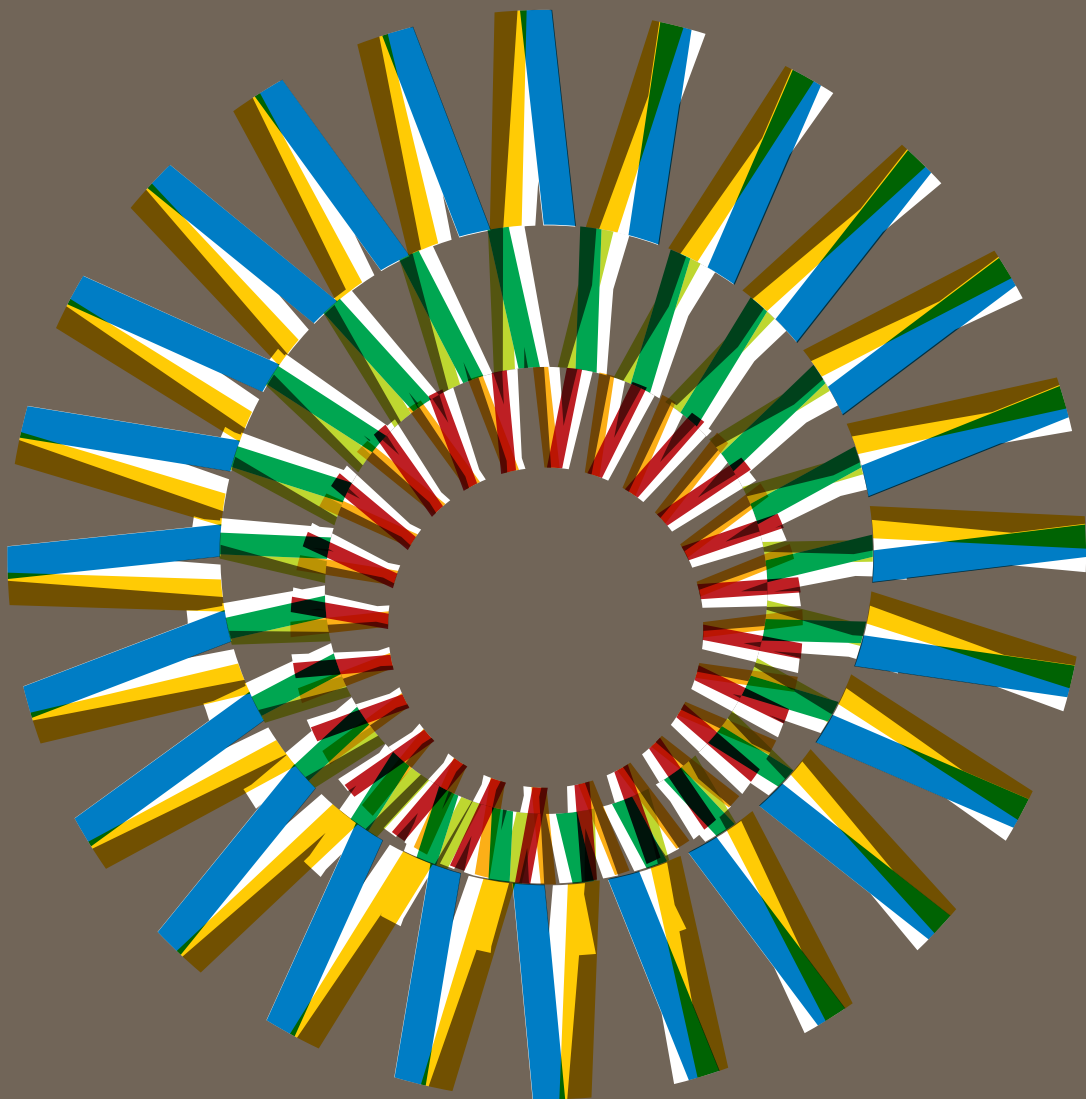


Strong sustainability for New Zealand

PRINCIPLES AND SCENARIOS

SUSTAINABLE AOTEAROA NEW ZEALAND INC (SANZ)



DEFINITION OF STRONG SUSTAINABILITY

- 1 Strong sustainability is the prerequisite and foundation of any human development, whether social, economic or technological.
- 2 Strong sustainability means the preservation of the integrity of all ecological systems in the biosphere.
- 3 Ecological integrity means the ability of an ecosystem to recover from disturbance and re-establish its stability, diversity and resilience.
- 4 A strongly sustainable human society lives and develops as an integral part of ecosystems that have ecological integrity.
- 5 Ethics, values and ‘world views’ directly support strong sustainability because people know that they are integral to the ecological systems of the biosphere. Therefore, people desire the integrity of those systems.

BEYOND THE THRESHOLD: A SUSTAINABILITY NAVIGATION TOOL

The purpose of this tool is to assist perception and understanding of the full scope of ‘sustainability’. We are all on a journey and this tool is intended to validate, locate, and illuminate all initiatives toward sustainability. A useful feature of the tool is that it summarises ‘connection’ as the overarching condition required for sustainability.

Note, time can flow in either direction. Today can be anywhere on the connection spectrum. The ‘threshold’ represents the achievement of such milestones as ‘zero waste’ and a return to atmospheric carbon dioxide levels of 350ppm. Where do your personal and professional activities lie on the spectrum?

CONNECTION	TOTALLY DISCONNECTED				TOTALLY CONNECTED	
HUMAN IMPACT	MORE DAMAGING	DAMAGING	LESS DAMAGING	THRESHOLD	REJUVENATING	OPTIMAL
PARADIGM	CURRENT				NEW	
PHASE	UNSUSTAINABLE	LESS UNSUSTAINABLE			STRONGLY SUSTAINABLE	
CHARACTERISTICS	<i>Economic growth first and last. Straight line (growth, planning, thinking).</i>	<i>Minimise impacts: reduce, reuse, recycle. Triple-bottom-line, footprint-based, mitigate, adapt, react, modify, responsibility.</i>			<i>Eco-system-centric. Connect, re-design, enhance, circular feedback, inspire, celebrate.</i>	

Strong sustainability for New Zealand

PRINCIPLES AND SCENARIOS

SUSTAINABLE AOTEAROA NEW ZEALAND INC (SANZ)

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Cultural Organization

**New Zealand National
Commission for UNESCO**
Te Kōmihana Matua o Aotearoa mō UNESCO



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'Beyond the Threshold' tool (back cover) inspired by
original diagram by Carl Chenery.

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The content of the paper is the responsibility
of the Board of SANZ.

SUMMARY

The purpose of this paper is to provide insights for people who wish to engage in thinking and debate about a strongly sustainable New Zealand.

Parts 1 and 2 provide a practical definition of strong sustainability and the conditions for achieving it are proposed. It is vital to understand that human civilisation is an integral part of the ecological systems of the planet. The present approach to economic and financial affairs is fundamentally inconsistent with strong sustainability and an alternative is required. This paper proposes a new economics that has market mechanisms that work to maximise community wellbeing and the happiness of individuals within the limits of ecological principles. It is based on a quite different set of underlying human ethics and values, and involves major shifts in human behaviour. Reforms in political structures and institutions are also required on the path to strong sustainability. It is argued that New Zealand should adopt the principles of strong sustainability, and adopt them even if many other countries are not yet doing so.

Complex global changes have already begun that will take human civilisation outside the range of prior experience in terms of magnitude, speed of arrival and simultaneity. These changes will cause abrupt and radical shifts in human living, work, and recreation. If the responses to these changes are sensible they will mark the early steps on the path to a sustainable New Zealand.

Parts 3 and 4 present a scenario of what a strongly sustainable New Zealand could be like, and how the transition to it could unfold. This scenario is deliberately optimistic in that it assumes that sensible decisions will be taken whenever these are needed. A plausible but pessimistic alternative scenario, which would be based on mistaken decisions and delays, is not presented here. It would describe chaotic confusion and hardship in New Zealand as well as the contribution of this country to the collapse and destruction of human civilisation as we know it, together with much of nature.

Despite the inherent optimism of this paper, the turbulence, hardship, and drastic changes that it describes and proposes could shock many readers. Some may disagree with the analysis and reject the proposals. This range of responses is expected in the spirit in which the paper has been prepared.

The issues raised in this paper must be considered with great urgency. Although attainment of strong sustainability will take many years, initiatives to begin the process are required now. We think that it is most likely that these initiatives will come from civil society – groupings of concerned citizens who are cognisant of the issues and challenges and are willing to act concertedly to effect the fundamental and systemic changes that are required.

PART 1 INTRODUCTION

The purpose of this paper is to provide insights for people who wish to engage in thinking and debate about a strongly sustainable New Zealand.

The paper is based on the output of three ‘think tank’ workshops that involved more than 30 people, and a subsequent discussion day that engaged a further 60, all in the second half of 2008. All those involved were knowledgeable about the subject of sustainability and contributed views from a wide variety of personal and professional experiences, while also representing different ages and interest groups. The project was coordinated by Sustainable Aotearoa New Zealand (SANZ) and has also provided inputs required by the UN Decade of Education for Sustainable Development, which SANZ manages in partnership with the New Zealand National Commission for UNESCO. Responsibility for this paper lies with the Board of SANZ.

Although the words ‘sustainable development’ and ‘sustainability’ are now used frequently in New Zealand, none of the meanings attached to them necessarily conveys the concept of strong sustainability. The next section addresses this confusion, beginning with a definition of strong sustainability.

The evidence for New Zealand’s current unsustainability includes our contribution to global greenhouse gas emissions; pollution from industrial waste; nitrate, phosphate, and organic contamination of lakes, rivers and groundwater; degradation of soils through some pastoral and arable farming practices; erosion of steep pastoral

land and consequent more extreme flooding of lowlands; loss of species and biodiversity; proliferation of solid waste in landfills; toxic dumps; and reduction in the vitality of human communities and consequent pathologies.

New Zealand cannot be fully sustainable if the rest of the world is not. For example, the greenhouse gases emitted by other countries will affect New Zealand’s climate far more than will our own emissions, and the acidification of the oceans will affect New Zealand’s marine ecosystems even though the major sources are offshore. Thus, the concept of strong sustainability for New Zealand is actually partial, and always subject to global actions that are outside New Zealand’s sovereignty.

This condition raises the question of whether it is sensible for New Zealand to take a path to strong sustainability if some other nations do not. We argue that New Zealand must accomplish all that it can internally (which is a great deal) and thereby engage in mutual support with other like-minded nations. The alternative, of delaying action until New Zealand can follow the lead of other countries, would make the adjustment process more difficult and costly, as well as contributing to a global apathy that would greatly increase the risk of catastrophic outcomes. Moreover, it is an opportunity for New Zealand to demonstrate innovative leadership.

There are further international aspects of sustainability associated with importing and exporting. If New Zealand imports products from places that allow unsustainable

production, this country is effectively condoning and accepting adverse impacts on global sustainability. A strongly sustainable New Zealand would not do so because use or consumption of such products in New Zealand is ultimately unsustainable wherever they are produced. Similarly, a strongly sustainable New Zealand would not export output from its own unsustainable production on the grounds that offshore customers do not care.

itself and its institutions – and especially the concept of perpetual economic growth – that must be changed.

The credit crisis mirrors another crisis that is not about credit but about the degradation of an irreplaceable asset upon which human civilisation depends – the global ecology. However, the cause is the same – unfettered economic growth and perverse economic outcomes. Both crises are about living off the

the achievement of strong sustainability will take many years, initiatives to begin the necessary changes are required now. We think that it is most likely that these initiatives will come from civil society – groupings of concerned citizens.

This paper is deliberately optimistic in that it assumes sensible decisions will be taken whenever these are needed. An alternative view, which would be based on mistaken

adopting these principles in New Zealand. It is demonstrated that New Zealand is currently very far from being sustainable and does not have policies and practices that can achieve sustainability. It is argued that unless urgent action is taken, the future for New Zealand is catastrophic.

PART 3 then uses these principles to present a scenario for New Zealand of a plausible transition to sustainability.

New Zealand is currently very far from being sustainable and does not have policies and practices that can achieve sustainability

International customer indifference would not be a justifiable reason for unsustainable production in New Zealand.

It would be misguided to think about future strong sustainability on the assumption that it can be achieved in the context of a continuation of current circumstances. In fact, any pathway to strong sustainability will be taken in the context of massive and unprecedented global change, which will occur anyway.

Since the work of the think tanks in 2008, the global credit and money crisis and consequent recessionary economy has worsened. We see these events as the onset of one aspect of the unprecedented change referred to above. Unfortunately, the response of leaders – globally and in New Zealand – has been to limit their thinking and actions to fixing the current economic and financial system on the basis that the system is sound and there has been an unfortunate aberration in the way that it works. We argue below that it is the system

future and not taking responsibility today for the full costs of human actions. On the day these words were written, newspapers reported that recessionary conditions had forced several renewable energy businesses in Europe and America to downsize.

While no doubt prudent from strictly business perspectives, were these decisions consistent with long term global social needs? Clearly not: the signals that the businesses acted upon were perverse from a social perspective. The same article reported a downturn in the price of carbon in carbon trading markets, apparently because traders are short of cash and credit. Does this price shift mean that the external social costs of emissions (which the carbon price is supposed to indicate) have suddenly fallen? Surely not. A similar ‘false response’ can be observed in the current reduction in the price of oil, which has nothing to do with long term trends.

