FREIGHT DATA REQUIREMENTS STUDY

A Research Report for the Department of Infrastructure, Regional Development and Cities

FINAL REPORT
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Foreword

This study examines the data needs of the Australian freight and supply chain sector. It found good evidence that better freight data could enhance the efficiency of Australia's freight supply chain and, in turn, benefit the Australian community via higher productivity. Recognising the complexity inherent in the national freight task and the range of stakeholders involved, the study identified a number of gaps in information availability and considered how they could best be resolved for the benefit of freight operators, supply chain and logistics firms, industry associations and all three levels of government.

Consistent with our terms of reference, we have sought to identify and prioritise the key freight data gaps, from different stakeholder perspectives. We have looked at the most promising proposals, pilot studies and programs (both in Australia and overseas) to enhance the use of existing freight datasets and addressing the identified gaps.

This study benefited strongly from information provided by the many sector stakeholders who engaged through online surveys, focus groups and interviews. We thank all those who have contributed to this study.

The study has been directed and managed by iMOVE Australia with the support of significant technical input from the Australian Road Research Board (ARRB), the Research Centre for Integrated Transport Innovation (rCITI, UNSW), the Australian Institute for Business and Economics (AIBE, University of Queensland), and the Centre for Supply Chain and Logistics (CSCL, Deakin University). We were also supported by industry and policy experts Andrew Ethell, Ingilby Dickson and Joe Branigan.

Ian Christensen

Managing Director

28 February 2019

Terms of Reference

Freight Data Requirements Study – Project Request

Project Outcomes

The Department of Infrastructure, Regional Development and Cities (the Department) is seeking expressions of interest for a research study into the freight data challenges identified by the recent industry led *Inquiry into National Freight and Supply Chain Priorities* (the Inquiry).

Using the latest available data and extensive industry and government stakeholder consultation, the supplier will produce an evidence-based report that delivers the following outcomes:

- Identify what freight data is required (for governments and across industry) to improve freight related planning, operations and investment decision-making.
  - For governments this may include freight movement data and other data to inform policy and investment decisions
  - For industry this may include operational data that would allow increased efficiency of freight firms
- Identify what currently exists and what the gaps are.
- Identify the appetite across industry sectors and governments for sharing the required data.
- Identify options for operational and governance frameworks for Australia to improve the collection and analysis of data to improve freight related planning, operations and investment decision-making.

Project Output

A detailed and evidence-based report containing:

- Summary of the freight data needs of both government and industry for improving planning, operations and investment decision-making.
- Pragmatic recommendations for how the Commonwealth can promote better data collection and dissemination practices through the Strategy, the National Action Plan and relevant Implementation Plans.
- Pragmatic recommendations for a suitable data model for collection and the most appropriate governance framework, with information regarding potential costs for future data collection and organisational structures.

Key Milestones

A proposed timeline with areas of focus is provided below:

- October 2018 – Identify stakeholder consultation list in conjunction the Department and the key user groups of freight data.
- November 2018 – What to measure – an examination of the type of data and information Australian decision makers require to effectively inform, planning, operational and investment decisions. Noting different decision makers may have different data requirements.
- November 2018 – What is being done domestically – assess what data is currently collected in Australia and by who, including what is being done by the Bureau of Infrastructure, Transport and Regional Economics (BITRE), other Commonwealth agencies as well as State and Territory transport agencies and industry. How the data is analysed and reported. Analysis into the effectiveness of current practices will be required.
- December 2018 – What is being done overseas – research into how other countries are collecting, analysing and reporting the identified data. Consideration needs to be given to analysing countries with similar economic characteristics and freight tasks to Australia.
- January 2019 – Delivery of project output.

Requirements

Stakeholder Engagement

The supplier will be required to have expertise in data management, collection and analysis processes as well as strong industry networks as this project will require heavy consultation with their own industry contacts as well specified stakeholders provided by the Department to ensure a representative cross section of stakeholder views are captured.

Role of BITRE

A key part of this project is to analyse the effectiveness of existing data collection and analysis practices, including that of BITRE. It is expected BITRE will be a point of contact at various stages of the project and will be closely involved in reviewing the outputs provided by the supplier. In carrying out the proposed work, other data related initiatives, such as the BITRE *National Infrastructure Data Collection and Dissemination Plan*, will need to be taken into account to avoid duplication of effort.

Acknowledgements

iMOVE appreciates the contributions of staff, academic researchers and consultants who worked on this research report and underlying analysis.

The project team was led by Ian Christensen (iMOVE), Jeff Kasparian (iMOVE) and Dickson Leow (ARRB), and included: Lachlan Benson and Jacqueline King (iMOVE); Charles Karl, Ronny Kutadinata and Stephanie Davy (ARRB); Rose Elphick-Darling (CSCL, Deakin University); Taha Rashidi and Ali Ardeshiri (rCITI, UNSW); Damien Hine and Elnaz Irannezhad (AIBE, University of Queensland); Nick Hudson, Infrastructure Partnerships Australia; Andrew Ethell, Ingilby Dickson and Joe Branigan (advisors to iMOVE).

Abbreviations

ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
AGIMO	Australian Government Information Management Office
AGLDWG	Australian Government Linked Data Working Group
AIBE	Australian Institute for Business and Economics (UQ)
ALC	Australian Logistics Council
ANAO	Australian National Audit Office
ANDS	Australian National Data Service
API	Application Programming Interface
APP	Australian Privacy Principle
ARC	Australian Research Council
ARRB	Australian Road Research Board
ASAC	Australian Statistics Advisory Council
ATDAN	Australian Transport Data Action Network
AURIN	Australian Urban Research Infrastructure Network
BITRE	Bureau of Infrastructure, Transport and Regional Economics
CAV	Connected and Automated Vehicles
CBA	Cost Benefit Analysis
CITS	Co-operative ITS
COAG	Council of Australian Governments
CRC	Cooperative Research Centre
CSCL	Centre for Supply Chain and Logistics
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DIRDC	Department of Infrastructure, Regional Development and Cities
DFAT	Department of Foreign Affairs and Trade
DPMC	Department of Prime Minister and Cabinet

DTA	Digital Transformation Agency
DTO	Digital Transformation Office
FMS	Freight Movements Survey
FOI	Freedom of Information
GIF	Graphics Interchange Format
GIS	Geographic Information System
G-NAF	Geocoded National Address File
GPS	Global Positioning System
GVA	Gross value added
HILDA	Household, Income and Labour Dynamics Australia
IAP	Intelligent Access Program
ICT	Information and Communications Technology
IDI	Integrated Data Infrastructure
iMOVE	iMOVE Australia (incorporating the iMOVE Co-operative Research Centre)
LBE	Large business enterprise
IoT	Internet of Things
IP	Internet Protocol
IPA	Infrastructure Partnerships Australia
IT	Information Technology
ITS	Intelligent Transportation Systems
JSON	JavaScript Object Notation
MaaS	Mobility as a Service
MADIP	Multi-Agency Data Integration Project
MBE	Medium business enterprises
MOG	Machinery of Government
MOU	Memorandum of Understanding
NCRIS	National Collaborative Research Infrastructure Strategy
NDC	National Data Custodian

NFSC	National Freight and Supply Chain (Strategy)
NID	National Interest Dataset
NHVR	National Heavy Vehicle Regulator
NSS	National Statistical Service
NTC	National Transport Commission
NSW DAC	New South Wales Data Analytics Centre
OAIC	Office of the Australian Information Commissioner
OECD	Organisation for Economic Co-operation and Development
PC	Productivity Commission
rCITI	Research Centre for Integrated Transport Innovation (UNSW)
SBE	Small business enterprises (LBEs)
SMART	SMART Infrastructure Facility, University of Wollongong
SMVU	Survey of Motor Vehicle Use
TCA	Transport Certification Australia
TIC	Transport and Infrastructure Council
TfNSW	Transport for New South Wales
TMR	Department of Transport and Main Roads Queensland

Recommendations

Our remit

DIRDC has sought the following in terms of the Study's recommendations:

(i) Pragmatic recommendations for how the Commonwealth can promote better data collection and dissemination practices through the Strategy, the National Action Plan and relevant Implementation Plans.

(ii) Pragmatic recommendations for a suitable data model for collection and the most appropriate governance framework, with information regarding potential costs for future data collection and organisational structures.

(iii) Advice on the future role and responsibilities of BITRE.

Group 1: Establishment of a national policy on freight data in Australia

We recommend the establishment of a national policy on freight data in Australia:

1. As the lead agency in the formation of the National Freight and Supply Chain Strategy (NFSCS), the Commonwealth should lead the development of a national policy on freight data that seeks to improve the collection, hosting, access to, and analysis of information relating to the movement of freight, and which addresses the interests of all stakeholders in the sector. It is recognised that the NFSCS is being developed in conjunction with all jurisdictions.

2. Consistent with existing legislative requirements, a mechanism should be established to define and implement nationally a framework of standards for freight data to facilitate aggregation and comparison across diverse data sources. The States, via COAG, would play a key role in facilitating a framework of data collection standards. The Commonwealth would play a coordinating role.

3. The Commonwealth should act to make its own freight related data available in a manner consistent with open data principles, and encourage other data owners such as asset and fleet managers, regulators, state government agencies, freight operators and freight customers to do likewise.

Group 2: Establishment and role of a Freight Data Coordination Office

Our second set of recommendations relates to the organisational and governance arrangements for collecting data. We recommend that:

4. A Freight Data Coordination Office be established to:

a. collect, host, and disseminate freight data at a national level, leaving data analysis to be conducted by relevant stakeholders according to their respective mandates, including at the state and regional level;

b. encourage data providers to deliver needed data compliant with established data standards; and

c. initiate processes to procure missing data.

5. A mechanism be established by which a steering group representative of data users and data collectors can guide the priorities of the Office to build trust in the new organisation and maintain its relevance to stakeholders.

6. The Commonwealth take a leadership role in the procurement of such 'commercial' freight related data as is needed and which exhibits good value for money. For example, if jurisdictions are separately purchasing vehicle movement data, there may be a benefit in the Commonwealth acting as a monopsony buyer of these datasets.

7. Secure protocols be established for data collection and handling that support participation and contribution from stakeholders that can supply a wide range of data sources.

8. Practical and robust arrangements be established for securing access to raw freight data from industry participants including rules relating to aggregation and public access to respect commercial sensitivity.

Group 3: Other initiatives

The following initiatives are intended to support progress towards better meeting stakeholders' requirements for fit-for-purpose and up-to-date data sets. We recommend that:

9. A republishing or 'hosting' website be established with the mission to republish all freight data on a single site.

10. A transition be encouraged to move towards low cost, harmonised collection processes for all freight related data from wherever it is generated or held. This includes (but is not limited to):

    a. the automation of current survey processes;

    b. the increased adoption of vehicle telemetry and usage of vehicle telematic data;

    c. the establishment of new automated sensing methods to generate needed data;

    d. accessing public and private datasets with agreed inquiry tools; and

e. changing data analyses to utilise the higher availability of automatically collected data.

11. Acknowledgment be made of the important contribution to the Australian freight data ecosystem by some existing programs, and that arrangements be made to either encourage, or directly support (if a Commonwealth program), their continuing operation. We recommend the following programs, among others, be considered for ongoing support:

    a. TranSIT (CSIRO);

    b. Supply chain Indicators, Infrastructure Performance Dashboard, Freight Performance Indicators, Developing and Promoting Best Practice Modelling Assumptions (BITRE);

    c. Customs Freight Data Analysis Project (National Transport Commission (NTC), BITRE);

    d. Tracking Commonwealth and state open data (Australian Transport Data Action Network (ATDAN), BITRE);

    e. Supply chain data visibility through the GS1 EPICS standard (Australian Logistics Council (ALC), Nestlè and others);

    f. Data Sharing Taskforce (NSW Government); and

    g. Heavy Vehicle Infrastructure Asset Registers (DIRDC, Australian Road Research Board (ARRB)).

12. The Commonwealth prioritise its investment in assembling 'missing' freight data towards the following five freight data needs (identified from a case-by-case assessment conducted by this study of the potential costs and benefits associated with the closure of each gap):

    Supply chain visibility:

    a. Improve the visibility of the containerised supply chain, from port to intermodal hub to final destination; and

    b. Improve the visibility of the domestic food and manufactured products supply chain, from farm/plant to warehousing and distribution centres to the final destination.

    Better coordination of existing freight data (standards, confidentiality, harmonisation, granularity):

    c. Adopt and propagate freight data standards and protocols (where considered beneficial) to align datasets to common standards and levels of granularity and confidentiality, focussing first on network utilisation measures (e.g. volumes) and

productivity measures already collected (or potentially easily collected at low cost) by freight operators.

Long-term planning and investment in the network:

d. Determine the most significant data needs related to the government's role in planning supply chain network integration and expansion, and long-term sustainability and resilience, potentially through dialogue with Infrastructure Australia and relevant state-based infrastructure advisory bodies (such as iNSW and Building Queensland).

e. Give priority to satisfying the network infrastructure data needs of these bodies.

In relation to 12 a. and b., we note the existing BITRE programs and recommend that consideration be given to expanding the existing supply chain indicators project to support these recommendations.

Role of BITRE

As part of the Project Request, the department sought advice on: "*the effectiveness of existing data collection and analysis practices, including that of BITRE.*"

From the perspective of the Australian community, and in particular Australian industry, BITRE has played a positive role in national economic management via its initiatives to provide publicly available and trusted datasets. While it is difficult for an 'outsider' to comment on the role BITRE has played internally within government, there is no doubt that more effort has been made in recent years to better prioritise infrastructure investment and make investment decision-making more rigorous.

The view of industry is that, while the datasets BITRE currently produces are useful, they could be more useful with better industry engagement. Of course, the demands of industry are perhaps infinite when there is no direct price signal placed on the products and services provided by the Australian taxpayer. But that said, industry would like more data, with shorter time lags from collection, at higher frequency and with more cohesive embrace of State data into BITRE's national perspective.

In our view, BITRE faces a 'design and governance' trade-off between its twin objectives of providing immediate (or real-time) advice to the government vis-à-vis providing industry with timely, fit for purpose datasets, analytical tools and analyses. Over the years, the quantity and quality of the BITRE analysis has improved markedly, becoming more industry-specific and more granular. That process seems set to continue with the suite of programs that the agency is currently shepherding. But industry senses resource constraints and recognises that the demands of the department and ministers must be prioritised and served in accordance with BITREs mandate.

On balance, in our view, BITRE is doing the best job it can of meeting the needs of industry while meeting its obligations to government. Of course, BITRE could be more industry-focussed if it was 'spun-off' into an independent agency but it is important to recognise that this would risk the

department losing expert in-house advice on many transport related issues. Perhaps a 'middle-road' path to consider would be to review BITRE's overall budget (based on our recommendations presented above), and encourage the agency to undertake more, and more regular, stakeholder consultation.

Executive Summary

Role of data in the modern economy

The unparalleled growth in data generation, dissemination and use since the mid-2000s has enabled a profusion of data-related products, applications and services for businesses and households. Across Australia's vast freight supply chain, this information and communications technology revolution has provided firms, regulators, state transport departments and other government agencies with the tools to support real-time monitoring and management of specific freight operations and overall network performance. That said, our Study has found that Australia lags the world's leading economies in the application of these new tools to better utilise data to improve the performance of freight supply chains.

Policy context

The potential benefits for Australia from better utilisation of existing freight data sources (for instance, via consistent standards, improved coordination, better access and greater sharing) is enormous. Australia relies on key export, import and domestic freight supply chains to underpin a significant proportion of our national income and maintain our high standard of living. These key supply chains connect Australia's resources basins and agricultural regions to our cities and ports and, in the reverse case receive and distribute a vast amount of merchandise sourced from overseas. The efficiency of these freight supply chains materially impacts our productivity performance, economic growth and living standards.

At the same time, the Australian freight task is formidable. Australia is a large country geographically – the world's sixth largest by land area,[1] but with a small population of just over 25 million people. Our settlement pattern is highly urbanised, with almost 90 per cent of the population living in our major capital cities and large regional towns.[2] This high level of urban density provides important economies of scale, scope and agglomeration benefits, but does not ameliorate the 'tyranny of distance' between major population centres and with major trading partners. As a result, Australia's national freight task is strategically and economically significant to our living standards, and our freight task is relatively large compared with our major trading partners[3].

1 Australian Government, Geoscience Australia, Australia's Size Compared, available at: http://www.ga.gov.au/scientific-topics/national-location-information/dimensions/australias-size-compared; accessed 28 Jan 2019.

2 Australian Bureau of Statistics, *2016 Census Survey of Population and Housing*, at: http://www.abs.gov.au/websitedbs/D3310114.nsf/Home/Census?OpenDocument&ref=topBar; accessed on 28 Jan 2019.

3 See, for example, the Productivity Commission Staff Working Paper: *Can Australia Match US Productivity Performance?* (Dolman et al, 2007).

In recent years, two factors have loomed large over the performance of Australia's freight supply chains, giving rise to a renewed policy interest in the performance of the network, particularly from the Commonwealth Government.

First, the world has experienced a rapid surge in technological innovation related to information processing, supported by sustained increases in computing power, storage capability, speed and accessibility. These developments present enormous opportunities to improve Australia's freight supply chain efficiency. However, the interdependent nature of supply chains requires a parallel evolution of business and government co-operation for the benefits to be secured.

Second, the Australian mining boom (2003-2012) has had a profound effect on Australia's economy, including increased demands on our freight supply chain and the consequent rapid increase in public and private infrastructure investment. At the same time, there has been a concomitant rapid increase in population. The resulting increased economic activity has put enormous pressure on the freight networks in our major cities, especially around our ports and in rapidly growing Sydney and Melbourne.[4]

In recent years, the Australian government and all states and territories have begun to embrace open data principles.[5] This approach can potentially improve the efficiency of Australia's freight supply chain through improved private and public sector sharing and decision-making. For example, previous academic work on freight supply chain efficiency has demonstrated that a lack of information (or imperfect information) among supply chain participants can lead to network coordination failures.[6] However, while most state government transport departments have developed an open data portal policy and architecture, not all provide the same quantity of data in a consistent and accessible format.

