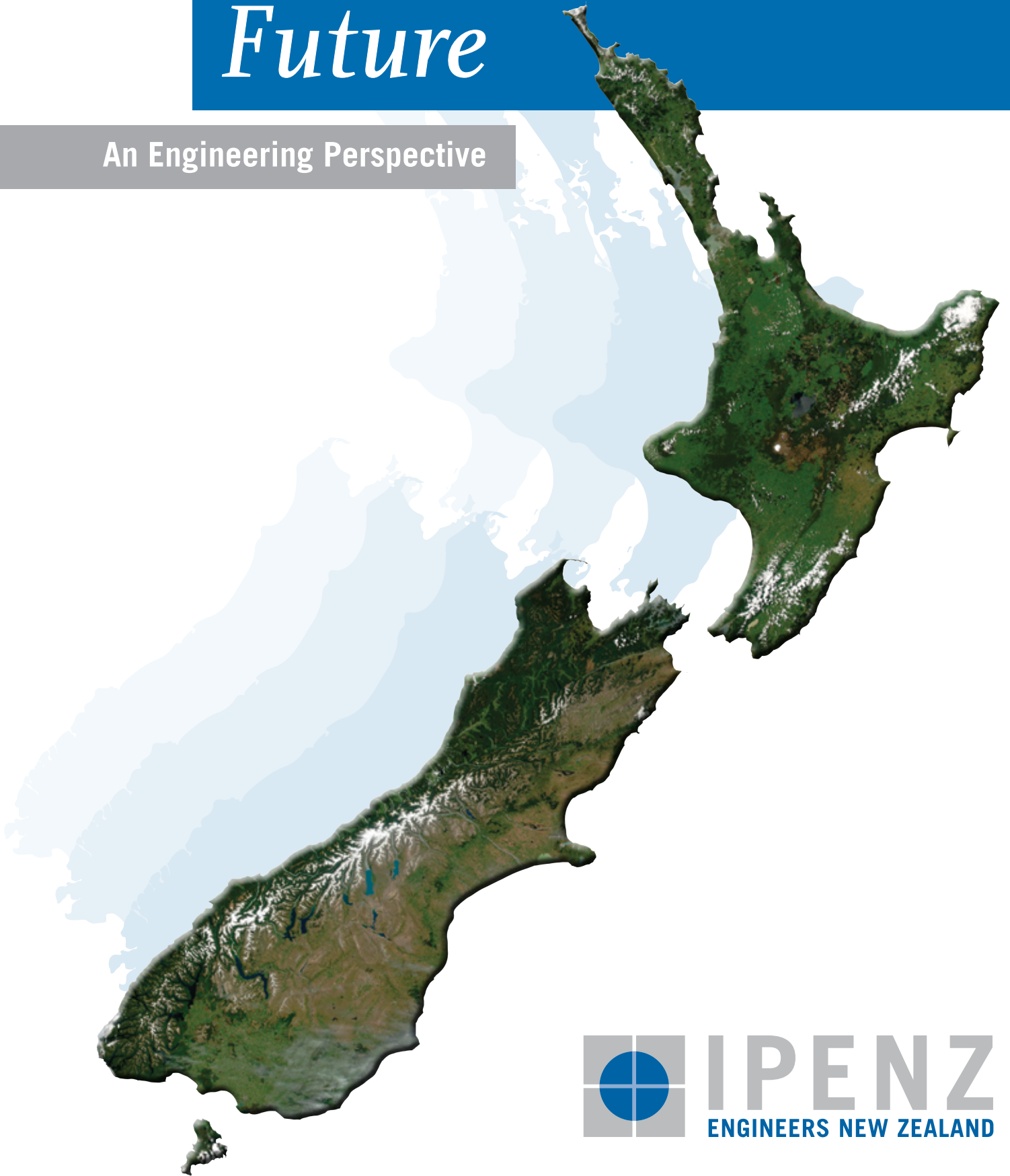


*Creating*

*New Zealand's*

*Future*

An Engineering Perspective



***Creating New Zealand's Future  
– An Engineering Perspective***  
*presents an engineering  
viewpoint on important public  
issues facing New Zealand.  
It provides a framework to  
transform New Zealand and  
create a future to which we can  
all aspire.*

# Key Messages

*IPENZ's vision for New Zealand is "a sustainable and prosperous society in which we can take pride".*

To achieve this vision, IPENZ proposes four transformational initiatives.

## **Create a technology-enabled society.**

We need to fundamentally shift the New Zealand economy by placing a stronger emphasis on technology investment in sustainability and the productive sectors.

*To help us adopt and commit to new technologies, we propose that New Zealand establish a Technology Commission.*

## **Unblock the skills pipeline.**

New Zealand needs more skilled people developing new and innovative ideas in knowledge-rich businesses to bring about a quantum change in productivity.

*To lift technological literacy in society, we propose that New Zealand establish a project to develop a technology skills action plan.*

## **Reach investment consensus.**

To meet New Zealand's future challenges we must dramatically alter the way we invest in our infrastructure, our businesses and our people.

*To identify the resource implications and priorities, and align public and private investment, we propose that New Zealand establish an Investment Forum.*

## **Build resilience to climate change.**

Climate change poses a great threat to New Zealand's environment and economy. We must design measures that enable communities to live with hazards and take the opportunities that change presents.

