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CHALLENGES FOR THE SUSTAINABLE DEVELOPMENT OF ROAD SYSTEMS

B JOHNSON & J KILBRIDE

Transit New Zealand
Wellington
New Zealand

barry.johnson@transit.govt.nz
james.kilbride@transit.govt.nz

ABSTRACT

This report focuses on how Transit New Zealand (Transit), the agency responsible for planning, constructing, maintaining and operating the national strategic roading network throughout New Zealand, is meeting the challenges of sustainability. It explains how Transit is aiming to achieve integrated multi-modal transport solutions by developing and implementing a range of initiatives.

The legislative framework that Transit operates within has an underlying ethos of sustainable management that is carried through transport, land use planning and environmental legislation. The generally accepted definition of sustainability in New Zealand is "meeting the needs of the present generation without compromising the ability of future generations to meet their own needs".

Transit is addressing sustainability by reviewing its priorities and emphasis, restructuring to better align the organisation with its priorities, revising its strategic plans and undertaking a range of practical initiatives aimed at embedding sustainability throughout the organisation and the services it delivers.

This paper provides a background on those initiatives and includes several case studies that illustrate how the initiatives are being implemented.

1.0 INTRODUCTION

This National Report has been prepared for the XXIIIrd World Road Congress, Paris 2007. It complements another New Zealand National Report addressing Asset Management. Both reports have been prepared by Transit. Further information on the matters discussed in this report is available at: www.transit.govt.nz

1.1 Scope

The theme of this report is the *challenges for the sustainable development of road systems* in New Zealand. It focuses primarily on Transit, which is the agency responsible for planning, constructing, maintaining and operating the national state highway network throughout New Zealand.

Section 2 provides background information on New Zealand and the external factors that influence how Transit operates. Section 2 also describes recent policy and legislative changes in New Zealand that are key drivers for the advancement of integrated multi-modal transport solutions and the sustainable development of New Zealand's transport systems.

Section 3 describes the internal structure of Transit and how it has evolved to meet the requirements of new legislation and address the need for more strategic and sustainable approaches to roading and transportation.

Section 4 explores some of the measures Transit has adopted in the past few years to tackle the challenge of making New Zealand's transport system more sustainable. Transit's National Report on Asset Management contains other examples.

Section 5 contains three case studies that illustrate sustainability in action in the transport sector.

2.0 THE NEW ZEALAND CONTEXT

2.1 Demographics

New Zealand is an island nation in the south-west Pacific with a land area of 270,500 km^2 comprising two main islands. It is situated approximately 1600km to the south-east of Australia and is of comparable size to Great Britain or Japan. The capital is Wellington and the largest city and leading port is Auckland. New Zealand is an independent nation and a member of the British Commonwealth.

New Zealand has a population of 4.1 million people, and a per capita GDP of US$23,000. 86% of the population live in urban areas and over half of the population lives in the northern most quarter of the country. The majority of New Zealanders are of European descent, with New Zealand's indigenous Māori people making up around 15% of the population (Statistics New Zealand 2006).

Figure 1 - New Zealand's State Highway Network

2.2 Vehicle ownership

New Zealand has the fourth highest per capita car ownership rate in the world behind the United States of America, Italy and Australia. In 2004, total vehicle ownership exceeded 700 vehicles per 1000 people and is still rising by between 3-6% per year. Increasing vehicle ownership rates have resulted from the relaxing of import tariffs and duties by the Government in 1990. About 70% of the country's vehicle fleet comprises used cars imported from Japan.

In addition, heavy traffic is growing at a faster rate than other forms of vehicular traffic. The growth in total vehicle numbers is placing pressure on the capacity of the road network and is increasing levels of congestion in New Zealand's major cities. Transport contributes 19% of New Zealand's total greenhouse gas emissions.

