

# Objectives-Driven Performance Measurement for New Zealand's Transport Network



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## ABSTRACT

An increased emphasis on linking traffic management and operations to regional and national objectives has led to an emerging concept internationally known as 'objective-driven performance-based planning' (ODPBP). This new concept makes use of performance measures based on operations data and the greater availability of data produced from Intelligent Transportation Systems (ITS). This includes both a systematic approach to collecting and managing data for performance measurement, combined with periodic monitoring and reporting of network and corridor performance.

Inherent to an ODPBP approach is that for objectives to be effective there must be performance measures aligned to the objectives where the necessary data is available. The performance of strategies and projects should then be measured, and where they are not performing be reviewed. With the focus that ODPBP brings to performance measurement, it provides a framework whereby the performance of strategies, projects and the responsible organisations is measured with direct alignment to the national or regional strategy goals and objectives.

This paper examines the 'state-of-the-practice' around ODPBP, and concludes that the ODPBP approach will have growing relevance to New Zealand and the New Zealand Transport Strategy. It concludes that a risk for the government in the NZTS 2008 arises from goals and objectives without measurable targets set, leading to potentially misaligned strategies, a corresponding difficulty in refining poorly performing strategies, or being able to determine the value for money being delivered by the strategy and the responsible organisation(s).

The paper also concludes that there is a need for New Zealand to invest further in Intelligent Transport Systems (ITS) infrastructure and analysis to support the NZTS.

The embedding of the NZTS/RLTS performance measures into strategies and projects will provide more certainty that the NZTS / RLTS will be effective in delivering strategies that contribute directly to government's regional and national goals.

## 1. INTRODUCTION

There has always been a desire to link regional transport objectives (RLTS) and national objectives (NZTS<sup>[1]</sup>) with performance metrics from projects / strategies, as well as with the accountability of individual senior roles in the responsible government organisations.

Our observation of New Zealand is that these links have been problematic due to insufficient traffic management and operations data, an undefined framework for developing metrics around stated objectives, and the poor linkage between strategy development and performance measures.

The future effectiveness of the updated New Zealand Transport Strategy (NZTS) and the associated Government Policy Statement (GPS<sup>[2]</sup>) will depend on how well national goals are linked with performance measurement and the integration of strategy development and project implementation.

This paper examines the benefits of enhancing New Zealand's previous approach of measuring success through the implementation of projects / strategies with the principles from Objective Driven Performance Based Planning (ODPBP).

The paper is significantly based on 2007 guidance provided by the US Department of Transportation<sup>[3,4]</sup>.

## 2. OBJECTIVE DRIVEN PERFORMANCE BASED PLANNING

Objective driven performance based planning (ODPBP) is an iterative process where performance measures are highly integrated into the transport planning and strategy development processes.

In the United States, the approach was a response to the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU)<sup>[3,4]</sup>.

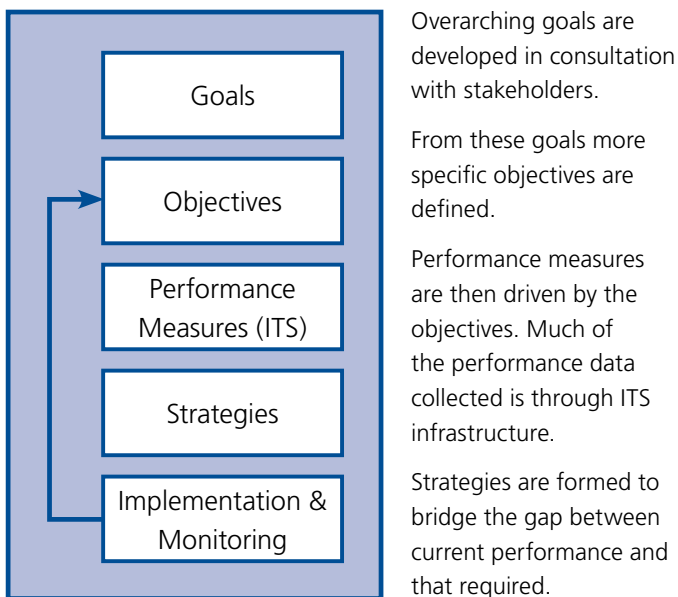
This legislation specifically includes ‘promote efficient system management and operations’ as a planning factor that must be considered when developing transport plans. It requires inclusion of not only capital projects, but also traffic management and operational strategies.