Increased involvement from the Commonwealth Government to provide coordinating support to the states is welcome because most of the potential benefits from better use of freight data require a national focus. For instance, it is unlikely to be cost effective (or even possible) for a single firm to collect and disseminate nationally industry-wide data. There would also be confidentiality issues around the dissemination of such data to surmount. At the same time, the availability of standardised, timely and quality datasets about Australia's freight sector may deliver significant public benefits. Accordingly, all governments can play an important role in realising the 'public good' value of data while maintaining its private value to individual firms.

What data currently exists?

There is a plethora of freight-related datasets in Australia, collected by all levels of government, by economic regulators, by ports and other infrastructure facilities, and by industry bodies. In addition, all freight operators and allied firms collect their own data for their own commercial uses or to meet

[4] See, for example, the RBA Research Discussion Paper: *The Effect of the Mining Boom on the Australian Economy* (Downes et al, RDP 2014-08).

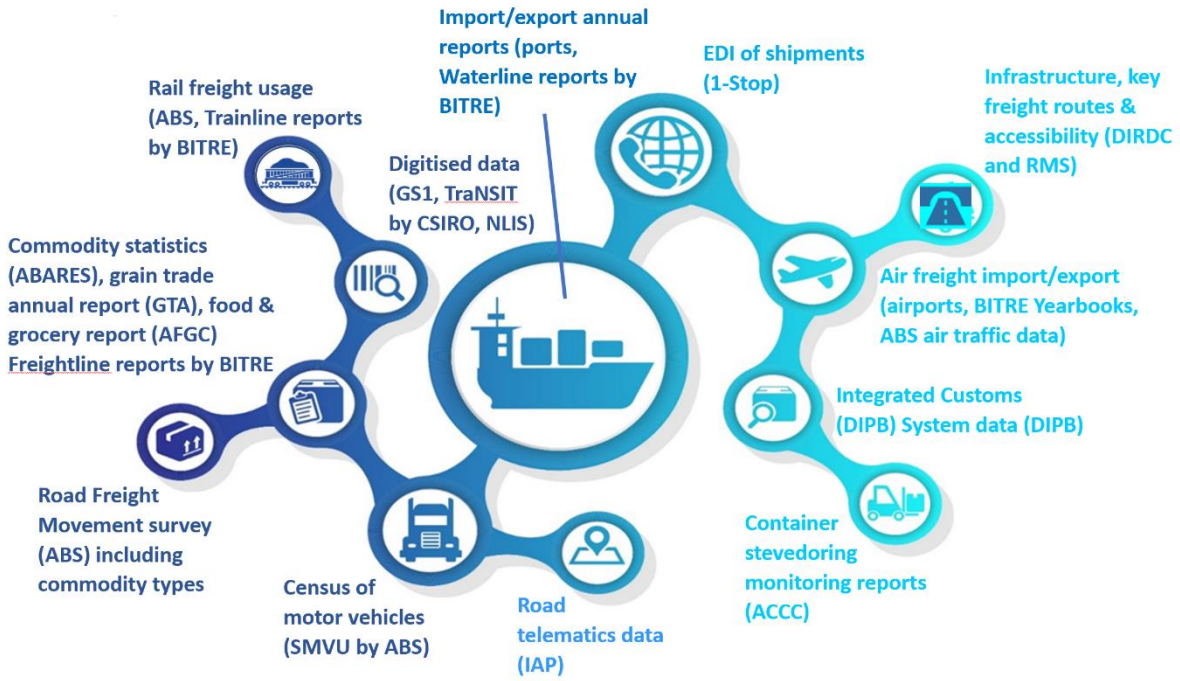
[5] See, for example, the Tasmanian Government policy here: http://www.egovernment.tas.gov.au/stats_matter/open_data/tasmanian_government_open_data_policy

[6] Discussed further in Section 3.1 of Appendix C Data Gap Analysis Final Report.

mandated regulatory requirements. Our research found over 350 unique freight related data sources. Around one-half of these unique data sources are in the form of irregular or ad hoc reports.

Figure S-1 below presents a schematic of the data sets referred to above. They cover a broad range of publications, including the 'Freightline', 'Trainline' and 'Waterline' reports by the Bureau of Infrastructure, Transport and Regional Economics (BITRE), the Survey of Motor Vehicle Use (SMVU) and the Freight Movements Survey (FMS) from the Australian Bureau of Statistics (ABS), customs import/export data, road telematics data, commodity freight models (TraNSIT) and even freight ID (NLIS).

Figure S-1. Diverse data sources



Source: iMOVE and partners analysis.

What gaps are there in Australian freight data?

Overall, our research has indicated that the most significant 'gaps' in terms of potentially useful freight datasets relate to the need to standardise, harmonise and concord existing (but currently incompatible) datasets, rather than a need to initiate entirely new collections. There are numerous datasets with common characteristics (say, by commodity or transport mode) that are not comparable across supply chains, regions or states, because the data are not standardised and concorded to the same levels of aggregation or granularity or collection frequency.

This study also indicated several other problems with government data release.[7] For instance, because governments do not (and may be contractually prevented from doing so) generally release the underlying raw data, it must necessarily make a call on the level of aggregation at which it publishes the information. A chosen level of aggregation clearly would not suit every data user.

Another common criticism is that government datasets are often released with a significant delay. Comparing the real-time availability of much operational data to the delays in publishing ABS surveys such as the SMVU and the FMS, which, in some instances, occur two years after collection (and in a highly aggregated form that precludes its use in modelling and forecasting), reflects poorly on government approaches to data dissemination.[8]

Our research identified and then classified freight data gaps into eight broad categories, based on the seven questions outlined here:

1. Is the identified gap likely to be useful to a broad cross-section of the freight industry?

2. Is there an identified 'market failure' (i.e. is there a reason why firms are not collecting or disseminating these datasets)?

3. Is the missing data required by a regulator or other government agency (local, state or federal) for supply chain planning or management?

4. Is there an identified 'governance failure' (i.e. is there a reason that governments are not collecting the data at a coordinated state or national level)?

5. Would filling the gap promote economic efficiency (productive, allocative, dynamic) from a national perspective?

6. Would filling the gap be likely to realise a latent public good value of data, particularly at the national 'economy-wide' scope?

7. Would filling this gap help to fill other identified data gaps, and if so how many other gaps?

On the basis of the above evaluation framework, we reviewed the eight freight data gaps identified and ranked those gaps in order of significance, as follows:

1. Supply chain visibility, particularly at intermodal nodes (e.g. around ports or road/rail interchanges);

2. Integration, standardisation or coordination schemes;

[7] Unless specifically identified, the term 'government' refers to the public sector, being federal, state and local government departments. Regulators are separately identified.

[8] SMVU – Survey of Motor Vehicle Use. FMS – Freight Movement Survey.

3. Freight tasks (operational);
4. Productivity measures (industry-wide);
5. Labour, fleet, operators (operational);
6. Network infrastructure/ land use (planning, investment);
7. Cost/revenue and economic contributions (economic analysis); and
8. Sustainability measures (environmental).

Table S-1-1 below illustrates each of the gaps using two specific examples that, in our view, are significant in terms of the potential benefits from addressing these gaps. For instance, an example of an identified supply chain visibility gap is the lack of end-to-end network visibility of containerised freight.

Table S-1-1. Freight data gap analysis

No.	Gap Classification	Example 1	Example 2
1	Supply chain visibility – specifically at intermodal nodes (e.g. around ports or road/rail interchanges)	End-to-end visibility of containerised supply chain (trade focus)	Visibility of food and manufactured products supply chain (domestic focus)
2	Integrated coordination schemes	Lack of coordination, interoperability & integration of freight operators and stakeholders in the import/ export trade through ports	Lack of coordination and integration of urban goods and services transport
3	Freight tasks	Regular and updated commodity-based freight task for all transport modes	Lack of enough granularity of freight task
4	Productivity measures	Productivity measures of trucking companies and rail operators	Standardisation of productivity measures
5	Labour, fleet, operators	Information about the number of labour per fleet, skills and age	Utilised fleet separately for ancillary and for-hire operators
6	Network Infrastructure/ Land use	Data about the first mile, last mile issues of network	Network resilience and integration of this data with modelling and planning
7	Cost/revenue and economic contributions	Commodity-based and region-based operational cost for all transport modes	Cost and quantity of inefficiencies in each element of the supply chain (e.g. cancellation fees, invalid PRAs, extra trips, etc)

No.	Gap Classification	Example 1	Example 2
8	Sustainability measures	Sustainability indicators of transport modes and logistics nodes	Impact of regulations to improve sustainability (i.e. before-after studies of imposed regulations)

What freight data is required for improved decision-making?

Overall, the consultation process revealed that stakeholders prioritise cost and volume data (i.e. detailed data about their own freight task). Some other contextual datasets, such as infrastructure condition data and employment data (related to labour costs and availability) are also frequently sought.[9]

On the basis of discussions with industry stakeholders and the online survey conducted for this study, we identified two key themes in relation to data requirements, namely:

1. At the level of the individual firm, there are operational needs for a more complete picture of where and when goods (bulk, non-bulk, and containers) are being moved across Australia's transport network. Firms seek this information as part of their perpetual search for potential savings in cost and time, and improved reliability. These firm-level operational needs can be classified into four categories:
    a. goods movement (what is being moved where?);
    b. cost of goods movement (how much does it cost?);
    c. time taken (how long does it take?); and
    d. capacity (what is the utilisation of the network?).
2. The stakeholder consultation also highlighted the importance of a number of related datasets, including information about:
    a. nationally significant freight corridors;
    b. first/last-mile deliveries;
    c. urban freight; gateways;
    d. capacity management; and

[9] We note that the stakeholder consultation survey group was skewed towards small firms, which do not necessarily account for the majority of goods moved on Australia's freight supply chain, given the concentrated industry structure in both road and rail freight transport.

e. data requirements for modelling purposes.

We then identified the data needs of the sector by type of stakeholder and by relevant time horizon, and found that:

- smaller firms are largely interested in real-time or recent operational performance data that could help them improve their commercial performance;
- medium sized firms showed particular interest in the flows and performance of international gateways (ports and airports);
- large firms were keen to obtain an accurate and comprehensive picture of the national freight task in their areas of commodity specialisation;
- all firms are interested in network performance, particularly at key nodes (such as moving from seaports and airports to rail and road links, and from road and rail to intermodal hubs);
- regulators, such as the NHVR, are interested in volume (or capacity) data and require forecasts of demand in order to establish investment and revenue targets of regulated entities; and
- state government transport departments require an understanding of real-time congestion and overall network efficiency, as well as longer-term trends (e.g. where will bottlenecks emerge at some future point in time).

These findings are consistent with the results of a number of recent public and industry studies that have, among other things, commented on how data could be utilised to increase supply chain efficiency.[10] A common observation from these studies is that different stakeholders have different data needs.

Are stakeholders prepared to share their own data?

Our consultation process identified the complexity of questions around sourcing and sharing data. On the one hand, firms generally appreciate the national interest benefit from increased data sharing, and their own commercial interest in gaining access to coherent and accurate 'national' data. In our surveys this was exemplified in a widespread 'willingness-in-principle' to share private commercial data.

However, on the other hand, firms also recognise the costs of data collection, both financial and strategic. They find that their internal costs of collecting, collating and sharing data to be high, and that, at least so far, they have derived little or no benefit from that process.[11] While the freight industry is, generally, willing to share operational data to improve the efficiency and productivity of Australian supply chains, it has been (as a group) reluctant to make commitments and/or undertake new

10 Examples include: (i) National Land Transport Productivity Framework (NTC, 2018), (ii) National Freight Performance Framework working paper (NFSCS, 2017), (iii) Data Availability and Use (Productivity Commission, 2017), (iv) National Telematics Framework (TCA, 2018), and (v) Towards a Multimodal Transportation Data Framework (CISCO, 2018).

11 We note here that the distribution of survey respondents by firm size is skewed towards smaller firms, making the costs of data collection proportionately higher than for larger firms.

initiatives. This reflects industry uncertainty around the potential benefits that could be gained in return for the effort required to share data. Other concerns reflect the absence of a systematic data collection approach, a lack of timeliness in terms of data delivery and dissemination, fragmented datasets that do not enable end-to-end supply chain visibility, and a lack of traction in previous initiatives on establishing some sort of 'data centre'.

Freight firms indicated their concern that they may lose competitive advantage as a result of sharing data, and that they may give competitors detailed insights into their operations. There are additional concerns over IP related to collection techniques, and that customers may not wish commercially sensitive data to be shared with third parties.

Overall, the key tensions identified in the course of the stakeholder consultations were that:

- data that is collected and published needs to be suitably transparent to enable benchmarking whilst also sufficiently aggregated to accommodate commercial sensitivities; and
- data exchange needs to offer mutually beneficial outcomes. An emphasis on the potential usefulness of outputs is necessary to encourage improved data sharing.

What are the options for improving the collection and analysis of data to support improved decision-making?

The literature review and stakeholder responses demonstrate that the fundamental shortcomings around freight data tend not to stem from the 'what is being collected', but instead from the 'how it is being collected and disseminated'. Existing datasets could and should be used more productively, since better utilising existing datasets would, *prima facie*, be a lower cost option than developing entirely new datasets. Therefore, in our view, the focus of future initiatives should be directed towards improving data coordination and the dissemination of datasets that are already being collected. Important components of this approach are:

- establishing consistent standards for collection, definitions, levels of granularity, scope, collection frequency etc.; and
- taking a national approach, led by the Commonwealth, but drawing support from important state/federal bodies.

The creation of a relatively independent data collection agency would likely facilitate a nationally-focussed freight data coordination effort. Stakeholders thought that such a 'data collection agency' should focus on data collection and dissemination, rather than on data analysis which might be more susceptible to pressure from 'vested interests' and 'data hoarding'. Such an agency should be neutral (rather than being allied to specific stakeholder groups), be responsive to the 'voices' of all stakeholders, and focus on the accuracy and timeliness of outputs.

The 'public good' value of a 'freight data office' is more closely related to the coordination, standardising, anonymising, collection and rapid dissemination tasks than to analysis and reporting. Our inquiries revealed an emerging 'body of practice' around the world that is addressing this need

for the neutral handling of public data. More generally, the core capabilities of an effective data governance regime are:

- a clearly defined and narrow remit of activities;
- initial design and governance input from all stakeholders, including all levels of government;
- a governance mechanism to engage users (such as an advisory committee); and
- mechanisms to ensure the confidentiality of commercial data that has been procured.

Our review of Australian and international approaches found several programs that could potentially improve supply chain efficiency and merit more government support, including 52 promising projects in Australia. Many of these programs are joint government-industry initiatives, which (on the whole) appear to work well to extract the 'public good' value from heretofore privately-held datasets. A number of state-level projects may be suited for expansion to a national focus, while several projects led by BITRE have important national economic management implications and should continue to be funded. In our view, several of these programs (Table S-1-2 below) should be reviewed and, where relevant, considered for expansion to meet the goals of this Study.

Table S-1-2 Australian freight data programs

Options	Data collection	Processing	Access	Governance	Focus area
Freight Observatory	Internal/ external	Internal	Open	Government	Planning Investment
Trade Community System	Internal	Internal	Restricted	Industry	Operations
AEOLIX	Internal	External	Restricted	Industry	Operations
Customs Integrated Cargo Systems	Internal	Internal	Restricted	Government	Planning Investment
TCA data / platform	External	Internal	Restricted	Government	Operations Planning Investment
Freight movement data	External	Internal	Restricted	Research	Operations Planning
BITRE	External	Internal	Open	Government	PlanningInvestment
ABS TrSA	External	Internal	Open	Government	Planning Investment
CSIRO TraNSIT	Internal	Internal	Open	Research	Planning Investment
NEVDIS	Internal	Internal	Restricted	Government	Operations
NRSPP	Internal/ external	Internal	Open	Industry	Operation Planning

Source: iMOVE and partners analysis.

Potential benefits of freight data reform

As part of this Study, we undertook a high-level policy costing analysis to provide a basic guide to the Department of total costs of the three sets of recommendations. We also provide an indication of whether the economic benefits of freight data reform are likely to exceed these costs.

The potential economic gains from freight data reform primarily relate to the freight and related industries. We estimate the size of the Australian freight supply chain industry at $106.5 billion (2017-18).[12] Based on this estimate, a 0.1% (that is, a one-tenth of 1 percent) improvement in capital and labour productivity would increase the gross value added (GVA) of the industry by almost $80 million annually.[13] Similarly, a 0.5% (that is, one-half of 1 percent) improvement in capital and labour productivity would increase industry GVA by close to $400 million annually.

We estimate the total fiscal costs of the three groups of policy recommendations to the Commonwealth Government to be $28 million over four years, or $7 million per year in nominal terms (excluding the costs borne by state governments and freight industry costs). When compared to the potential economic benefits, in our view these fiscal costs borne by the Commonwealth Government are low.

[12] We recognise that there exists other estimates of the size and scope of the transport industry, although there is currently no published estimate of the "freight supply chain" industry. A recent ALC/ACIL Tasman estimate of the size of the Australian logistics industry (which, in our view, is broader than the freight supply chain), at $139 billion (in 2017-18 dollars), is larger than our estimate. And the ABS Transport Satellite Account experimental estimates of the Australian transport industry (which includes non-freight transport and related industries) is $135 billion (in 2017-18 dollars).

[13] Gross value-added measures the contribution of a firm or sector to gross domestic product (GDP).

1 Introduction

1.1 About this research study

1.1.1 Background

The Australian Government announced (in November 2016) its intention to develop a National Freight and Supply Chain Strategy (Strategy). This announcement was in response to the findings and recommendations set out in the Australian Infrastructure Plan, which recommended a supply chain strategy be developed (Infrastructure Australia, February 2016). The primary objective of the Strategy is to lift the productivity and efficiency of Australia's freight supply chain.

The 2017 *Inquiry into National Freight and Supply Chain Priorities* identified as a priority the need to identify and remove barriers to the efficient operation of freight networks and supply chains by benchmarking freight performance domestically and international through identifying, collecting and sharing relevant data.

1.1.2 What we have been asked to do

As part of developing the Strategy, DIRDC initiated this *Freight Data Requirements Study* (Study) into the freight data challenges identified by the recent industry led *Inquiry into National Freight and Supply Chain Priorities* (the Inquiry).

