futuredemand

How could or should our transport system evolve in order to support mobility in the future?

Ministry of **Transport**
TE MANATŪ WAKA

futuredemand

How could or should our transport system evolve in order to support mobility in the future?

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Jennifer McSaveney, Emma MacDonald, Amelia Morgan, Anke Kole

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Ministry of **Transport**
TE MANATŪ WAKA

Foreword

As a Ministry our purpose is to ensure our transport system helps New Zealand thrive. Our country needs to invest wisely to evolve its transport system in a way that will support a changing society.

Society is changing socially, technologically, economically and environmentally. But that change is not altogether predictable. In turn, neither is the future demand that will be placed on our transport system – our roading network in particular.

The Ministry, with a wide cross-section of its stakeholders, has undertaken a piece of work called '**Future Demand**'. It has looked ahead to the year 2042. This report is the culmination of that work.

It shines a light on the need to acknowledge a diversity of different plausible futures for our society, our transport system and the demands placed on it.

Future Demand at its outset posed the question '*how could or should our transport system evolve in order to support mobility in the future?*'.

The purpose of the work and this report is not to specifically answer this question. This is something we must all share in doing. The purpose is to offer insight and guidance that will inform debate and decisions regarding our country's land transport programme. This programme has a current expenditure target for the next 10 years of $38.7bn. We must invest wisely.

Consider this report as important food for thought. Our challenge – your challenge – is to embrace the uncertainty we face and seize the opportunity to shape our future.

Martin Matthews
Chief Executive

Andrew Jackson
Deputy Chief Executive

Contents

resource paper available

Indicates (on pages where used) that a resource paper is available providing further detail

Summary

Mature economies around the world, including New Zealand, have seen an interruption in the last decade to the long-run growth in national car travel. Something has changed and there is now greater uncertainty about future demand.

Against an assembled backdrop of international and national evidence and insight, **Future Demand** has examined key drivers of change and critical uncertainties to produce four plausible depictions of New Zealand society and transport for 2042. We have estimated that scope for plausible change in total vehicle kilometres travelled is considerable – from growth to significant decline.

The set of scenarios – *and* the engagement process that produced them – has allowed us to explore the features of uncertainty and draw out insights and proposed responses we believe are important. These are summarised as follows.

Change – Future demand estimates vary. This reflects our limited understanding of cause and effect. Uncertainty of change in travel demand and its relationship with prosperity must be respected not concealed.

Flexibility – Flexibility should be valued when designing our systems and infrastructure to avoid 'lock-in' and to enable uncertainty to be accommodated. We must invest for plausible futures not predicted possibility.

Accessibility – Connecting together people, goods, services and opportunities for a thriving New Zealand is not just about our transport system. Access is determined by our transport system, the way we plan our physical environment and digital communications. We must invest in evolving this 'triple-access system'.

Technology – Technological advances continue to be remarkable and we must get better at tracking developments and better at critically examining future prospects.

People – We need to better understand how and why the travel behaviour of people at different life stages, from different backgrounds and in different locations is changing and what this means for our regions.

Responsibility – We do not know what people in the future will want to do or be able to do. We do know people can adapt. There is a responsibility to shape our transport system to support New Zealand's future. 'Predict and provide' should become 'decide and provide'.

Professor Glenn Lyons
Strategy Director

The past

Change is often gradual and yet powerfully cumulative

Today is probably much like yesterday. Tomorrow will be little different. Yet under our noses our world changes. Looking back over greater spans of time can sometimes reveal dramatic change. It can enlighten us to the change that is possible in the next 28 years.

Vehicles per 1000 people in the U.S.A.
1910: 5 1950: 324 1990: 773

BUS ONLY
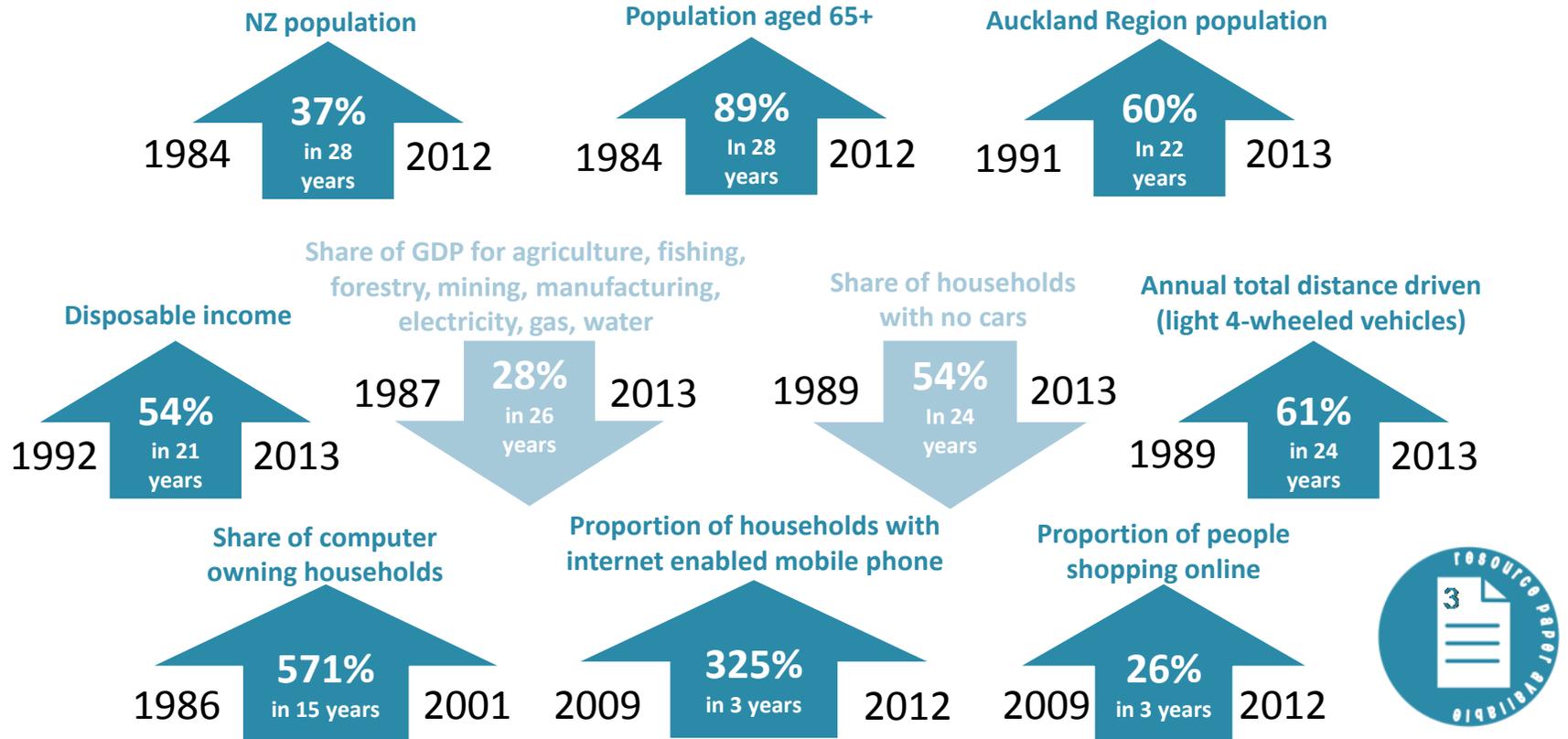
© Metro Transportation Library and Archive

The motor car reshaped society – society will likely be reshaped again

Technological possibility and societal appetite can drive
transformational change over a period of decades.

Triple-interlocking systems of vehicle manufacture, public use and
infrastructure construction exerted power and influence
to transition society into the motor age.

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NZ population

1984   **37%** in 28 years   2012

Population aged 65+

1984   **89%** In 28 years   2012

Auckland Region population

1991   **60%** In 22 years   2013

Disposable income

1992   **54%** in 21 years   2013

Share of GDP for agriculture, fishing, forestry, mining, manufacturing, electricity, gas, water

1987   **28%** in 26 years   2013

Share of households with no cars

1989   **54%** In 24 years   2013

Annual total distance driven (light 4-wheeled vehicles)

1989   **61%** in 24 years   2013

Share of computer owning households

1986   **571%** in 15 years   2001

Proportion of households with internet enabled mobile phone

2009   **325%** in 3 years   2012

Proportion of people shopping online

2009   **26%** in 3 years   2012

resource paper available

New Zealand has changed considerably in the last 30 years

In order to recognise how much NZ will change in the next 30 years,
it is helpful to look back at examples of the change in the last 30 years.

The population has been growing, ageing and urbanising.

People's spending power has grown as has the service economy.

Car ownership has grown and car travel has increased.

The presence of the digital age has grown – and is growing – rapidly.

The present

The present combines remnants of the past and signs of the future
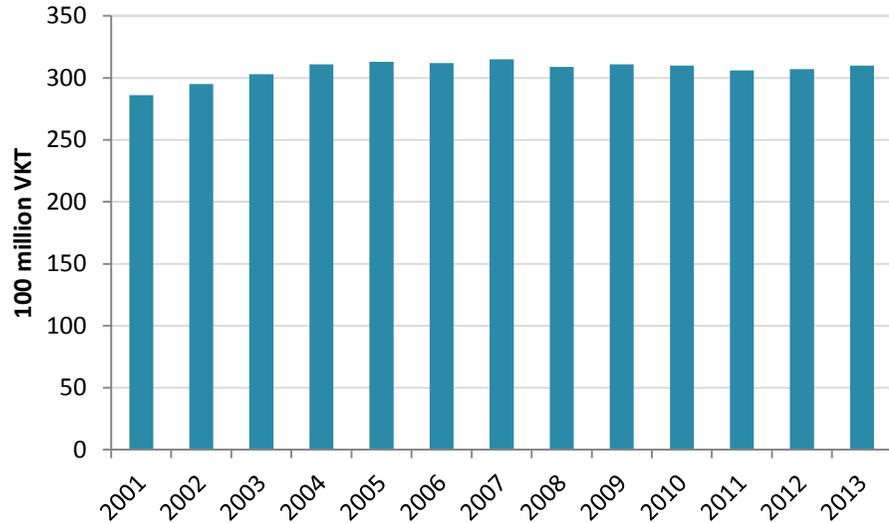
Present conditions provide clues but not confirmation for what lies ahead.

Emerging technology, if embraced by society, can lead to transformational change.

Human behaviour changes and can be changed.

Vehicle kilometres travelled (VKT)

Total VKT

Light passenger VKT

From Ministry of Transport Fleet Statistics

VKT per capita

Since its peak in 2004, light passenger vehicle kilometres travelled *per person* (VKT **per capita**) in New Zealand has fallen by 8%

There was little growth in car use in New Zealand over the last 10 years

Many developed countries – including New Zealand – have observed a recent flattening or reduction in the amount of car travel.

This began before the global economic downturn and has continued through it.