*To provide a national collaborative approach, we propose New Zealand establish a resilience to climate change project.*

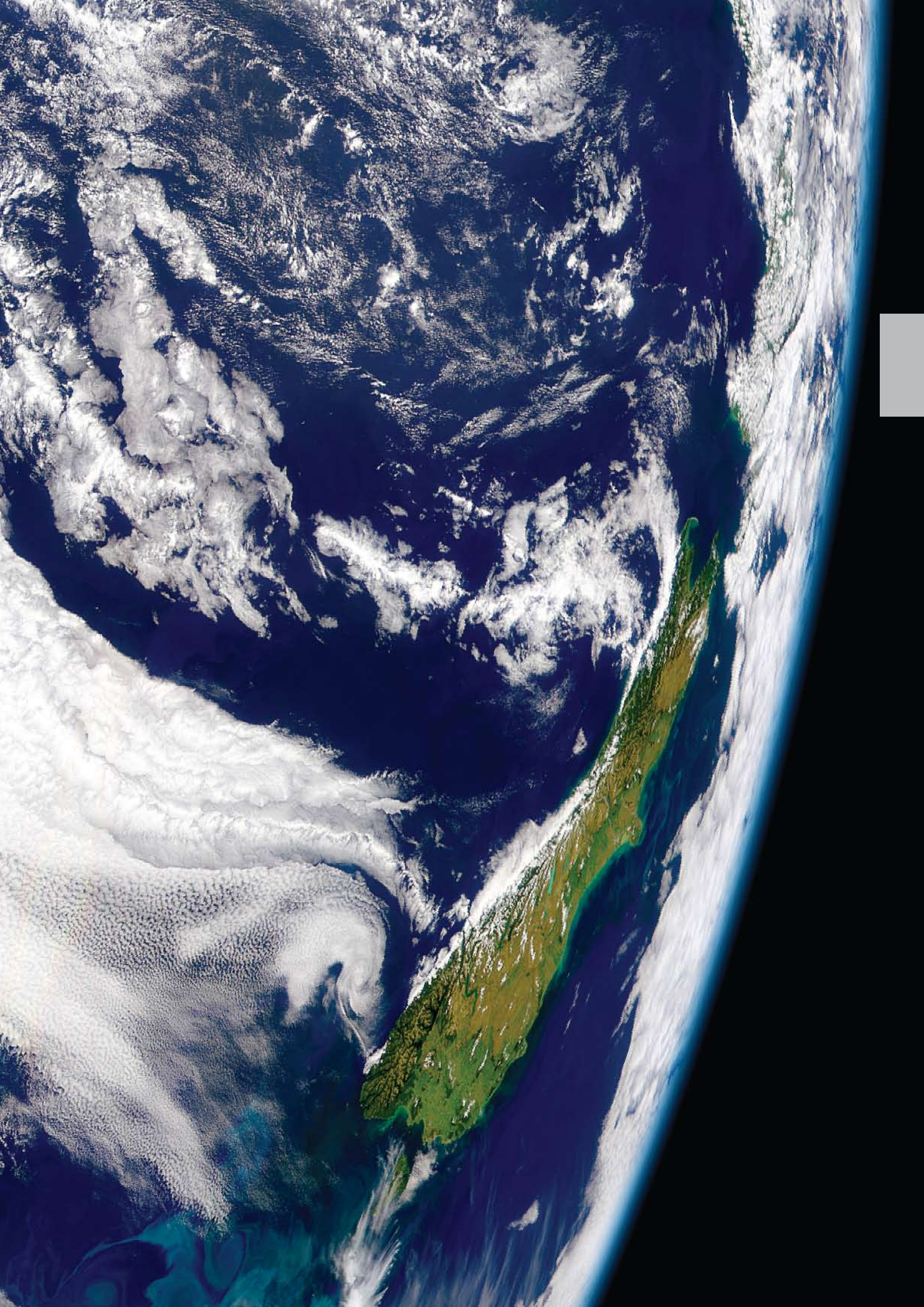
Underpinning these initiatives, New Zealand needs broad-based enabling policies. We must recognise the key roles that education and immigration play in the economy, and we need a regulatory system that does not create unnecessary impediments, but provides constructive incentives.

We also propose specific actions in energy, ICT, water, the natural and built environment, high-productivity industries, and transport.



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# Our Vision for

# New Zealand

*We need new thinking. The starting point for this must be a clear vision of what we want for our country. Our vision for all New Zealanders is a sustainable and prosperous society in which we can take pride.*

Over the last decade, New Zealand's economic performance has consistently fallen below our expectations, to levels that risk our ability to reach our aspirations and retain the talent that the country needs. Our major earning industries are fast reaching environmental limits that will restrict their further growth, and many New Zealanders are frustrated that the affordable standard of healthcare, education and other services are below what they expect.

To achieve our vision, we need to properly understand the issues facing our society, and be prepared to take a long-term view in planning and implementing the necessary actions.

## **Our society should be sustainable**

We must enable rather than constrain the choices and opportunities available to future generations, and manage our impact on the environment in a responsible and forward-looking way.

## **Our society should be prosperous**

We mean prosperity in more than just a material sense. An important element in prosperity is our quality of life, including personal health, quality of our environment, access to recreational opportunities, and freedom from human-imposed fear. We need our own view of what prosperity means.

## **Our society should have self-respect**

We should recognise and adhere to a set of core societal values. These values may not be written down but are reflected in the national and community policies and programmes we adopt, and the way our communities behave.