As the performance measurement will therefore involve traffic management and operations information, it encourages innovation in network efficiency, rather than static strategies or reliance on infrastructure projects.

ODPBP is particularly useful when / where there is a movement towards customer service-delivery orientation, which requires a response to both the growing and changing demands on infrastructure as well as the impact of a sustainable transport approach.

A key part of the approach is the development of performance measures and the reliance on Intelligent Transport Systems (ITS) infrastructure for monitoring performance. As both ITS infrastructure and ITS network coverage improves, the benefits and relevance of the ODPBP approach will further increase.

The outline of ODPBP is shown below:



Strategies are implemented with monitoring / evaluation carried out based on performance measures.

The OBPBP process loops back on itself, as outcomes of strategies and implementation are periodically used to guide and improve any next iteration of objectives.

### 2.1 GOALS

Goals are essentially the way of communicating a regional or national vision of how the transport system should contribute to the social, economic and environmental facets of the community. These are likely not only to be about capacity but also elements such as reliability and safety.

### 2.2 OBJECTIVES

ODPBP guidance specifies that objectives flow from the goal(s,) and are a critical component of creating an objectives-driven, performance-based approach. Operations’ objectives help to actualise what it means to accomplish the goal, and should specify clear measurements for evaluating progress towards the goal. They state what a region plans to achieve in regard to the operational performance of the transportation system, and thereby help to determine what strategies and investments to include in the MTP.

Objectives are specific, measurable statements relating to the attainment of goals. Given that the fundamental purpose of management and operations improvements is to better serve the transportation system user through increased system performance, operations objectives are preferably described in terms of system performance outcomes as experienced by users. Objectives focused on outcomes to the user address issues such as travel times, travel time reliability, and access to traveller information. The public cares about these measures, and in many regions, data may be available to develop specific outcome-based operations objectives.

As opposed to goals, ODPBP requires that an objective should have the well known “SMART” characteristics. By developing ‘SMART’ objectives, system performance can be examined and monitored over time.

Of interest, there are two distinct interpretations on the meaning of the ‘A’ in SMART:

- Agreed <sup>[4]</sup> – Partners come to a consensus on a common objective. This is most effective when the planning process involves a wide-range of stakeholders to facilitate collaboration and co-ordination, or
- Achievable <sup>[3]</sup> – Objectives should be realistic and within the reach. Objectives should not represent a ‘wish list’, but should take into consideration projections and trends available.

We would suggest that both of these are relevant and required. Our experience is that a trade-off can occur between the two, where negotiation and compromise to reach agreement can lead to inclusion of ‘wish list’ items. The challenge to transport professionals is how to achieve both ‘agreed’ and ‘achievable’.

Guidance on ODPBP suggests that in developing objectives, a common concern is the recognition that transport network performance may worsen without the implementation of new strategies or programmes, particularly in regions where population is growing rapidly not all objectives will be ‘improve on current conditions’ and the guidance recommends careful consideration of how to communicate with elected officials and the public on this. The example in Section 4 of this paper expands on this.

## 2.3 PERFORMANCE MEASURES

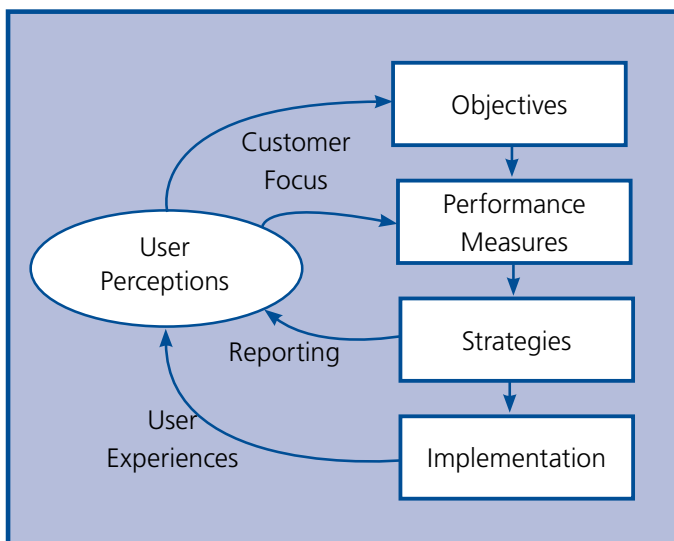
### Linkage to Objectives and Strategies

Performance measures are indicators of how well the transportation system is performing, and are inextricably tied to objectives. Under ODPBP, performance measures need to be identified and data collected in order to select appropriate regional objectives that are specific and measurable.

