Creating Futures

Futures Scenarios for the Waikato

Revised Version June 2008

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Information

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How to read this report

This report was prepared by Delaney & Associates Pty Ltd at the request and with the assistance of Environment Waikato. This document is a source of ideas about how the Waikato might be different from what it is today given clear and subtle, present and future developments. It is intended to catalyse strategic thinking. It is one of a number of sources that will inform Environment Waikato's thinking about the long-term when preparing documents such as the Long-Term Council Community Plan.

We cannot tell what the future will bring. But we wanted to explore how differently we might live, work and play in the Waikato as a result of the potentially huge changes ahead. To do this, we created alternative future scenarios to test our thinking about what the future might be like.

The four scenarios cover a number of important concerns and challenges but they are not exhaustive; they have not been backed up by econometric[1] analysis. The scenarios delve into a wide range of opinions (and doubts) about how individual events, current and emerging trends, and people's decisions might play out over time. They also explore how these factors might combine to create very different and surprising pathways to the future.

The scenarios include discussion about the five themes of Environment Waikato's regional Community Outcomes, developed during 2004-5.[2]

We do not believe that any of the scenario narratives as they are written will be the actual future. We think the actual future might include some elements of all of the stories told here. But we know it might be very different because our imaginations are limited. There are future possibilities that we cannot even imagine today.

We hope the scenarios will help you ask questions about the future. Thinking ahead helps us prepare for changes when they do happen. When you read the stories we tell here, we know that you might have very different ideas about what the future will be like. So, we hope that even if you do not agree with them, they will inspire you to consider:

- The Waikato will not be the same in 10 or 20 years as it is today
- What might change?

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1 Econometrics combines economic theory with statistics to analyse and test economic relationships (Wikipedia, July 2008).

2 A draft set of Waikato regional community outcomes was identified during 2004-2005 through a series of regional visioning workshops. The process included consultation with iwi in the region, information collected by local councils through consultation with their communities, and information from central and local government, businesses, industry groups and community organisations. A draft set of Waikato regional community outcomes was reviewed by key stakeholders and promoted for community feedback before being signed off in November 2005. The Waikato regional community outcomes are grouped under five themes:
   - Sustainable Environment
   - Quality of Life
   - Sustainable Economy
   - Culture and Identity
   - Participation and Equity

   Councils in the Waikato region (including Environment Waikato and the local city and district councils) are now working together with government agencies, community groups and other organisations to see how we can achieve these outcomes.

- Will these changes make a difference to you?

Introduction

If we examine the planning and budgeting techniques used by most of the government, private, third[3] and community sectors, we find that they can work relatively well under the following conditions:

- Change is relatively predictable, i.e. linear with respect to cause and effect
- The system is bounded and fits neatly into disciplines and departments
- Unintended consequences are minimal (or can be controlled or effectively ignored)
- Feedback is low or negative, so you have dampening effects and things do not spin out of control
- The rate of change in the environment is not going to exceed the rate of change in organisations.

What if our governments, businesses and communities confront a world that does not obey this set of rules? Many of the phenomena that decision-makers face, no longer change in simple, predictable ways. Maybe they never did, but the world in the past was less complex, less interconnected, and more forgiving of mistakes and miscalculations. We now live in a world characterised by what the Organisation for Economic Co-operation and Development (OECD) has termed "emerging systemic risks" that arise through the interactions between complex social, technological, environmental, and economic systems.

From a governance standpoint, as our world speeds up, a much higher premium is put on our ability to provide early warning and to take early and focused action as issues arise. A failure in one or both of these areas—early warning and early action—can lead to significant and often irreversible social and economic consequences.

Scenarios are plausible stories about how the future may unfold. Scenarios are neither predictions nor models. Scenarios ask "what if" the future happens in significantly different ways from how we believe it will develop.

These scenarios explore how relevant issues in and out of the Waikato may evolve, such as the future natural environment, social attitudes, technology and the strength of the economy. Because scenarios are not predictions, they are often used to represent the range of plausible developments.

> The scenario narratives are less important than gaining a better understanding of the environment in which decisions about Waikato's future will be made.

Scenarios allow us to analyse changes in direction and shifts in the environment, to take new perspectives and develop insights, and, then, to use this learning as a catalyst for action. In other words, they allow us to break out of traps; people need positive stories about what the future could be, and blunt warnings about dangerous paths.

The scenario stories in this report were written with the assistance of a facilitator in late 2006/early 2007. The stories themselves are less important than gaining a better understanding of the environment in which people and organisations in the Waikato might operate. This improved understanding can be used to inform other strategic processes and better decisions today and in the future.

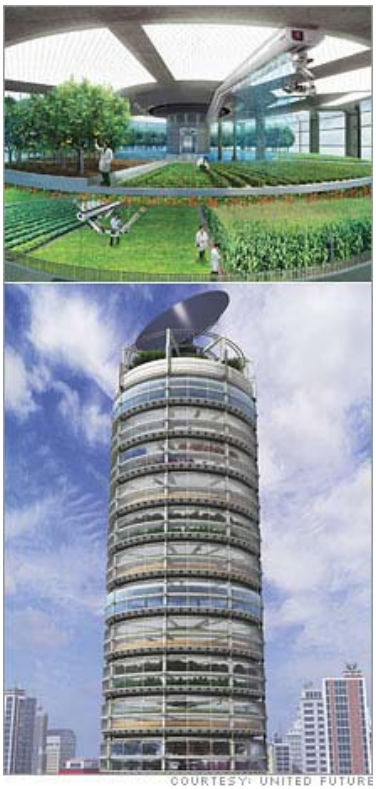
3 The 'third sector' refers to the sphere of social activity undertaken by organisations that are non-profit and non-governmental (also known as the voluntary or non-profit sector.

The scenario stories in this report take into account a wide range of information gained through key processes and sources including:

- A review of future scenarios developed around the world and in New Zealand
- A review of the academic and "gray"[4] literature about the major factors shaping change in the world, New Zealand and the Waikato
- An October 2006 workshop with a diverse group of government, community and business stakeholders in the Waikato, hosted by Environment Waikato
- A second workshop with a smaller group of people with knowledge of the Waikato
- A Futures Forum co-sponsored by NZTE with Waikato businesses and others in July 2008
- The insights of the FORST Waikato team
- Other relevant Environment Waikato initiatives.

What might change the future in the Waikato

A number of different forces will shape the future. **Driving forces** are the outside forces of change that will shape the future in both foreseeable and unpredictable ways. Driving forces include factors within our working environment, such as developments related to communities, and shifts in the broader environment – social, technological, economic, environmental, and political – that could have an unexpected impact.



Urban "Farming"

Some driving forces are unpredictable. While all driving forces are important, they are not of equal importance. The priority driving forces identified in this report were chosen because of their (1) degree of importance to the future of the Waikato, and (2) the degree of uncertainty surrounding those forces. It is also important to note that the scenario stories have been written around the **Community Outcomes** that Environment Waikato developed during 2004-5.

The future scenarios in this report focus on how two forces central and influential to the Waikato may come together. These forces are:

1. The attitudes, values and beliefs of all of the Waikato's peoples that – taken together – will dictate how natural resources (and the services they provide) are used.

4 'Gray' literature refers to foreign or domestic information that usually is available through specialised channels and may not be part of normal systems of publication and distribution. For example, technical reports from government agencies or scientific research groups, working papers from research groups or committees, white papers, or preprints.

- At one extreme we can see future circumstances where natural resources will be exploited without regard to their sustainability. At the other extreme we see signs that natural resources will be used sustainably. For the purposes of writing the scenario stories, we have called these two positions "mine" and "maintain", respectively.

2. The way we judge and measure **our wealth**.[5]

- One possibility is that we just consider our wealth in terms of dollars and cents, i.e. in terms of how much money we make per person; the second possibility is that we consider our wealth in terms of how we are doing economically, socially and culturally.

- In the first case we have used the term "gross domestic product" or GDP as a measure in which money comes first; in the second instance, we use the term GPI or "genuine progress index" to represent that concept that more than money is important, i.e. the Waikato is not wealthy unless we measure more than money – including things such as culture and identity, participation and social well-being. GPI suggests we measure whether Waikato's residents are better off (or not) by using a range of measures affecting their social, cultural, environmental and economic well-being.

Table 1 shows how these two central driving forces differ between the scenarios presented in this report.

Scenarios are created by combining the driving forces to create distinct stories about what the future could look like. The goal is to develop a set of plausible accounts that tell very different stories, each of which challenges different assumptions and conventional wisdom and, as a whole set, illuminates the strategic issues facing Waikato.

We can illustrate the way these "drivers" come together in a four box matrix, as shown in Figure 1.

Infrastructure will need protecting from rising sea level

5 There have been a number of attempts to put a monetary value on global ecosystem services, ranging from $250 billion – 2006 – for boreal forest services (in Canada) to the now-famous $33 trillion global ecosystem service valuation by **Costanza et al**. Given the magnitude of these figures in comparison to global GDP, and that what a dollar can buy or motivate itself changes over time, what meaning do such figures have? Are there alternate valuation metrics that would be more meaningful? See Robert Costanza, Ralph d'Arge, Rudolf de Groot, Stephen Farberk, Monica Grasso, Bruce Hannon, Karin Limburg, Shahid Naeem, Robert V. O'Neill, Jose Paruelo, Robert G. Raskin, Paul Sutton, & Marjan van den Belt. The value of the world's ecosystem services and natural capital. Nature, Vol 387, 15 May 1997

About the drivers of change

In a general sense, the wealth driver of change can be considered as a proxy for **the extent to which "economic rationalism" prevails** as the world view of different international and national institutions. We might ask the question: "How long will this view continue to underpin the international economic and trading systems?" or "What it would take to move to a world that recognises that the way we manage ecosystem services should be as fundamental to the economy as central banking is today?" For example, we could contemplate a future where the World Trade Organisation (WTO) accepts or introduces an international trading regime that takes into account the value of ecosystem services (which it presently does not do).

The second driver might be considered **a barometer of environmental behaviours** in New Zealand. It raises questions about what could drive people to truly behave differently. Within New Zealand there has been a considerable amount of thinking about the environment and surveys indicate that it is of great concern. The government has, for example, measured the value of ecosystem services (*Patterson,1999*) and has made clear its' intentions to be amongst the first carbon neutral nations in the world (2007).

Yet, attitudes and beliefs about the environment have not been reflected in major behavioural changes (*Environment New Zealand 2007, Ministry for the Environment*). The question that needs to be asked is "What will catalyse sizeable changes in peoples' behaviours?"

		Scenario 1	Scenario 2	Scenario 3	Scenario 4
		Crowded House	Sleeping In	Nature Counts	Science Society
	How we measure wealth in Waikato	profit focus	profit focus	people focus	people focus
	Waikato's 'Natural Capital'	Mine	Maintain	Maintain	Mine

Table 1: **Key drivers of change in the scenarios**

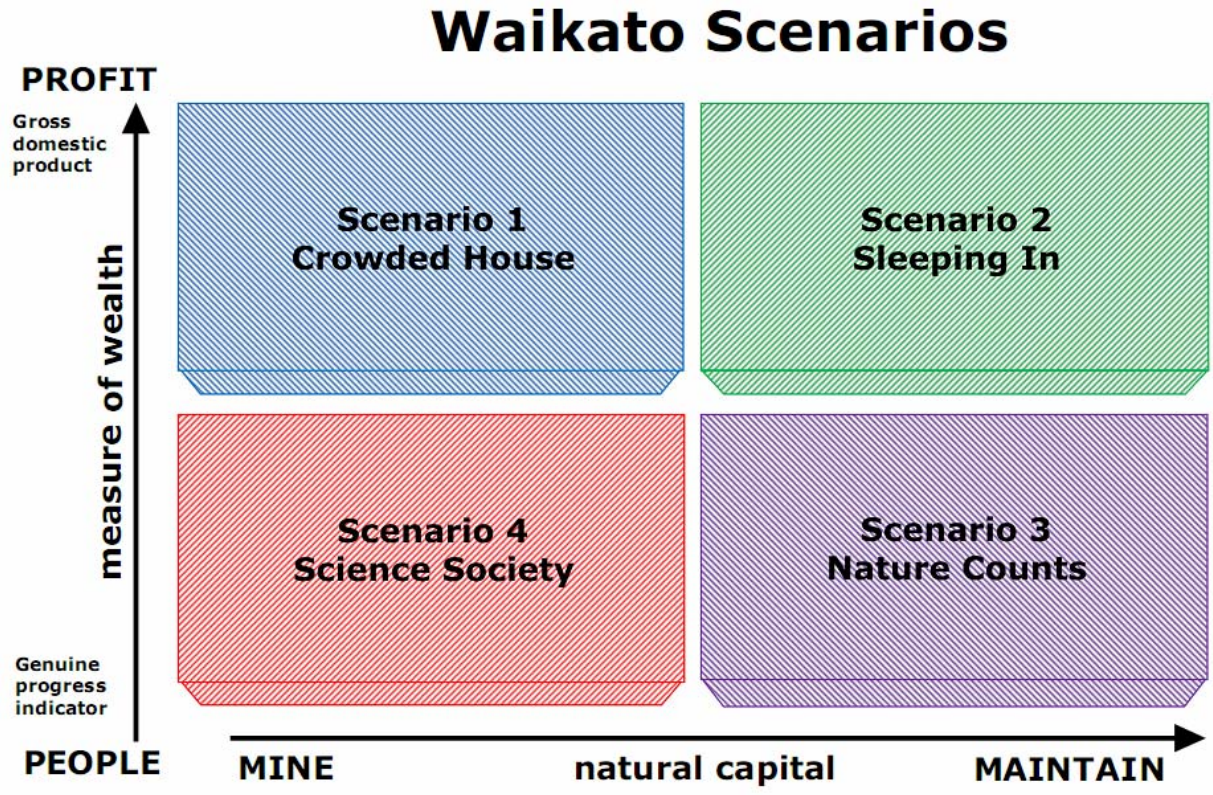


Figure 1: **The Waikato Scenarios**

We can also compare the scenarios across different community outcomes (see Table 2).

Comparison of Scenarios by Community Outcomes

		Crowded House	Sleeping In	Nature Counts	Science Society
		Scenario 1	Scenario 2	Scenario 3	Scenario 4
	Measure of Wealth	GDP	GDP	GPI	GPI
	Natural Capital	Mine	Maintain	Mine	Maintain
	Environment	↓	↓↑	↓↑	↓↑
	Quality of Life	↑↓	↑↓	↓↑	↑
	Economy	↑↓	↓	↑	↑
	Culture & Identity	↓	↓	↓↑	↓↑
	Participation & Equity	↓	↓	↑	↑

Table 2: **How community outcomes fare in each scenario**

The scenarios in brief

Crowded House

In this scenario we explore a future where international institutions and systems continue to view the world through an economic lens. This makes it difficult to develop effective international collaborative mechanisms to respond to climate change. Many highly populated countries in low-lying regions are particularly affected by climate change impacts, triggering the start of a massive global redistribution of the world's population. New Zealand accepts many refugees from the worst affected regional countries.

Although many parts of the world are severely affected by climate change, affecting economic prospects in commodity markets, New Zealand remains relatively well off. However, climate variability (more extreme weather events) is sometimes poorly managed.

Urbanisation trends, coupled with greater immigration intakes, exacerbate social problems in the "Greater Auckland" region.

Sleeping In

This scenario explores thinking about how fast things have to change before someone takes notice and begins to mobilise business, the public and/or politicians. We explore a world where we "outdrive our headlights" until we change our ways. Our capacity to respond is overwhelmed by the speed of change for some time. A period of relative wealth and affluence suddenly comes to an end when peak oil coincides with the onset of exponential climate change (climate change arrives faster than anticipated by even the most gloomy of internationally generated United Nations' models).

Environmental degradation and (mainly) peak-oil related economic stress are exacerbated by accelerating climate change. Climate change and climate variability result in very severe environmental costs and impacts on a global and national scale. The social costs associated with the end of cheap oil and the onset of climate change are high, notably for the most disadvantaged – overturning a national action stalemate.

These crises act as a tipping point (eventually) and prevent New Zealand and the Waikato from continuing its' drunkard's march into environmental and social catastrophe. They change our expectations, how we view the future, and what we're willing to do.

Nature Counts

In this scenario - *as in Scenario 2* – we explore a world where global resource depletion – especially oil and water – made worse through non-linear climate change – prompts political change. Eventually, these changes lead to a new road for New Zealand's economic development, based largely in the biological and life sciences. There is an important distinction between the two future worlds: ecosystem services are economically valued in Scenario 3 e.g. land which provides few ecosystem services is permitted to be farmed intensively.

A number of catalysing events make clear that it is time to live as though the day has come, because it has: tomorrow is too late. The question is, what might we do when one or many of those events which have been called "moments of contingency" shake us out of our collective inertia?

Globally, there is widespread acceptance that an ecological collapse is on its way, and that avoiding it demands widespread transformation. It is a future where we recognise

that more people living marginally greener lifestyles is not the answer. What we need is millions to change their lifestyles: practicing strategic consumption, inventing new answers, changing their companies, investing in change, mobilising their communities, redesigning their cities, and in any way possible making it happen.

Successive New Zealand governments live by the idea of "one planet, three decades[6]." This sustained focus helps drive development of a new economy. There has been a stream of innovations. Productivity growth has accelerated and, by historical standards, unemployment rates remain low.

