TRANSPORT PLANNING FOR RESILIENCE IN SPATIAL PLANS

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ABSTRACT

The Government's Blueprint for resource management reform highlights transport as a critical gap, being afforded inadequate weight in current spatial planning. This is identified as limiting *"…their ability to integrate and coordinate land-use planning, infrastructure planning and investment*."

The paper examines, describes and contrasts national and international best practice methods, frameworks and tools for assessing and prioritising climate change, adaptation and resilience in the transport environment. The framework for RMA reform is challenged to deliver best practice, transport outcomes for regional spatial plans (RSPs).

1 Objective & Study Overview

The objective of the paper is to examine current transport planning practice in spatial planning, identify strategic gaps and opportunities, and to challenge concepts for transport outcomes in RSPs under the proposed Planning Act.

The paper is structured as follows:

1. Establish the current context and operational baseline environment for spatial planning;
2. Describe current transport and infrastructure resilience guidance;
3. Undertake a case study of RSPs to inform current practice;
4. Research points of reference for international spatial and resilience planning frameworks;
5. A best practice framework from the NZ and International research;
6. Describe emerging RMA reform implications for spatial plans;
7. Identify gaps and opportunities by contrasting current and best practice frameworks;
8. Consider the transport case for a National Spatial Plan;
9. Explore the place for national planning standards in transport; and
10. Conclusions

2 The Current Context for Spatial Plans

This section draws on recent policy guidance, expert reviews, and sector-led research to describe the purpose of spatial plans, key gaps in current practice, and the role of transport, Te Tiriti o Waitangi, climate adaptation, safety, public health, and digital tools within the spatial planning system.

2.1 Purpose and Role of Spatial Plans in New Zealand

Spatial plans are intended to provide a long-term strategic vision for how regions and cities will grow, adapt, and change over a 30-year horizon. They identify future land-use patterns, infrastructure needs, and development opportunities. They are mechanisms to align land-use decisions with infrastructure investment, provide greater certainty for communities, developers, and infrastructure providers, and support integrated decision-making (NZ Medical Journal, 2023; Te Mana Ola – The Pacific Health Strategy). They are also to support sequencing of development based on infrastructure readiness and to promote sustainable, resilient, and equitable outcomes.

2.2 Identified Gaps in Spatial Planning Practice

There are significant gaps between the purpose of spatial planning and its practical implementation. The Government Blueprint for RMA reform identified transport as a critical weakness in the current spatial planning framework (MfE, 2025). It highlighted a lack of connection between strategic infrastructure planning, investment planning, the timing and certainty of infrastructure funding. It was found to limit the practical ability for land development to occur as intended.

2.3 Key Recommendations for Improving Integration

A set of high-level recommendations to improve the effectiveness of spatial plans are described in the EAG report, representing emerging best practice rather than statutory requirements (Te Uru Kahika, Regional and Unitary Councils Aotearoa, 2025).

Key recommendations include transport infrastructure development to be clearly sequenced and funded to support planned land development. Spatial plans should explicitly include infrastructure readiness mapping, identifying development readiness and where enabling investment is required.

Regional strategies are to better align transport investment decisions with land-use priorities.

2.4 Transport Planning Processes

Transport planning is increasingly positioned as an integral component of spatial planning rather than a subsequent process. Waka Kotahi outlines a set of transport planning processes that are widely regarded as best practice when embedded in spatial plans (Waka Kotahi, 2023). These include ensuring strategic alignment between transport outcomes and land-use, environmental, and climate objectives, supported by evidence-based modelling and forecasting, engagement, including iwi, local authorities, and communities. Spatial plans are to address infrastructure sequencing, funding alignment, and readiness mapping to support development certainty and coordinated investment.

2.5 Integrating Te Tiriti o Waitangi Principles

Upholding Te Tiriti o Waitangi is a foundational requirement for both spatial and transport planning. This requires more than consultation, emphasising genuine partnership with iwi and hapū throughout planning and decision-making processes (Te Ara Kotahi, Waka Kotahi, 2020). Spatial plans are expected to recognise Māori aspirations and values in transport outcomes, support Māori-led transport initiatives, and embed principles such as rangatiratanga, manaakitanga, and kaitiakitanga in planning frameworks and delivery processes. Research undertaken for Waka Kotahi highlights these same principles (NZTA Research Report 688).

