## CONTENTS

1. Introduction .......................................................... 2
2. The outcomes sought for transport and ITS technology .... 5
3. Where is the greatest potential for ITS technologies to address transport outcomes? 8
4. What are the key barriers to cost-effective implementation? 12
5. What is the government's role in ITS technology? 18
6. What are the immediate, urgent issues that the government should focus on first? 22
7. How should we encourage the conversation and co-ordinate the various players to maximise progress? 24
8. Next steps? ............................................................. 25
1. INTRODUCTION

1.1 Intelligent transport systems and the government’s objective for transport and the transport sector

The transport system has many interlinked and interacting parts, moving people and freight between and across land, sea and air modes. Transport connects people and enables trade. It is based on a complex and evolving set of technologies.

The government’s objective for transport is for an effective, efficient, safe, secure, accessible and resilient transport system that supports the growth of our economy, in order to deliver greater prosperity, security and opportunities for all New Zealanders.

Intelligent transport systems, enabled through technology, have the potential to support this objective for the transport system by achieving transformational change in the way the system operates.

1.2 What are intelligent transport systems?

Intelligent transport systems (ITS) are those in which information, data processing communication, and sensor technologies are applied to vehicles (including trains, aircraft and ships), transport infrastructure and users. The key components of a typical ITS system are shown in figure 1. Broadly speaking, intelligent transport systems:

• are designed in an intelligent way to be efficient and effective in meeting the needs of users. This takes into account the design and organisation of supply chains, and the design of transport infrastructure and networks in relation to location and demand. It has much to do with coordination and integrated planning, particularly in the areas of transport and land use, and in freight logistics.

• provide users, service providers, infrastructure owners and planners with intelligence. An ITS has the ability to provide information, both in real-time and over time, that makes transport easier, more efficient, safer and less environmentally damaging. This information needs to be available both to the users of all modes of transport, and to those planning, designing, constructing and operating the transport system.

• support and allow intelligent transport choices. ITS systems provide the tools to enable users to make intelligent transport choices in the way that they use the system.

• have built-in system intelligence. ITS systems adapt themselves in real-time and over time to improve transport outcomes without the need for user intervention.

We are aware that internationally there are a range of definitions of ITS and welcome feedback on the definition used in this paper.

1.3 What is the role of technology in ITS systems?

ITS systems are enabled by technology. Examples of technology that support ITS systems include:

• analytical and modelling software that allows better planning of future transport infrastructure and real-time traffic management

• information gathering technology (for example air traffic control, roadside air pollution monitoring, joint traffic control centres) that provides automated and often real-time information to operational managers, users and planners.

• payment systems such as electronic tolling, public transport ticketing using smartcards and electronic road user charging.

• vehicle control systems such as advanced driver assistance systems, semi autonomous and autonomous vehicles and ‘co-operative ITS systems’ (C-ITS).

• systems based on global navigation satellite system (GNSS) technology which, for example, allow efficient organisation of freight supply chains and management of fleets and allow accurate mapping in two and three dimensions.

• mobile phone/portable computing based information systems that can provide real-time and more general information to users, and which can be used to encourage efficient driving practices. Sophisticated systems tailor the information provided to individual users based on past use. These systems minimise the need for operator input and aim to maximise the benefits to the user.

1 From ‘Connecting New Zealand’ http://www.transport.govt.nz/ourwork/KeyStrategiesandPlans/ConnectingNewZealand/*CNZ HTML

2 Co-operative ITS enables vehicles and surrounding infrastructure to exchange information about the location, speed and direction of other road users also using C-ITS.
Figure 1: The key components of a typical intelligent transport system

- **Sensors** providing real time information on:
  - vehicles
  - infrastructure
  - users (e.g., via smart card use)

- **Stored information and databases** such as:
  - maps
  - timetables
  - user details
  - unique identifiers
  - historical data

- **Computer processing capacity**

- **User interface:** input and output devices for users and operators

- **Automated control systems:**
  - vehicles
  - infrastructure
1.4 What about other forms of transport technology?

There are a range of other technologies that can improve transport outcomes, particularly in the areas of vehicle design — for example car frontal impact technologies, alternative fuels or the use of carbon fibre to build lighter, more fuel efficient airliners. Some of these technologies face issues similar to those faced by ITS (for example the role of international standards) and are very much of interest to government. However, the focus of this conversation paper is on those technologies that specifically support the development of ITS systems.

1.5 What is the role of this conversation paper?

You have been sent this conversation paper as a key stakeholder with an interest in transport technologies and intelligent transport systems in New Zealand. The government is keen to achieve greater coordination within the ITS sector and this conversation paper is the first stage in this process.

This conversation paper seeks your views on how ITS technology can best be harnessed to support improved transport outcomes. In particular, it seeks your views and ideas on five key questions:

1. Where is the greatest potential for ITS technologies to contribute to desired transport outcomes within and across all modes of transport?
2. What are the key barriers to cost-effective implementation of ITS technology?
3. What is the government’s role?
4. What are the immediate, urgent issues or quick wins that the government needs to focus on first?
5. How should we encourage the conversation and coordinate the various ITS technology sector groups to maximise progress?

