IPENZ policy on transport

Executive Summary

IPENZ contributes to the community in matters of national interest where engineers have expertise. High on the issues facing NZ is transport which impacts on every dimension of the New Zealand way of life. This policy report presents IPENZ views on transport and sets out a series of recommendations that engineers have identified will improve the transport policy environment.

Widely expressed concerns about the present transport system in New Zealand include:

- Congestion in New Zealand's major cities is increasing, which has adverse economics impacts
- Total emissions continue to rise despite advances in the energy efficiency of the vehicle fleet
- Transport energy comprises 44 percent of the total consumer energy and this exposes the New Zealand economy to the cost of imported fossil fuels.
- The decline in road deaths has plateaued since 2006

These issues are complicated by the New Zealand geography, consisting of a long narrow country with challenging geology, and a small, increasingly urban, population. In addition, there are complex institutional, ownership, and funding arrangements for the transport sector.

IPENZ suggests that the above issues raise questions on:

- how to predict and manage demand
- what is the optimum mix of modes
- what will be the impact of future changes in vehicle technology
- where are the optimal areas for investment in transport.

In this Report these issues are considered under the headings of moving people, and moving freight as there are different influences that affect demand, and different modes are involved. However there are also a number of issues that are common to both and these are discussed as inter-related issues.

Moving people

Transport in New Zealand is dominated by private vehicles, car ownership rates are high and. the fleet is considered old when compared to other countries. The impact of land use policy initiatives and increasing densification on travel demand will have long term effects, and increase the need to manage demand in the next decade.

It is the view of IPENZ that there has been little inter-regional analysis of transport demand, or overall national network analysis, and there has been very little analysis of the impact of future societal trends.

IPENZ expects that changes in economic and recreational activity will continue to be, the main drivers for transport demand in the future but future lifestyle and demographic trends will also have an influence. These trends include the impacts of the changing labour force, childcare needs, more flexible working hours, reducing household sizes, aging population and workforce choice. Travel demand will also be affected by climate change impacting on land use patterns, and by the implementation of recent government energy, fuel and environmental policies.

In terms of energy use and environmental impact, buses and trains with high passenger loadings outperform cars, and providing quality public transport is often an effective means of meeting the growing demands being placed on transport systems in urban areas. In assessing conventional transport evaluation models, IPENZ is of the view that these models tend to undervalue public transport because they underestimate positive externalities and spill-over effects.

Recognising the difficulty in achieving significant mode shifts to walking and cycling and its small contribution to improving the efficiency of the transport system, government needs to carefully reconsider the value of the investment in infrastructure for these modes.

Improving the efficiency of the vehicle fleet to reduce energy consumption and emissions can be achieved through a combination of new technology and regulating minimum standards. It is the view of IPENZ that in doing so the government should not attempt to pick one technology winner, as more than one form of low emission technology will be required to meet targets.

Moving freight

Freight volumes have increased at a greater rate than GDP and are combination of the internal transport of raw materials to processing sites, transport to ports for export, the internal distribution of New Zealand-manufactured goods, and the internal distribution of imported goods.

The nature of the demand of the transport of raw materials to processing sites and the transport of goods and raw materials for export, are quite different both in total and regionally and therefore need to be considered separately.

IPENZ suggests that the overall projected 5 per cent growth in freight, based on doubling from 2005 to 2020, is unlikely to apply to goods and raw materials for export. We recommend that data relating to the transport to processing sites, ports and airports should be collected and assessed by freight transport forecasters. National forecasts also need to be based on likely industry change scenarios.

The demand profile for the internal distribution of NZ-manufactured components and finished goods has changed dramatically over recent decades. Industry changes include component specialization, manufacturing centralization, lower inventories, and just-in-time deliveries. With regard to imports, there are major changes taking place with changes to import locations (points of supply – ports/airports) relative to the location of markets (points of demand) and these have a significant impact on transport networks.

There are broader contextual trends occurring such as escalating fuel prices, changes in population centres, and changes in manufacturing locations, partly due to the effect of climate change on the agricultural sector.

In New Zealand, road is the dominant mode for freight transport but rail and coastal shipping have (insert type of e.g. price/efficiency) advantages over road for long distance freight transport. However these modes are often interdependent and require infrastructure for inter-modal transfers of freight.

The mix of public and private providers, funding mechanisms, the interdependency of modes, and network availability may deter the selection of economically optimal modes. Government needs to ensure that the pricing of each of the three freight modes matches the real costs, including non-direct costs.

There are currently inconsistencies in funding and regulatory mechanisms between road rail and sea and these need to be addressed. As the 2005 *Surface Transport Costs and Charges study*[4] excluded sea transport, IPENZ believes that further research should be undertaken on coastal shipping. Following such study, policies, including price mechanisms, can be introduced to place all transport modes on a level playing field.

With projected doubling of freight volumes by 2020 considerable improvements to the effectiveness of freight transport are necessary. The efficiency of the freight vehicle fleet can be improved by technology and possible by allowing larger and heavier vehicles; research should be undertaken on this issue. Ideally, standards for containers should be consistent across all vehicles to facilitate modal compatibility.

Freight network issues and needs will be better identified with road pricing, and for freight, the expression of costs on both a regional and time-of-day basis will be particularly relevant. There have been freight studies in some regions of a limited nature but IPENZ would like to see regional freight strategies developed and integrated into an over-arching comprehensive national freight strategy covering all modes.

Inter-related Issues

Addressing congestion in our major cities is a significant issue for New Zealand. Attempting to remove congestion would not be cost-effective - there is an economically optimal level of congestion that has to be accepted.

IPENZ supports road tolling and road pricing. Road pricing is a broader concept than tolling and includes options such as tolls on key components of network, price cordons, area-wide pricing and wider network pricing. Ultimately an electronic pricing regime could be applied to the whole of New Zealand road network. However, if road network pricing were to be introduced there needs to be strong public support.

Land use transport planning and urban design must be tackled together.
There are also questions whether urban sprawl should be controlled by more substantive regulatory mechanisms such as strengthening the Resource Management Act (RMA), or through pricing mechanisms. IPENZ's preference is for a mix of the two.
Initiatives that result in appropriate changes in land use, increasing intensification and reducing urban sprawl will have localised and limited impact on travel demand in the medium term and will take a long time to be effective.

In New Zealand, responsibility for transport planning, funding and delivery for the different modes is spread over different central government authorities and regional and territorial authorities. Better co-ordination of standards and integration of modes can be achieved between transport agencies working together facilitated by a central government agency with overall responsibility.

There are some fundamental issues with the current transport funding mechanisms as fuel excise tax is declining as a source of revenue and the funds from road users are increasingly being diverted for non-roading transport modes. For example, shortfalls in major capital for rail are currently funded by general taxation, while airport and port improvements are funded by users. IPENZ does not believe that recent moves by central government to increase transport funding are sufficient. New mechanisms for funding need to be considered such as Government debt, public-private partnerships (PPPs), tolling/road pricing, and differentiated vehicle registration systems.

Transport currently contributes 18 per cent of New Zealand's greenhouse gas (GHG) emissions, and reductions due to technology improvements in vehicles will probably only keep up with the increase in total energy demand for travel. Pricing policies could be one useful tool in bringing about the necessary behavioural changes in reducing travel demand and emissions.

It is clear government road safety targets can only be achieved by introducing major new initiatives. As the reduction in the road toll has recently leveled out, IPENZ is concerned with the priority given to road safety, and considers that analysis is needed on where the most benefit for the road safety dollar might lie. IPENZ believes that the best value may be from engineering initiatives rather than education and enforcement. Also it is a number of years since the value of life used in safety benefit analysis was reviewed and therefore needs to be reconsidered . In contrast there has been a review of the benefits of congestion reduction and the introduction of benefits for trip reliability.

Introduction

Transport is vital to modern society, and an efficient and effective transport system is essential to achieve national economic, social and environmental aspirations.

People must be able to move to undertake their productive activities (work), and also to meet their social needs. Transport of people is primarily by road and air with minor contributions from sea and rail. Public transport by ferries, buses and suburban trains is a small but an important part of the surface transport total, as are walking and cycling. Public transport operators receive a significant level of subsidies for their services reflecting the public interest in supporting these modes.

Transport of freight is necessary to bring goods and services to New Zealanders, and to move products to customers both within New Zealand and internationally. Transport of freight is by a combination of sea, rail, road and air. Transport by air is small by volume, although significant in terms of value. The freight vehicles used are largely owned by the private sector travelling on or through predominantly public sector infrastructure (ports, railway-lines, roads and airports).

Central government capital investment in transport has been focussed on the development and maintenance of the road and rail infrastructural assets. This includes the use of subsidies generated by road users to increase the viability of public transport or to support walking and cycling. There has been little government investment in airports or ports in recent years.

Central government invests more than $2.1 billion in land transport each year, mostly through the National Land Transport Fund. Regional and territorial authorities invest a further $700 million, mainly funded from rates[1]. Expenditure on transport is 16 percent of the total household expenditure[2]. Despite this huge investment there is a widely held perception that the transport system is not adequately fulfilling the needs of the nation.