2.6 Climate Adaptation and Managed Retreat

Climate change adaptation is a key matter for spatial plans, particularly for flooding, sea-level rise, and coastal erosion. The *Report of the Expert Working Group on Managed Retreat 2023* introduced Te Hekenga Rauora as a nationally relevant framework for planned relocation and long-term adaptation. Transport planning is to consider managed retreat scenarios, avoid path dependency in high-risk locations, and support adaptive infrastructure design, guiding long-term investment decisions that respond proactively to climate risk in Spatial Plans.

2.7 Transport Safety

Transport safety is a core outcome of spatial planning. This is based on the Safe Systems approach and methods. Co-designing safety strategies with Māori communities and monitoring effectiveness of spatial and transport interventions is vital (Auckland Transport, 2023).

2.8 Transport and Public Health Outcomes

There are strong relationships between transport, spatial planning, and public health. Spatial plans should promote public and active transport modes that support physical activity, reduce air and noise emissions, and contribute to injury prevention (NZ Medical Journal, 2023). These transport outcomes are closely linked to broader health and well-being objectives, including mental well-being and social connectivity, particularly for transport disadvantaged. Spatial planning should promote reduced emissions, active transport, and ensure equitable access to transport opportunities (Public Health Communication Centre, 2024).

2.9 National Planning Standards and Consistency

National Planning Standards provide a consistent framework for regional and district plans across New Zealand (MfE, 2019; updated 2022). Those that embed transport and infrastructure in spatial planning include the Zone Framework Standard; the District-wide Matters Standard, which addresses infrastructure, energy, and transport; and the Mapping Standard, which ensures consistency. The Definitions Standard supports clarity and integration by standardising terminology such as “infrastructure”, “transport corridor”, and “reverse sensitivity”.

2.10 Agile Spatial Planning and Digital Tools

Digital tools are key to supporting agile and effective spatial planning. These include GIS mapping and analytics, infrastructure sequencing dashboards, and scenario-modelling (NZPI, 2024). More

efficient and consistent assessment methods are established, and a "*one source of truth*" comprising more a information-rich basis is established for planners and decision-makers.

3 Spatial Planning Frameworks and Guidance in NZ

The following sections describe the key **guiding principles and evaluation criteria** for assessing spatial, transport, and infrastructure strategies through a resilience and climate-adaptation lens. They provide a consistent framework for testing strategic options, investment priorities, and delivery approaches to ensure alignment across planning systems, responsiveness to risk, and equitable long-term outcomes.

3.1 Integrate Spatial and Resilience Planning

To be applied at the earliest stages of RSP development, where long-term growth directions and investment priorities are being set. This ensures that future land-use decisions are directly informed by infrastructure constraints and climate risks. Recommendation:

- Ensure RSPs align with transport, water, housing, and climate adaptation plans.
- Embed natural hazard and climate risk mapping into spatial planning processes.

3.2 Prioritise Climate Adaptation

Applies when spatial plans are updated, growth areas are identified, and long-term infrastructure investment pathways are established. It enables flexibility as climate impacts intensify and avoids locking in development patterns that increase future risk. Recommendation:

- Apply Dynamic Adaptive Pathways Planning (DAPP)[1] to avoid deep uncertainty.
- Identify and protect areas vulnerable to sea-level rise, flooding, and seismic risk.
- Incorporate managed retreat policies with clear funding and governance arrangements.

3.3 Strengthen Transport System Resilience

To inform transport strategy, investment prioritisation, and business cases. Particularly for networks serving growth areas or communities exposed to disruption. A system-wide perspective ensures resilience outcomes are focused on people and places, not just assets. Recommendation:

- Shift from asset-based to system-based planning, focusing on community impacts.
- Use risk-based prioritisation (Likelihood × Consequence) to guide investment decisions.
- Maintain alternate resilient route planning and ensure access to critical services such as food supply, fuel, and emergency care.

