



A FOCUS ON FUTURE
FREIGHT IN QUEENSLAND

FROM A GLOBAL SUPPLY CHAIN PERSPECTIVE

An examination of global supply chain trends,
policy imperatives and freight infrastructure

March 2015



QATLC

QUEENSLAND TRANSPORT
AND LOGISTICS COUNCIL

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Foreword

As Queensland's peak freight transport and logistics advisory body to government, the Queensland Transport and Logistics Council (QTLC) is committed to representing industry to influence policy, regulation, infrastructure planning and investment to achieve sustainable and productive supply chains.

Central to this remit, the QTLC seeks to adopt a proactive approach in contributing to the freight agenda within Queensland, through the development and progression of various working papers and reports that will document the freight and logistics issues for both industry and government.

In line with this objective, the QTLC has developed a series of reports focusing on Queensland supply chains.

As Queensland seeks to increase its economic competitiveness in the global marketplace, it is critical that the productivity of our supply chains are optimised through the ongoing development of an efficient and resilient freight system.

To better understand supply chains in Queensland, the drivers of change, and the policy and infrastructure requirements to support future growth, the QTLC has undertaken an analysis of the global supply chain characteristics and policy imperatives driving economic development and growth and how these relate to proposed and existing infrastructure.

The first in a series of three reports, this report examines Queensland's major supply chains, identifying the drivers for change in supply chains from both a global and national perspective. Supporting this analysis is the development of a series of 11 Supply Chain Perspectives which define the specific characteristics of these sectors.

Furthermore, this report provides the basis for better understanding the policy and freight infrastructure imperatives required to meet expected supply chain demands both now and into the future.

Reports Two and Three of the 'A Focus on Freight' series consider strategies for optimising freight infrastructure critical to supporting high value supply chains in Queensland, namely the proposed Toowoomba Second Range Crossing and Queensland's Inland Highway.

In the current fiscally constrained environment, it is imperative that investment in freight infrastructure supports ongoing efficiency and productivity improvements in Queensland's strategically important and high economic value supply chains.

Improved global competitiveness through efficient freight transport delivers economic benefit to the whole of Queensland. As such, this report recommends a more detailed and ongoing analysis of the characteristics and trends for each of the sectors considered by the Supply Chain Perspectives and that this information be used to help plan and prioritise freight infrastructure development.

About the Queensland Transport and Logistics Council (QTLC)

The Queensland Transport and Logistics Council (QTLC) is a cooperative industry and government advisory body that provides advice to industry stakeholders and state and federal governments on the development, planning, regulation and operation of freight and logistics transport, infrastructure and services in Queensland.

The QTLC is jointly funded by the Queensland Department of Transport and Main Roads (TMR) and the Australian Government's Department of Infrastructure and Regional Development (DIRD).

As the peak industry body representing the views of the freight transport and logistics industry, the QTLC advocates for the provision of infrastructure, regulation and policy that will support sustainable freight transport and logistics in Queensland.

The QTLC supports the efficient movement of freight in order to support sustainable and productive economic development and prosperity by pursuing:

- appropriate and ongoing investment in supply chain infrastructure
- integrated regional and urban planning frameworks that secure land for current and future freight corridors
- an access policy and regulation environment that facilitates productivity and innovation
- efficient integration and linkage of freight and logistics systems across the whole supply chain.

The QTLC works towards operational and strategic solutions to impediments and issues within the freight supply chain with both long term and immediate benefits for industry.

More information on the QTLC and its activities can be found at www.qtlc.com.au or email admin@qtlc.com.au

Glossary

3PL	Third Party Logistics	QTRIP	Queensland Transport and Roads Investment Program
AusRAP	Australian road assessment program	SCM	Supply chain management
CBD	Central business district	SCOTI	Standing Council on Transport and Infrastructure
CEO	Chief Executive Officer	SEQ	South East Queensland
CoR	Chain of responsibility	SWA	Safe Work Australia
CSG	Coal seam gas	TCDP	Transport Coordination and Delivery Plan
CQTSCS	Central Queensland Transport Supply Chain Strategy	TEU	Twenty foot equivalent unit
DIT	Department of Infrastructure and Transport	TMR	Queensland Department of Transport and Main Roads
FMCG	Fast-moving consumer goods	TSRC	Toowoomba Second Range Crossing
GDP	Gross domestic product	WHUS	Warrego Highway Upgrade Strategy
HML	Higher mass limits		
HPV	High productivity vehicle		
HVAP	Heavy Vehicle Action Plan		
HVNL	Heavy Vehicle National Law		
HVS&PP	Heavy Vehicle Safety and Productivity Program		
IAP	Intelligent Access Program		
KPI	Key performance indicator		
LNG	Liquefied natural gas		
Mt	Million tonnes (mega-tonne)		
Mtk	Million tonne kilometers		
NHVR	National Heavy Vehicle Regulator		
NLFS	National Land Freight Strategy		
NT	Northern Territory		
OSOM	Over-size over-mass		
PBS	Performance-based standards		
PoB	Port of Brisbane		
PPP	Public/private partnership		
QTLC	Queensland Transport and Logistics Council		

1 Executive Summary

As Queensland seeks to increase economic competitiveness in the global marketplace, it is critical we have a freight system that supports resilient, effective and efficient supply chains, and which can meet the current and future demands.

To that end, the QTLC has undertaken an analysis of the global supply chain characteristics and policy imperatives driving economic development and growth, to understand how these relate to proposed and existing infrastructure.

In summary, QTLC's objective is to:

Better understand supply chains in Queensland, the drivers of change, and the policy and infrastructure requirements to support future growth.

This analysis from the project is presented in three reports, focusing on:

Future Freight in Queensland from a Global Supply Chain Perspective (this report)

This examines the major Queensland supply chains, global supply chain trends, policy imperatives and freight infrastructure. Eleven of Queensland's major supply chains are detailed through Supply Chain Perspectives, with this information informing subsequent investigations.

The Toowoomba Second Range Crossing (TSRC)

Using information derived from the Supply Chain Perspectives and an Industry Forum, this report provides an examination of the supply chain benefits, freight efficiency opportunities and broader economic opportunities provided by the TSRC.

Queensland's Inland Highway

This report identifies a resilient inland freight route connecting South East Queensland to northern Australia and to the key nodal infrastructure that supports Queensland's major supply chains.

This **Future Freight in Queensland from a Global Supply Chain Perspective** document has the following objectives, to:

- define the characteristics of the major Queensland supply chains in terms of freight movements and movement patterns, both current state and potential future state scenario/s.
- identify the drivers of change in our supply chains, from both a global and national perspective
- identify and examine current constraints, in terms of both infrastructure and the policy/governance framework.

Supply chain management is the integration of key business processes across the supply chain for the purpose of creating value for customers and stakeholders¹.

Prior to the emergence of supply chain management, companies within a network focussed on only the inputs and outputs of the processes, and operations were limited to the organisation's boundaries. Globalisation, a feature of the 1980s, required international systems and the expansion of supply chains over national boundaries. This provided the basis for the introduction of supply chain management, which has grown and developed to provide coordination across supply chains.

Supply chain development in Australia has focused on the physical distribution (logistics) elements. In the non-fast-moving consumer goods supply chains, the focus has been on vehicle productivity and, more recently, nodal activity interfaces with respect to higher productivity vehicles.

Freight policy frameworks and settings have been developed with the aim of delivering increasingly responsive, efficient and safe supply chain infrastructure to move Australia's key commodities to domestic and global markets.

The Queensland Commission of Audit comments regarding supply chain fragmentation in Queensland² and the recognition of supply chains in Moving Freight indicate the more widespread acknowledgment and emphasis on the impacts of supply chain management on the efficient movement of freight.

This project has been conducted with a supply chain focus to integrate the supply chain management and supply chain factors into considerations regarding productive and appropriate freight systems.

¹ *Supply Chain Management: Processes, Partnerships, Performance: Doug Lambert 2008*

² *Queensland Commission of Audit Final Report - February 2013 Volume 2*

In Queensland, supply chains comprise a mix of nodal and modal activity. As commodities move through the supply chain, nodal activity occurs at key functional steps such as:

- production
- processing, value adding and/or transformation
- supply chain practices, such as storage, order fulfilment, consolidation, deconsolidation, change in unit of movement
- consumption.

Modal activity occurs between the functional steps. The unit of movement (transport configuration) is defined by the most appropriate mode (road, rail, air or sea).

Queensland supply chains reliant on heavy vehicle movements include livestock, agricultural and horticultural, resources, projects and construction, fuel, over-size over-mass (OSOM), fast-moving consumer goods, general freight and the export supply chains. These supply chains generate in excess of 42 million heavy vehicle movements a year.

The movements include transporting the output from production as inputs to value adding processes. Finished goods are moved to points of consumption and/or export, and they link domestic markets and deliver the vital inputs to the resources and construction sectors. These heavy vehicles are then supported by a much larger fleet of medium sized articulated and rigid vehicles to access and deliver to the more densely populated areas.

The major drivers of change that will impact on these nodal and modal activities include:

- globalisation and supply chain management
- offshore/global sourcing
- port-centric logistics
- containerisation of commodities
- size of international shipping containers
- airports as hubs
- modal share of the freight task
- centralisation of supply chains
- road freight and vehicle productivity enhancements
- potential re-emergence of coastal shipping
- changes to manufacturing.

Policy and governance from all levels of government also influence supply chain practices including regulatory frameworks relating to:

- chain of responsibility
- fatigue, mass and maintenance management and accreditation
- network access for high productivity and performance-based standards vehicles
- workplace health and safety
- network resilience and operations
- infrastructure investment.

The types of changes expected include:

- Community concern regarding road safety performance and congestion issues has led government to focus on encouraging a modal shift away from road to support the use of rail for livestock and agricultural commodities.

Similarly, these concerns are driving policy and planning to effect a modal shift to rail for OSOM and fuel, currently moved by road.

To facilitate these modal shifts, additional infrastructure and investment will be required at ports, rail heads and where value adding processes occur.

- There is a growing trend for offshore manufacturing and global sourcing, resulting in less goods manufactured locally and more being imported. This will fundamentally alter supply chains as ports will become a hub, as is evident in the port-centric logistics models.
- These products are imported in shipping containers (TEU), resulting in more empty containers available to be repositioned internationally. This available TEU capacity may lead to containerisation of bulk products such as cotton, grains, chick peas, specialty grains and sugar and a move away from bulk handling systems.
- International markets for these supply chains will require that they be containersised in efficient TEU sizes. This is trending towards 40' containers (up from 20' containers), maximising payload capacity and resulting in heavier loads.
- This trend will result in ports with international shipping services playing an increased role in our import and export supply chains, and re-forming as regional distribution hubs in their own right. This may also be the catalyst for the re-emergence of coastal shipping.

- To efficiently move TEUs, high productivity vehicles (HPV) have been developed to deliver efficiency gains and to manage the potential increase in vehicle movements. These HPV have then been adapted and are being used to move a range of bulk products and livestock. While the technology to support heavy vehicles is reaching a stage of maturity, the uptake has been limited by two factors: access and the availability of new technology equipment.
- For HPV to continue to provide productivity gains of in the order of 25% to 50%, access must be managed from points of production to where value adding is occurring and then to domestic and export/import locations. Where direct access is unavailable, a de-coupling yard then becomes a strategic asset in the road freight network.
- The time to market and/or product handling requirements of many value chains excludes rail as a practical option, irrespective of cost. The continued utilisation of rail will be underpinned by a more detailed understanding of what supply chains are suited to rail.
- A realistic appraisal of opportunities will identify those value chains, and the individual supply chains within them, that can be adequately serviced by rail. Once established, these opportunities can be realistically appraised in terms of immediate adoption or for future development.

In summary, while extensive vehicle productivity gains are declining for some sectors, the need for gains remain a critical factor for Queensland's most strategically and economically important supply chains. Leveraging optimum advantage from investment in freight transport infrastructure, including rail, will require a detailed and comprehensive understanding of these supply chains at the nodal and modal level.

A specific and detailed focus on strategically important and high economic value chains is recommended, to prioritise freight infrastructure development and investment.

2 Background

2.1 Context

In 2011/12, the Australian domestic freight task represented 600 billion tonne kilometres³. Approximately 49% of this freight was moved by rail, with iron ore and coal exports representing over 80% of the rail task. Road freight was approximately 35% of the domestic freight task and coastal sea freight 17%. Air freight comprised less than 0.01% of total freight by weight.

By 2030, container movements through Australian ports are projected to be approximately 2.5 times the volumes achieved in 2010. The rail freight task is projected to be more than 1.9 times greater, predominantly attributed to continued growth in iron ore exports. This projection may require revision in the wake of the recent drop in steel production in China, a major consumer of iron ore. Road freight is projected to increase by 1.8 times in the same period. Given that the iron ore and coal comprise the bulk of goods moved by coastal shipping, projections that coastal shipping will grow by 15% may, by 2030, may also need to be revised following the downturn in the resources sector⁴.

Rail and coastal shipping are best suited to moving large tonnages over long distances, however road transport is the main mode of transport for the majority of commodities produced and/or consumed in Australia.

During 2011/12, road freight within capital cities and other urban areas represented over 30% of total road freight movements in Australia. Inter-capital road freight comprised 18%-19% with the remaining freight - approximately 50% - comprising movements between capital cities and regional areas, and other inter and intrastate freight.

Heavy freight vehicles – consisting of rigid and articulated trucks in Class 3 and above as per Austroads classification - have had a six-fold increase in productivity since 1971, with more than 90% attributable to articulated combinations. B-Double combinations are now the most significant road freight articulated vehicle combination, accounting for around 40% of total heavy road freight in 2011/12⁵. It is currently estimated that average heavy vehicle loads will increase by less than 5% between 2010 and 2030.

³ A tonne kilometre is the measure of one tonne moved one kilometre.

⁴ Freightline 1 - Australian freight transport overview (DIRD)

⁵ Bureau of infrastructure, transport and regional economics 2011, truck productivity: sources trends and future prospects. Report 123

As identified in Moving Freight⁶, and driven by strong economic activity including population growth and international trade, Queensland's freight task is expected to increase from 871 million tonnes (Mt) in 2010/11 to between 1,643 Mt and 1,741 Mt by 2026.

Using the low end estimates provided in Moving Freight, the projected increases for key commodity groups between 2016 and 2026 is 74% (190 Mt) for export coal and extracted minerals, 44% (4 Mt) for export agriculture, and 43% (355 Mt) for general freight.

In 2010/11, road freight movements represented 69% (599 Mt) of Queensland's intrastate freight volume, rail represented 29% (251 Mt), sea 2% (20 Mt) and air 0.05%. In road movements, light commercial vehicles undertook 7.8% (53 Mt) of the task, rigid vehicles 49% (294 Mt) and articulated vehicles 41.9% (251 Mt)⁴.