New Zealanders need to be made aware of the issues involved and decide what levels of service and what amount of funding they are happy with. Government should ensure that funding is invested in such a way that it reflects the publics' needs and provides the optimum level of service. This will involve consideration of not only maximising network capability, but also ensuring access for all, and fulfilling our environmental aspirations.

In a broad sense, the roles of Government in transport policy are three-fold:

- To create a policy framework that ensures that the value achieved from private investment in transport assets, particularly vehicles is maximised
- To create a policy environment conducive to investment, and act as a prudent investor itself, so that public expenditure on transport assets achieves maximum benefit for New Zealand, and

- To ensure that the transport system as a whole is suitable for achieving the economic, social and environmental goals of New Zealanders.

An effective policy response paralleled by smart engineering to maximise the value obtained from capital investment and maintenance allocations is required.

Widely expressed concerns about the present situation in New Zealand include:

- Economic impacts: Traffic congestion in Auckland has been shown to be worse at peak times than in any other Australasian city, including those much larger than Auckland [20], and will get even worse under current forecasts. The *World Economic Forum* has found that lack of infrastructure investment in New Zealand is a major limiter of economic growth[3] - congestion in New Zealand was already costing the country $1 billion a year in 2001/ 2002[4].

- Environmental impacts: The Prime Minister set the challenge, at the *Transport - the Next 50 Years* conference in Christchurch in 2007, for New Zealand to become the first carbon neutral country. Also, the *New Zealand Energy Strategy to 2050* (MED, 2007) reports that the government has taken "in-principle decisions to set a target of halving domestic transport emissions per capita by 2040".

  Transport contributes 18 percent of New Zealand's GHG emissions[5]. However, advances in the energy efficiency of the nation's motor vehicle fleet (cars, buses and trucks) have not compensated for increasing vehicle numbers and total emissions continue to rise, and are projected to rise 40 per cent by 2030.

- Energy: Transport comprised 44 per cent of the total consumer energy use in 2006 due to a high level of car ownership and low use of public transport. This exposes the New Zealand economy to the cost of imported fossil fuels.

- Social inclusion: there is demand from disadvantaged groups (including the disabled, low-income and elderly.) for affordable and reliable transport. This demand must be met if exclusion from society is to be avoided.

- Safety: During the period 1990 to 2005, the number of fatal injuries on New Zealand's roads almost halved despite the increase in the amount of road travel[6]. However the decline in road deaths has levelled out since 2006. Rail safety performance is comparatively better than for road transport[7].

  Contextual factors that affect these issues include:

- Population trends: New Zealand consists of large rural areas with declining populations[i] which will likely exacerbate funding issues for rural areas and raises the

[i] There was a decline of 14% in the proportion of people living in rural areas from 1991 to 2001[6]

question of how the transport needs of rural areas should be met in the future. Users of urban local roads already pay a lower proportion of costs than users of rural roads[Error! Bookmark not defined.] while rural ratepayers pay a higher proportion of rates on roads. This raises questions on the affordability of maintaining and/or improving the investment in these roads.

- Institutional structures: The institutional, ownership, and funding structure for transport is complicated. Also the respective roles of the various government and local government agencies, as well as the private sector, are unclear and often seem to overlap. This confusion makes it difficult to set and achieve national performance targets for the transport sector.

- Geography: New Zealand is a long narrow country with challenging geology in many areas which affects the viability of projects in some areas, including urban development locations. Geography also influences population densities and patterns, and consequently affects the feasibility of public transport. New Zealand's geography and small population have also resulted in a limited rail network.

IPENZ suggests that a framework for analysis should answer the following four key issues:

- Predicting and managing demand– what are the needs and desires for both freight and people in relation to changing economic activity in New Zealand, changing social needs, and our aspirations as a nation, including our ability to influence travel behaviour.

- Optimum mix of modes - knowing the demand profile for moving freight and passengers, what is the optimum mix of transport modes between road, rail, sea and air (and between public and private transport) using both private and public capital– are the price signals and varying regulatory regimes supportive of high quality decision making?

- Vehicle technology – what are the impacts of possible future technology changes, and how might these influence energy efficiency of transport, future mode choice, and the extent of demand.

- Investment – Is public investment being allocated to infrastructure that meets the needs of both passenger and freight transport to maximise economic and social benefits, whether this capital be used for increasing capacity, increasing safety, or influencing demand.

An analysis of these areas raises some fundamental questions:

- What is the appropriate balance of the various objectives of transport - economic growth, accessibility, safety, and the environment, and what trade offs we are prepared to make?
- Have all reasonable steps been taken to influence demand consistent with achieving economic and social objectives and what are likely to be the most effective mechanisms?
- Is it feasible to decouple economic growth from the adverse effects of the growth in transport?
- Do we understand future freight demands and the impact on the key freight modes of road, rail and coastal shipping?
- Is urban intensification effective in reducing demand, and if so how long will it take and do we have effective tools to promote it?
- What is the potential for public transport, walking and cycling to realistically contribute to congestion reduction and energy efficiency?
- What impact is there is likely to be from improved or breakthrough technologies, such as electric cars, on the New Zealand transport system?
- What is the optimal balance of modes?
- What is the most appropriate balance between increasing peak period capacity and maximising existing network capacity?
- Are we placing sufficient emphasis on reducing our crash rates?
- Are the current key funding mechanisms of fuel excise tax and road user charges appropriate and will they remain so in the future?

In order to address these issues, this paper separates people and freight transport as there are different drivers and ways of addressing the following:

- Drivers of demand
- Modes – different modes do different jobs and there is a need to identify the most appropriate mode for different situations (e.g. for moving freight) and optimise them (e.g. bus routes)
- Vehicles i.e. technological trends
- Networks

There are also issues which are common to both types of transport. These are:

- Congestion
- Land use planning
- Co-ordinated transport planning
- Environmental issues
- Infrastructure investment
- Safety

People transport

Þ Drivers of Demand

Transport in New Zealand is dominated by private vehicles. Light vehicles are 93% of the total fleet and car ownership rates are the highest rates in the OECD. In addition the average age of the fleet is 12 years which is considered old when compared to other countries.

The vehicle fleet (excluding motorcycles) has been predicted to increase from 2.5 million vehicles in 2000 to 3.1 million vehicles in 2015[8]. This is equivalent to an annual increase of 1.5%. Over the period 1989-2006 there was an average 2.5% p.a. increase in km travelled using motor vehicles with a shift to cars[ii] from other modes[39]. Unlike freight, the increase in the movement of people, both historical and predicted, is less than GDP growth.

Factors affecting demand include:

- economic activity
- immigration and birth rates
- school zoning policies (which is known to contribute significantly to morning peak demand in Auckland)
- vehicle standards and affordability
- Cost of transport
- urban design standards
- level of income
- tourism

Apart from the macro factors such as changes in economic and recreational activity there are future lifestyle and demographic trends which will also influence demand. These include the impacts of the changing labour force, childcare needs, more flexible working hours, reducing household sizes, aging population and workforce, and the need for multi-purpose trips influencing mode choice.

There are also the impacts of climate change which may affect land use patterns and the affects of recent government energy, fuel and environmental policies which will affect travel demand.

Changes in economic activity:
The nature of the future economy (i.e. knowledge-based as opposed to manufacture of bulky goods) will affect trends of movement of people in the future, as will the

[ii] In Auckland 80% of the journey to work is by private motor vehicle and in Wellington the figure is 69% (2006 census).

regional patterns of the productive sector, and technology developments (including telecommuting and videoconferencing).

The impact of new industries is also likely to have an influence on the transport of people. For example new plants for biological product processing industries are likely to be highly automated and thus not be labour intensive. The most significant changes might be in service industries, and in manufacturing industry relocation e.g. the growth of light industry in the Albany basin and airport regions of Auckland.

While there has been comprehensive transport modelling in the major metropolitan areas of NZ there appears to be little inter-regional analysis, and national network analysis, and there has been very little analysis the impact of future societal trends

Changes in land use:
The Urban Design Protocol, and related changes in urban design rules and densification, will affect the passenger demand profile. However the impact of these on travel demand is expected to be long term and localised, and thus and will only go a small way towards managing demand in the next decade.

The issue of decreasing housing affordability may also have an impact on travel demand by forcing the lower socio-economic families to remote housing and consequently having to travel long distances to work. Similarly, the higher socio-economic groups may choose to move away from increasingly dense urban districts and into lifestyle blocks.

Techniques to manage and reduce demand include:
- Road pricing
- Incentivising passenger transport
- Parking management
- Promotion of walking and cycling
- Travel plans and workplace programmes
- Land use planning.

Possible actions: analysis and research be undertaken on transport travel demand at the inter-regional and national levels and on the influence on demand of future societal and environmental trends.

Þ Modes

Public transport

From 1989 – 2006, in New Zealand there was a 50 per cent increase in km travelled using motor vehicles and a 5 per cent decline in km travelled using active modes

(walking and cycling) and public transport[9]. There was also an increase of 9 per cent in the use of private cars as a percentage of all trips.