### Importance of Customer-Focused Measures

For public transport, there is tension between operations-based commercial performance measures and customer-focused measures. Similarly for Road Controlling Authorities (RCAs), efficient commercial management might not give the best user perceptions.

The guidance explains “by focusing attention on system characteristics that are important to the travelling public, performance measures can help planners to focus on the day-to-day experience of transportation system users. This provides important balance in settings where planners have been exclusively focused on very long-term development of the network. With greater focus on the day-to-day characteristics of the system, the issues faced by [RCAs], such as incident response, work-zone management, and provision of traveller information, take on greater importance.”



### Measures for Performance-Based Planning

The US Department of Transportation provides a range of categories of measures suited for ODPBP <sup>[3]</sup>, including:

- Accessibility & Mobility [Examples: average travel time from origin to destination, average trip length, percentage of employment sites within x miles of major highway, number of bridges with vertical clearance less than 4.5m, origin-destination travel times, average speed or travel time, vehicle km travelled (VKT) by congestion level, lost time or delay due to congestion, level of service or volume-to-capacity ratios, vehicle hours travelled or VKT per capita, person km travelled (PKT) per VKT, customer perceptions on travel times, delay per ton-km, PKT per capita or worker, person hours travelled, passenger trips per household.]
- Economic Development
- Quality of Life [Examples: lost time due to congestion, crashes per VKT or PKT, tons of emissions, customer perception of safety and urban quality, average number of hours spent travelling, % population exposed to noise above certain threshold]
- Environmental and Resource Consumption [Examples: tons of emissions, number of days in air quality noncompliance, fuel consumption per VMT or PMT]
- Safety
- Operating Efficiency (System and Organisational)
- Transport Network System Preservation [Examples: % VKT on roads with deficient ride quality, % roads and bridges below standard condition, remaining service life, maintenance costs, roughness index for pavement]
- Outcomes (Operational) Performance Measures
  - Quantity of travel (users’ perspectives)
  - Quality of travel (users’ perspectives)
  - Utilisation of the system (Agency’s perspective)
- Outputs (Agency’s performance).

**Analytical Methods**

Current methods of data collection in widespread use which could support development of multi-modal performance measures include ITS (including network, vehicle and tolling and other technologies), manual surveys and surveillance and user surveys.

As covered in Section 4 where the ARTIS tool is discussed, it is important for the success of transport strategies that the data collection infrastructure is in place and transport planners are aware of the range of cost-effective ITS tools that can be deployed.

**2.4 STRATEGIES**

The development of performance measures under ODPBP necessarily focuses strategies on objectives and hence goals. A key but potentially controversial component of ODPBP is that as strategies and projects need to relate to specific performance measures, currently un-measurable strategies cannot form part of the ODPBP. However in our view this leads to these important things:

- Investing in new ITS infrastructure (or other data collection methods) that will enable performance measurement of the components of the strategy.
- The removal of ineffective objectives which lead to un-measurable strategies or revision and re-statement of the objectives in order to enable performance measurement of all strategies.

- The strategies that flow from performance measures will be measurable, and this makes performance measurement of the responsible agencies and roles within those agencies practical. We see this as a key difference from prior methods where the impact of strategies and the corresponding effectiveness of agencies was difficult to ascertain.

**2.5 IMPLEMENTATION / MONITORING / EVALUATION**

Through following an ODPBP approach, appropriate performance measures will be in place for monitoring and evaluation of strategies and projects.