The paper will be discussed at planned workshops in Auckland and Wellington in early July 2013, to which you will be invited. The outcome of the discussions will contribute to the development and release of a government Transport and Intelligent Transport Systems Action Plan for wider public consultation in late 2013.

1.6 How should I respond?

Please email your thoughts by 19 July 2013 to technology@transport.govt.nz.

Alternatively, please contact us at the above address if you would like to meet with one of the Ministry’s Technology and Transport Systems team members in person.
2. THE OUTCOMES SOUGHT FOR TRANSPORT AND ITS TECHNOLOGY

2.1 Desired transport outcomes

Government transport agencies are working towards four long-term transport outcomes. The Ministry of Transport has also identified a number of intermediate transport outcomes.

ITS technologies have the potential to make a major contribution in supporting these outcomes, for example by:

- reducing congestion and making supply chains more efficient
- increasing safety
- achieving better use of assets and increasing resilience of infrastructure
- reducing emissions.

The four long-term transport outcomes are:

- Resilient - meets future needs and endures shocks
- Effective - moves people and freight where they need to go in a timely manner
- Efficient - delivers the right infrastructure and services to the right level at the best cost
- Safe and responsible - reduces the harms from transport

The Ministry of Transport’s six intermediate transport outcomes are:

- More open and efficient transport markets
- Improved planning and investment in infrastructure and services
- Better quality regulation
- Improved government transport agencies’ performance
- Improved preparedness for, and management of shocks and major events.
- Fewer transport incidents and other harms

Figure 2: Transport outcomes
2.2 Specific objectives for ITS technology

There are also a number of specific objectives for ITS technologies that will help to maximise the contribution that these technologies can make.

2.2.1 Ensuring efficient technology markets

Efficient markets of all kinds produce significant benefits for society. Well-functioning markets allocate resources to their most valued use. They promote the best use of scarce resources such as land, labour and capital in a manner that maximises output and the welfare of citizens.

Key components of well-functioning markets include:
- **ease of market entry and exit** – free entry and exit enables markets to function efficiently, while barriers to entry reduce competition and efficiency
- **absence of significant monopoly power** – the presence of a significant monopoly power in a market reduces competition and pressure for efficiency and innovation, resulting in reduced levels of choice and price protection
- **price signals** – timely and accurate price information enables appropriate supply responses from businesses and demand responses from purchasers
- **absence of externalities** – all of the costs and benefits of goods or services provided are fully captured within the market
- **availability of information** – all parties in the market (businesses and consumers) need to be well informed if they are to make the most effective decisions.

The evolution of technological innovations

The S shaped curve refers to the relative speed with which technological innovations are adopted. The graph shows an initial slow uptake followed by rapid uptake and a tapering of uptake as the population of new user’s declines.

The rapid growth period is normally accompanied by a rapid decline in prices.

**Figure 3: S Curve**
2.2.2 Accelerating uptake where this represents good value for money

Transport and ITS technologies are on the threshold of much wider application, not only in the range and complexity of functions they can undertake, but also in their uptake by the transport sector.

We expect that as costs fall over the next 10 to 20 years there will be a rapid market-led increase in the uptake of ITS technologies. Increases in use and decreases in costs have often been the pattern with many other technological innovations.

Accelerating the uptake of ITS technologies will ensure that the benefits can be realised as early as possible. However, New Zealand is largely a technology taker, and there are dangers and costs associated with investing in technologies “ahead of the curve”.

2.2.3 Stimulating New Zealand-based technology companies

New Zealand lacks a large-scale domestic transport equipment manufacturing sector but has an active technology sector that is already selling ITS technology world-wide. The introduction of ITS technologies into New Zealand may well present an opportunity for these industries to carry out research and development in New Zealand. The government can ensure that quality research occurs, for example through facilitation and co-funding of research and development.
3. WHERE IS THE GREATEST POTENTIAL FOR ITS TECHNOLOGIES TO CONTRIBUTE TO DESIRED TRANSPORT OUTCOMES?

This chapter sets out our understanding and definition of the key ITS technologies in all modes of transport (although we acknowledge that there are a number of different international definitions). We are interested in your views on whether we have missed anything and what technologies do you think have the greatest current and future potential?

3.1 A strategic approach to ITS technology

ITS technology offers the potential to address a range of transport problems, and some ITS technologies promise to be transformative over the medium to long term in improving transport outcomes. It is important to focus on finding technological solutions to address transport problems, rather than the other way round. However, we recognise that most technological research and development happens outside government. The government needs to enable the implementation of innovative technological development, while focusing its attention and procurement on those technologies that contribute most to its strategic priorities.