Causal factors appear multiple and at present there is no professional consensus on the outlook for future demand for car travel.

Observations

Young adults have a reduced propensity to drive

Young adults are drawn to urban living

Urban areas have observed decline in car travel while some rural areas have observed growth

The link between GDP and car travel appears to have weakened

Social *as well as* economic factors appear to be at work

Past policy and investment decisions may have influenced present demand more than acknowledged

Unanswered questions

Has car travel per capita reached a level of saturation or equilibrium in urban areas?

OR

Does the recent decrease in per capita VKT simply reflect economic conditions with a prospect of future growth in car travel?

OR

Has a peak in per capita car travel in urban areas been reached such that decline will subsequently be observed?

Future demand for car use is uncertain; has it peaked or plateaued or will it return to growth?

A number of transport authorities around the world are focusing attention on explaining recent levels of car travel to aid future projections.

Time will tell – making sense of what is happening cannot be resolved with only one or two more years' data.

Future demand will be influenced by the size, make-up and spatial distribution of New Zealand's population.

The future

In times of uncertainty, that uncertainty must be embraced not concealed

Demand models and forecasting tools are a mainstay for transport authorities around the world when examining the future.
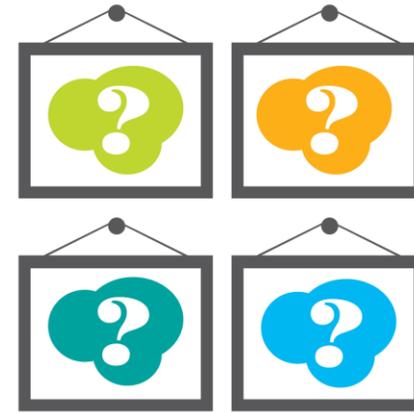
They are not enough for the times we face.

Diverse, plausible futures must be explored to help support robust decision making.

A number of key drivers...

can influence a diverse group of people...

to paint multiple pictures of plausible futures

Scenario planning can be used to explore uncertainty

Scenario planning helps to recognise, consider and reflect on the uncertainties likely to be faced and to stimulate strategic discussions.

It involves engagement with a diverse range of stakeholders and experts to produce (principally qualitative) depictions of plausible but divergent futures.

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A wide range of stakeholders helped create scenarios for 2042

The Future Demand project's scenario planning approach involved engagement with stakeholders in three workshops informed by perspectives from youth focus groups.

Society is diverse, so examining its future should involve a diverse range of people.

It is not about 'right or wrong' but about plausibility and possibility
as judged by a body of expertise and set of perspectives.

Strong engagement led to the identification of key drivers of future change
and the generation of four scenarios for 2042.

Urbanisation – Consensus over increasing number of people living in urban rather than rural localities in NZ

Ageing population – Consensus over a growing proportion of people in older age groups in NZ

Decentralisation of shopping – Consensus over greater role for at home consumption/production

Digitally connected society – Consensus over digital technologies playing an increasing role to connect society

Responding to environmental change – Consensus over proactive steps to address environmental change

Rise of Asia – Consensus over Asia playing a greater role in the NZ domestic and international community

Mixed views

Resilience to climate change – Mixed views over the extent to which action will be implemented

Pressures on raw materials and resource management – Mixed views over pressure and response

Technologies driving new industries/business models – Mixed views over the role of technologies in business

Wealth, access to employment – Mixed views over the extent of NZ's inequalities

**Governance, regulatory system, political system** – Mixed views over the future of decision making

Known unknowns

Values, community, identity – Uncertainty over the make-up of New Zealand culture

Fundamentalism – Uncertainties over the role/impact of ideologies

Smart infrastructure, nanotechnology – Uncertainty over the take-up of smart technology

Personal and state security – Uncertainty over the balance of security

Ownership of the internet – Uncertainty over the control of the internet

The stakeholders identified 16 factors or drivers that would shape future society and demand for travel

The group thought that some of the drivers were both important and were headed in a certain direction (green). Others could be important, but the group was uncertain about the degree of impact and type of effect (red). There was a mixed view on the importance of a third group of drivers (orange).

These 16 drivers were used as a basis for selecting two critical uncertainties.
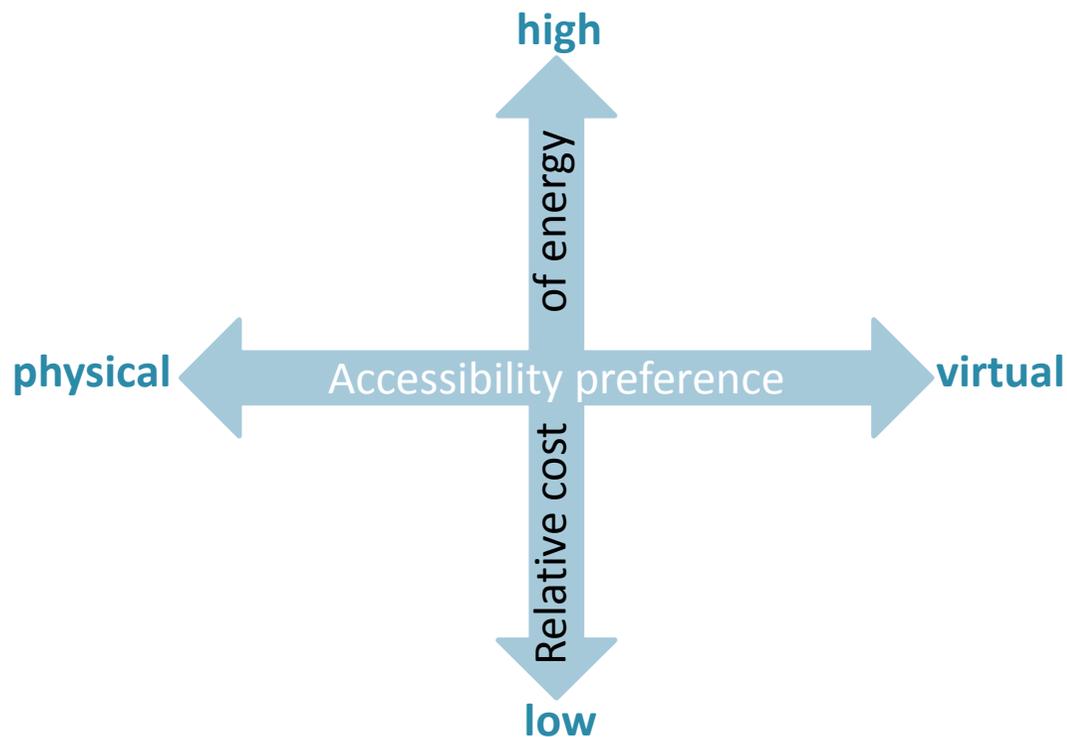
What will society want to do?

While technologically possible to connect physically (transport) or virtually (telecommunications), a critical uncertainty is how society will **want** to access people, goods, services and opportunities in 2042.

What will society be able to do?

Relative to other costs of living, affordability of energy is a critical uncertainty – this influences what people will be **able** to do.

We chose two important and uncertain factors to frame the scenarios (critical uncertainties)

Nine pairs of critical uncertainties were tested as the possible frame for the scenarios (using a two-by-two matrix).
The two critical uncertainties selected were accessibility preference to connect physically or virtually and the uncertainty around the relative cost of energy as high or low.

These were chosen because they produced a pair of axes which were proxies for what people wanted to do and what they were able to do.
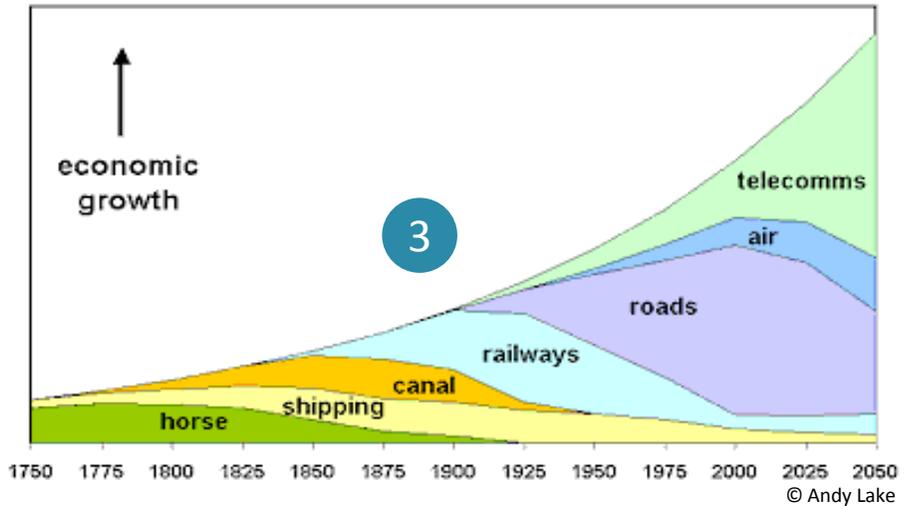
The scenario matrix creates a framework for describing four plausible futures that are then coloured from our palette of key drivers.
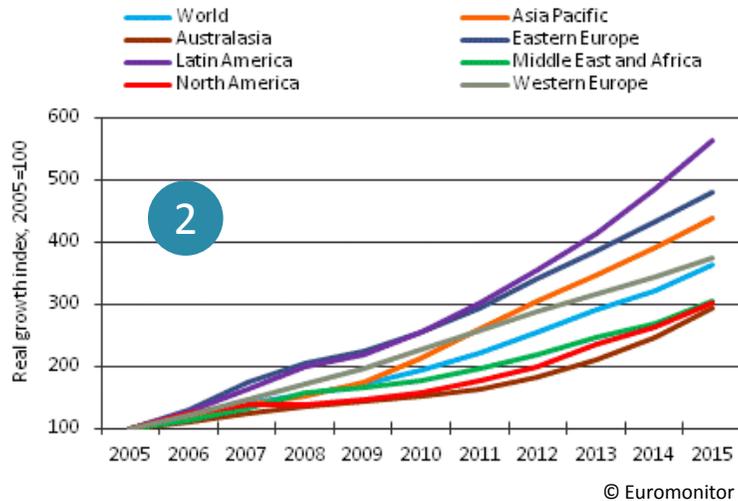
1 *"in broad terms, average travel time holds constant across populations [globally] and over time at around 1.0-1.1 hours per day"*