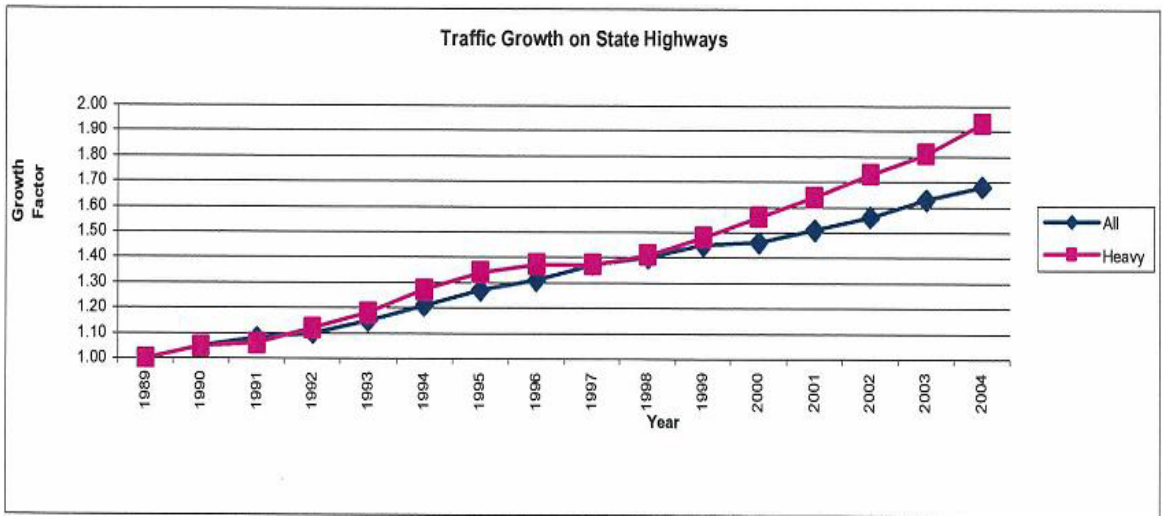


Figure 2 - Traffic growth on state highways in New Zealand

New Zealand's high dependence on private car travel is a result of the pattern of low density, sprawling urban development present in New Zealand's main centres combined with low provision of public transport and the geographical isolation of many small rural settlements. New Zealand's economy is dependant on high levels of primary production including farming and forestry, which has led to road networks often being established over difficult terrain and at high capital cost relative to the population size.

These factors create significant challenges for the sustainable development of road transport in New Zealand.

Economic reform and sustainable transport legislation

2.3 New Zealand's economic reform and the Resource Management Act

New Zealand's transport sector was deregulated in the 1980s as part of a comprehensive economic reform and market deregulation package implemented by the government. This led to many state-owned enterprises being privatised, including air and rail. While economic

efficiency was increased, these changes largely ignored the broader linkages between transport and other issues such as sustainability, regional development, urban form and social cohesion.

Deregulation and market reforms also led to a reform of New Zealand's planning and environmental legislation, culminating in 1991 with the passing of the Resource Management Act (RMA). Considered to be world leading environmental legislation at the time, the RMA replaced over 50 planning and environmental statutes and bought together laws that governed land, air and water resources.

The RMA introduced a new approach to environmental management that enables decision makers to look at the environment as a whole and to focus on the effects of activities on the environment. It sets principles for environmental management and sustainable development which are based on the concept of sustainable management of natural and physical resources. For Transit, the RMA process is one of the means of influencing land use planning decisions to incorporate the sustainable transport outcomes required by New Zealand's transport legislation.

2.4 New Zealand's transport legislation

Substantial reforms in the legislation, governance and funding of the transport sector in New Zealand were initiated in 2002 with the launch of the New Zealand Transport Strategy (NZTS). The NZTS considers sustainability to be paramount in all decisions relating to transport. The aim of the NZTS is that New Zealand will have "an affordable, integrated, safe, responsive and sustainable transport system by 2010".

The Land Transport Management Act 2003 (LTMA) was enacted to give legislative effect to the NZTS. The LTMA provides the framework for a more integrated approach to the funding and management of land transport. The Act also introduced a focus on long-term planning of the transport network in order to achieve more sustainable, integrated infrastructure and land use.

For Transit, the LTMA expanded its focus from delivering a "safe and efficient state highway system" to "contributing to an integrated, safe, responsive and sustainable land transport system". In fulfilling its new statutory objective, Transit is required to demonstrate a sense of social and environmental responsibility.

2.5 Management of the New Zealand roading network

The management of New Zealand's road network is divided into two parts: the national strategic roading network (national state highways – refer Figure 1) is managed by Transit New Zealand. Local government agencies (territorial local authorities) manage all other roads (known as local roads). How Transit and territorial local authorities manage the roads under their respective jurisdictions is similar. This report focuses on how Transit manages and operates New Zealand's state highway network.

3.0 TRANSIT NEW ZEALAND

Transit is a Crown entity and was established by statute in 1989. Transit operates in a three-way structure with the Ministry of Transport, which provides policy direction and Land Transport New Zealand, which distributes funding. Transit and Land Transport New Zealand are separate from the Crown, although ministerially appointed Boards provide governance and direction to each agency.