3.4 Foster Cross-Government Collaboration

Applies throughout all stages of spatial and resilience planning, from strategy through to implementation and monitoring. Collaboration across agencies is essential to address interdependencies between land use, infrastructure, and resilience outcomes. Recommendation:

[1] **Dynamic Adaptive Pathways Planning (DAPP)** is a decision-making approach for planning under uncertainty that enables long-term strategies—such as climate adaptation and infrastructure investment—to be implemented in **staged, flexible pathways** rather than as fixed end-point solutions. It involves identifying multiple possible future scenarios, defining **decision points or "trigger thresholds"** at which actions may need to change, and sequencing options over time so that decisions can be adjusted as new information about risks, impacts, or performance becomes available.

In a spatial and transport planning context, DAPP helps avoid locking in maladaptive development or infrastructure by allowing plans to evolve as climate risks, societal values, and funding conditions change.

- Coordinate across all government, local authorities, iwi/hapū, and infrastructure providers.
- Develop shared data systems for integrated hazard, resilience, and infrastructure planning.

3.5 Embed Equity and Treaty Principles

Applies across spatial strategy development, option assessment, investment decisions, and implementation. Ensures Māori rights, aspirations, and wellbeing. Recommendation:

- Give effect to Te Tiriti o Waitangi in all spatial and resilience planning.
- Recognise customary rights and ensure meaningful Māori participation in decision-making.

3.6 Build Proactive Resilience Programmes

Applies to investment planning and funding allocation, where early intervention can reduce long-term costs and risks. Enable cost-effective improvements and reduced reliance on reactive disaster recovery. Recommendation:

- Invest in low-cost, high-impact resilience areas such as drainage and slope stabilisation.
- Develop national resilience tools and standardised business cases for funding allocation.

3.7 Monitor and Report Progress

Applies when spatial and resilience strategies are adopted, ensuring intent is translated into action and outcomes are tracked over time. Ongoing monitoring and reporting support accountability, learning, and adaptive management. Recommendation:

- Require implementation plans for Regional Spatial Strategies with clear accountability.
- Report on resilience and climate adaptation outcomes at least every three years.

4 Current Practice Regional Spatial Plan Case Study

Three geographically distributed examples have been selected to evaluate the key transport themes currently integrated in RSPs in New Zealand. These are the **Hamilton–Waikato Metropolitan Spatial Plan (MSP)**, the **Greater Christchurch Spatial Plan (GCSP)**, and the **Queenstown Lakes Spatial Plan**. The headline transport themes identified in each plan are summarised below.

Table 1: Comparative Regional Key Transport Themes

Subject Matter	Hamilton	Christchurch	Queenstown
Accessibility			
Active modes (walking & cycling)			
Climate change / adaptation			
Connectivity & corridor protection			
Emissions reduction			
Freight corridors			
Infrastructure			
Infrastructure phasing linked to growth areas			
Integrated land use and transport planning			
Mass rapid, rapid and frequent transit networks			

Subject Matter	Hamilton	Christchurch	Queenstown
Mode shift			
Public transport			
Resilience			
Safety			
Strategic infrastructure			
Tourism			

Cross-Plan Observations

Across all three plans, the core principles informing spatial planning, such as growth management, governance, intra-regional collaboration, and recognition of key transport challenges are well embedded. There is an apparent focus on what is assessed to be regionally critical, however there are material differences in weighting and approach across accessibility, safety, infrastructure sequencing, resilience, emissions, implementation mechanisms and other subject matter. This variability highlights an ongoing challenge in translating strategic transport intent into nationally consistent funded and deliverable outcomes in New Zealand's spatial planning framework.

5 International Practice Frameworks – Strategic Points of Reference

The following references have informed the comparative international best practice assessment.