As identified in Moving Freight, cost-effective and affordable freight systems will be critical to the growing Queensland economy. Changing production and consumption trends are also likely to influence existing supply chains. Further, oil vulnerability provides the need to explore more efficient supply chain models and exploit the use of technology, including potential adaptation to alternate energy sources.

The Queensland Government is currently sponsoring a number of supply chain related studies focused on increased productivity, improved asset use and linking regional activity, in the following areas:

- agricultural and primary production
- coastal shipping and port infrastructure
- fuel movements
- heavy vehicle and freight specific strategies
- inland port
- modal shift catalysts
- over-size over-mass (OSOM) and project cargoes
- port-specific strategies
- regional resources and mining
- regional specific activities.

⁶ Queensland Government, *Moving Freight, Transport and Main Roads, December 2013* at: www.tmr.qld.gov.au/movingfreight

The Commonwealth Government has a clear focus on developing Northern Australia⁷, with a large component of this strategy relating to inland, coastal and northern Queensland. This focus will have significant implications for related supply chains, as the areas of increased production are typically remote from major logistics hubs. The forecast growth, compounded by geographic distances, will bring about unique challenges.

Notable is the emergence of considerations for an inland highway⁸ to improve resilience in times of natural disasters, particularly flood events. An inland freight route would ensure continuity of freight flows to and from north and north-west Queensland to southern locations.

The National Land Freight Strategy (NLFS)⁹ defines that the economic importance, productivity impact and expected growth and change of the freight task combine to identify freight as a priority issue of national significance that should be afforded national attention and coordination.

The NLFS identifies the Darling Downs and the Maranoa regions centred on Toowoomba as a hub for many of the key freight routes identified by Infrastructure Australia. The region is also the centre of significant current public infrastructure investment, the Toowoomba Second Range Crossing (TSRC) and inland rail.

As outlined in the supply chain developments nominated in Moving Freight, there are established practices and emerging trends that have implications for the supply chains of key Queensland commodities, both domestically and internationally.

While the development of supply chain management is primarily focused on global fast-moving consumer goods (FMCG) supply chains, principles and practices stemming from FMCG-focused supply chain management have application in other supply chains.

Trends in supply chain management methods are not only reacting to the need for effective supply chains or networks to compete in a global market¹⁰, they also recognise that more sustainable practices are being demanded by the community, which is seeking higher levels of amenity and less disruption from supply chain activities.

⁷ *White Paper on Developing Northern Australia, Australian Government 8 A Focus on Freight on Queensland's Inland Highway, QTLC, 2015*

⁹ *National Land Freight Strategy, Department of Infrastructure and Transport 2013*

¹⁰ www.courses.sens.buffalo.edu/eas590/pdf/Case4.pdf

2.2 Supply chain management¹¹

Understanding the scope and range of supply chain management and its relationship to operational supply chains will provide context for this project element, as supply chain management and supply chains are different. Supply chain management acts at the strategic and tactical level, providing the framework for the operations of the supply chain and logistics operations.

While the definition of supply chain management has been the source of debate, a simple definition is that supply chain management is the integration of key business processes across the supply chain for the purpose of creating value for customers and stakeholders¹².

Prior to the emergence of supply chain management, companies within a network focused on only the inputs and outputs of their processes, and their operations were limited to the organisation's boundaries. Globalisation, a feature of the 1980s, required international systems and the expansion of supply chains over national boundaries. This provided the basis for the introduction of supply chain management.

Supply chain management has grown and developed to provide coordination across supply chains. Supply chain management draws heavily on operations management, logistics, procurement and information technology to operate activities within the supply chain.

Supply chain development in Australia has focused on the physical distribution (logistics) elements. In the non fast-moving consumer goods supply chains, the focus has been on vehicle productivity and, more recently, nodal activity.

Freight policy frameworks and settings have been developed with the aim of delivering increasingly responsive, efficient and safe supply chain infrastructure to move Australia's key commodities to both domestic and global markets.

This project has been conducted with a supply chain focus, to ensure supply chain management and supply chain factors are taken into consideration when determining productive and appropriate freight systems.

¹¹ Note that, other than for specific details, references are not provided in this section. The information is sourced from multiple texts and articles, developed over time and as a part of the consultant's expertise.

¹² Supply Chain Management: Processes, Partnerships, Performance: Doug Lambert 2008

2.3 Policy framework

During analysis of freight related legislation and policy¹³, it was concluded that market-driven decisions and open regulatory frameworks (the mechanism for government action, particularly relating to safety) will underpin effective and efficient freight growth as needed in Queensland.

In December 2013, the Queensland Government published Moving Freight¹⁴, a 10-year strategy to develop a sustainable and productive multi-modal freight network.

Moving Freight recognises that Queensland's transport system is a large and complex mix of user, infrastructure, regulation, services and network operations, requiring multiple strategies and plans. The Queensland Department of Transport and Main Roads (TMR) strategic frameworks and the Transport Coordination and Delivery Plan (TCDP) should also be taken into consideration.

The TCDP's vision of connecting Queensland - delivering transport for prosperity - sets departmental strategy and direction to deliver the state government's objectives over a 10-year period. This is supported by decision-making criteria, objectives and performance indicators, guiding principles, a simple governance structure and clear accountabilities.

¹³ Included as Appendix A: Freight Transport In Queensland; A historical consideration of the impact of legislation and policy on modal choice, QTLC 2014

¹⁴ Moving Freight A strategy for more efficient freight movements, Department of Transport and Main Roads December 2013

2.4 Freight infrastructure plans

The Moving Freight strategy nominates six priorities for more efficient freight movement.

- Priority 1: Expand the use of rail freight
- Priority 2: Increase road freight network access
- Priority 3: Facilitate greater freight infrastructure investment
- Priority 4: Support future freight growth
- Priority 5: Better freight policy and information
- Priority 6: Engage industry for better and safer freight outcomes.

A key action under Priority 3 of Moving Freight, the Heavy Vehicle Action Plan (HVAP)¹⁵ aims to improve safety and productivity across Queensland through identification of infrastructure investment priorities for freight efficient vehicles, and outlines steps to an achievable course of action over the next 10 years. With industry input, the HVAP has identified high priority routes of significance that specifically support freight movement.

The HVAP also explores options to reduce the impact of over-size over-mass (OSOM) movements on the road network via alternative modes and identifies required infrastructure and upgrades to support OSOM in terms of envelopes, swept paths, pavement and load bearing capacity.

The Warrego Highway Upgrade Strategy¹⁶ is a 20-year master plan to increase the standard of the corridor to a more efficient, safer and reliable highway. A critical priority project on the Warrego Highway is the Toowoomba Second Range Crossing.

Toowoomba and the crossing of the Great Dividing Range is the main point of constraint for freight travelling to/ from the Port of Brisbane to agricultural and horticultural production areas, the Surat Basin energy province, western and Outback Queensland, and to interstate locations including the Northern Territory.

¹⁵ Heavy Vehicle Action Plan Stage 2 – Route Identification, Department of Transport and Main Roads, June 2013

¹⁶ Warrego Highway Upgrade Strategy, Department of Transport and Main Roads, 2012

Additional government freight planning initiatives relevant to this project are:

- Bruce Highway Action Plan¹⁷: Designed to implement a generational upgrade to acceptable Australian standards, this 10-year view is described as an ‘out of crisis’ action plan.
- Surat Basin Regional Transport Strategy¹⁸: This is a major transport planning study, including a multi-modal transport strategy. The strategy identified key initiatives for the short, medium and long term future. The TSRC is the critical link in the east/west transport corridor to access the Surat Basin from South East Queensland in three to four hours via road.
- Central Queensland Transport Supply Chain Strategy (CQTSCS)¹⁹: This is a multi-modal strategy for managing future transport demand within the Galilee and Bowen Basins.
- Inland Port 23: This concept is being considered as a component of the CQTSCS, to make possible the modal shift from road to rail of mining inputs and agricultural exports.
- Sea Freight Action Plan²⁰: This focuses on Queensland ports with a commercial propensity to support general cargo movements that have a comparative advantage to road or rail services.

2.5 Infrastructure commitments

There is significant infrastructure planning development in the Darling Downs and Maranoa regions including:

- The Toowoomba Second Range Crossing (TSRC): The Commonwealth and Queensland Governments have committed funding of more than \$1.6 billion to the TSRC project, with project costs on an 80:20 basis subject to bids demonstrating value for money.
- Inland rail - Melbourne to Brisbane including link to Port of Brisbane: The Australian Government has committed \$300 million for pre-construction activities. This includes investigation of a dedicated rail freight link to the Port of Brisbane.

Should they go ahead, these infrastructure developments will deliver benefits for existing physical distribution, predominately transport, tasks. They will also impact on the structure of some of Queensland’s major supply chains.

¹⁷ Bruce Highway Action Plan “Out of Crisis” TMR October 2012

¹⁸ Surat Basin Regional Transport Strategy, Department of Transport and Main Roads, 2012

¹⁹ Central Queensland Transport Supply Chain Strategy AECOM Nov 2013

²⁰ Sea Freight Action Plan, Department of Transport and Main Roads, June 2014

3 Scope and objectives

The QTLC has produced three reports focusing on Queensland supply chains. This document is the first of those providing:

A focus on future freight in Queensland from a global supply chain perspective, an examination of global supply chain trends, policy imperatives and freight infrastructure to meet demands.

3.1 Overall project objectives

The overall project, consisting of the three primary reports, 11 Supply Chain Perspectives²¹ and an analysis of the related legislative and policy²², has the objective of:

Better understanding of supply chains in Queensland, the drivers of change, and the policy and infrastructure requirements to support growth.

In detail QTLC's objectives are to:

- develop a clear view on supply chains that underpins the Queensland economy and what will drive supply chain change into the future
- define the infrastructure required - current, proposed and not yet identified - to enable the efficient, productive and safe flow of goods; and establish how the resultant benefits will accrue, and in what form
- identify policy and governance settings that are required to allow for success in each supply chain category
- identify additional policy, governance and infrastructure requirements to ensure resilience in Queensland's supply chains in times of natural disasters and unplanned crisis
- influence infrastructure design and/or investment by providing broad initial consideration of the economic and productivity benefits that can be leveraged by better optimising existing or committed corridors.

3.2 Project scope

While there is an unprecedented level of investigation and activity across a broad range of supply chain and related areas at the time of conducting this project, this project is focused on:

- the Toowoomba Second Range Crossing
- a potential inland road transport route to improve resilience, the Queensland Inland Highway.

3.3 Specific objective - focus on freight

The overall objective of this project component is to:

Provide an examination of global supply chain trends, policy imperatives and freight infrastructure to meet demands.

Specific objectives include:

- examining Queensland's major supply chains, developing a Supply Chain Perspective for each category, and defining the specific characteristics of these sectors and their supply chains, including freight movements and movement patterns
- identifying the drivers for change in supply chains from both a global and national perspective, applying these drivers to the supply chains for which Perspectives have been developed
- defining policy and freight infrastructure imperatives to meet expected supply chain demands.

²¹ A summary of the Supply Chain Perspectives are included as Appendix B. The complete versions are an Addendum to this report

²² Included as Appendix A: Freight Transport in Queensland; A historical consideration of the impact of legislation and policy on modal choice, QTLC 2014

4 Methodology

The initial phase of this project involved developing Supply Chain Perspectives²³ (Perspectives) for Queensland's major supply chains. Industry and sectors were selected based on their strategic importance, profile and/or volume of movement. Sectors that operate and/or have nodal or freight hub activity in the Toowoomba, Darling Downs and Maranoa region were also identified and included.

Perspectives were prepared for:

- bulk commodities
 - grain
 - sugar
- cotton
- fuel
- fast-moving consumer goods
- horticultural
- livestock and meat
- mine inputs (noting that mine outputs are out of scope)
- over-size over-mass (OSOM)
- TEU (shipping container) movements
- project and construction cargoes.

Based on the Perspectives, the QTLC convened an Industry Forum for transport industry representatives and stakeholders, including operators from the key industry sectors, Projects Queensland and the Queensland Department of Transport and Main Roads (TMR).

Although the forum specifically focused on the TSRC, information and input added to and confirmed supply chain issues and trends for inclusion in this report. The following sources were also reviewed and referenced in this report:

- related policy and governance frameworks, reflecting Commonwealth and Queensland Government strategies and objectives
- existing Commonwealth, Queensland Government and industry reports and information in the public domain
- contributions from industry content experts of information not in the public domain.

²³ A summary of the Supply Chain Perspectives is included as Appendix B.

To provide context, a comprehensive review of the past impact of governance frameworks, legislation and policy on modal choice was also undertaken. This is included as Appendix A²⁴.

Supply chains comprise a mix of nodal and modal activity. As commodities move through the supply chain, nodal activity occurs at key functional steps such as:

- production
- processing, value adding and/or transformation
- supply chain practices, such as storage, order fulfilment, consolidation, deconsolidation, change in unit of movement
- consumption.

Modal activity occurs between the functional steps. Ideally, the unit of movement (transport configuration) is defined by the most appropriate mode (road, rail, air or sea).

Employing a value chain approach²⁵ helps focus on where value is added in the supply chain and how these benefits will accrue in the respective value chains. Using this approach, the Perspectives can be categorised into three value chains as follows:

- population-based domestic supply chains - such as fast-moving consumer goods, import TEU and general freight, horticulture, construction and fuel
- supply chains that are part of a larger production or manufacturing system - such as sugar, grain, cotton, livestock, horticulture, OSOM, mine inputs, fuel, project and construction
- supply chains that merge a number of distribution networks - including exports of TEU, sugar, meat, grain, cotton, and general and domestic freight.

²⁴ *Freight Transport in Queensland, a historical consideration of Legislative and Policy on Modal choice. QTLC 2014*

²⁵ *A Handbook for Value Chain Research, Prepared for the International Development Research Centre (IDRC) by Raphael Kaplinsky and Mike Morris*



As supply chains comprise a mix of nodal and modal activity, how and where the supply chains require interaction between nodes and modes is important. Nodal activity for each commodity must be mapped to identify the locations where the key functional steps occur, such as:

- points of origin
- intermediate and/or final processing and/or value adding stages
- intermediate and/or final supply chain practices
- destinations.

Modal activity includes the unit of movement and preferred mode, and how these interact with the nodal activity, locations and the transport network. Locations used during a modal movement also form a key consideration for network access under Performance Based Standards (PBS) for multi-combination road based movements.

A key factor in defining the appropriate modal choice for specific commodities or commodity groups in a supply chain is understanding the demand profile. Handling requirements also have a bearing on the modal choice and configuration of the transport unit.