## **Our society should be internationally respected**

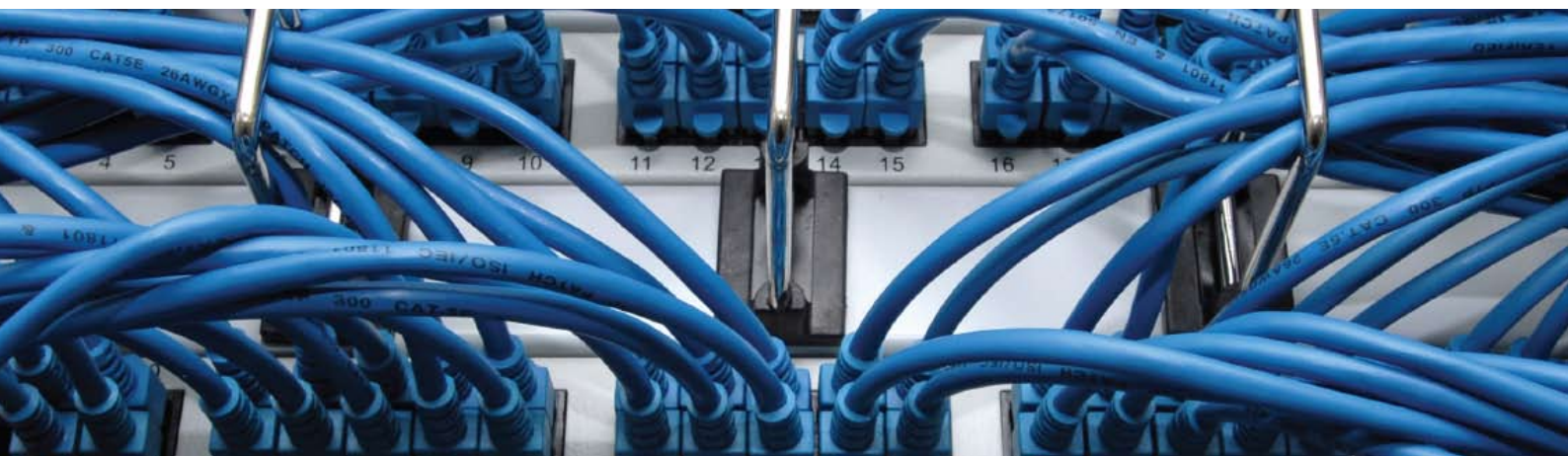
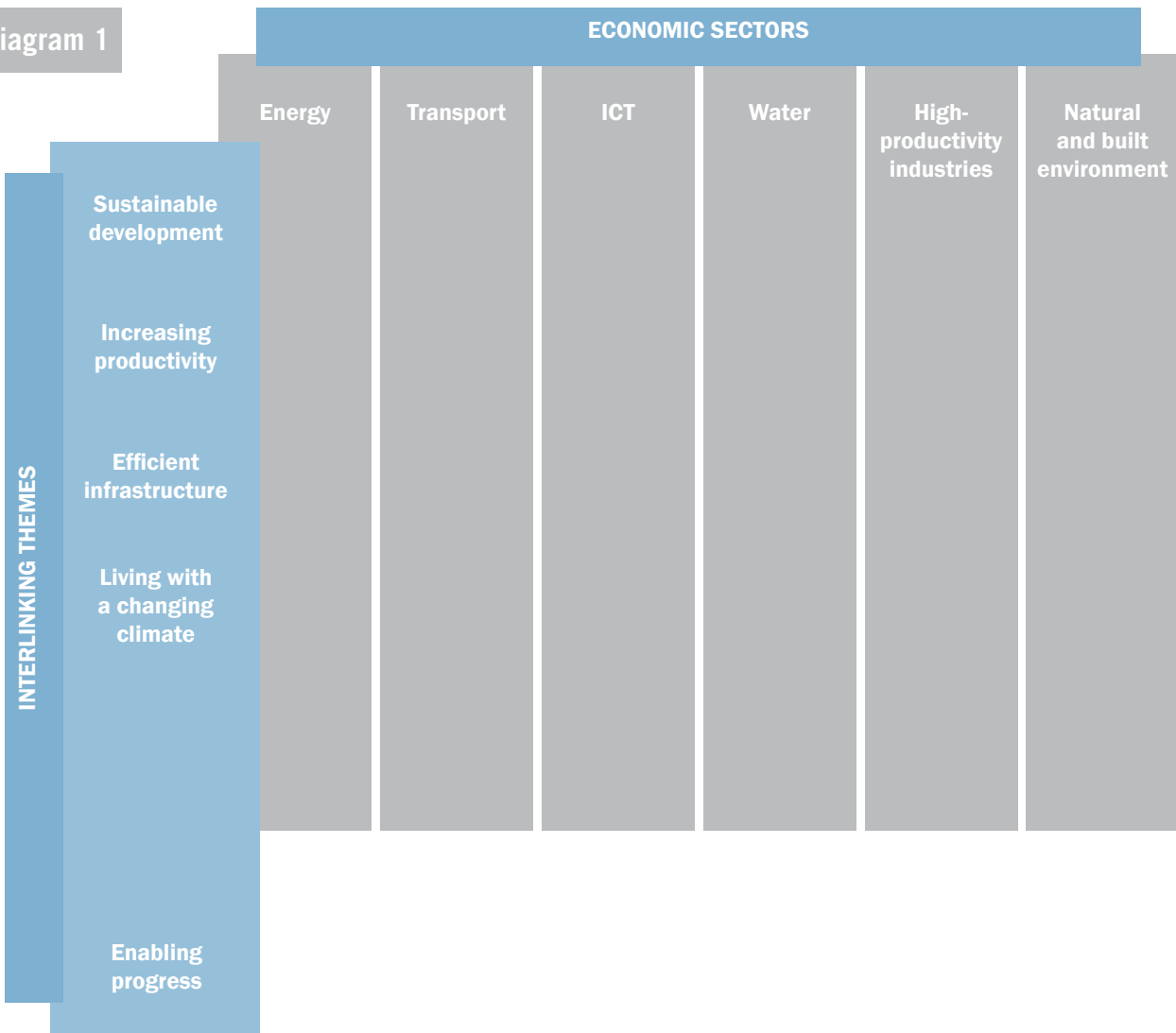
We should participate constructively in internationally-agreed initiatives and actively contribute to the development and support of less-advantaged communities outside New Zealand.