Problems that ITS technologies can help address
- Congestion
- Inefficiency in supply chains
- Inefficient use of infrastructure
- High cost of infrastructure
- Death and injury from transport
- Lack of information to allow travellers to make good choices
- Inefficient transport charging and pricing
- Harmful emissions, carbon emissions and other environmental impacts of transport
- Lack of mobility

ITS technologies generic applications
- Vehicle control systems (allow vehicles to operate more autonomously, or support user responses)
- Traffic and network management systems (automatically or semi automatically adjust the network in real-time to improve efficiency)
- Real-time and near-time information (allows people to make better transport choices as they travel)
- Supply chain and fleet management systems (optimise supply chains for maximum efficiency)
- Charging and payment systems (make payments easier, more accurate and with lower administrative costs)
- Infrastructure planning and development tools (provide mechanisms for better planning and development of transport infrastructure)
- Asset management tools (improve the efficiency of asset management)
- Compliance and enforcement (provide real-time information to operators and enforcement agencies)

ITS technology building blocks
- Wi-Fi/near field communications
- Mobile/smart phone, portable computing applications and Bluetooth tracking
- Global Navigation Satellite Systems
- Automatic pattern recognition
- Onboard computers
- Sensors including radar, lidar and proximity
- Geospatial programmes for modelling, planning, designing and operating the system
- Standards
3.2 Key ITS generic applications

3.2.1 Vehicle control systems
Vehicle control systems use real-time and other information to allow vehicles to respond to incidents and network conditions more autonomously, or to support the user in responding. ITS technology based vehicle control systems range from driver assistance systems and advanced driver assistance systems (ADAS) through to semi-autonomous and autonomous vehicles. These systems can include various degrees of cooperative ITS technologies (C-ITS). Such systems can potentially bring significant safety benefits, and can also address congestion problems and reduce emissions through smoother driving.

ADAS and semi-autonomous vehicles
Examples of ADAS and semi-autonomous vehicle systems include:
- Electronic stability control
- Adaptive cruise control
- Lane departure warning systems
- Lane change assistance
- Collision avoidance systems
- Automatic parking
- Blind spot detection

3.2.2 Traffic and network management systems
Traffic management systems optimise the movement of vehicles, by using real-time information to intervene and adjust controls such as traffic signals to improve traffic flow. Airways’ Collaborative Arrivals Manager provides an example of such systems in use in the aviation sector. These systems can improve efficiency, safety and environmental outcomes, and reduce the need to build additional infrastructure.

C-ITS in aviation
The aviation sector uses C-ITS technology in systems like the automatic dependent surveillance-broadcast system (ADS-B). ADS-B makes flying significantly safer. When using this system both pilots and controllers will see the same radar picture. With past systems such as the traffic alert and collision avoidance system (TCAS) aircraft could only see other aircraft equipped with the same technology.

Airways’ Collaborative Arrivals Manager
Airways’ Collaborative Arrivals Manager is a tool that generates savings by enabling airlines to work collaboratively with real-time air traffic information. Airlines can manage their aircraft movements to suit customers’ needs and minimise aircraft time spent in holding patterns and idling on the ground. In 2009/10 the new system reduced airborne delays into Auckland and Wellington from over 450 hours per month, to less than 85 hours per month.

3.2.3 Real-time and near time information for travellers
Real-time information systems use information gathered on network demand and disruptions, sometimes combined with GNSS, to help vehicle operators, public transport passengers and other users adapt and make informed travel choices. It can also be used to enable behaviour change, for example by providing information to drivers, to allow them to adopt efficient driving styles.

3.2.4 Supply chain and fleet management systems
For fleet managers, ITS technologies have provided improved vehicle effectiveness and efficiency through the monitoring of vehicle location performance and handling. ITS technologies can improve routing, fuel use, be used to co-ordinate freight arrival times and schedule vehicle and infrastructure maintenance.

The ability to track cargo from the farm gate to the consumer has allowed for streamlining of the supply chain and improvement of supply chain logistics.
3.2.5 Charging and payment systems

ITS technologies provide a more efficient and effective means of charging for transport services that closely match pricing to the use of the service. At their simplest these systems are used as swipe and go travel cards on public transport networks. More complex systems are capable of identifying individual vehicles and automatically debiting toll charges. In New Zealand the electronic road user charging system (E-RUC) allows users to pay their road user charges electronically.

Charging and payment systems, for example smart cards, can be integrated with other non-transport applications.

ITS technology based charging systems offer a simpler more cost effective alternative to paper based systems. These systems are becoming more sophisticated, reliable and cost effective, and are currently being investigated in many jurisdictions.

3.2.6 Infrastructure planning and development tools

ITS technologies are also available that support the design, construction and maintenance of transport infrastructure. The costs of infrastructure such as new roads can be large, and even small percentage gains in the way that such infrastructure is planned, designed and procured can have major financial benefits. Technologies that support infrastructure planning and procurement include the following:

- Geospatial information systems that map areas and assist in identifying the most effective places in which to build new infrastructure.
- Tools for project management, modelling, planning, designing, constructing and operating the transport system.
3.2.7 Asset management tools

ITS technologies are also available that support infrastructure managers in managing and maintaining their assets. These technologies include the following:

• Technologies that provide feedback on infrastructure (e.g. traffic counting devices, weigh-in-motion sites and monitors), allowing maintenance needs to be better informed and managed.