Science Society

In this scenario we investigate a future where advances in the sciences and technology have fostered development of a knowledge-based economy. While the country is wealthier, there are some dangers associated with the sciences underpinning economic developments.

The combination of fears and hopes surrounding the new economy lead to the imposition of many more regulations. New Zealand's governance systems are realigned as a result of our enhanced ability to measure and monitor everything in society; some argue there is too much governance. Many regional institutions and governance regimes have been subsumed in larger bodies and arrangements to accommodate economies of scale. While Waikato is still referred as a geographic region, it has far less independent administrative authority.

There has been a substantial shift in values away from individualism towards communitarianism.

6 The aim is to live with a 'footprint' equivalent to the resources of just one planet earth, as the science indicates the world has as little as three decades left before irreversible environmental change is inevitable.

Recurring narrative themes

A number of participants in the different forums and meetings which contributed to the development of these scenarios drew attention to the possibilities around several different "future" themes:

Climate change

- *All of the scenarios address the impacts of and costs of averting climate change impacts. Potentially dramatic climate induced changes in much of the world might occur much sooner than we expect. The narratives also explore – directly and indirectly – which industries might be at risk (and how much they would suffer) under different carbon regimes.*

- *The question of what it will cost to reduce carbon in the atmosphere is difficult because the answer depends on how bad we expect the effects of global warming to be. Some people assume that global warming will be less disruptive than others although it is clear that each degree of temperature rise increases the risk exponentially. Another unknown is what technologies and "green collar" jobs might arise in a carbon-free future.*

Terrorism

- *The scenarios raise the spectre of asymmetric terrorism and bioterrorism in worlds where emerging systemic risks loom large and where the prominence of and relationships between different regions, countries and economies are shifting. (These risks arise through the interactions between complex social, technological, environmental, and economic systems.) The idea of terrorism taps into deep-rooted and widespread public concerns about social fault lines and the roles played by governments, international institutions and businesses around the world.*

Gap between rich and poor

- *Each of the stories investigates the rich-poor divide as an example of the social costs of major change.* The stories encompass a range of issues, including environmental and labour standards, power and accountability and the impact on local cultures and communities. Dozens of actors, exercising different kinds of power, might vastly complicate the effort to find a better balance of influence and responsibility and to assure more equitable access to and distribution of natural resources

Primary industry

- *The scenarios explore the importance, costs and benefits of primary industry within the Waikato. The current economy depends on its vitality (e.g. commodities booms) and on its ability to act as a stimulus for spin-off economic activities (research and development, new technologies).*

Challenges for the Waikato in the scenarios

Common challenges arising in all future scenarios

1. Economic diversification

- The Waikato is dependent on a few key sectors. Indeed, some regard the Region as a monoculture. This might make the Region particularly vulnerable to rapid changes catalysed by environmental degradation, climate change and population movements.

2. Ecosystems decline

- All the scenarios highlight the importance of natural resource management and good ecosystem services[7] to maintain future well-being in the Waikato.

3. Energy transition

- All of the scenarios foresee a change in energy infrastructure driven by carbon-constraints, demand (for heat and power for homes and businesses) and environmental concerns. The indicators about which alternative energy sources will be used in the future remain unclear. However, it is clear that the Waikato will be using cleaner energy.

4. Demography/Youth/Employment

- Labour force composition and productivity could radically vary across the scenarios – matching business, government and others' interests, capability, skills and training needs might be problematic.

5. Infrastructure investment

- Substantial investments in infrastructure – affecting things like energy, transportation, water and communications systems – will be required in all scenarios.

In the key challenges listed below for each different scenario, we have indicated whether they are challenges primarily facing the community, Council or business concerns.

Key Challenges in Scenario 1: Crowded House

N^{O} 1 (Community)

Cultural integration/equity issues might be exacerbated by spill-overs from Greater Auckland urbanisation, social disruption, rapid and higher than anticipated immigration and diminished government capacity to act in areas where social welfare services were once provided.

7 Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth.

N^{o} 2 (Council)

National sustainable development initiatives give way to more local management, as country-wide decisions about and expenditures on the environment decline due to other exigencies and the expansion of industrial agriculture.

N^{o} 3 (Business)

The relative youthfulness of the Region's population, slower economic growth, tighter credit rules and potentially declining incomes mean more families in the Waikato live from "paycheck to paycheck", with reduced economic opportunities.

Key Challenges in Scenario 2: Sleeping In

N^{o} 1 (Council)

The simultaneous tasks of managing the rich and poor, i.e. high growth areas and centres in decline across the Region, within an environmental justice framework, while government is shrinking, require tailored, complex responses within the Waikato.

N^{o} 2 (Business, Community)

A crisis (or a series of crises) creates opportunities for reorganising the relationships of society to ecosystems. At such times, barriers to action might break down, if only for a short time, and new approaches have a chance to change the direction of ecosystem management. To succeed, a particular approach or vision must be well-formed by the time the crisis arises, because the opportunity for change might be short-lived.

N^{o} 3 (Community, Council)

Maintaining a sense of community, identity and place when faced with slow motion emergencies, compounded by fast punches, that affect individuals and settlements to different degrees.

Community – "Tug of War"

Key Challenges in Scenario 3: Nature Counts

N^{O} 1 (Business, Council)

Managing the transition to a national accounting system which focuses on resource productivity and ecosystem valuation (for services and commodities) to deliver a sustainable economy and still sends appropriate signals to the international economy.

N^{O} 2 (Council, Business)

Building appropriate foundation institutions (education, research centres, cultural) and services (health, communications) to permit idea chain reactions to occur.

N^{O} 3 (Business, Community)

Finding the right combination of incentives and measures ("carrots and sticks") which stimulate real and persistent changes in lifestyles and behaviours.

Key Challenges in Scenario 4: Science Society

N^{o} 1 (Business)

Adopting organisational strategies that increase flexibility, reduce uncertainty, encourage rapid experimentation, and the ability to improvise. Organisations will need to operate more like white-water kayakers than mechanistic entities following prescribed rule-sets.

N^{O} 2 (Council, Community, Business)

Re-balancing and constraining markets, individual and property rights and land uses while building a sense of responsibility (managing the balance of expectations about entitlements and obligations of governments, businesses and citizens).

N^{O} 3 (Business, Community)

Harnessing scientific advances and knowledge while managing the dangers at the frontiers of science applications and uses (managing for science "going too far"), which includes building trust in institutions and mechanisms that govern society and incorporates assurance mechanisms responsive to local needs.

Harnessing Science

Scenario challenges considered as a whole

The Waikato scenarios might also be considered in terms of the role that planning could have in worsening or ameliorating the conditions underpinning community outcomes. The scenarios vary the tempo of responses to crises (when people respond) and they also illustrate different possible degrees of damage that might occur depending on the overall severity of changes and the speed of changes in the strategic environment.

Consider the following diagram:

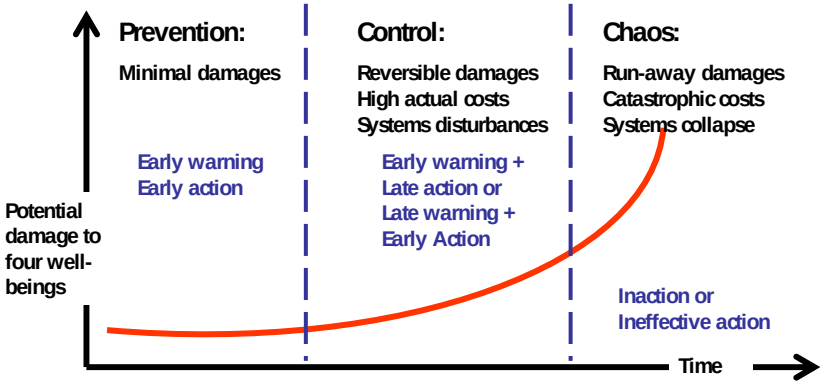
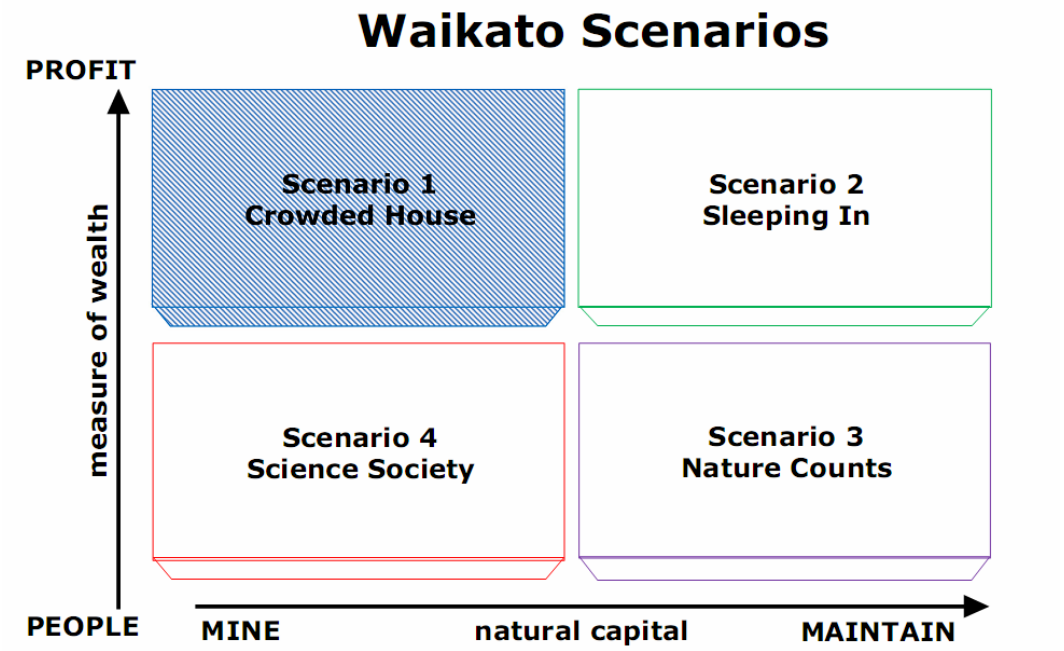


Figure 2: Prevention and control strategies can help ameliorate the worst future developments

Although a number of the scenarios are downbeat, the scenarios – based on participants' views – generally suggest that the challenges which might face people in the Waikato are often reversible and within our control. It is interesting to note that the potential for early action/early warning is also available under each scenario.

Scenario 1: Crowded house



Why this name?

This scenario focuses on the question of population growth in the Waikato. In some circumstances, population growth might be "too fast" and "too large" for business, the community and government to absorb smoothly.

What happens?

In this scenario we explore a future where international responses to climate change do not come together, triggering the start of a massive global redistribution of the world's population. New Zealand remains relatively unaffected by climate change, although managing greater climate variability is challenging for most businesses.

This means we have the time and capacity for innovation and mobilisation to create "one planet" lives with a carbon footprint of 400 ppm or less (which is the baseline standard around which a new consensus seems to be emerging).

Fiscal constraints mean that under-funded national governments sometimes find it difficult to take effective action and a longer-term view. Adaptive behaviours are driven by the global market and local communities, rather than from the centre. More resilient communities – such as the Waikato in this future – fare better. Important factors underlying this future scenario are:

- Ineffective global response to climate change
- Ongoing urbanisation trends (with social dislocation centered in Auckland)
- Refugee influx (migration policy)

- The *relatively* mild impact of climate change on New Zealand, tempered by increased climate variability in New Zealand (affecting agriculture, transportation and energy)

- Shifting international commodity markets (affecting economic outcomes).

The World in 2050

Energy, economics, demographics, environmental degradation, and climate impacts have changed the way the world is by 2050. Global warming is unstoppable. Although lack of political will has halted meaningful international engagement on the issue, a mixture of regional response mechanisms and approaches are still in place around the globe.

Tipping Points

This is a potentially very dangerous world in which exceptionally complicated systems (social, ecological, technological, and/or economic) might reach a certain threshold and tip, often irreversibly and with significant consequences. Virtually all government agencies deal with threshold phenomena, ranging from ecosystem management, to traffic congestion, disease outbreaks, or state failure, yet our ability to detect approaching thresholds using the appropriate indicators is not very well developed. In some cases, changing the threshold could radically reduce adverse impacts.

What does that mean for a government that must manage *four well-beings* in terms of its organisational structure, its work force, its conceptual models, and its analytical techniques?

In New Zealand, global warming has catalysed some internal migration and exposed industry and infrastructure to greater risks from climate variability (weather extremes). A number of agribusinesses are less able to manage the increased climate variability in the natural environment, although, on a relative scale New Zealand is less affected than most.

Some regional countries are being severely affected, especially where sea levels are rising and heavily populated and fertile coastal areas are drowning. National governments in these countries cannot afford to purse large-scale geo-engineering projects such as dikes and levies. Indonesia loses large swathes of its territory.

Other countries are faring better. Siberia is fast becoming a new global breadbasket, alongside Northern Canada. The world, overall, is not "worse off". But we have not yet fully lived through the painful adjustments of population movements. Some currently densely populated regions will be deserted eventually. (However, we need to keep this in a 200-year perspective – the time it took for European-led settlement of the United States.) Crowding, especially in urban areas, is exacerbated by mass population movements.

New Zealand's main focus in helping Pacific nations cope with climate change is economic, i.e. working with Pacific countries to ensure they can stay in situ. However, New Zealand has also increased its immigration intake ten-fold.

- At the same time, New Zealand has worked with the United Nations to expand other countries' acceptance of environmental refugees.

The acceptance of refugees coupled with on-going trends towards urbanisation means that Waikato more closely abuts the "Greater Auckland" region. Hence, there are heightened concerns about knock-on effects arising from social problems in Auckland. The Waikato itself is more urbanised, with a higher population density than anticipated at the turn of the century. The Tainui population has grown.

Community Outcome theme: *The Environment*

Natural Environment

Regional countries are hard hit by global warming in the next fifty years. Red Cross records show that the number of people in the Oceania region affected by weather-related disasters has soared by 65 times during the past 30 years. Increased numbers of cyclones, droughts and floods made life unviable on many islands.

- Global mean temperatures have risen 2.5°, New Zealand's by 1.8°.

- Arctic climate change is a bellwether for global climate change: in the Arctic, average temperatures have risen almost twice as fast as in the rest of the world and the melting of Arctic glaciers is contributing to global sea-level rise.

- Economic losses from extreme weather events roughly doubled every ten years from 2006 (and insurance premiums – where available – have skyrocketed).

- This is the last century of wild seafood. There is almost nothing left to fish from the seas by 2048. Meat (sheep and beef) demand is rising, causing some land use shifts.

- In the Asia-Pacific region, our doorstep:

- Tuvalu began evacuations to New Zealand in 2010.

- By 2015 the six Carterets (off PNG) are uninhabited, undefended and mostly submerged; residents moved to Bougainville in PNG.

- By 2025, Kiribati, the Marshalls and other low-lying island groups are only visible through a glass-bottomed boat.

- The low-lying river deltas of Bangladesh, India, Vietnam and China are also in trouble.

- The Indian monsoon, which waters India's agriculture, has run dry on five occasions – once a decade since 2006. These decadal switch-offs have been catastrophic for India's main crop, rice, which depends on heavy monsoon rains.

- The broader impacts of global warming, including increased periods of drought, incremental sea-level rises, storm surges and more frequent floods, are affecting food and water security in many regional countries.

Unfortunately, the problem will not improve soon. China, not America, is the world's leading emitter of greenhouse gasses. This has been the case since 2008. Other emerging economies, including Indonesia, are adding to emissions. Rising greenhouse gas emissions, coupled with a failure to reach an effective post 2012 Kyoto agreement (which in the end had no discernable impact on global climate), have shifted the climate change debate to adaptation, not mitigation. The world has "given up" on the fight against global warming because of a lack of political will.


Huntly Power Station

- Globally, we are actually emitting far more CO_2, because we're increasingly turning to coal-burning for our energy. The historical de-carbonization (from coal, to oil, to gas, which emits progressively less carbon) has been reversed. Many plants that came online in China and India in the period to 2020 do not capture CO_2 emissions. The natural environment is in a poor state in 2050, although it has shown signs of improvement in the last fifteen years.

New Zealand ecosystems have remained 'relatively unscathed' when compared to the very severe impacts of climate change in other countries. However, many New Zealand agribusinesses are highly affected by rising climate variability, which they find very difficult to manage.

Projections early in the century by NIWA scientists are quite accurate. Some of the most significant environmental, economic and social effects of global warming are caused by *changes in climate extremes* (for example, floods, droughts, frosts, strong winds, tropical cyclones and storm surges).

- As a 'rule of thumb' it's wetter in the west, drier in the east and westerly winds are about 20 percent stronger in New Zealand.

- There has been a small reduction in feed quality in pastures as far south as Waikato, with an increased incidence of subtropical species.

- Feed quality has decreased further in dry eastern regions, with more frequent drought leading to changes in pasture composition.

- Hayward kiwifruit are less economic in the Bay of Plenty by 2050. Apple production is at greater risk of heat damage.

- Availability of water for irrigation is an increasingly critical issue.

Respected Māori scientists suggest that after 2050, the Waikato is due for even more suffering because of the loss of mauri (the life force in all things). This loss affects the lives of people themselves, as well as the resilience of ecosystems.

- Governments are advocating the greater use of economic instruments because the science around changing behaviour shows that we frequently need a push to cooperate.

Management of water resources is a sensitive issue in the Waikato. Co-management arrangements with local Iwi have tempered but not resolved conflict between water users and conservationists.

