DIRDC FREIGHT DATA REQUIREMENTS STUDY STAKEHOLDER CONSULTATION FINAL REPORT

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

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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

1. Introduction

This report presents the analysis and findings from the stakeholder consultation segment of the FDRS, trying to better understand the information needs of the many stakeholders in both the public and private sectors of the freight and supply chain sector.

1.1. Methodology

The stakeholder consultation was undertaken in two stages, as follows:

- First, a targeted literature review was conducted to review relevant government and industry reports, particularly the various literature supporting the National Freight and Supply Chain Strategy. The focus of this review was to understand what had been said and done.
- Second, a survey of stakeholders was undertaken. This survey used a mix of methodologies suited to the compressed timeframe. This allowed the project team to execute these surveys concurrently to achieve complete coverage in a short timeframe

1.1.1. Survey method

The survey process utilised three forms of engagement.

The most widely deployed method was an online survey which was applied through a stratified sampling methodology that ensured adequate responses were received from all stakeholder groups. On-line surveying suits time poor respondents by using close-ended response modes, but is necessarily limited in the depth to which it can inquire. The study received 148 completed responses.

The second method was direct interviewing of key respondents selected for the depth of their knowledge of the subject matter (within the scope of their organisation). Telephone interviews generally deliver more direct and focused responses compared to other means and enable more open-ended questions than can be achieved through an online survey. A total of 37 interviews were conducted.

The third process was the conduct of focus groups. These enabled a deeper qualitative analysis of some issues and also enabled interim observations gleaned from the survey process to be tested and refined. Three focus groups were held.

By applying a mix of survey methodologies, this study was able to derive a wide range of information from multiple sources and able to identify and define the widely varying preferences and needs of stakeholders.

1.2. About this report

This report is structured as follows:

- Section 2 describes the main results of a focussed literature review;

- Section 3 describes the results of the stakeholder consultation, including the:
  - Telephone interviews;
  - Surveys; and
  - Focus Groups; and
- Section 4 draws together our main conclusions.

Appendices A and B provide detailed results of the survey. Appendix C describes the survey instrument (i.e. the questionnaire).

1.3. Key findings

1.3.1. Main themes

In discussions with stakeholders regarding their data needs and priorities, three key themes were identified:

- **What, where, when and how much?** There is strong demand for a more complete picture of what goods (bulk, non-bulk, containers) are being moved where and when across the transport network because of the potential savings in cost and time from improved decision-making.
- **Appropriate transparency and aggregation.** A key trade-off is that the provision of data needs to be suitably transparent to enable benchmarking whilst also aggregated enough to accommodate commercial sensitivity.
- **Data exchange needs to offer mutually beneficial outcomes.** An emphasis on the potential usefulness of outputs is necessary to encourage improved data sharing.

1.3.2. Performance metrics: movements, cost, time, and capacity

The fundamental need expressed by most stakeholders is to learn about the performance and competitiveness of some aspect of the national supply chain. The metrics sought depend on the stakeholders' interests and the scope of the decisions they are seeking to support. However, the underlying data that serve this purpose relate to four aspects:

- goods movements ("what, where, when, and how much"),
- associated costs,
- time (i.e. service level and reliability), and
- capacity (i.e. utilisation, congestion, and infrastructure conditions).

The consultation process revealed that stakeholders prioritise data on cost and volume (freight task) ahead of the other aspects. However, some other contextual datasets, such as infrastructure condition data and employment data are also frequently sought.

Our review of previous reports revealed the importance of economic competitiveness (productivity, efficiency, and reliability). This study, particularly from online survey, reinforced this view. We found that business entities, particularly small business entities, commonly seek insights into the competitiveness of their operation, whereas governments, larger firms and industry associations are more concerned about planning and investment decision-making.

In addition to this attention to economic competitiveness, the study also identified the importance of end-to-end network visibility, which enables decision makers to identify problems (eg. bottlenecks) and reduce waste of time and effort, in supply chains.

The study also identified the importance of: nationally significant freight corridors; first/last-mile deliveries; urban freight; gateways; capacity management; and data requirements for modelling purposes.

1.3.3. Interdependent relationships

It has been observed that industry, state, federal, and local government stakeholders are partners in, an interdependent relationship, in the sense that there is an inter dependence (and shared responsibility) between government and industry to fulfil freight data needs. Governments have an obligation to manage the transport networks, which are used by the freight industry but only the freight industry can report the use they actually make of those networks. Freight data typically has both 'private' and 'public good' value. The challenge is to find ways by which the government can invest in collecting and collating privately held data to generate public value without destroying the private value of that data in the process.

To do this, greater trust needs to be created between the government and the industry. To facilitate this, there may be a need for a neutral entity that can take responsibility for undertaking data pre-processing steps and data aggregation (to ensure commercial confidentiality) before distributing it for other stakeholders to use.

1.3.4. Transparency on benefits

The industry has shared their concerns on data sharing in several fora including in submissions to major recent public inquiries. In general, they are not opposed to sharing their operational data to help improve the efficiency and productivity of supply chains.

Despite being willing to share their data, the industry was reluctant to make commitments and/or undertake new initiatives. This is mainly due to industry uncertainty around the benefits they would derive in return for the effort they must make to share their data. Industry expressed scepticism about the value they have received to date from their data sharing in the past. Some of the concerns expressed were:

- Lack of timeliness on datasets delivery/dissemination;

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

Participants also indicated:

- They would be unwilling to share commercially sensitive data; and
- They sought that the effort and cost to them of additional data collection and processing (for sharing purposes) should be either minimal or funded by government. Alternatively, they welcomed the prospect of low-cost automated processes. This view was strong among smaller business entities, but less of an issue for larger businesses.

1.3.5. Learning from existing datasets

The study also identified several existing programs and associated datasets and tools that are considered to be particularly useful. These include: BITRE yearbook, ABS surveys (Motor Vehicle Use and Freight Movement), CSIRO's TraNSIT and TfNSW Freight Performance Dashboard.

However, it was frequently commented that the available data is lacking in one respect or another. Common observations were that:

- data updates are too infrequent,
- timeliness of delivery is often lacking, and
- the level of aggregation and presentation of the datasets is not suitable for the needs of the users.

1.3.6. Datasets in greatest demand

The study has clearly identified several datasets that are needed by stakeholders:

- Most notably, freight movement data (at various granularity levels); and,
- more broadly, performance indicators of the supply chains; particularly cost and time components of goods movement. Costs, service levels, and reliability are the most typically used measures of performance.

Segments of supply chains that were identified as needing greater clarity are:

- urban freight;
- first/last mile;
- regional issues;
- gateways;
- nationally significant corridors; and

- issues related to some specific commodities.

Respondents commented that the eventual goal is to achieve holistic freight data coverage in order to provide end-to-end visibility for the decision makers.

1.3.7. Better coordination is required

The literature review and stakeholder responses suggest that the deficiencies associated with currently available datasets stem more from collection procedures and information delivery/dissemination rather than the subject matter being collected. It appears that there are more issues associated with the 'how it is being collected and disseminated' than with the 'what is being collected'.

2. Literature review

This section presents the findings from the literature review.

2.1. Objectives, issues, and data needs

The section summarises the objectives, issues and underlying needs driving the demand for data. Data needs can be classified into several themes as follows (Taniguchi & Thompson 2015, CISCO 2018).

2.1.1. Economic competitiveness: productivity, efficiency, and reliability

Australia's freight supply chain is a vital economic cog and key strategic asset. The overall performance of Australia's supply chain impacts on achieving higher productivity growth and raising living standards. The three aspects of this broad theme, namely productivity, efficiency and reliability, are clearly interlinked and inseparable. Arguably, this is the main driving factor in relation to improving data collection for supply chains (TfNSW 2018, TfV 2018, IPA 2018, DIRDC 2018a, ALC 2018, Austroads 2006, Australian Railway Association & IISRI 2018, TMR 2013, Heaney 2013).

There are several key components in this theme, including:

- costs;
- capacity utilisation;
- data from trials of new technology;
- travel times, service times and reliability (congestion);
- freight growth management;
- land and corridor protection for freight;
- infrastructure performance;
- use of more productive and efficient vehicles;
- first/last-mile issue;
- border issues;
- end-to-end visibility (understanding where the pinch points, bottlenecks, constraints, and breakdowns are across the supply chain);
- regulatory or governance problems; and
- performance of gateways.

These identified components traverse the three levels of decision making defined in the scope of this study, namely: operation, planning, and investment.

Additional issues were identified by DIRDC in its "*Inquiry into national freight and supply chain priorities*" report (2018a), as follows:

- capacity limits and land-side access restrictions at key national freight terminals;
- diminishing industrial land around key national freight terminals and an inadequate allocation of land for intermodal terminals;
- conflicting freight and passenger rail and road movements during peak periods;
- fragmented access to national key freight routes;
- inadequate mechanisms for national supply chain integration, including a lack of freight data and information on the performance of Australian supply chains against international benchmarks;
- inadequate jurisdictional strategies for protecting freight corridors and strategic industrial and logistics areas from urban encroachment; and
- a lack of integrated planning and harmonisation of freight regulation and coordinated freight governance across and within governments.

These challenges may impose significant costs on freight businesses, Australian consumers and exporters.

2.1.2. Safety

Another important consideration is safety. Both NSW and Victoria included in their respective freight plans the intention to adopt new technologies and vehicles that may improve safety (TfNSW 2018, TfV 2018, TMR 2013). In this regard, data may play a part in informing which technology and vehicles provides the best return on investments in terms of safety benefits.

Additionally, crash data can be (and is) utilised to determine accident "black spot", which in turn can be actioned by the relevant road operators to reduce the number of crashes (Meuleners et al. 2002, Tziotis 1993).

Finally, safety improvements will inherently contribute to the economic competitiveness of the supply chain industry. For instance, Budd & Newstead (2014) provided an estimation of the financial savings associated with the uptake of more advanced vehicle safety features. For instance, the report indicates that if Autonomous Emergency Braking Systems (AEBS) were to be equipped in all heavy vehicles at all speeds, it would lead to a 25% fatal crash reduction with an estimated value of $62-187 million for Australia and $21-62 million for New Zealand. Furthermore, this translates to 67 and 14 lives saved in Australia and New Zealand respectively. Clearly, such safety-related data would help decision makers to justify safety-related investments.

2.1.3. Environment and sustainability

Environmental and sustainability considerations are also a focus of the literature as issues that need attention.

For example, noise TfNSW (2018) has pointed out that noise emissions around airports and rail freight supply-chains needs to be carefully managed. Additionally, noise emissions have been identified as a potential problem for proposals supporting off-peak freight delivery (Holguín-Veras et al. 2014, Austroads 2016, 2018a).

Other than noise, fuel emissions and the health impacts of heavy vehicles are identified as important considerations in the NSW Freight Plan (TfNSW 2018).

These sustainability considerations are intimately linked to supply-chain efficiency as well as freight corridor reservation.

2.1.4. Infrastructure and management

Infrastructure plays an important role in ensuring the efficiency of the freight supply chain network and is, therefore, an important aspect of the literature (TfNSW 2018, DIRDC 2018a, 2018b, TfV 2018, IPA 2018, ALC 2018, Austroads 2006).

Data about conditions of infrastructure and assets would improve the prioritisation and management of maintenance, operation (ie. avoiding bottlenecks), and congestion management, applicable to all modes (road, rail, sea, air). This is an area where new technologies developed in recent years have permitted data to be gathered and transmitted in real-time.

2.1.5. Interaction with structures

As part of the operation of freight vehicles, it is important to ensure that the roads and other structures (such as bridges) can accommodate the sizes and length of such heavy vehicles. The Victorian Freight Plan (TfV 2018) prioritised updating the principal freight network, as well as expanding the high productivity freight vehicle network. Further, the Plan identified the importance of developing freight friendly solutions for the Melbourne CBD. As another example, TfNSW (2018) has indicated the importance of protecting land needed for vital freight and logistics operations.

2.1.6. Modelling and forecasting

Modelling and forecasting have been identified as important exercises that help inform decision makers about the future challenges of various aspects, eg. policy, infrastructure provisions, economic impact, predictive congestion management, vehicle impact on transport network (BITRE 2018e, KPMG & Arup 2017, ALC & ACIL Allen Consulting 2014, SBEnrc 2017, Austroads 2018c, 2014, 2011, DG Cities 2018). More specifically, several researchers (Hensher et al. 2018, Camargo & Walker 2017) have provided various methodologies to analyse freight movements with the help of data.

Additionally, the TranSIT model which has been developed by CSIRO (2018), utilises data from the agriculture supply chain and serves as a strategic investment tool, which may help identify the most cost-effective options of infrastructure investments. Finally, Austroads (2006) has also pointed out that commodity-based modelling is preferred to vehicle-based modelling. This may have implications on the data requirement of developing the model.

2.1.7. Identified data needs

Based on the above, some of the data needs have been identified from the literature. A more expanded discussion of data needs can be found in the WP2 report.

2.1.8. Performance measures

Performance measures have been identified as the key data that are required to improve the overall performance of the supply chain industry.

DIRDC (2018a, 2018b) has emphasised the importance of measuring and monitoring the performance of supply chain such that actions can be taken that will improve productivity, as well as informing capital investments, maintenance, regulatory and governance reform. It also emphasises the needs of data consistency across jurisdictions. Although in some ways largely self-evident, the complicated structure of the supply chain, with different agents acting as owners and operators for example, makes it much less likely that there is a natural incentive for a particular stakeholder to collect these kinds of datasets.

There were many examples of performance indicators identified in the literature, particularly in the extensive logistics and operations research literature (TfNSW 2018, TfV 2018, Australian Railway Association & IISRI 2018, Katsikides n.d., KPMG 2018, NTC 2016b), including:

- rail terminal utilisation;
- rail service reliability and punctuality;
- road-to-rail ratio;
- truck service reliability and punctuality;
- truck queue time;
- truck two-way loading ratio;
- truck and booking slot utilisation;
- truck and container turnaround time;
- movement of cargo from/to port by rail (eg. port botany);
- location tracking and condition data, such as temperature and care when handling;
- freight movement: speeds, travel time, reliability, truck volumes, significant locations and corridors, o-d, route diversions;
- cost per tonne kilometre;
- total cost per tonne of the supply chain freight task;
- total time taken per supply route;

- a unitised measure of time (such as tonnes shipper per day); and
- tonnes moved per driver/per vehicle.

The performance indicators identified in the literature not only cover financial aspects of supply chain performance such as cost, but also asset performance and service quality (time, reliability). For example, Austroads (2018b) differentiated performance indicators into three different types: assets, finance, and service.

2.1.9. Externalities

An externality is an economic term that describes a policy, decision, action or institutional framework that leads to an impact outside the control of the entity in question. For example, freight companies are affected by urban traffic congestion, which is caused by an imbalance in the demand and supply of road space (which is shared by private, public and freight vehicles). There is nothing an individual freight company can do about congestion – it's an externality beyond its control.

The literature identifies several externalities (and available data) that will influence decision making within the freight supply chain industry. Examples of this type of data includes:

- congestion data;
- environmental impact data;
- employment data;
- licensing data;
- customs data (NTC 2017); and
- data on the supply of land for industrial uses (eg. Greater Sydney in NSW Freight Dashboard (TfNSW 2018)).

2.1.10. Data gaps

The issue of data gaps has been mentioned numerous times in the available literature. Austroads (2006) argued that:

> *"At the same time every freight inquiry in the last 25 years and most of the stakeholders consulted in this study identified the need for better data quality and quantity. They identified problems with current collections: such as the level of geographic disaggregation available from both the ABS Survey of Motor Vehicle Use (SMVU) and FDF Freight Info data and general collection quality and comparability. However these were far outweighed by concern about lack of collections. There was a lack of specific data: for example, there are few rail data post privatisation and a general dearth of data at many levels."*

It is interesting to compare this statement with one made recently by IPA (2018), as follows:

"Our work shows that the freight data deficit is not due to a lack of data collection. Much of the data decision makers need is already collected, but it remains fragmented, in silos, and rarely analysed. We have found systematic collection and publication of information about network performance is routinely deficient – often held in a patchwork of isolated datasets spread across tiers of government, industry, and the supply chain."

While raw data collection has increased since Austroads made its observation in 2006, the issue of the data being isolated and fragmented remains as recently pointed out by IPA. Austroads (2018b) has recently highlighted the issue of fragmented data.

A key outcome of the gap assessment presented in the report identified the following gaps:

- the lack of a consistent implementation of a data standard to support the knowledge sharing framework;
- the lack of assessment of data quality and maturity across agencies;
- there are no defined, agreed or consistent data processes, including data collection and the standardisation of spatial data;
- there are no established benchmarking requirements for agencies and jurisdictions to reference; and
- evidence-based decision making is not a consistent, understood priority for road management in Australia and New Zealand, although recent governance changes in Australia (and plans in NZ) have in part addressed this issue.

In addition to the general issue above, NTC (2016a) and ABS (2011) have identified the following more specific data gaps:

- the number of ancillaries versus hire-and-reward vehicles involved in road freight;
- the number of employees per fleet involved in road freight;
- the volume of commodities moved on rail freight networks;
- freight rail network utilisation;
- the fleet profile for tourist train operators;
- tourist rail usage;
- passenger rail network utilisation; and
- detailed, up-to-date economic measures of transport activity undertaken within the Australian economy that separately identify the own-account transport activity of businesses operating in industries.

2.1.11. Transport satellite account

The ABS (2011) has proposed the use of an Australian Transport Economic Account, an experimental Transport Satellite Account (TrSA) that provides a more comprehensive picture of transport by bringing together components of transport activity throughout the Australian economy. The development of a TrSA would provide data critical to supporting evidence-based decision making in the transport industry. A TrSA has the potential to assist in answering key policy questions such as:

- the economic impact of transport policies (eg. road user pricing, congestion charges, fuel surcharges) on all Industries, final consumers and the economy as a whole; and
- better understanding of broader transport activity in the economy including employment, productivity, energy consumption and the environment.

NTC (2017) suggested that any TrSA would include the following:

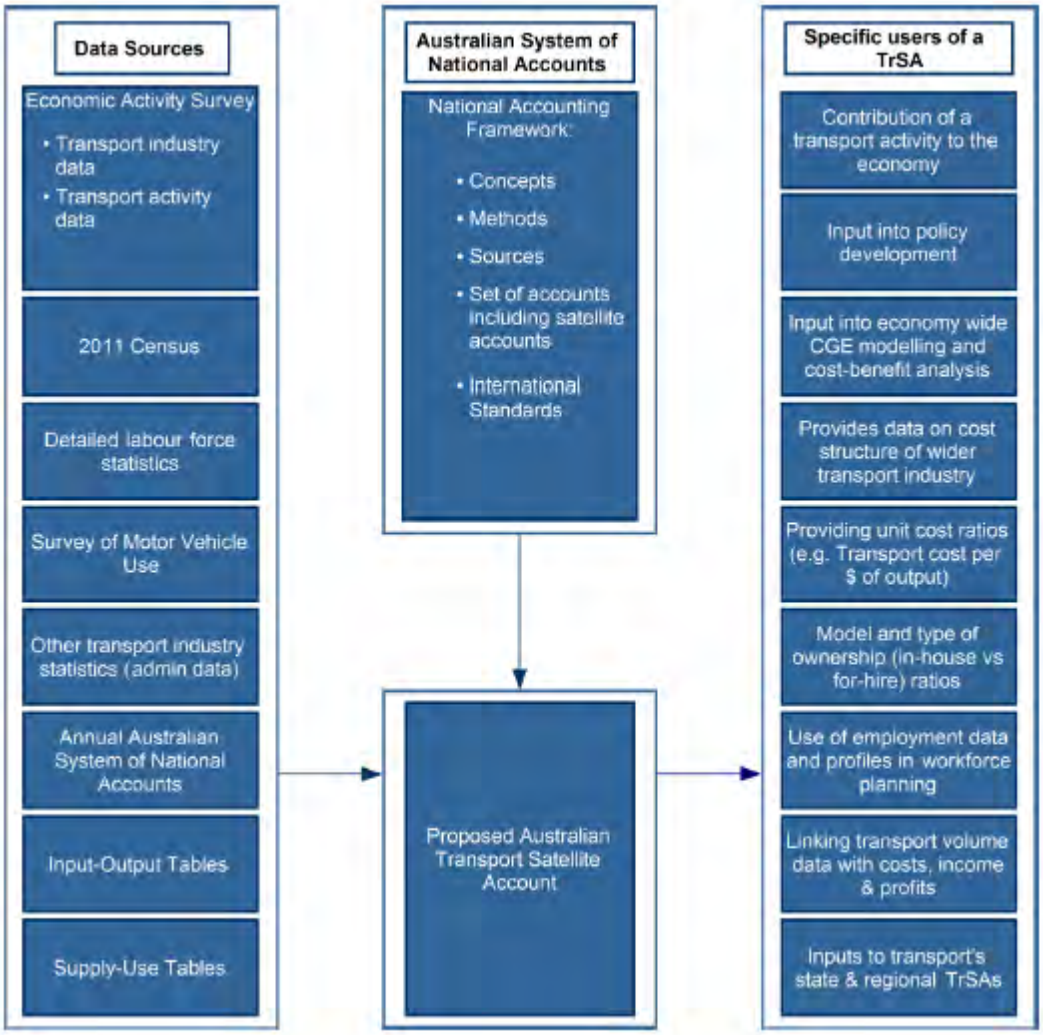
- the contribution of for-hire transport and own-account transport activity to industry gross value-added and GDP (among other aggregates);
- own-account transport would be treated as a single industry and valued based on the cost of its inputs;
- data may be split by passenger/freight activity and modal data (air, road, rail, water) but not by vehicle type;
- options to estimate profits on own-account transport would be explored;
- transport volume data (that is, number of vehicles) would be subject to quality of the data;
- capital expenditure data by vehicle type may be restricted to road vehicles and all other vehicles; and
- estimates of transport employment and hours worked would be explored.

Figure 2-1 below outlines in detail the linkages between various data sources which would support a TrSA, the national accounting framework and specific uses of TrSAs. The data requirements for a TrSA would encompass:

- transport related inputs (expenditure) data:
    - own-account transportation output;
    - a range of additional financial and some non-financial data as captured in the 2010-11 Economic Activity Survey, from both the Transport industry and in terms of transport activity undertaken in all other Industries;
    - transport related operating expenses (inputs) for each mode;
    - broader level transport expenses by mode from non-transport industries;

- production of transport services (income) data:
    - income from transportation services and its details (yet own-account transport activities are not able to be separately identified on the income side); and
- additional data requirements:
    - transport physical or volume data (for each industry), such as the number of transport vehicles and distance travelled classified by type of transport vehicle (eg. trucks, buses, cars, trains etc.); and
    - Transportation employment data, including employment aggregates and employee characteristics, the value-added ratio (ratio of own-account transportation value-added to total value added for each industry) to numbers of employees in each industry; and wages data/labour force ratios.

Figure 2-1. Data sources, linkages and uses of an Australian TrSA



2.2. Understanding data

The literature review highlighted that data necessarily comes in different formats and types. Thus, it is important to understand the form of the data that is most useful to industry.

2.2.1. Data processing

As first proposed by Keever & Pol (2002), there are four levels of data processing, as follows:

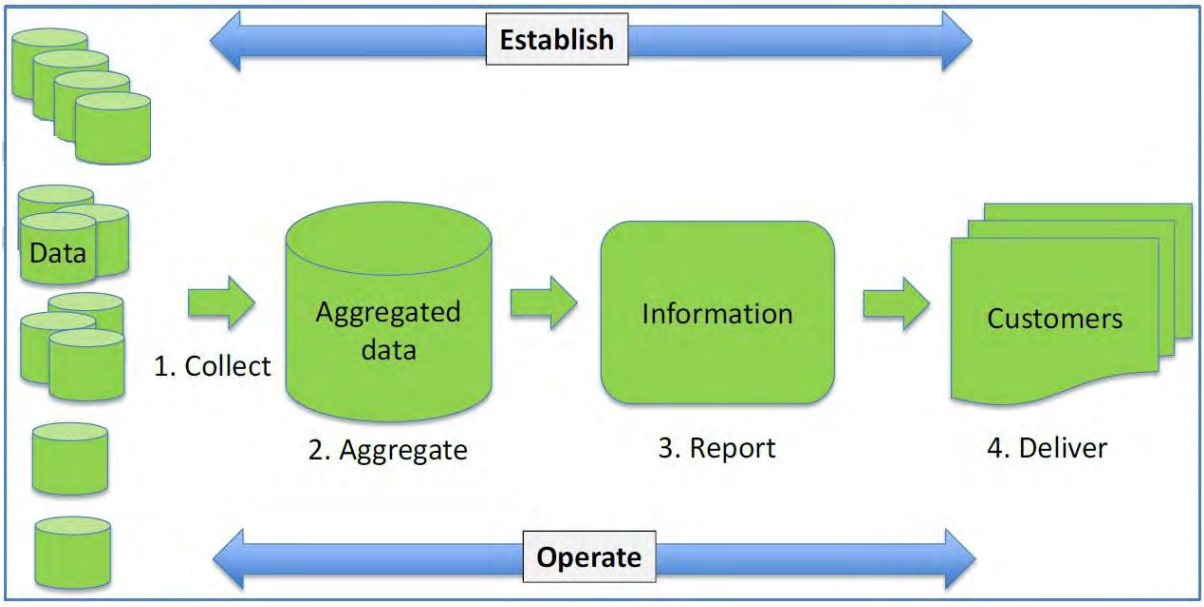
- Level 1: Data object refinements. At this level, data objects are refined into a consistent set of units. The data objects may be collected from various data collection procedures.
- Level 2: Situation refinements. The data from Level 1 is interpreted into meaning, similar to how human interpret the meaning of sensor data.

- Level 3: Expectation refinements. The current situation is extrapolated into the future (ie. forecast).
- Level 4: Meta process refinements. This provides a feedback loop that helps improving the overall process.

Based on the four levels of data processing described above, the output of each level of refinement is in essence a different type of dataset, which will be of different types and formats, compared to the inputs into the level. These datasets may address the same issue/objective yet might be of different scope. For example, speed data from loop detector may indicate a significant drop in speed, which is useful for an operation perspective to minimise risk of incidents. Further, the situation refinement process would interpret this as a potential incident data object, which is potentially used for planning purposes (eg. safety management plan). The potential incident data then can be forecasted to help prioritise road upgrade projects (investment) to increase safety. This example highlights the importance of the different types of data based on the refinement levels.

The image below also describes a similar concept. It shows that data objects may undergo some processing before being delivered to the users.

Figure 2-2. Illustration of data processing



2.2.2. Data quality

Furthermore, it is important to note the importance of so-called 'data quality'. ISO (2008) has defined data quality as follows:

"Data quality is a slight misnomer since the "perception of quality" or "measurement of excellence" is not what we really mean here. These terms actually relate to the perception of quality by the data consumer and are terms used to assess the fitness for purpose of the received data. What we mean in this Technical Report by the term "data quality" is a set of meta-data which defines parameters relating to the supplied data or service that allows data consumers to make their own assessment as to whether the data is fit for their intended application. Different applications require different aspects of data quality and so it is not possible to say, for instance, that a data set with a reporting interval of one minute is of a higher quality than one with a reporting interval of 3 min. Only the data consumer can make this judgement of "perceived quality" since it must be based on the needs of their application (eg. in terms of timeliness, accuracy, completeness, etc.)."

Several reports have suggested that data utilisation and sharing is lacking due to the fragmented nature of the data and emphasise the importance of consistency and standardisation (Austroads 2006, 2015, Ueda 2017, ALC 2018, Productivity Commission 2017, ACS 2017, NTC 2017, ITF 2015, IPA 2018, TIC 2016).

The concept of high value datasets was discussed by the Productivity Commission (PC 2017), which has two components, namely *use* and *quality*. The PC identifies several characteristics around *use* that high value datasets might possess, include that they (PC 2017, p.288):

- are unique (in the sense that there are no suitable substitutes or that they could not be easily replicated);
- contain unit record level data (which can be particularly useful for evaluating the effectiveness of particular policies);
- have a high degree of coverage in the population of interest — which minimises issues around sampling bias and allows for analysis of small and vulnerable groups;
- have been designed for linking with other datasets, or use identifiers to allow linking with other datasets;
- are central to service delivery and/or core decision making;
- contain time-specific data that allows for comparisons to be made over time; and
- have a high potential for use and re-use, and a large potential user base.

Characteristics that are indicative of *quality* could include that datasets:

- are current (real-time) and/or updated regularly;
- are accurate and complete;
- contain clear, consistent definitions; and

- provide details on data quality, lineage and provenance.

2.2.3. Stakeholders

It is also important to consider 'who' among the stakeholders needs the data, since their data needs may vary significantly, depending, for example, whether the stakeholder is a government or a private sector entity. In addition to the entities that are directly involved within the supply chain, there are several other stakeholders that are of relevance to this study. These stakeholders are important and a critical part of the Australian freight supply chain eco-system, with their own unique challenges and data needs:

- original equipment manufacturers, including:
  - technology suppliers;
  - vehicle manufacturers;
- peak industry bodies;
- research agencies; and
- government entities, including:
  - regulators;
  - local councils;
  - road operators; and
  - state/federal government departments.

2.3. Barriers for sharing data

Notwithstanding a general consensus about a lack of transport data and strong support for a national freight data strategy, the literature review identified several factors that act as barriers to data sharing. Austroads (2006) and the Productivity Commission (2017) offer the following list of these factors:

- There is a lack of consistency, transferability and standardisation of data collection procedures. In many instances, legacy IT systems hinder automation of data provision.
- Issues of commercial confidentiality are important, since some of the stakeholders are competitors at times and there will be data that they will not want to share. Commercial confidentiality is perceived as an important issue, especially in rail and aviation.
- There is concern about to how much benefit, if any, individual organisations would derive from data collaboration. Stakeholders almost unanimously said that the value of collaboration would need to be well established and understood before they would support a collaborative venture.

- In addition, many organisations in Australia note problems associated with the fragmented nature of freight data and the cost involved in locating, accessing and using these data. AusLink has highlighted the need for consistency between jurisdictional data sets to enable national comparability.[1] Other stakeholders have noted the fragmented nature of many collections, and that sporadic releases detract from data usability.

- Stakeholders were also concerned about the balance of benefits and costs, particularly as regards their own organisations. There was concern that benefits would likely be distributed to business and the community, but that most of the costs from a formal freight data collaboration system would be borne by contributing organisations. These could take the form of opportunity costs of staff time in all levels of the organisations, from the time of senior people reaching agreements in the planning stage, through infrastructure setup, to ongoing operation.

- Finally, there are operational, legal and political risks to consider when data is shared with other, perhaps competing, organisations and control is lost over data use and distribution. There is considerable legislative complexity, as well as concerns about data breaches and re-identification of individual contributors.

2.4. Other considerations

While the barriers to data sharing are considerable, there may be means of managing some of the obstacles that have been identified (Austroads 2006).

The data sharing mechanism itself may not be as important, as long as there is a nationally consistent system. Such a system would also be "useful for methodologies, generation rates and time trends parameters", as well as to "provide the level of detail required". It is also needed "ahead of a national freight data system to extend collection, transfer and to get the data needed at the level of disaggregation suitable for use".

In terms of governance, "a national freight data consortium may present a single client with greater buying power to influence the content and manner of collection of privately-available data". Such collaboration "can be arranged via informal and formal agreements, MOUs, licensing agreements and legislation". As part of the coordination, representatives from the major contributing organisations will form a governing body or steering committee. Furthermore, the operations of the data centre will be the responsibility of existing agency (such as the primary government sponsoring body), or a third-party data custodian (to address the "concern about state and national governments controlling access to information").