David Metz, Transport Reviews, 2008
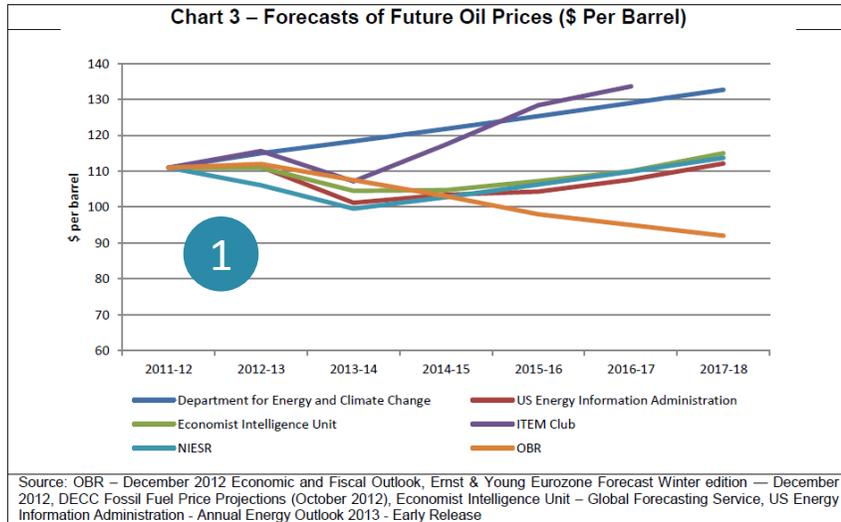
Time, mobility and economic growth

© Andy Lake

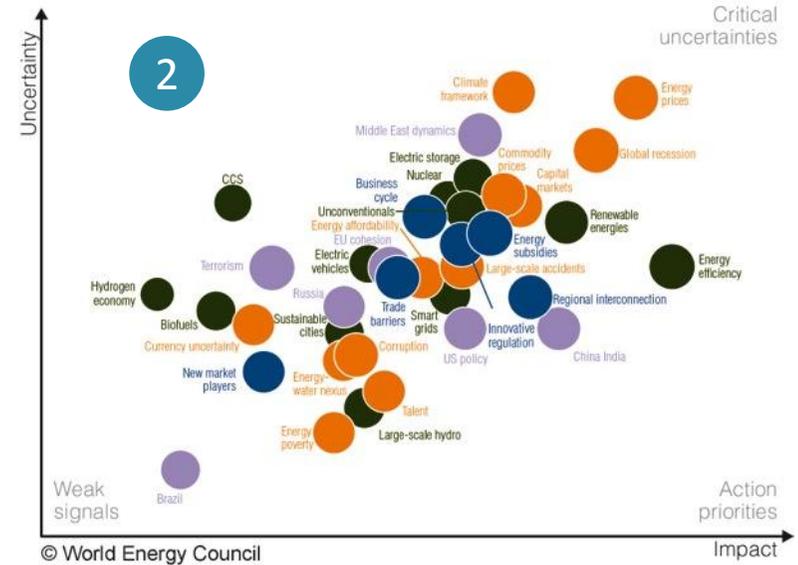**Internet Retail Sales by Region: 2005-2015**

© Euromonitor

A closer look at uncertainty about accessibility preference

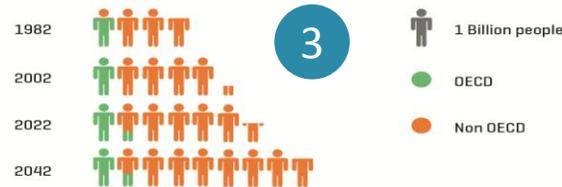There has been a historical trend of physical travel dominating provision of access.

1 Research shows that on average people like to travel for around an hour a day. This has been unaffected by technology, which to date has simply changed how far we travel and our means of travel.

2 However, the take-up of digital connections has been extraordinary. It has already had a massive impact on the way we shop.

3 It is speculated that it will significantly affect how we do business. Could it also alter the way we prefer to interact?
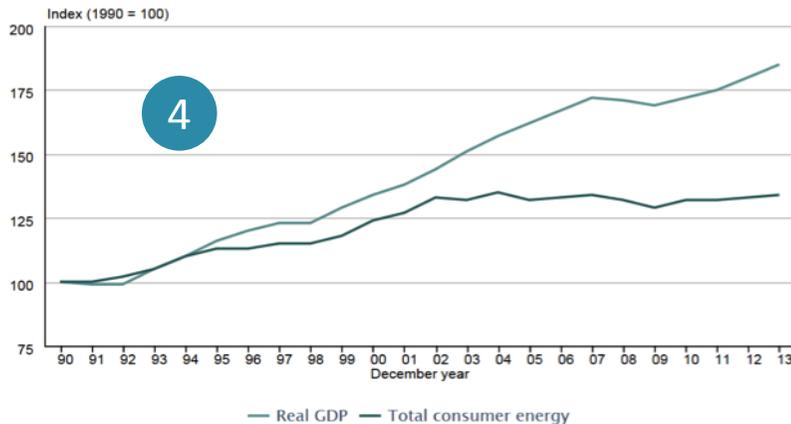
Chart 3 – Forecasts of Future Oil Prices ($ Per Barrel)

Legend:
- Department for Energy and Climate Change
- Economist Intelligence Unit
- NIESR
- US Energy Information Administration
- ITEM Club
- OBR

Source: OBR – December 2012 Economic and Fiscal Outlook, Ernst & Young Eurozone Forecast Winter edition — December 2012, DECC Fossil Fuel Price Projections (October 2012), Economist Intelligence Unit – Global Forecasting Service, US Energy Information Administration - Annual Energy Outlook 2013 - Early Release

World Population

1 Billion people

OECD

Non OECD

Energy intensity of the economy
1990–2013

Index (1990 = 100)

Real GDP   Total consumer energy

Source: Ministry of Business, Innovation and Employment and Statistics New Zealand

2014 World Energy Issues Monitor: 37 issues and their perceived impact, uncertainty and urgency for global energy leaders

© World Energy Council

A closer look at uncertainty about the relative cost of energy

1. Even looking out just six years there is a 40% variance in possible oil prices from a range of respectable sources – from a 10% decrease to a 30% increase.
2. Global energy leaders have identified energy prices as an issue of great uncertainty.
3. Energy prices could be driven up by increasing world population and rising energy demands in developing nations.
4. Energy prices could fall if economic growth can be achieved without comparable increases in energy use and as new sources of energy are exploited.

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2042 scenarios

The report now describes the four scenarios we created for New Zealand.
These are not predictions, nor is any one of them a suggestion for a preferred future.
The challenge for the reader is to put aside any preconceptions and ask the question:
is each of the scenarios plausible?

Cooperative and Close

While people value face-to-face contact, high energy costs have forced them to adapt. New Zealanders persevered through challenges by simplifying their lifestyles. They value strong communities, resourcefulness and simplicity.

Global Locals

In response to rising energy costs, society invested in energy-efficient technologies and virtual interfaces. Society has moved from car dependency to virtual confidence. People value adaptability, efficiency and ingenuity.

high

of energy

Relative cost

physical   Accessibility preference   **virtual**

New Zealand is awash with cheap energy, which powers rapid growth. Citizens prefer to connect with one another face-to-face as digital life feels less authentic. People support network pricing to ensure they have the transport system they need. They value individual liberties, privacy and self-reliance.

People enjoy a vast array of experiences and services anywhere, anytime, via their digital interfaces. Many people now feel more comfortable in digital worlds than in their own skins. They value openness, collaboration and innovation.

low

Travellers' Paradise

Digital Decadence

resource paper available

8

New Zealand is a bustling South Pacific powerhouse in this scenario, awash with cheap energy. Substantial oil and gas discoveries have enabled New Zealand to be a net oil exporter. Living costs are low thanks to a high New Zealand dollar that skyrocketed in value when exports flourished.

Abundant energy has powered economic growth and rapid expansion of New Zealand's sprawling major cities. Rural regions initially struggled with the high New Zealand dollar but they have found new ways to thrive. Both urban and rural citizens prefer to connect with one another face-to-face as digital life feels less authentic. Digital technologies are still widely used, but people are highly discerning about how they use them. People value individual liberties, privacy and self-reliance. Domestic tourism has soared as city slickers seek to escape the hustle and bustle of loud, crowded city streets.
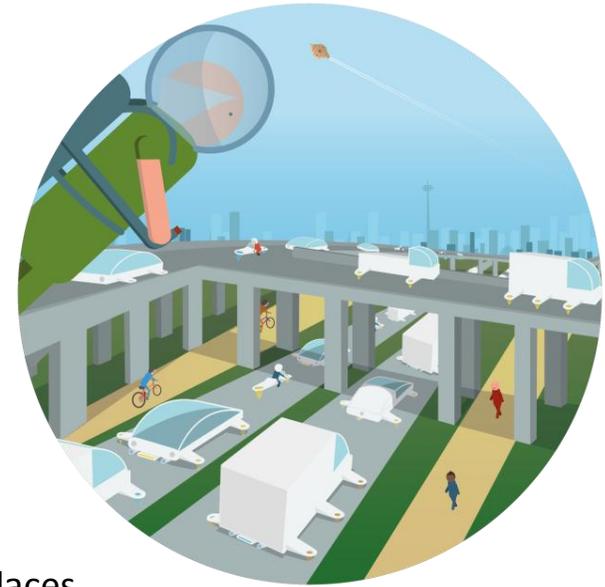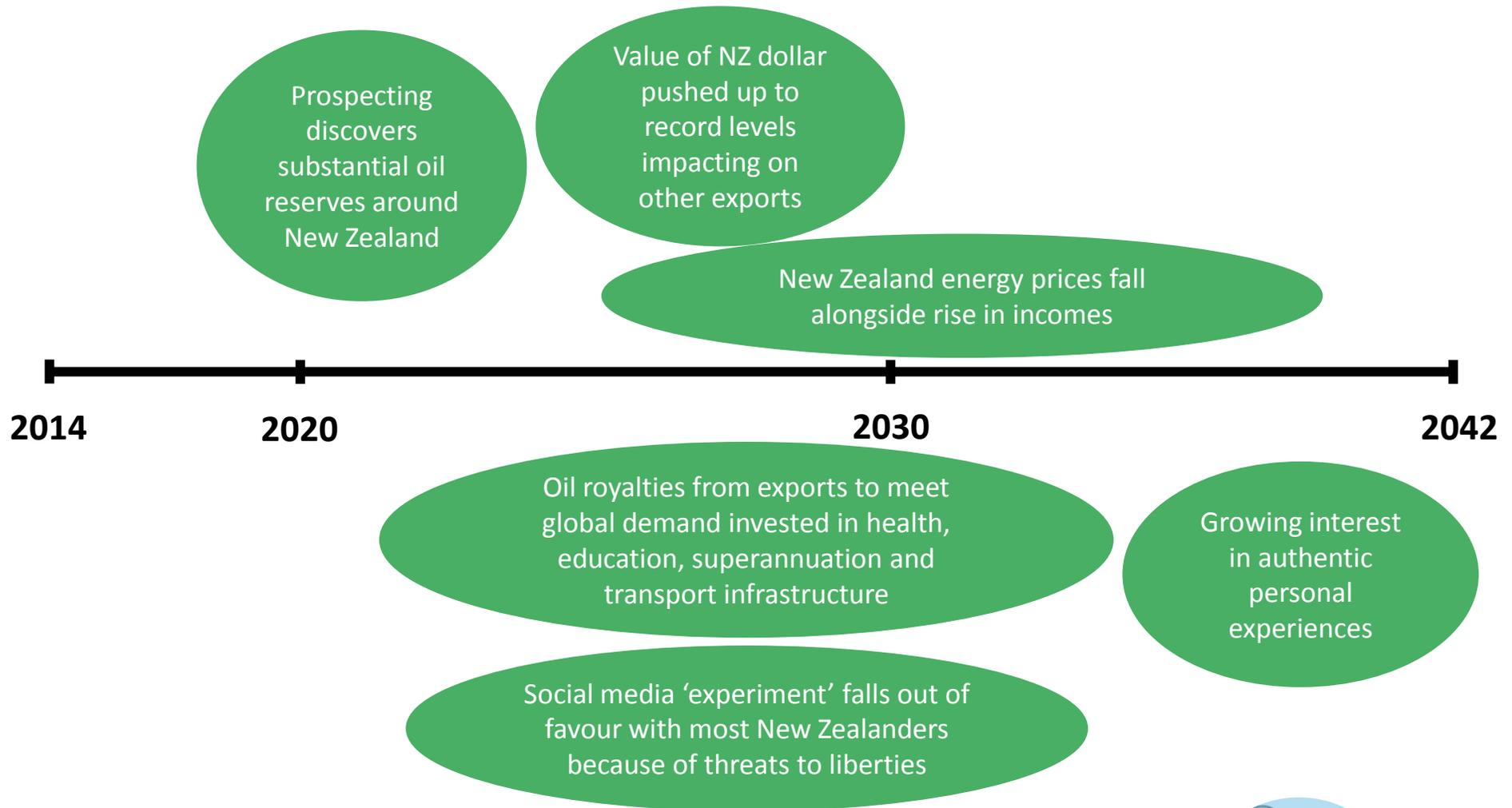
Compared to 2014, people are travelling more often. They want to get to places quickly, easily and on their own terms. Individual privacy and choice are paramount. While a significant programme of investment in transport infrastructure has continued, it has not been possible to physically out-build congestion on popular travel routes. Demand management initiatives have been introduced on these routes to better utilise transport infrastructure. In major cities, mass transit rail and rapid bus systems are also popular to move people around quickly. Cycling is often dangerous in fast-moving traffic. Climate emissions from transport have stabilised and New Zealand is meeting its international climate obligations.

