

## Friday Forum #34

*Sustainability in 2040:*  
How did we get there?

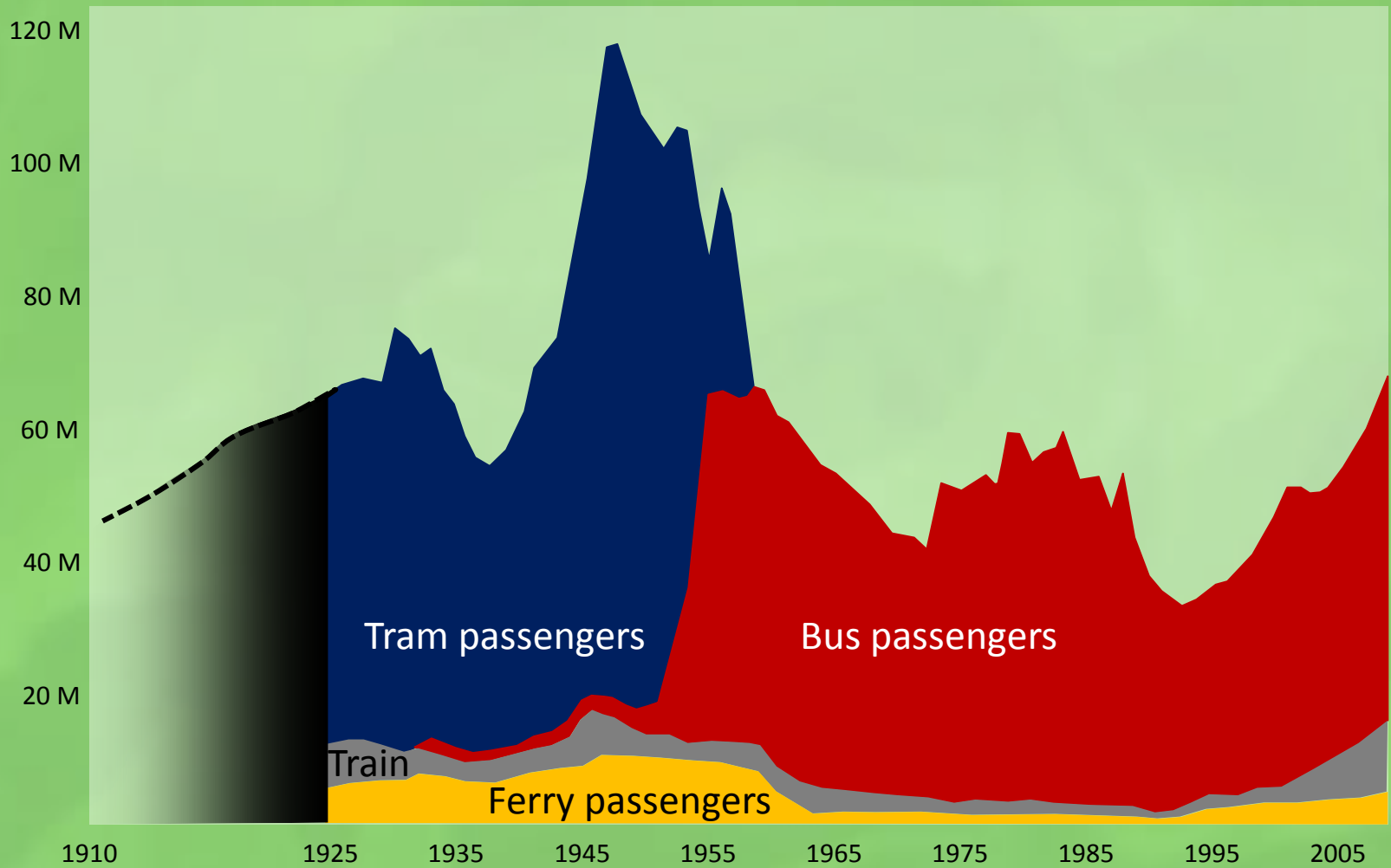
**It was easy!**

Or was it? And where did the money come from?

