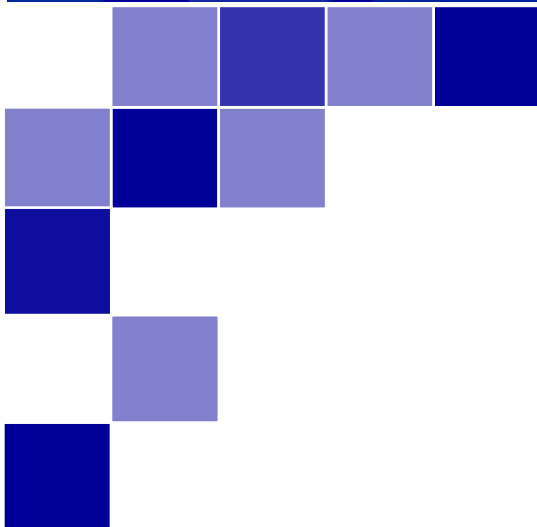




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RETHINKING STRATEGIC TRANSPORT PLANNING PRACTICES IN SOUTH AUSTRALIA



Report prepared for

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Executive Summary

Objectives

The objectives of this study were two-fold:

1. To identify DPTI's strategic transport planning needs, with an emphasis on how these needs might shift in the face of ongoing and future disruptions to the transport sector, as represented by the emergence of increasingly shared, electric, connected and autonomous modes of transport; and
2. To identify appropriate decision support systems that can support these needs, keeping in mind that these new technologies and services, in conjunction with other advances in big data, machine learning, etc., offer opportunities for developing new methods for evidence-based transport planning.

Methodology

In service of these objectives, we engaged extensively with relevant stakeholders across government, industry and academia, and we undertook a comprehensive review of the relevant bodies of grey literature. In particular:

- We interviewed DPTI's senior management team, and other relevant staff at the organization, to assess DPTI's past practices and future needs;
- We interviewed other transport planning organizations, both nationally and internationally, to see how DPTI's needs and practices compare with these other organizations;
- We interviewed local transport businesses and research centers, to assess how new methods for data collection and analysis can support the development of new decision support systems, and what local capacity exists in these emerging fields;
- We interviewed national and international academic experts in the field to determine what cutting-edge research is being pursued elsewhere, and how it can support this study's objectives; and
- We reviewed the grey literature on both the broader planning process, and the specifics of decision support systems.

We went very wide, so that this study wasn't just a review of strategic models and modelling practices, but the broader planning process that these models seek to inform. And we went very deep, looking not just at standard modelling paradigms that have been in circulation for the last few decades, but also examining how big data, machine learning and other recent advances in the measurement and analysis of transport behaviour can support the development of better decision support systems for strategic transport planning.

High-level findings and recommendations

Our findings and recommendations may be summarized as three key takeaways:

1. The strategic models should be used to compare and contrast the expected relative impacts of different projects, and to prioritize major transport investments accordingly;
2. The assessment process needs to adopt a scenario-based approach to account for future uncertainty, where priority is given to investments that maximize resilience across multiple plausible future scenarios; and
3. The strategic models that could support this assessment process within DPTI need to be recalibrated and validated using current data.

Over subsequent subsections, we describe each of these takeaways in greater detail.

Key takeaway I: Use strategic models for relative assessments

Travel demand models (TDMs) are quantitative tools that can help support evidence-based transport planning and policy-making, by offering insights on current patterns of travel behaviour, and providing a framework for predicting changes in behaviour in response to one or more future transport investments. Forecasts from TDMs are used by regional planning organizations for two broad purposes: (1) to determine the required capacity that new infrastructure must satisfy; and (2) to facilitate the economic, environmental and social impact assessments that accompany the debate on how to allocate funds between competing initiatives.

TDMs can be unreliable in terms of their *absolute* predictions. Forecasting human behaviour several years into the future is an inherently difficult problem. There are many variables, each of them a potential source of uncertainty, and even the most rigorous modelling exercise will inevitably fail to capture the effect of some of these determining factors appropriately.

