brought passenger rail back to Waterfront. High quality station. Cost \$204M.
- 2002-2012 rail stations upgraded. Western line double tracked. Refurbished rolling stock. Signaling upgraded with automatic train protection.
- 2011-2015. Passenger rail network electrification. EMUs introduced. Roll out of smart card and integrated ticketing.

Britomart: opened 2003, Auckland City Council



Auckland electric multiple units



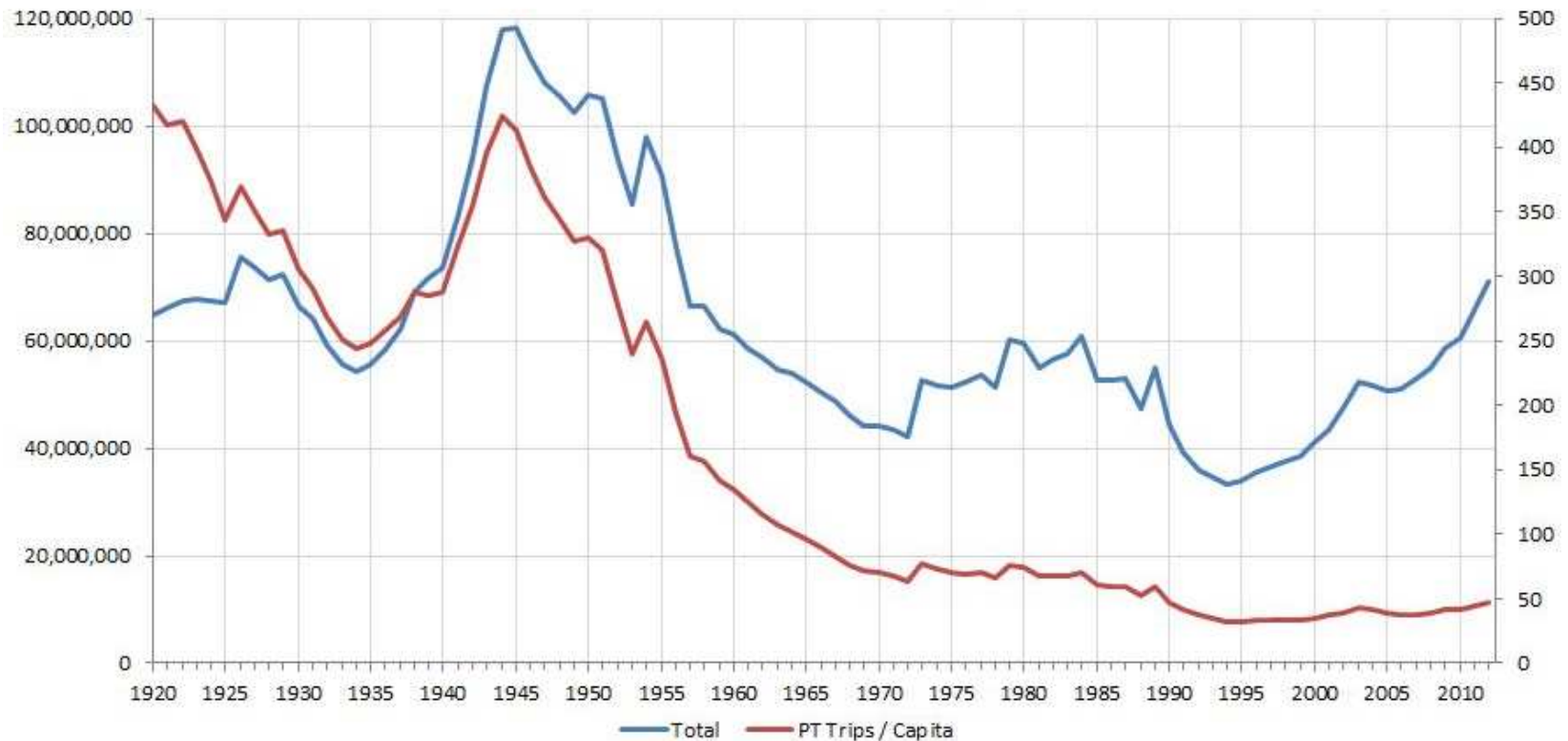
Mt Eden Station, about year 2000



But there is still a long
way to go

Auckland Patronage Statistics – really that good?