Transit's vision is:

"A transport system that builds a better New Zealand"

Transit's values are:

Leadership	be a world leader in transport solutions
Integrity	be honest, show respect for others and courage in our actions
Stewardship	be environmentally sensitive, socially responsible, and economically efficient
Responsiveness	proactively engage with communities, road users and partners
Excellence	do it right, at the right time – and do it with enthusiasm and pride
Innovation	discover alternatives and challenge assumptions

Transit New Zealand key facts:

- Transit New Zealand manages 11,000 kilometres of state highways and motorways
- State highways make up 12% by length of New Zealand's roads
- State highways account for half of the 36 billion vehicle kilometers travelled each year
- Motorways are 0.4% by length of New Zealand's roads and carry 9% of the traffic
- 24 kilometres of state highways within the Auckland region (New Zealand's largest urban area) carry 22% of vehicle kilometres travelled on the total state highway network
- The replacement value of state highways in accounting terms is approximately $15 billion
- Transit has increased its staff from 280 in 2003/04 to approximately 380 in 2006 to meet the challenges of delivering a sustainable integrated roading network.

3.1 The internal structure of Transit New Zealand

During 2004 and 2005, Transit underwent a major internal restructuring exercise. The new structure focuses on responding to and reflecting the intent of the NZTS and the LTMA. The restructuring was also driven by the need for new and enhanced skills to meet the challenges of providing a more sustainable approach to roading. The organisation was grouped into five divisions:

1. **Transport Planning,** planning for the long term, particularly focusing on integrating growth, development and land use planning with multi-modal transport planning
2. **Capital Projects,** delivering significant state highway improvement projects
3. **Network Operations,** managing traffic flow, maintaining and getting the best value from the state highway network
4. **Strategic Support,** focusing on key functions of setting direction, strategic communications, market research and stakeholder relationships

5. **Corporate Services,** providing information management and systems, and human resources, financial and administration services.

Transit has strengthened its transport planning capability in recent years. This investment to broaden skills recognises the need to work more closely and collaboratively with local government, other transport providers such as rail and passenger transport, and a wide range of stakeholders to address the need for long term planning. Considerable emphasis in now placed on ensuring land use and transport decisions are made together to ensure timing and funding is co-ordinated.

Transit's decision-making processes are designed to find appropriate balances between economic, social and environmental considerations. In an effort to ensure road users, local communities and the national economy benefit from development that can be supported by affordable infrastructure, Transit now takes an active role in land use planning.

This is achieved by working closely with local and regional government and being actively involved in policy and plan development to produce integrated growth strategies, long term community plans and development plans that address both transport and land use demands. Detailed advice is also provided by involvement in individual development applications. This involves working alongside local authorities, developers, other transportation agencies and local communities on a daily basis.

3.2 Transit's policy framework following the LTMA

Transit's primary focus prior to the LTMA was to operate "a safe and efficient state highway system", largely driven by cost effectiveness. The benefit cost ratio (BCR) of a project was the main factor in determining whether it received funding. While cost effectiveness is still a key element, under the LTMA Transit is now required to take into account how each construction or maintenance activity contributes to the objectives of the NZTS:

1. assisting economic development;
2. assisting safety and personal security;
3. improving access and mobility;
4. protecting and promoting public health; and
5. ensuring environmental sustainability.

To achieve this, these objectives have been embedded in all of Transit's guiding documents, such as the Statement of Intent and the National State Highway Strategy. Land Transport New Zealand has also adjusted its assessment processes to take account of these broader objectives. Transit has also committed itself to developing and implementing several strategies and plans to implement the principles of the NZTS and LTMA. For example, Transit released its Environmental Plan in November 2004 as a guiding policy for all Transit staff, project managers, contractors and consultants. The Environmental Plan sets a framework for managing the interface between the environment and the state highway network. Transit is now implementing the Environmental Plan by incorporating environmental responsibility into the contracts and everyday practices of its many contractors via performance measures. The Environment Plan carries the same triple bottom line reporting functions that are contained in the Statement of Intent.

3.3 Performance measurement

Transit started using 'Triple Bottom Line' reporting in 2002 to balance environmental and social considerations alongside economic factors when setting and reporting its performance objectives. Transit's performance measures were set to reflect the organisations' environmental, social and economic objectives in a transparent, accurate and comparable format.

Transit's measures have evolved to better reflect the vision and aims of the NZTS and the LTMA. Performance targets relate to:

- responsiveness to stakeholders
- alignment with regional land transport strategies (prepared by local and regional land use planning authorities)
- road safety
- noise and water
- energy efficiency and waste disposal in Transit offices
- completion of capital projects as forecast
- delivery of economic benefits
- road conditions

3.4 Funding of roading in New Zealand

Transport funding in New Zealand comes via the government from road user charges, fuel excise duty, motor vehicle registration and licensing fees, all of which go into the National Land Transport Fund (NLTF). The majority of funding comes from road user charges on heavy vehicles (mainly diesel) and fuel excise duty (mainly petrol). A portion of this fund is used for road safety initiatives such as police enforcement, while the remainder is distributed to road controlling authorities, these being Transit and 74 Territorial Local Authorities.