By 2050, science has made clear that forests are not the carbon sinks they were once considered. Under increasing temperatures in new forests, the carbon released during plant respiration negates the carbon absorbed in the process of plant growth.

- New Zealand's main emissions reduction approach is to reduce carbon dioxide emissions at the source, smokestacks and tailpipes. This hits the transportation, energy and business sectors, as well as individual car owners.

Built Environment

By 2050, 77 percent of the national population live in the Northland/Auckland/Waikato/Bay of Plenty regions. Changes in the built environment up to 2025 are dictated in the large part by Auckland's expansion to the Waikato and Bay of Plenty, based initially on the connectivity of Auckland-Hamilton urban areas. The region is identified as *Greater Auckland*.

Initially, weak planning regimes contribute to a continuation of many of the problems related to urban sprawl, rapid population growth and a car-centric society.

- The expansion of Greater Auckland's urban nodes extends along principal transport routes and coastal edges and is characterised by chronic traffic congestion, poor air-quality, the degradation of water bodies around the Region and natural habitat loss.

In New Zealand, flooding remains the most costly insured natural hazard. Extensive lowland flooding affects communities and land use options in the Waikato. Climate variability also magnifies:

- Storm damage of buildings
- Erosion and undermining of roads
- Bridges compromised due to floods
- Risk of major infrastructure collapse (roads, culverts, bridges etc) in high intensity rainfall
- City stormwater systems unable to cope with increased flows
- Sewerage systems adversely affected by stormwater intrusion and more frequent overflows.

Underinvestment in non-transport infrastructure development affects water services and power grids. They are more frequently interrupted. However, in country towns and industrial cores wireless networks provide an efficient source of connectivity.

These problems worsen until the Government makes large, albeit late, investments in widening existing motorways, improving trunk roads, building new roads in rural areas, and employing information technology to expand road capacity.

- These investments make longer commutes easier, so people are willing to live farther out in the Waikato (although congestion remains at 'choke points').

- The development of a high-speed rail network between Hamilton and Auckland is completed in 2037.

In the early years, the combination of more extreme weather and poor national infrastructure have a surprising upside. They open the door to the development of innovations such as 'amphibious houses' and energy generation and waste/grey water and desalination technologies for individual homes and small businesses.

- Dairy farms use diesel, biogas and wind or hydro generators during milking time and for milk chilling. They earn revenue by selling spare electricity back to the grid.

- A small export sector develops.

These developments in technology broadly reshape urban form in the Waikato (although less so in Auckland), as homes and businesses become more self-sufficient.

Land Use in the Waikato

Waikato's land use allocations will change in the fifty years to 2050, although it remains the breadbasket of New Zealand. Planning focuses primarily on initially encouraging and accommodating growth.

- More land will be devoted to urban development. Agricultural land area is of a similar size (or slightly larger, because of poorer soil quality). Forested areas protected for conservation and recreational land uses are more likely to fall.

- By 2025, adherence to both the Hamilton and Auckland Regional Growth Strategies achieved some changes for the better.

Community Outcome theme: *Quality of Life*

While national health services are more effective and efficient, the costs of managing dementia (the *new* epidemic), diabetes, obesity and other chronic diseases absorb large slices of the Health budget from the 2020s onwards. In addition, the health impact of climate change accelerates the problems associated with urban expansion and has reduced the quality of life for some Waikato residents.

- Dengue fever has made its way to the North Island. Heat stress affects a greater number of elderly residents, and water- and food-borne diseases are more prevalent.

- Insects and invasive species have introduced new disease vectors for people and animals, particularly in the North Island.

- The combination of urban heat islands and global warming mean that heat wave health hazards increase in Waikato, affecting the poor in particular.

In some cases, people live longer and healthier lives – by 2050, life expectancy at birth will have increased by at least ten years. Advances in medicine minimise the effects of

the ‘diseases of affluence,’ such as obesity and diabetes, for those who have opted into private medical regimes.

- People with low incomes sometimes find it difficult to pay for better food and residential improvements which would elevate overall health outcomes in their neighbourhood or immediate communities.

- In less well-to-do areas, nutritional and general health standards sometimes have (and continue to) put residents at a nutritional disadvantage, which has longer-term implications for their life time success.

- Fear of litigation has resulted in many local organisations, such as sporting and community service clubs, restricting their activities.

Community Outcome theme: *Economy*

The economy remains detached from its social purpose and is seen in a very narrow context – as a set of statistical indicators.

- New Zealand being at ‘the end of the earth’ is affected by rising fossil fuel prices, movements in commodity prices for agricultural goods, and global and domestic taxation measures to constrain carbon emissions. It is much harder to move things to other places and for people to come here to spend.

Many areas of the global economy weaken, including demand in emerging markets and developed country economies. The New Zealand and Waikato economies have slower rates of GDP Growth, coinciding with broader global economic decline.

- Maori tourism operates on several scales and in several directions, but it is difficult for operators to extract a ‘price premium’ from much of its ethnic tourism, especially given the sort of interactive multi-media tourism services widely offered over a variety of communications channels.

- Eco-tourism has waned somewhat, given climate variability and environmental degradation.

Rapid Population Growth

The large and relatively fast refugee intake, beginning with a trickle in the 2010s, has put pressure on housing, transportation and other infrastructure in the built environment, notably in Greater Auckland.

- For example, an expansion of second-hand automobile imports has compounded transportation impacts on the environment, health and incomes, typically harder hitting on new immigrants and New Zealanders earning a lower income.

Immigration intakes, mainly funneled through Auckland, bring many problems including crime, gangs and cultural barriers. Immigration has also added to pre-existing fiscal pressures in the health and education sectors across New Zealand and in the Waikato. Some services are provided as a last resort by the Government; they are no longer universal. For example, social welfare payments are capped to a lifetime entitlement under the *hand-up, not hand-out* concept.

Central government agencies have less money for broader social and cultural programs.

New Arrivals

- New Zealand has witnessed some very bitter arguments about who gets and who pays.

While New Zealand does not have the levels of racial tension of some countries, these are being exacerbated by settlement patterns where urban neighbourhoods are less culturally integrated than at the turn of the century.

- As ethnic, age, and regional gaps in the ability to adapt increase, there are many people wary and frustrated by technology, open borders, free trade and smart immigrants.

The weaker economy and poor 'life' prospects are important drivers of social change. People believe the economic damage done by higher crime rates tends to be grossly underestimated by central government.

A 'toxic culture' has emerged in some urban neighbourhoods in New Zealand – particularly in Auckland – where there are high rates of suicide, murder and drug overdoses. In the Waikato, as the economy declined and growth rates slowed to a crawl, petty-theft, in-house robbery and ATM and computer theft or fraud incidents have risen dramatically.

- Neighbourhood gangs are more common, as is gang-related violence and anti-social behaviour.
    - A great deal of money is spent on insurance, anti-theft devices, police and prisons. For the well-to-do, even minor personal errands require a hefty bodyguard.

Housing

In 2015, everything in the Waikato, from houses to health care to the supply chain that brings food to market, is designed to run on substantial supplies of fossil fuel. This infrastructure can't be replaced overnight with more energy efficient alternatives. However, over time changes do occur.

For example, housing has been a long-term problem in the Region:

- Housing needs have been in a chronic backlog of about seven years since the influx of refugees began, even at current building rates and with new (to Waikato) construction techniques such as straw bale housing.

- House prices have soared and sprawl remains a common complaint, but most Waikato residents want more housing to be built.

- The poor are worried about finding anywhere to live. A third of low income households are overcrowded. In Hamilton East, a refugee-dominated part of the city, there is an average of 3.5 households in each housing unit.

Cultivation, Franklin District

Intensive Agriculture

In the agriculture sector, production is increasingly dominated by large-scale agribusiness, intensive farming methods and, after much resistance, genetically modified crops. Some large scale production-oriented farmers delay adopting environmentally sustainable methods, and

the intensification of production erodes and degrades soils and pollutes water with runoff for some time.

Nonetheless, agribusinesses have less freedom because of more stringent international regulations and non-tariff trade barriers. Smaller remaining farmers diversify into regional and local foods and other high-value niche market specialties.

- Successive failed attempts to liberalise world agricultural trade, following the collapse of the Doha Round of the World Trade Organisation in 2006, have proved fruitless. The WTO became a political battle ground pitting the American model against both the European and the Asian 'values' model of capitalism (i.e. capitalism with Chinese characteristics).

- The European Union imposed new 'border adjustment taxes' to ensure parity with their carbon trading regimes in the 2010s, and, then, starting about 2015 imposed strict and costly paddock-to-plate environmental, food safety and animal welfare regulations. For example, dairy farmers are no longer able to tail dock, induce cows or discharge any effluent into the environment.

- Both industrialised food and alternative or organic food production have grown, while there is much reduced opportunity for food people obtain by dint of their own fishing, hunting, or gardening.

Overseas commercial competitors in the food chain have achieved some success with a series of 'environmental' campaigns. Even though the science shows their claims to be misrepresented or straight-out false, they are crafted cleverly and normally meet 'the reasonable person' test. Many are more subtle than the 2006 'food miles' argument launched out of the UK.

- Research that improves the safety of the food chain and food quality is encouraged. Every farm animal is bar-coded to better track individual animals and herds and more quickly trace the source of outbreaks like mad cow disease. (The bar-codes also allow breeders to pamper the top pigs and cows with better feed and sort them from the run-of-the-mill animals for wealthy consumers).

- Concerns over the toxicity of nano-materials for food and agriculture have considerably slowed its progress and introduction in the Waikato.

Market opportunities are a main area of economic weakness, reflecting the country's small population and economy, and isolation from major business centres. Nonetheless, a few New Zealand organisations do well in niche developments of 'next generation' food and environmental technologies.

- Alternative international markets in China and India, though open, are harder to market in and economic returns are less.

Domestic understanding of farm operations is viewed through an urban lens. People lack a 'connectedness' to the land.

Urban Agriculture

Development of distributed technologies (water, energy, communications) leads to the introduction of intensive hydroponics and urban agriculture. Urban farming occupies both the rooftops and the basements of Auckland skyscrapers (rice, fruit, veggies, herbs and flowers).

- Typical 'urban-farms' are pesticide free, controlled by computer, and lit by light emitting devices (quantum dots painted on walls). Auckland University of Technology established a very popular urban agricultural training facility in 2014.

Farms are tended by former 'floaters' (young people who hop between part-time jobs) with an interest in farming.

Biosecurity concerns are prominent as a number of new migrants ask visiting relatives to bring seeds, plant cuttings and other biological material for some of these gardens.

Community Outcome theme: *Culture and Identity*

All New Zealanders carry multiple identities defined in relation to the surrounding society in which they live. Housing, petrol and food affordability issues, declines in government budgets and other stressors emphasise the differences between rich and poor.

While never a homogeneous society, New Zealanders have had to live together as people of different religious faiths and ethnic backgrounds. However, by 2050 people's capacity to live together is diminished.

- Multiculturalism is no longer a work-in-progress. Wounds have been opened and politicians are now referring to New Zealand as a collection of differentiated 'peoples.'

- Immigration debates and 'population policies' are simmering on the political agenda.

- English-as-a-second-language instruction is a growing sector.

Diminishing common 'identity bonds' at a national level feed a reluctance to sustain the give and take and wins and losses which underpin national assistance and economic programmes, further undermining the capacity of national agencies to deliver welfare and other services. People are less willing to make sacrifices for others and to cooperate on wider scales.

Even though it is a part of Greater Auckland, the Waikato is more fortunate. The economic emergence of a large Tainui population has influenced Waikato's cultural identity; peoples' individual sense of identity or of being distinctive – i.e. ties of kith and kin – is more heavily derived from this connection. This is quite different from Auckland's more fragmented cultural mix, where rival identities are a greater source of conflict.

- Waikato residents use the relationship to differentiate insiders from outsiders.

- The Waikato has been a bilingual region since 2030; it was the first in New Zealand. Waikato has a good reputation for providing culturally specific services.

- People travel long distances to participate in social and cultural activities and to attend or receive preferred services.

Locally, Tainui-sponsored 'time banks,' which promote volunteering, civic engagement and mutual self-help by rewarding unpaid work in the community, are quite popular in some parts of the Waikato Region.

- 'Time banks' operate like reciprocal volunteering schemes,

Community Gardens

with a central broker to coordinate members' activities. Time banks are used as a 'co-production' tool by local government to encourage people to become involved in the delivery of public services which require the active participation of service users in order to be successful, e.g. health, education and waste management.

The potential for fractiousness exists in a number of social policy areas where the ideas of the Māori majority differ from those of (a) Asian and Pacific peoples and (b) the very rich and (c) national lawmakers.

Community Outcome theme: Participation and Equity

Within New Zealand, social and political cultures are increasingly different in each region, and gaps in the level of development larger. There is a sense that central government has failed at the individual level in terms of educational opportunities, access to health and technologies, and affordable living.

In Waikato, Canterbury and Southland, government is often considered the problem (not the solution). Citizens believe there has been too much 'central' government. People in regional communities agree that history indicates, in every case, weak or decentralised government but strong free trade led to surges in prosperity for all, whereas strong, central government led to *parasitic officialdom*, a stifling of innovation and relative economic decline.

Indeed, the newest member of Parliament from Waikato began her maiden speech "Government is a dangerous toy … the more we limit the growth of government, the better off we will be."

This has favoured the emergence of Iwi as an alternative source of governance, especially in the management of natural resources.

Key challenges in this scenario

Challenge Statements/Concerns for the Waikato

N^{o} 1

Cultural integration/equity issues might be exacerbated by spill-overs from Greater Auckland urbanisation, social disruption, rapid and higher than anticipated immigration and diminished governments' capacity to act in areas where social welfare services were once provided.

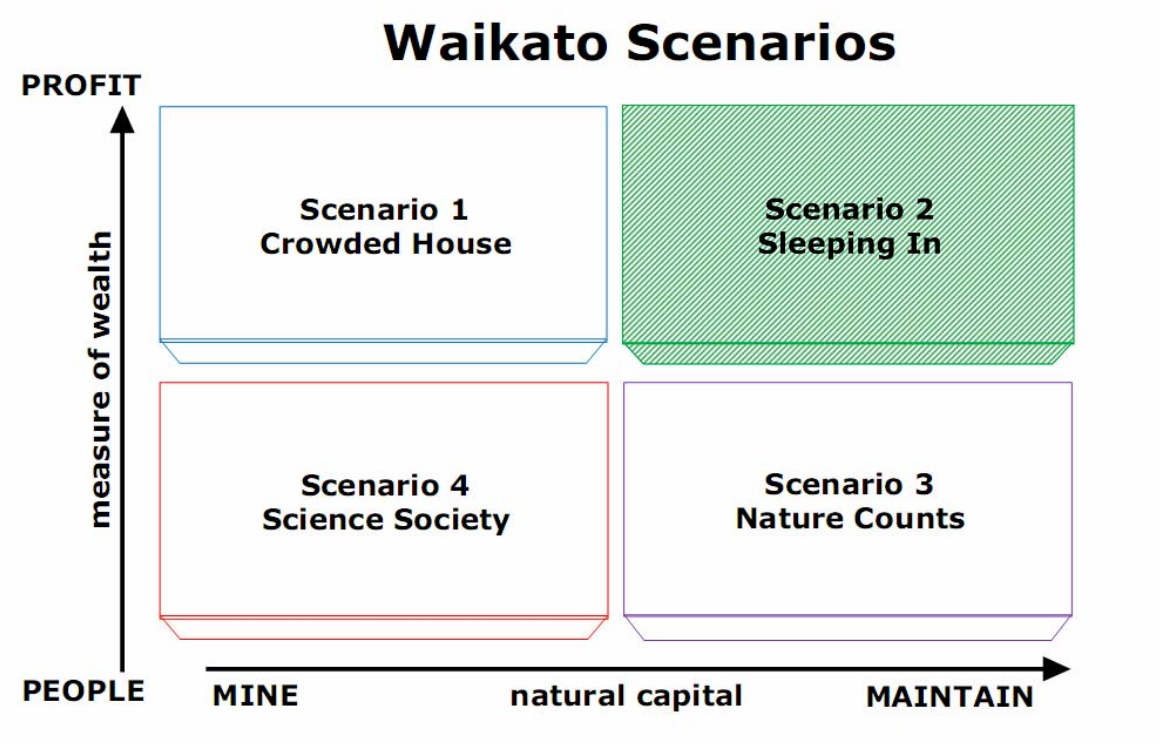
N^{o} 2

National sustainable development initiatives give way to more local management, as country-wide decisions about and expenditures on the environment decline due to other exigencies and the expansion of industrial agriculture.

N^{o} 3

The relative youthfulness of the Region's population, slower economic growth, and potentially lower incomes mean more families in the Waikato live 'pay-check to pay-check', with reduced economic opportunities.

Scenario 2: Sleeping In



Why this name?

This scenario was called "sleeping in" to signal that timid changes are not good enough. Serious and/or effective interventions do not occur until late in the piece, after the impact of a number of disasters have already been felt by households, businesses and others in the community.

What happens?

We explore a world where we 'outdrive our headlights' until we change our ways. Our capacity to respond is overwhelmed by the speed of change for some time. A period of relative wealth and affluence suddenly comes to an end when **peak oil coincides with the onset of exponential climate change** (climate change arrives faster than anticipated by even the most gloomy of United Nations' models).