Travellers' Paradise

Preference for **physical** accessibility in a context of **low** energy prices relative to other costs of living

2042

Prospecting discovers substantial oil reserves around New Zealand

Value of NZ dollar pushed up to record levels impacting on other exports

New Zealand energy prices fall alongside rise in incomes

2014   **2020**   **2030**   **2042**

Oil royalties from exports to meet global demand invested in health, education, superannuation and transport infrastructure

Growing interest in authentic personal experiences

Social media 'experiment' falls out of favour with most New Zealanders because of threats to liberties

Getting from 2014 to Travellers' Paradise
Preference for **physical** access and **low** relative energy costs

Although people value face-to-face contact, high energy costs have forced people to adapt. New Zealanders have persevered through challenges by simplifying their lifestyles and working together. They value strong communities, resourcefulness and simplicity. Local community life is flourishing but some tensions exist between communities.

Travelling by large private vehicle is expensive so most people prefer to stay close to their local communities and workplaces. Adapting has been strenuous and often painful for low-income families who live on the outer edges of settlements. They commute long distances to work by carpooling or using public transport (where it exists).

Digital technologies are still available, but they are used as a complement for access. Society lost trust in relying solely on digital technologies for access thanks to several high profile security breaches through the 2020s. The preference for face-to-face contact has strengthened local communities.
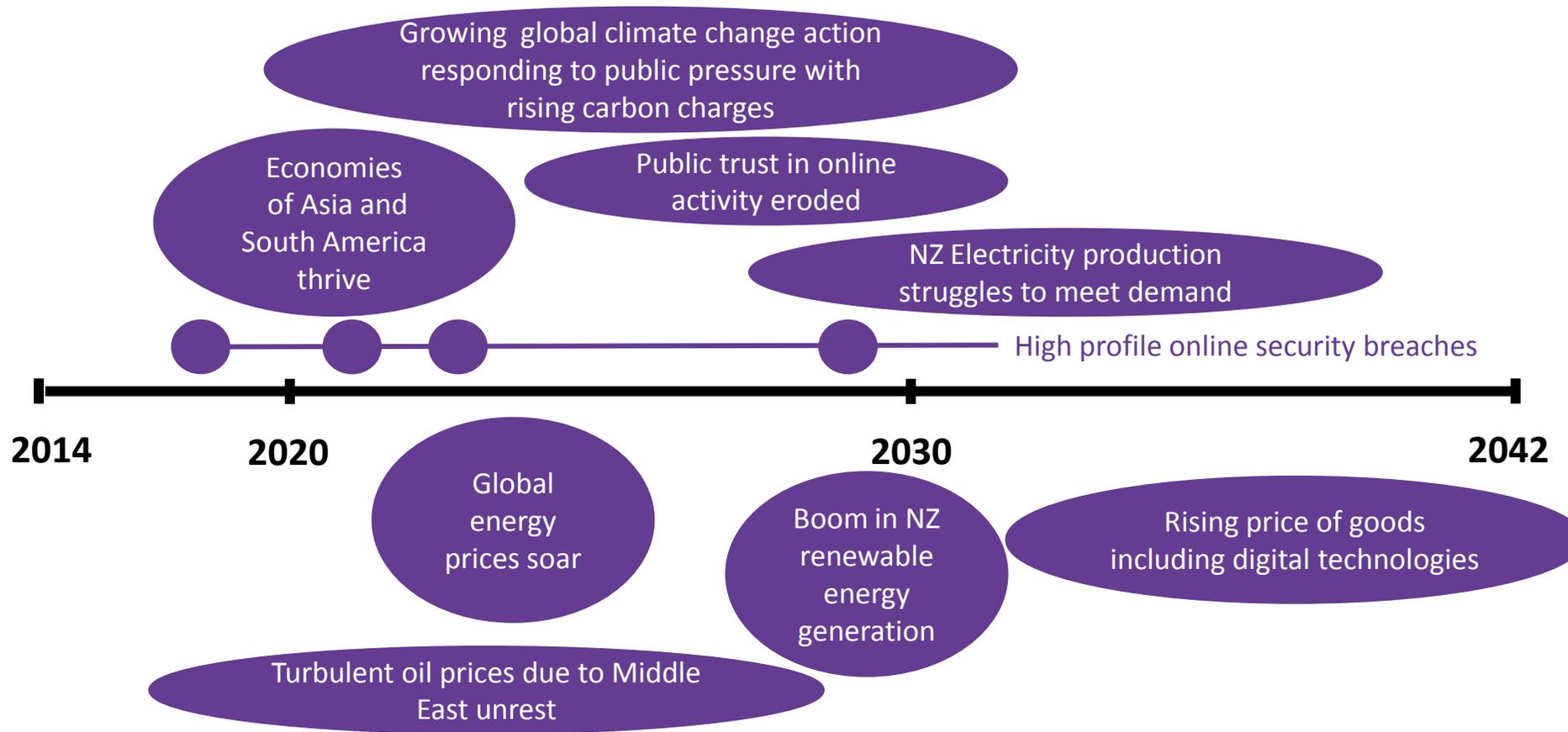
Compared to 2014, people are travelling less by motorised means. They are travelling more by foot and on bikes, and co-share transport. Many people are healthier because they lead more active lifestyles. Climate emissions from transport have decreased dramatically.

Cooperative and Close
Preference for **physical** accessibility in a context of **high** energy prices relative to other costs of living

Growing global climate change action responding to public pressure with rising carbon charges

Economies of Asia and South America thrive

Public trust in online activity eroded

NZ Electricity production struggles to meet demand

High profile online security breaches

2014

2020

2030

2042

Global energy prices soar

Boom in NZ renewable energy generation

Rising price of goods including digital technologies

Turbulent oil prices due to Middle East unrest

Getting from 2014 to Cooperative and Close
Preference for **physical** access and **high** relative energy costs

New Zealanders pride themselves on their 'can do' attitude in this scenario. Government, business and community leaders could see escalating challenges on the horizon and they navigated their way through them before big changes were forced upon them. New Zealand rapidly responded to spiralling energy costs by embracing smart technologies and virtual interfaces to do business and stay connected. New Zealanders value adaptability, efficiency and ingenuity. They love living in their digital worlds, which offer greater security than the physical world.