While government funding would need to be provided initially, once operating, a national data collection initiative should be self-sustaining in the long term. For instance, products and services could be made available to the general market at a cost (but be available free for partners). In this

[1] At the same time, there may be opportunities to reduce the costs of replicating data surveys by translating data sets for an industry from one region to other regions, if consistent processes to do so were available.

way, 'customers' of the database could come from all sectors of government, industry and community as well as the general public.

2.5. Findings from the literature

The literature review highlighted that there is already quite an amount data being collected, through various government programs, eg. IAP (TCA 2018), ABS surveys (ABS 2005, 2015, 2017), BITRE statistics (BITRE 2018a, 2018b, 2018c, 2018d), and container stevedoring monitoring reports (ACCC 2018). Yet accessing and making use of the data is not necessarily straightforward:

- The available data is 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 main reasons why firms are reluctant to share data is that the benefit of doing so may be uncertain or may not outweigh the perceived concerns (eg. commercial confidentiality). There are also concerns that a government-run national data entity would 'control' what it wants to share. There may therefore be a case for establishing a structurally independent data agency.
- 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.

Thus, it is important to ensure that the surveys be designed such that the stakeholders' understanding of data is addressed, including the types of data, what it is used for, as well as their willingness to share data.

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

- The focus of governments is to improve national productivity and international competitiveness. Further, there are several other important objectives including: safety, infrastructure management, and modelling/forecasting for planning purposes.
- The data needs of the stakeholders are mainly driven by the desire to be able to understand the performance of the supply chains, with an eventual goal to achieve end-to-end visibility.
- In this regard, datasets that are highly sought after include: congestion, travel time and asset condition. Associated datasets include: employment, licensing and customs data.

It is important to note 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. As stated by DIRDC (2018a):

"Policy leaders are now calling for a renewed focus on productivity growth to ensure Australia remains internationally competitive in the future."

In contrast, for industry, the most commonly sought data relates to 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).

Advances in data collection technology explain much of the renewed focus on freight data. For instance, TfNSW (2018) when proposing actions to improve economic growth highlighted a need to assist industry planning and decision making by sharing data with industry, improving data on rail freight and supporting national freight data initiatives.

The literature identifies several other reasons for collecting data, including: safety, environmental impact and sustainability, infrastructure and management, interaction with structures, and finally modelling and forecasting. The needs identified from the literature mostly refer to planning and investment decision making, while operational decision making was cited more infrequently.

Several externalities-type data have also been identified as useful, such as: employment data, congestion data, licensing data, and customs data. Additionally, it is also important to understand the details of the data requirement itself, which is often referred to as the 'data quality'. This includes the reporting frequency, level of aggregation (commercial sensitivity vs. usefulness), standards (eg. metadata standards), as well as the perspectives of the stakeholders requiring the data.

3. Stakeholder consultation

This section outlines the findings from the stakeholder consultation exercise that comprised two components, namely:

- interviews with government and industry stakeholders; and
- an online survey distributed to industry stakeholders.

3.1. Interview consultation process

Stakeholder consultation was undertaken with representatives from a range of organisations. The interview cohort included representatives from government agencies, industry bodies and private industry.

An initial contact list of approximately 100 individuals working in freight and supply chain related government agencies and industries was developed and emails were circulated inviting their participation. Where there was an interest expressed by representatives of other organisations to participate in the consultation process this was also accommodated by forwarding the same email invitation. Follow-up phone calls were also undertaken to target organisations where no email response was received. Representatives from 17 different organisations took part in the consultation process which took place during November and December 2018:

- Government agencies and regulators: the Australian Bureau of Statistics (ABS), the Bureau of Infrastructure, Transport and Regional Economics (BITRE); the Department of State Growth TAS; the Department of Transport and Main Roads QLD; Infrastructure Australia; the National Transport Commission; the Office of Northern Australia; Roads & Maritime Services NSW; Transport Canberra & City Services ACT; and Transport for NSW;
- companies/professional services/transport operator: Jacobs; NSW Ports; Pacific National; RDW Advisory; Telstra; and Virgin Australia; and
- Industry bodies and advocacy groups: Red Meat Advisory Council.

Phone calls were the means used to hold these discussions which tended to run for approximately 60 minutes duration. Stakeholders were typically asked questions covering requirements and accessibility issues in relation to how data is currently used as well as how it could be better used in future to inform decision-making in relation to planning, operations and investment areas.

In discussions with stakeholders regarding their data needs and priorities, three key themes were identified:

- **What, where, when and how much?** There is a strong demand for a more complete picture of what goods and finished products are being moved where and when across the transport network, and the associated value in cost and time and impact terms is needed to provide opportunities for improved decision-making.

- **Appropriate level of transparency and aggregation.** Data that is provided needs to be suitably transparent to enable benchmarking whilst also aggregated enough to accommodate commercial sensitivity.
- **Data exchange needs to offer mutually beneficial outcomes.** An emphasis on usefulness of outputs is necessary to encourage improved data sharing between government and firms.

3.1.1. What, where, when and how much?

3.1.1.1. Existing data sources

Several existing data sources were commonly mentioned by stakeholders as being useful for their planning and investment decision making, and to a lesser extent for operations. A list of these sources can be found in the WP2 report. While the value in these existing data sources was generally recognised, it was also acknowledged that improvements to these data sources could be achieved through better engagement with industry, particularly in relation to data transparency, anticipating the data needs of industry, and providing access to data on a more regular and timelier basis.

Existing supply of data and data gaps

The transport data that is currently accessible does not enable sufficiently comprehensive insights on end-to-end supply chain movements to allow monitoring of the associated cost and time considerations.

> *"Better focus on investment in the parts of the supply chain that are causing the greatest costs"*

An absence of systematic data collection that provides comparative data between different transport modes and associated infrastructure means there is some rigidity in transport decisions.

> *"The boundaries that we have via states are not boundaries for states!"*

With data collation remaining siloed, there is a lack of opportunity to explore the viability of different options.

> *"Would road be more viable than rail?"*

Better understanding around corridors of national significance was also a recurring point of interest in discussions with stakeholders.

> *"Which particular corridors are carrying the highest value freight?"*

Some industry stakeholders expressed the need for better transparency around regulatory costs:

> *"Understanding where the costs are in the system; where they accumulate"*

The data that are currently available in detailed formats tends to be data that are mandated in legislation, such as reporting requirements for approval and funding purposes.

Benefits of taking a holistic approach

GPS data, telematics data and Internet of Things (IOT) data are generally viewed as a promising tool for improving data collection capacity, addressing knowledge gaps as well as enabling opportunities for efficiency gains:

> *"We need to start to access that data and being able to share it could help to optimise movements and schedules"*

National productivity and international competitiveness outcomes can only be achieved when there is end-to-end understanding on time and cost considerations.

While understanding the bottlenecks that exist in the transport network will go some way in addressing capacity and network capability, having a more holistic understanding of capacity across the entire network can offer broader advantages.

> *"If we keep fixing bottlenecks, we're basically just pushing the issues to the next bottle neck"*

In summary, objectives for planning and investment should focus on the entire supply chain rather than individual elements in order to optimise the whole system.

3.1.2. Appropriate transparency and aggregation

Benchmarking

Improved transparency around data formats and granularity was regarded as a key opportunity for government and industry to undertake benchmarking.

> *"Gaps in specific data about where there are capacity constraints on the network"*

There was some concern that inconsistencies between data collection methodologies amongst jurisdictions could make benchmarking difficult. However, it is also understood that the higher priority

is to first establish a baseline of data, as issues with harmonisation could only be addressed once there is clarity and transparency around the specifics of the data that is available.

> *"There's a gap between what's really there and available; secondly what doesn't line up once there is that transparency"*

Consultations with industry stakeholders indicated that there is an appetite for benchmarking their performance and competitiveness within their industry both domestically and internationally. The industry's willingness to share data seemed to stem from their understanding of how valuable the outcomes from sharing data would be. In this regard, trust in the quality of data available as well as the level of aggregation that is required for reporting is also a key factor. This is particularly prevalent in industries with fewer companies controlling the market share, where the risks to commercial interests for individual companies are amplified.

Government agencies have already begun sharing data in many cases due to open data policies. Open data practices can be strengthened through reducing lags between data acquisition and publication.

> *"Share the data unless you have a really good reason not to"*

Commercial issues

In order for industry to share data, there are a number of barriers which would need to be overcome. These include the manual work involved to classify and categorise the information and provide it in suitable formats. This could be a significant time investment especially for smaller businesses.

> *"Best to start with what's achievable and that helps to build trust to get the harder things working"*

Sharing data is something that most stakeholders expressed as important to improve Australia's productivity and competitiveness.

It was also regularly indicated that the return on investment for industry effort in providing data to government may not be demonstrated or articulated clearly enough.

> *"Being able to do that in a way that benefits everyone, and so no one loses their competitive advantage"*

3.1.3. Data exchange needs to offer mutually beneficial outcomes

Mutually beneficial outcomes

Examples of successful data models mentioned by stakeholders typically involved elements of shared benefits. The data requested by government should help with more focussed investment decisions; however, it can also be made accessible to industry to improve opportunities for improved competitiveness on a commercial and operational level.

> *"We're talking about sucking data out but at what point do we talk about feeding it back in?"*

Costs need to be countered with benefits for industry to better engage in data sharing initiatives. As noted above, data collection presents an opportunity cost for private firms, as well as potential competitive and legal risks. In order to encourage the transport sector to participate in any data sharing initiative, any private benefits that an individual firm might gain would have to outweigh these costs.

Usefulness of data outputs and data models

With governments becoming increasingly reliant on private sources of data to facilitate their analytical and policy requirements, a platform for sharing data would allow data sources to be more-easily combined.

It was generally acknowledged that real-time access to data is not necessary and, in any case, most of the relevant data is not collected in real time. Interviewees agreed that data should be reported with roughly the same frequency that it is collected for it to be useful (eg. quarterly collections are reported quarterly). Another finding from the interviews was that a single data platform could offer a simple means for storing and providing access to data.

Data models such as Transport for NSW Freight Hub and CSIRO TranSIT were referenced as being suitable prototypes which could be implemented more widely to facilitate data sharing. The success of these programs was attributed to delivery being managed by a trusted party to de-identify and aggregate the data in combination with extensive engagement with industry with reporting provided at a suitable frequency.

3.2. Online survey

3.2.1. Methodology

The online survey was designed to identify freight data needs for planning, investment and operational purposes. The analysis aimed to uncover the needs of various industry stakeholders and provide quantified measures of the value of data sharing and data acquisition from the point of view of these different stakeholders. The analysis will enable the Australian Government, as this Project's sponsor, to have a comprehensive understanding of demand and supply of data and how it can be of value for the stakeholders.

In order to answer these main research questions, an online survey was developed, programmed and fielded among senior management in the freight industry. Government agencies were excluded from this part of the research process. The survey contained three major components, as follows.

In the first component of the survey, respondents answered questions regarding the entity they were representing, including:

- the type of entity;
- the entity's role in the freight supply chain;
- the entity's industry classification;
- employment size and annual turnover;
- type of cargo handled; and
- which transportation mode is used for the movement of goods.

In the second component, respondents were required to provide information regarding any datasets that they owned and managed internally. Based on the literature review, the currently available freight data were classified into 10 main categories and 22 sub-categories. Respondents had the option to provide other types of category and subcategory if needed. After selecting the relative main categories and subcategories, respondents were asked about the purpose (planning, investment, operational) and frequency of use, and if the dataset can be shared.

A similar procedure was used to determine whether firms or industry bodies are using any data sourced externally. The survey also asked about data acquisition costs. Furthermore, to provide actionable recommendations to government about which metrics are best suited to improving national productivity and international competitiveness, several propositions were posed, and respondents were asked to select all that were relevant or of interest to them and their industry. Note that these propositions were derived from the findings of the pre-survey focus group (see above). Respondents were also asked whether they believe there are any gaps in the currently available data sources.

In the third and last section, respondents were asked to provide answers regarding the current limitations on data sharing. For this section, respondents were asked to rank the current limitations for sharing data from most to the least important barrier to sharing.

Data for our analysis came from a sample of 148 senior managers in the freight industry Australian wide. Respondents were recruited using two sources: 110 respondents were drawn from a panel held by a major national online panel company, with the remainder being invited via email to participate in the survey. The survey was administered online from 30th of November until 11th of January 2019, through a web-based interface. A copy of the survey can be found in Appendix C. Appendix A contains the detailed results of the online survey.

3.2.2. Overview of survey participants

Appendix A provides a description of the survey participants, in terms of activities, size, and other characteristics.

From the sample of 148 respondents, around 45% were classified as a small business entity (SBE), around 25% as a medium business entity (MBE) and around 17% as a large business entity (LBE). A further 7% were from an Industry Association (IA) and the 6% of respondents who selected other were partly from the local government sector.

Around half of SBEs have less than 20 employees and almost 80% have less than 50 employees. Around a quarter of MBEs have between 50 to 99 employees, while 20% of LBEs indicated they have more than 5,000 employees, although many had significantly fewer employees. Most MBEs have higher than $50 million annual turnover, while LBEs mainly belong to categories with less than $750 million of annual turnover, with one-third having an annual turnover of between $250 million and $500 million.

Around a third of respondents indicated that they receive commodities, a third said they primarily acted as a shipper, around 15% of the respondents reported being logistics, transport or carrier type companies, and a little more than a quarter reported being a service provider to other freight and logistics companies. Almost 33% of respondents are engaged in national/cross-border operations, and more than 24% in international operations. A little less than a quarter are active in state and regional operations.

Most respondent companies handle parcels (32%); large shipments comprising liquid, break and dry bulk, pallets and containers cover around 41% of the primary cargo of the surveyed businesses. Respondent SBEs mainly handle parcel and carton, respondent MBEs handle parcels and containers, and LBEs handle containers, pallets and dry bulk. Respondent SBEs mostly handle consumer and manufactured goods, MBEs handle manufactured goods, while respondent LBEs handle consumer goods, manufactured goods and fuel. Transport by road is the dominant mode of transport. SBEs tend to use road transport, while MBEs and LBEs also rely more on roads, but also rail and water. The Industry Associations are distributed among all modes.

3.2.3. Summary of findings: Need to measure performance: operation and planning

Most respondents (67%) noted that they only deal with one category of data. Among these, the category ‘competitiveness’ is the most commonly internally used data, followed by ‘safety’. For data that are sourced internally:

- small business enterprises (SBEs) are mainly concerned about competitiveness data;
- medium business enterprises (MBEs) are also concerned with competitiveness and international gateways performance datasets;
- large business enterprises (LBEs) are interested in market comparisons, but also seem to be using many different types of data;

- labour and infrastructure datasets are the dominating subcategories of the competitiveness category, which is used commonly by companies;
- operational data is the most commonly indicated purpose of use for internally sourced data, which is mainly related to competitiveness and performance of international gateways;
- the planning purpose mainly focuses on competitiveness, followed by infrastructure performance and safety;
- Performance of international gateways, safety, and competitiveness was found to be the most commonly used types of external data. Among these, safety data appears to be a concern of SBEs and Industry Associations (IA). For MBEs, competitiveness is the data used the most, while LBEs are interested in having data on mode-specific transport.

3.2.4. Summary of findings: Data availability

Among the subcategories of data, costs and freight volumes were identified by the respondents as requiring further supporting data sources. Respondents also said that they require more data for planning purposes to be made available:

- only 24.7% of the respondents indicated that accessibility to reliable, consistent, comprehensive and timely data on freight movements is very important; and
- SBEs and MBEs are reasonably satisfied with the available data sources, while LBEs and IAs considered more data sources to be necessary.

Where identified gaps in the data are concerned, respondents thought that:

- more data should be provided on performance of international gateways, competitiveness, performance of multimodal networks, Infrastructure performance and regional freight; and
- how data is used by the entities was found to be critical in determining whether a gap is felt by the respondents; for instance, respondents demanded more data for planning purposes to be available.

3.2.5. Summary of findings: Data sensitivity and trusted entity

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. Competition barriers (34.5%) was seen as the most important critical barrier and challenge for freight data sharing, followed by resource barriers (29.7%):

- SBEs indicated a reluctance to participate as they are more sensitive to commercial losses as a result of greater competitive pressures
- MBEs indicated a willingness to share their data, except in cases related to the safety category;

- compared to all the other types of companies, industry associations (IAs) seem to be extremely sensitive to sharing their internally sourced data, regardless of the data type;
- LBEs participating in this survey appear to be concerned about sharing their internally sourced data. Even when they are happy to share their data, they prefer to make it publicly available or share it to government agencies instead of other types of agencies.
- Summary of findings: Limitation & barrier to sharing freight data

Overall, concerns about competitors were viewed as the most important critical barrier and challenge for freight data sharing (34.5%). The cost in terms of necessary *resources* (29.7%) 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.

Based on the literature review, five categories of barriers were further classified into 20 sub-categories. Respondents were asked to make choices about these based on a Discrete Choice Experiment (DCE).[2] A DCE asks a respondent to make a choice between a hypothetical set of alternatives. By altering features of an alternative/good/service in a systematic way in repeated questions, DCEs use choice frequencies to infer the value associated with product characteristics: how often a respondent chooses option A over option B indicates how much the respondent values A over B. DCEs rely on relatively few questions by using principles from the design of statistical experiments to support inferences about multiple hypothetical 'what if?' scenarios. Additionally, 'best-worst' scaling asks people not only to report the 'top' choice in each choice set, but also the 'bottom' choice.

The approach adopted elicited the following findings:

- Overall, '*disclosure of individual shipment or company data*' is viewed as proprietary or business-sensitive, while '*data sharing with foreign countries*' was ranked the least (or equally least) important factor.
- For SBEs, disclosure of individual shipment or company data is viewed as proprietary or business-sensitive ranked 1, but the same concern was ranked 2 for LBEs and IAs, and ranked 3 for MBEs.

3.3. Focus groups

Several focus groups were held as part of the consultation process. The participants of these focus group were largely executive-level personnel and/or principal industry consultants.

[2] Discrete Choice Experiments (DCEs) are a type of Stated Preference elicitation approach embedded in random utility theory (Thurstone 1927). DCE methodology makes use of choices rooted in real life that provide testable predictions (Louviere et al. 2000). DCEs, an alternative to the revealed preference method, systematically vary combinations of levels of each attribute, to reveal new opportunities relative to the existing circumstance of attribute levels on offer.

3.3.1. Pre-survey focus group

The first focus group was held before the online survey was distributed. The purpose of this focus group was to get an initial understanding of the views of the industry stakeholders in terms of freight data needs. The focus group discussed the following questions:

- What data is needed to improve national productivity and international competitiveness?
- What data does industry need to enhance their businesses?
- What does the industry want from government to better run their businesses?

In discussions it became apparent that the main priority for businesses was to satisfy their customers' needs. It was also noted that taking a national approach may pose a risk that state jurisdictions might not be fully engaged, especially since state jurisdictions are competing against each other.

The discussion was then directed to establishing the understanding around freight performance indicators. The following points were made:

- Three key metrics are: unitised cost, size of supply chain, service (related to time), and reliability (consistency). Note that cost only related to freight transport, not the cost of goods themselves.
- Forecast and projection data are also needed for planning and investing. This is also important to ensure that the industry can analyse the data to come up with better ways to run their business, if necessary.
- Performance indicators and comparisons can be done separately for each of the supply chain components, as well as for each mode.
- Current data is fragmented, eg. inconsistent update frequency. However, various cost data is already available (eg. stevedore reports, waterline reports)

The discussion also included identification of characteristics of data that would be required. The main comments that were received indicated that:

- Data should be anonymous, which might represent a problem if participation is low so that entities could be identified;
- There would need to be trust in the accuracy of the data and data custodians;
- Data collection should be light touch, low cost or funded, harmonised, and low frequency or automated;
- Data should be internationally benchmark-able (if aggregation uses percentage, the data might not be useful for international benchmarking); and
- Governance does not really matter as long as the data is anonymised; for instance, if a trusted independent body holds the data.

Finally, the discussion focused on identifying several pressing issues that could be resolved with the help of data:

- **Bulk commodities.** Australia's significant supply chains carry bulk commodities, particularly iron ore, coal and LNG. While they are already among the world's most productive it is in our national interest to protect and enhance these supply chains. Learning about their best practise productivity metrics, capital allocations, service standards and regulatory environments may provide a framework to improve national productivity.
- **Non-express domestic forwarding (FTL, LTL, Rail, Sea).** This is another significant logistics component in Australia, encompassing various modes of transport including road, rail, and sea, as well as both FTL and LTL. The efficiency of our linehaul journeys is a direct contributor to national productivity and, hence, framing the most fit for purpose metrics is vital.
- **Import/export containers and national gateways.** Australia is a significant importer of containerised goods and our container ports are our national gateways. The more cheaply and reliably we can import and export goods the more productive our economy will be. We need to consider the most effective metrics to drive national productivity improvements considering the stevedoring component as well as transport within the port and road and rail land-side transport outside the port to the consignee.
- **Agricultural goods.** Agricultural exports have been important to Australia for more than two centuries. Competing on a global basis means our farm goods must get to market reliably while retaining their high quality.
- **Express, e-commerce and first and last mile deliveries.** This is the fastest growing part of the logistics sector especially as a result e-commerce sale. The big challenges are time and reliability of delivery as well as cost. The national productivity challenge here is to find metrics that can lead to increased efficiency in congested areas, tight timeframes, problems such as access to loading zones and against a backdrop of too many failed deliveries.
- **Land planning and corridor protection.** Efficient supply chains require seamless networks and sites where goods can be consolidated and separated out cheaply, reliably and quickly. A real focus on supply chain needs by planners and policy makers across governments is necessary to improve productivity. Access to appropriately zoned land at key transport nexus points is vital. Similarly, freight corridors of all modes and their entry and exit points should be protected from encroachment to ensure that safe high productivity transport can easily be used.

3.3.2. Post-survey focus group

The final focus groups were held following the distribution of the online survey and towards the end of the interview consultation process. These focus groups aimed to confirm the findings of the other stakeholder consultation activities.

A list of identified data gaps and priorities were provided as a starting point for discussion. There was consensus amongst participants that the list covered most of the data gaps and priorities. The following additional key points were made:

- Planning of network extensions, freeways and other infrastructure investments in the pipeline are not transparent, restricting opportunity for industry to make optimal decisions;
- The data that is currently accessible is mostly operational; relatively little is readily accessible from a planning point of view; and
- There was perceived to be a lack of communication and sharing of information between government departments and agencies.

A list of principles of open freight data were provided as a starting point for discussion. There was general agreement that these principles were not currently being implemented, but agreed that implementation would be difficult, for instance in relation to road freight data. Respondents also noted that it can be difficult to properly de-identify data and to ensure that the data are not commercially sensitive. Thus, a good understanding of the market often means that data sources can be identified.

Regarding sharing industry operational data, the following points were made:

- There are considerable issues around the competitive advantage aspects for industry in protecting their data;
- Existing confidentiality agreements with key customers are a concern; customers may not wish data to be disseminated; and
- Government should also be sharing operational data to encourage measurement of its performance.

3.4. Summary of findings

Table 3-1 summarises the findings of the stakeholder consultation.

Table 3-1. Summary of online survey findings and focus groups

			Industry			Industry Association
			Small	**Medium**	**Large**	
DATA IN USE	*Sourced internally*	Data category	1-Competitiveness	1-Competitiveness	1-Safety 2-Regional freight	1-Competitiveness 2-Performance of multimodal networks 3-Safety 4- Regional freight 5-Mode-specific transport data
		Data sub-category	1-Labour, 2-E-commerce, 3-Value of freight	1-Roads tracks bridges tunnels	1- Labour 2- Freight volumes	1 & 2 & 4 - Landside logistics costs 3 & 5 - Freight volumes
		Data purpose	Operation and Planning	1-Investment	1-Planning operation & investment	1-Planning and investment 2-Planning and operation 3-Planning and operation 4-Planning operation and investment 5-Planning operation and investment
		Frequency of use	Every day	Once a week	1- Once a week 2-Everyday	Once a month
		Data sharing	Yes, publicly to anyone	Yes, publicly to anyone	No, the data cannot be shared with anyone at all	No, the data cannot be shared with anyone at all
	Sourced externally	Data category	1- Competitiveness 2-Safety	Competitiveness	1- Regional freight 2-Performance of international gateways 3-Mode-specific transport data	1-Performance of international gateways 2- Performance of multimodal networks 3- Safety

		Data sub-category	1-E-commerce & Congestion metrics 2-Volumes & Airports	Labour	1- Landside logistics costs 2- Rail 3-Road	1- Ports 2- Landside logistics costs 3- Road
		Data purpose	Operation	Operation	Planning	1- Planning operation & investment 2- Planning & investment 3- Operation & planning
		Frequency of use	1-Every day 2-Two to three times a week	Once a month	1- Every day 2- Every three months 3- Every day	1 & 2-Every year or more 3- Every three months
		Cost to access data	Less than $1000	Less than $1000	Less than $1000	Less than $1000
IN GAPS FOR DATA			Generally, No	Generally, No	Generally, Yes	Generally, Yes
MOST IMPORTANT BARRIERS FOR DATA SHARING			1-Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive 2-Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to participation 3- Data source diversity and in some cases the large amounts of data requires costly processing	1-Sensitivity about sharing information which could be used by competitors 2-Compatibility issues between national freight data sets 3-Sharing across international boundaries is difficult as is coordination with multiple international agencies	1-Sensitivity about sharing information which could be used by competitors 2-Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive 3-Data source diversity and in some cases the large amounts of data requires costly processing	1-Sensitivity about sharing information which could be used by competitors 2-Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive 3-Compatibility issues between national freight data sets processing & Private sector interests do not always align with the public good

*note that the numbers in each cell in column correspond with each other.

4. Conclusions

The freight supply chain industry, both in Australia and overseas, recognises that access to better freight data can improve firm and industry performance as well as enabling investment in the network to be better targeted.

4.1. Key findings

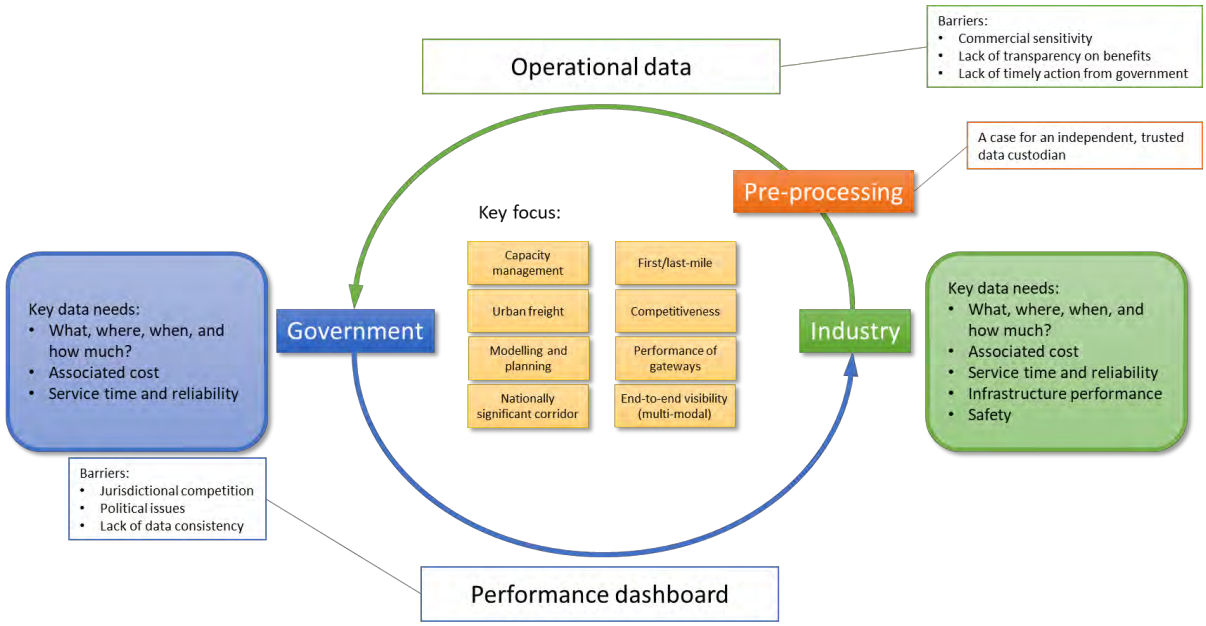
4.1.1. Main themes

In discussions with stakeholders regarding their data needs and priorities, three key themes were identified:

- **What, where, when and how much?** There is strong demand for a more complete picture of what goods (bulk, non-bulk, containers) are being moved where and when across the transport network because of the potential savings in cost and time from improved decision-making.
- **Appropriate transparency and aggregation.** A key trade-off is that the provision of data needs to be suitably transparent to enable benchmarking whilst also aggregated enough to accommodate commercial sensitivity.
- **Data exchange needs to offer mutually beneficial outcomes.** An emphasis on the potential usefulness of outputs is necessary to encourage improved data sharing.

The key points from this research project are illustrated in the figure below.

Figure 4-1. An illustration of the key findings



4.1.1.1. Performance metrics: movements, cost, time, and capacity

The fundamental need expressed by most stakeholders is to learn about the performance and competitiveness of some aspect of the national supply chain. The metrics sought depend on the stakeholders' interests and the scope of the decisions they are seeking to support. However, the underlying data that serve this purpose relate to four aspects:

- Goods movements ("what, where, when, and how much");
- Associated costs;
- Time (i.e. service level and reliability); and
- Capacity (i.e. utilisation, congestion, and infrastructure conditions).

The consultation process revealed that stakeholders prioritise data on cost and volume (freight task) ahead of the other aspects. However, some other contextual datasets, such as infrastructure condition data and employment data are also frequently sought.

Our review of previous reports revealed the importance of economic competitiveness (productivity, efficiency, and reliability). This study, particularly from online survey, reinforced this view. We found that business entities, particularly small business entities, commonly seek insights into the competitiveness of their operation, whereas governments, larger firms and industry associations are more concerned about planning and investment decision-making.

In addition to this attention to economic competitiveness, the study also identified the importance of end-to-end network visibility, which enables decision makers to identify problems (eg. bottlenecks) and reduce waste of time and effort, in supply chains.

The study also identified the importance of: nationally significant freight corridors; first/last-mile deliveries; urban freight; gateways; capacity management; and data requirements for modelling purposes.

4.1.1.2. Interdependent relationships

It has been observed that industry, state, federal, and local government stakeholders are partners in, an interdependent relationship, in the sense that there is an inter dependence (and shared responsibility) between government and industry to fulfil freight data needs. Governments have an obligation to manage the transport networks, which are used by the freight industry but only the freight industry can report the use they actually make of those networks. Freight data typically has both 'private' and 'public good' value. The challenge is to find ways by which the government can invest in collecting and collating privately held data to generate public value without destroying the private value of that data in the process.

To do this, greater trust needs to be created between the government and the industry. To facilitate this, there may be a need for a neutral entity that can take responsibility for undertaking data pre-

processing steps and data aggregation (to ensure commercial confidentiality) before distributing it for other stakeholders to use.

4.1.1.3. Transparency on benefits

The industry has shared their concerns on data sharing in several fora including in submissions to major recent public inquiries. In general, they are not opposed to sharing their operational data to help improve the efficiency and productivity of supply chains.