Environmental degradation and (mainly) peak-oil related economic stress are exacerbated by accelerating climate change. Climate change and climate variability result in very severe environmental costs and impacts on a global and national scale. The social costs associated with the end of cheap oil and the onset of climate change are high, notably for the most disadvantaged, overturning a national *action stalemate*.

These crises act as a tipping point (eventually) and prevent New Zealand and the Waikato from continuing its' drunkard's march into environmental and social catastrophe. They change our expectations, how we view the future, and what we're *willing to do*.

Even though actions occur later, New Zealand is still better positioned to deal with sudden 'flips' than most because it has given coinsiderable thought – beforehand – to being carbon neutral. And, people have already adopted the 'easy-to-do' environmentally-friendly behaviours.

The World in 2050

International regulatory and financial regimes – such as the GATT (General Agreement on Trades and Tariffs) - have finally incorporated new ways of thinking about the environment (by valuing ecosystem services). Kyoto 3 is under negotiation and it promises a much smoother ride than its predecessor.

Before 2025, a basic assumption of successive international and some national governance systems and governments was that the economic forces that catalysed environmental problems and damages would produce the wealth to clean it up. That is, remedies to the costs of climate change should be mostly derived from the power of the market economy and science and technology. Market-based instruments (e.g. water markets) were heavily favoured. Hence, global responses to the impacts of climate change were fragmented and left to the private and third (non-government) sector.

At home, the early international fracas over "what (and when) to do about climate change" did not hinder national debates, which focused on the extent to which the narrowing of the ecological base puts the economic foundations of New Zealand society at risk. Good early thinking (e.g. becoming carbon neutral) and research by governments and environmental interests in the private and third sectors positioned New Zealand well to quickly change economic approaches and systems. The difficulty then – as now – was in knowing when to make great efforts.

> Conventional oil peaks about 2017. Peak Oil is the economic bulldozer that changes everything.

Although climate change is the larger threat, the magnitude of peak oil problems clearly outweigh climate change concerns by the teen years of the early 21st Century, as fossil fuels are ingrained in almost the entire global (and New Zealand) infrastructure. It is thought that integrating peak oil and climate change into the practice of planning and design will be necessary to making a successful global energy transition.

How bad can it get?

The planet is teeming with non-linear systems: systems in which things go okay, they go a little poorly, they go a little more poorly, and then come flying apart in utter chaos. Climate might be the most dangerous non-linear system of all. Put enough carbon in the atmosphere and all sorts of unusual impacts erupt (from melting ice caps to ocean currents gone awry to the biological death of undersea life).

The combination of peak oil and climate change has severe local implications for food production and prices, immigration and refugees, liability of homes and cities, economy, inflation, jobs, and political stability and safety. Conventional oil peaks about 2017 and depletes rapidly (faster than new energy and oil substitutes, e.g. tar sands, can be scaled up). Declining fuel supplies lead to negative growth in many arenas. Investors lose faith and currencies fall (again). Natural gas fails to offset this. Nations

battle for resources abroad and battle unrest at home. Health and food crises worsen – populations contract as a result of lower birth rates and life expectancies.

About 2020 the central government recognises that in reaching a sustainable future "A climate strategy that ignores peak oil would be like sticking our heads in the sand" and finally take action. For example, they couple policy on peak oil and climate change. The strategy that emerges is one that moves New Zealand toward a post-carbon future. Government begins to rapidly take measures to 'power-down' fossil-fuel dependent energy and transportation systems, 'power-up' clean and resilient sources of energy, and re-localise our economies.

Over the past fifty years, New Zealand has restructured its energy economy to reduce carbon emissions by:

- Cutting electricity use in all homes, offices, and stores
- Increasing wind, solar, tidal and other renewable power
- Doubling the fuel economy of cars
- Introducing hybrid and hydrogen powered cars.

While a multitude of solutions and cooperative global and grassroots efforts will be necessary to make an energy transition (from net-zero buildings to grid-tied solar power, wind-energy co-ops to district heating), communities across New Zealand have found new ways to start their own renewable energy facilities, build new modes of transportation and imagine new ways of decreasing their carbon footprint.

Community Outcome theme: *The Environment*

In the early 21st Century, most people enjoy a level of material prosperity due to a global resources boom). Unemployment is around five percent, inflation below three percent, and economic growth at an impressive 3.5 percent.

- Politicians claim we've won the economic *trifecta.*

Rapid growth creates new jobs for skilled individuals and professionals. In a self-accelerating process, more and more businesses are drawn down the corridor by the skill set of the growing population and access to relatively inexpensive real estate.

Around 75% of the population feels pressure to change the way they live to reduce climate change.

In general, people believe that New Zealand can be ecologically modern (we can afford to be green) as the economy can continue to grow profitably and protect the environment at the same time. They think that environmental regulatory regimes will be sufficient i.e. provide enough incentives for more sustainable environmental performances from all sectors of the economy. For example, businesses will incorporate environmental considerations into production and consumption processes, including pollution abatement, resource efficiency and waste recycling. Green businesses will be established. Scientific and technological improvements and better management contribute to this 'refinement of production'.

All in all, the general view is that greater wealth will bring about greater efficiency, so that neither economic growth nor profit making is curtailed. It is 'business as usual' – benefiting the investor, the customer and the environment. It is a win-win situation.

Being 'green' is now becoming the norm, with many more people wanting to adapt their lifestyle to be more environmental. Reducing the amount of energy in the home is seen to be as virtuous as donating to charity. Along with an increasing recognition that climate change is now an issue that each of us is responsible for, comes a readiness to act. It is the most affluent parts of society who are doing the most. It seems that many of us do a few small things. For example, a few buy food that's locally produced and regularly compost household food and garden waste, or do washing at 30 degrees Celsius. However, this is a case where there is a disconnect between reality and 'wishful thinking' or, put another way, between what people say and what they do. Bigger changes, such as cutting out holidays involving air travel, not buying a plasma TV and getting rid of patio heaters are less appealing.

Even as people enjoy their affluence there is a sense of unease – a feeling that the good times cannot last. This sense of unease is proved right over time. The nexus of peak oil and climate change hits hard. The Prime Minister has it right when he says "There is something about oil prices that focuses the mind. We have been aware of climate change for years but it has not stimulated anything like this. Necessity is the mother of invention."

By the 2020s, peak oil and climate change have combined with other stressors such as urban corridor development (from Auckland) and have coloured the Waikato's economic development strategies. The combined weight of people, climate change, agricultural production and land use decisions are taking a toll on Waikato's air quality, water ways, rivers and lakes, coastal zones and biodiversity.

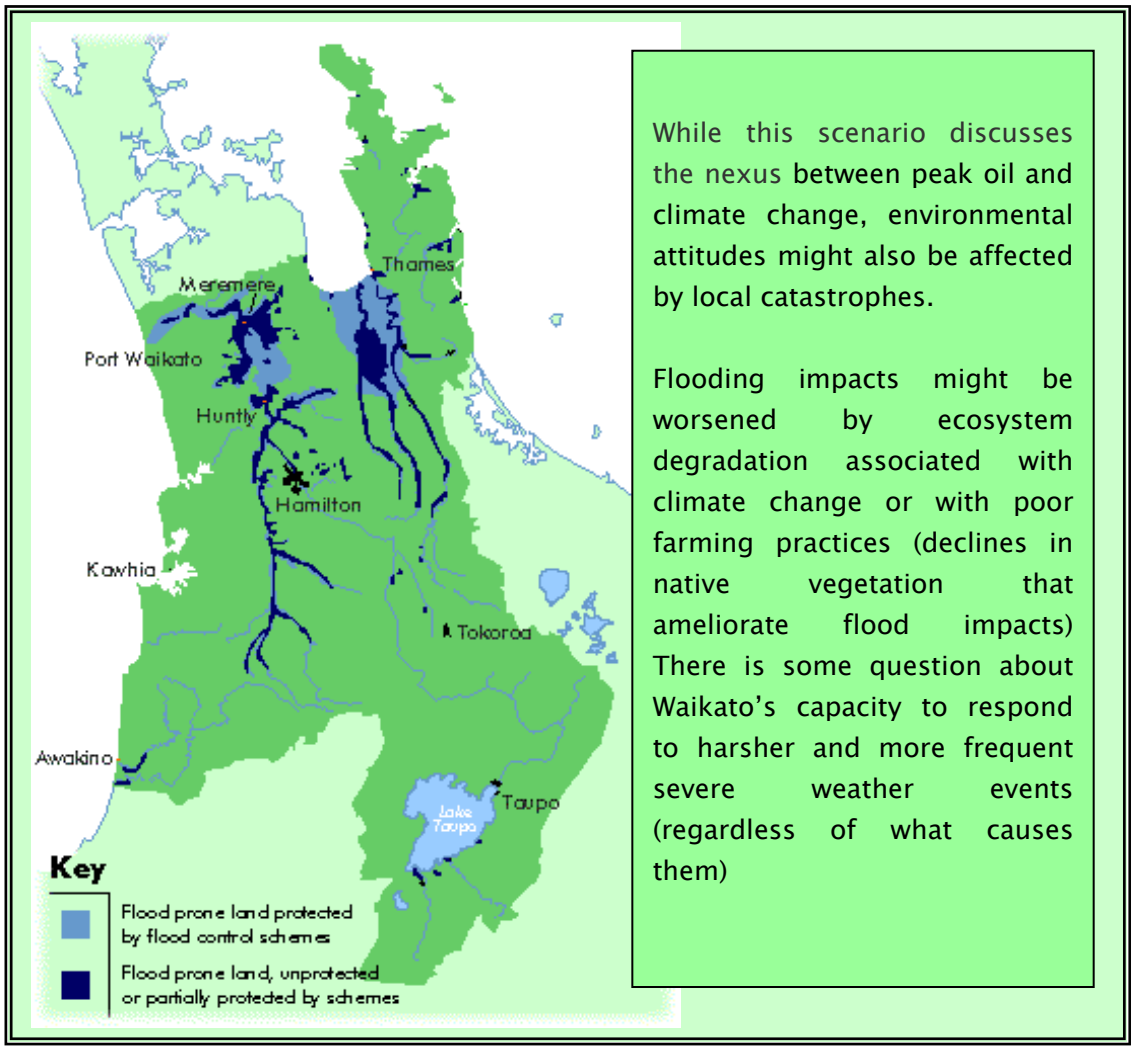


Figure 3:: Main Areas in the Waikato Region which are flood prone (EW)

In less settled areas, climate change is visibly increasing the amount and frequency of rainfall, causing more flooding in some areas of the Waikato Region, and decreasing rainfall in other areas, causing drought. Sea levels have pushed the sea inland, affecting low-lying areas and estuaries. Landslides occur regularly, triggered by heavy rain, as much of the soil throughout the Waikato Region is volcanic and prone to erosion.

The introduction of invasive plants, diseases and pests by sea or air has significantly cost New Zealand and the Waikato.

- Seventy + percent of emerging infectious diseases are zoonoses or infections that jump from animals to humans. For example, streptococcus suis, once common in pigs alone, is now found (and often deadly) in China, Thailand and PNG. Drug resistance is spread from animals to humans as well.

Although independent farmers lobby for and are granted relief from economic pressures (including taxes, environmental laws and fuel costs), many are forced to downsize or quit farming altogether by the 2020s.

- It is increasingly hard to earn a 'traditional' living from the land and at sea. For example, on a global scale, many fish species have reached their limits and are classified as fully exploited or overexploited throughout their entire ranges by 2030.

Land Use in the Waikato

By 2050, land use in the Waikato will have changed because of both natural and human induced climate change. While more land is devoted to urban development, there are reductions in agricultural areas because of major (and flash) flooding and less visible environmental changes (e.g. poorer soil quality).

Bio-energy production rises, especially when second generation biofuel production comes on stream.

Recreational areas protected for conservation and recreational use are likely to degrade as there is no budget for some years.

Demand for Biofuels

Community Outcome theme*: Quality of Life*

Eroding social structures from family through local communities are a grave concern and worsen as economic difficulties grow.

The gap between rich and poor is now at its highest level ever. This has led to a polarisation in society and created an underclass characterised by poor education, unemployment, bad health and a lack of access to services many take for granted, such as banking.

In more than one third of Waikato households, no-one works full-time and about a third of adults have problems reading and writing and are innumerate.

Oxfam describes New Zealand as "one of the most poverty-stricken developed countries in the world". The Government argues that statistics do not take into account the working family support schemes, minimum wage, a new 10 percent tax band and improving literacy rates in primary school pupils.

- Successive central governments indicate that poverty and social exclusion will only be eliminated with the active involvement of community organisations and business.

Community Outcome theme*: Economy*

Natural resources (including services in the form of tourism) are where New Zealand's comparative advantage currently lies. That will be the situation at least until New Zealand builds new endowments in terms of workforce and managerial skills, available technologies and infrastructure. Even then, it may be that this knowledge will often be better applied to increasing the competitiveness of New Zealand's primary resource-based industries or selling the expertise overseas, than in entering high-technology industries.

- Exploiting natural resources is seen as unattractive by some people, yet natural resources do confer irreproducible advantages. While the products may be low-technology, the processes involved in making them increasingly employ high-technology and highly sophisticated business practices, and the customers can be demanding yet willing to pay premiums for valued attributes.

- A burst of production and services outsourcing in the 2010s to lower costs countries (e.g. some of Fonterra's dairy production moved to South America), was eventually tempered by some growth in the high value and services sectors, based on a range of creative, communications and biotic technologies.

New Zealand's economic decline means it is easier for governments to put aside environmental plans (for a while). In fact, as people age and healthcare systems become too expensive, people see similarities between healthcare and environmental protection – both can be 'bottomless pits'. No amount of money can purchase perfect health for an individual or the environment: how much is enough?

There is no fixed answer to that question and within each government term, very different answers can be and are given. Two questions underpin the debate in the period before the onset of rapid change:

- Given the uncertainty in the intellectual track record, what is the real nature of the environmental crisis in New Zealand?

- Should any steps taken to restrict environmental damage be undertaken with or against market forces?

Traditional tertiary qualifications are considerably less affordable, less of a guarantee of economic success and less important culturally. Fewer New Zealanders pursue degree programmes and, instead, capitalise on vocational training and apprenticeships. Education is often seen as a commodity rather than a preparation for life.

- Dual systems, combining education with workplace training, have been shown to be successful at promoting youth employment.

- Access to training is distributed very unequally over the adult workforce in Waikato. Those people with the least education and skills participate much less in training, as there is co-financing of training (an individual contribution must be made to access government subsidisation).

Small Business

Many New Zealanders cannot afford to buy their own home. By 2050, in fact, a number of New Zealanders have no interest in doing so, having seen their parents' exposure to housing debt and its impact on their lives.

- While small businesses used to get their original financing from a loan secured by the business owner's home, the central government and the private sector now provide micro-financing 'entrepreneurial starter' funds; not everyone qualifies.

- Given the viability of many small businesses (i.e. closing down in less than five years), some companies adopt the mentality of looking for short-term business opportunities and profits, which when combined with a hit-and-run approach to conducting business, sometimes makes it quite difficult to find reliable business partners.

Finding work in smaller enterprises has re-enforced New Zealand's adoption of its own '*quanxi*' system where personal connections, business networks and relationships are vital.

Early labour shortages become acute by 2025, creating a small surge in business investment in training for low-skilled workers and unemployed people who have dropped out of the labour market. There is strong push to encourage older workers to postpone retirement and stay on the job.

- This approach creates new jobs for a few long-time rural residents, reducing their resentment toward newcomers. It also reduces poverty among older people, which has long been a downside of rural life.

Female millionaires in New Zealand outnumber their male counterparts across all age groups by 2026. Women own 60 per cent of all personal wealth.

- 'Creatives' are an asset. These people have kick-started a small army of businesses in translation services, high-technology animation, fashion design and applied science research but are hard to keep pinned down. 'Creatives' sign on with the expectation that the company will be sold within a few years, whereupon they will find a new assignment.

Value of "Creatives"

The affluent have become extremely aggressive, demanding, high maintenance consumers in general. Instead of controlled consumption, restraint and denial, there is much more need to seek some form of expression by *badging* oneself as rich.

- The latest 'badge' is a television that rolls up like a rug and is super easy to transport (made from organic semi-conducting polymers).

In New Zealand, the rich work longer hours than the poor. However, this can be attributed to the widening disparity in the incomes of the wealthy and non-wealthy, meaning the marginal wage of extra work is exceptionally high for the rich, less so for the poor. Plus, New Zealand's rich are workaholics; many of its members find work more fulfilling than leisure, and the rest get considerable status benefit from the mere fact of working long hours.

- ‘Energy coaches’ are a burgeoning personal service industry. They offer education on nutrition and healthy lifestyles, such as advising on the right foods and drugs which enable people to do things like forgo sleep for 48 hours and delay puberty in their children.

Wealthy consumers ask for more diversity, more service, and more information.

- Sociological analyses of consumption suggest that the scope of individuals and groups to change their behaviour is limited by existing social infrastructure and institutions – systems of provision – which ‘lock in’ consumers into particular patterns of consumption.

An ‘Energetic’ Economy

Auckland’s and New Zealand’s energy system moves from crisis to crisis (with skyrocketing prices), with an unfortunate series of brown-outs and other power supply disruptions in the 2020s. Nonetheless, the energy sector has helped keep the economic ball rolling in the Waikato. Growing energy needs have firmed the Waikato’s emergence as an energy provider, mainly, as the ‘powerhouse’ to Auckland.