New Zealand is embedded in a global matrix of digital highways and byways. Highly educated people can work anywhere in the world from the comfort of their armchairs. People have traded off concerns about being monitored or tracked by corporations and government for the security and utility the digital world offers. Communities are largely based on talents and interests, rather than proximity to other people. Less technologically literate people continue to do manual jobs that keep society functioning.
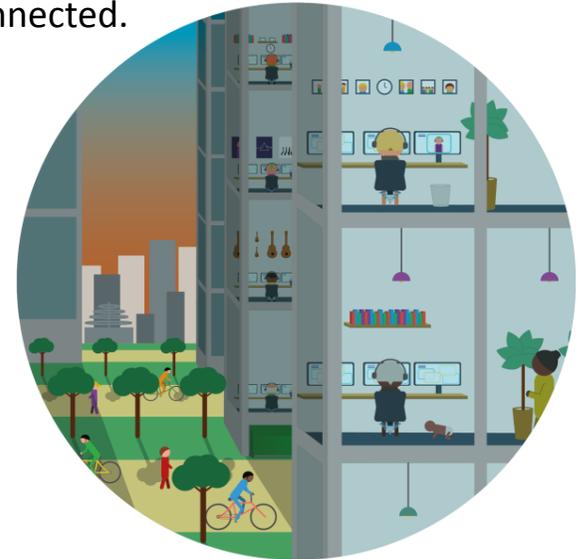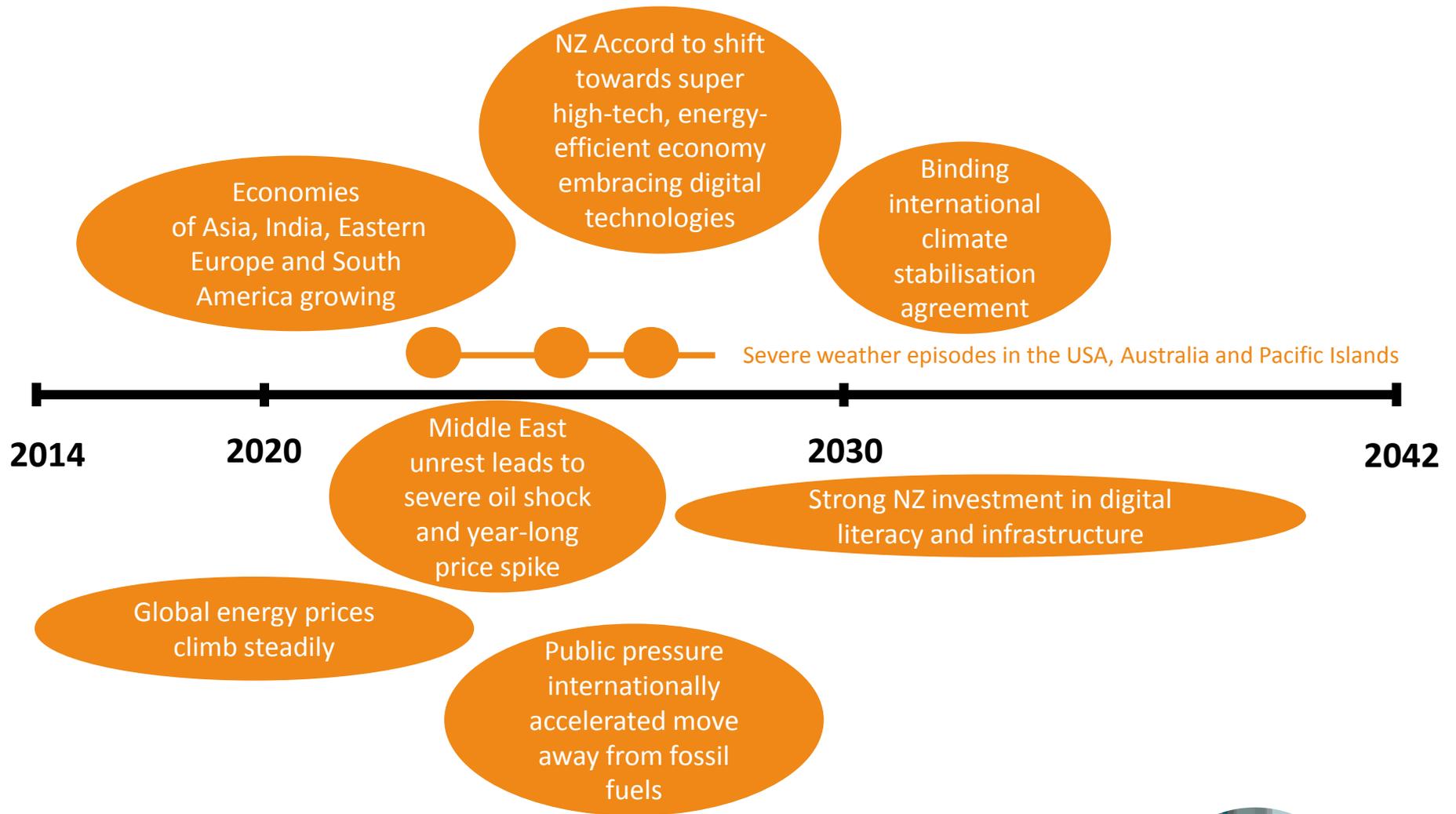
Compared to 2014, people are using all motorised forms of transport far less. People prefer exploring the digital world to travelling outside. Obesity and diabetes rates have increased because of a lack of physical exercise. People regularly try to manage their health by walking and cycling for recreation. Climate emissions from transport have fallen dramatically.

Global Locals

Preference for **virtual** accessibility in a context of **high** energy prices relative to other costs of living

2042

NZ Accord to shift towards super high-tech, energy-efficient economy embracing digital technologies

Economies of Asia, India, Eastern Europe and South America growing

Binding international climate stabilisation agreement

Severe weather episodes in the USA, Australia and Pacific Islands

2014 **2020** **2030** **2042**

Middle East unrest leads to severe oil shock and year-long price spike

Strong NZ investment in digital literacy and infrastructure

Global energy prices climb steadily

Public pressure internationally accelerated move away from fossil fuels

Getting from 2014 to Global Locals

Preference for **virtual** access and **high** relative energy costs

The true measure of success for most New Zealanders in this scenario is not how many possessions they own but how rich their digital experiences are. Most experiences are mediated through immersive and sometimes addictive digital technologies. People carefully groom their digital lives to express their individuality. The sense of power and enjoyment that they get from creating their digital selves has spilled into the material world. People actively participate in online forums and readily share their likes and dislikes. New Zealanders value openness, collaboration and innovation.

New Zealand is a magnet for digital entrepreneurs, 'enhanced reality' designers and social innovators. Traditional industries have also had a new lease of life. Food and fibre exports from automated farms and factories are booming. Energy costs have reduced globally and energy is widely affordable in New Zealand thanks to high exports, super-efficient technologies and access to abundant renewable energy sources.
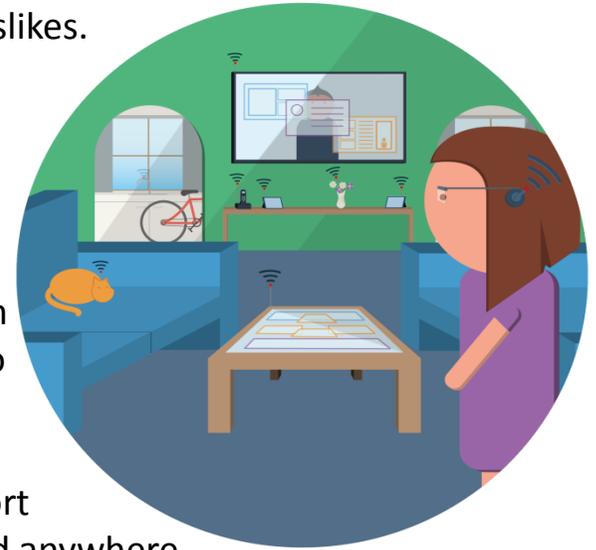
Compared to 2014, people are travelling less on all forms of motorised transport because they can enjoy a vast array of experiences and services — anytime and anywhere — by activating their digital interfaces. When people need to travel it is cheap for them to do so. They prefer to travel in self-driving cars so they can remain connected. Doctors regularly prescribe walking and cycling to people who are not physically active. Climate emissions from transport have fallen dramatically as most vehicles run on renewably-sourced electricity.

Digital Decadence

Preference for **virtual** accessibility in a context of **low** energy prices relative to other costs of living

2042

Lines between online and offline lives blur

Digital technologies continue to evolve exponentially with falling prices

Digital Rights Act introduced, ensuring connection equality and security. Connectivity becomes a basic human right

2014 **2020** **2030** **2042**

Strong social response to lack of government and business leadership on climate stabilisation

Cheaper in NZ to access most energy from renewable sources thanks to renewable energy technologies

Gradual increases in global fossil fuel prices

Getting from 2014 to Digital Decadence

Preference for **virtual** access and **low** relative energy costs

From storytelling to number crunching

© iQoncept / Dollar Photo Club

We produced estimates of demand in 2042 for the four futures

In order to decide how much to invest in our land transport system we need to estimate future demand.
We usually do this using models which take historic data and forecast this forward.
This is a good approach if historic trends and the relationship between factors
such as GDP and travel remain constant.

The scenarios allow us to explore plausible futures which do not follow historic trends.
In order to understand the impact of these scenarios on investment needs
we have estimated likely demand in each of these scenarios.

Given the uncertainties, we developed a simple structural model
to estimate demand which is being made openly available.

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The model includes input data from Treasury, Statistics NZ and the Ministry of Transport

The key assumptions in the model for the baseline for future passenger VKT were:

From Treasury and Statistics NZ:

- Real GDP – forecast to increase by about 50% from 2014 to 2042
- Fuel prices expected to increase by around 50% in real terms
- Low price elasticity for fuel
- Population – projected to increase to 5.5 million by 2042
- Population ages – percent 65+ increases from 14.6% in 2014 to 23.3% in 2042
- 81% expected to live in urban areas

From the Ministry of Transport:

- VKT by reasons for travel obtained from the Household Travel Survey
- Expected average fuel efficiency of 10.48 km/litre by 2042
- Driver response to increases in fuel efficiency

Quantification model – baseline results

The model produces a baseline of a 4% decrease in VKT per capita by 2042.
This compares to an 8% decrease per capita in the last 10 years.

We ran the model for each scenario with changes to five of the input parameters

The input parameters we varied were:

- Fuel prices
- Percent of urbanisation
- Average vehicle fuel efficiency
- Estimate of the impact of digitisation on reduction in VKT
- Population for the Digital Decadence scenario

Quantification model

The model estimates changes in total VKT to 2042 ranging from
an increase of 35% to a decrease of 53%.

Cooperative and Close

Digital connectivity effect

Change in total VKT by 2042

Work – main/other job	0%
Work – employers' business	0%
Education	0%
Shopping/personal business	0%
Social visits	0%
Recreation	0%

Urbanisation effect
Urban population share by 2042
90%

Energy price change effect
Change in fuel price in 2042 compared to the baseline
500%

Fuel efficiency effect
Petrol vehicle efficiency (km per litre)
14.00
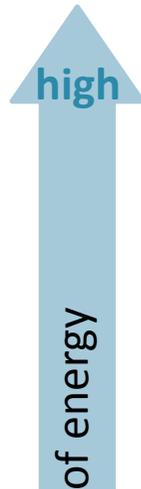
Global Locals

Urbanisation effect
Urban population share by 2042
85%

Energy price change effect
Change in fuel price in 2042 compared to the baseline
300%

Fuel efficiency effect
Petrol vehicle efficiency (km per litre)
12.00

Digital connectivity effect

Change in total VKT by 2042

Work – main/other job	-50%
Work – employers' business	-40%
Education	-45%
Shopping/personal business	-55%
Social visits	-70%
Recreation	-45%

high

of energy

physical ← **Accessibility preference** → **virtual**

Relative cost

Travellers' Paradise

Digital connectivity effect

Change in total VKT by 2042

Work – main/other job	15%
Work – employers' business	15%
Education	10%
Shopping/personal business	15%
Social visits	15%
Recreation	15%

Urbanisation effect
Urban population share by 2042
80%

Energy price change effect
Change in fuel price in 2042 compared to the baseline
-50%

Fuel efficiency effect
Petrol vehicle efficiency (km per litre)
11.00

low

Urbanisation effect
Urban population share by 2042
75%

Energy price change effect
Change in fuel price in 2042 compared to the baseline
0%

Fuel efficiency effect
Petrol vehicle efficiency (km per litre)
11.00

Digital Decadence

Digital connectivity effect

Change in total VKT by 2042

Work – main/other job	-50%
Work – employers' business	-25%
Education	-50%
Shopping/personal business	-50%
Social visits	-50%
Recreation	10%