Based on the three discreet value chain categories, the following report will outline how evolving supply chain practices and emerging and future developments in supply chain management will impact on these individual categories. Each category forms a critical component of Queensland's economic performance.

5 Queensland's Supply Chains

5.1 Supply Chain Perspectives

The Perspectives provide a detailed understanding of the structure and drivers of major Queensland supply chains, including the economic value, origins and destinations, movement patterns, freight volumes, vehicle configurations and nodal activity requirements for each industry or sector investigated.

The implications of supply chain management developments and measurement of the effectiveness of existing and planned infrastructure can then be understood, including policy and legislative settings for current and potential future developments.

Industries or sectors for which Perspectives were prepared are shown in Table 1. This table provides data on the economic value of the industry or sector in Queensland and the scale of the related freight transport task.

Refer to Appendix B for a more detailed summary of the Perspectives. A complete version is provided as an addendum to this report.

The vehicle movements nominated in the following are indicative and represent only the core movement, and therefore need to be at least doubled to include return trips with a factor for other inputs and outputs.

Table 1: Summary detail - Supply Chain Perspectives

SUPPLY CHAIN	ANNUAL DIMENSION	MOVEMENTS	COMMENTS
COTTON	\$667 million*		
		48,000	Annual cotton modules from farm to gin
		35,000	Annual HV movements for export, feedlots and processors
		6,700	Annual HV movements of bulk cottonseed to Port of Brisbane
FAST-MOVING CONSUMER GOODS	\$57 billion**		
		1,600,000	Annual HV movements
		4,500	Daily HV movements
FUEL	13,800 ML	298,560	Annual B-Double movements
GRAIN	\$1.2 billion*		
		30,000	Annual HV movements to ports
HORTICULTURE	\$2.5 billion*		
		72,000	Annual HV movements
LIVESTOCK & MEAT	\$4.5 billion*		(Annual HV movements below)
		39,000	Station to saleyard
		11,600	Saleyard to feedlot
		130,000	Grain to feedlot
		27,000	Station to abattoir
		15,600	Feedlot to abattoir
		54,800	TEU abattoir to port
		23,100	Abattoir to domestic fast-moving consumer goods
	51,187	Station to station	
MINE INPUTS	\$38 billion****		(Movements included in general freight)
	\$8 billion****		Annual transport, warehousing and postal expenditure

*Gross value added **Annual sales ***Project value ****Spend

SUPPLY CHAIN	ANNUAL DIMENSION	MOVEMENTS	COMMENTS
OSOM		70,976	OSOM movements
PROJECT & CONSTRUCTION	33,664		Annual residential building commencements
	\$7.4 billion***		Non-residential works
	\$35.9 billion***		Engineering construction works
	\$18 billion***		Major projects, >\$100 million @ 2013
	\$9.5 billion***		Forecast by 2015/16
	\$12 billion***		Forecast by 2018
	\$245.7 million***		National networks (road, rail, infrastructure)
	\$979.2 million***		State networks (road, rail, port infrastructure)
	\$49.6 million***		Local networks (road infrastructure)
SUGAR	\$1.7 billion*		Value of sugar produced in Queensland 2013
	\$1.3 billion*		Export sales 2013
		62,000	HV movements mills to port or first domestic distribution
TEU & GENERAL FREIGHT	<i>TEU</i>	1,143,897	TEUs moved through Queensland ports
		762,693	Full TEU road movements (73.9%)
		212,271	Empty TEU road movements (20.6%)
		31,194	Full TEU rail movements (3.0%)
		25,279	Empty TEU rail movements (2.5%)
		45%	By high productivity vehicle
		45%	By semi-trailers
		9%	By side-loaders
		<1%	By rigid trucks
		<i>GENERAL FREIGHT</i>	3,300
		>8,300	Daily movements in/around Brisbane
		>21,900	Daily movements in regional Queensland

*Gross value added **Annual sales ***Project value ****Spend



5.2 Global supply chain drivers

Unlike other business disciplines such as manufacturing and marketing, operational process resulting from developments in supply chain management is not necessarily directly ‘transportable’ from one country and/or organisation to another. While principles and strategic considerations most often remain consistent, the operational supply chain methods required vary based on the unique circumstances of the location and/or organisation, including policy and regulatory considerations.

Australia’s relatively sparse population, coupled with vast distances, emphasises the role of freight transport. Goods are moved from often distant areas of production, manufacture or import to service the population base, or for export. This is particularly relevant in Queensland, due to the large geographic area with spread regional population and activity.

Globalisation and supply chain management

The movement from international trade to globalisation was a feature of the 1980s, although the primary facilitator - the standard international shipping container - began use on commercial routes in the late 1950s and early 1960s following successful deployment during the Vietnam War²⁶.

Container movements revolutionised the international movement of break bulk commodity types. For bulk shipping of a single type of goods such as oil, extracted minerals and grains, both ships and port facilities were already specialised to allow more rapid loading and unloading at lower costs. This specialised bulk shipping had become industrialised in contrast to break bulk.

Supply chain management, first used in 1982²⁷, evolved concurrently with globalisation and began to have significance during the late 1990s, with the goal of increasing competitive advantage, adding value and reducing costs through global sourcing.

Supply chain management is now leveraging the immediacy of information via the internet. Global organisations are aligning supply chain processes to reduce physical distribution costs and provide ‘agile’ supply chains able to react to market developments.

²⁶ See: *History and Impact of the Intermodal Shipping Container* - John Tomlinson Pratt Institute 2009

²⁷ When Keith Oliver of Booz Allen Hamilton used it in an interview with the *Financial Times*

Many of Queensland’s major supply chains in cotton, grain, meat, sugar and horticulture are part of global supply chains, which requires them to align their practices and processes to ensure maximum freight transport efficiency accrues across the whole supply chain. Evidence of the impact of supply chain management development includes examples such as the containerisation of grain and the emerging trend for the use of larger (40’) and more heavily laden containers²⁸.

Although a large proportion of Queensland freight movement is domestically based and will remain in more traditional (buy/sell) supply chain arrangements, the need to meet the most current supply chain management requirements for agility and globally efficient transport will increase. Thus, the requirements of global supply chains should be included in considering freight related developments, extending beyond the freight network and modal preferences within Queensland or Australia.

Offshore/global sourcing

Global sourcing is the practice of sourcing goods and services overseas with a view to maximising the efficient delivery of a product or service.

PricewaterhouseCoopers nominated in its 10th annual CEO survey that global sourcing was experiencing robust growth, with cost still the major driver of global sourcing strategies. For more mature companies, managing supply chain risk is becoming more critical as global sourcing becomes more complex²⁹.

Global sourcing has been recognised by Australia’s largest retailers as more complex, with a major retailer identifying the need to enhance its capabilities in this area to achieve lower costs³⁰. The need to move to the ‘next level’ of sophistication in end-to-end supply chain application was also identified.

Many of Queensland’s major export supply chains form part of the global sourcing strategies of their customers. This emphasises the need for policy and regulatory guidelines to include the requirements of global supply chains.

²⁸ Provided at the TSRC Industry Forum convened by the QTLC for this project

²⁹ *Global Sourcing: Shifting Strategies*. PricewaterhouseCoopers 10th annual CEO survey

³⁰ Woolworths Analyst presentation FY10

Port-centric logistics

Port-centric logistics is the selective application of assets and services within or adjacent to major container ports to generate significant reductions in supply chain costs, generally reduced stevedoring, reduced land-based transport costs and/or improved product availability³¹.

Several major retailers have recently located distribution centres adjacent to the Port of Brisbane, providing early access to inventory and/or enabling heavily loaded containers to be processed.

Mass merchants now use port services to deconsolidate imported products for direct delivery to store or for shipment to their regional distribution centre. The process complements the mass merchant's off-shore sourcing strategies.

In some applications, notably in the UK, the port-centric concept has been integrated with coastal shipping where port processes deconsolidate and re-consign imported items to other non-major ports. While not yet a feature in Australia, a major retailer is known to have recently investigated this option.

At the Port of Brisbane, the establishment of third party logistics (3PL) operations is also a manifestation of the port-centric concept. 3PLs accept, process and store and/or dispatch goods received at the port, acting as part of their client's supply chain.

The port-centric concept is already apparent in Queensland's supply chains, not only for imported goods. Adoption of the concept at the receiving ports of export supply chains is a driver for some of the emerging trends in the containerisation of grain and for heavier loaded larger container movements in specific supply chains.

³¹ *PortCentric Logistics SM: SCC Associates*

Containerisation of commodities

Trade statistics for the Port of Brisbane indicate an increase in the shipment of commodities by shipping container, with the number of import and export TEUs growing. These developments are consistent with trends in global shipping markets³² relating to the most recent supply chain management developments. These developments aim to provide agile and globally efficient transport, in these cases to niche markets or to locations where port-centric activity dictates that container movement is the most efficient method.

The ultimate level of adoption of containerisation for items previously transported in bulk is unknown. This, coupled with a further trend to heavily laden 40' containers, has significant implications for the design of the freight network.

These factors also require consideration of the need for and location of nodal infrastructure, such as container packing, to support efficient and effective global supply chains.

Larger and heavier containers

The trend towards using heavily loaded 40' shipping containers to reduce sea freight related process charges including land transport, stevedoring and carriage, is also a consequence of the port-centric concept being applied in the export markets. Australia's mass merchants (largest retailers) are embracing this strategy in conjunction with their global sourcing and regional distribution models.

In relation to cotton, grain and meat, high level adoption of this trend would require high mass limit (HML) access for HPV to facilitate maximum efficiency of movement. As cotton, grain and meat represent 47.7% of current movements across the Toowoomba Range, this has a major impact on the Toowoomba Second Range Crossing design and is also a consideration for the freight networks servicing major ports.

Airport as hubs

Internationally, there has been an increase in the positioning of supply chain hubs close to or on airport land. A number of the world's high volume airports are being used as the 'hub' for distribution within their geographic area. Other locations have leveraged their near city location and/or available land to create a desirable hub location based on the supply chain distribution capability and general amenity.

With the proposed Australian agricultural production increase predominately for export, this has implications for the development of the West Brisbane Wellcamp Airport and the adjacent Charlton Wellcamp Industrial Area.

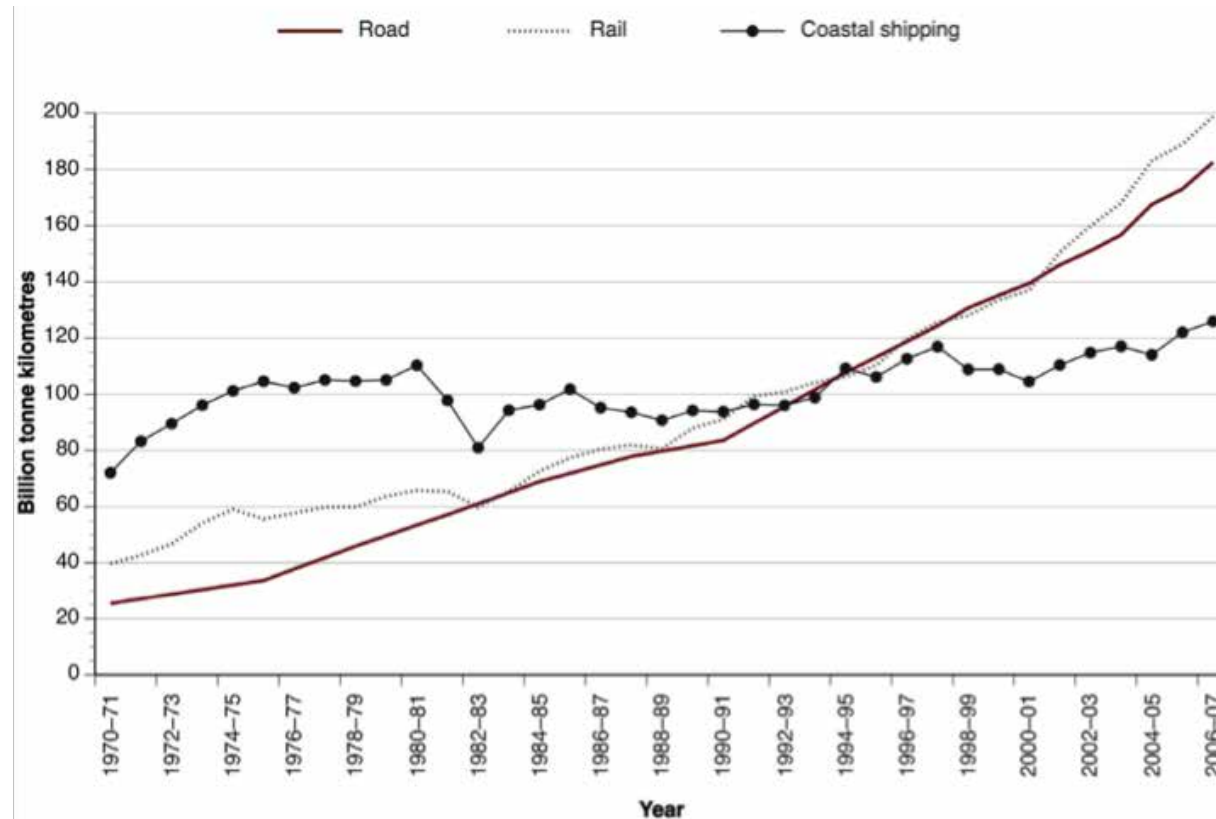
³² *The Containerization of Commodities: Professor Jean-Paul Rodrigue PhD; Van Horne Researcher in Transportation and Logistics, Hofstra University*

5.3 Domestic supply chain drivers

Modal share of the freight task³³

Figure 1 demonstrates the share of domestic freight task between road, rail and coastal shipping for freight transport from 1970/71 to 2006/07.

Figure 1: Modal share of domestic freight task



Source: Allen Consulting, *National Freight Network Strategy, Background Paper, February 2010, page 8, based on information in BTRE (2006), 'Freight Measurement and Modelling in Australia'.*

Coastal shipping was the dominant transport mode across Australia until the early 1990s as measured by tonne-kilometres. Road and rail haulage growth has since accelerated at a much greater rate than coastal shipping. Coastal shipping tonnages have been relatively flat since 1993/94, when the total freight task was split evenly between the three different modes.

³³ Included as Appendix B: *Freight Transport in Queensland, a historical consideration of Legislative and Policy on Modal choice. QTLC 2014*

Emergence of road transport

By the 1980s, the more general use of road transport, permitted under the *State Transport Act of 1960* had seen the emergence of large transport companies and an increase in long distance road freight.