For this Study, DIRDC has asked iMOVE and its research partners to:

- identify what freight data is required (for governments and across industry) to improve freight related planning, operations and investment decision-making:
  - for governments this may include freight movement data and other data to inform policy and investment decisions;
  - for industry this may include operational data that would allow increased efficiency of freight firms;
- identify what currently exists and what the gaps are;
- identify the appetite across industry sectors and governments for sharing the required data; and
- identify options for operational and governance frameworks for Australia to improve the collection and analysis of data to improve freight related planning, operations and investment decision-making.

In terms of the Study's 'deliverables', DIRDC has requested that iMOVE provide the following:

- an analysis of the effectiveness of existing data collection and analysis practices;

- a summary of the freight data needs of both government and industry for improving planning, operations and investment decision-making;
- pragmatic recommendations for how the Commonwealth can promote better data collection and dissemination practices through the Strategy, the National Action Plan and relevant Implementation Plans; and
- pragmatic recommendations for a suitable data model for collection and the most appropriate governance framework, with information regarding potential costs for future data collection and organisational structures.

1.2 Our approach

To achieve these outcomes in a relatively short time period, the project was structured into four work packages, as follows:

- Work Package 1 (WP1) surveyed all relevant government and industry stakeholders for information about freight data needs in planning, operational and investment decision.
- Work Package 2 (WP2) undertook a systematic review of freight data and data sources currently available, to outline a data resource that would meet the key needs of informing planning, operations and investment decisions.
- Work Package 3 (WP3) identified and developed pragmatic options for the hosting, governance and dissemination of freight data.
- Work Package 4 (WP4) examined how comparable countries are collecting, analysing and reporting freight data. It will identify best practice models relevant to Australian freight sectors

At the Preliminary Draft Report stage, we submitted to DIRDC four reports encompassing the four work packages. We subsequently presented our initial findings and recommendations to the department in Canberra on 21 December 2018. We then presented a further set of recommendations to the department in mid-January 2019 and received positive feedback.

This Final Report presents our evidence-base, findings and recommendations in a format that matches the questions outlined by the department in the Project Request. We have also produced the four work packages as separate final reports in the form of appendixes to this main report.

1.3 Study participants

iMOVE, with the support of DIRDC's Data Reference Group partners, has undertaken extensive consultation for this Study, including:

- focus group interviews with representatives from a range of organisations, including from government agencies, industry bodies and private industry;

- an online survey of a large cross-section of stakeholders to provide quantified measures of the value of data sharing and data acquisition from the point of view of these stakeholders;
- targeted telephone interviews with key industry executives; and
- other expert input (from industry leaders) into the process of developing recommendations.

1.4 Structure of this report

This report is structured to address the specific questions asked in the Freight Data Requirements Study Project Request. This report is intended to be read as a stand-alone document with supporting material provided in several appendices.

This report is structured as follows:

- Chapter 2 investigates what freight data currently exist;
- Chapter 3 identifies the freight data gaps that currently exist;
- Chapter 4 asks whether stakeholders are prepared to share their data;
- Chapter 5 provides a public policy evaluation framework specific to the questions around freight data institutional design and governance;
- Chapter 6 addresses the question how data collection can be improved; and
- Chapter 7 provides a preliminary and high-level (fiscal) policy costing of the recommendations and explores the potential economic benefits.

We provide a concordance (or cross-reference) of our recommendations to our findings and evidence base at Appendix A.

Greater detail about the Study, including the methodology and detailed analytical and survey results, can be found in four appendices, as follows:

- Appendix B. Stakeholder Consultation Final Report
- Appendix C. Gap Analysis Final Report
- Appendix D. Institutional Arrangement Final Report
- Appendix E. International Approaches Final Report

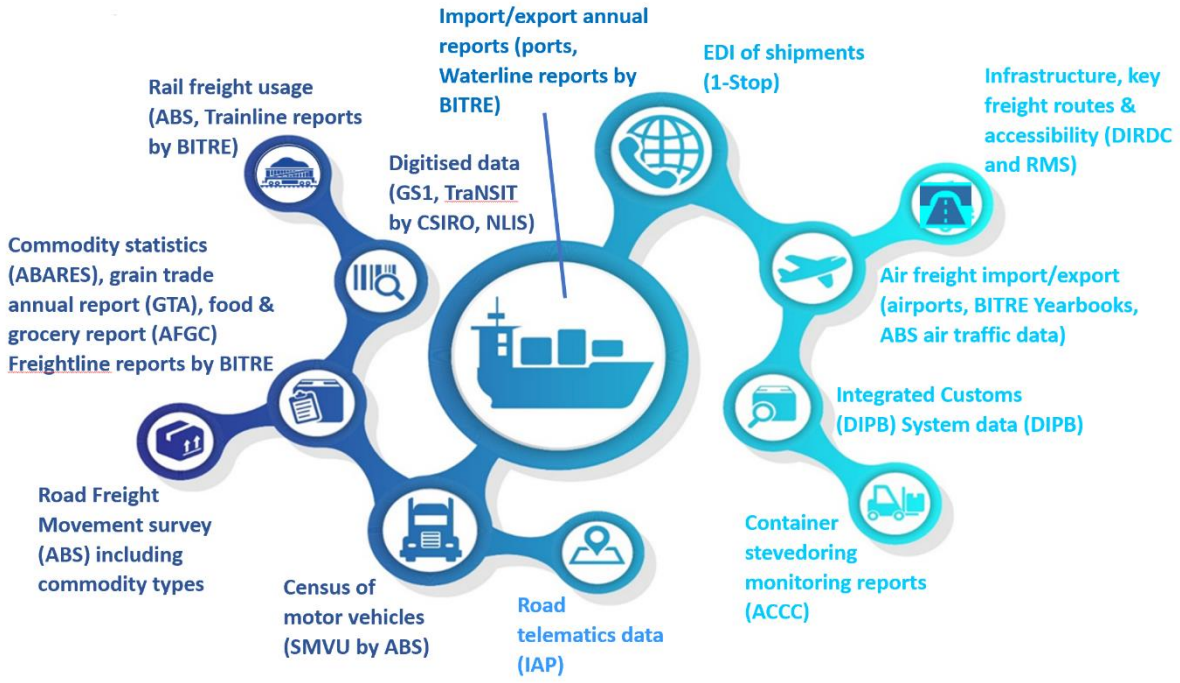
2 What freight data currently exists?

2.1 Identifying existing freight data

There is a plethora of freight related datasets in Australia, collected by all levels of government, regulators, port and other infrastructure facilities and industry bodies. In addition, all freight operators and allied firms collect their own data for their own commercial uses and to meet regulatory requirements. In total, our research found over 350 unique freight related data sources (Figure 2-1):

- Classified by mode, the majority of these unique sources relate to the road network, perhaps reflecting the structure of the market (where there are many freight firms), and the custodial responsibilities of local, state and national governments for management, planning and investment.
- Classified by commodity, our research found 84 data sources that included significant and longstanding time series datasets for wheat, beef and other key exports.
- Around one-half of these unique data sources are irregular or ad hoc reports produced by government agencies, industry bodies, large firms (or their consultants). Often these reports are designed to influence some aspect of public policy in relation to Australia's freight supply chain. Nonetheless, the data and analysis produced can generally be used by any third-party.

Figure 2-1. Main existing Australian freight data reviewed



Source: iMOVE and partners.

2.2 Our approach

A commodity and mode-specific approach was adopted to catalogue the current datasets and previous efforts in information integration across three categories of stakeholders, being: national government, state governments, and private businesses. Over 350 data sources were reviewed and various attributes of datasets and data points documented, such as the length of data series (in terms of time), the dataset release formats and key data users. Accordingly, a spreadsheet was compiled from all the existing datasets and reports for all transport modes (road, rail, air, sea and coastal), and commodity groups across three levels (Table 2-1).[14]

2.3 Findings

There is a large body of freight related datasets in Australia. However, there are significant gaps in the datasets, most notably in relation to how data with common characteristics (say, by commodity or mode) is not comparable across supply chains, regions or states because it is not standardised and concorded to the same levels of aggregation or granularity or collection frequency.

That said, this review has shown that the Australian government and all states and territories have begun to embrace open data principles. Two good examples of this new approach are the IP Australia open data model, and Transport for NSW's (TfNSW's) commitment to 'open' and 'easy' access to some freight government data.[15] This new approach has the potential to improve the efficiency of Australia's freight supply chain through improved private and public sector decision-making (supported by new and innovative analytical approaches). However, while we have observed that most state government transport departments have developed an open data portal policy and architecture, not all departments have provided the same quantity of data in a consistent and accessible format.

This study also indicated several other problems with government data release. For instance, because the government does not generally release the underlying raw data, it must necessarily make a call on the level of data aggregation, which will clearly not suit every data user. Another common criticism is that data are often released with significant delay. This criticism is relatively recent and is driven by the fact that modern information and communications technology means that information in other aspects of life are released in real-time. Comparing this to the delays in publishing ABS surveys such as SMVU and FMS, which in some instances occur two years after collection (and in a highly aggregated form that prevents modelling and forecasting precision), reflects poorly on modern government approaches to data dissemination.[16]

[14] The spreadsheet will be delivered to DIRDC as part of the Final Report work package.

[15] https://data.gov.au; accessed on 28 January 2019.

[16] SMVU – Survey of Motor Vehicle Use. FMS – Freight Movement Survey.

Table 2-1. Key holders of freight data

Type	Primary collector	Collector and analyser	Disseminator	Open Data portal
Commonwealth Government	Australian Bureau of Statistics (ABS)	Bureau of Infrastructure, Transport and Regional Economics (BITRE)	National Transport Commission (NTC)	Data.gov portal
	Department of Foreign Affairs and Trade (DFAT)	Australian Logistics Council (ALC)	Australian Competition and Consumer Commission	
		Bureau of Resources and Energy Economics (BREE)		
		Ports Australia		
		The Department of Natural Resources Mines and Energy (DNRME)		
		Department of Agriculture, Fisheries and Forestry		
		Australian Bureau of Agricultural and Resource Economics (ABARES)		
		Department of Infrastructure and Regional Development and Cities (DIRDC)		
State governments		Queensland Government • Department of Transport and Main Roads (TMR)		Data Queensland government
		South Australian Government		Data SA
		Victoria State Government • VicRoads • Department of Economic Development, Jobs, Transport & Resources (DEDJTR)		Victorian Government Data Directory

Type	Primary collector	Collector and analyser	Disseminator	Open Data portal
		NSW Government • Digital Topographic Database (DTDB) • Department of Planning, Transport and Infrastructure • Transport for NSW • Transport, Roads and Maritime Services		Data NSW
		WA Government • Department of Transport • WA Environmental Protection Authority		Open Data Portal for Western Australia
		ACT Government • Roads ACT		ACT Open Data Portal
		Tasmanian Government • Department of State Growth • TAS Department of Infrastructure, Energy and Resources		TAS Data
		NT Government		Digital Territory
Government-supported organisations		South Australia Freight Council - SA		
		New South Wales Mineral Council Ltd. - NSW		
		Freight and Logistics Council of WA		
		Queensland Transport and Logistics Council (QTLC) - QLD		
		Transport, Housing and Local Government Committee		
		The Australian Industry and Skills Committee (AISC)		

Type	Primary collector	Collector and analyser	Disseminator	Open Data portal
Research organisations		Austroads		
		AgriFutures Australia (Rural Industries Research and Development Corporation)		
		ARRB		
		CSIRO and Data61		
Private parties		Qantas freight		
		ARTC and Arc Infrastructure		
		John Holland		
		Port Botany		
		Port of Brisbane		
		Port of Melbourne		
		Port of Fremantle		
		Port of Adelaide		
		IBIS World		
		Consulting reports		

In summary, our review found that:

- Many aspects of freight data would benefit from greater harmonisation and common data standards. For instance, considerations of cost, return, productivity, safety, comparisons of alternative transport modes, capacity, contributions to economy, the impact and response to major events and effects of policy changes at the state and federal levels are all better assessed using comprehensive, longitudinal data.
- The national data surveys are costly and follow time-consuming cleansing and analysing processes. As a result, there is a long time lag before data can be released for use by the public.
- In some cases, the lack of statistically suitable sample sizes leads to a suspension of data collection. Hence, critical information is missing in some aspects of the freight task datasets, including seasonal variations, activity-based and commodity-based information.
- Privately-owned data is not often shared with the government due to data confidentiality issues, and a lack of any data sharing procedures.

2.4 Recommendations

Given the disparate and inconsistent approaches taken to collect freight data in Australia, we recommend the establishment of a national policy on freight data in Australia, led by the Commonwealth (Group 1):

1. As the lead agency in the formation of the National Freight and Supply Chain Strategy (NFSCS), the Commonwealth should lead the development of a national policy on freight data that seeks to improve the collection, hosting, access to, and analysis of information relating to the movement of freight, and which addresses the interests of all stakeholders in the sector. It is recognised that the NFSCS is being developed in conjunction with all jurisdictions.
2. Consistent with existing legislative requirements, a mechanism should be established to define and implement nationally a framework of standards for freight data to facilitate aggregation and comparison across diverse data sources. The States, via COAG, would play a key role in facilitating a framework of data collection standards. The Commonwealth would play a coordinating role.
3. The Commonwealth should act to make its own freight related data available in a manner consistent with open data principles, and encourage other data owners such as asset and fleet managers, regulators, state government agencies, freight operators and freight customers to do likewise.

3 What are the freight data gaps?

The question what freight related datasets are needed by stakeholders is at the heart of this study. We used several approaches to answer the question, as follows:

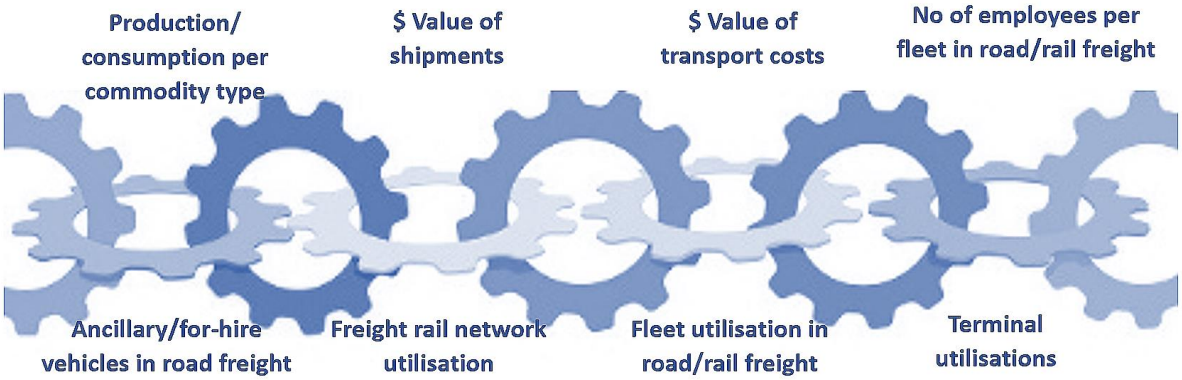
- a targeted literature review was conducted to review relevant government and industry reports;
- stakeholder consultations via direct interviews with industry and government stakeholders, and via an online questionnaire; and
- an internal cap analysis to analyse and draw together the above findings.

3.1 Findings from the literature review

It is useful to briefly review three recent studies that produced similar results to this Study in relation to identifying and classifying freight data gaps.

The National Freight and Supply Chain Strategy (NFSCS) identified freight data as a key requirement to improve decision-making in the freight sector, both for individual businesses and from the perspective of government planning and investment. At the same time, a number of recent studies identified significant gaps in the freight datasets that are available in Australia. For example, the most recent "*Who Moves What Where*" study, which was completed by the NTC in 2017, identified the 'major freight data gaps' shown in Figure 3-1.

Figure 3-1. Major freight data gaps identified in "*Who Moves What Where*" (NTC 2017)



Source: NTC (2017).

In 2018, BITRE and the ABS convened a Steering Group with the goal of filling key data gaps and developing performance data. The Final Data Collection Plan provides a list of 16 priority projects, including:

- a heavy vehicle infrastructure asset register;

- an infrastructure performance dashboard;
- freight performance indicators;
- network optimisation frameworks;
- measuring transport's contribution to the economy via a special transport 'satellite account' within the national accounting framework;
- collating non-fatal road injury data;
- a customs freight data analysis project;
- a road freight telematics data collection initiative; and
- road operator data to support connected and automated driving.

The Australian Logistics Council (ALC) is the lead advocacy organisation to all levels of Government and industry on freight transport and logistics supply chain regulation and infrastructure issues. Some of the recommended priorities for assembling common datasets for freight supply chains made by ALC (2018) are to:

- encourage the adoption of global data standards and collaborative electronic platforms across all freight modes to streamline the exchange, comparison, and understanding of data within the land, sea and air freight sectors;
- establish a data gathering and performance review mechanism focused on travel times and reliability on key freight routes and the efficiency of the interfaces at freight terminals with routine public reporting of performance over time;
- benchmark the performance of key export supply chains against international competitors;
- fund the ABS' proposed transport satellite account that separately reports the value of freight transport for the economy as a whole; and
- fund a freight observatory to collect, analyse and publish freight performance data for all freight modes and supply chains to better inform decision making and investment, with appropriate governance arrangements and the potential for this function to be held by an independent body that has industry confidence.

Overall, the literature review highlighted that a significant amount of useful data are already being collected through various government programs. Yet accessing and making use of the data is not necessarily straightforward:

- The available data are presented in an aggregated format, which may be more useful for planning/investment purposes. This points to an important trade-off between data aggregation, which may be useful from a government planning perspective, versus data granularity, which may be more useful for firm-level planning.

- The cost of locating and accessing data is also an issue, due to the non-standardised data and the fragmented/siloed nature of current data collection.

The literature review furthermore showed that the needs and interests of industry and government are not necessarily aligned. While governments will generally adopt a broader perspective that is focused, for instance, on the productivity or safety of an industry, individual firms can reasonably be expected to be focused on their own performance and profitability. While these respective objectives may coincide in some instances, there is no guarantee that this will always be the case.