# Outline

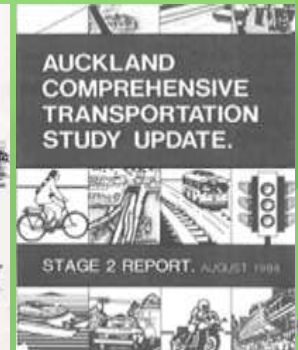
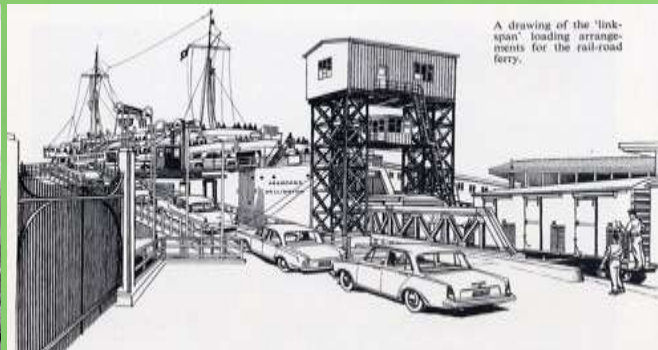
- A Transport Timeline
- Not sustainable nor very smart
- Seven questions
  - Why are our cities the way they are?
  - Do people like our cities?
  - Why did we take up cars?
  - Do we like public transport?
  - Is public transport cheaper?
  - How do people use different modes?
  - Does environmental concern influence travel behaviours?
- Pathways to sustainability
  - Alternatives
  - Our choice: an electric public transport-centred future
  - It was easy!

# 100-year timeline of transport



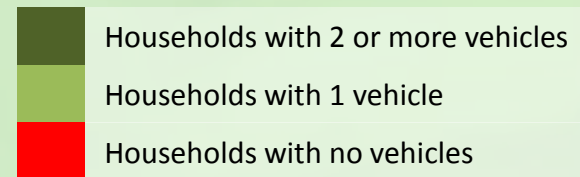
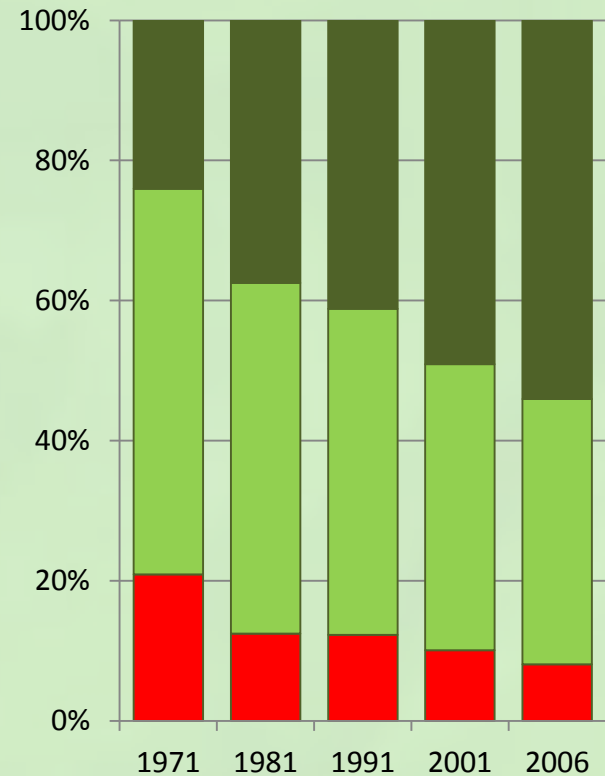
# 60 years ago, we took a new pathway

- We scrapped electric trams and we gave the road space to cars
- We changed rail from coal to (imported) diesel-electric
- We made Auckland Harbour Bridge and we made it only for vehicles, helping determine Auckland as a car-based city
- Roll-on roll-off ferries enabled goods transport by road and rail making coastal shipping obsolete
- We established a separate roading funder (NRB) with a dedicated roading fund
- We laid out plans for urban motorway systems for Auckland, Wellington, Christchurch, and Dunedin - we are still building these
- We increased transport-energy use from 0.5 to 2.0 MJ per passenger-kilometre and we moved transport from an indigenous to an imported activity