Despite being willing to share their data, the industry was reluctant to make commitments and/or undertake new initiatives. This is mainly due to industry uncertainty around the benefits they would derive in return for the effort they must make to share their data. Industry expressed scepticism about the value they have received to date from their data sharing in the past. Some of the concerns expressed were:

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

Participants also indicated:

- They would be unwilling to share commercially sensitive data; and
- They sought that the effort and cost to them of additional data collection and processing (for sharing purposes) should be either minimal or funded by government. Alternatively, they welcomed the prospect of low-cost automated processes. This view was strong among smaller business entities, but less of an issue for larger businesses.

4.1.1.4. Learning from existing datasets

The study also identified several existing programs and associated datasets and tools that are considered to be particularly useful. These include: BITRE yearbook, ABS surveys (Motor Vehicle Use and Freight Movement), CSIRO's TraNSIT and TfNSW Freight Performance Dashboard.

However, it was frequently commented that the available data is lacking in one respect or another. Common observations were that:

- Data updates are too infrequent;
- Timeliness of delivery is often lacking; and
- The level of aggregation and presentation of the datasets is not suitable for the needs of the users.

4.1.1.5. Datasets in greatest demand

The study has clearly identified several datasets that are in demand:

- Most notably, freight movement data (at various granularity levels); and,
- more broadly, performance indicators of the supply chains; particularly cost and time components of goods movement. Costs, service levels, and reliability are the most typically used measures of performance.

Segments of supply chains that were identified as needing greater clarity are:

- urban freight;
- first/last mile;
- regional issues;
- gateways;
- nationally significant corridors; and
- issues related to some specific commodities.

Respondents commented that the eventual goal is to achieve holistic freight data coverage in order to provide end-to-end visibility for the decision makers.

4.1.1.6. Better coordination is required

The literature review and stakeholder responses suggest that the deficiencies associated with currently available datasets stem more from collection procedures and information delivery/dissemination rather than the subject matter being collected. It appears that there are more issues associated with the 'how it is being collected and disseminated' than with the 'what is being collected'.

Table 4-1 below summarises the main findings of this study.

Table 4-1. Summary of findings of this study

<table>
<tr><th></th><th colspan="3">Industry</th><th>Industry Association</th><th>Government</th></tr>
<tr><th></th><th>Small</th><th>Medium</th><th>Large</th><th></th><th></th></tr>
<tr><td rowspan="2">Owned data</td><td colspan="3">Competitiveness, performance of gateways, and regional freight are the top three datasets sourced internally
Specifically, the popular subcategories are labour and infrastructure competitiveness, as well as regional freight volumes.
The data is used mainly for operation purpose, and the data used for this purpose is mainly on competitiveness, safety, and performance of gateways
Competitiveness data is used commonly for all three purposes
Frequency of data use is high, at least weekly</td><td rowspan="2">Generally using many types of data
The most popular subcategory is landside logistics costs
Generally using their data for all three purposes
Frequency of data use is month, less compared to business entities</td><td rowspan="2">Various government datasets including:
IAP telematics data
ABS surveys
BITRE statistics
(A full listing of identified data sets is reported in WP2 report)</td></tr>
<tr><td>SBEs mainly collecting competitiveness data, used for both planning and operation</td><td>MBEs are mainly collecting infrastructure competitiveness data, which is used for investment purpose
The data can generally be shared publicly</td><td>Quite engaged in volume and labour subcategories
Using all types of data, with focus on safety, regional freight, and performance of gateways
LBEs typically use their data for all three purposes</td></tr>
<tr><td>Data needs</td><td colspan="3">Better transparency around regulatory cost
To benchmark performance and competitiveness both locally and globally</td><td></td><td>Better understanding around corridors of national significance</td></tr>
</table>

	Industry			Industry Association	Government
	Small	Medium	Large		
	• To understanding performance of gateways and safety issues • More data is requested for planning and operation • More data on competitiveness, performance of multimodal networks, regional freight, and infrastructure performance is requested • Generally, they do not pay more than $1,000 to access external data • Frequency of use of external data is generally lower, compared to internally sourced data. • Planning for infrastructure investment and general freight processes are identified as key needs • Understanding operational reliability of public transport infrastructure			• Requesting more data sources • Ports data is the most commonly sought-after subcategory, followed by landside logistics cost • Generally, they do not pay more than $1000 to access data	• GPS, telematics data and IoT is a promising tool to collect more data that will enable opportunities and efficiency gains • Holistic understanding of capacity across the entire network • Freight transport regulators require freight operator performance (speed, fatigue, load restraint, mass, vehicle maintenance etc) and Data to improve regulator safety confidence to allow higher productivity vehicles
	• Generally happy with availability of data	• Generally happy with availability of data	• Requesting more data sources • Landside logistics cost is the most commonly sought-after subcategory		
Barriers/ likeliness to share data	• In general, data sensitivity and commercial confidentiality is the main barrier for sharing • Another barrier of data sharing is the lack of standardisation of diverse datasets • It is quite likely that competitiveness data can be shared publicly, yet there is also a large group of respondents stating that it cannot be shared • Safety-related data is another type of data that generally cannot be shared			• Very sensitive to share data, since likely they are in no position to share data from their members	• Government representatives are generally more open to share data, yet there might be some governance and institutional barriers across borders

	Industry			Industry Association	Government
	Small	Medium	Large		
	• Stakeholders are more likely to share data to government agencies or departments • Data sharing can be more readily done with appropriate data governance: simplification, harmonization, cost-benefit, outcomes focused, fit for purpose, seat at table				
	• More sensitive to competitiveness data	• More open to share, yet more concerned with sharing safety data	• Concerned about data sharing, likely due to market domination prevents sufficient anonymisation • More likely to share with government rather than other entities		

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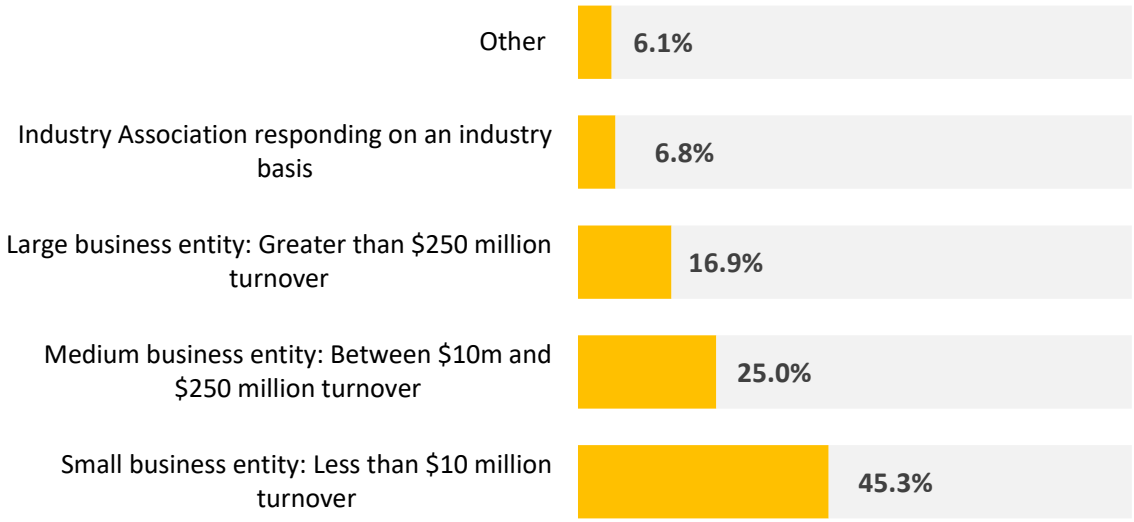
Appendix A. Detailed online survey results

A.1. Overview of survey respondents

A.1.1. General overview and activity

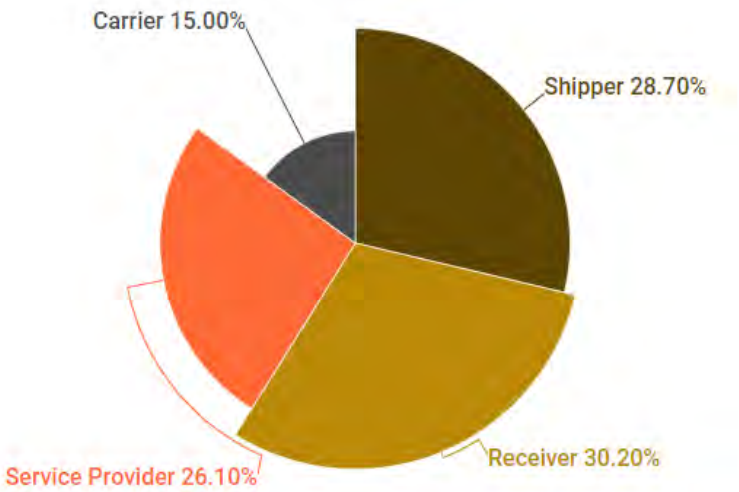
From the total sample of 148 respondents, around 45% were classified as a small business entity (SBE), around 25% as a medium business entity (MBE) and around 17% as a large business entity (LBE). A further 7% were from an Industry Association (IA) and the 6% of respondents who selected *other* were from the local government (Figure 4-2).

Figure 4-2. What sort of entity are you responding on behalf of?



In terms of the primary role of the entity, around 30% indicated they are receiving commodities, around 29% indicated their primary role as a shipper, and around 15% of the respondents reported being logistics, transport or carrier type companies. Around 26% of the entities reported being a service provider to other freight and logistics companies or individuals (Figure 4-3).

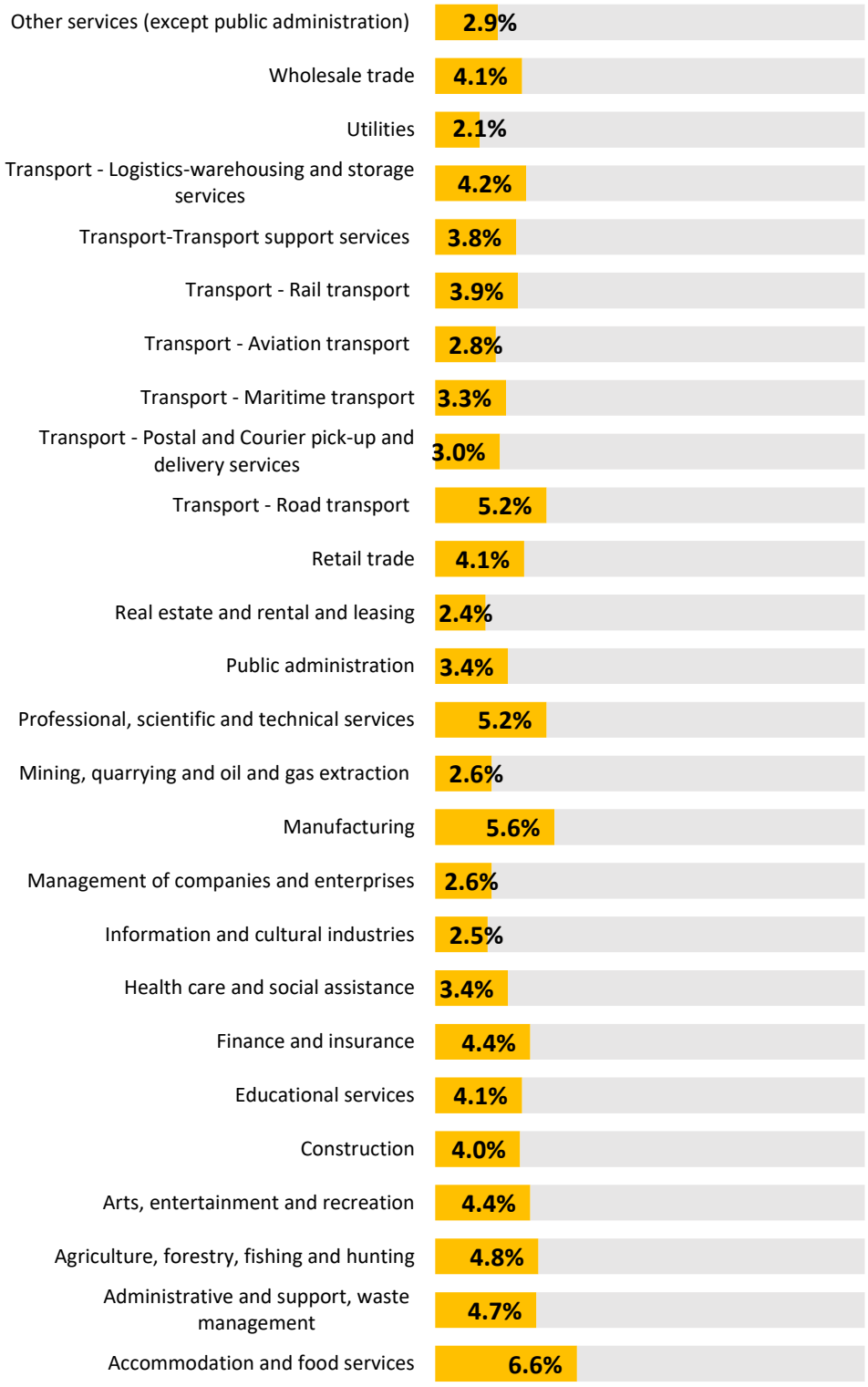
Figure 4-3. Entity role in the freight chain?



We also asked respondents to identify their industry classification using the ANZSIC 4-digit level classification system.[3] Over one-quarter of companies identified as part of the transport services industry, with the remaining companies spread across several services industries as well as a small percentage of firms operating in the mining and manufacturing sectors. Most firms (around 26%) are in the transport sector (Figure 4-4) with the remaining firms covering a broad range of sectors, including accommodation and food services (6.6%), manufacturing (5.6%), and agriculture (4.8%).

[3] Australia and New Zealand Standard Industry Classification system.

Figure 4-4. Please select which industry classification(s) best applies to your entity?



A further split down of industry categories is presented in Figure 4-5 where the percentage of shippers, carriers, service providers and receivers are shown for each industry categories. Firms represent a wide cross-section of industrial classification, confirming the breadth of the supply-chain industry and the robustness of the survey.

Figure 4-5. Please select which industry classification(s) best applies to your entity?

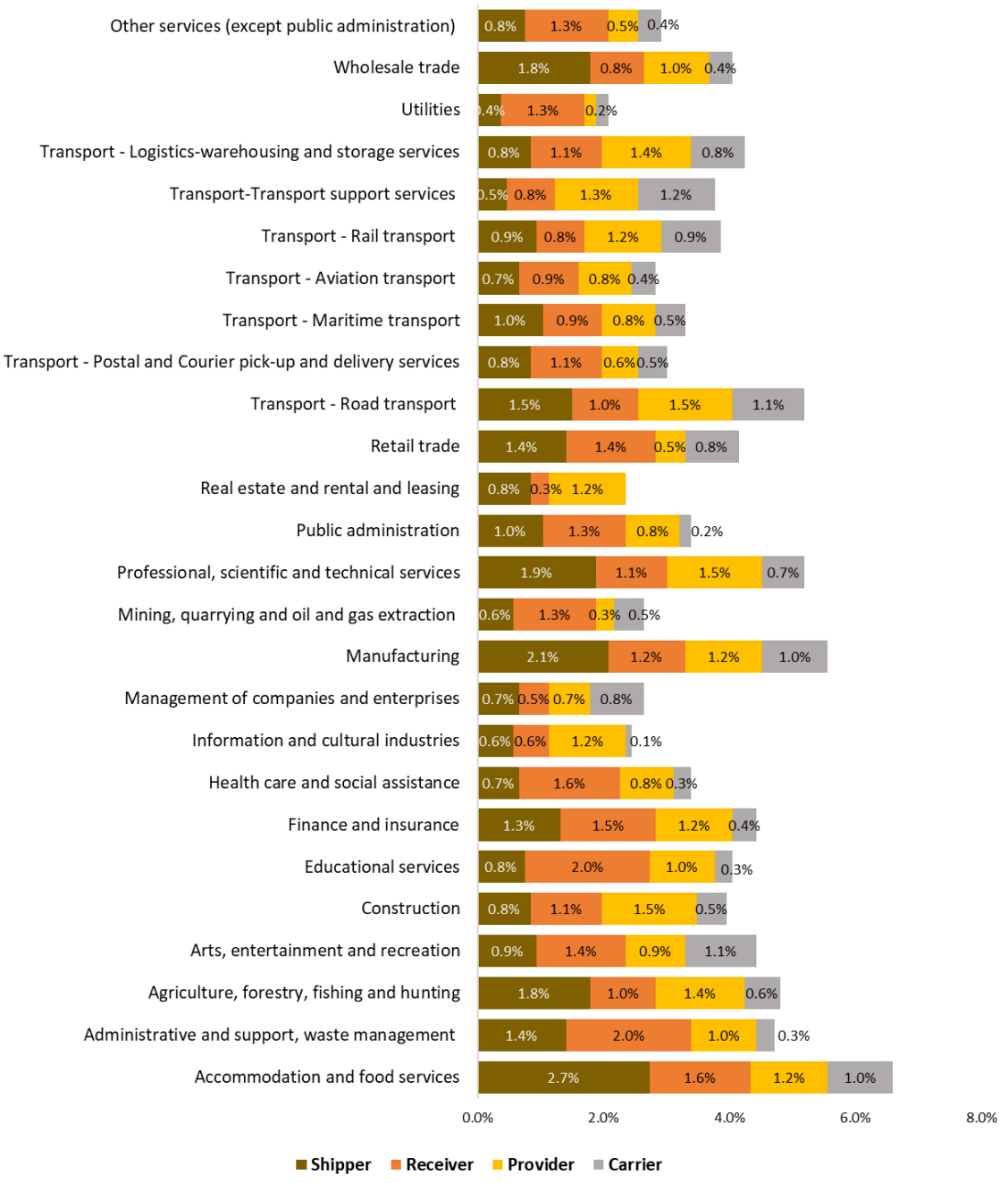
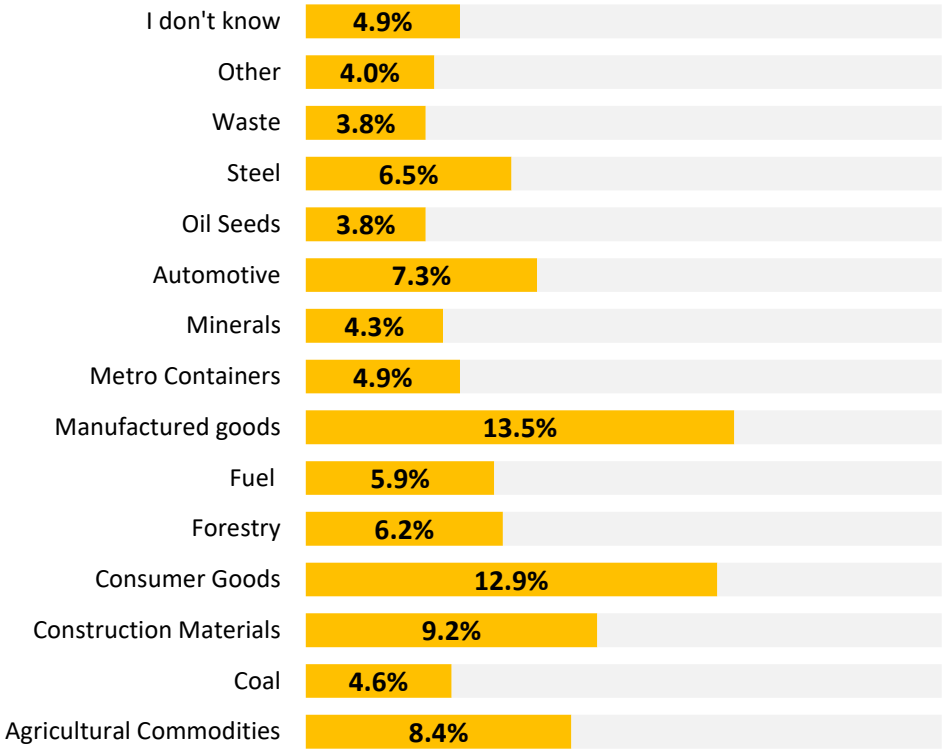


Figure 4-6 asks about the role of the respondent within the supply chain. Almost 33% of firms are engaged in national/cross-border operations, and more than 24% in international operations. A little more than a quarter engaged in state and regional operations.

Figure 4-6. At which level is your entity involved?



A.1.2. Respondents by employment size

Table 4-2 shows the breakdown of employment size based on the entity type representation. The sample includes a diverse set of companies with various amounts of annual turnover.

Around half of SBEs have less than 20 employees and almost 80% have less than 50 employees (Table 4-2). Around a quarter of MBEs have between 50 to 99 employees. In the sample, 20% of LBE indicated they have more than 5000 employees, although many had significantly fewer employees.

Table 4-2. Participants' employment size based on the entity type representing

	Small Business	Medium Business	Large Business	Other
Less than 20 employees	52%	3%	0%	63%
20 to 49 employees	26%	5%	0%	0%
50 to 99 employees	12%	24%	8%	0%
100 to 199 employees	6%	16%	8%	0%
200 to 349 employees	2%	22%	12%	13%
350 to 499 employees	0%	8%	4%	0%
500 to 999 employees	2%	16%	16%	25%
1000 to 2499 employees	0%	3%	16%	0%
2500 to 4999 employees	2%	0%	16%	0%
5000 plus employees	0%	3%	20%	0%
Total count	34	19	10	2

Around half of industry associations have more than 5,000 employees (Table 4-3), while smaller companies are evenly distributed into two categories of less than 500 and more than 2,500 employees.

Table 4-3. Participants' employment size based on the Industry Association representing

	Industry Association
Less than 500 employees	20%
2500 to 4999 employees	20%
5000 or more employees	50%
I don't know	10%

Employee size is broadly aligned with the revenue/expenditure of a company as seen in Figure 4-7, Figure 4-8, Figure 4-9, and Figure 4-10:

- The annual turnover of MBEs is significantly larger than that of SBEs as the majority of MBEs have higher than $50 million annual turnover. Having said that the turnover of the MBEs does not frequently exceed $200 million (limited to 10.6%).
- LBEs mainly belong to categories with less than $750 million of annual turnover, where one-third have an annual turnover of between $250 million and $500 million.

Figure 4-7. Small business entities annual turnover before tax

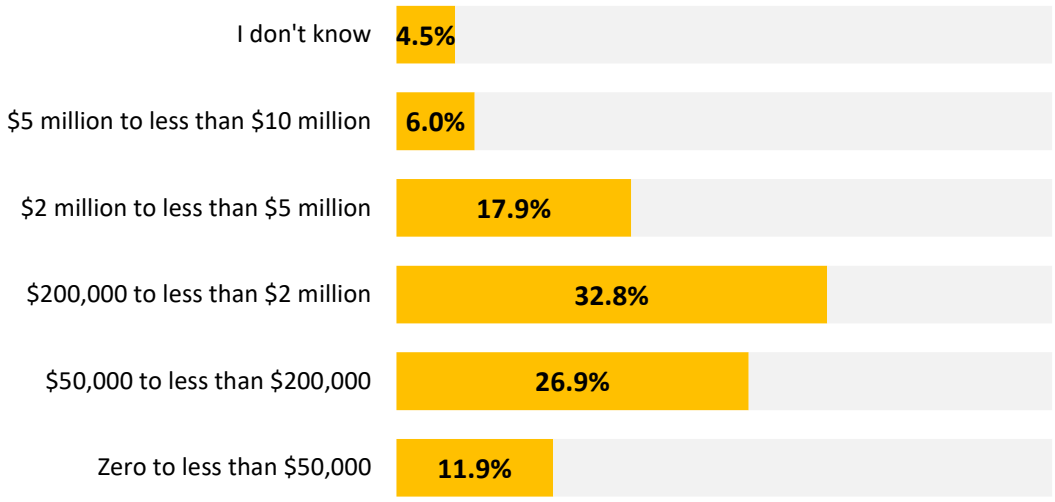


Figure 4-8. Medium business entities annual turnover before tax

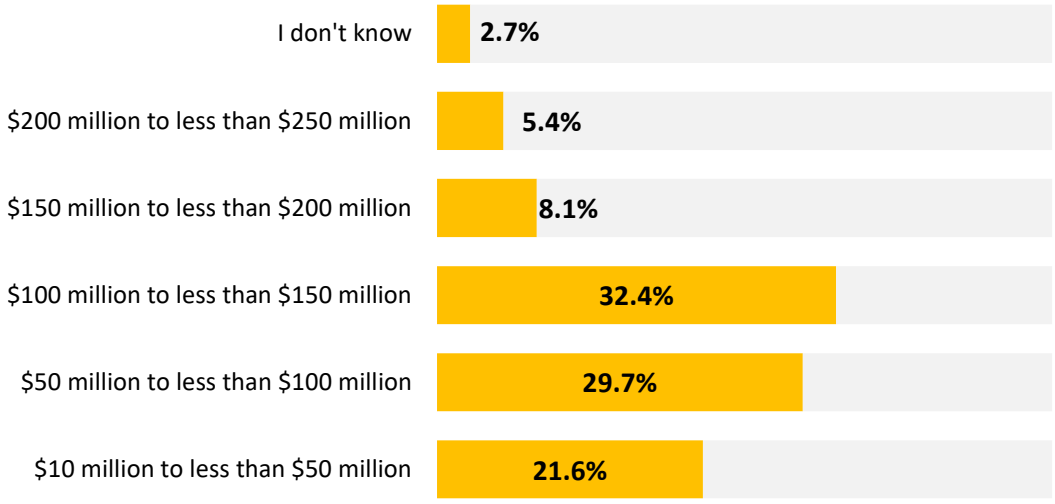


Figure 4-9. Large business entities annual turnover before tax

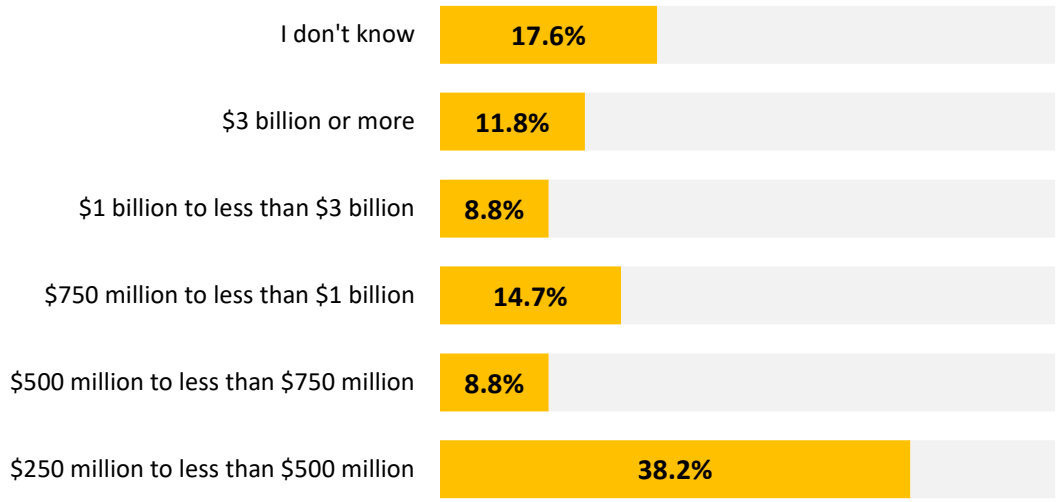
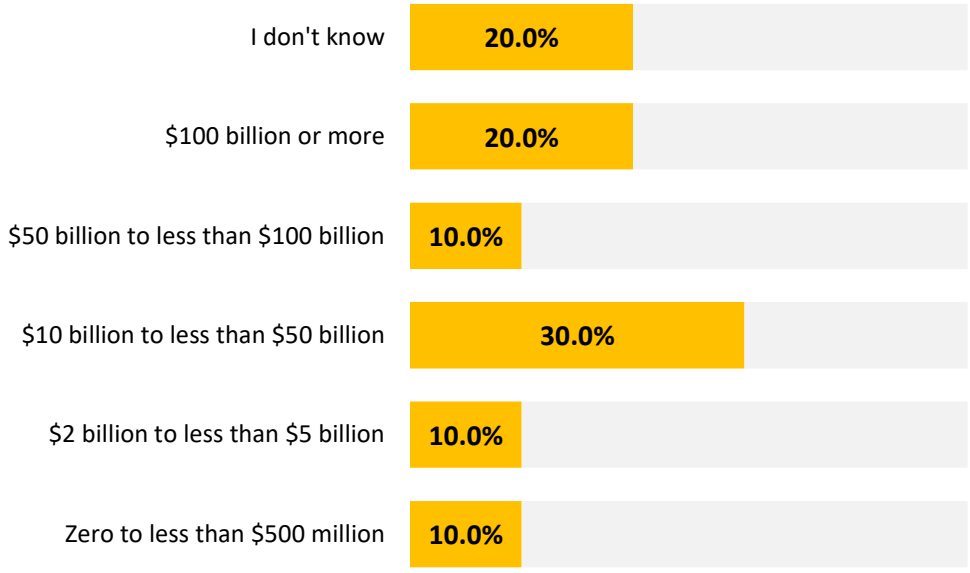


Figure 4-10. Industry association annual turnover before tax



A.1.3. Entities and their activities

The following graphs provide an indication of the types of entities participating in the survey based on the commodity they deal with, noting that service providers are excluded. Most companies deal with parcels (32%) while large shipments comprising liquid, break and dry bulk, pallets and containers cover around 41% of the primary cargo of the surveyed businesses (Figure 4-11). Most of the businesses

surveyed (80%) also deal with a second type of cargo, where carton again dominates (27%), followed by various bulk goods and pallets (Figure 4-11Figure 4-12).

Figure 4-11. The primary type of cargo entities are involved with

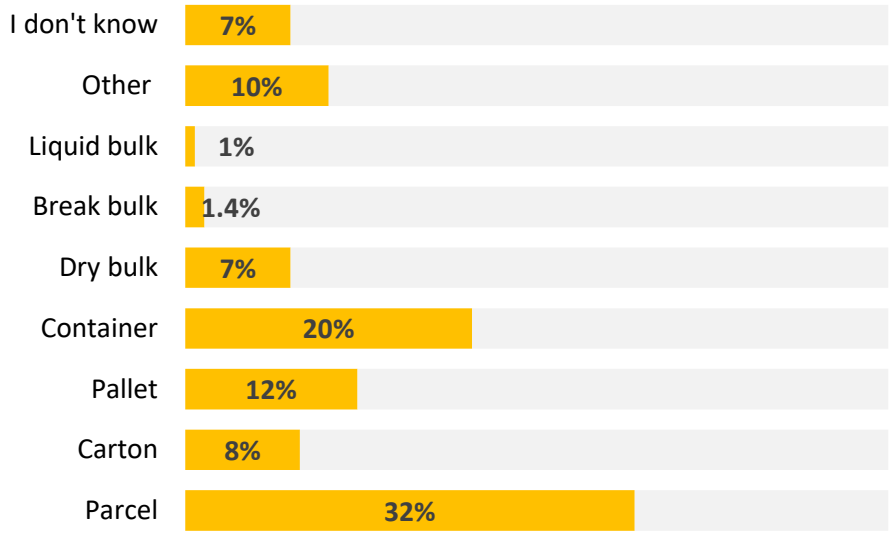
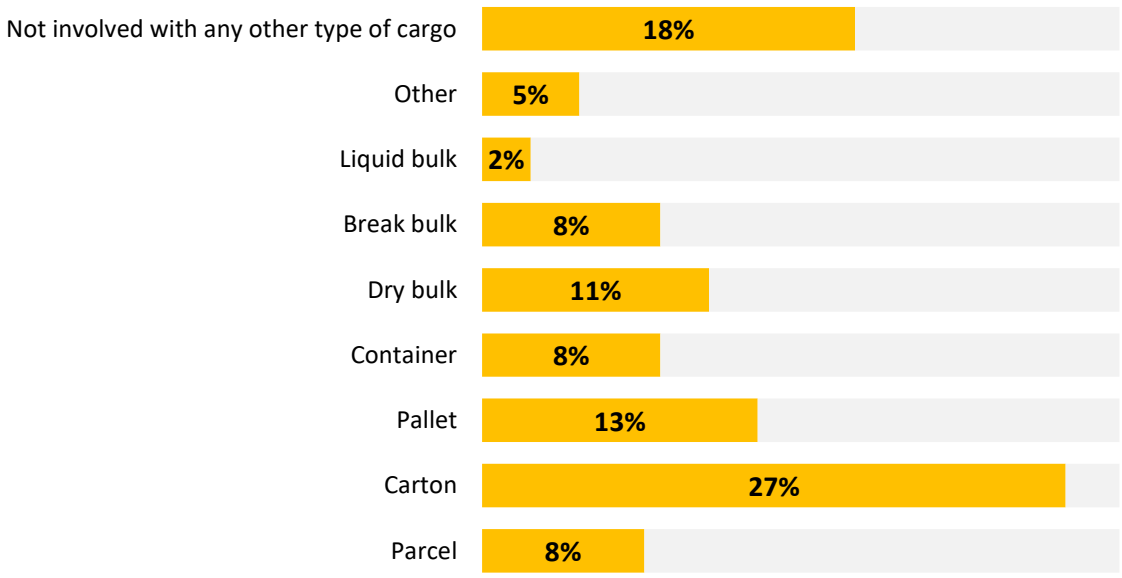


Figure 4-12. The second main type of cargo entities are involved with



To further analysis the type of cargo the respondents are involved with, Table 4-4 provides a cross tabulation of the primary and secondary cargo types. A closer look at the tables reveals that parcel

and carton cargo types are correlated with each other, while other types are typically fall into the large cargo categories such as bulk, pallet and container.

