National Infrastructure
Data Collection and Dissemination Plan

Consultation Draft – September 2017
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Foreword

The Bureau of Infrastructure, Transport and Regional Economics (BITRE) has released this draft version of the National Infrastructure Data Collection and Dissemination Plan (Data Plan) to assist individuals and organisations to contribute to the development of the Final Data Plan. It contains and outlines:

• an overview of the purpose, objectives and approach for developing the Data Plan
• an initial list of ‘Enduring Questions’ to address in the Data Plan
• data and information gaps related to the Enduring Questions
• prioritised Enduring Questions
• opportunities relating to Enduring Questions
• draft infrastructure and freight performance frameworks
• next steps and matters which BITRE are seeking comment and information.

Participants are not restricted to comment only on matters raised in the Draft Data Plan (Appendix A). BITRE wishes to receive information and comment on issues which participants consider relevant to the project’s Terms of Reference (Appendix B).

Comments and suggestions can be lodged online via BITRE@infrastructure.gov.au or by phone on +61 2 6274 7818.

Further information on the project and specific requests for input are available at https://bitre.gov.au/data_dissemination/tor.aspx

The Bureau of Infrastructure, Transport and Regional Economics (BITRE)

BITRE provides economic analysis, research and statistics on infrastructure, transport and regional development issues to inform Australian Government policy development and wider community understanding.

BITRE holds unique aviation, maritime, road and rail transport data collections which are made available in a number of publication series. BITRE also publishes the results of individual research projects. Most BITRE publications are made available on its website.

BITRE employs about 30 staff, comprising economists, statisticians, modellers, social researchers and policy analysts.

For more information visit https://bitre.gov.au/
Chapter 1: Introduction

Key Points

A National Infrastructure Data Collection and Dissemination Plan (Data Plan) is being developed to provide improved and more timely information for infrastructure decisions and monitoring infrastructure performance. This chapter of the Draft Data Plan summarises the background to the overall project and the process used to develop the Data Plan.

Background

Better software, better technology and better use of data is fundamentally changing the way that our infrastructure networks operate. As new technologies are developed and rapidly become very affordable, they are taken up very quickly by businesses and organisations in the infrastructure sectors. The increasing automation of infrastructure services is also fundamentally changing our built environment. Infrastructure assets and vehicles are now providing us with real-time information on the movement of people and goods.

New ways of generating, collecting, sharing and analysing data can help us determine where infrastructure investments are most required and how to better utilise existing infrastructure assets. The ability to connect infrastructure users with operators also has the potential promoting consumer-focussed infrastructure decision making.

For example, smart traffic sensors can report on road conditions and congestion. GPS Tracking devices can pinpoint the exact locations of buses or the whereabouts of emergency crews. Automated weather stations can report conditions, and smart phones contain sensors that can – when specifically authorised by their users to do so – collect their position, speed, commuting patterns, where they cluster at different times of the day and the environmental conditions around them.

The Australian Government recognises the opportunity to utilise the growing quantity of infrastructure and transport data. In November 2016, the Minister for Urban Infrastructure, the Hon Paul Fletcher MP, announced a focus on obtaining more and better data in the transport and infrastructure space, through a National Infrastructure Data Collection and Dissemination Plan (Data Plan). The announcement was made as part of the Commonwealth Government’s response to Infrastructure Australia’s Australian Infrastructure Plan, which also highlights the importance of data in infrastructure decision making.

The Data Plan will improve and coordinate information and data collection, and will provide improved and more timely information for infrastructure investment decisions and monitoring of the performance of Australia’s infrastructure networks. Developing opportunities to harness new data sources (including ‘Big Data’) from emerging data sources will be a key part of the Data Plan’s development.

Minister Fletcher released the Terms of Reference for the National Infrastructure Data Collection and Dissemination Plan on 28 February 2017 (Attachment B) that outlines the overall objectives of the Data Plan:
- Identify key national infrastructure and transport statistics;
- Develop national infrastructure performance measures;
- Identify opportunities to use new technologies to collect infrastructure data;
- Develop means of disseminating data to encourage innovation and improved public and private decision making; and
- Promote and identify priority projects that:
  - Fill key data gaps
  - Develop and report performance relevant to infrastructure operators and customers
  - Support innovation in data collection and use.

**Scope**

The Data Plan will focus on data used to assess and inform the performance, investment and planning related to Australia’s transport, water, energy and communications infrastructure networks and assets. Infrastructure use and impact will also be assessed as part of the Plan.

**Project management**

The Bureau of Infrastructure, Transport and Regional Economics (BITRE), within the Department of Infrastructure and Regional Development, is leading the development of the Data Plan, with assistance from an expert Steering Group (see Appendix C for membership).

**Building on similar projects**

The Data Plan will draw on similar recently completed, or ongoing, projects, including:
- The National Transport Commission’s (NTC): Who moves what where: Better informing transport planning for Australians
- Australian Strategic Transportation Agenda for Research and Technology (ASTART)
- The Australian Transport Data Action Network (ATDAN)
- New Zealand Transport Domain Plan and Transport Research Strategy 2016–2020
- State and territory transport and infrastructure data projects.
Approach for developing the Draft Data Plan

This Draft Data Plan was developed using a similar process to develop the *New Zealand Transport Domain Plan*. This involved the following steps:

**Identifying Enduring Questions, gaps and opportunities (Chapter 2)**
- Creating an initial list of ‘Enduring Questions’ to be addressed in the Data Plan, grouped by overarching topic (such as ‘Infrastructure performance’). These were developed based on Steering Group feedback and the Terms of Reference for the project. They outline the main infrastructure statistical and information needs for the Data Plan.
- Identifying and summarising *key data and information sources*, data and information gaps and opportunities that relate to the Enduring Questions. This provides an assessment of what we already know and what we need to know.
- Prioritising enduring questions and gaps based on early stakeholder feedback. This process serves to manage the scope of the Data Plan. The Data Plan is developed around these Prioritised Enduring Questions.

**Opportunities (Chapter 3)**
- Identifying opportunities to expand existing projects and develop new projects to address gaps.
- Identifying opportunities to utilise data from new and emerging technologies.

**Infrastructure performance measures (Chapter 4)**
- Developing an infrastructure performance framework and applying it to different infrastructure types
- The framework incorporates customer-side measures and producer-side measures (of which productivity is the primary focus here) of infrastructure performance and also suggests some whole-of-supply chain measures.

**Data dissemination (Chapter 5)**
- Consider the benefits from improved data dissemination.
- The need for a national framework for public data sharing and accessibility.
- Identifying priorities for improved data sharing and accessibility.

The Final Data Plan will incorporate stakeholder feedback and develop Priority Projects that relate to data priorities, utilising opportunities from new and emerging technologies, and improvements to data sharing and accessibility.

The steps involved in developing the Data Plan are summarised in Figure 1.1.

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4 Key data sources refer to high-level statistical and information sources that relate to transport activity and infrastructure networks.
How to Contribute to the Data Plan

BITRE is particularly interested in receiving input from individuals and organisations on the following aspects of the Draft Data Plan:

- Key statistical and information sources, and data and information gaps (Chapter 2)
- Prioritised Enduring Questions (Chapter 2)
- Opportunities (Chapter 3)
- Draft infrastructure and freight performance measures (Chapter 4)
- Priorities for improving infrastructure data sharing and accessibility (Chapter 5)
- Ideas for priority projects that relate to data gaps associated with prioritised Enduring Questions.
Specific requests for input are listed in Appendix A. Formal submissions may be made by email or mail.

**By email:**

BITRE@infrastructure.gov.au

**By post:**

Data Collection and Dissemination Plan  
Bureau of Infrastructure, Transport and Regional Economics  
Department of Infrastructure and Regional Development  
GPO Box 594  
CANBERRA CITY ACT 2601

Submissions are open until 1 November 2017.
Chapter 2: Enduring Questions

Key Points

This chapter summarises the prioritised Enduring Questions that were identified through initial stakeholder consultation and form the basis of the Data Plan. These Enduring Questions outline the underpinning reasons for collecting infrastructure data. Associated gaps and opportunities are also summarised.

Draft Enduring Questions and key data sources

Enduring questions were developed based on the Terms of Reference for the Data Plan and Steering Group input. They outline the overarching questions that need to be addressed in order to provide improved and more timely information for infrastructure investment decisions and monitoring of the performance of Australia’s infrastructure networks.

Enduring Questions were grouped into six broad categories:

1. **Infrastructure stocktake**
   
   These questions seek to provide descriptive statistics on Australia’s major economic infrastructure networks (transport, communications, energy and water). This information is essential for infrastructure planning, measuring performance and understanding the impact of infrastructure.

2. **Infrastructure performance**
   
   Australians expect their infrastructure networks to support a high quality, first world standard of living\(^5\). These questions seek to assess the performance of Australia’s major economic infrastructure networks and also develop customer-focussed measures of infrastructure performance.

   A draft Infrastructure Performance Framework based on these questions is included in Chapter 4. Freight performance measures are also applied to this framework.

3. **Infrastructure investment and planning**
   
   Investment in infrastructure has the capacity to stimulate and enhance the productivity of the economy in both the short and long term. It is an investment that has a multiplier effect throughout the economy, generating lasting economic, social and environmental benefits. These questions seek to provide better information to promote sound infrastructure investment, decision making and planning by governments.

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4. Impact of infrastructure

Efficient and effective infrastructure is a key driver of the Australian economy and its use has significant environmental impacts, for example, through carbon emissions. Infrastructure, or lack of infrastructure, also has key social impacts, such as, social exclusion. These questions attempt to better assess the economic, environmental and social impacts of infrastructure.

5a. Infrastructure use – Transport

These questions are aimed at improving the quality of freight and passenger data to enable better informed planning and policy development.

5b. Infrastructure use – Energy, Water and Communications

This section aims to better understand the provision of energy, water and communications services in Australia.

6. Data for decision making and innovation

These questions relate to improving the availability, discoverability and accessibility of government and non-government transport and infrastructure data.

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### Table 2.1 Draft Enduring Questions

<table>
<thead>
<tr>
<th>Topic</th>
<th>Enduring Questions</th>
</tr>
</thead>
</table>
| 1. Infrastructure Stocktake | EQ 1.1 – What infrastructure does Australia have, what is its capacity, geospatial location and value?  
EQ 1.2 – What is the condition of Australia’s infrastructure? |
| 2. Infrastructure and freight performance | EQ 2.1 – How well are Australia’s infrastructure networks performing?  
EQ 2.2 – How can customer satisfaction measures be combined with other infrastructure performance measures to provide a holistic measure of the performance of Australia’s infrastructure networks?  
EQ 2.3 – [Specifically] How well is Australia’s freight sector performing? |
| 3. Infrastructure investment and planning | EQ 3.1 – How well are infrastructure projects assessed in Australia before they are built?  
EQ 3.2 – What are the planned and actual costs and benefits involved in infrastructure projects?  
EQ 3.3 – How do infrastructure construction costs vary?  
EQ 3.4 – Are Australia’s infrastructure assets sufficient to meet current and projected needs? |
| 4. What are the impacts of our infrastructure? | EQ 4.1 – In what ways and to what extent does infrastructure provision impact on the environment?  
EQ 4.2 – What are the social impacts of infrastructure?  
EQ 4.3 – What are the main sources, types and quantities of economic benefits from transport? |
| 5a. Infrastructure use – Transport | EQ 5.1a – What freight is moving to, from and around Australia, what is it comprised of, how are different industries affecting the volume and value of freight?  
EQ 5.2a – How and when does freight move to, from and around Australia, and by what routes?  
EQ 5.3a – What barriers exist to efficiently transporting freight to, from and around Australia?  
EQ 5.4a – What are the key service characteristics of freight movement services in Australia (including cost, time and reliability) and how do these characteristics affect mode and route choice, and the amount and type of services provided?  
EQ 5.5a – How, when, why and in what numbers do people travel to, from and within Australia, for what purposes, what are the origins and destinations of their journeys? |
| 5b. Infrastructure use – Energy, Water and Communications | EQ 5.1b – What are the key service characteristics for water, energy and communications (including cost, time, speed, accessibility and reliability) and how do these characteristics affect the amount and type of services provided? |
| 6. Data for decision making and innovation | EQ 6.1 – What infrastructure data and information is currently publicly available and what datasets and information can be made available?  
EQ 6.2 – What data do governments need to provide in order to enable emerging technologies and innovative business models of infrastructure provision and use?  
EQ 6.3 How can existing and new data be used to enhance transport service delivery? What data can be collected from existing and future transport services and infrastructure? |
### Table 2.2  Key data and information sources, grouped by Enduring Question subject area

