Economic Efficiency Assessment for a new Planning and Environmental Management System

Modelling and analysis on the dynamic and allocative efficiency of the reforms

5 December 2025

ALLEN + CLARKE

Infometrics
Economics put simply

Policy assumptions and interpretation

All analysis in this report was completed based on information as of 28 July 2025 on the proposed bills provided by the Ministry for the Environment and subsequent discussions. The actual bills were not viewed as part of this project as they were still being drafted.

Modelling assumptions and interpretation

The economy-wide modelling results presented in this report are based on computable general equilibrium (CGE) modelling undertaken by Infometrics. The modelling explores a series of stylised 'what if' scenarios designed to test the direction and relative scale of potential efficiency gains under different assumptions about how the resource management reforms could be implemented.

The scenarios are illustrative rather than predictive. They are not forecasts of what will occur, nor do they represent government policy or implementation decisions. The results are expressed in constant dollars and reflect long-run equilibrium responses across the economy. Because many non-market effects cannot be represented in a CGE model, the findings likely understate the full social and environmental benefits of effective reform. Conversely, they may not capture all transitional or distributional impacts at the regional or household level. Spatial effects within regions are also not captured.

Readers should therefore interpret the results as evidence of the direction of the efficiency potential of the new system, not as specific forecasts of economic outcomes or providing insights into the relative merits of different types of development.

Table of contents

1 Executive Summary

1.1 Purpose

Allen + Clarke and Infometrics have prepared this report to support the Government's and the public's understanding of the potential gains in economic efficiency from replacing the Resource Management Act 1991 with the new system (*the RM reforms*).

This report examines how the combination of the Planning Bill and Natural Environment Bill could improve the three dimensions of economic efficiency – productive, allocative, and dynamic – across the country's economy. It draws together evidence from previous studies, including reports by SGS Economics and Planning, Castalia, MartinJenkins, Sapere, and others, as well as earlier work by *Allen + Clarke* and Infometrics, with new economy-wide modelling to test the potential efficiency gains from specific aspects of the reforms.

The modelling seeks to understand whether an economically efficient planning and environmental management system can improve outcomes by lowering the cost of housing and infrastructure, making productive investments easier, and encouraging more innovation. It assumes a system that enables development within environmental limits underpins New Zealand's economic resilience and long-term prosperity.

This assumption reflects that the economy is fundamentally intertwined with the environment, depending on continual flows from stocks of natural resources. A healthy ecosystem is essential for every part of the economy. It sustains primary production and tourism, supports the functioning of infrastructure, provides the water, energy, and materials needed for manufacturing and industry, and underpins the liveability, safety, and cultural identity of our towns and cities. The way New Zealand manages its land, water, and other environmental assets determines how effectively those resources support economic activity and living standards of current and future generations.

1.2 Approach to the modelling and its interpretation

The modelling for this report uses Computable General Equilibrium (CGE) to examine how changes in one part of the economy flow through to other sectors, households, and government accounts. It shows what could happen under different 'what if' scenarios based on a general understanding of the reforms under certain simplifying assumptions about sequencing, servicing, price signals, and limits.

For the purposes of modelling, the scenarios sometimes use edge or extreme cases to isolate the key drivers of change. By pushing a system variable to one end of its plausible range, such as assuming all new housing capacity comes from brownfield redevelopment or all from greenfield expansion, the modelling highlights which factors matter most, the direction of change, and the relative scale of potential net benefits. In practice, the implementation of the reforms will involve a mix of these conditions, not any one extreme or single scenario.

The scenarios are illustrative rather than predictive. They are not mutually exclusive, and their purpose is to show how the system behaves when particular levers change. The modelling also assumes that zoned development capacity becomes real over time and that development occurs within environmental limits and natural hazard constraints. Full assumptions and parameters of the CGE modelling are described in Appendix A with a simplified overview in Appendix B.

Building on the modelling, this report distils the findings of earlier studies from a range of sources, drawing out the elements most relevant to understanding how the reforms affect productive, allocative, and dynamic efficiency.

1.3 Conclusions for decision making

A summary of the modelling results and analysis is included in Section 0 and not repeated here.

Economic efficiency is ultimately influenced by the extent to which decisions are made with as complete and accurate information as possible. Our main conclusion about the RM reforms is that enduring gains are likely to be made through greater allocative and dynamic efficiency, with the Planning Bill driving near-term growth and the Natural Environment Bill protecting those gains in the long term. However, realising these efficiency gains relies on the two bills working together cohesively in relation to economic activities. These potential efficiency gains will only be maximised if certain conditions are met through implementation. In particular, the following four conditions are critical to delivering the modelled economic efficiency gains:

- The administrative settings in the Planning Bill are delivered in practice through standardisation, e-planning, and resourcing, and the Natural Environment Bill contains the policy mechanisms best suited to giving effect to limits and other types of standards.
- Planning and economic decisions are grounded in sufficient, reliable, accessible, and spatially explicit environmental data so that price signals and incentives point towards the right places and activities over time.
- Sufficient emphasis on monitoring, attribution, compliance, and enforcement is in place (including improved access to, and use of environmental and compliance data) so that development occurs within limits.
- Any exemptions from environmental limits and other types of standards are narrow, used only where strictly necessary to deliver regionally or nationally significant outcomes, and clearly set out who bears the cost of the limit or standard being breached.

It is important to note that efficiency gains will not automatically be shared evenly. Transition costs will fall unevenly across sectors and places. Managing these through compensation, transition support, and risk-sharing mechanisms can help maintain fairness, legitimacy, and social licence while protecting aggregate efficiency.

2 Introduction

2.1 Purpose and audiences

This report has been prepared by *Allen + Clarke* and Infometrics for the Ministry for the Environment to support consideration of the Planning Bill and the Natural Environment Bill. It builds on previous analysis of resource management reform in New Zealand to provide a clear, evidence-based assessment of the potential economic efficiency, focusing on 1) how resources are shared between our wants and needs (allocative efficiency) as well as 2) how they are used or saved over time (dynamic efficiency). The report synthesises modelling of 'what if' scenarios and a broader body of analysis completed over the past decade to inform current decision-making.

The analysis presented in this report is illustrative (i.e., it illustrates how the reforms might play out) rather than predictive. For modelling, the term **directional** refers to predicting simply the upward or downward movement of a variable, while **predictive** typically aims for a precise estimate of the actual future value (magnitude) of that variable. The economic modelling in this report is directional and should not be viewed as a forecast of what will happen, but rather as a structured way to show what could happen under different assumptions (e.g., sequencing, servicing, and price signals). The 'what if' scenarios modelled are designed to highlight the potential impacts of specific aspects of the RM reforms on the economy, supporting more informed decision-making.

The modelling assumptions include that zoned capacity becomes real (i.e. potential development is actually undertaken in the zoned locations), and that development occurs within robust environmental limits and natural hazard constraints. These assumptions reflect both the statutory direction of the reforms (as provided by MfE in summary form based on content in July 2025) and the clear evidence from earlier work that emphasises that the scale of any economic efficiency gains is connected to the level of confidence that individuals and businesses have about where activity will and will not be permitted. Where limits or constraints are absent or breached, costs can rise sharply through environmental degradation, natural hazard losses, and stranded assets.

Earlier assessments by SGS, Castalia, Martin Jenkins, and Sapere established the scale of administrative savings and process efficiency gains that could be expected from the changes signalled in the reforms. More recent contributions, such as previous Infometrics CGE modelling and *Allen + Clarke's* high-level valuation of New Zealand's environmental data architecture, seek to extend the analysis to dynamic and allocative efficiency, showing how the reforms affect wider system performance. The present work integrates those findings with the scenario-based modelling to provide a more coherent view of the economic efficiency of the RM reforms.

By situating the scenarios within this broader evidence base, the report will support decision makers to weigh policy and implementation choices with a clearer understanding of both the opportunities and the risks. The report recognises the importance of, but does not fully model, distributional impacts. For completeness, it also discusses broader considerations that cannot be incorporated into CGE modelling. In testing economic efficiency, this report (and the previous analysis it builds on) is intended to test the extent to which the reforms achieve real value for New Zealand through efficiency gains while looking after the environmental foundations on which that value depends.

2.2 Approach and limitations

CGE modelling is used to examine how changes in one part of the economy flow through to other sectors, households, and government accounts. It shows what could happen under different 'what if' scenarios based on a general understanding of the reforms under certain simplifying assumptions about sequencing, servicing, price signals, and limits. A summary of the CGE modelling results is provided in Section 8.1 with a detailed overview of the CGE modelling in Appendix A and a simplified overview in Appendix B.

The body of the report draws on economic theory to contextualise the potential economic efficiency gains from the resource management reforms, draws on previous economic analysis of resource management reform efforts in New Zealand, and, using the CGE modelling results, interprets the economic and policy significance of those findings rather than on the technical detail of the models themselves.

There are five important limitations:

- **Scope of analysis:** The report considers the reforms at a national and conceptual level. It does not analyse implementation at the level of individual regions, councils, or projects. The costs and benefits of reform will be distributed differently across regions, depending on factors such as how close relevant catchments are to breaching environmental limits.
- **Dependence on complementary work:** The quantitative results draw on CGE modelling completed for this report and other published studies.
- **Implementation uncertainty:** The realised efficiency gains will depend on how the new system is funded, designed and delivered. Factors such as institutional capability, data infrastructure, and market confidence will shape actual outcomes.
- **External influences:** The modelling assumes a stable macroeconomic and policy environment. External factors such as global market shifts, climate and other hazard impacts, or domestic policy changes could materially affect outcomes.
- **Legislative certainty:** The modelling and analysis was based on summaries of the information provided by the Ministry as the final policy and legislation was still being drafted during the development of this report.

3 Policy context and reform objectives

The Planning Bill and Natural Environment Bill are intended to replace the resource management system that has been in place since 1991. The new planning and environmental management system is designed to respond to long-standing concerns about poor outcomes, uneven quality, and high costs in the way that decisions relating to the environment and development are made. At the same time, they intend to strengthen requirements to manage within environmental limits and to reduce risks from natural hazards. The analysis in this report is based on outputs available in September 2025, based on decisions taken to date by Ministers. All findings and analyses remain subject to any further amendments made during the parliamentary process and the final passage of the legislation.

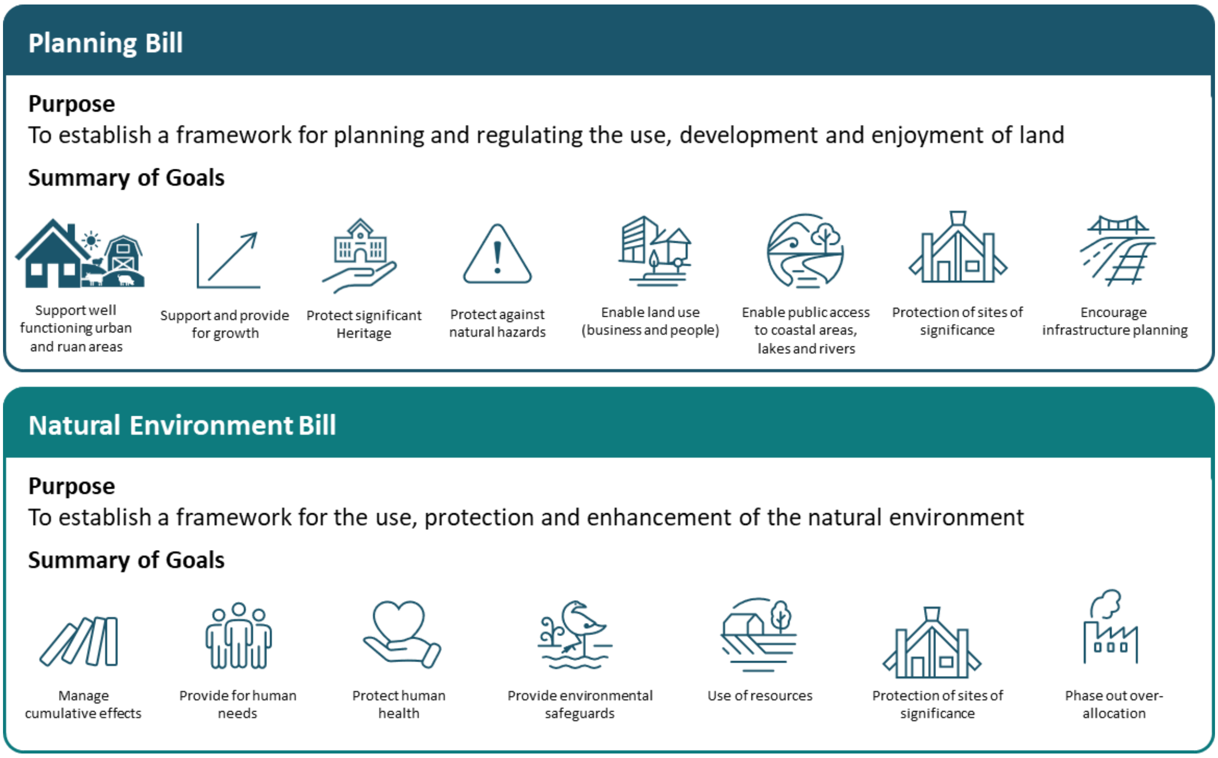
The problems that have built up over time are well recognised:

- Housing has become increasingly unaffordable, with the median house price rising to around eight times the annual average income. This reflects persistent shortages of serviced land and high development costs, coupled with challenges related to access to funding, interest rates, and broader tax settings.
- The natural environment has come under significant pressure. Most catchments now require reductions of around 30% or more in at least one of the four major contaminants[1] to restore ecological health.
- System processes are slow, litigious, and expensive, with administration and compliance costs estimated at around $32.9 billion over thirty years in today's prices.
- It typically takes five to eight years to complete a district plan, creating long delays and uncertainty.
- The quality of regulation has been inconsistent across the country, with more than 1,100 planning zones in place across 67 councils.
- The system has not been data-driven and has relied heavily on case-by-case decision-making. Its focus on avoiding adverse effects has encouraged risk aversion and resulted in high volumes of resource consents, with around 30,000 issued each year, with around 2.5% of those notified (which indicates that most of these consents are considered low risk).

[1] The big four contaminants are:
- **Nitrogen** (mainly from fertiliser use and animal urine, contributing to algal blooms and reduced oxygen in waterways),
- **Phosphorous** (from soil erosion and fertiliser run-off, also driving algal growth and eutrophication),
- **Sediment** (fine particles from land disturbance, which smother habitats and carry attached nutrients and metals), and
- **Pathogens** (E. coli and other faecal microbes – from livestock, wastewater, and stormwater discharges, affecting human and animal health).

The reforms are designed to address these problems directly. A high-level view of the proposed purpose, goals, and principles of the two Acts is below.

Figure 1: Proposed purpose and goals of the Planning Bill and Natural Environment Bill



The Natural Environment Bill would establish a framework for the use, protection and enhancement of the natural environment, including by setting limits through National Policy Directions, while the Planning Bill will allow for more standardised and certain approaches, as well as require long-term regional spatial strategies to guide growth, investment, and infrastructure provision. A shift from locally and regionally led policy setting towards more consistent and comprehensive policy direction from the central government is intended to reduce variation in rules and improve certainty for communities and investors.

The Planning Bill aims to increase development capacity for housing and business growth, make possible the delivery of high-quality infrastructure (including the expansion of renewable energy), and support the growth and development of the primary sector, including aquaculture, forestry, pastoral farming, horticulture, and mining. At the same time, the Natural Environment Bill is designed to safeguard the environment and human health, support adaptation to the effects of climate change and reduce risks from other natural hazards, and improve regulatory quality in the resource management system. Any tensions between the goals and outcomes of the two proposed Bills will be worked through during the spatial planning process, informed by community consultation and engagement – rather than on each ad-hoc consent, as occurs under the current system.

It is intended that the system is supported by greater use of the ‘user pays’ principle to recover the costs of running the system and, in time, charge for private use of common-pool resources. In general, the reforms will require those whose actions result in costs being incurred within the system to pay for those costs where that is administratively efficient. This is fairer, will incentivise thoughtful engagement within the system to minimise cost, and will support adequate resourcing of key functions and roles (especially monitoring, compliance and digital enablement).

A series of system shifts support the reform objectives. The scope of regulation will be narrowed to focus on the most important externalities and market failures (supported by the greater focus on the ‘user pays’ principle). This includes fewer matters requiring consent, higher thresholds for residual effects, and the ability to consider both positive and negative effects. Property rights will be strengthened, with greater scope for landowners to use and develop land, and compensation potentially available where reasonable use is severely impaired. The balance of decision-making between national, regional, and local levels will be reset, with standardised rules and methods designed to create a more consistent and predictable framework.

Environmental limits will be set to safeguard human health and protect the life-supporting capacity of ecosystems. Limits can be set for domains across the landscape: fresh water (quantity and quality), air quality, indigenous biodiversity, land and soil health, and the coast. As part of this discussion in this report, there is an important distinction between those set in policy (the thresholds set in plans and regulations) and the planetary boundaries beyond which ecosystems may collapse, noting that these ecosystems will be degrading well before they reach planetary (or biophysical) boundaries.

Environmental limits are set in policy and informed by robust scientific analysis. In setting them, society’s values, preferences, and aspirations are considered. Limits will factor in uncertainty and the cumulative effects of activities (including those that are less than minor), as well as delays from policy setting and changes in practices. Setting limits lays out what is acceptable up front, with difficult conversations early, followed by certainty on what is and is not permitted, which incentivises the better use of resources and innovation. Where resources are already over-allocated, policy interventions will be required to return them to sustainable levels. Resource use permits under the Natural Environment Bill will be used more proportionately, with other, less regulatory-intensive tools used where they will achieve the desired outcome. For example, farms operating within catchment limits may use farm plans aligned with good management practices. In contrast, those operating in a catchment that has exceeded its limits will generally require targeted permits to manage activities relevant to those specific limits.