*Creating New Zealand's Future* sets out proposals which we think will catalyse the achievement of our vision.

# Interlinking

## Themes

Diagram 1





*Economic sectors are a well-understood way to categorise and describe issues, and many economic sectors correspond to the manifestos which make up government activities, such as transport and energy.*

However, strong interlinking themes cross these economic sectors and reflect the integration which is a characteristic of real-world activity. Government especially needs to better recognise the interlinking of activities, and the need to examine consequences across a broad range when developing policy. **Diagram 1** illustrates how we use these ideas in *Creating New Zealand's Future*. Some key interlinking themes are:

### **Sustainable development**

We need to lower the resource intensity of our economic activity. This makes good economic and environmental sense, as we aim to leave a world that can meet the needs of future generations.

### **Increasing productivity**

Lifting labour productivity is the key to improving our economic performance. It means investing in many sectors across the economy, new technology, and the development of better skills in our people.

### **Efficient infrastructure**

Infrastructure provides the basic physical framework to support the social, economic and environmental outcomes sought by society. It achieves effective circulation of people, resources, products, services and information.

### **Living with a changing climate**

We need to understand, manage and mitigate the impacts of a changing climate on our society, natural and built environments, and economy, and create opportunities for the future.

### **Enabling progress**

To achieve our vision we need to remove constraints resulting from poorly-framed regulatory systems and inappropriate standards, and from labour, skill and research shortages.

Interlinking themes and economic sectors are a good way to describe the full scope of *Creating New Zealand's Future*, but it is also important to identify actions that will make a significant difference across a wide spectrum of activities. We have called these actions the transformational initiatives.

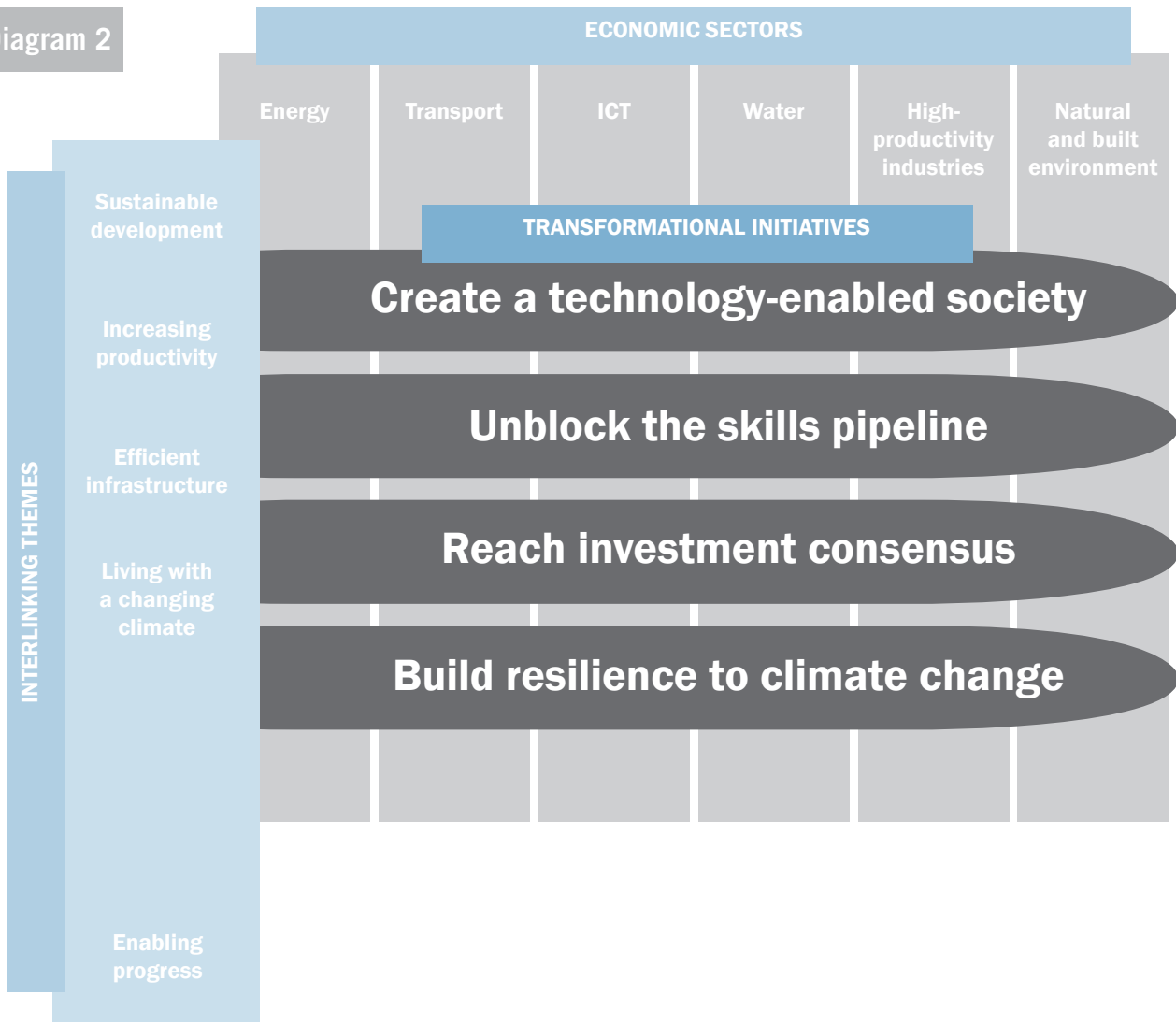
**Diagram 2** on page 08 shows how these transformational initiatives relate to the interlinking themes and economic sectors.