- By 2050, there are some industries that are in business to clean up the environment. It is also true that some firms see a benefit from adopting a green image. Greener energy technologies have been used, when available, given greater funding for research into alternative-energy sources.

Alternative Energy

Ocean power (or tidal power or wave power) might be a dark horse renewable energy system for New Zealand. Less transient than wind or solar power and less of a visual trigger for ‘NIMBY’ backlashes than wind turbines, ocean or tidal power might by 2050 represent one of the largest source of centralised energy production worldwide (solar will probably figure higher overall, with the widespread use of solar-embedded building materials, paints and polymers).

But, the fact is that ‘coal remains king.’ As one local Waikato MP said ”No one can honestly think we’ll not dig it [coal] out of the ground if it’s there and cheap. Sure, we need to think of future generations but we don’t need to unduly punish people today by driving the economy into the ground while we are doing this.”

- Rising energy demands (53 percent) simply could not be met by alternative energy sources which are more widely used. Yet the emergence of new second generation bio-fuels technologies allow more of a plant's material to be turned into fuel, which means that bio-fuels play a much bigger role.

- Although nuclear power has followed an international growth path - despite concerns over safety and the risk of radioactive material falling into the hands of al Qaeda or other similar groups – New Zealand has not pursued this course.

Export sales to China, and Chinese business partnerships in the energy and minerals sectors have grown ten-fold. For example, *Waikato Bioprospectus*, a subsidiary of China Sea Prospects International, is largely Chinese-owned and has been intensifying operations off the Coromandel since 2040.

Agriculture

Agriculture has not fared as well as the energy sector, in spite of a few well known success stories. Several trends converged between 2010 and 2020 to create a 'perfect storm' of dangerous agricultural products. Deadlier bacteria on fresh produce, plus a rise in transfer to humans of animal-borne diseases has changed people's dietary preferences.

- This has compounded the rise in obesity, diabetes and heart disease.
- More residents in Waikato are also being diagnosed with 'micronutrient deficiency' – a diet that is deficient in many micronutrients. As a consequence, many people's health is affected for want of tiny amounts of iodine, iron, vitamin A and zinc. Symptoms of deficiency include fatigue, shortness of breath and lethargy.

Importance of Chinese consumers

- A lack of iron damages productivity and cuts GDP by 2 percent in the Waikato.

By 2050, greater farm productivity is being pursued through 'eco-technology', which integrates approaches from biotechnology[8], organic farming, and traditional wisdom to build a safer food supply chain.

Insurance

Several years of weather-related insurance losses lead the re-insurance industry to deny insurance for 'risky' areas, because damage bills are unaffordable. Deductibles in coastal and 'extreme weather' zones are in the thousands and tens of thousands of dollars per household by 2025,,if offered at all.

Many large company's CEO's are taking out professional indemnity insurance claims based on their efforts to reduce greenhouse gas emissions. New Zealand government agencies require this as a pre-cursor to doing business with central government.

8 Biotechnology is the use of living organisms and other biological systems to manufacture drugs and other products for the purposes of environmental management and/or for the betterment of individual and societal health and well-being. Biotechnology is often broken down into several categories, including red biotechnology for medical processes, white biotechnology for industrial processes, green biotechnology which applies to agricultural processes, and blue biotechnology, which deals with the marine and aquatic applications of biotechnology.

The future of environmentalism

One of the interesting questions for New Zealand might be what influence environmentalism might have on future government policies. It is possible that environmentalists might have very different belief systems about how to go about protecting the environment. They might adopt the perspective that it is a 'personal responsibility,' or that we need to provide incentives for social and technological innovations to address the problems of economic capitalism, or that substantial lifestyle transitions need to be driven by government intervention (upending economic growth as a goal).

Community Outcome theme: Culture and Identity

People have established new identity cues. Lifestyles are more ad hoc, situational and deal-based. Relationships are more about short-term contracts than about loyalty. Few relationships are binding.

There is a diversification of family life in New Zealand, a move away from the nuclear model of a heterosexual couple with children and a strict gendered division of paid and unpaid work. In the Waikato, the number of families with three or more generations living together has increased. Sole parenting is very common, as is the proportion of 'home alone-rs.' There are more older people, more household fission and more people 'living apart together'.

- The cost of bringing up children rises even faster than house prices. However, wealthy couples with a child will spend a lot on that child.

Community Outcome theme: Participation and Equity

Views will be significantly influenced by a global mass media; at the same time, views have become more localised around particular influences. The media now concentrated and subject to commercial pressures, has lost its role as the fourth estate. There is an information deficit (imbalance) in society.

There is a reduction in the size of local government, principally through shared administrative services across councils, regional and other local bodies.

- Where there is less face-to-face service, interactive communications technologies take up the slack.

- While more traditional forms of community engagement are prevalent, Maori-led 'wisdom councils' are called every few months as an alternate means of the community facing choices. These groups (randomly selected by lottery from Waikato residents) address a particular problem, identifying solutions, concerns,

data and problem-statements and then, through a choice-creating process, issue a unanimous statement.

By 2030, Local Exchange Trading Schemes (LETS), which build Waikato's local economies through cashless exchange, are quite popular in some parts of the Waikato Region.

- A wider range of people living in Waikato meet and work with each other.
- People gain local credits to exchange for goods and services within the Waikato.
- LETS earnings are equivalent to cash income. Government captures the value of these local credits through virtual taxation systems, which capture upwards of 95 percent of these transactions in New Zealand's mainly cashless society, no matter how small.

Cashless Society

Alternatively, people also create other forms of non-taxable 'social' currency. For example, unemployed people who cannot afford to pay healthcare costs for their elderly relatives in distant cities, care for someone else's grandmother, and accrue credits for someone else to take care of theirs.

The emergence of LETS social networks lays the foundation for a broader nation-wide environmental justice movement. Rising concerns about the carrying capacity of the Waikato, coupled with the health and social effects of being a 'forgotten region' prompt a handful of environmental justice proponents to try to redress inequitable distributions of environmental burdens (pollution, industrial facilities, crime, etc) and to provide equitable access to environmental goods (nutritious food, clean water, parks, recreation, health care, education, transportation and safe jobs).

- These advocates are particularly concerned about the deteriorating quality of land, water, energy and air; unresponsive, unaccountable government policies and regulation; and lack of resources and power in low income and minority communities.

Key challenges in this scenario

Challenge Statements/Concerns for the Waikato

N^{o} 1

The simultaneous tasks of managing the rich and poor, i.e. high growth areas and centres in decline across the Region, within an environmental justice framework, while government is shrinking, require tailored, complex responses within the Waikato.

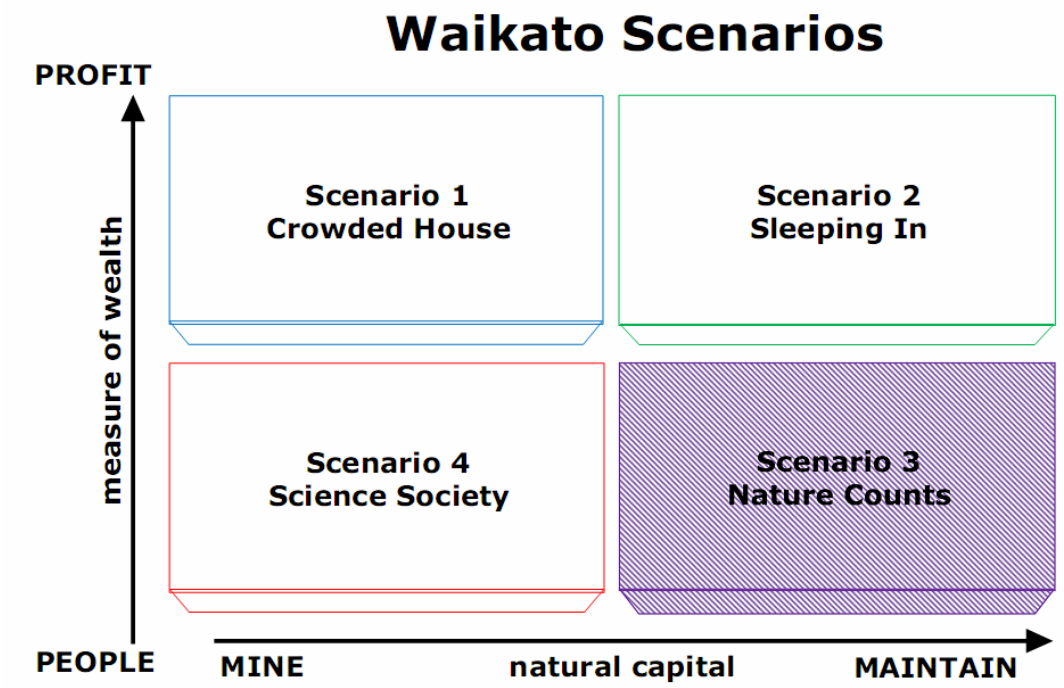
N^{o} 2

A crisis (or a series of crises) creates opportunities for reorganising the relationships of society to ecosystems. At such times, barriers to action might break down, if only for a short time, and new approaches have a chance to change the direction of ecosystem management. To succeed, a particular approach or vision must be well-formed by the time the crisis arises, because the opportunity for change might be short-lived.

N^{o} 3

Maintaining a sense of community, identity and place when faced with slow motion emergencies, compounded by fast punches, that affect individuals and settlements to different degrees.

Scenario 3: Nature counts



Why this name?

"Nature counts" refers to a shift in peoples' attitudes which is taken up by governments and businesses and the wider community. The value of the environment is reflected in the prices we pay for goods and services, and our behaviours change to reflect the way we work, live and play.

What happens?

In this scenario - as in scenario 2 – we explore a world where global resource depletion, especially oil and water, made worse through non-linear climate change, prompts political change and eventually leads to a new road for New Zealand's economic development, based largely in the biological and life sciences. There is an important distinction between the two future worlds: ecosystem services are economically

Name a resource fundamental to the maintenance of our civilization:

Oil. Water. Topsoil. Fisheries. Seeds. Arable land. Copper. Food.

and it's probably at risk of collapse in the next two decades (from 2008). All of these can be mitigated, managed or replaced in time; again, it's a matter of making the decision to do so. Some of the solutions will require transient sacrifice, but many will make our lives demonstrably better. Unfortunately, all require upsetting the status quo.

valued in Scenario 3 when decisions are made. For example, land which provides few ecosystem services is permitted to be farmed intensively.

A number of catalysing events make clear that it is time to live as though the day has come, because it has: tomorrow is too late. The question is, what might we do when one or many of those events which have been called "moments of contingency," shake us out of our collective inertia?

Globally, there is widespread acceptance that an ecological collapse is on its way, and that avoiding it demands widespread transformation. It is a future where we recognise that more people living marginally greener lifestyles is not the answer. What we need is millions changing their lifestyles: practicing strategic consumption, inventing new answers, changing their companies, investing in change, mobilising their communities, redesigning their cities, and in any way possible making it happen. Successive New Zealand governments live by the idea of "one planet, three decades."

This sustained focus helps drive development of a new economy - there has been a stream of innovations. Productivity growth has accelerated and, by historical standards, unemployment rates remain low. New Zealand, for example, focuses on the advantages it has in a carbon constrained world, working to meet:

- Research opportunities arising from demand for low emission technologies like renewable sources, carbon capture and storage
- Exploration opportunities arising from the demand for gas
- New markets opening because of provision of 'ecosystem services' like carbon abatement and biodiversity.

The World in 2050

In this future, world-wide demand for resources increased rapidly, alongside population and economic growth, such that use of even some renewable resources (such as water) began to outstrip their supply. From the 2010s a messy Iraq withdrawal, other political changes in the Middle East, natural depletion of oil resources, competition for fossil fuel supplies and extraction, and production capacity problems came together to place severe pressure on the world economy.

- Energy prices rise substantially, partly from rising costs and partly as a result of policies designed to internalise the environmental costs of energy use.

Crises create opportunities for reorganising the relationships of society to ecosystems.

During crises, barriers to action might break down, if only for a short time, and new approaches have a chance to change the direction of ecosystem management. To succeed, a particular approach or vision must be well-formed by the time the crisis arises, because the opportunity for change might be short-lived.

People's reactions to the impacts of this world-wide resource depletion vary considerably. Processes leading to overuse of natural resources and responses to this overuse differ across the globe and within New Zealand.

Coincidentally, the United States, the global 'engine of economic growth,' stalled for some time.

- The faltering US economy and, consequently, a longer-term decline in Chinese economic growth in the 2010s had a ripple effect throughout the international system.

A Breakthrough Agreement

Changes in the condition and availability of natural resources, and their long-term, usually negative, impacts on society and economy have been pointed out clearly and alarmingly for decades by several comprehensive studies, such as the Millennium Ecosystem Assessment (2005). While nothing significant came of these, international networks continued to 'plug away' at correcting direction.

In 2010, at an international meeting set to run parallel to the World Economic Forum, a group of concerned scientists and non-government organisations formed the Coalition of the Concerned (CoC). Their mandate is to take full advantage of the international networks of scientists that have been working for some decades. It is clear that in the next 50 years to 2050, there will be more changes in science than in the last 500 years. Biology will lead the way. This is where the most scientists, the most economic value, the most ethical debate and the most learning takes place.

This group works tirelessly to raise funds, influence the agendas of both national governments and international bodies, and educate the world's middle class. Using a mixture of 'sticks and carrots', over time, the CoC begins to make inroads while working with, and sometimes against, global and national institutions.

- Several New Zealand scientists are actively engaged in this 'snakes and ladders' process.

In 2012 New Zealand and the Cairns Group, following continued delays in reaching agreement over the liberalisation of agricultural trade at the World Trade Organisation, negotiate an agreement with the CoC to achieve '25 by 25'.

This makes substantial funding available for science and technology developments that improve human health and longevity through sustainable improvements to agricultural practices and the natural resources base.

- The goal is to discover, develop and introduce into use 25 new technologies by 2025. Based on its early success, this agreement is renegotiated in 2022 to reach '50 by 50'.

While much is done, resource depletion and the management of resources remain globally significant challenges for several decades, exacerbated by climate change trends (which continue to bite, despite successful development of new energy technologies like carbon capture and sequestration, because of accumulated greenhouse gases already in the atmosphere).

Community Outcome theme*: The Environment*

Environmental degradation, especially depletion of resources such as air, water and soil, the destruction of ecosystems and the extinction of wildlife, continue for some decades. Many of New Zealand's ecosystems suffer reductions in resilience and carrying capacity (food, habitat, water and other necessities available within an ecosystem).

Land Use in the Waikato

Over the next fifty years in the Waikato, there may be increases in the size of urban areas. There may be reductions in agricultural areas for food production because of a decline in its productivity. Forest land and areas protected for conservation and recreational use are likely to remain about as they are today or increase slightly.

An additional 23 percent of the Waikato's soils are degraded to the extent that their productivity is limited.

Forested areas have decreased by 1 percent every year.

Community Outcome theme*: Quality of Life*

In a comprehensive overview of New Zealand's place in the international system, the 2015 New Zealand Interdependence Report revealed how the country was being woven into an even more integrated, complicated economic, cultural and social fabric, with both positive and negative consequences. As global instability worked its way around the world, New Zealanders became increasingly restive.

By the 2017 election, the newly minted Prime Minister saw the economy as part of "the social question." His party favoured establishment of a self-sufficient republic.

- Most New Zealanders agreed with the party message that economic activity is meaningless unless it contributes to social ends.

- They encouraged national and local (and successive) governments not take a narrow view of economic activity at monthly electronic Citizen's Dialogues, periodic Citizen's Assembly and annual 21st Century Town Hall Meetings.

In Waikato, Canterbury and Southland, the possible loss of government safety nets in housing, income, and health were very threatening. People raised concerns about the decline in neighbourhood shops and services (corner shops, banks, grocers, and cafes) which affected both New Zealand and the Waikato's social fabric.

- For most people in these regions, the threats of insecurity related to illness, unemployment, high debt loads, high petrol (and energy) prices and other events that plunge individuals into poverty.

- Struggling households could not fund upgrading their skills, a lesser priority. Fear of further economic change helped mobilise political resistance in favour of protection.

Community Outcome theme*: Economy*

In his campaign, the Prime Minister, recognising the ideas of the Auckland voting base, argued "It is becoming increasingly impossible to escape the conclusion that the current paradigm of economic development is not working. Growth isn't working. Finance, although important, should not be at the centre of our economic thinking. We see the Government's responsibility and influence as extending to our wealth in its widest meaning – our wealth of human, family, social, natural and physical capital. We need to break the chains of conventional and mainstream economic thinking. We will

spend the next few years laying the foundations for a coherent and concrete alternative to the current paradigm of the global economy, backed by a broad and inclusive coalition of global civil society."

Genuine Progress Measures

In her first budget, the Treasurer tabled a new core set of national accounts for New Zealand's decision makers. These included broad indicators, such as the New Zealand Genuine Progress Indicator (first developed by the Parliamentary Commissioner for the Environment), which account for some costs not covered in the narrow framework of 'old' national accounts[9] (e.g. loss of work-life balance), and which show that living standards have risen much more slowly than implied by per-capita GDP.

Economic progress is not only measured in terms of labour productivity (the wealth produced per person per hour). it is also measured in terms of resource productivity or the amount of wealth produced per unit of natural resources.

In 2006 we had low resource productivity, e.g. rainwater running down drains rather than being captured. Early gains in resource productivity include better building insulation and 'green' buildings, more efficient use of transportation and significant elimination of waste.