The following main findings relate to freight data needs and availability:

- The data needs of all stakeholders are mainly driven by the desire to be able to better understand the performance metrics of the supply chain. Typically, performance is measured in terms of utilisation, service level and reliability, cost, and goods movement (volume, route, time). In this regard, datasets that are highly sought after include: congestion, travel time and asset condition. Associated datasets include: employment, licensing and customs data.
- The focus of governments is on national economic management, including national or regional productivity; international competitiveness; safety; minimum standards for workers; and network infrastructure (i.e. asset) management (such as planning and investment).

3.2 Findings from the stakeholder consultation

The stakeholder consultation comprised two components - telephone interviews with government and industry stakeholders, and an online survey distributed to industry stakeholders augmented by focus group interviews.

3.2.1 Interviews and focus groups – key themes

In discussions with stakeholders, several key themes were identified. The relatively free-form framework of the interviews conducted with stakeholders enabled a broad range of issues to be discussed:

- **Data provision**. Data collection costs for individual firms can be high. There is an opportunity cost associated with collating and assembling data, as well as potentially legal risks, for instance if data incorporates customer information. Data exchange therefore needs to offer mutually beneficial outcomes for all parties. An emphasis on usefulness of outputs is necessary to encourage improved data sharing between government and firms, for instance by enabling a focus on investment on those parts of the supply chain where the greatest costs arise.
- **Data accessibility.** Stakeholders raised accessibility issues such as infrequent data updates, data dissemination that is often not timely, and the level of aggregation and presentation of the datasets being viewed as not fit-for-purpose.
- **Data sharing.** Stakeholders said that the main reason why firms are reluctant to share data is that the net benefit of doing so was not clear. In particular, firms were concerned about 'giving

away' commercially sensitive information. There are also concerns that a government-run national data entity would 'control' what it wants to share.

- **Data aggregation.** The data that are currently accessible do not enable sufficiently comprehensive insights into end-to-end supply chain movements to allow for monitoring of the associated cost and time considerations.
- **Data usefulness.** Stakeholders noted that freight data is not focussed on key network problems. An absence of systematic data collection that provides comparative data between different transport modes and associated network infrastructure means that transport planning decisions are necessarily not fully informed, in particular around corridors and nodes of national significance. Stakeholders also indicated that while understanding the bottlenecks that exist in the transport network will go some way in addressing capacity and network capability, a more holistic understanding of capacity across the entire network can offer broader advantages.
- **Potential role of benchmarking.** Industry stakeholders indicated that there is an appetite for benchmarking the performance and competitiveness of the Australian freight sectors, both domestically and internationally. In this regard, trust in the quality of data available as well as the level of aggregation that is required for reporting is a key factor.

3.2.2 Online survey – key themes

The online survey of freight sector businesses attempted to better understand what use respondents make of internal and external data, where businesses saw gaps in data availability and businesses' assessment of barriers to sharing data. Around two-thirds of the 148 respondents only deal with one category of data, although the type of data of interest varies by size of business. Small business enterprises (SBEs) are mainly interested in competitiveness data, medium business enterprises (MBEs) are concerned with competitiveness and international gateways performance datasets, while large business enterprises (LBEs) are interested in market comparisons, but also seem to be using many different types of data. Overall:

- Gaps were identified in relation to costs and freight volumes. Respondents thought that more data should be provided on performance of international gateways, competitiveness, performance of multimodal networks, infrastructure performance and regional freight.
- A critical concern of all companies, specifically about the data sourced internally is whether the data can be shared with others. Almost two-thirds of respondents stated that their data can be shared to some extent, whereas one-fifth stated that their data can become publicly available. SBEs and LBEs indicated a greater reluctance to share data than MBEs; industry associations (IAs) seemed to be most sensitive to sharing their internally sourced data, regardless of the data type presumably because their 'internal' data. is sourced from their members under conditions of confidentiality.
- Overall, concerns about competitors were viewed as the most important barrier and challenge for freight data sharing (35%). The cost in terms of necessary resources (30%) was viewed as

the second most important barrier. Almost one-third of the sampled participants indicated that they are currently involved in any existing cooperation between Australian data holders.

3.2.3 Classification of gaps, by stakeholder

Figure 3-2 below illustrates the data needs that, in our view, stakeholders would likely require to improve the efficiency of their operations, their competitiveness in the market, or, in the case of government, to make better planning and investment decisions.

Figure 3-2. Data Needs/Gaps by stakeholder

Source: iMOVE and partners analysis.

3.3 Findings from the freight data gap analysis

The first step to address the data gaps is to understand the nature and key causes of individual data gaps and potential barriers ahead. The second step is exploring the benefits of each individual item of data, if collected, for different stakeholders in short-term and long-term.

Our research first classified freight data gaps into eight broad categories, in order of significance:

- supply chain visibility;
- particularly at intermodal nodes (e.g. around ports or road/rail interchanges);
- integration, standardisation or coordination schemes;
- freight tasks (operational);
- productivity measures (industry-wide);
- labour, fleet, operators (operational);
- network infrastructure/ land use (planning, investment);

- cost/revenue and economic contributions (economic analysis); and
- sustainability measures (environmental).

We then applied a ranking methodology to identify the most significant of these 8 freight data gaps. The ranking methodology identified seven factors, in the form of qualitative (yes/no) questions, as follows:

1. Is the identified gap likely to be useful to a broad cross-section of the freight industry?
2. Is there an identified 'market failure' (i.e. is there a reason firms aren't collecting these data already other than 'social costs > social benefits')?
3. Is the missing data required by a regulator or other government agency (local, state or federal) for supply chain management?
4. Is there an identified 'governance failure' (i.e. is there a reason that governments are not collecting the data at a coordinated state or national level)?
5. Would filling the gap promote economic efficiency (productive, allocative, dynamic), broadly from a national perspective?
6. Would filling the gap be likely to realise a latent public good value of data, (particularly at the national 'economy-wide' scope)?
7. Would filling this gap help to fill other gaps, and if so how many other gaps? (note, this question is quantitative)?

As a result of applying the above evaluation framework, we ranked the most significant freight data gaps with 'supply chain visibility' and 'Integration coordination schemes' ranking highest. We then found the two best examples of those gaps to provide DIRDC with a clearer understanding of what is missing at a detailed level. Finally, we circulated the results of this analytical approach to the Study's expert industry advisors to 'sanity check' whether we identified good examples of what the industry is looking for. Table 3-1 below summarises our main findings in relation to the data gap analysis.

Table 3-1: Top gaps identified, by main gap classification

No.	Gap Classification (in order of significance based on applying methodology)	Example 1	Example 2
1	Supply chain visibility	Visibility of containerised supply chain (trade focus)	Visibility of food and manufactured products supply chain (domestic focus)
2	Integrated coordination schemes	Lack of coordination, interoperability & integration of freight operators and stakeholders in the import/export trade through ports	Lack of coordination and integration of urban goods and services transport
3	Freight tasks	Regular and updated commodity-based freight task for all transport modes	Lack of enough granularity of freight task
4	Productivity measures	Productivity measures of trucking companies and rail operators	Standardisation of productivity measures
5	Labour, fleet, operators	Information about the number of labour per fleet, skills and age	Utilised fleet separately for ancillary and for-hire operators
6	Network Infrastructure/ Land use	Data about the first mile, last mile issues of network	Network resilience and integration of this data with modelling and planning
7	Cost/revenue and economic contributions	Commodity-based and region-based operational cost for all transport modes	Cost and quantity of inefficiencies in each element of the supply chain (e.g. cancellation fees, invalid PRAs, extra trips, etc)
8	Sustainability measures	Sustainability indicators of transport modes and logistics nodes	Impact of regulations to improve sustainability (i.e. before-after studies of imposed regulations)

3.4 Recommendations

Our recommendations are intended to support progress towards better meeting stakeholders' requirements for fit-for-purpose and up-to-date data sets (Group 3). We recommend that:

12. The Commonwealth prioritise its investment in assembling 'missing' freight data towards the following five freight data needs (identified from a case-by-case assessment conducted by this study of the potential costs and benefits associated with the closure of each gap):

Supply chain visibility:

a. Improve the visibility of the containerised supply chain, from port to intermodal hub to final destination; and

b. Improve the visibility of the domestic food and manufactured products supply chain, from farm/plant to warehousing and distribution centres to the final destination.

Better coordination of existing freight data (standards, confidentiality, harmonisation, granularity):

c. Adopt and propagate freight data standards and protocols (where considered beneficial) to align datasets to common standards and levels of granularity and confidentiality, focussing first on network utilisation measures (e.g. volumes) and productivity measures already collected (or potentially easily collected at low cost) by freight operators.

Long-term planning and investment in the network:

d. Determine the most significant data needs related to the government's role in planning supply chain network integration and expansion, and long-term sustainability and resilience, potentially through dialogue with Infrastructure Australia and relevant state-based infrastructure advisory bodies (such as iNSW and Building Queensland).

e. Give priority to satisfying the network infrastructure data needs of these bodies.

In relation to 12 a. and b., we note the existing BITRE programs and recommend that consideration be given to expanding the existing supply chain indicators project to support these recommendations.

4 Are stakeholders prepared to share their data?

4.1 Data sharing involves complex trade-offs

Our consultation process identified the range and complexity of issues around sourcing and sharing data. On the one hand, firms do see the national interest benefit from increased data sharing, and their own interest in gaining access to coherent and accurate 'national' data. In our surveys this was exemplified in a widespread 'willingness-in-principle' to share private data.

However, on the other hand, firms also see costs, both financial and strategic. They find their internal costs of collecting, collating and providing data into the sharing process to be high, and their dissatisfaction is aggravated by the lack of benefit they have derived thus far from the outcome. They are also anxious that through sharing they may lose competitive advantage, and particularly in 'thin' markets that they might give their competitors unreasonably detailed insights into their business. There are additional concerns over IP related to collection techniques. For instance, some firms have invested significant resources into developing new applications to collect their own data and want to protect that IP.

The key tensions identified in the course of the stakeholder consultations were that:

- data that is collected and published needs to be suitably transparent to enable benchmarking whilst also sufficiently aggregated to accommodate commercial sensitivities; and
- data exchange needs to offer mutually beneficial outcomes. An emphasis on the potential usefulness of outputs is necessary to encourage improved data sharing.

4.2 Stakeholder views

The freight industry has shared its concerns on data sharing in several fora including in submissions to major recent public inquiries.

Our stakeholder consultation indicated that, in general, industry is not opposed to sharing operational data that can help improve the efficiency and productivity of the supply chains. That said, industry is nonetheless reluctant to make commitments and/or to undertake new data initiatives. This is mainly due to uncertainty around the potential benefits firms would gain in return for the effort they must make to share their data, given that, to date, the outcomes that have flowed from sharing data have not been viewed as being particularly useful from the firm's point of view. Smaller business entities emphasised that the cost and effort of additional data collection and processing (for sharing purposes) should be either minimal or funded by government. Alternatively, low-cost automated processes would be acceptable, again if additional costs were met by government.

Particular comments from industry on any potential benefits that might flow from data sharing centred on the lack of:

- timeliness on datasets delivery/dissemination;

- systematic data collection efforts;
- end-to-end visibility due to fragmented datasets; and
- traction from previous initiatives on establishing some sort of 'data centre'.

There was a widely held view that organisations would be selective in the data that they were willing to share and that the more commercially sensitive data, especially data relating to customers, would not be shared.

Finally, examples of successful data models were discussed during the consultation process. Stakeholders noted that successful data-sharing models typically produced shared benefits. For example, the data requested by government should help with more focussed transport infrastructure investment decisions. Additionally, these datasets could also be made accessible to industry to improve opportunities for improved competitiveness on a commercial and operational level.

4.3 Recommendations

We consider that many of the concerns voiced by stakeholders can be addressed through suitable organisational and governance arrangements for collecting data (Group 2). We recommend that:

4. A Freight Data Coordination Office be established to:
    a. collect, host, and disseminate freight data at a national level, leaving data analysis to be conducted by relevant stakeholders according to their respective mandates, including at the state and regional level;
    b. encourage data providers to deliver needed data compliant with established data standards; and
    c. initiate processes to procure missing data.
5. A mechanism be established by which a steering group representative of data users and data collectors can guide the priorities of the Office to build trust in the new organisation and maintain its relevance to stakeholders.
6. The Commonwealth take a leadership role in the procurement of such 'commercial' freight related data as is needed and which exhibits good value for money. For example, if jurisdictions are separately purchasing vehicle movement data, there may be a benefit in the Commonwealth acting as a monopsony buyer of these datasets.
7. Secure protocols be established for data collection and handling that support participation and contribution from stakeholders that can supply a wide range of data sources.

8. Practical and robust arrangements be established for securing access to raw freight data from industry participants including rules relating to aggregation and public access to respect commercial sensitivity.

9. A republishing or 'hosting' website be established with the mission to republish all freight data on a single site.

10. A transition be encouraged to move towards low cost, harmonised collection processes for all freight related data from wherever it is generated or held. This includes (but is not limited to):

    a. the automation of current survey processes;

    b. the increased adoption of vehicle telemetry and usage of vehicle telematic data;

    c. the establishment of new automated sensing methods to generate needed data;

    d. accessing public and private datasets with agreed inquiry tools; and

    e. changing data analyses to utilise the higher availability of automatically collected data.

5 Data governance evaluation framework

5.1 A complicated landscape

A key feature of Australia's freight network is that there is a complex mix of government and private ownership across all transport modes. The different networks are subject to different regulatory regimes by various governments. Overlapping this is the fact that the Commonwealth and state and local governments act as custodians for different parts of the same network and share decision-making and financing responsibility for maintaining the network. While making this point, for the purposes of this study we take this network complexity as given. Firms aim to operate as efficiently as possible in the given political, policy and regulatory environment. Governments make decisions about infrastructure investment within the same complex environment.

5.2 What is the purpose of collecting freight data?

In commissioning this study, DIRDC has asked us to identify what freight data are required to improve freight related planning, operations and investment decision-making, or, more broadly, what freight data are required to improve the efficiency of Australia's freight supply chain. Efficiency is thought of as having three components:

- productive (short-term) efficiency, which is concerned with minimising costs (broadly defined) in a given environment with existing investments and infrastructure, for instance, by trucking goods between two points via the most direct route;
- pricing (short-term) efficiency, which is concerned with sending the 'right' price signals that reflect the underlying opportunity costs, for instance, by raising or lowering charges depending on whether the capacity utilisation of a port is particularly high or particularly low; and
- dynamic or investment (long-term) efficiency, which is about ensuring that the investments which are undertaken are 'net beneficial' in the sense that the resulting benefits exceed the costs, and that the investments themselves are least-cost. In other words, dynamic efficiency can be defined as achieving productive efficiency over time via efficient investment.

Efficiency is therefore a relatively complex, but also multi-faceted concept. In the context of freight supply chains, this concept touches on a large number of operational and investment aspects that have been canvassed extensively in past reviews of the Australian freight sector. Clearly, in a market-based economy, there is a strong desire to constantly improve firm performance (Aberdeen Group 2013).

The ALC (2014) noted that the industry is affected by many regulations, some of which overlap and generate inefficiencies. Freight does not have a voice in many planning debates, resulting in the provision of inefficient infrastructure and a loss of productivity. The ALC (2014) also claimed that there has yet to be a clear whole-of supply chain focus on strategic corridors. In part, ALC's concerns relate to long-term investment efficiency, as it relates to Australia's freight supply chains, including by better

identifying and delivering important infrastructure projects, and supporting efficient intermodal facilities. The concern raised by ALC about overlapping jurisdictional regulations points to a potential source of productive efficiency, since multiple regulations may require operators to expend additional effort and resources to navigate the regulatory landscape.

The NFSC report (2018) also identified several problems in the management of supply chains and specifically a lack of freight data and information. The mechanisms to integrate national supply chains are inadequate, and there is a lack of freight data and information on the performance of Australian supply chains against international benchmarks.

Overall, it is clear that the task of collecting freight data as a means of gaining some insights into the efficiency of Australia's freight supply chains would need to cover many, if not all aspects of these complex constructs. There are also a number of broader considerations that are relevant to identifying the limits of the data collection task in the context of the broader efficiency objective that is of interest to DIRDC:

- **Industry costs and competitive implications.** In general, collecting detailed, accurate and timely data is likely to be both costly and/or intrusive for freight industry participants. There are therefore trade-offs to be considered between the potential benefits that could come from requiring certain participants to collect and submit certain data, and the potential costs that this would entail for these participants. At a minimum, concerns about placing onerous data obligations on participants would imply that any such data would be purposive, in the sense that there is a clear benefit – in terms of the information that can be gained – from collating and assembling them. Furthermore, to the extent that private businesses have invested resources into data collection as part of the competitive process, these businesses may be concerned that a sharing of proprietary data might offer competitors and advantage.

- **Role of performance metrics.** Information, such as the cost or time required to transport goods between point a and point b, will provide interested parties with a comparative metric that might indicate how efficient or inefficient a freight service is. However, in many if not most cases, the data (alone) are unlikely to be helpful in identifying the cause of any identified inefficiencies. Thus, high $ per tonne kilometre ($/t-km) haulage costs relative to some comparator route may be a function of transport-related factors, such as infrastructure characteristics that require trains to travel at low speeds or particular crewing arrangements, or of external factors, such as high fuel prices.

- **Interdependencies.** Relatedly, a focus only on productive efficiencies alone may obscure the fact that there are often interdependencies between operational and investment outcomes. Thus, high costs and delays on a particular freight route may have as an underlying cause a failure to invest in capacity expansion in a timely manner. Alternatively, the absence of any delays or congestion may mean that the route may have been 'overbuilt', in the sense that there is always excess capacity.

- **Planning and investment.** Finally, although dynamic efficiency is perhaps the most important aspect of efficiency since investment in transport infrastructure is often very costly, data collected by participants that is, by definition, historical may be of limited use in this regard.

Investment decisions are forward-looking and based on freight and other projections. Past trends in throughput and costs play an important role here, in the sense that they provide an indication of historical trends, but ex ante, whether an investment is efficient or not depends on its costs as well as its benefits, all of which need to be forecast.

