AUSTRALIAN LOGISTICS CHALLENGES AND SOLUTIONS TO OVERCOME THEM

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Abstract

Logistics challenges are present around the world in many different areas ranging from transportation and legislation to weather phenomena and demographical issues. Obstacles that face logistics processes and functions result in the additional loss of resources, money and time. The country of Australia presents a unique logistics environment, and as a result, unique logistics challenges.

The method of qualitative research was used. The aims were to define the current logistics environment in Australia, identify the existing logistics challenges and present different solutions to overcome them.

The Internet was relied heavily upon in order to obtain information on the topic. Several practical examples further illustrate the challenges. An interview was also conducted with a courier from Australia's largest city, Sydney, in order to give a special insight into the logistics challenges faced by an everyday Australian within the transportation industry.

Many different logistics challenges that are present in Australia were identified. The challenges range from the 'tyranny of distance' and the presence of wild animals on the road to increasing security risks and the pressures of sustainable development.

In response to the identified challenges, some potential solutions are presented. The solutions include ideas such as increased driver training, better forecasting and planning, improving transport networks and infrastructure and looking at different production methods.

Keywords
Logistics, Australia, challenges, transport, interview

Miscellaneous

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FIGURES

OTHER GRAPHS AND TABLES

Throughout this thesis there are several mentions of monetary values given in dollars ($). In the case of this thesis, the Australian dollar is the used currency unless otherwise stated. This is due to the nature of the thesis topic. The table below shows how the Australian dollar (A$1) faired against other major currencies during September 2011, the time at which the majority of this thesis was completed.

Currency	Lowest Value	Highest Value	Average Value
Euro (€)	0.71770	0.76938	0.74354
American Dollar ($)	0.96249	1.07618	1.01934
British Pound (£)	0.62298	0.66668	0.64483

1. Introduction

1.1 Overview

Australia is a unique country with a relatively short history. Demographical, geographical and political conditions combine to create a unique logistics environment subject to varying challenges.

The following research work describes the logistics environment in Australia before moving on to define the challenges that are present. Several examples are used to further illustrate the challenges. The thesis concludes with potential solutions to overcome the challenges.

The focal point of the thesis is domestic logistics in Australia, but international logistics, including imports and exports, and some of the challenges associated with them, are also briefly covered. Australia's remoteness and isolation from other countries presents additional challenges in international logistics that need to be covered.

Due to the sheer size of the Australian logistics industry, however, this paper alone cannot completely cover the challenges of both domestic and international logistics. There is also the matter of when international logistics related to Australia is no longer solely an Australian issue. Australian domestic logistics is filled with challenges and therefore, this is the main focus of the thesis.

1.2 Aim of the Thesis

This thesis is a personal research project. It is not a study or research project that is being commissioned by a company. The purpose of this thesis is to inform others about logistics challenges facing companies and businesses in Australia. It may also give an insight into how the challenges faced compare to those faced in other countries around the world. A discussion about the potential solutions to these challenges is also covered.

As an Australian student in Finland, this topic is one of great interest for the author. It gives the opportunity to further describe life in Australia. Perhaps the information presented here may also be useful in the classroom. Few people outside of Australia truly understand the nature of Australian logistics and this may help to educate others.

The three main aims of this thesis are:

1. Define the current logistics environment in Australia
2. Identify the existing logistics challenges
3. Present potential solutions to overcome the identified challenges

1.3 Research Methods

This work is based on the method of qualitative research. Qualitative research is the best method available for this particular topic, as numerical data associated with quantitative research cannot adequately describe the challenges present.

The research was completed in Finland. Due to the foreign nature of the topic, Australian logistics, the majority of the research was carried out on the Internet as it was difficult to acquire textbooks that were relevant to the topic. Articles found online are also used to back up certain pieces of information.

In order to reinforce some of the ideas presented throughout this thesis, a one on one interview was also conducted. The interview was held with an employee of a small courier company in Sydney's Eastern Suburbs. The answers are published and discussed further in the latter part of this work.

2. Definition of Logistics Challenges

Logistics is defined in the Council of Supply Chain Management Professionals' Supply Chain Management Terms and Glossary (2010, 114) as:

> *The process of planning, implementing, and controlling procedures for the efficient and effective transportation and storage of goods including services, and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements.*

Waters (2003, 5) also describes logistics as 'the function responsible for the flow of materials from suppliers into an organisation, through operations within an organisation, and then out to customers'.

Logistics is present in everything around us, whether it be the production and delivery of a case of beer to a store or the delivery of several hundred heads of cattle from the Australian outback to abattoirs in Indonesia. It is not limited to transportation, or storage, but encompasses everything related to a process. Other activities of logistics include, but are not limited to, purchasing, receiving, stock control and recycling.

A challenge is defined by Oxford Advanced Learner's Dictionary (2000, 192) as 'a new or difficult task that tests somebody's ability and skill'. Challenges are faced by people every day in all aspects of life.

If the two definitions are combined, a logistics challenge can be seen as an obstacle or something difficult that is facing logistics processes and functions. The ever increasing pressure of limiting our negative effects on the environment can be seen as a global logistics challenge, whereas the effect that winter weather has on a city airport can be seen as a local logistics challenge.

Logistics challenges are faced by companies every day, whether their business focus is logistics orientated or not. They can be continuing challenges or new ones. Some challenges may be overcome in time while others may just have to

be dealt with. It is up to each government, company, group or individual on how they should combat these challenges in the most effective and efficient way.

3. Australia as a Nation

The history of Australia is relatively short compared to most other countries around the world. When it was originally settled by the British as a penal colony in 1778, only local groups of the native Australians, Aborigines, were present. It served as a colony within the British Empire until 1901 when Australia became a sovereign nation. The following section describes the geographical, demographical, climatic and political conditions of Australia.

3.1 Geography

In terms of land area, Australia is the sixth largest country in the world with a total of 7,692,024 square kilometres (United Nations Statistics 2009). It is also the world's smallest continent. It is a very flat country with the highest peak being Mount Kosciuszko at 2,228m (Australian Rocks and Mountains 2011), dominated by vast areas of desert. Australia is commonly known to be made up of six states and two territories with the city of Canberra, located in the Australian Capital Territory, as the capital. Figure 1 is a map of Australia showing the states and territories and their respective capitals.

FIGURE 1. Map of Australia (Street-directory.com.au 2011)

There are also several smaller external territories under the control of the Australian government including Norfolk Island, Christmas Island and Cocos (Keeling) Islands among others. These islands, however, do not have large populations and have little impact on the overall running of the country as well as logistics issues.

3.2 Demography

The population of Australia as of 27 October 2011 stands at 22,744,608 with an average growth of one person every 1 min 31 seconds (Australia Bureau of Statistics 2011). The majority of Australians live in the large coastal cities. According to Chen and McAneney (2006, 2), 30% of Australian addresses are

located within 2 km and 50% are located within 7 km of the shoreline. Figure 2 shows Australia's population distribution.