Auckland Public transport patronage vs Per Capita



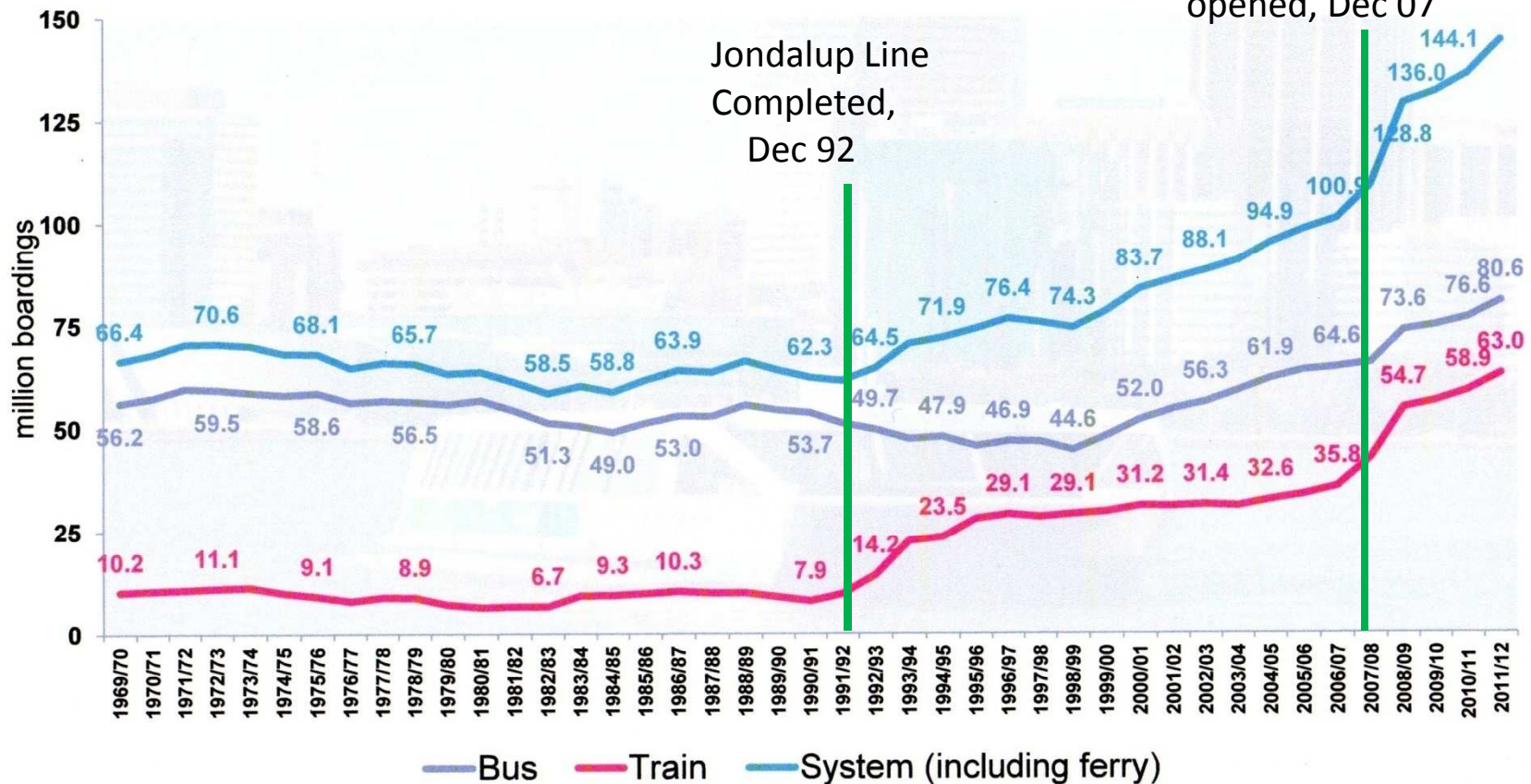
Public Transport Trips/Person/Year

(some data from the auckland transport blog)

- Auckland 48 trips/capita/year in 2014
- Southeast Queensland 65 trips/capita/year
- Perth, WA, 77 trips/capita/year
- Portland (Oregon) 70 trips/person/year and Seattle 69 trips/person/year
- Melbourne, Victoria, 124 trips/capita/year
- Vancouver, BC, 133 trips/capita/year,

Public Transport Growth to 2011/12

Transperth Total Boardings

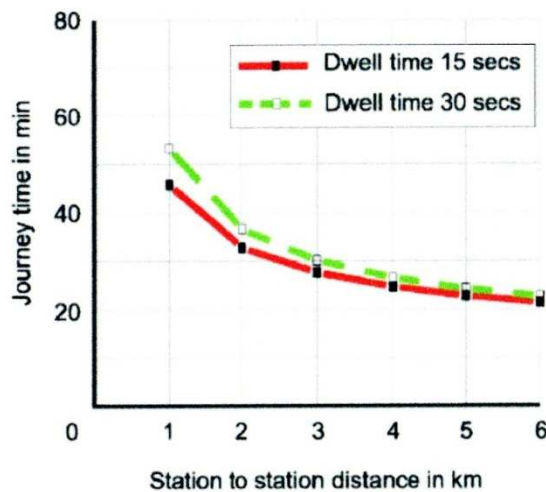




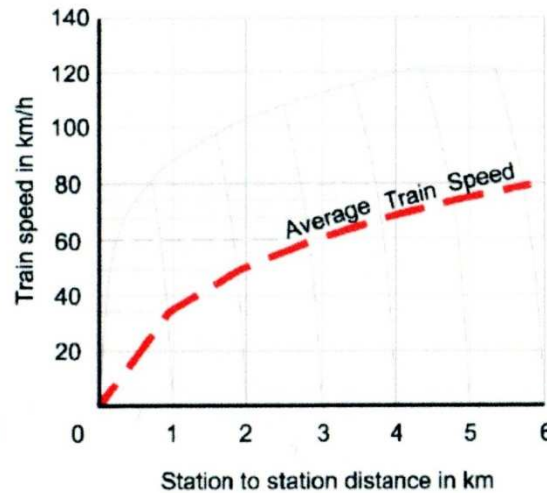
Transport & Land Use Integration Designing Mass, Rapid Transit Rail for Low Density

Relationship between Station Spacing, Journey Time, Train Speed and Rollingstock required for a given Task