5.3 Role of government

The case for government 'intervention' in the collection and curation of data essentially rests on the 'public good' characteristics of data. While collecting and administering data is costly, at least a share of that data potentially confers some wider benefit on users and the general public, for instance, in terms of the ability to discern longer-term trends in freight traffic and planning transportation networks to the benefit of the wider community.

Individual businesses' commercial considerations would also support an active role on the part of government. Businesses may be more inclined to share data with an independent and commercially disinterested party, who may be in a position to assemble individual datasets into a meaningful large whole while preserving confidentiality. The objective of putting data to good use in the furtherance of the public interest would then also provide a justification for government funding of the collection and administration of (transport-related) data.

5.4 An evaluation framework for freight data

This section presents the evaluation framework that has been used to develop the Study's recommendations.

5.4.1 Focus on indicators of productive efficiency

The discussion in the previous section then suggests that the primary focus of collecting freight supply chain data should be on indicators that provide information about the operational efficiencies of freight supply chains and their components. Indicators, such as cost metrics, but also time and other meaningful quality metrics (such as reliability or delays) will give an immediate, high-level indication of how a particular supply chain or component operates relative to comparable freight supply chains, either in Australia or overseas. Such information can then form the basis for a closer assessment of any underlying issues that are apparent in the data, whether they relate to investment requirements or inefficient (past) investments, the effects of complex regulations, or other issues that may play a role.

5.4.2 Focus on a minimum of high-quality, comparable and timely data

How detailed that data should be reflects a trade-off between collection costs (and potentially other issues, such as concerns about information that is commercial-in-confidence) and the additional insights that might be gained. For instance, including data on staffing levels might provide additional insights on labour utilisation levels that may go to the source of certain inefficiencies, but requiring participants to collect data on labour inputs may well be considered both arduous and intrusive. A more practical option may be to ensure that a minimum amount of quality and comparative data is

collected across all (important) freight supply chains and their components. This approach would then represent a starting point in the sense that it would provide a high-level indication of performance.

In addition, in order to be meaningful as a basis for comparison and policy-making, such data should be:

- as far as possible, comparable – that is, using consistent definitions for different metrics – across freight supply chains and their components;
- comprehensive across freight supply chains, in the sense that an end-to-end assessment can be made with reference to cost or other indicators; and
- timely, so that information that is collated is reasonably up-to-date and therefore useful.

5.4.3 Focus on data that is fit-for-purpose

Given that Australia's freight supply chains tend to be relatively unique, comprise different modes of transport, and serve distinct markets – for instance grain versus coal versus general road haulage – it is also possible that a 'one size fits all' approach will not be workable, and that, to an extent at least, the data that is collected is relatively specific to the freight service in question. The recent National Freight Supply Chain Priorities Report (NFSC 2018a, b) identified three main supply chains of interest:

- import/export freight;
- inter- and intra-state freight; and
- urban freight.

BITRE (BITRE 2018, unpublished) also investigated suitable supply chains for study in order to develop a 'supply chain performance dashboard'. BITRE derived a final list of three key supply chains; these being:

- exports (grain and containers);
- imports (containers); and
- urban freight and ecommerce supply chains.

The NTC (2017b) in turn considered the key focus for data from the perspective of modes and infrastructure. From a freight perspective, this classification encompasses:

- the rail mode (freight trains);
- the road mode (light vehicles and heavy vehicles);
- land-side services; and
- intermodal terminals.

6 Options to improve data for better freight related planning, operations and investment decision-making

6.1 Origin of the identified freight data gaps

As discussed in previous sections of this report, there are many freight-related datasets and reports in Australia, but there are also a number of data gaps. Importantly, many of these identified gaps could be filled (wholly or partly) by addressing the lack of standardisation and coordination, and confidentiality concerns across jurisdictions and transport modes, and between firms and governments. Our research indicates that there are two primary and related reasons why there is a 'freight data shortfall' in Australia. The first relates to a well-known 'governance failure' in our federation and the second relates to an equally well-known 'market failure' in economics.

First, a key feature of Australia's freight network is that there is a complex mix of government and private ownership, maintenance and management responsibility across all transport modes. And different networks are subject to different regulatory regimes by various governments. Overlapping this is the fact that the Commonwealth and state and local governments act as custodians for different parts of the same network and share decision-making and financing responsibility for maintaining the network.

Second, a well-known problem is economics relates to the under-provision of 'public goods' from society's perspective. Data has public good characteristics in the sense that the same data can be used (shared) at very low (or zero) cost without impacting on the use of any other user. That is, data is 'non-rivalrous' in consumption (e.g. the ABS National Accounts dataset). However, data can be 'excludable' in order to protect a firm's intellectual property.[17] This raises an issue if the release of a firm's data could potentially benefit society overall. Because these public benefits accrue to society overall (not to private individuals or firms) it would be almost impossible for the market to find a mechanism to resolve the impasse without some form of government intervention.

6.2 Australian approaches for hosting, governance and dissemination

This section details a range of options for hosting, governance and dissemination of freight data and information. As noted, in the Australian context, we identified and categorised 52 promising projects and we found several more overseas in countries with similar governance characteristics to Australia. Many of these programs are joint government-industry initiatives, which (on the whole) appear to work well to extract the latent or 'public good' value from heretofore privately-held datasets. A number have been conceived and operated at the state-level and may be suited for expansion to a national focus, while several projects led by BITRE have important national economic management characteristics.

[17] The strict definition of a public good is that it is 'no-rival' and 'non-excludable' in consumption. Freight data arguably exhibits the first characteristic but not the second.

6.2.1 Freight observatories

'Freight Observatory' is the term given to an institution or system that is intended to: "*…collect, analyse and publish freight performance data for all freight modes and supply chains to better inform decision making and investment, with appropriate governance arrangements and the potential for this function to be held by an independent body that has industry confidence*". (NFSC 2018a).

According to McKinnon (2015), the objective of a Freight Observatory is to collect enough information to be able to answer four public policy questions:

1. How much freight is being moved?
2. What are the origins and destinations of the freight?
3. What is the relative use of different transport modes?
4. How efficiently is freight being transported?

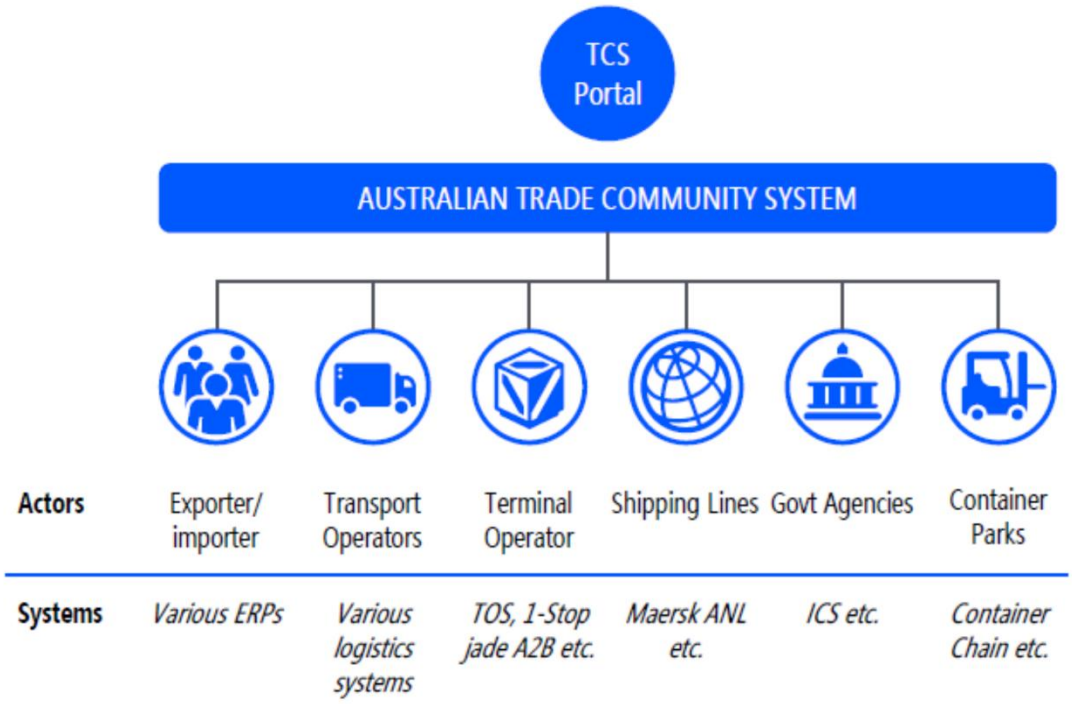
Together, the answers to these four questions build a picture of the aggregated journeys of all freight and – if answered in sufficient detail – with the ability to drill down to understand the movement of individual shipments. The closer this ideal can be approached, the better actions to increase efficiency and effectiveness can be identified.

6.2.2 Trade Community Systems

A Trade Community System (TCS) is a platform where participants in the supply chain can share information securely in order to drive productivity and service innovation through trusted end-to-end visibility of the supply chain (PwC 2018). In contrast to traditional Port Community Systems (EPSCA 2018), a TCS would operate beyond the boundaries of the port community to the source and final destination of goods.

PwC are working with the Australian Chamber of Commerce and Industry and the Port of Brisbane to initiate a pilot TCS with blockchain technology. A six-month pilot program is proposed in mid 2019 with the first three months devoted to development and integration of the pilot platform to run in parallel with the supply chains of two significant Australian businesses and their supply chain actors. (Figure 6-1). The subsequent three-month period will then focus on assessing the technological and commercial impacts of the TCS concurrently to evaluate and refine identified costs, benefits, risks and opportunities.

Figure 6-1: TCS Pilot - proposed

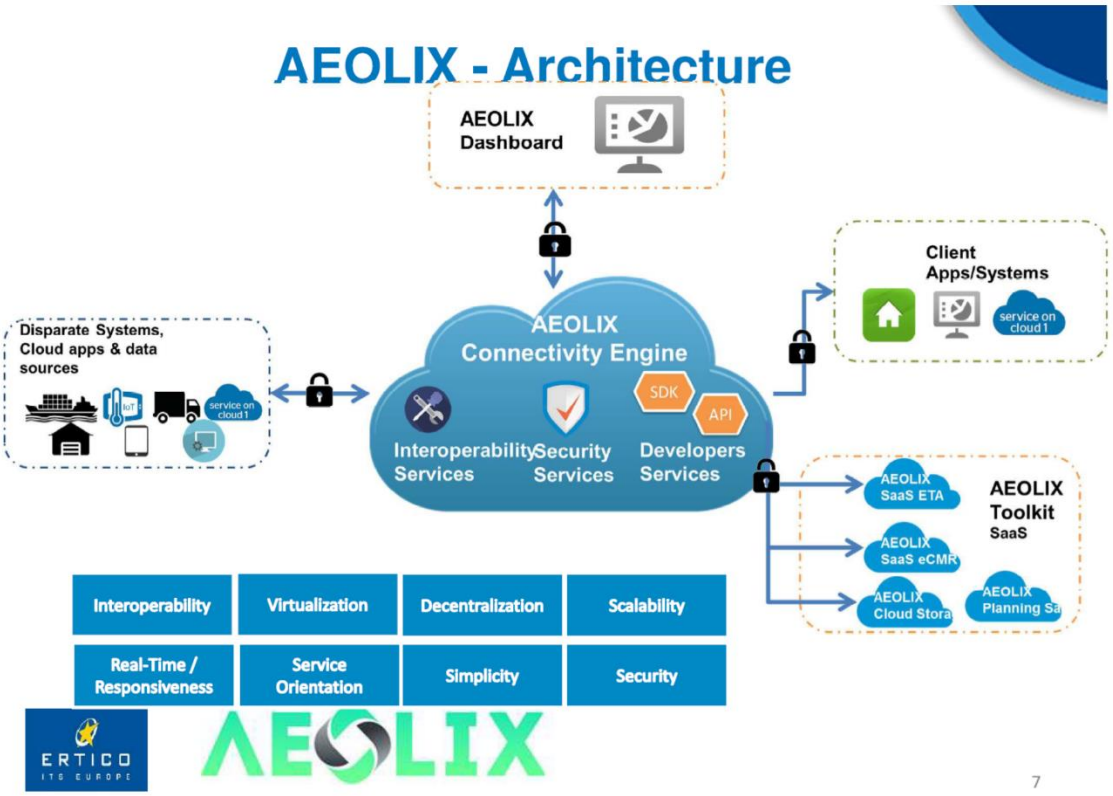


Source: PwC, 2018.

6.2.3 AELOIX

The Architecture for European Logistics Information exchange (AEOLIX 2018) is an open cloud ecosystem facilitating collaboration and information sharing, real-time and responsiveness, simplified integration and performance in pan-European logistics (ERTICO 2018). This is a three-year program that started in Sept 2016 to Aug 2019 with EU funding of 16 million euros, 30 partners and 12 living labs. The AEOLIX architecture is shown in Figure 6-2.

Figure 6-2: AELOIX architecture



Source: AEOLIX, 2018.

AEOLIX will develop a platform for connecting logistics information systems of different characteristics, intra- and cross-company, for immediate (real-time) exchange of information in support of logistics-related decisions (AEOLIX 2018). The ambition is to develop architecture for a distributed open system which will exchange information among key logistics actors (commercial companies as well as relevant authorities), enabling increased use and impact of such information in the value chain. During the project, logistics related business issues have been selected as use cases to be researched at different Living Labs to validate and demonstrate the benefits of the platform. In combination with the proposed PwC TCS system detailed earlier, the developments in AEOLIX across the EU and the linkages with the Australian TCS initiative linking in the future is obvious and capable of delivering significant benefits to the freight and logistics industry.

6.2.4 Customs Integrated Cargo System data

The Integrated Cargo System (ICS) administered by the Department of Immigration and Border Protection is the only method of electronically reporting the legitimate movement of goods across Australia's borders. The NTC and the Department of Immigration and Border Protection (DIBP) have been working together under arrangements consistent with the Commonwealth guidelines for data sharing, to establish access to information about the movement of commodities across Australia's borders. Non-sensitive DIBP data about commodity movements at a de-identified, aggregate level

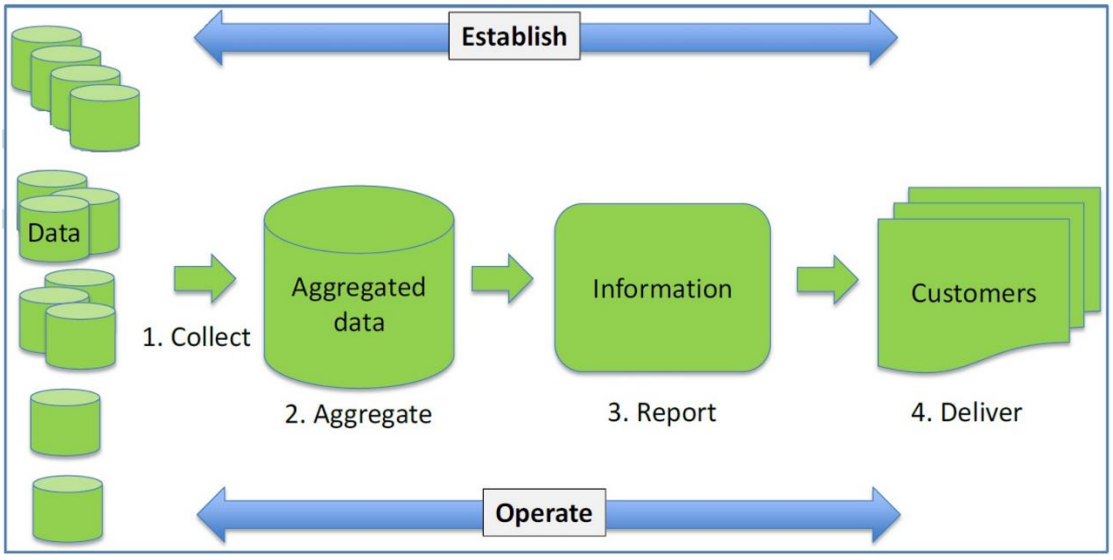
have been produced and are available to governments (NTC 2017c). The NTC is currently considering the processes to make the data available to private port operators.

6.2.5 Freight movement data collection service

In 2015 discussion took place between Main Roads Western Australia (Main Roads), Fremantle Ports, the Western Australian Road Transport Association (WARTA), the Department of Transport (DoT), the Freight and Logistics Council (FLC) and ARRB Group Ltd (ARRB) on the collective benefits in developing a comprehensive data collection capacity sourcing government and private sector transport data on the movement of heavy and medium sized freight vehicles. This would be principally in the metropolitan area but would also have value for regional movements. The agencies saw merit in investigating the establishment of a Freight Movement Data Collection Service (Service) of which they would become the foundation partners.

The Service would draw on relevant data sets from various sources and platforms and aggregate these into a consolidated format under standard headings. This allows for the information to be tailored to individual customer requirements. The data would come from existing government data sets and from industry information, particularly the larger trucking companies. Other platforms such as HERE, Google, on-board vehicle reporting platforms, collection of data from telematics and cameras would also be utilised. The operation of the service is depicted in Figure 6-3. A three staged approach was proposed with scoping, a data collection pilot followed by the establishment of a full-scale freight movement data collection service.