• Business analytics and asset management software used to provide real-time, accurate analysis and reporting of network assets to help operators manage their assets in a more efficient manner.

Well-targeted and optimally-timed asset management, based on good asset condition information, can bring significant financial savings.

KiwiRail Asset Management Software

An example of the ability of ITS technologies to contribute to cost effective asset management is KiwiRail commissioning IBM to develop an asset management system to improve the visibility and management of its network assets.

The system will provide information that will help KiwiRail to prioritise repairs and preventative maintenance before operations are affected by breakdowns or system failure.

3.2.8 Compliance and enforcement

Transport rules and regulations are designed to ensure that the greatest economic, safety and environmental benefits are delivered to society. ITS systems can be used to create a seamless information exchange for operators and enforcement agencies, and reduce the costs of complying with rules and regulations for all involved. It can also assist in making enforcement more targeted and cost effective, reducing the burden on those who comply with transport rules.

Where is the greatest potential for ITS technologies to solve transport problems?

Have we missed any key ITS technology applications?
This section outlines the regulatory and non-regulatory barriers we are aware of to the cost-effective implementation of ITS technologies across all modes of transport. We are interested to hear whether you think that we have missed any key barriers, especially those that the government can help resolve. Also what do you think are the most important or pressing barriers to cost-effective implementation?

Barriers to ITS technology implementation in New Zealand include

- GNSS coverage and accuracy
- Radio spectrum allocation and lack of international standards
- Interoperability and data sharing
- Fragmented and complex ownership structures
- Liability
- Security of systems and information
- Accuracy and reliability of information
- Funding and cost barriers
- Network effects and critical mass issues
- Public perception of information privacy risks
- Cultural and information barriers
- Other New Zealand specific barriers

4. WHAT ARE THE KEY BARRIERS TO COST-EFFECTIVE IMPLEMENTATION?

4.1 GNSS coverage and accuracy

Unlike many nations New Zealand faces challenges relating to satellite based positioning data. Our hilly topography and lack of augmentation make it difficult to get good satellite coverage in all areas, and there is a strategic risk because we rely on global satellite systems that can be switched off or degraded by the jurisdiction which operates them.

In future the lack of accurate augmented GNSS coverage may limit the benefits offered by some ITS technologies. At some point the government or the sector may need to invest in additional ground-based augmentation systems to ensure that GNSS technology works effectively in New Zealand.

4.2 Radio spectrum allocation and lack of international standards

Communication between C-ITS vehicles and infrastructure will depend on access to interference free radio spectrum. Currently the US, the European Union and Japan are standards setters in this area. Unfortunately, each of these jurisdictions is proposing to use a different part of the radio spectrum. Ideally, all vehicles in a fleet should operate to the same standard, so New Zealand will need to select one of these frequency ranges. Table One shows the proposed spectrum allocation for C-ITS vehicles in the US, the EU, and Japan.

The risks of having vehicles on the network using different frequencies are not fully understood; for example interference may cause a vehicle to brake unexpectedly in response to a phantom signal.

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3 Augmentation of GNSS is a method of improving a navigation system’s attributes, such as accuracy, reliability, and availability, by integrating external information into the system’s processes. Augmentation can be ground or satellite based.

4 Europe has reserved the same frequency band as New Zealand, but plans to only use a narrow portion of the band at this point.
Australia has proposed adopting the 5.9GHz range allocated in the EU. Most new vehicles offered in New Zealand are built to Australian or European standards, so there is good reason for us to adopt the same C-ITS frequency range as Australia.

The Ministry of Business, Innovation and Employment (MBIE) is responsible for providing policy advice to government on the allocation of New Zealand’s radio spectrum. MBIE has not formally reserved the 5.9 GHz frequency for ITS use, but is monitoring its use or demand and advises that it is available.

There is also the need to protect areas in the MHz spectrum used by the aviation sector to allow new technologies like ADS-B, GNSS and ground based augmentation navigation systems to be protected from encroachment by mobile phone and other systems which need spectrum.

There may also be other areas where a lack of common international standards creates a barrier to ITS technology uptake in New Zealand.
4.3 Interoperability and data sharing

Open technology markets are characterised by a number of competing players providing alternative systems that offer consumers choice. However the full benefits of some ITS systems such as C-ITS and smart card ticketing systems are only likely to be achieved if these different systems are able to interoperate and communicate with each other, and share common information. This may be achieved through sector cooperation, or may require standards and regulation to achieve an open market.

In 2010 the New Zealand Transport Agency (NZTA) commissioned work as a first step in developing a national architecture for ITS technologies across the government sector. The work also provided a means of facilitating collaboration with the private sector and academia.

Without a common architecture there is a risk that a task may be performed by multiple agencies, or not at all. For example central and local government agencies may gather or hold the same information without either party realising this.

An agreed architecture would also enhance the ability for the private sector to provide services because data available from existing systems could be shared at a lower cost than if new systems were built to collect the data. An agreed ITS technology architecture would contribute to the creation of an effective and efficient transport system by encouraging interoperability between systems and devices.