- Resource productivity in energy (less energy use), materials (fewer and new materials) and transport (less movement of people and goods) are particularly important.

Government financing deals (e.g. public-private partnerships), which imposed high liabilities on New Zealand, were scrapped in favour of outright borrowing, as the Prime Minister promised "liabilities will be clearly spelled out rather than hidden behind commercial contractual relationships."

The Minister for the Environment, in a complementary policy push, introduced plans to ensure New Zealand would live within its *ecosystems' capacity* by repaying the ecological debt incurred over the past fifty years or more. It is the view of the Minister that the environment – the set of natural resources which provided the basis for New Zealand's wealth and other well-being – were under-priced for too long. New taxes are introduced.

The Government, and its coalition partners (5 of the 12 parties in Parliament), did not allow the process of this new economic transition to be 'scuttled', in spite of deep concerns in poorer electorates. The Government believed it had a legislative duty to defend and uphold community values in matters involving private behaviour, to prevent people from yielding to their own self-destructive instincts.

- For example, quadruple bottom line accounting is mandatory.

'Sustainable consumption for human health' has gained wide international and national currency as a new sustainable development policy objective, requiring widespread

9 In 2006, national income indicators, by which policymakers judge New Zealand's' economic performance, abstract the costs of natural resource depletion and environmental degradation. By abstracting these costs, national income indicators mislead policymakers, presenting the depletion of resources and environmental assets as income generation. In the case of natural resource extractive activities such as forestry, income will be recorded as total revenues less extraction costs. No costs are deducted either for the inherent value of the resource or for any damage associated with its removal. Failing to subtract these costs inflates the true value generated by the activity and presents the sale of an asset as production.

changes in behaviour at all levels of society to reduce the environmental impacts of consumption.

Sustainable consumption can "only be achieved through massive investments in science and technology." A *Futures Fund* is established to create a new national economy based on judicious development and use of science and technology. This fund receives a large boost of cash from the international CoC.

Headline News

Futures Fund Gets International Financing Boost

In central government circles, environmental concerns take precedence over social cohesion, as the Government takes a strong role in planning for the achievement of sustainable development.

While this results in real health and quality of life benefits, the amount of capital devoted to environmental sustainability creates a legacy of high housing costs, high tax rates, reduced social services, and, in some pockets of the Waikato, worsening rural poverty.

Natural Capital

Natural capital, both commodities and services, become more important. Commodities are the goods provided by nature – air, wood, coal, and fish – while services are less visible things like breathable atmosphere, fertile soil, insects for pollination, sunlight and water.

The focus shifts towards finding substitutes for commodities which are being exhausted, but there are no substitutes for many services.

A Bio-economy

By 2050, New Zealand has built an economy focused on inward and outward technologies. Biological manufacturing is widely used in some industries (e.g. bio-fuels production) and is fast growing. In the Waikato, the bio-economy uses renewable resources (yeasts, enzymes and biomass).

Evolution is being 'engineered' through the use of genetic, robotic information and nanotechnologies processes.

- We are moving faster and faster; computers increase the amount of information we have access to by seventy-fold per year. Compare, for example, the 15 years it took to sequence the HIV virus, to the 31 days it took to unravel SARS virus genetically, to the 2 days it takes to investigate most new viruses.

- Brain-computer interfaces, first introduced in practical numbers in the 2010s for therapeutic purposes (cortical implants allowed paralysed patients to move

equipment by direct cerebral command), have been applied to the normal human brain, extending our memory span and the speed of our access to information.

Because the commodity in biotechnology is information, rather than things, and the infrastructure costs for renewable biological manufacturing continue to decline, New Zealand can maintain leadership in some niche technologies.

Technologies aimed inward at modifying our minds, memories, metabolisms (+48 hrs without sleep), personalities (non-narcotic 'happiness' cocktails) and progeny (delayed puberty) have all been trialled. Some are in wider use.

- By 2050, New Zealanders have access to a number of technologies and life enhancement drugs that allow us to live longer, more healthy lives, but these are sometimes accessible only at great expense. In general, life expectancy is higher and infant mortality lower.

We also use outward aimed technologies for controlling our environment including: manufacturing (clothes), production (agriculture), design (cities) and mobility (space travel).

In fact, biotechnology is partly domesticated in 2050, as the computer was from 1980, in expensive and user-friendly tools and do-it-yourself kits (e.g. gardeners design their flowers and veggies) and games for children to create organisms.

Agriculture

New Zealand introduces a scheme of different valuation strategies for the services provided by agricultural ecosystems. One system allows farm products and other services to be valued by markets (for which price incentives drive human management decisions). Another applies to those services that are publicly valued and for which policy incentives drive management decisions. Other services (such as the provision of private recreation) are privately valued so that their provision is not rewarded by markets or policy.

As a result, there is a move away from cropping systems that solely focus on a single ecosystem service, the production of a marketable commodity.

By 2050, second generation biofuel crops, which can grow on marginal lands, comprise an important response to climate change and have become a new source of income for small farmers.

- Services valued include clean water and air, pollination, disease suppression, habitat for organisms such as songbirds and beneficial insects, and carbon storage.

New production approaches are developed that combine the most productive and environmentally sound aspects of conventional and organic farming with new advanced technologies. The use of pesticides is reduced, water resource management reduces usage and increases collection and retention of water, and precision agriculture decreases agricultural run-off.

Actively managing for multiple services substantially reduces agriculture's environmental footprint, but requires production incentives that reward environmental stewardship.

Some farms change hands, some ground is lost to development, and some land is moving out of traditional agricultural production toward recreation and 'hobby farming'. While the negative impacts of such change receive the bulk of attention from activist groups, there is evidence that some positive effects have resulted. Streams, wetlands, game fish habitat and grazing land are reclaimed by wealthier buyers of recreational properties interested in clean and healthy natural resources.

By 2050 we see changes in the agriculture sector in the Waikato. New ideas trigger new ideas in a chain reaction, similar to what happened in Silicon Valley with new information technology.

- Bright people begin to flock to the Waikato.

Paying Farmers for Ecosystem Services

Farmers constitute the largest group of natural resource managers in the world (agriculture accounted for over 40% of global employment in 2008). The concept of paying farmers for the ecosystem services they provide, thereby creating a financial incentive for environmental protection, is an approach generating increasing support worldwide. Farmers might generate enhanced environmental services in three main ways by 2050:

- Changing methods of production
- Diverting current agricultural land to other uses
- Avoiding future conversion of new land to agriculture.

Housing/Accommodation

Government policy is reshaped to minimise urban sprawl. Financial inducements, zoning and other measures encourage builders to pursue relatively high density, mixed-use development clusters.

- In these clusters, jobs, shops and a substantial amount of housing are located close to each other, reducing the amount of car travel needed in daily life.

- Housing prices rise to meet the growing demand for energy efficient homes, low water-use fixtures and distributed energy e.g. solar roofs.

Growth of small-scale rural tourism (typified by the bed-and-breakfast) is encouraged but leisure, tourism and hotel projects at the larger scale are restricted.

New Schools

After a decade in office, schools simply cease to exist (as we know them in 2006). Education is a key part of the 'new' social contract and more than the development of functional survival or industry skills (though necessary).

- Educationalists were told to ensure students are able to share experiences, developing new contracts and conventions of living in a society, and teachers were to design curricula allowing a full range of talents to be developed.

- Some of New Zealand's educational approaches are considered a proof of concept to the larger economies.

In Auckland, schools have been largely replaced by 2034 by 'safe places,' where children learn how to do things that they are interested in. Even today, their interests guide their learning. Twenty five percent of all students have opted out of the existing school system and are now being home schooled.

- The Government's role is to create places that are attractive to children, to encourage them to go there.

- In the Waikato primary and secondary school systems, more traditional schooling persists. Less than 7 percent of students have changed over to the 'new schools.'

Ecological responsibility, studying how to preserve the health of the earth, is a popular area of study. The University of Waikato, partnered with other national institutions such as Landcare Research, has become a world leader in valuing ecosystem services for different land uses.10

Auckland and its environs' knowledge and research infrastructure, the relatively low costs of the country's knowledge workers, political stability and safety are all attractive features for private overseas investors.

- Overseas direct investment has risen substantially.

New sustainable energy technologies are making a difference in power generation, buildings, transport and industry. A full mix of energy technologies has been deployed, including improved energy efficiency, CO_2 capture and storage (CCS), re newables and (where acceptable) nuclear energy. Clean and more efficient technologies have lowered greenhouse gas emissions to 2006 levels by 2050 and have also halved the expected growth in both oil and electricity demand.

- Fewer energy intensive companies have footprints in New Zealand. Energy intensive companies have moved offshore, where possible, although many have retained some knowledge intensive segments of their operations here.

Nuclear energy – option?

Security Concerns

There are difficulties in this bio-economy. Scientific and technological ideas are less mobile because science is more politicised. Ageing populations in the 'West' and in China are less innovative. The international 'brain circulation' system, both virtual and

10 Ecosystem services are the benefits people obtain from ecosystems. These include provisioning services such as food and water; regulating services such as flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling that maintain the conditions for life on Earth.

physical (people, including students, moving around the globe), has been increasingly curtailed.

- Security concerns heighten over time because of the ongoing 'war on terror' and the growing numbers of failed and failing states which are unable to monitor and regulate their 'scientific' community.

- Internationally valid patents for vague, general ideas are much easier to get than they were before. This has slowed down the introduction of new technology. Academics in biotechnology, for example, are less likely to share their latest research with potentially competing colleagues (which also slows down the creation of new technology).

Community Outcome theme: Culture and Identity

It is not uncommon for individuals and the small groups with whom they associate to hold seemingly inconsistent and opposing views.

Citizen's Science

Many people rely on widely diverse information sources from both the mainstream and from *citizen's science* (people who have perceptions about science, the scientific literature and its implications that differ from those prevailing in the scientific community), opinion and personal networks. Their opinions are formed from a mixture of ideas, coming from both the mainstream and fringe of global society.

- Intellectually, people understand environmental challenges but many individuals are divorced from the direct impacts of nature, barring natural catastrophes.

- People with means and access can live their lives cushioned from nature. For example, ambient intelligence devices can advise them of pollen counts so they can take their allergy pills before stepping out of their home.

- The internet has become a 'second home' for many people. People spend large periods of time in virtual space, using high quality, 3D, immersive, computer-generated environments linked to their nervous system (you can shake hands) at work and socially. Life as an e-self has its drawbacks though, because of monitoring and control mechanisms. E-down-shifters meet in real cafés, person to person.

Domestic city markets in 2050 (and target markets in major international destinations) now serve people who believe that the food you eat has an effect on your mind as well as your body. It is generally preferable to eat fresh organic vegetarian food or raw food which is locally grown and in season.

- Some people question the origins of the clothes we wear and the foods we eat. For example, they are more aware of the conditions under which animals live.

Farmers Markets – a popular choice

Community Outcome theme: Participation and Equity

By 2050 some of the significant changes in central government direction take hold and overtake the inbuilt inertia in institutional systems. It was the Government's preference, reinforced by vocal sectors of society, for using voluntary measures to manage contentious resource management and environmental issues. The introduction of

highly consultative approaches has not been reversed by subsequent governments. This means:

- There is an increasing focus on smaller-scale governance and citizen action at various sub-national levels, from local government to grassroots community groups and individuals.

- There is a growing policy emphasis on the role of socially and environmentally-motivated individuals to exercise consumer sovereignty and transform markets through their daily purchasing decisions.

Community and personal fulfilment are more easily optimised and maximised in Auckland. In the Waikato, where material consumption was much higher because of the local economy's reliance on primary production, the implications of adjusting to the new policy directions are significantly harsher.

- Social conflicts occur here and there, mostly between urbanites and residents in poorer regions. There is an increase in rural-urban migration, mainly among young men.

A majority of Auckland residents have embraced personal forms of spirituality and some aspects of other belief systems – from the East and the West – such as environmentalism and holistic health.

- The 'happiness industry' which emerged in the 2000s has continued to grow, particularly amongst people with higher incomes and in Auckland. In the last two decades, it emphasises optimism, personal strengths and virtues, and encourages people to discover what makes us truly, authentically happy.

New Zealanders still heavily debate these, and foreseeable scientific and technological developments, and whether they will lead to visions of 'heaven' or 'hell' in 2050.

- Heated debates about the social and biological consequences of extending human life span (e.g. human germ-line research) still erupt and consume considerable public attention. Opinions remain split. To date, most citizens maintain belief that New Zealanders have and will continue to do the 'right thing' (even as other nations exhaust other possibilities first).

- When pressed, people generally think it is acceptable for us to individually use technology for medical purposes. However, New Zealanders are still wary of the use of a range of biotechnology and nanotechnology in our food chain and in some other production processes.[11]

- It is not hard to find earlier examples of when these types of technologies went 'wrong', for example, in Italy's olive oil industry in 2023, or in the early European trials to eliminate avian influenza (bird flu).

11 Nanotechnology is defined as the science and technology of building electronic circuits and devices from single atoms and molecules, or the branch of engineering that deals with things smaller than 100 nanometers. A nanometer is about ten thousand times smaller than the width of a human hair. Nanotechnology deals with and manipulates anything that occurs within the scale of a nanometer.

Key challenges in this scenario

Challenge Statements/Concerns for the Waikato

N^{o} 1

Managing the transition to a national accounting system which focuses on resource productivity and ecosystem valuation (for services and commodities) to deliver a sustainable economy and still sends appropriate signals to the international economy.

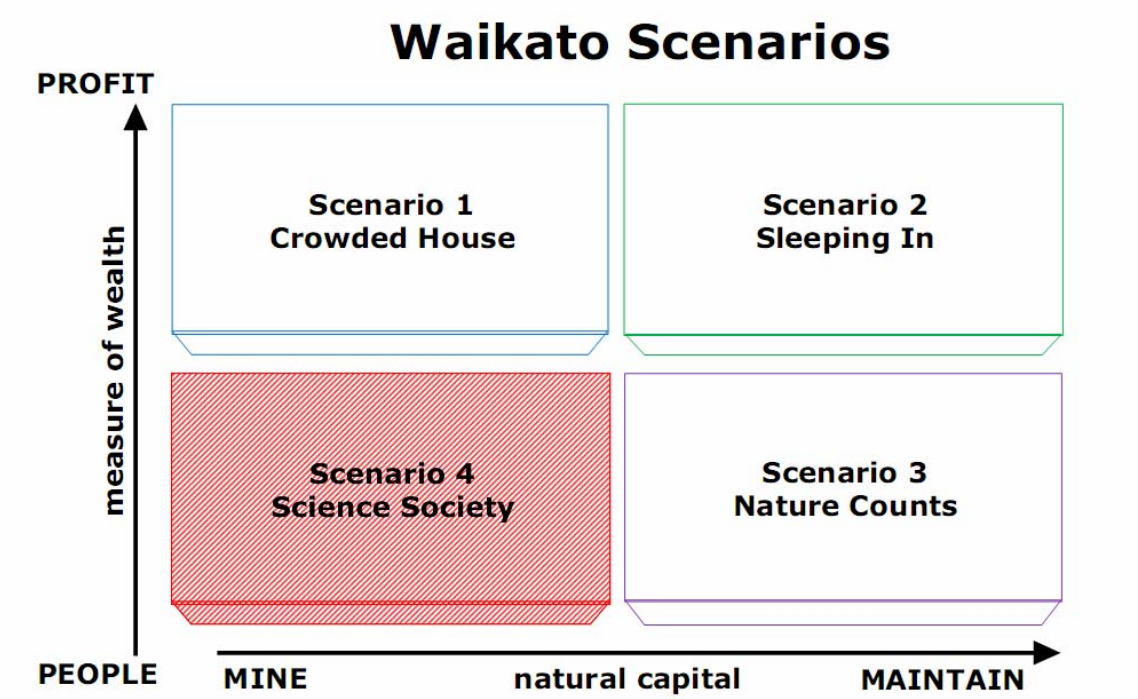
N^{o} 2

Building appropriate foundation institutions (education, research centres, cultural) and services (health, communications) to permit idea chain reactions to occur.

N^{o} 3

Finding the right combination of incentives and measures ('carrots and sticks') which stimulate real and persistent changes in lifestyles and behaviours.

Scenario 4: Science society



Why this name?

Science society describes a future where many new technologies are rapidly developed and adopted – New Zealanders are generally fast followers.

What happens?

In this scenario we investigate a future where advances in the sciences and technology have fostered development of a knowledge-based economy. This future is one where we move from a world in which the big eat the small to a world in which the fast eat the slow. University of Chicago paleontologist Lee van Valen has described this as the "Red Queen Effect," after the character in Lewis Carroll's *Through the Looking Glass* who remarked to Alice that she had to keep running faster and faster just to stay in the same place. Moving at ever-higher tempos, organisations or systems reach a point of 'persistent co-evolution' where no one has comparative advantage very long. This places

additional pressures on people, businesses and governments. Some have more adaptive capacity than others, and winners and losers alike might overshoot.

Future science and technology driven change might be step-wise, where large gains in efficiency, knowledge and so on occur in short time periods, resulting in a rapid flood of new capabilities. These types of changes might occur when major discoveries or innovations change the rules of the game for decision-makers or create new possibilities or threats that have not existed before. Another driver underlying transformative change might be extremely rapid advance. This occurred recently when a combination of new robotic and computational capabilities effectively increased the sequencing rate of the genome by a factor of ten within a very short time period and led to the completion of the genome project almost four years ahead of schedule.