Figure 6-3: Service operation for data collection



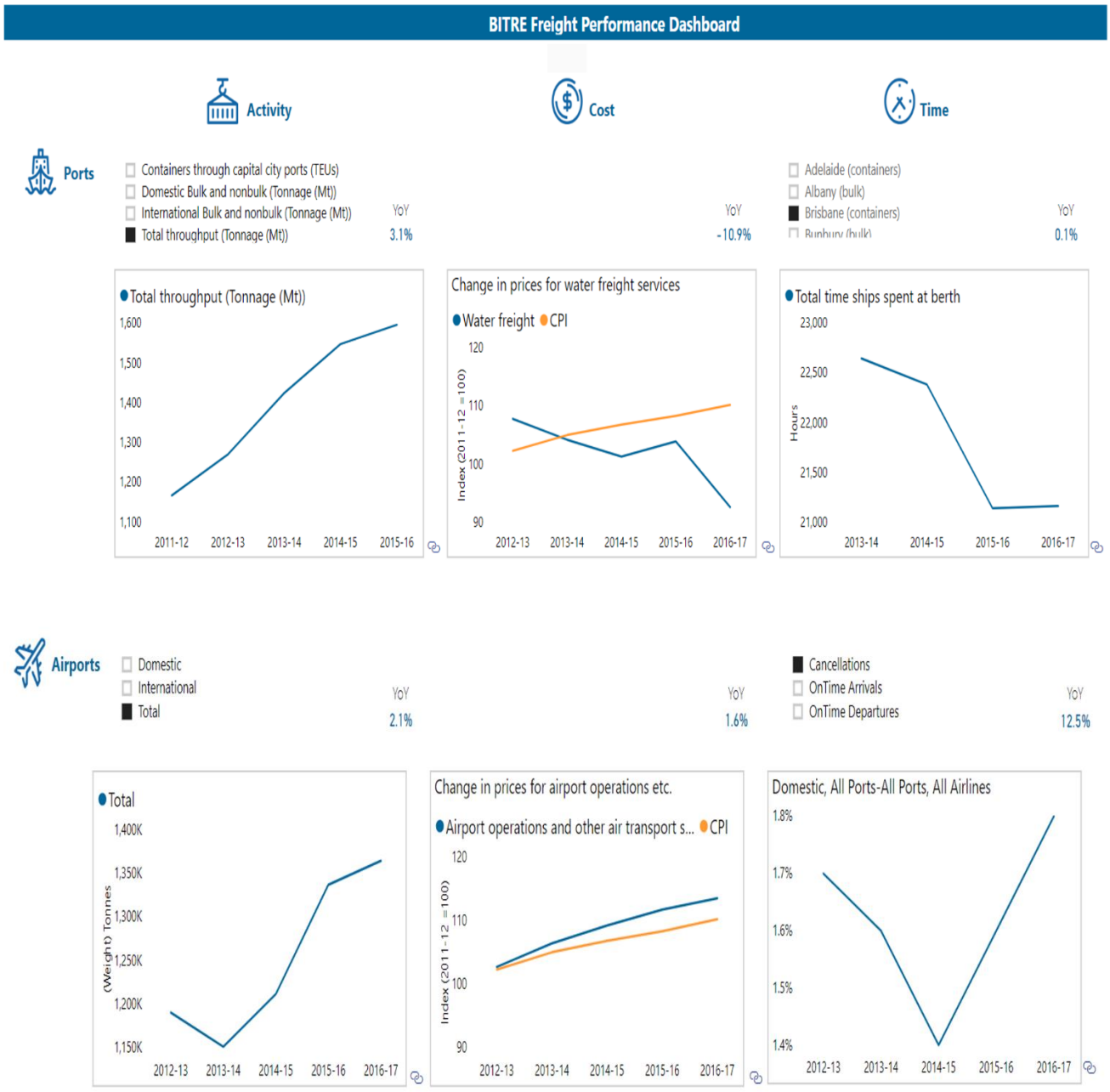
Source: ARRB, 2016.

6.2.6 BITRE projects

BITRE is undertaking a range of important projects to improve transport data, including making use of GPS data from trucks and through better measuring in-house transport activity. BITRE's freight performance dashboard and aggregated truck telematics data are shown in Figure 6-4 and

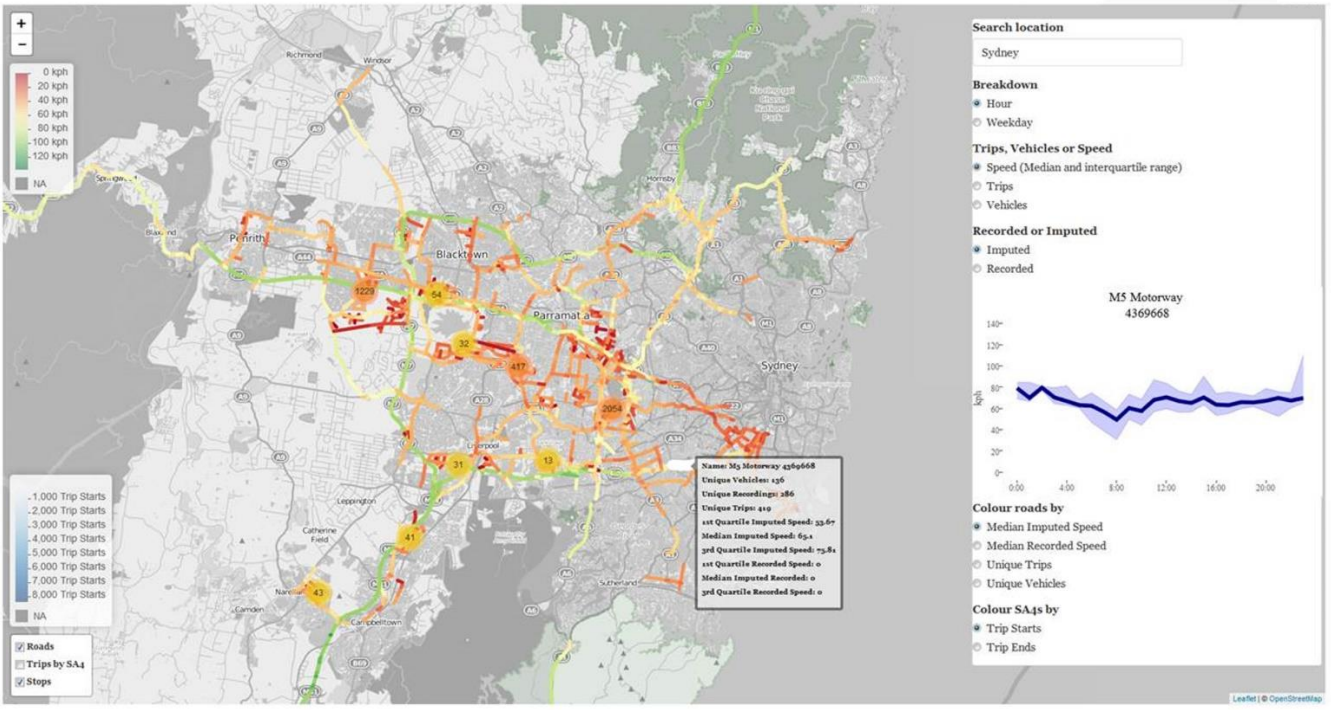
Figure 6-5 below.

Figure 6-4: Freight performance dashboard



Source: BITRE, 2018.

Figure 6-5: Truck telematics data – Sydney



Source: BITRE, 2018.

6.2.7 Overview of data Australian hosting, governance and dissemination options

A summary table of the options identified is provided in Table 6-1 below. Table 6-1 shows that industry activities in freight data are more operationally focussed while government activities are centre on planning and investment needs. Industry data is restricted access while more government options have open access.

Table 6-1: Summary of freight data hosting, governance and dissemination options

Options	Data collection	Processing	Access	Governance	Focus area
Freight Observatory	Internal/ external	Internal	Open	Government	Planning Investment
Trade Community System	Internal	Internal	Restricted	Industry	Operations
AEOLIX	Internal	External	Restricted	Industry	Operations
Customs Integrated Cargo Systems	Internal	Internal	Restricted	Government	Planning Investment
TCA data / platform	External	Internal	Restricted	Government	Operations Planning Investment
Freight movement data	External	Internal	Restricted	Research	Operations Planning

Options	Data collection	Processing	Access	Governance	Focus area
BITRE	External	Internal	Open	Government	Planning Investment
ABS TrSA	External	Internal	Open	Government	Planning Investment
CSIRO TraNSIT	Internal	Internal	Open	Research	Planning Investment
NEVDIS	Internal	Internal	Restricted	Government	Operations
NRSPP	Internal/ external	Internal	Open	Industry	Operation Planning

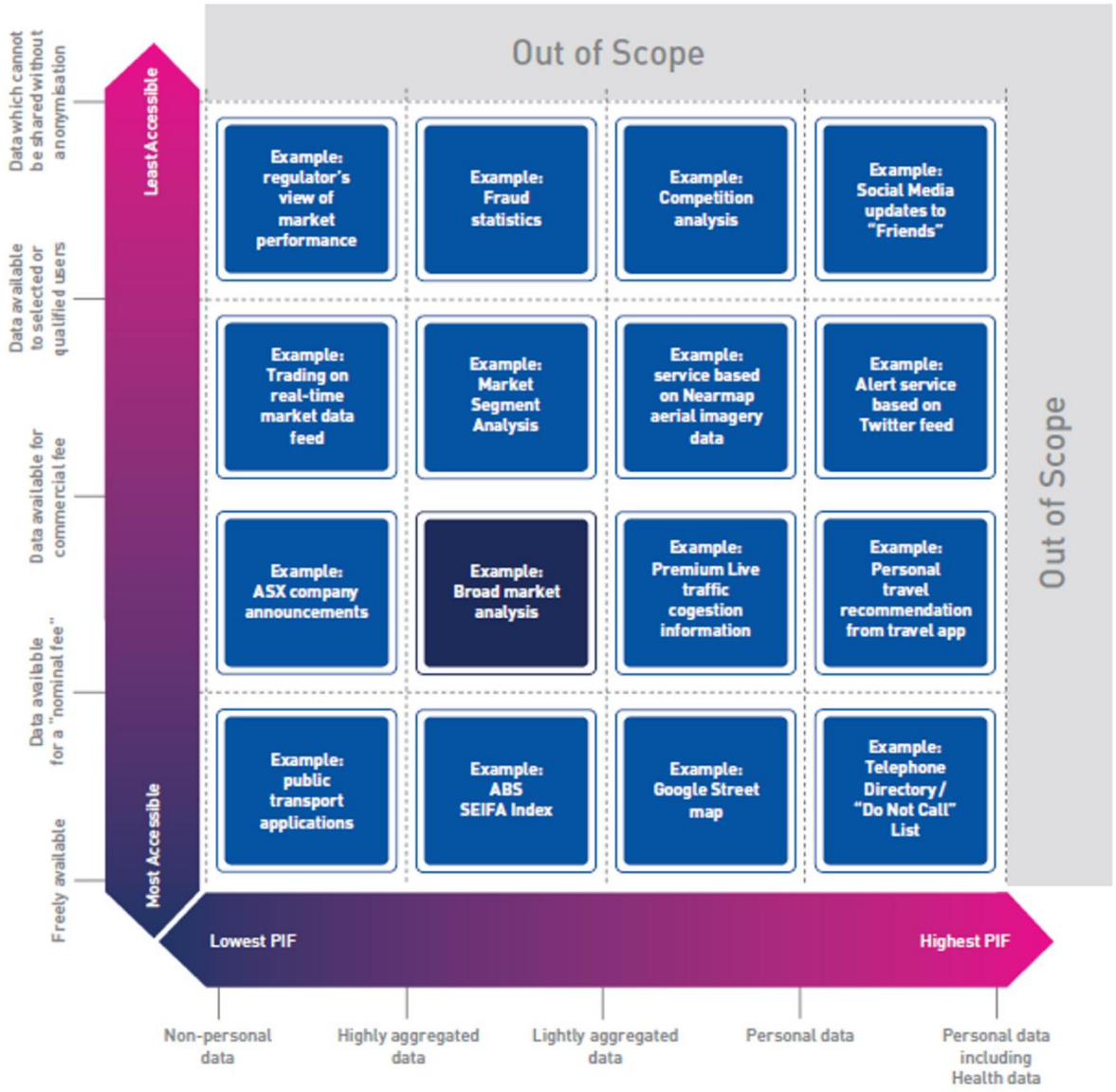
Source: iMOVE and partners analysis.

6.3 A classification framework

The next step was to identify a lens through which to look at the 52 projects. For this we used a matrix developed by the Australian Computer Society (ACS 2017, p55) which ranked degree of accessibility on one axis and degree of confidentiality on the other axis.

Figure 6-6 below depicts the type of data/information that would fall into the space between the two axes. The bottom left hand quadrant, where the data/information is highly accessible and of no commercial sensitivity, includes data such as public transport timetables. At the other end of the scale in the upper right-hand quadrant, information is highly sensitive.

Figure 6-6: Accessibility and confidentiality matrix



Source: ACS, 2017.

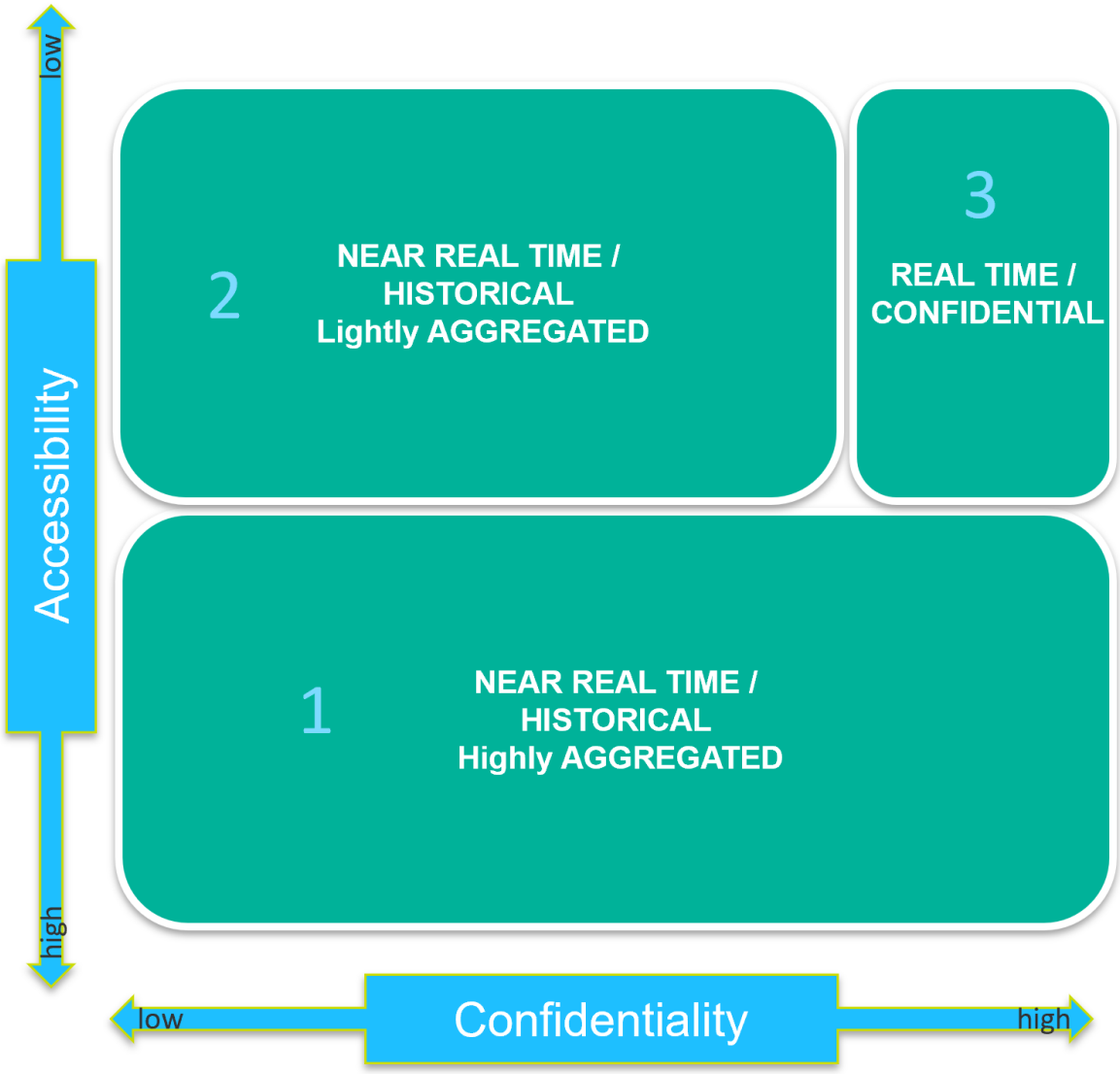
In transposing this lens for freight data, we considered three groups;

- Group 1 – Highly-aggregated freight data/information (historical or near real time); for example, road link travel times, weigh-in-motion data by axle groups and vehicle classification;
- Group 2 – Lightly-aggregated freight data/information (historical or near real time); for example, Bluetooth data based on MAC address on a road link, truck telematics data, mobile phone data at SA1 level, supply chain data along a key route; and

- Group 3 – Confidential freight data/information (real time); for example – identifiable compliance and enforcement data, individual supply chain data, image data, e-tag data, individual tracking data

Figure 6-7 below shows the three groups developed for this report. Group 3 appears at the top right-hand side of the matrix the data is personally identifiable and therefore confidential to the operator or business and has highly restricted access. Group 2 has lightly aggregated data but such data is still sensitive or confidential as it relates to commercial operations, products and $ values. Finally Group 1 data is more highly aggregated an of a less sensitive commercial value.

Figure 6-7: Matrix for 52 projects



Source: ARRB analysis, 2018.

6.4 Key observations

The allocation of the projects into the three groups was somewhat subjective we do not think any of the allocations were contentious. There were 23 projects listed in Group 1, 15 projects in Group 2 and 14 projects in Group 3, making a total of 52 projects. The details of the projects in the three groups are listed in Attachment 4 of the WP3 Final Report.

6.4.1 Common elements: Groups 1 and 2

The common elements and differences in Groups 1 and 2 are as follows:

- **Investment and planning focus – information and reports**. The objectives of a number of projects in these two groups were to produce information and reports for specific purposes. The purposes mainly related to planning and investment requirements. Hence the creation of the priority projects was to enable the collection, integration and presentation and dissemination of specific data/information for the stakeholder needs.

- **Larger perspective, e.g. supply chains, infrastructure investment**. The projects in these groups mainly had a larger perspective or scope – e.g., national or state level, a supply chain, infrastructure access, asset pricing, platforms for exchange, aggregation of specific data and information, network performances, etc. The groupings also include more mature data/information products and services that once started as proof of concepts and trials with a smaller scope and pool of data. In this area, we can find examples where private data is available as a service or product which is then utilised or supports in the creation of new data/information required in addressing other data/information gaps.

- **Data standards/guidance/methods**. In support of the co-operation of industry and government and third parties in these projects, we also see projects developing standards, processes, platforms and tools for interoperability and scalability across many stakeholders. This then links into international activities.