<table>
<thead>
<tr>
<th>Topic</th>
<th>Key data and information sources</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Infrastructure Stocktake</strong></td>
<td>Australian Infrastructure Audit (IA). Undertaken every five years and summarises current stock of infrastructure and whether this is sufficient to meet current and projected demand</td>
</tr>
<tr>
<td></td>
<td>Transport and Infrastructure Council Road Expenditure and Condition Plans and Asset Registers</td>
</tr>
<tr>
<td></td>
<td>Infrastructure Yearbook – BITRE—summary statistics for all economic infrastructure types</td>
</tr>
<tr>
<td></td>
<td>An assessment of available data, by sector, is included below:</td>
</tr>
<tr>
<td>Data available?</td>
<td>Gaps?</td>
</tr>
<tr>
<td>Transport</td>
<td>Yes – National and state-level data</td>
</tr>
<tr>
<td>Energy</td>
<td>Yes – particularly for rail. Also issues with consistency between collections (e.g road condition data and detailed road maintenance data).</td>
</tr>
<tr>
<td>Water</td>
<td>Yes – consistent data available for most states</td>
</tr>
<tr>
<td>Communications</td>
<td>Yes – data missing for small water providers and rural water services</td>
</tr>
<tr>
<td></td>
<td>Yes – limited publicly available data on condition of networks</td>
</tr>
<tr>
<td><strong>2. Infrastructure and freight performance</strong></td>
<td>BITRE’s review of existing performance frameworks² summarises some available infrastructure performance frameworks.</td>
</tr>
<tr>
<td></td>
<td>Performance data is available for all infrastructure types, specific gaps include:</td>
</tr>
<tr>
<td>Transport</td>
<td>particularly around comparisons between states and modes</td>
</tr>
<tr>
<td>Energy</td>
<td>not all states covered, particularly for National Electricity Market (NEM) reliability indicators</td>
</tr>
<tr>
<td>Water</td>
<td>data missing for small water providers and rural water services, especially in regard to water quality indicators</td>
</tr>
<tr>
<td>Communications</td>
<td>limited information on internet reliability, actual internet speeds, and service quality for mobile phones</td>
</tr>
<tr>
<td><strong>3. Infrastructure investment and planning</strong></td>
<td>Infrastructure business cases, post completion reports, annual reports, industry reports (e.g. “Electricity Generation Major Projects”)</td>
</tr>
<tr>
<td></td>
<td>BITRE Infrastructure benchmarking report</td>
</tr>
<tr>
<td></td>
<td>Infrastructure asset management models</td>
</tr>
<tr>
<td></td>
<td>State government and BITRE demand forecasting</td>
</tr>
<tr>
<td></td>
<td>State government infrastructure and transport planning documents</td>
</tr>
<tr>
<td></td>
<td>ABS population projections</td>
</tr>
<tr>
<td><strong>4. What are the impacts of our infrastructure?</strong></td>
<td>Infrastructure business cases</td>
</tr>
<tr>
<td></td>
<td>Benefit realisation studies (ex-post analyses)</td>
</tr>
<tr>
<td></td>
<td>ABS National Accounts (Gross Value Added by industry)</td>
</tr>
<tr>
<td></td>
<td>ABS Census information (e.g. employment/household location and spatial distribution of incomes).</td>
</tr>
<tr>
<td></td>
<td>BITRE Yearbook (transport emissions, safety and freight data help track the broader impacts of transport infrastructure).</td>
</tr>
<tr>
<td></td>
<td>Department of Environment, numerous reports about emissions by sector (e.g. Australia’s Emissions Projections)</td>
</tr>
</tbody>
</table>

² Appendix D contains more detailed information on key data and information sources.

Table 2.2  Key data and information sources, grouped by Enduring Question subject area (continued)\textsuperscript{9}

<table>
<thead>
<tr>
<th>5a. Infrastructure use – Transport</th>
<th>Infrastructure Yearbook (BITRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mode-specific domestic and international freight information (BITRE)</td>
</tr>
<tr>
<td></td>
<td>NTC’s Who Moves What Where Project (Freight)</td>
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<tr>
<td></td>
<td>New and alternative sources of road traffic-related data, such as, GPS, Bluetooth readers and video imaging detection\textsuperscript{10,11}</td>
</tr>
<tr>
<td></td>
<td>Household Travel Surveys (states) Journey to Work surveys (ABS)</td>
</tr>
<tr>
<td></td>
<td>Smart card (e.g. Opal, Myki) data</td>
</tr>
<tr>
<td></td>
<td>State government road reports and traffic data (numerous sources)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5b. Infrastructure use – Energy, Water and Communications</th>
<th>Infrastructure Yearbook (BITRE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Energy, Water and Communication specific government reports (e.g. ACMA monitoring report) and industry reports (e.g. Optus coverage maps)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. Data for decision making and innovation</th>
<th>Open data portals (data.gov.au and state and territory open data portals)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Transport and infrastructure data portals (e.g. Aurin Portal)</td>
</tr>
<tr>
<td></td>
<td>Infrastructure Pipeline portal (IPA), <a href="http://infrastructurepipeline.org/">http://infrastructurepipeline.org/</a></td>
</tr>
</tbody>
</table>

\textsuperscript{9} Appendix D contains more detailed information on key data and information sources.  
\textsuperscript{10} Data sources summarised in https://bitre.gov.au/events/2014/files/NewDataSources-BackgroundPaper-April%202014.pdf  
\textsuperscript{11} Data can also be used to assess infrastructure performance
Priority Enduring Questions, Gaps and Opportunities

Based on initial Steering Group consultation, the Enduring Questions were prioritised depending on the relevance of identified associated data and information gaps and the feasibility (in terms of cost and time) of addressing these data and information gaps as part of the Data Plan.

These Priority Enduring Questions serve to manage the scope of the Data Plan and promote the development of achievable Priority Projects (in the Final Data Plan). BITRE acknowledge that Enduring Questions not prioritised are still important and warrant attention.

Table 2.3 Prioritised Enduring Questions, grouped by Enduring Question subject area

<table>
<thead>
<tr>
<th>Topic</th>
<th>Prioritised Enduring Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Infrastructure Stocktake</td>
<td>EQ 1.2 – What is the condition of Australia’s infrastructure?</td>
</tr>
<tr>
<td>2. Infrastructure and freight performance</td>
<td>EQ 2.1 – How well are Australia’s infrastructure networks performing?</td>
</tr>
<tr>
<td></td>
<td>EQ 2.3 – [Specifically] How well is Australia’s freight sector performing?</td>
</tr>
<tr>
<td>3. Infrastructure investment and planning</td>
<td>EQ 3.2 – What are the planned and actual costs and benefits involved in infrastructure projects?</td>
</tr>
<tr>
<td></td>
<td>EQ 3.3 – How do infrastructure construction costs vary?</td>
</tr>
<tr>
<td></td>
<td>EQ 3.4 – Are Australia’s infrastructure assets sufficient to meet current and projected needs?</td>
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<tr>
<td>4. What are the impacts of our infrastructure?</td>
<td>EQ 4.3 – What are the main sources, types and quantities of economic benefits from transport?</td>
</tr>
<tr>
<td>5a. Infrastructure use – Transport</td>
<td>EQ 5.1a – What freight is moving to, from and around Australia, what is it comprised of, how are different industries affecting the volume and value of freight?</td>
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<tr>
<td></td>
<td>EQ 5.2a – How and when does freight move to, from and around Australia, and by what routes?</td>
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<td></td>
<td>EQ 5.3a – What barriers exist to efficiently transporting freight to, from and around Australia?</td>
</tr>
<tr>
<td></td>
<td>EQ 5.5a – How, when, why and in what numbers do people travel to, from and within Australia, for what purposes, what are the origins and destinations of their journeys?</td>
</tr>
<tr>
<td>5b. Infrastructure use– Energy, Water and Communications</td>
<td>EQ 5.1b – What are the key service characteristics for water, energy and communications (including cost, time, speed, accessibility and reliability) and how do these characteristics affect the amount and type of services provided?</td>
</tr>
<tr>
<td>6. Data for decision making and innovation</td>
<td>EQ 6.1 – What infrastructure data and information is currently publicly available and what datasets and information can be made available?</td>
</tr>
<tr>
<td></td>
<td>EQ 6.2 – What data do governments need to provide in order to enable emerging technologies and innovative business models of infrastructure provision and use?</td>
</tr>
</tbody>
</table>
Table 2.4  Prioritised Enduring Questions, associated data and information gaps and opportunities

<table>
<thead>
<tr>
<th>EQ</th>
<th>Data and Information Gaps</th>
<th>Opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2</td>
<td>Data for better infrastructure asset management and the ability to make like-for-like comparisons.</td>
<td>Cost effective approach to monitoring of (transport infrastructure) assets. Using this data to create a national database.</td>
</tr>
<tr>
<td>2.1</td>
<td>A consistent approach for measuring infrastructure performance.</td>
<td>Develop an Infrastructure performance framework and key performance metrics for transport, energy water and communications sectors.</td>
</tr>
<tr>
<td>2.3</td>
<td>Measuring freight performance.</td>
<td>Develop a national freight performance framework and associated freight indicators.</td>
</tr>
<tr>
<td>3.2</td>
<td>Determining the accuracy of benefit cost ratios (BCRs).</td>
<td>BITRE to continue post completion analysis work.</td>
</tr>
<tr>
<td>3.3</td>
<td>Assessing value for money in infrastructure investments.</td>
<td>BITRE to continue cost benchmarking work.</td>
</tr>
<tr>
<td>3.4</td>
<td>Population estimates or growth factors for rapidly growing small areas.</td>
<td>Develop short-term population updates or growth factors for the fast growing areas.</td>
</tr>
<tr>
<td>4.3</td>
<td>Measuring transport’s economic contribution.</td>
<td>Develop Transport Satellite Account.</td>
</tr>
<tr>
<td>5.1a</td>
<td>Better understanding the movement of freight to and from ports.</td>
<td>Utilise Customs data collected by the Department of Immigration and Border Protection.</td>
</tr>
<tr>
<td>5.2a</td>
<td>Determining points of congestion for freight vehicles and when road freight is moved around Australia.</td>
<td>BITRE to continue and expand their collection and analysis of truck telematics data.</td>
</tr>
<tr>
<td>5.3a</td>
<td></td>
<td>Use of emerging data sources.</td>
</tr>
<tr>
<td>5.5a</td>
<td>Understanding large scale patterns in the movement of people.</td>
<td></td>
</tr>
<tr>
<td>5.1b</td>
<td>Reporting on water, energy and communications infrastructure use.</td>
<td>Track developments in water, energy and communications infrastructure use reporting.</td>
</tr>
<tr>
<td>6.1</td>
<td>Consistent data standards for transport and infrastructure data.</td>
<td>Promoting consistent data standards.</td>
</tr>
<tr>
<td>6.1</td>
<td>Locating and understanding available transport and infrastructure datasets.</td>
<td>Projects aimed at improving the discoverability and metadata information for infrastructure datasets (e.g. improvements to data.gov.au).</td>
</tr>
<tr>
<td>6.1</td>
<td>Incomplete recording of historical infrastructure and transport data, policies and regulation.</td>
<td>Promote the recording of historical infrastructure data and information.</td>
</tr>
<tr>
<td>6.1</td>
<td>Data sharing guidance, methods and standards.</td>
<td>Facilitate data sharing by developing data sharing guidance, methods and standards.</td>
</tr>
<tr>
<td>6.2</td>
<td>Open data to support the implementation of Connected and Automated Vehicles (CAVs).</td>
<td>Identify gaps between what road operator data is provided to users (e.g. TomTom) and what is likely to be required in future for CAV operations.</td>
</tr>
</tbody>
</table>
Chapter 3: Opportunities

Key Points

This chapter outlines opportunities to address the information and data gaps identified for the Prioritised Enduring Questions (summarised in Table 2.4). Opportunities are grouped into ‘expanding ongoing projects’, ‘developing new projects’ and ‘harnessing data from new and emerging sources’. Case studies illustrating how data can be used to address gaps are also discussed. ‘Infrastructure and freight performance’ Enduring Questions (EQ 2.1 and 2.3) and ‘Data for decision making and innovation’ Enduring Questions (EQ 6.1 and 6.3) are discussed in more detail in Chapter 4 and 5.