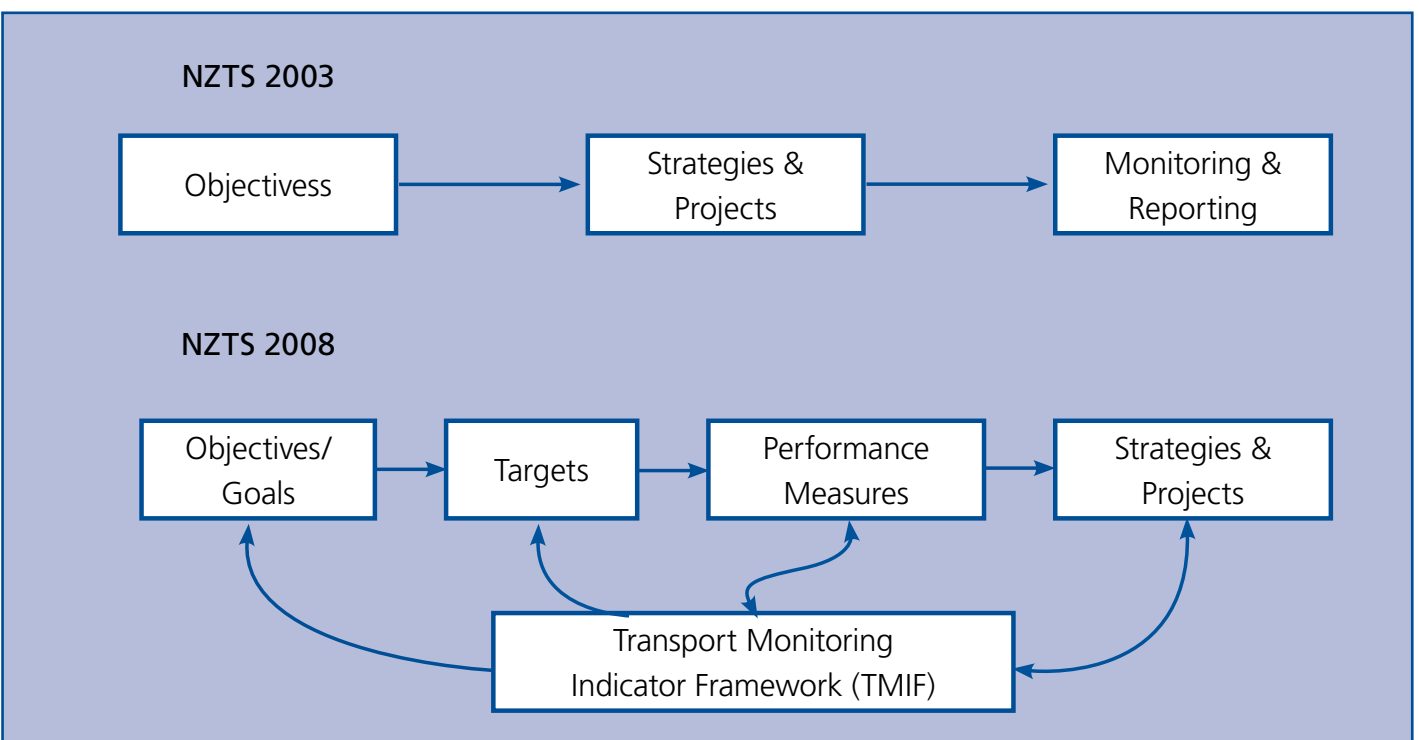
Using the ODPBP approach, periodic performance reporting provides a method of directly informing decision-makers and the responsible government organisations how well the strategies are performing in delivering towards the goals and objectives of the regional and national transport strategy and targets.

Through this there must be a process whereby the objectives could be altered to match changing characteristics and the ability to contribute towards the transport goals. Efficient automated processes for routine reporting are therefore valuable.

**3. TRANSPORT STRATEGY IN NEW ZEALAND**

**3.1 NEW ZEALAND TRANSPORT STRATEGY 2008**

The Government recently released the revised New Zealand Transport Strategy 2008 (NZTS). It was developed to provide direction to the transport sector for the next 30 years in line with the government’s sustainability agendas.



With the NZTS revision, there are now similarities between the NZTS and an ODPBP approach. The revised NZTS now contains targets to support the delivery of the transport objectives. The objectives are intended to follow the 'SMART' guidelines. An objective driven performance measurement is a central theme with Vision, Objectives, Targets, Challenges and Actions almost mirroring the Goals, Objectives, Performance Measurement, Strategies, Implementation and Monitoring mantra of the ODPBP.

Key targets are:

- halve per capita domestic transport greenhouse gas emissions by 2040
- for identified critical routes: improve reliability of journey times
- for identified critical routes: reduce average journey times
- reduce the kilometres travelled by single occupancy vehicles in major urban areas on weekdays by ten percent per capita by 2015 compared to 2007.

As stated in the NZTS document (Section 6.2), the framework of targets is not complete – insufficient data in some cases has meant it has not been possible to set a specific target. The NZTS also states that other targets set the broad direction for progress, but have yet to be refined into measurable targets so interim targets need to be developed to enable the measurement of progress in the short to medium term.