The issues raised in this paper must be considered with great urgency. Although

decisions and delays, is not presented here. It would describe much confusion, chaos and hardship and would indicate New Zealand’s contribution to the collapse and destruction of human civilisation as we know it, together with much of nature.

Despite the inherent optimism of this paper, many people may be shocked by the turbulence, hardship, and profound changes that will be required in New Zealand’s economy and communities, in its international relations, and in the lifestyles of its citizens, if New Zealand is to become strongly sustainable. The paper is intended to help New Zealanders become more aware of the need for these changes and to debate the issues that arise. Some people may disagree with the analysis and reject the proposals. This range of responses is expected in the spirit in which the paper has been prepared.

The paper has three further parts, as follows:

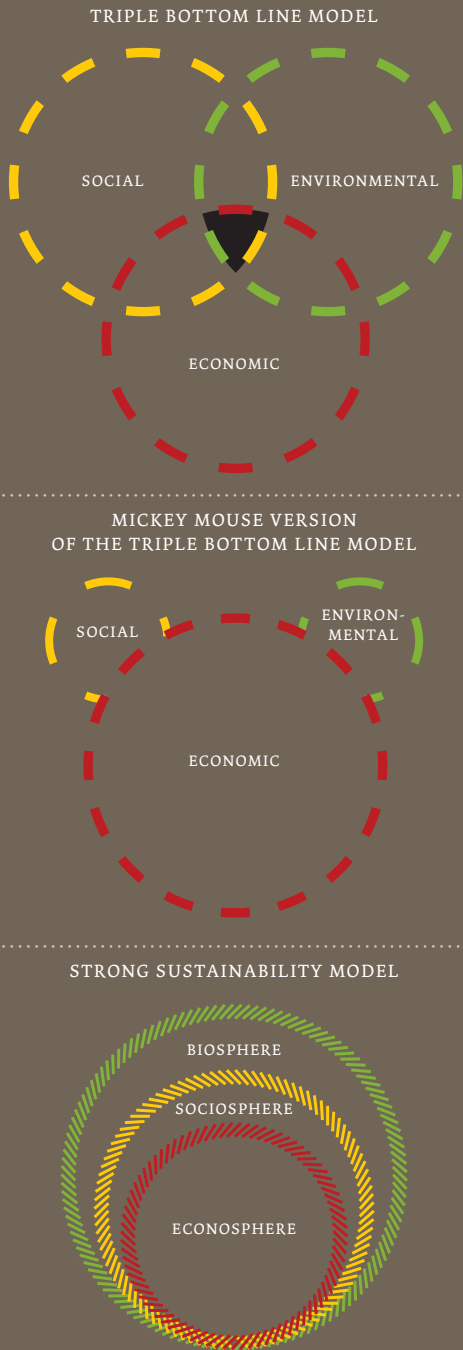
PART 2 describes the principles of strong sustainability and makes the case for

The scenario is deliberately optimistic in that it indicates that sustainability can be achieved. However, the pathway is inevitably unpleasant, painful and sometimes chaotic. It is also stimulating for those who grasp the challenges and contribute strongly. The scenario is based on the assumption that the right things are done at the right times. If this does not happen, catastrophic alternative outcomes will occur.

PART 4 takes the scenario further into the future and provides a plausible description of New Zealand in a strongly sustainable state. The purpose of this scenario is to encourage New Zealanders to comprehend the truly huge changes that are required to be sustainable. Again, this scenario is feasible only if New Zealanders commit now to achievement of strong sustainability and also make consistently wise and timely decisions during the transition.

PART 2 THE PRINCIPLES OF STRONG SUSTAINABILITY

FIGURE 1 ALTERNATIVE MODELS OF THE CONCEPT OF SUSTAINABILITY



2.1 MODELS AND DEFINITIONS

The graphical models shown in Figure 1 (left) help to explain what is meant by strong sustainability. The diagram labelled ‘Strong Sustainability model’ shows that all of life – including humans – is contained within the biosphere. This is simply a fact: the Earth is a closed or self-contained system except for sunlight received, heat reflected into space, and external gravitational effects. Thus, all human life and actions are contained within the biosphere and are part of it. A subset of human actions is known as the economy, which is part of the sociosphere. The definition of strong sustainability shown below is based on these scientific facts.

Before going to that definition, consider the other two models in Figure 1. The so-called ‘Triple Bottom Line model’ (also known – with different graphics – as the Three Pillar model) is the one that underpins most of the discourse and policy-making in fields such as those referred to as ‘sustainable development’, ‘environmental protection’ and ‘sustainability’. The model asserts that what is needed is an appropriate (usually not specified) balance between economic, environmental and cultural (or social) outcomes. Only the (usually tiny) intersection of the three circles represents the possibility of sustainability. The ultimate limits imposed by the environment (biosphere) on economic and social activity are ignored. This makes the model wrong in terms of fundamental science and therefore dangerously misleading as a framework for human policy.

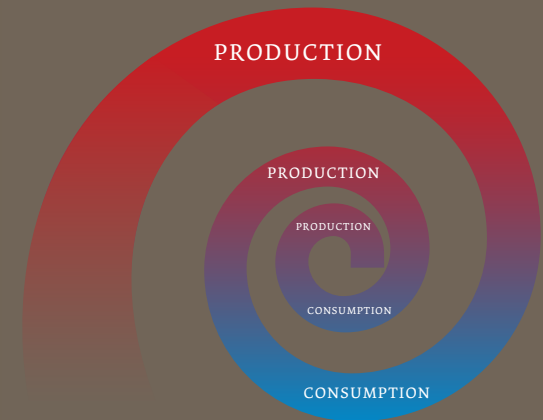
At its worst, the Triple Bottom Line model leads to human activity in which economic outcomes dominate and environmental and social outcomes receive scant attention. The intersection representing possible sustainability disappears. This has been termed the Mickey Mouse model, but it is actually no joke. It is currently the model that underpins most global economic and political decision making (with very small Mickey Mouse ears!), and is referred to below as ‘Business as Usual’ (BAU). It is the path that intensifies global unsustainability and hence eventual failures of critically important ecosystems and catastrophic ‘tipping points’ in climate, and thus destruction of human civilisation.

A supporting view is provided by comparison of the two diagrams shown in Figure 2 (right), which is due to Herman Daly (see Recommended Readings). The Standard (Growth) Economy diagram is equivalent to the Triple Bottom Line and Mickey Mouse models. It assumes the possibility of ever-growing cycles of production and consumption without considering the role of the supporting ecosystem, thus establishing the belief that there are no biophysical limits to economic growth.

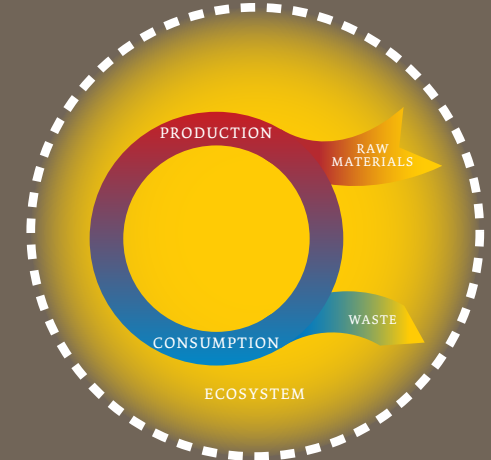
By comparison, the Steady State Economy diagram represents stabilised population and consumption. Resource throughput and waste disposal remain roughly constant, the scale of economic activities fits within the capacity provided by ecosystems, there is fair distribution of wealth, and allocation of resources is efficient. A steady state economy is necessary for strong sustainability.

FIGURE 2 COMPARISON OF STANDARD (GROWTH) AND STEADY STATE ECONOMIES (HERMAN DALY)

STANDARD (GROWTH) ECONOMY DIAGRAM



STEADY STATE ECONOMY DIAGRAM



The Triple Bottom Line model has a further insidious influence. Many members of the public, businesses, governments, and NGOs – people who want genuinely to reduce or prevent outcomes such as environmental degradation or human inequality – accept the model as true. They believe their actions are contributing to eventual global sustainability. Many of these initiatives indeed improve the environment and alleviate poverty, but at best their efforts

approach cannot take New Zealand and its citizens to a sustainable future. From the concepts represented in the Strong Sustainability model in Figure 1, and drawing on several sources, the following practical definition of strong sustainability is proposed.

This definition introduces the concept of ‘ecological systems’ within the biosphere. This is because ecological systems are the life of the biosphere. Humans and all their activities are part of many of the biosphere’s ecological systems. From a human point of view, ecological systems provide most of our food, some of our consumable energy and a massive clean-up service that absorbs air, water, and soil pollutants. Alas, the current scale of human activity exceeds the capacity

people and the biosphere. By ‘societal values’ we mean the relative worth a society places on the quality of the lives of its people and its communities. Societal ethics and values are sometimes stated explicitly but may also be implicit in societal behaviour, without any formal statement.

The reason the shift is necessary is simple: the ethics and values currently dominant in global and New Zealand society are

The orientation and scope of all New Zealand law and policy... is in current (sustainability related) the category of weak sustainability

are making the world less unsustainable. Because there is no recognition that human activity must be constrained by the capacity of the biosphere, and the underpinning model says that this is just fine, there is no possibility of these efforts resulting in strong sustainability. To make the distinction, and following accepted nomenclature, we call these initiatives ‘weak sustainability’. When it comes to strong sustainability, ‘doing less bad’ or ‘doing some good’ are not sufficient.

The orientation and scope of all current New Zealand law and policy relating to resource management, environmental protection and management, and mitigation of climate change is in the category of weak sustainability. This is so because New Zealanders have accepted the Mickey Mouse model of relationships between economic activity, social outcomes and environmental outcomes. Even the most environmentally focussed policies and actions are aimed at doing no more than some good or less that is bad. This

DEFINITION OF STRONG SUSTAINABILITY

- 1 Strong sustainability is the prerequisite and foundation of any human development, whether social, economic or technological.
- 2 Strong sustainability means the preservation of the integrity of all ecological systems in the biosphere.
- 3 Ecological integrity means the ability of an ecosystem to recover from disturbance and re-establish its stability, diversity and resilience.
- 4 A strongly sustainable human society lives and develops as an integral part of ecosystems that have ecological integrity.
- 5 Ethics, values and ‘world views’ directly support strong sustainability because people know that they are integral with the ecological systems of the biosphere. Therefore, people desire the integrity of those systems.

of ecosystems to carry out this cleansing service. The result is an accumulation of pollutants which, in turn, degrade the ecosystems and further reduce their capacity for cleansing, as well as for food production and energy sources. Typically, ecosystem cleansing services are either ignored or taken for granted and hence are not valued explicitly by human society.

2.2 THE REQUIRED SHIFT IN SOCIETAL ETHICS AND VALUES

We believe that a shift in societal ethics and values is key to humans being willing to adopt a path that leads to strong sustainability.

By ‘societal ethics’ we mean the principles, beliefs and understandings that members of a society have (their ‘world views’) that determine the societal view of proper conduct and ‘the life worth living’. It includes a sense of what is right and wrong, including what is acceptable and what is not acceptable in relationships between people, and between

fundamentally opposed to the concept that human activity must lie within the constraints of the biosphere. Although societies – including New Zealand – usually have a wide variety of ethical views and stances, the one that is quite dominant at the present time relates to our support and acceptance of the mainstream capitalist mixed economy model. This is based on neoclassical economics, the legal systems required to support it, and the political structures needed to support both.

In the Western tradition, this model has its basis in the utilitarian ethic and the social contract theory of property rights that goes with it. Utility (happiness) is held to be directly related to material income and wealth, and individual self interest is assumed (‘economic man’). Economic growth is seen as the only way to achieve more utility. Nature is valued only in terms of what it can offer to generate utility for humans – that is, nature has only instrumental value.

...the ethics and values currently New Zealand society to the concept that human the constraints

Although based originally on other traditions, modern business in eastern countries such as Japan, China and India appears to have had no difficulty adopting very similar values, albeit associated with variants of collectivism.

The daunting truth is that this utilitarian ethical stance – which is currently accepted essentially without question by society in the capitalist mixed economy world – is incompatible with strong sustainability because:

- 1 Perpetuation of economic growth is deemed to be intrinsically good – indeed aspects of the money and credit system depend on growth for their integrity – whereas this is actually impossible because the biosphere has finite limits.
- 2 Markets do not even acknowledge the services of ecological systems, or value the huge societal assets provided to humans through access to the biosphere. The assets and services that are essential to strong sustainability are not even part of the market mechanism, which therefore has nothing useful to offer.
- 3 It is held that humans are separate from nature and are therefore free to exploit it, which is untrue.
- 4 It is held that individualistic human activity will bring best outcomes, whereas strong sustainability requires that humans respond interdependently to the interacting ecosystems in which they are embedded.

A very different set of societal ethics and values is needed by those who commit to strong sustainability, including:

- 1 Placing great importance on non-material sources of happiness.
- 2 Removing the perceived linkage between economic growth, material possessions, and success.
- 3 Affirming the deep interdependence of all people. The associated community values include a robust sense of mutual respect, fairness, cooperation, gratitude, compassion, forgiveness, humility, courage, mutual aid, charity, confidence, trust, courtesy, integrity, loyalty, and respectful use of resources.
- 4 Affirming the value of local community, with associated benefits of reduced environmental footprints and increased cooperation between people.
5. Valuing nature intrinsically through knowing that human society and its political economy are integral and interdependent components of nature and the biosphere. Humans have reverence for nature and know that they are responsible for their impact on the integrity of all ecosystems in the biosphere.