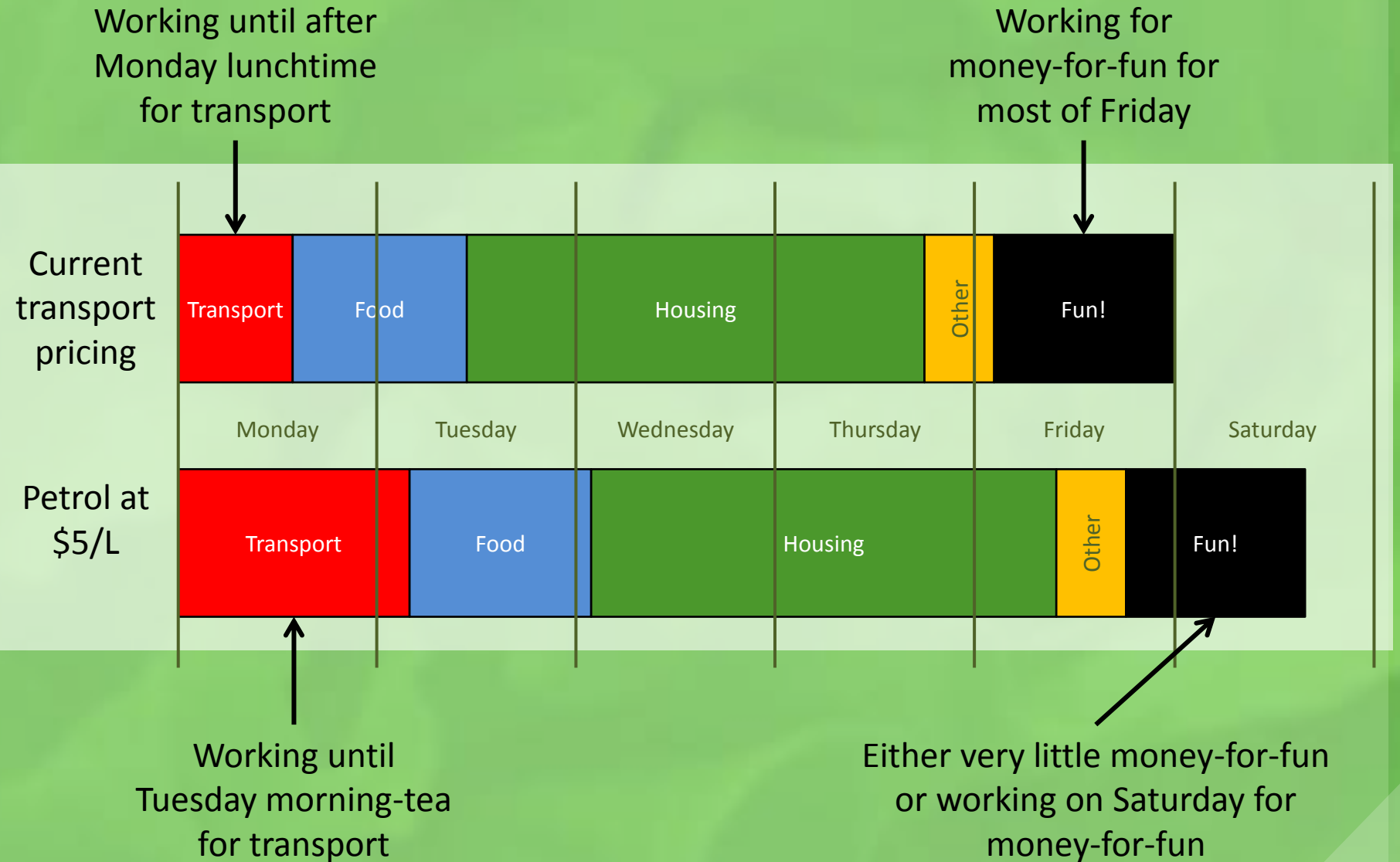


# Cars are now our most likely other household member

- In 2006:
  - Households with no vehicles = 8 %
  - Households with one usual occupant = 23%
- About 0.8 cars per person aged 20+ years
- We spend about as much owning and operating our cars as we do on our food
- We use our cars only 5 percent of the day and only a few times a month for the reason that vehicle was bought
- Cars now live in the house with us – and they have the biggest room!
  - 15 to 30 percent of the house-area
  - increasing housing costs