The NZTS states (Section 6.5) that the government will closely monitor and report progress in achieving the targets set within this Strategy. Where insufficient progress is being made, measures carried out by the government will be adjusted to bring performance in that area back on target.

The monitoring and publishing of performance will be undertaken by means of the Transport Monitoring Indicator Framework (TMIF). The outputs from the TMIF are accessible via the Ministry of Transport website at [www.transport.govt.nz](http://www.transport.govt.nz) and will be updated and published on an annual (or more frequent) basis.

The NZTS states (Section 6.6) that every third year, the results of performance monitoring against the targets will lead to a review of the actions required over the next three years. This review will be used by the government to determine whether funding is being targeted at the various activity classes in the most effective way, and whether the right balance between policy measures is being achieved. This review will feed directly into both the next action plan and the GPS.

### 3.2 NZTS and an ODPBP Approach

While NZTS does have many compatible approaches to ODPBP, there are areas where it diverges from ODPBP best practice.

#### Incomplete Target Framework

As stated in the NZTS document (Section 6.2), the framework of targets is not complete due to insufficient data being available. The strategy identified in the NZTS of requiring measurable interim targets is in line with an ODPBP approach. Nonetheless ODPBP best practice suggests that any delay in setting these targets or limitations in appropriate data collection requirements will lead to difficulties. The difficulties are primarily in determining both whether appropriate strategies are being developed and delivered by the responsible organisations, as well as potentially reducing the perceived ability of those responsible organisations to contribute to the targets.

NZTS 2008 sees performance monitoring leading to reallocation of funding towards or away from strategies that are under-performing. There is potential danger where targets and their corresponding strategies are either poorly aligned or have minimal performance measurement data, as they will avoid the same level of iterative refinement as those that are more easily measurable, thus reducing the overall value for money of government's transport investment.

#### User Perspective Performance Measures

ODPBP guidance suggests that for an effective strategy, targets need to include a proportion which focus on user perspectives: quality and quantity of travel.

The travel time and reliability targets of NZTS focus on quality of travel, but the quantity of travel important to individuals is more difficult as it typically conflicts in some areas with environmental and vehicle occupancy targets. The use of for example a 'persons moved' rather than a 'vehicles moved' approach may be the appropriate solution, but the implication of this is the requirement for different performance measures and thus the current data collection capability / analysis from ITS infrastructure will need significant change – the paper authors are currently investigating practical options for this.

### Transport Monitoring Indicator Framework (TMIF)

Part of the TMIF role will need to be defining transport network data collection options, identifying current gaps in ITS coverage, and scoping the required investment in infrastructure and analysis tools.

It is likely that a consequence of NZTS 2008 is a requirement for further investment in New Zealand's ITS infrastructure outside of key State Highways.

Using an ODPBP approach would require that this be done with a sole focus on the objectives (targets) of NZTS 2008, and that there be a feedback mechanism so that where there are objectives that can't be measured that potential review and re-statement of the objectives.

The publishing of TMIF data, so long as the targets represent performance measures around user perspectives (travel time and reliability do this), is a key component of the ODPBP ongoing process, as it facilitates decision making and any required review of targets / objectives.

## 4. RELEVANT EXAMPLES IN NEW ZEALAND

### 4.1 Performance Measurement on Identified Key Routes using ARTIS <sup>[5]</sup>

For the NZTS and GPS to be effective in both delivering and reporting on the performance of strategies and investment, there needs to be the appropriate data collection infrastructure and analysis available to match the performance measure.

One of the requirements of the NZTS is to measure the user perception of the performance of key routes through travel time and travel time reliability. Traditionally the expensive ITS sensors that are capable of monitoring these characteristics are either not installed or limited to motorways, leading to the use of 'floating-vehicle' surveys to monitor performance.

Only very recently have tools been developed to make use of the sensors that are present at all intersections controlled by traffic signals and other sensors used to monitor traffic flows and speeds to collect data sufficient to report on these key performance measures. Previously this SCATS traffic signal data has been under-utilised in corridor performance measurement.

**ARTIS (Advanced Real-Time Traffic Information System)** is add-on software that uses actual and dynamic traffic data available from SCATS and through mathematical analysis, provides traffic system performance reporting such as congestion, travel times, unit delay, level of service, a mobility index and spare capacity.

**ARTIS** has been used with the Auckland SCATS system to test the monitoring of particular arterial and motorway segments; the figure to the right shows some of the graphical output from the **ARTIS** system.