- Federal Highway Administration (FHWA) Vulnerability Assessment (USA);
- United Nations Economic Commission for Europe (UNECE) Stress Test Framework (Europe);
- Infrastructure Australia Resilience Framework;
- The Permanent International Association of Road Congresses (PIARC) International Climate Change Adaptation Framework;
- The United Nations Development Programme (UNDP) Adaptation Policy Framework,
- The United Nations Framework Convention on Climate Change (UNFCCC) Best Practices for Least Developed Countries;
- The United States National Climate Resilience Framework;
- The United States Department of Transportation (DOT) Momentum Toolkit;
- National Adaptation Plans (NAPs), developed under the guidance of the United Nations Framework Convention on Climate Change (UNFCCC);
- The US Federal Highway Administration (FHWA) Vulnerability Assessment Scoring Tool (VAST); and the
- The San Diego Association of Governments (SANDAG) Prioritisation Tool.

The key objectives, policies and outcomes identified are summarised as follows:

5.1 Objectives

- **Integrate Climate Resilience into Transport Planning:** Embed adaptation and risk reduction into all stages of transport planning, design, and operations.
- **Protect Critical Infrastructure and Services:** Ensure continuity of essential transport networks under climate stress and extreme events.

- **Promote Equity and Inclusion:** Address the needs of vulnerable communities and incorporate indigenous and local knowledge.
- **Enable Long-Term Adaptation Pathways:** Use dynamic, flexible approaches to accommodate uncertainty and future climate scenarios.
- **Support Decarbonisation and Sustainability:** Align adaptation with emissions reduction and sustainable development goals.

5.2 Policies

- **Risk-Based and Evidence-Driven Planning:** Apply vulnerability assessments, stress tests, and scenario modelling to prioritise interventions.
- **Mainstream Adaptation into Development:** Integrate resilience into national, regional, and local transport strategies and investment plans.
- **Lifecycle Approach to Infrastructure:** Incorporate resilience in design, maintenance, and renewal phases.
- **Collaborative Governance:** Foster partnerships across government levels, private sector, and communities.
- **Financing and Implementation Tools:** Use innovative funding mechanisms (e.g., resilience bonds, public-private partnerships) and prioritise projects based on cost-benefit and equity criteria.

5.3 Outcomes

- **Resilient Transport Networks:** Systems that withstand shocks and recover quickly, minimising disruption to mobility and supply chains.
- **Data-Informed Decision Making:** Transparent prioritisation of adaptation projects using standardised tools and metrics.
- **Integrated Land Use and Transport Planning:** Compact, connected urban forms that reduce exposure and support sustainable mobility.
- **Enhanced Institutional Capacity:** Strengthened governance, technical skills, and monitoring frameworks for continuous improvement.
- **Community Wellbeing and Economic Stability:** Reduced vulnerability, improved safety, and sustained economic productivity under climate change.

6 A Best Practice Framework

The following framework is structured to ensure clear principles, support a practical guide for embedding resilience, climate adaptation, and equitable transport outcomes into RSPs.

6.1 Integrate Spatial and Resilience Planning

Principle: Spatial planning should be the primary vehicle for coordinating land use, infrastructure investment, and resilience outcomes. Recommendation:

- Align with transport strategies, climate adaptation and resilience plans.
- Embed natural hazard and climate risk mapping as the evidence basis for decision-making.
- Ensure resilience objectives consistency across all strategy to avoid policy disconnects.

6.2 Prioritise Climate Adaptation

Principle: Anticipate and respond to long-term climate risk. Recommendation:

- Apply Dynamic Adaptive Pathways Planning (DAPP) to enable staged and flexible responses under climate uncertainty.
- Identify, map, and protect areas vulnerable to sea-level rise, flooding, and seismic risk from inappropriate development.
- Incorporate managed retreat policies, with governance structures and funding pathways.
- Align adaptation responses with decarbonisation and emissions-reduction objectives.

6.3 Strengthen Transport System Resilience

Principle: Focus on system performance, risk, community and accessibility. Recommendation:

- Shift from asset-based to system-based planning approaches, prioritising access to jobs, services, and lifeline infrastructure.
- Apply risk-based prioritisation (likelihood and consequence) to guide investment decisions.
- Maintain redundancy and alternate route options for critical and lifeline corridors.
- Integrate stress-testing and vulnerability assessment tools in planning and investment.