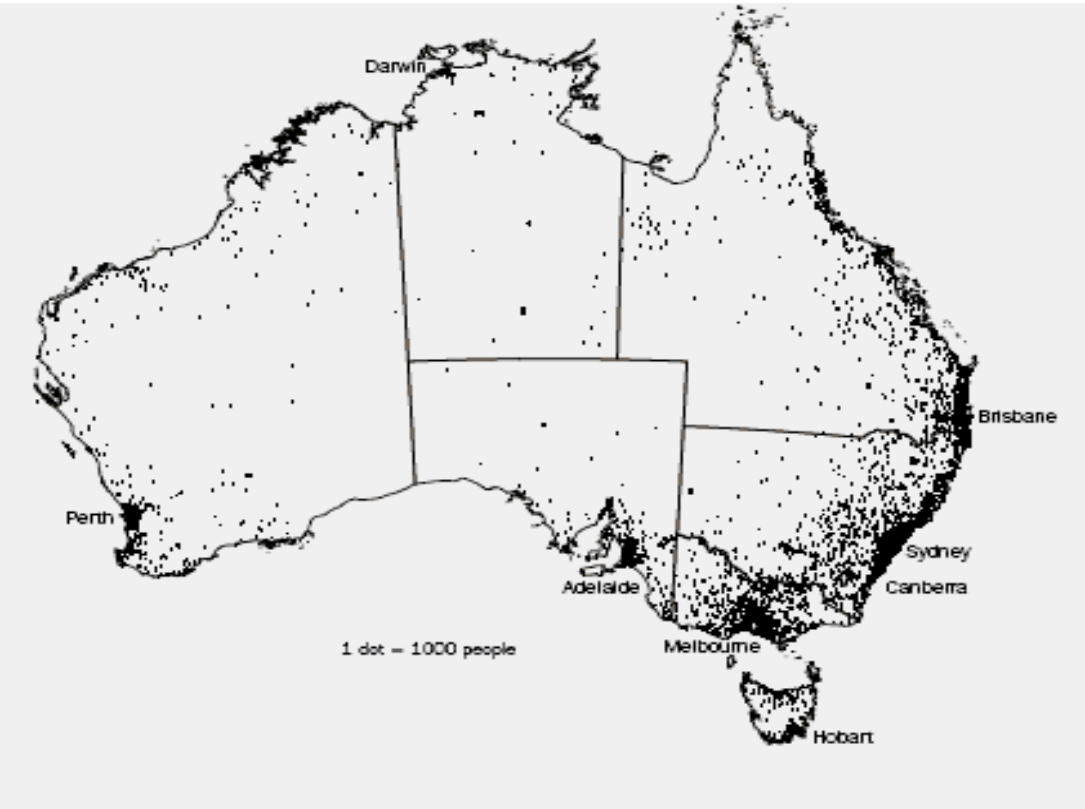


FIGURE 2. Map of Australia's population distribution (Australian Bureau of Statistics Census 2006)

The south east of Australia is where most of the population is concentrated. The temperate climate and the initial settlement of Australia are reasons for this. The Australian Capital Territory has the highest population density, followed by the state of Victoria, while Western Australia has the lowest (Australian Bureau of Statistics 2010a). Sydney has the highest population of any city followed by Melbourne, Brisbane, Perth and Adelaide (Australian Bureau of Statistics 2010b).

As with most developing countries, Australia's population is ageing due to lower birth rates and advances in technology that lead to increased life expectancy

rates. Using information provided by the Australian Bureau of Statistics (2010c), the median age of the Australian population has increased from 32.1 years at 30 June 1990 to 36.9 years at 30 June 2010.

3.3 Climate

Australia is the second driest continent on Earth, behind Antarctica, making it the driest inhabited continent (The Australian Continent 2011). The inland parts of Australia are particularly dry and much land is almost uninhabitable. The climate conditions again reinforce the reasons for coastal settlements. The conditions inland lead to low fresh water levels and non-arable land that is not sustainable for large cities. The nation's capital Canberra is the largest inland city with a population of around 350,000, significantly less than most of the other capitals around Australia. Even then, Canberra is approximately only 150 km inland (Geoscience Australia 2011).

Rainfall

Figure 3 shows how different parts of Australia are subjected to varying levels of rainfall. As mentioned above, the interior of Australia is very dry and receives very little rain throughout the year. The northern parts in the tropics receive heavy rainfall during the summer season, while other parts of Australia receive varying levels of rain due to prevalent weather patterns.

FIGURE 3. Map of Australia's major seasonal rainfall zones (Australian Bureau of Meteorology 2011a)

Seasonal Variations

Due to the large size of Australia, many different types of weather are experienced. It should be noted that Australia experiences its seasons at the opposite time of the year when comparing to locations in the Northern Hemisphere. During the summer the temperature can rise to over 45C in inland regional centres. Even the coastal cities, including Sydney and Melbourne, are capable of reaching temperatures above 40C several times a year. It is also possible for high temperatures to occur during spring and autumn.

The northern parts of Australia have a typical tropical climate, including a wet season. The winter months are hot and dry, while the summer is hot, humid and wet.

The winter is quite cool in the southern states of South Australia, Tasmania, Victoria and New South Wales. A prevailing southerly wind bringing cold weather from Antarctica and the Southern Ocean helps to keep temperatures cool during winter.

The Great Dividing Range is a mountain range which runs from Victoria up into southern Queensland. The Snowy Mountains, located on the southern end of this range, receive snow each winter. Tasmania and other inland parts of the mainland, particularly in the south east, are also capable of receiving snow. Temperatures very rarely go to extremely low levels, the lowest ever recorded temperature in Australia is -23C (Australian Bureau of Meteorology 2011b), but icy conditions are still encountered in different parts of the country.

El Niño

In addition to seasonal fluctuations, Australia also experiences long-term variations (Australian Bureau of Meteorology 2011c). El Niño is a natural event that takes place in the Pacific Ocean. While it can affect many countries not just on the Pacific Rim, it can lead to drought conditions in eastern parts of Australia for several years. Its opposite, La Niña, can bring heavy rainfall and flooding. The floods in south eastern Queensland in late 2010 and early 2011 are an example of this. Australians need to plan ahead in order to deal with these conditions which, to some degree, can be forecast.

3.4 Government

Australia gained independence in 1901 and since then has remained a part of the British Commonwealth. While this has little impact on the general day to day running of the country, the Queen of England is still Australia's head of state and is represented in Australia by the Governor-General. A prime minister and their cabinet run the country with federal elections held at least every three years.

There are two main political parties in Australia; Liberal and Labor. Not since the 1960s has a party other than these two been in power.

In addition to the Federal government, each state and territory also has a government. The state and territory governments must work in cooperation with the Federal government on many different issues, even if the ruling parties are not the same. This can create problems due to different party policies.

At an even lower level, there is the local government which governs small regional areas. For example, in New South Wales there are 152 local governments.

4. Logistics in Australia

4.1 Overview

As with any country in the world, logistics plays an important role in assisting the running of the nation's economy. The Australian Logistics Council (2011) states that 'while overseas experience provides some examples, Australia's situation as a remote, sparsely populated island continent largely dependent on the export of raw material, poses unique challenges for transport and logistics'. According to Estrada-Flores (2008, 3), Little (2007) stated that the cost of logistics activities in 2007 equated to approximately 9% of Australia's Gross Domestic Product (GDP) for that year, a figure well into the billions of dollars. The following section of this paper describes the current logistics environment in Australia.

4.2 Transport Networks in Australia

The transport network in Australia covers a wide range of modes of transportation. Due to the large size of the country, road, rail and air freight all have a share in transportation activities while shipping is extremely important for international freight.

4.2.1 Roads

The Australian road network is made up of three road categories: Federal highways, state highways and local roads. Federal highways are large roads that connect capital cities. The funding for these roads is provided by the Federal Government, although state governments also have some input when necessary. State highways and local roads make up the remaining roads and funding comes from the respective state government.

Figure 4 shows the road network in Australia. The nation's major highways are illustrated.

FIGURE 4. Map of the Australia's Major Highways (Australian Travel & Tourism Network 2011)

Road conditions in Australia are generally very good with multi-lane freeways connecting the larger cities with each other. Regional centres are connected by highways that are continually being upgraded and improved. Different types of road and warning signs are abundant and several types of safety features, such as barriers, road reflectors and guard rails, are in place.

An example of a road being upgraded is the Pacific Highway. It connects Newcastle to Tweed Heads on the east coast of Australia and acts as one of two major routes between Sydney and Brisbane. It has undergone many improvements over the last 15 years. A progress report by the New South Wales Roads and Traffic Authority (2011a, 1) stated that at the end of August 2011, about 51% of the 664 km highway was dual carriageway. An additional 195 km is

also either under construction or in the planning phase. Improvements like this greatly increase road safety and decrease journey times.

There are also speed limits in force throughout the country to ensure the safety of drivers. In remote areas there are long stretches of straight road, while winding roads are encountered elsewhere, both of which can be dangerous to drivers for different reasons.

4.2.2 Railways

The passenger rail network in Australia is not as extensive as other countries around the world, although freight rail transportation is an integral part of Australia's logistics network.

Australia did not experience a large rail boom like Great Britain and the United States did during the mid to late 1800s. This was due to a small population and the fact that Australia was still made up of individual colonies that did not make decisions with the whole population in mind. Despite this, at the time of Federation in 1901 there was more than 20,000 km of track. However, three different track gauges had been built. In fact, the three different gauges are still in use in different parts of the country, although each capital city on the mainland is connected by a fourth uniform gauge. (Australian Department of Infrastructure and Transportation 2011a.)