New Zealand's governance systems are realigned as a result of our enhanced ability to measure and monitor everything in society; some argue there is too much governance. Many regional institutions and governance regimes have been subsumed in larger bodies and arrangements to accommodate economies of scale. While the Waikato is still referred as a geographic region, it has far less independent administrative authority.

Technology Backlashes are Possible

Technology has the potential to be a double-edged sword. Many past technological innovations have had unexpected consequences – not all of them good ones. The benefits of new technology might seem obvious: better, faster, smarter (and usually cheaper) products. As technology became more pervasive, we also need to be prepared to deal with the problems associated with technology. It's often easy to just throw technology at a problem but it's worth recognising that doing so always raises unexpected issues – and those issues may not be technological on their own, but social, cultural or legal issues.

The World in 2050

The science of biology has increased what we know enormously. We have learned more in the fifty years to 2050 than we learned in the last 500 years. The concentration of effort in biology – which has attracted more scientists, more money and more ethical debates – has been taken further by computer calculations and new ways of making observations and measurements.

We better understand how the biology of how our bodies and the natural environment work – how different variables can come together resulting in positive and negative developments that affect how we live and work, and the natural environment that enable us to do both. Knowledge about how diseases in plants, animals and humans evolve and harm us is clearer.

- We can change ourselves (as it will be easier to change the way we sleep, eat, age and think).

- We know more about the links between our bodies and minds and how these links affect intelligence, moral sentiments, aesthetic judgment, interpretation of others or religious beliefs.

- We can change our environment (reducing CO_2 emissions, harnessing new forms of energy, desalinating water, restoring arable land, rebuilding nutrient levels in soil and recharging aquifers).

Global Warming

The processes of global warming continue to 2050. Greenhouse gases that are already in the atmosphere will continue to act on the natural environment and people are responding to these changes or adapting to them.

A number of potentially-transformative technologies have a real chance to show critical breakthroughs by the late 2020s: Molecular manufacturing; artificial general intelligence; synthetic biology; human augmentation biology. Individually and combinatorially powerful, how they emerge will depend on political, economic and cultural choices made today. As catalysts, they can reshape the tools we have to manage the other drivers, offering new pathways to succeed and new models of risk.

- Ironically, the climate change prognosis has become gloomier as scientific cooperation has helped clean up the so-called 'Asian brown haze.'

- Until the 2030s, the haze was a semi-permanent feature of the region, stretching from the northern Indian Ocean to China and much of Southeast Asia during summer (and caused by a combination of ash from fires lit by humans, vehicle emissions, and soot from millions of inefficient cookers using wood and cow dung). In the last decade, the reduced haze has means the world has lost a 'cooling effect' which masked the true rate of global warming. As one headline succinctly put it: "Goodbye haze, hello heat."

Other natural processes that affect the natural environment also continue, such as the El Niño. The combination of induced and natural changes to our environment and the 'political will' to mange adjustments to them is still highly variable. Our ability to embrace or resist change varies considerably at both an individual and collective level.

Belief is still an important part of the human story; globally we still have two camps of thinking. One speaks about the threats we still face (i.e. are we likely to go beyond the limits of recovery in our pursuit of new sciences or when consuming resources?). The other speaks about the promises of even more advances in medicine, science and computers that allowed science to bloom in the late 20th and early 21st Century. Our knowledge is still interpreted and used differently. The diversity of interests and identities within New Zealand means that a number of contesting world views co-exist.

Cultural conflicts and wars still flare occasionally but there is more social stability as more people have moved into the global middle class. Increasing numbers of people now accept that access, not possession, is the measure of wealth.

In New Zealand, the improved ability to collect, monitor and understand how apparently unrelated ideas can come together over time and distance to create new ideas, science and technology has been harnessed. We obsessively observe and measure everything that can be measured, hoping we will be able to shape the direction of how these things evolve. Government is the biggest employer, although a large part of the economy is based on this measurement-mania and the love of technology.

Community Outcome theme*: The* Environment

Science Networks

Powerful science networks, which began to emerge in the 1990s, expanded rapidly to combat threatened pandemics and global warming, and to police 'rogue' scientists or 'terrorists' misusing viruses, disease and genetic engineering. The global science network is continuing to expand, with strong regional hubs. In Asia-Pacific a key science hub has developed around Japan-China-India; Australia, New Zealand and Singapore are important in this hub. These networks operate somewhat independently of national interests, in spite of efforts to curtail them by national governments – as the United States did in the 2010s by restricting student visas granted. New Zealand's governments have embraced this community, which is of increasing importance in the *Asia Pacific Science Consortium*, a network of scientists across 40 countries.

The elements of national power that count today are the Measure of Domestic Progress (MDP) (a derivative of earlier genuine progress indices), population, defense spending and innovation in science and technology. The most striking development of recent decades has been the very uneven slowdown in population growth rates around the globe. While many developing countries are fuelling growth, China, India and Mexico are on the cusp of 'hyper-ageing'; by 2050, one third of China's population is over 60. China is also facing the consequences of a gender imbalance. New Zealand's relative youthfulness and strong 'family' ties to China, Singapore and Hong Kong are an advantage (immigration trends).

Increased outward direct investment (ODI) in New Zealand by China has bolstered development of science, information, communications and technology-related niche industries suited to serving 'global champions' (large multinational firms with globally recognised brands and retail reach). Many New Zealanders speak three languages: English, Chinese and Maori.

The engagement of immigrants in international trade has had a significant economic impact. New Zealand has managed to spawn a number of cutting-edge, knowledge-based industries in the life sciences, geo-engineering and biotechnology. Last year, the Forbes 200, an annual ranking of the world's best small companies, included four New Zealand firms.

Globally, the biological sciences, geo-engineering and nanotechnology have helped us to sustain a larger world population and still preserve significant parts of the natural environment, in the face of natural resource depletion and climate change. There is much less malnourishment today than in the past.

We have better earth observation systems. This has reduced the number of times we are surprised by natural events like earthquakes, and increased our use of early warnings to implement timely and effective responses.

We are also better able to live with nature. For example, in New Zealand coastal regions, only amphibious houses and roadways are allowed to be built. Other architectural devices (moveable rooms and roll up televisions) are widely used in

combination with new composite materials and technologies (anti-viral polymers in paints which reduce the spread of germs, paint-on solar cells) in new and re-built homes and offices. These generally reduce the material intensity of our society.

Land Use in the Waikato

With respect to land use in the Waikato, by 2050, changes in urban design principles will slow anticipated expansion of the Auckland urban area. There may be relatively large reductions in agricultural areas for food production, partly compensated for by increases in crops for bio-medical and bio-energy production. Forest land and areas protected for conservation and recreational use are likely to increase.

Community Outcome theme*: Quality of Life*

By 2050, the medical profession has gained substantial control of birth, death and pain. The convergence of pharmacology, artificial intelligence (AI), nanotechnology and biotechnology will give us power over our own evolution.

Living Longer

Radical life extension and expansion is available to New Zealanders. Life-spans extend well beyond a century. Not everyone takes up the opportunity but many people do.

Sprawling urban areas

- The demand for prescription drugs has dropped and pharmaceutical companies are affected.
-
- Bio-medical research funding has dropped, as we become healthier.
- Work of local doctors/physicians is substantially different.
- By 2035, we are reverse-engineering and reprogramming the processes underlying disease and ageing, and this process is accelerating, doubling every year.
- Our senses perceive things beyond their natural ability.
- We remember more of our lives, with greater fidelity.
- We master fatigue, arousal and attention, give ourselves more intelligence, gain greater control over our emotions and are less subject to depression, compulsion and other mental illness.
- New forms of gene therapy are now able to place new genetic information in the right place on the right chromosome.
- New Zealand's Active Ageing industries are solid players in the 'health tourism' sector.

- Nationally, the birth rate is below the replacement rate.

In addition to reprogramming biology, nanotechnology (computerised nanobots in the bloodstream and nanoparticles designed to target specific organs) is widely used. Imaging technologies have exponentially extended our health care services' ability to treat disease and trauma cases. Robots, some quite human in appearance, are used for everything from exploration to prosthetics to companionship.

- The first completely robotic fast food restaurant opened in 2031. At the mall, stores are stocked, cleaned and clerked by robots.

Unfortunately, the potential of a bioterrorist to engineer a new biological virus has also risen. It is an ongoing game of tag to come up with a way to combat these types of viruses. The world has faced similar issues with nanotechnology since the late 2020s.

- Luck has played a part, so far.
- Many radical groups have found that the threat of bioterrorism is enough of a catalyst to disrupt their target's activities and economic standing, whether a company, a country or a group that holds a social or religious view inimical to their particular beliefs or goals.
- A few 'incidents', including the poisoning of groundwater supplies in some locations, have been addressed through technology (e.g. rapid introduction of desalination technologies).
- The emergence of a few new medically unexplainable diseases in humans, and plant and animal diseases, has been linked to 'bio-terrorism' in some quarters but is generally unproven.

Organisational Clockspeed

One of the issues that this scenario tables is whether there are mismatched organisational clockspeeds – *the rate at which organisations can change processes and products, reinvent mind-sets, and modify organisational structures in response to external threats or opportunities* – across various sectors of the economy with the government.

In this future there might be less clockspeed parity between the public sector and the sectors of the economy the government was interacting with around policy issues. If the parity gap widens significantly and many sectors are moving much faster than government, it could well make it far more difficult to anticipate policy issues, build public-private partnerships or avoid unintended social and ethical consequences of private sector actions.

A significant difference in clockspeed will fundamentally affect the types of strategies government can use in relationship to various competitors, collaborators or enemies. Falling behind the people you are trying to influence limits your strategic options. Simply put, the faster runners are in a better position to shape your world and you end up having to adapt.

More Regulation

There is a fierce ongoing domestic public debate between enthusiasts who favour human transformation and conservatives who are happy about technology as long as it doesn't change human nature too much.

Public health officials use a more diverse policy mix, including economic instruments and regulation, to modify behaviour ranging from drug use to driving and dog control.

- Bio-monitoring plays a major role in environmental health. Public health officials find it a valuable tool, e.g. to trace children's exposure to harmful substances. Successive public health initiatives use bio-monitoring to guide development of exposure prevention strategies.

The weight of evidence suggests that, where a significant shift in public behaviour is needed, voluntary measures are not enough. Successive governments will use 'push' measures when necessary, to preserve 'national interests.'

- These campaigns usually address anti-social behaviour, unhealthy behaviour and behaviour that affects others in public places or in the workplace.

- Most people agree that it is better for the Government to 'err on the side of caution', although there are some strong, small protest groups with opposing views dotted throughout the country.

Given the professional consensus that marriage is conducive to healthy adults, thriving children, and flourishing communities, the Government supports marriage for all as a preferred lifestyle option, using a variety of *family incentive* options.

- In the United States, rather than providing family incentives, their Supreme Court has approved laws requiring parental licensure (introduced in the 2020s as a reaction to the rise in fatherless children, unmarried mothers, prison inmates, teen-age pregnancies and adolescent runaways).

As individuals, we have the ability to choose our sensory experiences to a much greater extent than ever before.

- By 2020 almost every book, article, movie, TV show, and song ever created is on the Internet.

- People are still concerned with how they present themselves, both in physical space and in cyberspace. The fraction of our income that we spend on personal presentation has been increasing steadily in the 50 years to 2050. As it becomes easier to satisfy our material needs, we seem to focus more on what we are in relation to other. There is great demand for what the economists call 'positional goods'.

Our desire for entertaining virtual realities is substantial. We can create both imagined realities and a set of memories to support these. You can attend Princess Diana's wedding or visit Europe during the Enlightenment, and make the experience realistic by implanting safely generated temporary memories or controlled visions.

In the future, you will be able to create other simulated lives to add to your 'real' life.

- New Zealanders have a great nostalgia for 'the way we were.' Although often inaccurate, theme parks and villages are wildly popular in the local tourism sector. A few communities live 'retro' lifestyles; experiential television series filmed in these locations are very successful.

Community Outcome theme*: Economy*

We are generally richer today than fifty years ago, even though a small, well-educated, technological elite is the main owner of intellectual property, the most valuable economic asset. Falling boundaries between countries, cross-border commerce, merging economies and the instant global flow of information have enriched developing and emerging economies, although not without fits and starts. There are more middle class people in the world today than ever before; unfortunately some countries have been 'left behind.'

Economic Restructuring

Most people did not appreciate how fast science and technology would change over the next 50 years. The convergence of nanotechnology, biotechnology, information technology and cognitive science merge science and engineering.

There is an increasing push for more flexible, cleaner and convenient forms of final energy and energy services from 2006. The economy is less energy and resource intensive in 2050. The quest for energy sources to meet rising demand was successful. There has been sufficient energy developed to fuel Asia's growth.

- The energy policy mix we use today is considerably expanded. There has been a substantial, time-consuming and costly shift away from coal towards renewable energy sources, cleaner fossil fuels and energy efficiency. In fact, ironically, we are now dealing with the very real possibility of future abundances of fossil fuels, as methane hydrates (now extractable from the sea-bed) dwarf natural gas reserves.

- Drivers' licensing regulations which make it more difficult to be licensed, accessible and affordable public transportation systems, compact urban design which encourages walking and cycling, and attractive shared car ownership options have worked together to change the face of mobility in New Zealand. The country is much less car-centric today.

Industry production processes and retails services are much changed.

- Molecular nanotechnology assembly devices manufacture a range of products, with inexpensive tabletop devices.

  - In agriculture, improvements are made on the back of biology. For example, genetic processes mean cows emit less methane.

  - Automated restaurants, where no human hand touches the food from the time it enters the building in its raw state until it is served, are increasingly popular.

While technological literacy has grown, embedded computing, smart machines and user-friendly technology (e.g. voice-enabled access to the Internet through very small mobile phones that are built into clothing) mean most people are unaware of the complexity of science and technology around them when going about their day-to-day lives.

- Computer science has delivered machines that are intelligent; they can learn and adapt to our needs and their 'vision' and data-mining capabilities were imaginable in 2010.

Tertiary education in the life, agricultural and ecological sciences and technology fields is free, partly funded by commercial entities in return-of-service exchanges. Social and cultural programs are now science-based neuroscience and cognitive behavioural programmes, focused on how the brain and brain-body mechanisms work. The Arts are largely consumed with computer-generated ideas and imaging.

University of Waikato

Democracy Re-defined

Democracy is considerably different in 2050. Regional areas such as the Waikato are simply considered artefacts of history.

The Internet became a right of citizenship for New Zealanders in 2036 – guaranteeing the connection of virtually all people to the national (and global) information and communications grid. Government services are almost exclusively delivered through virtual and life-like networks. People feel as if they are having a face-to-face meeting, even if they are dealing with *avatars* (online virtual bodies).

- Voting is compulsory, as are completion of national surveys about attitudes, values and beliefs.

- Geographically-defined communities are less relevant; individuals and entrepreneurs can stand outside of their physical settings. But concerns for national and individual security and safety mean that privacy is dead. As soon as any privacy enhancing technology (PET) is invented, countermeasures are developed.

- Surveillance networks cover larger and larger territories in more and more detail. Government tracks all communications forms to avert threats, crimes and anti-social behaviour, using technologies like combinatorial computing and face recognition software. Companies monitor customers, the police monitor public places, the military monitor foreign countries and non-government organisations monitor all of them.

- As part if its very broad anti-social behaviour management program, the Government strictly regulated media violence once it was proven to induce imitative violence, after fierce internal debates. People are even fined for 'flaming' (being very rude or angry in their internet behaviour).

Because of the speed and ubiquity of communications systems, decision-makers and the general public are often aware of the consequences of their decisions as they occur. Feedback on the results of actions is so rapid that real-time self-correcting decisions are the norm.

- Government routinely convenes ideas markets on the Internet. Thousands of citizen speculators place 'bets' on hypotheses about future scientific or technological breakthroughs, political events and so forth. These have proven much more accurate than expert panels. Citizen's panels that generate fruitful ideas which are commercialised, share substantial cash awards.

With the merger of Internet capabilities and mobile phones, swarms of people quickly form, share information, coordinate actions, and disband. These *flash mobs* are very unsettling for government. Science 'backlashes' are quick and often volatile. The environmental movement uses this approach to try to close down fossil fuel and agricultural production and nanotechnology research facilities or other 'dangerous' activities, just as they shut down all global animal research activities which ceased in 2022.

- Environmental impacts and resource use tolerated 50 years ago are certainly not tolerated today.

Stronger community spirit

Community Outcome theme: Culture and Identity

New Zealanders have moved from a culture which promotes individualism towards *communitarianism* stressing the family, organisation, community and the nation. Many changes have contributed to this shift. These changes have been partially driven by the ethnic composition of the population (more Maori, Pacific and Asian), the introduction of social technologies which encourage networking and the adoption of a new style of electronically enabled democracy.

Rules and regulations that assure community cohesion, personal safety and national security are important; two of the last Prime Ministers served in the Foreign Affairs and Defence Portfolio; two were Health and Well-Being Minister.

Community Outcome theme: Participation and Equity

Government databases are regularly analysed for trends to discover existing and new values, attitudes and behaviours, using computers with pattern-seeking software to develop very sophisticated combinatorial exploration techniques and multiple hypothesis matrices. These allow officials to concurrently test different ways people's thinking and behaviours may come together by creating all possible combinations and quickly discarding those that do not make sense. Hypotheses are rapidly tested against the scientific literature which explains human behaviour through computation; new research is funded, generally through *sciSortNZ* (the New Zealand arm of the Asia-Pacific Science Consortium), if there are gaps in knowledge.