This era also saw the growth of the road freight industry for the line haul movement of livestock rather than rail. However, the road transport sector has continued to grow in response to the increased containerisation of goods, an expansion facilitated by innovations in heavy vehicle design³⁴.

³⁴ Appendix B: *Freight Transport in Queensland, a historical consideration of Legislative and Policy on Modal choice. QTLC 2014*



Centralised distribution

The emergence of road transport as the dominant mode included the widespread introduction and adoption of express road transport (express) services in the late 1970s and 1980s. The service capability and relative low cost of this transport option created the opportunity for more centralised Australian based distribution, especially in fast-moving consumer goods supply chains.

Express transport provided many industry types/ organisations with the opportunity to reconsider the balance between facility, transport and inventory costs, known as the 'logistics trade-offs' in fast-moving consumer goods supply chains. Organisations consequently centralised their distribution operations to one major eastern seaboard city, reducing or removing their stock deployments and facilities in other locations.

The emergence of specialist transport companies, able to leverage their large scale operations through reduced vehicle and operating costs and increased vehicle capacity, resulted in state-based consolidation by the grocery retailers. The first 'mega' distribution centres and national structures for merchandise retailers were subsequently developed.

The introduction of service-focused road transport methods at comparatively low cost and road transport-based efficiency have been the catalyst for much of the reform in the population-based domestic supply chains.

Decentralisation

When balanced with other logistics trade-offs of inventory and facility costs, the cost benefit of express road services was impacted by the increase in fuel costs over the last decade³⁵. Express road services will not, in future, benefit from the significant vehicle productivity gains experienced over the past decades.

As demonstrated by mass merchants and the mining support sector, there is a high probability that population-based domestic supply chains will decentralise their distribution operations. This will occur where the balance between transport, facility and inventory holding costs are lowest in a decentralised model.

Mass merchants are at the first levels of decentralisation, using a regional distribution model coordinated with offshore sourcing and, where advantageous, using port services in line with the port-centric concept.

Organisations with less scale will not be able to operate in-house supply chains. However, the emergence of 3PL operations at the Port of Brisbane indicates that this port-centric development is an alternative to support more decentralised supply chains. This supports the Queensland Government's recognition that the regions are the engine rooms of the state, and are critical to Queensland's economy and future.

35 At the time of publication, the price of fuel had dropped significantly as a result of decreasing crude oil prices. Despite this, a concomitant reduction in freight transport costs was not yet widely evident, likely due to continuing higher fuel prices in regional areas and other increasing operating costs such as vehicle registration.

Vehicle productivity improvements

The total domestic road freight task has grown six-fold over the last four decades, from around 27 million tonne kilometres (Mtk) in 1971 to over 180 Mtk in 2007.

Heavy vehicles have had a six-fold increase in productivity since 1971, with articulated combinations contributing more than 90% of the increase in total road vehicle productivity³⁶. Factors contributing to increased heavy vehicle productivity include the introduction of B-Doubles and expanded network access for higher productivity vehicles.

Heavy vehicle productivity growth is likely to be much less than in the previous period, with heavy vehicle average loads likely to increase by less than 5% between 2010 and 2030. Increased uptake of higher productivity vehicles under PBS is likely to have a small impact on national heavy vehicle productivity given these larger vehicles represent less than 20% of the total road freight.

While significant for the overall freight task, especially the fast-moving consumer goods supply chains, the predicted slowing of average vehicle load growth is not expected in many major Queensland supply chains. The Industry Forum highlighted current practices and emerging trends such as A-Double movement of multiple containers and heavier loaded larger containers for export. These trends will require a significant increase in heavy vehicle productivity for these movements.

Infrastructure developments should consider and accommodate potential future requirements. Representatives at the Industry Forum highlighted that it is critical for such significant infrastructure developments to be 'future proofed'.

Coastal shipping

The Inquiry into Coastal Shipping³⁷ highlights that shipping already plays a significant role in Australia's domestic freight task. As demonstrated in Figure 1, revitalised coastal shipping has considerable potential benefits in contributing to the national freight task. The Inquiry contended that coastal shipping will need to become competitive with rail and to a lesser extent road, before it can increase its share of the national freight task.

³⁶ Bureau of Infrastructure, Transport and Regional Economics 2011, *Truck Productivity: sources trends and future prospects. Report 123*

³⁷ House of Representatives Committees: *Inquiry into Coastal Shipping Policy and Regulation 2008* www.aph.gov.au/parliamentary_business/committees/house_of_representatives_committees?url=itrdlg/coastalshipping/report.htm

Through industry feedback, it is understood that a regular scheduled coastal shipping service is being considered for commercial operation between the Port of Brisbane and ports of Townsville and Mackay, and ports north of Gladstone for over-size over-mass and project-related cargos.

The basis of this potential service is container movement for the agriculture and resources sectors. This highlights there is recognition of the potential future role of coastal shipping in increased container movement.

As demonstrated in sections regarding global sourcing, port-centric logistics and decentralisation, there is evidence of changed supply chain structures that will benefit from coastal shipping.

Changing manufacturing landscape

While changes in the Australian manufacturing landscape involving the offshore manufacture and/or sourcing of products for Australian domestic consumption is not a subject for detailed review in this project, there are clear implications for supply chain structures.

Manufacturing is declining as a share of GDP relative to services and increased manufactured imports³⁸. This directly affects the demand for freight transport services with reduced demand from former manufacturing centres and greater reliance on port-based services.

The demise of the Australian car industry provides an example of this decline in manufacturing and increased manufactured imports, given all vehicles will be imported into Australia after 2017. It is likely that the supply model used currently by some off-shore manufacturers will become more prevalent.

The buyer will be able to purchase the vehicle at the showroom, plus additional after-market items, or alternatively order a tailored specification vehicle for delivery from the factory with an appropriate lead time. These individualised vehicles are then received and processed at the nearest state port, prior to delivery to the selling agent for final preparation and delivery.

³⁸ *Moving Freight - A strategy for more efficient freight movements, Department of Transport and Main Roads December 2013*

5.4 Policy influence on supply chains

Freight Transport in Queensland – A historical consideration of the impact of Legislation and Policy on Modal Choice (Appendix A) outlines the impact of legislation and policy on modal choice and the extent of supply chain considerations in that era. The Moving Freight strategy outlines many of the policy influences that currently apply in reference to supply chains including:

- The first of the six nominated priorities is to expand the use of rail freight.
- The Queensland Ports Strategy³⁹ recognises that ports are key to facilitating movement of freight and that it is essential to identify supply chains connecting to Queensland's ports, emerging freight growth areas and corridors essential to port growth.

Moving Freight also informs and complements a broader range of Queensland Government supply chain related frameworks and initiatives such as:

- Queensland's Agriculture Strategy 2040 and the Central Queensland Transport Supply Chain Study
- economic development plans such as the Galilee Basin Coal Infrastructure Framework and North Queensland and Central Queensland Resources Supply Chain projects.

In terms of 'managing the system', Moving Freight recognises that, in addition to the need to manage and develop Queensland's freight system to support industry and respond to national reform, there is also a need to consider and address safety and community amenity impacts.

While the National Heavy Vehicle Regulator (NHVR) has national responsibility in these areas, the Queensland Road Safety Action Plan 2013/2015 will coordinate the development of the plan to improve heavy vehicle safety. This will address areas such as safer innovative heavy vehicles, provision of safer roads, employment of technology to monitor compliance of heavy vehicle operations, and management of heavy vehicle driver fatigue, including improving heavy vehicle rest area sites across the state.

³⁹ Queensland Ports Strategy 2014, Department of State Development, Infrastructure and Planning

National regulatory frameworks

The National Land Freight Strategy (NLFS) was formally approved and released by the Standing Council on Transport and Infrastructure (SCOTI) in September 2013. The strategy's objective is to improve the efficiency of the freight network, minimise associated negative impacts and influence related policy.

The NLFS Update⁴⁰ nominated the first of five major principles to underpin a national land freight strategy as the 'recognition of logistics and context'. The NLFS strategy⁴¹ nominates that freight planning and policies need to take an integrated approach including national and international supply chain considerations.

The NHVR was, as agreed by SCOTI, established to administer one set of laws, minimise the compliance burden on the heavy vehicle transport industry and reduce duplication and inconsistencies across state and territory borders.

Uniform application of Heavy Vehicle National Law (HVNL) and regulations administered by the NHVR came into force in the Australian Capital Territory, New South Wales, Queensland, South Australia, Tasmania and Victoria on 10 February 2014.

In addition to heavy vehicle accreditation, the NHVR is responsible for:

- Chain of responsibility (CoR)⁴²: CoR recognises that multiple parties may be responsible for offences committed by drivers and operators, aiming to ensure that breaches of road transport laws do not occur by sharing equal responsibility across all parties in the supply chain.
- Fatigue management⁴³: laws for fatigue management cover all aspects of work and rest relating to heavy vehicles. This is based on the primary duty that a driver must not drive a fatigue-regulated heavy vehicle on a road while impaired by fatigue.

⁴⁰ National Land Freight Strategy Update June 2012

⁴¹ National Land Freight Strategy, Department of Infrastructure and Transport 2013

⁴² www.nhvr.gov.au/safety-accreditation-compliance/chain-of-responsibility

⁴³ www.nhvr.gov.au/safety-accreditation-compliance/fatigue-management/about-fatigue-management

The NHVR controls road access management, journey planner and vehicle mass dimensions and loading in addition to:

- Performance-Based Standards (PBS) Scheme⁴⁴: offers the heavy vehicle industry the potential to achieve higher productivity and safety through innovative and optimised vehicle design. The application of higher productivity vehicles will continue to benefit the supply chains of many key industries.
- Intelligent Access Program (IAP)⁴⁵: enables an increase in the productivity of road freight transport, while aiming to protect road infrastructure and improve road safety. The program can provide improved access in return for remote monitoring of vehicles, ensuring vehicles comply with the agreed road access conditions. The IAP is mandatory in Queensland for nominated vehicles.

Risk

The AusRAP program works in partnership with government and non-government organisations, using risk mapping and performance tracking to identify and improve the performance of the Australian road network.

As part of the AusRAP process, RACQ analysed 4,784 km of Queensland roads, representing 23% of Australia's road network. The 333 deaths that occurred during 2005/09 represent 28% of the national network total. Findings regarding the risk profile are consistent with those of Moving Freight.

Workplace health and safety

Transport is recognised as a high risk industry and is identified by Safe Work Australia (SWA) as one of the priority industries for prevention activity. SWA is the national policy body, with states responsible for regulations and enforcement of workplace health and safety laws⁴⁶.

Workplace Health and Safety Queensland is advised by a transport and storage industry sector standing committee, representing employers and workers. Members have experience and competence in managing workplace health and safety issues⁴⁷.

⁴⁴ www.nhvr.gov.au/road-access/performance-based-standards

⁴⁵ www.nhvr.gov.au/road-access/intelligent-access-program

⁴⁶ *Transport and storage industry report, Workplace Health and Safety Queensland Feb 2013*

⁴⁷ www.deir.qld.gov.au/workplace/aboutus/industry-sector-standing-committees/index.htm#VBDO_fmSzuQ

Network resilience

The reliability of Queensland's freight system is regularly impacted by extreme weather events and harsh environmental conditions. The focus of the third report in this project is on identifying a flood resilient inland freight route, connecting South East Queensland to northern Australia and to the key nodal infrastructure that supports it.

5.5 Changes in value chains driven by global supply chain trends

In summary, there are a number of drivers of change that will influence Queensland supply chains including:

- globalisation and supply chain management
- offshore/global sourcing
- port-centric logistics
- containerisation of commodities
- size of international shipping containers
- airports as hubs
- modal share of the freight task
- centralisation of supply chains
- road freight and vehicle productivity enhancements
- potential re-emergence of coastal shipping
- changing manufacturing landscape.

Considering these trends, the following analysis of Queensland supply chains is grouped by the three similarly characterised value chains.

Population-based value chains

(Fast-moving consumer goods, import TEU, general freight, horticulture, construction and fuel)

These consumption supply chains are predominately serviced by road within the local network, and are therefore constrained by access into populated areas. This freight task is forecast to double over the next 15 years.

Goods consumed are produced domestically and overseas. Import TEU, construction inputs and fuel are moved via specialised equipment. Fast-moving consumer goods, general freight and horticulture move in standard and often environmentally controlled rigid and articulated vehicles.

Organisations in these maturing and increasingly more centralised supply chains have developed global supply lines based on supply chain management. They are sourcing more manufactured and finished product from overseas, with imported TEU moving direct to the closest port of call for regional distribution.

Global supply chains are focused on increasing productivity and reducing costs, therefore maximising the payload in the import TEU. These loads often exceed those permissible on the road network. To avoid unproductive double handling, organisations establish logistics hubs at port, using a port-centric logistics model. HPV are used as internal shuttles at port to these logistics hubs, proving significant productivity gains with extended HPV access being sought.

Early adopters are altering international supply lines, with some imports going direct to regional ports in addition to major ports. Major retailers and motor vehicle manufacturers are currently importing through the Port of Townsville and construction firms are importing through the ports at Gladstone, Mackay and Townsville, subject to project location.

The driver of this strategy is the encouragement of organisations to locate at, or close to, port as the first land side movement into their domestic supply chain. Domestic manufacturing is decreasing for items such as white and brown goods, non-perishable food, motor vehicles, hardware and many everyday items. This is decreasing freight movements on traditional routes and creating new routes based on these import supply chains.

The fresh food and perishable items produced in horticultural and livestock supply chains are being developed to meet consumer demand and are becoming more aligned to the global export markets that they also service. These drivers reinforce the need for supply chain links at ports, but must also recognise the differing and individual supply chain requirements.

Production/manufacturing/value adding value chains

(Sugar, grain, cotton, livestock, horticulture, over-size over-mass, mine inputs, fuel, project and construction)

As part of a larger production process, these supply chains must access the nodes where the value adding is conducted. This includes mills, refineries, abattoirs, project sites, batching plants, industrial estates, fabrication and manufacturing plants and ports for imported equipment and componentry.

The sources of origin are typically remote from the value adding node and a line haul movement is required and facilitated by local access at the node. Although efficiency improvements inside the nodal activity are within control of industry, HPV are required for the modal components to gain overall supply chain efficiency. This may create a local access issue where the nodal activity is not adjacent to heavy vehicle routes.

As the uptake of HPV increases in these value chains, the local access issues will become more frequent. Future land use planning must cater for this by integrating planning on strategic freight routes with industrial and residential land use plans.

Fuel supply chains are altering due to refinery closures in Australia, with refineries being converted into imported refined logistics hubs.

Distribution network value chains

(Export TEU, sugar, meat, grain, cotton and general freight)

In South East Queensland, fast-moving consumer goods move into and out of distribution centres to store using vehicle configurations based on the delivery node constraints. General freight movements to remote locations typically undergo a value adding step prior to the final destination.