Transit is fully funded by the NLTF, although tolls and developer contributions contribute in some cases. Transit is increasing its focus on seeking financial contributions from developers to ensure developers mitigate any adverse effects their developments (such as residential subdivisions or retail centres) have on the safety and functionality of the state highway network.

Local Authorities receive on average 50% of their roading construction and maintenance budget from Land Transport NZ, with property taxes and other local authority revenue providing the balance. However, Transit's projects are 100% funded by Land Transport New Zealand. All Road Controlling Authorities submit Land Transport Programmes (LTP) indicating the extent of works and the funding they are seeking for the coming year.

Transit produces a 10-year State Highway Forecast, which is released each year in parallel with the National Land Transport Programme. The forecast outlines the projects Transit is planning for future construction on a rolling 10-year basis. The Forecast also serves as Transit's Land Transport Programme.

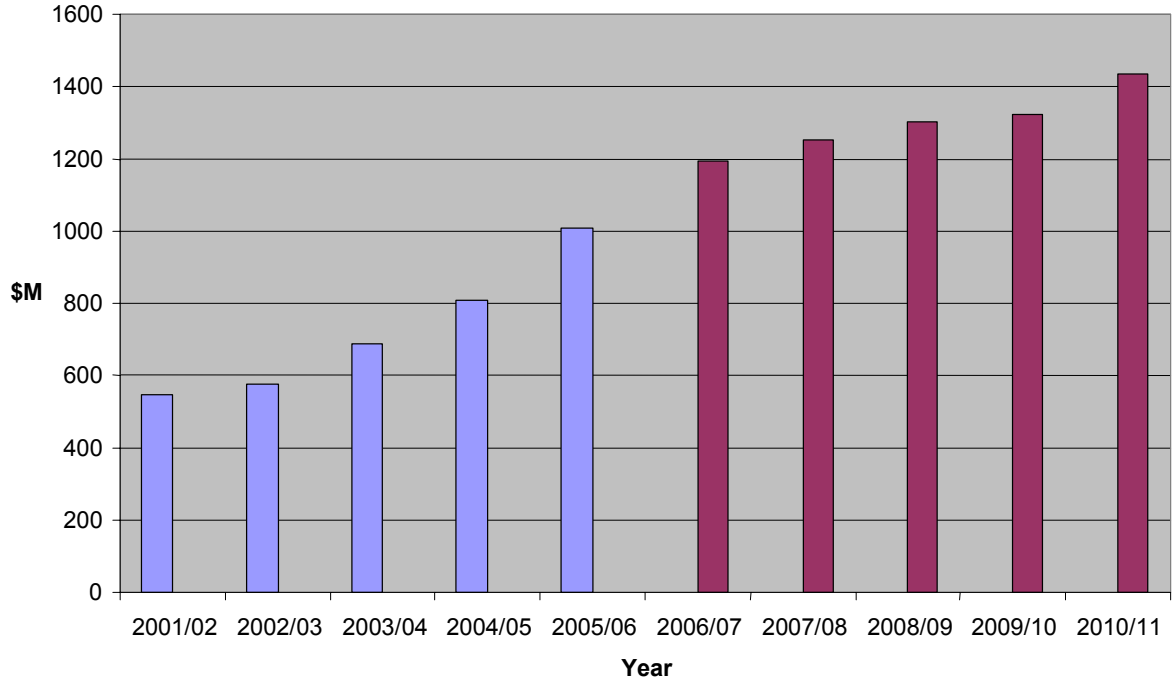
Until recently Transit expenditure was of the order of $NZ600m ($US390m) with about half being spent on maintenance and management and half on new capital works directly

increasing capacity. In 2004/05 the government decided that additional expenditure was required to address increasing congestion, to make further improvements to meet safety targets (especially reductions in fatalities on state highways) and to meet economic growth and development. The funding available to Transit for expenditure on state highway capital projects increased by approximately $NZ400m ($US260m) to a total of just over $NZ800m ($US520m). In 2005/06 this was further increased by an additional $NZ200m ($US130m) to just over $NZ1b ($US650m).

In addition, the government announced a guaranteed future funding package for the next 5 years of $NZ6.5b ($US4.23b). The importance of this move is the significant increase in state highway funding and the increased certainty of the funding allowing longer-term planning to meet the needs of growth, congestion and safety.

The following graph (Figure 3) illustrates the increase in government expenditure on state highways over the period 2001/02 to 2010/11.