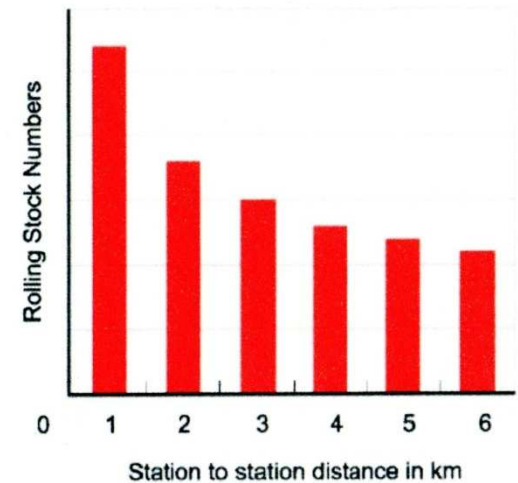
Average speed for 30 sec dwell time



Journey Time



DESIGNING RAPID TRANSIT



Rollingstock Requirements

The Effect of Station Spacing on -

- journey time
- average journey speed; and
- rollingstock requirement

Messages - It is not just the City Rail Link

- Public transport investment can succeed, but requires strong, and consistent, public sector leadership over many years.
- The Auckland rail network has too many stations. We need to increase station spacing by closing lightly used stations.
- We need to progressively remove level crossings – Perth has none on its north and south lines. Auckland has far too many.
- We need to better separate rail freight from passenger traffic

The new integrated public transport network

Proposed Rapid & Frequent Service Network 2016



The new integrated network

- To succeed the new network must be accompanied by integrated ticketing permitting transfer between services and operators plus:
 - investment in new and improved interchanges
 - Implementation of bus priority measures across the network and particularly on arterial roads
- **An aggressive programme of public transport interchange and bus priority measures must accompany the introduction of the new network if it is to achieve its potential.**

Waitemata Harbour Crossing

Auckland Motorway Traffic Flows

(extracted from NZTA state highway data)

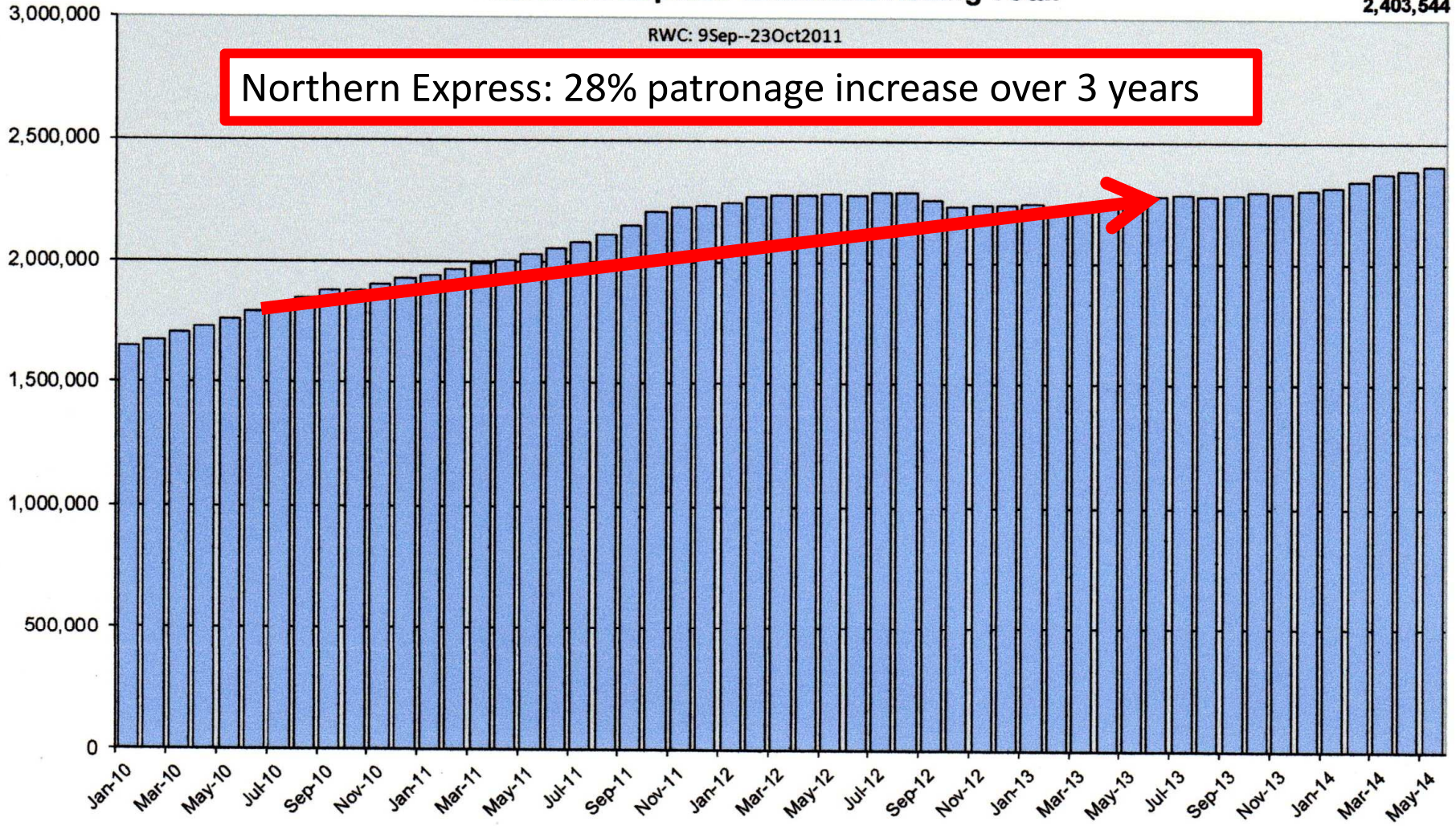
Motorway Location	Annual Average Daily Traffic Volumes (AADT)				
	1990	2000	2005	2010	2013
SH1 North of Tristram	42,000	78,000	96,000	101,000	104,000
SH1 Harbour Bridge	120,000	155,000	166,000	158,000	159,000
SH1 Khyber-Gillies	N/A	197,000	202,000	195,000	204,000
SH1 Panama Road	78,000	105,000	112,000	116,000	117,000
SH16 West Waterview	58,000	86,000	91,000	90,000	92,000
SH20 Mangere Bridge	53,000	77,000	90,000	93,000	108,000
SH18 Upper Harbour Bridge	N/A	N/A	25,000	27,000	37,000

Northern Express 12 Months Rolling Total

2,403,544

RWC: 9Sep--23Oct2011

Northern Express: 28% patronage increase over 3 years



Recent Bus Rapid Transit Examples

Guangzhou BRT 2010



Bogota BRT 2013 (with cycleway)



Waitemata Harbour Crossing

- 2006-13: Bus share of commuter trips to City Centre went from 25.2% to 34.5%. Number commuter trips by car reduced.
- City Centre plan assumes no traffic growth over next 30 years. Southern Motorway is at/near capacity south of City Centre.
- Current strategy (as articulated by government): Build additional road crossing in tunnel by 2025-30 at cost of \$4.6B with ability to provide a future rail line at a later date.