These ethics and values are the core of the needed societal understanding about how to live within the Earth's limits and in harmony with people and all other species.

dominant in global and are fundamentally opposed activity must lie within of the biosphere

2.3 THE ESSENTIAL CONDITIONS FOR A SUSTAINABLE NEW ZEALAND

Based on the principles of strong sustainability discussed in sections 2.1 and 2.2, we propose that certain conditions must be met for New Zealand to become strongly sustainable. We propose a 'Core Condition', which is the ethical stance stated in section 2.2, but repeated here for completeness, and six 'Enabling Conditions' (overleaf). Although stated separately, it is obvious that they are all connected in practice.

CORE CONDITION: SOCIETAL ETHICS AND VALUES New Zealanders:

- Place great importance on non-material sources of happiness.
- Remove the perceived linkage between economic growth and success in their communities.
- Affirm the deep interdependence of all people – in New Zealand and in global communities. These ethics support community values that include a robust sense of mutual respect, fairness, cooperation, gratitude, compassion, forgiveness, humility, courage, mutual aid, charity, confidence, trust, courtesy, integrity, loyalty, and respectful use of resources.
- Affirm the value of local community, with associated benefits of reduced environmental footprints and increased cooperation between people.
- Value nature intrinsically through knowing that human society and its political economy are integral and interdependent components of nature and the biosphere.
- Have reverence for nature and know that they are responsible for their impact on the integrity of all ecosystems in the biosphere in which they are engaged.

ENABLING CONDITION 1

New Zealand limits emissions into the atmosphere, discharges into waterways and the ocean, and chemicals into soil, to levels within the assimilative capacities of the relevant ecosystems.

ENABLING CONDITION 2

New Zealand regenerates and grows natural and social capital to sustain the health and resilience of its people and their institutions, and the whole of nature.

ENABLING CONDITION 3

New Zealand substitutes renewable resources for non-renewable resources wherever feasible, and uses these as efficiently as possible. Non-renewable material resources are stewarded within closed cycles that maintain their quality, and non-renewable energy resources are used at a rate that is no greater than the rate of investment in their replacement by renewable energy sources.

ENABLING CONDITION 4

New Zealanders are broadly and deeply eco-literate and have a strong human-Earth relationship. Through education, they know that people are part of nature and ecosystems and understand that what they do to nature they do to themselves.

ENABLING CONDITION 5

Strong sustainability understanding is deeply embedded in all of New Zealand's governance, economic, legal, and educational systems, and all applications of these systems.

ENABLING CONDITION 6

New Zealand imports only from countries and regions that have produced goods according to strongly sustainable criteria and refuses to benefit materially from unsustainable practices offshore. All

New Zealand's exports are produced by strongly sustainable processes and practice.

The unavoidable problem with utilitarianism is that it is used to justify policies and actions that are immoral.

2.4 THE REQUIREMENT TO CHANGE NEW ZEALAND'S APPROACH TO ECONOMICS

The discussion of Figure 1 demonstrated that, in principle, a human society based on current mainstream economic and financial practices, that we have referred to as 'business as usual' (BAU), does not conform to the requirements for strong sustainability. This is as true for New Zealand as any other country where the mainstream model of economics and commerce has been adopted. This section explores how this situation has arisen and argues for major changes in the role and principles of economics. These ideas are then implemented in the scenarios presented in Parts 3 and 4.

Today's globally dominant economic model (BAU) is based on neoclassical economics, which is in turn based on utilitarian ethics and the principles of property developed from Locke's theory of the social contract. Locke established the primacy of individual and organisational property ownership, and the inviolability of contracts.

Utilitarianism states that an action is right when its outcome produces the maximum utility ('a measure of the relative satisfaction

from or desirability of consumption of various goods and services') or happiness, and the minimum amount of pain for humans in comparison with other relevant options.

The unavoidable problem with utilitarianism is that it is used to justify policies and actions that are immoral. Utilitarianism has been extended to the consideration of animal welfare, but not to other aspects of nature. It does not provide a comprehensive coverage of moral language and behaviour on which ethical theories need to be based.

A major problem with the concept of utility is that it is often impossible to assess even the shorter term consequences of our actions, let alone the longer term impacts. For this reason, the use of the utilitarian ethic in cost-benefit analyses has been shown to disadvantage poor people, future generations, and the environment.

The social contract is the process and outcome of justifying arrangements about natural rights by considering the agreement that would be made among suitably situated rational, free, and equal persons. Natural rights are those rights that human beings are supposed to have before government

intervenes. Natural rights, by Locke's reckoning, are life, liberty, health and property. According to Locke, any social contract establishing a government cannot morally be maintained if these natural rights are ignored. For Locke, people come to own previously unowned land by their investment in the labour of their land.

Locke's social contract theory falsely asserts the notion of natural rights to include the individual right to property. Locke ignored indigenous people's means of owning land. He established this concept of property rights at a time when the world was not overpopulated, and when indigenous people were assumed to possess no prior rights to their territories. These territories could therefore be appropriated by people whose values were perceived to be 'more highly civilised'. Locke's arguments do not provide an adequate conceptual base for modern thinking about property ownership that could be public, communal or individual. A further major weakness of his theory is that land and resources are seen in instrumental terms (being of value for human purposes only). It ignores the interdependency of humans on other humans, and the interdependency of humans on non-human entities and systems.

American philosopher Martha Nussbaum states:

'More deeply, we may need to call into question the whole idea of a social contract for mutual advantage as a way of thinking about choosing basic political principles. It simply cannot sufficiently express the dignity of those who give and receive care. Instead of a Kantian image of people, which stresses rationality and reciprocity, we may need to move more to an Aristotelian image, which sees dignity and need as subtly intertwined. Instead of picturing one another as rough equals making a bargain, we may be better off thinking of one another as people with varying degrees of capacity and disability, in a variety of different relationships of interdependency with one another.'

The founders of neoclassical economic theories believed in the existence of natural

by the development of far-reaching new understandings. By copying the equations of mid-19th century physics, economists fell victim to the assumptions of the time, but unlike physicists, who rapidly incorporated their new understandings into markedly different theories, economists held tenaciously to their now unfounded theories. Amazingly, these long-outmoded ideas still remain central in neoclassical economics.

According to neoclassical economics, market systems are closed and production and consumption are physically neutral processes that do not alter the sum of utility within the system. An associated tenet is that the resources of nature are essentially inexhaustible, and those that are not can be replaced by other resources or by technologies. Hence, our current economic paradigm assumes that there are no bio-

to flows of energy and matter, and do not exist in equilibrium but in a 'steady state' that is actually very far from equilibrium. Such systems exist in intimate and dependent relationships with their surrounding ecosystems, and are capable of complex forms of behaviour that are vastly different from those of the regular, equilibrium state of the economists' theories. The physicists of the time informed economists about this fundamental change in their theory, but were ignored. Thus, the mainstream of neoclassical economic theory and practice continues to adhere to faulty assumptions about planetary systems.

The result has been that neoclassical economics, starting from unscientific assumptions but using a formidable array of mathematical tools, has created a vast assembly of theories that have no real

A corollary of these erroneous economic theories is that the political economy of capitalism is based on the privatisation of profits by risk-taking owners of capital and by the socialisation of losses. This whole body of belief and practice is at the centre of the reasons why humanity and nature are currently on a collision course, and why so many governmental policies (on climate change, energy, waterways and soils, for example) are completely failing to address the real issues, let alone incorporate the understandings that might enable realistic solutions to be employed. In some cases, existing legislation could help to address the issues, but the dominant economic paradigm prevents it from being implemented.

In the long run, only solar energy (with modest amounts of energy from geothermal sources and tidal and wave movement)

...neoclassical economics, starting from scientific assumptions but using a formidable array of mathematical tools, has created a vast assembly of theories that have no real basis in fact, but appear very convincing to the scientifically uninformed

laws of economics that were analogous to the laws of physics. In the mid-19th century these laws were seen as the ultimate in scientific understanding. In their enthusiasm, classical economists used basic equations from physics as a template, and in order to formalise their ideas, substituted economic variables from classical economics for physical variables.

The problem with this approach was that the physics they used was soon to be outmoded

logical or physical limits to the growth and expansion of market systems, and has resulted in multiple forms of ecological intervention.

In reality, however, by the late 19th century, physicists had expanded their understandings to take into account radically new ideas, particularly those related to the second law of thermodynamics. These scientific advancements made it clear that all real systems are open, being continually subject

basis in fact, but appear very convincing to the scientifically uninformed. By promising outcomes such as continuous growth and infinite substitutability of scarce resources, economists gained positions of considerable power in government and commerce, and have been able to influence political and economic processes in ways that are now completely at odds with the idea of a resilient and sustainable relationship between humanity and nature.

can be relied upon for high quality energy inputs to maintain economic (or any other) activity. Given that the vast majority of solar energy captured on Earth is in the form of plant matter, we need to be cautious about assuming that solar energy is 'the answer' to our sustainability problems. Biofuel crops, while potentially very valuable, are likely to require substantial soil and water resources so will compete significantly for these resources with food production. Solar capture technologies currently require substantial investment

...only solar energy...can be relied upon for high quality energy inputs to maintain economic (or any) activity

of non-renewable material and energy resources (such as concrete and steel for hydro dams) and should therefore be seen as intermediate technologies, until these non-renewable resources can be replaced with renewable ones. These issues can be clarified by using measures of ecological footprint.

The current attempts to 'solve' the world-wide credit crisis by injecting large amounts of money into the banking sector may have some positive outcomes, but are nevertheless more like putting Band-Aids on a cancer.

Evidence has been mounting for more than a decade that the current economic system is failing. This view is supported by recent admissions from some of the most senior people in world economics and finance that they simply did not see the crisis coming. If economics really is a predictive science, why did they fail to do so?

If we look behind the news items, there are three defining aspects of the crisis:

- 1 Human consumption of resources making totally unsustainable demands upon the earth's ecosystems.
- 2 Appalling human inequalities and resultant social breakdowns in many countries.
- 3 An economic system that requires continuous and perpetual economic growth and that is dominated by financial markets and global corporations.

It is time to replace a 20th century economy designed and managed to serve monetary values with the culture and institutions of a new 21st century economy designed to serve life values.

2.5 THE GLOBAL DRIVERS OF CHANGE THAT NEW ZEALAND MUST BE PREPARED FOR

Any pathway to strong sustainability will be taken in the context of massive and unprecedented global change, most of which will arise from global unsustainable practices of the past and present. Through to 2030 and beyond, the global economy and community will be subjected to forces of unprecedented change, which will have profound and often divergent effects on nations, regions and communities.

It is important to distinguish between direct change drivers and other changes that are induced by decisions to attempt to mitigate their effects. For example, climate change (and corresponding extreme weather events) is a direct change driver that induced the Kyoto Protocol intention to partially expose emitters of greenhouse gases to the social costs of their actions and practices. The resulting shift of cost structures has itself become a major indirect change driver.

These major global change drivers will place great stress on economies, governance and

communities at all levels because all of these human institutions have evolved to cope with only relatively mild incremental change.

Further, there is a misalignment between the relatively short-term horizons of corporate investment and the long-term investment and preparation needed to address mitigation of most of the effects of the change drivers. An associated difficulty is that some of the effects of change are in the 'commons' – especially those involving the atmosphere and oceans – which the corporate sector struggles to value and therefore to invest in. In short, for several reasons, the market economy based on neoclassical economic ideology (the BAU model described above) cannot be expected to perform well, if at all. The alternative, of undertaking this investment through governments, exposes another difficulty. Elected governments also have short-term electoral horizons and so may not be prepared to face up to immediate expenditure for only long-term gains.

As the inadequacy of traditional economic and governance activity becomes apparent, it is inevitable that citizens will question the viability of the institutions involved, and the validity of the ethical stance (utilitarianism and the social contract) upon which they are based. Such disaffection is likely to motivate civil society to commit to pathways that take it to strong sustainability.

Initiatives aimed at achieving strong sustainability induce deliberate changes which can be seen as an overlay on the direct change drivers that will occur anyway. The induced changes may reduce or alter some of the direct effects.

MAJOR GLOBAL CHANGE DRIVERS

There is general agreement in the foresight literature that the major global change drivers to 2030 and beyond will include:

- 1 Degradation of global ecologies caused by population growth and human economic activity, further reducing the already grossly overloaded capacity of these ecological systems to 'clean up' pollution from human industry and consumption, and to contribute food, fibre, and energy.
- 2 Rapidly accelerating global climate change, with associated extreme weather, producing direct impacts as well as the indirect impacts of resulting policies of mitigation and adaptation. Within a few years, public concern about potentially catastrophic climate 'tipping points' will intensify.
- 3 Radical increasing trends in hydrocarbon (oil, coal, natural gas) prices and wider variations around the trend, caused by increasing costs of extraction, internalisation of carbon gas emission costs, and recognition of 'peak oil'. Substitution of renewable energy will increase, stimulated by these price trends, but will be insufficient to avoid major

economic and social disruption as whole sectors of global and local economies fail. In addition, nations that hold hydrocarbon reserves will seek increasingly to conserve and conflicts will result.