4.4 Fragmented and complex ownership structures

Ownership of transport infrastructure is spread across a wide range of government, local government, and private agencies and individuals. No one agency in New Zealand has direct control of the entire New Zealand roading network, the seaports and airports are competitors, and there is no agreed ITS technology goal for the network.

This complexity of ownership applies equally to information and data. Ownership of the intellectual property rights of publicly funded data will need to be clearly understood and agreed by all who use the data.

This complex pattern of ownership may hold back efficient uptake and use of ITS technologies, unless there is strong coordination and use of common standards. The government has a role in helping to facilitate this sector coordination.

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National integrated fares and ticketing system

The NZ Transport Agency has developed and implemented a national integrated ticketing and fares system, initially in Auckland. This will ensure that different ticketing systems used by public transport operators are built to a common standard that ensures interoperability. This is essential for seamless public transport use across providers, and is an excellent example of government action to maintain open markets enabled through technology.

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4.5 Liability

ITS technology raises issues about liability. For example for semi-autonomous and autonomous vehicles involved in crashes how would investigators know whether a crash happened while the car was in driverless mode? Driverless cars may need some form of black box like aircraft, ships and trains.

Governments around the world are looking into these issues to determine their role. New Zealand law does not specifically address the issue of driverless vehicles.

The sale of imported second-hand vehicles in New Zealand raises further liability issues. To what extent should the importer, final seller, or manufacturer be liable in the event of a fault? Can a manufacturer who does not sell a model into New Zealand be held liable for a vehicle operating outside its intended area of use? This is likely to become an issue as more second-hand vehicles built to Japanese ITS specifications are imported into New Zealand.

4.6 Security of systems and information

The use of wireless communication by ITS technology including payment, enforcement, and licensing systems and C-ITS-equipped vehicles and infrastructure introduces the possibility of malicious tampering with the systems, including hacking, jamming, pirating of the signals and theft of personal data.

A hacked vehicle control system could cause a serious crash while the hacking of infrastructure would allow false warnings about congestion or directions to be given to road users. Hacking of payment systems would compromise public confidence and therefore the efficient operation of the system.

The security of electronic information and communication systems is a well-known issue, but may have particular implications for ITS applications that will need to be understood and managed. For ITS to be implemented and utilised, public confidence in the whole system must be maintained, including all aspects of regulation and operation.

4.7 Accuracy and reliability of information

For all ITS applications, accuracy of information is important. For some, particularly those that involve vehicle control, they are critical. In payment and charging applications, accuracy and reliability of information are essential in maintaining public confidence.

Some sources of information, for example GNSS positioning data, may not be accurate enough for some potential ITS applications. For others, reliability and accuracy may require significant investment in infrastructure capacity (for example communications capacity if widespread C-ITS uptake beyond the aviation sector is to occur) which may represent a barrier to implementation.

4.8 Funding and cost barriers

Many overseas governments are funding ITS technology development or are providing new funding specifically for the introduction of ITS capable infrastructure. Such funding is based in part on the view that ITS technologies will be able to increase the efficient use of existing roading infrastructure and achieve productivity benefits more cost-effectively than the construction of physical infrastructure that would deliver a comparable benefit.

Government transport agencies will need to ensure that all ITS procurements represent value for money. Equally the potential gains from future ITS technology development are important factors in ongoing considerations of the need for new infrastructure.

There may also be cost barriers to the introduction of new ITS technologies for individual users, particularly for lower-income families. The costs of technology tend to reduce sharply as the number of users increases.

4 In an effort encourage research and development Nevada, Florida, and California have passed laws clarifying the legality of driverless cars on public roads and the EU is investigating regulatory change.
Network effects and critical mass issues may affect the efficient and cost effective uptake of ITS technologies. These issues apply in two separate ways.

Some ITS technologies such as C-ITS require a critical mass of users to be effective and may produce limited safety gains until enough C-ITS equipped vehicles are present on the transport network. Equally, because the cost of technologies tends to drop sharply with volume of demand, a critical mass of users (perhaps globally) is required before the technology becomes generally affordable.

Conversely, a sudden uptake of C-ITS technologies may exceed the ability of existing infrastructure to cope with the demands of C-ITS technologies. Reaching a critical mass in uptake may trigger a need for new infrastructure investment, such as communication capacity in C-ITS systems.

Accurately predicting the rate of uptake of ITS technologies in New Zealand is vital for ensuring that the correct investment decisions are made at the local and central government level. Some information will come from monitoring the uptake of ITS technologies overseas.

Information technology critical mass effects

The introduction of mobile phones is a good example of a network effect. Initially, there were few users as the phones were expensive to buy and operate and coverage was limited.

However as more people purchased mobile phones, they became more useful. Demand increased and costs fell to the point were New Zealand now has near total coverage for users.

Along the way there were times when the popularity of the new phones and demand for bandwidth exceeded the capability of service providers.
4.10 Public perception of information privacy risks

ITS technologies can generate information about vehicles and, by default, vehicle operators. The widespread adoption of technologies that allow the tracking of vehicles has caused public concern both in New Zealand and internationally, which may affect the rate of uptake by customers.