In 1997, the Australian government created the Australian Rail Track Corporation (ARTC). It is a government owned corporation that controls a large share of Australian railways. It mainly controls the uniform gauge lines, but also smaller regional lines. There are also many other operators, such as state government corporations and large mining companies, that control rail lines in Australia.

Figure 5 shows the rail network in Australia. The yellow line shows the uniform gauge track that connects the major cities. Tasmania also shows a small rail network, although this is limited to freight traffic. The network in the south eastern area of the mainland is quite extensive and the east coast is fairly well connected.

Elsewhere though, only one rail line connects the east to the west, and the mid south (South Australia) to the mid north (Northern Territory). Railways that service mines in the north west are also isolated.

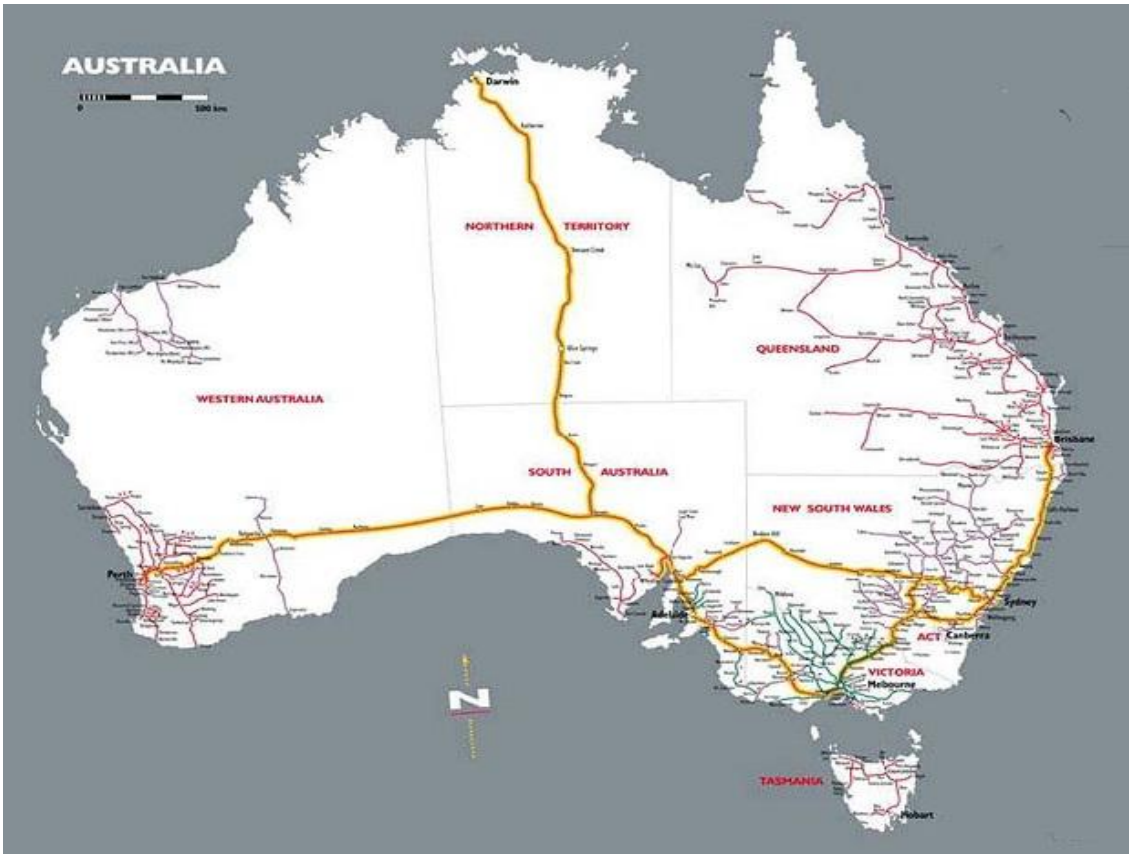


FIGURE 5. Map of the Australian Rail Network (Freight Rail Operators Group 2011)

The majority of lines are not electrified. All freight and the majority of long distance passenger traffic operates under the power of diesel, while the majority of metropolitan public rail systems use electricity. A large number of lines have been built purely for the transportation of raw materials such as iron ore, coal, copper and sugar cane.

While the network itself is comparatively smaller than others around the world, rail plays an important role in the movement of goods throughout Australia.

4.2.3 Airports

Each capital city in Australia, of both state and territory, is serviced by a main airport. Other large airports include Gold Coast and Cairns, both located in the state of Queensland. The majority of Australian airports are quite close to the city and have good road connections, while some are also connected by rail.

Figure 6 shows the location of Australian airports. The larger airports are defined by name. Even though it can be seen that the majority of the coastline is lined with airports, supporting the population centres, there is a surprising number of airports in regional Queensland. These airports serve regional centres that are home to mining operations.

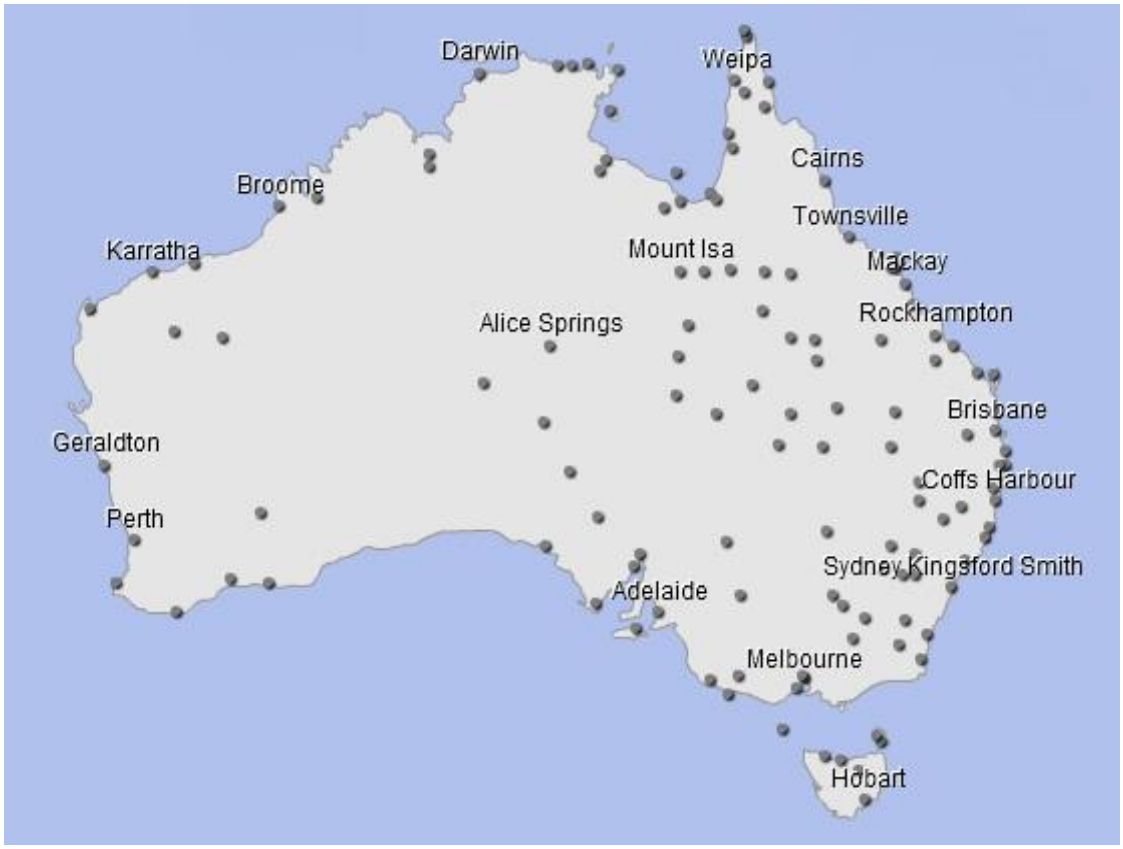


FIGURE 6. Map of Australian Airports (Skyscanner 2011)

In terms of cargo and goods, each airport has the facilities to cater for a variety of shipments. Again, Sydney is the largest airport for incoming goods. In 2010, Sydney's Kingsford-Smith airport received 304,938 flight movements, inclusive of passenger flights, of which 73,908 were aircraft over 136 tonnes (Airservices Australia 2010). Many airports are mainly used for cargo shipments or small passenger transports, particularly those inland.