EQ 1.2 – What is the condition of Australia’s infrastructure?

Data gap: Data for better transport infrastructure asset management and the ability to make like-for-like comparisons.

Description: Current monitoring of transport infrastructure assets (such as roads, tracks, bridges, and tunnels) is made on an ad hoc basis, with data being collected by private or public entities. This leads to difficulties in developing consistent infrastructure asset management measures and difficulties in having near real-time asset management (where needed).

Opportunity: There is a need for a cost effective approach to monitoring transport infrastructure assets and using this data to create a national database, similar to the Heavy Vehicle Infrastructure Asset Registers (Case Study 3.1). There is also an opportunity to use more data from smart sensors and other emerging data sources for real time monitoring of infrastructure assets.

<table>
<thead>
<tr>
<th>Expanding existing work</th>
<th>New project</th>
<th>Data from new and emerging sources</th>
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</table>

EQ 2.1 – How well are Australia’s infrastructure networks performing?

Data gap: A consistent approach for measuring infrastructure performance.

Description: In many cases, there is little or no requirement for infrastructure operators to collect performance data that can be used to measure performance or to enable comparisons to be made between infrastructure asset types. In even fewer circumstances has data been used to incentivise infrastructure owners to respond to the needs of their customers. This leads to difficulties in comparing infrastructure performance across infrastructure operators and asset types.

Opportunity: Develop a consistent and general framework for comparing performance, incorporating customer satisfaction, across different infrastructure asset types and to develop infrastructure key performance measures. This is addressed in Chapter 4 of the Data Plan.

<table>
<thead>
<tr>
<th>Expanding existing work</th>
<th>New project</th>
<th>Data from new and emerging sources</th>
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</table>
Case Study 3.1 - Heavy Vehicle Infrastructure Asset Registers

Heavy Vehicle Infrastructure Asset Registers (asset registers) provide information on key freight routes across Australia. The asset registers increase the transparency of service delivery to the heavy vehicle industry and enhance public understanding of the performance of the road infrastructure network.

The asset registers are developed annually for each jurisdiction and published on the Transport and Infrastructure Council website. The information is provided in both data tables and interactive map files, which can be opened in Google Earth or a similar mapping application.

Opportunities exist to improve and expand on the asset registers over time, including, for example: harmonisation of asset reporting data across states and territories; improved data accessibility; and increased breadth of data – to incorporate more roads.

The image to the left shows heavy vehicle infrastructure routes in Ravenshoe (Far North Qld).

Ratings above the expected level for a particular road type are coloured blue, those within the expected range are coloured green while those with a rating below the expected range are coloured red.

EQ 2.3 – How well is Australia’s freight sector performing?

Data gap: Measuring freight performance.

Description: Mode-specific freight indicators are currently available in a number of publications from BITRE and other sources. However, this information is not easily available, making comparisons across transport modes difficult. There is also limited information on supply chain performance measures.

Opportunity: Develop a freight performance framework, including identifying and developing new performance measures – This is addressed in Chapter 4 of the Data Plan.

| Expanding existing work | ✓ | New project | × | Data from new and emerging sources | ✓ |

EQ 3.2 – What are the planned and actual costs and benefits involved in infrastructure projects?

**Data gap:** Determining the accuracy of cost benefit studies for infrastructure projects.

**Description:** Governments at all levels make infrastructure spending decisions based on cost-benefit analyses (CBA). CBAs are a rigorous, transparent, quantitative method that measures the degree to which individual projects generate net benefits (benefits minus costs) across Australia, and allows comparison and ranking of options and projects\textsuperscript{13}. CBAs are conducted ex-ante (before construction), meaning, based on CBAs only, there is limited information on the accuracy of CBA predictions and whether projects fulfil their objectives.

**Opportunity:** Conduct independent post completion (ex-post) evaluations of CBAs for infrastructure projects and make findings publicly available. This will complement work already completed by BITRE (see Case Study 3.2).

| Expanding existing work | ✓ | New project | ✗ | Data from new and emerging sources | ✗ |

**Case Study 3.2 - Ex-post Economic Evaluation of National Road Investment Projects**

BITRE has undertaken two rounds of ex-post evaluations of national road investment projects: one in 2005-2007 and the other in 2014-2016. BITRE Research Report 145 (unpublished) synthesises the earlier ex-post evaluation results with the aim of identifying opportunities to improve future cost-benefit analysis (CBA) and project appraisal. Evidence drawn from the ex-post case studies suggests there is much room for improvement in the quality of practical Australian road CBAs if they are to be used as an effective tool for option ranking and project prioritisation purposes.

Key areas identified for improvement include:

- CBA documentation
- CBA review
- Traffic forecasts
- Road user benefit assessment; and
- Project cost estimation.

Findings of this report are expected to inform the ongoing update of Australian Transport Assessment and Planning (ATAP) guidelines and Infrastructure Australia’s Assessment Framework, which will in turn contribute to making better infrastructure investment decisions in future.

\textsuperscript{13}BITRE (2014), Overview of Project Appraisal for Land Transport. 
EQ 3.3 – How do infrastructure construction costs vary?

**Data gap:** Assessing value for money in infrastructure investments.

**Description:** Careful evaluation of infrastructure construction costs is essential to ensure value for money in infrastructure investments, a fact noted by the 2014 Productivity Commission inquiry into Public Infrastructure\(^{14}\).

**Opportunity:** In response to the Productivity Commission Inquiry, Australian, state and territory governments committed to carrying out regular cost benchmarking for road projects through the Transport and Infrastructure Council (TIC). BITRE subsequently completed a pilot cost-benchmarking study for TIC in 2015\(^{15}\), which covered 65 separate road projects. This work is being updated in 2017 to cover recently completed construction projects. The active participation of the Australian, state and territory governments in road cost benchmarking helps identify opportunities for improved practice to reduce costs. There is also the potential to expand this work to include non-transport sectors. The water sector has been identified as the next priority.

| Expanding existing work | ✓ | New project | ✓ | Data from new and emerging sources | ✓ |

EQ 3.4 – Are Australia’s infrastructure assets sufficient to meet current and projected needs?

**Data gap:** Population estimates or growth factors for rapidly growing small areas

**Description:** Small area estimated residential populations are used by governments as part of their infrastructure planning. These estimates are based on census data (collected every five years), with estimates for non-census years calculated by the ABS using indicator data (e.g. Medicare enrolments)\(^ {16}\). These population estimates are released annually, nine months after the reference date, and so the latest estimate for an area can be up to 21 months old. For most parts of Australia, where populations do not change too much over time, population estimates up to 21 months old are still relevant, but for the most rapidly growing areas – particularly some urban areas in Melbourne and Sydney – populations can change substantially over this 21-month period. Furthermore, the accuracy of modelled population estimates declines the further out from a Census year they are prepared.


**Opportunity:** The ABS could take on responsibility for developing short-term population updates or growth factors for the fastest growing areas – thereby reducing the need for multiple government departments to produce their own population estimates, and leading to a consistent methodology. These estimates would need to draw on a wide range of data sources, some not currently utilised in the development of population estimates.

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</table>

**EQ 4.3 – What are the main sources, types and quantities of economic benefits from transport?**

**Data gap:** Measuring transport’s economic contribution.

**Description:** At present, a key gap that exists with transport statistics is having a set of detailed, up-to-date economic measures of transport activity undertaken within industries whose main function is not transport, including transport activities that occur as part of retail and within mining, agricultural and service industries.

**Opportunity:** The ABS to develop a “Transport Satellite Account” (TrSA) to assess the full contribution of transport across the whole of the economy. This would make it possible to measure transport activity undertaken by all industries, including their costs, capital expenditure, income, employment, hours worked, as well as volume data such as vehicle stocks and even emissions. The need for a TrSA has been raised by ATDAN and the NTC\(^7\), and would also be integral for developing transport productivity estimates (see Chapter 4, ‘Infrastructure Productivity’). Preliminary scoping work for a TrSA been carried out by the ABS\(^8\).

<table>
<thead>
<tr>
<th>Expanding existing work</th>
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<th>Data from new and emerging sources</th>
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EQ 5.1a – What freight is moving to, from and around Australia, what is it comprised of, how are different industries affecting the volume and value of freight?

Data gap: Better understanding the movement of freight to and from ports.

Description: BITRE currently reports on Australia’s international trade using trade data from the ABS, which is based on Customs information collected by the Department of Immigration and Border Protection (DIBP). This data provides information on commodity type, mode of transport (air or sea), freight volume and value, and port of origin and destination\(^1\). However, DIBP also collects more detailed data that provides information on how freight is carried (for example, containerised versus non containerised) and the location (postcode) of the importer or exporter.

Opportunity: NTC recently established a data sharing arrangement with DIBP for BITRE and state territory transport agencies to access confidentialised Customs freight data. There is an opportunity to utilise this data source to better understand freight movements to and from ports in Australia.

| Expanding existing work | ✗ | New project | ✓ | Data from new and emerging sources | ✗ |

EQ 5.2a – How and when does freight move to, from and around Australia, and by what routes?; and

EQ 5.3a – What barriers exist to efficiently transporting freight to, from and around Australia?

Data gap: Determining points of congestion for freight vehicles and when road freight is moved around Australia.

Description: The high cost and significant lag time of collecting freight-related data by traditional surveys means that detailed data on road freight movements in Australia is scarce, not sufficiently timely and not available at low enough levels of geography. This lack of sufficient data to inform decision making increases the risk of governments underinvesting, or investing in the wrong places. There is also limited data on congestion, which is of particular interest to the public, industry and government.

Opportunity: BITRE and the ABS are currently working to develop innovative means of collecting road freight data from telematics and administrative data sources. This project has involved collaboration with the Australian Trucking Association (ATA) and Australian Logistics Council (ALC), freight industry operators, government agencies, vehicle telematics services providers and other freight industry stakeholders.

A pilot study using vehicle telematics data was completed in 2016 (see Case Study 3.3).

BITRE is currently working with Data61 to expand this pilot study into a pilot collection, by moving to routine collection of data from a larger sample of fleet operators. This will enable users inside and outside government to better understand the freight industry, including identifying points of congestion and patterns in the movement of road freight.

<table>
<thead>
<tr>
<th>Expanding existing work</th>
<th>New project</th>
<th>Data from new and emerging sources</th>
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</thead>
<tbody>
<tr>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
</tbody>
</table>

**Case Study 3.3 – Road freight telematics pilot study**

BITRE and the ABS recently completed a pilot study using vehicle telematics data based on one month of vehicle GPS records, collected from 1,500 vehicles. This equates to approximately 18 million individual GPS records. Data from the analysis provides insights into questions that influence government and private sector decisions that shape our transport infrastructure, including:

- What routes are currently used by freight vehicles, and do these align with agreed national freight routes?
- Where does freight congestion occur? What parts of the network are the most congested locations for freight?
- Where do trucks stop? Is the existing network of rest stops and service centres adequate?
- How do route travel times vary across urban areas?
- How do freight movements vary over time and by region?

The figure (left) is based on the GPS sample dataset and shows average truck speeds across roads in the Sydney Greater Metropolitan Area, during the sample period (May 2016). Red sections represent slow average speeds and the coloured circles represent stops at popular stop locations.
EQ 5.5a – How, when, why and in what numbers do people travel to, from and within Australia, for what purposes, what are the origins and destinations of their journeys?