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Some questions

1. What is really driving the current construction timeline?
2. When are freight traffic effects on Harbour Bridge structures expected to require reconstruction of the 'clip-ons'?
3. When is patronage demand expected to require major investment in public transport from the North Shore across or south of the Waitemata Harbour?
4. Does the investment have to be rail-based? Where would a rail line north of bridge go and how would it be staged?

Funding & prioritising

Current national land transport funding

- Government now determines how much of the National Land Transport Fund goes into each “activity class” through its GPS for Land Transport.
- It also requires the NZTA to allocate funds to “Roads of National Significance” due to their claimed benefits to the economy.
- The government’s funding allocations to individual activity classes and its focus on road projects are not consistent with Auckland’s strategic direction.

What needs to change?

- The current system supports the status quo road reliance.
- We need an urban transport funding approach directed to achieve longer term strategic objectives with firm, stretch, short term targets.
- **Auckland should be allowed to prioritise funding to achieve specific objectives**, e.g. prioritise public transport investment to implement the new integrated network; prioritise building a continuous network of safe, separate cycle facilities.

City Rail Link

- A government contribution to the capital cost of the City Rail Link from general revenue is essential.
- **Auckland must be allowed to raise funds from road users.** This is best achieved through a congestion charge whose primary aim is to make more efficient use of the existing road network. It should be introduced on completion of the CRL and should be seen as an essential adjunct to the project.

Climate change must be
faced and responded to

Climate Change: Our ethical responsibility

- “The overwhelming majority of climate scientists agree that human activities, especially the burning of fossil fuels (coal, oil, and gas), are responsible for most of the climate change currently being observed” (US National Research Council).
- ESR considers that as engineers, we have an ethical responsibility to base our decisions and advice on current scientific knowledge as determined by experts in their respective fields.

Climate change realities

- Human activities have increased atmospheric CO₂ from its pre-industrial level of approx. 280ppm to 399ppm.
- Global mean temperature is about 0.8°C above pre-industrial levels. The impacts have already started to emerge.
- Present trends could result in a 2°C warming in 30 years and 4°C by 2100.
- NZ's greenhouse gas emissions per head are high (9.28 tonnes in 2009).