# Transformational

# Initiatives

Diagram 2



*Action needs to start now. We propose four transformational initiatives which will revitalise New Zealand's approach and make a significant impact on a wide range of issues.*

### **Create a technology-enabled society**

As private consumers, New Zealanders are fast adopters of new technology, but our performance in the productive economy is piecemeal and lacks comprehensive commitment. Historically, our capital expenditure is disproportionately directed toward real estate and away from productive technologies. As a society, New Zealand is not as committed to the importance of technology or as technology literate as other countries that have been economically more successful.

Improving sustainability without reducing living standards requires maximum use of improved technologies. The largest single challenge in the medium term is reducing greenhouse gas emissions to meet our international responsibilities without lowering our living standards. This requires sophisticated technological responses, not just the application of economic instruments. The same approach is also needed to make the most of national resources such as water.

Other countries have developed deliberate policies to adopt new technology as rapidly as possible in order to progress economically and environmentally.

To learn the lessons and develop appropriate policy actions to break through the barriers, we propose the establishment of a **Technology Commission**. The Technology Commission would advise on how to lift our commitment to and adoption of technologies – from the development of a more technology-literate and technology-committed society and workforce, through to technology investment in the productive sectors. The Commission should have a limited initial life to provide a strong focus on “making a difference” in both economic development and in addressing key sustainability and environmental issues.

### **Unblock the skills pipeline**

To increase the income of New Zealanders we must increase the value created by each working hour. Creating higher value requires higher skill levels in parallel with capital investment. We need many more people who can create intellectual capital value (ideas that can be developed to earn money overseas), and also those who can exploit the opportunities. We think we are a nation of innovators, but with the growing sophistication of our competitors we have gone backwards in relative terms so we sometimes look like improvisers rather than leaders.

The biggest gaps are in technical skills and in the management of knowledge-rich businesses. New Zealand's graduation rates for engineering, manufacturing and construction qualifications are only half the OECD mean, and we rank all but last amongst OECD members. Without creating a pool of technicians, advanced trades people, engineers, technologists, and experienced technical managers, it will be difficult to develop, attract, embed and retain the sorts of companies that will lift New Zealand's labour productivity.

To unblock the skills pipeline, we must address issues at all stages of supply and demand – we must attract young people into the right qualifications and attract skilled people from overseas, ensure we have an effective education system that assists and does not block our skills goals, and ensure that we have a receptive and committed business community which values technology skills and acts accordingly.

To this end, New Zealand must make a national commitment to understand the need for upgraded technology literacy (in addition to literacy and numeracy) across our entire population, and value our technology leaders as much as our sporting and cultural role models. We need to invest accordingly in technology education, and in particular, ensure it meets the needs of Māori and Pasifika communities. All of this must be backed by the actions of employers.

We propose a limited-life project to develop a **technology skills action plan** which can then be used to trigger action by the multitude of players involved in the skills system.

We would assign the lead on this project to the Technology Commission, but in the expectation that a multi-party working group will achieve the best progress.

## Reach investment consensus

A characteristic of the mid-twentieth century was a strong focus on investing for the future – partly in response to the devastation caused by two world wars, but also reflecting confidence in the future and the need to accommodate growing national aspirations.

New Zealand needs to refocus on investment – not just renew the investments of the past but to recognise and take action to meet the investment challenges of the future – investments in our infrastructure, our businesses and our people. These challenges will be extreme as we move into a future that requires us to manage serious issues, such as climate change and the progressive move to resources and technology options which will be far more capital intensive to develop and use than they are at present.

Capital markets will need to reflect the financial implications of this change. Superannuation schemes are major investors in other countries, and they may have a greater role here. More fundamentally, we need to ensure that public sector investments (national and local) are in harmony with private sector investments, and that the interconnection between the two are explicitly recognised and then reflected in public policy. As a nation, we need to ensure we understand the wider resource implications of investment, including the availability of effective technologies, the range of skills needed to translate investment intentions into practical reality, and of course funding.

To recognise the scope of investment that has to occur, and the resource implications and priorities, we propose the establishment of an **Investment Forum**. The Investment Forum will establish the capital needs of our economy as it transitions, bring ideas together, promote a “whole of society” approach, monitor progress and discuss solutions to the inevitable issues that will arise. One of the initial tasks of the Forum should be to consider the current provision of publicly-owned utilities.



## Build resilience to climate change

New Zealand faces a new challenge – a changing-climate future. While arguments continue over the science underlying climate change – as they do within the engineering community – there is a wide and growing international acceptance that action is warranted.

International action primarily aims to mitigate the effects of global climate change by reducing greenhouse gas emissions. New Zealand has an obligation to contribute to international initiatives in this area and, in particular, to meet our international obligations. Our challenge is to meet our targets through cost-effective measures, including energy efficiency, clean technology and innovation in primary production that will sustain productivity and promote sustainable economic development. Being cost effective means looking at the lowest-cost approaches first, and having robust processes in place to ensure we achieve real and sustainable reductions to our carbon footprint. The real test for the Emissions Trading Scheme will be whether it enables us to meet these criteria.

However, the primary thrust of New Zealand's strategy should build resilience to climate change, so we can manage the adverse impacts and take advantage of the opportunities that a changing climate presents. It is essential that we understand the nature, magnitude and probability of the possible impacts, and as information becomes available and analysis improves, we can distinguish the impacts of climate change from those we expect to occur anyway.