Data gap: Understanding large scale patterns in the movement of people.

Description: Temporary population estimates, which represent actual population counts for areas at particular points in time, are a significant data gap and provide information on large scale movements of people. For example, patterns in movements of people from their usual residence to place of work or study. This is particularly a problem for regional areas, where movement data sources often do not exist (e.g. Smart Card data). A data gap also exists in understanding how and why people travel within Australia.

Opportunity: There is an opportunity to use telecommunications data (see Case Study 3.4) and other emerging sources of data (see Case Study 3.5) to better understand the movement of people within Australia, both in regional and urban areas. This could compliment already completed work by the ABS and other agencies.

Expanding existing work ✗ New project ✓ Data from new and emerging sources ✓

Case Study 3.4 – Telstra Location Insights®

Telstra Location Insights® utilises aggregated and anonymised GSM (Global Systems for Mobile Communications) data from Telstra’s national mobile network and CRM platform. Telstra weights and projects against the ABS universal estimates, enabling Telstra to offer rich insights on the movements of the national Australian population, with characteristics such as location, travel patterns, times and demographics while ensuring that customer privacy is protected. As of 11 May 2017, Telstra has matured its spatial resolution offering from SA2 sized geometries to higher granularity of SA1 sized areas.

Customers are able to access near real-time insights on transient populations. Organisations can plan and report on performance of infrastructure before, during and after implementations, a council can quantify the strain of tourism on local facilities or government bodies can observe and predict the shift in population movements stemming from a natural disaster.

The figure (left) is based on analysis Telstra completed for a client to better understand transient populations. The figure shows population insights at an SA1 level covering the Melbourne CBD district and inferring residential, worker and visitor representations using sophisticated data science modelling.

Case Study 3.5 – Using retail data to provide insights on the travel habits of granular population segments

Within Quantum’s data ecosystem, there are over 20 trillion data points on the everyday habits of Australians, including anonymised credit and debit transaction records. Quantum has applied analytics to these data points and other open source routing data to map citizen journeys. This was done by looking at their transactions location at each point in their journey and applying algorithm to predict which path they would have taken. This analysis provides insights into the travel habits of different population segments and answers several questions, such as:

- Who are the travellers?
- Where are they travelling to?
- Why are they travelling? (for example, grocery shopping or attending medical appointments)
- Which segment of the road network are they using?

The images below shows retail footprint of citizens aged 65+ who live in the Sydney suburb of Liverpool, by time of day and postcode. Darker colours represent higher number of retail transactions.

These images (Images) have been prepared by The Quantum Group Pty Limited and / or Market Blueprint Pty Ltd (together, Quantum) using raw data owned by National Australia Bank Limited (NAB). NAB has not been involved in the analysis of the raw data, nor the preparation of these Images and does not make any representation (express or implied), nor give any warranty in relation to the accuracy, completeness or appropriateness of the raw data or the analysis supporting these Images. To the maximum extent permitted by law, NAB expressly disclaims, takes no responsibility for and has no liability for the preparation, contents, accuracy or completeness of these Images or the analysis on which it is based. The information in this report is provided in confidence and may only be used for the purpose provided and may not be reproduced or disclosed without permission.
EQ 5.1b – What are the key service characteristics for water, energy and communications (including cost, time, speed, accessibility and reliability) and how do these characteristics affect the amount and type of services provided?

**Data gap:** Better reporting on water, energy and communications infrastructure use.

**Description:** BITRE currently reports on water, energy and communications infrastructure use in its Australian Infrastructure Yearbook based on data provided by external sources. However, as specified in Table 2.2 and Appendix D, key data and information gaps exist for these sectors, including, for example, lack of data for rural water suppliers and limited data on actual internet speeds.

**Opportunity:** There is an opportunity to track developments in water, energy and communications infrastructure use reporting, and to use new data and information sources to report on infrastructure use. This could be done by reviewing data sources as well as including these sectors in the Infrastructure Performance Measurement Framework (discussed in Chapter 4).

| Expanding existing work | ✓ | New project | × | Data from new and emerging sources | ✓ |
Chapter 4: Infrastructure performance measures

Key Points

This chapter presents a proposed draft infrastructure performance framework that is sufficiently general enough to cover the wide range of infrastructure sub-sectors, but at the same time also provides for collection of detailed measures to provide meaningful performance information. The framework incorporates customer-side measures and producer-side measures (of which productivity is the primary focus here) of infrastructure performance and also suggests some whole-of-supply chain measures. Data priorities relating to measuring infrastructure performance are also discussed.

Customer performance framework

Historically infrastructure performance has usually been measured on a mode-specific basis and often using producer-centric output-based measures. However for customers, more relevant measures include service availability, timeliness and reliability. Increasingly, for many customers, whole-of-supply-chain, or door-to-door, performance is also of greater importance than the performance of any individual mode or part of the transport supply chain.

Currently there is no customer-focused, consistent and broadly implemented infrastructure performance measurement framework. In response to this, BITRE, in collaboration with the Better Infrastructure Initiative, recently released a report, Measuring infrastructure asset performance and customer satisfaction\(^{21}\), which outlines a newly developed infrastructure performance framework created from the perspective of infrastructure users.

Service quality performance measures

The framework combines objective service quality performance measures and customer perception of performance (subjective performance measures). The framework is divided into seven service quality attributes which are applicable across the transport, water, communications and energy sectors:

- **Price** – what customers must pay to access an infrastructure asset or service.
- **Accessibility/availability** – the degree to which an infrastructure service is accessible by its customer or potential customers, either as a result of its coverage, its proximity to other forms of infrastructure, and/or the frequency, and/or class of service\(^{22}\) (if applicable).
- **Timeliness** – the average infrastructure service delivery time.

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\(^{21}\) BITRE (2017), Measuring Infrastructure Asset Performance and Customer Satisfaction.

\(^{22}\) Class of service is relevant for when there are multiple classes of product in the same infrastructure asset category, which is particularly relevant for telecommunications services. For example, accessibility for mobile telecommunications services may relate to the coverage of 4G signal in a particular area, and customer’s perception of the availability of 4G signal in that area. Ratings of telecommunication service speed may be covered in either the Timeliness service quality attribute, or the Reliability service quality attribute, depending on the performance measures available and the phrasing of customer perception questions.
• **Reliability** – the degree to which an infrastructure asset’s availability varies, including the variability in the timeliness (standard deviation) of services, travel times and the frequency and length of interruptions to normal services.

• **Safety** – typically measured by the number of casualties, health, and/or safety-related incidents associated with the infrastructure asset or the service provided.

• **User amenity** – the quality of an infrastructure asset or service provided, including crowding, compliance with disability standards and the presence of desirable additional features.

• **Information** – the availability to consumers of timely and up-to-date information on the status of the preceding service quality attributes.

Several further measures are frequently of great interest to infrastructure operators and governments, if not to customers, and are often essential to gauging the operational efficiency of infrastructure services. These include:

• **Activity (use)** – the number of users (for example, passengers, freight volume, vehicles or other relevant metric) of the infrastructure over a period of time.

• **Capacity** – the capacity of the infrastructure or service in terms of either throughput per unit time and/or maximum storage capacity at any point in time (where applicable).

These supplementary measures provide indicators of infrastructure service output, rather than service outcomes encapsulated by the seven service quality attributes.

Several additional measures can be derived from these and other data sources, including:

• **Capacity utilisation** – a measure of the margin to accommodate additional utilisation derived from measures of activity and capacity. (The ACCC’s Airport Monitoring Report, for example, captures and reports capacity utilisation measures across several aspects of airport operations).

• **Productivity** – the level of output (throughput) per unit of input (See *Infrastructure productivity* section for further discussion).

**Applying the framework**

As per Figure 4.1, the framework involves identifying,

1. the infrastructure asset type;
2. the customer segment; and
3. an objective measure and customer perception measure for each service quality attribute, and an objective measure for each supplementary output attribute (activity and capacity).
Objective measures and customer perceptions are then combined into a single metric for each service quality attribute and output attribute using Eboli and Mazzulla’s (2011) methodology. As an example, Table 4.1 presents the infrastructure performance and customer satisfaction framework in a form that shows how it might be applied to residential urban water. The measures are sourced from the Bureau of Meteorology’s *Urban water utilities national performance report*, but further consideration should be given as to which measures are the most suitable proxies for each service quality attribute.

**Table 4.1 Application of Infrastructure Performance and Customer Satisfaction Framework, Urban Water – Residential**

<table>
<thead>
<tr>
<th>Service quality attribute</th>
<th>Candidate objective measures</th>
<th>Customer perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>Annual bill based on 200kL/a – $</td>
<td>Residential customer rating of water costs</td>
</tr>
<tr>
<td>Availability</td>
<td>Average duration of an unplanned interruption – minutes</td>
<td>Residential customer rating of water availability</td>
</tr>
<tr>
<td>Timeliness</td>
<td>Na</td>
<td>Na</td>
</tr>
<tr>
<td>Reliability</td>
<td>Average frequency of unplanned interruption per 1 000 properties</td>
<td>Residential customer rating of water reliability</td>
</tr>
<tr>
<td>Safety</td>
<td>Percentage of population where microbial compliance is achieved</td>
<td>Residential customer rating of water safety</td>
</tr>
<tr>
<td>Amenity</td>
<td>Water quality complaints per 1 000 properties</td>
<td>Residential customer rating of water quality</td>
</tr>
<tr>
<td>Information</td>
<td>Na</td>
<td>Na</td>
</tr>
<tr>
<td>Activity</td>
<td>Average annual residential water supplied – kL per property</td>
<td>na</td>
</tr>
<tr>
<td>Capacity</td>
<td>Urban water storage/conveyancing capacity</td>
<td>na</td>
</tr>
</tbody>
</table>

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23 Adapted from BITRE (2017), *Measuring Infrastructure Asset Performance and Customer Satisfaction*.
Table 4.2 presents how the framework might be applied to roads. Most of the measures are taken from the Transmission Gully Project (New Zealand road project) performance contract, so would most readily apply to toll roads, or other individual major roads, rather than a road network as a whole.

<table>
<thead>
<tr>
<th>Service quality attribute</th>
<th>Candidate objective measures</th>
<th>Customer perception</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>Cost of toll</td>
<td>Road user rating of toll price</td>
</tr>
<tr>
<td></td>
<td>Average annual increase in toll</td>
<td></td>
</tr>
<tr>
<td>Availability</td>
<td>Percentage of time during the period whole road is available to traffic</td>
<td>Road user rating of road availability</td>
</tr>
<tr>
<td>Timeliness</td>
<td>Average time to delivery of upgrades/maintenance</td>
<td>Road user rating of duration of road works</td>
</tr>
<tr>
<td>Reliability</td>
<td>Percentage of time during the period where travel times exceeds baseline travel time</td>
<td>Road user rating of congestion</td>
</tr>
<tr>
<td>Safety</td>
<td>Number of incidents not responded to within 25 minutes after receipt of notification</td>
<td>Road user rating of incident response</td>
</tr>
<tr>
<td></td>
<td>Number of causalities/road crashes/fatalities on road</td>
<td>Road user rating of safety of road</td>
</tr>
<tr>
<td>Amenity</td>
<td>Percentage of road meeting pavement condition assessment standard</td>
<td>Road user rating of road surface</td>
</tr>
<tr>
<td>Information</td>
<td>Availability of real-time road and travel condition information to road users</td>
<td>Road user rating of information services (e.g. road closure, travel time advice, etc.)</td>
</tr>
<tr>
<td>Activity</td>
<td>Average daily traffic</td>
<td>Na</td>
</tr>
<tr>
<td>Capacity</td>
<td>Maximum free flow traffic capacity</td>
<td>Na</td>
</tr>
</tbody>
</table>


Infrastructure productivity

Productivity is a measure of the rate at which inputs (labour, capital and intermediate goods) are transformed into outputs. Infrastructure operators and governments focus on productivity because, in developed economies, improved productivity is the largest driver of long-term income and GDP growth, as well as a measure of competitiveness of trade-exposed industries.