6.4 Foster Cross-Government and Multi-Stakeholder Collaboration

Principle: Coordinated decision-making across institutions and sectors. Recommendation:

- Formalise partnerships between government, iwi/hapū, infrastructure providers, and the private sector.
- Develop shared data platforms for integrated hazard, resilience, land-use, and infrastructure planning.
- Establish governance frameworks that enable joint decision-making, shared accountability, and coordinated investment.

3.1 Embed Equity and Treaty Principles

Principle: Actively promote equity and give effect to Te Tiriti o Waitangi. Recommendation:

- Give effect to Te Tiriti o Waitangi at all stages of spatial and resilience planning.
- Ensure customary rights, meaningful Māori participation in governance / decision-making.
- Incorporate Indigenous knowledge, support community-led adaptation and resilience.

3.2 Build Proactive Resilience Programmes

Principle: Early, preventative investment delivers better resilience outcomes and reduces long-term costs. Recommendation:

- Invest in low-cost, high-impact resilience such as drainage and slope stabilisation.
- Develop nationally consistent resilience tools and business cases for funding decisions.
- Apply lifecycle resilience principles across asset design, maintenance, and renewals.

3.3 Integrate Land Use and Transport for Resilience

Principle: Integrate planning for urban form and transport networks, reduce risk and support sustainable mobility. Recommendation:

- Concentrate growth in resilient, well-connected locations with multi-modal transport options.
- Invest in mode shift, mass rapid transit, active modes, and high-quality public transport.
- Protect strategic and freight corridors from hazard exposure and incompatible development.

3.4 Financing and Implementation

Principle: Translate strategy into funded, staged, and deliverable actions. Recommendation:

- Link RSPs to long-term infrastructure strategies and clearly identified funding mechanisms.
- Use innovative financing tools and structured prioritisation to support resilience investment.
- Phase infrastructure delivery based on risk exposure, resilience benefits, and readiness.

6.5 Monitoring and Reporting

Principle: Ensure accountability and continuous improvement. Recommendation:

- Establish clear performance indicators for resilience and climate adaptation outcomes.
- Require implementation plans for RSPs with defined responsibilities and timeframes.
- Report progress at regular intervals (every 3–5 years), aligned with statutory review cycles.

6.6 Expected Outcomes

When applied consistently, this best-practice framework will deliver:

- Transport networks that are resilient to shocks and recover quickly.
- Transparent, evidence-based prioritisation of adaptation and resilience investments.
- Integrated urban form that supports sustainable mobility and reduces hazard exposure.
- Stronger institutional capability for coordinated resilience planning and delivery.
- Improved Māori and community wellbeing and economic stability.

7 Comparative Gap Evaluation Matrix

Table 2 contrasts the key differences between international frameworks, NZ spatial planning guidance, and current NZ practice:

Table 2: Comparative Matrix: Transport Planning for Resilience in Spatial Planning

Dimension	NZ Spatial Planning Guidance	Current NZ Practice Themes	International Best Practice	Key Differences
Integration of Resilience	RSP aligned with transport, housing, water, climate adaptation; hazard mapping	Embedded in plans but variable depth	Mainstream adaptation across all planning stages	NZ guidance strong on integration; practice less consistent; international emphasises systemic integration and stress testing
Climate Adaptation	DAPP, managed retreat, hazard avoidance	Considered but often secondary to growth	Dynamic pathways, scenario planning, iterative adaptation	NZ uses DAPP but lacks widespread application; international frameworks more advanced in scenario modelling and uncertainty planning
Transport System Resilience	Risk-based prioritisation; alternate routes; system-based approach	Corridor protection, freight resilience, mode shift	Lifecycle resilience, stress tests, vulnerability scoring	NZ guidance aligns conceptually but lacks formal stress testing tools used internationally
Governance &	Cross-government	Strong regional	Multi-level	NZ practice strong locally;