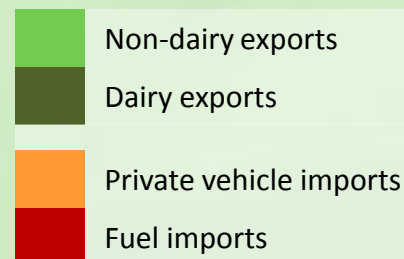
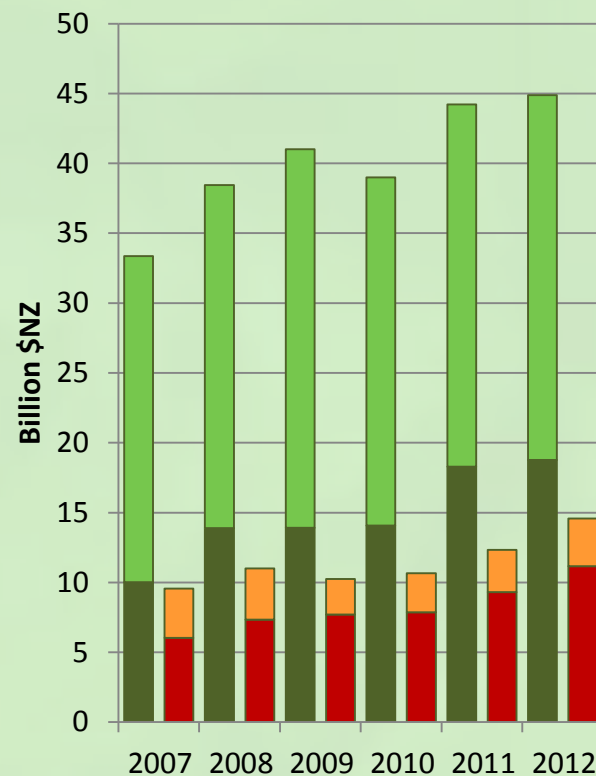


# Working 9 'til 5... to drive

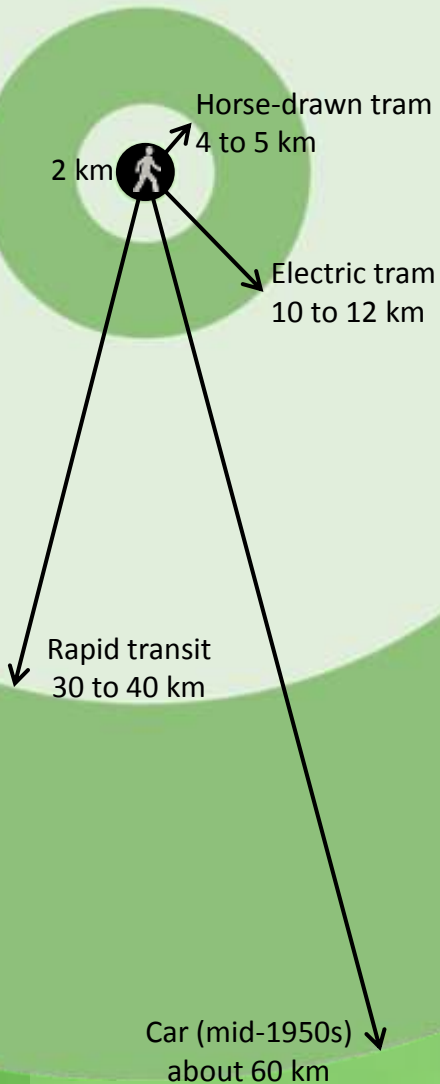


# National figures

- We import all our transport
  - Our transport imports just about cancel out our dairy exports
- Current energy-use for transport – and increasing
  - 221 PJ total transport
  - 147 PJ for passenger transport by road
    - 133 PJ of that for cars and vans
    - 3.5 PJ of that for buses
  - 69 PJ for freight transport by road
- The internal combustion engine is an inefficient user of energy