- 4 Poor and declining regional supplies of water (volume and quality) and consequent negative impacts on human health and mortality, and on agricultural food production. Regional conflicts will result.
- 5 Critical global food supply deficit as population growth further outstrips the ability of both subsistence and cash food and fibre production to feed humanity, resulting in widespread starvation, despite successful initiatives to minimise wastefulness.
- 6 Atmospheric and water-borne toxins and toxic substances having much more serious direct effects on the health and mortality of humans and many other species.
- 7 Geopolitical shifts and disruptions as nations and blocs suffer adverse conditions, adjust to change, and attempt to exercise shifts in relative economic and military power.
- 8 Wide swings in economic activity, including market failures and dislocations, as economic and financial institutions struggle – with declining success – to operate in a world that is shifting and changing beyond their ranges of competency.
- 9 Advances in computers, information technology, connectivity, nanotechnology, robotics and other technologies. Some of these will help to mitigate aspects of the changes listed above, but they will not provide a ‘magic bullet’.

There will be complex interactions between all of these change drivers. All are subject to uncertainty about timing and magnitude.

The changes will be outside the range of prior human experience in terms of magnitude, speed of arrival, and simultaneity (several change drivers occurring together so that their impacts reinforce each other).

The changes will cause abrupt and radical shifts in human living and work, creating risks and opportunities.

There will be complex interactions between all of these change drivers. The changes will be outside the range of prior human experience in terms of magnitude, speed of arrival, and simultaneity.

IMPLICATIONS FOR NEW ZEALAND AND ITS SECTORS, DISTRICTS AND COMMUNITIES

The implications for New Zealand of these global change drivers need to be analysed and understood so that appropriate responses and preparations can be made. Local change drivers should also be taken into account at this level.

Space does not permit a full review here of the plausible local scenarios that can be constructed in this way, but the following are indicative categories of effect:

- 1 Major shifts in land use, including retirement from production due to drought, flooding, and erosion. Climate change and energy costs cause major shifts in patterns of production of food and fibre and reduce aggregate supplies – in New Zealand and world wide – thereby raising prices, and shifting international trade flows. In many international regions

– but not in New Zealand – there will be huge food supply deficits.

- 2 Increased local food production, the introduction of policies for greater national and district self-sufficiency, and reduced reliance on international trade.
- 3 Significant changes in urban living patterns. First, more concentrated housing in CBDs and urban nodes in response to the greatly increased costs of commuting. Second, substantial depopulation of sprawling cities as citizens prefer to shift to semi-rural village environments where they can grow more of their own food and be closer to places of employment, which also decentralise.
- 4 Very low tolerance for industrial and household emissions to the atmosphere, contamination of water ways and ground water, and solid waste, with consequent major shifts in farming systems, manufacturing practice, physical distribution, and the heating of buildings.
- 5 Much greater emphasis on national and local self-sufficiency in energy, and constantly increasing costs of fossil fuels relative to alternatives.
- 6 Increasing rates of global human mortality due to poor and declining water availability and quality, crop failures, pathogens strengthened by global warming, and extreme weather events.
- 7 Increased geopolitical instability as power shifts, especially towards nations that are both politically unstable and ecologically precarious, with consequential risks to financial structures, economic activity and trade, and global ecological systems.

Despite the ‘doom and gloom’ tone of the list above, the changes will also provide substantial opportunities for new technologies, innovation and new business development, and for social and community enrichment. The ongoing transformational developments in computing, information technology, connectivity and robotics – although tempered by unstable investment conditions – will also provide much opportunity.

On the other hand, there is still an ‘elephant in the room’: the inevitability of catastrophic global warming tipping points being reached unless greenhouse gas emissions are reduced urgently and drastically.

The following quote¹ from an LA Times article by Bill McGibben, commenting on a Science article by James Hansen, makes the point:

‘People will doubtless survive on a non-350 planet, but those who do will be so preoccupied, coping with the endless unintended consequences of an overheated planet, that civilization may not. Civilization is what grows up in the margins of leisure and security provided by a workable relationship with the natural world. That margin won’t exist, at least for long, as long as we remain on the wrong side of 350. That’s the limit we face.’

When facing the prospect of change drivers that are uncertain in terms of timing and magnitude, the sensible human action is to anticipate and conduct foresighting, to assess the risks and opportunities, and then to respond and prepare. This enables people to address change with purpose and hope. Without adequate foresight and consideration they tend to regard themselves as pawns or even victims.

For this reason, there is an urgent need for all citizens to develop the following capabilities:

- 1 Skills in foresight analysis and interpretation, deep understanding of alternative futures, and anticipation of change.
- 2 Skills to think through and formulate responses to anticipated changes, often at short notice, and without useful historical experience to call upon.
- 3 Aptitude for decision-making and implementation in stressful circumstances.
- 4 Mental and emotional resilience.
- 5 Ways of achieving interpersonal cooperation, trust, respect, and a sense of community, while at the same time being always ready to challenge and debate assumptions and practices.

¹ The ‘350’ refers to the concentration of carbon dioxide in the atmosphere. The level is currently 385ppm and rising fast. Hansen asserts that irreversible tipping points will be reached unless this is reduced to 350ppm in the very near future.

PART 3 A SCENARIO OF A TRANSITION TO STRONG SUSTAINABILITY

This part describes what could happen in New Zealand – in its global context – during a transition to strong sustainability. It presents a scenario that has been prepared from the perspective of a person at a future time (date not specified) who is describing the changes that have taken place in the transitional period. Like all scenarios, this one is not intended to be predictive. It is a story that is plausible in terms of reasonable foresight analysis and judgements.

From New Zealand’s position now, in a state of strong sustainability, it is clear that its citizens were quite unready in 2009 to embrace the concept of sustainable living and the changes required to achieve it. Modern historians have marvelled at the fact that the 2008 General Election scarcely mentioned the subject, despite the substantial evidence of unprecedented future change which existed even at that time.

It has been hard, but the environmental profligacy by the so-called ‘baby boomer’ generation that caused most of the degeneration has been forgiven. The generation that followed, which included our 2009 leaders, could see no further than wanting to continue the fools’ paradise of their predecessors, but we have forgiven them too.

It is thought now that the prevailing ethical principles of that era, and the institutions of economics and governance that were derived from these principles, simply blinded most political leaders and citizens to the evidence

already in front of them. The few who did see the signs were largely ignored.

This myopia did not continue for very long. The drivers of major change that had been identified by 2008 all appeared, some with much more severity than had been envisaged. The doubters of climate change and ‘peak oil’ – the two change drivers that had most evident early impact – changed their minds very quickly.

One crucial development was the international agreement to curb fossil fuel consumption through a scheme of fiscally-neutral taxes and tariffs. This eventually replaced the carbon cap-and-trade scheme that was found to be cumbersome and costly in operation, subject to widespread cheating, and ineffective anyway.

The world economy became deeply recessionary. This was triggered initially by the turmoil in the money and credit system that began in 2007-2008, then snowballed into major declines in aggregate demand and international trade. It was spurred further by political unrest in several major nations and blocs, resulting in multiple regional conflicts. The economic forces supporting globalisation weakened markedly.

As this happened, some of the basic assumptions about global economics began to change. Investors realised that they could not expect long-term rapid global economic growth to resume and, hence, that the prices

of securities would in future have little or no component based on growth. This had severe implications for the performance of superannuation and pension funds, which had been constructed on the erroneous assumption that growth would continue in perpetuity. The role of money also changed. After the monetary debacles of 2007-2009, the problems associated with creating money as debt – and its derivatives – were increasingly recognised. Money supply processes became regulated and money itself reverted to its traditional role of facilitating the exchange of goods and services. These changes were the first in the shift to the new economics of ‘ecological capitalism’ which is discussed further in Part 4.

Water shortages and climate change led to declining population health and reduced food production capacity. As the situation worsened, many millions died each year from a combination of malnutrition, water contamination, toxins, epidemics, extreme weather events, regional wars over access to water and oil, and ideological conflicts.

Through all of these events, sensible decisions were taken in New Zealand whenever they were needed. With the benefit of hindsight we now know that if any key decisions had been mistaken or unduly delayed, our recent history would have been one of much greater confusion, chaos and hardship. There would have been a substantial collapse of human civilisation in this country, together with irreparable damage to our ecological systems.

New Zealand’s economic output fell markedly and its dependency on international trade reduced. Consequently, principles of regional and local self-sufficiency were introduced.

The years between 2009 and 2020 were very difficult – globally and in New Zealand – as the entrenched economic and governance systems struggled to cope, with deteriorating degrees of success.

As this severe inadequacy of the traditional approaches to economics and governance became apparent, movements in civil society began to question, with rapidly strengthening influence, the viability of the institutions involved and the validity of the principles upon which they were based. The advanced development of the original Internet had (and still has) great power in ensuring the connectivity of people who were now more physically separated. This facilitated the rapid spread of transformational initiatives that began in civil society, then acquired strong political interpretations in northern Europe and germinated quickly in New Zealand as well. The relative simplicity of government in this small country made it easier for the changes to evolve and become established.

In this gradual but insistent process, the traditional ideologies and institutions of economics and governance were rejected because they were failing and were replaced by alternatives that took years to evolve. The people who made these changes are now greatly respected. At the time, the chaotic global situation did not support optimism, but these people had hope and vision, together with the personal resilience and a commitment to find a path through the morass. Of course, those people who were still engaged with the traditional approaches tried strenuously to maintain them, but the evolving changes eventually prevailed. They were quite different to any previous approaches to political economy.

As a result of the reforms brought about by this movement, New Zealand is now strongly sustainable within its sovereign territory, and possesses substantial influence in other countries that are on a similar path. At the heart of our country are the ethical principles explained in section 2.3, and reverence for the sustainability criteria that they support.

Alas, the way to full global sustainability is still very much in the balance. Scientists believe that catastrophic global warming tipping points and runaway climate change have been averted but this is still not assured, so this is still ‘hanging over our heads’ despite our best efforts to contribute to mitigation. Global ecosystem degradation has been huge. Very turbulent climatic patterns persist and will do so for decades to come. Quite simply, New Zealand has shaped its communities and lifestyles to accommodate this situation.

PART 4 A SCENARIO OF A STRONG SUSTAINABLE NEW ZEALAND

This part describes the implications for people living in New Zealand when the conditions for strong sustainability have been met. It presents a scenario in several sections, each of which describes an aspect of New Zealand. The scenario has been prepared from the perspective of a person at that future time (date not specified) who is describing things as they are and commenting on the changes that have taken place. Like all scenarios, this one is not intended to be predictive. It comprises stories that are plausible in terms of reasonable foresight analysis and judgements. We acknowledge overlaps between some of the sections and some minor inconsistencies between them. This is because the sections have been written by several future historians.

4.1 GOVERNANCE AND LEADERSHIP

As we painfully felt the impacts of the economic and ecological meltdown on a day-to-day basis, we were finally able to see what had gone wrong. It wasn't our good intentions, and it wasn't that we didn't have enough information. Maybe there was too much denial and complacency – we were all busy. But more than all our failures to reverse unsustainable trends, our biggest problem was the lack of imagination. Our public and private institutions were too busy keeping 'the economy' going and never really tried. The leaders of these institutions only paid lip service. They lacked imagination and therefore did not actually lead. There were true leaders – creative artists, inspiring

teachers, visionary thinkers, innovative engineers, forward-looking people in business and government, young activists – but they could not by themselves bring about the change. Too much time and energy were wasted as the managers blocked progress with the institutional 'needs' of staying competitive and financially afloat.

When, after several years, the citizens of New Zealand realised that their institutions lacked the necessary imagination and leadership, they decided to change the institutions themselves. That made all the difference! Institutions are like ecosystems, they are living systems with forces of stability and forces of change. If institutions follow short-term economic rationality they will emphasise competition, stability and material growth. If they follow long-term ecological rationality, they will emphasise cooperation and change. The shift from pure economic to ecological rationality was crucial. No institution can succeed in the long run without wider ecological orientations (relationships with people, communities and the environment).

The breakthrough came by dealing with complexities and not just talking about them. Our governments, businesses, schools and universities began to develop strategies for dealing with complexities. They developed ideas they had never considered before.

The first idea was to realise what governance for strong sustainability meant. This kind

of governance has certain key features and components:

1 POLICY INTEGRATION

Effective integration for practical decision making based on acceptance of common overall objectives, coordinated elaboration and selection of policy options, and cooperative implementation designed for reasonable consistency, all based on long term sustainability strategies and including effective interaction between government and non-government institutions.

2 COMMON OBJECTIVES, CRITERIA, TRADE-OFF RULES AND INDICATORS

These include:

- Shared sustainability objectives
- Sustainability-based criteria for planning and approval of significant undertakings
- Specified rules for making trade-offs and compromises
- Widely accepted indicators of needs for action and progress towards sustainability.

3 INFORMATION AND INCENTIVES FOR PRACTICAL IMPLEMENTATION

New policy instruments such as ecological footprint guidance, ecological tax reforms, liability laws, product labelling, and pricing to include environmental costs.

4 PROGRAMS FOR SYSTEM INNOVATION

Policymaking frameworks that actively seek to identify, nurture, and coordinate action for sustainable technologies, co-evolving societal processes characterised by continuous changes in formal and informal institutions, and fundamental change in the systems of goods provision,

by using different resources, knowledge and practices.

Once these features and components were understood, the next idea was to think about the practicalities of change. They were summarised as 'transition management'. Transition management describes a governance-strategy that tries to combine long-term envisioning, multi-actor interaction and short-term actions based on innovation. Transition management broke with the old plan-and-implement model aimed at achieving particular outcomes. It is based on a different, more process-oriented philosophy.