Public passenger transport (buses, trains, trams and trolleybuses) can contribute to:

- Social equity, as public transport systems decrease social exclusion of disadvantaged groups[10]
- Reducing congestion, particularly at peak times.
- Reducing energy consumption (if well-utilised).
- Reducing pollution and improving health.

Conventional transport evaluation models tend to undervalue public transport because they overlook many benefits and may underestimate the positive externalities and spill-over effects[11].

Providing quality public transport is often an effective means, in combination with other actions, of meeting the growing demands being placed on transport systems - particularly in urban areas[12].

Public transport is widely used in major metropolitan areas – particularly Auckland, Wellington and Christchurch. The use of rail passenger transport in Wellington is greater than in other New Zealand cities because it is available to sizable areas of the population and provides reasonably direct access to key areas of employment,. In Wellington passenger transport accounts for 17 per cent of all region wide work trips (the target is 21 per cent in 2016) while in Auckland a comparatively low 6.5 per cent of people use passenger transport (2006 census) although this is likely to have increased. In New Zealand, people from lower income households are more likely to use public transport, suggesting public transport is contributing to social equity[13].

Features of a good public transport system are: integrated ticketing with other modes; efficient transfers/interchange between modes; provisions for personal safety; dedicated busways; and the provision of adequate and secure parking facilities.

Understanding the nature of the preferences for transport can result in increased usage. Faced with declining patronage, a number of UK bus companies grouped together to "study the tastes of their consumers and the choices that were available to them"[14]. They realised that to survive in a "demand-led culture" – brought about by increasing affluence and consumer choice – "the bus "product" needed to reposition itself as something other than a public utility of last resort". An analysis of the desires of potential consumers (which included reliability, minimum waiting times and status desires which were met by giving buses priority) allowed a bus service to be designed to win market share – bus patronage grew by up to 30 per cent.

Energy efficiency

The economic and environmental effectiveness of public transport is very dependent upon loading levels. This is shown in table 1.1.

Table 1.1 – Energy use by passenger loading per vehicle[15]

Mode	Energy use MJ/passenger km	Loadings passengers per vehicle
Cars	2.29	1.57
Transit buses	2.83	8.70
Commuter trains	1.68	32.9
Air travel	2.60	90.4
Intercity rail	1.81	23.7
Motorcycles	1.49	1.1

This shows that the lower energy users are commuter trains and intercity rail. It also shows that lightly loaded transit buses (8.7 passengers) are not energy efficient.

Under Melbourne peak hour conditions, petrol cars, diesel buses, diesel trains and electric trains had energy use (MJ per passenger – km) of 3.7, 0.28, 0.1 and 0.04 respectively[16], showing huge energy advantages for public transport when there are high loadings. Similarly, UK *Department for Transport* figures for 2005, with high passenger loadings, showed about a twelve times energy advantage per passenger mile for trains over cars, and buses outstripped cars by about 3 to 1[17]. Many other studies show similar results – that high occupancy cars are about as energy efficient as buses, but buses and trains with high passenger loadings out perform cars[18].

Possible actions: review whether the positive externalities of public transport are adequately considered in transportation modelling in metropolitan areas.

Active modes

The 2002 *New Zealand Transport Strategy* promotes active modes (walking and cycling).

The benefits of such modes are:
- Personal health
- Environmental sustainability
- Reducing peak road traffic demand.

Consequently, the government has published a *Walking and Cycling Strategy4* and provides financial support for local authorities. In Wellington the Regional Land Transport Strategy 2007-16 proposes a target of increased mode share for pedestrian and cyclists from 13 per cent of region wide journey to work trips in 2006 to 15 per cent in 2016. Nationally, the updated NZTS proposes increasing the percentage of walking and cycling trips from 17 per cent of trips in 2003-2006 to 30 per cent by 2040.

Despite this, active modes meet only a small percentage of transport needs. In Auckland only 5 per cent of people use walking and cycling modes (2006 census) and in Wellington the mode share was 13 per cent in 2006.

Therefore even with significant percentage increases in the use of these modes, this will result in only a small reduction in congestion. Due to the previous lack of success in encouraging a change to more active modes, and the negligible effect on the efficiency of the transport system, government needs to carefully consider the value of the investment in promoting the change to active modes, including the provision of costly infrastructure providing minimal benefits.

In principal IPENZ supports the promotion of a greater use of these active modes. However there are safety issues with cyclists sharing roads with cars without adequate traffic engineering techniques to dedicate road space and make provisions for cyclists at intersections. Also, the money invested in the promotion of active modes may not be delivering commensurate benefits.

Possible action: Cost:benefit analysis should be undertaken to assess what level of investment in walking and cycling is appropriate.

Þ Vehicles

The transport sector in New Zealand consumes more energy than any other sector. Transport comprised 44 per cent of the total consumer energy use in 2006[19]. Private motor vehicles account for almost 90 per cent of total passenger transport energy use[20].

Most technology developments in cars are to increase energy efficiency on a “well-to-wheel” basis (i.e. allowing for the full fuel chain), or developments to reduce emissions by allowing the use of alternative fuels. In the short-term (1 – 10 years), such developments, which require minimal vehicle modifications, are likely to have the highest take up. In the longer term, it will

be necessary to move towards a transport system with a very low consumption of oil and consequently completely new technologies[55].

Technologies to enhance the efficiency of current cars include:

- Improvements to internal combustion engines (variable-valve control, direct fuel injection and engine down-sizing)
- Hybrid vehicles
- Energy efficient on-board appliances and tyres
- "light-weighting"
- Improved aerodynamics[21]

It has been estimated that the use of these technologies could reduce new car fuel consumption by up to 25 per cent at a relatively low cost by 2015, and 50 per cent by 2050. However, as road transport globally is expected to double by 2050, these initiatives would only keep emissions at about current levels.

The effect of higher fuel prices can be seen in the USA, where the use of more fuel efficient vehicles has increased but people travel more km/yr as improved vehicle efficiency more than offsets the price increase. This results in a higher usage of assets but lower revenue from fuel tax.

Regulating minimum standards can also have a major impact as it is estimated that 50 per cent of vehicle emissions in a modern society come from the worst performing 10 per cent of the vehicle fleet. The New Zealand Government is soon to implement standards for cars that are imported into the country, the predicted effect of this is (need to check!)

To reduce emissions to low levels, it will be necessary to use alternative fuel systems (electricity, hydrogen or advanced biofuels). Forecasts show that the greatest reductions in emissions are likely to result from either: hydrogen; electricity produced from renewables; nuclear energy; or from fossil energy with CO_2 capture and storage. Advanced biofuels (from ligno-cellulosic biomass) also offer considerable potential. However the transition to near-zero emission transport is expected to take 4 decades or more[22] so it may be necessary to use all of the options available in the meantime.

We note that the *Update of the NZTS* 2007 indicates that the government wants New Zealand to be one of the first countries to widely deploy electric vehicles in the fleet. While electric vehicles could have many advantages for New Zealand, they are only one of the potential low-emission vehicle technologies for the future and there are still many technical barriers to be overcome before they would be suitable for wide-scale use. The government's should not attempt to pick one technology winner, as more than one low emission fuel system will be required to met targets. Its role should be to provide incentives to all systems, including the removal of barriers to the uptake of potential new technologies. Also, the total carbon

footprint of the manufacture and distribution of new technologies needs to be taken into account.

New Zealand also has potential to contribute to the development of new technologies, particularly building upon strengths in the biological sciences (for biofuels) and renewable energy. Support for new technology development should be considered under the national innovation policy as domestic production of a liquid fuel from renewable sources would enhance transport security.
In addition to these steps promotional activities can encourage fuel efficiency by the provision of public information, campaigns, driver education, and the use of fuel-economy based vehicle registration fees.

Possible actions: To reduce energy consumption and emissions for the existing vehicle fleet, incentives should include providing information to the public, and the fleet should be upgraded by promoting new technologies and by setting minimum fuel and emission standards for a range of fuel systems.

Þ Network Efficiency

Studies in New Zealand[6,23] have found that a combination of pricing, new road construction and better use of existing roads complemented by *traffic demand management*[52] (TDM), are the best approaches to improving network efficiency and reducing congestion. This is similar to the suite of policies that has proven successful in many overseas cities. To enhance network efficiency, the overall aim should be to shift average demand close to peak demand.

There are many TDM tools, both "hard", such as road pricing and parking rules, and "soft", including:

- Workplace and school travel plans
- Shared travel
- Staggered work hours
- Encouragement of increased cycling, walking and use of public transport
- Intelligent Transport Systems.