Through **ARTIS** it is also possible to monitor trends on the performance of arterial corridors, including pedestrian delay information in a manner that has not been previously possible. **ARTIS** is a key tool for delivering effective arterial corridor strategies in support of the NZTS.

Our view is that more emphasis needs to be placed in New Zealand on the use of ITS and data fusion whereby different sources of ITS data are combined, making use of the advantages and reducing the effect of the some of the disadvantages of each.

For example, fusing the following data sources will provide an effective picture of performance that will then enhance the value of the NZTS, GPS and RLTS:

- Floating Car Surveys (accurate, limited routes, small sample size)
- ARTIS data (all traffic signal controlled routes 24 hours / 7 days)
- Public Transport Real-time Systems (mode specific)
- User Perception Surveys (covers non-motorised modes).

This is particularly effective as an integral part of any route optimisation activities.

#### 4.2 AUCKLAND MOTORWAY ALLIANCE (AMA)

The Auckland Motorway Alliance (AMA) is a ‘state of the practice’ New Zealand example of Objective Driven Performance Based Management & Operations. The AMA is responsible for maintenance and operations of state highways in Auckland for the ten years beginning 1 October 2008.

The Alliance form of contract has objectives at the very core - the profit paid out to Alliance parties is dependent on the measured performance (KRA) of the AMA.

These Key Result Areas (KRAs) are akin to ‘Objectives’ in ODPBP. Similarities between the Alliance contract and the ODPBP are noted in the table below:



ODPBP Nomenclature	Alliance Nomenclature	Auckland Motorway Alliance Example [Note these are currently only Draft KRAs ]
Goals	Primary Objective	“To operate and maintain a pleasant network for all customers to confidently know they will be able to get to their destinations comfortably, safely and quickly at all times of the day or night”.
Objectives	Key Result Areas:	<ul style="list-style-type: none"> <li>Maximised Network Efficiency</li> <li>Customer and Stakeholder Driven Organisation</li> <li>Positive Legacy</li> <li>Enhanced Value for Money</li> </ul>
Performance Measures	Key Performance Indicators	<ul style="list-style-type: none"> <li>Number of incidents involving struck objects other than barriers</li> <li>Extent of Congestion – Temporal and Spatial</li> <li>Person Kilometres Travelled</li> <li>Travel Time Consistency (Point Speed Variability)</li> <li>Incident Response Times</li> <li>Delays due to planned road closures</li> </ul>

Where an indicator is outside of the AMA’s control, financial pain or gain based on this indicator is not directly Alliance performance related. An example is the Extent of Congestion – Temporal and Spatial. The extent of congestion may depend as much on fuel costs and land use growth as on the Alliance’s ability to maximise network efficiency.

The counter argument to this is the maxim “What is measured is managed”. By placing financial emphasis on the congestion measure, the AMA is motivated to make any influence it may have to minimise congestion.

The AMA model of developing strategies demonstrates how an ODPBP-compatible approach leads to, amongst other benefits:

- strategies clearly related and responsive to regional and national goals
- performance measurement of the responsible agency and key roles.

#### 5. CONCLUSIONS

The Objective-Based Performance Based Planning model which is becoming best practice in the United States is relevant to New Zealand, especially so with the recent release of the New Zealand Transport Strategy 2008 and upcoming RLTS.

The key process within ODPBP is the development of performance measures aligned to objectives / targets, which are then used to both develop strategies and report on the success or otherwise of the strategies and organisations responsible for these strategies.

One risk for the government in the NZTS 2008 arises from the goals and objectives which do not currently have measurable targets set. Without prompt development of measurable targets and performance measures, there is a risk of misaligned strategies and a corresponding difficulty in refining poorly performing strategies or being able to determine the value for money being delivered by the strategy and the responsible organisation(s).

There is a need for New Zealand to invest further in Intelligent Transport Systems (ITS) infrastructure and analysis tools to support the NZTS based on ODPBP guidance. Efficient automated processes for routine reporting are required, in particular ones which are able to fuse data from different sources.

There is risk from introducing environmental goals in that there will be an unresolved conflict with any 'quantity of travel' performance measure – it is important that New Zealand move to a 'person km travelled' (and corresponding ton-km travelled) measure.

This requires the use of tools such as ARTIS, and the embedding of the NZTS/RLTS performance measures into strategies and projects will provide more certainty that the NZTS / RLTS will be effective in delivering strategies that contribute directly to government's regional and national goals.

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