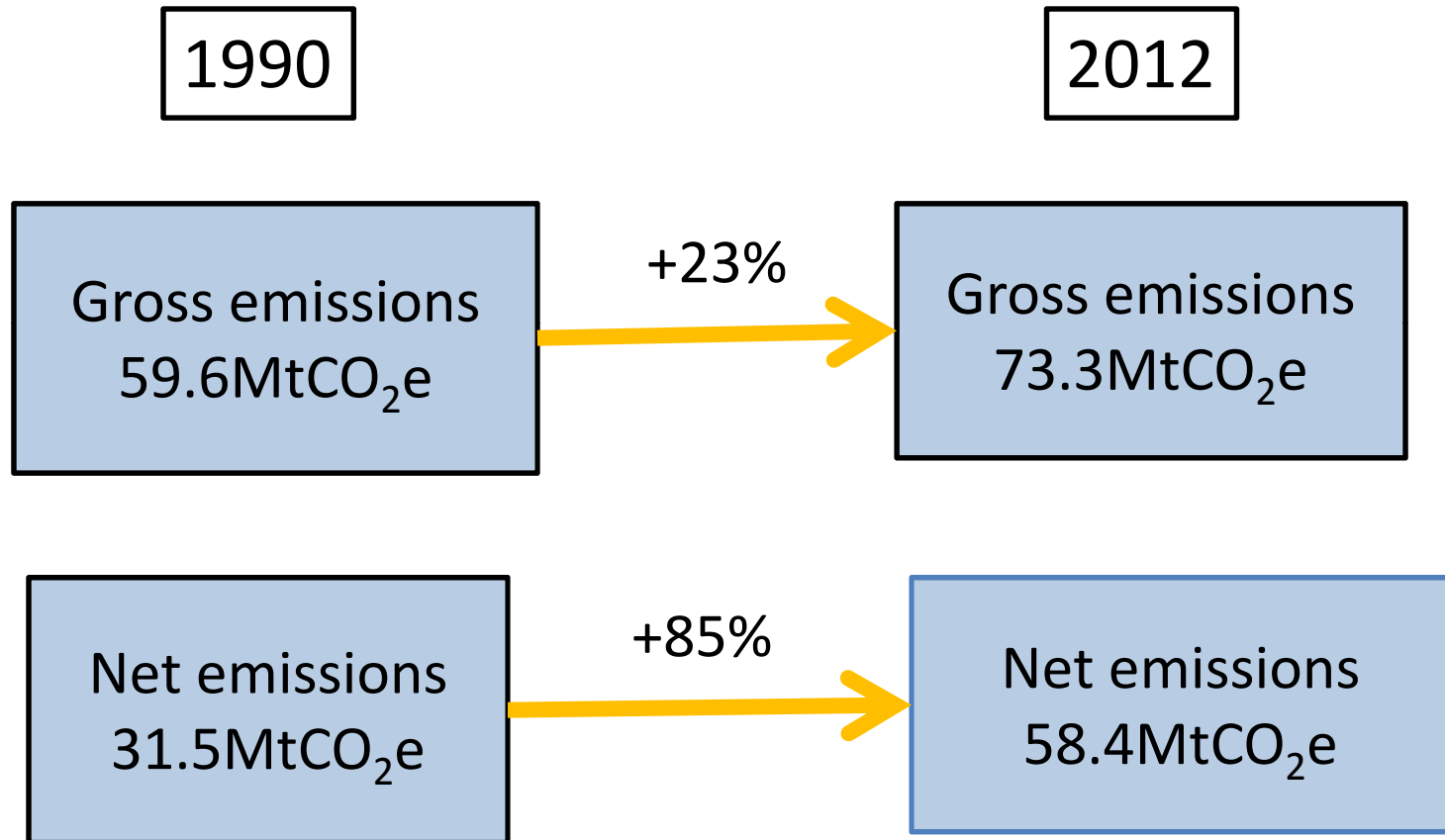
Energy Sources & Climate Change

- Climate change and energy sources for transport and electricity generation are intimately related.
- NZ's transport system is heavily reliance on oil, most of which is imported and refined at Marsden Point.
- Road transport produces 41% of NZ's energy sector GHG emissions. Its emissions are 70% above 1990 levels.

Oil Supply Risks

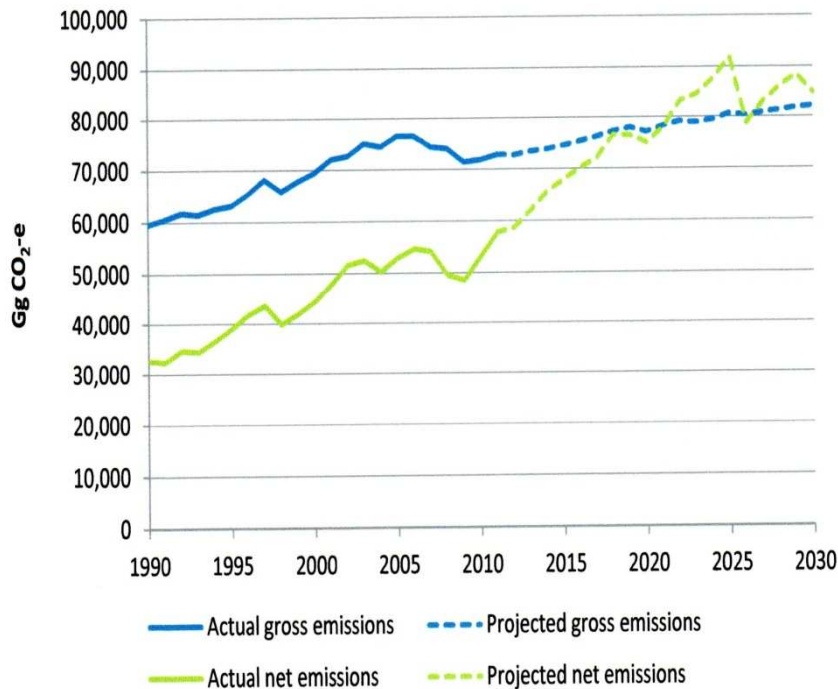
- New Zealand's distant location and reliance on imported oil from the Middle East (source of half of our imported crude oil) make it highly vulnerable external disruptions to supply we cannot prevent.
- A strategic view clearly points to taking effective action to reduce our economy's dependence on imported fossil fuel, irrespective of the climate changing effects of burning it.
- NZ's response – drill for oil. There is no Plan B.

NZ's GHG emissions 1990 and 2012



Where is New Zealand really heading?

Dec 2013 MfE Emissions Projection



Implications

NZ's current 2020 target

5% reduction

(56.6 MtCO₂-e)

The updated 2020 projection

26% increase!

(75.0 MtCO₂-e net emissions)

ESR's position

- The risks to humanity's future well being from climate change are increasingly apparent and of major concern. Unless effective action is taken, widespread environmental, social and economic disruption, including threats to food supplies for tens of millions of people, and a significant rise in sea level making highly-populated low-lying areas uninhabitable appear likely.
- New Zealand should demonstrate strong leadership in responding to climate change risks and not use the inactions of others as an excuse for doing very little.

Reducing NZ's greenhouse gas emissions

- Set firm but ambitious targets for increasing the proportion of electricity generated from renewable resources from around 73% today to 95-100% within 30 years.
- Phase out coal as a source of electric power until, or unless affordable carbon capture and storage becomes technically feasible and is part of the electricity generation process.
- Introduce a carbon charge or make the emissions trading scheme effective.

Some national transport priorities

- Identify and implement actions to reduce our exposure to climate change and imported fuel supply risks, including:
 - promote and facilitate alternative transport fuels which reduce our CO₂ emissions and are produced here.
 - specifically incorporate climate change risks (increased flooding, storm surges, sea level rise etc) in land use and transport planning and infrastructure design.
 - give high priority to measures to reduce our very high reliance on travel by car in urban areas.