Intelligent Transport System (ITS) tools include:

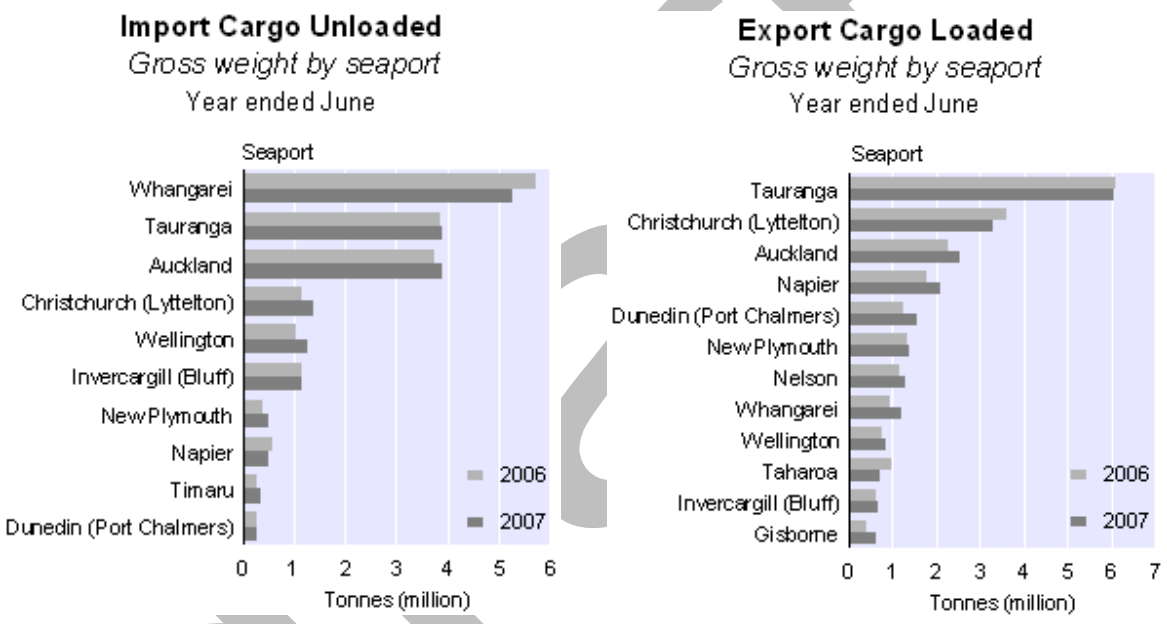
- Real-time information on road congestion[24]
- Electronic road pricing/ tolling/ congestion charging (these are discussed in the following section)
- Adaptive signal controls
- Ramp metering
- Detection and management of incidents

Communication technology improvements already allow some people to work from home and avoid some travel.

Freight transport

Þ Freight Drivers

Freight transport in New Zealand in 2020 has been projected to be 100 per cent greater than in 2005[25], resulting from about 5 per cent growth per year. This is based on the assumptions that future GDP growth will average 3.5 per cent per annum (this was the average from 1995 to 2005) and that freight volumes will increase at a greater rate than GDP. Data from 1997 to 2005 showed that a 29 per cent increase in GDP resulted in a 42 per cent increase in the number of heavy motor vehicle miles travelled.



Export cargo by port location (sea and air)
By weight, Tauranga remained the port to load the most export cargo, but Napier and Dunedin had the largest increases from year ended June 2006, both up about a third of a million tonnes. The two commodity groups leading these respective increases were logs, wood and wood articles, and dairy produce.

Auckland and Dunedin were the two port cities leading the increase in value of export cargo for the year ended June 2007. *Dairy produce* provided the majority of both increases. Despite the large weight increase in Napier's export cargo mentioned above, the value of cargo dropped slightly (down 0.6 percent).
Statistics NZ, Overseas Cargo Statistics - Year ended June 2007

Freight distribution

The following figure shows that growth patterns vary by region, most of New Zealand's freight is through a few ports, and the distribution is different for exports and imports.

IPENZ considers it vital that detailed analysis and research be undertaken to develop a sophisticated forecast, both on a cumulative national basis and on a regional basis. The following discussion highlights the drivers that influence freight movements and makes recommendations for this future analysis and research.

In general the freight movements are influenced by:

- Internal transport of raw materials to processing sites
- Transport of goods (or raw materials) to ports for export
- Internal distribution of New Zealand-manufactured components or finished goods
- Internal distribution of imported goods.

The nature of the demand within these groups will be quite different both in total and regionally.

Transport of raw materials to processing sites

The prevailing economic outlook for New Zealand is for increased production of milk in areas with irrigation potential and suitable climate – largely east coast lowland areas in Canterbury, Otago and Southland. There may be increased production of horticultural produce, and a corresponding decline in meat animal numbers. There will be increasing amounts of lumber to transport, sometimes from new regions, e.g. from 1980s/1990s planting on the North Island's east coast.

Because of the benefits of economies of scale, the dairy industry is expected to have a lesser number of larger treatment sites so the milk volumes to be road-freighted to these sites are expected to increase. This will result in the mean collection radius for milk to increase and this will have a localised impact of increased volumes.

Meat processing plants do not offer the same economy of scale but changes in stock numbers associated with changes in land use raises the issues of increasing and decreasing patterns in stock transport to plants. An additional issue are periodic seasonal stock transport needs in response to drought conditions.

Specialised transport such as of ironsands to Glenbrook, or of coal to factories and power stations (in the short term) etc are expected to continue.

Transport of goods and raw materials for export

Again, IPENZ recommends a regional and industry-based approach to understand demand better. Key commodities for which the demand pattern needs to be understood include coal, dairy products, unprocessed and processed wood, horticultural products, and meat and wool.

Some of the trends that will impact on the future transport of goods or raw materials for export are:

- Increasing volumes of freight
- Regional and industry trends
- The changing nature of manufactured exports, and possible increase in value per unit resulting in lower volumes
- Increasing inter-change with Australia so that goods previously only distributed domestically are now also going to Australia through the TTMRA.
- Possible new industries producing high freight volumes
- Trends in sea freight and shipping ports used for exports (the current trend is to fewer ports of call)
- Availability of specialised freight handling facilities e.g. the new container cranes in Auckland.

Based on the above trends, IPENZ suggests that the overall projected 5 per cent growth in freight is unlikely to apply to goods and raw materials for export, and there will be sharp regional and industry differences. Data relating to the transport of goods and raw materials to processing sites and ports and airports should be collected and understood by freight transport forecasters, and national forecasts developed based on likely industry change scenarios.

Possible action: Research be undertaken into the current and forecast transport of goods and raw materials to processing sites, and for export, by region and by industry.

The internal demand profile for NZ-manufactured components and finished goods has changed dramatically over recent decades.

Industry has become more specialised, and components of finished goods are often now sourced from further away. With specialisation comes a reduction in the number of sites making components, and consequently increased freight demand on some routes. This is a type of demand where the rate of growth could be disproportionate.

The same is true of finished goods. In a classic “large factory” industrial economy, large volumes are produced in a production run – these are then distributed in bulk to regional distribution centres, and only from those regional distribution centres does the product go into mixed load freight systems. A further impact is the move to lower stock inventories and just-in-time deliveries.

As preservation and storage technologies have developed, short shelf-life products, such as bread and milk products, have been increasingly made in fewer locations, and the freight distribution network has increased in size. Again, this can lead to freight demand growth beyond the general rate of economic growth.

The key issue forecasters must assess is the extent to which the factors that have been taking place in recent years in the pattern of distribution will continue. If the centralisation of the supply of goods or components is likely to slow and this is not recognised in forecasts, then forecasts of demand could be substantially too high.

Possible action: Research be undertaken into the impacts of component specialization, manufacturing centralization, lower stock inventories, and just in time deliveries and how these will affect future freight movements.

Distribution of imported goods

Oil products are the dominant import by volume, coming into Whangarei. The other large single product import is aluminium at Bluff. The imports of manufactured goods, plant and equipment, and vehicles are also important.

The import site for manufactured goods tends to reflect population distribution with large flows into Auckland and Tauranga. The future transport profile for such imports will depend on our population growth and consumer demand for imported products.

There are major changes taking place with global shipping with large ships and a trend to fewer ports of call resulting in imports being delivered to ports that suit the shipping line efficiences rather than necessarily the capacity of the internal transport network.

The impact of import port changes could be major. For example, if Auckland was displaced in favour of Whangarei and Tauranga then the freight demand on road, rail, and coastal shipping would be vastly different. Changes in time of day demand for freight are also vitally important – ports that work overnight to ensure clear road transport corridors have advantages and might grow above the norm. Further changes could be expected, with more freight entering or leaving the ports by rail. There are already moves towards delivery and collection by trucks being either in booked time slots at the port, which allow more space efficient stacking of containers, or indirectly via an inland port.

Possible action: Research be undertaken on the potential changes to import locations (points of supply) relative to the location of markets (points of demand) and the impact on transport networks.

Macro Impacts

Other impacts on freight could include the effect of escalating fuel prices which make domestic long distance freight transport uneconomic for particular goods. This may slow total demand slightly and possibly have an impact on air freight transport.

Any change in the extent of backloading could also be very important – given that exports and imports tend to happen from different ports, and the need to use

specialised types of containers for some products, there is a significant transport of empty containers.

The change in population distribution, and manufacturing sites will have an impact – current expectations are for increasing population in Auckland and the Bay of Plenty – products must be freighted to and from these regions.