# Why are our cities the way they are?



- Transport, city-form, and land value are intertwined
- Each transport-technology has a natural range limit
- City-size changes with each transport-technology
- Each transport-technology changes the location of activities within the city, making it difficult to stay living with the old transport-technology
  - For example, the shift of retail from where public transport-users converge (city centre) to where car-users converge (satellite big-box retail and suburban malls)
- Cities grow and change in surges of building activity (10-15 years) usually corresponding to, but out of sync with, surges in population growth.
- Our cities are an accumulation of the city-forms associated with evolving transport-technologies and the styles associated with periodic surges of building activity



## Imprints of the past:

### Walkable CBD's and old tram routes are still the best places to live



- In both cities, the old walkable city has been repopulated
- In both cities, the old tram routes still have the best public transport and the most liveable suburbs
- Public transport works well in Wellington because it has expanded little beyond the original public transport system
- Most of Auckland's growth occurred in the car-based era

# Do people like our current cities?

- Ideas and aspirations about liveability determine the way the market drives continuation or change in city-form
- People are very satisfied with what they have now, for now, and resist change
- Liveability views are clustered into about 4-5 dominant viewpoints
- Liveability preferences change with life-course and changes in personal circumstances (we shift houses often)
- All scales of urban-form and urban-design contribute to people's notion of liveability
  - Dwelling, street, suburb, city, and surrounding region are all important
- Personal infrastructure (my house and section) and public infrastructure (neighbourhood and beyond) contribute to liveability
  - Moving from large city to small town: expectations are for an increase in personal infrastructure and decrease in public infrastructure.... and the reverse is also true.
  - People may accept less personal-infrastructure if the public realm is enhanced

## Do people like our current cities?...continued

- At typical New Zealand suburban densities, residential satisfaction factors are:
  - Access and adequacy of school services;
  - Access and adequacy of commercial services;
  - Internal practicability (walking, cycling, etc.);
  - Aesthetics of buildings;
  - Space between buildings.
  - Public transport services are the ninth most important factor
- Our homes need to allow for the occasional extra use (visitors, etc.)
- Generally an increase in density above that currently being lived in is viewed negatively and resisted

## Lead-investment in transport

- Both investments completely transformed their cities
- Both investments were user-pays



- Who gained the benefits and where was the re-investment to come from?

# Why did we get cars?



- 60 years of data and 80 years of photos shows that **social-recreational travel** appears to be the major cause in the original uptake of vehicles.
  - Trips into the countryside
  - Trips to the beach
  - Still the main trip type, occurs weekends and evenings
  - Trips to visit family and friends(now reconnects us as cities have become more dispersed, a frustration of 1980's car-less days))
  - Petroleum's attributes favour this independent travel.
  - This trip determines vehicle size
- Once bought, this vehicle is used for all trips

## *Other Reasons*

- Safety. We think larger vehicles are safer
- To carry things
  - Retail locations and public transport
  - Delivery costs are not borne by the supplier
- Negative views of public transport:
  - The social-mixing on public transport concerns us
  - Speed and comfort are key travel requirements

# Do people like public transport?

## Users

- Users love rail and ferries but are diffident about buses
- Heylin (1974): Most people had neutral to strongly-negative views about public transport, based on comfort, speed, and reliability
- Discourse from newspapers 1970 to 1980: Mainly negative towards buses, based on unreliable and circuitous routes
- 2002 and 2007 studies show views are still similar but with geographic variation (AK, Wgtn, ChCh.) *Users* rated both bus and rail favourably