The real strength of TDMs lies in their ability to compare and contrast the expected relative impacts of different projects, and to prioritize major transport infrastructure investments accordingly. Should we build a new road or improve existing road infrastructure, or run a new bus line, or implement travel demand management strategies that help contain congestion, are questions these models can handle. While absolute forecasts from TDMs for each of these alternative strategies will still be subject to the same sources of error, many of these sources are often shared across different strategies, and in terms of ranking the effectiveness of each of these strategies, these same models have proven to be far more reliable. Questions about how many cars will use a motorway can be better handled by different tier of tools, e.g. highway assignment models.

Key takeaway II: Adopt a scenario-based approach for relative assessments

The transport sector is witnessing unprecedented levels of disruption. Privately owned cars that operate on internal combustion engines have been the dominant modes of passenger transport for much of the last century. However, new modes of shared, electric, connected and autonomous transport are expected to lead to dramatic changes in the cost, comfort and convenience of transport. How will people respond?

As Cortright (2016) writes, “The optimists see a world where parking spaces are beaten into plowshares, the carnage from car crashes is eliminated, where greenhouse gas emissions fall sharply and where the young, the old and the infirm, those who can’t drive have easy access to door-to-door transit. The pessimists visualize a kind of exurban dystopia with mass unemployment for those who now make their living driving vehicles, and where cheap and comfortable autonomous vehicles facilitate a new wave of population decentralization and sprawl.” Reality will likely lie somewhere between these heaven and hell scenarios.

The current planning process is not equipped to deal with such fundamental uncertainty about the world. Strategic transport infrastructure plans typically have planning horizons of 20-40 years. In the past, it would have been reasonable to assume that the broader context surrounding travel behaviour remains relatively stable over these forecasting horizons, and investment decisions could be made with the objective of prioritizing projects that performed the best across the most likely future scenario. However, new transport technologies and services promise to upend extant patterns of travel behaviour, and these methods require significant rethinking.

Scenario-based approaches are increasingly being adopted by planning organizations, both nationally and internationally, to explicitly account for future uncertainty within their investment decision-making process. TDMs can be used to assess the performance of different projects across different likely future scenarios. As opposed to prioritizing projects that perform the best across the most likely future scenario, the selection criteria can be adjusted to test the resilience of projects across multiple future scenarios with varying degrees of likelihood. Consequently, the proposed scenario-based approach could help safeguard against potential sources of uncertainty about the future.

Key takeaway III: Recalibrate and validate strategic models using current data

There is a need to recalibrate and validate existing models to current data, and in order to do that, there needs to be a new round of travel diary data collection.

There are many reasons, but here we focus on three points. First, new transport technologies and services, such as electric vehicles, shared mobility services, and connected and autonomous vehicles, are not explicitly captured within the TDMs being used currently by DIT. As a consequence, current TDMs can not support the assessment of transport investments in a future that is likely to be dominated by these emerging modes of transport.

Second, consumer preferences themselves have changed dramatically over time. The 2000s witnessed a decline in car ownership and licensing rates, as well as private car use, across Australia. Following the COVID-19 pandemic in 2020, public transport use has declined across all major metropolitan areas.

And third, concurrent advances in information and communication technologies are changing the need for transport. Email clients, video conferencing services, and other means of data sharing and communication have made workplaces increasingly flexible, both in terms of their physical location, and in terms of work schedules. Similarly, the rise of e-commerce and online delivery services is changing the demand for physical retail stores. And social media platforms and digital streaming services are changing how and where we socialize.

Detailed action plan

We have developed a roadmap for DPTI on how to address the needs identified in the previous section, based around four milestones. The roadmap is illustrated below, and described in greater detail in Chapter 3. Overall, these milestones are anticipated to comprise a 4-year plan, with the objective of producing a strategic regional transport plan at the end of the 4-year period. We summarize this research plan as a table with actionable items at the end of the executive summary. Over subsequent sections, we discuss key elements of this plan, corresponding to the four different milestones, beginning with the immediate and moving towards the long-term.

Road map for improving transport demand modelling practices within DPTI

Long term	Review the South Australian government's long-term vision for the state, how transport and land use fit within that picture, and how can transport modelling support that vision at a more detailed level through scenario planning
Medium to long term	Identify what changes to the existing model structure are needed, if any, to support long-term strategic planning
Short to medium term	Recalibrate and validate existing (and potentially new) models using new sources of data
Short term	Improve organizational practices around model governance and ownership, and engagement with end-users

Organizational practices

As part of the 4-year plan, by the end of the first year, all recommended changes to organizational practices should have been implemented. For more details, the reader is referred to Chapter 7 of the report.