Table 4-4. What is the primary type of cargo your entity is involved with? * What is the second main type of cargo your entity is involved with? Cross-tabulation

What is the primary type of cargo your entity is involved with?	What is the second main type of cargo your entity is involved with?									
	Parcel	Carton	Pallet	Container	Dry bulk	Break bulk	Liquid bulk	Other	Not involved with any other type of cargo	*Total*
Parcel	0	24	7	0	1	3	0	0	11	**46**
Carton	4	0	3	2	1	1	0	0	0	**11**
Pallet	3	8	0	5	1	1	0	0	0	**18**
Container	2	3	5	0	8	4	3	1	3	**29**
Dry bulk	0	0	2	4	0	2	0	0	1	**9**
Break bulk	0	1	0	0	1	0	0	0	0	**2**
Liquid bulk	0	0	0	0	0	0	0	0	1	**1**
Other	1	0	0	0	2	0	0	5	7	**15**
Total	**10**	**36**	**17**	**11**	**14**	**11**	**3**	**6**	**23**	**131**

The cargo types that are mainly dealt with by SBEs are parcel and carton, for MBEs they are parcels and containers, and LBEs handle pallets and dry bulk. Further, the respondents falling into the industry association category are mainly involved in larger other cargo types.

Table 4-5. What sort of entity are you responding on behalf of? * What is the primary type of cargo your entity is involved with? Cross-tabulation

What sort of entity are you responding on behalf of?	*What is the primary main type of cargo your entity is involved with?*									
	Parcel	Carton	Pallet	Container	Dry bulk	Break bulk	Liquid bulk	Other	I don't know	Total
Small business	33	7	5	5	2	1	1	6	7	**67**
Medium business	11	4	5	11	3	1	0	0	1	**36**
Large business	2	1	6	9	5	0	0	1	1	**25**
Industry Association	0	0	1	3	1	0	0	4	1	**10**
Other	1	0	1	2	0	0	0	4	1	**9**
Total	**47**	**12**	**18**	**30**	**11**	**2**	**1**	**15**	**11**	**147**

Figure 4-13 suggests that there is a fairly even distribution of the commodities handled by the survey respondents. Manufactured goods and consumer goods comprise 13.5% and 12.9%, respectively, but construction materials and agricultural commodities are also important.

Figure 4-13. Please specify which commodity groups you work with

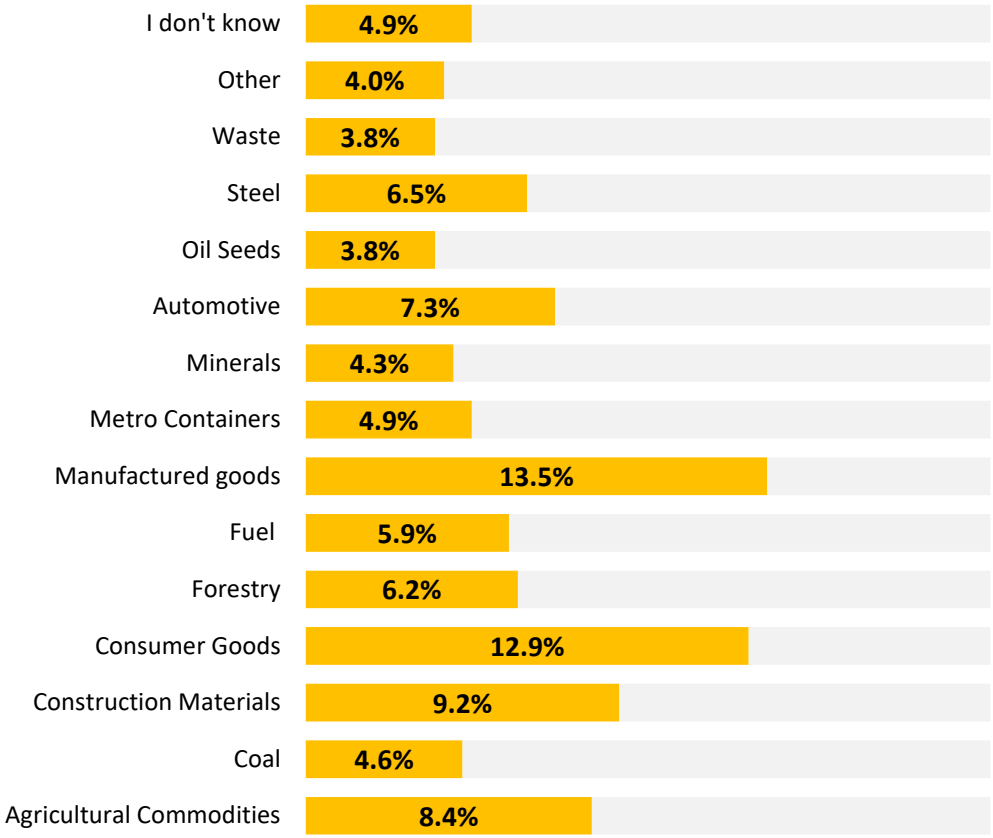


Table 4-6 through Table 4-9 show a breakdown of commodities based on the entities and their role in the freight chain. For entities that ship goods, SBEs mostly handle consumer and manufactured goods, MBEs manufactured goods, LBEs consumer goods, manufactured goods and fuel, while members of an industry association handle a range of goods (Table 4-6). This pattern is very similar for entities that receive goods (Table 4-7), for entities that provide goods (Table 4-8), and for those that are carriers of goods (Table 4-9).

Table 4-6. Cross-tabulation between entity types and commodity groups, if the entity is a *shipper* of goods

		What sort of entity are you responding on behalf of?				
	Counts	*Small business*	*Medium business*	*Large business*	*Industry Association*	*Other*
Please specify which commodity groups you work with?	Agricultural Commodities	4	2	5	3	2
	Coal	4	1	3	1	1
	Construction Materials	6	4	5	1	2
	Consumer Goods	15	2	9	3	1
	Forestry	4	3	4	1	1
	Fuel	4	3	6	0	2
	Manufactured goods	8	10	8	3	1
	Metro Containers	1	0	4	2	0
	Minerals	2	0	3	2	1
	Automotive	6	3	5	2	1
	Oil Seeds	1	1	3	1	0
	Steel	2	4	4	4	2
	Waste	0	1	3	1	3
	Other	5	0	0	1	0
	I don't know	4	2	0	0	1

Table 4-7. Cross-tabulation between entity types and commodity groups, if the entity is a *receiver* of goods

Please specify which commodity groups you work with?	What sort of entity are you responding on behalf of?				
Counts	*Small business*	*Medium business*	*Large business*	*Industry Association*	*Other*
Agricultural Commodities	4	2	3	2	2
Coal	3	1	2	0	1
Construction Materials	6	4	3	2	2
Consumer Goods	13	0	6	2	1
Forestry	4	3	2	0	1
Fuel	4	4	4	0	2
Manufactured goods	8	10	5	1	1
Metro Containers	1	0	2	2	0
Minerals	2	0	2	0	1
Automotive	6	3	3	2	1
Oil Seeds	1	1	1	0	0
Steel	2	4	2	2	2
Waste	0	1	1	0	3
Other	7	0	0	1	0
I don't know	5	2	0	0	1

Table 4-8. Cross-tabulation between entity types and commodity groups, if the entity is a *provider* of goods

		What sort of entity are you responding on behalf of?				
		Small business	*Medium business*	*Large business*	*Industry Association*	*Other*
Please specify which commodity groups you work with?	Agricultural Commodities	4	2	6	1	4
	Coal	3	1	3	0	2
	Construction Materials	5	3	4	1	2
	Consumer Goods	12	1	7	1	2
	Forestry	3	2	5	0	3
	Fuel	3	3	5	0	3
	Manufactured goods	8	9	8	0	2
	Metro Containers	1	0	4	1	1
	Minerals	1	0	5	0	1
	Automotive	6	3	5	1	2
	Oil Seeds	1	1	4	0	1
	Steel	2	4	4	1	2
	Waste	0	1	3	0	3
	Other	7	1	0	1	0
	I don't know	11	2	0	1	2

Table 4-9. Cross-tabulation between entity types and commodity groups If the entity is a *carrier* of goods

Please specify which commodity groups you work with?	What sort of entity are you responding on behalf of?				
	Small business	*Medium business*	*Large business*	*Industry Association*	*Other*
Agricultural Commodities	5	2	4	3	1
Coal	3	0	3	0	0
Construction Materials	7	4	5	2	0
Consumer Goods	11	0	4	3	0
Forestry	3	1	4	0	0
Fuel	3	2	3	0	0
Manufactured goods	6	9	7	2	0
Metro Containers	0	0	4	2	0
Minerals	1	0	4	0	0
Automotive	7	1	4	2	0
Oil Seeds	1	1	3	1	0
Steel	2	3	3	3	0
Waste	0	0	2	0	1
Other	4	0	0	1	0
I don't know	2	3	0	0	1

A.1.4. Transport modes

The following graphs show mode of transport used for moving cargo by different respondents. Transport by road is the dominant mode of transport while the other three modes are relatively equally used by the businesses of the sample (Figure 4-14).

Figure 4-14. Which mode of transport does your entity use to move the cargo?

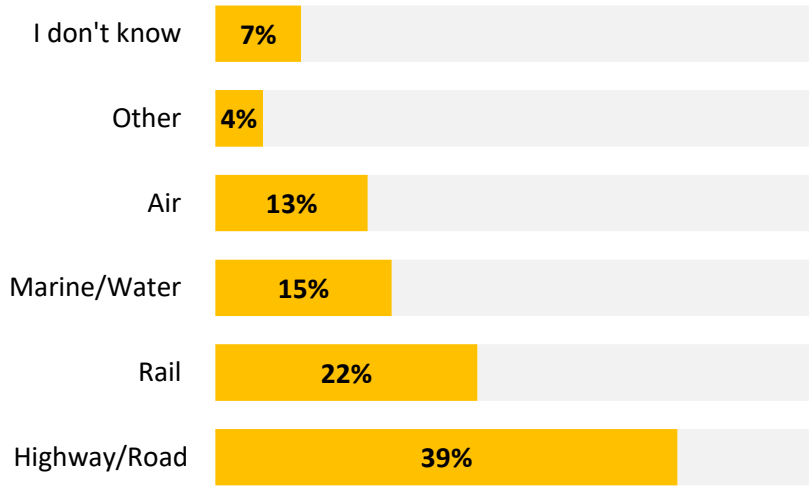


Figure 4-15 cross-tabulates the modes of transport used by the respondents and their size. SBEs tend to use road transport, while MBEs and LBEs also rely more on roads, but also rail and water. The Industry Associations are distributed among all modes.

Figure 4-15. Cross-tabulation of mode of transport & entity type

		Which mode of transport does your entity use to move the cargo						
	Count	*Highway / Road*	*Rail*	*Coast / Water*	*Air*	*Other*	*I don't know*	***Total***
What sort of entity are you responding on behalf of?	Small business	43	15	5	19	5	12	99
	Medium business	27	18	13	5	1	1	65
	Large business	19	17	12	6	0	0	54
	Industry Association	5	4	5	1	2	2	19
	Other	3	1	2	1	2	3	12
	Total	**97**	**55**	**37**	**32**	**10**	**18**	**249**

Figure 4-16 cross-tabulates the mode of transport and the frequency with which goods are transported. Most respondents said that they use road transport more than 50 times per day; other modes of transport are used less frequently.

Figure 4-16. Cross-tabulation of mode of transport & the frequency of transport of goods

		Which mode of transport does your entity use to move the cargo?						
	Count	*Highway / Road*	*Rail*	*Coast / Water*	*Air*	*Other*	*I don't know*	***Total***
How often does your entity transport goods via these modes?	Less than once per month	0	1	1	2	1		**5**
	Once per week	3	0	1	1	0		**5**
	Once per day	0	1	1	1	0		**3**
	Between 2 and 10 times a day	1	3	5	0	0		**9**
	Between 10 than 50 times per day	2	5	3	0	0		**10**
	More than 50 times per day	14	6	6	2	1		**29**
	I don't know	2	2	2	2	3		**11**
	Total	**22**	**18**	**19**	**8**	**5**	**76**	**148**

A.2. Data requirements

This section presents the detailed responses by survey respondents on the datasets used in their entity, whether internally or externally sourced.

A.2.1. Data sourced internally

Starting with internally sourced datasets, Table 4-10 and Table 4-11 describe how these data are being used by the respondents. The majority of the entities (67%) noted that they only deal with one category of data. Among these entities mainly dealing with one type of data, the category *competitiveness* is the most common followed by *safety* and *performance of international gateways*.

Table 4-10. Data sourced internally and its combination

	Frequency	***Percent***	***Valid percent***
One category	99	67%	67%
Two categories	10	7%	74%
More than two categories	11	7%	81%
Missing	28	19%	100%
Total	148	100%	

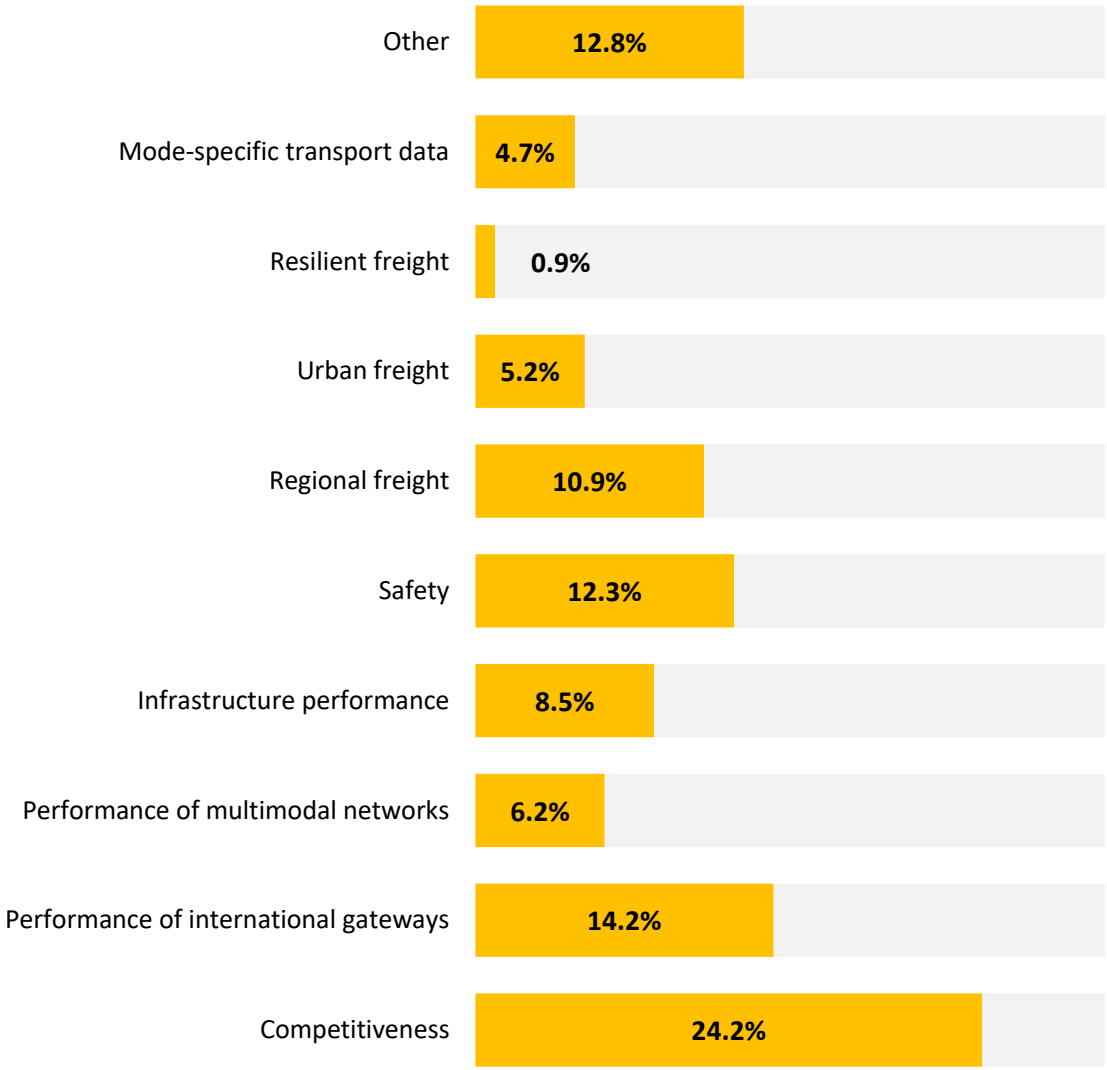
Table 4-11. Composition of data type sourced internally

	Data category(s)	Counts
One category only	Competitiveness	35
	Performance of international gateways	16
	Performance of multimodal networks	2
	Infrastructure Performance	4
	Safety	6
	Regional freight	12
	Urban Freight	5
	Resilient freight	2
	Mode-specific transport data	4
	Other	13
Two categories	Competitiveness & Performance of international gateways	1
	Performance of international gateways & Infrastructure Performance	3
	Performance of multimodal networks & Urban Freight	1
	Safety & Regional freight	1
	Regional freight & Mode-specific transport data	1
	Urban Freight & Performance of international gateways	1
	Performance of multimodal networks & other	1
	Other & Other	1
More than two categories	Competitiveness & Safety & Regional freight	1
	Competitiveness & Performance of international gateways & Safety	1
	Performance of international gateways & Safety & Mode-specific transport data	1
	Performance of international gateways & Regional freight & Urban Freight	1
	Infrastructure Performance & Safety & Mode-specific transport data	1
	Competitiveness & Performance of multimodal networks & Infrastructure Performance & Safety & Regional freight	1
	Infrastructure Performance & Safety & Regional freight & Urban Freight	1
	Performance of international gateways & Regional freight & Urban Freight & Mode-specific transport data	1
	Competitiveness & Performance of multimodal networks & Infrastructure Performance & Safety & Regional freight	1
	Performance of international gateways & Infrastructure Performance & Safety & Mode-specific transport data & other	1
	Competitiveness & Performance of multimodal networks & Infrastructure Performance & Safety & Regional freight &Urban Freight & Mode-specific transport data & Mode-specific transport data	1

Total	120

Further analysis of categories of internally used data is described in Figure 4-17. The category *competitiveness* appears to be the most commonly used data sourced internally followed by *performance of international gateway* (14.2%) and safety (12.3%).

Figure 4-17. Overal percent of data type sourced *internally*



The type of data being used is compared with the type of entity stating the data requirement to provide more insights on the data usage of the respondents (Table 4-12). SBEs are mainly concerned about the usage of *competitiveness* data sources, while MBEs work with the *Performance of multimodal networks* datasets. LBEs seem to be using all types of data, sources internally, to some

extent but regional freight and safety related data category more. The small samples available of the industry association are also interested to sources internally variety types of data categories.

Table 4-12. Cross-tabulation between type of entity & data category sourced *internally*

What sort of entity are you responding on behalf of?	Counts	Data type sourced internally: *Competitiveness*	*Performance of international gateways*	*Performance of multimodal networks*	*Infrastructure performance*	*Safety*	*Regional freight*	*Urban freight*	*Resilient freight*	*Mode-specific transport data*	*Other*	**Total**
	Small business	26	13	3	9	8	2	5	1	1	6	**74**
	Medium business	18	8	3	3	5	5	2	1	2	1	**48**
	Large business	5	9	5	4	10	11	2	0	4	5	**55**
	Industry Association	2	0	2	1	2	2	1	0	2	2	**14**
	Other	0	0	0	1	1	3	1	0	1	13	**20**
	Total	**51**	**30**	**13**	**18**	**26**	**23**	**11**	**2**	**10**	**27**	**211**

Several subcategories are provided for the major data categories discussed earlier in the previous figures and tables. Table 4-13 shows the further breakdown of internally used datasets based on respondents' answers. *Labour* and *market comparison* are the dominating subcategories of the *competitiveness* category which is used commonly by companies, sourced internally. The safety category does not have a dominant subcategory, while the *performance of international gateways* appears to be further reflected under the *best practice modelling assumptions* and the *value of freight to the national economy.* Further, *rail,* road, *first mile access metrics*, *remote metrics* for *Northern Australia* and *weather* are the least frequent subcategories in the reported data types.

Table 4-13. Cross-tabulation between data category & subcategory sourced internally

Data category	Data Subcategory																								
Counts	Labour	Value of freight to the national economy	Ports	Airports	Customs Freight Data Analysis Project	Network Optimisation Frameworks	Best Practice Modelling Assumptions	Roads, tracks, bridges, tunnels	Road	Volumes	First mile access	Last mile performance metrics	Land supply and conflict	Landside logistics costs	Congestion metrics	Remote metrics for Northern Australia	Rail	Forecasting and projection	Timestamp	Market comparison	Weather	Other	E-commerce	Total
Competitiveness	10	4	2	2	0	0	1	8	4	5	0	1	0	1	0	0	1	3	0	4	0	0	5	51
Performance of international gateways	2	4	5	1	2	1	3	0	1	3	1	1	0	4	0	0	0	0	1	0	0	0	1	30
Performance of multimodal networks	0	2	2	1	0	2	0	1	0	0	1	0	0	2	0	0	1	0	0	0	0	1	0	13
Infrastructure performance	1	3	0	2	0	1	0	1	3	3	0	0	0	1	0	0	1	1	0	0	1	0	0	18
Safety	5	0	3	0	0	1	3	2	3	2	2	0	1	0	0	0	1	0	0	1	0	2	0	26
Regional freight	1	0	1	0	1	2	0	1	0	6	0	2	1	4	1	0	1	0	1	0	0	1	0	23
Urban freight	1	0	2	0	0	0	0	0	2	2	0	1	0	2	0	0	0	0	0	1	0	0	0	11
Resilient freight	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2
Mode-specific transport data	0	0	2	0	0	2	1	0	1	1	0	0	0	0	0	0	2	0	0	1	0	0	0	10
Other	1	0	3	1	1	0	1	0	0	1	0	0	0	0	0	1	0	1	1	1	0	15	0	27
Total	**21**	**14**	**20**	**7**	**4**	**9**	**9**	**13**	**14**	**23**	**4**	**5**	**2**	**14**	**2**	**1**	**7**	**5**	**3**	**8**	**1**	**19**	**6**	**211**

Table 4-14 shows what type of data is used for what purpose. Operation, as the most commonly indicated purpose of use for internally sourced data, is mainly related to *competitiveness* and *performance of international gateways*. The *planning* purpose, however, has a major concentration on *competitiveness* followed by *infrastructure performance* and safety. When all three usage purposes are considered (last column), *mode specific transport data* becomes critical, although this category has a small overall proportion among all data types.

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. The breakdown across different data types (Table 4-15) reveals that when data cannot be shared is mainly used for *competitiveness* and *safety. Performance of international gateways* and *infrastructure performance* are the two categories having a wide range of concerns with regard to data sharing.

To better understand the distribution of data types used by companies, the cross tabulations presented previously are further classified based on entity types. Table 4-16 shows the distribution of different data types of SBEs. SBEs are mainly using data in the category of *competitiveness* which can be mainly broken down to the labour subcategory.

When focusing on distribution of purpose and data types for SBEs, when compared to all entities (Table 4-17), SBEs are more focused on *planning* than *operation* where the distribution of data categories is relatively evenly distributed for the *operation* category. However, when it comes to data sharing, smaller companies show a greater reluctance, as they are more sensitive to their *competitiveness* with their counterparts (Table 4-18).

Unlike the small sized companies, the internally sourced data for MBEs is mainly used for *operation* than *planning*. As Table 4-19 shows, *competitiveness* is not the dominating data category for medium sized companies. Table 4-21 shows that MBEs seem to be quite receptive to share their data, and when they are not, they seem to be concerned about data falling into the safety category.

Table 4-22 shows the distribution of data categories and subcategories for LBEs. LBEs (like MBEs) are more interested in *operation* purposes with a major difference that they consider data for more types of purposes when using their internally sourced databases. Unlike the MBEs, LBEs participated in this survey appear to be concerned about sharing their internally sourced data. Even when they are happy to share their data, they prefer to make it publicly available or share it to government agencies compared to other types of agencies (Table 4-24).

Table 4-25 through to Table 4-27 discuss the responses of Industry Association (IA) entities. With regard to the type of data they use, *volume, first mile, lands and logistics costs, remote metrics for Northern Australia* and *market comparison* are the only subcategories identified by the respondents of this type (Table 4-25). IA entities appear to be more interested in using their internally sourced data for multiple purposes, especially for all three categories of *planning*, *investment* and *operation* (Table 4-26). Compared to all the other types of companies, IA entities seem to be extremely sensitive in sharing their internally sourced data, regardless of the data type (Table 4-27).

Table 4-14. Cross-tabulation between data category & purpose of use for data sourced *internally*

		Data Purpose							
	Counts	Planning	Operation	Investment	Planning and operation	Planning and investment	Operation and investment	Planning, operation and investment	Total
Data category	Competitiveness	12	13	11	7	4	1	3	**51**
	Performance of international gateways	3	10	4	7	1	0	5	**30**
	Performance of multimodal networks	0	1	1	5	2	0	4	**13**
	Infrastructure performance	4	4	5	1	3	0	1	**18**
	Safety	4	8	2	6	0	3	3	**26**
	Regional freight	2	3	2	4	2	3	7	**23**
	Urban freight	3	3	3	1	0	1	0	**11**
	Resilient freight	0	2	0	0	0	0	0	**2**
	Mode-specific transport data	2	0	0	1	1	1	5	**10**
	Other	13	4	1	3	1	0	5	**27**
Total		**43**	**48**	**29**	**35**	**14**	**9**	**33**	**211**

Table 4-15. Cross-tabulation between data category & if the data could be shared, for sourced *internally*

Data category	Counts	Can this data be shared?					
		Yes, publicly to anyone	Yes, to any government agency or department	Yes, to non-government entities	Yes, to government agency with structural independence	No, the data cannot be shared with anyone at all	**Total**
	Competitiveness	26	8	4	1	12	**51**
	Performance of international gateways	4	10	7	6	3	**30**
	Performance of multimodal networks	4	2	2	3	2	**13**
	Infrastructure performance	4	6	2	2	4	**18**
	Safety	3	5	1	3	14	**26**
	Regional freight	4	5	1	5	8	**23**
	Urban freight	2	2	0	2	5	**11**
	Resilient freight	0	2	0	0	0	**2**
	Mode-specific transport data	1	4	0	1	4	**10**
	Other	5	2	2	1	17	**27**
	Total	**21**	**53**	**46**	**19**	**24**	**69**

Table 4-16. Cross-tabulation between data category sourced internally & subcategory for *SBEs*

Data category \ Data Subcategory	Labour	Value of freight to the national economy	Ports	Airports	Customs Freight Data Analysis Project	Network Optimisation Frameworks	Best Practice Modelling Assumptions	Roads, tracks, bridges, tunnels	Road	Volumes	First mile access	Last mile performance metrics	Landside logistics costs	Congestion metrics	Forecasting and projection	Timestamp	Market comparison	Weather	Other	E-commerce	Total
Competitiveness	7	4	0	1	0	0	0	0	2	2	0	1	0	0	2	0	2	0	0	5	**26**
Performance of international gateways	2	3	1	0	1	1	1	0	0	1	1	0	1	0	0	0	0	0	0	1	**13**
Performance of multimodal networks	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	**3**
Infrastructure performance	1	1	0	1	0	1	0	1	2	0	0	0	0	0	1	0	0	1	0	0	**9**
Safety	0	0	0	0	0	0	3	1	1	0	1	0	0	0	0	0	1	0	1	0	**8**
Regional freight	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	**2**
Urban freight	1	0	0	0	0	0	0	0	2	1	0	0	1	0	0	0	0	0	0	0	**5**
Resilient freight	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
Mode-specific transport data	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Other	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	2	0	**6**
Total	**13**	**9**	**2**	**3**	**1**	**3**	**5**	**3**	**7**	**4**	**2**	**1**	**2**	**1**	**3**	**2**	**3**	**1**	**3**	**6**	**74**

Table 4-17. Cross-tabulation between data category sourced internally & purpose for *SBEs*

		Data Purpose							
	Counts	Planning	Operation	Investment	Planning and operation	Planning and investment	Operation and investment	Planning, operation and investment	Total
Data category	Competitiveness	8	9	3	4	0	1	1	**26**
	Performance of international gateways	3	4	1	4	1	0	0	**13**
	Performance of multimodal networks	0	1	0	1	1	0	0	**3**
	Infrastructure performance	3	2	2	0	2	0	0	**9**
	Safety	3	2	1	1	0	1	0	**8**
	Regional freight	0	1	0	0	0	1	0	**2**
	Urban freight	2	1	2	0	0	0	0	**5**
	Resilient freight	0	1	0	0	0	0	0	**1**
	Mode-specific transport data	0	0	0	0	1	0	0	**1**
	Other	3	2	0	0	0	0	1	**6**
	Total	**22**	**23**	**9**	**10**	**5**	**3**	**2**	**74**

Table 4-18. Cross-tabulation between data category sourced internally & if the data can be shared for *SBEs*

Data category	Counts	Can this data be shared?					
		Yes, publicly to anyone	Yes, to any government agency or department	Yes, to non-government entities	Yes, to government agency with structural independence	No, the data cannot be shared with anyone at all	**Total**
	Competitiveness	12	3	2	0	9	**26**
	Performance of international gateways	3	6	3	0	1	**13**
	Performance of multimodal networks	1	1	1	0	0	**3**
	Infrastructure performance	2	4	1	1	1	**9**
	Safety	0	1	1	2	4	**8**
	Regional freight	0	0	0	0	2	**2**
	Urban freight	1	0	0	1	3	**5**
	Resilient freight	0	1	0	0	0	**1**
	Mode-specific transport data	0	1	0	0	0	**1**
	Other	2	1	0	0	3	**6**