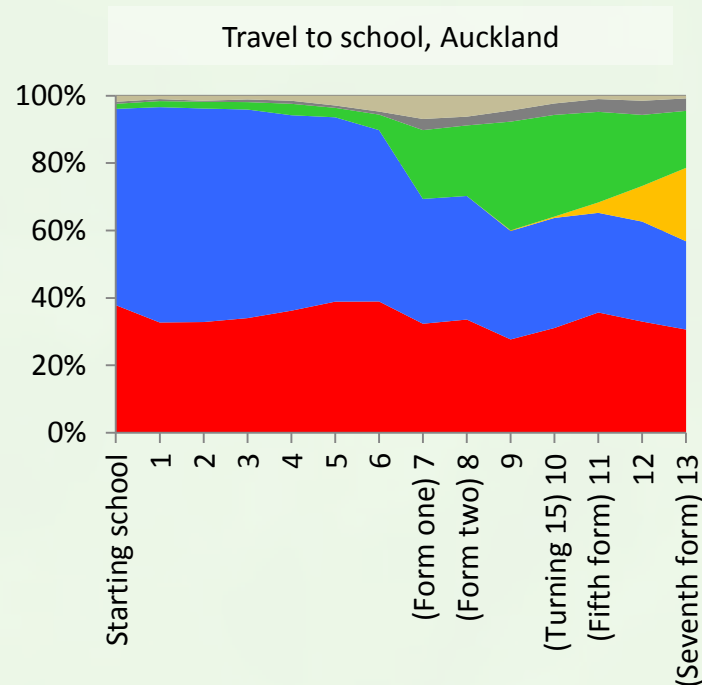
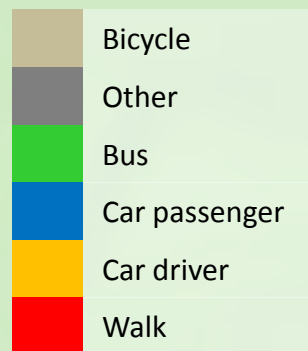
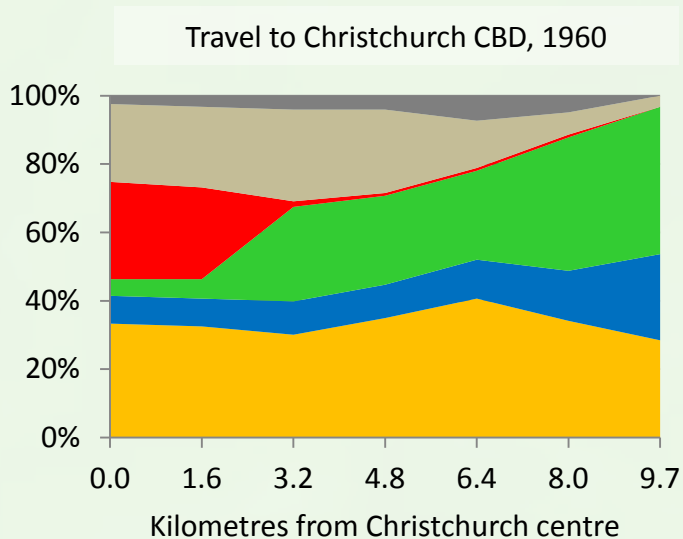
## Suppliers

- Since the mid-1960s, suppliers have been reluctant to invest because of uncertainty of uptake
- Fractured governance from the mid-1960s onwards
- Viewed as another form of social welfare from the 1970s onwards
- Service levels of 25 to 35 per day are well below the 60+ needed for a public transport *lifestyle*
- Street patterns developed since the 1970s are unfavourable to buses, and bus services through new subdivisions are added as an afterthought (Chivers, 1980)

Investors like rails



# How people use their choice of modes



- Cars are used for any trip length
- Depending on trip-length, interplay between
  - Bus and walk
  - Bus and bicycle
- Buses offered with no fares often gather up walkers and cyclists, not car-users