Air cargo is especially important for goods that must be transported in a short period of time. Overnight deliveries are achievable throughout Australia thanks to air transportation. High end goods also rely greatly on air transportation.

4.2.4 Ports

Like airports, each capital city, except Canberra, is serviced by a main shipping port. There are also many other important ports around Australia. Sea transportation is very important to Australia's exports industry. Australia relies on this form of transportation for 99% of its exports (Australian Department of Infrastructure and Transport 2011b). While inland water transportation is not very common due to the small number of lakes and inland waterways, domestic shipping along the coast also exists.

Figure 7 illustrates the location of Australian ports. The majority are located in the south east and up along the eastern coastline, although those located on the western coastline are also important.

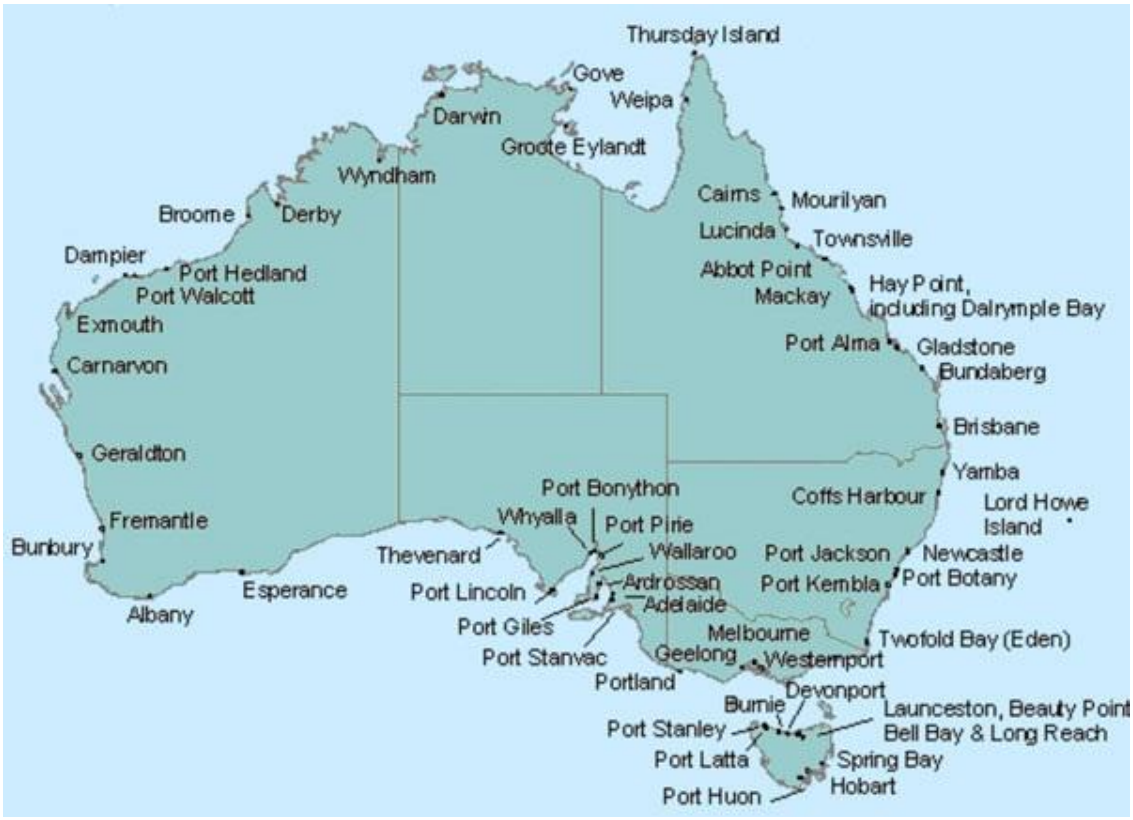


FIGURE 7. Map of Australian Ports (Australian Quarantine and Inspection Service 2011)

Table 1 below shows the leading ports in imports and exports during the 2008/2009 financial year in terms of weight and value. International shipping trade accounts for 89% of the total trade. The remaining 11% is accounted for by domestic trade.

TABLE 1. Leading Australian Ports in Imports and Exports (Bureau of Infrastructure, Transport and Regional Economics (BITRE) 2010a, 17-18)

	Imports	**Exports**
Weight (tonnes)	Sydney (Port Botany) (NSW) 15,403,757	Port Hedland (WA) 154,854,419
Value ($ thousands)	Melbourne (VIC) 46,272,024	Dampier (WA) 25,734,700

From the table and the location of the ports listed, it can be surmised that the Western Australian ports of Port Hedland and Dampier deal exclusively in heavy and valuable raw materials such as iron ore and coal, while Sydney and Melbourne, as the largest population centres in Australia, receive large quantities of imported manufactured and consumer goods.

Foreign Trade

According to BITRE (2010b, 21), China and Japan are the leading import and export partners in terms of value. As mentioned above, international shipping is responsible for 99% of international trade. Air freight represents the other 1%. Exports are extremely important to Australia. Australia's abundance of valuable raw materials such as iron ore and coal results in high demand from many countries around the world. China's continually growing industry, for example, relies greatly on materials sourced in Australia. Australia also relies on China for

many imported consumer goods that are not economically viable to produce within Australia.

4.2.5 Pipelines

Another less common form of transportation is the use of pipelines. Pipelines are used to transport natural gas, oil, ethane and slurry. Natural gas is the most common substance to be transported by pipeline and there is a fairly extensive network of pipes throughout Australia. Many of these pipelines are privately owned by large corporations such as BHP Billiton.

4.3 Legislation

There are many different types of legislation that affect logistics operations in Australia. Some key regulations are described below.

Transport Regulations

There are strict sets of guidelines for transportation in Australia. All Australian states have their own regulations, while there are also regulations that cover the whole country. Regulations cover, but are not limited to, vehicle size, maximum loads, packaging, speed limits and the different types of goods carried. The dangerous goods code, for example, complies with standards laid down by the United Nations and is enforced nationwide.

Vehicle size is an important regulation throughout Australia, particularly for the large ‘road trains’ that operate in remote areas. Figure 8 shows an Australian road train.

FIGURE 8. An Australian Road Train in Northern Territory (Trotman 2006)

Road trains are large, multi-trailer vehicles that operate in Australia. They are also used in other countries including Mexico and Canada. Their main purpose is to carry a large amount of goods across a large distance, while eliminating the need for rail transportation. They are very useful in remote areas that cannot be accessed by rail. Road trains can carry many types of cargo including fuel, animals, wood and coal. Road trains are only permitted in certain areas in Australia. For example, they are not permitted in the state of Victoria and other states limit their activity to regional areas. Lower speed limits are also enforced. Road trains can be as long as 53.5 metres (Northern Territory Department of Lands and Planning 2011, 5).

Quarantine

Quarantine laws in Australia are extremely strict due to its fragile ecosystem. Australia's biodiversity is unlike any other place in the world and the smallest foreign substance can greatly impact the environment. Since the introduction of Quarantine Act 1908, incoming goods have been subject to stringent checks and many items are prohibited from entering the country. Foods, plant and animal materials are the highest risk items. There are strict guidelines set out by the Australian Quarantine and Inspection Service (AQIS), a branch of the Australian Government. These guidelines define what can and cannot enter the country. Items of particular mention that are subject to restrictions include food substances such as meat and fruits and organic material such as seeds, leaves and untreated wood.

The movement of goods within Australia is also monitored. Particular items such as fruits, vegetables and animals should not cross state borders without the required permits.

Work Safety

Workers unions have long been campaigning for better work safety in a variety of job sectors. As a result, the Australian government has implemented several work safety laws over the last decade or two. For example, warehouse environments require high visibility safety vests, steel capped boots, and depending on the goods stored, may also require protective eyewear or hardhats among other items.