Total	**21**	**18**	**8**	**4**	**23**	**74**

Table 4-19. Cross-tabulation between data category sourced internally & subcategory for *MBEs*

Data category	Counts	Labour	Value of freight to the national economy	Ports	Airports	Customs Freight Data Analysis Project	Network Optimisation Frameworks	Best Practice Modelling Assumptions	Roads, tracks, bridges, tunnels	Road	Volumes	Land supply and conflict	Landside logistics costs	Congestion metrics	Rail	Forecasting and projection	Market comparison	Total
		Data Subcategory																
Data category	Competitiveness	2	0	1	1	0	0	1	8	2	1	0	0	0	1	1	0	18
	Performance of international gateways	0	1	2	1	0	0	2	0	1	0	0	1	0	0	0	0	8
	Performance of multimodal networks	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	0	3
	Infrastructure performance	0	2	0	0	0	0	0	0	0	1	0	0	0	0	0	0	3
	Safety	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	5
	Regional freight	0	0	0	0	1	1	0	0	0	1	0	1	1	0	0	0	5
	Urban freight	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	2
	Resilient freight	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Mode-specific transport data	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	2
	Other	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1

Total	**3**	**5**	**6**	**3**	**1**	**2**	**4**	**9**	**4**	**4**	**1**	**2**	**1**	**1**	**1**	**1**	**48**

Table 4-20. Cross-tabulation between data category sourced internally & purpose for *MBEs*

		Data Purpose							
	Counts	Planning	Operation	Investment	Planning and operation	Planning and investment	Operation and investment	Planning, operation and investment	**Total**
Data category	Competitiveness	3	4	8	2	1	0	0	**18**
	Performance of international gateways	0	4	2	2	0	0	0	**8**
	Performance of multimodal networks	0	0	0	2	1	0	0	**3**
	Infrastructure performance	1	1	1	0	0	0	0	**3**
	Safety	0	0	1	3	0	1	0	**5**
	Regional freight	1	0	1	2	1	0	0	**5**
	Urban freight	1	1	0	0	0	0	0	**2**
	Resilient freight	0	1	0	0	0	0	0	**1**
	Mode-specific transport data	1	0	0	0	0	0	1	**2**
	Other	0	0	0	0	0	0	1	**1**
	Total	**7**	**11**	**13**	**11**	**3**	**1**	**2**	**48**

Table 4-21. Cross-tabulation between data category sourced internally & if the data can be shared for *MBEs*

		Can this data be shared?					
	Counts	Yes, publicly to anyone	Yes, to any government agency or department	Yes, to non-government entities	Yes, to government agency with structural independence	No, the data cannot be shared with anyone at all	**Total**
Data category	Competitiveness	13	2	2	0	1	**18**
	Performance of international gateways	1	3	2	2	0	**8**
	Performance of multimodal networks	2	0	0	1	0	**3**
	Infrastructure performance	1	0	1	0	1	**3**
	Safety	2	1	0	0	2	**5**
	Regional freight	0	2	1	2	0	**5**
	Urban freight	0	1	0	0	1	**2**
	Resilient freight	0	1	0	0	0	**1**
	Mode-specific transport data	0	2	0	0	0	**2**
	Other	1	0	0	0	0	**1**
	Total	**20**	**12**	**6**	**5**	**5**	**48**

Table 4-22. Cross-tabulation between data category sourced internally & subcategory for *LBEs*

Data category	Count	Data Subcategory: Labour	Ports	Airports	Customs Freight Data Analysis Project	Network Optimisation Frameworks	Road	Volumes	First mile access	Last mile performance metrics	Land supply and conflict	Landside logistics costs	Rail	Forecasting and projection	Timestamp	Market comparison	Other	Total
	Competitiveness	1	1	0	0	0	0	1	0	0	0	0	0	0	0	2	0	5
	Performance of international gateways	0	2	0	1	0	0	2	0	1	0	2	0	0	1	0	0	9
	Performance of multimodal networks	0	1	0	0	1	0	0	0	0	0	1	1	0	0	0	1	5
	Infrastructure performance	0	0	1	0	0	1	1	0	0	0	0	1	0	0	0	0	4
	Safety	4	2	0	0	1	0	0	1	0	0	0	1	0	0	0	1	10
	Regional freight	0	1	0	0	0	0	4	0	2	1	2	1	0	0	0	0	11
	Urban freight	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	2
	Mode-specific transport data	0	1	0	0	1	1	0	0	0	0	0	1	0	0	0	0	4
	Other	0	2	0	1	0	0	1	0	0	0	0	0	1	0	0	0	5

Total	**5**	**10**	**1**	**2**	**3**	**2**	**10**	**1**	**4**	**1**	**5**	**5**	**1**	**1**	**2**	**2**	**55**

Table 4-23. Cross-tabulation between data category sourced internally & purpose for *LBEs*

		Data Purpose							
	Count	Planning	Operation	Investment	Planning and operation	Planning and investment	Operation and investment	Planning, operation and investment	Total
Data category	Competitiveness	1	0	0	1	1	0	2	**5**
	Performance of international gateways	0	2	1	1	0	0	5	**9**
	Performance of multimodal networks	0	0	1	0	0	0	4	**5**
	Infrastructure performance	0	1	1	1	0	0	1	**4**
	Safety	1	4	0	1	0	1	3	**10**
	Regional freight	0	2	0	2	0	1	6	**11**
	Urban freight	0	1	0	1	0	0	0	**2**
	Mode-specific transport data	1	0	0	1	0	1	1	**4**

Other	0	0	0	3	0	0	2	**5**
Total	**3**	**10**	**3**	**11**	**1**	**3**	**24**	**55**

Table 4-24. Data category (Internal) * Can this data be shared (Internal) Cross-tabulation – LBEs

		Can this data be shared?					
	Counts	Yes, publicly to anyone	Yes, to any government agency or department	Yes, to non-government entities	Yes, to government agency with structural independence	No, the data cannot be shared with anyone at all	Total
Data category	Competitiveness	1	2	0	1	1	**5**
	Performance of international gateways	0	1	2	4	2	**9**
	Performance of multimodal networks	1	1	0	2	1	**5**
	Infrastructure performance	1	2	0	1	0	**4**
	Safety	1	3	0	1	5	**10**
	Regional freight	1	3	0	2	5	**11**
	Urban freight	0	1	0	1	0	**2**
	Mode-specific transport data	0	1	0	0	3	**4**
	Other	2	1	0	0	2	**5**
	Total	**7**	**15**	**2**	**12**	**19**	**55**

Table 4-25. Cross-tabulation between data category sourced internally & subcategory - *IAs*

		Data Subcategory							
	Counts	Road	Volumes	First mile access	Landside logistics costs	Remote metrics for Northern Australia	Market comparison	Other	Total
Data category	Competitiveness	0	1	0	1	0	0	0	2
	Performance of multimodal networks	0	0	1	1	0	0	0	2
	Infrastructure performance	0	0	0	1	0	0	0	1
	Safety	1	1	0	0	0	0	0	2
	Regional freight	0	0	0	1	0	0	1	2
	Urban freight	0	0	0	1	0	0	0	1
	Mode-specific transport data	0	1	0	0	0	1	0	2
	Other	0	0	0	0	1	0	1	2
	Total	**1**	**3**	**1**	**5**	**1**	**1**	**2**	**14**

Table 4-26. Cross-tabulation between data category sourced internally & purpose - *IAs*

Data category	Data Purpose						
Counts	Operation	Investment	Planning and operation	Planning and investment	Operation and investment	Planning, operation and investment	**Total**
Competitiveness	0	0	0	2	0	0	**2**
Performance of multimodal networks	0	0	2	0	0	0	**2**
Infrastructure performance	0	0	0	1	0	0	**1**
Safety	1	0	1	0	0	0	**2**
Regional freight	0	0	0	0	1	1	**2**
Urban freight	0	0	0	0	1	0	**1**
Mode-specific transport data	0	0	0	0	0	2	**2**
Other	1	1	0	0	0	0	**2**
Total	**2**	**1**	**3**	**3**	**2**	**3**	**14**

Table 4-27. Cross-tabulation between data category sourced internally & if the data can be shared - *IAs*

Data category	Counts	Can this data be shared?					
		Yes, publicly to anyone	Yes, to any government agency or department	Yes, to non-government entities	Yes, to government agency with structural independence	No, the data cannot be shared with anyone at all	**Total**
	Competitiveness	0	1	0	0	1	**2**
	Performance of multimodal networks	0	0	1	0	1	**2**
	Infrastructure performance	0	0	0	0	1	**1**
	Safety	0	0	0	0	2	**2**
	Regional freight	0	0	0	1	1	**2**
	Urban freight	0	0	0	0	1	**1**
	Mode-specific transport data	1	0	0	0	1	**2**
	Other	0	0	1	0	1	**2**
	Total	**1**	**1**	**2**	**1**	**9**	**14**

A.2.2. Data sourced externally

Most respondents stated that they primarily use only one category of data (Table 4-28).

Table 4-28. Data sourced *externally* and its combination

	Frequency	*Percent*	*Valid percent*
One category	58	39%	39%
Two categories	6	4%	43%
More than two categories	11	7%	51%
Missing	73	49%	
Total	148	100%	100%

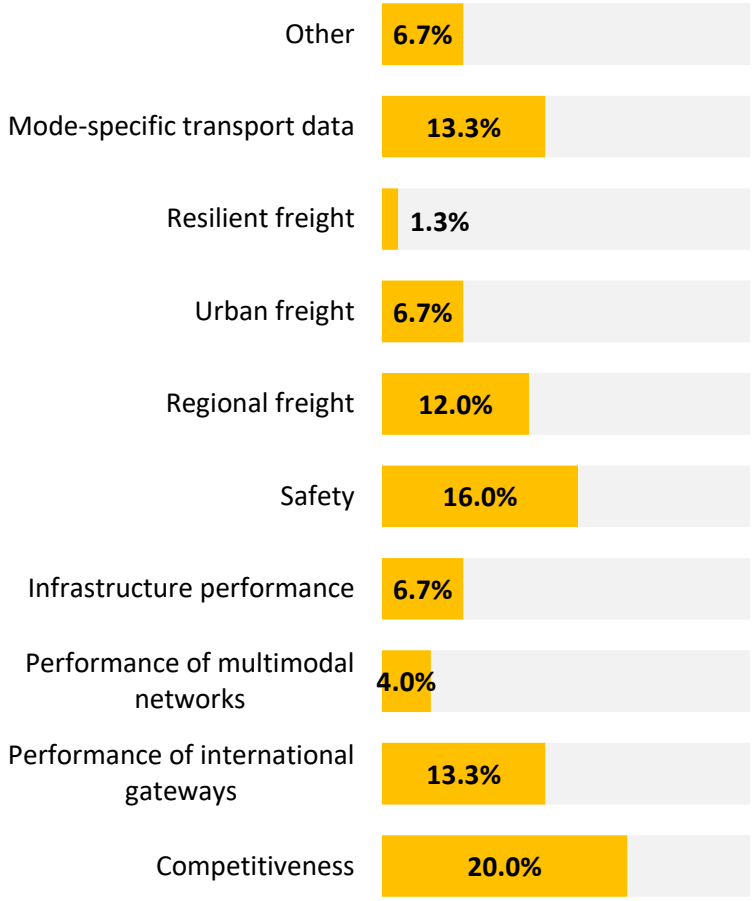
Competitiveness, performance of international gateways, safety, and *competitiveness* were found to be the most common types of data used by entities, as external data (Table 4-29).

Table 4-29. Composition of data type sourced *externally*

	Data category(s)	Count
One category only	Competitiveness	11
	Performance of international gateways	8
	Performance of multimodal networks	2
	Infrastructure Performance	5
	Safety	8
	Regional freight	7
	Urban Freight	5
	Resilient freight	1
	Mode-specific transport data	7
	other	4
Two categories	Competitiveness & Performance of international gateways	1
	Performance of international gateways & Infrastructure Performance	1
	Safety & Regional freight	1
	Regional freight & Urban Freight	1
	Performance of multimodal networks & Mode-specific transport data	1
	Performance of multimodal networks & Other	1
More than two categories	Competitiveness & Performance of multimodal networks & Resilient freight	1
	Performance of multimodal networks & Infrastructure Performance & Mode-specific	1
	Infrastructure Performance & Regional freight & Urban Freight	1
	Safety & Urban freight & Regional freight	1
	Safety & Regional freight & Mode-specific transport data	1
	Performance of international gateways & Performance of multimodal networks &	1
	Safety & Performance of multimodal networks & Mode-specific transport data &	1
	Competitiveness & Performance of international gateways & Infrastructure	1
	Performance of multimodal networks & Regional freight & Urban Freight & Mode-	1
	Competitiveness & Performance of multimodal networks & Infrastructure Performance	1
	All data categories	1
	Total	75

The overall distribution of different data types, presented in Figure 4-18, conform to some extent with what was observed for the internally sourced data. The top noted categories are competitiveness (20%), safety (16%), and *mode-specific transport data (13.3%)* and *performance of infrastructure* (13.3%).

Figure 4-18. Overal percent of data type sourced *externally*



When the size of the entity and the type of data being used is of interest, competitiveness ranks highly for SBEs and MBEs (Table 4-30), safety is only noted by SBEs. LBEs appear to be interested in a broad range of issues, including *mode-specific transport data* and *performance of international gateways*.

Table 4-30. Cross-tabulation between the type of entity & data category sourced externally

		Data type										
	Counts	*Competitiveness*	*Performance of international gateways*	*Performance of multimodal networks*	*Infrastructure performance*	*Safety*	*Regional freight*	*Urban freight*	*Resilient freight*	*Mode-specific transport data*	*Other*	Total
What sort of entity are you responding on behalf of?	Small business	8	4	4	5	8	5	3	1	1	2	**41**
	Medium business	13	2	1	3	0	3	2	0	5	0	**29**
	Large business	1	4	2	2	1	4	2	1	6	2	**25**
	Industry Association	3	3	2	2	5	3	3	1	3	1	**26**
	Total	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**3**	**2**	**15**

Table 4-31 shows the detailed breakdown of data categories among different data subcategories. *Labour* and *market condition* are not the dominating subcategories, while *volumes* appear to be most dominating type of data being sourced externally for usage by the respondents. Although the sample is relatively small for companies reported externally sourced data being used by them, still all subcategories have at least one company being interested in having access to such data.

Table 4-31. Cross-tabulation between data category & subcategory sourced *externally*

Data category (Counts)	Labour	Value of freight to the national economy	Ports	Airports	Network Optimisation Frameworks	Best Practice Modelling Assumptions	Roads, tracks, bridges, tunnels	Road	Volumes	First mile access	Last mile performance metrics	Land supply and conflict	Landside logistics costs	Congestion metrics	Remote metrics for Northern Australia	Rail	Forecasting and projection	Timestamp	Market comparison	Weather	Other	E-commerce	**Total**
Competitiveness	12	2	2	0	1	0	0	1	1	0	0	1	1	2	0	0	0	0	0	0	0	3	**26**
Performance of international gateways	0	1	3	1	0	0	0	1	4	0	0	1	0	0	1	2	0	0	0	0	0	0	**14**
Performance of multimodal networks	0	0	1	0	0	0	0	0	1	0	0	0	3	2	0	1	0	0	1	0	1	0	**10**
Infrastructure performance	0	1	2	0	1	0	2	0	0	0	2	0	3	1	0	0	0	0	0	1	0	0	**13**
Safety	0	0	0	2	0	0	0	4	4	0	0	1	0	0	0	1	0	0	0	1	2	0	**15**
Regional freight	0	1	0	0	3	0	1	1	1	1	2	0	4	1	0	0	0	1	0	0	1	0	**17**
Urban freight	0	1	1	0	0	0	0	0	2	0	1	1	3	1	0	0	0	2	0	0	0	0	**12**
Resilient freight	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**
Mode-specific transport data	0	0	3	0	0	1	0	3	3	0	2	0	1	0	1	2	0	0	1	0	0	1	**18**
Other	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	2	0	**7**

Total		**14**	**7**	**13**	**5**	**6**	**1**	**4**	**10**	**16**	**1**	**7**	**4**	**15**	**7**	**2**	**6**	**1**	**3**	**2**	**2**	**6**	**4**	**136**

The externally sourced databases are only used for one purpose (Table 4-32. Cross-tabulation between data category & purpose of use for data sourced externally., ie. no multiple purposes are reported in the data, where planning is the most commonly considered purposes across all data types, while *operation* is primarily considered if the data type being used is *competitiveness, safety*, or *performance of international gateways.* Surprisingly, the *investment* purpose is seldom noted by the respondents as the main purpose of using externally sourced data.

Table 4-32. Cross-tabulation between data category & purpose of use for data sourced externally

		Data Purpose			
	Counts	Planning	Operation	Investment	**Total**
Data category	Competitiveness	7	17	2	**26**
	Performance of international gateways	9	4	1	**14**
	Performance of multimodal networks	6	3	1	**10**
	Infrastructure performance	8	2	3	**13**
	Safety	6	9	0	**15**
	Regional freight	7	8	2	**17**
	Urban freight	5	4	3	**12**
	Resilient freight	2	1	1	**4**
	Mode-specific transport data	11	5	2	**18**
	Other	5	2	0	**7**
	Total	**66**	**55**	**15**	**136**

A new piece of information is provided for the externally sourced data which is about the frequency of usage. Table 4-33 shows the distribution of the frequency use of the data based on the type of data for all respondents. Almost all data types have been reported to be used by a few companies on daily basis. As the distribution of data in Table 4-33 is not skewed toward any side of the table, almost half of the data records are referring to data being used less frequent than once per month. This finding is clearer for mode specific data types as well as the *safety* category.

Table 4-33. Cross-tabulation between data category & the frequency of used, for sourced *externally*

Data category	Counts	Frequency of use: Every day	Two to three times a week	Once a week	Twice a month	Once a month	Every three months	Every six months	Every year or more	Total
	Competitiveness	4	2	7	0	9	1	1	2	**26**
	Performance of international gateways	0	3	4	1	5	0	0	1	**14**
	Performance of multimodal networks	2	2	1	1	3	0	0	1	**10**
	Infrastructure performance	1	3	3	0	3	2	0	1	**13**
	Safety	1	2	2	0	3	4	0	3	**15**
	Regional freight	4	2	2	1	4	0	1	3	**17**
	Urban freight	3	0	1	0	5	1	1	1	**12**
	Resilient freight	1	0	0	0	2	0	0	1	**4**
	Mode-specific transport data	6	1	0	0	4	2	2	3	**18**
	Other	0	0	1	0	4	0	0	2	**7**
	Total	**22**	**15**	**21**	**3**	**42**	**10**	**5**	**18**	**136**

The cost of accessing to the reported externally sourced databases appears to be mainly less than $1,000, unless it is related to *performance of multimodal networks,* which is skewed toward the $1,000 to $9,9999 category (Table 4-34). There are only 6 responses referring to the instance of externally sourced data that cost more than $10,000.

Table 4-34. Cross-tabulation between data category & the cost to access, for sourced *externally*

		Cost to access data			
	Counts	Less than $1,000	$1,000 - $9,999	$10,000 or more	**Total**
Data category	Competitiveness	20	2	2	**24**
	Performance of international gateways	10	3	1	**14**
	Performance of multimodal networks	8	3	0	**11**
	Infrastructure performance	10	4	0	**14**
	Safety	12	2	1	**15**
	Regional freight	13	3	1	**17**
	Urban freight	8	2	2	**12**
	Resilient freight	3	0	1	**4**
	Mode-specific transport data	13	1	4	**18**
	Other	5	0	2	**7**
	Total	**102**	**20**	**14**	**136**

Like the analysis of the internally sourced data, we focus more on the impact of size of the component on the type of data being used and externally sourced. Table 4-35 shows the distribution different data categories and subcategories. Iven the small sample size such distribution does not reveal a trend, nonetheless, it can still be seen that the *volume* and *safety* are considered by the smaller companies.

Table 4-35. Cross-tabulation between data category sourced externally & subcategory, for SBEs

Data category (Counts)	Labour	Value of freight to the national economy	Ports	Airports	Network Optimisation Frameworks	Roads, tracks, bridges, tunnels	Road	Volumes	Last mile performance metrics	Land supply and conflict	Landside logistics costs	Congestion metrics	Rail	Timestamp	Market comparison	Weather	Other	E-commerce	**Total**
Competitiveness	1	0	0	0	1	0	1	0	0	0	0	2	0	0	0	0	0	3	**8**
Performance of international gateways	0	1	0	0	0	0	0	2	0	1	0	0	0	0	0	0	0	0	**4**
Performance of multimodal networks	0	0	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	0	**4**
Infrastructure performance	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	1	0	0	**5**
Safety	0	0	0	2	0	0	1	3	0	0	0	0	1	0	0	1	0	0	**8**
Regional freight	0	1	0	0	0	0	1	0	1	0	0	1	0	1	0	0	0	0	**5**
Urban freight	0	0	0	0	0	0	0	0	0	0	2	0	0	1	0	0	0	0	**3**
Resilient freight	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Mode-specific transport data	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**
Other	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**2**

Total	**2**	**2**	**2**	**3**	**1**	**1**	**3**	**6**	**2**	**1**	**2**	**5**	**1**	**2**	**1**	**2**	1	**4**	**41**

Like what was observed for the internally sourced data, SBEs are focused on using the data for *planning* and *operation* purposes, however the focus on *planning* is less strong for the externally sourced data (Table 4-36).

Table 4-36. Cross-tabulation between data category sourced externally & purpose for *SBEs*

		Data Purpose			
	Counts	Planning	Operation	Investment	**Total**
Data category	Competitiveness	1	7	0	**8**
	Performance of international gateways	2	2	0	**4**
	Performance of multimodal networks	2	2	0	**4**
	Infrastructure performance	3	1	1	**5**
	Safety	3	5	0	**8**
	Regional freight	1	4	0	**5**
	Urban freight	2	1	0	**3**
	Resilient freight	1	0	0	**1**
	Mode-specific transport data	0	1	0	**1**
	Other	1	1	0	**2**
	Total	**16**	**24**	**1**	**41**

The frequency of usage of externally sourced data for smaller companies is very high where very few responses have provided for using any data types for less frequent than once per month (Table 4-37). Those instances of using the data for less than once a month are observed for the *safety* and *infrastructure performance.*

Table 4-37. Cross-tabulation between data category sourced externally & frequency of use, for *SBEs*

		Frequency of use								
	Counts	Every day	Two to three times a week	Once a week	Twice a month	Once a month	Every three months	Every six months	Every year or more	**Total**
Data category	Competitiveness	3	1	3	0	1	0	0	0	**8**
	Performance of international gateways	0	1	2	1	0	0	0	0	**4**
	Performance of multimodal networks	1	2	0	1	0	0	0	0	**4**
	Infrastructure performance	0	0	2	0	1	2	0	0	**5**
	Safety	1	2	1	0	2	1	0	1	**8**
	Regional freight	0	1	1	1	0	0	1	1	**5**
	Urban freight	0	0	0	0	2	1	0	0	**3**
	Resilient freight	1	0	0	0	0	0	0	0	**1**
	Mode-specific transport data	0	0	0	0	1	0	0	0	**1**
	Other	0	0	0	0	1	0	0	1	**2**

Total	**6**	**7**	**9**	**3**	**8**	**4**	**1**	**3**	**41**

Table 4-38 shows that SBEs are willing to purchase data for values higher than $1,000, especially if it is related to the performance of the system.

Table 4-38. Cross-tabulation between data category sourced externally & cost of access, for *SBEs*

Data category	Cost to access data: Less than $1,000	$1,000 - $9,999	$10,000 or more	Total
Competitiveness	5	1	2	**8**
Performance of international gateways	2	2	0	**4**
Performance of multimodal networks	1	3	0	**4**
Infrastructure performance	2	3	0	**5**
Safety	5	2	1	**8**
Regional freight	4	1	0	**5**
Urban freight	2	1	0	**3**
Resilient freight	0	0	1	**1**
Mode-specific transport data	1	0	0	**1**
Other	2	0	0	**2**
Total	**24**	**13**	**4**	**41**

Data for MBEs is limited to almost half of the data categories (Table 4-39). *Competitiveness* is the dominant category of interest.

Table 4-39. Cross-tabulation between data category sourced externally & subcategory, for *MBEs*

Data category	Counts	Data Subcategory: Labour	Value of freight to the national	Ports	Network Optimisation Roads, tracks, bridges, tunnels	Road	Volumes	First mile access	Last mile performance	Landside logistics costs	Congestion metrics	*Remote metrics for Northern Australia*	*Rail*	*Timestamp*	Total
	Competitiveness	11	1	0	0	0	1	0	0	0	0	0	0	0	13
	Performance of international	0	0	0	0	0	1	0	0	0	0	1	0	0	2
	Performance of multimodal	0	0	0	0	0	0	0	0	0	1	0	0	0	1
	Infrastructure performance	0	1	0	0	0	0	0	1	1	0	0	0	0	3
	Regional freight	0	0	0	1	1	0	1	0	0	0	0	0	0	3
	Urban freight	0	1	0	0	0	0	0	0	0	0	0	0	1	2
	Mode-specific transport data	0	0	2	0	0	1	0	0	0	0	1	1	0	5
	Total	**11**	**3**	**2**	**1**	**1**	**1**	**2**	**1**	1	**1**	**1**	**2**	**1**	**1**	**29**

Operation is the main purpose for purchasing externally sourced data for MBEs, which was the case for internally sourced data as well (Table 4-40). *Investment* and *planning* are also important for MBEs, where *planning* is related to performance related categories, and *investment* pertains to freight related categories.

Table 4-40. Cross-tabulation between data category sourced externally & purpose, for *MBEs*

Data category	Counts	Data Purpose: Planning	Operation	Investment	Total
	Competitiveness	4	9	0	13
	Performance of international gateways	1	1	0	2
	Performance of multimodal networks	1	0	0	1
	Infrastructure performance	3	0	0	3
	Regional freight	0	2	1	3
	Urban freight	0	0	2	2
	Mode-specific transport data	3	2	0	5
	Total	**12**	**14**	**3**	**29**

As is the case for SBEs, the data that is used by MBEs is used frequently, as seen in Table 4-41.

Table 4-41. Cross-tabulation between data category sourced externally & frequency of use, for *MBEs*

Data category	Counts	Frequency of use: Every day	Two to three times a week	Once a week	Once a month	Every three months	Every six months	Every year or more	Total
	Competitiveness	0	1	4	6	1	1	0	13
	Performance of international gateways	0	1	1	0	0	0	0	2
	Performance of multimodal networks	0	0	0	1	0	0	0	1
	Infrastructure performance	1	1	1	0	0	0	0	3
	Regional freight	2	1	0	0	0	0	0	3
	Urban freight	1	0	0	0	0	1	0	2
	Mode-specific transport data	2	0	0	1	0	1	1	5

	Total	**6**	**4**	**6**	**8**	**1**	3	1	**29**

Also, like what was observed for SBEs, when MBEs purchase data, they are happy to pay over $1,000, as seen in Table 4-42.

Table 4-42. Cross-tabulation between data category sourced externally & cost of access, for *MBEs*

		Cost to access data			
	Counts	Less than $1,000	$1,000 - $9,999	$10,000 or more	**Total**
Data category	Competitiveness	10	1	0	**11**
	Performance of international	1	1	0	**3**
	Performance of multimodal	2	0	0	**4**
	Infrastructure performance	3	1	0	**3**
	Regional freight	1	2	0	**3**
	Urban freight	0	1	1	**2**
	Mode-specific transport data	3	0	2	**5**
	Total	**20**	**6**	**3**	**29**

Table 4-43 shows external data used by LBEs; data uses is fairly evenly distributed across categories.

Table 4-43. Cross-tabulation between data category sourced externally & subcategory, *LBEs*

Data category	Data Subcategory: Ports	Airports	Best Practice Modelling Assumptions	Road	Last mile performance metrics	Land supply and conflict	Landside logistics costs	Rail	Forecasting and projection	Other	Total
Competitiveness	1	0	0	0	0	0	0	0	0	0	1
Performance of international	0	1	0	1	0	0	0	2	0	0	4
Performance of multimodal	0	0	0	0	0	0	1	1	0	0	2
Infrastructure performance	1	0	0	0	0	0	1	0	0	0	2
Safety	0	0	0	0	0	0	0	0	0	1	1
Regional freight	0	0	0	0	1	0	3	0	0	0	4
Urban freight	0	0	0	0	1	1	0	0	0	0	2
Resilient freight	0	1	0	0	0	0	0	0	0	0	1
Mode-specific transport data	1	0	1	2	1	0	0	1	0	0	6
Other	1	0	0	0	0	0	0	0	1	0	2

Total	**4**	**2**	**1**	**3**	**3**	**1**	**5**	**4**	**1**	**1**	**25**

Table 4-44. Cross-tabulation between data category sourced externally & purpose, *LBEs*

Data category	Counts	Data Purpose: Planning	Operation	Investment	Total
	Competitiveness	0	0	1	1
	Performance of international gateways	4	0	0	4
	Performance of multimodal networks	1	1	0	2
	Infrastructure performance	0	1	1	2
	Safety	0	1	0	1
	Regional freight	2	2	0	4
	Urban freight	0	2	0	2
	Resilient freight	0	1	0	1
	Mode-specific transport data	5	1	0	6
	Other	2	0	0	2
	Total	**14**	**9**	**2**	**25**

Table 4-45. Cross-tabulation between data category sourced externally & frequency of use, *LBEs*

Data category	Counts	Frequency of use: Every day	Once a week	Once a month	Every three months	Every year or more	Total
	Competitiveness	1	0	0	0	0	1
	Performance of international	0	1	0	3	0	4
	Performance of multimodal	1	0	0	1	0	2
	Infrastructure performance	0	2	0	0	0	2
	Safety	0	0	1	0	0	1
	Regional freight	2	0	1	1	0	4
	Urban freight	1	0	1	0	0	2
	Resilient freight	0	0	0	1	0	1
	Mode-specific transport data	4	1	0	0	1	6
	Other	0	0	1	1	0	2
	Total	**9**	**4**	**4**	**7**	**1**	**25**

The cost of data being used by large companies appears not to be not very high, as most of all observations fall under the category of less than $1,000 (Table 4-46).

Table 4-46. Cross-tabulation between data category sourced externally & cost of access, *LBEs*

Data category	Counts	Cost to access data: Less than $1,000	$1,000 - $9,999	$10,000 or more	Total
	Competitiveness	1	0	0	1
	Performance of international gateways	4	0	0	4
	Performance of multimodal networks	2	0	0	2
	Infrastructure performance	2	0	0	2
	Safety	1	0	0	1
	Regional freight	3	0	1	4
	Urban freight	1	0	1	2
	Resilient freight	1	0	0	1
	Mode-specific transport data	4	1	1	6
	Other	2	0	0	2
	Total	**21**	**1**	**3**	**25**

The IA respondents use the data for particularly planning purposes (Table 4-47). IA bodies use externally sourced data less frequently than other companies and are willing to pay less than $1,000 for the data they purse from external sources (Table 4-48).