The Privacy Act 1993 and the privacy of personal information are discussed in the next section.

4.11 Cultural and information barriers

New ITS technology products require marketing to potential users. There may be cultural barriers that are specific to New Zealand, for example linked to age, language or ethnicity, that require targeted marketing of certain products and technologies.

Most ITS technologies used by the public will be marketed by manufacturers and there is no reason for the government to become involved. However there may be specific themes or issues, such as privacy and security, where coordinated education and information provision will require government involvement to overcome barriers to ITS technology uptake.

The next section includes a discussion of the government’s education and information role in more detail.

4.12 Other New Zealand specific barriers to infrastructure development and market operation

There are a number of additional New Zealand-specific barriers to the uptake of ITS technology. These include:

- low population density, with few large population centres. This relative dispersal of our population means that economy of scale benefits possible in many jurisdictions may not be achieved in New Zealand for ITS technologies.
- the limited number of alternative routes should state highways or the main trunk line be unavailable for use may require particular forms of real-time traffic information to ensure that users benefit from the information.
- the length of the New Zealand road and rail networks relative to population may increase the costs of ITS infrastructure relative to benefits
- our distance from international markets
- the slow turnover of the New Zealand vehicle fleet, which may restrict the speed of uptake for ‘built-in’ rather than ‘bolt-on’ technologies.

What are the key barriers to cost-effective implementation?
Have we missed any key barriers?
5. WHAT IS THE GOVERNMENT’S ROLE IN ITS TECHNOLOGY?

This section sets out our views on the key roles of government in ITS technology. We are interested in hearing your views - have we missed anything, and what should the government focus on?

The government’s role in ITS technology includes:
- Leadership and strategic direction-setting
- Funding, procurement, ownership, operation and network planning
- Information gathering and coordination
- Regulation and standards
- Privacy of personal information
- Financial incentives
- Education
- Cross-government collaboration

5.1 Leadership and strategic direction-setting

In order for the New Zealand transport sector to maximise the benefits represented by ITS technologies the government needs to take a leadership role. This will include developing a strategic approach to the setting of priorities for investment, setting overall goals, and ensuring that the market operates in an open manner.

Achieving this strategic approach will also involve close collaboration and dialogue with the sector. We think that establishing a transport and ITS technology sector group would be of value to the introduction of ITS technologies in New Zealand.

This conversation paper and the development of an ITS Action Plan that will follow, are part of the Ministry of Transport developing its leadership role, working with other government departments, agencies, and the wider transport sector.

5.2 Funding, procurement, ownership, operation and network planning

The government is responsible for a significant proportion of New Zealand’s transport infrastructure. Central government owns and operates:
- the State highway network (through the NZ Transport Agency),
- the rail network (through KiwiRail),
- the air traffic control system (through Airways),

The government also has significant interests in other key transport assets including a majority shareholding in Air New Zealand, joint venture ownership of six airports and a holding in four corporatised airports.

Through the operation of these state assets the government makes extensive use of ITS technologies to improve the efficiency and effectiveness of its network operations. It also uses information gathered from ITS technologies in the ongoing process of planning the future development of the network. Examples of ITS technologies used to improve network planning and operations include:

- the Wellington Traffic Operations Centre and Auckland Joint Traffic Operations Centre for the monitoring and management of traffic in Wellington, Auckland and the wider state highway network
- tolling systems such as on the Northern Gateway Toll Road
- regional transport models and network planning technologies
- asset management technologies
- electronic road user charge collection
- KiwiRail asset management software
- Airways air traffic control systems.

The government also co-funds ITS technologies used in local government operated transport networks, particularly local roads and public transport, under the National Land Transport Programme. Examples include:

- integrated public transport fares and ticketing
- real-time travel information on local roads and public transport networks
- regional transport modelling and network planning.
5.3 Information gathering and coordination

Before New Zealand businesses and the public can fully benefit from ITS technology it will be necessary for more accurate data to be made available. This data is likely to include highly accurate three dimensional digital maps of the roading and transport network, including key features such as speed limits, school zones and low bridges. Aircraft using ITS technologies will require accurate 3D maps of the entire country. Real-time information gathered from a range of sources will also be required.

The government owns some of this information, particularly where it relates to government-owned infrastructure, and may need to update it regularly to support ITS operations. Other information may be provided commercially. The most cost efficient way to gather and co-ordinate data may be for the government to set and maintain standards for the provision of data and allow the market to meet demand.

5.4 Regulation and standards

The use of ITS technologies raises a range of regulatory issues. A key issue is the extent to which the government should require or enable ITS technologies through regulation.

Regulation of ITS technologies will need to be flexible enough to accommodate rapid developments. Regulation may also need to be considered where market failures exist to ensure open and effective markets. Those who import or develop ITS technology early may gain first mover advantage, which may stifle innovation and competition in the sector.

The Ministry of Transport is developing a transport regulatory policy statement which includes guidance on best practice regulatory principles.