- **Combining datasets to close information gaps**. A further few projects involve integration of disparate data collections which, when presented together, provide more insights for government and industry. The task of refining data into a common set of units and co-ordinates is not trivial as each stakeholder often have their own way of storing data. Modelling, crash data, traveller information data, road use and road condition data, mass data, freight type data, congestion data and incident data are some such examples.

- **Proof of concepts / trials**. As mentioned earlier, some of the specific projects are not just desk based, but involve real world, in field trials requiring sensors, infrastructure, collection systems and connectivity to provide the content for transformation into data and information. Some projects also work the opposite way and disseminate the information back to roadway systems, message boards and road users.

- **Frameworks**. At a system level these projects also develop and transfer knowledge to all the stakeholders involved which then lead to projects reviewing frameworks, performance measures (new and improved), processes, tools and policy.

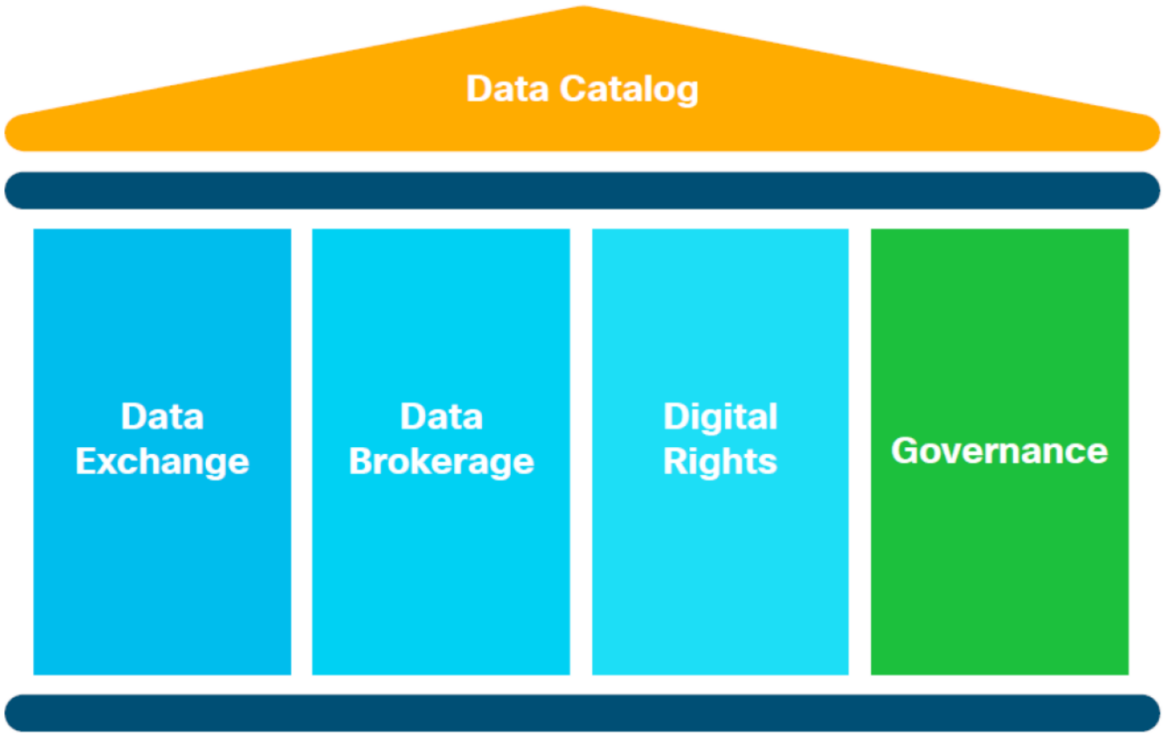
6.4.2 Common elements: Group 3

The key characteristic of Group 3 projects is that data/information needs reflect *real-time operational requirements*, be it as part of the supply chain and logistics operations, or in traffic management. Thus, some of the issues raised by industry in terms of timeliness and reliability, are areas that can be addressed with the data and information generated from Group 3 projects. Real-time information, if it is stored, can also subsequently be used by projects in Group 1 and 2 (subject to appropriate de-identification and user controls).

The key areas of interest are:

- **Compliance**. There are projects that continue exploring further applications of regulatory telematics, using technology over paperwork, roadside enforcement and roadside infrastructure to achieve regulatory outcomes (access, speed, fatigue, mass, etc) and recently announced heavy vehicle charging initiative.
- **Operations**. Other projects include the CAVI (Qld), CITI (NSW) and various trials not mentioned around improved green light progression for heavy vehicles and enhanced level crossing safety between heavy vehicles and rail. The projects utilise technology to communicate between vehicles to infrastructure. The ARRB has been involved in a number of projects to trial heavy vehicle 'platooning', enabling the headway between trucks to be reduced and delivering fuel savings. These types of initiatives require data to be shared at a 'tactical level' to coordinate trucks of different makes and operators, as well as at a 'strategic layer' for overall co-ordination.
- **Data exchange**. Projects in Group 3 tend to focus on data exchange more broadly. The areas of interest are shown in Figure 6-8 (CISCO 2018). As part of the project, each of the areas depicted, data catalogue, data exchange, data brokerage, digital rights and governance need to be scoped, developed and implemented for the project.

Figure 6-8: Key elements in Data Framework



Source: CISCO, 2018.

- **Technology**. A number of these projects have greater numbers of technology partners as they are showcasing or proof of concepts of new architectures and infrastructure. A number of these projects are supported under the Smart Cities Program from DIRDC.[18]
- **Administrative**. At the same time, specific projects are also developing protocols and interoperability rules, standardised data inputs, developing tools, processes and social networks between the parties involved.
- **Traveller information**. A few projects are also focussed on provide more time sensitive real time information to drivers and enforcement officers at the roadside in addition to traffic management systems as mentioned before.
- **Next generation data**. In general, the projects are involved in exploring, within the context of Australian field deployments in specific use case (urban, arterial, precinct, etc), a whole of system view of next generation data for transport.
- **Security blockchain**. Two projects are also looking at blockchain security, one project initiated by the private sector and another facilitated by transport agency.

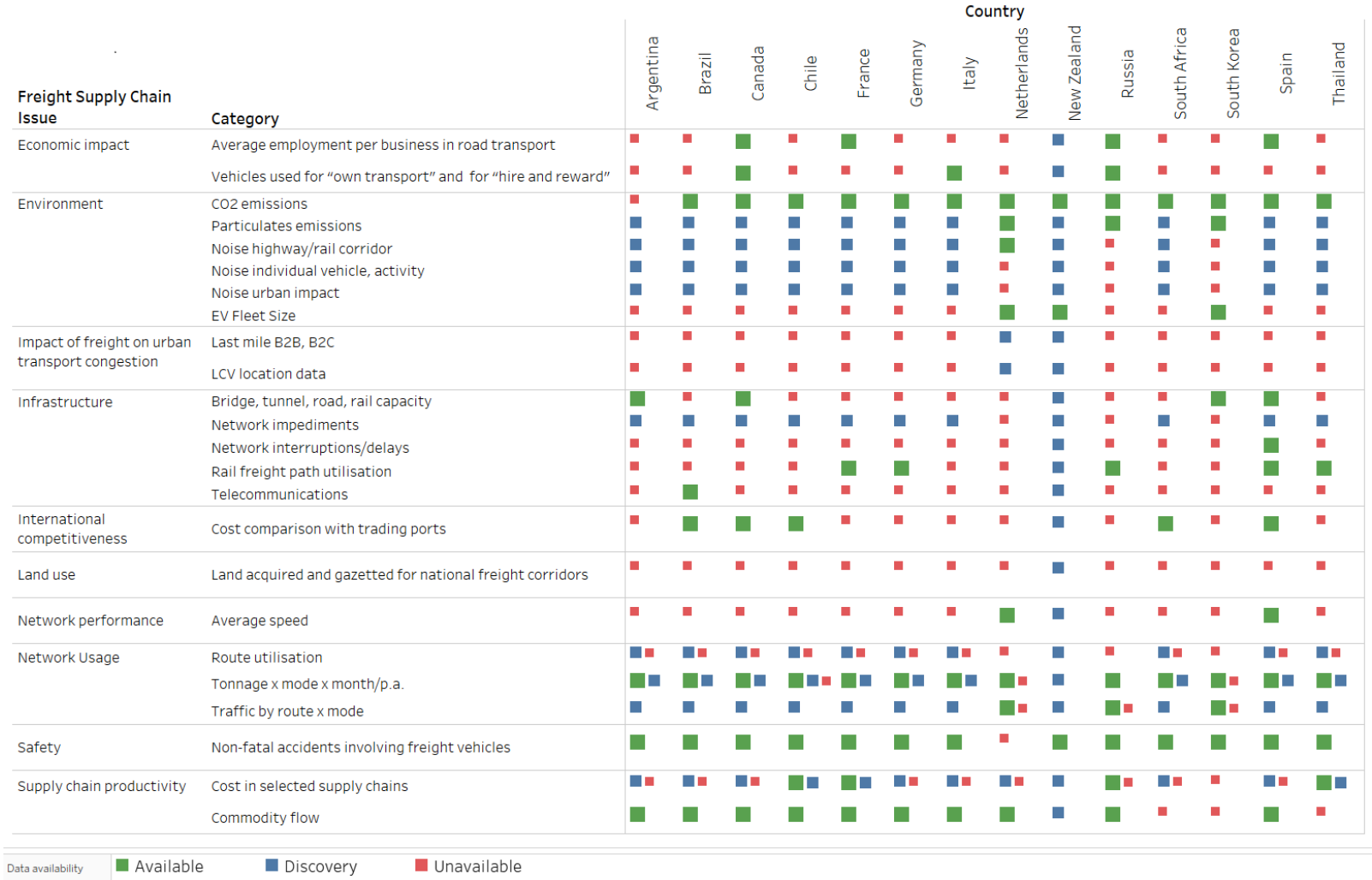
[18] https://infrastructure.gov.au/cities/smart-cities/; accessed on 28 January 2019.

6.5 International approaches

This section summarises the findings from an examination of international 'best practice' in terms of the collection, curation and release of freight data. Table 6-2 summarises key data and its availability in countries examined. Where two data metrics relate to a category, these are indicated. It is evident that datasets have been developed in a number of jurisdictions that match the data gaps identified in Australia. Examples include supply chain data collated from a range of commodity and freight types indicating monthly movements, mode of transport, net tonne kilometres travelled and vehicle types. In some jurisdictions, freight cost in segments by activity in the supply chain is measured. Some countries measure selected supply chains eg. fuel, manufactures, commodities, while others have a monthly reporting regime, indicating internal, transiting, import and export flows.

One conclusion that can be drawn from the table is that the datasets are more likely to be available by parameter rather than by country. For example, safety, network usage and CO2 emissions datasets are almost universally produced across the select comparator countries. On the other hand, no country comes close to producing the range of freight supply chain parameters identified. This finding most likely reflects a number of factors, including: (i) economic and governance development stage; (ii) political imperatives; and (iii) layout and risks associated with each supply chain network.

Table 6-2. Data availability in required categories

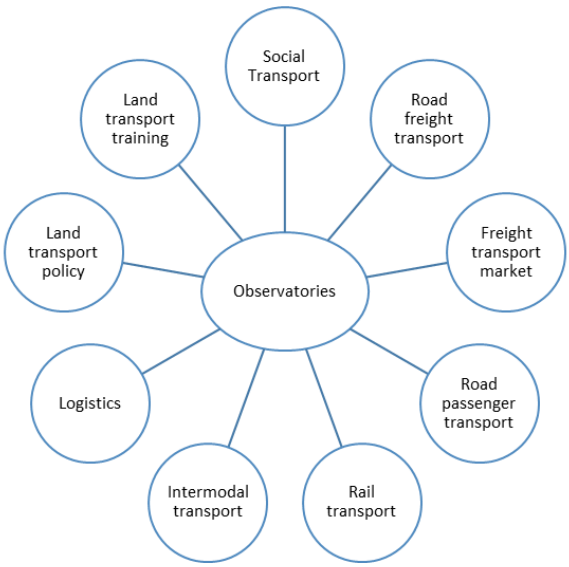


6.5.1 A snapshot of approaches

Overall, the research on freight data repositories put in place overseas indicates the following:

- **Observatories**. A number of observatories for transport more generally, or specifically to collate freight and trade data, have been established in the last two decades, notably in European countries. These have become mainstays for government and industry data sharing. A number of jurisdictions have also formed theme-specific observatories and in Spain, for example, there are nine dedicated observatories to study different aspects of transport (Figure 6-9).

Figure 6-9. Transport observatories, Spain



Source: Ministry of Development, Spain.

- **Thematic freight data hubs**. Several hubs have been formed, often through industry-government joint venture companies or industry-led initiatives, to focus on answering pressing questions related to freight planning, operations and investment. These tend to be associated with themes such as use of emerging technologies in freight productivity, understanding the impact of freight in cities, or testing solutions to lessening the environmental and amenity impacts of freight movement.

- **Accessibility and open data**. The trend to make data more transparent and accessible is contributing to the drive for the establishment of government metadata and data repositories. For example, the UK government has established an open data site (https://data.gov.uk/), the EU has established the European Data Portal (https://www.europeandataportal.eu), and the US Federal Government issued a Directive in 2009 requiring metadata records to be deposited on the open data site (https://www.data.gov/).

- **Partnership between government, industry and academia**. Hubs utilising data from the Internet of things (IoT), big data pools, or requiring enhancement using artificial intelligence (AI) or machine learning techniques tend to rely more heavily on external sources of expertise to provide the analytical tools to prepare data for subject matter expert interrogation. This indicates new alliances forming to create this capacity and new governance models required to manage these relationships and the hybrid data created.

6.5.2 Key findings

6.5.2.1 Agility and resourcefulness required for a unique country

The unique character of Australia's supply chains and freight transport settings when compared with other countries suggests that a freight and supply chain data system may be difficult to borrow directly from international models and will require adaptation to the Australian context.

Successful data systems are often supported by a larger economy or country grouping (such as in the European Union), enabling scarce resources to be dedicated to building data capture, analysis and dissemination systems. For example, the European Union collectively funds many institutions, including related to data collection, spreading the costs and benefits across the 28-member union.

Effective datasets, methodologies and repositories have also been identified in other jurisdictions such as in Canada, the United States and United Kingdom. Australia is advancing its efforts in similar directions and can learn from the approaches of international counterparts. That said, an Australian system will need to be as agile and resourceful as possible to deliver comparable datasets to the large-scale survey methodologies used in larger economies.

6.5.2.2 Data sharing within government

Recognising the benefits of open data from both a public transparency and economic efficiency perspective, governments are seeking to improve publicly-owned metadata records and create more accessible dashboards and API-based dataset accessibility for researchers in government, industry and academia.

A key example is the EU Open Data Portal established in 2012, following a European Commission decision on the reuse of Commission documents.[19] All EU institutions are invited to make their data publicly available whenever possible. This means data can be reused free of charge and without any copyright restrictions. The portal holds metadata records, links to the datasets, published reports on data, data procurement activities, visualisation programs, analyst training and developer APIs.

In France and South Africa, annual reporting across a number of datasets held by numerous agencies is presented as the *State of Logistics*. The basis of the reporting is data-sharing arrangements established between the reporting agency and data custodian agencies within local, regional and national governments.

[19] Decision 2011/833/EU.

6.5.2.3 Mandating data collection

The use of mandated data collections for informing policy agencies was notable in the international experience. Mandating data collection as an intrinsic part of economic regulation is more common overseas than in Australia (although Australian regulators generally have powers to compel the provision of data from regulated firms such as rail operators), as is the extent of regular survey instruments relating to freight movement and commodity flows. Rolling monthly surveys and annual collections that are legislated deliver longstanding, detailed data series that benefit government in planning infrastructure investment and industry in understanding infrastructure capacity.

These datasets are generally derived via two paths:

- through national or supranational legislation enabling statistical agencies and transport portfolios to mandate collection; or
- through national regulators with responsibility to collect data on the performance of concession-holders and lessees of transport networks and nodes such as air/sea ports and intermodals.

6.5.2.4 Accessing non-government data

Generally, the freight datasets in comparable countries demonstrate greater convergence of industry real-time data with government's more static point-in-time (time series) data. All governments investigated are forming government-industry alliances, contracting to source these datasets and exploring the implications of this transformation. Intelligent Transport Systems and the Smart Cities movements have been at the forefront of this trend and many of the protocols and architectures stem from this work.

The transition to the use of administrative sources of data and big data pools, often from commercial activities, are happening at a pace, made possible by the speed of technology change.[20] This transition has raised many issues, including those related to access, cost and risk management. Governments are, rightly, concerned about these issues but have, nonetheless, entered into agreements and participated in joint venture arrangements with industry and 3rd party suppliers and custodians. A key example is the creation of a Big Data Ecosystem for Europe over the past 5 years, as a result of concern that the USA was ahead of Europe in innovating products, applications and services from big data pools. In 2014 the EU formed the Big Data Value Association through a Public-Private Partnership contractual model to provide industry leadership and participate in the Horizon 2020 research agenda.[21]

[20] According to Berg and Li (2015), administrative sources are data holdings containing "information collected primarily for administrative (not statistical) purposes by government departments and other organisations usually during the delivery of a service or for the purpose of registration, record-keeping, or documentation of a transaction".

[21] http://www.bdva.eu/PPP; accessed on 28 January 2019.

6.5.2.5 Standardisation of data formats and interoperability

The sharing mechanisms in portals or cloud-based networks are dependent on data standards and protocols so they can be shared effectively. Effort in standardising collection formats, definitions and data are in motion across national and supranational groupings. Work on creating data dictionaries to format transport data is being undertaken in USA, UK as well as in Australia (TfNSW Freight Data Portal).

Establishing an architecture for the data collection and dissemination is a vital role which tends to be adopted by governments across the selected countries. For example, the Spanish transport and logistics observatory (OTLE) is a good case study of the substantial effort taken to access and reconcile datasets from government agencies and the highly autonomous regions of Spain.