Governments do not use the 'antiquated' engagement and consultation approaches which emerged in the late 1990s. These have been replaced by other sophisticated analytical approaches that ensure all citizens views are rapidly cross-balanced and taken into account. Everyone's views are heard through electronic means; lobby and special interest groups are a relic of the past.

Headline News

Hamilton Government Offices Closures Announced

The few people now elected to Parliament and *much smaller* regional and local governments, can readily access the 'true' views and the 'pulse' of their constituencies, as a result of very clever information processes. Many regional institutions and governance regimes have been subsumed in larger bodies and arrangements to accommodate economies of scale. While the Waikato is still referred as a geographic region, it has far less independent administrative authority.

A small number of libertarian groups are vocally opposed to the loss of personal freedom, autonomy and privacy and the heavy reliance on science and technology. They argue that New Zealand's *democratic deficit* has made the country much more vulnerable to foreign influence, scientists, cyber-nuts and terrorists. Radical opposition is very rare but has resulted in a few attacks (or hoaxes) on important national power, communications, transportation and water supply systems and grids.

Key challenges in this scenario

Challenge Statements/Concerns for the Waikato

N^{o} 1

Adopting organisational strategies that increase flexibility, reduce uncertainty, encourage rapid experimentation, and the ability to improvise. Organisations will need to operate more like white-water kayakers than mechanistic entities following prescribed rule-sets.

N^{o} 2

Re-balancing and constraining markets, individual and property rights and land uses while building a sense of responsibility (managing the balance of expectations about entitlements and obligations of governments, businesses and citizens).

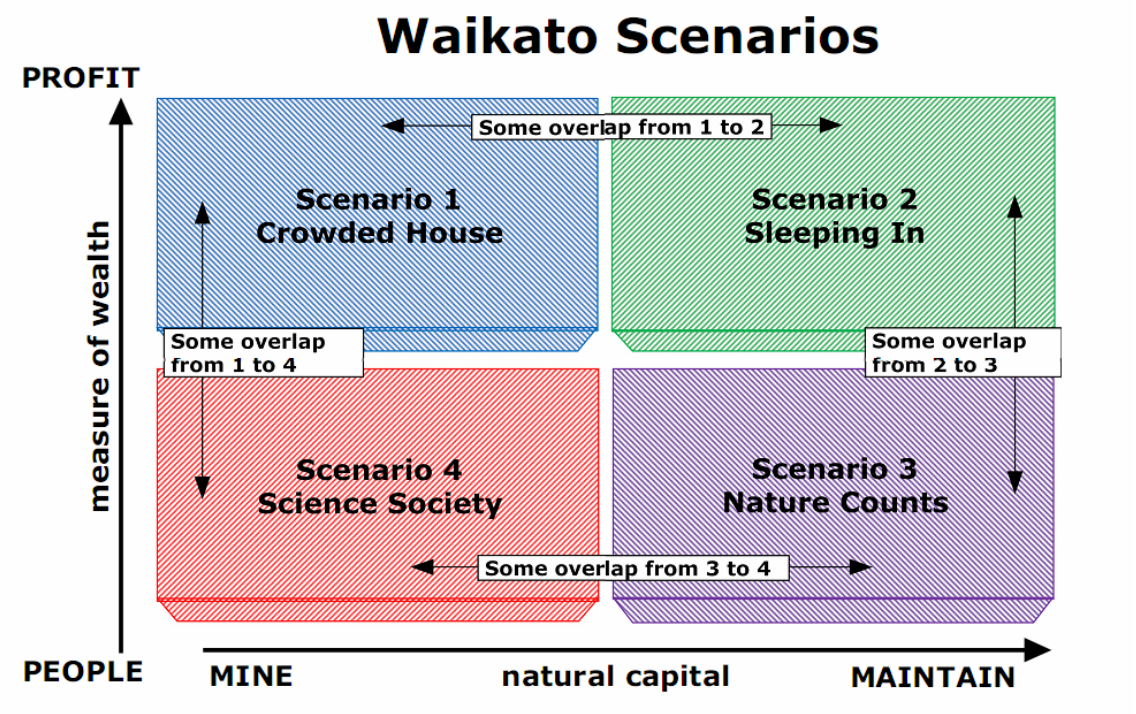
N^{o} 3

Harnessing scientific advances and knowledge while managing the dangers at the frontiers of science applications and uses (managing for science 'going too far'), which includes building trust in institutions and mechanisms that govern society and incorporates assurance mechanisms responsive to local needs.

Annex A: TimeLine – Prior changes in New Zealand

	1945 – 1978	1978 – 1984	1984 – 1990	1990s	2000 onwards
Theme	Britain's farm	Muldoonism	Rogernomics	Levelling the playing field	Playing on the field
Role of state	Owning the field		Spectator	Referee	Coach
Role of the public service	Owner/regulator (centralised)		Regulator – limiting the role of the state (fragmented)		Enabling State (networked??)
Societal consensus	Broad consensus for majority	Dissatisfaction	Conflict	Conflict Biculturalism Multiculturalism	Diversity tolerance but more consensual processes
Economic Paradigm	Regulation and 'old style' intervention		Deregulation	The Enabling State	
Economic cycle	3rd highest GDP per capita in OECD (1963)		Terms of trade with UK in EEC Oil Crisis Stock market Boom	1987 – Slow recovery 1991 – Depression Asian financial crisis 10.8% unemployment	Sustained economic growth
Welfare and employment policy	Every male unemployed person is known by name	1984 – creation of the employment portfolio	1987 – training programmes	1991 – welfare cuts (wedge between benefit and earned income) 1993 – PM's taskforce on employment – changes in school leaving age	2004 – Future Directions
Education	State owned/provided – conformity and universality		1988 – Tomorrow's Schools (devolved governance)	Tertiary sector reforms: EFTS system Quasi market NQF created	"Steering the system"

Annex B: A word about the overlap between the scenarios



Ideally, scenario narratives illustrate clear, distinct possibilities about how existing trends, emerging issues and peoples' responses can combine in different ways to create memorable 'histories of the future'. However, our imaginations can limit our capacity to create different story arcs about plausible combinations of how the future might evolve.

We can illustrate this problem by comparing Scenario 2 (Sleeping In) with Scenario 1 (Crowded House), and Scenario 2 with Scenario 3 (Nature Counts)

Scenario 2 should have similarities with Scenario 1 because they both retain GDP (and the underlying thinking associated with this) as a primary measurement of wealth – our proxy for political worldview.

- The distinction between the first two scenarios that we have drawn out in this document is the severity of environmental challenges – in the first story it is not enough to drive attitudinal change.

Scenario 2 should overlap with Scenario 3 as they both envisage a change in environmental attitudes (as measured by the mine-maintain barometer).

- The distinction between Scenarios 2 and 3 is one of timing (responses to environmental changes occur later) and degree (responses are deeper in Scenario 3 and more fundamental, requiring a re-think of economic and environmental frameworks).

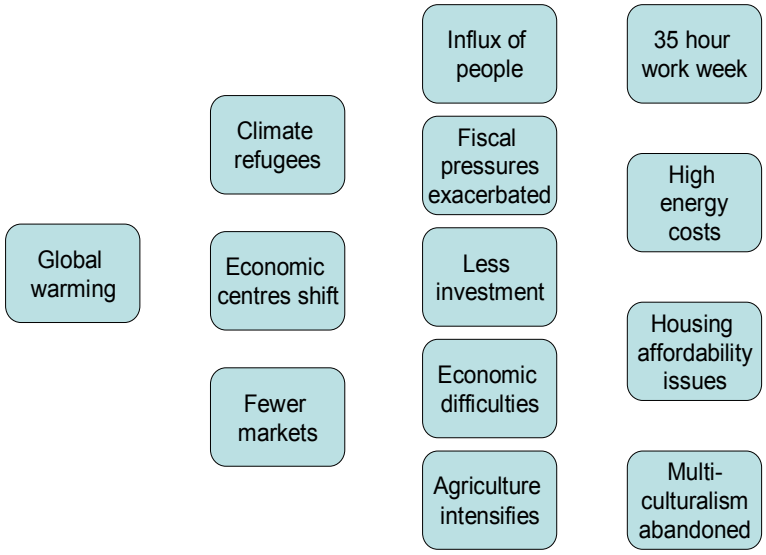
In Scenario 2 (late action) we suggest that substantive transitions are not made until later in the time period to 2050.

- We think that the difference between ‘early action’ and ‘late action’ has important cost and policy distinctions for New Zealand and the Waikato.

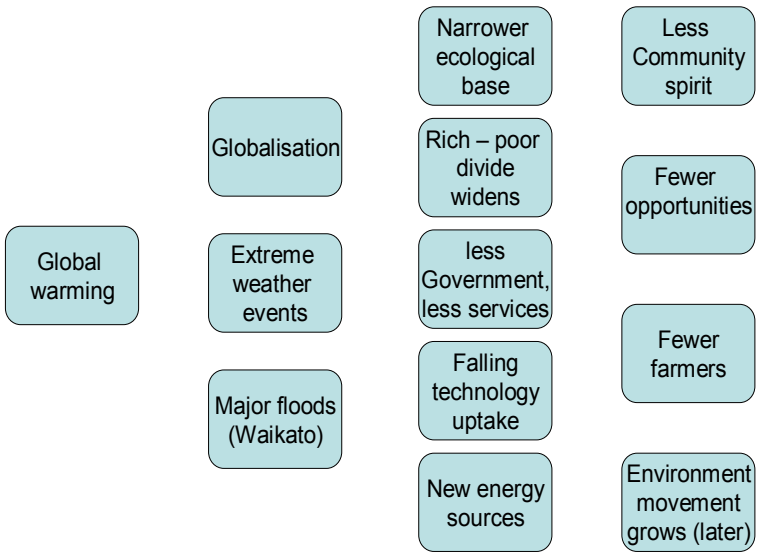
Annex C: Key Scenario Developments by scenario

During the 2006 community workshops we received the following information about possible scenario developments. Columns one through three outline global and national developments. The last column in each figure represents what the **impact on the individual** might be in that future world.

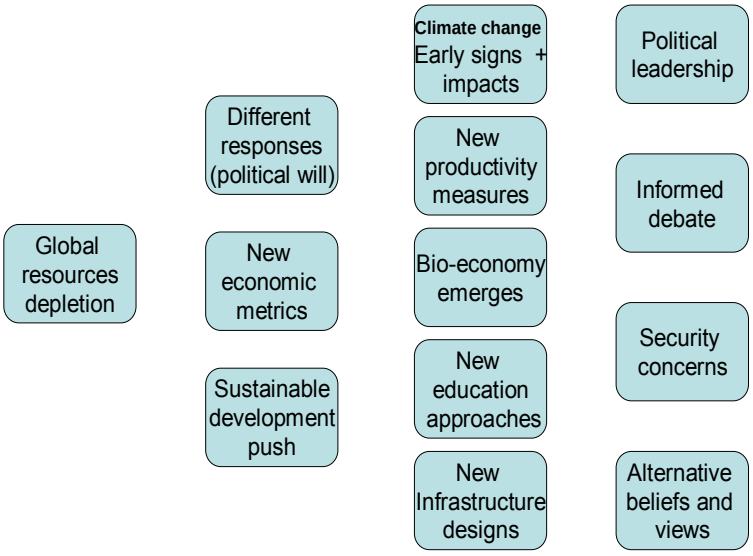
Crowded House



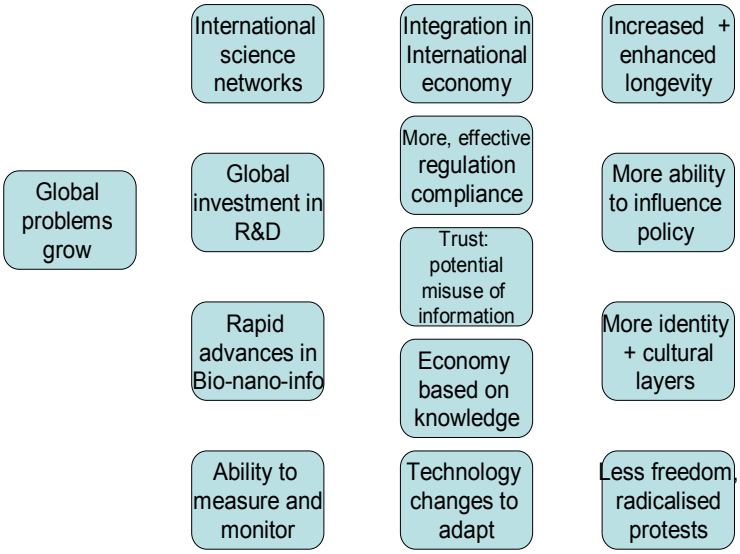
Sleeping In



Nature Counts



Science Society



Further Reading (2008)

CMI (2008) Management Futures: *The World of Work in 2018*, UK Chartered Management Institute (CMI).

- The CMI prepared an environmental scan and a scenario report that suggest by 2018 business markets will experience more competition and conflict; business models will become more open to external influences (e.g. environmental concerns and regulation will create products with longer lifecycles and 'virtual businesses' will be commonplace); and business structures will reflect changes in society and be more multi-generational with increased numbers of senior women. The study calls for a focus on 'intellectual property banks' to balance requirements for openness with business protection. The ability to drive change will be a prized skill and "innovation and creativity will be key to most tasks".

Harper, Sarah (2008) Future of Retirement Report: *Investing in Later Life*, HSBC Insurance.

- This study examined the data collected from over 21,000 people in 25 countries and territories around the world. Four key themes were: a large proportion of the world's ageing population are unprepared for later life and are potentially facing the prospect of falling into a serious 'vulnerability trap' in retirement; there is a significant lack of confidence that governments across the world will be able to support their ageing populations; the majority of people think that the role of governments should be in enforcing additional private savings; and, individuals would prefer to leave their children their perspective on life than money.

MAF (2008) Future Focus: *Signposts to Success for New Zealand's Primary Industries*, Ministry of Agriculture and Forestry, New Zealand.

This project identified external drivers likely to impact on the agriculture, food and forestry sectors, and in the biosecurity setting over the next two decades. The six key drivers of change identified from the global scenario database were: global warming, climate change, and extreme weather; energy cost and supply; geopolitical power shifts, and international trade and investment; ecosystem degradation, and water quality and availability; demographic shifts; and, technological advances.

Oxford Analytica (2007) Strategic Business Risk 2008: *The Top Ten Risks for Business,* Ernst & Young Global and Oxford Analytica.

- Based on expert views, this report identified the top ten risks as: regulatory and compliance risk; global financial shocks; ageing consumers and workforce; the inability to capitalise on emerging markets; industry consolidation/transition; energy shocks; execution of strategic transactions; cost inflation; radical greening and consumer demand shifts.

Padmore, Liz & others (2002) Business in a fragile world: *01.01.2012.*, Policy and Corporate Afairs, Accenture.

- This scenario study argued that the world was at a tipping point driven by the degree of economic interdependence and the extent of collaboration in the socio-political environment. Three of their four scenarios demonstrate that although globalisation may well continue, a globalised world may come in very different forms, some much more positive for business than others. The fourth scenario highlights the real possibility of an overall retreat from globalisation.

PWC (2007) Managing Tomorrow's People: *The future of work to 2020,* PricewaterhouseCoopers LLP.

- In this report, a team of people brought together by PricewaterhouseCoopers consultancy explored the future of work by developing three scenarios. The scenarios which might co-exist were (1) “Corporate is king: The blue world” where big company capitalism rules; (2) Companies care: The green world where social responsibility dominates the corporate agenda; and (3) Small is beautiful: The orange world where companies begin to break down into collaborative networks of smaller organisations. The report said these scenarios illustrate that business models will change dramatically, people management will present one of the greatest business challenges and the role of HR will undergo fundamental change.

Saffo, Paul (2007) Six rules for effective forecasting, *Harvard Business Review,* July-August 2007.

- In this article, Paul Saffo argues that businesses need to be more anticipatory to better cope with expected change and unanticipated surprises. This not only involves understanding how change might happen; it also requires decision makers to: (1) embrace the things that don’t fit; (2) hold strong opinions weakly; (3) look back twice as far as they look forward; and (4) know when not to make a forecast.

Shell (2008) Shell Energy Scenarios to 2050, Shell International BV.

- In this scenario exercise, Shell describes two worlds that describe alternative ways energy systems might develop. In the ‘Scramble’ scenario, policymakers pay little attention to more efficient energy use until supplies are tight. Greenhouse gas emissions are not seriously addressed until there are major climate shocks. In the ‘Blueprints’ scenario, growing local actions begin to address the challenges of economic development, energy security and environmental pollution. A price is applied to a critical mass of emissions, giving a huge stimulus to the development of clean energy technologies and this results is far lower carbon dioxide emissions.

Taylor, Rhys, Frame, Bob, Delaney, Kate & Brignall-Theyer, Melissa (2007) Four Future Scenarios for New Zealand: Work In Progress Edition 2. Manaaki Whenua Press.

- These New Zealand scenarios focus on what might happen under different sustainability agendas. The scenarios - named Independent Aotearoa, Fruits for a Few, New Frontiers and Living on No.8 Wire - give a rich sense of how life could differ in the future: at work, at home, in politics and in business.

WBCSD (2006) Business in the world of water: *WBCSD Water Scenarios to 2025,* The World Business Council for Sustainable Development (WBCSD).

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