The effect of changing climate may also be important if major industries migrate. This has already occurred with the wine industry leaving the more humid north, and industries such as kiwifruit may be forced to move south to access sufficient frost. These will have impacts on demand patterns.

Possible action: Research be undertaken on the wider influences on freight movement – fuel prices, back-loading, population distribution, and the possible changes in manufacturing locations as a result of climate change.

Þ Freight Modes

In New Zealand, road is the dominant mode for freight transport, conveying an 83 per cent share of tonnage (67 per cent share of tonne-km) compared to rail (13 per cent and 18 per cent) and coastal shipping (4 per cent and 15 Per cent). Over the last two decades road has been carrying an increasing share of New Zealand freight whilst rail has remained static and coastal shipping has decreased26.

Rail and coastal shipping often have advantages over road for long distance freight transport. The energy required for different modes to carry one tonne of freight is: rail, 200Wh/ tonne.km; truck, 810Wh/ tonne.km and coastal shipping, 100Wh/ tonne.km, so there is great potential for energy reduction by mode transfer.

Depending on origins and destinations, both rail and coastal shipping are highly reliant on truck transport for transport from the place of manufacture and for delivery to the final customer. This interdependency makes analysis complex and requires infrastructure for inter-modal transfers of freight. Manufacturing techniques such as "just-in-time delivery" of inputs also require fast and flexible transport systems – often at odds with bulk hauling of goods on sea or rail.

In 1994 there were 15 New Zealand flagged ships carrying cargo outside of Cook Strait, and in 2006 only 3[27]. The Government has announced through its draft Sea Freight Strategy, *Sea Change*, that it wishes to see the proportion of inter-regional freight moved by sea increased from the current 15 per cent to 30 per cent i.e. doubled. Similarly in the Updated NZ Transport Strategy discussion paper the Government proposed increasing the proportion of freight moved by rail from 18 per cent to 25 per cent - a 40 per cent increase.

The mix of public and private providers, funding mechanisms, the interdependency of modes, and network availability may not be encouraging selection of the economically optimum modes. For instance, if a new factory, wharf or shopping centre is built it will probably have a road provided to it, partly funded by general road users. The cost to build a rail siding is higher, and is funded privately, and the commercial feasibility of this can be limited by having to deal with a commercial single rail operator.

Rail has higher fixed costs than other modes which can affect economic viability if lines are under-utilised. The current investment programme and more equitable pricing will tend to increase utilization in rail but the appropriateness of some costs (such as safety standards) creates barriers. Rail also faces a different regulatory regime to road – for example a factory needs to have a rail service license to move wagons around a site.

The most important action Government can take is to ensure that the pricing of each of the three freight modes matches the real costs including non-direct costs. One of the major concerns is the pricing for use of physical assets – the cost of using the rail network, the cost of using ports, and the cost of using roads. The three modes also need to operate in regulatory regimes that do not create artificial barriers to competition.

The Ministry of Transport undertook the *Surface Transport Costs and Charges study*[4] in 2005 but this did not extend to sea transport. IPENZ believes that this study should be extended to include sea transport and then introduce policies to implement pricing mechanisms in order to place all transport modes on a level playing field.

Possible action: The current and future modal distribution of freight be analysed, and the Surface Transport Costs and Charges study be extended to include coastal shipping.

Pricing for all modes for freight needs to take into account the cost of capital – including sunk costs. Three examples highlight this:

- The outbound freight transport from the West Coast is dominated by the transport of coal – the actual costs of the railway line to Lyttleton, including the costs of sunk capital, and the actual costs of the necessary road system leading to a West Coast port need to be expressed in a way that the major coal exporters are presented with the real costs.

- The timber to be transported out of the East Coast region of the North Island is raises some interesting questions. The actual costs of the options of a road to the export port (Gisborne or Napier) versus the coastal shipping options from Gisborne or Tolaga Bay to Napier, including any necessary port upgrades, need to be expressed in a tangible way to the owners of the trees.

- Imports to the port of Auckland – the cost of capital can be estimated but the competition for road capacity in Auckland should be expressed through time of

day pricing – it can be legitimately argued that a lower price might apply if the port chose to work overnight and avoid peak periods. Similarly, the cost of debottlenecking critical parts of the rail network needs to be priced.

We consider that there is no absolute right way of distributing capital costs to users, and that there should be consistent treatment of capital cost allocation within the modes of road, rail and sea to avoid inadvertently favouring one mode. This also raises the issue of the current public funding allocation criteria which favours incremental development and has difficulty in determining the optimal allocation of funding to modes. Our concern is that this consistency may not occur due to the number of agencies involved, especially considering that some of the roads concerned are owned by local authorities who own 88 per cent of the network by length.

Possible action: Ensure that the cost of capital is included in the pricing of freight transport, and there be consistency of funding and regulatory mechanisms between road, rail and sea.

Þ Freight Vehicles and Fuel

Technology can improve the efficiency of freight vehicles, through improved engines and better fuel use, and techniques such as regenerative braking. Diesel engines offer better fuel economy than petrol engines and so produce relatively less CO_2.The government is also in a position to promote the introduction of freight vehicles capable of using boifuel blends. It is essential that the skills capability exists in New Zealand to take full advantage of such technology developments.

Freight vehicles are generally owned by the private sector, and incentives will be needed for the uptake of new technologies. The role of Government will also be to ensure that there are not unnecessary barriers to new vehicle technology.

Emission standards are one example where Government can act to change the road freight vehicle fleet, getting poor vehicles out of the fleet.

Options also need to be explored for allowing larger and heavier vehicles. This is needed to improve freight transport productivity to accommodate the projected doubling of freight volumes by 2020. There is also a particular problem in transporting overweight export shipping container to ports and railheads. This will have implications for transport infrastructure – bridges, carriageways, tunnels, and these issues need to be adequately investigated.

As the owner of the rail and road networks Government does have a role to ensure that the network can accommodate industry changes, e.g. any new international standards for shipping containers. Ideally, standards should be consistent across all vehicles to facilitate modal compatibility.

Possible action: Promote standards for improvements to freight vehicle efficiency and fuels, and evaluate the impacts of introducing larger and heavier vehicles into the road freight fleet.

Freight Network Efficiency

The geometry of New Zealand roads, including the major freight routes, have lower standards in terms of alignment and width when compared internationally. By comparison with North America, New Zealand roads are designed and built to different standards of roughness. These standards impact on all aspects of moving freight (freight damage, vehicle damage, road damage and resulting life cycle costs). Rural freight routes are affected by the fact that approximately a third of New Zealand roads are unsealed.

The 2005 National Rail Strategy pointed out that there is a need for investment of address a serious backlog of deferred maintenance and that this was constraining the ability of rail to compete for freight business in some areas. Significant increases in rail freight may lead to the electrification of the busier rail routes. Advantages will include greater capacity, reduced emissions, and substantial energy savings.

Freight network issues and needs will be better identified with road pricing, and for freight in particular, the expression of costs on both a regional and time of day basis will be particularly relevant. The opportunity costs and benefits of moving freight demands away from road or rail networks at times when their capacity is largely taken up by passenger vehicles will need to be costed and made evident to decision makers in the freight industry, and to asset owners such as port authorities.

IPENZ recognises the importance of the Auckland Regional Freight Strategy as about 25 per cent of all freight traffic in New Zealand occurs within the Auckland region (and half within the broader Waikato, Bay of Plenty, Auckland region), and particularly endorses the evidence-based approach. This strategy considers the development of inland ports which will increase freight efficiency. There have also been freight studies in other regions of a limited nature. To some extent these identify local network needs.

IPENZ would like to see regional freight strategies developed and integrated into an over-arching comprehensive national freight strategy covering all modes. A national transport strategy needs to explicitly recognise the importance and specific characteristics of the freight transport network, to ensure the efficient linking between regions, and to identify future network needs to accommodate the considerable future freight demands.

A national freight strategy should also recognise that improved logistic technologies for freight transport, when used with more aggressive development of inter-modal facilities, can significantly increase network efficiency[28].

Possible actions: A national freight strategy be developed forecasting future demands and the way to meet these demands.

Interrelated issues

Congestion

It is widely recognised that "Building one's way out of congestion" is unlikely to maximise the benefits of capital investment in networks, as at some point alternative methods of reducing congestion will provide better returns on investment. In addition, congestion reduction measures are often confronted with suppressed demand offsetting improvements. The use of traffic flow management measures can offer returns as high as $5 for every $1 spent[29]. Nor is planning to entirely reduce congestion likely to be cost-effective - there is an economically optimal level of congestion that has to be accepted.

Any effective solution for congestion is likely to include bold measures such as road pricing and increased allocation of existing road space to bus priorities as described in the "rapid growth" scenario from the Auckland Transport Strategic Alignment Project[30].

IPENZ supports tolling on new roads if alternative routes exist and also on existing roads, and tolling should encourage and not inhibit the development of alternative transport systems that may have lower environmental and/or social impacts (e.g. urban trains or buses on parallel routes). There are both demand suppression and economic efficiency arguments in shifting the burden of taxes and charges away from general taxes (such as fuel excise) to charges (such as tolls) that vary with usage[31].