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BITRE produces two regular reports providing industry production performance:

- **Waterline** provides information on container movements on both the wharf-side and landside of five major Australian port terminal: Brisbane, Sydney, Melbourne, Adelaide and Fremantle. The twice-yearly publication includes 24 container terminal productivity measures, covering both capital and labour productivity measures.

- **Trainline** provides an overview of freight, urban and non-urban passenger rail. The report analyses traffic levels, the provision of infrastructure and rolling stock, and railway performance.

BITRE has also previously analysed long-term trends in productivity in the road transport sector. In the report, *Truck productivity: sources, trends and future prospects*[^27], BITRE calculated that average road freight productivity doubled between 1971 and 2007, meaning that the 2007 road freight task required half as many vehicles as would have been required in the absence of productivity growth.

One problem with the existing data on transport productivity is that the transport, postal and warehousing industry classification under the Australian and New Zealand Standard Industrial Classification system only covers businesses whose primary activity is to provide transport, postal and/or warehousing activities to third parties. This means, for example, that all of the transport-related construction activity (e.g. rail infrastructure to Port Hedland) that has taken place in the mining industry over the past decade is captured by mining sector productivity statistics, not the transport, postal and warehousing productivity statistics. As a further example, only around a third of total road vehicle capital and operating expenditure in 2010-11 was made by the transport, postal and warehousing sector[^28]. A Transport Satellite Account in the System of National Accounts would “present a more complete picture of transport activity within the national accounting framework by explicitly measuring transport services in all industries, not just the transport industry”[^29]. Developing a Transport Satellite Account is listed as a data development opportunity in Chapter 3 – EQ 4.3 – “What are the main sources, types and quantities of economic benefits from transport?”. A Transport Satellite Account would also present the opportunity to link physical data with monetary data contained in the National Accounts. To this end, the National Transport Commission (NTC) has recently considered potential measures of land transport activity and productivity that would allow jurisdictional- and national-level comparison of this data over time[^30]. Further work to develop additional productivity indicators would require calculating the physical capital assets of each infrastructure asset or transport mode.

End-to-end (supply chain) performance

As part of the Inquiry into National Freight and Supply Chain Priorities, BITRE has proposed a new focus on end-to-end supply chain performance\(^{31}\). The proposal centres on the performance of freight supply chains, rather than individual assets or single transport modes within the chain. This is an acknowledgement that exporters and importers are concerned with the aggregate performance of the freight network, rather than the performance of individual firms or assets along it. Many importers and exporters may only deal with one company along the freight supply chain (for example, a freight forwarder), rather than each firm that will handle their goods.

A similar case can be made for other infrastructure networks in which customers may only interact with one company. Residential and non-industrial electricity and gas customers only deal directly with their energy retailer, but the quality of service they receive is also dependent on various gas producers, electricity generators, and distribution and transmission companies.

End-to-end performance indicators

A narrower set of indicators will likely be possible for supply chain performance than are contained in the full Measuring infrastructure asset performance and customer satisfaction\(^{32}\) set. Additional measures, notably of productivity and capacity, which are important to the freight industry could also be included in the end-to-end performance framework.

Some proposed mode-specific indicators are summarised in Table 4.2 and include indicators currently available in a number of publications from BITRE (see Appendix D for descriptions of data sources), as well as some indicators in development and/or based on data from new and emerging sources.


\(^{32}\) BITRE (2017), Measuring Infrastructure Asset Performance and Customer Satisfaction
Table 4.3 Existing mode-specific freight performance indicators

<table>
<thead>
<tr>
<th></th>
<th>Container ports</th>
<th>Rail</th>
<th>Road</th>
<th>Air freight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost</strong></td>
<td>$/container (including landside)(^{23})</td>
<td>Freight rate estimates(^{34})</td>
<td>Freight rate estimates(^{34})</td>
<td>Freight rate estimates(^{34})</td>
</tr>
<tr>
<td></td>
<td>ABS producer price indexes(^{25}*)</td>
<td>ARTC revenue/km</td>
<td>ABS producer price index(^{24})</td>
<td></td>
</tr>
<tr>
<td><strong>Travel/transport time</strong></td>
<td>Container turnaround times(^{33})</td>
<td>Scheduled terminal to terminal time(^{23})</td>
<td>Some road speeds, as available from states(^{38})</td>
<td>Flight delays(^{41})</td>
</tr>
<tr>
<td></td>
<td>Truck turnaround times(^{33})</td>
<td></td>
<td>In development: Average travel time/Truck speeds on key freight routes(^{39})</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vessel turnaround times(^{33})</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Duration of import/export procedures(^{36})</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>95(^{th}) percentile of ship turnaround time(^{33})</td>
<td>Trains within 30 minutes of schedule(^{23})</td>
<td>In development: GPS truck movement data(^{40})</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ships waiting at anchorage &gt; 2hr(^{23})</td>
<td></td>
<td>GPS car data</td>
<td></td>
</tr>
<tr>
<td><strong>Productivity</strong></td>
<td>Wharfside, landside and whole of port indicators(^{23})</td>
<td>Tonnes/route (track)km.</td>
<td>Tonnes/truck per kilometre(^{23})</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ABS productivity estimates (whole of transport &amp; storage industry)(^{23})</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Capacity</strong></td>
<td>Ship turnaround times(^{33})</td>
<td>Scheduled dwell time (due to other trains using line)(^{37})</td>
<td>Congestion measures (e.g. GPS car data)</td>
<td>In development: truck speeds at congested locations (from GPS data)(^{40})</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Double stacking capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Permitted train lengths</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Safety</strong></td>
<td>Maritime fatalities and injuries(^{44})</td>
<td>Rail-related fatalities and injuries(^{44})</td>
<td>Fatalities and injuries from heavy vehicle crashes(^{45})</td>
<td>Aviation fatalities and injuries(^{44})</td>
</tr>
</tbody>
</table>

*The producer price index (PPI) measures changes over time in prices received by producers

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\(^{26}\) Available from Dept. of Immigration & Border Protection


\(^{29}\) See example in Chapter 4, Case Study 4.1.


Complementing the mode-specific performance indicators already collected and those in development, BITRE proposes investigating three additional indicators: access, land use/encroachment and emissions. These are summarised in Table 4.3.

### Table 4.4  Potential new mode-specific indicators

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Transport modes</th>
<th>Potential indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access</strong></td>
<td>Road</td>
<td>% of network accessible to each vehicle class</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% of producers within a set distance of network for each class</td>
</tr>
<tr>
<td><strong>Land use/encroachment</strong></td>
<td>All modes – Air and Sea Ports, intermodal terminals, logistics precincts</td>
<td>Population and jobs density within set distance of port precinct or intermodal terminal sites</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Congestion on roads approaching ports</td>
</tr>
<tr>
<td><strong>Environment</strong></td>
<td>Road, Rail, Air, Sea</td>
<td>Emissions per tonne kilometre of freight</td>
</tr>
</tbody>
</table>

### Overarching framework

These three perspectives presented in this chapter—customer, productivity and supply chain—are closely related. While they fulfil different purposes, one important commonality is the data used in each. The data for the three supply chain indicators include the same data that as three of the service quality attributes in the infrastructure performance and customer satisfaction framework. Data on activity and capacity can both be used by productivity measures and the infrastructure performance and customer satisfaction framework. The interaction of the three perspectives with data collection is shown in Figure 4.2.

### Figure 4.2  Data requirements for performance frameworks
Priorities for measuring infrastructure performance

The following data priorities are based on data gaps related to Enduring Questions under Topic 2 – ‘Infrastructure and freight performance’ (see Table 2.4).

**EQ 2.1 – How well are Australia’s infrastructure networks and assets performing?**

**Data gap:** A consistent approach for measuring infrastructure performance across and within infrastructure sectors.

**Description:** As discussed earlier in this chapter, BITRE has developed a consistent and general framework for comparing infrastructure performance.

**Opportunity:** Specific objective and customer-focussed service quality performance indicators for example water, energy, communications and transport assets could be developed or identified (based on existing performance reporting) and applied to this framework. These indicators could be presented in an accessible location and updated regularly to allow performance comparisons over time, and between and within infrastructure types and assets. The framework would also provide an opportunity to expose key data gaps.

| Expanding existing work | ✓ | New project | ✗ | Data from new and emerging sources | ✓ |

**EQ 2.3 – [Specifically] How well is Australia’s freight sector performing?**

**Data gap:** Measuring freight performance

**Description:** BITRE has recently proposed a National Freight Performance Framework and associated freight performance indicators.

**Opportunity 1:** Mode-specific freight indicators

As part of a National Freight Performance Framework, these freight indicators could be presented in a single location, which would increase visibility and provide an overall picture of freight performance (see example presentation in Table 4.5). This work would involve first developing a set of widely agreed performance indicators, some potential indicators are presented in Table 4.3.

| Expanding existing work | ✓ | New project | ✗ | Data from new and emerging sources | ✓ |
### Table 4.5  
Potential presentation of new mode-specific freight performance indicators, using price and reliability indicators as an example.

<table>
<thead>
<tr>
<th>Infrastructure asset</th>
<th>Customer</th>
<th>Service quality attribute</th>
<th>Objective measure</th>
<th>Performance over past decade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Container ports</td>
<td>Freight importers and exporters</td>
<td>Price</td>
<td>Port Interface Cost Index (real $/container, index 2016=100)</td>
<td><img src="image" alt="Graph showing steady performance over past decade" /></td>
</tr>
<tr>
<td>Rail</td>
<td>Freight movers</td>
<td>Price</td>
<td>Non-bulk rail freight rate (real $/ntk)</td>
<td><img src="image" alt="Graph showing steady performance over past decade" /></td>
</tr>
<tr>
<td>Road</td>
<td>Freight movers</td>
<td>Price</td>
<td>Non-bulk road freight rate (real $/ntk)</td>
<td><img src="image" alt="Graph showing steady performance over past decade" /></td>
</tr>
<tr>
<td>Air freight</td>
<td>Freight movers</td>
<td>Price</td>
<td>Air freight rate (real $/ntk)</td>
<td><img src="image" alt="Graph showing steady performance over past decade" /></td>
</tr>
<tr>
<td>Container ports</td>
<td>Freight importers and exporters</td>
<td>Reliability</td>
<td>95th percentile of ship turnaround time (hours)</td>
<td><img src="image" alt="Graph showing improving performance over past decade" /></td>
</tr>
<tr>
<td>Aviation</td>
<td>Freight movers</td>
<td>Reliability</td>
<td>% flights within 15 min of schedule</td>
<td><img src="image" alt="Graph showing steady performance over past decade" /></td>
</tr>
</tbody>
</table>

For specific supply chains, mode specific indicators could also be combined to calculate performance using a weighted\(^{46}\) score for each relevant mode. Indicative supply chains will be chosen to capture, as far as possible, a range of freight types, locations, and modes. Table 4.6 shows a potential list of indicative supply chains.

Mode-specific and whole of supply chain measures for these indicative supply chains could also be regularly updated, to monitor changes in performance over time, and to compare with similar domestic and international supply chains. There is also the potential to present mode-specific indicators through data visualisations (see Case Study 4.1 for HERE data example).

Table 4.6 - Potential Supply chains to include in supply chain performance reporting.

<table>
<thead>
<tr>
<th>Supply chain</th>
<th>Perspective represented</th>
<th>Representative routes</th>
<th>Transport modes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Road</td>
</tr>
<tr>
<td>Grain</td>
<td>Producer/exporter</td>
<td>Riverina -&gt; overseas</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WA wheatbelt -&gt; Perth</td>
<td></td>
</tr>
<tr>
<td>Export beef (air)</td>
<td>Producer/exporter</td>
<td>Darling Downs -&gt; overseas</td>
<td>✓</td>
</tr>
<tr>
<td>Imported manufactured goods</td>
<td>Final customer</td>
<td>Overseas -&gt; suburban retailer</td>
<td>✓</td>
</tr>
<tr>
<td>Intercapital general freight</td>
<td>Freight customer</td>
<td>Sydney -&gt; Brisbane</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Melbourne-Perth</td>
<td></td>
</tr>
</tbody>
</table>

\(^{46}\) Individual weightings will need to be developed, potentially based on time and/or distance.
Case Study 4.1 - Prototype road-speed performance dashboard

HoustonKemp has built a prototype road-speed dashboard using HERE traffic GPS probe data to provide information on speed performance and reliability of road networks.