New Zealand will also need to play an active part in ensuring that the development of international standards recognises the challenges our topography, population density, existing infrastructure, and satellite coverage pose to the introduction of ITS technologies.

5.5 Privacy of personal information

In New Zealand the Privacy Act promotes and protects personal privacy by setting minimum standards for the collection, use, handling, and sharing of personal data. In particular, the Privacy Act places obligations on all agencies (public and private sector) to manage personal information with due care.

In 2011 the Law Commission completed a review of the Privacy Act. The Law Commission’s finding on the interaction between the Privacy Act and technology agreed with findings from similar recent reviews in Europe and Australia. The review supported the principles-based approach, which allows the Privacy Act to remain relevant as technology changes and noted that

“...The technology-neutral privacy principles should be retained. However, during this period of rapid technological change, the principles should be regularly reviewed (5-yearly) to ensure that the Privacy Act continues to effectively respond to privacy issues raised by technological development...”

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2 Review of the Privacy Act 1993: Review of the Law of Privacy Stage 4
5.6 Financial incentives

Where faster implementation is required, the government can incentivise the introduction of ITS technologies through financial measures such as seed funding. However, the conditions under which it may be appropriate to do so, rather than relying on markets to operate freely, remain to be explored. As ITS technology is a new and evolving sphere, there is a risk that, without careful research, the government could incentivise the uptake of systems that are not the best suited for their task.

ITS technologies can also be incentivised by the government passing on the savings resulting from the use of the systems. The E-RUC system is an example of how ITS technologies can be used to move from paper based to electronic real-time cost recovery in a way that allows the reduced costs to the user to incentivise greater uptake.

5.7 Education

Commercially-developed ITS applications are generally marketed by the system developers. Many ADAS technologies are now appearing in high and mid priced road vehicles. However there may be occasions where the government has a role in educating users and potential users, particularly in relation to ITS investments on government networks, to stimulate uptake and effective use. There are clear parallels with the government’s education role in road safety.

Education may need to focus on the cost benefits of moving from paper based to electronic recordkeeping, payment and licensing systems, and when the benefits offered by a technology are not seen as having a sufficiently short payback period. Education may also be needed to ensure that security, liability, and personal anonymity provisions are understood.

Education can be supported with consumer information, provided either on a mandatory basis (for example the mandatory fuel economy labelling scheme for new and used cars) or on a voluntary basis.

The government can also facilitate ‘proof of concept’ demonstration trials of ITS technologies to ensure that the technologies can operate in New Zealand conditions, and raise awareness of them to potential users.

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**Land transport administration fees**

In 2012, the Government reduced a number of administration fees and at the same time introduced differential fees for land transport services (motor vehicle registration and licensing and road user charges services) based on payment channel. For example, the admin fee when paying for your annual vehicle licence online is now $3.57 compared to $6.26 if paid over the counter (excluding GST).
5.8 Cross-government collaboration

We believe that cross-government collaboration is essential to address common problems and realise cross portfolio gains. Collaboration also presents the opportunity to make cost savings. The issues addressed by cross-government collaboration include:

- opportunities for solutions to policy problems that cross departmental boundaries
- cost savings and efficiency
- reducing the duplication and overlap of programs, systems, and expenditures
- improved service to the public and business by providing consistent advice and streamlining the advisory process
- the capacity for government agencies to share systems, applications, and information.

We think that to ensure the most efficient and effective uptake of ITS technology in New Zealand there is much to be gained from establishing a local and central government ITS technology steering group. Such a group would ensure that taxpayer funded ITS technology was introduced in a consistent and efficient manner.

What is the government’s role in ITS technology?
Have we missed any key roles for government?
6. WHAT ARE THE IMMEDIATE, URGENT ISSUES THAT THE GOVERNMENT SHOULD FOCUS ON FIRST?

We do not think that the best use of government resources is to investigate all barriers to the uptake of ITS. Internationally a lot of research is being undertaken into barriers to uptake. The lessons learnt from this research will be applicable to the uptake and use of ITS technology in New Zealand. The best use of government resources is therefore to focus on barriers specific to New Zealand or the applications that will bring most benefit.

We are aware of a number of New Zealand specific barriers that need to be addressed early, some relatively urgently. The five barriers we would like to focus on are set out below. Are there any other urgent issues or quick wins that require government action?

6.1 Coordinated cross sector dialogue

We think there is a need for coordinated dialogue between all members of the New Zealand ITS sector. A cross sector conversation would help to achieve a clearer policy and strategic direction - this will in turn maximise the gains and minimise the costs associated with the introduction of ITS technologies into New Zealand. We believe that this is a high priority.

This conversation paper and the associated workshops are the first part of the process by which the government intends to engage with the ITS sector.

6.2 Lack of standard radio spectrum allocation and international standards

Clear, interference free, radio spectrum and agreed standards are vital if C-ITS technologies are to deliver the full gains they offer. Internationally no common radio spectrum has been officially allocated for use by C-ITS equipment. The US, EU and Japan are all proposing to use different spectrum.