Figure 3 - Forecast Expenditure on State Highways



4.0 RECENT INITIATIVES TO MAKE NEW ZEALAND'S NATIONAL ROAD SYSTEM MORE SUSTAINABLE

4.1 Procurement initiatives

Transit's Long Term Procurement Plan established a new proactive, future-oriented approach to implementing delivery of capital improvement and asset management projects on the state highway network. The document describes how Transit intends to procure suppliers and deliver services and products to achieve best value for money while being aligned with the principles of sustainability. It highlights the importance of understanding and evaluating the whole of life economic, social and environmental dimensions of a proposed road construction or maintenance project.

One important factor in being able to evaluate tenders in terms of economic, social and environmental factors has been the successful implementation of a new tender evaluation method, known as Price Quality Method (PQM). PQM provides an evaluation framework for differentiating bidders based not just on price, but also quality, time and the ability of the bidder to meet social and environmental responsibilities (and hence linking to triple bottom line reporting). It does this by differentiating the "intangible" aspects using a scoring system, and then converts it to a "price quality differentiator" that is used to offset the bidder's price, providing a more balanced perspective in selecting the preferred supplier.

Transit does not have a one-size-fits-all approach to procurement. Instead it has a range of procurement models that can be applied for delivering projects of varying scale, risk and complexity. They extend from the standard three-year network maintenance management contract for a section of highway through hybrid contracts, to performance-specified 10-year contracts.

There is also a range of contracts for capital projects from the traditional method of separate professional consultancy packages and a works contract, through design-construct, and full delivery via alliance models. Alliance models allow Transit to work in collaboration with its suppliers to deliver large, complex, difficult and critical projects. The method relies on an open-book approach with all risks shared and incentive structures that encourage high quality outcomes.

4.2 Cross-government integrated approach to planning project

The government recently produced the "Transport Sector Strategic Directions" (TSSD) document, which sets priorities for achieving the objectives of the NZTS. The TSSD identifies important transport priorities that need to be addressed collectively by government transport agencies to achieve the priorities of the NZTS.

Transit is taking the lead on a project titled the "Integrated Approach to Planning" to Identify gaps and barriers to achieving better integration, both within and between transport planning and land-use planning. It is widely acknowledged that multi-modal planning issues in New Zealand are not being resolved well under current arrangements. The IAP project will consider all aspects of planning for domestic transport including roads, aviation and maritime and their interrelationship with land-use planning.

The project aims to identify a series of actions that can be undertaken to achieve the following goals:

- a more systematic and integrated approach to planning across government, business and community
- better and quicker results in resolving transport planning and land use issues at central and local government levels
- better delivery against the NZTS objectives, and
- associated cost savings.

The actions to be developed are expected to achieve quicker implementation of appropriate transport system improvements, reduce bureaucracy and costs and help to better inform public discussion on land use and transport planning issues.

To complement the actions, several case studies are being developed to demonstrate real life examples of how an integrated approach to planning for transport and land use can create more effective and sustainable outcomes.

4.3 Toll roads and Public Private Partnerships

Provision for road tolling in New Zealand is relatively new. The LTMA enables tolling of 'new roads' (providing there is an un-tolled alternative route) and agreements to allow for some new roads to be built and operated under concession arrangements.

Transit sees tolling as:

- A revenue source that can fund the costs of advancing the construction of major projects; and
- An effective mechanism to ensure the sustainability of new infrastructure.

Toll schemes require an Order in Council (OIC) to be made by the Governor General, generally on the recommendation of the Minister of Transport. In making a decision, the Minister is required to consider a range of matters including the objectives of the NZTS and the outcomes of consultation.

Transit received government approval to build and operate the Auckland Northern Motorway Extension (ALPURT B2) as a toll road in April 2005. Construction is underway and the road is scheduled to open in 2009 (see section 4.11). This will be New Zealand's first tolled state highway under the LTMA and other options for more toll roads and PPPs are currently being investigated.

4.4 Cost sharing policy

The increased emphasis on promoting integrated and affordable land use and transport solutions has led to an increase in Transit seeking contributions of land, works or money from developers where new development has an adverse effect on the safety or functioning of a state highway. Typically this arises where a new development, such as a retail complex,

results in a significant increase in trip generation that triggers the need to upgrade an intersection or widen a stretch of highway.

The New Zealand Courts have supported the principle that councils and developers ought to share the costs of upgrading state highway infrastructure in order to mitigate the direct adverse transport impacts of development.

Accordingly, Transit recently adopted a Cost Sharing Policy to draw together best practice and improve the consistency and robustness of Transit's approach to cost sharing. The policy outlines when Transit will seek a contribution and the basis for determining an equitable contribution. Due to New Zealand's legislative framework, the policy emphasises the importance of negotiating voluntary outcomes rather than using judicial processes.