Input parameters for each scenario were based on internal debate informed by New Zealand trends and projections
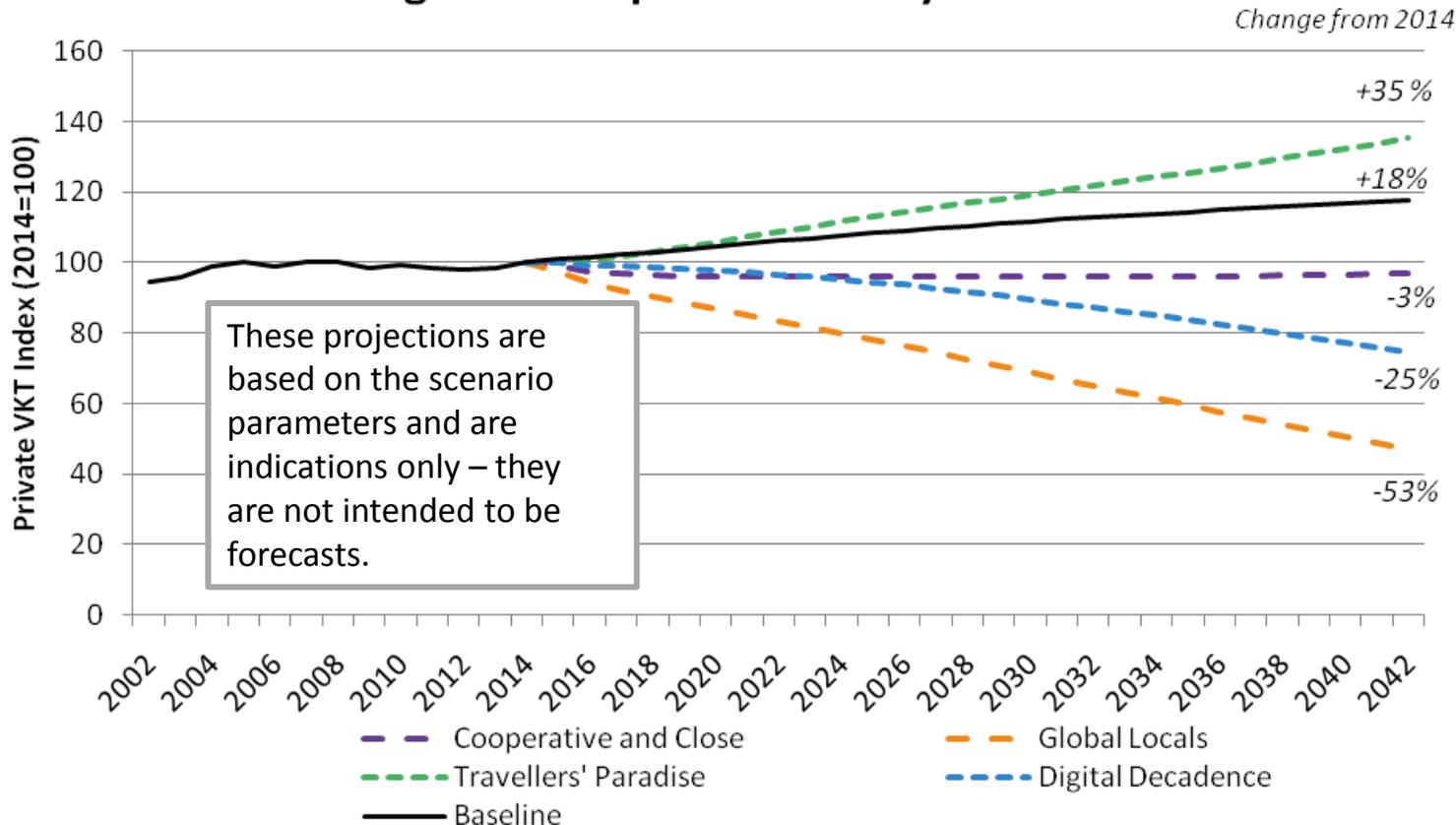
Change in private VKT per capita by scenario
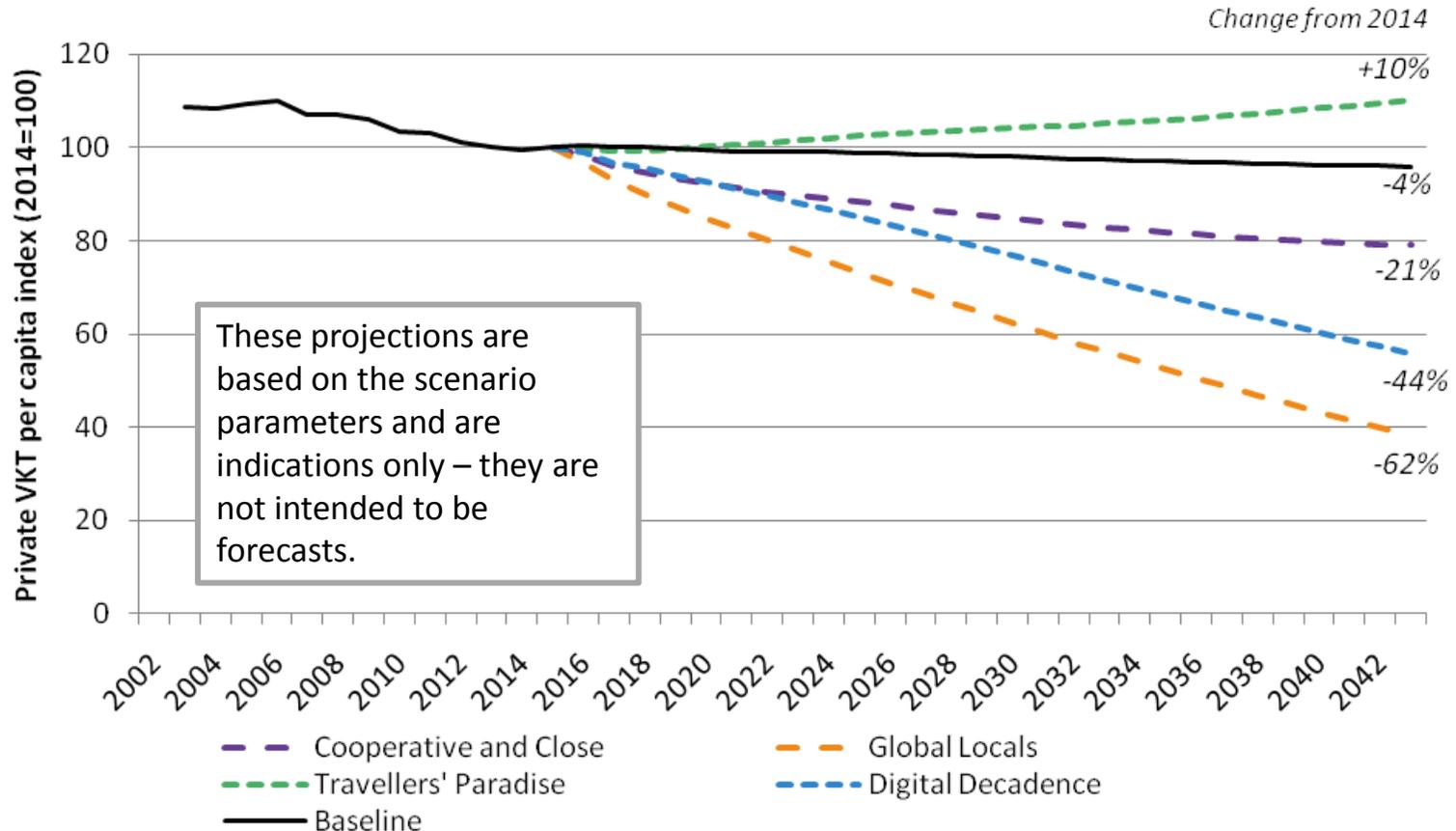
The model estimates between a 10% increase and a 62% decrease in VKT per capita

In New Zealand we currently drive on average 6960 km per capita per year. If this increased by 10%, this would increase to 7650 km per capita. If our VKT reduced by 62% per capita, this would reduce to 2660 km per person.

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Change in total private VKT by scenario

Change from 2014

These projections are based on the scenario parameters and are indications only – they are not intended to be forecasts.

+35 %
+18%
-3%
-25%
-53%

Private VKT Index (2014=100)

- - - Cooperative and Close
- - - Travellers' Paradise
—— Baseline
- - - Global Locals
- - - Digital Decadence

The model estimates total private VKT varying between a 35% increase and a 53% decrease

A day in the life

Meet Jess. Jess is 42 and owns a kiwifruit orchard
in the Hawke's Bay with her partner. They have two school aged children.

Living in
travellers' paradise

Living in
digital decadence

On average Jess drives the kids about 8 km a day to Napier and back.

With few close neighbours, Jess travels about 50 km a week to catch up with her family and friends.

Jess travels around 90 km a week to get groceries or to go shopping in Hastings.

The kids need to go to town twice a week for swimming – a round trip of about 12 km.

Jess buys her goods online, but occasionally she drives 15 km to buy a coffee. She likes the retro feel of a café.

Jess catches up with friends online. However, she still visits her parents. She travels about 11 km a week for this.

Daily travel will depend on who you are and where you live

Travel in each scenario changes depending on a number of factors including if you live rurally or in the city, if you are male or female and the stage of your life.
This is an example of life for Jess, a rural woman with two children.

There are more than four possible futures

The future is uncertain. However, the diversity of this set of four plausible futures offers a tangible range of possibility with which to test thinking and examine the robustness and flexibility of policy and investment decisions.

© Bill Frymire / Masterfile

Our work has highlighted 12 insights to inform views on how our transport system could or should evolve in order to support mobility in the future

The scenarios reflect diversity of possibility for future mobility. As a set, the scenarios, their development and the accompanying contextual work have given rise to a series of insights for responding to the focal question.

These now follow – under six related themes.

They are intended to be catalysts for strategic debate for all those involved in informing or making decisions that will shape our transport system.

Six insight themes

We need a better understanding of what is shaping the changes in **people**'s behaviour.

We face an uncertain future as we see **change** in patterns of demand.

We need to build **flexibility** into our transport system to accommodate change.

We need to invest in **accessibility** recognising this can be achieved through a good transport system, good planning of our physical environment or through good digital connection.

We need to recognise that the decisions we make will shape future demand. We should accept **responsibility** for that and start a discussion on what sort of transport system is appropriate.

We need a better understanding of emerging **technology** and its speed of adoption.