4.4 Types of Material Transported

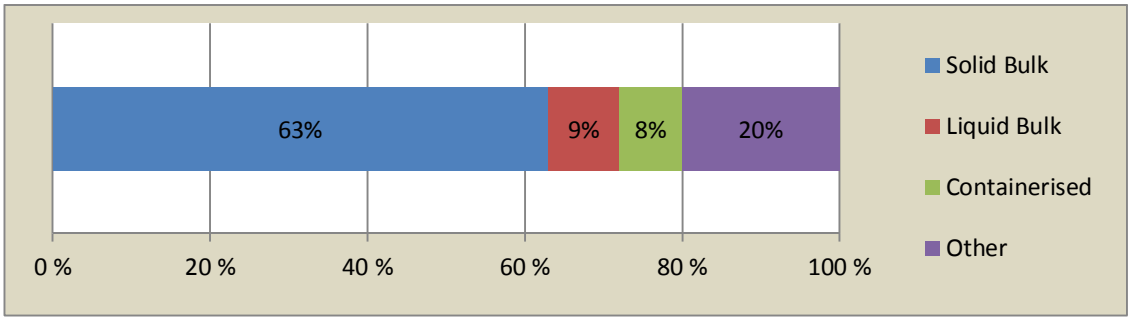
There are many different types of material transported in Australia, both domestically and internationally, ranging from food and animals to iron ore and wood. Different regions in Australia specialise in different raw materials while

different materials require different types of transportation modes. Vehicles must be modified in order to carry certain loads. In terms of rail transportation, certain rail cars must be used for certain types of material. Some loads also require special permits (as mentioned in section 4.3.1), such as a dangerous goods permit, and vehicles carrying those loads must display special warning signs.

The Australian Bureau of Statistics gives four classification categories for the types of material being transported. They are listed below.

1. Solid bulk – Large amounts of unpackaged material in solid form such as coal, iron ore or sugar cane.
2. Liquid bulk – Large amounts of unpackaged materials in liquid/gas form such as fuel, liquid petroleum gas or milk.
3. Containerised – Materials/cargo transported in containers.
4. Other – Anything that does not fit in with the above categories or is undefined.

Graph 1 shows the percentages of each category in freight movements from April 1 2000 to March 31 2001. While this data is a decade old, it still gives a fair indication of today's percentages in Australia.



GRAPH 1. Types of Freight Movements in Australia April 2000 – March 2001 (Australian Bureau of Statistics 2002)

4.5 Technology

Technology in logistics is continually improving throughout the world and it is no different in Australia. Information technology (IT) is a necessity in logistics. According to Hammant (1995, 32), Christopher (1992) stated that 'information has always been central to the efficient management of logistics but now, enabled by technology, it is providing the driving force for competitive logistics strategy'.

Warehouse systems are becoming more advanced through the use of radio-frequency identification (RFID) and barcode scanners. The task of eliminating paperwork has increased efficiency and effectiveness in the workplace. The introduction of automated sorting facilities has also greatly increased the sorting capacity of warehouses and, in turn, improved lead times.

Warehouses, equipment and other pieces of property have much improved security systems in place to prevent theft and vandalism. Advanced IT systems, such as enterprise resource planning (ERP) systems, also a hold a larger amount of information and provide faster and more convenient access than ever before.

Global positioning system (GPS) and RFID technology allow for real-time tracking throughout Australia. Items sent abroad can also be tracked. GPS and other navigational technologies provide the ability to calculate the most efficient transportation routes by road as well as helping to monitor traffic conditions. Other route planning systems are also in place.

Companies using advanced technology in their logistics operations have a competitive advantage over those that do not. Australian companies continually update their systems to stay in line with the world's best available technology.

5. Australian Logistics Challenges

The following section defines different logistics challenges faced by companies in Australia. It covers challenges related to geography, demography, the environment, legislation and technology as well as other challenges that are present. Examples are used to illustrate the challenges in order to give a better understanding of how relevant and realistic they are.

5.1 Geographical Challenges

Many different geographical conditions can be encountered around Australia. Urban and regional areas offer different logistics challenges to different companies. They are described below.

5.1.1 Urban Challenges

Traffic Congestion

The large coastal cities of Australia, particularly Sydney and Melbourne, experience traffic congestion every weekday. The morning and afternoon peak hours lead to a much larger volume of traffic on the roads leading in and out of the city area. Freeways and motorways have been constructed in multiple directions but even those are heavily congested.

New plans and solutions to decrease congestion are continually developed but as the ownership of cars and urban sprawl continue to increase, they are likely to fail. The transportation of goods is likely to be affected if their routes take them through these congested areas at peak hour times.

As mentioned above, one solution to overcome congestion has been to build motorways. These avoid smaller arterial roads with traffic lights and are generally

wider in terms of the number of lanes. In Australia many of these motorways are built by a private company under contract with the local state government.

Having a warehouse located in the city may also lead to traffic congestion being a daily challenge.

Toll Roads

An example of a road built by a private contractor is the Lane Cove Tunnel, situated in Sydney's inner north-west. It is a four kilometre tunnel built to connect the Gore Hill Freeway to the M2 motorway. The project has been considered by many to be a disaster with the initial contractor, Connector Motorways, going into receivership in 2010, just under three years after the tunnel opened. The tunnel itself is a toll road.

There are many toll roads in Sydney and they can be considered to be challenges themselves, despite them being built to overcome the initial challenge of traffic congestion. The Sydney Orbital Network, shown in Figure 9, is a 110 kilometre collection of motorways and freeways designed to connect different parts of the city. The majority of this network includes toll roads. In addition to this network, the M4, which was previously a toll road, connects the inner west of Sydney to the Blue Mountains (as shown in Figure 9). The toll roads are paid for by using an electronic tag, or 'E-tag', assigned to individual vehicles. When passing through a toll gate the tag registers electronically and the cost of the toll is deducted from a special account.

FIGURE 9. Map of Sydney's Orbital Network (New South Wales Roads and Traffic Authority 2011b)

The Sydney Motorways website provides a toll calculator for motorists to use when planning a trip. Using the calculator provided on their website, a one way trip from Penrith to Hurstville covering 56 kilometres of the M7 and M5 motorways (illustrated in Figure 10) would incur a cost for a heavy vehicle of $15.80. A trip in the opposite direction would cost $10.80, leading to a return trip cost of $26.60.

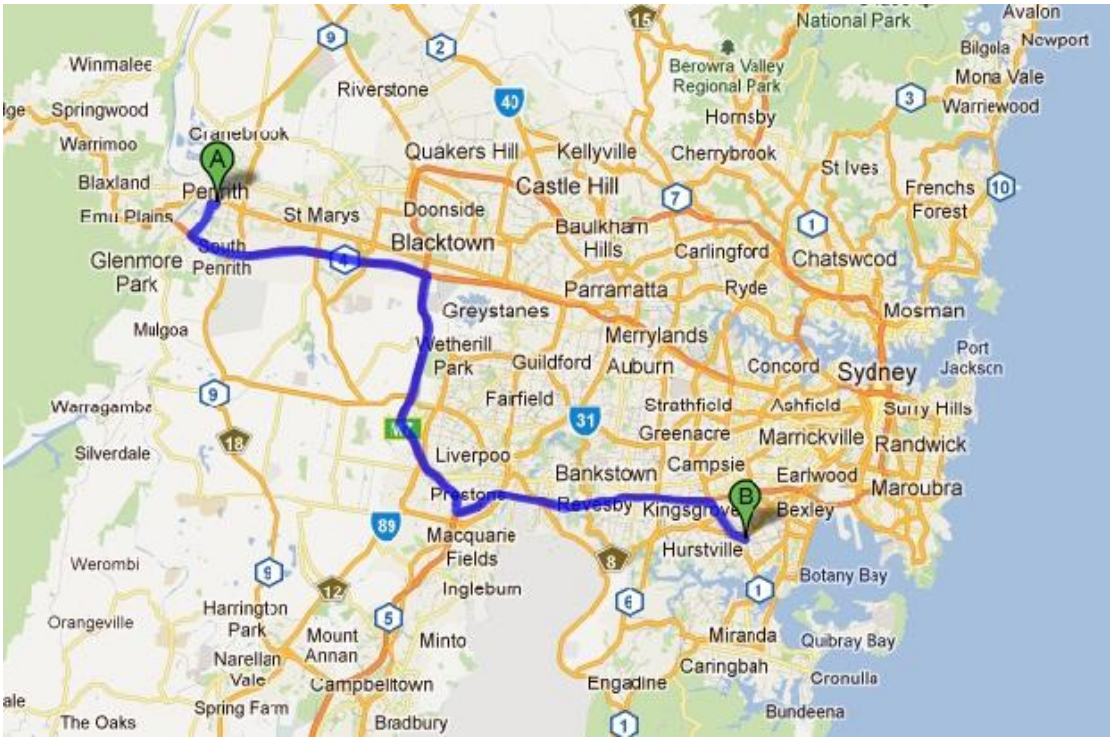


FIGURE 10. Trip from Penrith to Hurstville using the Sydney Orbital Network (Google Maps 2011)

Assuming a heavy vehicle uses this return route once daily, 5 times a week for 52 weeks a year, the total annual cost from tolls alone totals $6916.