Table 4-47. Cross-tabulation between data category sourced externally & subcategory, *IAs*

Data category \ Data Subcategory	Ports	Network Optimisation Frameworks	Roads, tracks, bridges, tunnels	Road	Volumes	Last mile performance metrics	Land supply and conflict	Landside logistics costs	Congestion metrics	Market comparison	Other	Total
Competitiveness	1	0	0	0	0	0	1	1	0	0	0	3
Performance of international	3	0	0	0	0	0	0	0	0	0	0	3
Performance of multimodal	0	0	0	0	0	0	0	2	0	0	0	2
Infrastructure performance	0	0	1	0	0	0	0	1	0	0	0	2
Safety	0	0	0	2	1	0	1	0	0	0	1	5
Regional freight	0	1	0	0	0	0	0	1	0	0	1	3
Urban freight	0	0	0	0	1	0	0	1	1	0	0	3
Resilient freight	0	0	1	0	0	0	0	0	0	0	0	1
Mode-specific transport data	0	0	0	0	1	1	0	0	0	1	0	3
Other	0	0	0	0	0	0	0	0	0	0	1	1
Total	**4**	**1**	**2**	**2**	**3**	**1**	**2**	**6**	**1**	**1**	**3**	**26**

Table 4-48. Cross-tabulation between data category sourced externally & purpose, *IAs*

Data category	Counts	Data Purpose: Planning	Operation	Investment	Total
	Competitiveness	1	1	1	**3**
	Performance of international gateways	1	1	1	**3**
	Performance of multimodal networks	1	0	1	**2**
	Infrastructure performance	1	0	1	**2**
	Safety	2	3	0	**5**
	Regional freight	2	0	1	**3**
	Urban freight	1	1	1	**3**
	Resilient freight	0	0	1	**1**
	Mode-specific transport data	1	0	2	**3**
	Other	0	1	0	**1**
	Total	**10**	**7**	**9**	**26**

Table 4-49. Cross-tabulation between data category sourced externally & frequency of use, *IAs*

Data category	Counts	Frequency of use: Every day	Once a week	Once a month	Every three months	Every year or more	Total
	Competitiveness	0	0	1	0	2	**3**
	Performance of international gateways	0	1	1	0	1	**3**
	Performance of multimodal networks	0	1	0	0	1	**2**
	Infrastructure performance	0	0	1	0	1	**2**
	Safety	0	0	1	3	1	**5**
	Regional freight	0	0	1	0	2	**3**
	Urban freight	1	0	1	0	1	**3**
	Resilient freight	0	0	0	0	1	**1**
	Mode-specific transport data	0	0	1	0	2	**3**
	Other	0	0	0	0	1	**1**

Counts	Frequency of use					
	Every day	Once a week	Once a month	Every three months	Every year or more	**Total**
Total	**1**	**2**	**7**	**3**	**13**	**26**

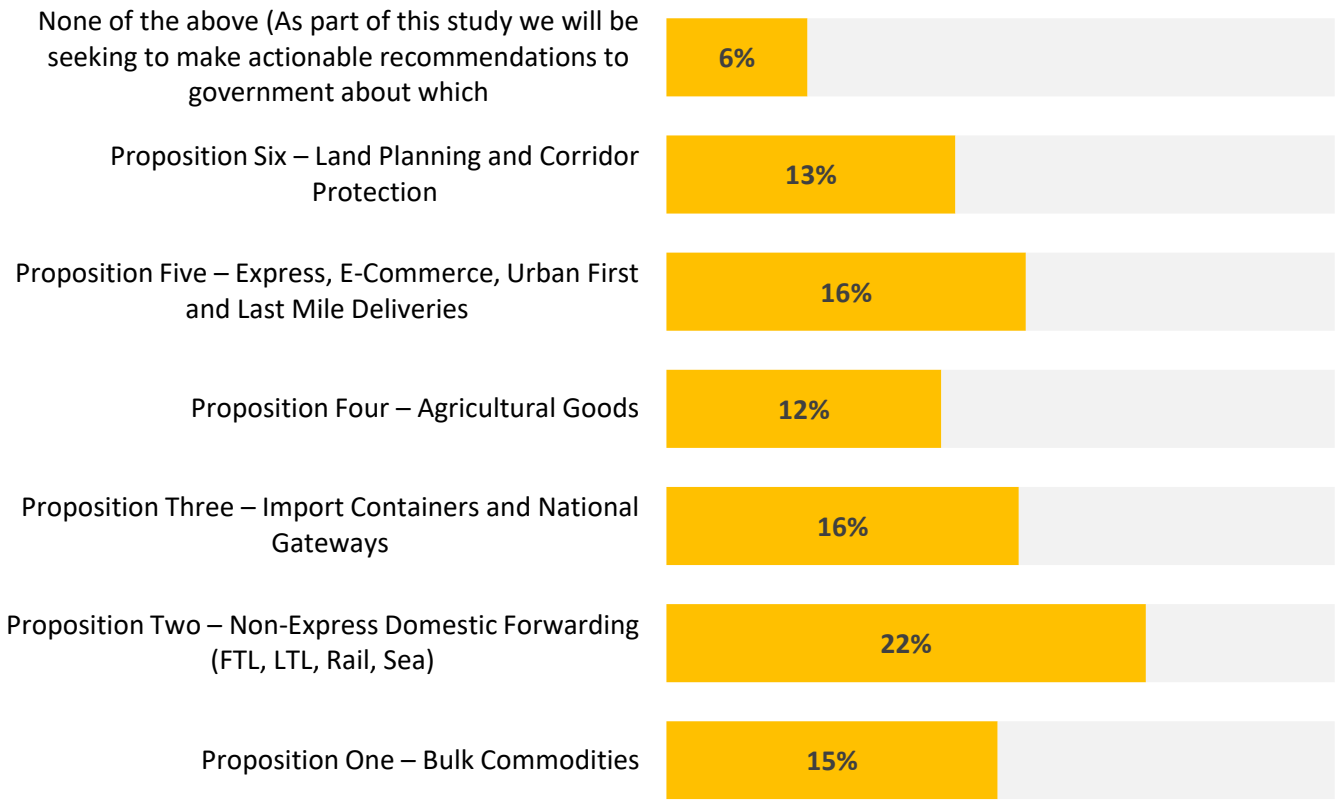
Table 4-50. Cross-tabulation between data category sourced externally & cost of access, *IAs*

Data category	Counts	Cost to access data		
		Less than $1,000	$10,000 or more	**Total**
	Competitiveness	3	0	**3**
	Performance of international gateways	2	1	**3**
	Performance of multimodal networks	2	0	**2**
	Infrastructure performance	2	0	**2**
	Safety	5	0	**5**
	Regional freight	3	0	**3**
	Urban freight	3	0	**3**
	Resilient freight	1	0	**1**
	Mode-specific transport data	3	0	**3**
	Other	1	0	**1**
	Total	**25**	**1**	**26**

A.2.3. Responses to propositions

In this section, we report the results of six propositions that were presented to respondents as part of a focus group session with the industry stakeholders.

Figure 4-19. Responses to the 6 propositions



Respondents could pick more than one proposition. Table 4-51 presents the different combinations of selection among the respondents. The table shows that 85% of respondents found at least one proposition to be relevant to their circumstances, 35% of the responses are for those finding more than one response to be relevant to their cases, while 50% of respondents found only one to be critical to their interests.

Table 4-51. Different combination of selection of proposition among the respondents

Combination of selection	Percent
None of Proposition	13.5%
Proposition 2	12.8%
Proposition 5	12.8%
Proposition 1	10.1%
All Propositions	8.1%
Proposition 6	5.4%
Propositions 2& 3	3.4%
Propositions 1 & 2 & 3 & 4 & 6	3.4%
Proposition 3	2.7%

Combination of selection	Percent
Propositions 1 & 2	2.7%
Proposition 4	2.0%
Propositions 2& 4	2.0%
Propositions 2 & 3 & 4	2.0%
Propositions 2 & 3 & 4 & 5 & 6	2.0%
Propositions 3 & 5	1.4%
Propositions 1 & 4 & 5	1.4%
Proposition 2 & 3 & 5	1.4%
Propositions 2 & 5 & 6	1.4%
Propositions 1 & 2 & 3 & 4	1.4%
Propositions 2 & 3 & 5 & 6	1.4%
Propositions 1 & 3	0.7%
Propositions 1 & 4	0.7%
Propositions 2 & 5	0.7%
Propositions 1 & 3 & 6	0.7%
Propositions 2 & 3 & 6	0.7%
Propositions 4 & 5 & 6	0.7%
Propositions 1 & 2 & 3 & 6	0.7%
Propositions 1 & 3 & 5 & 6	0.7%
Propositions 2 & 3 & 4 & 5	0.7%
Propositions 2 & 3 & 4 & 6	0.7%
Propositions 3 & 4 & 5 & 6	0.7%
Propositions 1 & 2 & 3 & 5 & 6	0.7%
Propositions 2 & 3 & 4 & 5 & 6	0.7%

68.5% of the respondents found the existing data sources sufficient for their needs.

Figure 4-20. Are there any gaps in the currently available data sources required for your entity?

To further understand which types of entities expressed further needs for accessibility to more data, Table 4-52 breaks down which entity believes there are gaps in the currently existing data. SBEs and MBEs are reasonably satisfied with the available data sources, while LBEs and IAs requested for more data sources to become available to them.

Table 4-52. Cross-tabulation between the type of entity and if there are any gaps in the currently available data sources required for your entity

What sort of entity are you responding on behalf of?	Are there any gaps in the currently available data sources required for your entity?		Total
	Yes	*No*	
Small Business	19	48	**67**
Medium Business	12	25	**37**
Large Business	14	11	**25**
Industry Association	7	3	**10**
Other	7	2	**9**
Total	**59**	**89**	**148**

Furthermore, by looking at the type of data entities consider as a gap, entities are less concerned about gaps in the following data categories: *safety, regional freight, urban freight and mode specific transport*. However, more data should be provided on *performance of international gateways*, competitiveness, *performance of multimodal networks, Infrastructure performance* and *regional freight* (Table 4-53).

Table 4-53. Cross-tabulation between data category in demand and if there are any gaps in the currently available data sources required for your entity

Are there any gaps in the currently available data sources required for your entity?	Data category (Missing data)										
	Competitiveness	Performance of international gateways	Performance of multimodal networks	Infrastructure performance	Safety	Regional freight	Urban freight	Resilient freight	Mode-specific transport data	Other	**Total**
Yes	14	12	21	13	2	15	5	1	12	2	**97**

Among the subcategories of data, *landside logistics costs* are those identified by the respondents requiring further supporting data sources (Table 4-54).

Table 4-54. Cross-tabulation between data sub-category in demand and if there are any gaps in the currently available data sources required for your entity

Are there any gaps in the currently available data sources required for your entity?	Subcategory (Missing data)																					
	Labour	Value of freight to the national	Ports	Airports	Customs Freight Data Analysis Project	Network Optimisation Frameworks	Best Practice Modelling Assumptions	Roads, tracks, bridges, tunnels	Road	Volumes	First mile access	Last mile performance metrics	Land supply and conflict	Landside logistics costs	Congestion metrics	Remote metrics for Northern Australia	Rail	Forecasting and projection	Timestamp	Market comparison	Other	**Total**
Yes	2	7	7	9	8	3	4	2	3	9	1	5	1	13	3	1	4	9	2	2	2	**97**

The way data is used by the entities is another factor found to be critical in determining whether a gap is felt by the respondents. Entities are demanding for more data for planning purposes to be available (Table 4-55).

Table 4-55. Cross-tabulation between purpose of data in demand and if there are any gaps in the currently available data sources required for your entity

Are there any gaps in the currently available data sources required for your entity?	Purpose of data (Missing data)			Total
	Planning	*Operation*	*Investment*	
Yes	54	33	10	**97**

Concerns regarding data gaps and the response to different propositions are evenly distributed (Table 4-56).

Table 4-56. Cross-tabulation between if there are any gaps in the currently available data sources required for your entity & the six propositions

Are there any gaps in the currently available data sources required for your entity?	Propositions	Count	Percent
	Proposition 1	49	18%
	Proposition 2	46	17%
	Proposition 3	52	19%
	Proposition 4	51	18%
	Proposition 5	33	12%
	Proposition 6	46	17%
	Total	**277**	**100%**

Table 4-57 provides insights on data categories identified to be requiring supplementary data and the propositions selected by the respondents. When competitiveness data types are of interest, the fifth proposition is again of less importance. The next three data categories that are related to performance indicators appear to be having a similar pattern of significance across different propositions. The rest of the categories are not selected frequently by the respondents to require supplementary data, except for the *regional freight* data category where propositions 1, 2 and 4 appear not to be quite attractive.

Table 4-57. Cross-tabulation of data categories in demand and the six propositions

Counts	Propositions						
	1 -Bulk Commodities	2 -Non-Express Domestic Forwarding	3 -Import Containers and National Gateways	4 -Agricultural Goods	5 -Express, E-commerce, Urban First and Last Mile Deliveries	6 -Land Planning and Corridor Protection	Total
Competitiveness	9	7	7	6	4	6	39
Performance of international	4	2	2	4	1	1	14
Performance of multimodal	9	9	13	10	6	10	57
Infrastructure performance	6	8	8	7	6	8	43
Safety	1	1	0	1	2	1	6
Regional freight	9	6	8	12	2	8	45
Urban freight	1	2	3	1	3	3	13
Resilient freight	1	1	0	1	1	1	5
Mode-specific transport data	9	9	10	8	7	7	50
Other	0	1	1	1	1	1	5
Total	**49**	**46**	**52**	**51**	**33**	**46**	**277**

A.3. Limitation & barriers to sharing freight data

This component starts with a Likert scale question to analyse participants understanding of the importance of 13 transportation factors in moving freight more efficiently. Respondents were asked to rate each statement from very important to not at all important. Figure 4-21 presents the percentage for each scale. We found that Transportation cost had the highest percentage selected as being a very important factor and Knowledge of freight volume had the lowest percentage. Interestingly, only 24.7% of the respondent had indicated that *accessibility to reliable, consistent, comprehensive and timely data on freight movements is very important.*

Figure 4-21. How important are the following transportation factors in moving freight more efficiently?

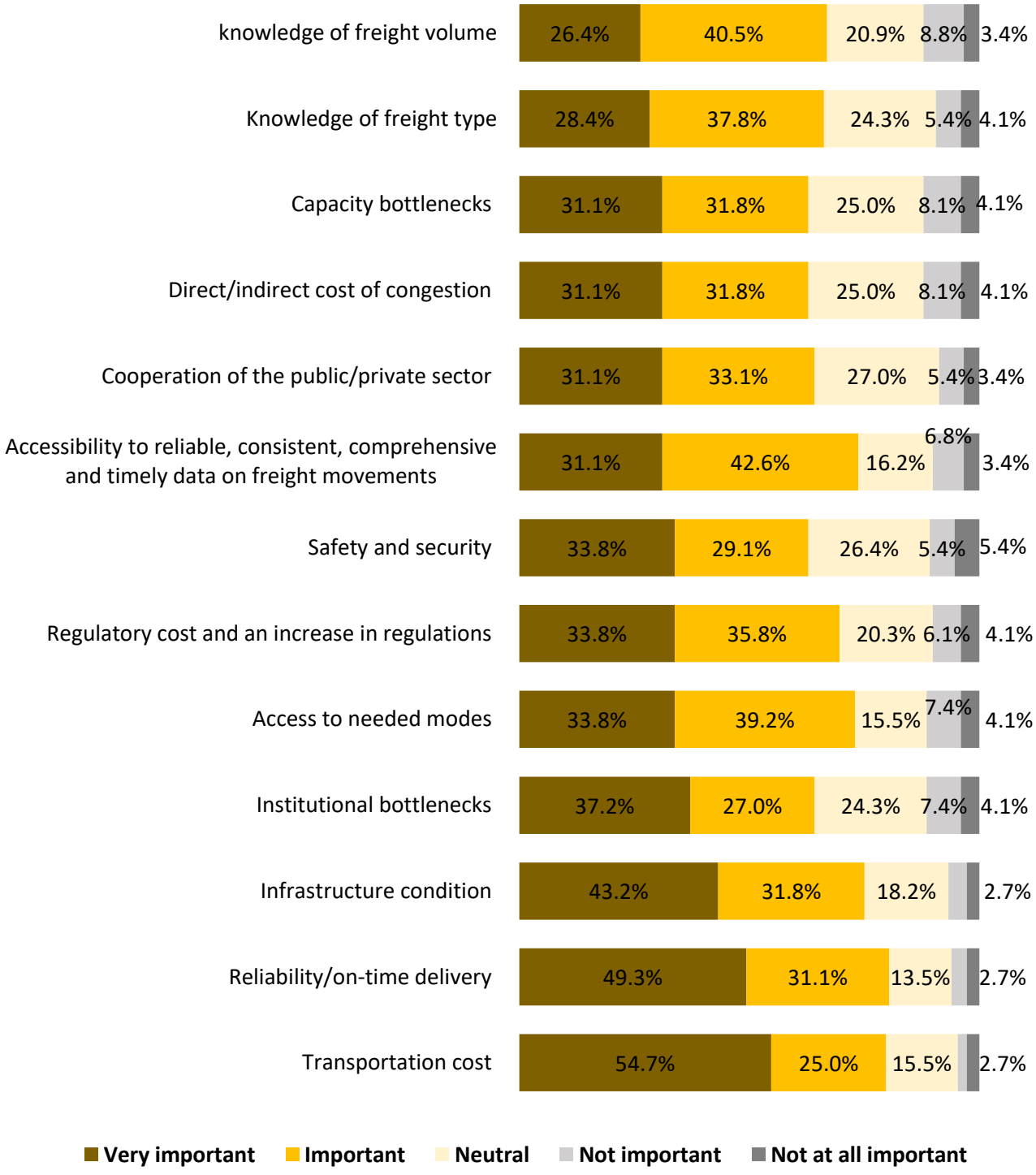
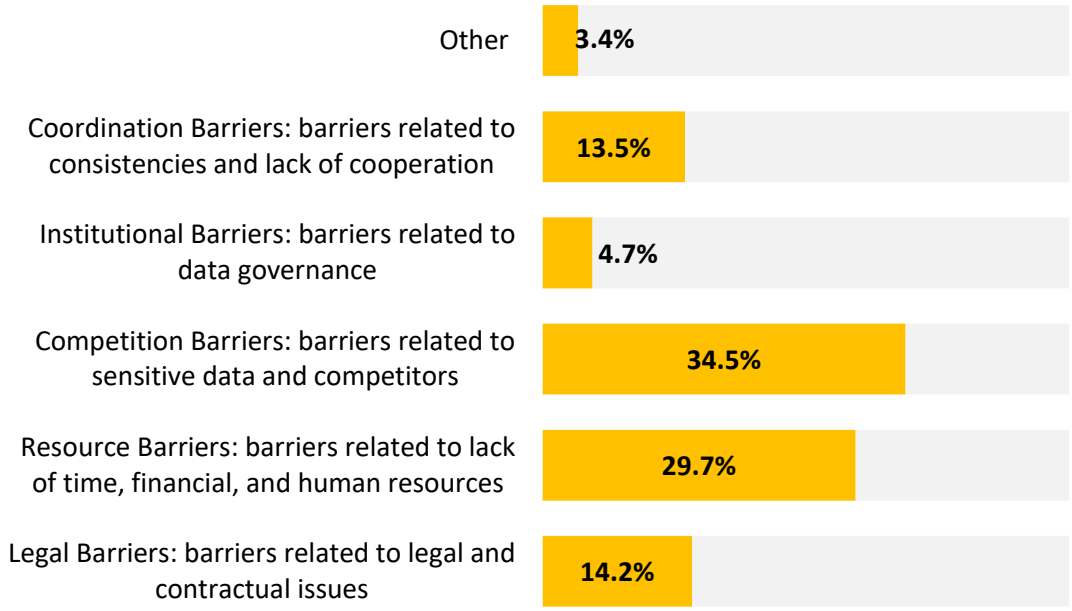


Figure 4-22 highlights that competition barriers (41.1%) is seen as the most important critical barrier and challenge for freight data sharing. After that *resource barriers* with 23.3% was selected as the second most important barrier.

Figure 4-22. In your opinion, which of the following items is the most important barrier and challenge for freight data sharing?



Based on the literature review the five categories mentioned in Figure 4-22 were further classified into 20 sub categories (Table 4-58). In order to understand the importance of these factors a best-worst methodology was used. Best-worst scaling is a type of discrete choice experiment.

Table 4-58. Important categories and sub-categories considered as a barrier for data sharing

Legal Barriers	*Resource Barriers*	*Competition Barriers*	*Institutional Barriers*	*Coordination Barriers*
Lack of a formal contract	Small companies find it harder to provide freight data	Sensitivity about sharing information which could be used by competitors	Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned	Not articulating uses of data to private data providers
Lack of legal basis for public-private partnerships	Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to participation	Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive	Private sector interests do not always align with the public good	Lack of coordination with stakeholders
Control of data by technology contractor	Limitations in data analysis that can be done with aggregated data	Increased requirements of data compliance may delay cargo	Different facilities, such as border crossings operate differently and may have different requirements	Sharing across international boundaries is difficult as is coordination with multiple international agencies
National security sensitivities	Data source diversity, and in some cases the large amount of data requires costly processing	Third-party data supplier' s validation and cleaning process not known	Compatibility issues between national freight data sets	
Data sharing with foreign countries				

Table 4-59and Table 4-60 report the ranking of the studied factors based on industry segmentation (being shippers, receivers, providers, carriers). In the first column in

Table 4-59 we have presented the ranking of the factors for the full sample. In Table 4-60 we have segmented the data based on entity types (being SBEs, MBEs and LBEs). The results of this analysis are similar to the results classified by industry group.

Table 4-59. Ranking of *most* to *least* important factor that participants (based on their role in the freight chain supply) consider as a barrier to sharing freight data

Factors	*All sample (ranking) N=148*	*Shippers (ranking) N=100*	*Receivers (ranking) N=95*	*Providers (ranking) N=104*	*Carriers (ranking) N=70*
Sensitivity about sharing information which could be used by competitors	1	1	1	1	2
Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive	2	2	1	1	1
Data source diversity, and in some cases the large amounts of data requires costly processing	3	3	2	2	3
Limitations in data analysis that can be done with aggregated data	4	11	6	3	9
Third-party data supplier's validation and cleaning process not known	4	7	5	3	9
Compatibility issues between national freight data sets	5	6	5	5	9
Private sector interests do not always align with the public good	5	12	5	3	7
Sharing across international boundaries is difficult as is coordination with multiple international agencies	6	5	4	4	5
Increased requirements of data compliance may delay cargo	6	4	3	3	4
Lack of coordination with stakeholders	7	10	6	5	7
Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed	7	8	4	6	8
Not articulating uses of data to private data providers	8	15	8	5	8
Small companies find it harder to provide freight data	8	13	6	6	7
Different facilities, such as border crossings operate differently and may have different requirements	9	14	8	8	10
Lack of legal basis for public-private partnerships	10	9	7	7	11
Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned	11	16	8	9	10
Control of data by technology contractor	11	17	9	6	9
National security sensitivities	12	18	6	7	6
Lack of a formal contract	13	19	10	10	12
Data sharing with foreign countries	14	20	11	11	13

Competition Barriers | ***Resource Barriers*** | ***Coordination Barriers*** | ***Institutional Barriers*** | ***Legal Barriers***

Table 4-60. Ranking of *most* to *least* important factors that participants (based on their entity size) had consider as a barrier to sharing freight data

Factors	*All sample (ranking) N=148*	*Small business (ranking) N=67*	*Medium business (ranking) N=37*	*Large business (ranking) N=25*	*Industry Association (ranking) N=10*
Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive	1	1	4	2	2
Sensitivity about sharing information which could be used by competitors	2	7	1	1	1
Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to	3	2	12	11	7
Limitations in data analysis that can be done with aggregated data	3	5	8	5	5
Sharing across international boundaries is difficult as is coordination with multiple international agencies	3	7	3	7	5
Data source diversity, and in some cases the large amounts of data requires costly processing	4	3	6	3	6
Third-party data supplier's validation and cleaning process not known	4	5	5	6	7
Compatibility issues between national freight data sets	4	10	2	5	3
Private sector interests do not always align with the public good	5	7	10	4	3
Lack of legal basis for public-private partnerships	6	9	7	10	9
Not articulating uses of data to private data providers	7	8	9	9	4
Lack of coordination with stakeholders	8	11	8	5	7
Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned	9	10	11	8	8
Small companies find it harder to provide freight data	10	6	7	10	8
Increased requirements of data compliance may delay cargo	10	4	11	6	6
National security sensitivities	10	9	11	13	11
Different facilities, such as border crossings operate differently and may have different requirements	11	7	9	7	9
Control of data by technology contractor	11	6	10	9	10
Lack of a formal contract	12	12	13	14	6
Data sharing with foreign countries	13	13	9	12	12

Competition Barriers ***Resource Barriers*** ***Coordination Barriers*** ***Institutional Barriers*** ***Legal Barriers***

Almost one-third of the sampled participants had indicated that they are currently involved in any existing cooperation between Australian data holders. Table 4-61 represents a cross-tabulation between the type of entity and if their entity is currently involved in any existing cooperation between Australian data holders.

Table 4-61. Cross-tabulation between the type of entity and if their entity is currently involved in any existing cooperation between Australian data holders

Count		Is your entity currently involved in any existing cooperation between Australian data holders?		
		Yes	*No*	**Total**
What sort of entity are you responding on behalf of?	Small business	18	49	**67**
	Medium business	14	23	**37**
	Large business	8	17	**25**
	Industry Association	4	6	**10**
	Other	1	8	**9**
	Total	**45**	**103**	**148**

Appendix B. Best-worst scores

Figure 4-23. Best Worst scores for all sample (n=148)

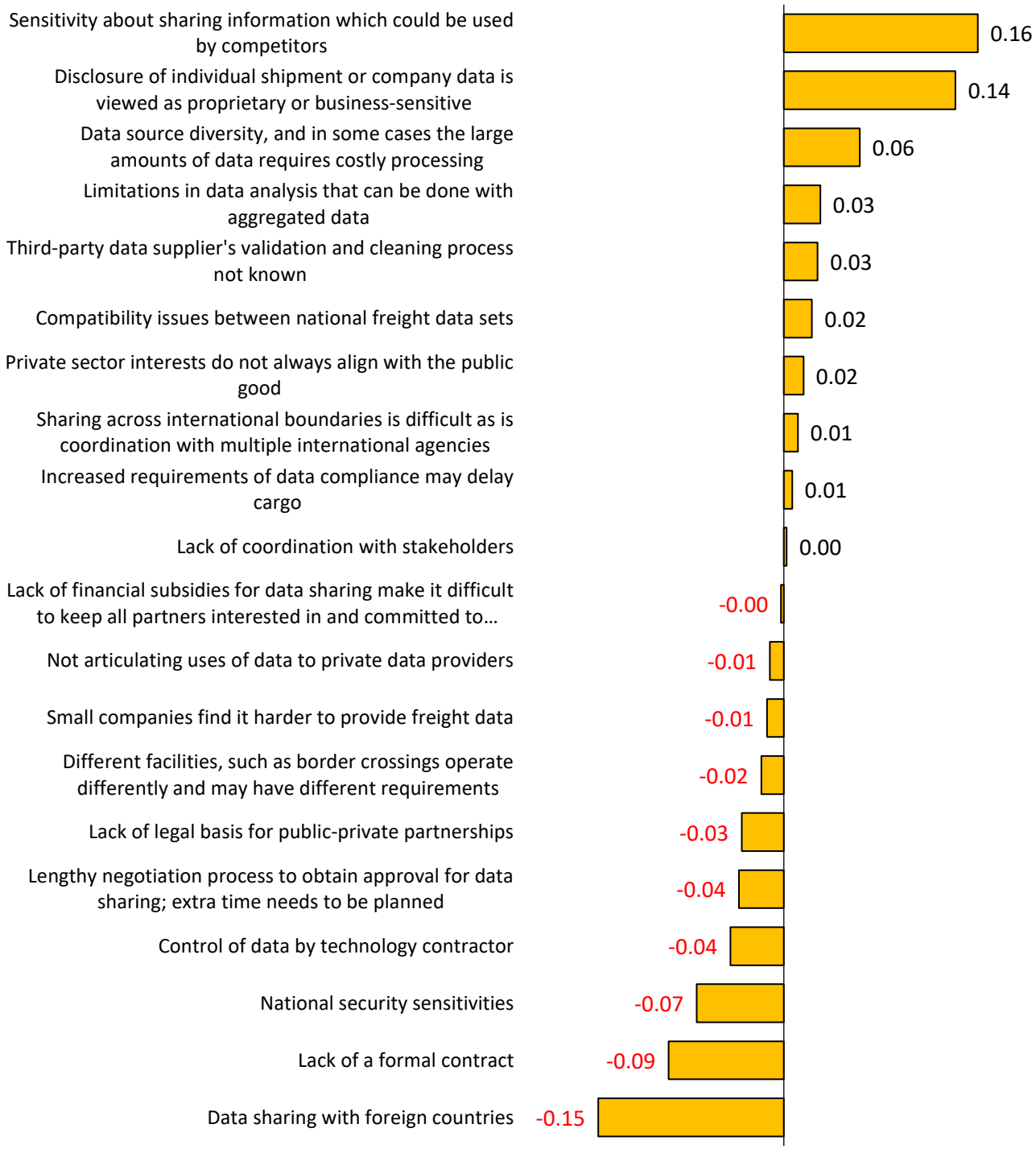


Figure 4-24. Best-Worst Scores for Shippers (n=100)


Sensitivity about sharing information which could be used by competitors
0.11
Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive
0.11
Data source diversity, and in some cases the large amounts of data requires costly processing
0.06
Increased requirements of data compliance may delay cargo
0.04
Sharing across international boundaries is difficult as is coordination with multiple international agencies
0.03
Compatibility issues between national freight data sets
0.03
Third-party data supplier's validation and cleaning process not known
0.02
Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to…
0.02
Lack of legal basis for public-private partnerships
0.00
Lack of coordination with stakeholders
0.00
Limitations in data analysis that can be done with aggregated data
-0.00
Private sector interests do not always align with the public good
-0.01
Small companies find it harder to provide freight data
-0.01
Different facilities, such as border crossings operate differently and may have different requirements
-0.02
Not articulating uses of data to private data providers
-0.02
Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned
-0.03
Control of data by technology contractor
-0.04
National security sensitivities
-0.05
Lack of a formal contract
-0.11
Data sharing with foreign countries
-0.12

Figure 4-25. Best-Worst Scores for Receivers (n=95)


Sensitivity about sharing information which could be used by competitors
0.06
Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive
0.06
Data source diversity, and in some cases the large amounts of data requires costly processing
0.05
Increased requirements of data compliance may delay cargo
0.04
Sharing across international boundaries is difficult as is coordination with multiple international agencies
0.02
Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to…
0.02
Third-party data supplier's validation and cleaning process not known
0.01
Private sector interests do not always align with the public good
0.01
Compatibility issues between national freight data sets
0.01
National security sensitivities
0.00
Small companies find it harder to provide freight data
0.00
Limitations in data analysis that can be done with aggregated data
0.00
Lack of coordination with stakeholders
0.00
Lack of legal basis for public-private partnerships
0.00
Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned
-0.02
Not articulating uses of data to private data providers
-0.02
Different facilities, such as border crossings operate differently and may have different requirements
-0.02
Control of data by technology contractor
-0.03
Lack of a formal contract
-0.08
Data sharing with foreign countries
-0.12

Figure 4-26. Best-Worst Scores for Providers (n=104)