In terms of potential impacts and engineering, we need to examine hazards such as floods, rising sea levels, changes in climate patterns (droughts, incidence of rainfall), storm events and erosion. It may be impractical to isolate our communities from such hazards, and instead we may need to design measures that allow our communities to live with hazards and rapidly recover. We need good-quality analysis so that we can make good choices and ensure that investment is timely and well-directed.

At present, Government advice on infrastructure policy and performance is largely sector-specific, with responsibilities spread across many government agencies, State Owned Enterprises, local government and utility companies. The new challenge from the changing climate calls for a comprehensive and co-ordinated response to manage the hazards and to obtain agreement on socially and economically acceptable levels of risk across society.

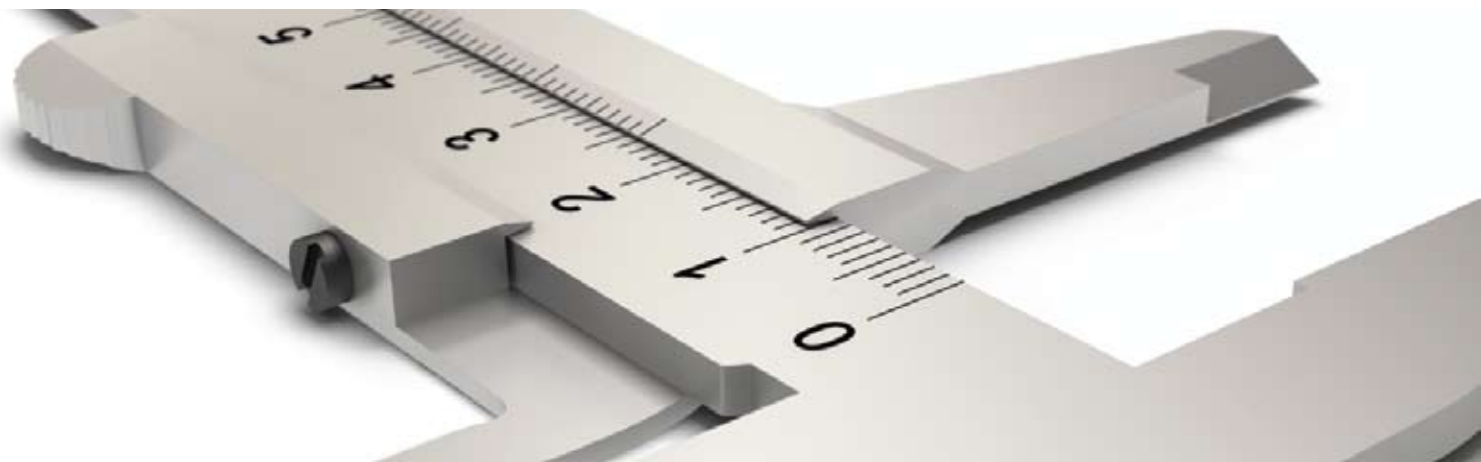
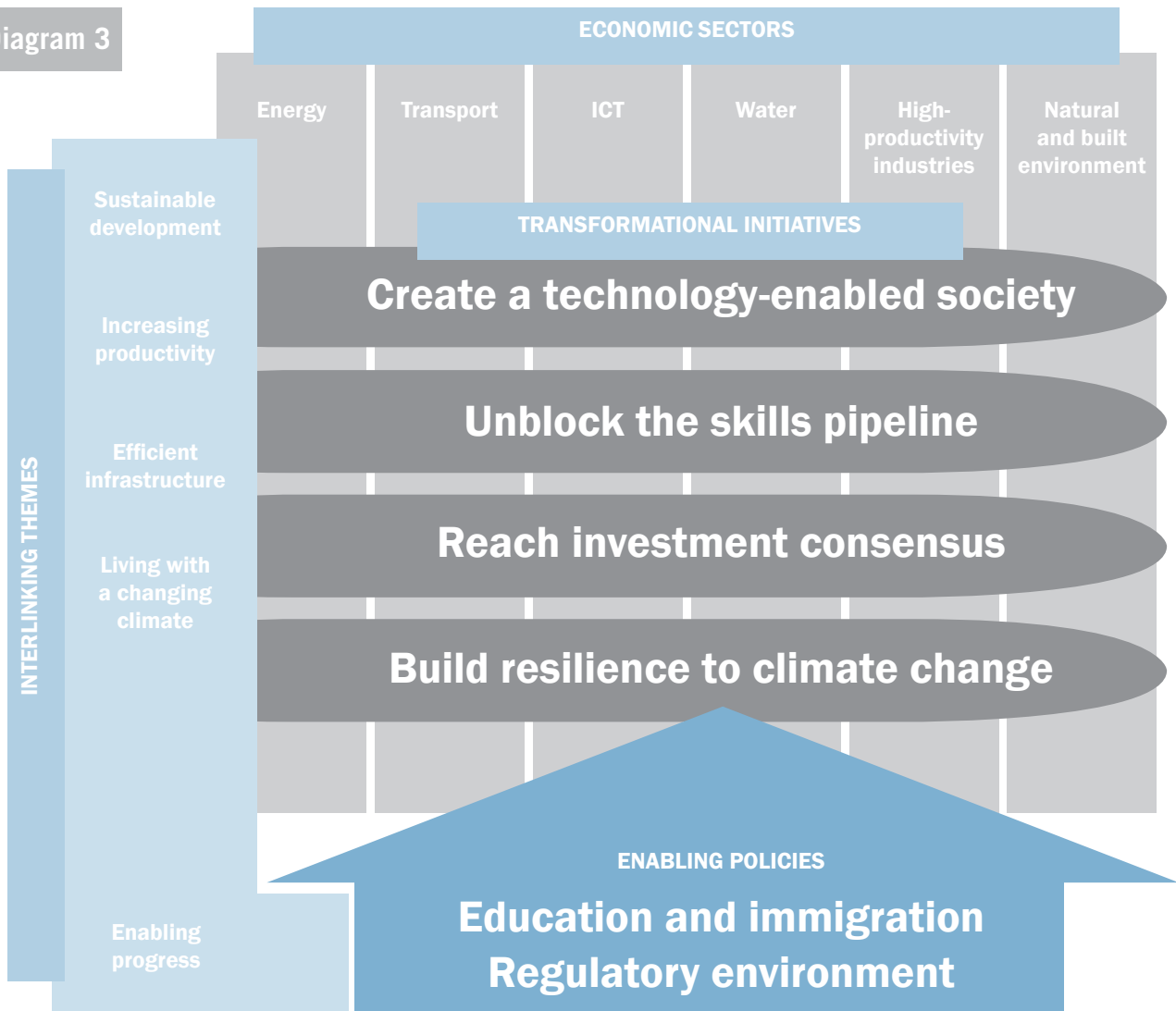
There needs to be a co-ordinated approach to our climate change strategies. To ensure information sharing, consistent advice, cross-agency consensus on approaches, a collaborative response, and leadership, we propose a **resilience to climate change project**. This will develop a national strategic approach to deal with climate change in a resilient and cost-effective manner that includes emission mitigation, and understanding and living with the impacts.