- Mode used for travel to school reflects independence growing with age

# Is public transport cheaper?

- Litman: North American studies
  - Quality public transport reduces household transport expenditure by 30 percent
  - Quality public transport + mixed use development reduces household transport expenditure by 50 percent
  - Indications that high-frequency public transport encourages more walking (because public transport is the back-up)
- Singapore surveys
  - Those in the lowest-income-quintile travel mainly by public transport and percentage household expenditure on transport (8.8 %) is about half that of the upper-income-quintile who travel mainly by car (18.0 %)
- Public transport users walk the short trips
  - New Zealand households without cars walk about four times as often as those with cars



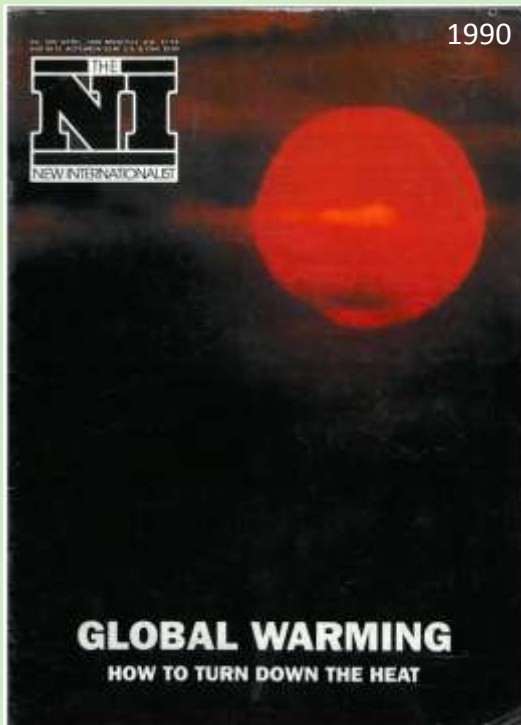
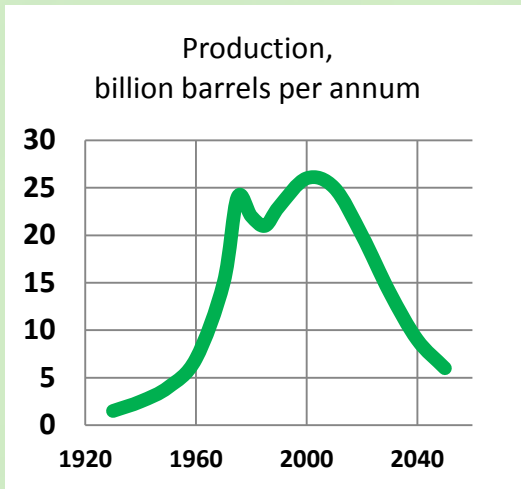
## And a few more transport behaviours

- Walking speeds:
  - The broader the groups of people from the population that walk, the slower the average speed
  - 78 m/min in Auckland versus 88 m/min in Levin and Palmerston North
- Most people identify the *perceived* distance to their local public transport as a bit further than a reasonable walking distance
- Most people arrive at the railway station within 2 to 6 minutes before their service's scheduled departure time
- The driver of 1 in 6 cars in most park-and-rides lives in easy walking distance

# Does environmental concern or knowledge influence mode choice?

- No.
- Surveyed:
  - Hutt Valley-Wellington: Commuters by train and as car drivers
  - Auckland: Commuters by bus and as car drivers
  - Wellington and Auckland: “Smoky” SUV drivers
- No heightened environmental concern or environmental knowledge of
  - public transport users compared to car drivers
  - those driving vehicles with no visible pollution compared to those driving visibly polluting vehicles

# Peak oil and Climate Change: Imperatives for early action



- Peak Oil (or Plateau Oil): A geological rather than market phenomenon
- Timing is uncertain at a global level but many indications of its imminence.
- Forecast price rises and very unpredictable
- Climate Change Response:
  - Failure to respond locks in uncompetitive high energy paradigm
  - Unacceptable trading partner and tourist destination if not part of the collective effort