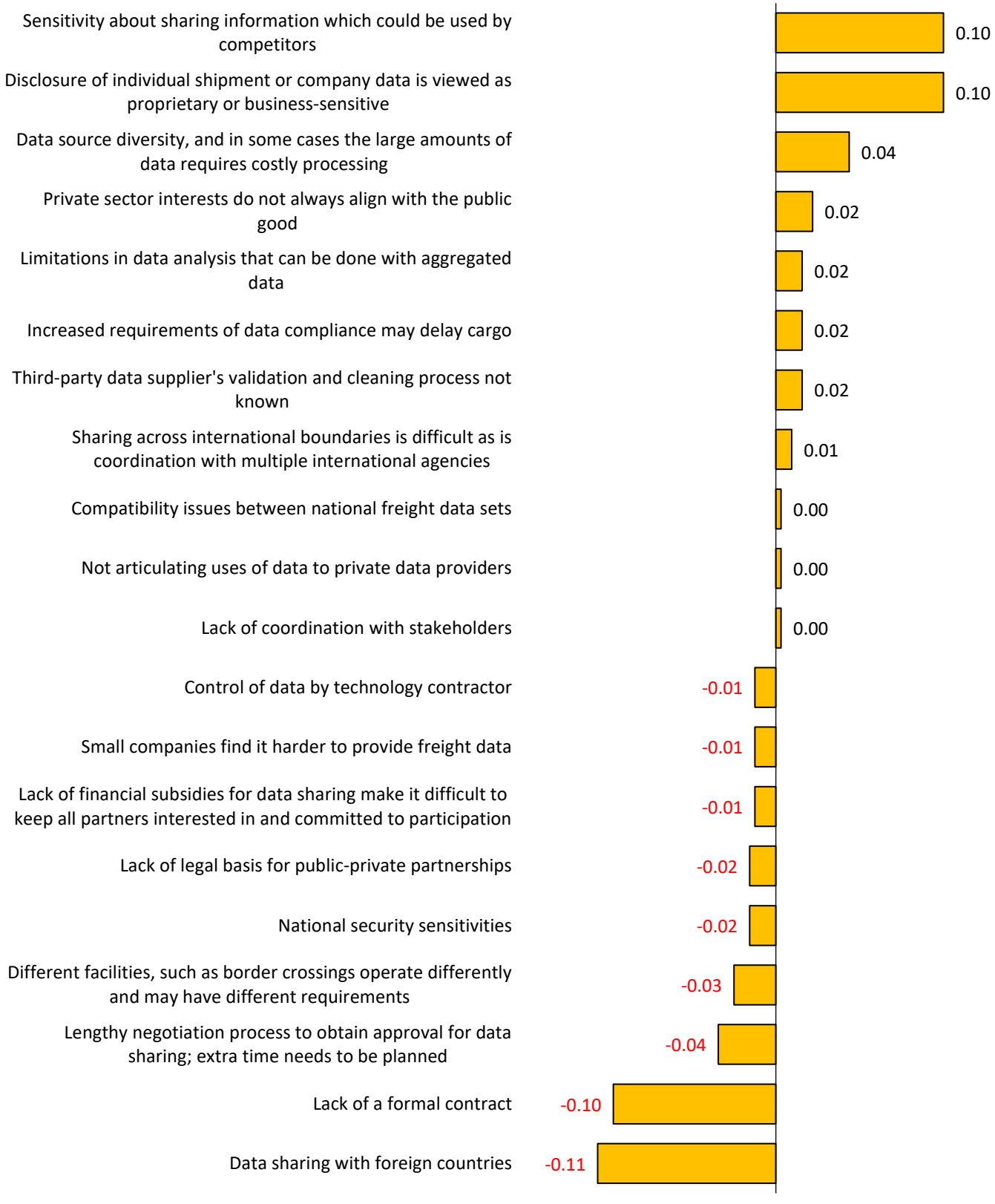

Sensitivity about sharing information which could be used by competitors
0.10
Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive
0.10
Data source diversity, and in some cases the large amounts of data requires costly processing
0.04
Private sector interests do not always align with the public good
0.02
Limitations in data analysis that can be done with aggregated data
0.02
Increased requirements of data compliance may delay cargo
0.02
Third-party data supplier's validation and cleaning process not known
0.02
Sharing across international boundaries is difficult as is coordination with multiple international agencies
0.01
Compatibility issues between national freight data sets
0.00
Not articulating uses of data to private data providers
0.00
Lack of coordination with stakeholders
0.00
Control of data by technology contractor
-0.01
Small companies find it harder to provide freight data
-0.01
Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to participation
-0.01
Lack of legal basis for public-private partnerships
-0.02
National security sensitivities
-0.02
Different facilities, such as border crossings operate differently and may have different requirements
-0.03
Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned
-0.04
Lack of a formal contract
-0.10
Data sharing with foreign countries
-0.11

Figure 4-27. Best-Worst Scores for Carriers (n=70)

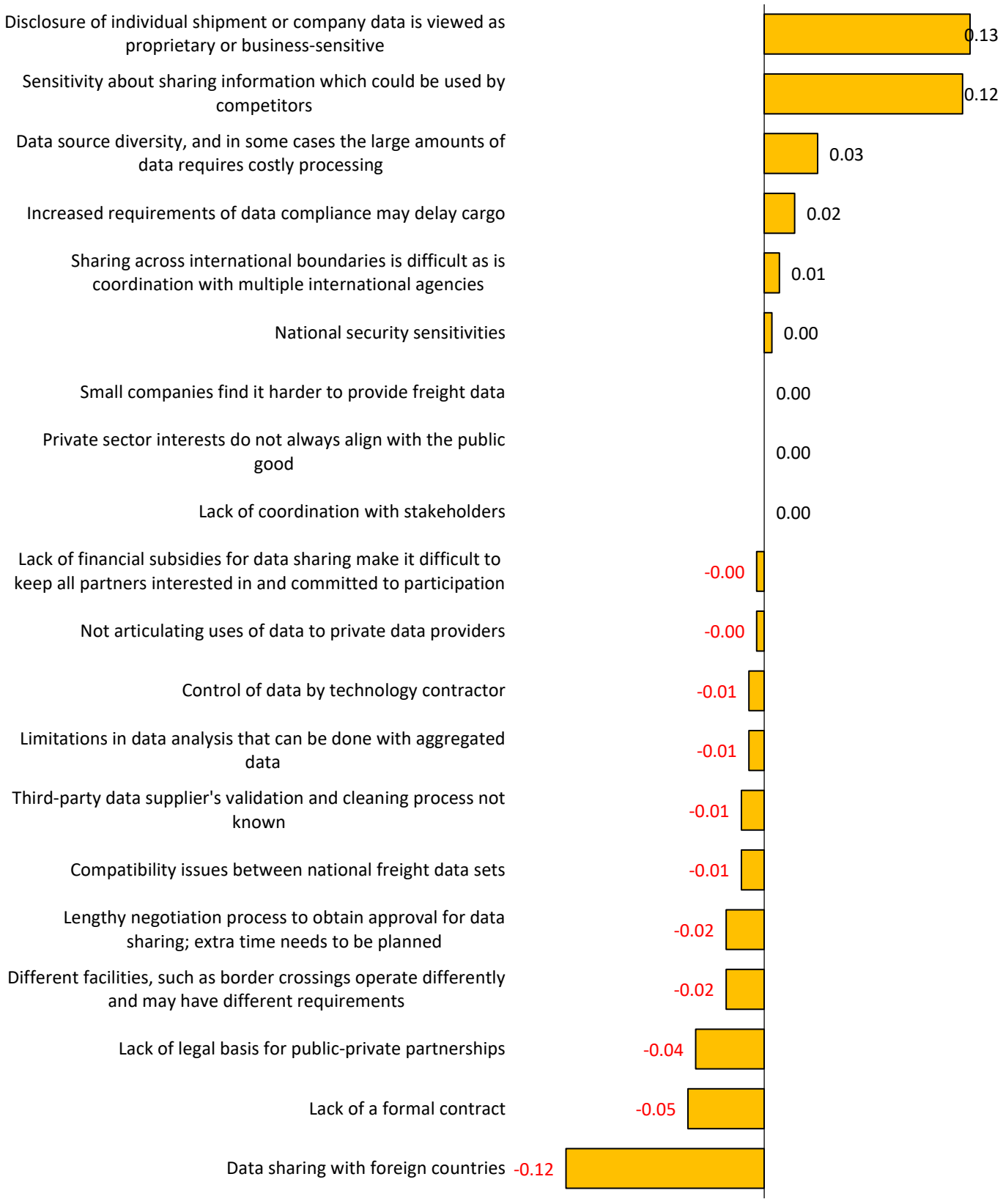

Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive
0.13
Sensitivity about sharing information which could be used by competitors
0.12
Data source diversity, and in some cases the large amounts of data requires costly processing
0.03
Increased requirements of data compliance may delay cargo
0.02
Sharing across international boundaries is difficult as is coordination with multiple international agencies
0.01
National security sensitivities
0.00
Small companies find it harder to provide freight data
0.00
Private sector interests do not always align with the public good
0.00
Lack of coordination with stakeholders
0.00
Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to participation
-0.00
Not articulating uses of data to private data providers
-0.00
Control of data by technology contractor
-0.01
Limitations in data analysis that can be done with aggregated data
-0.01
Third-party data supplier's validation and cleaning process not known
-0.01
Compatibility issues between national freight data sets
-0.01
Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned
-0.02
Different facilities, such as border crossings operate differently and may have different requirements
-0.02
Lack of legal basis for public-private partnerships
-0.04
Lack of a formal contract
-0.05
Data sharing with foreign countries
-0.12

Figure 4-28. Best-Worst Scores for Small Business Entities (n=67)

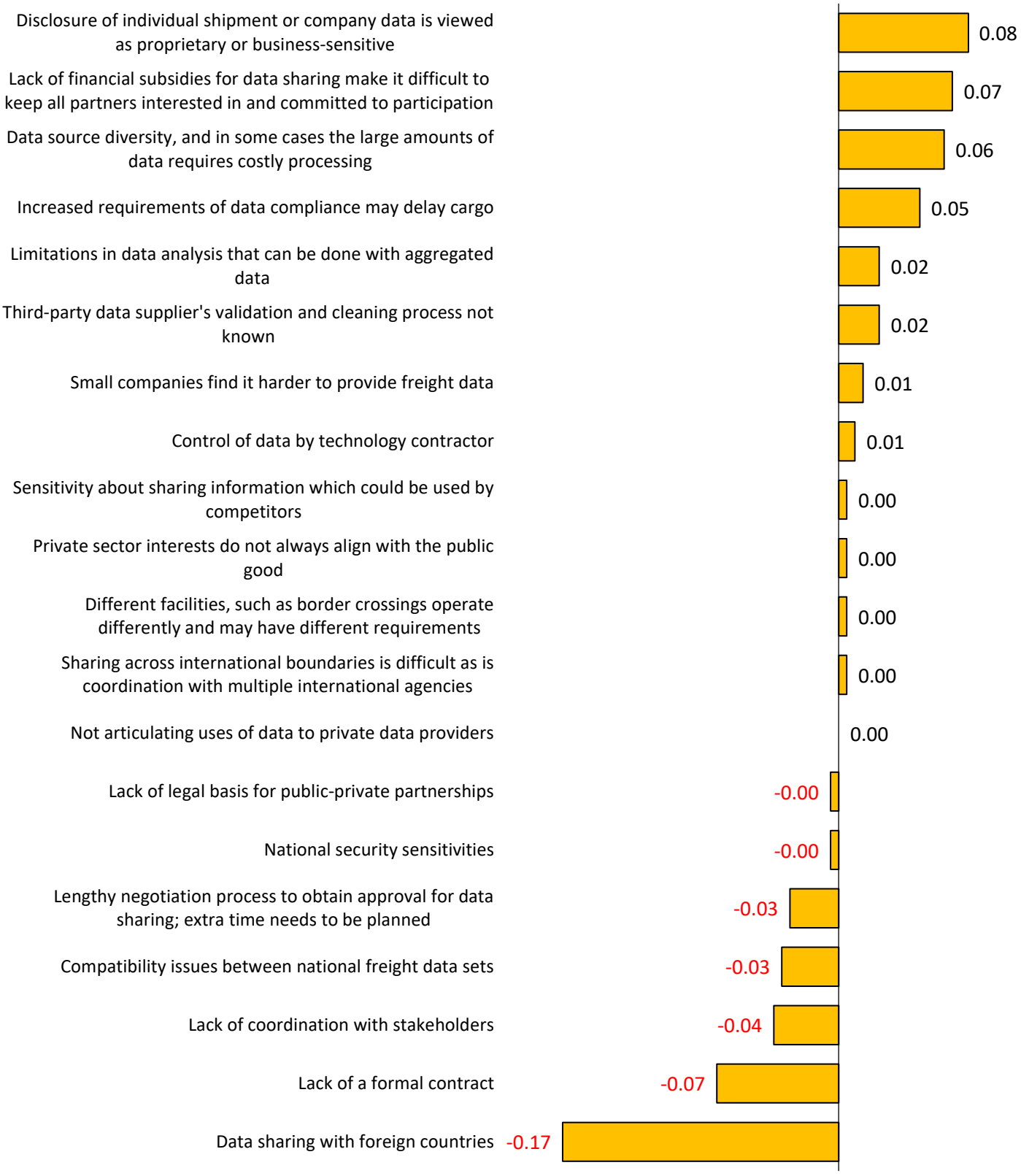

Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive
0.08
Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to participation
0.07
Data source diversity, and in some cases the large amounts of data requires costly processing
0.06
Increased requirements of data compliance may delay cargo
0.05
Limitations in data analysis that can be done with aggregated data
0.02
Third-party data supplier's validation and cleaning process not known
0.02
Small companies find it harder to provide freight data
0.01
Control of data by technology contractor
0.01
Sensitivity about sharing information which could be used by competitors
0.00
Private sector interests do not always align with the public good
0.00
Different facilities, such as border crossings operate differently and may have different requirements
0.00
Sharing across international boundaries is difficult as is coordination with multiple international agencies
0.00
Not articulating uses of data to private data providers
0.00
Lack of legal basis for public-private partnerships
-0.00
National security sensitivities
-0.00
Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned
-0.03
Compatibility issues between national freight data sets
-0.03
Lack of coordination with stakeholders
-0.04
Lack of a formal contract
-0.07
Data sharing with foreign countries
-0.17

Figure 4-29. Best-Worst Scores for Medium Business Entities (n=37)

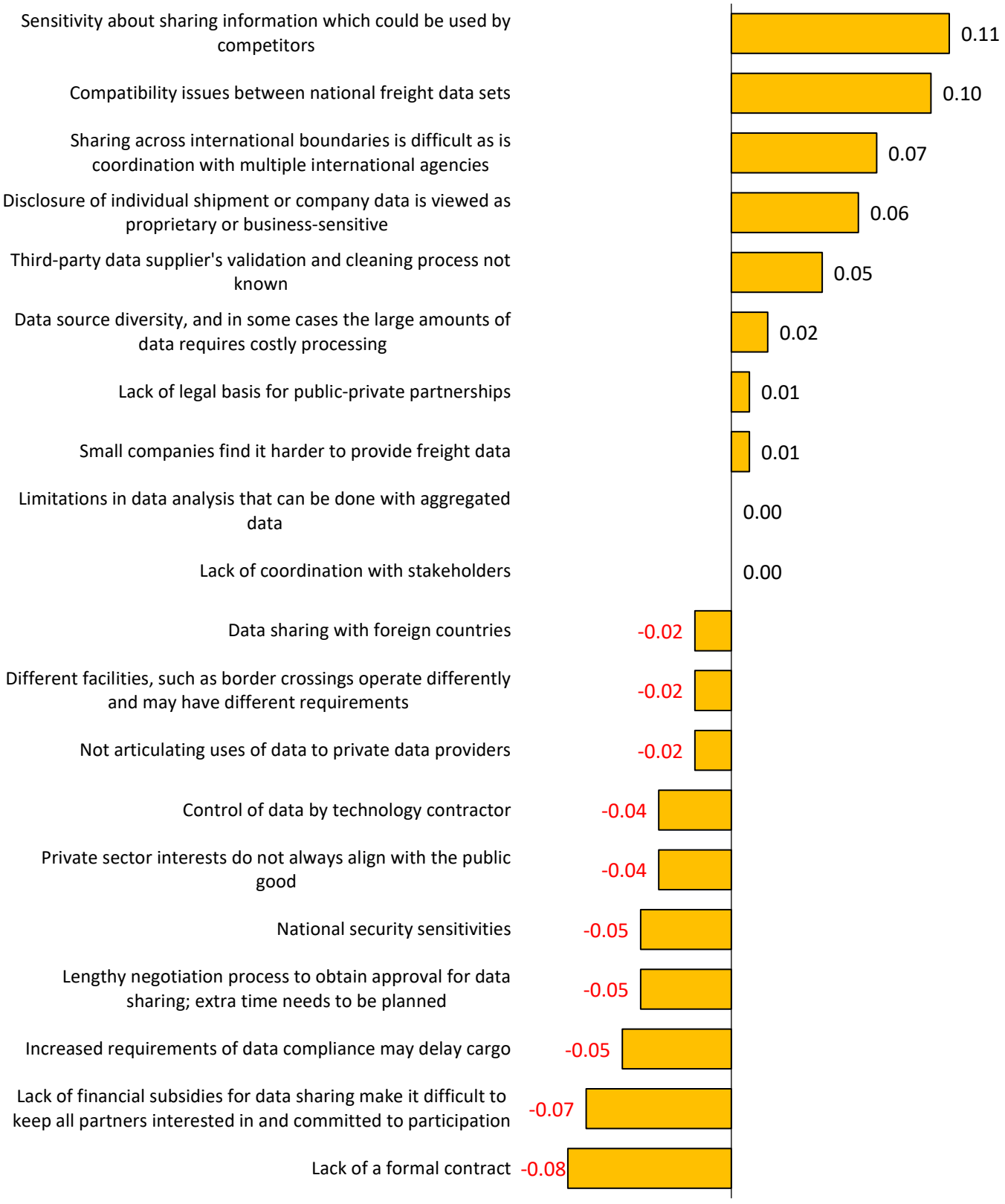

Sensitivity about sharing information which could be used by competitors
0.11
Compatibility issues between national freight data sets
0.10
Sharing across international boundaries is difficult as is coordination with multiple international agencies
0.07
Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive
0.06
Third-party data supplier's validation and cleaning process not known
0.05
Data source diversity, and in some cases the large amounts of data requires costly processing
0.02
Lack of legal basis for public-private partnerships
0.01
Small companies find it harder to provide freight data
0.01
Limitations in data analysis that can be done with aggregated data
0.00
Lack of coordination with stakeholders
0.00
Data sharing with foreign countries
-0.02
Different facilities, such as border crossings operate differently and may have different requirements
-0.02
Not articulating uses of data to private data providers
-0.02
Control of data by technology contractor
-0.04
Private sector interests do not always align with the public good
-0.04
National security sensitivities
-0.05
Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned
-0.05
Increased requirements of data compliance may delay cargo
-0.05
Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to participation
-0.07
Lack of a formal contract
-0.08

Figure 4-30. Best-Worst Scores for Large Business Entities (n=25)

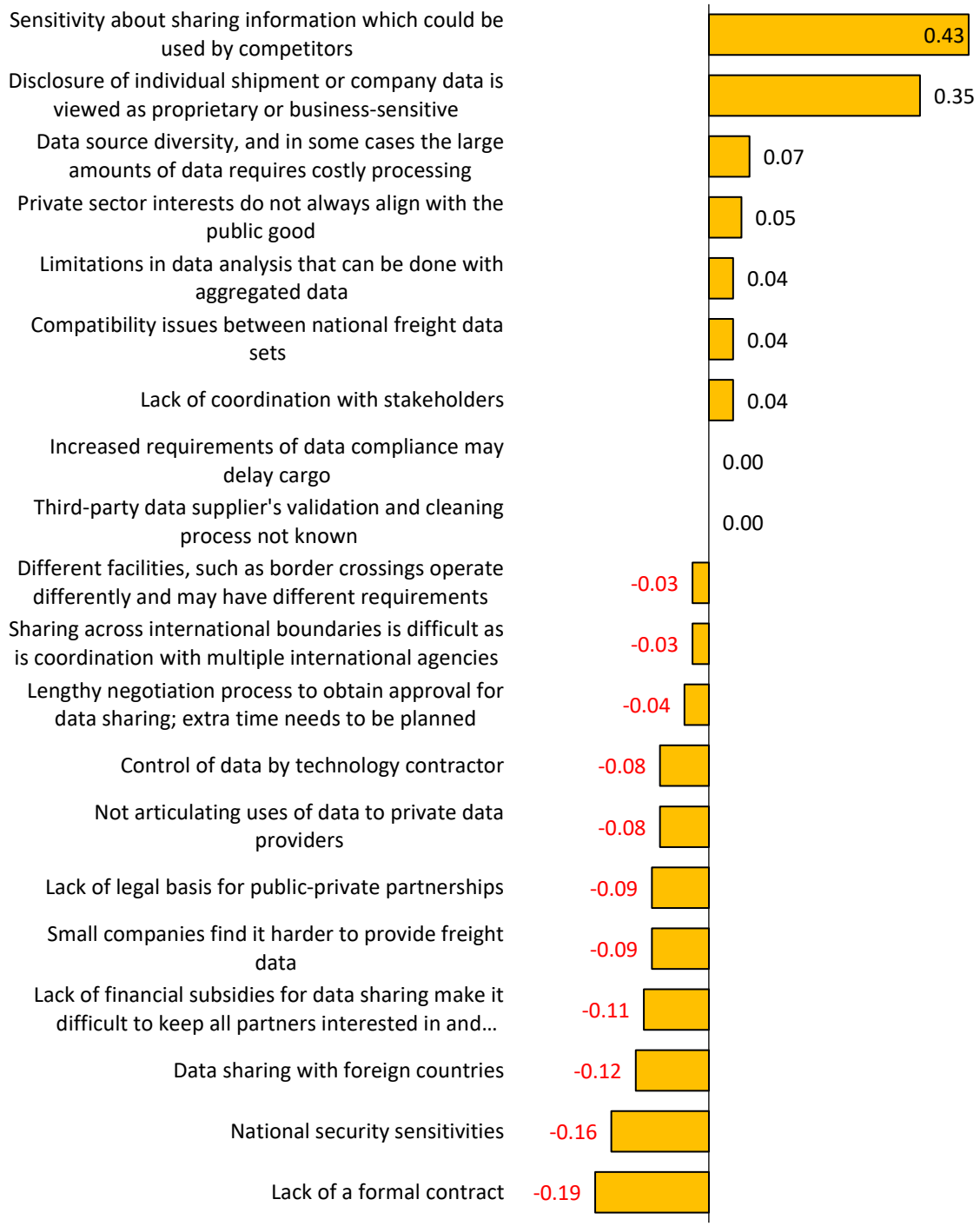
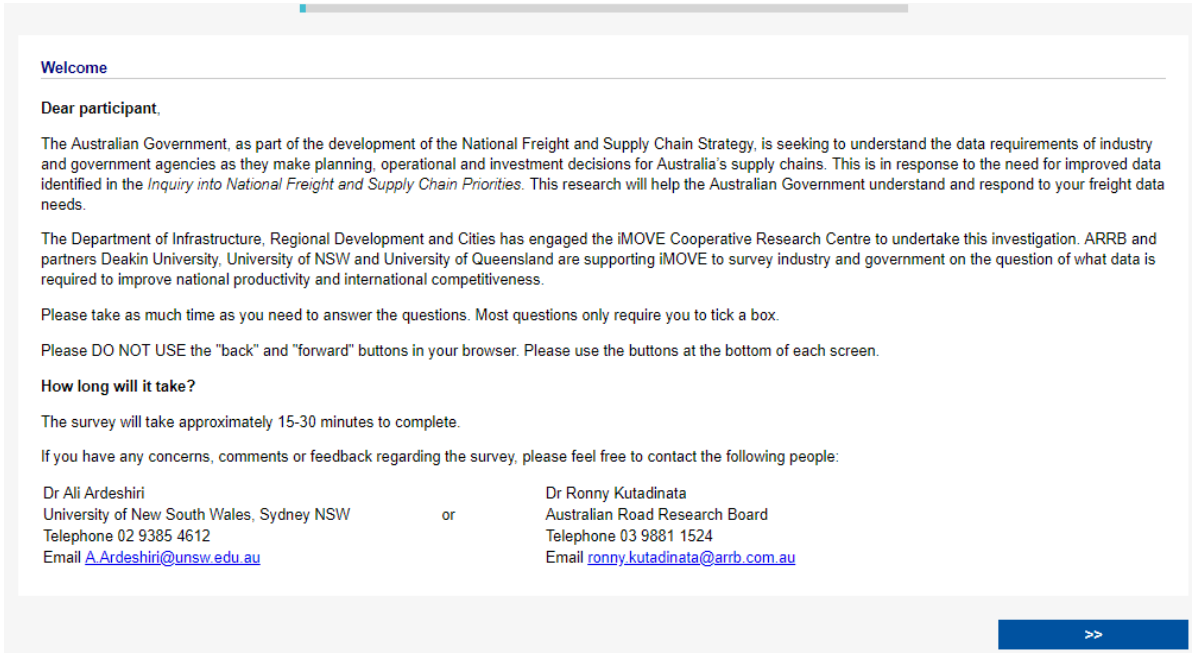


Figure 4-31. Best-Worst Scores for Industry Association (n=10)

Appendix C. Survey instrument



Welcome

Dear participant,

The Australian Government, as part of the development of the National Freight and Supply Chain Strategy, is seeking to understand the data requirements of industry and government agencies as they make planning, operational and investment decisions for Australia's supply chains. This is in response to the need for improved data identified in the *Inquiry into National Freight and Supply Chain Priorities*. This research will help the Australian Government understand and respond to your freight data needs.

The Department of Infrastructure, Regional Development and Cities has engaged the iMOVE Cooperative Research Centre to undertake this investigation. ARRB and partners Deakin University, University of NSW and University of Queensland are supporting iMOVE to survey industry and government on the question of what data is required to improve national productivity and international competitiveness.

Please take as much time as you need to answer the questions. Most questions only require you to tick a box.

Please DO NOT USE the "back" and "forward" buttons in your browser. Please use the buttons at the bottom of each screen.

How long will it take?

The survey will take approximately 15-30 minutes to complete.

If you have any concerns, comments or feedback regarding the survey, please feel free to contact the following people:

Dr Ali Ardeshiri
University of New South Wales, Sydney NSW
Telephone 02 9385 4612
Email A.Ardeshiri@unsw.edu.au

or

Dr Ronny Kutadinata
Australian Road Research Board
Telephone 03 9881 1524
Email ronny.kutadinata@arrb.com.au

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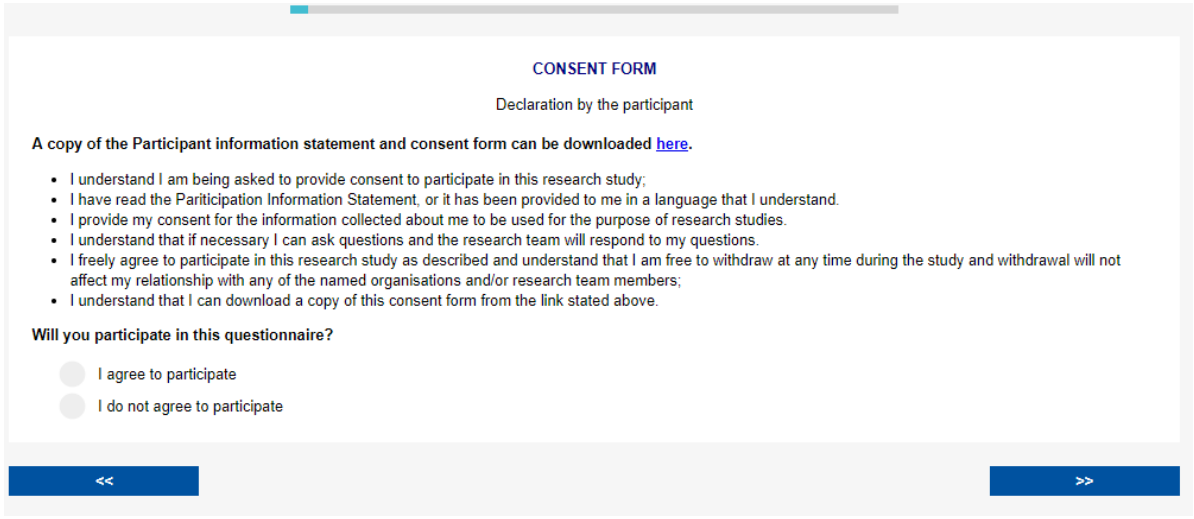


CONSENT FORM

Declaration by the participant

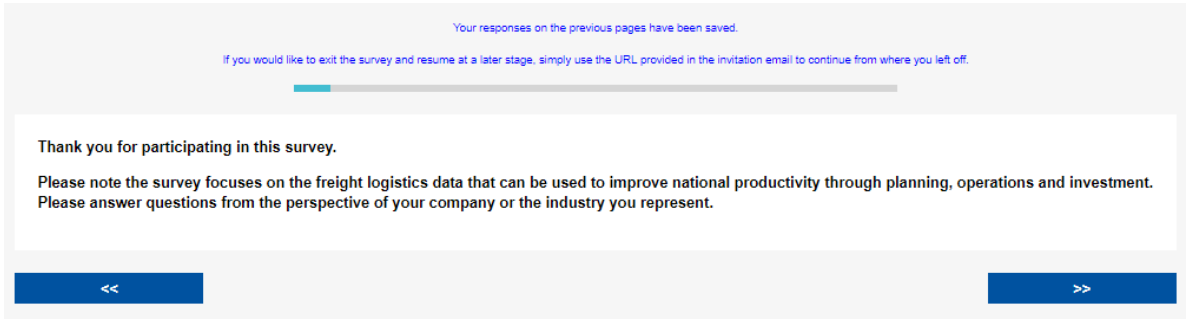
A copy of the Participant information statement and consent form can be downloaded here.

- I understand I am being asked to provide consent to participate in this research study;
- I have read the Paritication Information Statement, or it has been provided to me in a language that I understand.
- I provide my consent for the information collected about me to be used for the purpose of research studies.
- I understand that if necessary I can ask questions and the research team will respond to my questions.
- I freely agree to participate in this research study as described and understand that I am free to withdraw at any time during the study and withdrawal will not affect my relationship with any of the named organisations and/or research team members;
- I understand that I can download a copy of this consent form from the link stated above.

Will you participate in this questionnaire?

I agree to participate
I do not agree to participate

<< >>



Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Thank you for participating in this survey.

Please note the survey focuses on the freight logistics data that can be used to improve national productivity through planning, operations and investment. Please answer questions from the perspective of your company or the industry you represent.