The dashboard currently provides information on speed performance and reliability at a number of spatial scales: citywide, major roads, postcode, point to point custom route selection, and for individual roads. Users are provided with insights on road performance across a number of time dimensions, including hourly, AM and PM peaks, by day of the week, monthly and yearly.

The prototype version currently contains data from January 2013 to December 2016 and for Brisbane, but can be extended to include data up until yesterday and to all roads across Australia. The dashboard is currently only available to BITRE staff.

The screen shot (above) is from the Houston Kemp Dashboard showing speed performance and reliability measures.
Chapter 5: Data Dissemination

Key Points

This chapter provides a summary of current Australian data initiatives and commitments aimed at improving the availability of data, as well as specific examples of realised benefits associated with the release\(^{47}\) of infrastructure data. Data sharing is also discussed, focussing on infrastructure and transport data sharing activity. The need for a national framework for public data sharing and accessibility, and other priorities for improving infrastructure data sharing and accessibility are also highlighted.

Data held by governments and the private sector is often of high value and its use can lead to improved services delivery and better policy outcomes. Recognising the potential social and economic benefits associated with open data and data sharing, the Australian Government, and state and territory governments have recently made commitments and implemented several initiatives and projects to improve the release and sharing of public data. In addition, specific national infrastructure and transport data sharing and accessibility priorities are identified in this Data Plan. These are summarised in Figure 5.1 and discussed further in this Chapter.

Figure 5.1 Overview of open government data commitments and initiatives, infrastructure data sharing activities, and Data Plan data sharing and accessibility priorities.

\(^{47}\) It is important to recognise the distinction between the ‘release’ and ‘sharing’ of data. In the context of this Data Plan, ‘data release’ refers to making data accessible to all potential users without restrictions (open data), while ‘data sharing’ is the restricted provision of data to organisations or individuals.
Australian Government data commitments and leading entities

**Australian National Action Plan under the Open Government Partnership 2016-2018**

On 7 December 2016, the Australian Government released its first National Action Plan that contains open data commitments including the release of high-value datasets while maintaining public trust and addressing concerns about data sharing and release.

**Australia’s adoption of the International Open Data Charter**

On 27 March 2017, Australia adopted the International Open Data Charter as part of its Open Government National Action Plan. The Charter reinforces Australia’s commitment to open data agenda and enables Australia to share and learn best practice on international open data initiatives.


Commits Australian Government entities to make non-sensitive public data open by default, and also to other actions aimed at improving the availability and accessibility of public data, while maintaining appropriate security and privacy protections.

**Data Integration Partnership for Australia (DIPA)**

Data Integration Partnership for Australia (DIPA) is a Commonwealth initiative that will establish data analytics teams and use Government data to deliver improved, evidence-based programs and policy. DIPA will coordinate specialised teams focused on social, industry, environmental and government efficiency policies.

BITRE is leading the Department of Infrastructure and Regional Development’s involvement in DIPA and will work with other Commonwealth agencies on cross-portfolio data activities, particularly focused on energy and natural resources analysis.

**The Data and Digital Branch in the Department of the Prime Minister and Cabinet (DPMC)**

The Data and Digital Branch develops and provides advice on whole-of-government policies on the use and reuse of data. It also manages the secretariat for APS wide data governance structures that provides leadership and facilitates the use of public data across government and private entities.

The Branch manages specific open-data initiatives that include -- data.gov.au and NationalMap (see ‘Open Data Initiatives’ section).

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Data61 was created from the merger of National ICT Australia (NICTA) and CSIRO’s digital research unit.

Part of Data61’s remit is to use data analytics to connect disparate government datasets and publicly release them on open data platforms. Data61 is also actively involved with other open data and data sharing projects.

State and territory data commitments and associated entities

All state and territory jurisdictions have an official open data policy, or are working towards an open data policy, and have a particular department with ownership and lead implementation responsibilities for that policy.

Open Data initiatives

data.gov.au

data.gov.au provides an easy way to find, access and reuse public datasets. As of 10 August 2017 data.gov.au has over 28,000 discoverable datasets and 6,000 APIs, and includes transport and infrastructure datasets published by BITRE and other Australian government agencies, state and territory governments and local governments. See Case Study 5.1 for more information on recent developments to data.gov.au.

Case Study 5.1 – search.data.gov.au

The Data and Digital Branch at DPMC are working with Data61 to develop the next generation of data.gov.au. This work includes sharing early prototype projects. Information about this functionality is available on preview.data.gov.au providing users with the opportunity to provide feedback.

One early prototype is located at search.data.gov.au. It demonstrates the concept of ‘borderless searching’, making it easier to discover data from all levels of government by including search results from open data portals not usually available through data.gov.au. The prototype also improves user experience by providing enhanced searching options such as a search syntax that allows users to find data from a specific publisher or in a particular data format.

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55 An API – application programming interface – allows programmers to easily access data and present it in new and different ways, for example, public transport data APIs are often used by trip planning app developers.
56 Note. search.data.gov.au will eventually work in all browsers, but currently only works with modern web browsers (such as the latest versions of Google Chrome and Mozilla Firefox).
NationalMap is a website for map-based access to spatial data from Australian government agencies. The software was developed by Data61 working closely with the Department of Communications and the Arts, Geoscience Australia and other government agencies with the goal to facilitate the opening and access to public spatial data. Users are able to overlay spatial data from multiple government agencies and also load their own custom data. See Case Study 5.2 for a demonstration of displaying multiple spatial datasets on NationalMap.

Case Study 5.2 – NationalMap demonstration

This case study demonstrates how data from multiple sources can be displayed using NationalMap. The image below shows regions around Australia’s largest coal port, Newcastle, and includes spatial datasets on:
- The location of major sea ports (Department of Infrastructure and Regional Development)
- Mine areas (Geoscience Australia)
- Railways (Geoscience Australia)
- Industry of employment data (mining), by SA2 (ABS).

NationalMap also allows users to interactively display information on selected datasets by clicking on the relevant section of the map. For example, the box on the right of the image below shows Industry of Employment data for the Singleton region.

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GovHack

GovHack is a community driven international open data competition that started as a government sponsored initiative in 2009. Since its inception, GovHack has grown into a volunteer run international competition, and in 2017 over 2,300 participants took part in the event.

A key benefit of GovHack is that it encourages governments across Australia to improve how they deliver their data, to make it easier for the public to understand how governments use revenues, and to focus more attention on delivering citizen centric services.

Commonwealth and state/territory transport and infrastructure agencies regularly sponsor GovHack. In 2017, the Department of Infrastructure and Regional Development, sponsored two award categories:

- ‘Going places’ - projects aimed at enabling the Department to factor in population change and technology to plan sustainable cities and regions for the next 30 years.
- ‘Places hack’ – projects aimed at cultivating more productive cities and towns – ‘smart cities’.

Submissions to these and other categories are able to be accessed via – https://2017.hackerspace.govhack.org

State and territory open data portals

Most jurisdictions have well developed open data portals which provide access to government data in a similar way to data.gov.au. Portals include:

- ACT https://data.act.gov.au
- QLD https://data.qld.gov.au
- SA https://data.sa.gov.au
- VIC https://data.vic.gov.au
- WA http://data.wa.gov.au

Most state and territory open data portals also encourage the use of their data by app developers through making data available in APIs.

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58 See GovHack, https://govhack.org/
Case Study 5.3 – Transport for NSW Open Data Hub Open Data Hub

TfNSW’s [Open Data Hub](https://www.nsw.gov.au/transportservices) was launched in April 2016 and is the portal to TfNSW’s data and information. It also acts as a showcase for innovation from the use of transport data.

There are now around 5,000 subscribers on the Transport Open Data Hub, including a range of Data Scientists, Researchers, App Developers and other members of the community who are deriving benefits from it. There is also a supporting forum which enables active dialogue with the subscriber community that provides the direction for the further release of data sets and continuous improvement in the Open Data Hub.

The image below shows the Product Showcase section of TfNSW Open Data Hub. Users are able to click on individual Apps to access more information and to view download links.

### Product Showcase

![Product Showcase](image)

**Infrastructure and transport related portals**


**Australian Urban Research Infrastructure Network (AURIN)** – brings together a broad range of research and data relevant to urban and infrastructure researchers, policy-makers and planners—[https://aurin.org.au/](https://aurin.org.au/).
Benefits of making public data open

Technological developments and advances in analytical techniques allow open public data to be used in innovative ways, thus realising immense social and economic benefits such as:

- Stimulating economic growth and enabling innovation;
- Facilitating the development of new products and services;
- Increasing transparency of government decision-making and policy development;
- Fostering collaboration between government, business, academia, non-government organisations and the community;  
- Provision of better, richer information to customers
- Ability for customers and regulators to compare relative performance across infrastructure operators, develop transparent performance benchmarks and expectations, and create incentives/pressures to improve services and performance
- Improved public and customer engagement.

Specific examples relating to the use of publicly available infrastructure and transport data include:

- Apps that utilise real time road data to provide alerts to road users of congestion incidents and alternative routes;
- Public transport trip planning apps e.g.
- Information on upcoming public infrastructure investment and major construction activity (also see Case Study 5.4).

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61 [https://transportnsw.info/apps](https://transportnsw.info/apps)
Case Study 5.4 – Australia & New Zealand Infrastructure Pipeline

The Australia & New Zealand Infrastructure Pipeline (ANZIP) is a joint initiative between the Australian and New Zealand Governments, and Infrastructure Partnerships Australia (IPA). It informs industry of where and what infrastructure opportunities are available, and when they come to market by tracking greenfield and brownfield transactions from when they are proposed, until they reach contractual and financial close. ANZIP information is displayed on an interactive map that provides a forward view of public infrastructure activity across Australia and New Zealand. Users are able to filter infrastructure projects by jurisdiction, type, status and value and click on individual projects for more information (see example below).

Infrastructure and transport data sharing

There are several ongoing projects that aim to better utilise infrastructure and transport data through data sharing between government agencies. These projects can be grouped into three broad categories, examples for each are listed below:

- **Data sharing between government agencies to create national data**
  - **Heavy Vehicle Infrastructure Asset Registers**
    - State and territory agencies share road condition data that is published on the Transport and Infrastructure Council website - see Case Study 3.1 in Chapter 3.

---

64 See Australian and New Zealand Infrastructure Pipeline, [http://infrastructurepipeline.org/](http://infrastructurepipeline.org/)
• **National key freight routes map** [66] -
  ○ Developed through the collaboration and data sharing between Commonwealth, state and territory governments and industry, to provide a more comprehensive understanding of Australia’s freight system.

**Data sharing to combine data from multiple data sources**

• **Austroads pilot study on non-fatal hospitalised road (BITRE as project lead)**
  ○ Involves developing a national approach to supply routine national data on non-fatal hospitalised road injuries in Australia by linking crash and hospital data. This project requires approvals in each state and territory from transport agencies, (in some cases) Police, ethics committee/s and hospital data custodian/s; as well as the AIHW and Flinders University.

• **Understanding the Infrastructure Needs of Communities** [67] (Infrastructure NSW in partnership with the NSW Data Analytics Centre)
  ○ This project draws on over 100 datasets, from multiple agencies, and applies analytics to better understand the composition of communities and their dependence on infrastructure, including transport, schools, hospitals, water and electricity.

**Private sector data shared with government agencies**

• **Road freight telematics pilot study (BITRE and ABS)**
  ○ Utilises truck telematics data shared by the trucking industry (see Case Study 3.3 in Chapter 3).