4.5 Reflection of public opinions

Transit places a strong emphasis on ensuring it is informed about stakeholders and road user views and has carried out public opinion surveys since its inception in 1989. Focus groups are used to design questionnaires and academic peer review is used to ensure they achieve their objectives.

There are two primary surveys:

1. The National Road User Survey which gauges opinions of end users; and
2. The Stakeholder Survey which gauges opinions of how well Transit conducts its business.

NATIONAL ROAD USER SURVEY – Triennial
This survey measures the opinions of the end users (i.e. road users) in terms of the product and services Transit provides. This informs Transit about users actual concerns and helps to prioritise expenditure to meet those concerns. Action plans are developed to address key issues that come out of the survey and the results of the survey are integral to reporting against Transit's performance measures.

The survey seeks to identify public priority areas, e.g. safety, congestion, environment. Solutions are then developed within Transit based on the issues identified through the survey.

STAKEHOLDER SURVEY – Triennial
This is a measure of how well Transit does its business. The survey covers contractors, consultants, local and central government agencies and the media. The survey identifies issues reflecting the strategic and performance goals of Transit and rates the levels of satisfaction from stakeholders. The survey indicates stakeholder's perceptions on how well Transit achieves best practice, delivers against its objectives and makes balanced decisions. This information forms part of the business planning process.

When asked to rate Transit's achievement of best practice regarding a commitment to sustainable development, 54% of respondents to Transit's 2005 Stakeholder Survey found it was adequate, good or excellent. However 28% either did not answer (2%) or did not know (26%) indicating a lack of understanding of the term sustainability within the stakeholder group. Transit will use these results to target this lack of understanding through newsletters and information sheets and will track it in subsequent surveys.

In addition, the following surveys are also undertaken to inform the direction of Transit's business:

TRAVEL TIME SURVEYS

Travel time surveys are carried out in areas of high traffic flow to inform Transit and other road controlling authorities about where congestion is occurring, trends in the performance of the state highway network, as well as being able to report on specific route travel times. For the surveys, Global Positioning System (GPS) instrumented vehicles are driven over specific sections of state highways and local roads during three peak travel time periods each day, on five consecutive weekdays to create a quantifiable measure of the time that is lost as a result of congestion.

PROJECT SPECIFIC SURVEYS
Public opinion surveys are undertaken to gauge public opinion on the need for some new roads. This is particularly the case with proposed new urban roads that may create significant adverse effects such as community severance and disruption.

OTHER CONSULTATION
Transit also carries out extensive consultation with stakeholders and the public in relation to the 10-year State Highway Forecast to ensure that the projects, the priorities and the timing of the programme of work included in it reflects the views of the key stakeholders and the travelling public. In addition, detailed consultation is undertaken on individual projects with affected parties.

4.6 Urban design

In March 2005, Transit became one of the early signatories to the New Zealand Urban Design Protocol. The Protocol is a key Government programme of action addressing how good urban design can better contribute to the development of sustainable towns and cities.

Transit appointed two urban design champions within the organisation whose role is to influence and promote Transit's commitment to the protocol. The champions are the General Manager of Transport Planning and the General Manager of Capital Projects, both senior managers with key areas of responsibility that directly impact upon urban design.

Transit's implementation of urban design has in the past been mainly implicit and limited to environmental or visual enhancements. More recently, the delivery of urban design has become more explicit as Transit recognises how it can add value to the roading benefits it provides to communities.

A primary aim of urban design is to ensure Transit demonstrates a context sensitive approach to the way the state highway network is planned, built and operated. To achieve this Transit has sought to ensure that all environmental treatments (such as storm water facilities and ecosystem protection), economic development (such as access for businesses and services), engineering factors (such as road design being safe and functional) and social requirements (such as providing pedestrian and cycling linkages) are incorporated into the design of roading projects from the outset. By providing a context sensitive approach early in the

planning process Transit can deliver on its commitments to the Protocol in a cost efficient manner.

Transit has developed Urban Design Implementation Principles to help guide the organisation in implementing quality urban design. The principles are consistent with Transit's commitment to the protocol and the broader concept of sustainable development. Transit's urban design team also provides advice on projects at the investigation stage. Transit project staff are being educated through project reviews, the development of case studies and training.

Urban design provides Transit with value for money solutions. Adopting an urban design approach has cost benefit advantages in the long term, particularly through savings in long term maintenance and the reduced need for lengthy statutory approvals. However, it needs to be integrated into the planning and design process from the outset, hence Transit's on-going focus on up-skilling staff to recognise opportunities early and act on them.