The system is also proposed to make greater use of market-based mechanisms to allocate resources. Where resources are scarce, price incentives and other tools will be investigated to support their more efficient allocation. These mechanisms may build on existing models, such as water allocation trading and the emissions trading scheme. However, the application of market-based mechanisms to environmental issues, such as water quality and biodiversity, is complex and requires careful consideration, particularly in relation to equivalence and appropriate scales. For example, consideration is needed of cumulative effects and sensitive downstream receiving environments. This approach will be underpinned by better information on environmental stocks and flows, landscape context, and by stronger monitoring and enforcement to ensure limits are respected.

By reducing transaction costs, clarifying property rights, and enabling market-based allocation within clear and robust limits, these reforms create the conditions for improved economic efficiency across all dimensions. Users of the system will have clearer national standards, fewer consents, more consistent decisions, and greater certainty earlier in the process. The result is expected to be more efficient planning processes and reduced costs for users, within a system that emphasises greater use of monitoring and compliance. It is needed to ensure cumulative effects are more efficiently dealt with than under the RMA, resulting in less overuse of natural resources, as well as more certainty for investment.

The reforms represent a significant system change that will require careful sequencing and transition arrangements to achieve these objectives without creating unintended disruptions. The reforms are therefore best understood as a shift to a system that seeks to improve both efficiency and consistency, while also providing greater assurance that development will occur within environmental limits and natural hazard constraints. The modelling results presented in this report test how far these objectives and system shifts can be realised in practice under different assumption.

4 Economic efficiency and resource management

4.1 Economic efficiency

The economy is a system by which people produce, trade, and consume goods and services. In much (but not all) of this system, trading occurs via markets. In economics, value is a measure of worth at a point in time. It is determined by utility (or usefulness) and scarcity, both being influenced by a society's values, preferences, and aspirations. The challenge lies in measuring value when not all things of worth have prices (nor is it necessarily appropriate that they do).

Efficiency, or more correctly economic efficiency, is a commonly used but often misunderstood concept. In simple terms, it is about making the best (or highest value) use of scarce resources over time. These resources include human and social capital, natural capital, as well as financial and physical (or built) capital.

Economic efficiency is not only about how resources are used in the production of goods and services but also how they are shared between the goods and services produced so as to maximise societal welfare (i.e., net beneficial outcomes).

Economic efficiency has three main dimensions:

- **Productive efficiency:** Producing goods and services at the lowest possible cost, using the optimal combination of inputs and technology, so that outcomes occur close to the production possibility frontier (PPF), with little to no resource waste or externalities**. Productive efficiency includes technical efficiency,** which is focused on achieving a given output with the minimum quantity of inputs.[2]
- **Allocative efficiency:** Sharing resources across the economy according to the value of their use so the mix of goods and services produced and consumed maximises societal welfare. Prices for goods and services capture some, but not all, of this value. The gap between prices and value is the reason why some regulation is needed.
- **Dynamic efficiency:** Using resources in ways that promote innovation, investment, and adaptation so that wellbeing and productivity improve over time, not just in the short term. Dynamic efficiency encapsulates the notion of achieving both productive and allocative efficiency over time by producing the most valuable bundle of goods and services at any point in time and doing so at least cost. It reflects how well the economy can adjust to new information, technologies, and environmental limits while maintaining or increasing overall value.

[2] Technical efficiency is sometimes considered separately for the purposes of discussion in this report to support consideration of the RM reforms and their impacts. For an example of discussion of the types of efficiency, see Steering Committee for the Review of Government Service Provision (2013)

These dimensions or forms of efficiency build on each other. Technical efficiency in processes promotes productive efficiency in an economic agent's production system such as a firm, government, or household, which supports allocative efficiency across the economy and dynamic efficiency between time periods.

4.2 Efficiency and resource management

Planning and environmental management are well-aligned with the concept of economic efficiency because the latter focuses on maximising value from economic activities while recognising scarcity and constraints (e.g., planetary boundaries and natural hazards).

1. **Productive efficiency** in resource management means producing society's desired goods and services at the lowest total cost, which includes accounting for positive and negative externalities. A consent process that is fast and cheap in administration but fails to account for flood risks or water quality effects is not productively efficient, as the resulting community costs represent hidden subsidies. Productive efficiency internalises all these costs, ensuring that businesses, government agencies, and households operate on or near the production possibility frontier with minimal waste. Inconsistent and/or missing data, particularly on environmental costs and limits, limit productive efficiency under the Resource Management Act 1991 because decisions are unable to account for potential environmental effects properly.
   a. Productive efficiency requires **technical efficiency**, which, in a resource management context, primarily concerns administrative and procedural performance. For instance, if two councils process similar resource consents, the one completing them accurately with fewer resources and in less time is more technically efficient. In the current resource management system, duplication, complex plan-making, and prolonged appeals all reduce technical efficiency and add unnecessary costs.
1. **Allocative efficiency** means that natural resources like land, soil, and water flow to their highest-value uses from an all-of-society perspective, having accounted for externalities. The existing system often allocates resources on a first-come, first-served basis or through legacy rights, which can lock resources into lower-value uses while other uses face shortages. For example, low-density urban land remains in use for agriculture despite acute housing demand. Unaccounted-for effects around resource and land use can increase an activity's profitability, meaning that it attracts resources at the expense of others that may be more productive. Allocative efficiency is also relevant to the division of roles and responsibilities between central and local government.
2. **Dynamic efficiency** in resource management relates to creating stable, clear, and predictable conditions that encourage innovation, investment, and adaptive responses over time. When environmental limits are unclear, not based on science, or not enforced, rules frequently change or unnecessarily prohibit productive activity, or when regulatory risk is high, businesses and communities can have limited incentives to invest in new technologies or sustainable practices. A dynamically efficient system supports forward-looking decisions that improve long-term outcomes.

Together, these three efficiency dimensions form a logical framework for evaluating the planning and natural environment management legislation. However, many current assessments focus on partial outputs and transaction costs, with less emphasis on externalities and longer-term impacts. To be complete, an evaluation needs to consider all relevant costs and benefits and value over an intergenerational time horizon.

Taken together, this suggests that economic development can only be achieved efficiently if it occurs within environmental limits and natural hazard constraints. Breaching limits (for example, over-extracting water from an aquifer or using too much of a chemical that leeches into the environment) creates false economies: short-term gains that translate into long-term losses through degradation, remediation costs, stranded assets, higher than necessary disaster damage, or loss of life. Clear and robust limits are therefore not a constraint on efficiency but a precondition.

The modelling findings presented later in this report focus on allocative and dynamic efficiency as this is where the potential from the reforms, through robust limits, stronger price signals, and reduced uncertainty, can achieve the most significant gains. Technical and productive efficiency improvements, while valuable, flow more directly from simpler processes and standardisation already well documented in earlier assessments.

Figure 2 provides a visual overview of how the different types of efficiency relate to the resource management reforms.

Figure 2: Understanding efficiency in the resource management reforms

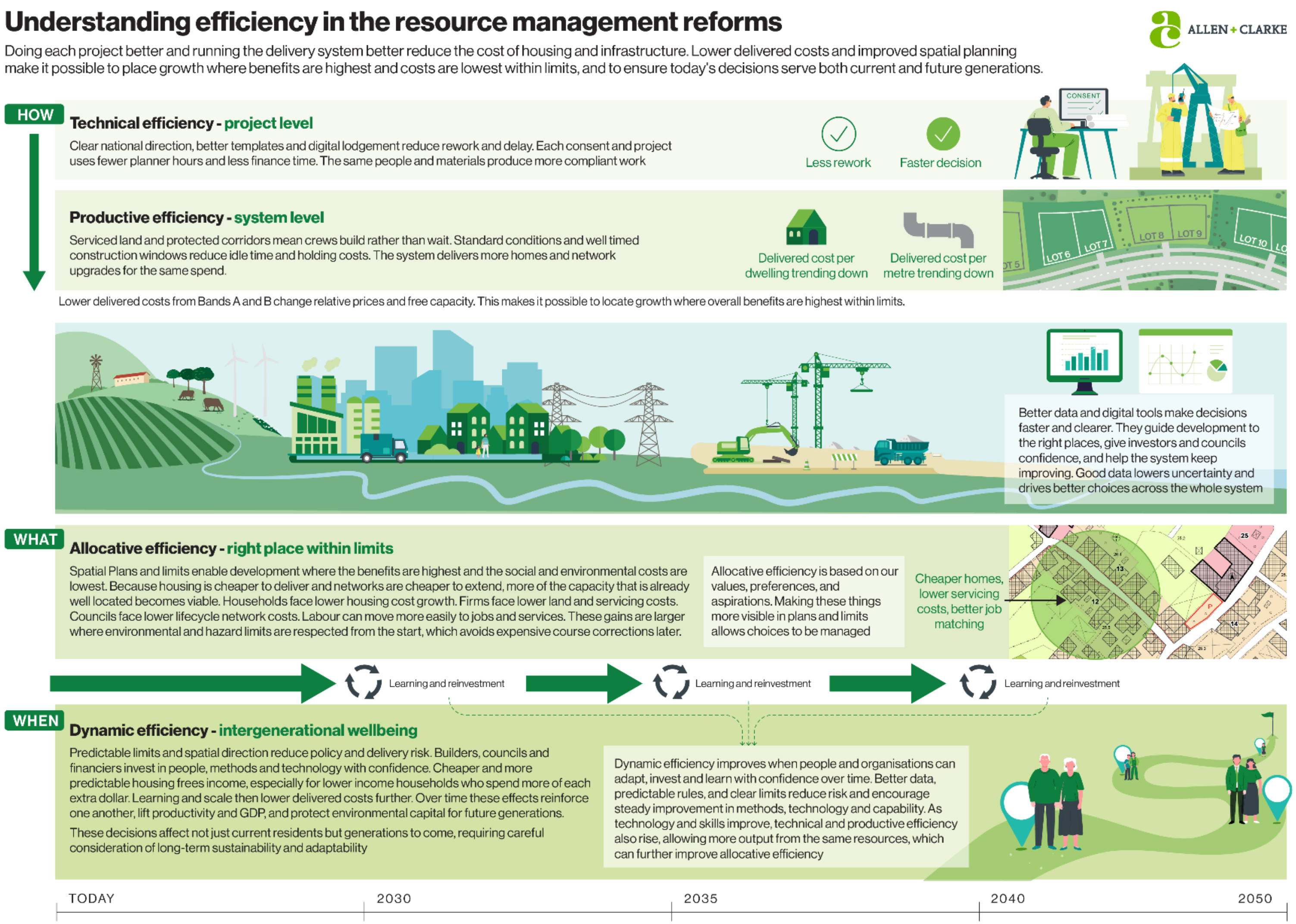


Table 1 provides a general summary of how the RM reforms can be expected to contribute to each of the three dimensions of efficiency. In this table, technical efficiency is listed separately from productive efficiency to highlight its specific contribution.

Table 1: Summary table of how RM reforms contribute to economic efficiencies

Type of efficiency	Contribution of RM reforms	Illustrative sectors and examples
Productive	Cuts the cost of operating the system by reducing the number of activities that require consent, the cost of consenting, and reducing hearings, appeals, and processing times. Internalises externalities by ensuring users bear the costs of their effects through targeted fees, environmental charges, and risk-based compliance requirements.	Developers spend less on compliance; businesses face clearer environmental requirements that reduce hidden costs to communities.
Technical (a subset of Productive Efficiency)	Simplifies and digitises planning processes. Reduces duplication, standardises information, and shortens consent times.	Councils processing consents more quickly; e-plans reducing plan-making time by years; e-consent portals automating routine assessments; new planning tribunal can resolve technical / process disputes faster at lower cost.
Allocative	Directs scarce resources to their most valuable use through clearer limits, user-pays principles, better price signals, and market-based allocation mechanisms (including more competitive land markets). Avoids low-value or natural hazard-prone development.	Water allocated to higher-value crops; urban growth steered to locations that minimise infrastructure costs and reduce congestion.
Dynamic	Provides certainty for long-term investment and innovation. A more flexible and enabling approach drives agglomeration benefits, housing affordability and commercial productivity, travel savings and lower land price differentials. Clear and robust limits reduce the risk of stranded assets, monitoring allows adaptive management, and stronger national direction supports resilience.	As demonstrated in our scenarios, renewable energy projects proceed with confidence; adaptation investments reduce future hazard losses; cheaper infrastructure and lower cost housing create economy-wide benefits.

5 What we already know and how we know it

Over more than a decade, a series of studies have examined the economic performance of the resource management system. Each of the 11 studies reviewed for this report has approached the question from a slightly different angle, but together they have built a picture of where inefficiencies lie, what they cost the country, and how system transformation could improve outcomes.

Early work on process costs

The earliest analyses focused on administrative and compliance costs (i.e., transactional). SGS Economics and Planning (2021) quantified the duplication and delays created by separate local plans and a complex consent process. In a Supplementary Analysis Report, Ministry for the Environment (2022) compared reform options and concluded that fewer plans, stronger national direction, and clearer roles for central, regional, and local government would yield significant savings. These studies were important because they estimated a monetary value for the burden of the current system.

Cost–benefit analysis of the previous attempts at reform

Subsequent cost–benefit analysis, including Castalia (2021) and Castalia (2025), went further by estimating the net present value from parts of the previous (2021) and current (2025) proposed reforms. These studies confirmed that administrative and compliance savings were large in absolute terms, but that the largest benefits came from changes in land supply, infrastructure delivery, and hazard management. The updated assessment in 2025 estimated total net benefits of around $13.26 billion. At the same time, these reports underscored that the scale of benefits depends on how reforms are implemented. Some of the “savings” reflect costs shifted between groups rather than absolute efficiency gains, and assumptions about timing and uptake were necessarily stylised. The lesson is that while the direction of impact is clear, the magnitude should be interpreted with care.

Broadening the economic lens

Other studies explored dimensions of efficiency that go beyond compliance costs. Resource Economics Ltd et al. (2021) highlighted the cost of delays in infrastructure and planning, demonstrating that billions of dollars in potential benefits are lost when decisions are drawn out. This report added a distributional perspective, showing that inefficiencies in the system impose uneven costs on families locked out of affordable housing, on communities exposed to hazards, and on Māori. Together, these reports reinforced that inefficiency is not only a fiscal problem but also a barrier to growth, equity, and resilience.

System design and national direction

A series of three reports have since shown that robust environmental data and national planning frameworks deliver additional efficiency gains by reducing uncertainty, enhancing consistency, and fostering long-term investment.

Allen + Clarke (2022, 2025) developed a cost benefit analysis of the proposed changes to the Environmental Reporting Act. Taken together, the amendments to the Environmental Reporting Act deliver their value as an integrated package, with complementary proposals combining to reduce regulatory burden, strengthen Māori engagement, slow environmental degradation, lessen exposure to pollution, and even improve workforce stability. The CBA estimated a benefit cost ratio of 1.90 with a 1.2% probability of the costs exceeding the benefits. The CBA did not explicitly look at efficiency but provided a framework for understanding the potential benefits from improved decision making, such as from slower ecosystem degradation.

Allen + Clarke & Infometrics (2023) further analysed the costs and benefits of a centralised national planning framework as drafted for the previous RM reforms. That report found that it is crucial to consider where the potential benefits accrue to ensure decision-making is centralised or devolved to the most efficient level. For example, it found that benefits that accrue at a national or international level (like broader public health or biodiversity) are most efficiently considered at a national level, with more localised benefits (such as decisions about a specific catchment) devolved to regional or local levels.

The report provided a framework for assessing the optimal level of devolution for resource management decisions. An indicative estimation produces an annual benefit of the proposed approach to implementing a National Planning Framework of over $1,500 million in (or around) 2035 compared to proposed costs of $300 million per annum. The $1,500 million was the potential economic gain of 'getting it right' – the ideal balance between the breadth and detail of national direction, and the need to allow for region-specific characteristics such as exposure to the effects of climate change, types of soil, or infrastructure requirements.

More recently, *Allen + Clarke* et al. (2025) completed a high-level valuation of New Zealand's environmental data architecture to illustrate the value of monitoring and compliance data in underpinning an efficient RM system. The report concluded that the success of the new resource management system will depend on sustained investment in high quality environmental data, without which the shift to a more permissive and faster decision-making regime risks creating unintended consequences that could erase all of the economic gains expected from the reforms. The report found that improved environmental data alone could conservatively deliver $1.3 to $1.9 billion in additional value (additional to administrative gains) through reduced degradation and fewer pollution-related harms, and that when accounting for the broader economic impacts of decisions informed by that data, the scale of benefits from investing in environmental data rises sharply. International evidence reinforced this picture, demonstrating that jurisdictions with integrated environmental information systems realise sizeable efficiency, investment, and innovation benefits. For example, Australia's National Water Information System (Bureau of Meteorology) was found to deliver $67-287 million annually in benefits, and the benefits from earth observation from space contributed $38.57 billion to Australia's GDP in 2023/24 with substantial job creation as a result.

The 2025 study built on the previous reports to show that allocative and dynamic efficiency are more important than savings in transactions, and that relatively small increases in environmental degradation can negate transactional gains.

Current modelling

The present report builds directly on this evidence base. It differs from earlier work in two important respects. First, this report uses economy-wide modelling to test how changes in costs, risks, and resource allocation flow through to households, industries, exporters, and government. Second, it looks explicitly at allocative and dynamic efficiency alongside the role of process or transaction costs in productive efficiency. In doing so, the report reinforces others' conclusions about the high administrative and compliance burden of the current system. It also broadens their analysis to capture distributional (including sectoral) effects and highlight further gains from enabling development within environmental limits and recognising natural hazard constraints.

When all of these studies are taken together, the sequence of analysis shows an increasing degree of certainty about the impacts of reform. Initial studies established that the system imposed very large compliance and process costs. Later work broadened the lens to show that inefficiencies reduce productivity, distort resource allocation, and create risks for households and industries. Most recent work, including this report, demonstrates that reforms can improve allocative and dynamic efficiency in ways that support long-term investment and innovation, while the costs of environmental protection and hazard management are economically manageable.

Table 2 provides a list of the reports that have contributed to the knowledge base and were used as specific inputs into the modelling and synthesis for this report.