Model calibration and validation

In the short-term, DPTI needs to recalibrate and validate its existing models to current data. Consistent with these short-term objectives, we recommend four actions:

1. The first year of the 4-year plan should prepare the groundwork for a new round of data collection in terms of planning and developing a business case, lobbying government for funding, and procurement of appropriate services from the private sector.
2. As part of this preparatory work, DPTI should explore the ability of GPS-based smartphone survey applications to replace traditional methods of household travel diary data collection. To date, smartphone survey applications have only been used for small-scale research studies. DPTI should assess the viability of the technology for conducting large-scale regional household travel surveys through a pilot study during the first year of the 4-year plan.
3. We do not recommend the use of standalone GPS loggers, as either a complement to existing data collection methods or a replacement for the same, because the costs of using this technology will likely not be significantly less than existing methods.
4. The new household travel survey should go to field during the second year of the 4-year plan; by the end of the second year, a new dataset for the region should be available for analysis.

Household travel surveys are expensive. DPTI needs a long-term plan for how its TDMs will be regularly updated in the future. We recommend undertaking an exploratory study over the first three years of the research plan that investigates the ability of multiple sources of data, old and new, used in conjunction with each other, to replace traditional household travel surveys.

By the end of the third year of the 4-year plan, DPTI should have a system in place for how these alternative sources of data can be employed to regularly update TDMs in the future. For more details, the reader is referred to Chapter 6 of the report.

Model structure and functionality

In the medium-term, DPTI needs to identify how TDMs currently being used by the organization are lacking, and how they might be improved using an incremental needs-based approach. In terms of structure and functionality, we find DPTI's modelling tools to meet national and international guidelines, though there is scope for improvement.

Based on a comprehensive review of the literature on TDMs for strategic planning, we have identified eight potential areas of improvement. Our recommendations have been informed by the needs of the strategic plan drafting process. What potential projects and policies will be assessed by the TDMs? What are the expected impacts of these projects and policies on extant patterns of travel and activity behaviour? To what extent can current TDMs capture these impacts, and how important are these impacts from a planning and policy-making standpoint? During the fourth year, DPTI can consider making additional improvements to the model, as described in greater detail in Chapter 5.

Strategic planning and policy-making

We recommend the adoption of a five-step scenario-based framework for investment appraisal. Scenario-based approaches for investment decision-making are increasingly being adopted by planning organizations, both nationally and internationally, to safeguard investment decisions against potential sources of future uncertainty. For more details on the framework, the reader is referred to Chapter 4.

1. **Identify long-term vision:** There are a number of planning documents that articulate a long-term vision for South Australia and its transport network. In general, we find that the long-term vision is well-defined, and not in need of any major change.
2. **Set measurable goals & targets:** The long-term vision needs to be translated into a set of goals and targets that can be forecasted well using available modelling tools. These goals and targets can subsequently be used to evaluate the performance of both the existing transport system, and any proposed changes to the same.
3. **Develop likely future scenarios:** Determine the planning horizon and identify expected changes in macro factors that serve as external inputs to the TDMs to develop future scenarios of greatest relevance to the planning and investment decision-making process. Relevant macro factors might include changes in demography, such as age and life cycle stages; changes in the economy, such as income and employment distributions across different industries; changes in the environment, such as climate change; and changes in technology, such as the emergence of driverless cars and unmanned aerial vehicles
4. **Identify potential projects:** The inclusion of potential projects within the investment appraisal process should be determined based on a common understanding of the biggest challenges currently facing the transport system, and challenges likely to emerge in the future. Additional consideration should also be given to the frequency with which these plans will be revised and updated, and the scale of projects that can feasibly be included within the assessment process.
5. **Assess and prioritize projects:** TDMs should be used to evaluate the performance of each of the projects identified in Step 4 for inclusion in the investment appraisal process, against the set of goals and targets identified in Step 2, across the range of scenarios and sub-scenarios identified in Step 3. Projects and policies that perform the 'best' should be prioritized.