Change

Respecting uncertainty and our limited grasp of cause and effect

Gross Domestic Product (GDP) and vehicle kilometres travelled (VKT) by vehicle type

Legend: Total VKT — Light passenger VKT — Light commercial VKT ····· Truck VKT — GDP

Y-axis: 2001 base = 100 (90 to 140)
X-axis: Year (2001 to 2013)

Labels at right: GDP, Light commercial VKT, Truck VKT, Total VKT, Light passenger VKT
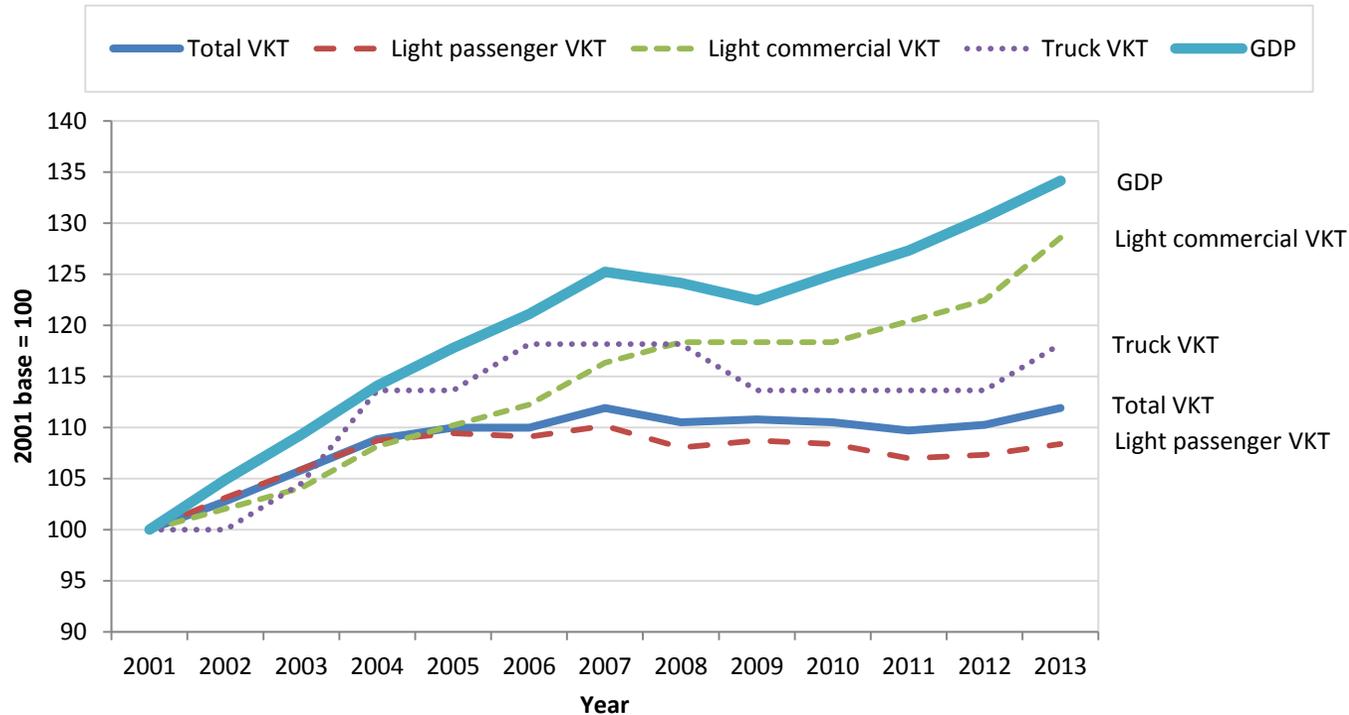
Since 2007 the amount of car traffic per unit of economic output has been decreasing, against a historic increase

The traffic intensity of the economy has been reducing for over a decade

There are signs in a number of countries including New Zealand that economic prosperity is not as seemingly dependent on people travelling by car as it once was.

The roading network remains important for a thriving New Zealand but it is not unique in supporting economic activity – other factors must be at work. These are not well understood but may include the changing makeup of the economy and also changing preferences for alternative forms of *access* besides the car.

Responding to the insight

Further investigation is needed to better understand the changing traffic intensity of economic activity. This is not a matter unique to New Zealand so a collaborative international approach should be considered – perhaps through the International Transport Forum.

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Never trust a crocodile

© Sondem / Dollar Photo Club
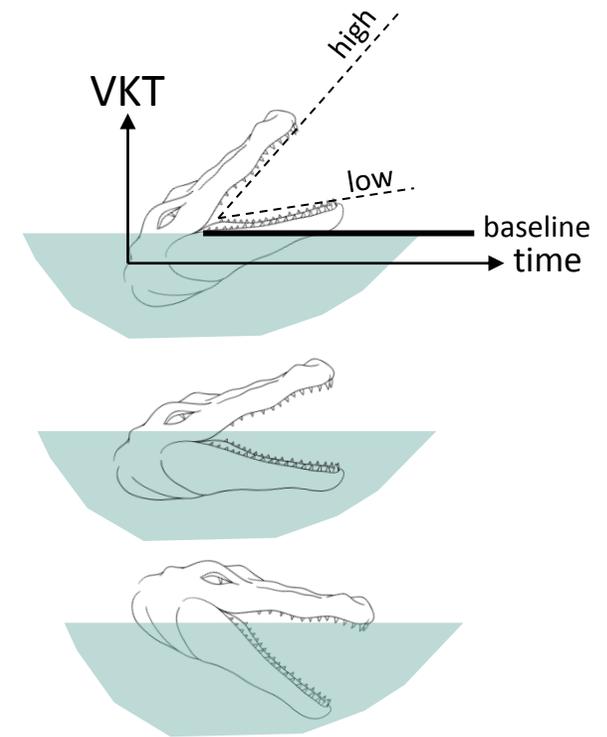
The matter about which one can have greatest confidence of outcome is that a projection about the future will be wrong

Whether dealing with prediction or plausibility, we are at best producing estimates of change to a complex system based on limited understanding of cause and effect.

Such estimates involve assumptions – both implicit and explicit.

Future Demand has produced estimates for four plausible futures. These will be at odds with other estimates of future demand.

The 'crocodile jaws' of possibility can widen or close; they can tilt up or tilt down. Either way – they are still the jaws of a crocodile and should be treated with the caution they deserve.

Responding to the insight

Any production of estimates of future demand possibility should seek to be as transparent as possible about the underlying assumptions and limitations that are involved. Differences between estimates from different sources should be constructively examined rather than applying premature judgements over credibility. There are important lessons to be learnt from past estimates over time of future demand which are at odds with later observation of actual demand.

©Hansueli Krapf

and yet...

We should not dismiss the plausibility of seeing little change in the future

Uncertainty implies change and indeed suggests substantial change – to transport and society. However uncertainty should also encompass the plausibility of little fundamental change.

There can be features of inherent stability in our systems over time.

Change arises both from opportunity but also from the motivations and actions of the actors in the system.

Change to governance and social practice can be subject to significant inertia as can in some respects our changing built environment.

Responding to the insight

In reflecting on this report and in the examination of uncertainty, stability and inertia should be recognised alongside change. Yet complacency from presuming inertia rather than change will prevail should be avoided.

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Flexibility

Designing our systems to accommodate uncertainty

Beware (P) Preconceptions

Predicted – extrapolated outlook for the future giving a (misguided) sense of confidence

Plausible – outlook for a future who's potential emergence cannot be denied based on current knowledge

Presumed – outlook for the future on a basis of probability and instinct but without proof

Preferred – outlook for a future that is desirable (so therefore value laden)

Practical – outlook for the future that aligns best with immediate interests and imperatives

We need to be willing to be flexible in our thinking

Present day decisions about our transport system's development for future needs can only amount to best endeavours – we cannot know what the future will look like.

As analysts, experts and decision makers we would be wise to acknowledge to ourselves (and others) the standpoint(s) we contribute from. 'Predict and provide' is one such standpoint. Which outlooks are you inclined towards?

Responding to the insight

A wider range of possibility for future mobility should be entertained than has traditionally been the case. Plausible outlooks should be considered – not (only) predicted outlooks. Flexibility and resilience to future uncertainty should be accounted for in policy and investment decisions. This may warrant employing a real options approach which attributes value to flexibility in appraisal of investment options.

Forward planning

We need to future-proof the development of our built environment

We need to plan carefully. Infrastructure planning that fails to anticipate future conditions can constrain society's changing needs. Legacy infrastructure can become underutilised or even abandoned. Inadequate investment can limit our economic growth.

We need to future-proof our land use and transport systems to maximise opportunities, balancing the need for good return on infrastructure investment with the high degree of uncertainty we have about the future.

Responding to the insight

Decision makers need to balance current demands for infrastructure with avoiding 'lock in' that will limit the ability of future generations to meet their needs. Examples of existing urban and rural development should be reviewed in terms of built-in flexibility as should methodologies to inform investment decisions.

Accessibility

Ensuring society can reach people, goods, services and opportunities

Triple-access system to help New Zealand thrive

© NZTA

motorised vehicles for access

© schmidt hammer lassen architects

physical proximity for access

© ArtemSam / Dollar Photo Club

digital communications for access

transport   land-use

telecommunications
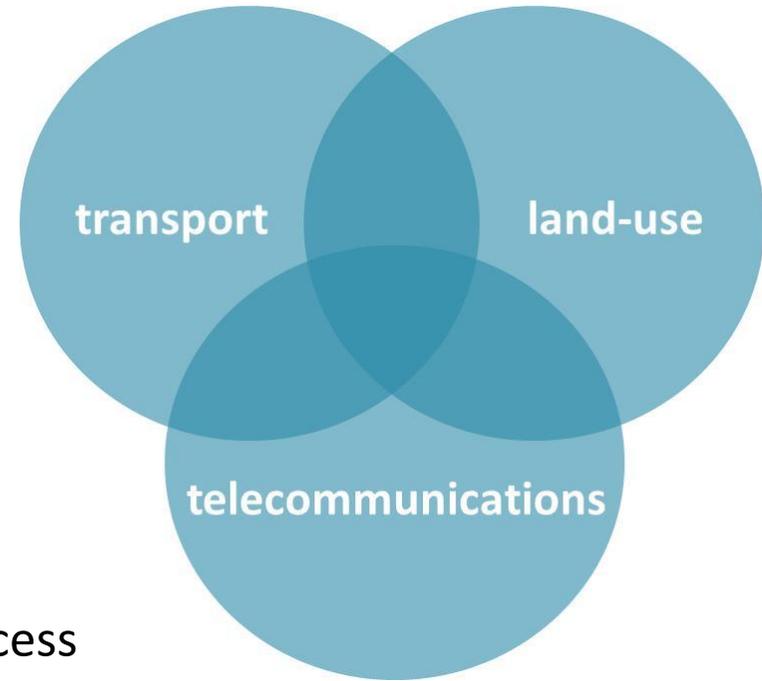
We must recognise it is about access not transport

The purpose of our transport system is to allow society to access people, goods, services and opportunities. Access supports economic and social wellbeing.

Access is influenced by three interacting systems: transport, land use and telecommunications – all three are evolving and all three are relevant to policymaking and investment.

Responding to the insight

Transport policy cannot be isolated from developments in land use and digital communications. Consideration should be given to establishing an overarching body or function that considers how transport, land use and communications co-create, and can improve provision of access for a thriving New Zealand. There is a need to evolve this triple-access system to ensure resilience and flexibility in the face of uncertainty.