Table 2: Compilation of previous analysis on RM reforms

Year	Report	Focus	Key findings	Contribution to certainty
2021	SGS Economics and Planning, *Measuring the benefits of the Strategic Planning Act*	Administrative, compliance, and spatial efficiency	Examined duplication and delays from many local plans and the potential for savings from fewer, simpler processes. Also explored how concentrating development in lower-risk and higher-density areas could increase productivity, reduce infrastructure costs, and lift overall economic efficiency.	Established that significant savings exist in process costs, and identified potential long-term productivity and resilience gains from spatially efficient development.
2021	Castalia, *Economic impact analysis of proposed Resource Management Act reforms*	Cost–benefit analysis of the previously proposed RM reforms	Estimated total administrative and compliance burden present value over 30 years at approximately $2.06 billion including establishment costs, showing the scale of reform costs.	Shows monetised costs; showed scale but relied on strong assumptions.
2021	Resource Economics Ltd et al., *Reforms to the Resource Management System: An analysis of potential impacts for Māori, the housing market and the natural environment*	Māori, housing, and community impacts	Showed uneven distribution of costs/benefits; highlighted equity issues.	Introduced distributional considerations into efficiency debates.
2022	Ministry for the Environment, *Supplementary Analysis Report*	System design and alternatives	Compared reform options; highlighted benefits of stronger national direction and clearer roles.	Provided stronger rationale for narrowing scope and embedding limits.
2022	Principal Economics, *Great Decisions are Timely – Benefits from more Efficient Infrastructure Investment Decision-Making*	Cost of delay in RMA	Demonstrated how planning and consenting delays suppressed productive investment and innovation.	Extended analysis beyond compliance costs, linking to growth and productivity.

Year	Report	Focus	Key findings	Contribution to certainty
2023	*Allen + Clarke* & Infometrics, *Impacts analysis for the first National Planning Framework.*	Impacts of national direction	Found efficiency gains from consistency and reduced duplication, especially when considering the optimal centralisation or devolution of decision-making depending on where the benefits were likely to accrue. Benefits in the order of $1.5 billion by 2035 against implementation costs of $300m per annum.	Strengthened case for standardisation and national rules where efficient.
2024	*Allen + Clarke* et al., *Unlocking the benefits of environmental data for RM reform: High-level valuation of New Zealand's environmental data architecture and its role in resource management*	Value of environmental data and its delivery	Demonstrated role of data in reducing uncertainty and improving efficiency.	Highlighted dynamic efficiency gains from certainty and information.
2025	Castalia, *Economic impact analysis of the proposed Resource Management reforms*	Economic impact of current reforms	The Castalia Report (February 2025) using the Blueprint reform proposals from the Expert Advisory Group calculated net benefits of $14.8b NPV. This figure is dependent on assumptions; administrative savings real but modest, larger gains from land and infrastructure. *Note that the revised Castalia report (October 2025) that considered Cabinet decisions has revised the NPV to be $13.26 billion.*	Most comprehensive CBA to date; reinforced scale of benefits but raised debate on assumptions and distribution.
2025	MartinJenkins, *Economic benefits of effective resource management*	Economic Benefits of Resource Management	The evidence base supports the view that resource management has the potential to provide large-scale economic benefits across broad areas of market activity.	Comprehensive review of relevant literature that demonstrates impact across a range of benefit areas.

Year	Report	Focus	Key findings	Contribution to certainty
2025	*Allen + Clarke* & Infometrics, *Economic Efficiency Assessment for a new Planning and Environmental Management System* (current report)	Efficiency scenarios (housing, infrastructure, hazards, water, sediment)	Tested allocative and dynamic effects; found environmental protection manageable, gains greatest where certainty improves allocation.	Provides economy-wide evidence; broadens scope and confirms earlier conclusions under different assumptions.
2025	Parliamentary Commissioner for the Environment, *Annual report for the year ended 30 June 2025*	Overall discussion of state of the environment	The pervasive uncertainty hanging over the direction of policy means investing in solutions is seen as risky. Provides a statement that all politicians should agree about the critical importance of high-quality, spatial, multi-layered environmental information to decision-making.	Recap of recent recommendations for investment in a federated data system and system certainty to support investment.

6 Economic efficiency and the RM reforms

6.1 From transactional to transformational

The accumulated evidence reveals two distinct scales of efficiency gain from resource management reform: transactional and transformational.

Transactional savings, such as administrative savings from fewer plans, streamlined consents, and reduced appeals, are real and valuable. Castalia (2025) estimates at the net present value as $13.26 billion over the next thirty years using Treasury's social discount rate of 2%. Yet when viewed against the size of the whole economy, these process improvements represent modest gains of less than 0.1% of GDP annually, which provides reliable fiscal savings but not the transformational change needed for sustained productivity growth.

The transformational potential of the reforms lies in how they may reshape resource allocation and investment decisions, especially when underpinned by better access to high-quality data.

- When land supply for housing increases meaningfully (whatever the mix of brownfield and greenfield), costs fall and household resources are freed up for other goods and services.
- When infrastructure proceeds in areas away from higher natural hazard risks without multi-year delays, capital generates returns sooner, uncertainty premiums are lower, and the productive capacity for the rest of the economy improves. For example, completed electricity infrastructure may lower energy costs or provide more secure supply.
- When environmental limits are clear and robust, long-term investments can be made with confidence, and communities can trust their values, preferences and aspirations are being considered.

The modelling in Resource Economics Ltd et al. (2021) and the CGE modelling for this report consistently show that these allocative and dynamic efficiency gains will substantially outweigh the savings in transactional costs identified by Castalia (2025).

Another key pathway to transformational gains in efficiency is through agglomeration effects; the productivity gains that occur when firms, workers, and services cluster in well-functioning urban areas. Agglomeration allows businesses to share infrastructure and labour pools, facilitates knowledge spillovers, and increases access to customers and suppliers. The Planning Bill's emphasis on standardised, enabling spatial plans can strengthen these effects by coordinating housing, transport, and infrastructure investment, reducing fragmentation and duplication across regions. While agglomeration effects were not explicitly modelled in this work, they are well-established in the literature and are likely to reinforce the allocative and dynamic efficiency gains identified in our scenarios. Further work could examine these effects more explicitly, particularly where spatial planning and infrastructure sequencing shape how urban areas evolve over time.

When the planning system signals that more land can be developed or intensified for urban use over time, even if not yet fully serviced, it gives councils more flexibility to respond to demand, and allows cities and towns to grow in ways that better connect jobs, homes, and services. Over time, these interactions may amplify both allocative efficiency (by directing people and capital to their most productive uses) and dynamic efficiency (by supporting innovation and adaptation through dense, well-connected economic hubs).

The timing of the reform's policy interventions is likely to be critical for achieving this transformation. Historical analysis by the Ministry for Primary Industries shows that while the removal of financial subsidies for agriculture in the 1980s initially reduced output efficiency and competitiveness ultimately improved.[3] Importantly, deregulation of the New Zealand economy also occurred during this period. However, in some cases development during the years that followed have seen increasing environmental externalities that, when unaccounted for, are akin to subsidies that have arguably reduced economic efficiency.

Similarly, setting clear environmental limits can drive innovation and efficiency improvements by ensuring that development reflects the true costs of resource use. In this way, limits are not constraints on growth but mechanisms that enhance allocative and dynamic efficiency by encouraging cleaner technologies and more sustainable patterns of investment.

One aspect of economic efficiency is the changes in option values over time, where a decision today can either increase or decrease the options for that land in future. A case in point is highly productive land, which is classified according to its versatility. Evidence from Auckland shows that 20% of LUC[4] Class 1 land, 13% of LUC Class 2 land, and 7% of LUC Class 3 land were lost to urban development between 2002 and 2019.[5] When small parcel fragmentation is included, these figures rise to 36%, 19%, and 8% for LUC classes 1, 2, and 3, respectively.

This outcome is effectively a permanent reduction in capacity for land-based primary production, with an unknown net cost or benefit. While housing development generates immediate economic returns, the loss of our most versatile soils has implications for future options, such as food production. Such losses may negatively impact dynamic efficiency because they are not normally captured in current market prices. However, the specific impacts for a location would depend on a wide range of factors.

This distinction between transactional and transformational efficiency gains carries important implications. While process improvements (technical efficiency) provide immediate relief for system users, the economic case for RM reform rests primarily on achieving better use of scarce resources, supporting long-term investment, and building resilience within environmental limits.

6.2 Allocative efficiency requires information

Allocative efficiency occurs when resources flow to their highest-value uses (where 'value' is based on society's values and preferences). In the context of resource management, this

[3] For example, see Myers, R., & Kent, J. (1998) and Ministry for Primary Industries (2017)
[4] Land Use Capability (LUC) is a classification system used to rate land based on factors such as soil, slope, climate, and erosion risk to determine its long-term suitability for production. Land is classified in a LUC class based on how versatile the soil is, with Class 1 the most flexible, and Class 8 the least flexible.
[5] See Curran-Cournane, et al. (2021).

means resources are shared across those activities that generate the most net benefit to society. Importantly, the efficiency test commonly used is whether total benefits outweigh total costs (their distribution is discussed in section 8.1). The current system's fragmented information, inconsistent planning frameworks, and unclear environmental baselines often prevent this efficient allocation.

The modelling completed for this report shows substantial allocative gains across scenarios. When housing supply responds effectively to demand, resources absorbed by inflated land prices are freed for other productive uses. When infrastructure projects proceed without multi-year delays in lower-risk locations, capital generates returns sooner, and uncertainty premiums fall. When environmental limits are clear and stable, businesses can commit to long-term investment earlier rather than holding capital back in anticipation of regulatory change, and resources can be put to their best and highest use.

These gains materialise through improved price signals. Clear environmental limits allow markets to price constraints accurately, directing investment toward activities that are economically and environmentally viable. Better hazard information prevents capital from flowing into vulnerable locations, while streamlined planning reduces transaction costs that prevent land from shifting to higher-value uses.

Allocative efficiency depends fundamentally on information. When environmental baselines are unclear or hazard risks are poorly understood, decision-makers cannot accurately assess true costs and benefits. The reforms' emphasis on national direction, reliable environmental data, and clearer frameworks seeks to directly address these information gaps, which should improve resource allocation. Over time, this creates the sustained economic gains shown in the modelling.

6.3 Dynamic efficiency requires development within environmental limits

Sustained and sustainable productivity growth depends on the confidence that economic activity remains within environmental limits and recognises natural hazard constraints. Clear and robust limits give investors and communities the certainty to commit capital, learn, and innovate. Breaching limits, by contrast, generates non-linear costs: environmental damage that needs expensive remediation, regulatory tightening that strands capital, retreat of insurance coverage, and human health effects, such as degraded air quality or contaminated drinking water.[6]

However, the economic case for limits extends beyond avoiding future costs. Environmental limits also protect non-market values that are important to people living in New Zealand. Many New Zealanders value nature for its own sake, suggesting it has intrinsic worth independent of human use. The principle of kaitiakitanga, from te ao Māori and embedded in Te Tiriti o Waitangi, represents an obligation to protect and enhance the mauri of natural resources for future generations, not only for current economic benefit. These values, while difficult or

[6] See for example, OECD (2017).

impossible to quantify in economic models, contribute to societal wellbeing and should be considered within the context of efficiency analysis for the new planning and environmental management system.

Different groups conceptualise their relationship with the environment differently, and sometimes in opposition to each other. Some view nature through an ecosystem services lens, such as providing food and clean water, climate regulation, and recreational opportunities. Others, including within te ao Māori, see reciprocal relationships where the health of people and the environment are linked and inseparable. Others would say they value wild places and native species simply for existing, regardless of any benefit to humans. The challenge of setting clear environmental limits is to consider all these perspectives by ensuring the natural systems remain intact enough to support economic use, cultural practices, and intrinsic values simultaneously.

This diversity of values and relationships with the environment illustrates that when degradation occurs, it undermines not only productive capacity but also cultural identity, recreation, and existence values, creating both social costs and economic losses. Yet, as highlighted Manaaki Whenua | Landcare Research (2021) there remains a significant gap in how these effects are measured. While MfE and Stats NZ collate a range of pressure, state, and impact indicators, most data currently tracks environmental pressures and condition, with limited information on the *impacts* on human wellbeing. The Parliamentary Commissioner for the Environment has also observed the need for additional indicators to capture the drivers of change and the real effects of environmental degradation on communities.

The certainty provided by well-defined environmental limits allows for long-term planning that aligns with intergenerational societal welfare. This long-term view strengthens allocative efficiency by ensuring that current decisions account for future costs and benefits, allowing resources to be directed not only toward the highest immediate economic returns but toward uses that maximise overall welfare.

6.3.1 Economic costs of exceeding limits and hazard constraints and why they are often underestimated

Overshooting environmental limits and natural hazard constraints imposes costs across multiple channels. The life-supporting capacity of ecosystems declines, hazard exposure increases, and assets may become stranded as rules tighten or risks materialise. Insurance can become unavailable or unaffordable, shifting risks back onto households, firms, and government. Compliance expenditure would be expected to rise as regulators attempt to bring the environment back within limits, and reputational damage may undermine both short- and long-term exports.

The costs of exceeding environmental limits are often underestimated because the underlying information is complex and subject to significant time and policy lags. Environmental systems are dynamic, making prediction and monitoring difficult, while cumulative effects are frequently recognised only after substantial damage has already occurred. Analysis undertaken for the *Allen + Clarke's* valuation of environmental data architecture shows that better measurement substantially reduces these risks by enabling earlier intervention and avoiding costly remediation. When limits are exceeded, the economic impacts cascade, and what begins as localised environmental damage can escalate into broader market failures and costly regulatory interventions that reduce overall economic efficiency.

The modelling also shows that the timing of action matters. Delaying infrastructure investment on one hand, or delaying environmental protection on the other, both impose significant costs. Prices and pressures (including those driven by climate change) are expected to continue to rise, and making progress sooner is almost always cheaper than deferring and facing more intensive interventions later.

6.3.2 Setting limits and other environmental protections now is more dynamically efficient

The reform process represents an opportunity to reset the entire system. With multiple Bills being legislated simultaneously and widespread stakeholder engagement underway, expectations can be aligned across the whole system. Establishing limits during the system design and implementation phases, rather than retrospectively, maximises dynamic efficiency by allowing investment and innovation to adapt immediately to known parameters. The delay in providing national direction for matters of national importance, such as freshwater and indigenous biodiversity, was a major failing of the RMA.

Clear, credible limits become a platform for innovation and resilience. Investors and communities can make long-term decisions with confidence, knowing the environmental bottom lines are stable. This encourages technological improvement, supports adaptive land use, and reduces the risk premiums that discourage capital investment. Over time, this creates a positive feedback loop: clear limits reduce uncertainty, which lowers costs of capital and enables innovation, which in turn lifts productivity and strengthens dynamic efficiency across the economy.

Establishing robust environmental protections (for example, limits, standards, and monitoring requirements) now would direct financial and natural resources toward activities that can operate within those constraints. Retrofitting environmental requirements to activities after they have been established is generally more disruptive and costly than building them in from the outset. If limits and associated standards and monitoring are postponed, investment will flow into activities that may become non-compliant, creating stranded assets, wasted infrastructure, and a greater likelihood of contentious litigation when limits are eventually introduced.

The Expert Advisory Group on Resource Management Reform (2025, p48) Blueprint for resource management reform highlighted this risk in relation to the RMA's insufficient environmental limits. It noted that:

> *There has been a lack of national direction for how place-based protection tools are developed and implemented, leading to inconsistent approaches. For example, despite ONFLs being considered a matter of national importance in the RMA since 1991, central government has provided little direction on how to identify these places and what counts as inappropriate development.*

The Expert Advisory Group on Resource Management Reform (2025, p113) also emphasised the importance of aligning implementation across the new system early to minimise wasted effort:

> *[t]o avoid potentially wasted effort by system users and councils needing to make plan changes to implement national direction, we recommend aligning Phase 2 national direction with our proposals where appropriate. We acknowledge that this could delay delivery of some Phase 2 instrument but consider the benefits will be outweighed by delivering a more effective and efficient system overall.*

Setting limits and protections for the environment from the outset would enable the market component of our economy to price in environmental constraints more accurately, encourage innovation toward sustainable practices, and prevent the locking in of unsustainable development patterns. This is especially important given the reforms' more enabling approach, which allows a greater range of activities to proceed without consent. In this context, well-defined limits provide the essential safeguard for managing cumulative effects and ensuring that overall environmental pressures remain within sustainable bounds.

The alternative of setting limits later creates more risk that environmental limits would be overshot, creating the need for regulatory interventions that would (by comparison) destroy value, undermine trust, and impose far higher transition costs. Setting limits and other protections during reform implementation can help provide the certainty that investors and communities need to innovate and adapt, thereby reducing litigation risk while supporting both allocative and dynamic efficiency.

By establishing environmental limits now, the reforms can create a stronger foundation for the efficiency gains demonstrated in our scenarios while avoiding the environmental degradation that would undermine those benefits. Limits are therefore not a constraint on economic efficiency but its foundation. The potential transformational gains to the economy come from the certainty and direction that limits provide for long-term investment and innovation.

7 Implementation choices will determine outcomes

The design of the RM reforms creates the potential for considerable economic efficiency gains but realising them will depend on the quality of its implementation. Implementation is a complex process that relies on having the appropriate policy tools and investment. The shift in balance from the RMA towards more activities being allowed 'as of right' will alter where the system's effort is concentrated. Setting environmental limits alone will not guarantee they are met. The challenge lies in having the right tools and incentives to ensure they are given effect to. Traditional regulatory levers, such as consent conditions, will be used less often and so more will depend on there being suitable mechanisms to manage activities appropriately, such as through spatial and temporal buffers. Even with such mechanisms, staying within limits will depend in large part on how effectively non-regulatory measures, such as monitoring, education, and market-based incentives, are deployed in conjunction with regulation.

The availability of data will be key to successful implementation. Economic efficiency is ultimately influenced by the extent to which decisions are made with as complete and accurate information as possible. Information is needed about factors such as the net benefits of development, opportunities foregone, environmental issues, resource availability, infrastructure costs, and natural hazard risks. When high-quality data is readily available, it improves confidence and supports investment and innovation that aligns economic activity with society's values and preferences. Conversely, when information is incomplete or inaccessible, uncertainty increases and risk premiums rise, along with resources being wasted. Poorly informed or delayed decisions may erode many of the potential gains from RM reforms.