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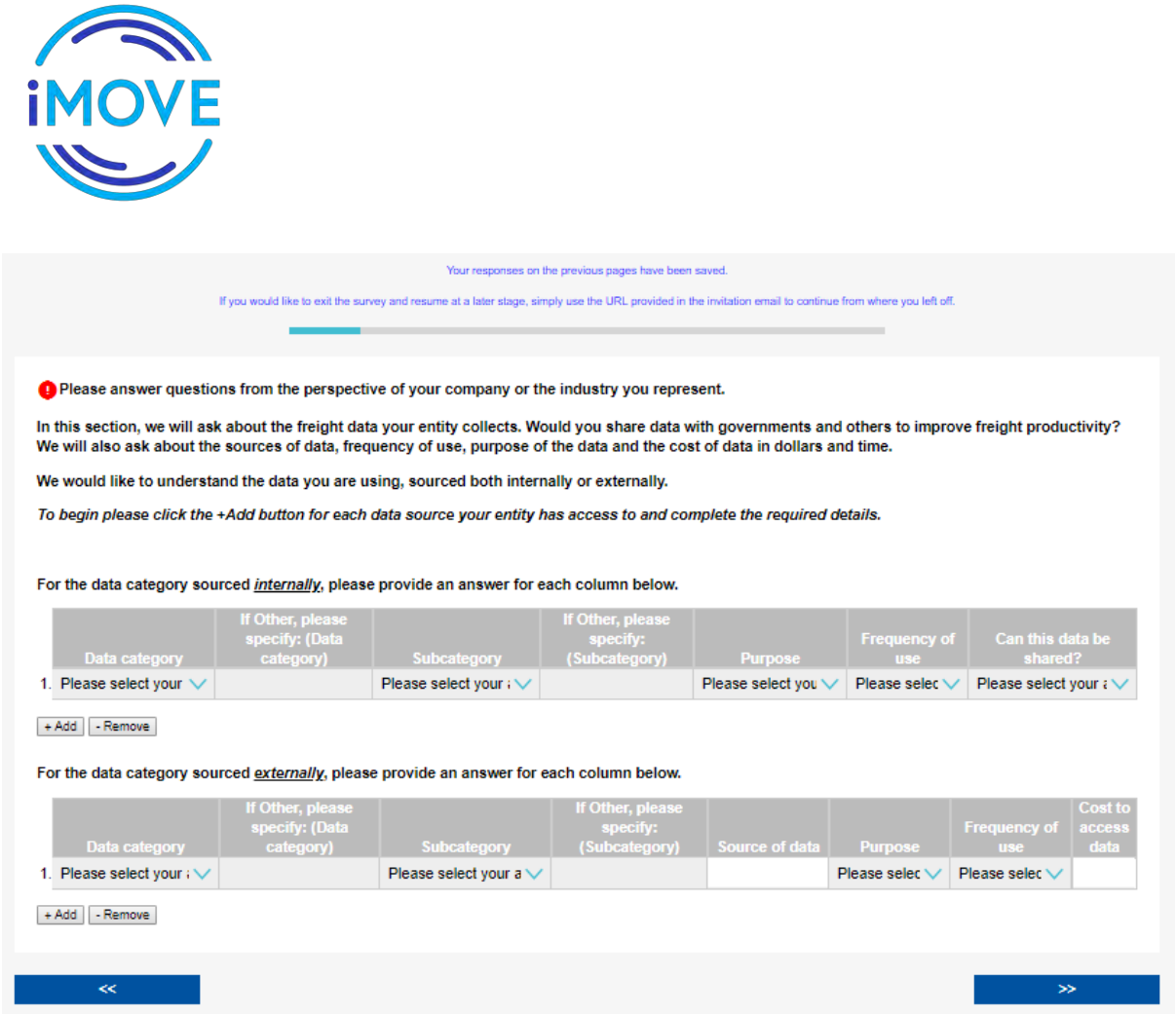
Your responses on the previous pages have been saved.
If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.
Please answer questions from the perspective of your company or the industry you represent.
In this section, we will ask about the freight data your entity collects. Would you share data with governments and others to improve freight productivity? We will also ask about the sources of data, frequency of use, purpose of the data and the cost of data in dollars and time.
We would like to understand the data you are using, sourced both internally or externally.
To begin please click the +Add button for each data source your entity has access to and complete the required details.
For the data category sourced internally, please provide an answer for each column below.
Data category
If Other, please specify: (Data category)
Subcategory
If Other, please specify: (Subcategory)
Purpose
Frequency of use
Can this data be shared?
1. Please select your
Please select your
Please select you
Please selec
Please select your
+ Add
- Remove
For the data category sourced externally, please provide an answer for each column below.
Data category
If Other, please specify: (Data category)
Subcategory
If Other, please specify: (Subcategory)
Source of data
Purpose
Frequency of use
Cost to access data
1. Please select your
Please select your a
Please selec
Please selec
+ Add
- Remove
<<
>>
Your responses on the previous pages have been saved.
If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.
Please answer questions from the perspective of your company or the industry you represent.
What sort of entity are you responding on behalf of?
Small business entity: Less than $10 million turnover
Medium business entity: Between $10m and $250 million turnover
Large business entity: Greater than $250 million turnover
Industry Association responding on an industry basis
Other (please sepcify:)
<<
>>

Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Please answer questions from the perspective of your company or the industry you represent.

Please select which industry classification(s) best applies to your entity:
Select all that apply.

	Shipper	Receiver	Service provider	Transportation / logistics firms (carrier)	Other (please specify:)
Accommodation and food services					
Administrative and support, waste management and remediation services					
Agriculture, forestry, fishing and hunting					
Arts, entertainment and recreation					
Construction					
Educational services					
Finance and insurance					
Health care and social assistance					
Information and cultural industries					
Management of companies and enterprises					
Manufacturing					
Mining, quarrying and oil and gas extraction					
Professional, scientific and technical services					
Public administration					
Real estate and rental and leasing					
Retail trade					
Transport - Road transport (i.e. road freight transport)					
Transport - Postal and Courier pick-up and delivery services					
Transport - Maritime transport (e.g. water freight transport)					
Transport - Aviation transport					
Transport - Rail transport					
Transport - Transport support services (e.g. freight forwarding, customs agency services, stevedoring services, port operations)					
Transport - Logistics-warehousing and storage services					
Utilities					
Wholesale trade					
Other services (except public administration)					

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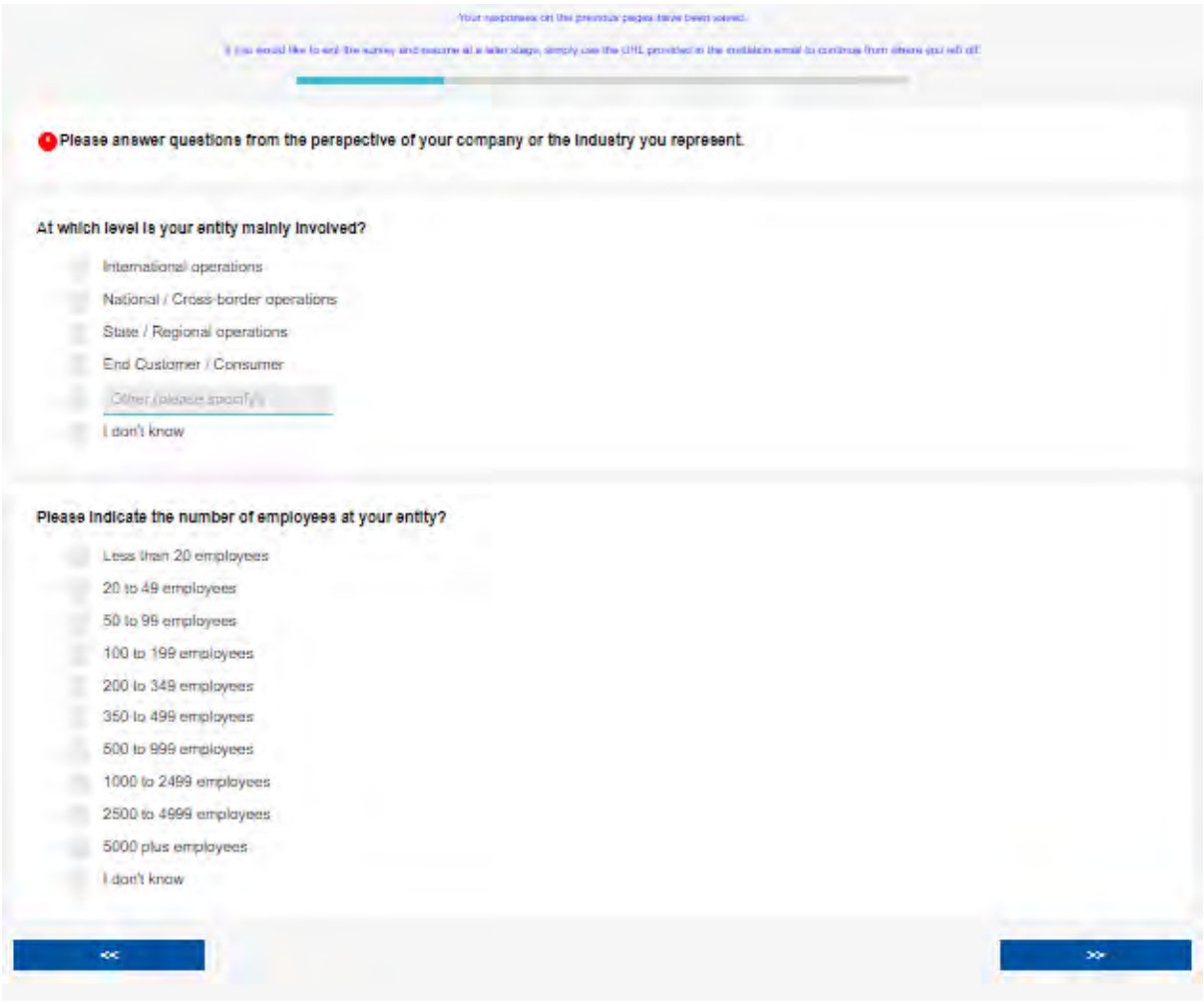
Your responses on the previous pages have been saved.
If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.
Please answer questions from the perspective of your company or the industry you represent.
At which level is your entity mainly involved?
International operations
National / Cross-border operations
State / Regional operations
End Customer / Consumer
Other (please specify)
I don't know
Please indicate the number of employees at your entity?
Less than 20 employees
20 to 49 employees
50 to 99 employees
100 to 199 employees
200 to 349 employees
350 to 499 employees
500 to 999 employees
1000 to 2499 employees
2500 to 4999 employees
5000 plus employees
I don't know
<<
>>

Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Please answer questions from the perspective of your company or the industry you represent.

Which range best matches your entity's annual turnover before tax?

- Zero to less than $50,000
- $50,000 to less than $200,000
- $200,000 to less than $2 million
- $2 million to less than $5 million
- $5 million to less than $10 million
- I don't know

What is the primary type of cargo your entity is involved with?

- Parcel
- Carton
- Pallet
- Container
- Dry bulk
- Break bulk
- Liquid bulk
- Other (Please specify:)
- I don't know

What is the second main type of cargo your entity is involved with?

- Carton
- Pallet
- Container
- Dry bulk
- Break bulk
- Liquid bulk
- Other (Please specify:)
- Not involved with any other type of cargo

Please specify which commodity groups you work with?
Select all that apply.

- Agricultural Commodities
- Automotive
- Coal
- Construction Materials
- Consumer Goods
- Forestry
- Fuel
- Manufactured goods
- Metro Containers
- Minerals
- Oil Seeds
- Steel
- Waste
- Other (please specify:)
- I don't know

What is the average annual volume of cargo your entity deals with (either directly or indirectly)?

Quantity	Unit
	Please select your answer

Which mode of transport does your entity use to move the cargo (either directly or indirectly)?

Select all that apply.

- [ ] Highway/Road
- [ ] Rail
- [ ] Marine/Water
- [ ] Air
- [ ] Other (please specify:)
- ( ) I don't know

How often does your entity transport goods via these modes?

	Less than once per month	Once per week	Once per day	Between 2 and 10 times a day	Between 10 and 50 times per day	More than 50 times per day	I don't know
Highway/Road	( )	( )	( )	( )	( )	( )	( )
Rail	( )	( )	( )	( )	( )	( )	( )
Marine/Water	( )	( )	( )	( )	( )	( )	( )
Air	( )	( )	( )	( )	( )	( )	( )

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Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

As part of this study we will be seeking to make actionable recommendations to government about which metrics are best suited to improving national productivity and international competitiveness. We need to find the most effective and repeatable metrics which come at lowest cost in terms of your time and labour.

We have provided several propositions to frame the contexts of your response to this section. While we believe these examples are central to national success they are not meant to be comprehensive. Please read the propositions and select all that are relevant or of interest to you and your industry.

- [ ] **Proposition One – Bulk Commodities**
  Australia's significant supply chains carry bulk commodities, particularly iron ore, coal and LNG. While they are already among the world's most productive it is in our national interest to protect and enhance them. Learning about their best practise productivity metrics, capital allocations, service standards and regulatory environments may provide a framework to improve the national productivity as a whole.
- [ ] **Proposition Two – Non-Express Domestic Forwarding (FTL, LTL, Rail, Sea)**
  This is another significant logistics component in Australia, encompassing various modes of transport including road, rail, and sea, as well as both FTL and LTL. The efficiency of our linehaul journeys is a direct contributor to national productivity and, hence, framing the most fit for purpose metrics is vital.
- [ ] **Proposition Three – Import Containers and National Gateways**
  Australia is a significant importer of containerised goods and our container ports are our national gateways. The more cheaply and reliably we can import and export goods the more productive our economy will be. We need to consider the most effective metrics to drive national productivity improvements taking into account the stevedoring component as well as transport within the port and road and rail land-side transport outside the port to the consignee.
- [ ] **Proposition Four – Agricultural Goods (peak and trough, drought and bumper crops)**
  Agricultural exports have been important to Australia for more than two centuries. Competing on a global basis means our farm goods must get to market reliably while retaining their high quality.
- [ ] **Proposition Five – Express, E-Commerce, Urban First and Last Mile Deliveries**
  This is the fastest growing part of the logistics sector especially as a result e-commerce sales. The big challenges are time and reliability of delivery as well as cost. The national productivity challenge here is to find metrics that can lead to increased efficiency in congested areas, tight timeframes, problems such as access to loading zones and against a backdrop of too many failed deliveries.
- [ ] **Proposition Six – Land Planning and Corridor Protection**
  Efficient supply chains require seamless networks and sites where goods can be consolidated and separated out cheaply, reliably and quickly. A real focus on supply chain needs by planners and policy makers across governments is necessary to improve productivity. Access to appropriately zoned land at key transport nexus points is vital. Similarly, freight corridors of all modes and their entry and exit points should be protected from encroachment to ensure that safe high productivity transport can easily be used.
- ( ) None of the above

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Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Based on your answers to the previous question, please select which propositions the data is relevant to.

External data sources

Select all that apply.

Hover your cursor over each proposition for more details.

	Proposition 1 - Bulk Commodities	Proposition 2 - Non-Express Domestic Forwarding	Proposition 3 - Import Containers and National Gateways	Proposition 4 - Agricultural Goods	Proposition 5 - Express, E-commerce, Urban First and Last Mile Deliveries	Proposition 6 - Land Planning and Corridor Protection	N/A
Competitiveness | Timestamp	☐	☐	☐	☐	☐	☐	○

<< >>

Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Are there any gaps in the currently available data sources required for your entity?

- ○ Yes
- ○ No

<< >>

Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

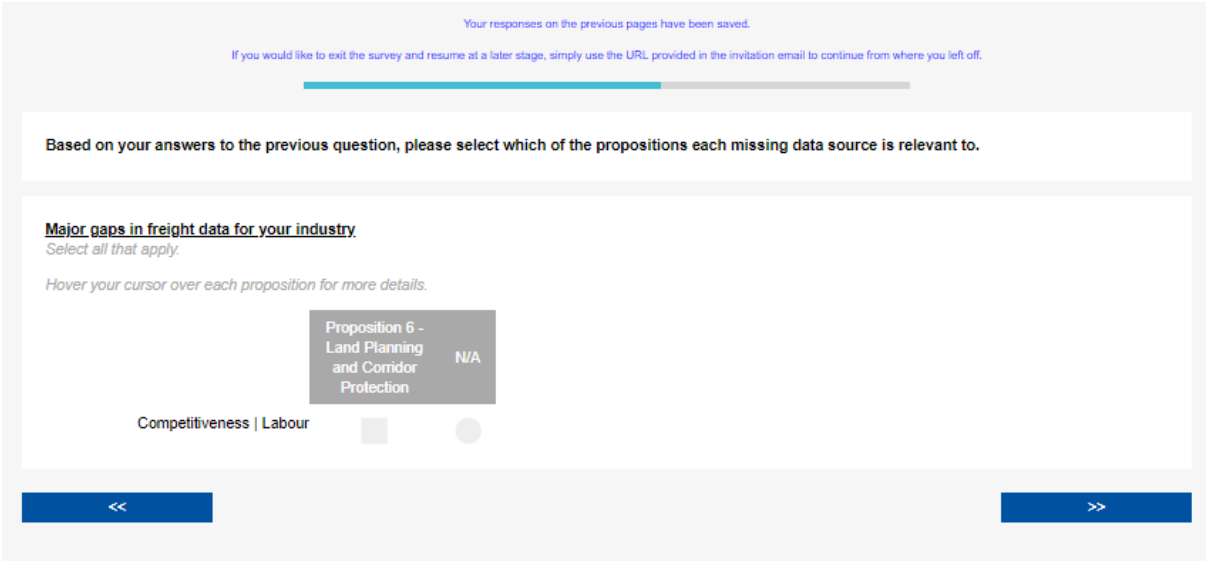
What are the major gaps in freight data to support any "Planning", "Operational" or "Investment" decisions in your industry?

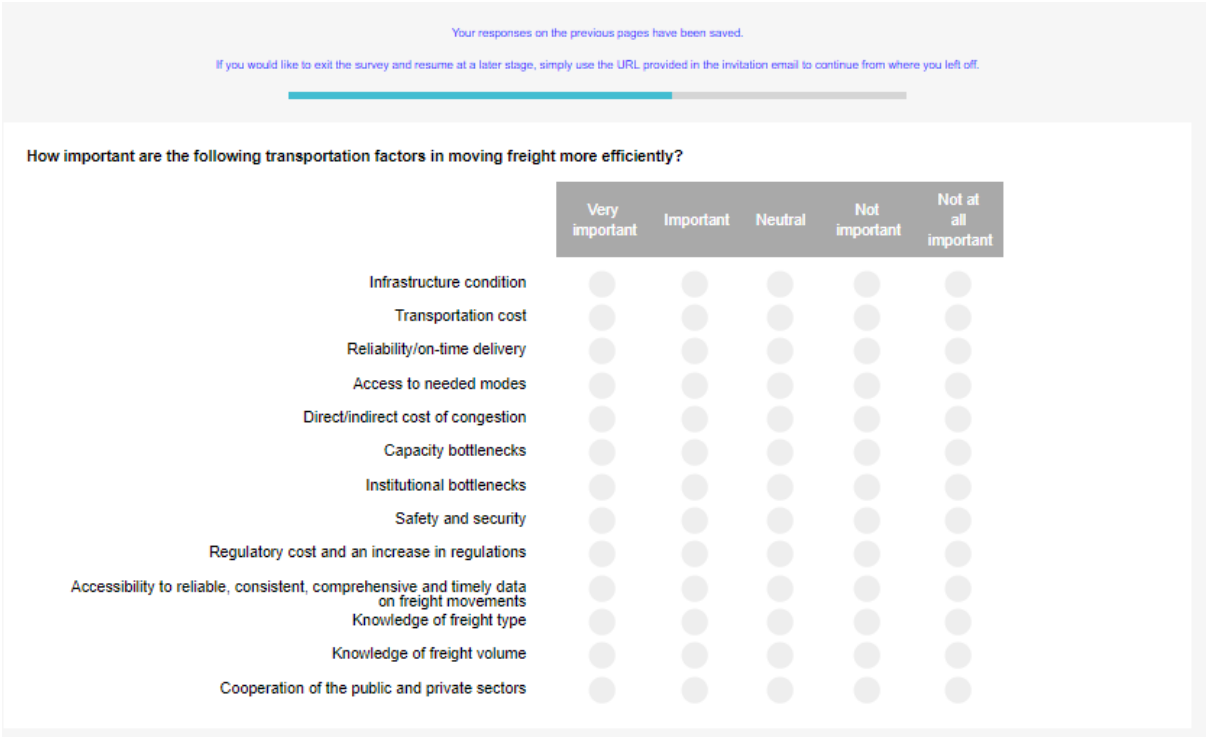
To begin please click the +Add button and specify where you believe the major gaps in freight data are and which area it can support.

	Data category	If Other, please specify: (Data category)	Subcategory	If Other, please specify: (Subcategory)	Purpose of the data
1.	Please select your answer		Please select your answer		Please select your a

+ Add - Remove

<< >>


Your responses on the previous pages have been saved.
If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.
Based on your answers to the previous question, please select which of the propositions each missing data source is relevant to.
Major gaps in freight data for your industry
Select all that apply.
Hover your cursor over each proposition for more details.
Proposition 6 - Land Planning and Corridor Protection
N/A
Competitiveness | Labour
<<
>>


Your responses on the previous pages have been saved.
If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.
How important are the following transportation factors in moving freight more efficiently?
Very important
Important
Neutral
Not important
Not at all important
Infrastructure condition
Transportation cost
Reliability/on-time delivery
Access to needed modes
Direct/indirect cost of congestion
Capacity bottlenecks
Institutional bottlenecks
Safety and security
Regulatory cost and an increase in regulations
Accessibility to reliable, consistent, comprehensive and timely data on freight movements
Knowledge of freight type
Knowledge of freight volume
Cooperation of the public and private sectors

In your opinion, which of the following items is the most important barrier and challenge for freight data sharing?

- **Legal Barriers**: barriers related to legal and contractual issues
- **Resource Barriers**: barriers related to lack of time, financial, and human resources
- **Competition Barriers**: barriers related to sensitive data and competitors
- **Institutional Barriers**: barriers related to data governance
- **Coordination Barriers**: barriers related to consistencies and lack of cooperation
- Other (please specify:)

<< >>

Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Instructions

In this section you will be shown six (6) different scenarios similar to the example set below. Each scenario will present factors that can be considered as a barrier for your entity to share freight data. Please select your most important and least important factor in each scenario presented. While this will seem repetitive it is an important element of this questionnaire.

EXAMPLE TASK

Please select the *most important* and *least important* factor that you consider as a barier to sharing freight data.

Most important	Factors	Least important
	Funding uncertainties make it difficult to keep all partners interested in and committed to participation	
●	Different facilities, such as border crossings operate differently so may have different requirements	
	Lack of coordination with stakeholders	
	Increased security data requirements may delay cargo	
	Disclosure of individual shipment or company data viewed as proprietary or business-sensitive	
	Control of data by technology contractor	
	Limitations in data analysis that can be done with aggregated data	
	Sharing across international boundaries are more difficult as is coordination with multiple international agencies	●
	Private sector interests sometimes interfere with the public good	
	National security sensitivities	

<< >>

Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Task 1 of 6

Please select the *most important* and *least important* factor that you consider as a barrier to sharing freight data.

Most important	Factors	Least important
○	Control of data by technology contractor	○
○	Increased requirements of data compliance may delay cargo	○
○	Different facilities, such as border crossings operate differently and may have different requirements	○
○	Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to participation	○
○	Private sector interests do not always align with the public good	○
○	National security sensitivities	○
○	Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive	○
○	Limitations in data analysis that can be done with aggregated data	○
○	Lack of coordination with stakeholders	○
○	Sharing across international boundaries is difficult as is coordination with multiple international agencies	○

<< >>

Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Task 2 of 6

Please select the *most important* and *least important* factor that you consider as a barrier to sharing freight data.

Most important	Factors	Least important
○	Compatibility issues between national freight data sets	○
○	Control of data by technology contractor	○
○	Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to participation	○
○	Third-party data supplier's validation and cleaning process not known	○
○	Data source diversity, and in some cases the large amounts of data requires costly processing	○
○	Lack of a formal contract	○
○	Lack of coordination with stakeholders	○
○	Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive	○
○	Private sector interests do not always align with the public good	○
○	Data sharing with foreign countries	○

<< >>

Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Task 3 of 6

Please select the *most important* and *least important* factor that you consider as a barrier to sharing freight data.

Most important	Factors	Least important
	Third-party data supplier's validation and cleaning process not known	
	Increased requirements of data compliance may delay cargo	
	Compatibility issues between national freight data sets	
	Lack of a formal contract	
	Data sharing with foreign countries	
	National security sensitivities	
	Limitations in data analysis that can be done with aggregated data	
	Sharing across international boundaries is difficult as is coordination with multiple international agencies	
	Data source diversity, and in some cases the large amounts of data requires costly processing	
	Different facilities, such as border crossings operate differently and may have different requirements	

<< >>

Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Task 4 of 6

Please select the *most important* and *least important* factor that you consider as a barrier to sharing freight data.

Most important	Factors	Least important
	Lack of legal basis for public-private partnerships	
	Data source diversity, and in some cases the large amounts of data requires costly processing	
	Third-party data supplier's validation and cleaning process not known	
	Not articulating uses of data to private data providers	
	Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned	
	Small companies find it harder to provide freight data	
	Sensitivity about sharing information which could be used by competitors	
	Data sharing with foreign countries	
	Compatibility issues between national freight data sets	
	Lack of a formal contract	

<< >>

Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Task 5 of 6

Please select the *most important* and *least important* factor that you consider as a barrier to sharing freight data.

Most important	Factors	Least important
	Sharing across international boundaries is difficult as is coordination with multiple international agencies	
	Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned	
	Not articulating uses of data to private data providers	
	National security sensitivities	
	Different facilities, such as border crossings operate differently and may have different requirements	
	Limitations in data analysis that can be done with aggregated data	
	Small companies find it harder to provide freight data	
	Increased requirements of data compliance may delay cargo	
	Lack of legal basis for public-private partnerships	
	Sensitivity about sharing information which could be used by competitors	

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Your responses on the previous pages have been saved.

If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.

Task 6 of 6

Please select the *most important* and *least important* factor that you consider as a barrier to sharing freight data.

Most important	Factors	Least important
	Small companies find it harder to provide freight data	
	Not articulating uses of data to private data providers	
	Disclosure of individual shipment or company data is viewed as proprietary or business-sensitive	
	Lack of coordination with stakeholders	
	Lack of financial subsidies for data sharing make it difficult to keep all partners interested in and committed to participation	
	Lack of legal basis for public-private partnerships	
	Sensitivity about sharing information which could be used by competitors	
	Control of data by technology contractor	
	Private sector interests do not always align with the public good	
	Lengthy negotiation process to obtain approval for data sharing; extra time needs to be planned	

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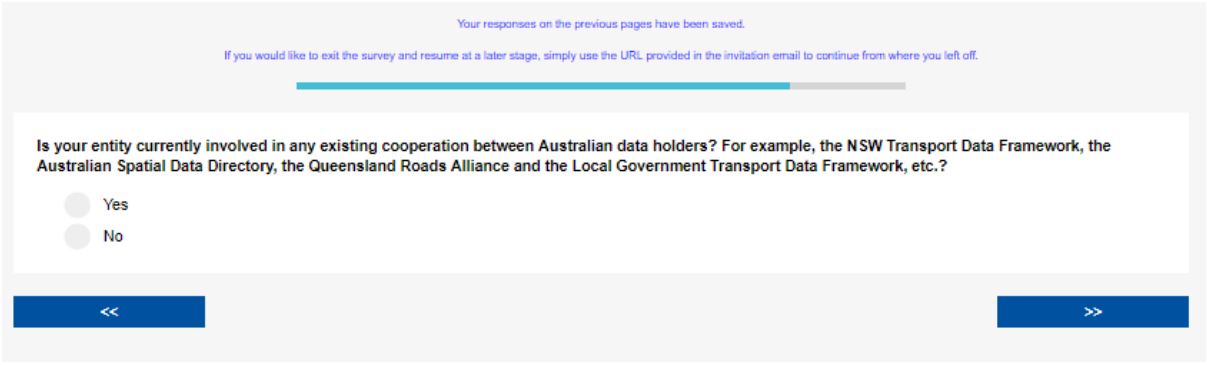
Your responses on the previous pages have been saved.
If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.
Is your entity currently involved in any existing cooperation between Australian data holders? For example, the NSW Transport Data Framework, the Australian Spatial Data Directory, the Queensland Roads Alliance and the Local Government Transport Data Framework, etc.?
Yes
No
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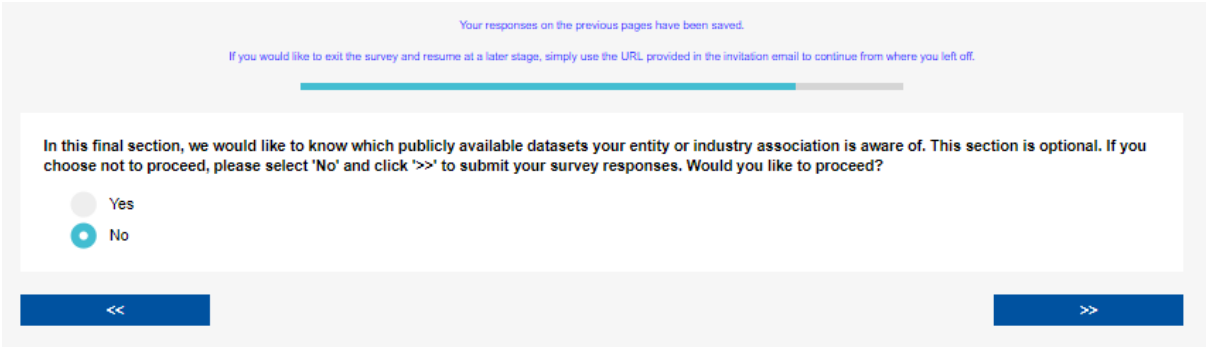
Your responses on the previous pages have been saved.
If you would like to exit the survey and resume at a later stage, simply use the URL provided in the invitation email to continue from where you left off.
In this final section, we would like to know which publicly available datasets your entity or industry association is aware of. This section is optional. If you choose not to proceed, please select 'No' and click '>>' to submit your survey responses. Would you like to proceed?
Yes
No
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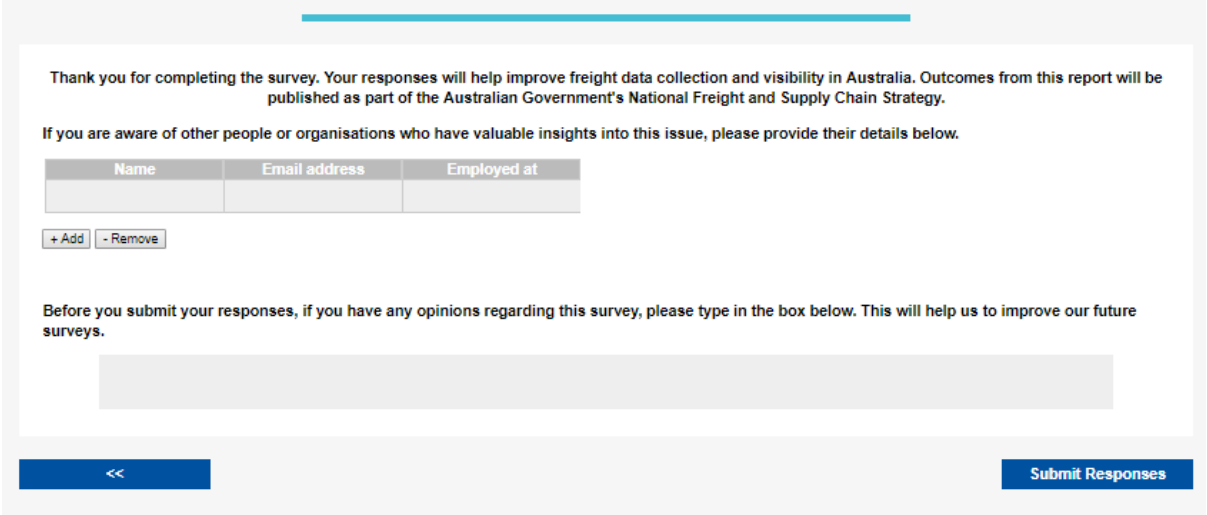
Thank you for completing the survey. Your responses will help improve freight data collection and visibility in Australia. Outcomes from this report will be published as part of the Australian Government's National Freight and Supply Chain Strategy.
If you are aware of other people or organisations who have valuable insights into this issue, please provide their details below.
Name
Email address
Employed at
+ Add
- Remove
Before you submit your responses, if you have any opinions regarding this survey, please type in the box below. This will help us to improve our future surveys.
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Submit Responses