• **Waterline (BITRE)** [68]
  ○ Based on data provided by stevedores and port authorities.

• **Aviation statistics (BITRE)** [69]
  ○ Based on data shared with BITRE by the airline industry.

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The need for a national framework for public data sharing and accessibility

As outlined above, the Australian Government, and most state and territory governments have implemented a number of open data policies and initiatives to make non-sensitive public sector data open by default. There are also several infrastructure and transport related open data and data sharing projects. However, as noted by the Productivity Commission, the sharing and release of data is still often hampered by a complex, restrictive and conflicting legislative framework that is outdated for the modern data driven environment. There is a clear need for a data sharing and release framework that can scale up, evolve and improve in line with technology.70

The Productivity Commission’s public Inquiry into Data Availability and Use (Inquiry report)71 proposes a new data sharing and release framework aimed at improving the way Australians use and share data.

The Inquiry Report recommends:

- A new Data Sharing and Release Act that is meant to simplify the existing legislative framework for data access, and allow data access arrangements to be dialled up or down according to the different risks associated with different types of data, uses and use environments;
- Accredited Release Authorities (ARAs) that will bear the primary responsibility for curating, linking, sharing and releasing data within a particular sector (while data custodians would still have responsibility for business-as-usual sharing and releasing data). ARAs do not necessarily have to be Commonwealth entities, even if the relevant sectoral datasets cut across jurisdictional boundaries.
- National Data Custodian (NDC) to guide the operation and integrity of the reformed data Framework.
- Designation of a small number of nationally beneficial National Interest Datasets (NIDs) that would be assessed and nominated for declaration as NIDs by the NDC. The NIDs will be a particular category of datasets that should be treated and funded as national assets (because of their ability to deliver benefits in the national interest), and available for wider use in an integrated fashion.

The Inquiry Report also recommends that Australian Government agencies should create comprehensive, easy to access registers of datasets, including metadata, they hold or fund. Where datasets are not available for public release, the register should indicate why this is so.

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In response to the Inquiry Report, the Australian Government has established a cross-portfolio Data Availability and Use Taskforce within the Department of the Prime Minister and Cabinet. The Taskforce will be responsible for developing the Government’s response to the Productivity Commission’s recommendations in consultation with stakeholders from the public sector, academia, not-for-profits, industry and the community.

The Final Data Plan will report on progress relating to the Government’s response, focussing specifically on infrastructure data.

Priorities for improving data sharing and accessibility

The following priorities are based on data gaps related to Enduring Questions under Topic 6 – ‘Data for decision making and innovation’ (see Table 2.4).

EQ 6.1 – What infrastructure data and information is currently publicly available and what datasets and information can be made available?

<table>
<thead>
<tr>
<th>Data gap:</th>
<th>Consistent transport data standards.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>To enable comparisons and linking of available transport datasets and transport models it is important to have consistent data standards.</td>
</tr>
<tr>
<td>Opportunity 1:</td>
<td>There is a need to further promote consistent transport data standards. This will complement ongoing work such as the Austroads’ Road Data Harmonisation Project(^2) (see Case Study 5.5) and the Household Transport Survey Harmonisation Project(^3).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Expanding existing work</th>
<th>New project</th>
<th>Data from new and emerging sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td></td>
<td>×</td>
</tr>
</tbody>
</table>

**Case Study 5.5 – Data Standard for road management and investment**

Austroads is undertaking a project to establish a harmonised road asset data standard for use in Australia and New Zealand. Types of data considered in the project include road asset data, descriptions and locations of assets, maintenance activities and cost metrics, asset condition and performance and road classification.

The first version of the Standard involved extensive research into existing data requirements and current practice and provided information for road managers and the wider road sector. It was delivered by Opus International Consultants and GI S SA and published in November 2016\(^4\). The second version of the Standard is being undertaken by Opus International Consultants and will contain additional data fields, and will be supported with an implementation plan. It is expected to be published in 2017.

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Description: Estimates of the potential benefits and costs associated with infrastructure investments are often based on model outputs, such as those from traffic forecasting models. These models often use inconsistent modelling assumptions, making it difficult to compare models, and assess infrastructure project proposals and planning documents.

Opportunity 2: There is a need to develop and promote national best practice and consistent modelling assumptions to improve infrastructure planning and investment. This work could expand on work currently underway in New South Wales (see Case Study 5.6)

<table>
<thead>
<tr>
<th>Expanding existing work</th>
<th>New project</th>
<th>Data from new and emerging sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
</tbody>
</table>

Case Study 5.6 – Driving Consistency with Common Planning Assumptions

The preparation of Common Planning Assumptions is a New South Wales initiative to collect and document fundamental assumptions to underpin the development of key government strategies. This cross-agency initiative is aimed at ensuring the alignment and consistency of assumptions in strategies and plans prepared by different NSW government agencies and departments. It was established to minimise the risk of some agencies using different assumptions and projections for service and infrastructure planning – a situation which could contribute to sub-optimal decision making.

The Common Planning Assumptions represent a consistent baseline or a starting point to underpin planning decisions and policy analysis for government strategies and investment decisions. They include:

- assumptions for economic growth, industry sectors, fertility, mortality, migration and infrastructure (to inform projections); and
- projections, forecasts and the use of approved targets for population, housing and employment.

The Common Planning Assumptions provide for certain agencies to have primary responsibility for key assumptions.

Data gap: Locating available transport and infrastructure datasets

Description: Data portals such as data.gov.au and state and territory portals provide access to open transport and infrastructure datasets. However, it is sometimes difficult, especially for non-experienced users, to locate key transport and infrastructure datasets due to problems with identifying appropriate datasets from the large quantity of available datasets. Metadata describing each collection is also sometimes lacking.
Opportunity 3: There is an opportunity for BITRE to work with state and territory transport and infrastructure agencies to develop consistent open data principles, such as consistent metadata information. BITRE could also work with the Data and Digital Branch on ways to improve the discoverability of key transport and infrastructure datasets through data.gov.au and NationalMap.

<table>
<thead>
<tr>
<th>Expanding existing work</th>
<th>✓</th>
<th>New project</th>
<th>✗</th>
<th>Data from new and emerging sources</th>
<th>✗</th>
</tr>
</thead>
</table>

**Data gap:** Incomplete recording of historical infrastructure and transport data, policies and regulations.

**Description:** Information on historical infrastructure data, policies and regulation data needs to be available to make accurate retrospective analysis of the effectiveness of infrastructure and transport policy. Currently, the recording of historical infrastructure data is incomplete, and historical infrastructure policy and regulation data is not treated as key data. For example, driver licence restrictions vary by jurisdiction and often change over time. This historical information is not readily available making long term analysis of road safety outcomes difficult.

Opportunity 4: There is an opportunity to promote the recording of historical infrastructure and transport data, and to treat and record policy and regulation information as data.

<table>
<thead>
<tr>
<th>Expanding existing work</th>
<th>✗</th>
<th>New project</th>
<th>✓</th>
<th>Data from new and emerging sources</th>
<th>✗</th>
</tr>
</thead>
</table>

**Data gap:** Data sharing guidance, methods and standards

**Description:** Despite the potential benefits of increased data sharing and the establishment of state-level legislative reform around public data sharing⁷⁵, data sharing within government remains a challenge for several reasons.

Many data custodians remain hesitant to share data due to concerns around appropriate use and interpretation of data, concerns about unintended consequences of sharing data, concerns about accidental release of sensitive data and concerns about adherence to privacy legislation.

Aggregation of individual data is a standard approach to reduce the risk that personal information is included in a shared dataset. Part of data sharing challenge is that there is no way to unambiguously determine if there is personal information in aggregated data.

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⁷⁵ For example, the NSW Data Sharing (Government Sector) Act 2015.
There are also concerns by Privacy advocates that as the capability of data analytics increases so does the risk of combining multiple datasets to reveal personal information. Accurately assessing the privacy risks associated with linking multiple datasets often exceeds the ability of human judgement.

Opportunity 5: In addition to the recommendations proposed by the Productivity Commission\textsuperscript{76}, there is an opportunity to facilitate data sharing by:

- providing advice on existing relevant legal frameworks;
- developing methods and standards for anonymising personal information; and
- developing methods for testing the existence of personally identifiable data in datasets.

This Opportunity could involve tracking data sharing work currently led by the NSW Data Analytics Centre and the Australian Computer Society (see Case Study 5.7)

| Expanding existing work | ✓ | New project | ✗ | Data from new and emerging sources | ✓ |

### Case Study 5.7 – Data Sharing Taskforce

A Data Taskforce led by the Australian Computer Society (ACS), and the NSW Data Analytics Centre (DAC) has been created to address the overarching challenge of developing privacy preserving frameworks which support automated data sharing to facilitate smart services creation and deployment. This framework will seek to address technical, regulatory, and authorising frameworks. The intention is to identify, adopt, adapt, or develop frameworks for data governance, privacy preservation, and practical data sharing which facilitates smart service creation and cross jurisdictional data sharing between governments. The approach is to identify best practice where it is known to exist; consider existing models in an Australian privacy context or identify ‘whitespace’ opportunities to develop frameworks for Australia.

The Taskforce includes representatives from ACS, the NSW DAC, Standards Australia, the Federal Government’s Digital Transformation Office (DTO), CSIRO, Data61, the Department of Prime Minister and Cabinet, other Commonwealth and State agencies/departments, Gilbert and Tobin, the Communications Alliance, Telstra, IBM, Mastercard, and Microsoft.

EQ 6.2 – What data do governments need to provide in order to enable emerging technologies and innovative business models of infrastructure provision and use?

**Data gap:** Open data to support the implementation of Connected and Automated Vehicles (CAVs).

**Description:** The ongoing advances in transport technology have the potential to fundamentally improve safety, efficiency, sustainability and accessibility of Australia’s transport systems. Australian Governments, industry and research institutions recognise this potential and are actively exploring the best ways to develop and deploy new transport technologies such as CAVs.

The developers of these new transport technologies may require dynamic road operator data, such as speed zone changes, road closures and road works information, to operate effectively.77

**Opportunity 6:** There is a need to identify gaps between the road operator data provided to users (developers) and what is likely to be required in future for CAV operations (see Case Study 5.8, for example project).

| Expanding existing work | ✓ | New project | × | Data from new and emerging sources | ✓ |

**Case Study 5.8 – Open Data to support connected and automated vehicle (CAV) systems**

Austroads, as part of the National Policy Framework for Land Transport Technology78, is undertaking a project to investigate key road operator data attributes that will be used as part of the CAV system. The project will identify gaps with the current environment and whether a further range of projects are required on this issue, given the work that is being undertaken by road operators.

Issues that will potentially be explored as part of this project will include road data management, standardisation/harmonisation and support for proprietary models, and road authority regulatory framework in a digital environment.

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Appendix A – Requests for input


Specific areas for comment include:

1. **Key statistical and information sources and data gaps (Table 2.2 and Appendix D)**
   - Additional key statistical and information sources.

2. **Prioritised Enduring Questions and associated data and information gaps (Table 2.3 and 2.4)**
   - Relevance and prioritisation of Enduring Questions.
   - Additional data and information gaps associated with these questions that need to be addressed in the Data Plan?

3. **Opportunities (Chapter 3; and summarised in Table 2.4)**
   - Additional opportunities to address identified data and information gaps? This could include similar ongoing or completed projects.

4. **Infrastructure performance measures (Chapter 4)**
   - Overarching infrastructure performance framework.
   - Additional priorities for measuring infrastructure performance.

5. **Priorities for improving data sharing and accessibility (Chapter 5)**
   - Additional priorities for improving data sharing and accessibility.
Appendix B – Terms of Reference

The Bureau of Infrastructure, Transport and Regional Economics (BITRE), within the Department of Infrastructure and Regional Development, will lead the development of a Data Collection and Dissemination Plan (the Plan) that:

- Identifies key national infrastructure and transport statistics;
- Develops national infrastructure performance measures;
- Identifies opportunities to use new technologies to collect infrastructure data;
- Develops means of disseminating data to encourage innovation and improved public and private decision making; and
- Promotes and identifies priority projects that:
  - Fill key data gaps
  - Develop and report performance relevant to infrastructure operators and customers
  - Support innovation in data collection and use.