Experience of tolls on the Tauranga Harbour Bridge (which ceased in 2001) shows that "tolls can have a much greater effect than simply encouraging people to divert to other routes. Tolls can have the effect of suppressing or redistributing trips, and this has important implications for TDM"[32].

Road pricing is a broader concept than tolling and includes options such as tolls on key components of network, price cordons, area-wide pricing and wider network pricing. Ultimately, the whole New Zealand road network could be fall under an electronic pricing regime. If road network pricing were to be introduced there needs to be a strong public perception of the need for it[33], the money raised must be used to improve transport, and there must be alternatives such as public transport. The latter would also help to reduce social inequity arising from road pricing.

However, road pricing on existing roads in New Zealand would require a change of legislation, and funding mechanisms, and significant investment in information technology infrastructure (noting that the satellite/GPS technology is developing rapidly). Also, assessment is necessary to ensure the benefits of road pricing outweigh the costs. There are lots of data from overseas to inform such assessments - though

care must be taken in extrapolating these findings to New Zealand. There has already been extensive work (e.g. the Auckland Road Pricing Evaluation Study34) to evaluate road pricing for Auckland. Studies in Auckland and Wellington have shown that road pricing has the potential to significantly reduce demand and are much more effective than the "soft" TDM mechanisms.

National electronic road pricing also has the potential to be a much more effective means of matching benefits to costs (economic allocation), than the current fuel excise tax and Road User Charges. Currently fuel excise is an average pricing system and the National Land Transport Fund is used to fund non roading modes - public transport, and walking and cycling.

Possible actions: Promote tolling initiatives, local road pricing and in the future a move to national electronic road pricing

Þ Land use planning

Transport planning and urban design must be tackled together. It is important to manage urban design so that people do not become unnecessarily reliant on the need for inefficient or low value travel with resulting energy consumption and emissions. Congestion is not only, or necessarily primarily, a traffic engineering problem – the urban region must be managed as a whole. Efficient urban transportation enhances agglomeration in urban areas and therefore lifts living standards and community cohesion, and can lead to reductions in transport energy use[35]. Transport strategy makes little sense without an urban development strategy and vice versa[36].

The long-term impact of land use change on transport should be a basic requirement for all statutory planning, but at present this is not the case in New Zealand[37]. A major purpose of the Land Transport Management Act 2003 is to ensure that a region is collectively planned and that transport serves land use needs. The Local Government Auckland (Amendment) Act 2004 mandated all territorial authorities in the Auckland region to integrate their land transport and land use provisions and to ensure these are consistent with the Regional Growth Strategy. Similar provisions need to apply to all the regions in New Zealand by amendment to the Local Government Act 2002.

The Ministry of Transport will need to ensure that the link between transport and urban design is recognised across government and local government and the necessary competencies developed, including capability within the Resource Management Act processes to properly assess transport-orientated development (TOD) proposals.

There are significant questions whether the current regulatory mechanisms are sufficient to reduce urban sprawl and promote intensification of development – particularly around transport nodes. Planning mechanisms are largely about managing

affects rather than controlling activities. There are also arguments whether urban sprawl should be controlled by more substantive regulatory mechanisms by strengthening the Resource Management Act (RMA), (urban limit boundaries can create economic distortions), or through pricing mechanisms. IPENZ's preference is for a mix of the two.

IPENZ also has concerns with the current provisions of the RMA relating to preserving transport corridors. The RMA provides for designations to lapse in 5 years unless it is acted upon or progress has been made to justify a longer period. In light of the longer planning periods of the State Highway Strategy and Long Term Council Community Plans, this current provision is an anomaly.

Changing land use, increasing intensification and reducing urban sprawl have localised and limited impact on travel demand and will take a long time to be effective. This is because of the relatively small part of urban areas that will be affected and the time it takes for new urban development patterns to change. It is therefore not expected that they will have a significant impact on travel demand, but they will still play a small part.

Possible actions: The Local Government Act and the Resource Management Act be amended to strengthen the links between land use and transport planning, increase the designations period from 5 years.

Þ Co-ordinated transport management

In New Zealand, responsibility for transport planning, funding and delivery for the different modes is spread over different central government authorities and regional and territorial authorities.

There are some obvious examples where current practices lead to inefficiencies in the national transport system. Each roading authority in New Zealand is responsible for setting its own design standards[38]. This practice is not efficient for building roads stretching across more than one authority.

Similarly, even relatively simple-sounding initiatives, such as integrated ticketing for public transport, become very complicated when different regional councils and private transport companies are using different and non-compatible systems. Mode integration can only be fully achieved if there is wider co-ordination.

Standards need to be set to facilitate co-operation and integration between different authorities.

Possible action: There be better co-ordination of standards and integration of modes by transport agencies, and this be facilitated by a central government agency.

Þ Environmental Issues

Transport contributes 18 per cent of New Zealand's GHG emissions[39]. Emission reductions due to technology improvements in vehicles will probably only keep up with the increase in total energy demand for travel, meaning no overall reduction in emissions unless other non-technological measures are taken to manage demand[40]. These technology improvements include cleaner engines and some use of biofuels, however technologies such as lignite-to-oil add production emissions on top of consumption emissions.

Studies show that pricing policies could be one useful tool in bringing about the necessary behavioural changes in reducing travel demand and emissions. Research shows that, if pricing policies are correctly set, the environmental impacts of transport can be decoupled from economic growth[41]. These results need to be fully investigated for the New Zealand situation.

Possible action: Road pricing policies be considered at a mechanism for reducing vehicle emissions.

There are other ways that transport can assist in meeting national sustainability targets particularly with infrastructure maintenance. The incorporation of recycled materials into road construction[42] supports the national goal of reducing waste going to landfill while also possibly reducing the cost of roads. This includes recycling asphalt and concrete as roading materials. IPENZ strongly supports the use of such innovative technology solutions.

Þ Infrastructure investment

All funding sources and costs, including externalities that affect others including non-road users, need to be considered when comparing investment in modes. The Surface Transport Costs and Charges (STCC) study[4] shows that rail users overall pay 77 per cent of their travel costs, road users pay 62 per cent of costs, and trucks, with whom rail must compete for freight, 56 per cent. Ratepayers fund 8 per cent of road travel costs and taxpayers fund the remainder. These costs include environmental and accident externalities. Coastal shipping and air transport should be included in future studies and in reviews of the STCC.

IPENZ understands there is some dispute over the accuracy of the STCC figures. While the exact figures may be disputed, it does seem clear that, when all costs are considered, road users have received more support than rail and coastal shipping over recent decades. These difficulties in agreeing on the study indicate that the context for mode integration in New Zealand is currently inadequate. A more widely accepted approach needs to be agreed and developed. It also needs to be recognised that many

costs cannot be determined accurately and there is a need to adopt a practical approach of using the most robust figures available and charge as fairly as possible.

IPENZ believes in the principle that users should bear the cost of transport unless there is a good economic reason to provide support, and any support needs to be transparent. There may be valid reasons for the government to influence mode selection but as it is now two years since the STCC study was done the government needs to review the study, consider the comments made on it, and incorporate non "surface" transport i.e. shipping and air transport. In order to prevent ongoing analysis and delays IPENZ does not believe that significant more research is required, and the emphasis should be on a review, update and gaining support.

Possible action: The STCC study be reviewed to consider previous comments, gain wider support, and incorporate all modes.

Investment in transport infrastructure in New Zealand is estimated to have a shortfall over the next 10 years of $3.5 billion[3]. In 2002, IPENZ recommended urgent capital injection into the transport system to increase the productivity of the nation[43].

There are some fundamental issues with the current transport funding mechanisms. Improved fuel efficiency means that fuel excise tax is declining as a source of revenue and the funds from road users are increasingly being diverted for non-roading transport modes – walking, cycling, and public transport. Major capital for rail not funded by operators is being funded by general taxation, and airport and port improvements are funded by users.

IPENZ does not believe that recent moves by central government to increase transport funding are sufficient. New mechanisms for funding need to be considered such as Government debt, public-private partnerships (PPPs), tolling/ road pricing, and differentiated vehicle registration systems. All of these mechanisms have been used in other countries.

Transit NZ has recognised that "Funding repaid from tolls is the only genuine alternative that increases funding levels over time... and that will allow more projects to be built"[44].

The Land Transport Management Act 2003 allows PPPs; despite this there have been no such projects in New Zealand to date. IPENZ agrees with the view that the LTMA consultation and decision-making processes are too complex for private investors and a disincentive to their participating in PPPs[45]. There may also be insufficient capability within the public sector to effectively manage PPPs and this needs to be addressed. The use of PPPs for selected projects in Australia has resulted in lower overall cost to the State and improved services to the community[46]. However, it is also true that some PPP projects have failed in other countries, and the use of PPP can add risk to a project. The risks of PPPs can be mitigated by the development of PPP protocols and

guidelines based on international best practice. The Office of the Controller and Auditor General's report "*Achieving Public Sector Outcomes with Private Sector Partners*" (Feb 2006), suggests that the experience of other countries is that there is a need for clear government policy and direction if partnering is to be used to any great extent.