Some national transport priorities

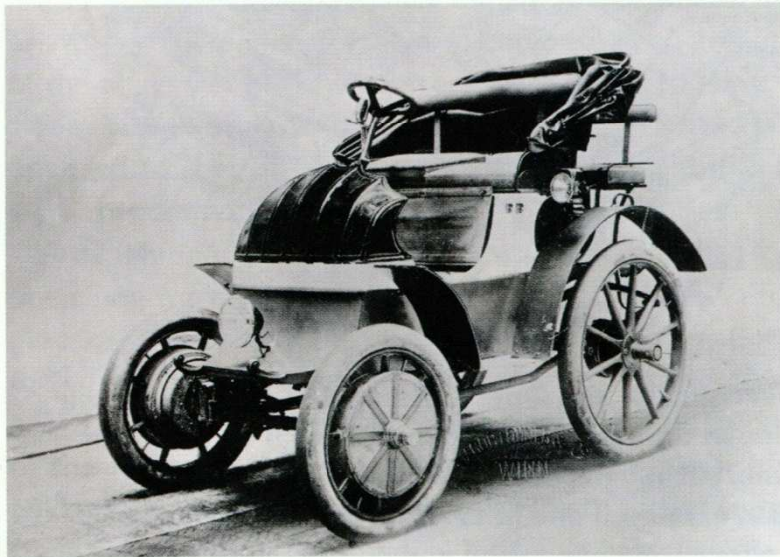
- Actively support the deployment of plug-in hybrid and fully electric vehicles in NZ, e.g. through provision of fast charge stations for longer distance inter-urban travel and supporting wireless charging technology development.
- Currently freight traffic is very heavily reliance on imported diesel. Aim to produce significant quantities of drop-in bio-diesel within New Zealand.
- Electrify the main rail freight lines.
- Consider encouraging flex-fuel vehicles through a network of E85 refuelling stations using ethanol produced in NZ.

On-street electric vehicle charging station, Amsterdam



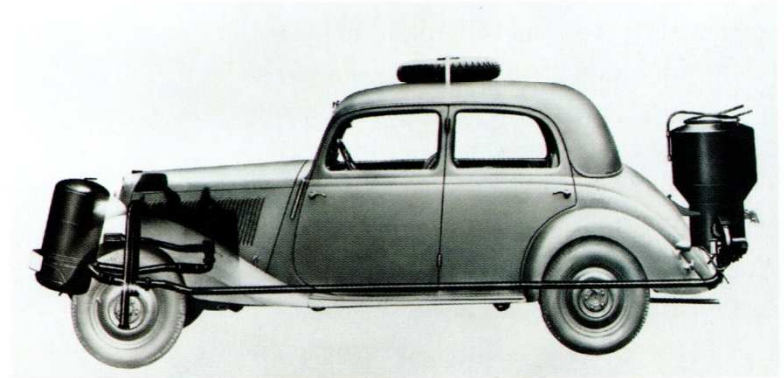
Some earlier ideas

1900 EV/ 1901 Hybrid (small petrol engine plus battery pack)



The Lohner-Porsche. Porsche

1943 Wood burner (wood gasification producing hydrogen)



A Mercedes-Benz type 170VG from 1943, equipped with a wood gasification system. Daimler AG