The Plan will improve and coordinate information and data collection across key stakeholders, and provide improved and more timely information for infrastructure investment decisions and monitoring of the performance of Australia’s infrastructure networks. Developing opportunities to harness new data sources (including ‘Big Data’) from emerging data sources will be a key part of the Plan’s development.

A Steering Group will be established to oversee the development and implementation of the Plan and include representatives from:

- The Department of Infrastructure and Regional Development;
- Infrastructure Australia;
- The Australian Bureau of Statistics (ABS);
- Data61;
- State and territory transport departments
- Private industry; and
- Academia.

Collaboration and workshops with key transport and infrastructure stakeholders, and research and data analytics groups will be part of developing the Plan. This will give people working in the transport and infrastructure space an opportunity to highlight what data and information is required to achieve better transport and infrastructure outcomes, and identify methods for obtaining and disseminating this information.

A draft Plan will be available for industry and government comment in six months, and the final Plan will be provided to the Commonwealth Government within 12 months.

Paul Fletcher
Minister for Urban Infrastructure
28/2/17
Appendix C – Steering Group membership

A Steering Group made up of key transport and infrastructure stakeholders, and research and data analytics groups has been established to oversee the development of the National Infrastructure Data Collection and Dissemination Plan. Steering Group members include:

- Dr Gary Dolman, Head of Bureau of Infrastructure, Transport and Regional Economics (BITRE), Department of Infrastructure and Regional Development
- Mr Bill Simpson-Young, Director, Engineering and Design, CSIRO
- Prof Pascal Perez, Director SMART Infrastructure Facility, University of Wollongong
- Mr Roy Cummins, Chief Executive Officer, Port of Brisbane
- Mr Royce Christie, Group Manager, Public Policy and Research, Group Corporate Affairs, Toll Group
- Ms Amanda Clark, Program Manager, Geospatial and Regional Statistics Branch, The Australian Bureau of Statistics
- Mr Jeff Potter, Project Director Productivity and Safety, National Transport Commission
- Mr Phil Davies, Chief Executive Officer, Infrastructure Australia
- Mr Brendan Lyon, Chief Executive Officer, Infrastructure Partnerships Australia
- Dr Ian Oppermann, Chief Executive Officer and Chief Data Scientist, NSW Data Analytics Centre
- Mr Phil Bullock, Director, Transport Performance and Analytics, Transport for NSW
- Mr Garry Bowditch, Executive Director, Better Infrastructure Initiative, University of Sydney.
Appendix D – Key data and information sources

Table D.1  Infrastructure Stocktake – Key data and information sources

<table>
<thead>
<tr>
<th>Sector</th>
<th>Data Source</th>
<th>Entity</th>
<th>Description</th>
<th>Link to publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>All</td>
<td>Infrastructure Yearbook</td>
<td>BITRE</td>
<td>Provides a single, comprehensive annual source of economic infrastructure statistics.</td>
<td>Yearbook - 2016</td>
</tr>
<tr>
<td>Transport – rail</td>
<td>Trainline</td>
<td>BITRE</td>
<td>Presents an overview of characteristics of the railways and train operators' rolling stock.</td>
<td>Trainline 4</td>
</tr>
<tr>
<td>Transport – maritime</td>
<td>Australian Sea Freight</td>
<td>BITRE</td>
<td>Summarises information on Australian owned and/or operated trading vessels.</td>
<td>Australian Sea Freight 2014-15</td>
</tr>
<tr>
<td>Transport – maritime</td>
<td>Waterline</td>
<td>BITRE</td>
<td>Information about facilities and port services available at the five major Australian container ports</td>
<td>Waterline 59</td>
</tr>
<tr>
<td>Energy</td>
<td>State of the energy market reports</td>
<td>AER</td>
<td>Summarises electricity and gas markets, the transmission and distribution networks and the rapidly evolving retail sector</td>
<td>State of the energy market, May 2017</td>
</tr>
<tr>
<td>Water</td>
<td>Urban water, water storage information and other water data</td>
<td>BOM</td>
<td>BOM currently report on a series of water infrastructure, including urban water, water storage information.</td>
<td>BOM water publications</td>
</tr>
<tr>
<td>Communications</td>
<td>NBN rollout map</td>
<td>NBN</td>
<td>Provides interactive information on NBN rollout</td>
<td>NBN rollout map</td>
</tr>
<tr>
<td>Communications</td>
<td>Communications report</td>
<td>ACMA</td>
<td>Includes information on communications infrastructure</td>
<td>Communications report 2015–16</td>
</tr>
</tbody>
</table>

Key data and information sources include national level statistical and information sources that relate to transport activity and infrastructure networks. The tables in Appendix D are not aimed at providing a comprehensive list of all transport and infrastructure data and information sources and focuses specifically on available data and information sources.

Link to latest publication, if routine publication.
## Table D.2  Infrastructure and freight performance – Key data and information sources

<table>
<thead>
<tr>
<th>Sector</th>
<th>Data Source</th>
<th>Entity</th>
<th>Description</th>
<th>Link to latest publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple sectors</td>
<td>BITRE’s review of existing performance frameworks&lt;sup&gt;81&lt;/sup&gt;</td>
<td>BITRE</td>
<td>Summarises some available infrastructure performance frameworks, focussing mostly on transport infrastructure.</td>
<td>The publication is published on the <a href="https://www.bitre.gov.au">BITRE website</a>.</td>
</tr>
<tr>
<td>Communications</td>
<td>Australian Communications and Media Authority (ACMA) Communications Report</td>
<td>ACMA</td>
<td>Provides an overview of the Australian telecommunications industry performance against a range of regulatory obligation</td>
<td><a href="https://www.acma.gov.au/communications-performance">ACMA Communications report 2015–16</a></td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Sector</th>
<th>Data Source</th>
<th>Entity</th>
<th>Description</th>
<th>Link to latest publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple sectors</td>
<td>Infrastructure business cases</td>
<td>-Project proponent</td>
<td>A rigorous and transparent analysis of the costs and benefits of a project. Business cases normally provide strategic context, options development and full cost-benefit analysis.</td>
<td>For large projects, full or partial business cases are normally available on proponent’s website. Project evaluations, including summary of costs and benefits, are published on Infrastructure Australia’s website for projects and initiatives on the Infrastructure Priority List.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Infrastructure Australia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multiple sectors</td>
<td>Infrastructure post completion reports</td>
<td>Project deliverer</td>
<td>Seeks to understand the outcomes of the project, as well as project delivery, against the benefits described in the business case.</td>
<td>Not systematically undertaken or published.</td>
</tr>
<tr>
<td>Multiple sectors</td>
<td>Annual reports</td>
<td>Asset owner</td>
<td>Describe the organisations projects, achievements and financial position for the year. Include information on capital and operating costs.</td>
<td>Website of each organisation.</td>
</tr>
<tr>
<td>All sectors</td>
<td>Demand forecasting models</td>
<td>State governments and BITRE</td>
<td>Benefits from infrastructure investments are usually strongly related to forecast infrastructure utilisation levels. So demand forecasts play a critical role in appraisal of initiatives.</td>
<td>State governments and BITRE regularly produce demand models for different sectors. BITRE’s demand forecast outputs (e.g. container throughput projections) are included in Trends: Transport and Australia’s Development to 2040.</td>
</tr>
</tbody>
</table>
| All sectors             | State government infrastructure and transport planning documents | Relevant state government infrastructure agencies | Provide a summary for the planning, investment and delivery of infrastructure and Transport                                                                                                                                                                                                                                               | Example Plans Include:  
  - State Infrastructure Plan (Qld);  
  - Long Term Transport Master Plan (NSW)  
  - 10 Year Infrastructure Plan (NT).                                                                                                                                                                                                                                                                                                                   |
| Energy                  | Electricity Generation Major Projects            | Office of the Chief Economist | Provides a list of major electricity generation projects in Australia                                                                                                                                                                                                                                                                                                                              | Electricity Generation Major Projects                                                                                                                                                                                                                                                                                                                     |

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### Table D.3 Infrastructure investment and planning – Key data and information sources (continued)

<table>
<thead>
<tr>
<th>Sector</th>
<th>Data Source</th>
<th>Entity</th>
<th>Description</th>
<th>Link to latest publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td>NBN CBA</td>
<td>Department of Communications</td>
<td>Independent Cost-Benefit Analysis of the NBN</td>
<td>NBN CBA</td>
</tr>
</tbody>
</table>

### Table D.4 What are the impacts of our transport infrastructure?– Key data and information sources

<table>
<thead>
<tr>
<th>Sector</th>
<th>Data Source</th>
<th>Entity</th>
<th>Description</th>
<th>Link to latest publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multiple sectors</td>
<td>Infrastructure business cases</td>
<td>Project proponent -Infrastructure Australia</td>
<td>Generally information on relevant impacts as part of cost benefit analysis.</td>
<td>Normally available on proponent's website</td>
</tr>
<tr>
<td>Multiple sectors</td>
<td>Infrastructure post completion reports</td>
<td>Project deliverer</td>
<td>Seeks to understand the outcomes of the project, as well as project delivery, against the benefits described in the business case.</td>
<td>Not systematically undertaken or published.</td>
</tr>
<tr>
<td>Transport</td>
<td>Benefit realisation studies (ex-post analyses)</td>
<td>BITRE</td>
<td>Systematic review of the after projected costs and benefits of major investments.</td>
<td>BITRE ex-post evaluations – Working Paper 70.1 and 70.2</td>
</tr>
</tbody>
</table>
### Table D.5a  Infrastructure services – Transport – Key data and information sources

<table>
<thead>
<tr>
<th>Mode</th>
<th>Data Source</th>
<th>Entity</th>
<th>Description</th>
<th>Link to latest publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>All modes</td>
<td>Infrastructure Yearbook</td>
<td>BITRE</td>
<td>Contains freight and transport metrics for all transport modes.</td>
<td>Yearbook - 2016</td>
</tr>
<tr>
<td>All modes</td>
<td>BITRE freight data</td>
<td>BITRE</td>
<td>BITRE produce mode-specific statistical publications for rail, road, air and sea freight.</td>
<td>BITRE publications grouped by subject area</td>
</tr>
<tr>
<td>Road and rail</td>
<td>Who Moves What Where – Freight and Passenger Transport in Australia</td>
<td>NTC</td>
<td>Reviews existing transportation data sources and reports and presents information on passenger and freight movements in Australia.</td>
<td>Who Moves What Where</td>
</tr>
<tr>
<td>Road</td>
<td>New and alternative sources of road traffic-related data overview</td>
<td>Summary by BITRE and IPA</td>
<td>This report summarises new and alternative sources of road-traffic data.</td>
<td>New traffic data sources – An overview</td>
</tr>
</tbody>
</table>

### Table D.5b  Infrastructure services – Energy, Water and Communications

<table>
<thead>
<tr>
<th>Mode</th>
<th>Data Source</th>
<th>Entity</th>
<th>Description</th>
<th>Link to latest publication</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sectors</td>
<td>Infrastructure Yearbook</td>
<td>BITRE</td>
<td>Contains energy, water and communications metrics</td>
<td>Yearbook - 2016</td>
</tr>
<tr>
<td>Energy</td>
<td>Australian Energy Regulator (AER) regular reports</td>
<td>AER</td>
<td>The AER publishes a regular reports on gas and electricity markets, including information on price and demand.</td>
<td>Gas and electricity reports</td>
</tr>
<tr>
<td>Water</td>
<td>Australian water markets report</td>
<td>ABARES</td>
<td>Presents comprehensive annual statistics on water trading activity across Australia</td>
<td>Australian water markets report 2015–16</td>
</tr>
<tr>
<td>Communications</td>
<td>ACMA Communications Report</td>
<td>ACMA</td>
<td>Reports communications (e.g. internet) usage, access and cost.</td>
<td>ACMA Communications report 2015–16</td>
</tr>
</tbody>
</table>