The New Zealand government has not allocated radio spectrum for C-ITS use because there are no ITS technology radio standards to guide allocation and C-ITS technologies are not yet in wide use in. The government has however, reserved the spectrum expected to be used by the US and EU for C-ITS.

A clear way forward on spectrum allocation will help provide certainty to system developers and procurers, and to vehicle importers.

6.3 Lack of large scale accurate 3D mapping in New Zealand

As noted in section 5 some advanced ITS technologies will require detailed 3D maps of the transport network and area in order to provide maximum benefits. Currently the NZTA does not have spatial data in a consistent digital format. However, at least two private satellite navigation companies have collected some of the data.

The issue of digitally mapped road speed limits may be a particular priority. These are important for a number of C-ITS applications.
6.4 Satellite navigation system coverage

Many ITS technologies require accurate real-time GNSS location data to function accurately. Unlike Northern hemisphere jurisdictions New Zealand lacks constantly accurate GNSS coverage.

Internationally in response to the growing need for accurate positioning information many jurisdictions are launching their own satellite navigation systems and/or providing augmentation. It is not known yet if these systems will provide data to New Zealand at the level of accuracy needed for all advanced driver assistance systems to work.

Government agencies may therefore need to investigate the costs and benefits of increased ground or satellite based augmentation systems to ensure that GNSS based ITS technologies work accurately and safely.

6.5 New Zealand specific ITS-related standards

As noted, the case for New Zealand adopting any ITS technology standards developed by Australia is a strong one. It is, therefore, important that New Zealand is involved in the development of Australia’s standards, and possibly those of other jurisdictions.

By taking part in the drafting of standards our less accurate satellite coverage, limited number of alternative routes, the mixed source of our vehicle fleet, and our population density and spread can more effectively be taken into account.

There is also a role for the government in setting or adopting and maintaining national standards to ensure that all data provided for ITS technologies is produced in a consistent format by whoever provides it.

What are the immediate, urgent issues that the government should focus on first? Are there others in addition to the five listed above that require immediate government action?
7. HOW SHOULD WE ENCOURAGE THE CONVERSATION AND CO-ORDINATE THE VARIOUS PLAYERS TO MAXIMISE PROGRESS?

To tackle many of the issues raised in this conversation paper will require collaboration and coordination across the sector. We have identified the following sector and government groups as key stakeholders in the ITS technology field. Please let us know if you are aware of a group we have missed.

We are proposing workshops in early July to further discuss this paper. This will help to shape an ITS technology action plan. As part of this we are also interested in your views about how best to engage in the longer term with the ITS technology sector and at what level the engagement should be made. What are your ideas about how we encourage conversation, collaboration and coordination within the sector?

Accident Compensation Corporation
Biosecurity New Zealand
Customs New Zealand
Police
KiwiRail
Land Information New Zealand
Ministry of Health
Maritime New Zealand
Ministry of Business, Innovation and Employment
Treasury
New Zealand Transport Agency
Energy Efficiency and Conservation Authority
Standards New Zealand
Office of the Privacy Commissioner
Auckland Transport
Local Government New Zealand
Civil Aviation Authority
Airways New Zealand
Board of Airline Representatives New Zealand Inc
New Zealand Airport Association
Vodafone
Telecom
2degrees
Institute of Professional Engineers of New Zealand
New Zealand Council for Infrastructure Development
Infrastructure New Zealand
Motor Industry Association
Automobile Association
Motor Trade Association
Shipping Council
Fire Service
Imported Motor Vehicle Industry Association
Road Transport Forum
Chartered Institute of Logistics and Transport
The Customs Brokers and Freight Forwarders Federation of New Zealand
National Ambulance Sector Office
Intelligent Transportation Systems New Zealand (Inc)
Austroads
International Organization for Standardization

How should we encourage the conversation and co-ordinate the various players to maximise progress?

Have we missed any key ITS stakeholders?
8. NEXT STEPS

This conversation paper and the accompanying workshops in early July are intended to identify how government involvement can ensure that ITS technologies are rapidly, cost effectively and safely introduced into New Zealand. We would request any written feedback you would like to provide by 19 July 2013.

Following the workshops and feedback we will draft an ITS technology Action Plan that sets out the government’s ITS technology policy and regulatory aims for the next three to five years. We believe that, given the speed with which this technology is evolving, three to five years will see significant changes to the technology and will require a review of the government’s actions.

We intend to release the Action Plan for general public comment in late 2013. You will receive a copy of the draft Action Plan when it released for public consultation. Following public consultation the final Action Plan will be released by mid 2014.
COMMENT FORM

Below are the key areas we are seeking comments on, there may however be other ITS addressed in the conversation paper areas that you want to comment on.

1. **Where is the greatest potential for ITS technologies to contribute to the desired transport outcomes within and across all modes of transport?**

2. **What are the key barriers to cost-effective implementation of ITS technology?**

3. **What is the government’s role?**
4. What are the immediate, urgent issues or quick wins that the government needs to focus on first?

5. How should we encourage the conversation and co-ordinate the various ITS technology sector groups to maximise progress?