Dimension	NZ Spatial Planning Guidance	Current NZ Practice Themes	International Best Practice	Key Differences
Collaboration	coordination; shared data platforms	partnerships	governance, private sector engagement	international adds private sector and global standards
Equity & Treaty Principles	Te Tiriti o Waitangi, Māori participation	Embedded in plans (e.g., Kāinga nohoanga)	Equity and inclusion, indigenous knowledge	NZ uniquely strong on Treaty obligations; international focuses broadly on vulnerable groups
Proactive Resilience Programmes	Low-cost interventions; national tools	Infrastructure phasing, resilience upgrades	Financing innovation (resilience bonds, PPPs)	NZ lacks advanced financing mechanisms common internationally
Land Use & Transport Integration	Compact growth, hazard avoidance, mode shift	Mass rapid transit, active modes	Integrated land use and transport for resilience	Alignment strong; international adds resilience scoring for land-use decisions
Financing & Implementation	Link RSP to long-term strategies; accountability	Variable linkage across plans	Innovative funding tools; prioritisation frameworks	NZ guidance weaker on funding innovation; international uses structured prioritisation tools (VAST, SANDAG)
Monitoring & Reporting	3-year reporting; implementation plans	Annual monitoring in some plans	Standardised metrics, transparent prioritisation	NZ lacks standardised resilience metrics and scoring tools
Expected Outcomes	Resilient networks; community wellbeing	Mode shift, emissions reduction	Resilient systems; institutional capacity	NZ outcomes align but international emphasises measurable resilience performance

By way of an overall summary assessment, the following can be seen:

- **NZ Guidance**: Strong on integration, Treaty principles, and adaptation concepts (DAPP), but less prescriptive on financing, stress testing, and standardised metrics.
- **Current NZ Practice**: Good alignment with guidance but variable depth; resilience is often secondary to growth priorities.
- **International Best Practice**: More advanced in risk modelling, stress testing, financing innovation, and transparent prioritisation tools.

8 Planned NZ RMA Reform

Two separate pieces of legislation to support climate adaptation and environmental protection are being introduced in NZ. The Planning Act will regulate how land is used, developed, and enjoyed. It will enable urban development and infrastructure projects including renewable energy and will address natural hazard management. The Natural Environment Act (NEA) will focus on protecting and enhancing the natural environment, including freshwater, indigenous biodiversity, landscapes, and the cultural relationship Māori have with natural resources.

Regional Policy Statements (RPS) are to be removed and partially replaced by Regional Spatial Plans developed under the Planning Act. These spatial and regulatory plans will be standardised and combined into a single digital platform known as "*one national e-plan for NZ*." Spatial plans will cover areas such as the coastal marine environment and will map major constraints, identify existing and future infrastructure, and highlight areas for urban growth and development opportunities.

Each Act will also include national goals that define the main objectives of the regulatory framework and provide a basis for monitoring progress. The Planning Act will focus on goals related to infrastructure provision and the development of well-functioning urban and rural areas, while the NEA will set goals for protecting key natural values. The current outline framework for the two pieces of legislation is summarised in Figure 1.