Technology

Tracking developments and critically examining future prospects
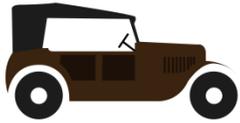
T I M E
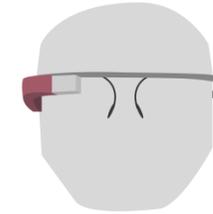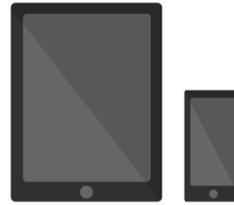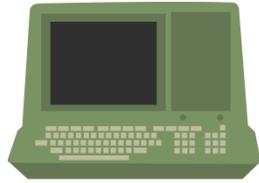
"the world is poised on the cusp of an economic and cultural shift as dramatic as that of the Industrial Revolution"

Steven Levy, Wired, 1997 – a 'plausible' outlook

We need a better understanding of emerging technologies and their likely impact on transport and travel demand

We are at a point in history where the motor age has been accompanied, and may be challenged, by the digital age which has been in rapid ascendance.

The landscape of access possibility in and against which our transport system plays its part has been changed forever and is continuing to change.

The scenarios play out the 'collision' between the motor age and digital age for different contexts of energy affordability – accounting also for land use change.

Responding to the insight

National work is needed to assemble a more detailed picture of take-up of digital technology and its use for economic and social ends. Such work needs to continue over time. This should be allied to a 'technology watch' that charts the emergence of new technologies and services that have the possibility for widespread influence on access in New Zealand. To inform policy and investment there is a need to better gauge whether digital technology use is augmenting or replacing access using the transport system.

VISIBILITY

Peak of Inflated Expectations

Plateau of Productivity

Slope of Enlightenment

Trough of Disillusionment

Technology Trigger

TIME

© Gartner
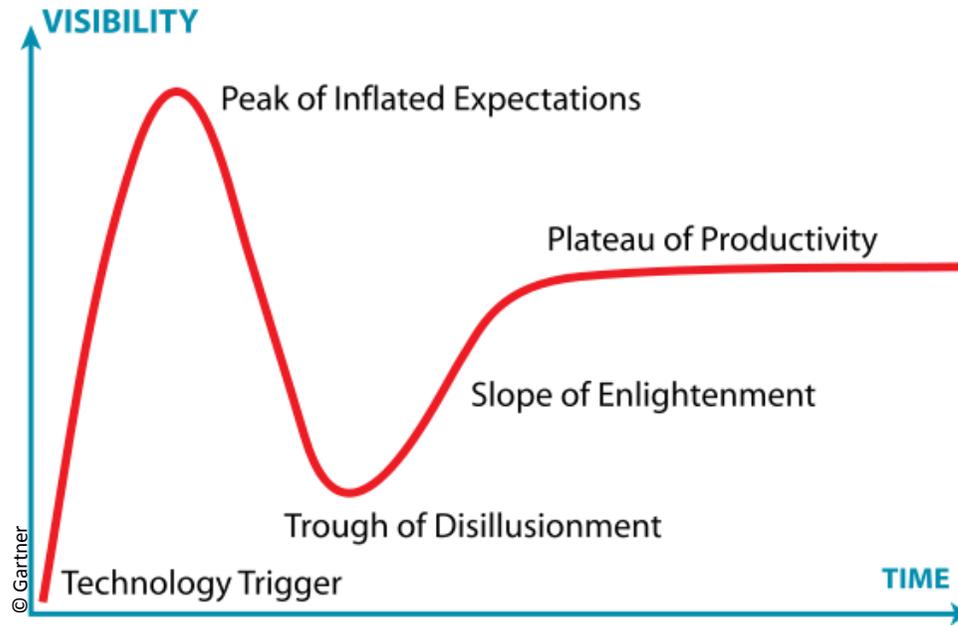
New Zealand – technology test bed, early adopter or take-up laggard?

But we need to treat the impact of emerging technologies on access with caution

Ideas and inventions reflect human capacity for creativity and ingenuity.

They provide glimpses of future possibility for New Zealand's society.

But they only become important once they translate into innovation and adoption; and this takes time, if it happens.

History tells us that today's hype has every prospect of becoming tomorrow's disillusionment, with uncertainty over whether enlightenment will follow.

New Zealand may lead or follow the hype-disillusionment cycle.

Responding to the insight

Collaborative exercises should be undertaken to critically examine 'hyped' technologies as they arise. This should involve a number of perspectives to develop informed and robust understandings of the possibilities that lie ahead beyond the initially inflated expectations.

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People

Understanding behaviour for different people in different locations
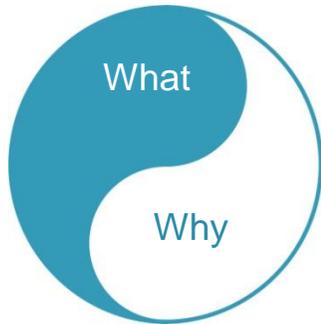
Total (car) travel combines **what** people are doing and how many people are doing it

Per capita (car) travel better reflects whether **'why'** people are travelling may be changing
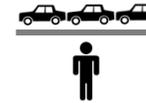
We need to **ask people** not only what they are doing (or not doing) but why

We need to understand what is shaping travel behaviour change

Trends in total (car) travel inform us of demands on our transport system (dependent on time and place). These combine changing population size with changing behaviour.

Changing behaviour itself is more apparent in trends in car travel per person which will also embody and reflect signals of social and lifestyle change.

Stronger clues for the future and its possibilities come from the latter. However there is a need to move from observing to understanding.

Responding to the insight

Future uncertainty could be reduced if we better understood the travel behaviour dynamics of the present. There is a need to review the adequacy of available national data and whether more needs to be done in terms of data collection and/or further analysis to improve understanding.

Who?

© Hipoperation Crew

© Soka Gakkai International NZ

How many?

Where?

We need to recognise that different types of people will change in different ways

Lifestyle preferences and location choices for a diverse and growing population are key to future demand on the transport system.

Beware of averages and aggregation – they mask divergent trends and divergent needs.

Responding to the insight

It is suggested that all regions engage in a strategic exercise to examine and compare their present populations and their lifestyles. Such an exercise should then examine the uncertainty over how these could change in future. Evolution of the triple-access system of transport, land-use and telecommunications should be informed by the outcomes of such an exercise.

Responsibility

Making decisions today to enable adaptation for a thriving future

Want
What do people want to do?

© Rafael Ben-Ari / Dollar Photo Club

© Inna Alesina

Need
What do people need to do?

Afford
What can people afford to do?

© skif55i / Dollar Photo Club

Adapt
What can people adapt to do?

While we face many uncertainties we need to realise we can make choices that will shape our future

There is uncertainty about how people will want to connect in future – physical or virtual.

There is uncertainty over how much people will be able to afford to connect in the way(s) they might wish.

People's adaptability is key to reconciling the challenge of making decisions today on what people might want in the future. Choice between transport, telecommunications and proximity ensures society's adaptability and capacity to thrive.

Responding to the insight

Policymaking should recognise human capacity to adapt. It should give greater priority to *leading* developments that can assure people's future needs can be met. This should be alongside if not instead of *following* people's demands based on how they currently fulfil their needs (and wants). Feasibility of how we seek to evolve our transport system must nevertheless be acknowledged. Policy intentions and rationale must be clearly communicated.

> "A self-fulfilling prophecy is an assumption or prediction that, purely as a result of having been made, causes the expected or predicted event to occur and thus confirms its own 'accuracy.'"
>
> Paul Watzlawick

You will be successful

New roading capacity can cause the generation of new traffic

Removal of roading capacity can cause traffic to disappear

High quality public transport provision can cause increasing patronage

Urban areas attractive to dwell in can cause people to dwell in them

Should we move from 'predict and provide' to 'decide and provide'?

Assuming how people will behave and then providing for that behaviour can overlook that the behaviour occurs because of the provision. Without that provision or with different provision people will behave differently.

Evolution of our transport system is not merely serving society – it is shaping it, including the demand for travel.

It is not perhaps a question of predicting future demand but deciding the demand that is appropriate and investing in ways to bring that demand about and ensure it is supported.

Responding to the insight

We need to recognise the investment choices in the transport system will shape demand. We need to acknowledge this and debate what our goals should be. Consideration should be given to dialogue to establish compatible 2042 targets for transport, land-use *and* telecommunications access at national and regional levels and determining suitable investment trajectories. Such an approach would also require a review of hypothecation in terms of implications for revenue generation and use.

Conclusions

How could or should our transport system evolve in order to support mobility in the future? This is a challenging question to answer given the unknowns we face. 'How *could* it evolve?' has more than one answer, reflective of both policy and investment decisions that are made and of the uncertainties ahead. 'How *should* it evolve?' also has more than one answer reflecting diversity of public, professional and political opinion.

However, there are three important principles that emerge from this work that can help us.

Firstly, it is *access* not mobility per se that is key to a thriving New Zealand. There are uncertainties over what make-up of access will be desirable and affordable in future.

Therefore, secondly we must ensure a resilient provision of access options that provides for adaptability of behaviour over time. This means a combined and coordinated effort to evolve and improve roading *and* proximity *and* digital communications.

Our transport system's nature and scale partly determine the demand placed on it. Therefore, thirdly when evolving our transport system we should have in mind providing for the demand we believe is *appropriate* (and feasible) rather than providing for the demand we may be tempted to predict.

The question posed by this project is not confined in its jurisdiction only to transport and neither is it only pertinent to New Zealand. National and international dialogue are important for us to foster and engage in.

With a multi-billion dollar investment programme for land transport comes a responsibility to give serious attention to the issues set out in this report.

We hope this piece of work has provoked new and fruitful thinking – please let us know: future.demand@transport.govt.nz

The End...of the Beginning

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The Players

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Cormac McBride – Traffic Design Group
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Debbie Hopkins – University of Otago
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Isabelle MacKay – Z Energy
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Jon Butler – National Infrastructure Unit
Joshua Arbury – Auckland Council
Kapu Waretini – Committee for Auckland
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Marcela Fuentes – Maritime NZ
Paul Smith – Consumer NZ
Peter Baird – NZ Police
Sarah Allen – NZ Police
Susan Krumdieck – University of Canterbury
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Ingrid Sage – Ministry of Transport*
Jennifer McSaveney – Ministry of Transport*
Paul Clark – NZ Transport Agency*
Tom Forster – Ministry of Transport*

Youth Perspectives

Kapiti Youth Council members (6 participants)
Manurewa Youth Council members (12 participants)
Auckland University students (15 participants)

The Players

1. Future Demand Scoping paper
2. The motor car and the construction of a new world
3. New Zealand transport and society: Trends and projections
4. Peak car: Does it exist and is it evident in New Zealand?
5. Grow, peak or plateau: The outlook for car travel
6. Insights into the scenario planning methodology
7. Future Demand: A youth perspective
8. New Zealand transport and society: Scenarios to 2042
9. Future Demand Model overview and user guide
10. Transport's digital age transition

resource paper available

Resource Papers

Papers produced during the process of the Future Demand project.

Intended to offer more depth of material in support of this report.

Feedback welcome – future.demand@transport.govt.nz

Acknowledgement of sources for selected images and graphs used