This monetary figure just goes to show the effect tolls can have on the operations of a transportation company in one of Australia's larger cities. Several thousands of dollars might be required by a company for tolls if they want to use the most efficient route possible. These costs are a challenge to companies when conducting route planning and must be taken into account, especially when it comes to a large fleet of vehicles where travel costs are incurred by the company.

Road Changes

It is quite common in Australia for local roads to be adjusted and modified in order to help control the flow of traffic in certain local areas. There are highway upgrades that bypass local towns improving travel times and pedestrian safety while reducing traffic congestion on smaller roads. On the other hand there are times when roads are closed and blocked off to encourage vehicles to use available motorways. These motorways, however, often have a toll, as mentioned above. There are also suburban streets, particularly those on which schools are located, that forbid heavy vehicles from entering them. These changes may create confusion and increase travelling times.

5.1.2 Regional Challenges

Distance

The most obvious challenge in Australia for logistics companies is the 'tyranny of distance'; the great distances between cities. Currently there is a road distance of 880 kilometres between Sydney and Melbourne and another 930 kilometres between Sydney and Brisbane. A road trip from Sydney to Melbourne equates to over 10 hours of travel time. Sydney and Perth are a massive 3,950 kilometres apart by road. Rail journeys also take a considerable amount of time.

Many remote roads have very few petrol stations and it may be necessary to carry additional fuel. In any case, senders of goods need to be aware of the time taken to travel these distances and the costs involved and plan ahead accordingly.

The geographical location of some places can be a challenge to logistics providers. Mining sites, in particular, are in remote locations and the process of getting goods to them often involves complex, long distance transportation that needs to be carefully planned beforehand.

The March 2011 edition of Tolltoday (2011, 9), a magazine published quarterly by Australia's largest logistics services provider Toll Holdings, describes a project that involved transporting '218 loads of cargo from seven vessels from Port Hedland to the BHP Billiton Yandi mine site'. Large, oversized items up to 14 metres wide, 28 metres long and 7 metres high were part of the cargo. A road distance of 482 kilometres needed to be traversed in one of Australia's most remote areas in the state of Western Australia. A complex logistics program was developed to carry out the operation. Operations similar to this one occur fairly regularly in Australia.

Road trains (see section 4.3) are a common site in the remote areas of Australia. This form of transportation is very helpful at overcoming the issue of goods carried per kilometre by road.

Another issue faced due to travelling long distances is driver fatigue. Driver fatigue is a big issue in Australia as many drivers are overworked and pressured to complete deliveries within short timeframes. Fatigue on the road is an extremely important safety issue. It can lead to severe injury or even death. Drivers may struggle to deal with the pressures of their job and may feel forced to use drugs to stay awake. Drivers may also break speed limits over long journeys to ensure deliveries are made on time.

Animals

Animals, most commonly kangaroos, are considered to be a great hazard on the road. They can be encountered in suburban areas or in the middle of nowhere, throughout the country. Not only are they a threat to equipment but, more importantly, they are a threat to human life.

According to Rowden, Steinhardt and Sheehan (2008, 6-7), Australian insurance company AAMI (2007) reported 'a 25% increase in animal-related crash claims from 2005 to 2006' and that the costs of vehicle repairs totalled $10.2 million in 2005 and $15.3 million in 2006. While insurance can cover the damage costs,

injuries to drivers can be serious or even fatal. In terms of costs, the downtime of a vehicle in repair or the time lost following an accident can be extremely high. Bullbars are commonly used in Australia to protect vehicles in regional areas but sometimes even they are not enough to prevent vehicle damage.

Road Conditions

As mentioned in section 4.2.1, road conditions in Australia are generally quite good. However, due to the large size of Australia and its relatively small population, the maintenance of the extensive road network is a large and daunting task. Some roads, particularly regional roads, may be in a state of disrepair. Potholes can be particularly dangerous. These problems may lead to longer journey times or even damage to equipment.

5.2 Demographical Challenges

Australia's ageing population is continuing to place a strain on the nation's social welfare system. Many people are forced to continue working past the traditional retirement age of 65 years old to ensure they have enough money to survive later in life. In terms of logistics, an ageing population may create problems. It is commonly said that the older one gets, the harder it is to learn new things, and with the current advances in technology many workers in the older generation may find it hard to keep up. It could also be argued that older workers are not capable of working at the same level physically for as long as younger employees.

The growing concentration of populations in Australia's large coastal cities may also create problems. The need to ensure efficient and effective logistics processes in these areas will continue to increase. While the population of regional centres increase at a slower rate, it is necessary to ensure that their needs are also met. The increased attention in the cities should not compromise

the needs of the regional centres. Logistics companies need to adjust and adapt to the different growths in demand.

5.3 Environmental Challenges

Australia's climate and environmental conditions present different kinds of challenges to logistics operations. Global awareness of climate change and the associated pressures also create different challenges.

5.3.1 Climate Change and Green Logistics

Whether human induced climate change is real or not, an issue not to be discussed here, one cannot ignore the effects of man on the environment and the global pressures placed on large companies in regards to environmental responsibility. Green logistics has become a topic of much discussion in the last few years and is one that is becoming increasingly important for companies who operate both locally and globally.

Minimising waste and pollution has been on the agenda for many companies that wish to ensure their business operations are seen by the public in a good light. Green logistics has become an integral part of a company's planning processes. Not only is minimising waste better for the environment, it can also save money by using only what is necessary.

Operating efficiently with the environment in mind has become a challenge for logistics providers and will continue to be in the next few decades. Renewable energy sources need to be developed on a large scale and the act of preparing for their implementation in the coming years needs to be seriously taken into account.

5.3.2 Seasonal Problems

Winter

In the winter snow can fall in The Great Dividing Range, the geographical feature that runs from eastern Victoria up the coast to southern Queensland. This can cause chaos on the roads. In the Blue Mountains, approximately 100 kilometres west of Sydney, road closures are often enforced a couple of times each winter if the roads are too dangerous due to snowfalls. This can also occur in other parts of Australia, particularly Victoria, Tasmania and southern New South Wales.

The winter of 2004 saw a severe storm front cross through the southern half of New South Wales and north eastern Victoria in mid-July. The Sydney Morning Herald (2004) reported that 'authorities were forced to close major roads in both states, while they laid down sand and salt to reduce the danger'. The Great Western Highway, the main road through the Blue Mountains connecting Penrith in Sydney's west to the mid-west of New South Wales, was affected by this closure.

Studded tyres are rare and at some times during the year places may only be accessible with the use of tyre chains. Large vehicles such as semi-trailers and three or more axle trucks must avoid these areas. Road closures can last for several days in severe conditions and, as a result, goods may not be able to reach their destinations on time if alternative routes cannot be used.

In terms of rail traffic, snow can also affect goods movement. This is, however, fairly rare due to the location of railway lines and the small chance of heavy falls in places of low altitude. Again, the Blue Mountains are a good example of a place where snow can interrupt rail traffic.

Snowfalls can also disrupt air traffic, as is the case in other parts of world, although this is rare in Australia due to the fact that most large airports are located on the coast where snow is extremely rare.