In remote locations, products are trans-shipped and consolidated at regional hubs such as Toowoomba, Townsville and Cairns. Products are then on-forwarded by road and sea to the final destination. HPV are typically used for movement once through the hub, with access constrained by the hub location.

The remaining supply chains, all of which have an export focus, have similar requirements to meet the needs of their global supply chain partners via outturns of maximum payload TEU. Total global supply chain requirements and costs influence the unit of movement, packaging and TEU loading decisions.

Points of production and value adding are typically located in regional Queensland, resulting in access issues between these nodes and ports. Despite the expected slowing in the gains achieved through HPV, HPV will continue to drive productivity gains to meet the needs of global supply chain partners.

Recent developments in containerisation indicate there is a new trend in the bulk handling of commodities such as grains and sugar. There are three drivers for this: large new/niche markets are opening up as countries develop; there is global capacity in international shipping containers with about 50% of all TEU movements empty; and shipping lines are encouraging producers to containerise product so as to access the new/niche markets.

Modal shift to coastal shipping, a major transport mode globally, is being considered as an alternative for rail and road-based movements. Although rail is also an option, trends over the last 10 years have moved towards road transport.

Policy and governance policies from all levels of government influence supply chain practices including:

- chain of responsibility
- fatigue, mass and maintenance management accreditation
- high productivity vehicles, performance-based standards and the Intelligent Access Program
- workplace health and safety
- network access, resilience and operations
- infrastructure investment.

Vehicle productivity is influenced by network design and vehicle performance, and is considered in terms of road safety and community amenity. There are a number of community-based action groups calling for change with respect to road safety performance.

There are current key pieces of infrastructure, such as the Toowoomba Range Crossing and the Bruce Highway, that are at capacity and experiencing capacity constraints. Alternative routes must be considered, based on community concern, road safety performance and the economic impacts.

Compliance requirements are now placed on all participants in supply chains, with responsibility spread end to end. This will develop to ensure acceptable levels of road transit and safety performance are reached.

Flooding occurs regularly in many parts of the state, impacting on the network’s capability to ensure communities remain connected, and that economic activity can continue. Due to the geographically dispersed nature of Queensland, a resilient network is paramount for continued and reliable network access.

5.6 Productive freight infrastructure

Queensland’s road network has an asset valuation of \$61.48 billion, with the total investment program in 2014/15 valued at \$4.956 billion. Of this, 19.7% relates to restoration of infrastructure from natural disasters, with \$0.98 billion invested in natural disaster restoration.

Other resilience projects are also included in the 51% attributed to project and construction investments. In excess of \$1 billion is spent annually on road network resilience. The current transport and roads infrastructure investment from Queensland Transport and Roads Program (QTRIP)⁴⁸ is summarised in Table 2.

⁴⁸ Queensland Transport and Roads Investment Program (QTRIP) 2014-15 to 2017-18, Queensland Government

Table 2: QTRIP Investment Program 2014/15

Queensland Transport and Roads Investment Program (QTRIP) 2014-15	National Network	State Network	Local Network
	\$ million	\$ million	\$ million
Maintenance, preservation, operations and other minor enhancements	\$ 175.9	\$ 605.9	
Project planning, initiation and construction	\$ 1,296.2	\$ 1,207.9	
Natural Disaster (NDRRA)	\$ 157.0	\$ 817.4	
Administered Capital (QR)		\$ 452.6	
Local Network Special Initiatives			\$ 147.3
Black Spot			\$ 10.8
Other Transport Grants			\$ 44.3
Transport Infrastructure Development Scheme			\$ 40.7
	\$ 1,629.1	\$ 3,083.8	\$ 243.1

Note: Includes Commonwealth Vehicle Safety and Productivity Programme Funding

The road network is managed at four levels:

- national network roads
- state-controlled roads
- other state-controlled roads
- local government-controlled roads.

The national network consists of 5,017 km of roads, part of a single national network of transport links that are of strategic national importance. These national and inter-regional transport corridors link areas of production and consumption, ports and airports, rail, road and include connections to intermodal facilities. These networks are critically important to support economic growth and regional development.

The state-controlled network comprises 33,352 km of roads, the longest network in Australia. Movements range from 50 to 140,000 vehicles per day handling freight, tourism and commuters, and providing access to services and recreation.

Other state-controlled roads cover 4,084 km of strategic roads and 24,251 km of regional and district roads. Local government-controlled roads are owned and managed by local governments, in partnership with the Department of Transport and Main Roads (TMR).

TMR works with the Commonwealth Government to manage the strategic road network via the Heavy Vehicle Safety and Productivity Programme (HVS&PP). This program is focused on productivity and safety outcomes to support heavy vehicle operations throughout Australia.

The investment program is driven by a number of factors including:

- maintenance and repairs to existing assets
- enhancements and upgrades to existing assets to handle higher traffic volumes and HPV
- new infrastructure
- safety initiatives and black spot elimination
- network resilience.

Queensland's Bruce Highway has identified issues in terms of capacity, congestion, delay and safety, prompting the development of the Bruce Highway Action Plan (BHAP). The BHAP is a 10-year program of works designed to implement a generational upgrade to acceptable Australian standards.

The Toowoomba Second Range Crossing (TSRC) is a critical piece of infrastructure and of national importance. It has a significant role in strengthening the supply chains that travel east to west from regional Queensland to South East Queensland markets, and in servicing export links to cater for future growth.

The Warrego Highway Upgrade Strategy (WHUS) is a vital east-west freight link supporting agricultural, resources and passenger freight movements. WHUS consists of 41 investment priorities over the next 20 years on the 714 km-long highway.

The HVS&PP has provided funding over the last four years to cater for construction of heavy vehicle rest areas, livestock spelling yards and the upgrade of three bridges. Two bridges are located on the Warrego Highway and one on Port Drive at the Port of Brisbane.

The Inland Rail project will link Melbourne to Brisbane via Toowoomba, with a dedicated link to the Port of Brisbane also proposed. This project is seen as a strategic investment for the future to provide capacity for the next 50 years for the east coast freight market.

QTRIP recent and current works include investment on heavy vehicle related infrastructure assets, including:

- upgrades on the Warrego Highway to cater for increasing demands
- improvements to freight flows on Beaudesert and Granard Roads and links to the Logan Motorway
- lane duplications around the Charlton Wellcamp Enterprise Area (CWEA)
- Toowoomba CBD ring road
- Surat Basin road network upgrades to cater for future freight demands
- safety upgrades on the Cunningham Highway
- Type 2 road train access to west of Roma with a de-coupling yard
- bridge upgrade at Mitchell
- heavy vehicle route through Roma
- upgrades in Central Queensland to cater for the traffic resulting from the Galilee Basin resources developments
- Townsville bypass to cater for high speed heavy vehicle and commercial freight movements
- sealing of sections of the Hahn Highway between The Lynd and Hughenden
- heavy vehicle yard outside of Mt Isa
- improving freight infrastructure in the Cape York region
- a number of projects on the Kennedy Highway and Developmental Road.

The HVAP specifically examines routes that are required to support heavy vehicle movements for the agriculture and resources sectors, and identified the need for;

- an inland north-south HPV route
- a Toowoomba – Northern Territory HPV route
- a Central Queensland HPV and an over-size over-mass route
- investment on the Kennedy and Gregory Developmental Roads, Flinders Highway and Clermont to Alpha Road to support agricultural movements.

The Heavy Vehicle Action Plan (HVAP) was developed in consultation with industry and recommends:

- increased access to Type 2 road trains and PBS Level 4 vehicles on the north-south routes (potentially leading to greater supply chain efficiency)
- increased access to Type 2 road trains and PBS Level 4 vehicles closer to Toowoomba from the current location west of Roma
- increased access on the Peak Downs Highway from B-Double to A Double vehicles.

Potential benefits from these actions may include:

- freight moving away from the Bruce Highway, which will relieve some of the safety, congestion and capacity issue
- an improved supply chain cost base to compete for new markets in the Northern Territory currently serviced from South Australia and Western Australia
- productivity and efficiency gains including:
 - a 5% shift of B-Double freight movements from the Bruce Highway (215,000 annual trips) to a north-south route, leading to a 49% reduction in movements (if by a Type 2 road train QUAD), with a 5% reduction in pavement wear
 - using A-Double and not B-Double vehicles on Peak Downs Highway, reducing movement through urban Mackay by 23%.

The HVAP supports the need for an inland freight route and identifies benefits that accrue as a result.

The QTLIC Report 2, A focus on freight on the Toowoomba Second Range Crossing (TSRC) has identified:

- Access off the TSRC to the Toowoomba local area requires planning so that local business can gain the maximum benefit through the use of HPV.
- Access to the east of the TSRC will be required for the reference design vehicles (B-Triple and PBS Level 3 equivalent) for maximum benefit to the economy.
- This access requires direct entry to value adding and logistics hubs to the east of the TSRC, including the Port of Brisbane, Brisbane East, Brisbane West, Logan City and Ipswich industrial estates and road networks.
- Alternatively, a de-coupling yard is required at a location based on a logistics analysis to service the high freight intensity areas.

The QTLIC Report 3, A focus on Queensland's Inland Highway has identified a number of potential benefits to freight operators and the economy as a result of an inland freight route including:

- lower current freight volumes than the Bruce Highway
- lower traffic volumes than the Bruce Highway
- existing levels of access for high productivity vehicles with opportunities to increase current access levels
- higher levels of road safety performance
- superior flood resilience across the road network
- time and distance advantages on a number of routes to Melbourne
- alternative routes to Brisbane and Sydney, with slight time and distance disadvantage.

While translation into economic benefits for individual supply chains and the economy of Queensland is more difficult to forecast, the following points can be made.

- Based on the scenarios modelled for the inland freight routes, the vehicles on a Melbourne return trip would experience a reduction in distance travelled and time of between 10% and 25%, leading to increased use of those assets, with a corresponding reduction in fuel consumption and operating costs for each trip.
- A reduction in road safety incidents (currently costing around \$3.2 million per fatality and \$0.317 million per serious injury) should result, and which would receive broad community support.
- A reduced investment in infrastructure would be required to support the future economic growth, as the asset already exists and would only require an investment as proposed in the HVAP.

- Freight load on other networks such as the Bruce Highway would be reduced, leading to increased productivity when using PBS Level 3 and 4 vehicles, with indicative gains of between 23% and 49% reduction in movements, and a 5% reduction in pavement wear.
- Regional towns along the inland route could benefit economically from the increase in traffic, which would require amenities such as fuel, maintenance support, rest stops, food and accommodation.

The QTLC Report 3 also examines the inland route as a modal route for long haul north-south freight movements.

- As movements are generated at nodal points of production or value adding operations, policy settings and incentives for industry should align to the vision of an inland route and these nodes should be developed to align with an inland route strategy
- Development of production and value adding operations should be encouraged alongside the inland network and the west-east feeder routes, especially those focused on the interstate markets of Victoria, South Australia, Western Australia and the Northern Territory.
- Export supply chains would also require access to nodes for air freight and sea freight, ensuring higher levels of vehicle productivity throughout the entire journey. Ports that could accommodate this level of access include Townsville, and potentially Brisbane, as identified in the TSRC Report 2.
- Other Queensland regional multi-cargo ports are constrained by their location, as all are situated alongside major regional cities. Infrastructure investments would be required at these ports to improve access for HPV. Airports are also located alongside cities and towns, so have similar access issues.

6 Conclusions

These investigations have provided a detailed understanding of the historical and contemporary developments in freight transport legislation and policy, and the corresponding evolution of supply chain management and supply chains. Together with the preparation of the Perspectives and the information provided at the Industry Forum, this is instructive in understanding the characteristics of today's supply chain structures, the factors that shape them and the freight networks that enable them.

Significant developments from the 1970s until recently provide a background, being:

- the removal of road transport restrictions relative to rail
- the consequential emergence of road transport and supply chain management at the time of globalisation
- road transport's role in facilitating the centralised distribution structures that have developed in Australia's population-based supply chains
- the increase in heavy road vehicle efficiency, facilitating similar efficiency gains and affecting the structure of supply chains
- regulatory frameworks to enable 'managed' use of the high productivity vehicles
- Commonwealth and state recognition of the vital role of transport within supply chains.

Significant known and visible trends include:

- expected reduction in the gains achieved in vehicle productivity
- state and federal governments' recognition of the need to coordinate transport policy and infrastructure development, given the expected growth in freight task
- recognition that future considerations need to include both domestic and international supply chain factors
- national coordination through the National Land Freight Strategy (NLFS) and introduction of the National Heavy Vehicle Regulator
- state-based plans aligned to the NLFS, such as Moving Freight and supporting strategies such as the Heavy Vehicle Action Plan
- infrastructure commitments such as the Toowoomba Second Range Crossing, inland rail, and long-term upgrade plans for significant freight corridors such as the Warrego Highway and the Bruce Highway
- stated preference for rail use other than for bulk commodities
- recognition of the importance of to/from port freight capability

- reconsideration of the role of coastal shipping
- emphasis and focus on community amenity and network safety
- current and potentially further decentralisation of Australian land-based supply chains, especially at the mass merchant level
- extension of global sourcing, from simply accessing lower cost items to managing the global supply chain for maximum efficiency and requiring agility
- global sourcing and port-centric logistics is impacting on strategically important supply chains for products such as grain and meat, and facilitating decentralisation
- altered movement patterns due to the changes in manufacturing, such as car manufacturing, which will see supply chain reconfiguration
- the focus on northern Australia as an area to substantially increase Australia's agricultural output, predominantly for export markets
- emerging consideration regarding a resilient inland road freight route
- continuation of strong extracted minerals exports, and the mid to long-term developments in coal seam gas, liquefied natural gas.

Moving Freight states there is 'a broad range of freight, supply chain and logistics issues confronting the industry'. It also states the Queensland Government's intention to ensure Queensland's freight system is receptive and responsive to customer needs and the changing requirements of a growing economy.

The Commonwealth and Queensland legislative frameworks and policy intent are clearly responding in a coordinated manner to address the identified future needs, including those of international supply chains. Nationally coordinated strategies such as the National Land Freight Strategy, the National Heavy Vehicle Regulator and National Heavy Vehicle laws demonstrate a coordinated national approach.

Queensland Government strategies such as Moving Freight and the Heavy vehicle Action Plan and infrastructure developments such as the Warrego Highway Upgrade Strategy, the Bruce Highway Action Plan and the Toowoomba Second Range Crossing (TSRC) demonstrate the focus being applied to freight and transport networks.