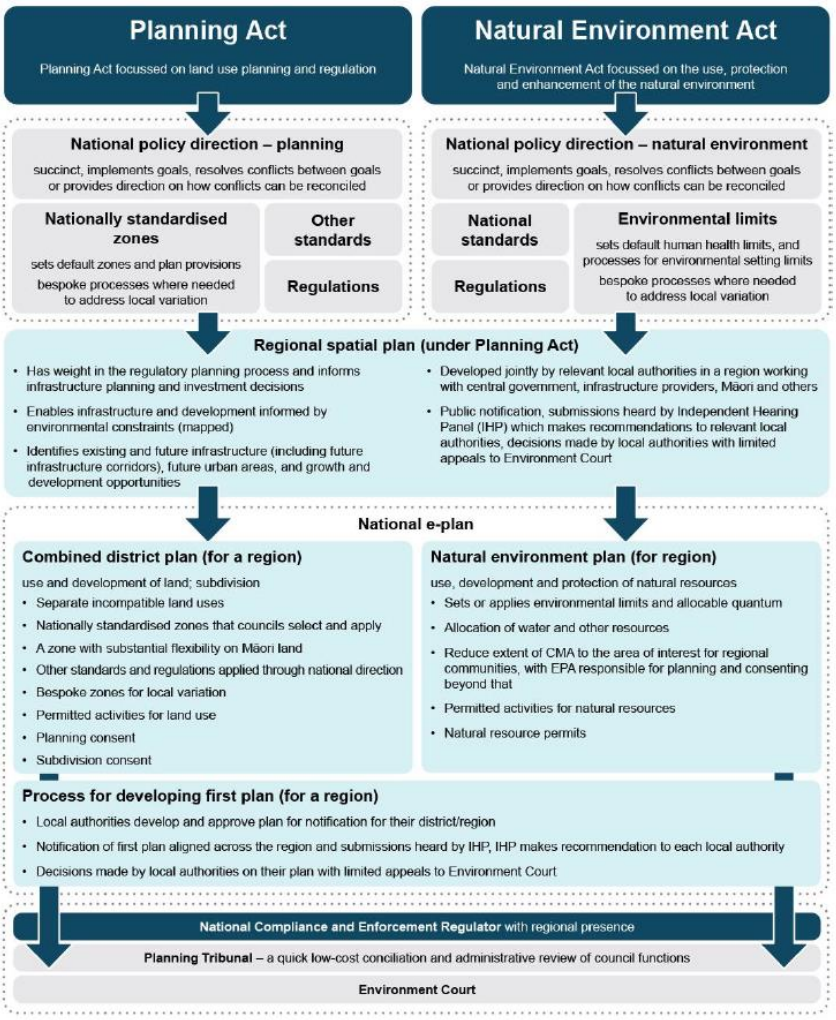

Figure 1 Current outline framework for the Planning Act and NEA (Source: NZ Government Blueprint for resource management reform, 2025)

While this provides a solid framework for integrating transport into RSPs, the challenge for the legislation will be to bridge the current gaps described in delivery of spatial plans.

9 The Transport Case for a National Spatial Plan

An evaluation of recent spatial planning practice highlights the evident need for a National Spatial Plan that embeds transport as a central strategic layer. Current planning hierarchy lacks a national spatial reference point, creating fragmentation between international obligations, national strategies, and RSPs.

9.1 Key and Current Transport Challenges

- Lack of National Integration: Transport infrastructure planning is siloed across agencies, with no spatial mechanism to coordinate investment or align with national goals.
- Missed Opportunities for Climate Resilience: Without a national spatial framework, transport corridors are not consistently assessed for climate risk or adaptation potential.
- Fragmented Freight and Logistics Planning: Strategic freight routes, ports, and airports are not spatially integrated at the national level, risking inefficiencies and vulnerabilities.

- Limited Support for Mode Shift and Accessibility: National strategies lack spatial tools to promote active transport, public transport uptake, and equitable access.

A National Spatial Plan for Transport offers significant benefits by enabling coordinated and consistent planning across regions. It aligns transport investment with national and international priorities, ensuring infrastructure decisions support strategic goals. By incorporating climate risk mapping and adaptation planning, transport networks are more resilient to environmental hazards and future uncertainties.

Economic efficiency is enhanced through reliable freight corridors and productive transport links. It promotes equity and inclusion by embedding the principles of Te Tiriti o Waitangi and ensuring all communities have fair access to transport infrastructure. These elements will create a more integrated, future-ready transport system that supports sustainable development across NZ

9.2 National Databases, Tools, and Information Systems

These are crucial to improving transport resilience. They ensure consistent, evidence-based insights that support better decision-making. For example, centralised datasets on climate hazards, land use, infrastructure condition, and socio-economic trends enable planners to assess vulnerabilities across regions and timeframes. Tools like GIS platforms, digital twins, and transport modelling software help simulate future scenarios, evaluate adaptation options, and prioritise investments based on risk and equity.