For example, the Parliamentary Commissioner for the Environment (2025) noted that one of the issues on which politicians should be able to agree:

> *… is the critical importance of high-quality, spatial, multi-layered environmental information to decision making. Without such information, we simply cannot run a modern economy. We have a vast amount of information, but it is riddled with gaps, often lacking in time series, uses methodologies that defy comparative analysis and is highly fragmented. Investing in improving information and its accessibility is a core responsibility of central government – as crucial to our nation as investment in defence or law enforcement.*

Steps such as producing and making available environmental data, implementing effective monitoring systems, deploying digital tools, reflecting true costs in prices, and how partnerships function will determine whether New Zealand captures transaction savings alone or achieves broader economic transformation.

Monitoring, attribution, compliance, and enforcement

When more activities are allowed as of right, more effort needs to be invested in monitoring of effects, and their attribution, as well as compliance and enforcement. These steps become the system's primary assurance mechanisms. This shift from precautionary to enabling of economic activities has major implications for all dimensions of efficiency.

A practical challenge in moving to more of an 'ex-post' regulatory system where most compliance occurs after activities have taken place is attribution: linking observed environmental change to specific activities once adverse effects have already occurred. When more activities proceed as of right, the contribution of any single action to a cumulative impact becomes harder to identify. Diffuse sources, such as sediment, nutrient runoff, or incremental land-use change, may collectively push an area beyond its limits, even when individual activities comply. This can make it more difficult to assign responsibility and respond when limits are approached or breached. Addressing this challenge will require ongoing investment in environmental and spatial data, the development of methods to enhance the traceability of certain activities and assigning clear monitoring responsibilities to support credible and proportionate enforcement.

Allen + Clarke's valuation of New Zealand's environmental data architecture demonstrates the high returns from investment in monitoring infrastructure. The analysis shows that robust environmental data systems can generate benefits from administrative improvements alone; however, when combined with better decision-making (enabled by comprehensive data), the total benefits multiply markedly. For example, CGE modelling undertaken for the valuation revealed that inadequate environmental data could lead to suboptimal renewable energy investment, resulting in a $1.2 billion reduction in national income and 4.7 million tonnes of additional CO_2 emissions. Conversely, data-enabled improvements of just 2% in capital formation efficiency could generate over $407 million in additional national income by 2035. Making better data available to users is likely to improve decision-making that prioritises longer-term efficiency, as it ensures that negative externalities are better understood and factored into the real value of land.

Strong monitoring capacity supports allocative efficiency by ensuring resources remain within sustainable bounds. When users have confidence that limits are real and consistently enforced, they are more likely to make efficient long-term investments. Dynamic efficiency improves as consistent enforcement creates stable conditions for innovation and adaptation. Technical efficiency gains from reduced consenting are therefore supported and maintained by monitoring that prevents cumulative effects from undermining the basis for permitted activity rules that require regulator intervention to manage in the future.

The modelling scenarios on inundation, public health (drinking water contamination), and sedimentation demonstrate these dynamics in practice by showing that relatively inexpensive prevention activities can prevent larger negative impacts from adverse events or downstream responses in the future. Investment in the capability and capacity to ensure the system has robust data and effective monitoring is an investment in a strategic asset that will underpin the broader efficiency gains of reform.

Improved data to support digital planning and transparent consent channels

The move to combined digital plans and e-consent portals offers an opportunity to further improve the technical and productive efficiency of the reforms. Digital plans reduce search costs for developers, enable automated compliance checking, and create a single source of truth that eliminates conflicting interpretations. Transparent and standardised processes reduce costs, shorten timeframes, and give communities and investors greater certainty and visibility over how rules are applied. The use of new technologies, like automation, can further reduce processing times and provide certainty sooner.

Improved environmental data to support better planning and investment decisions

A second dimension of data improvement relates to the information that underpins planning, design, and investment decisions. Accurate, trusted, and available environmental data helps planners, businesses, and communities understand where development can occur within limits and where risks (such as flooding, erosion, or sea level rise) are too high. Making reliable environmental data readily accessible enables decision-makers to account for externalities, identify suitable locations for investment, and mitigate future costs associated with climate or environmental events. Over time, this enhances allocative and dynamic efficiency by directing capital and activity to the places and practices that deliver the greatest long-term value within environmental constraints.

Funding and pricing

Allocative efficiency relies on price signals and/or regulatory signals that reflect the true cost of resource use (i.e., accounting for externalities) and the timing of infrastructure provision. Implementation is dependent on funding and pricing tools that bring forward the right infrastructure at the right time, avoid cost-shifting between users (including across generations), discourage low-value or hazard-prone development, and encourage the efficient use of natural resources.

Interface with fast-track and infrastructure exemptions

A further consideration for implementation is the potential impact of exemptions from limits for certain qualifying infrastructure investments, as well as 'fast-track' approvals through a related but separate regulatory process. While the impacts of such projects are outside the scope of this report, it is worth noting that fast-tracked projects may erode some of the efficiency gains anticipated from the reforms. Where projects proceed reliant on an exemption, uncertainty can arise around the application of spatial plans, environmental limits, and cost-recovery mechanisms, which have the potential to erode the benefits the new system is designed to deliver. These effects may be partially mitigated through careful consideration of how the costs of the exemption (e.g. a reduction in the resource available to existing permit holders) are shared over time.

In practice, the durability of efficiency gains from the reforms will depend less on the legislation itself and more on how effectively data, monitoring, pricing, and compliance systems work together to enable development within environmental limits.

7.1 Risks, distributional impacts, and equity

The efficiency benefits of the reform depend not only on the design of the system but also on how risks are managed and how costs and benefits are distributed. While the reforms create the conditions for lower costs, faster processes, and stronger investment, these gains are not automatic. Effective implementation should account for who bears risks when they materialise and whether the distribution of costs and benefits is equitable, as these factors can influence confidence and investment behaviour, and ultimately the efficiency of the system.

Key risks

1. **Construction capacity and cost inflation**: If housing and infrastructure pipelines are accelerated too rapidly without matching workforce and material capacity, bottlenecks could drive up costs. This risk is *not directly modelled*. The CGE framework assumes resources can move between sectors without short-term bottlenecks.
2. **Uneven distribution of costs and benefits:** The modelling includes analysis of household income quintiles, showing gains and losses spread unevenly across income groups. Many of the changes, such as reduced cost for housing, will have broad impacts including for those on lower incomes. However, if not monitored and managed, these differences could become a risk to both efficiency and equity where benefits concentrate in certain regions, income brackets, or asset classes, while others may bear disproportionate adjustment costs. The modelling does not capture differences across places, impacts on iwi and Māori communities, or collectively owned assets. Monitoring these distributional impacts will be important to ensure that efficiency gains translate into wider wellbeing improvements and maintain the social licence for reform.
3. **Fiscal exposure from network choices**: Fiscal exposure and funding responsibilities have important implications for allocative efficiency and the realisation of environmental limits. While the modelling captures aggregate investment and cost reductions in infrastructure, it does not allocate costs between central and local government or between public and private actors. In practice, how networks are funded, whether through rates, debt, or the Crown balance sheet, affects who bears fiscal exposure and whether costs are distributed equitably across regions and income groups.

   Under the proposed reforms, environmental limits for human health are expected to be set nationally, while those for life-supporting capacity are to be determined at a regional level. This approach reflects a balance between national consistency and regional diversity. However, implementing and enforcing limits requires technical expertise, data, and financial resources that may vary regionally. In some cases, fiscal pressures such as increasing rates or debt constraints could influence the speed or scope of implementation and may create opportunity costs for other core local functions. The resulting variation in timing or capability could affect how efficiently limits are achieved and how benefits are distributed across regions.
4. **Insurance and lender standards**: The modelling assumes insurability and financing remain available. In practice, both will depend on how effectively hazard constraints are enforced and how credible the new system proves over time. Strong hazard mapping and enforcement should reduce exposure and stabilise market confidence, but legacy developments and residual risk will still influence insurance availability and lending criteria. Market adjustments could therefore continue to alter the distribution of costs and benefits, particularly during the transition period, and may require complementary measures to maintain access to finance and manage exposure.

Efficiency and distributional effects

Treasury's cost–benefit guidance states that distributional effects are important. In considering distribution, there are two tests of efficiency. A Pareto improvement means at least one group is better off without making anyone else worse off, but these outcomes are rare in practice. A Kaldor–Hicks improvement occurs when total benefits outweigh total costs: one or more groups may be worse off but they can (in principle) receive compensation from those who are better off. Every Pareto improvement is a Kaldor-Hicks improvement, but most Kaldor-Hicks improvements are not a Pareto improvement. In other words, Pareto improvements are a subset of the Kaldor-Hicks improvements.

The RM reforms are best understood as creating Kaldor–Hicks efficiency improvements. The modelling shows that aggregate efficiency gains are considerable, but some groups will bear adjustment costs as the system shifts towards higher value uses. For instance, the sedimentation scenario shows efficiency gains overall, but land-using exporters bear upfront costs while benefits flow to ports and tourism operators. The inverse also applies: when externalities are not fully priced, some users receive an implicit subsidy while others bear the resulting environmental and social costs. The modelling highlights these impacts in broad terms (by income quintile or sector), but it does not capture the full equity dimension.

The modelling provides directional inferences but does not consider short-term constraints, place-specific impacts, and financial market behaviour. Implementation choices will determine whether benefits are broadly shared and whether those who bear costs are adequately supported. Monitoring of the distribution of costs and benefits across income groups, regions, and iwi/Māori land can help to show how changes in economic efficiency may translate into outcomes for societal welfare.

8 Findings and conclusions for decision making

The modelling results and the wider evidence summarised in this report point to a consistent set of findings about how the RM reforms can improve economic efficiency. The CGE scenarios illustrate the direction and scale of potential economy-wide impacts under different assumptions, while the broader research base shows how changes to planning, limits, and data systems can support more efficient land use, investment, and environmental management. This section summarises the modelling results, synthesises the wider research findings, and sets out the conclusions for decision makers about the conditions that will determine whether the reforms realise their full potential efficiency gains.

8.1 Summary of modelling results

Five 'what if' scenarios were modelled to test how specific reform elements might influence various economic outcomes. Table 3: Summary of Modelling Scenarios and Results summarises the key results from each scenario, showing the direction and relative scale of potential efficiency impacts.

Results should be read as illustrative and comparative, showing where gains or trade-offs could arise depending on implementation. The technical parameters, assumptions, and detailed results are provided in **Appendix A**.

Table 3: Summary of Modelling Scenarios and Results

#	Scenario	Description of the modelling	Key Findings
1	**Housing (all greenfield)**	Edge case of increasing land supply and reduced consenting costs from more permissive zoning and faster approval of new development areas.	Land price effects dominate compliance savings. Modelled economic gains are in the order of $2.4b. More permissive zoning and additional development capacity help moderate price differentials and support more efficient market responses.
	Housing (all brownfield)	Edge case of intensification only within existing urban areas using existing infrastructure capacity and reduced delays to redevelopment.	Substantial gains from infrastructure efficiency. Modelled economic gains are in the order of $1.2b (lower than greenfield, but noting that reality would be a mix of the two). As with greenfield scenario, more permissive development within limits would likely to lead to more efficient outcomes.
2	**Horizontal Infrastructure**	Earlier and better-sequenced delivery of major infrastructure projects, reducing construction lags and capital idling.	Conservative estimate shows $500m+ lift in national income. Cumulative project delays likely far exceed modelled impacts. Reduced input costs improve export competitiveness.

#	Scenario	Description of the modelling	Key Findings
3	**Inundation (pre-emptive investment)**	Comparison of proactive flood-protection and adaptation investments versus delayed, reactive responses.	Benefit Cost Ratio (BCR) of 1.15 for pre-emptive adaptation versus reactive response. Benefits are likely understated as they exclude non-market losses, cleanup costs, multi-year impacts. Dynamic pathways could substantially improve value further.
4	**Potable Water**	Avoided economic and health losses from improved water-quality management and reduced contamination events.	Prevention vastly cheaper than response (BCR ~750). Spatial planning and environmental limits prevent major economic losses.
5	**Sediment (upstream management)**	Reduced sediment loads through improved land-use and catchment management practices.	Minimal economic cost ($100m) enables major non-market benefits. Even modest environmental gains exceed investment costs.
	Sediment (downstream dredging)	Comparison of ongoing dredging versus investment in upstream sediment-reduction measures.	Upstream sediment management more cost-effective than downstream removal. Climate change compounds port maintenance challenges.

8.2 Research findings

The new system is designed around landowners' right to use and enjoy their property, with a stronger focus on managing negative externalities when they occur (i.e., when there is market failure) rather than restricting economic activities ahead of time to manage a broad range of potential societal interests, including aesthetic interests (i.e., being precautionary).

This paradigm shift is expected to generate productive efficiency gains by regulating fewer activities, increasing certainty for activities still needing regulation, and reducing financing and compliance costs. An activity's productive efficiency includes more fully accounting for its externalities (or effects).

By treating land-use rights within science-based environmental limits as the starting point, the system can be expected to improve allocative efficiency (from a total societal welfare perspective) by allowing resources to move more freely towards their highest-value uses (having accounted for their externalities). Here, 'value' or worth is based on society's values, preferences, and aspirations.[7]

[7] For example, see discussion of total economic value in OECD (2018, pp38-40).

The efficiency gains expected from this more enabling and market-responsive system complement the gains modelled in this report. They are reinforced by other aspects of the reform, including greater standardisation of rules, requirements, planning methodologies and zones; the development of market-based allocation tools for scarce resources such as freshwater and coastal space; and (depending on the implementation choices made by Ministers) digital and AI-enabled e-planning and e-consenting. Findings on potential efficiency gains are outlined below.

Enduring gains come from allocative and dynamic efficiency.

The CGE modelling and other analyses indicate that the most significant near-term gains of the new system are likely to arise from productive efficiency through lower transaction costs (administrative and compliance). Over time, the more material gains come from allocative and dynamic efficiency as land, capital, and natural resources are allocated to higher-value uses within clear limits, and when the system enables innovation and learning over time.

The Planning Bill drives near-term economic efficiency and growth.

The Planning Bill is the main driver of near-term economic efficiency and, therefore, economic growth. By simplifying and standardising rules, narrowing the scope of adverse effects to be considered, and enabling more certain and faster consenting, it will support more competitive land markets, lower barriers to intensification, and reduce coordination problems that have contributed to poor housing and infrastructure supply, along with other constraints such as funding availability and tax settings. Removing these constraints will promote agglomeration benefits, lower travel times, and reduce price differentials across urban land markets. The strongest gains do not necessarily come from greenfield expansion on highly productive land or in natural hazard-prone areas; instead, they come from freeing up development capacity where infrastructure either already exists or can be provided efficiently, while removing rule complexity that currently fragments activity and adds delay and cost.

The Natural Environment Bill sustains and protects gains longer-term.

The Natural Environment Bill helps to protect economic gains and make sure they can be sustained. Clear, accurately set, and timely environmental limits that are well monitored and enforced will reduce uncertainty and guard against the erosion of natural capital. Limits are essential for improving dynamic efficiency because, with less ability in the future to access what are effectively environmental subsidies, people will have more incentives to invest in new technologies and make better decisions. A major failing of the RMA was the long delay in providing national direction for matters of national importance, such as fresh water and indigenous biodiversity.

Environmental limits are foundations, not brakes.

A key conclusion from this report is that environmental limits are not a brake on the economy; they provide the certainty needed for development to occur within agreed environmental bounds. Limits are also consistent with the "user pays" principle, with costs falling on those who impose them. While working within limits may mean some prices rise in the short term, it avoids stranded assets and is almost always cheaper than delaying and requiring more involved fixes in the future. As an example, the modelling scenarios for sediment management, potable water, and natural hazards (preventing inundation) demonstrate that, under those assumptions, it can be more efficient to invest in well-timed and financed interventions (such as pre-emptive protection and adaptation to climate change-related hazards) and to account for the opportunity costs of ignoring environmental standards (such as from contaminated drinking water).

Acting early is cheaper than fixing later.

When considered together, the concept of 'delay' highlights the tension for economic efficiency. There is the cost of delaying infrastructure on one hand, but also the cost of delaying the interventions to protect the environment. Early clarity on limits and early investment in enabling infrastructure and data deliver better value for money than implementing more intensive interventions later. Creating a system that enables the activities to take place with appropriate safety features in place can create conditions to force technology to drive growth.

Funding and fiscal choices influence who captures the gains

The efficiency and distribution of benefits will depend on how infrastructure is funded and who bears the cost. While the modelling shows broad efficiency gains from better sequencing and servicing, it does not assign costs between central and local government or between public and private actors. In practice, funding mechanisms — whether rates, debt, or the Crown balance sheet — determine how risks are shared and whether infrastructure is delivered where it generates the greatest long-term value. Clear allocation of fiscal responsibility supports allocative efficiency by aligning incentives, ensuring that investment occurs where it provides the highest net social return, and preventing cost-shifting between generations or regions.

Efficiency gains are Kaldor–Hicks in nature.

If robust and timely environmental limits are set, then total benefits are expected to exceed total costs. However, there will be winners and losers: some groups will gain while others may face permanent losses as resources shift toward higher value uses. Importantly, "higher value" should not be interpreted solely in terms of market prices, because prices do not fully capture cultural, environmental, or intergenerational values. Clear limits, strong national direction, and good information are therefore essential to ensure that decisions reflect a broader conception of value and that transitions are managed fairly. Transition design, risk sharing, and monitoring of distributional impacts will matter for legitimacy and maximising societal welfare.

These conditions will help lift overall economic efficiency. However, the efficiency gains identified in this report are best understood as Kaldor–Hicks improvements where total benefits exceed total costs, even if some groups bear adjustment costs during the transition phase of the new system. The most efficient time to establish clear environmental limits is during deregulation, when the benefits of additional economic growth can offset any costs and before new investment decisions lock in other costs or constrain flexibility for the future.