Possible actions: Better use be made of public and private debt financing of infrastructure, the current legislative impediments to PPPs be removed, and guidance be provided on best practice in the application of PPPs.

Þ Safety

Since 1990 the road toll has decreased from 729 deaths to 391 in 2006. However since that time numbers of deaths have plateaued at the level of 400 per annum. Despite this levelling out, the 2010 Safety Strategy set a target of 300 deaths by 2010 and the Updated NZTS sets a target of 200 by 2040. While achievements in the past have been creditable it is clear that the 2010 target will not be reached and the recent trend indicates that it is getting more difficult to further reduce the road toll.

It is clear that the 2040 target will not be achieved without major new initiatives in all three areas of engineering, enforcement and education. The other approach currently being used is to consider road safety from a systems point of view, with three elements contributing to road safety - the driver, the vehicle and the road itself. The Ministry of Transport have signalled that the necessary new initiatives will be outlined in a Road Safety 2020 Strategy which will be in place by 2010, and will presumably set intermediate targets

There is currently very little pubically available information on where the best return for safety expenditure might lie. In November 2004 in an Evaluation ("Stocktake") of the Road Safety to 2010 Strategy (by Taylor Duignan Barry Limited) it was pointed out that the LTSA and Police road safety funding increased by around 27 per cent between 1997-99 and 2003/04. When the improvements in road safety were adjusted for capital improvements and fleet improvements, the reduction in fatality and hospitalisation rates attributable to the increased LTSA and Police funding were 10 per cent and 16 per cent respectively. This implies that it is difficult for an increasing spend on education and enforcement to demonstrate that there are commensurate improvements in road safety.

However IPENZ believes that there are still some areas where regulation will be effective, such as the driver license regime. In New Zealand people are allowed to achieve a full licence by 16.5 years compared to most of Australia which has a 3 year probationary driving period which cannot be completed before 20 years of age. The New Zealand fatality rate for 15 to 19 year olds is 22 per 100,000 population, which is 50 per cent higher than the same group in Australia (14.8 per 100,000 population). Also the lack of

compulsory third party insurance means that young drivers with limited experience can drive any car regardless of performance.

There are other new initiatives that can contribute to improving safety – fatigue awareness campaigns, creating a safety culture, reducing distractions such as the use of cell phones and GPS, and fleet improvements such as electronic stability control.

With the plateauing off of the reduction in the road toll, IPENZ is concerned with the priority given to road safety. Contributions to this may be the demise of a dedicated road safety organisation, the emphasis in funding allocation to congestion, the diverse objectives of the NZTS giving equal weighting to safety, access and mobility, and public health, and the lack of any analysis on where the most benefit for the road safety dollar might lie. As discussed above based on the "Duignan Report" IPENZ believes that the best value may be from engineering initiatives rather than education and enforcement. We also understand that it is a number of years since the value of life used in safety benefit analysis was reviewed – whereas there has been a review of the benefits of congestion reduction and the introduction of benefits for trip reliability.

Possible action: Regulatory intiatives be undertaken to address the high fatality rate for young drivers, and work be undertaken on fatigue awareness, creating a safety culture, reducing driver distractions, and fleet safety improvements. It is also suggested that analysis be undertaken on where the best value for the road safety dollar might lie, and the benefits relating to the value of life be reviewed.

Conclusion

We live in a society dependant upon the independent movement of people and freight principally by vehicles and by road. With increasing economic activity and increasing demands for mobility in society we are facing constraints in our transport networks and related disadvantages to our economy, environment and society.

The ways that New Zealand has attempted to address these issues is through behaviour change, demand management, the promotion of land use changes, and also the promotion of alternative modes –walking, cycling, and public transport. As discussed in this document these alternative modes only provide for a small proportion of travel, and can take long periods of time to be effective. Bringing about significant changes in behaviour by education, promotion and policy interventions has proven to be very difficult. These three factors combined, lead IPENZ to the view that they will not be sufficiently effective in resolving the transport issues facing NZ in the foreseeable future. It is the view of IPENZ that the most effective way to address the issues facing people and freight transport in New Zealand is to move towards a comprehensive pricing regime so that users face the true costs of travel, including externalities.

There are questions on how to balance and make trade-offs between the various objectives for transport, and there needs to be clarity about these to provide a framework for price-based transport policies. Pricing will help to decide the appropriate balance between transport modes and our investments in them.

There is also a lot that is not known about our transport system. This includes the impact on transport of future changes in society, the existing and future trends in freight demand, and the impacts of technology on travel demand and on vehicle developments.

There are a number of unresolved challenges facing the transport system in New Zealand. One of is the impacts of transport on the environment. IPENZ suggests that pricing mechanisms may be one way to address this as well as technology. IPENZ believes that the improvements in road safety have stalled and suggest that government tackle this principally through a greater investment in roading improvements that have safety benefits.

Recommendations

The following are our recommendations based on the conclusions reached in this report.

People transport:

- Undertake analysis and research on transport travel demand at the inter-regional and national levels and on the influence on demand of future societal and environmental trends.
- Review whether the positive externalities of public transport are adequately considered in transportation modelling in metropolitan areas.
- Review the current investment in walking and cycling to consider whether it is delivering commensurate benefits
- Reduce energy consumption and emissions for the existing vehicle fleet, incentives be provided by providing information to the public
- Upgrade the vehicle fleet by promoting new technologies and by setting minimum fuel and emission standards for a range of fuel systems.

Freight transport:

- Undertake research into the current and forecast transport of goods and raw materials to processing sites, and for export, by region and by industry.
- Undertake research into the impacts of recent industry changes such as component specialization, manufacturing centralization, lower inventories and just in time deliveries, and how these will affect future freight movements.
- Undertake research on the potential changes to import locations (points of supply) relative to the location of markets (points of demand) and the impact on transport networks.
- Undertake research on the wider influences on freight movement – fuel prices, backloading, population distribution, and possible changes in manufacturing locations as a result of climate change.
- Analyse the current and future modal distribution of freight and extend the Surface Transport Costs and Charges study to include coastal shipping.

- Ensure that the cost of capital is included in the pricing of freight transport, and there be consistency of funding and regulatory mechanisms between road, rail and sea.

- Promote standards for improvements to freight vehicle efficiency and fuels, and evaluate the impacts of introducing larger and heavier vehicles into the road freight fleet

- Develop a national freight strategy forecasting future demands and the way to meet these demands.

Inter-related issues:

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

- Amend the Local Government Act and the Resource Management Act to strengthen the links between land use and transport planning, and to increase the designations period from 5 years

- Improve co-ordination between transport agencies for the joint development of transport standards (facilitated by a central government agency)

- Review the Surface Transport Costs and Charges study to consider previous comments, gain wider support, and incorporate all modes.

- Take advantage of opportunities for public and private debt financing of infrastructure by removing the current legislative impediments to PPPs, and providing guidance on best practice in the application of PPPs.

- Undertake regulatory safety initiatives to address the high fatality rate for young drivers,

- Develop safety policies on fatigue awareness, creating a safety culture, reducing driver distractions, and fleet safety improvements.

- Undertake analysis on where the best value for the road safety dollar might lie, and review the benefits relating to the value of life.

Appendix 1: Institutional Arrangements in New Zealand's Transport Sector

The *Ministry of Transport* (MoT) provides policy advice to the Minister and develops legislation and rules in association with the transport *Crown Entities*, the work of which it co-ordinates as an agent of the Minister. The MoT also represents New Zealand internationally. The transport *Crown Entities* are: *Aviation Security Service, Civil Aviation Authority, Land Transport New Zealand (LTNZ), Maritime New Zealand, Transit New Zealand* and the *Transport Accident Investigation Commission.*

Transit New Zealand is responsible for the State highway network. *LTNZ* allocates funding for transport infrastructure and services through the *National Land Transport Programme* (NLTP). LTNZ considers funding requests from about 80 approved organisations (regional councils, territorial authorities, the *Auckland Regional Transport Authority* (ARTA) and Transit NZ) set out in the Land Transport Plan (LTP) for each organisation. *LTNZ* is also responsible for licensing and for education on safety and sustainability. The Government has recently announced (in a speech by Minister of Transport to Roading New Zealand Conference, 28th August 2007) that it will merge *Transit New Zealand* and *LTNZ* into one new organisation. The new organisation is expected to be in place by mid-*2008.*

Three state-owned enterprises have transport functions: *Airways Corporation of New Zealand Ltd.*, *Meteorological Service of New Zealand Ltd*. and ONTRACK. ONTRACK was established in 2004, when the Crown repurchased the rail network, to own and maintain the railway infrastructure. It also provides advice to the Minister. For the rail sector, some funding is received from the NLTP, for passenger transport, but rail infrastructure is funded from access charges.