KEY FEATURES OF 'TRANSITION MANAGEMENT'

- 1 Development of sustainability visions and setting of transition goals.
- 2 Use of transition agendas.
- 3 Establishment, organisation and development of a transition-arena (for innovative actors) besides the normal policy arenas.
- 4 Use of transition-experiments and programs for system innovation.
- 5 Monitoring and evaluation of the transition process.
- 6 Creating and maintaining public support.
- 7 Use of learning goals for policy and reliance on circles of learning and adaptation.

The transitional approach towards governance for sustainability was a sensitive start. It allowed for 'learning-by-doing' and step-by-step advances. However, like any strategy, the transitional approach also needed objectives, and central to these was a defined idea of sustainability. Governance structures needed to reflect the strong sustainability model: economy nested within society and society nested within ecology. We identified issues-based units and associated governance

structures with regional, river basin and local layers of governance. These are entities with spatially defined responsibilities for managing the landscape and landscape process from an ecological, social and economic point of view.

The ideas to explore ‘governance for strong sustainability’ and ‘transition management’ triggered off a whole host of other ideas about governance.

One of them was to further explore the way we make decisions. Our age is the age of democracy. We think that decisions affecting the public must be made in a democratic manner, albeit with strong and visionary leadership.

We have had to consider who is ‘the public’ in this age of sustainability. Today’s decisions, no matter how democratic or non-democratic, can affect people all around the world – now and in a distant future. Potentially, the entire planet is affected by decisions we make every day.

By 2015 neo-liberal economics had severely eroded individual welfare, society and democracy. Reclaiming lost ground, therefore, became paramount for disempowered communities and disenfranchised citizens. But this in itself was not enough. The big issue became whether the common good – the sustainability of life – could be ensured through democratic forms of governance. While the word ‘sustainable’ had been slapped onto everything from sustainable development to sustainable economic growth, sustainable communities and sustainable energy production, the theory of sustainability and what it means for the concept of democratic governance had hardly been discussed. Some thought that

sustainability was a mere ideal and rather removed from politics.

But even when it became widely accepted that sustainability was a journey as well as a destination, some clarity was urgently needed. Because the democratic institutions – governments, political parties, media – had remained fixated by economic growth, sustainable development had never been accepted as part of the global market ideology. The ‘displacement of the political by the market’ raised the question of how democracy and sustainability could ever be revived.

Fortunately, we in New Zealand strongly felt that both concepts were absolutely indispensable and that one could not be realised without the other. However, we also came to understand that the concept of democracy had to be reformulated and grounded in commonly accepted principles. Among these were the traditional principles of freedom, equity, and justice. To these we added strong sustainability. The search for a principled approach to democracy had occupied discourse for a long time. This pointed to the blind spot of democratic decision-making – responsibility not only for the here and now, but also for the there and then.

Once we asked the question about how democracy and sustainability could go together, we had a debate on fundamental values on our hands. That was a very healthy experience! It turned out that some people were only ever concerned with increasing their wealth. However, most New Zealanders knew that market ideology had profoundly failed us and looked for a new arrangement between the public, the state and the economy. Given the fundamental importance of sustainability it became increasingly clear that any such arrangement had to be based on

values and principles. After all, sustainability is foundational to society in the same way as freedom, equality and justice.

Sustainability began to fill the empty space of democracy. The money-and-power system had not completely colonised the democratic process, leaving a vacuum of silence that could no longer be ignored. Images of sustainability as ‘filling an empty space’, ‘adding a missing link’ or ‘providing a foundation’ became expressions of a search for a direction that was missing in governance and democracy in the first part of the 21st century. The previously dominant form of representative democracy had institutions and timeframes that favoured short-term gains over long-term responsibility. Overcoming this defect required a fundamental rethinking of governance.

The reason for the traditional short-term horizon of dominant governance was that representative democracy created political decision-makers whose performance was measured solely by their success in meeting voters’ immediate wants. There was little to be gained from meeting genuine needs, let alone the needs of future generations, or the planet itself. Short-term achievements were rewarded with re-election. In this sense, unsustainable decision-making processes were a deeply embedded characteristic of representative democracy. In exceptional cases, politicians responded to voters with a long-term perspective, but as a rule they made unsustainable decisions to keep their jobs.

It was a major step forward, therefore, to try to reverse this logic. Knowledge of sustainability was increasingly seen as a requirement for running for public office. Eventually, a Royal Commission for Governance Reform recommended some

procedural and institutional changes to the democratic system at national and local level, including:

- 1 A requirement that political parties have statutes that require the development of policies that are ecologically sustainable, economically efficient, and socially fair.
- 2 Crucially, a legislative framework was created that obliged politicians, administrators, and judges to implement sustainability. The definition and objective of strong sustainability was clearly specified in legislation and the new Constitution of New Zealand. In this way, all levels of decision-making – national, local, and corporate – are now underpinned by requirements to follow sustainability principles.
- 3 Independent statutory authorities were established to participate in public decision-making. Some have an advisory function, while others have veto power and legal standing as ‘guardians of the future’. Joint decisions by governments and these independent bodies are mandatory whenever the integrity of ecosystems is at risk.
- 4 Establishment of a ‘Commons Trust’ that manages resources held by society in common, thus ensuring that utilisation of these resources is strongly sustainable.

Although the actual arrangements were not too difficult to install, the process leading to them was a lot more laborious. As the various governments of the day had no sense of urgency and never admitted their own ineffectiveness, it was left largely to civil society to initiate and organise change. In New Zealand – like in most other countries – citizens, not governments, took charge. As a consequence, a far-reaching governance reform became inevitable.

One of the key elements for governance reform was the implementation of the principle of subsidiarity. This tenet holds that nothing should be done by a larger and more complex organisation that can be done just as well by a smaller and simpler organisation. So centralised governance is not used to perform tasks done equally or better by decentralised governance, and sustainability activities that can be performed at community level are being performed locally. The new Constitution of New Zealand followed the example of various European countries and guaranteed the autonomy of local communities to conduct their own affairs. Again, the big political parties were, for a long time, reluctant to support this idea as they feared that it would reduce their dominating influence. However, they could not overlook the many and ever-growing local action groups converting small towns and local areas to models of sustainable communities. Eventually, central government had to acknowledge that the leadership towards sustainability came from communities and their citizens.

An active citizenship will always be the only hope for democracy. In hindsight it is clear that citizens need to lead the change they want from governments. Likewise, consumers need to lead the change they want from producers. 'Ordinary' members of our social institutions need to provide the leadership they expect from their leaders. This leadership has supported the development of the required functional and systems perspectives and fields of expertise.

Our experience has been that values-based governance in governments, corporations, schools and universities only happens if the 'users' lead the way. The sustainability issue, therefore, called for a new understanding of citizenship.

This new citizenship is global and ecological. Without a strong sense of global ecological citizenship, governance for sustainability would have never been achieved. Only by taking the global citizen's perspective could we, as New Zealanders, understand that our traditional forms of governance had to go.

Within this new political context the long-term issues relating to Maori – especially the settlement of Treaty claims and rights regarding the foreshore and seabed – were resolved to the satisfaction of all citizens. Aspects of the successful application by Maori of the model of specific trusts were implemented more widely by other communities as well.

4.2 THE ECONOMY, POPULATION, INFRASTRUCTURE AND INDUSTRY

This part of the scenario has seven sections:

- The economy, international relations and trade
- Population and immigration
- Physical infrastructure – transportation, energy and water
- Social infrastructure – education and health care
- Manufacturing and urban industry
- Rural land use
- Food production and consumption

THE ECONOMY, INTERNATIONAL RELATIONS AND TRADE

The size and success of the New Zealand economy is no longer measured in financial terms. The concept of economics has shifted radically since 2009. It now focuses on human society's most precious asset – its stable and sustainable presence as an integral part of the ecology of all life. All human activity is continually planned ('budgeted'), monitored, and adjusted to ensure that the conditions for

this are maintained within the sovereign land territories and oceanic rights of New Zealand. Material growth is no longer central to economics, which is now concerned with the process of efficient production and delivery of needed goods and services within the limits of economic integrity. GDP is no longer our measure of economic performance. Years ago, we saw the nonsense of attempting to measure human wellbeing as the cost of resources used in the economy! Our economy has market mechanisms and forces that work to maximise community wellbeing and the happiness of individuals within the requirement for ecological integrity. All investment proposals are now evaluated in terms of their impact on ecological integrity, then on their contribution to community wellbeing and happiness. When financial evaluations are needed, we use an agreed social discount rate.

Most of this planning and adjusting is undertaken autonomously by citizens who live by their ethics and principles and so simply know what is right. Our governments – national, regional and local – do the monitoring and intervene in matters that require these levels of focus. The methods used for monitoring and managing the human interface with the rest of nature are complex but transparent to everyone. They were developed from the concepts of 'ecological footprinting'; the 'systems conditions' introduced by The Natural Step; the 'rules' proposed by Daly; the General Progress Indicator; and 'solar budgeting' (also called Net Primary Production) – all of which were first developed well before 2009.

The various levels of government still have financial budgets and controls, but these are regarded now as processes for ensuring financial accountability within the context of human ecological accountability.

The size of the material economy (as measured in earlier times by GDP) is very substantially less than it was in 2009. This reflects the ethical rejection of material consumption as the principal source of human happiness. This has been replaced by the joy experienced by humans when they know that they are in harmony with nature and the deep satisfaction of having the orientation and energy to share many kinds of experiences with other people, especially with family and friends, and within local communities.

The role of money has reverted to its essence – facilitating exchange of goods and services – and wealth no longer equates to accumulation of money. The supply of money is regulated to support the volume of market transactions. It is no longer created by issuing debt – the process that was at the centre of the global recession that began in 2008.

Business enterprises flourish within a shifted concept of what businesses are, and their role in New Zealand society. The notion of a limited liability company, which could essentially do what it liked (within the law) to maximise outcomes for financial investors, has gone. It was an artefact of the old utilitarian ethic. Each enterprise now has a mandate from our new public authorities to operate in a specified field of product and service delivery. Competition is encouraged, but is now conducted on the basis of independently published information about resource use, customer satisfaction, community impact and 'ecological footprint'. Market forces ensure that the owners of enterprises that succeed on these terms receive fair returns on their investments. Persuasive brand advertising and promotion is considered by most citizens to be pointless, so is very rare. New market entrants and

innovation are encouraged through awarding trial mandates. Similarly, mandates are withdrawn from enterprises that transgress ecologically.

The ecological standards have the practical effect of permitting only very low levels of gaseous emissions to the atmosphere, contamination of water ways and ground water, and land deposits of solid waste. Systems for manufacturing and land based production of food and fibre have all adjusted to these regimes. Many of these systems have higher cost structures than their polluting forebears and acceptance of this is an essential aspect of New Zealand's ethical principles.

Since 2009 there have been major shifts in land use. Some were forced by climate change and weather events, and others by the adjustments required by the process of becoming strongly sustainable.

Electricity is the major form of energy for all applications, and none is generated from fossil fuels. Hydro is still the major renewable source of electricity, but there is also significant generation from wind, tidal, wave-power and non-polluting geothermal fields. A substantial proportion is generated locally from solar and small wind turbines, with local storage. Use of fossil fuels by vehicles is limited to the very few essential applications where no alternative technology is yet available. This has severely affected air travel and freight, because most is not deemed essential and non-fossil fuels have not yet proven satisfactory. International travel by high-technology ships is flourishing, as are meetings between physically distant people through advanced connectivity such as holographic conferencing.

Personal travel and transport of goods are carried out in vehicles using renewable alternative energies. Mass transit, bicycles, and electric vehicles have become the norm.

Most human living is now structured around small 'villages,' most of which are semi-rural, with some remaining inside larger urban settlements. The village provides most of the necessities of life, including schools, clinics, and shopping, and most employment is within easy walking or cycling distance. Major institutions, such as universities and tertiary-level hospitals are located to serve regions.

A high proportion of food is grown locally and seasonally. Nearly everyone has a plot of land and is involved in growing some of their own food. This has been one of the most effective ways of helping people establish the intrinsic value of non-human entities and systems. The farmers' market concept is very popular.

Productive land may still be privately owned but this has a new meaning. Ownership is now conditional on continual demonstration of ecological stewardship according to rules and standards established by our new community and national public authorities. Any land owner who persistently fails to meet stewardship criteria is required by law to sell the land. Ownership of dwellings also remains mainly private, and they are built or redeveloped using sustainable design techniques and materials.

There is a real sense of community that was missing from life in 2009. Village functions are within cycling distance, and public transport connects village communities to each other and to bigger centres where universities, specialised hospitals, research facilities, and large-scale arts complexes are located.

Because of the reduction in consumption and waste, there is only moderate need for paid labour and money income, although there are jobs for all who want them. Many full time jobs are shared between two or three workers.

People devote much more of their time to leisure, but rather than taking leisure vacations far from home, they are more likely to pursue community activities (such as participatory music and sports) and public service (such as day care and elder care). Some of this time is exchanged using local community currencies such as time banks.

Unemployment has become an obsolete idea, as has the distinction between work and leisure. People are able to do things they really enjoy much more of the time. Although physical travel has decreased, people communicate electronically over a much wider web, and physical travel is treated as the privileged learning opportunity it is: we travel more slowly, for longer durations. Ours is a truly global community maintained with an appreciation of, rather than a requirement for, physical travel.