Section 4.11 contains an example of how urban design has been applied to a recent roading project.

4.7 Travel demand management

Travel Demand Management can contribute to reducing the pressure for more roads by maximising the efficiency of the existing network.

Transit has identified a number of TDM measures that it is pursuing to maximise the benefit of the existing network. They include:

- Integrated land use and transport planning.
- Management and operation of the state highway network via:
    - support for public transport, cycling and walking; and
    - traffic management – including integrated traffic management systems such as Auckland's Traffic Management Unit; transit/high occupancy vehicle lanes; priority for freight; ramp signalling on motorways; deployment of Advanced Traffic Management System; other applications of intelligent transport systems.
- Travel behaviour change programmes via:
    - traveller information systems that inform travel choices;
    - travel plans; and
    - support for education campaigns.

Transit's position is well aligned with the NZTS and the LTMA. Well planned, new state highway links will continue to play their part in the development of the transport system, but a range of other tools can be used to ensure the state highway network delivers sustainable, high levels of service and is a key feature of an integrated transport system - at national, regional and local levels.

4.8 Traffic noise

Transit has recognised for a number of years that the management of traffic noise is a significant environmental issue. The latest Strategic Plan includes a goal to 'achieve reductions in traffic noise and vehicle energy consumption by extending the length of new

noise reducing surfaces on the existing network by an additional 50%, i.e. approximately 7 km per year at an estimated additional cost of $2m per year'.

This is a step forward for Transit as it is now one of the few road controlling authorities in Australasia that seeks to address noise issues associated with the existing road network.

In order to give effect to the goal, Transit introduced a 'noise improvement programme' in its Environmental Plan. The programme is a nationally co-ordinated initiative that is designed to prioritise funding for noise mitigation where noise levels exceed 65 dB(A) Leq(24hr) on the existing network. During 2005 / 06 three sections of state highway were retro-fitted with quieter road surfaces under the programme.

5.0 CASE STUDIES DEMONSTRATING SUSTAINABLE APPROACHES

5.1 Case study: Integrated approach to transport and land use planning – strategic example: *Christchurch Urban Development Strategy (UDS)*

Christchurch is the largest city in the South Island of New Zealand. It serves as the gateway to international markets for trade via Christchurch International Airport and the Port of Lyttelton. Christchurch is often the starting point for many tourists travelling around New Zealand's South Island.

Residential and Industrial growth is now expanding beyond the city boundaries and putting pressure on infrastructure in the region. For example, Waimakariri is one of the fastest growing districts in New Zealand with 18% growth in 2006. Rapid growth has led to increased pressure on the transport networks, especially the road networks in and around Christchurch.

Transit's response to the current and projected growth in and around Christchurch has been to collaborate with local and regional authorities in the greater Christchurch area to establish an Urban Development Strategy (UDS). This reflects Transit's increasing emphasis on strategic regional planning to make sure the transport implications of growth are addressed early on.

The early identification of growth areas is helping to inform decisions on Transit's long-term plans and provide some certainty of infrastructure and transport links to complement future urban growth. Options being considered include increasing the density of brown field sites close to existing transport corridors and identifying green field sites that can be made more accessible by developing key transit nodes, while conserving environmental areas and unique character.

5.2 Case study: *Integrated approach to transport and land use planning – local example Waingawa Industrial Development*

Transit has been collaborating with territorial authorities north-east of Wellington in the Wairarapa region to ensure development pressures do not compromise the state highway network or the local roading network. The local authority was under pressure from developers to provide land for industrial development. By working in collaboration with the local authority Transit was able to ensure that land re-zoned for industry was in an appropriate location for

road and rail links. The developers were also encouraged to contribute to the cost of upgrading the intersection of the state highway with the local roads to help facilitate safe and efficient access to the new industrial area. This was a voluntary cost sharing agreement between the various developers and Transit, in accordance with Transit's Cost Sharing Policy.

5.3 Case study: Sustainability, Urban Design, Tolling, Project Alliance, Environmental Management: *State Highway 1 Northern Motorway Extension (ALPURT B2)*

A new project to construct a 7.5 kilometre section of motorway north of New Zealand's largest city, Auckland has broached new territory for Transit in two ways:

1. it is New Zealand's first tolled state highway; and
2. the project will be delivered under an alliance contract.

The project also uses innovative tools and techniques to achieve a context sensitive design that provides a high level of environmental protection.

Under current funding criteria, the project was not considered a national priority for public funding. Therefore, progressing ALPURT B2 as a toll road under the LTMA was the best way of providing certainty about the timing of its construction. It was a means of bringing forward construction of the road to its earliest possible start date and unlocking the economic and social benefits for the region a lot sooner than would otherwise be possible.