Summer

Hot weather is prevalent throughout Australia from late September to late April, and all year round in the northern parts. High temperatures can cause all kinds of problems when it comes to logistics and it affects many different areas. Railway lines are commonly affected with rails sometimes buckling due to the conduction of metal. Electricity lines also have to deal with a great level of stress as a result of higher temperatures.

Road transportation is also affected. There are many types of perishable items that need cooler temperatures to ensure their longevity. Meat and fish products that travel from abattoirs to city centres need to be properly refrigerated. High temperatures can affect the running of cooling systems on trucks. Warehouses that act as cross-docking points must also ensure that their cooling systems can withstand the added pressure placed on them during hotter days.

It may sound simple but hot weather can also affect employees. Heat exhaustion is a serious issue that needs to be considered and many people can be at risk if their work takes place outdoors.

Natural Disasters

Australia is a country that is often affected by natural disasters. The most common are bushfires, floods and cyclones. These disasters can cause a considerable amount of damage, both to infrastructure and equipment. Costs and time delays can result. Natural disasters usually also lead to an increase in the demand for supplies. It may be difficult to ensure goods reach their destination during these times.

5.4 Legislative Challenges

National legislation poses different kinds of logistics challenges. These challenges can be in varying levels of business, from operational to strategic. The

following section presents some logistics challenges faced in Australia as a result of legislation.

Funding Disagreements

Funding disagreements are a common problem in Australia. State governments and the Federal Government have responsibilities to provide funding to certain areas such as education, infrastructure and health. Sometimes there is a disagreement over who should be paying. Each level of government has a strict budget that they try to adhere to and occasionally funds become thin in different areas.

In terms of logistics, it can be detrimental to operations if roads or railways are not built on time as a result of these disagreements. The logistics industry requires functioning and useable infrastructure such as roads and railways in order to operate.

Transport Regulations

Regulations that govern the movement of goods can affect logistics operations. If special transportation is required it may be necessary to have additional permits or specially modified vehicles. The modification of vehicles or obtaining required permits may take time and almost certainly will incur additional costs.

Quarantine

If a company wishes to import goods to Australia as part of their business they must obtain permission from AQIS (see section 4.3). Even after obtaining permission there are specific measures that must be taken to ensure that foreign and unwanted materials do not cross the border. AQIS inspects all incoming materials to Australia whether it is passenger luggage, mail items, shipping containers or people themselves. Random quarantine inspections also take place

as an extra measure of security. Exports are closely monitored and permits are required for this practice also.

Companies that undertake import activities need to be aware of the required permits. Additional planning is also needed.

Work Safety

As mentioned in section 4.3, work safety is a continually growing issue in Australia. The pressures to ensure a safe workplace may lead to increases in costs for businesses. A relatively recent law that was introduced and can be seen in the logistics industry, among others, is the introduction of compulsory high visibility safety vests for all workers. These vests are not only limited to operational level warehouse workers, but drivers and upper level management employees must also wear the vest in designated areas. Hardhats, safety glasses and steel capped boots may also be required. Workers and/or employers will also end up footing the bill for these safety items.

5.5 Technological Challenges

The current level of technology in the world presents special challenges to the logistics industry and as technology continues to advance, additional challenges may arise.

Additional Costs

New technology can be extremely costly. Having the most up-to-date technology may give a company a strategic and competitive advantage, but the required levels of investment must be seriously taken into account. Additional detailed budgeting and forecasting must be done to ensure the additional costs that would be incurred are feasible.

Lack of Integrated Systems

Ensuring that different suppliers and their customers have the same computer and ERP systems can be quite difficult. Companies and their primary, or largest, suppliers may use the same system, but smaller suppliers may have different systems in use. System clashes can lead to time delays and disrupt the flow of information.

Dependence on Technology

Every day more companies go digital. An increasing amount of information is stored on computers and internet servers. In fact, it would be very difficult to even find a company in Australia that does not use some kind of electronic technology to store information. If technology fails, however, it can create problems. It is necessary to back-up information to a second, or even third, source to ensure it is not lost. This may lead to additional costs.

Regional Issues

Due to Australia's large size and low population density, some regional areas may find it difficult to accommodate new technologies. Particular infrastructure may not be available. For example, internet speeds are commonly known to be slower and mobile phone reception can be weaker in regional centres than the major cities in Australia. These issues may present challenges to logistics operators in smaller inland cities.

Resistance to Change

A simple, yet ongoing challenge is the traditional resistance to change. Many employees may feel change is difficult and perhaps not necessary. Technological changes can be especially disturbing to a workplace. In logistics, the

implementation of a new ERP system may take several weeks. Employees must undergo training and need to quickly adjust to new systems in as minimal time as possible. Companies need to manage such a change effectively to ensure their employees understand why the change is taking place and that they have any support they may find necessary.

Adjusting to New Systems

Not only are employees at risk of falling behind following the implementation of a new system, but whole companies and their operations are. Transferring old information to new systems takes time and can be a confusing process. Companies may require additional external assistance to help them cope with the changes. This may lead to delays in production or distribution.

5.6 Other Challenges

There are also several other challenges that companies may come across that do not fit into any of the above categories. They are described below.

Rising Fuel Prices

Using statistics from BITRE (2008), Estrada-Flores (2008, 3) stated that road and freight rates in Australia increased by 9% and 5% respectively from 2001 to mid-2008. A large amount of this increase was due to rising fuel prices. Every country around the world has experienced additional strain on transport and the resulting costs from higher fuel prices. While Australia is not alone, the challenge of keeping other costs down to accommodate for these increases is still present.

Security Issues

Theft and property damage is an increasing risk in goods movement and storage. Items that are most at risk include high value electronic goods such as computer equipment, laptops and mobile phones, as well as other goods such as cigarettes and jewellery. Security systems are now a must and they are continually being upgraded to prevent theft.

According the Mayhew (2001, 1), Salkin (1999) claimed that worldwide losses from cargo theft totalled US$30 billion a year at the turn of the century. This figure has surely increased during the last decade.

Mayhew (2001, 3-5) gives some tips for improving the security for goods, both in transit and in storage. These strategies are widely used in the logistics industry today. They can include the following.

- Additional surveillance systems
- Additional seals on packaging
- Additional locks on windows, doors etc.
- Supervised loading/unloading
- Strict controls over access to warehouses and dockyards
- Random security checks
- Additional fraud prevention measures
- Use of enclosed trucks so goods cannot be seen

Each of these measures taken to improve security comes at a cost. Meanwhile, criminals are improving their techniques and are discovering new ways to get around the newly implemented security measures. Australian logistics companies need to take these measures into account.

Different Rail Gauges

The initial construction of three different rail gauges (see section 4.2.2) has led to a challenge also seen in Europe. The three gauges mean trains cannot continue

travelling on different tracks and that cargo must be unloaded. The present uniform gauge provides some relief to this problem, and it may not be as severe as in the early 1900s, but it still creates a challenge on smaller regional lines.

Maintenance Work

Maintenance work on infrastructure such as roads and rail may result in transportation delays. Additional planning prior to journeys must be done.

Individual Oversized Shipments

Oversized shipments are quite common, as in many countries around the world. The transportation of large items such as those used in construction and large pieces of machinery need additional planning (see example in section 5.1.2). Australia's geography may create additional problems that need to be overcome.

Market Entrance/Competition

Large Australian logistics companies like Toll Holdings and Linfox hold a large percentage of the market share. Their operations also cover a wide range of logistics solutions. A new company looking to enter the market, or an established company looking to diversify their operations, may run into barriers. Toll Holdings itself has acquired many smaller companies during the last decade or two.

6. Case Study: Interview with a Sydney Courier

6.1 Background

Sydney is the largest Australian city with a population of over 4.5 million people. As a result of urban sprawl the city has expanded to cover just over 4000 square kilometres. This is almost equal in size to London and is double that of New York City despite having a much lower population density. The city area itself, known locally as the Central Business District (CBD), is approximately 26 square kilometres. (Sydney Media 2011)

As with any large city there is a need for local courier and transportation services. While Australia Post is capable of delivering these services, the sheer number of goods and the urgent need for them to be delivered quickly has led to an increase in the number of courier companies in Sydney over the last 20 years. Inside the CBD one will find hundreds of local cyclist couriers who deliver small envelopes from one business to another. On a city scale there are thousands of vans and small trucks available to transport and deliver envelopes, parcels, boxes, pallets and other small goods to their destination with the added value of personal customer service.