# Transport energy options that maintain the status quo

- Electric vehicles
  - Very fuel-efficient to operate
  - Standard-sized vehicles are expensive and will remain so
  - Batteries are expensive and may not last the life of the vehicle
  - Rather than minutes to refuel by petrol, recharging takes hours
  - High emissions embedded in the manufacture and delivery to New Zealand
  - Components may be in short-supply and high-demand
  - The technical issues are being rapidly solved but electric vehicles are a high-priced option for individuals and nationally and provide only a transport solution
- Bio-fuelled vehicles
  - Direct replacement of existing fuels and vehicles can be used as now
  - An additional 1.5 times the current forested area (2million hectares) would be required, with its own environmental impacts
  - Bio-fuel is exportable, so it would be sold in New Zealand at world-prices (perhaps better to export it)
  - This is a high-energy option, vulnerable to price fluctuations, and is a transport solution only. We would be manufacturing a fuel to use inefficiently

# The opportunity of *Sustainability in 2040*

- Change is coming
  - How can we use the change to our energy use to recast the way we live to become a more successful and sustainable society?
  - How can the change be used as an economic solution?
  - What are New Zealand's advantages in becoming a low-energy society?
  - What are the advantages to New Zealand in becoming a low-energy society?
- Our goal should be to become a sustainable, economically successful, low energy society in which:
  - the major portion of personal transport is by electrified public transport or by active modes; and
  - freight is by electrified railways, electric vehicles and bio-fuelled vehicles



# Our pathway to a low energy society

- Focus energy-investment in transport towards renewable electricity
  - Based on current electricity usage and transport's additional usage, 120 PJ electricity would be needed to achieve 90 percent from renewable sources
- Establish modern electrified public transport network to shape the city by lead-investment and allow the city to evolve around this network
  - Fast, comfortable, and frequent
  - Targeting weekend and evening travel as well as work and education commuting
  - Ensure retail locations and public transport converges
- Out-of-town social-recreational travel *is a high public demand*, so cater for it in ways that do not require car ownership
- Ensure populations in rural and small-centres have access to the fuel-efficient and electric vehicles they need
- Invest in electrified rail for longer freight movement
- Electric trucks for local freight

# New Zealand's advantages for becoming a low-energy society

- We have a very large capacity for renewable electricity (155 PJ)
  - 90 percent of our electricity could come from renewable sources
- We do not have a vehicle-manufacturing sector to maintain
  - We have a wide scope
- Large parts of many of our cities were formed in the public transport era
  - Influences on form still remain or could be re-established
- The transport-technology already exists. Immediate action is possible
- Many of our cities are small enough to readily fit the natural range of walking, cycling or conventional public transport
- Our larger cities:
  - Wellington and Christchurch are well-configured for public transport
  - Auckland needs a more sophisticated public transport system but it is viable and affordable
- Rail still connects our towns and cities. The Auckland-Wellington route is already nearly 80% electrified

# Benefits of New Zealand changing to a low energy society

- Immediate start is possible
- Energy use is lower
  - Modern public transport can achieve 0.2 MJ per passenger-kilometre, compared to current 2.0 MJ per car-passenger-kilometre
- Households budgets benefit
  - Public transport-use can reduce household transport expenditure by more than 50 percent, in contrast to the doubling that would occur with retaining car-use
- Ability to readily accommodate a growing population of uncertain size as densification is more attractive
  - New Zealand by 2040: 5 million people? 6 million? 8 million?
- Localised economic growth around public transport and active modes
  - GDP growth around public transport modes is already measurable in Auckland
- Highly liveable, low-energy societies will attract skilled immigrants and retain local skills which in turn attract new business
- Additional gains
  - With high ride-quality, travel time on public transport can be used productively or for relaxation
  - Active modes such as walking can be invigorating improving productivity
  - Health benefits



## Sustainability by 2040: It was easy

- The economics line up. We can:
  - Save on transport costs;
  - Decrease economic vulnerability; and
  - Grow employment and GDP
- New Zealand has many advantages that it is currently not making the best use of.
- There was a time of worldwide change, we changed and we did more than make the minimum change that we needed to, but rather we took advantage of the need to change to make as much change as possible...  
to recast how we live into a sustainable, economically successful, low energy society