Potential Bio-fuel Sources

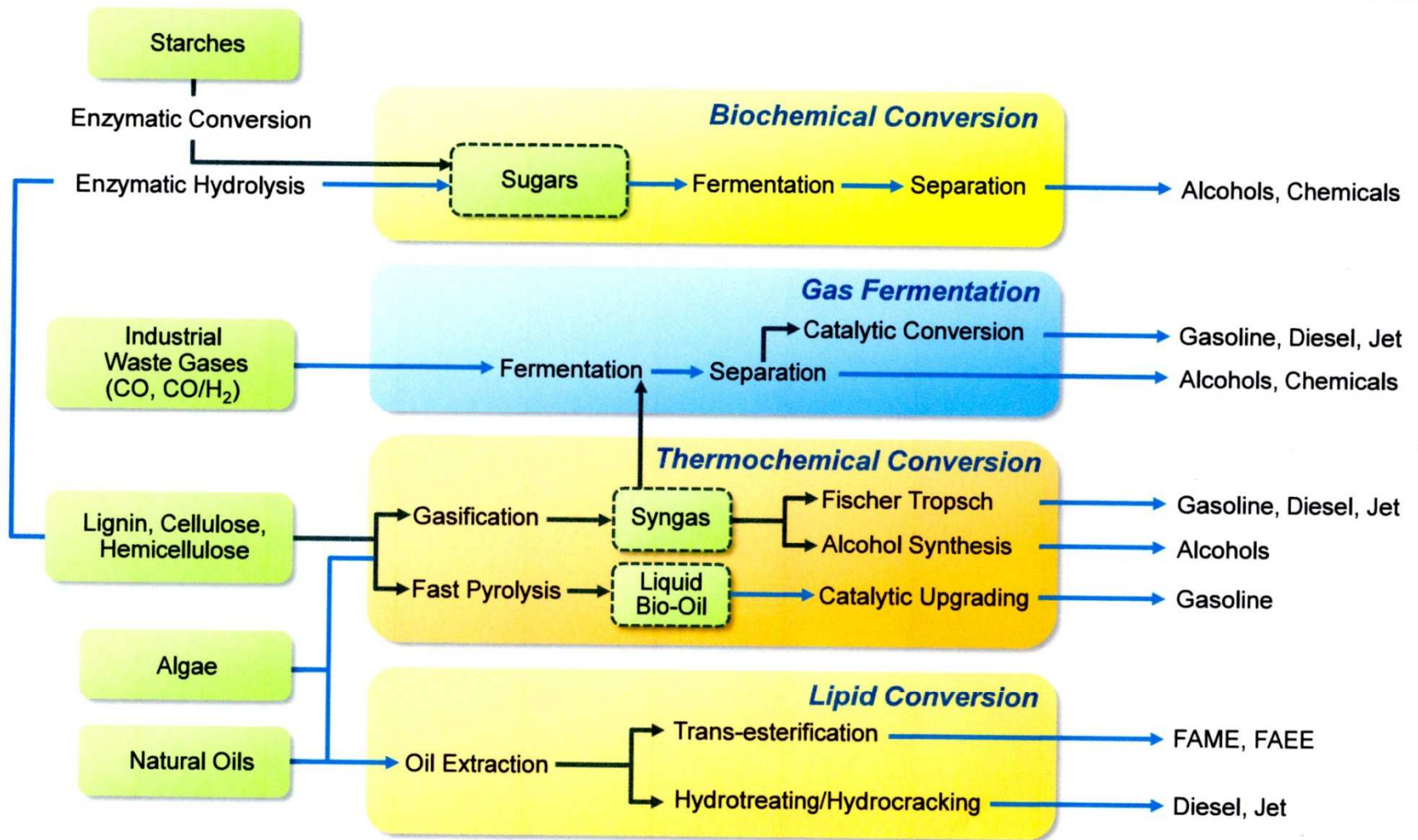
Kaingaroa Forest



Switch Grass



Novel Approach to Biofuels and Chemicals LanzaTech

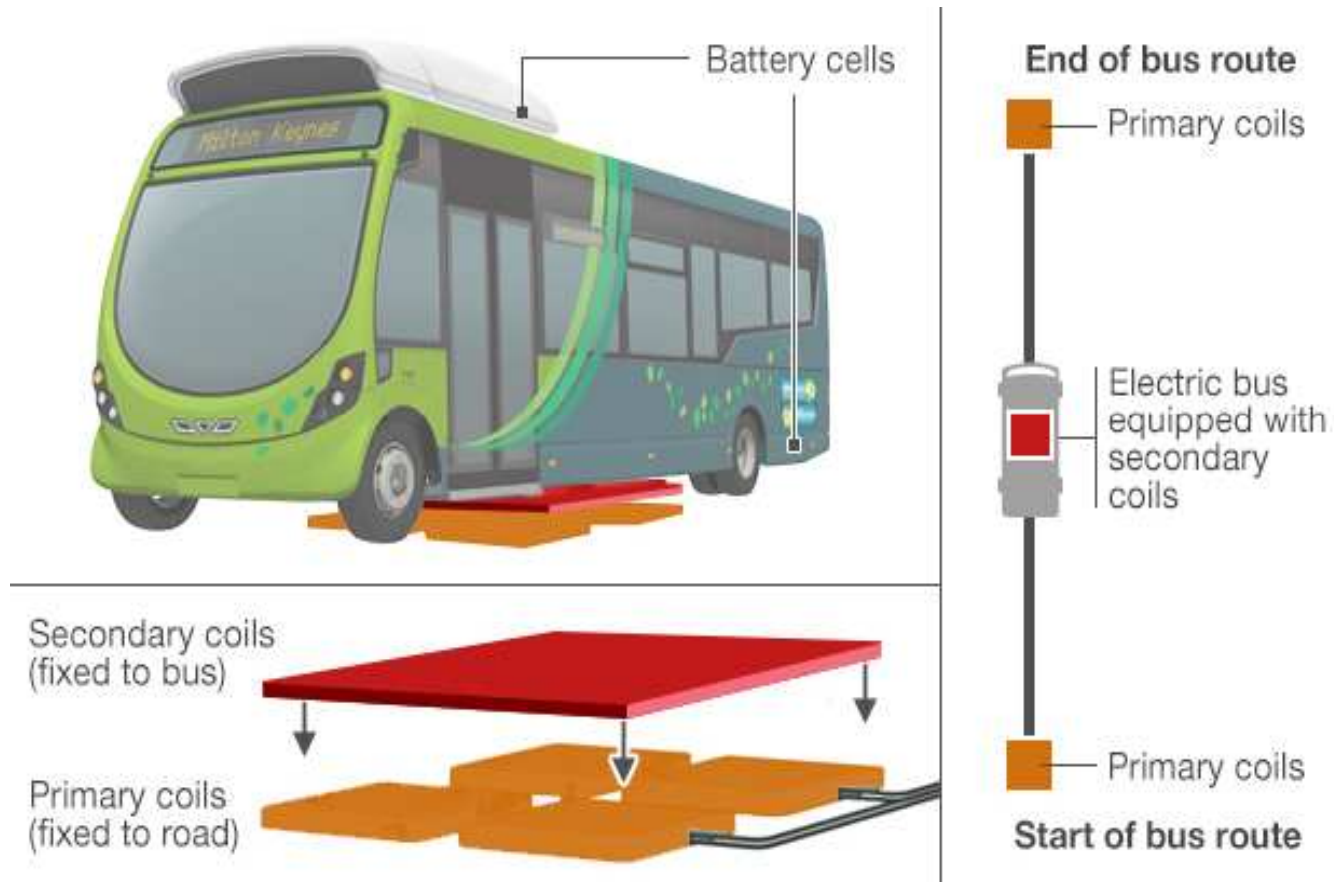


Portfolio of Options

Reduce our imported fossil diesel fuel reliance

- Establish a pilot plant for the production of bio-diesel from sources such as wood waste and grasses to reduce CO₂ emissions and diesel imports.
- In the interim investigate replacing diesel buses with buses using CNG or LNG.
- Look to the introduction of electric buses or hybrid buses which recharge batteries when stationary (using inductive charging). These may become a viable option within 5 years.

Inductive loop charging trial, Milton Keynes



Features of a climate-change adapted future

- A transport system with a smaller proportion of travel by single occupant private vehicles, reduced travel distances and a high use of zero to low carbon emission vehicles.
- A land use form with higher densities, more mixed use development, less sprawl, and less exposure to sea level rise
- Transport infrastructure better able to deal with high intensity rainfall events and storms.
- Greater focus on ensuring lower income residents have access to a range of services within walking distance of their homes, plus good public transport service access.