Standardisation can create economies of scale.

The reforms will narrow the scope of what requires consent. A greater role for central government in setting common rules and standards can reduce the number of different approaches across the country. This delivers two main efficiency gains. First, it allows the Crown to develop national rules once, rather than having each council design its own version, reducing duplicated administrative effort and improving the consistency and quality of regulation. Second, developers and other system users no longer need to navigate a complex array of local rules, which will lower compliance costs and make it easier to undertake projects in multiple locations. While standardisation should not override the need for appropriate local variation, effective centralisation can materially reduce costs for both government and users by creating a more coherent, scalable system.

8.3 Conclusions

The accumulated evidence (Section 5) and scenario analysis (Appendix A) show that the economic efficiency gains from RM reforms are potentially transformational but contingent on a range of critical factors.

In particular, they depend on the quality of the implementation process. The following factors will be critical to delivering the modelled efficiency gains:

1. **Development within limits delivers sustained efficiency gains.**

   Breaching environmental limits or failing to recognise and plan for natural hazard constraints imposes large and non-linear costs through degradation, remediation, stranded assets, and lost productivity. Clear, robust limits provide certainty and direction for investors, supporting allocative and dynamic efficiency.

2. **Early clarity maximises allocative and dynamic efficiency.**

   Creating certainty by setting limits, standards, and funding frameworks early directs capital toward sustainable uses and prevents the much higher costs of later correction. Early certainty helps markets price environmental issues and natural hazard risks accurately, improving both allocative efficiency and investment confidence. The reform period represents an opportunity to reset expectations across the system. Establishing limits and environmental protections early in the process helps direct resources to activities that can operate within them and reduces uncertainty that could otherwise impede investment.

3. **High-quality data multiplies the benefits of reform.**

   Data is both an input and an enabler of efficiency. Robust environmental and spatial data reduces uncertainty, lowers compliance costs, and allows better alignment between infrastructure provision, land use, and environmental capacity. Early investment in data systems is cheaper than waiting to build systems that need to fill in more gaps, and the investment can be expected to deliver compounding returns over time.

4. **Data and monitoring infrastructure promote adaptive management.**

   The shift from front-loaded consenting to greater reliance on monitoring and enforcement benefits from sustained investment in environmental data. High-quality information reduces administrative costs, makes early intervention possible before limits are breached, and protects the long-term gains of reform. Without this investment in tools to support less conservative and/or risk averse decision making, culture, and practice change may not occur.

5. **Capacity is realised through sequencing and servicing.**

   New development capacity in plans creates value when it can be connected to infrastructure, serviced affordably, and delivered in a timely way. Prioritising investment and sequencing development helps ensure that some of the planned capacity translates into actual houses, businesses, and jobs.

6. **Agglomeration benefits are likely to be an important source of efficiency gains.**

   A more flexible and enabling approach underpinned by strong spatial planning should drive agglomeration benefits, especially where housing and infrastructure investment are aligned. Well-functioning urban areas generate agglomeration effects by lowering transport and infrastructure costs, supporting labour mobility, and enabling productivity spillovers. These benefits compound over time, making efficient urban form a key driver of both allocative and dynamic efficiency.

7. **Implementation choices need to consider risk and distribution.**

   Efficiency gains will not automatically be shared evenly. Transition costs will fall unevenly across sectors and places. Managing these through compensation, transition support, and risk-sharing mechanisms can help maintain fairness, legitimacy, and social licence while protecting aggregate efficiency.

Taken together, these conclusions suggest that RM reform's potential will be realised through thoughtful implementation that addresses sequencing, limits, and information infrastructure in an integrated way. The reform architecture provides the potential, and implementation choices will determine the scale and distribution of benefits achieved.

Appendix A: Detailed overview of CGE Modelling

Introduction & Summary

The general equilibrium modelling analyses a set of five main scenarios that explore the possible effects of proposed changes to the resource management system, notably the proposed Planning Act and the proposed Natural Environment Act. The analysis builds on earlier work by Infometrics and joint work between Infometrics and *Allen* + *Clarke*.

General equilibrium models capture a wide range of direct and indirect economic effects from changes in economic policy and external economic events – effects on household consumption, greenhouse gas emissions, the government's fiscal position, industry output and so on. These types of models inherently incorporate the pursuit of productive efficiency by industries and, through matching supply to consumer preferences, also achieve allocative efficiency. Adding a time dimension, such as with cost-benefit analysis that includes the calculation of net present value presents a way to assess dynamic efficiency as well.

These models do not incorporate or provide an assessment of non-market economic costs or benefits. This is an important limitation and one of the reasons that general equilibrium modelling should complement other types of cost-benefit analysis when determining the direction or likely outcomes of a potential policy change. Spatial effects within an economy are also excluded in this model.

The five scenarios tested here are based on some of the intended outcomes of the proposed resource management reforms. Implicitly the counterfactual is a continuation of current regulations and practices, acknowledging that in the absence of the proposed reforms other changs to resource management could occur. However, the scenarios are not forecasts They represent possible pictures of how the economy might look at a particular point in time in the future, given various assumptions about how the resource management reforms could be implemented.

More specifically, the scenarios look at:

- housing
- horizontal infrastructure (roads, water reticulation and electricity distribution)
- inundation
- potable water
- sediment issues in waterways and ports.

Collectively these scenarios show that it is possible to achieve substantial economic gains or avoided losses (in billions of dollars annually by 2050) from resource management reform. That does depend, however, on the types of investment facilitated by the reforms being well-timed and financed (such as pre-emptive protection and adaptation to climate change-related hazards) and that they take into account the opportunity costs of ignoring environmental standards (such as from contaminated drinking water).

Nevertheless, the scenarios examined here are in no sense exhaustive of what the resource management reforms could facilitate. As the details of the reforms and their implementation options become more apparent there will be opportunities to test other scenarios and to refine those studied here.

Scenarios

Specification

Using a general equilibrium model of the New Zealand economy we investigate five main scenarios related to the possible effects of changes to the resource management system.

The scenario results are expressed as changes from the model's 2050 Baseline that implicitly contains no changes to the current RMA, its application and interpretation. When the reforms will be effective and how long the economy's transition period will be is uncertain. Thus 2050 is a convenient common anchor point across the scenarios, allowing for comparisons, but some effects will materialise earlier and some later.

Importantly, general equilibrium models are not forecasting models. Their strength is in scenario analysis, with a model's Baseline scenario acting as a frame of reference (or anchor) against which other scenarios may be compared or measured. The Baseline is intended to be a plausible picture of the economy, being largely a continuation of recent historical trends without major external or internal events or policy changes. A summary is presented in Appendix A1, and an outline of the general equilibrium model is presented in Appendix A2.

Scenario 1: Housing

Scenario 1 is split into two parts to create two ends of a spectrum, with Scenario 1a assuming that all new housing is by way of greenfield development (new development on newly available land) and Scenario 1b assuming that all new housing is brownfield development (upgrading development on previously developed land). In reality we would expect a mix of both types of new housing. Running two extreme scenarios is merely an efficient way of ascertaining the extent to which each type of development could raise national wellbeing.

Scenario 1a: All greenfield

In Scenario 1a we simulate a reduction in user compliance costs for consenting new houses and apartments of $300 million per annum (Resource Economics et al., 2021). When calculated over 25 years and as a proportion of the projected dwellings capital stock in 2050 of almost $1000 billion (real 2019/20 prices),[8] this reduction corresponds to a productivity improvement of 0.75%.

[8] Infometrics estimate.

In addition to the reduced compliance costs, we also include a reduction in the cost of housing through greater land availability. For example, the Ministry of Housing and Urban Development estimate that the effect of land restrictions in Auckland was an extra $378/m^2 (in 2021) on the inside of the urban-rural boundary (Housing Technical Working Group, 2024). Allowing for other areas in New Zealand having lower boundary differences and assuming that the RM reforms do not completely smooth out these differences, we model a nation-wide reduction of $150/m^2 in land prices for new housing.

Accumulated over all new dwellings constructed to 2050 (about 1.06 million in the Baseline) and assuming a conservative average land per dwelling of 220m^2 (allowing for the likelihood of more high-rise apartments and more housing density), improves the efficiency of the dwelling capital stock by 3.5% by 2050. Only the new capital stock incurs the cost reduction, as any effect over the existing stock is essentially a transfer between parties. Also, not all new housing constitutes a net addition to the dwelling capital stock. Some new dwellings will be replacing existing dwellings that are no longer fit for purpose. However, the RM reforms may accelerate such replacement.

Scenario 1b: All brownfield

Here we consider the effect of all brownfield development for new housing (the opposite end of the continuum from Scenario 1a). Sense Partners (2024) estimates show that there are significant differences in annual costs per dwelling for local roading and three waters between less dense and more dense housing. Note that the cost differences relate to the current infrastructure network. They do not include the costs of new infrastructure with high fixed costs such as a mass transit network.

In the modelling we adopt differences of $200/yr per dwelling for road costs and $600/yr per dwelling for three waters costs. We model this as lower property rates for households, coupled with a matching change in the level and mix of spending by local government. Unlike in Scenario 1a, there is no change in land prices at the urban fringe because all development occurs within the existing urban area. By 2050 property rates are lower by approximately $830 million if all new dwellings between now and 2050 are brownfield.

There are many important caveats on both scenarios. For example, any deleterious effects of brownfield development on consumer utility such as blocked sunlight and less privacy are ignored in the modelling, but then so are agglomeration effects. With regard to greenfield development, the scenario does not consider the consequences of the potential irreversible loss of highly productive land (i.e., land with the most versatility for different crops), nor exposure to natural hazards (e.g., flooding, landslips).

Scenario 2: Horizontal infrastructure

Scenario 2 looks at a general reduction in the cost of investment in infrastructure projects, such as land transport networks and utility systems, that stretch across the land rather than vertically like buildings. This type of infrastructure connects people as well as industries, and is needed to supply critical services like wastewater, telecommunications and electricity. The reduction in cost is brought about by the resource management reforms lowering compliance and consenting costs, lengthening the duration of consents and enhancing corridor planning. Principal Economics (2022) estimate the cost of delays in construction of the Waikato

Expressway at $334 million per annum, while Sapere (2021) estimate a cost of $1.29 billion annually for the consenting of infrastructure projects.

For modelling purposes, we assume a 10% reduction in infrastructure costs for electricity distribution, three waters and roading, emphasising that this 10% is merely a guide to potential effects. We also explore a more conservative 5% reduction.

Scenario 3: Inundation

In this scenario we look at the effects of a more streamlined process for pre-emptive investments related to inundation, whether pluvial (flooding caused by rain), fluvial (flooding caused by high river levels) or coastal (caused by storm surges and/or sea level rise). We split Scenario 3 into two parts:

Scenario 3a: An inundation scenario under climate change (details below) that has a 1% chance of occurring in any year (1% AEP – Annual Exceedance Probability) without investment in more protection and adaptation measures.

Scenario 3b: A scenario with investment in sufficient pre-emptive adaptation and protection measures to avoid the loss associated with an AEP=1% event.

The average combined direct damage cost of cyclone Gabrielle and the Auckland floods was about $12 billion (Noy, 2025), although as pointed out by Noy these estimates are likely to be on the low side. The flooding associated with Cyclone Gabrielle has been estimated as a 1-in-550-year event and the Auckland floods as a 1-in-200-year event (NIWA, 2024; Science Media Centre, 2024). Thus $4 billion in direct damages for a 1-in-100-year event seems quite plausible.

To that effect, in this scenario, we assume a loss of 0.35% of the capital stock across nine industries, which we model as accelerated depreciation.

1. horticulture
2. dairy farming
3. forestry
4. water supply
5. waste water & waste disposal
6. owner-occupied dwellings
7. non-residential property operation
8. telecommunications
9. local government services (includes roading).

Of course, the effects of inundation are not necessarily limited to these industries. The above nine are selected based on their level exposure, but the damage from any given inundation event depends on many variables such as location, the duration of a flood, its depth and water velocity. Thus, in the modelling we cannot ascribe the damages estimate of $4 billion to any particular location or event.

Of the $4 billion in damages, $3.5 billion represents residential property. By way of comparison, Storey et al. (2025) estimate that between 2026 and 2050, the cumulative expected loss of residential property values from AEP=1% (or worse) events ranges from $1.4 billion to $8.7 billion. The lower end of the range corresponds to a few properties incurring high damage and the higher end corresponds to many properties with relatively low damage. Without climate change (RCP 4.5 projection) these market losses are estimated to be one third lower.

With regard to investment in protection and pre-emptive adaptation, Te Uru Kahika (2023) have estimated that spending $5 billion over ten years is needed for the economy to be resilient against a 1-in-100-year flood event under an RCP6 climate change scenario.

In order to obtain a better perspective on the relative costs, for modelling purposes we allocate investment of $500 million to 2050, but note that in our subsequent Present Value (PV) analysis we assume that this investment in pre-emptive adaptation primarily occurs earlier in the period. However, defining an optimal path for such investment should be based on real options analysis that considers the frequency of inundation events.

In both Scenarios 3a and 3b we fully expect the model to generate negative macroeconomic benefits. The point of the modelling is to test the extent to which the loss in Scenario 3a can be avoided by the expenditure in Scenario 3b. In other words, we are measuring the effect of the investment, which is better enabled to occur by the resource management reforms.

Scenario 4: Potable water

In Scenario 4 we look at the effects of microbial contamination in the environment on the economy. The assumption is that, by improving spatial planning in urban areas and enabling limits for human health to be set, such situations are more likely to be avoided under the resource management system.

In 2016 in Havelock North, drinking water contaminated with animal faeces made much of the town’s residents ill. According to a report by Sapere (2017) the economic cost of the outbreak was about $21 million (market plus non-market).

Not all of the costs estimated by Sapere can be simulated in a general equilibrium model. The non-market losses include the value of lost Quality of Life Years (QALYs), which is a metric used in the health sector, and time away from undertaking normal household activities. They amount to about $13 million. The market losses comprise mostly medical costs, local government costs, and costs to business.

To obtain an input shock needed for modelling (I.e. that is visible above the model’s error margins), we multiply the Havelock North incident, in which 5000 people were adversely affected over two weeks, by twenty – akin to an event in which 100,000 people are affected in a main centre such as Auckland, Wellington or Christchurch.

With the time available, we were unable to model the cost of avoiding such a specific episode, so no cost benefit analysis is presented for prevention. However, very approximately, if we assume that the cost of delivering potable water is about $2/kilolitre (a typical charge where water use is metred, giving us a price to use) and that household water use is 200 litres per person per day, then the estimated cost is $0.40 per person per day. In the Havelock North case that cost estimate implies an avoidance cost of $28,000, and thus an implied Benefit-Cost Ratio (BCR) of preventative action of 750 – which is an impressively high result even allowing for error margins in the calculation.

We note though that the $0.40 per person per day is a long run average cost, but even scaling up the $28,000 by a factor of twenty still yields a high BCR.

Scenario 5: Sedimentation

Scenario 5a: Upstream soil conservation

In Scenario 5a we move upstream from Scenario 4 to look at the cost of obtaining cleaner waterways by reducing sedimentation. That may have beneficial effects on the downstream cost of further treatment to drinking water standard, but that trade-off is not examined here. Our focus is on determining the opportunity cost of reducing sediment (and its accompanying hazards such as E. coli), in the sense of displacing other economic activity.

There are of course numerous benefits to cleaner waterways. Some, such as avoided flood damage include economic benefits, but many such as greater biodiversity and less illness from contact with the water, are non-economic, or at least not easy to simulate in a general equilibrium model. They can be assessed outside the model.

A report by Polyakov et al. (2024) estimates a marginal abatement cost (MAC) curve for reducing suspended and deposited fine sediment in waterways in the Manawatu-Whanganui region, such that they attain a rating of at least Band C for visual clarity. This rating is above the National Bottom Line (the threshold between Band C and Band D) in the National Objectives Framework (NOF).[9] A MAC curve depicts the rate at which the cost of abatement increases as the target becomes progressively more ambitious.

Stats NZ (2022) estimated that about 15% of the waterways (by length) nationally are in Band D (i.e. below the National Bottom Line). To present a plausible scenario we look at the cost of bringing one third of that 15% up to Band C. Assuming that the MAC curve estimated by Polyakov et al is reasonably applicable to the rest of the country, the cost would be around $2.6 billion. About 75% of this is directly foregone agricultural production, while the rest represents capital expenditure for activities such as afforestation and bush retirement. We assume that the afforestation is native forest which is not harvested.

The time period over which $2.6 billion might be spent is unknown. For modelling purposes we assume ten years, implying a model shock of $260 million, which puts the scenario on a par with the previous one. Any maintenance costs are not included so would be additional.

[9] The NOF is a classification system that was introduced into the National Policy Statement for Freshwater Management in 2014.

Scenario 5b: Avoided dredging

Here we look at how the new resource management system (e.g. enabling limits to be set for attributes such as sediment quantity) may help New Zealand's ports to maintain their business-as-usual activity for importers and exporters. In its two parts this scenario considers how lower levels of suspended sediment reaching the coast may offset the likely need for extra maintenance dredging expected as a result of climate change which exacerbates sediment run-off.

Many ports in New Zealand require annual or biennial dredging to continue normal operations. Five ports; Auckland, Tauranga, Taranaki, Gisborne and Lyttelton combined typically dredge more than 1.4 million m^3 per annum. Smaller amounts of dredging at other ports such as Napier and Timaru easily bring the total to over 1.5 million m^3 per annum.

Neverman et al. (2023) estimate that coastal sedimentation will increase significantly over the next 70 years. Their estimates cover a very wide range, depending on region, time span and climate scenario, but a plausible average to 2050 is a 30% increase (±10%). For modelling purposes, we assume an increase of 500,000m^3 in coastal sediment that could need dredging.

Market Economics (2018) estimated the cost of various options to dispose of dredged sediment – in addition to the cost of dredging itself which is common to all disposal options. Their estimates ranged from \$47/m^3 to \$290/m^3 depending largely on whether the material is disposed of at sea on or land. For modelling we assume a conservative total cost of \$150/m^3 which, when applied to 500,000m^3, implies an annual cost of \$75 million. The cost was simulated in the model as payment by port operators to dredging companies and passed on to exporters and importers.