The project has also presented Transit with an opportunity to further explore ways to achieve a full range of economic, social and environmental objectives through its contractual processes.

The project vision for ALPURT B2 is 'to create a Northern Gateway (for Auckland city) that is a visual showcase of environmental and engineering excellence.' This vision underpins the approach to design. Throughout the design phase a sustainability matrix was used to guide the selection of individual design elements. The project treats the design as flexible, making changes as construction progresses to deliver better solutions.

The original proposal involved a significant amount of excavation and large areas of cut and fill, some to depths exceeding 50 vertical metres. The proposal also included an 'eco viaduct' to prevent severance of ecosystems on either side of the proposed motorway alignment. However, a revised design that included significant changes to the original proposal was developed to reduce the project's ecological footprint. Changes included a second eco-viaduct and twin tunnels through a hill to replace a large cutting that would have caused severance of the surrounding ecosystem, created a significant amount of fill and been visually intrusive.

Environmental concerns have a high priority in project works. Strict controls are in place to ensure vegetation clearance is restricted to areas of current works only and cleared vegetation is being recycled as mulch to aid revegetation. The Alliance has worked with the National Institute of Water and Air to recreate the aquatic habitat inside culverts, building rock weirs to help the passage of fish. Other measures are providing for the regionally endangered Fern Bird and native New Zealand lizard species of the area. A focus on efficient resource use and waste management is also an important aspect of treading lightly on the environment.

A number of these measures result from the ‘triple bottom line’ focus of the project, encouraged by Transit’s commitment in this area. A suite of project objectives and key performance indicators, are driving the project’s vision through the day-to-day site activities. On site, social objectives focus strongly on safety. The Alliance has invested significantly in raising workers’ awareness of safety issues and behaviour.

Externally, the impacts on the neighbouring community are also a strong focus of the project’s social objectives. The Alliance’s engagement with the local community and iwi (indigenous people) has included presentations, newsletters and the establishment of a community reference group, as well as active involvement in local community life. The project is proving a showcase of what can be achieved in delivering on the LTMA requirements to address environmental and social responsibility. The LTMA also requires new development to demonstrate value for money. The project’s results to date demonstrate that a careful balance is needed, but it is achievable.

Figure 4 - Partly completed eco-viaduct shows the small footprint created during construction to retain existing ecosystem beneath the structure

Figure 5 - Otanerua Eco Viaduct

The Eco Viaduct (256m long) spans across the northern tributary of the Otanerua Stream. The viaduct provides an ecological corridor under the road that enables local fauna to travel unimpeded and ensures the sustainability of an area of significant native vegetation.

The engineering and environmental challenges have been to design and construct the bridge with methods that minimise damage to native vegetation while still remaining economic and practical to build. The piers have been designed with the minimum possible footprint on the valley floor and allow for as much preservation of the ecological function of the forest as possible. Once the piers have been constructed, the bridge deck can be erected without further access to the valley floor and rehabilitation of the vegetation beneath the bridge can commence.

The design of the bridge is such that in some sections it will enable the forest canopy trees to reach full height. Underneath the bridge, extensive replanting has been undertaken in the limited areas that required removal of vegetation and irrigation was installed where appropriate to assist plant survival. Bridge aesthetics on all viaducts have focused on providing a simple design in order to let the surrounding environment be the dominant aesthetic feature.

6.0 CONCLUSION

The examples outlined above demonstrate how Transit is implementing its vision of delivering best value for money with road infrastructure development while also ensuring that the principle of sustainable development is met.

6.1 A time of changing emphasis

The need to move towards a more sustainable approach to transport as set out in the New Zealand Transport Strategy and the Land Transport Management Act is gaining increasing recognition. Continuing growth in vehicle numbers on New Zealand's roads, fuel price increases and growing certainty of climate change are just some of the pressures that are leading the push for more sustainable roading and transport networks in New Zealand.

Transit is seeking to provide an integrated and sustainable transport system now and in the future. It is doing this through working closely with local and regional authorities to ensure a close alignment between land use and transport planning that will result in effective, sustainable solutions to long-term growth pressures.

The cost of urban road schemes is often high and is escalating - not just financially, but also socially and environmentally. Transit is seeking alternative funding sources and using tolling as a method of bringing forward roading projects to meet current shortfalls in capacity while investigating other methods for maximising the capacity of the existing state highway network.

Considering a range of integrated and alternative transport solutions, thinking long-term, and taking a proactive approach to planning has created a significant challenge to the way Transit operates. Meeting the demands of the future requires an organisational culture change and a significant investment in people and new professional skills. It is only by doing this that we can meet the demands of achieving more sustainable roading and transport infrastructure.