Some policies for Auckland

- Prioritise investment in public transport including the City Rail Link and publicised programs for the following:
 - passenger rail network improvements
 - arterial bus priority measures
 - interchange upgrading on the new integrated network
 - improving walk and cycle access to public transport
- Implement travel demand management measures to make more efficient use of the existing transport network.

Some policies for Auckland

- Make climate change reduction and adaptation a key transport objective.
- Identify and implement measures to reduce the potential effects of future fossil fuel cost increases on the less well off and the economy as a whole.
- Progressively introduce measures to encourage electric vehicle uptake.

Some policies for Auckland

- Optimise the performance of the main freight traffic routes through better signal timing and signal coordination, plus introduction of truck platoons with vehicles “connected” to each other wirelessly.
- Improve the quality and safety of pedestrian facilities in those centres identified for higher density, mixed use development.
- Provide a network of continuous, dedicated, safe cycle routes.

Some policies for Auckland

- Place less reliance on very high cost, potentially unaffordable projects.
- A series of relatively small incremental changes implemented consistently over time can make a big difference.

A potential new urban
technology

'pod' system, Heathrow airport

(NCE International July 2014, ice publishing)

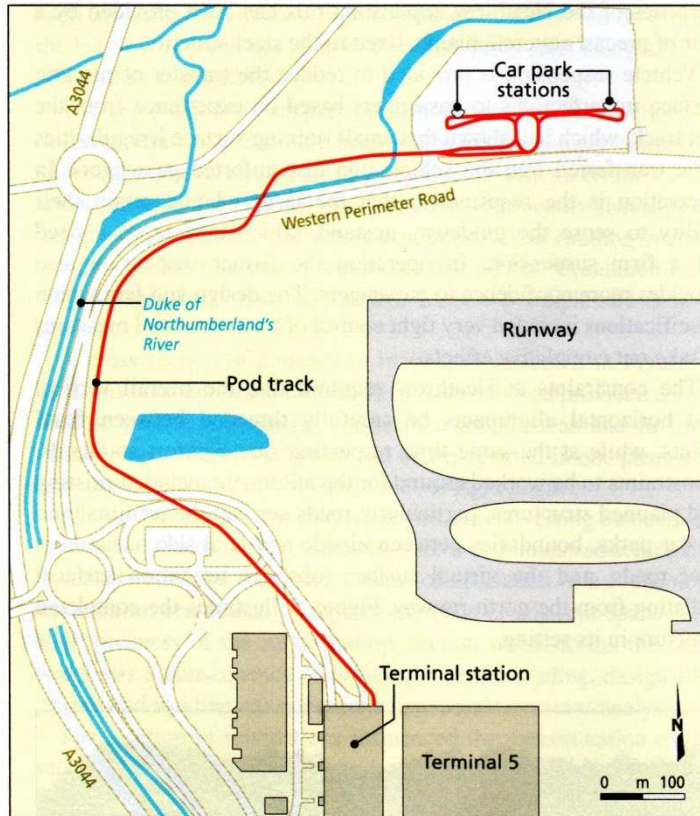


Figure 4. Final layout for the Heathrow pod – there are two stations in the remote business car park and one on the second floor of the short-term car park next to Terminal 5

- Links business car park with Heathrow Terminal 5, approximately 1 km from car park.
- Two stations on 2nd floor of short-term car park.
- Opened in May 2011.

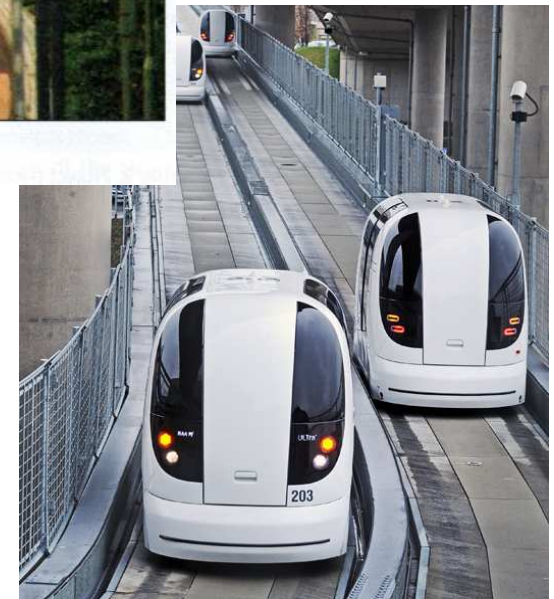
'pod' system, Heathrow airport

- Fully automated system on a dedicated guideway.
- Key in destination at station. Taken straight there without stops. Stations are off-line.
- Vehicles 3.7m long, 1.4m wide with a single side door and opposing seats. Rubber-tyred wheels. Seat 4.
- Operates at speeds up to 40 km/h at 6 second headways (600 cars/h). Said to be capable of 3 second headways.
- On-board batteries power electric motors for driving, braking and steering. Batteries are charged when cars are stationary.
- Steel guideway with precast concrete tracks. Double track with total width of just under 4m.

“Ultra” pod system, Heathrow



Figure 5. The low-profile guideway was built over two rivers and seven roads without requiring any highway or service diversions



Operational data & feedback

- Has carried over 1 million passengers since opening.
- Average system availability during 2012-2013 exceeded 99%
- Average waiting time for a vehicle is less than 15 secs.
- Excellent reliability and availability, greater than conventional surface transportation systems.

- Comments from passengers are overwhelmingly favourable.

- Light weight of vehicles results in transport infrastructure with far lower weight, cost, visual intrusion and embodied energy than usual.