There is, however, an apparent challenge in seeing this well-directed and demonstrated intent translated into 'future capable' infrastructure that can support Queensland's most strategically and economically important supply chains.

As detailed in the TSRC-focused second report in this project, the reference design proposed for this critical piece of freight infrastructure does not address current and emerging trends in supply chain management and structures. Future proofing this and other major freight network infrastructure is critical to enabling ongoing efficiency improvements.

Future proofing must also address the connecting network capabilities and nodal requirements that will enable maximum potential to be achieved from freight infrastructure investment. The TSRC report provides more detail on this point. Encouraging production and value adding operations in proximity to the primary network will also provide benefits in supply chain efficiency and network design.

Population-based supply chains have now taken up the vehicle productivity gains available to them and it is expected that recent gains in vehicle productivity will not be repeated into the future with current nodal constraints. Advances in vehicle productivity will, however, remain a critical efficiency opportunity for strategically important and high economic value supply chains such as grains, livestock, meat, horticulture and the construction element of major projects.

A specific and detailed focus on these strategically important and high economic value chains is recommended to help prioritise freight infrastructure development and ensure effectively targeted investment.

At this level, it will be necessary to have a detailed understanding of both the nodal and modal requirements needed to maximise efficiency gains. This detail is required for each supply chain, potentially including regional variants, to ensure the specific detail is understood. This approach will be critical in improving freight system performance through heavy vehicle access systems.

The time to market and/or product handling requirements of many value chains excludes rail as a practical option, irrespective of cost. A detailed understanding of strategically important and high economic value supply chains is also recommended, to help existing rail capacity support freight demand.

Identifying those value chains and the individual supply chains within them that can be adequately serviced by rail will provide a realistic appraisal of opportunities. Once established, these opportunities can be realistically considered in terms of immediate adoption or for future development as the impact of energy costs changes the balance between the logistics trade-off.

In summary, it is evident that the legislative frameworks and policy settings clearly recognise future requirements and that there is a nationally coordinated and state-focused approach to improving the freight network. These address the expected future volume of movements and acknowledge the requirements for increasing community amenity and safety.

While extensive vehicle productivity gains are declining for some sectors, the need for gains remains a critical factor for some of Queensland's most strategically and economically important supply chains. Leveraging optimum advantage from investment in freight transport infrastructure, including rail, will require a detailed and comprehensive understanding of these supply chains at the nodal and modal level.

Both Freightline and Moving Freight recognise that reliable and up-to-date information about current and projected future use of the network is essential for efficient network planning and management. This should be an immediate priority for Queensland's most strategically and economically important supply chains.

APPENDIX A:

FREIGHT TRANSPORT IN QUEENSLAND: A HISTORICAL CONSIDERATION OF THE IMPACT OF LEGISLATION AND POLICY ON MODAL CHOICE

FREIGHT TRANSPORT IN QUEENSLAND

Context

The demonstrated advantages of road freight over rail and coastal shipping are the flexibility, accessibility and responsiveness of road transport. Whereas rail and coastal shipping are best suited to moving large tonnages over long distances, road transport provides the flexibility of 'door-to-door' delivery and the responsiveness to meet time sensitive requirements.

Historically, this dichotomy has been exacerbated by fundamental differences in industry structure; particularly in relation to the integration of infrastructure and users, the nature and number of operators, and, for coastal shipping, statutory restrictions on the use of available capacity.

In structural terms, the rail sector in Queensland has been characterised by the continued integration of 'above' and 'below' (rail) operations – albeit third party access has been mandated through various competition policy initiatives since the mid 1990s. As a result, the rail market is dominated by a handful of providers, functioning in near-monopoly circumstances in a strictly regulated environment.

In contrast, the road freight sector is distinguished by a myriad of operators, with relatively unrestricted access to a primarily publicly-owned road network. Allowing heavy vehicle access to this network (often referred to as 'deregulation') has resulted not only in the removal of barriers, which were seen as anti-competitive, but also in substantial increases in vehicle dimensions and payloads, with a resultant decrease in road transport unit costs.

The reverse has occurred in coastal shipping trade, with the further tightening of regulatory restrictions in 2012⁴⁹. The intent of these restrictions was to reduce the number of foreign vessels carrying coastal freight. Groups such as the Institute of Public Affairs consider there will be a consequential increase in transport costs that could result in 'bulk commodities being sourced from cheaper overseas markets, thus negatively affecting Australian commodity producers'⁵⁰.

⁴⁹ *Coastal Trading (Revitalising Australian Shipping) Act 2012 (Commonwealth)* at: www.comlaw.gov.au/Details/C2012A00055

⁵⁰ *Institute of Public Affairs (IPA), December 2013, 'Coastal Shipping Reform: Industry Saviour or Regulatory Nightmare?' Paper by Chris Berg & Aaron Lane, Page 2*, at: www.ipa.org.au/portal/uploads/Coastal_

Concurrently, there has been a significant shift in supply chain structures, notably the migration from centralised distribution arrangements to a higher level of short cycle replenishment methods, now often (incorrectly) referred to as 'just-in-time'.

Given its inherent advantages of flexibility and responsiveness, road freight transport has adapted well to such changes. There has been a substantial increase in the range and quantity of commodities moved by road. Consequently, the road sector has increased its modal share of the supply chains of most goods, excepting bulk commodities such as coal.

In contrast:

- the diversified nature of freight rail nodes and markets has diminished significantly, with the substantial increases in rail freight tonnages largely attributable to coal movement on main lines
- over 84% of cargo moved by coastal shipping is dry or liquid bulk; containers represent only 9-10% of the cargo moved between Australian ports, despite the number of internationally flagged container vessels operating through Australian waters⁵¹.

Legislative frameworks for state intervention

The *State Transport Coordination Act (1931)* was 'an Act to provide for the improvement and for the coordination of transport, and for other purposes'⁵². Similarly, the *State Transport Act (1938), Queensland*, was 'an Act to provide for the better coordination and utilisation of transport facilities within the State, and for other purposes'⁵³.

The 1938 Act dissolved the (then) State Transport Board and established a State Transport Commission. The Commission was charged with ensuring that the reasonable requirements of the public were adequately met in conveying passengers and goods at all times.

Shipping_Report-Institute_of_Public_Affairs-Dec_13.pdf

⁵¹ *IPA (2013), 'Coastal Shipping Reform: Industry Saviour or Regulatory Nightmare?' Table 1, Page 7*

⁵² www.austlii.edu.au/au/legis/qld/hist_act/stca0193122gvn48429/
⁵³ www.austlii.edu.au/au/legis/qld/hist_act/stao19382gvn15312/

The 1938 legislation provided that the Commission had to 'secure as great a degree of coordination as possible among the various forms of transport for the conveyance of goods and passengers, avoiding unnecessary overlapping of and uneconomic competition between the various forms of transport'.

The legislation also enabled the Transport Commission of the time to recommend to the Minister the appointment of an expert body or expert bodies to examine the position (including closure) of branch railway lines that 'are earning less than working expenses'.

The themes of better coordination and use of transport facilities, explicit government involvement and railway 'profitability' continue through to the current day. More recent examples include the enactment of the *Transport Planning and Coordination Act (1994)* and the review and explicit funding of rail branch lines initiated in 1992⁵⁴.

Influences on modal choice and allocation

The Queensland Trucking Association noted that, during the 1950s, the road transport industry felt the effects of the rail lobby efforts as regulations, permits and work hours were drafted to limit the competition between road and rail⁵⁵.

In his opening speech for Parliament in 1962, the Queensland Governor noted that 'the wide use of road transport permitted under the *State Transport Act of 1960* resulted in a consistent expansion in the country areas. Many of the restrictions originally imposed on transport by road have been lifted and permit fees lightened where the overall revenue budget position has permitted it. The movement of goods is a matter very closely bound up with the economy of the State and it will continue to receive the attention of my Ministers'⁵⁶.

By the 1980s, large transport companies had emerged, along with an increase in long distance road freight. This era also saw the growth of the road freight industry in the 'line haul' movement of livestock rather than the traditional mode of rail. However, in the main, the road transport sector grew in response to the increased containerisation of goods, an expansion made possible by innovations in heavy vehicle design⁵⁷.

⁵⁴ The extent of public sympathy for the retention of freight on railways, can be seen in Parliamentary debates about the (then) proposal to close 29 branch lines: refer www.parliament.qld.gov.au/documents/hansard/1993/930914ha.pdf; and www.parliament.qld.gov.au/documents/hansard/1993/930915ha.pdf

⁵⁵ Queensland Trucking Association www.qta.com.au/index.cfm?MenuID=86

⁵⁶ www.parliament.qld.gov.au/documents/hansard/1962/1962_08_21.pdf

⁵⁷ Queensland Trucking Association www.qta.com.au/index.cfm?MenuID=86

Notwithstanding the growth in road freight, the restriction of certain goods to rail transport continued until the early 1990s. The Industry Commission Report on Rail Transport (Report No. 13, 21 August 1991) noted that⁵⁸:

- 'coal, coke, domestic grains (except seed grains), limestone, liquefied petroleum gas, minerals and ores and raw sugar are regulated to rail in Queensland'
- 'with the exception of grains, road permits are issued when ... road transport is more competitive for the carriage of these restricted goods'
- 'there are several reasons why State governments might want commodities to be transported by rail ... (including) ... to protect the State's investment in the rail system; to reduce the adverse effects of road haulage on road maintenance, congestion, pollution and accidents; to provide revenue through monopoly pricing; and for safety reasons.'

Nonetheless, the (then) Industry Commission recommended the removal of restricted goods provisions from Queensland legislation, except for some dangerous goods considerations⁵⁹. This recommendation focused on the need to reduce 'monopoly pricing; opportunities and to apply increased pressure for efficiency improvements in rail freight'.

The Queensland Government subsequently introduced a suite of transport legislation that reaffirmed the overarching need for transport coordination. Modal-specific transport strategies were developed in parallel with the removal of statutory restrictions on modal choice and a more transparent system of fees and charges for road use implemented⁶⁰.

⁵⁸ Table 10.4 (Regulated commodity traffics by State) at www.pc.gov.au/research/conference-papers/?a=6756

⁵⁹ IC Report No. 13 (1991), Recommendation 10.1

⁶⁰ Acts in the suite of transport legislation included:

- *Transport Planning and Coordination Act 1994*
- *Transport Infrastructure Act 1994*
- *Transport Operations (Marine Safety) Act 1994*
- *Transport Operations (Passenger Transport) Act 1994*
- *Transport Operations (Road Use Management) Act 1995*
- *Transport Operations (Marine Pollution) Act 1995*

Structural changes

In the 1990s, at the behest of the Commonwealth Government and concurrent with technological advances particularly in road transport, restructuring of state railway systems (including privatisation) commenced⁶¹.

The Commonwealth Government had determined that a national approach required funding and the ‘One Nation’ program commenced in 1992.

By 1995, One Nation funding meant that all mainland capital cities, except Darwin, were linked by standard gauge rail track. Competition across modes increased, with the freeing up of road use (for a fee) and enhanced road access, additional and explicit funding for rail infrastructure, and the 1998 establishment of the Australian Rail Track Corporation (ARTC). The ARTC was seen as a ‘one stop shop for train operators seeking access to the interstate rail network’.

With the market open to competition, and innovation encouraged by the changes in the 1990s, the road freight industry focused on enhancing productivity⁶². At the macro level, this is best seen in the 35 years from 1971 to 2007, when Australia’s road freight task increased six-fold. Over the same period, total kilometres travelled by commercial vehicles increased only three-fold, implying a near two-fold increase in average heavy vehicle productivity⁶³.

⁶¹ “Since the mid 1990s, Australia’s railways have undergone an ownership, operational and technological revolution.” See “Commonwealth involvement in reform of the rail freight industry”, Research Paper No. 19 (Richard Webb). Parliament of Australia, January 2009

⁶² For example, the Cannington Icon Road Train – a 98 wheeler, 53.5 metre long truck made up of a tri-drive Mack tractor unit pulling two B-triples hooked together by a tri-axle dolly converter, was introduced in the late 1990s into Queensland to operate on a public road between the rail and loading facility near Cloncurry for the Cannington mine operation.

⁶³ From 1971 to 2007, road freight grew from 27.2 billion tonne kilometres to approximately 184.1 billion tonne kilometres, outstripping growth in both rail and domestic sea freight.

See: Australasian Transport Research Forum 2010 Proceedings, Paper titled Heavy vehicle productivity trends and road freight regulation in Australia by David Mitchell (BITRE). Australian Bureau of Statistics 2008, Survey of Motor Vehicle Use, Australia, 12 Months Ended 31 October 2007, Catalogue No. 9208.0, Canberra

The principal factors contributing to increased heavy vehicle productivity included:

- the introduction of and expanded network access for larger heavy vehicle combinations, particularly B-doubles
- progressive increases in regulated heavy vehicle mass and dimension limits
- strong growth in long distance freight
- cumulative long-term investment in major road infrastructure, particularly the realignment and duplication of parts of the inter-capital highway network.

Modal share of the freight task

The split between road, rail and coastal shipping for freight transport from 1970/71 to 2006/07 is demonstrated in Figure 1 (on page 21).

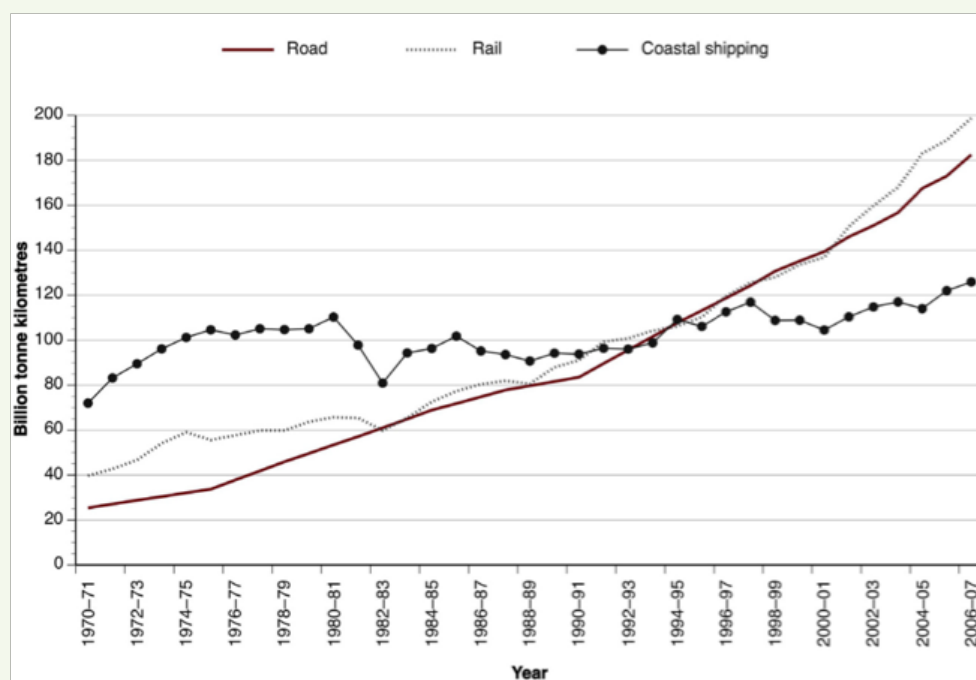
In the context of tonne-kilometres, coastal shipping was the dominant transport mode until the early 1990s. Road and rail haulage growth has accelerated at a much greater rate than coastal shipping since that time. Coastal shipping tonnages have been relatively flat since 1993/94, when the total freight task was split evenly between the three different modes.