Immigration policy and population size are central to New Zealand's economy and its international relations. This has been one of the most difficult issues to resolve on our path to strong sustainability. It is discussed in the section below.

New Zealand's international relations are now centred on its widely-perceived position as an exemplar of strongly sustainable human existence. It links closely with other nations and international movements that have similar objectives. The number in this group is now expanding rapidly.

New Zealand's ethical principles determine that it can import only from countries and regions that have produced goods according to strongly sustainable criteria: we refuse to benefit in a material sense from unsustainable practices offshore.

Traditionally New Zealand's pastoral farming systems produced high quality protein foods (mainly milk-based, lamb and beef), as well as fruit, at relatively low costs by world standards. As we moved on the path to strong sustainability, we quickly found that these farming systems were unsustainable because of their reliance on synthetic fertilisers, chemical herbicides and pesticides and pasture grazing practices that polluted waterways. Therefore, these farming systems were phased out and replaced by innovative new systems that are strongly sustainable. However, these farming systems, and the strongly sustainable food processing and manufacturing that utilise their raw materials, have cost structures that are significantly higher than other world producers who still use unsustainable systems (despite the sharply increased prices of the synthetic fertilisers that these producers still use). Thus, New Zealand producers no longer attempt to compete in world commodity markets. Instead, their international customers are in market segments that attach premium value to New Zealand products because they are produced in strongly sustainable systems, as well as their intrinsic quality. Although export volumes of protein foods (dairy and meat), fruit, and wine have declined markedly, price increases have more than compensated the higher unit costs of strongly sustainable systems for production and processing.

POPULATION AND IMMIGRATION

Unfortunately, the world's human population still greatly exceeds the Earth's ecological carrying capacity, although massive attrition continues.

New Zealand, however, has a human population that is consistent with strong sustainability and is demographically stable. This has been achieved in two ways. The core mechanism is a citizen-led and voluntary approach to managing the birthrate. This has arisen directly from the ethical principles that are held so dearly. Citizens understand and accept that human reproduction is not a matter of individual rights but an aspect of societal stewardship.

This approach to birth rate management has been complemented by immigration policy. This policy evolved over a long period of grappling with a moral dilemma. This arose because the citizens of New Zealand were (and are) staunchly committed to ecological integrity – first getting to it, then holding to it – while, at the same time, there were large numbers of people wishing to emigrate to New Zealand. As the pressures of huge global change built up – especially climate change, population growth, ecological degradation and food deficits – millions of people who were termed 'eco-refugees' sought to move to countries such as New Zealand that were relatively less affected.

New Zealand adopted a clear policy of accepting immigrants but with numbers limited to the carrying capacity of our ecosystems. All appropriate technologies and management techniques have been applied to maximise this carrying capacity.

This prompted urgent research into what the carrying capacity of these ecosystems would

be if they were subjected to various human lifestyles and food production regimes. It turned out that the carrying capacity in terms of human population was far lower than some offshore analysts had suggested. This was because they had greatly over-estimated greatly the area of productive land in New Zealand and the fertility of its soils. A large proportion of the New Zealand land mass is mountainous or steep hill country that cannot be farmed. Steep land that was farmed has been withdrawn because this land use is not sustainable. Moreover, most New Zealand soil types are naturally much lighter and less fertile than had been assumed by some of these offshore commentators.

Thus, the number of eco-refugees that New Zealand has been able to accept is lower than many commentators expected. This has made New Zealand vulnerable to uninvited international interventions in a still overpopulated world, and there have been several hostile threats. However, the collective voice of the movement for global transformation to strong sustainability has prevailed to protect our position. This has been supported by New Zealand's great willingness to share its experiences and the many technologies that it has developed. The fact that the military and logistical strength of most countries has declined in association with economic recession has also been helpful in this respect.

PHYSICAL INFRASTRUCTURE – TRANSPORTATION, ENERGY, AND WATER

Twentieth century infrastructure was like the blood in our veins that connected, transported and provided the resources essential to our lives. It enabled people to extend beyond the capability of their human bodies and free themselves of the geographical boundaries that defined resource availability that would otherwise have limited our social and economic development. The last century saw a world dominated by big projects; dams, roads, pipes and pylons. They opened up the rural communities and the suburbs; it seemed that they would continue to expand, providing an ever more resource hungry world with limitless opportunities for growth.

Then the world exceeded its ecological footprint and energy demand started to outstrip supply with consequent sharp escalation of prices. Contaminants – especially greenhouse gases – were widely acknowledged to have a detrimental impact on human and ecological health. World markets took a dive and by 2010 the world had begun to change. Infrastructure, while still an absolute requirement for the future, took on a different form.

The escalating price of oil and fierce competition for access to remaining supplies, which imposed threats on the reliability of oil supplies, coupled with heightened global efforts to reduce carbon dioxide in the atmosphere, focused New Zealand intensely on redefining its infrastructure.

Initially and critically, our telecommunications networks with broadband for everybody soon became available. Surprisingly, given the prevarication in supplying that

service in previous years, this was the easy part, delivered while energy and transport were reasonably readily available. This world-class communications system enabled more New Zealanders to work from home or to enjoy the alternative community environment of shared work facilities close to their residences.

New industries evolved to deliver a range of small scale distributed but networked energy sources such as small hydro, solar and wind, and the development of a global centre of excellence in wave and tidal power. We also perfected the technology for producing biofuels from lignin, a waste product of sustainable forest management systems. At the same time energy demand was dramatically reduced. A large proportion of New Zealand homes were retrofitted to be far more energy efficient, and healthy as well. With hugely reduced domestic demand, remaining energy requirements were mainly provided for on-site with the grid acting as a giant battery. No more major power generating stations were built after 2010; no more major rivers had to be dammed. The social benefits were huge, with domestic energy bills vastly reduced and all New Zealanders able to enjoy snug, healthy homes.

The policy context for this development was a massive injection of funding into retrofitting homes. The prediction that social and economic benefits would be gained through a reduced need for health care, and even reduced crime, proved to be accurate. It surprised many of our political leaders how many of the social ills of the country were attributable to poor urban design and housing. Policy and economic incentives were also put in place to encourage research and development, especially in green technologies such as renewable energy. New Zealand

followed Germany's lead to incentivise, for an initial period, rapid uptake of renewable and distributed electricity generation by purchasing on-site generated power at prices higher than grid customers paid for their power.

Transport was always a key issue for a sparsely populated long narrow country with a dependency on tourism and land based production. By 2025 we had stopped debating where to spend our transport infrastructure dollars. Few new major roading projects were started after 2012. Instead, existing roads were reconfigured for better public transport and, within metropolitan areas, cycle lanes and networks were abundant and well used. Of course, increased density and mixed-use housing also meant less travel. The rail network had been rebuilt, at considerable cost, but without it the prohibitive double whammy of energy prices and the price of carbon would have virtually brought the country to a standstill. Thank goodness the government elected in 2008 had the foresight to make that courageous investment, without which many smaller towns may have died through lack of connectivity with larger centres. The electric trains were fuelled through a mix of wind, solar, tidal, and wave generation, and biofuels. Legislation had been introduced to ensure that key arterial transport routes – road, rail or shipping – had priority for energy sources over non-essential transport, although the massive shift in people's travel behaviour since 2010 has meant that there has been little need actually to enforce this legislation. Air travel has been significantly diminished as the technology to replace aviation fuel is still not available at affordable prices. It remains the focus of much research, however development is slow.

Water services have also changed dramatically. Water is no longer seen as a carrier

of waste. Every attempt had been made to reduce demand and ensure that only pure water re-enters the environment. Projected new water supplies around the country were not needed due to the wide-scale rapid uptake of very water efficient products and appliances. A key driver for that change in New Zealand was the energy used in both the water services infrastructure and providing hot water within the home. Banning the older style products seemed a bit draconian at first but within a couple years, using those products became second nature. Rainwater tanks were built into the structure of new buildings, both for enhanced storm-water management, hence minimising environmental impacts, and providing a supplementary water supply. Wastewater recycling became common and councils took on a role of ensuring their communities had fit-for-purpose water services through a range of technical and often financially incentivised mechanisms and with a variety of operational service provisions, rather than only providing a reticulated supply.

Now, sufficient infrastructure is available to provide our needs, given that our perceived needs are less resource intensive than before. It feels good to be more aware of the Earth's limitations, to not take key resources so much for granted and to be an integral part of the solution to living within a sustainable ecological footprint. Having the ability to work from home or locally, being more self-sufficient in energy and water, having the resilience to cover major infrastructure shortages and a much improved public transport system have turned out to be very positive for our overall wellbeing. Rather than restricting our potential, many people are thriving on the feeling of more control over their everyday lives.

SOCIAL INFRASTRUCTURE – EDUCATION AND HEALTH CARE

EDUCATION

The role of education and the approach taken to it has changed greatly since 2009. At that time, education was based on a presumption that 'business as usual' would continue. Changes in the context of education were incremental and centred mainly on developments in computing and electronic connectivity. This comfortable situation was shattered when radical initiatives were required to cope with forces of unprecedented global change, which had profound effects on regions and nations, including New Zealand.

The changes were outside the range of prior human experience in terms of magnitude, speed of arrival, and simultaneity. They caused abrupt and radical shifts in living and work patterns, and placed great stress on economies, governance and communities at all levels over a period of many years. There were complex interactions between the drivers of change and all were subject to uncertainty about timing and magnitude.

After a period of denial and inertia, the role of education shifted to focus much more on preparing people to anticipate and cope with major changes in their living and working environments with hope and satisfaction. It was recognised that if people were not prepared in this way, there would be great risk that they would succumb to anxiety and fear, which would be inherently harmful to themselves and to society as a whole. Five new learning programmes were brought into mainstream curricula at appropriate levels:

- 1 Skills in foresight analysis, deep understanding of alternative futures, and anticipation of change.

- 2 Capabilities to think through and formulate responses to anticipated changes, often at short notice, and without useful historical experience to call upon.
- 3 Decision-making and implementation in stressful circumstances.
- 4 Mental and emotional resilience.
- 5 Ways of achieving interpersonal cooperation, a sense of community, and trust and respect.

These changes were radical for traditional education for two reasons. First was the emphasis on understanding a new future rather than relying on an assumption that projections based on the past and present would suffice. The second reason was the much stronger requirement for personal development, life skills, and interpersonal behaviours.

These needs and priorities remain today as the core of education in our strongly sustainable New Zealand.

A second radical initiative was a deliberate community choice made as an essential part of the decision by New Zealanders to adopt a pathway to strong sustainability. Education – formal, and within the community – became an integral part of the national determination to understand very clearly how all aspects of society and the economy had to change to achieve strong sustainability. Developments in education focused around three objectives:

- 1 Building awareness of the need for strong sustainability.
- 2 Understanding the systemic principles of strong sustainability and specific practical approaches.
- 3 Embracing freely the ethical shifts needed to commit to strong sustainability.

Education in the field of shifting ethical perspectives was especially challenging because it dealt with matters traditionally either taken for granted or left to individuals and families, and their religious organisations and political affiliations. Because ethics underpinned our agreed social change, it became a matter for mainstream education.

These two major initiatives introduced from the outset a requirement for education to reduce its focus on individual subjects and disciplines and, instead, to introduce more cross-disciplinary systemic perspectives and futures orientations. This was difficult because education – especially at the tertiary level – had become deeply embedded in disciplinary specialisation. The education system had also become highly structured and bureaucratic. It could not continue in this form. The formality has been cleared away so that education can respond rapidly to change and fulfil its essential role in our strongly sustainable society.

Now, the disciplines of economics, sociology, and civics are seen to be part of ecology – the human part. This has brought together studies in the fields of biology, physics, and social sciences, which are now regarded as a systemic whole, in which human interdependency and our oneness with nature are integral aspects.

Our entire approach to education is now based on the principles of being strongly sustainable and on how to maintain this condition at the levels of fundamental ecological science, the new economics, governance, society as a whole, local community and family. Education also has a core global and international orientation. Citizens have the knowledge and skills to assess continually

the global change still in progress, and New Zealand's positioning and role in international affairs.

We see that the core purpose of education is to ensure that each citizen has the wisdom, knowledge, and skills that are required to live, contribute, and play in ways that are in harmony with the whole of our strongly sustainable society.

HEALTH CARE AND WELL BEING

Global changes have had major implications for health care. Tropical and subtropical diseases are now more prevalent, and previously unknown diseases have manifested as a result of warming and climate change.

Improved housing has brought improved health and reduced use of individual cars has lessened traffic injuries and deaths.

Strengthened family and community values have resulted in older people now being more likely to be part of extended families, rather than separated off into retirement villages, as was so prevalent in 2009. Changes in pension and superannuation schemes have also encouraged this shift.

The pharmaceutical industry now has a less aggressive profit-motivated approach, and a 'more biological and less chemical' perspective.

Due to our citizen-led and voluntary approach to managing the birthrate, many women now choose not to have their own children and they, and couples who are not able to have their own children, participate in the experience of caring for children and grandchildren through extended family and local community networks.

We now eat nutritionally better food, much of which is grown locally and, often, personally. Demand for cheap but nutritionally inadequate imported food has diminished. We have a high level of knowledge about establishing a sustainable food chain and we have achieved this. Individuals take more personal responsibility for their health and safety than was the norm in 2009. This has resulted in healthier lifestyles, better diets, more exercise and less stress.