Regional councils develop regional land transport strategies to guide the transport decision-making of territorial authorities. These strategies must take into account any current national land transport strategy and must be kept current for a period of not less than 3 years in advance (and not more than 10) and must be renewed at least once every 3 years (as set out in the Land Transport Act, 1998). Regional councils fund public transport and total mobility with LTNZ. In Auckland, territorial authorities cannot receive funding directly from LTNZ. Instead, ARTA prepares a LTP and co-ordinates activities on behalf of the region.[iii]

Territorial authorities (city and district councils) own, maintain and develop the local road network and perform regulatory functions. They can set their own parking and traffic flow restrictions. Territorial authorities are required to produce *Long Term Council Community Plans* (LTCCP's) which set out a planning process for 10 years ahead and must be formally updated every three years. The LTCCP, provided it contains certain information, can also serve as a LTP for the purposes of seeking funding from the NLTP. Other government agencies with responsibilities for transport

[iii] State Services Commission, *Next Steps in the Land Transport Review* (2007)

include: the New Zealand Police, Department of Labour; Ministry for the Environment, Ministry of Economic Development, Energy Efficiency and Conservation Authority and the Ministry of Health.

Appendix 2: Relevant Legislation

The MoT administers 29 Acts and many Regulations, Orders and Rules . The most important Act for transport is the *Land Transport Management Act 2003.* This supports the aims of the *Land Transport Strategy* by taking an integrated long-term approach to land transport as a whole, with an emphasis on social and environmental needs. Flexibility is given to fund projects other than road, such as rail, public transport, cycling and walking. To facilitate funding for new land transport infrastructure that might otherwise be delayed, a generic framework for tolling schemes is and public/private partnerships are allowed if certain conditions are met. Existing roads can only be tolled if they are integral to a new road.

Other important Acts for transport include:

Land Transport Act 1998 - This *Act* requires regional councils to prepare regional land transport strategies.
Transport Act 1962, and *Land Transport Amendment Act* 2005- amongst other things, entitle councils to make Bylaws regulating traffic and parking and support road safety initiatives.
Resource Management Act (RMA) 1991 - provides the framework for local authorities to manage the environmental effects of activities. Land transport infrastructure projects require resource consents.
The Local Government Act 2002 - provides the general framework and powers under which New Zealand's 85 local authorities operate

References

[1] Land Transport New Zealand, *National Land Transport Programme 2007/08*, fig. 1 (2007)
[2] Ministry of Transport, *New Zealand Transport Strategy* (2002)
[3] New Zealand Council for Infrastructure Development, *Meeting New Zealand's Transport Infrastructure Needs to 2025*, GHD (2006).;
[4] Ministry of Transport, *Surface Transport Costs and Charges* (*STCC Study),* (2005)
[5] Ministry of Transport, *Discussion Paper Sustainable Transport (2007)*
[6] Land Transport New Zealand, *Sustainable and Safe Transport Trends and Indicators* (2007)
[7] Ministry of Transport, *National Rail Strategy to 2015* (2005)
[8] Ministry of Transport, *New Zealand Transport Strategy* (2002)
[9] Land Transport New Zealand, *Sustainable and Safe Transport Trends and Indicators* (2007)
[10] Lucas, K., *Transport Studies Group*, *University of Westminster, Providing Transport for Social Inclusion within a Framework for Environmental Justice in the UK*, *Transportation Research Part A: Policy and Practice*, Vol. 40, Issue 10, pp 801-809, 2006.
[11] Litman, T; *Evaluating Public Transit Benefits and Costs, Victoria Transport Policy Institute* (VTPI), Victoria, BC, Canada (2006); Ministry of Transport, *Getting Auckland Back on Track* (2007)
[12] *Stern, N; The Economics of Climate Change*, HM Treasury, UK, (2006); *Organisation for Economic Co-operation and Development, (Managing Urban Traffic Congestion, Transport Research Centre June 07);* Local Government "News" (February 2004)*;* Litman, T; Victoria Transport Policy Institute (VTPI), Victoria, BC, Canada *Evaluating Public Transit Benefits and Cost* (2006); Press Release, Minister of Transport *Opportunities Ahead for Public Transport*, (2007); Auckland Regional Land Transport Strategy (2005)
[13] Miller, Doug, *A quantitative study of travel behaviour during peak hour*; Land Transport New Zealand (June 2007)
[14] Land Transport Today Ltd, *Routes to Revenue Growth: the message from nine successful bus companies* (2006)
[15] US Department of Energy, *Transportation Energy Data Book, Edition 26* (2007)
[16] Public Transport Users Association, *Common myths – public transport doesn't really save energy and Cars aren't the biggest polluters, so there's no point focussing on them,* Melbourne (2007)
[17] *Fuel Efficiency in Transportation*, Wikipedia, http://en.wikipedia.org/wiki/Fuel_efficiency_in_transportation (2007)
[18] Becken, S, *Tourism and Transport in New Zealand, TRREC discussion paper* (2002); Strikland Ca., *Energy Efficiency of Different Modes of Transportation, http://strickland.ca/efficiency.html,* 2007 ; *Energy Demand for Different Means of Transport*, Vierreg, M. and ROSSLER, K., VIEREGG and RÖSSLER GmbH, Germany, (2007).
[19] NZ Government, *The New Zealand Energy Strategy* to 2050 (2007)
[20] Energy Efficiency and Conservation Authority, *www.eeca.govt.nz/transport/indexnew.html,* (2007)
[21] .International Energy Agency, *Energy Technology Perspectives: Scenarios and Strategies to 2050, Fact Sheet: Road Transport Fuels Technologies and Fuels* (2006)
[22] International Energy Agency, *Energy Technologies for a Sustainable Future, IEA Technology Briefs* (2005); Bristow A., Tyndall Centre for Climate Change Research, UK; *How can we reduce carbon emissions from Transport?* (2004)
[23] Ministry of Economic Development, *Getting Auckland Back on Track* (August 2007)
[24] Trolove, W., *Auckland's Transport Makeover, e.nz Magazine, IPENZ (*January/February 2007)
25 Friedlander, T, A, *The Road Transport Forum*, *Freight Growth Forecast*, Presented at *Transport – the Next 50 Years* Conference, Christchurch, July 2007
[26] Jackson, C, *Integrate or Disintegrate – Maximising Efficiency Through Better Transport Integration*, Land Transport Forum (2007)
[27] New Zealand Shipping Federation, *Roadways to Waterways* (2006); Jackson, C., *Integrate or Disintegrate – Maximising Efficiency Through Better Transport Integration*, Land Transport Forum (2007)
[28] International Energy Agency (IEA), *Energy Technologies for a Sustainable Future, IEA Technology Briefs* (2005)

[29] Eddington, R., *The Eddington Transport Study, UK Treasury and Department for Transport* (2006) (2006).
[30] *Auckland Transport Strategic Alignment Project Steering Group* (2007)
[31] IEA*, Pricing our Roads* (July 2004)
[32] Land Transport New Zealand, *Land Transport NZ Research, Issue 11* (September 2007)
[33] Land Transport New Zealand, *Investigation of Implementation Issues for Congestion Charging*, LTNZ report 286 (2006)
[34] Ministry of Transport, *Auckland Road Pricing Evaluation Study* (2006)
[35] Ministry for the Environment, *The Value of Density* (June 2005)
[36] Grimes, A. , *Transformative Transport: Transport and Economic Transformation*, Presented at *Transport – the next 50 years* conference, Christchurch (2007)
; OECD, *Managing Urban Traffic Congestion* (June 2007); Litman, T., *Community Cohesion as a Transport Planning Objective,* Victoria Transport Planning Institute, (2006);
[37] Lewis, M; Hammond, L. and Wignall, D., Land Transport New Zealand, *The role of land use planning in shaping our transport system over the next 50 years*, Presented at *Transport – the next 50 years* conference, Christchurch (2007)
[38] Ministry of Transport, *Next Steps Update* (Second update, August 2007)
[39] Ministry of Transport, *Discussion Paper Sustainable Transport (2007)*
[40] Organisation for Economic Cooperation and Development, *Guidelines for Environmentally Sustainable Transport,* Conference Presentation, Austrian Ministry of Agriculture, Forestry, Environment and Water Management, Vienna, Austria, October 2000; Eddington, R., *The Eddington Transport Study*, UK (2006);, Bristow A., *How can we reduce carbon emissions from Transport?*, *Tyndall Centre for Climate Change Research*, UK (2004); Parliamentary Office of Science and Technology, UK, *Low Carbon Private Vehicles, Postnote no. 255* (Jan. 2006);
[41] Organisation for Economic Cooperation and Development, *Decoupling the Environmental Impacts of Transport from Economic Growth, Environment Directorate* (2006)
[42] Land Transport New Zealand, *Research* (Issue 11, September 2007)
[43] IPENZ, *Economic Growth and National Infrastructure*, IPENZ Informatory note 10 (December 2002)
[44] Land Transport New Zealand, *Implications of Selected Urban Road Tolling Policies for New Zealand*, *LTNZ report 270* (2005)
[45] NZCID, The Environment for PPPs in New Zealand, Ascari Partners Ltd., August 2005
[46] Department of Treasury and Finance Victoria State Government, Australia, *Facts and Fictions about PPPs*, (March 2007)