Macroeconomic Results

As noted earlier the five scenarios provide alternative snapshots of 2050 relative to the model's Baseline which implicitly contains no changes to the current RMA and its application.

The modelling results are presented to two decimal places, just to provide a better indication of the relative differences between the scenarios. They are not accurate to that degree. There is considerable uncertainty around the RM reforms and modelling in general.

In the tables below:

- Dollar values are in constant 2019/20 prices. Between then and 2024/25 the Implicit GDP deflator rose by 21.7%.[10] This is a simple scaling factor that could be used to convert the model's dollar values into 2024/25 prices.
- Percentage changes are more reliable than changes in levels, as the latter directly reflect both the size and composition of the economy in the Baseline, which will

[10] The Implicit GDP deflator is the ratio of GDP expressed in current prices to its value expressed in constant (inflation adjusted) prices, relative to some base year. It is not a pure price index as the mix of underlying quantities may change between time periods.

undoubtedly prove to be only partially correct. For example, higher population growth might lead to higher GDP in 2050 than in our Baseline, but the relative effects of RM reforms would not be markedly different if this was to occur.

- Gross Domestic Product (GDP) is a commonly used measure of the size of the economy but says nothing about quality. We present it in the tables below along with Real Gross National Disposable Income (RGNDI), which is defined as GDP plus adjustments for the terms of trade and net factor payments overseas, such as for emission units.[11] RGNDI is a thus more useful measure of the income available to the economy than GDP.
- Except in the scenarios where it is explicitly changed, government consumption is fixed at its Baseline value.

Scenario 1: Housing

Both Scenarios 1a and 1b show strong macroeconomic benefits from an RM system that is more enabling of housing. See Table 4 below. Exports expand due to improved competitiveness and private consumption increases by more than the pure government-private switch in Scenario 1b – recalling that government consumption has been deliberately lowered as part of the scenario specification. Higher exports, lower deadweight loss and consumers being able to spend their effective increase in disposable income on other goods and services all percolate throughout the economy, multiplying the size of the initial productivity shock.

Table 4: Summary of Results for Scenario 1 (changes on Baseline)

	Baseline	Scenario 1a (greenfield)		Scenario 1b (brownfield)	
	$billion (2019/20)	Δ$	Δ%	Δ$m	Δ%
Private consumption	356	1765	0.58	1795	0.50
Govt consumption	111	0	0.00	-835	-0.75
Gross investment	149	530	0.41	295	0.20
Exports	168	380	0.27	-35	-0.02
Imports	165	215	0.15	-15	-0.01
GDP	623	2420	0.45	1205	0.19
RGNDI	601	2285	0.44	1250	0.21
	Mt	Mt		Mt	
Gross CO_2e	49.9	0.04	0.08	-0.17	-0.33

Given the above assumptions, easing land restrictions for greenfield housing appears to be a better option than brownfield housing, all other things equal. However, in reality it is a complex topic and many other factors need to be considered: local & regional price differences, the

[11] We treat payments for emissions units like an annual licence, although the units could also be treated as a stock (asset) rather than a flow. This doesn't affect the essence of the modelling.

type of land in question (such as versatile/productive land)[12], the type of housing (e.g. large single dwellings or apartments), access to transport links and amenities, neighbourhood effects and the productivity gains from businesses and people being in closer proximity to each other. Not all of these are necessarily in favour of brownfield development. For example, brownfield development may reduce consumer wellbeing if high-rise development diminishes access to sunlight or raises ambient noise levels.

Sensitivity test: Scenario 1c

Equally important are the modelling assumptions. In Scenario 1a the assumed effect of loosening land use constraints is $150/m^2. In a sensitivity test, Scenario 1c (not shown in Table 1) that assumption is reduced to $50/m^2, but keeping the $300 million reduction in compliance costs, results in:

- Private consumption: Changes of $810 million and 0.23% in Scenario 1c, compared to $1765 million and 0.58% in Scenario 1a.
- GDP: Changes of $1110 million and 0.18% in Scenario 1c, compared to $2420 million and 0.45% in Scenario 1a.
- RGNDI: Changes of $1050 million and 0.17% in Scenario 1c, compared to $2285 million and 0.44% in Scenario 1a.

Unsurprisingly the macroeconomic effects of a lower land price difference (Scenario 1c) are much less than in Scenario 1a, but they also fall below those in Scenario 1b, demonstrating the sensitivity of whether housing growth occurs as greenfield or brownfield to the trade-off between more intensive use of existing urban infrastructure and the lower cost of land in rural areas.

The RM reforms are intended to be enabling – removing restrictions on where new housing, and what type of housing, may be built. In some cases, brownfield development will be the preferred choice; in others, greenfield development. The important point is that permissive choices (within limits) are likely to lead to more efficient outcomes. The lesson from the modelling is that poorly thought out/ill-considered decisions can be extremely costly.

Scenario 2: Horizontal Infrastructure

Table 5 summarises the macroeconomic results for Scenario 2, a general reduction in the costs of investing in horizontal infrastructure that provides critical services, such as transport, water, electricity, and telecommunications. Lower infrastructure costs improve industry competitiveness, as demonstrated by the increase in exports of 0.2% (that is, lower input costs support lower pricing). In absolute dollar terms households benefit the most, gaining over $400 million annually by 2050.

[12] Using versatile rural land for urban development is akin to extinguishing an option to use it later for agriculture. That may or may not enhance dynamic efficiency.

Scenario 2a presents a simple sensitivity test with the assumption of a 10% efficiency improvement halved to 5%. Unsurprisingly, the results show half the effects, although for changes larger than 10% the effects are likely to become progressively less linear.

The main value of this type of scenario is to provide an indication of the cost of delayed investment. As noted above, Principal Economics estimated the cost of delay at $334 million per year for the Waikato Expressway. In another example, it was recently estimated by NZIER that without the container berth extension at the Port of Tauranga, the country will miss out on $485 million to $749 million of GDP annually by 2032. The project has been in the consenting process for more than six years (The Maritime Executive, 2025).

Table 5: Summary of Results for Scenario 2 (changes on Baseline)

	Baseline	Scenario 2		Scenario 2a	
	$billion (2019/20)	Δ$m	Δ%	Δ$m	Δ%
Private consumption	356	405	0.11	205	0.06
Gross investment	149	115	0.08	55	0.04
Exports	168	345	0.20	170	0.10
Imports	165	160	0.10	80	0.05
GDP	623	710	0.11	355	0.06
RGNDI	601	540	0.09	265	0.04
	Mt	Mt		Mt	
Gross CO_2e	49.9	0.15	0.30	0.08	0.15

Against these two examples, the $540 million lift in national income in Scenario 2 seems light. It would not take many infrastructure project delays for the cost to cumulate to over half a billion dollars per annum.

Scenario 3: Inundation

In Scenario 3a (the event scenario) the $4 billion loss of capital stock from an AEP=1% event reduces national income by $1085 million in 2050 and in Scenario 3b the $500 million of investment in protection in adaptation measures reduces national income by $290 million.

The inundation event has a negative effect on exports as primary production is curtailed by the loss of productive land and capital stock. In Scenario 3b the market effect of protection is mainly a loss resulting from the switch of resources out of consumption and into investment, without that investment necessarily delivering any return – by definition. The foregone private consumption is $780 million (see Table 6).

In Scenario 3a, why does a loss of $4 billion of capital stock cause a loss of only $1 billion or so in national income in 2050? The reasons are, firstly, that capital stocks are assets that produce flows of income over more than one year, and secondly, that the economy adjusts to the change. Lost output in one location may be offset by increased activity elsewhere – in the same year or over time, by more on-line transactions or by imports. People may move from places where workplaces have been lost to other places or other industries where jobs are available.

Table 6: Summary of Results for Scenario 3 (changes on Baseline)

	Baseline	Scenario 3a (event, no investment		Scenario 3b (no event, with investment)	
	$billion (2019/20)	Δ$m	Δ%	Δ$m	Δ%
Private consumption	356	-840	-0.24	-780	-0.22
Gross investment	149	-260	-0.17	495	0.33
Exports	168	-350	-0.21	0	0.00
Imports	165	-190	-0.11	0	0.00
GDP	623	-1265	-0.20	-300	-0.05
RGNDI	601	-1085	-0.18	-290	-0.05
	Mt	Mt		Mt	
Gross CO_2e	49.9	-0.08	-0.16	-0.02	-0.03

Comparing the $1085 million and $290 million seems like a good benefit-cost ratio, but we need to consider that the loss in Scenario 3a is incurred only if an inundation event actually happens, whereas the $290 million is incurred every year for 10 years. How many AEP=1% events could be expected over the 25 years to 2050?

Storey et al. (2025) estimate damage costs from AEP=1% events for each of the 16 regions in New Zealand. Assuming independence of events (and acknowledging that events are actually related to catchments, not regions) there is a 98% chance of at least one such event somewhere in the country, with a statistically expected number of 3.53 events by 2050. Thus, the expected loss in national income over the next 25 years is $3.83 billion.

At a discount rate of 2% the present value is $3.06 billion compared to the present value of the investment in protection of $2.66 billion, yielding a Benefit Cost Ratio expressed in terms of the cost to national income of 1.15. That result seems plausible, but a number of important caveats apply, most of which, if recognised, would be expected to enhance the Benefit-Cost Ratio. These caveats include (but are not limited to):

- The income loss from any single inundation event may endure for more than one year.
- The model knows nothing about non-market and non-economic losses (including morbidity and mortality), which are particularly important in the context of destroyed housing.
- Uncertainty about the future frequency and size of AEP=1% events over the next 25 years is high.
- Clean-up and remediation and clean-up costs are excluded.
- The benefit-cost balance is likely to vary markedly in different places.

- Phasing the timing of investment in protection in response to evolving risks (i.e., a Dynamic Adaptive Pathways Planning approach) could deliver much better value for money.[13]

Our key inference from the modelling is that better enabling of pre-emptive investment in adaptation measures for extreme weather events could avoid losses in national income of hundreds of millions of dollars, if not billions of dollars over the next 25 years. This does not imply that all such investment is worthwhile, but it does highlight the need for RM reforms that ensure easier and quicker processes for a range of timely adaptation measures such as:

- Construction of flood protection infrastructure (e.g. stop banks, flood gates).
- Nature-based solutions.
- Building design (e.g. floor heights).
- Arrangements with landowners to accommodate over-design events.
- Limiting new assets being installed behind publicly funded protection
- Managed retreat.

Scenario 4: Potable water

Scenario 4 explores the effect of a direct economic loss $260 million due to illnesses contracted from contaminated drinking water. As discussed above, non-economic losses (such as lost quality of life) associated with such outbreaks could add another 150% to that figure (i.e., a total of $650 million).

Table 7: Summary of Results for Scenario 4 (changes on Baseline)

	Baseline	Scenario 4	
	$billion (2019/20)	Δ$m	Δ%
Private consumption	356	-445	-0.13
Govt consumption	111	190	0.17
Gross investment	149	-80	-0.05
Exports	168	-155	-0.09
Imports	165	-90	-0.05
GDP	623	-410	-0.07
RGNDI	601	-335	-0.06
	Mt	Mt	
Gross CO_2e	49.9	-0.04	-0.07

Table 7 shows that the direct costs of this scenario are multiplied by a factor of about 1.3 when considering the wider cost to national income. This result comes about as indirect effects flow through the economy, such as staff illness in one industry preventing supplies going to another industry. These flow-on effects are moderated because some substitution occurs – either over

[13] See for example Infometrics & PSConsulting (2015)

time (but still in the same year) in the form of deferred consumption, or over space if goods and services can be sourced from elsewhere.

The fall in private consumption in this scenario is partly attributable to the rise in government consumption (associated with the costs of the outbreak) which requires an increase in taxes on households to pay for it.

Our approximate cost-benefit calculations above suggest that the cost of preventing contamination of drinking water are very low in comparison to the benefits to be gained. They are also too small to be able to simulate as a single event in an economy-wide model.

Scenario 5: Sediment

The results of Scenarios 5a and 5b are presented in Table 8. Scenario 5a has an investment of $260 million to achieve a water clarity national bottom line for one third of the 15% of country's waterways (by length) that do not meet that standard. Following Polyakov et al (2024) the $260 million investment is a mix of capital expenditure in the forestry and agricultural industries, plus a productivity loss in agriculture as some farmland is set aside for native bush. The $260 million is an annual cost for ten years.

In terms of production (as measured GDP) the $260 million investment in improving water clarity has a net cost of only $100 million in 2050, which is attributable to lower exports. That also has the beneficial effect of reducing emissions which cushions the fall in national income (RGNDI), though at $25 million the effect is so close to zero as to be considered within error margins.

Table 8: Summary of Results for Scenario 5 (changes on Baseline)

	Baseline	Scenario 5a		Scenario 5b	
	$billion (2019/20)	Δ$m	Δ%	Δ$m	Δ%
Private consumption	356	-15	0.00	-120	-0.03
Gross investment	149	-5	0.00	-40	-0.03
Exports	168	-105	-0.06	-45	-0.03
Imports	165	-30	-0.02	-30	-0.02
GDP	623	-100	-0.02	-175	-0.03
RGNDI	601	-25	0.00	-155	-0.03
	Mt	Mt		Mt	
Gross CO_2e	49.9	-0.05	-0.10	-0.00	-0.01

The results of this scenario imply that even small benefits – whether market (such as to fishing and aquaculture industries) or non-market – from investment in curtailing suspended and deposited sediment would swing the net effect into positive territory, even allowing for timing differences. The investment may be largely upfront, with an initial incidence on the rural sector, but the benefits of cleaner waterways would accrue over the entire community for generations.

For example, at a 2% discount rate (Treasury, 2015) the present value of $260 million each year for 10 years is $2.38 billion. Spreading the cost evenly over 25 years produces a present value of $2.07 billion while a linear annual decline staring at $200 million and ending at $8 million has a present value of $2.23 billion. These values are close, so a net present value that includes benefits (economic and non-economic) would be robust to differences in the timing of the expenditure.

In Scenario 5b the $75 million increase in costs for port operators represents about 1.1% of revenue in the wider transport support services industry (ANZSIC Industry 52) and leads to a decline in exports of 0.03% (about $45 million). Imports decline by less as importers are generally in a better position to pass on cost escalation than exporters. The effects may be small, but the directions are clear.

The falls in GDP and RGNDI in Scenario 5b are larger than in Scenario 5a, even though the model input shock is smaller. The cost of bringing waterways up to a specific clarity standard is not necessarily comparable with the cost of additional dredging of coastal sediment due to climate change. However, the results suggest that there are important differences in the cost-effectiveness of reducing or trapping sediment closer to its source compared to removing sediment from its deposition in commercial harbours and other situations such as navigable rivers and estuaries. The management of sediment in such receiving environments may become more challenging in the future, potentially even with relatively small rises in sea level (e.g., 20cm).

Households and Industries

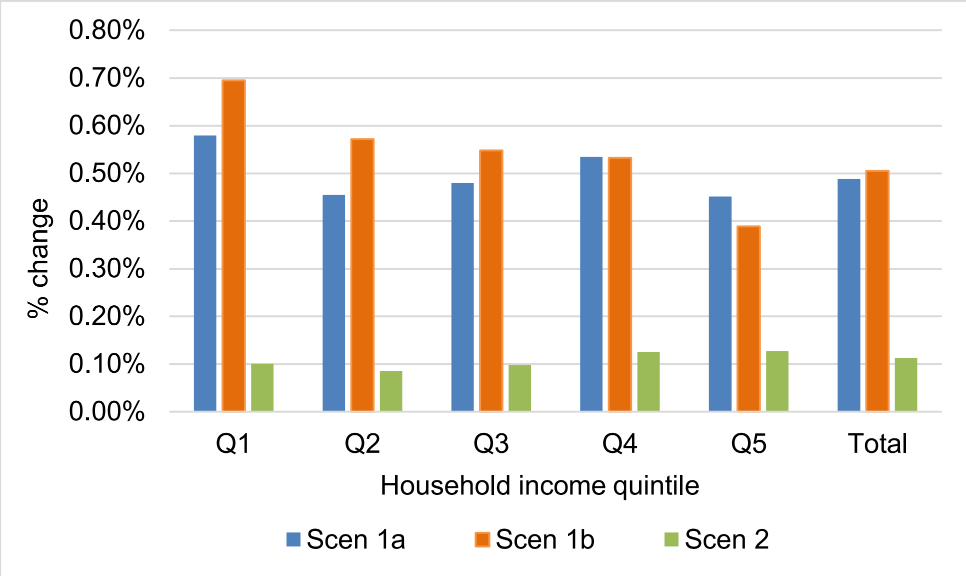
Private consumption

Figure 3 presents the change in real private consumption by household income quintile (each has 20% of households grouped by income – Q1 is lowest), for Scenarios 1 (housing) and 2 (horizontal infrastructure). Figure 4 presents the results for Scenarios 3 (inundation) and 4 (potable water), and Figure 5 for Scenario 5 (sediment). Note that the scale of the vertical axis changes between the graphs.