Primary health care focuses much more on health education, disease prevention and earlier diagnosis of disease conditions. Compared to 2009, we have a far more balanced approach to wellness with natural therapies and traditional medicine integrated with medical practice.

Community health services are tailored to respond to local health issues and are more proactive, efficient, and effective. Intelligent IT and remote diagnosis and treatment systems (such as remote surgery) reduce treatment delays and keep the need for expensive interventions at low and sustainable levels.

Village community networks proactively contribute to wellbeing and health systems. Intergenerational understanding and mutual support is strong in these systems.

Practical life skills and knowledge are highly valued. Collective quality of life is valued more highly than individual prestige, celebrity and personal wealth.

However, we are still coping with legacy health issues (diabetes, obesity, mental health, cancers, cardio-vascular disease) arising from the effects of pollution, GDP-driven lifestyles, and the breakdown of ecosystems.

The responsibility for health is accepted much more at personal and community levels, with a reduced requirement for government to take this responsibility. There is public acceptance that all 'ills' cannot be fixed by technological and medical advances. The speed and scale of societal transformation has driven the shift to this culture of self responsibility and self sufficiency.

MANUFACTURING AND URBAN INDUSTRY

Manufacturing now operates within the limitations of ecological integrity.

This process of change has been slow but the sustainable manufacturing movement is now mainstream. The principles of industrial ecology and bio-mimicry are now fundamental to all aspects of manufacturing. Industrial ecology uses the principles of nature to better organise industrial systems and biomimicry applies selected concepts found in nature to product design.

Because we have moved away from the competitive model of business to one of stewardship, commercial organisations now routinely share their technology and innovations.

We manufacture locally unless it is more strongly sustainable to import. Where we are importing we are trading with overseas manufacturers who share our values. Industry follows people and vice versa (reducing commuting and goods transport). Our exports are all produced by strongly sustainable processes and practice.

We have moved totally from the old model where the manufacturer made a product, consumers used it for a time, then threw it

away, to a new model where manufacturers take responsibility for the full lifecycle of every element of what they manufacture. The new model has consumers hiring durable products from manufacturers who then reuse or recycle components and resources when they are returned.

Packaging is now minimal and restricted to product protection and necessary containment. Packaging is totally appropriate to the product and is recycled after use so there is zero waste. Most digital products (the old CDs, DVDs, etc) are only available online and hard-format players have become largely obsolete.

The Government facilitated the transformation of manufacturing by regulating the need to meet the conditions for strong sustainability without prescribing how these would be met.

Not everything changed. We still drink beer and wine and it comes in reusable bottles!

The strongest driver of change in manufacturing was a huge increase in the prices of hydrocarbon fuels and materials such as plastics that were derived from oil. There has been massive substitution of plastics by biomaterials that are derived from natural fibre (mainly wood) and various resins and polymers also derived from plants. They have properties and practical applications at least equivalent to the plastics and metals that were so prevalent in our unsustainable past, and they are biodegradable.

Non-degradable industrial waste, toxic dumps and landfills that were associated with our old ways of manufacturing were incompatible with strong sustainability, and are now not required.

Our sustainability principles, resource scarcity, and changing cost structures also expedited redesign of products. Consumers now have a much stronger appreciation of well designed products that add value to their lives as well as conforming to ecological requirements. Product designs are publicly rated on effectiveness in use, ecological impact, durability, and recyclability. New Zealand went through a period of scarcity of eco-designers and eco-design knowledge, but we are now recognised as among world leaders. Designers and manufacturers have transformed their sector to one that creates beautifully and intelligently designed products that holistically benefit society. This transformation was fuelled by the changed priorities of our new ethics and values.

RURAL LAND USE

Rural land use has changed greatly since 2009. Early changes were forced on us by climate change – especially extreme weather conditions – and by energy prices. More recently, the changes have reflected our holistic view of what is required to be truly sustainable: that we must live in harmony with nature, accepting its services with gratitude but never compromising its sustainability.

There has been major reinvention of farming and horticultural production systems. Before New Zealand took its pathway to strong sustainability pastoral and arable agriculture, and horticulture, depended on manufactured synthetic fertilisers (mainly phosphates and urea) to augment most soil types that are naturally relatively light and infertile. These fertilisers can no longer be used, although trace elements are applied in certain soil types in which they are deficient. The totally natural (biological) replacement systems that were developed and introduced

over many years have had the required result of eliminating nutrient runoff into streams and groundwater. Soil structures now have much stronger ecologies of micro-organisms. However, the productivity of commercially farmed land, measured as human food nutrient production per hectare, has fallen and the costs of producing food commercially have increased.

By world standards New Zealand is no longer a low-cost producer of dairy protein and sheep meat. Offshore competitors who still use unsustainable farming practices have lower cost structures. This radically changed the competitive position of New Zealand producers in offshore markets for foods. It required strategic refocussing on target markets that value products that are produced sustainably and where customers are prepared to pay for the additional costs involved.

Within New Zealand, our underpinning principles have resulted in far more food being produced locally in quite small-scale operations that have strong community and family involvement. The productivity of some of this land is very high due to intensive use of voluntary labour.

The roles and objectives of forestry have also shifted radically, moving from a dominant wood fibre orientation (logs, sawn timber, and pulp) to recognition of multiple sources of value in forests. Apart from provision of industrial fibre for biomaterials, these values are derived from carbon sequestration, biofuel production, land conservation, heritage, and amenity uses. Forestry is no longer focussed exclusively on radiata pine, although that species remains widely grown. A variety of species now provide different sources of value.

CHANGES DUE TO GLOBAL WARMING, CLIMATE CHANGE AND EXTREME WEATHER

By 2015 the incidence of more frequent and severe storms placed most North Island steep hill country sheep and cattle farms at very high risk of major erosion. This land has been retired from pastoral farming, and is now in conservation forest estates. These estates combine managed reestablishment of native bush ecosystems with forests of species such as radiata pine and redwoods that provide more intensive long-term carbon sequestration. Some of these conservation estates have been vested into the care of Maori trusts, reflecting historical stewardship of these tracts. Rural communities have been retained and enhanced through the employment required by the conservation estates, by amenity-based enterprises including eco-tourism, and for local food production on the arable land of valley floors. The policy of retiring the land from pastoral use included public purchase at fair value, which was a major social investment.

Maintenance of infrastructure on some flood plains became increasingly difficult and costly as severe storms became very frequent. Some river stop banks have been raised and strengthened so that farming and horticulture continues, but others have been abandoned and the land has been retired from agricultural use and is also managed as conservation estates as it reverts to natural ecosystems. Roads and electricity lines have been realigned to avoid these areas. Pastoral and horticultural land that has been retired in this way was purchased at fair value.

Eastern regions became much more drought-prone. In the driest districts, pastoral and arable farming became unprofitable and

has been abandoned. These areas are now conservation estates and have amenity value. In dry districts where irrigation was possible, management of water usage became a major issue, especially as social policy addressed allocation of water across hydro, irrigation, amenity provision, and conservation values. These issues have been resolved through our dominant principle of maintaining the integrity of ecological systems.

Most of the long-term influences predicted by the IPCC report of 2007 began to be felt in the period 2010–2020, especially warming-induced increases in the range and incidence of pests and diseases, and migration southwards of subtropical pasture species and weeds. This resulted in shifts in locations of some farming and horticultural enterprises and changes to the production systems they use.

CHANGES DUE TO ENERGY PRICES

The real prices of oil-based energy products and natural gas (including carbon emission costs and taxes) increased 300% by 2015 and five-fold by 2020. Prices also became more volatile within this rapidly rising trend. This had huge impacts on the economics of all land-based production, logistics, processing, and transportation to domestic and international markets. Domestic food production moved closer to its consumers. Export production and processing shifted to high-value products that could better absorb energy costs. Food and fibre processing became less energy intensive. The traditional international market positioning of New Zealand land-based industries as low cost producers was no longer tenable. These were difficult times for the sheep, beef and dairy industries as they were forced to adjust to rapid change in cost structures, and reduced market competitiveness of traditional

products, while also dealing with the early impacts of climate change.

Increasingly attractive land use opportunities for crops as energy sources placed further competitive pressure on these traditional enterprises and these crops – especially willows – are now well established.

Since 2009 the science of greenhouse gas emissions has been used to develop ever more precise policy measures. Some of these have applied strengthened disincentives and incentives to a wider range of alternative land use enterprises. These policies now recognise more deeply the complexities of the impact of land use decisions on atmospheric carbon. They are applied in the context of enterprise systems and, in addition to the traditional impacts of plant and animal use, now include recognition of the carbon sequestering effects of soil management through use of bioactives and substances evolved from our earlier biochar technology. Sequestration in soils became much more valuable as the costs imposed on use of fossil fuels eventually increased to levels that curbed consumption of them.

CHANGES DUE TO IMPLEMENTATION OF THE CONDITIONS FOR STRONG SUSTAINABILITY

The changes in New Zealand rural land use outlined above would have occurred even if our society had not chosen to take a path to strong sustainability. However, we did take this path, and further radical changes in land use have followed from this decision.

Our ecological standards have, for many years past, allowed only very small releases into water ways and ground water of phosphates, nitrates, and other residues from chemical fertilisers, the use of which is now close to

zero. The use of most chemical herbicides and pesticides is now banned because they do not meet standards of minimum soil and atmospheric contamination.

Hence, the ‘scientific farming’ systems that were so productive and popular in 2009, especially for the pastoral systems in dairying and intensive beef, sheep and deer farming, are no longer feasible. Their effects on waterways, ground water, and the ecology of soils were much too destructive to be sustainable.

The industry resistance to changing these systems was strong and protracted, but two factors eventually enabled the shift. One was that an increasing number of farmers subscribed personally to our ethic of strong sustainability and so wished to change their farming systems as soon as innovation, backed by a ‘new science’ of farming, had shown the way. The other was that, as early as 2008, several innovators had already begun to show the effectiveness of bioactive organic fertilisers and feeding systems that reduced the level of contamination of streams and groundwater from animal dung and urine, while actually improving both soil health and the overall productivity of the land. The livestock farming systems now in use have been developed from these beginnings. These systems do, however, incur higher costs per unit of output. This has steered the dairy and meat industries towards international niche market segments that pay premium prices for highly nutritional products – especially protein-dominant – and which also value the products by virtue of the ethical principles by which they have been produced.

A greatly increased proportion of land near to population centres – which includes many more rural villages – is now used for vegetable and fruit production as well as for

specialty cheeses, yogurts, eggs, and meats – all for mostly local consumption. Local ‘farmers’ markets’ are flourishing. More of the land around dwellings is also used for vegetable gardens and orchards.

CHANGES IN USE OF LAND FOR FORESTRY

Use of land for forestry has changed substantially since 2009. Some of this change has arisen from retirement of at-risk pastoral land to meet conservation values, as already described above. Much of this estate is managed re-establishment of native bush ecologies. Another aspect of the ‘new forestry’ is social investment in long-term sequestration of carbon dioxide and in plantings around margins of rivers and lakes as part of water quality enhancement regimes. Most of these estates have significant amenity value as well as their primary purpose and provide locations for limited volumes of specialised tourism.

The core of the forestry industry remains radiata pine plantations, but the areas of clear felling and harvesting methods are now managed to minimise damage to waterway ecologies. Much of the wood fibre is now used in biomaterials applications as substitutes for oil-based plastics. All residues of bark and harvesting ‘slash’ are used in energy production – mostly biofuels and electricity.

FOOD PRODUCTION AND CONSUMPTION

FOOD PRODUCTION IN NEW ZEALAND

Being a nation of islands in the mid latitudes of the Southern Hemisphere, New Zealand has been less severely affected by climate change than many other nations. Warmer temperatures have allowed increased productivity in many areas, but changes in rainfall patterns and extreme weather events have reduced production in other areas. Climate change is impacting on agriculture both in New Zealand and Australia. While New Zealand is still a net food producer, Australian agricultural production has significantly decreased. Together with the drying out of pasture and rangelands in arid and semi-arid areas in the subtropics, tropics and northern hemisphere, this has decreased the supply of livestock products globally, increasing costs. Locally, cereal crops have become much more costly.

We have seen a shift to low-chill varieties of traditional temperate crops, an increase in warm temperate and subtropical crops, and introduction of tropical crops in some northern areas. There is a greater variety of foods produced within New Zealand and a shift to forage and arable crops which are drought resistant.

A major constraint on export industries is the energy cost of transporting products to distant markets. Although new shipping technologies have provided a more sustainable and energy efficient means of transporting goods, the huge increase in energy prices has resulted in shipping costs per unit that are much higher than in 2009. However, our isolation has brought us the advantage of fewer biosecurity risks: new

pests and diseases rampant in other parts of the world have not reached New Zealand, and improved technologies for border biosecurity have helped us maintain our biodiversity and the health status of plants, animals and humans. Despite this, animal and plant pests and diseases have spread significantly in New Zealand and throughout the Pacific region as the climate has warmed, with more species of arthropods (insects, spiders etc) and animal macro-parasites.

New Zealand agricultural systems are world renowned for their high health status, ecological sustainability and ethical treatment of animals. Thus, the food we produce is sought after and has very high value. We produce and export considerably less than in 2009, but create more value.