# Needs for Action –

# Enabling Policies

Diagram 3



*New Zealand must recognise that education and immigration act as enablers across the economy. Both need specific attention to ensure support for the four transformational initiatives and each economic sector.*

Without the right regulatory environment, the Transformational Initiatives may struggle to succeed. We need a regulatory system with incentives for good behaviours, and the ability to limit poor behaviours. Unnecessary regulatory impediments must be withdrawn. **Diagram 3** shows these enabling policies.

## Education and immigration

### School curriculum

To develop a technology-literate society, re-categorise the technology curriculum at Year 12 and 13 into strands of ICT/electronics, manufacturing/construction and processing, thereby facilitating the transition towards work.

### NCEA

Redevelop NCEA's Level 2 and Level 3 achievement standards in maths, science and technology to better align with tertiary study and employer expectations.

### Teachers

Redesign the training for and address the shortages in technology, mathematics and science teachers, remunerate at market rates, and increase the ICT literacy of all teachers.

### Networks of provision

Establish national guidance plans across all levels of the National Qualifications Framework and tertiary education to guide national investment in a network of provision for economically-critical disciplines in international short supply – presently engineering and technology.

### Tertiary spending

Ensure that the student component of tertiary education funding in economically-critical disciplines in short supply matches the costs, thereby enabling tertiary providers to maintain a viable national network of provision.

### Immigration

Identify key skill sets that are either too specialised for New Zealand to produce at all, or we are unlikely to produce in sufficient quantities, and establish streamlined immigration processes for the relevant occupational groups.

## Regulatory environment

### Major projects

Consolidate the assessment provisions of the Resource Management Act for projects of national significance into a separate section of the Resource Management Act.

### Overlapping statutory requirements

Develop a single set of statutory provisions for projects of national infrastructure to avoid multi-approval and consultation mechanisms.

### Building consents

Rationalise building consent functions by standardising national processes, requirements and standards, and investigate the benefits of delivery by a single agency.

### Standards

Invest in Standards New Zealand for public good standards to underpin New Zealand as a technology-enabled society.



# Needs for Action –

## Sectors

### Energy

#### **Research and development**

Increase publicly-funded investment in research and development of relevant renewable energy sources (for example, marine, geothermal, wind, photovoltaic, and biological sources), potentially transformational end-use technologies, and electricity-storage technologies.

#### **End-use technologies**

Progressively introduce more energy-efficient products by adopting a comprehensive range of mandatory minimum-energy-performance standards, and require state agencies to lead by immediate action.

#### **Building stock**

Set advanced but achievable energy efficiency standards immediately for new buildings, but also introduce progressive requirements to upgrade the existing building stock.

#### **Electricity supply**

Continue to allow market forces to determine the details of our generation sources, including the impact of emissions trading, but establish much clearer benchmarks to achieve the lowest-cost generation mix against acceptable security of supply. Empower the Electricity Commission to take a more effective role in achieving this goal.

#### **Gas availability**

Set policy conditions so that oil and gas exploration continues to enhance future security of gas supply and provides the opportunity for economic benefits from significant discoveries.

#### **Transport fuels**

Take a policy approach to transport fuels that recognises the international character of the fuels market, and the importance of considering both energy source availability and vehicle technology advancement in moving forward.



## Information and Communication Technology

### **Infrastructure**

Use public co-investment in fibre-optic, satellite and wireless broadband to speed up the provision of high-performance services to businesses and key social agencies, such as schools and health service providers.

### **Private connectivity**

Use public co-investment to ensure remote communities receive a level of service above a minimum acceptable threshold.

### **Content**

Open up and expand the content market to enable providers to charge for the content that has a high degree of user interactivity.

### **Skills**

Develop and implement a robust ICT competency framework and certification programme aligned with international practices to lift our service delivery to match international best practice.

## Water

### **Strategic approach**

Develop a research informed and comprehensive national strategy for managing the use of water for economic, environmental and social purposes.

### **Improve allocation**

Resolve rights to use, and introduce an equitable system for allocating water, including the consideration of tradable water rights for commercial use.