In 2006/07, road and rail freight (in tonne-kilometres) was responsible for 36% and 39% of total freight movements, respectively⁶⁴. While nearly all of our export trade was moved by ship, it was considered there was room for growth in Australia’s domestic (coastal) shipping industry and an increasing appetite for its resurgence.

The Institute of Public Affairs noted that ‘transportation is a derived market; therefore, the focus of coastal shipping reform should have been on increasing the efficiency of the bulk transport industry to ensure that Australian products remain globally competitive’⁶⁵.

⁶⁴ Allen Consulting, National Freight Network Strategy, Background Paper, February 2010, Chapter 2, Page 3 at: www.infrastructureaustralia.gov.au/publications/files/freight_network_background_paper_Feb_2010.pdf
⁶⁵ IPA (2013), Coastal Shipping Reform: Industry Saviour or Regulatory Nightmare? Page 31

Figure 2: Modal share of domestic freight task



Source: Allen Consulting, *National Freight Network Strategy, Background Paper, February 2010, page 8*, based on information in BTRE (2006), *Freight Measurement and Modelling in Australia*.

In 2008, a House of Representatives Standing Committee concluded that a strong domestic shipping industry could help alleviate land transport bottlenecks, infrastructure constraints and environmental impacts, as well as provide the economic benefits derived from the creation of local employment and the growth of maritime services.

Paradoxically, in terms of seaborne container traffic, there would seem to be surplus capacity in international carriers. The Institute of Public Affairs has noted the (then) Commonwealth Government’s view that containerised coastal shipping in Australia was only competitive for distances above 2,200 kilometres⁶⁶.

In 2002, the Commonwealth Government released *Freight Logistics in Australia: An Agenda for Action*, Industry Steering Committee of the Freight Transport Logistics Industry Action Agenda with five principles to guide government’s regulatory reform in the transport industry.

This ‘whole of logistics chain’ approach, identified the need to:

- recognise the links between regulation, accreditation regimes, industry performance and quality assurance standards
- move towards performance-based standards
- have regulations which are clear, capable of consistent application and auditing
- assist government agencies to adapt to changes in the logistics task⁶⁷.

⁶⁷ Department of Transport and Regional Services (DoTaRS), 2002, *AusLink Green Paper: Towards the National Land Transport Plan & 2004. AusLink White Paper: Building Our National Transport Future*.

⁶⁶ *Rebuilding Australia’s Coastal Shipping Industry, Inquiry into Coastal Shipping Policy and Regulation, House of Representatives Standing Committee on Infrastructure, Transport, Regional Development & Local Government, October 2008, Canberra IPA (2013), Coastal Shipping Reform: Industry Saviour or Regulatory Nightmare? Page 7*

Infrastructure funding guidance

In 2004, the Commonwealth Government proposed a more strategic cross-modal approach to land transport infrastructure funding. AusLink was created, with a ‘logistics rather than modal focus’, albeit centred on land transport (including ports) to the exclusion of maritime and air freight services⁶⁸. The *AusLink (National Land Transport) Act 2005 (Commonwealth)* funded projects related to land transport and other related purposes.

In parallel with the Auslink funding model, the Commonwealth, states and territories agreed to establish the National Transport Commission (NTC)⁶⁹. This merged the former National Road Transport Commission (NRTC) into a new body to include rail but not maritime or aviation.

By 2008, the Auslink model (re-labelled as the Building Australia Fund) had been supplemented with Infrastructure Australia, a new statutory body established under the *Infrastructure Australia Act 2008 (Commonwealth)*.

Until recently, the functions of Infrastructure Australia have focused on advice to governments, investors and infrastructure owners on issues. Examples include current and future infrastructure needs, mechanisms for financing infrastructure investments, policy, pricing and regulation, and the consequential impacts on investment and on the efficiency of the delivery, operation and use of the national infrastructure network⁷⁰.

To date, Infrastructure Australia’s advisory role has been intended to assist Australian governments in developing a strategic blueprint for unlocking infrastructure bottlenecks and in modernising the nation’s economic infrastructure.

⁶⁸ *AusLink was a decisive and visionary initiative with straightforward aims, namely:*

- develop an integrated network of land transport corridors of strategic importance to the nation, including road and rail links and intermodal connections to ports and airports.
- develop a unified, long-term national infrastructure plan for the development of this network, based on clear national objectives and priorities that focus on the major transport challenges facing Australia
- establish a coherent national framework that can implement this plan in an effective, workable way, by directing funds and effort to the best uses
- develop a broader National Land Transport Plan to take improvements to the national network further by integrating improvements to infrastructure, systems, regulation, safety and other important land transport issues. (Source: Response of the Federal Government to the House of Representatives Standing Committee on Communications, Transport and the Arts, Report, Back on Track.

⁶⁹ *The National Transport Commission Act 2003 (Commonwealth) is an Act to establish the National Transport Commission, and for related purposes.*

⁷⁰ *For the complete range of functions see: www.austlii.edu.au/au/legis/cth/num_act/iaa2008293/s5.html; noting that the role of Infrastructure Australia has been enhanced with the Infrastructure Australia Amendment Bill 2013 finally passing both Houses on 26 June 2014.*

Questions of ‘national significance’ and ‘priorities for investment’ appear fundamental to the use or otherwise of Infrastructure Australia’s inputs in guiding the allocation of Commonwealth monies, including Building Australia Funds⁷¹.

In the period 2010/12, Infrastructure Australia and the NTC developed Australia’s first National Ports Strategy. The lead objective of this strategy was to improve the efficiency of port-related freight movements. In 2014, the Queensland Government released its Ports Strategy, the vision for which is to ‘drive economic growth through the efficient use and development of Queensland’s long-established major port areas, while protecting and managing Queensland’s outstanding environmental assets.’⁷²

Whereas the National Ports Strategy represents a framework for investment prioritisation of landside infrastructure, the Queensland Ports Strategy is aimed at endorsing the retention and growth of existing ports with due cognisance taken of the proximity of these ports to the Great Barrier Reef Marine Park.

Despite these differences in policy approaches, the Productivity Commission’s Draft Report on Public Infrastructure (March 2014) clearly demonstrates that the Commonwealth Government⁷³:

- continues to refine the methodologies used for determining infrastructure priorities to enhance the efficiency of freight movement, but cost-benefit analysis remains at the core of all assessments
- is reliant on the states for the input information (including usage data) that underpins all assessment methodologies.

⁷¹ *The Building Australia Fund was established under the Nation Building Funds Act 2008 (Commonwealth). See www.austlii.edu.au/au/legis/cth/consol_act/nfa2008217/ and also www.ncoa.gov.au/report/appendix-vol-3/3-3-the-commonwealths-role-in-infrastructure.html*

⁷² *www.dsip.qld.gov.au/resources/plan/queensland-ports-strategy.pdf*

⁷³ *See Volume 1, Page 226 of Draft Report at: www.pc.gov.au/_data/assets/pdf_file/0007/134674/infrastructure-draft-volume1.pdf*

National harmonisation of regulations

In May 2009, the Australian Transport Council (of Ministers) recommended successfully that the Council of Australian Governments (COAG) agree on a transition to single national regulators covering rail safety, maritime safety and heavy vehicles, and a national rail safety investigator⁷⁴. In 2010, Allen Consulting advised the network was still not operating efficiently, imposing many costs on society including congestion and pollution, delays and inefficiencies in supply chains, and sub-optimal allocation of resources in storage and handling facilities.

Numerous causes of these problems were identified, ranging from past under-investment in infrastructure, poor regulatory design and issues associated with Australia having a federal system of government. The harmonisation of regulations relating to land use planning, labour and the environment were considered the most influential on the efficiency of freight movement.

Such reforms take lengthy periods of time to put in place as demonstrated by the Seamless National Economy Reforms - National Heavy Vehicle Regulator and National Rail Safety Regulation.

⁷⁴ Discussion Paper - National Land Freight Strategy, Infrastructure Australia (February 2011) at www.infrastructureaustralia.gov.au/publications/files/NLFS_220211.pdf

Overarching freight-specific policy frameworks

The Standing Council on Transport and Infrastructure's (SCOTI) National Land Freight Strategy - A Place for Freight (2012) addresses the landside movement of freight to and from major economic nodes of activity, including ports and airports⁷⁵.

This document represents a paradigm shift in attention to the end points of freight corridors, especially as these nodes, and often the corridors, have become increasingly pressed by encroaching urban development, higher community expectations about noise, dust and other environmental impacts, and the need to handle significantly increasing levels of freight economically and efficiently.

Like most SCOTI outputs, the document was developed through a partnership between all levels of governments and industry. In the context of its intended purpose of delivering a streamlined, integrated and multimodal transport and logistics system, it is not dissimilar to initiatives such as Auslink.

One of the key actions is the development of specific jurisdictional freight plans consistent with the objectives of the Freight Strategy, including mechanisms for protecting freight corridors and precincts for the growing freight task⁷⁶. In December 2013, the Queensland Government published Moving Freight, a 10-year strategy to develop a sustainable and productive multi-modal freight network. The strategy is intended to provide direction to business and industry for managing freight. It will also contribute to the Queensland Government's broader commitment to developing the economy⁷⁷.

Freight volumes in Queensland are estimated to increase from 871 Mt in 2010/11 to 1,643-1,741 Mt by 2026, reinforcing the necessity of enhancing transport efficiency and effectiveness. Importantly, the Moving Freight strategy identifies a broad range of freight, supply chain and logistics issues confronting the industry.

⁷⁵ Standing Council on Transport & Infrastructure (SCOTI) at: www.transportinfrastructurecouncil.gov.au/publications/files/National_Land_Freight_Strategy_Compressed.pdf

⁷⁶ Page 54 of National Land Freight Strategy, A place for freight (2012)

⁷⁷ www.tmr.qld.gov.au/movingfreight Moving Freight will inform, and complement, a range of broader state government frameworks and initiatives that inform freight movement such as:

- statutory regional plans
- government strategy (e.g. Queensland's Agriculture Strategy 2040)
- supply chain planning (e.g. Central Queensland Transport Supply Chain Study)
- economic development plans (e.g. Galilee Basin Coal Infrastructure Framework and North Queensland and Central Queensland Resources Supply Chain projects)
- strategic infrastructure programs
- economic development direction statements (e.g., Queensland Airports 2013–2023). In addition, Moving Freight has a significant relationship with the Queensland Ports Strategy.

Moving Freight outlines short, medium and long-term actions to move freight onto rail and to improve the efficiency of road freight. It is intended to ensure Queensland's freight system is receptive and responsive to customer needs and the changing requirements of a growing economy⁷⁸.

Queensland's transport system is a large and complex mix of users, infrastructure, regulation, services and network operations, which requires multiple strategies and plans.

Moving Freight acknowledges that the Commonwealth Government has primary carriage of the issue of pricing. As such, potential impacts on end users and/or downstream consumers are of paramount consideration in future reviews of the pricing playing field, especially those policy responses that promote the adoption of vehicle tracking technology to introduce actual road usage charges.

Other issues in Moving Freight have been considered in light of the strategic framework of the Department of Transport and Main Roads, in particular the Strategic Plan 2014-18, and the Transport Coordination and Delivery Plan (TCDP)^{79 & 80}.

The TCDP is at the apex of the transport policy framework, with its vision of 'connecting Queensland – delivering transport for prosperity'. The TCDP sets departmental strategy and direction to deliver on the government's objectives in a 10-year horizon. It provides a clear strategic framework for making decisions to achieve the government's vision for the transport system and is supported by decision-making criteria, objectives and performance indicators, guiding principles, a governance structure and clear accountabilities.

There remain differences in the way that infrastructure is provided across Australia's transport sector. For example, transport infrastructure is a mix of public and private ownership, integrated and separate above and below rail approaches. This increases the challenge of effecting coordinated, flexible, safe and responsive integrated transport infrastructure systems which engender long term

certainty, and provide a degree of transparency upon which both public and private sector investments may be made.

Queensland Government policies relating to freight movement are striving to be consistent across and within relevant portfolios. In the Australian context, market-driven decisions coupled with open regulatory frameworks (the latter being the place for government action particularly in regard to safety) will underpin effective and efficient freight growth as needed in Queensland.

⁷⁸ Queensland Government, *Moving Freight, Transport and Main Roads*, December 2013 at: www.tmr.qld.gov.au/movingfreight

⁷⁹ [https://publications.qld.gov.au/storage/f/2014-06-](https://publications.qld.gov.au/storage/f/2014-06-27T07%3A38%3A59.036Z/00810-tmr-strategic-plan-2014-2018-a1.pdf)

[27T07%3A38%3A59.036Z/00810-tmr-strategic-plan-2014-2018-a1.pdf](https://publications.qld.gov.au/storage/f/2014-06-27T07%3A38%3A59.036Z/00810-tmr-strategic-plan-2014-2018-a1.pdf)

⁸⁰ www.tmr.qld.gov.au/Community-and-environment/Planning-for-the-future/About-planning-for-the-future.aspx

APPENDIX B:

SUMMARY OF SUPPLY CHAIN PERSPECTIVES

The following provides a summary of the Supply Chain Perspectives prepared in this phase of the project. The full versions are an Addendum to this report.

Cotton

Cotton is one of Australia's largest rural export earners and helps underpin the viability of more than 50 rural communities. In 2012/13 the gross value of total cotton production was \$667 million in Queensland.

The cotton supply chain in Australia is currently dominated by road transport. In 2012/13 in excess of 500 Mt of product was transported on road. Transportation of cotton is mostly undertaken by long distance road hauliers using articulated semi-trailer, B-Double or A-Double road vehicles.

An estimated 48,400 (96,800 return) heavy vehicle truck trips were required to transport cotton modules from Queensland farms to gins in 2011/12. A further 33,500 heavy vehicle movements (67,000 return) are estimated to move cotton products to warehouses for packing prior to export, and to feedlots and domestic processors.