National resources enable standardisation and coordination across jurisdictions. Shared frameworks such as vulnerability assessment methodologies, emissions tracking tools, and resilience indicators ensure that local and regional plans align with national goals. They enable monitoring and evaluation, helping agencies track progress toward climate targets, mode shift, and safety outcomes. Integrated spatial planning and infrastructure funding mechanisms, and national tools significantly enhance effectiveness and accountability of climate-resilient transport strategies.

9.3 Transport Planning Innovation - Improving Resilience and Climate Adaptation

Transport agencies and infrastructure developers are increasingly adopting technology-driven approaches to enhance climate resilience. For example, the Boston Consulting Group highlights the use of predictive analytics, digital twins, and AI-based monitoring systems to assess vulnerabilities and guide investment decisions across the full infrastructure lifecycle.

10 A Role for National Planning Standards

National Planning Standards (NPS), introduced under sections 58B–58J of the Resource Management Act 1991, aim to improve the consistency, usability, and efficiency of regional and district plans. While the first set of standards (published in 2019 and updated in 2022) focused on structure, format, definitions, and electronic accessibility, there is a strategic need for transport-specific standards to support spatial planning outcomes.

10.1 Why Transport-Focused Standards Are Needed

Spatial planning relies on integrated decision-making across land use, infrastructure, and environmental domains. However, without consistent national standards for transport, regional and local plans risk fragmentation, inefficiency, and misalignment with national priorities. Key areas where transport-focused standards are vitally needed include:

- **Transport Corridor Definitions**: Clear, consistent definitions for transport corridors, hierarchy, nodes, and modal infrastructure are essential for mapping and zoning.
- **Infrastructure Readiness Mapping**: Standards should guide how transport infrastructure sequencing and readiness are spatially represented.
- **Mode Shift and Emissions Metrics**: Nationally consistent indicators for mode shift, emissions reduction, and active transport uptake are needed to support climate goals.

- **Safety and Accessibility Provisions**: Standards should embed minimum requirements for transport safety, universal design, and equitable access.
- **Integration with Te Tiriti o Waitangi**: Transport standards must reflect Māori values, aspirations, and partnership principles in infrastructure planning.
- **Digital and Spatial Layers**: GIS-compatible standards for transport overlays and spatial layers will enable better integration with other planning tools.

10.2 Role in Supporting Spatial Planning

National transport-focused planning standards would serve as critical reference point for RSPs and local spatial plans under the Planning Act. They would:

- Enable consistent interpretation and application of transport provisions across regions.
- Support cross-boundary infrastructure coordination.
- Provide a foundation for scenario modelling and investment prioritisation.
- Ensure alignment with the National Planning Framework and other national instruments.

11 Conclusions

Transport planning must evolve to meet the challenges of climate change, urbanisation, and social equity. By adopting best-practice frameworks and embedding resilience into spatial planning, NZ can deliver transport systems that are robust, adaptive, and inclusive.

Critical gaps and risk factors have the potential to undermine robust RSP decision making with consequent and legacy effects. National Planning Standards for transport are essential to realise the full potential of RSPs in NZ. These standards will provide clarity, consistency, and strategic alignment for planning, ensuring that transport infrastructure supports resilient, equitable, and sustainable outcomes.

The best practice approach described at section 6 of this paper is recommended to fully integrate transport outcomes with RSP. We have access to knowledge already. Making the most effective use of this will ensure we deliver well-considered, efficient, affordable resilience outcomes for our collective futures.

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AUTHOR CONTRIBUTION STATEMENT

Mark Apeldoorn is the principal author. He determined the concept for the paper, established the outline structure, content and focus for the assessments. He undertook substantial national and international research, evaluated the findings and wrote these sections in relation to transport planning resilience in spatial plans. He has contributed to and reviewed the assessments of RMA reform, the case for a National Spatial Plan, and National Planning Standards.

Cameron Martyn has undertaken the research, investigation, assessment and evaluation in relation to RMA reform, National Spatial Plan, and National Planning Standards and has prepared the reporting for these sections, as well as contributing to the national and international research undertakings. Cameron has reviewed the paper and Mark is responsible for the overall paper production and lodgement.