### **Efficient delivery**

Rationalise, potentially through regional approaches, the existing water utility services to ensure the most effective and efficient delivery of water.

### **Demand for water**

Manage the demand for water by implementing universal water metering and cost recovery for the treatment and delivery of potable water.

### **Water conservation**

Promote water reuse and recycling where it is safe and environmentally beneficial to do so.



## Natural and Built Environment

### Infrastructure resilience

Formulate a risk management strategy to ensure sufficient resilience in essential infrastructure and avoid cascade failures that arise through too great an interdependence between forms of infrastructure.

### Design for climate change

Develop national standards based on the most up-to-date information that enable the design and construction of infrastructure that is resilient to natural hazards.

### Flooding

Develop nationally-consistent policies to ensure that flood risk is sufficiently considered when determining permissible land uses and establishing flood mitigation requirements.

### Sea level rise

Develop a national strategy to ensure a nationally consistent approach to protecting existing and future coastal communities and infrastructure from rising sea levels, swells and storm surges.

## High Productivity Industries

### Industry development agency

Create a national agency tasked with building the private sector's capability to absorb, use and increasingly undertake research and development linked to market opportunities. This agency should focus on the high and physical technology industries and be publicly funded in proportion to private sector co-investment and personnel transfer to industry. The Technology Commission would assist during the establishment phase.

### Skills

Correct the imbalance between disciplines in the research-literate workforce by setting stipends for postgraduate study at market rates, thereby creating talent in the disciplines most in demand in the labour market.

## Transport

### Road pricing

Promote tolling initiatives, local road pricing, and in the future move to national electronic road pricing.

### Funding

Increase debt funding for major projects and provide guidance on best practice for public-private partnerships.

### Fuel efficiency and emissions

Upgrade the vehicle fleet by promoting new technologies and by setting minimum fuel efficiency and emission standards for a range of fuel systems.

### Freight fleet

Promote standards to improve freight vehicle efficiency and fuels, and evaluate the effect of introducing larger and heavier vehicles.

### Freight strategy

Develop a high-level national freight strategic plan to meet changing future demands, and require all transport infrastructure entities to consider the future freight task in their forward plans.

### Safety

Conduct analyses to determine the best investment opportunities for improving road safety.

# About

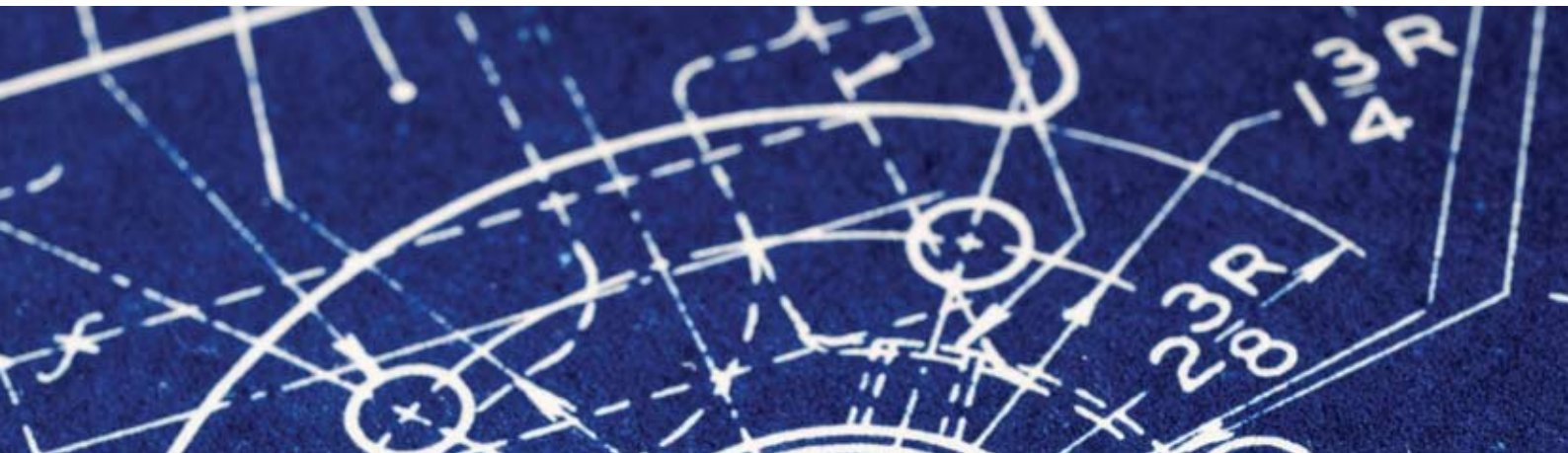
## IPENZ

*The Institution of Professional Engineers New Zealand (IPENZ) is the lead national body representing the engineering profession in New Zealand. IPENZ has approximately 10,000 Members, ranging from engineering students to our cadre of Distinguished Fellows.*

IPENZ is an apolitical body and our primary role includes serving the interests of our Members and providing a vehicle that enables engineers to contribute to the public good.

The engineering profession is a major contributor to New Zealand's development – engineers are vital to building a sustainable environment which enables economic productivity while protecting our natural resources. Many of those contributions are in the public arena, such as roads, water, wastewater, buildings, equipment, machinery, industrial plants, power stations and utility networks. But engineers also contribute in less visible ways in areas such as health, education, innovation, research and development. Engineers also bring technical expertise to management, and national and local affairs.

Many IPENZ Members contributed to the development of this document. While *Creating New Zealand's Future – An Engineering Perspective* does not represent the views of all engineers, we believe that most will identify with the core of opinion that runs through this document.



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