Our production systems are now carefully matched to the ecological carrying capacity of the land. Water storage and management systems are implemented in all production systems as well as precision irrigation systems to ensure water resources are used optimally. Plants are selected not only for their high nutritional content, but also for their ability to contribute to soil and ecosystem health. Soil health is seen as critical to all food production systems and nutrient inputs are matched with biological demands. Organic matter is returned to soil through modern recycling systems. Improving soils through use of biochar (charcoal produced from biomass) is common practice as a way of reducing our carbon footprint and maintaining soil fertility. Synthetic nitrogen fertilisers have become increasingly expensive and scarce as the world competes for dwindling oil supplies, and worldwide phosphorus supplies are close to depletion. In any case, our ecological standards have very little

tolerance for these fertilisers and hardly any are used. New Zealand has made significant advances in composting of plant materials and management of animal (including fish) and human wastes to extract nitrogen and phosphorus to maintain adequate food production.

Sustainable farming is achieved through multiple land uses. Multi-crop and multi-animal systems of farming are standard. A high degree of biodiversity is gained through intercropping, crop rotation, multiple land uses (such as timber, fruit and nut crops, and animal production) as well as though use of land for recreational and conservation areas. Farmers derive income from multiple activities, as well as food production – a true ecosystems approach. Pests and diseases are managed through biological agents as part of balancing productive ecosystems and optimising animal and plant health, rather than total elimination via synthetic pesticides. These approaches are developments of the permaculture concept.

At individual and community levels, more food is produced in home gardens and community allotments. Urban gardens are commonplace as buildings and urban spaces are designed to utilise plants not only for amenity value but to improve air and water quality, regulate temperature and provide food. Much of the waste streams from urban centres are biodegradable, and efficient composting and nutrient extraction systems enable them to be key providers of nutrients for both urban and peri-urban production systems.

Overall, our terrestrial primary production utilises modern technology to manage sophisticated, complex ecosystem approaches to land management. These require a highly

skilled workforce. Proportionally more people in New Zealand now contribute to agriculture and food production than at any time since the early days of European settlement.

Improved ecological monitoring of marine life and an increase in marine reserves and coastal wetlands have allowed us to maintain sustainable coastal fisheries for local consumption. Freshwater aquaculture systems have become a component of many rural businesses.

Climate change and variability have modified the productivity (recruitment and growth) and distribution of New Zealand's offshore marine fisheries and food production, with unpredictable consequences. The productivity of colder water species has reduced in our increasingly subtropical waters and the distribution of spawning areas and fisheries has been affected. Their ability to extend their range further southward has been limited by the lack of suitable habitat. The productivity of warmer water species has been enhanced in the more extensive subtropical waters and distribution of more tropical species has expanded southward within New Zealand's Exclusive Economic Zone (EEZ). Continual increase in climate variability is making fisheries predictability and management much more challenging. We still suffer from a paucity of knowledge of the effects of climate on regional fisheries.

The long-established quota management system has provided an appropriate mechanism to respond to changes in fish yields within the EEZ. The establishment of institutional mechanisms using bilateral and multilateral agreements within and across national boundaries and EEZs – to respond to changes in resource distribution – has been

very challenging. Australia and New Zealand now have functional regional governance regimes to control illegal, unreported and unregulated fishing, which is the main activity of the ANZAC defence forces.

FOOD CONSUMPTION IN NEW ZEALAND

Global change drivers have continued to put pressure on the security of food supplies and distribution networks. Consumers demand food quality, safety and production within ecologically sustainable and ethical systems. As people have more time and less disposable income, greater value is placed on the nutritional and health benefits of food rather than on its convenience. As a consequence of increased costs of food production and of transport (both in monetary and ecological terms), and concerns over risks of terrorism and food contamination, a far greater proportion of the food we eat is now grown and prepared at home or locally. A wider range of foods is now consumed as people learn to appreciate and utilise more readily available seasonal foods. Food preparation and cooking are key household activities. Ways of preparing, preserving and cooking foods have become more efficient and less wasteful, and a resurgence in community activity has led to more communally prepared and shared meals. The shift away from intensive farming systems, for ecological and ethical reasons, has led to more expensive meat and dairy products and thus reduction in the amounts consumed per person per year. However, better understanding of the roles of nutrition in human health and well being has led to increased consumption of certain nutrient-rich foods.

4.3 BUILT ENVIRONMENT, COMMUNITIES, AND CULTURES

This part of the scenario has three sections:

- Cities and towns
- Community and social forms
- Cultural diversity

CITIES AND TOWNS

When New Zealand society eventually decided to put its weight behind change, things began to move very fast. Legislative amendments were quickly introduced, such as replacement of the ineffective and cumbersome emissions trading scheme by a commitment to carbon rationing using fiscally-neutral carbon taxes. Changes to planning legislation to promote local agriculture, horticulture and co-housing also helped things along. While some of what was needed had to happen at a national level, much of it in practice emerged at the local level, reflecting the population's rapidly-growing awareness and understanding of the need to change.

The central organising principle of town planning follows the ecological principle of natural communities using solar energy as the main energy source, augmented with sources such as wind and biomass. Fossil fuels are still used, but primarily for the construction of the physical infrastructure needed during the transition to long-term strong sustainability. Industries and systems of production are now organised in such a way that, as far as possible, matter cycles continuously between producers and consumers and back again.

Population centres are now composed mostly of small, village-like communities, some in rural areas, some within larger urban centres, such as cities and towns. Vegetable gardens,

allotments and orchards are a feature of each community, and some people keep chickens and small animals. Many community resources are shared. The size and shape of each community is defined by the natural terrain and the need to have all necessary functions (shopping for food, elementary school, neighbourhood help) within walking distance. Other community functions (medical, sports, high school, community administration and services, craftspeople, artisans and repair services, specialised shops, many work places) are found in the town centre within cycling distance. Farms are much smaller, with more labour employed in place of machinery. Food is grown organically, and the distance between farm and table has been considerably reduced, to the extent that food grown in people's own gardens is sometimes described as associated with 'food metres', rather than 'food miles'!

Key policies reflecting the ethic of sustainability are replenishment of indigenous biodiversity and providing for human needs in a sustainable manner. Extensive planting of indigenous vegetation for windbreaks, shade and microclimate control is being carried out, with the side effect of encouraging an explosion in birdlife, which in turn results in the extension of planted areas by the natural transmission of seeds.

New Zealand is now carbon neutral, with the side effect of greatly reduced pollution. Because both the transitional industrial processes and the new processes superseding them are significantly more labour-intensive than the fossil-fuelled capital-intensive processes of 2009, there are plenty of jobs. This contrasts with earlier periods of unemployment caused by 'peak oil' and related drivers of global change.

National socio-economic transition processes have achieved more equity, and the introduction of local community currencies – to complement our national currency – has made a significant difference to the quality of life of many people.

To be strongly sustainable, our cities and towns had to change from being merely *in* the world, to being *for* the world. That change in focus has had dramatic implications for the way we operate. A city or town for the world has an ethical foundation; it becomes a place of solidarity, where relations between the individual, the group, outsiders, and the planet are better aligned. Similarly, a city or town for the world brings together the complex mix of ecological, social, cultural, economic, and spiritual aspects into a living whole specific to time, place and stage of local human development.

We have now attended to all of this.

To achieve strong sustainability we have also made major changes towards long-term sustainable options for the physical infrastructures of transport, buildings, food production and delivery, provision of water and electricity, and disposal of wastes. These, however, are no more than the hardware to ensure that, biophysically, the system is sustainable. Whether it is socially, economically or culturally sustainable is another matter, and we have given considerable attention to this as well. Our biophysically-based political economy of sustainability and development, where equity in treatment of people takes precedence over accretion of individual wealth and power, is a good start. But the overarching importance of an ethic founded on ecological integrity, mutual respect, interdependence, and associated community values has been

essential in creating the sort of society in which we want to live and work.

COMMUNITY AND SOCIAL FORMS

The low status of community and localness in 2009 has been transformed. Despite the evolution of the global community via email, the Internet (and its successors), and holographic video dialogues, the physical community is thriving locally. Food is more local, the workplace is more local, recreation is more local, and there is more engagement, particularly in decision making.

Village space is an important part of life.

Community is a global (connected to global communities via technology) network of networks. Technology enables active participation in local and national conversations and decision making.

Communities are more mixed (diverse, resilient) not 'gated'. Extended families are more proximate. Those of reproductive age are able to work while the non-reproductive are available to care for the young.

There are more shared facilities.

Personal talents and attributes are developed to the highest potential; learning and scholarship are important social capital; wealth is seen in terms of experiences rather than money or assets.

Employment is more diverse and home based. Part-time paid work is mainstream and a 40+-hour week is unusual.

Local community activities (voluntary) and pursuit of personal interests make up a significant proportion of an average week and

the not-for-profit sector is actively supported and recognised as essential infrastructure in society.

Compared to 2009, fewer people are employed in the manufacturing, retail, wholesale and distribution, construction, financial services and freight transport sectors. More are employed in the IT, telecommunications, healthcare, resources and utilities, education, art and craft, local government, public transport, food and agriculture sectors.

Having learned from countries which were already successfully introducing sustainable solutions at the community level in 2009, our communities are far more engaged in decision-making because they are now regularly responsible for making their own decisions with government playing more of a facilitation role. Stakeholders who were either unengaged or who lobbied the authorities and became disengaged, are now involved in the entire process, with the Government relied on to implement the consensus.

CULTURAL DIVERSITY

Cultural diversity is now viewed as a strong asset of New Zealand society.

There has been a move away from dominant ideologies to a more pragmatic approach. The need for strong sustainability has guided people to be more eclectic and less ideological. Bridges have been built between people who disagreed on ideological grounds in 2009.

There is now a collective language of citizenship. Terms such as monoculturalism, biculturalism, and multiculturalism are viewed as old fashioned and are no longer in use. Diverse peoples live alongside each other in unity and with mutual benefit.

The political sensitivities and unresolved issues that in 2009 were still associated with interpretation and implementation of the Treaty of Waitangi have all been resolved.

The norm for governance bodies, boards, and political parties is a vibrant mix of cultures. Social and economic exchange among all members of the community is also the norm.

There is a strong sense of social cohesion and support for the functioning of formal institutions. We actively distil the best of traditional practices – in all spheres. Interactions between modern science and traditional knowledge have led to economic and other advantages. The 'cultural industries' of 2009 are now mainstream.

The global transitional years of food and water shortages, resource wars, and climate change led to widespread recognition of human inter-dependency, respect for 'the commons', and our universal needs. Based on this experience, New Zealanders opted for strength in diversity rather than survival of the strongest.

People freely express their own customs and practices. More of us earn our living from our cultural knowledge. Our people have diverse beliefs about many matters but we are united in adherence to our framework of common values and beliefs relating to sustainability. This enables us to operate confidently in both the collective and our individual dimensions. For example, people no longer feel compromised 'fitting in' or 'being themselves'. Both are now seen as strengths.

RECOMMENDED READING

Several participants in the Think Tank Project and the subsequent preparation of this report mentioned books, journal articles and DVDs that were particularly helpful. The following is a selection of the book suggestions. A more extensive list of readings and other materials is on the SANZ website (www.phase2.org).

Barnes, P. (2006), *Capitalism 3.0: A Guide to Reclaiming the Commons*, San Francisco: Berrett-Koehler.

Bossel, Hartmut (1998), *Earth at a Crossroads: Paths to a Sustainable Future*, Cambridge University Press.

Bosselmann, Klaus (2008), *The Principle of Sustainability: Transforming Law and Governance*, Aldershot: Ashgate.

Brown, Peter G and Geoffrey Garver, et al. (2009), *Right Relationship: Building a Whole Earth Economy*, San Francisco: Berrett-Koehler.

Cook, David (2004), *The Natural Step: Towards a Sustainable Society*, Totnes, Devon: Green Books.

Daly, Herman E. (1991), *Steady-State Economics*, Washington DC: Island Press.

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Flannery, Tim (2005), *The Weather Makers: the History and Future Impact of Climate Change*, Melbourne: Text Publishing.

Heinberg, R. (2007), *Peak Everything – Waking up to the Century of Decline*, Gabriola Island: New Society.

Korten, David C. (1999), *The Post-Corporate World: Life After Capitalism*, San Francisco: Berrett-Koehler and West Hartford: Kumarian Press.

Korten, David C. (2006), *The Great Turning: From Empire to Earth Community*, San Francisco: Berrett-Koehler.

Korten, David C. (2009), *Agenda for a New Economy: from Phantom Wealth to Real Wealth*, San Francisco: Berrett-Koehler.

Light, Andrew and Holmes Rolston III (eds.) (2003), *Environmental Ethics: an Anthology*, Hoboken: Wiley-Blackwell

Lovelock, James (2006), *The Revenge of Gaia: Earth's Climate Crisis and the Fate of Humanity*, New York: Basic Books.

Nadeau, Robert L. (2006), *The Environmental Endgame: Mainstream Economics, Ecological Disaster, and Human Survival*, New Brunswick: Rutgers University Press.

Speth, James Gustave (2008), *The Bridge at the Edge of the World: Capitalism, the Environment, and Crossing from Crisis to Sustainability*, Washington DC: Island.

Sveiby, Karl-Erik and Tex Skuthorpe (2006), *Treading Lightly: the Hidden Wisdom of the World's Oldest People*, Crows Nest: Allen and Unwin.

Westra, L., K. Bosselmann, and R. Westra (eds.) (2008), *Reconciling Human Existence and Ecological Integrity: Science, Ethics, Economic and Law*, London: Earthscan.