Interoperability is stressed in the formation of collaborative data portals within industry, for example:

- Architecture for European Logistics information Exchange (AEOLIX) formed in 2016 from a consortium of shippers, ports, technology companies, funded under the EU Horizon 2020 program, to provide a means to support data exchange between supply chain partners, without the need to develop multiple portals; and
- iSHARE in the Netherlands provides a neutral transactional platform for logistics; and in China the Smart Logistics clouds fulfil a similar requirement.

6.5.2.6 Role of industry in freight data collection

Concerns related to industry data sharing that have been suggested as barriers, such as protection of commercially sensitive data, use for identifying regulatory breaches etc, are increasingly being dealt with through quite sophisticated access arrangements and processes that negate many of the concerns of data producers/owners. These developments are in the context of increasing privacy requirements (e.g. the “right to be forgotten” (EU, UK), and “my data my say” (NZ) policies and programs).

In some jurisdictions, the role of industry is prominent in the collection and aggregation of industry operational data, often held by industry bodies (e.g. CONFETRA in Italy, ATRI in the USA/Canada and CFLP in China) where data is aggregated and prepared for use by external customers, keeping the raw data at arm’s length from government. The industry entities charged with this task appear to have high levels of cooperation and trust from the businesses they collect data from.

6.6 Recommendations

Our assessment of promising Australian freight data initiatives and the international experience confirms many of the recommendations we have made with respect to the need for a collaborative approach and a consistent approach towards data collection. We find that a number of the initiatives trialled in Australia show promise and should be pursued. We recommend that:

11. Acknowledgment be made of the important contribution to the Australian freight data ecosystem by the following programs, and that arrangements be made to either

encourage, or directly support (if a Commonwealth program), their continuing operation. We recommend the following programs, among others, be considered for ongoing support:

a. TranSIT (CSIRO);

b. Supply chain Indicators, Infrastructure Performance Dashboard, Freight Performance Indicators, Developing and Promoting Best Practice Modelling Assumptions (BITRE);

c. Customs Freight Data Analysis Project (National Transport Commission (NTC), BITRE);

d. Tracking Commonwealth and state open data (Australian Transport Data Action Network (ATDAN), BITRE);

e. Supply chain data visibility through the GS1 EPICS standard (Australian Logistics Council (ALC), Nestlè and others);

f. Data Sharing Taskforce (NSW Government); and

g. Heavy Vehicle Infrastructure Asset Registers (DIRDC, Australian Road Research Board (ARRB)).

We have also been asked to comment on the role of BITRE.

On balance, in our view, BITRE is doing the best job it can of meeting the needs of industry while meeting its obligations to government. Of course, BITRE could be more industry-focussed if it was 'spun-off' into an independent agency but it is important to recognise that this would risk losing expert in-house advice on many transport related issues within the department. Perhaps a 'middle-road' path to consider would be to review BITRE's overall budget (based on our recommendations presented above), and encourage the agency to undertake more, and more regular, stakeholder consultation.

7 High-level policy costing

7.1 Scope of analysis

While not directly specified in the original Project Request, DIRDC has requested an analysis of the fiscal costs of our recommendations. This chapter sets out a basic analysis that should be interpreted as providing 'ball park' estimates of (fiscal) costs and (economic) benefits. The estimates presented in this chapter for the costs of our recommendations have, necessarily, been undertaken at a high-level because precisely how our recommendations might proceed in practice is unknown and outside of our control.[22] We also note that we have not undertaken a normal net present value (NPV) type analysis (that would apply in a CBA-type analysis for example), but rather have added values in nominal terms, which is the approach taken by governments in relation to budgeting.

Similarly, without undertaking a full business case analysis, including a properly specified CBA, it would be difficult to quantify (let alone characterise and define) the benefits of our recommendations. Instead, we offer an observation on the potential gains from incremental improvements in freight supply chain efficiency.

Therefore, our high-level estimates of costs and benefits are not directly comparable. Their usefulness relates to identifying the general range of benefits vis-à-vis costs. For instance, if one estimate was significantly different (higher or lower) from the other, tentative conclusions might be able to be drawn.

7.2 Policy costs

For all recommendations, we have assumed that there are three types of fiscal costs, these being:

- capital costs;
- operating costs (mainly labour costs, including overhead and consulting costs); and
- 'competition payments' made by the Commonwealth to the states and territories.

Although we have largely assumed a re-prioritisation of the existing DIRDC budget for operating costs, we have still counted those costs as part of the total fiscal costs. Our costings are for four years and reported in nominal terms, that is, costs are not discounted into 'today's dollars'.

[22] For example, economic costs would include the deadweight cost of raising taxation whereas fiscal costs do not. Borrowing costs are generally accounted for in fiscal analysis where borrowing is required, such as for large infrastructure investments. In this analysis, we have not calculated borrowing costs. We have not applied an NPV analysis keeping with common budget practice of reporting and summing values across years in nominal terms.

7.2.1 Group 1 recommendations: Establishment of a national policy on freight data in Australia

Table 7-1 summarises the overall cost estimates for the Group 1 recommendations. We estimate a total cost of the Group 1 recommendations to be $12 million over 4 years in nominal terms.

These costings were derived as follows:

- **Recommendation 1**. For this recommendation we assume only labour (and related overhead) costs, with zero capital costs and zero competition payments required. In terms of staff, which presumably would be re-prioritised within DIRDC, we estimate that the total net cost to DIRDC would be zero (given that a unit already exists within the department to take up this new task).
- **Recommendation 2**. For this recommendation we assume that additional capital and labour costs are zero. However, in our view a non-negligible amount of 'competition payments' would be required to motivate the states to support this policy. There would also be consulting costs for the Federal Government to seek independent advice on what the mechanism and standards might look like. We believe that, at a minimum, the cost would be $2 million to procure the advice, and a further $1 million per jurisdiction to support development. The total cost would be $10 million.
- **Recommendation 3**. This recommendation has two components. The first component is that the Commonwealth Government invest in making its own freight related data more available. The second component relates to guiding other stakeholders to do the same. Here we assume that the second component would largely be covered off by the competition payments set aside for the previous recommendation:
  - The cost of the first component is likely to range from a modest cost (less than $2 million) to a more significant cost (upwards of $50 million) depending on the design of the 'open data hub' and whether it is 'DIRDC-specific' or much broader encompassing the entire federal government. It is very difficult to estimate without going to the next stage of policy design. As such, we have assumed a 'minimalist' design at the beginning.
  - Perhaps, a more logical way to view this is to ask what would be the lowest dollar value to achieve a positive effect in the industry. In our view, based on a review of recent studies on the capital costs of hosting an open data portal, $2 million would be the minimum figure. For $500,000 per year, it would be possible to 'rent a cloud' of around 1,000TB (for $250,000) and transfer out 1,000TB (for a further $250,000).

Table 7-1. Group 1 Recommendations - costing

Recommendation		Total cost ($m), 4-years (nominal)	Note
1	As the lead agency in the formation of the National Freight and Supply Chain Strategy (NFSCS), the Commonwealth should lead the development of a national policy on freight data that seeks to improve the collection, hosting, access to, and analysis of information relating to the movement of freight, and which addresses the interests of all stakeholders in the sector.	0.0	Re-prioritise program objectives within existing departmental budget
2	A mechanism should be established to define and implement nationally a framework of standards for freight data to facilitate aggregation and comparison across diverse data sources.	10.0	Will require expert resourcing, significant industry consultation and cooperation among federal jurisdictions
3	The Commonwealth should act to make its own freight related data available in a manner consistent with open data principles and encourages other data owners such as asset and fleet managers, regulators, state government agencies, freight operators and freight customers to do likewise.	2.0	Re-prioritise operating costs. This figure is for capital costs within DIRDC, does not include other departments
	Total Cost of Group 1 Recommendations	12.0	

7.2.2 Group 2 recommendations – Establishment and role of a Freight Data Coordination Office

Table 7-2 summarises the overall cost estimates for the Group 2 recommendations. Our central recommendation is also difficult to cost without more precisely defining its scope, which in turn might limit the department's flexibility in designing a freight data coordination office to suit a broad set of stakeholders.

We have assumed, at a minimum scale, an 8-person team at a cost of $3 million per year over the first 4 years, totalling $12 million. This budget provides some scope (money) to seek expert industry input across a range of matters (via consultancies and stakeholder consultation). In addition, we have allocated a capital cost for the hosting website, of $500,000 per year over 4 years, totalling $2 million (discussed further below). As such, we have estimated a total cost to fund the FDCO of $14 million over the first 4 years in nominal terms.

Table 7-2. Group 2 Recommendations – costing

Recommendation		Total cost ($m), 4-years (nominal)
4	1A Freight Data Coordination Office be established to: (a) collect, host, and disseminate freight data at a national level, leaving data analysis to be conducted by relevant stakeholders according to their respective mandates; (b) encourage data providers to deliver needed data compliant with established data standards; and (c) initiate processes to procure missing data.	
5	A mechanism be established by which a steering group representative of data users and data collectors can guide the priorities of the Office.	
6	Procurement be arranged on a national basis of such 'commercial' freight related data as is needed and which exhibits good value for money.	
7	Secure protocols be established for data collection and handling that support participation and contribution from stakeholders that can supply a wide range of data sources.	
8	Practical and robust arrangements be established for securing access to raw freight data from industry participants including rules relating to aggregation and public access to respect commercial sensitivity.	
	Total Cost of Group 2 Recommendations	14.0

7.2.3 Group 3 Recommendations – Other initiatives

The Group 3 recommendations consist of a range of other initiatives intended to facilitate the overall data collection and dissemination process. Many of these recommendations require zero funding in the short-term as they are either already funded or funding has been identified in the first two groups of recommendations. We therefore estimate the total cost of progressing these initiatives to be $2 million over four years in nominal terms (Table 7-3).

Table 7-3. Group 3 Recommendations – costing

Recommendation		Total cost ($m), 4-years (nominal)	Note
9	A republishing or 'hosting' website be established with the mission to republish all freight data on a single site.	Already accounted for above	We estimate the smaller 'web hosting' office would be about half the cost of the FDCO (at $7 million over 4 years)
10	A transition be encouraged to move towards low cost, harmonised collection processes for all freight related data from wherever it is generated or held. This includes (but is not limited to):	Re-prioritise within budget	Would require 'competition payments' that are already identified above

Recommendation		Total cost ($m), 4-years (nominal)	Note
	a) the automation of current survey processes; b) the increased adoption of vehicle telemetry and usage of vehicle telematic data; c) the establishment of new automated sensing methods to generate needed data; d) accessing public and private datasets with agreed inquiry tools; and e) changing data analyses to utilise the higher availability of automatically collected data.		
11	Acknowledgment be made of the important contribution to the Australian freight data ecosystem by the following programs, and that arrangements be made to either encourage, or directly support (if a Commonwealth program), their continuous operation: a) TranSIT (CSIRO); b) Supply chain Indicators, Infrastructure Performance Dashboard, Freight Performance Indicators, Developing and Promoting Best Practice Modelling Assumptions (BITRE); c) Customs Freight Data Analysis Project (National Transport Commission (NTC), BITRE); d) Tracking Commonwealth and state open data (Australian Transport Data Action Network (ATDAN), BITRE); e) Supply chain data visibility through the GS1 EPICS standard (Australian Logistics Council (ALC), Nestlè and others); f) Data Sharing Taskforce (NSW Government); and g) Heavy Vehicle Infrastructure Asset Registers (DIRDC, Australian Road Research Board (ARRB)).	Short-term funding already secured	Short-term funding envelope is (presumably) secured for these programs. There would potentially be a medium-term cost if DIRDC chose to support these programs to continue and/or expand.
12	The Commonwealth prioritise its investment in assembling 'missing' freight data towards the following five freight data needs (identified from a case-by-case assessment conducted by this study of the potential costs and benefits associated with the closure of each gap):		
	Supply chain visibility: • i) Improve the visibility of the containerised supply chain, from port to intermodal hub to final destination. • (ii) Improve the visibility of the domestic food and manufactured products supply chain, from farm/plant to warehousing and distribution centres to the final destination.	1.0	A consulting budget to draw in expert and stakeholder advice when needed.

Recommendation	Total cost ($m), 4-years (nominal)	Note
Better coordination of existing freight data (standards, confidentiality, harmonisation, granularity): • (i) Adopting and propagating freight data standards and protocols (where considered likely to be beneficial) to align datasets to common standards and levels of granularity and confidentiality, focussing first on network utilisation measures (e.g. volumes) and productivity measures already collected (or potentially easily collected at low cost) by freight operators.	0.0	Budget already identified in Group 2 Recs (above).
Long-term planning and investment in the network: • (ii) Determine the most significant data needs related to the government's role in planning supply chain network integration and expansion, and long-term sustainability and resilience, potentially through dialogue with Infrastructure Australia and relevant state-based infrastructure advisory bodies (such as iNSW and Building Queensland). • (iii) Give priority to satisfying the network infrastructure data needs of these bodies.	1.0	A consulting budget to draw in expert and stakeholder advice when needed.
Total Cost of Group 3 Recommendations	2.0	

7.2.4 Total policy costs

Overall, we estimate the total costs of the three groups of recommendations to be $28 million over four years, or $7 million per year (Table 7-4). As noted, these estimates are preliminary and subject to the exact design of the various recommendations. Nonetheless, they provide a 'ball park' estimate of costs, which can be compared to likely benefits (discussed in the section below).

Table 7-4 Total policy costs, 4-years (nominal)

Recommendations	$m, nominal
Group 1	12.0
Group 2	14.0
Group 3	2.0
Total cost	28.0

Source: iMOVE analysis.

7.3 Policy benefits – a proxy estimate

The potential gains from freight data reform primarily relate to the freight industry and its related industries across the supply chain. Table 7-5 below lists a number of estimates of the size of the freight supply chain industry in Australia (as there is no published single estimate available):

- The estimate from the Australian National Accounts reports the GVA in the Transport, postal and warehousing industry in 2017-18. Industry GVA, which is an equivalent measure to GDP was $83.7 billion in 2017-18.
- The internal iMOVE estimate draws on the ABS National Accounts input-output tables to understand the industries that supply to and use resources from the transport industry. Using this approach provides an industry size estimate of $106.5 billion.
- The third estimate is drawn from a report published by the ALC (2013) with modelling from ACIL Allen (then ACIL Tasman), which is $139 billion (in 2017-18 dollars). It is difficult to precisely understand how the 'Australian logistics industry' is defined from reading the report, but nonetheless the logistics industry would presumably be a reasonable proxy for the freight supply chain industry. This estimate is similar to the ABS Transport Satellite Account experimental estimates (of the Transport industry) at $135 billion (discussed below). In our view, both the ACIL Tasman and ABS estimates probably overstate the size and scope of the freight supply chain industry. However, for the purposes of this Study we have not precisely defined the industry.
- Finally, an 'upper-bound' estimate of the size of the freight supply chain industry could proxied by the total expenditure in the transport industry as defined by the ABS. This estimate of $175 billion is not directly comparable to GVA as in includes industry 'overheads', which effectively double-counts industry GVA.

We considered using the ABS Australian Transport Account: An Experimental Transport Satellite Account (ABS 5720.0). This estimate of the size of the broad Australian transport industry is $135 billion (2017-18), which is a similar estimate to the ACL/ACIL Tasman estimate.[23] However, we considered this estimate to overstate the size of the freight supply chain and we did not have the time of resources to make a proper estimate of industry size at this state of the Study.

[23] The ABS estimate is $125.3 billion in 2015-16. We have grown this figure based on the calculated 5-year growth rate (of 3.8%) to $135.0 billion (2017-18).

Table 7-5 Estimates of the size of the Australian freight supply chain industry, 2017-18

Industry classification	Estimated size ($m) 2017-18	0.1% improvement in productivity ($m)	0.5% improvement in productivity ($m)
Transport, postal and warehousing (ABS ANA industry GVA, equivalent to GDP)	83,707	79.4	397.0
Australian 'freight supply chain industry' (iMOVE estimate, using a TSA-type analysis, ABS IO Tables, GVA equivalent)	106,513	101.0	505.0
Australian 'logistics Industry' (ALC/ACIL Tasman estimate, industry GVA equivalent)	138,862	131.6	658.2
Total expenditure in Transport, postal and warehousing (using ABS IO tables, represents 'maximum' industry reach)	175,062	N/A	N/A

Notes: Productivity estimates assume an improvement to capital and labour productivity after removing the estimated tax share of GVA (being 5.2%, not including the import share of production). The ALC/ACIL Tasman estimate was $131.6 billion in 2013, which we have inflated by the real growth rate in the transport industry (by 1.08% per year over 5 years) to arrive at a 2017-18 estimate of $138.9 billion.

Source: ABS National Accounts, ALC and iMOVE analysis.

In our view, a reasonable approximation of the size of the industry is our own in-house estimate, and a fair range would be from a lower-bound of the (ABS) transport industry and an upper-bound of the (ALC/ACIL Tasman) logistics industry.

Using the iMOVE estimate, a 0.1% (that is, a one-tenth of 1 percent) improvement in capital and labour productivity would increase industry GVA by almost $80 million. And a 0.5% (that is, one-half of 1 percent) improvement in capital and labour productivity would increase industry GVA by close to $400 million. Note that these estimates represent upper-bounds because they are 'static' and do not account for dynamic responses to this productivity improvement across the economy (as would be the case in a CGE model).

7.4 Conclusion

This, necessarily high-level, analysis has demonstrated that the potential gains from modest policy reforms to improve the availability of freight supply chain data are likely to exceed the fiscal costs of undertaking these reforms.

We have estimated the total fiscal costs of these three groups of reforms to the Commonwealth Government (and excluding the costs borne by state governments in excess of competition payment and freight industry costs) to be $28 million over four years, or $7 million per year in nominal terms.

This cost, when compared to the potential benefits, is low. Even a one-tenth of 1 percent improvement in freight supply chain productivity could provide a $100 million benefit to the Australian economy *each year*.

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Appendix A. Findings and evidence base

Delivered as a separate electronic file.

Appendix B. Stakeholder Consultation Final Report

Delivered as a separate electronic file.

Appendix C. Gap Analysis Final Report

Delivered as a separate electronic file.

Appendix D. Institutional Arrangements Final Report

Delivered as a separate electronic file.

Appendix E. International Approaches Final Report

Delivered as a separate electronic file.