Overall, the quintile differences are small, but there are some interesting variations across scenarios:

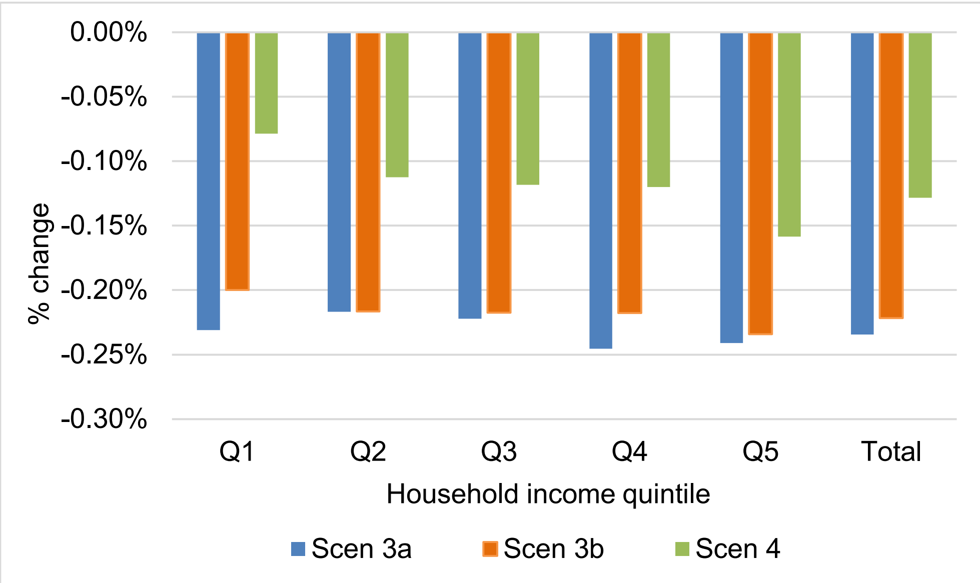
- In Scenario 1a (all greenfield the largest proportionate gain accrues to Q1 households, which has the highest proportion of renting households. Q5 shows the smallest relative gain as household in the group are less sensitive to land prices. Q2 has a high proportion of superannuitant households so is also less sensitive to changes in cost of building new dwellings.
- In Scenario 1b (all brownfield) Q1 households again see the largest proportionate gain, which declines monotonically thereafter. Lower property rates generally affect lower quintiles most.
- In Scenario 2, Q4 and Q5 households benefit most, being relatively large consumers of utilities such as water and roads.

Figure 3: Private consumption changes by income decile, Scenarios 1 & 2



- In Scenario 3a (with an AEP=1% event) the most affected quintiles are Q1 and Q4, due to the effect on property values and the shares property values play in household consumption.
- In Scenario 3b the cost of investment in adaptation falls relatively more on Q5 households, largely driven by the higher taxation required to fund central government costs.
- For the same reason, plus higher local government costs, the cost of water contamination also falls relatively more on Q5 households (Scenario 4).

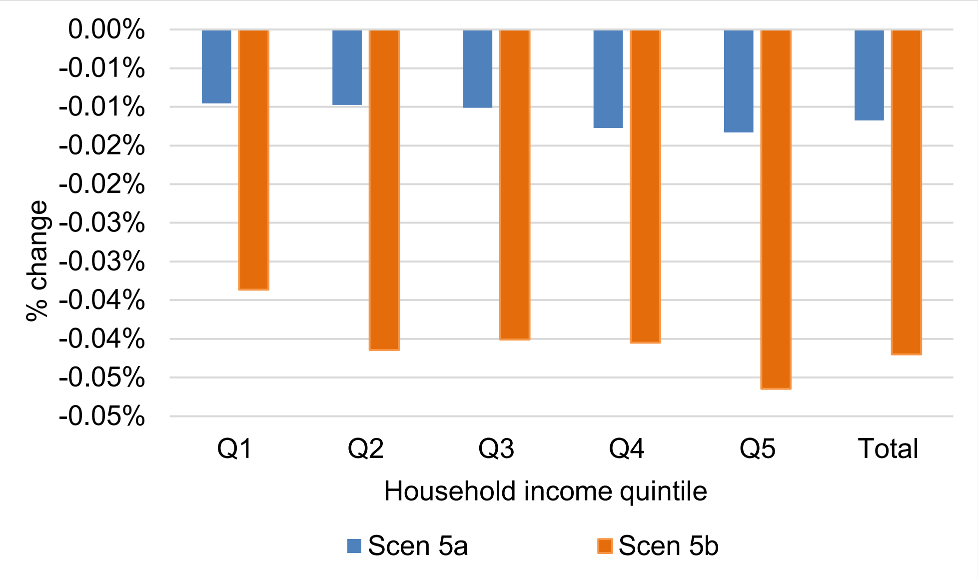
Figure 4: Private consumption changes by income decile, Scenarios 3 & 4



- It is possible that the model understates the differences across household quintiles in Scenarios 3a and 3b, not so much with regard to the incidence of taxes and property rates (about which the data is generally satisfactory), but with regard to the exposure of housing to climate change-related hazards. The main reasons are that the model knows nothing about the geographical location of properties and the risks they face.

- Scenario 5a has very small differences across the quintiles, but a general trend of relative costs increasing with household income, as exporting industries tend to have a higher proportion of value-added payable to owners of capital.
- Scenario 5b is slightly different with a larger proportionate difference between Q1 and Q5. This reflects the fiscal closure rule against the background of a smaller economy requiring an increase in net household tax payments.

Figure 5: Private consumption changes by income decile, Scenario 5



Industry Results

Table 9 presents the changes in real gross output by industry for Scenarios 1 (housing) and 2 (horizontal infrastructure), for industries that are potentially of most interest in the context of RM reforms.[14] Table 10 does the same for Scenarios 3 and 4 (inundation and potable water), and Table 11 for Scenario 5 (sediment).

Scenario 1

Unsurprisingly in Scenario 1a (all greenfield) the two industries related to housing, real estate services (includes rental housing) and owner-occupied dwellings, see the largest increments in output. Demand for housing increases because the new dwellings produce the same level of utility as before, but at a lower cost. Most other industries also see a benefit, particularly those that supply inputs to housing such as, forestry construction and manufacturing.

[14] The model has 55 industries (refer Appendix A2), which are aggregations of the 109 industries identified in Stats NZ's input-output tables.

One might ask how an industry such as horticulture comes to benefit from a reduction in housing costs. Perhaps most horticultural farms include a dwelling, but then that is also true for, say, dairy farms, but dairy farming does not expand in this scenario (relative to Baseline). In fact, general equilibrium effects provide the explanation. With more of the nation's resources going into housing and the industries that supply it, other industries such as dairy farming that are intensive users of land improvement services, metal fabrication and construction trades, are in a less competitive position. Exports are still needed to pay for the increase in imports of consumer goods, so other exporting industries such as horticulture which generate higher value per hectare than pastoral agriculture are still able to compete. We stress though that these changes are very small.

In Scenario 1b (all brownfield) the housing industries are again the main beneficiaries, followed by local government. Based on the assumptions this industry faces lower costs to supply infrastructure so is in a better position to supply those services than in Scenario 1a.

Scenario 2

The largest benefits from cheaper horizontal infrastructure accrue to primary and manufacturing industries - they are the main users of water, electricity and roads. Households also benefit while there are relatively small costs for central and local government.

Table 9: Industry gross output, Scenarios 1 & 2

Industry	Baseline % share	Scenario 1a (greenfield)	Scenario 1b (brownfield)	Scenario 2
			%Δ on Baseline	
Horticulture	1.4	0.23	-0.05	0.21
Sheep & beef	1.1	0.03	-0.07	0.14
Dairy	1.8	0.00	-0.04	0.18
Forestry	0.8	0.36	-0.03	0.23
Other primary	1.8	0.21	-0.06	0.29
Manufacturing	15.0	0.16	-0.03	0.21
Utilities & construction	15.9	0.24	-0.27	0.11
Real estate services	5.9	1.36	0.90	0.16
Owner-occupied dwellings	5.5	2.65	2.11	0.11
Central government	3.3	-0.05	0.55	-0.03
Local government	0.4	0.05	0.61	-0.05
Other Services	47.2	0.21	-0.07	0.16
Total	**100.0**	**0.40**	**0.11**	**0.16**

Scenario 3

Scenario 3a is the inundation event scenario, showing the largest losses in owner-occupied and rental housing, although some primary industries are also amongst the most adversely affected. Industries such as horticulture can recover quite quickly from inundation provided the trees or vines are not completely destroyed. In the case of forestry, the loss is from trees and equipment being washed away through subsiding and slipping ground.

In Scenario 3b, the investment scenario, there are similarities but also differences. The utilities and construction industries benefit from the investment in protection (such as stopbanks and higher bridges), but much of that investment is to protect dwellings, the cost of which is recovered from household taxpayers and ratepayers. So, the industries that supply housing services again experience a relatively strong decline.

Scenario 4

In Scenario 4 (water contamination) most industries see small losses, frequently through indirect effects. The exceptions are local and central government, with the former in particular having to respond to an outbreak by more testing and investigation of water sources, ongoing treatment and monitoring, and possibly incurring legal costs.

Those effects aside, the exclusion of non-economic costs means that overall losses are larger than the losses in industry output would suggest. For example, direct costs such as for GP visits are included, but there is no allowance for illness preventing normal activity – a loss of quality of life.

Table 10: Industry gross output, Scenarios 3 & 4

Industry	Baseline % share	Scenario 3a	Scenario 3b	Scenario 4
			%∆ on Baseline	
Horticulture	1.4	-0.42	-0.03	-0.17
Sheep & beef	1.1	-0.13	-0.04	-0.07
Dairy	1.8	-0.15	-0.03	-0.06
Forestry	0.8	-0.42	0.01	-0.15
Other primary	1.8	-0.23	0.00	-0.04
Manufacturing	15.0	-0.19	-0.01	-0.09
Utilities & construction	15.9	-0.17	0.13	-0.06
Real estate services	5.9	-0.33	-0.13	-0.09
Owner-occupied dwellings	5.5	-0.52	-0.26	-0.14
Central government	3.3	0.05	0.15	0.05
Local government	0.4	-0.08	-0.01	2.34
Other Services	47.2	-0.18	-0.05	-0.07
Total	**100.0**	**-0.20**	**-0.02**	**-0.07**

Scenario 5

In Scenario 5a the forestry industry sees the largest decline. That may seem counter-intuitive with the increase in afforestation, but with native forests and no harvesting (by assumption), there is no ‘output’, just input costs for ground preparation, planting etc. And possibly some displacement of exotic forest with native forest.

Dairy production declines as some farmland is allocated to bush and forest. Similarly for sheep and beef production. One might argue that the cost of the externality is being internalised to some extent. As noted earlier, the main benefits of cleaner waterways are expected to be non-economic.

Consistent with the macroeconomic changes in Scenario 5b, the changes in industry output are very small. Only utilities and construction see an increase in output, attributable to more dredging activity. The general reduction in other industries is caused by the higher port costs which mostly affect primary exports but also imports of building materials and consumer goods.

Table 11: Industry gross output, Scenario 5

Industry	Baseline share	Scenario 5a	Scenario 5b
		%∆ on Baseline	
Horticulture	1.4	0.02	-0.01
Sheep & beef	1.1	-0.11	-0.02
Dairy	1.8	-0.19	-0.01
Forestry	0.8	-0.47	-0.04
Other primary	1.8	-0.09	-0.01
Manufacturing	15.0	-0.06	-0.01
Utilities & construction	15.9	-0.01	0.04
Real estate services	5.9	-0.01	-0.03
Owner-occupied dwellings	5.5	0.00	-0.04
Central government	3.3	0.00	0.00
Local government	0.4	0.00	0.00
Other Services	47.2	-0.01	-0.03
Total	**100.0**	**-0.03**	**-0.01**

Appendix A1: Baseline Scenario

Assumptions

The following are the main model input assumptions for the 2050 Baseline scenario. These assumptions remain in place for the other scenarios, but that does not mean that nothing changes over time. For example, the price of oil will likely change between 2025 and 2050, but whatever price prevails in 2050 will be the same across scenarios. Even though some input assumptions may be open to argument, their invariance between scenarios means that it would take very large differences to have a significant effect on the results.

- Carbon price: $250 per tonne CO_2e. It is assumed that international emission units can also be bought at that price. Existing international commitments are honoured.
- Methanex has ceased operation by 2035.
- Biogenic CH_4 enters the ETS in 2030 with 95% free allocation, declining linearly at 1% p.a. for 10 years, then at 2% pa.
- Oil price: US$80 per barrel.
- Forestry CO_2 sequestration: 19,500 kilotonnes (i.e., 1 million kilogrammes).
- Population, labour force etc, Stats NZ 50th percentile projections.

Results

General equilibrium models are suited to analysing policy changes and external shocks that are large enough to have macroeconomic effects. Nevertheless, all of the ‘what if’ scenarios are just that – scenarios of what could happen, not forecasts. Hence, we have no particular interest in the Baseline results other than to check for anything that seems implausible or unusual enough to potentially affect the percentage differences (i.e., the change not the absolute levels) in results between the Baseline and the scenarios tested.

Table 12: Changes in Macroeconomic Variables for Baseline Scenario

	%∆ per annum 2024 to 2050
Real private consumption	2.1
Real gross investment	2.3
Real exports	2.6
Real imports	2.4
Real GDP	2.2
RGNDI[15]	2.3
Real wage rate	1.3
Gross CO_2e (base 2023)	-1.6

[15] RGNDI is real gross national disposable income, defined as GDP plus adjustment for the terms of trade and net factor payments overseas, such as for emission units.

Table 12 presents the changes between the 2023/24 (the latest year with full data) and 2049/50 in the main macroeconomic variables for the Baseline scenario. For example, real private consumption (not per capita) increases by 2.1% per annum over the 26 years.

Model Closure

Macroeconomic closure rules are required to account for external constraints, government policies and agents' behaviour that are not endogenous to the model. Consistent with generally accepted modelling practice we adopt the following closure rules:

1. The current account balance is fixed as a percentage of GDP. This means for example that if consumers demand more imports, their cost cannot be met simply by borrowing more from overseas with deferred repayment. It also means that the model is not suited to studying speculative surges in imports (such as if a devaluation is expected) leading to a larger current account deficit.
2. The post-tax rate of return on investment is unchanged between scenarios. This acknowledges that New Zealand is part of the international capital market and ensures consistency with the preceding closure rule.
3. Any change in the demand for labour is reflected in changes in wage rates, not changes in total employment. This prevents the long run level of total employment being driven more by environmental or social policies. Instead, we assume that over time education and training programmes respond to different sets of market demands so that those entering the labour force acquire the necessary skills.

   This closure rule means that the model, with a long-term focus such as on 2050, is not tailored to studying short term change in aggregate employment.
4. The fiscal balance is fixed across scenarios. This means for example that if the government is faced with a potential fall in revenue it would have to reduce expenditure or adjust tax rates. Personal income taxation, as represented by household effective income tax rates, including social welfare benefits, are the default equilibrating mechanism.

The real (trade weighted) exchange rate adjusts to generate the required changes in exports and imports. Nominal prices are not modelled. All prices are relative to a numeraire such that if the numeraire is doubled, all prices double, so there is no change in relative prices or quantities. The numeraire could be almost anything, but in our case it is the price of a basket of imports excluding oil.

The real exchange is one of the most important prices in the model and is one of the features that distinguishes a GE model from a PE model. Along with the wage rate, the cost of capital and the terms of trade, it plays an important part in determining how the economy adjusts to a 'shock' such as a change in the price of carbon.

How does the model work?

The model is not an optimisation model in the sense of maximising some macroeconomic measure such as GDP – unlike linear programming models for example. It is simulation model in which consumers optimise utility and producers maximise profits. Consumers (households) have a set of behavioural equations that describe how much they spend on various goods and services, their income, their savings and their payments to and receipts from government. Producers have production functions that allow for substitution between intermediate inputs, energy, labour, capital and in some cases land. They also pay taxes to and receive subsidies from government. Consumers and producers can substitute between imported and locally made goods. More detail is in Appendix A2.

Appendix A2: ESSAM Model

The ESSAM (Energy Substitution, Social Accounting Matrix) model is a computable general equilibrium (CGE) model of the New Zealand economy. It takes into account the main inter-dependencies in the economy, such as flows of goods from one industry to another, plus the passing on of higher costs in one industry into prices and thence the costs of other industries.

The ESSAM model has previously been used to analyse the economy-wide and industry specific effects of a wide range of issues. For example:

- Analysis of the New Zealand Emissions Trading Scheme and other options to reduce greenhouse gas emissions.
- Changes in import tariffs.
- Public investment in new technology.
- Funding regimes for roading and wider economic benefits.
- Biofuels from purpose grown forestry.

Some of the model's features are:

- 55 industry groups, as detailed in the table below.
- Substitution between inputs into production - labour, capital, materials, energy.
- Four energy types: coal, oil, gas and electricity, between which substitution is also allowed.
- Substitution between goods and services used by households.
- Social accounting matrix (SAM) for tracking financial flows between households, government, business and the rest of the world.

All models use equations to portray the behaviour of economic agents. These equations contain error margins which flow thought into the model's output. Noting that caveat, the main equations in the ESSAM model are described below.

Model structure

Production Functions

These equations determine how much output can be produced with given amounts of inputs. For most industries a two-level standard translog specification is used which distinguishes four factors of production – capital, labour, materials and energy, with energy split into coal, oil, natural gas and electricity.

Intermediate Demand

A composite commodity is defined which is made up of imperfectly substitutable domestic and imported components - where relevant. The share of each of these components is determined by the elasticity of substitution between them and by relative prices.

Price Determination

The price of industry output is determined by the cost of factor inputs (labour and capital), domestic and imported intermediate inputs, and tax payments (including tariffs). World prices are not affected by New Zealand purchases or sales abroad.

Consumption Expenditure

This is divided into Government Consumption and Private Consumption. The latter is split into household income quintiles and eight household commodity categories. Spending on them is modelled using price and income elasticities in an *Almost Ideal Demand System* framework. An industry by commodity conversion matrix translates the demand for commodities into industry output requirements and also allows import-domestic substitution.

Government Consumption is usually either a fixed proportion of GDP or is set exogenously. Where the budget balance is exogenous, either tax rates or transfer payments are assumed to be endogenous. Government consumption does not enter the household utility function.

Inventories

The industry composition of the change in inventories (stocks) is set at the base year mix, although variation is permitted in the import-domestic composition. Total stock change is exogenously set as a proportion of GDP, domestic absorption or some similar macroeconomic aggregate.

Investment

Industry investment is related to the rate of capital accumulation over the model's projection period as revealed by demand for capital in the horizon year. Allowance is made for depreciation in a putty-clay model so that capital cannot be reallocated from one industry to another faster than the rate of depreciation in the source industry. Rental rates or the service price of capital (analogous to wage rates for labour) also affect capital formation. Investment by industry of demand is converted into investment by industry of supply using a capital input-output table. Again, import-domestic substitution is possible between sources of supply.