Approximately 202,000 tonnes of bulk cottonseed and 30,000 TEU of lint were delivered to the Port of Brisbane by road in 2011/12. This required an estimated 6,700 (13,400 return) bulk heavy vehicle deliveries and 26,300 heavy vehicle trips (52,600 return) for containers, if undertaken by semi-trailer.

Fast-moving consumer goods (FMCG)

FMCG refers to the vast range of general retail items, consumer packaged goods, consumer electronics and routine household items including hardware and white goods.

The Australian retail sector generates \$265 billion in sales a year and employs 1.2 million people. In Queensland, the sector generates \$57 billion a year in sales with in excess of 12,000 businesses involved.

The sector is dominated by a small number of large retailers, who operate using globally accepted supply chain practices. The sector is characterised by a large international supply chain task, with retailers maximising the use of global sourcing and offshore manufacturing.

The areas where FMCG products are consumed and in what volume, is directly proportional to population.

Road transport is typically used to service all stores south of Queensland, into northern New South Wales. For locations north of Rockhampton, rail is used by the major retailers to move their goods to stores, with the delivery to and from rail terminals typically by TEU carrying container skeleton trailers.

Annual pallet movements in Queensland are estimated at 1.6 million, more than 162,000 truck movements, covering both inbound and outbound transport. Total Queensland FMCG-related movements estimates are 33 million pallets, with more than 1.6 million truck movements annually or 4,500 daily truck movements, covering both inbound and outbound transport.

The size of the vehicles is dictated by the store capability and access and egress constraints, either at the sending or receipt location. It is at times a requirement that rigid body trucks, often with twin steer, are required to deliver volumes of 10-14 pallets. Also, shorter length trailers carrying 14 to 18 pallets are used where possible. Typically to-store trailers are 20-24 pallet capacity.

For longer rail-based consignments, skeleton type TEU carrying trailers move the 20 foot and 40 foot containers to a rail intermodal terminal for line haul to regional locations.

The major retailers' network design is being configured around regional networks (RDC) and national networks (NDC) distribution centres. These distribution centres provide a channel to market based on the relative speed at which the product moves, also taking into account the handling characteristics.

Due to global sourcing and offshore manufacturing, the major retailers are positioning their networks closer to ports, so as to handle their increasing international logistics task. This is referred to as port-centric logistics.

Fuel

Queensland consumes around 25% of all petroleum products in Australia and is the leading consumer of diesel by state or territory, with 30.5% of total national consumption.

Queensland's total consumption profile is skewed towards diesel when compared to other states due to mining and road transport operations, which consume 52% and 34% respectively.

In 2010/11, Australia imported 83% of its crude oil and other refinery feedstock. With the closure of domestic refineries at Clyde and Kurnell and, as recently announced, the Bulwer Island refinery in Brisbane, the percentage of refined imported petroleum products will increase.

Using the total annual consumption of petroleum product in Queensland for 2012/13 as the base for calculation, 298,560 loaded B-Double single trip annual movements (579,119 return) would occur throughout Queensland, covering 13,754,083 km.

Due to the nature of fuel movements and the points of consumption, fuel travels on all major highways, motorways, developmental roads, state and local council roads.

Grain

Queensland's broadacre and intensive grain growers produce three major types of grains: cereals, oilseeds and legumes.

In 2012/13, the gross value of total grain production in Queensland was \$1.2 billion. The gross value of total grain production Australia wide was \$13.9 billion.

Approximately 50% of grain grown in eastern Australia is consumed locally. Domestic consumption of grain produced on the east coast is centred on livestock feed, food processing (including the milling, malting and brewing industries) and industrial use.

In Queensland, the Port of Brisbane handles the majority of bulk commodity grain exports, 73.3% of the 2013 crop, with the balance handled by the Ports of Mackay (12.4%) and Gladstone (14.4%). Export supply chains have traditionally been handled by rail transport, from storage to ports, predominantly in the January to June period.

In 2012, 1.7 million tonnes of grain and other cereals were exported through the Port of Brisbane. Of this amount, 65% (1.1 Mt) was transported by road, mainly in B-doubles, and 35% (600,000 tonnes) was transported by rail, from growing areas in southern Queensland and northern New South Wales.

Based on this data, TMR has estimated 30,000 heavy vehicle movements (60,000 return trips) were undertaken to haul grain from consolidation points (silos) to ports in 2010/11. The estimated production for 2012/13 required approximately 6,500 additional vehicle movements (13,000 return trips), to move export grain in bulk from consolidation points.

Horticulture

Horticulture is Queensland's second largest primary industry, worth more than \$2.5 billion per year and employing around 25,000 people. The 2,800 horticultural farms produce more than 120 types of fruit and vegetables, and are located from Stanthorpe in the south to the Atherton Tablelands in Far North Queensland.

Export trade volumes for fruit and vegetables is low, equating to 7%, and 77% volume market share is attributable to the retail (to) market channel. Supermarkets hold around 60% of the total market.

The consumption of the horticultural products is broadly in line with the demographic spread. The very wide variation between the produce types that comprise the horticulture sector creates a complex and variable supply chain structure.

The horticulture sector has many discreet supply chains, not, as for most industries, just different channels within one supply chain.

While there is perhaps no 'typical' vehicle profile given the diversity of the horticultural sector, conventional road transport equipment is widely used, ranging from smaller rigid vehicles for at-farm and to-consolidation transport, through to HPV combinations for transport to the more distant markets.

Limitations to vehicle configurations influence this sector, as the final destination for much of the production, distribution centres and central markets are within major population centres. Environment controlled semi-trailer and B-Doubles are commonly used for deliveries to these major destinations.

Based on the total annual statewide tonnage of 1,089,079 tonnes, and using a 15 tonne average payload, the equivalent of >72,000 single trip movements are generated by horticulture. Given the location of the marketplaces in major population centres, it is not expected that recent or future advances in HPVs will have any significant impact. The move to 24-pallet articulated vehicles may have some impact on this supply chain.

Given B-Doubles are a major unit of movement, changes on the main B-Double routes - in line with PBS based increases - will be beneficial. For movements of large volumes from Far North Queensland to the southern markets such as bananas, rail may well increase market share.

Livestock and meat

Queensland has Australia's largest beef cattle herd and is the nation's largest producer and exporter of beef. Historically, beef comprises approximately 83% of the gross production value of all of Queensland's livestock industries and is Queensland's largest agricultural industry.

As at June 2012, Queensland held an estimated 12.2 million head of cattle, 42% of Australia's herd, and produced 1.1 million tonnes carcass weight of beef and veal, 50% of Australia's production.

The combined gross value of Queensland's beef cattle production and meat processing sectors was worth approximately \$4.5 billion in 2011/12, of which the gross value of beef cattle production is estimated to be \$3.4 billion.

Australia-wide, 67% of beef and veal produced is exported to over 100 countries worldwide. The value of beef and veal exported from Queensland in 2008/09 was \$3.1 billion.

Beef cattle production occurs across all regions in Queensland, being highly concentrated in the state's western districts; 70% of cattle produced are pasture fed, with the remaining 30% raised between pasture and feedlot in order to manage cyclical drought conditions.

The livestock and meat supply chain is multi-dimensional, with high nodal and modal activity required to move livestock from stations, through saleyards - with up to 30% of all cattle moving into feedlots - and ultimately through abattoir nodes to the export and domestic consumption supply chains.

The supply chain is broadly categorised as the Northern and Southern Beef regions. The Northern Territory, Queensland and the top end of Western Australia form the Northern Beef region, and the balance makes up the Southern Beef region. Livestock move between all of these regions for fattening, processing and consumption or export, subject to cattle type and market destination.

The majority of meat products are exported through the Port of Brisbane, with a small volume exported through Townsville. The Port of Brisbane is the largest destination due to its proximity to the Darling Downs region, which contains a large portion of the meat processing industry in the state.

At an indicative/order of magnitude level, the following vehicle movements are estimated:

- station to saleyard: 39,000 movements
- saleyard to feedlot: 11,600 movements
- grain to feedlot: over 130,000 movements at 32 tonnes average payload
- station to abattoir: 27,000 movements feedlot to abattoir, 15,600 (assume 20 head per deck)
- abattoir to export port: 54,800 TEU
- abattoir to domestic channel: 23,100 movements
- station to station: has not been calculated, but is assumed at 17% of total.

Type 2 road train specified prime movers are the standard for livestock haulage. A 'deck', 12.2 m in length and legal width, is the term used to measure the livestock carrying capacity of a configuration. A set floor area per head per deck, with the size of the cattle (weight and horn widths) governing the area provided. Typically, the number of head per deck can span from 38 down to 18, with a weight span of 250 to 650 kg per head.

A Type 2 road train is six decks, a Type 1 is four decks, and a standard articulated trailer is two decks. Varying deck capacities then exist in the B-Double (three decks) and B-Triple (four to 4.5 decks) configurations, subject to trailer lengths.

Mine inputs⁸¹

Mining is a significant contributor to the Queensland economy. At 10.7% of Queensland's gross value added, mining is ahead of construction (9.3%), and manufacturing (8.1%). The three sectors are interdependent, as mining requires manufactured items and generates ongoing construction activity, in both greenfield and brownfield mine sites.

A QRC survey identified that out of a total of \$37.9 billion in direct spending, \$30.9 billion was in direct purchases with local business and community contributions, and a further \$67.4 billion in indirect spending, including \$45.7 billion in purchases from local business.

Other Supply Chain Perspectives - TEU, general freight, over-size over-mass and fuel movements - include the mine inputs movement information.

⁸¹ Bulk commodities and minerals are out of scope, however, their inputs are in scope.

Over-size and/or over-mass (OSOM) movements

The road movement of vehicles or cargo exceeding the Queensland standard operating envelope of 3.5 m (width) by 4.6 m (height) is controlled by Queensland Government Department of Transport and Main Roads (TMR), and other agencies as required. These movements are known as over-size over-mass (OSOM).

In 2012/13 there were 70,976 OSOM movements totalling 17,363,998m³. A large portion of OSOM is generated from or heading to Central Queensland and surrounding areas. This is largely driven by the delivery to and servicing of mine equipment for mines operating in the Bowen Basin, Blackwater and Dawson Basin regions.

Vehicles used in OSOM movements include the following characteristics:

- high horsepower and high torque prime movers, well signed with warning lights
- multi-wheel trailers, usually with low profile decks to spread the load across numerous axels, often using an intermediate dolly to further spread loads
- prime movers capable of operating in multi-unit mode when very heavy loads and steep grades are encountered
- pilot vehicles often play a key role in providing advance warning of the oncoming load, and then from behind to stop unsafe passing manoeuvres.

Project and construction

In 2013/14, there were 33,664 residential building commencements, \$7.4 billion in non-residential works and \$35.9 billion of engineering construction works.

In the major projects category (greater than \$100 million), Queensland is coming off the back of unprecedented levels of construction activity, with over \$18 billion in construction during 2013. Major construction activity is forecast to decline to approximately \$9.5 billion by 2015/16, rising again to \$12 billion by 2018.

In Queensland's supply chain modal network infrastructure (road, rail and sea), the following expenditure is planned for the coming 12 months:

- national networks \$245.7 million
- state networks \$979.2 million
- local networks \$49.6 million.

Project and construction movements are included in OSOM, fuel, general freight and TEU (twenty foot equivalent units) Perspectives.

Sugar

Sugar is one of Australia's most important rural industries, worth \$1.5-\$2.5 billion to the Australian economy. The value of the sugar produced in Queensland in 2013 was estimated to be in the order of \$1.7 billion, with more than \$1.3 billion in export sales.

The Ports of Townsville and Mackay handle the majority of bulk sugar exports at 53.8% of the 2013 crop, with the balance handled by the Ports of Mourilyan, Lucinda, Cairns, Bundaberg and Brisbane.

Transport movements in the sugar industry occur in two, fundamentally different, forms. Initially, from farm to mill, in an unprocessed state as billets of whole stick cane. In the 2013 season, an estimated 10%, or 3.05 Mt, of cane was transported by road. The unit of movement for road transport is a mix of standard articulated vehicles, through to B-Double configurations.

The second form, from mill to refinery and from mill/refinery to either the ports, is a raw or refined sugar state ready for export, or for domestic value adding and/or local consumption. In 2011/12, an estimated 62,000 heavy vehicle movements (124,000 return) were required to transport sugar product from mills to port and first points of distribution in domestic markets.

The increase in the anticipated increase in sugar production for 2012/13 was expected to require an additional 18,500 heavy vehicle movements (37,000 return) for the transport of sugar product from mills to ports and domestic refineries and storage prior to further distribution.

TEU and general freight

A large range of product and materials that are imported to and exported from Australian ports are transported in shipping containers. These are referred to as TEUs (twenty foot equivalent units). They are the most common method of unitisation for the international transport, import/export, of non-bulk commodities.

In 2012/13, 1,143,879 TEUs were moved through Queensland's ports. This represents an increase of 50,692 TEUs (or 4.6%) from the previous year. A high proportion of imported TEUs, around 85%, are manufactured goods destined for distribution centres.

Of all import TEUs unloaded at the Port of Brisbane, 26.7% were unpacked in or near the port. In total, 65.8% of import containers are unpacked in the Brisbane area, 27.2% in adjacent statistical areas, with the balance in regional Queensland and interstate.

In 2012, there were:

- 762,693 full TEU road movements of import and export containers
- 212,271 empty TEU road movements of import and export containers
- 31,194 full TEU rail movements of import and export containers
- 25,279 empty TEU rail movements of import and export containers.

45% of TEU were transported by HPV (Super B-Doubles, A-Doubles and B-Doubles) with 45% by semi-trailers, 9% by side loaders and less than 1% by rigid trucks. Each truck carries, on average, two TEU. 56,000 TEU were moved by rail.

The general domestic freight task (including interstate) is significant and is forecast to increase. This is in line with the expected increases in consumption, due to increased population and changing consumer behaviour.

There is a slight imbalance of interstate road freight flows, with 18,321 kt moving out of Queensland by road to other states, and 17,917 kt moving into Queensland. Due to the large distances involved, the tonne carried per kilometre travelled is 59.4% for regional Queensland, Brisbane 22.6% and interstate (from and to) Queensland is 18%.

The total interstate freight task is 36.4 Mt a year. Approximately 3,300 B-Doubles enter and leave Queensland on the interstate haulage runs daily (assume 32 tonnes per unit of movement and round trips).

Assuming an average 15 tonne per trip, >8,300 general freight movements occur around Brisbane daily and >21,900 daily in regional Queensland. Articulated trucks account for 78% of all movements, of which B-Doubles move approximately 40% of the total task. Heavy rigid transport accounts for 18% of all movements.





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