Exports

These are determined from overseas export demand functions in relation to world prices and domestic prices inclusive of possible export subsidies, adjusted by the exchange rate. It is also possible to set export quantities exogenously.

Supply-Demand Identities

Supply-demand balances are required to clear all product markets. Domestic output must equate to the demand stemming from consumption, investment, stocks, exports and intermediate requirements.

Balance of Payments

Receipts from exports plus net capital inflows (or borrowing) must be equal to payments for imports; each item being measured in domestic currency net of subsidies or tariffs.

Factor Market Balance

In cases where total employment of a factor is exogenous, factor price relativities (for wages and rental rates) are usually fixed so that all factor prices adjust equi-proportionally to achieve the set target.

Income-Expenditure Identity

Total expenditure on domestically consumed final demand must be equal to the income generated by labour, capital, taxation, tariffs, and net capital inflows. Similarly, income and expenditure flows must balance between the five sectors identified in the model – business, household, government, foreign and capital.

Industry Classification

The 55 industries identified in the standard ESSAM model are defined in Table 13. Industries definitions are according to Australian and New Zealand Standard Industrial Classification (ANZSIC06).

Input-Output Table

The model is based on Statistics New Zealand's latest input-output table which relates to the year ended March 2020.

Greenhouse gas emissions

Greenhouse gas (GHG) emissions from energy are directly linked to the use of fossil fuels, split into coal, oil products, and natural gas. In addition, there are process emissions such as from the calcification of lime in the production of cement. GHG emissions from livestock are also treated as process emissions. Methane emissions are linked to the volume of output, and nitrous oxide emissions are partly linked to output and partly to the use of fertiliser. Major sources of fluorinated gases are also captured, again treated as process emissions.

All emissions are also cross-tabulated by industry and households. Emissions related to the use of private vehicles by households are treated as household emissions, analogous to emissions from gas used to heat homes. As with electrical appliances, if a household has an electric vehicle, any emissions from thermal electricity generation are treated as emissions from the Electricity Generation industry.

Error margins

Although the model contains may econometrically estimated parameter values, it has not been econometrically estimated as a self-contained set of simultaneous equations. Thus, the model does not have overall statistical error margins. That might be possible by running many simulations with parameter values drawn from each of their underlying statistical distributions. However, from many years of experience with CGE models we have found that results tend to be more sensitive to just how scenarios are specified, followed by the setting of the model's closure rules. Parameter values and their accompanying functional forms tend to be less important, though of course there can be exceptions.

Table 13: Industries identified in ESSAM model

	Abbrev	Description
1	HFRG	Horticulture and fruit growing
2	SBLC	Sheep, beef, livestock and cropping
3	DAIF	Dairy and cattle farming
4	OTHF	Other farming
5	SAHF	Services to agriculture, hunting and trapping
6	FOLO	Forestry and logging
7	FISH	Fishing
8	COAL	Coal mining
9	OIGA	Oil and gas extraction, production & distribution
10	OMIN	Other Mining and quarrying
11	MEAT	Meat manufacturing
12	DAIR	Dairy manufacturing
13	OFOD	Other food manufacturing
14	BEVT	Beverage, malt and tobacco manufacturing
15	TCFL	Textiles and apparel manufacturing
16	WOOD	Wood product manufacturing
17	PAPR	Paper and paper product manufacturing
18	PRNT	Printing, publishing and recorded media
19	PETR	Petroleum refining, product manufacturing
20	CHEM	Other industrial chemical manufacturing
21	FERT	Fertiliser
22	RBPL	Rubber, plastic and other chemical product manufacturing
23	NMMP	Non-metallic mineral product manufacturing
24	BASM	Basic metal manufacturing
25	FABM	Structural, sheet and fabricated metal product manufacturing
26	MAEQ	Machinery and other equipment manufacturing
27	OMFG	Furniture and other manufacturing
28	EGEN	Electricity generation
29	EDIS	Electricity transmission and distribution
30	WATS	Water supply
31	WAST	Sewerage, drainage and waste disposal services
32	CONS	Construction
33	TRDE	Wholesale and retail trade
34	ACCR	Accommodation, restaurants and bars
35	ROAD	Road transport
36	RAIL	Rail transport
37	WATR	Water transport
38	AIRS	Air Transport
39	TRNS	Transport services
40	PUBI	Publication and broadcasting
41	COMM	Communication services
42	FIIN	Finance and insurance
43	HIRE	Hiring and rental services
44	REES	Real estate services
45	OWND	Ownership of owner-occupied dwellings
46	SPBS	Scientific research and computer services
47	OBUS	Other business services
48	GOVC	Central government administration and defence
49	GOVL	Local government administration
50	SCHL	Pre-school, primary and secondary education
51	OEDU	Other education
52	MEDC	Medical and care services
53	CULT	Cultural and recreational services
54	REPM	Repairs and maintenance
55	PERS	Personal services

Appendix B: Simplified overview of CGE Modelling

Summary of findings from the modelling

The CGE modelling by Infometrics provides a structured way of testing how the RM reforms might influence economic efficiency under different assumptions. The scenarios are not forecasts. They are stylised examples that highlight the conditions under which efficiency gains or losses could occur, and the sectors and households most likely to be affected.

Across the scenarios, two clear findings stand out. The first finding is that most improvements come when resources are able to flow towards higher value uses. Housing and infrastructure scenarios show that lowering land price differentials or reducing the cost of major projects leads to broad gains for households and industries. This finding assumes that development occurs within environmental limits, as breaching them results in environmental damage, and that natural hazard constraints are recognised to avoid disaster losses. This is allocative efficiency in practice as the economy performs better when scarce resources are used where they generate the most utility (or usefulness) based on society's values and preferences, which includes accounting for externalities.

However, market prices reflect current preferences and incomes, not necessarily the interests of future generations. Dynamic efficiency includes considering how resources are used in ways that support innovation, adaptation, and sustained wellbeing over time. This is why policy intervention is needed to correct market failures, such as environmental degradation or unpriced risk, that prevent markets from delivering outcomes aligned with long-term societal welfare.

A related factor is how network infrastructure is funded and who bears fiscal exposure. The modelling shows broad efficiency gains from improved sequencing and servicing, but outcomes depend on how costs are shared between central and local government and between public and private investors. Clear and sustainable funding frameworks support allocative efficiency by ensuring investment occurs where it delivers the highest long-term value and by preventing cost-shifting across generations or regions.

The second finding is that long-term certainty supports better investment and innovation. The adaptation scenario (preventing inundation) demonstrates that pre-emptive measures to reduce flood risks can be more cost effective than bearing the damage of repeated events. This is a case of dynamic efficiency, where conditions incentivise the economy to adapt and it therefore grows more strongly within limits.

These efficiency improvements are achieved through the system changes introduced by RM reform; clearer limits, stronger property rights, consistent national direction, and better price signals. These results also highlight the distinction that Treasury makes in its cost–benefit analysis guidance between two tests of efficiency. A *Pareto improvement* is one where at least one group is better off, and no one is worse off. These are rare in practice. A *Kaldor–Hicks improvement* is one where total gains outweigh total losses, even if some groups bear costs, because in principle the winners could compensate the losers. The housing and infrastructure scenarios are closer to Pareto improvements, with households and industries broadly sharing the gains. The adaptation scenario is more like a Kaldor–Hicks improvement, where upfront costs fall more heavily on some groups, but the avoided losses across society are much larger.

Environmental protection measures, such as sediment reduction or safe drinking water, appear modest in cost (typically less than 0.5% of GDP annually) but generate large long-term benefits. The macroeconomic impacts of these investments are small, and even small additional benefits or avoided losses turn the balance positive. This reinforces that environmental limits, once clearly set, should not be seen as a drag on the economy but a safeguard for future prosperity.

It is important to note what is not captured. The scenarios do not cover the full scope of RM reform. Many reforms, such as clearer national direction through National Planning Framework standards, streamlined combined plans, or improved data systems, are difficult to model but likely to provide further gains, particularly where costs are low. Non-market benefits, such as ecological health, cultural values, or public confidence, are also outside the modelling but would add further weight to the case for reform.

Overall, the scenarios show that the reforms are most valuable where they improve allocative and dynamic efficiency. Process savings matter for individual users but are relatively small at the scale of the economy. The wider value of RM reform is in creating a more efficient and resilient economy that grows within environmental limits and natural hazard constraints, consistent with the principles that underpin Treasury's approach to cost–benefit analysis (New Zealand Treasury, 2015). The detailed scenarios that follow illustrate these principles in action, showing how specific aspects of the reforms could deliver these efficiency gains in practice.

Specific scenarios modelled

Each scenario explores a different aspect of the system where clearer rules, stronger direction, or improved data could change costs, risks, and outcomes.

All scenarios are compared against a baseline that represents the continuation of current resource management practices, allowing clear identification of reform-specific impacts.

These five scenarios were selected based on: (a) areas that are likely to be impacted by the specific changes in the RM reforms, (b) areas identified in previous assessments and modelling as having the highest potential efficiency gains to ensure that economy wide benefits would present in the modelling, and (c) sectors with sufficient data for robust modelling.

Table 14: Overview of CGE scenarios

CGE Scenarios
Housing This scenario tests the effect of reducing the cost of housing through greater land availability and improved development processes. It assumes that expanding zoned capacity reduces land price differentials at the urban boundary, improving the efficiency of the housing stock. Sensitivity tests compare different price gaps and the relative costs of brownfield and greenfield development as two ends of a continuum, where in reality there would be a mix of both.
Horizontal infrastructure This scenario considers the impact of quicker consenting and reduced costs for three waters, electricity networks, and roads. It tests the economic gains from lowering the cost of investment in core infrastructure by 10%, with a 5% variation.
Preventing inundation This scenario compares the economic impacts of investing in adaptation to reduce flood risk against the costs of a large flood event. It simulates $5 billion in pre-emptive adaptation investment over ten years compared with the loss of capital stock from a severe inundation event. The results highlight how the timing of investment affects the balance of benefits and costs.
Potable water This scenario is based on scaling up the Havelock North outbreak to a larger population. It estimates the economic costs of a widespread contamination event, including impacts on health, exports, and government spending. It also considers the cost of preventive measures relative to the scale of potential losses. This scenario demonstrates the economic value of maintaining environmental limits for human health protection.
Sedimentation This scenario examines the costs of reducing suspended sediment to meet minimum bottom lines for water clarity. It includes two variants: **Catchment interventions:** investing $2.6 billion over ten years in catchment interventions like afforestation to move one-third of Band D waterways to Band C, and **Harbour dredging:** the costs of increased harbour dredging due to climate-driven sedimentation increases. Both test the economic implications of managing sediment within environmental limits.

While modelled separately for clarity, these scenarios would interact in practice. For example, clearer natural hazard constraints (Preventing inundation scenario) would influence housing development patterns (housing scenario). The scenarios do not sum to a total impact as they address different aspects of the system.

Together these scenarios provide a broad view of how different elements of the system affect economic performance. They link the goals of RM reform with tangible impacts on households, industries, and regional economies. The results are reported in the following section.

Economic efficiency and distributional impacts by scenario

Table 15 provides a summary of the economic efficiency impacts of each scenario and Table 16 provides a summary of the distributional impacts of each scenario.

Table 15: Economic Efficiency Impacts by Scenario[16]

Efficiency type	Scenario 1a Housing – Greenfields Max	Scenario 1b Housing – Brownfields Max	Scenario 2 Infrastructure	Scenario 3a Inundation – Severe event	Scenario 3b Inundation – Adaptation	Scenario 4 Potable water	Scenario 5a Sedimentation – Catchment interventions	Scenario 5b Sedimentation – Harbour dredging
Productive	Lower compliance costs reduce waste for users	Shifts infrastructure costs depending on location; potential savings from cheaper servicing	Quicker approvals reduce holding costs for capital projects	Large unplanned emergency response costs	Pre-emptive adaptation reduces long-term response costs	Reduced health system burden from avoided outbreaks	Reduces long-term costs of land-use change and afforestation	Recurring dredging costs create lower productive efficiency
Technical	Minor gains from fewer, simpler consents reducing processing time	Limited (focus is on relative land use costs)	Gains from faster, more predictable consenting reducing delays	Limited	Limited	Limited	Limited	Limited
Allocative	Strong: lower compliance costs allow land and housing resources to be more efficiently used	Strong: reallocation of land between brownfield and greenfield; lower long-run infrastructure costs if well sequenced	Strong: cheaper utilities and transport capital used more efficiently	Misallocation from sudden capital destruction	Avoided capital losses by steering investment into resilient locations	Moderate: prevents resources being diverted to outbreak response	Moderate: resources shift from sediment-generating to cleaner land uses, avoiding downstream costs	Weak–moderate: resources diverted into repeated dredging rather than higher value uses

16 Note: This table summarises modelled impacts only. Additional efficiency gains from unmodeled reform elements (e.g., combined plans, national direction) would further enhance outcomes across all categories.

Efficiency type	Scenario 1a Housing – Greenfields Max	Scenario 1b Housing – Brownfields Max	Scenario 2 Infrastructure	Scenario 3a Inundation – Severe event	Scenario 3b Inundation – Adaptation	Scenario 4 Potable water	Scenario 5a Sedimentation – Catchment interventions	Scenario 5b Sedimentation – Harbour dredging
Dynamic	Supports long-term investment in urban form if limits are clear	Influences sequencing of development and infrastructure pipelines	Clearer investment pipeline encourages innovation and long-term planning	Reduces certainty; discourages investment in natural hazard-prone areas	Strong: adaptation reduces uncertainty and encourages resilience investment	Creates certainty in food safety and export reputation enabling market access	Supports innovation in land use and afforestation under clear, robust limits	Locks system into repeated costs, discourages innovation

Table 16: Distributional impacts by Scenario[17]

Group	Scenario 1a Housing – Compliance costs	Scenario 1b Housing – Brownfield vs Greenfield	Scenario 2 Infrastructure	Scenario 3a Inundation – Severe event	Scenario 3b Inundation – Adaptation	Scenario 4 Potable water	Scenario 5a Sedimentation – Catchment interventions	Scenario 5b Sedimentation – Harbour dredging
Households	Lower compliance costs reduce housing prices, benefiting all; proportionately larger gains for lower- and middle-income groups.	Lower property rates flow through more strongly to lower income households; higher-income households bear more of infrastructure servicing costs.	Lower rates from cheaper utilities; top income quintiles benefit most from infrastructure-intensive consumption.	Severe events hit lowest quintiles hardest due to asset loss and disruption.	Adaptation costs fall more heavily on higher income households via taxation and rates; lower quintiles benefit most from reduced risk.	Illness and reduced labour productivity affect all; higher quintiles contribute more through taxation to fund response.	Cleaner waterways and reduced natural hazard risks benefits all communities long term; upfront land-use change costs fall partly on rural households.	Limited direct household benefits; costs of dredging absorbed indirectly through higher prices or rates.

[17] Note: Distributional impacts shown are indicative and would vary by region and implementation approach. The RM reforms include mechanisms for managing transitions and ensuring equitable outcomes.

Group	Scenario 1a Housing – Compliance costs	Scenario 1b Housing – Brownfield vs Greenfield	Scenario 2 Infrastructure	Scenario 3a Inundation – Severe event	Scenario 3b Inundation – Adaptation	Scenario 4 Potable water	Scenario 5a Sedimentation – Catchment interventions	Scenario 5b Sedimentation – Harbour dredging
Industries	Construction, utilities, and real estate services see direct gains.	Lower demand for imports, so less need or exports to maintain the current account balance.	Primary industries and manufacturing benefit most due to reliance on water, power, and roads.	Most industries face disruption and output losses from capital destruction.	Construction sector benefits from adaptation investment; other industries avoid long-term disruption.	Dairy and horticulture exports decline; reputational risk for food exports.	Land-using and exporting industries face higher costs from afforestation and land-use changes; long-run benefits from cleaner water.	Ports, shipping, and tourism benefit from maintained channels; land-using sectors see no improvement in sediment loads.
Exporters	No major impact beyond lower compliance costs.	Minor adverse effects as less need to earn foreign exchange.	Gains from cheaper infrastructure that reduces production costs and improves competitiveness.	Loss of exports from flood disruption and damaged logistics.	Avoided long-term export losses from natural hazard events; greater resilience for supply chains.	Export losses in dairy and horticulture during outbreaks.	Higher costs for exporters in agriculture and forestry; long-term benefits for export reputation as water quality improves.	Shipping exporters benefit from clearer harbours, but costs remain for land-based exporters.

Group	Scenario 1a Housing – Compliance costs	Scenario 1b Housing – Brownfield vs Greenfield	Scenario 2 Infrastructure	Scenario 3a Inundation – Severe event	Scenario 3b Inundation – Adaptation	Scenario 4 Potable water	Scenario 5a Sedimentation – Catchment interventions	Scenario 5b Sedimentation – Harbour dredging
Central government	Limited role; indirect fiscal effects through housing policy settings.	Limited role; may be drawn into infrastructure financing if local capacity is weak.	Gains from lower financing needs for national infrastructure projects; reduced pressure on the balance sheet.	Bears most of the fiscal burden for disaster recovery.	Bears upfront adaptation investment but avoids much larger recovery costs later.	Funds public health response; prevention costs relatively minor.	May fund catchment programmes or afforestation; long-term fiscal savings from avoided dredging and environmental decline.	May contribute to dredging subsidies for ports; higher ongoing fiscal exposure compared with catchment solutions.
Local government	Reduced consent and plan-making costs.	Shifts in rates and infrastructure charges between greenfield and brownfield areas.	Lower consenting delays reduce capital project costs and ease financing pressures.	High recovery costs and disruption to local infrastructure after severe events.	Avoids recovery costs and disruption when adaptation reduces risk.	Local councils and water providers likely to fund prevention; avoid reputational damage from contamination.	Responsible for implementing catchment limits and monitoring; upfront costs but reduced long-run port maintenance costs (depending on ownership model and role for councils).	Port companies pay for ongoing dredging obligations, but due to ownership and ratepayer expectations likely to have impact on councils and ratepayers.

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