One man has been delivering goods in Sydney by van for 15 years as a local courier. His job has taken him to Newcastle (160 kilometres away) and Canberra (290 kilometres). The knowledge gained throughout the years has made him a more than competent employee in a small courier company in Sydney's eastern suburbs.

An interview was conducted with this courier in order to give a different and realistic view on the logistics challenges faced by an everyday Australian working within the logistics industry in the country's largest city.

6.2 Method

In keeping with the theme of this thesis, the interview and the resulting analysis are based on the method of qualitative research. In order to obtain the most comprehensive results it was decided that the best way to approach the interview was to give the interviewee time to think about his answers. Twelve questions (refer to Appendix 1) were devised and sent by email to the interviewee. The interviewee then wrote his answers to the given questions separately on a piece of paper before they were then returned for analysis.

6.3 Results

The answers given to the interview questions pointed out several challenges that the courier has faced in his job. They include:

- The weight of items and the influence from the Transport Workers Union (TWU)
- Security lockouts in CBD buildings
- Security of goods
- Rising fuel prices
- Traffic congestion as a result of increased cycleways and bus only lanes

6.4 Discussion

The results given in the interview shed some light on the logistics challenges faced at an operational level. While this is only a small part of the process of logistics, the courier brings up some interesting points.

The challenges mentioned by the courier further reinforce the ideas presented earlier in this thesis. Traffic congestion (see section 5.1.1) and security issues (see section 5.6) are notable mentions.

Weight of Items

The courier states that ‘the major logistics challenge today is the weight of items’. He goes on to explain that any item weighing over 20 kg must be transported or lifted by two men, as stipulated by the TWU. While the TWU has the best interests of workers in mind, in this case their wellbeing, sometimes this is not practical. There may be times when there is no other option than for one worker to lift an item weighing more than 20 kg. As the courier points out, even a television can weigh approximately 28 kg. Obeying this rule may lead to time delays. Despite that, the reason the rule is in place is obvious and, if possible, should be followed at all times to avoid personal injury.

Security Lockouts

A daily challenge faced by the courier is the issue of security lockouts in the CBD; ‘deliveries in the city can be a challenge because a lot of buildings have a security lockout on certain floors’. In order to get around this, building staff such as the concierge or security personnel must be contacted. This incurs lost time and extends time delays for items that are to be delivered later in the day. If a job cannot be performed, as stated by the courier, it requires rebooking. This extends time delays even further as well as increases the costs.

Security Issues

A logistics challenge that was not as evident previously, but is one of large concern today, is the security of goods. The courier states ‘my van has a compulsory alarm and central locking system as well as tinted windows’ and that ‘the company I subcontract (for) requires that my van has no company logos’. This is something that has changed dramatically in the last 10 years. Theft and the damage of goods through vandalism is something that companies are becoming more aware of and the realisation of needing to protect goods is more widespread.

Although it is not mentioned in the interview answers, the courier drives together with an ‘offsider’. One stays with the van and goods at all times while the other makes the deliveries. This procedure only came into force a few years ago. If security issues were not of such huge concern, then each courier could drive separate vehicles and complete far more work in the same period of time.

Rising Fuel Prices

Rising fuel prices is a concern around the world. As companies battle to combat the rising costs of fuel, many individuals who need to pay for fuel to carry out their work are suffering. As a result the courier has needed to adjust his driving habits to save fuel. His driving habits now include ‘using lower revs, higher gears and higher tyre pressures’. These all help to improve fuel economy and therefore reduce associated costs.

Traffic Congestion

As mentioned in section 5.1.1, traffic congestion is a major logistics challenge in Australian cities. In the courier’s experience, ‘the number of vehicles travelling in the CBD has remained basically the same for the past five years’. However, due to the introduction of cycleways and bus only lanes in an effort by the local government to reduce personal car traffic in the CBD and to promote greener alternatives, traffic congestion has increased. It is not practical to think that motions to decrease personal car traffic will also decrease goods traffic. There will always be goods traffic coming into the city. In fact, goods traffic will probably increase as more businesses are established in the CBD area. Transit times will be affected if the city does not provide the necessary space and allowances.

The courier also mentions poor traffic light synchronisation as a logistics challenge. This leads to increased traffic jams and time delays.

Solution Suggestions

The courier only provides a couple of suggestions to solve the issues he faces; 'get rid of the cycle lanes and better synchronise traffic lights to maximise traffic flow', he says. As with many large cities around the world, in Sydney there is a feeling of resentment between drivers and cyclists. While cyclists can be a nuisance to drivers, it is necessary for both to share the road. Cyclists should also understand the need for at least some cars on the road and respect them.

One suggestion to overcome traffic congestion during the day is to promote delivery times outside of regular daytime hours. Early morning deliveries, for example, at 4am could reduce traffic congestion during the day.

7. Potential Solutions to Challenges and Conclusion

After looking at the content of this thesis, it is easy to see that there are many logistics challenges facing companies in Australia. While there are some challenges that simply exist and have no solution, such as work safety legislation, there are other challenges that could be addressed in different ways. The following tables examine some of the challenges mentioned earlier and put forth some potential solutions to overcome them.

While some solutions may overcome one particular problem, they may, in turn, create additional challenges. The solutions are solely for the challenge mentioned and do not take into account any additional challenges that may arise.

Urban Challenges

Challenge	Potential Solutions
Traffic congestion	• Road changes to improve traffic flow • Encourage public transport to reduce the number of road vehicles • Consider warehouse relocation away from congested areas • City lockouts/special entry times for certain vehicles • Better route planning
Toll roads	• Consider different routes that do not include tolls • Minimise trip numbers by having bigger loads
Road changes	• Better route planning to avoid trouble spots • Ensure most recent information is used

Many of these suggestions, if not all, are viable. City lockouts and special entry times for certain vehicles may be the most difficult to implement. This would involve giving certain vehicles, such as large trucks and vans, certain times when they can enter the CBD. It could be enforced, for example, in the early hours of the morning on weekdays from 3am to 5am. It would almost definitely face opposition from many transportation workers and unions simply because some workers would be forced to work at different times. A driver completing a set run of deliveries may also be unable to deliver to destinations outside of the CBD in the early morning.

State and local governments could be more lenient on drivers in attempting to force them to use toll roads by creating additional routes and modifying roads. Road changes may also include widening existing motorways to allow for additional traffic.

Regional Challenges

Challenge	Potential Solutions
Distance	• Bigger loads to ensure greater capacity per trip (e.g. use of road trains) • Consider different transport modes such as rail • Source different local suppliers eliminating need for distant transportation • Better planning • Better driver management and forced breaks to decrease fatigue
Animals	• Better awareness of animals • Driver training • Protective equipment for vehicles • Fencing to prevent animals from crossing the road • Signs to warn drivers
Road conditions	• Better/more warnings signs • Open feedback channels allowing community members to request upgrades or inform local government of problems • Improve older roads

Distance is a challenge that will simply not go away in Australia. However, companies could consider using different transportation modes. Using rail, for example, could 'kill two birds with one stone' by eliminating the need for trucks as well as the need for additional drivers on the roads, eliminating driver fatigue. However, as mentioned earlier some places are not accessible by rail.

Improving roads is an ongoing effort. Increased signage, more safety features and upgrading roads is the responsibility of the Government. If feedback

channels were created for members of the public to inform the local governments about the need for road upgrades, trouble spots may be identified and rectified more quickly.

Environmental Challenges

Challenges	Potential Solutions
Climate change/green logistics	• New transport technologies that are environmentally friendly • Minimise waste • Look at different production methods and/or materials • Bigger loads to ensure greater capacity per trip (e.g. use of road- trains) while minimising trips • Look at green and environmentally friendly technologies for other processes (e.g. green warehouse technologies)
Seasonal problems	• Look at alternative routes and transport modes to overcome poor weather conditions • Monitor weather forecasts in planning • Better cooling technologies in warehouses and vehicles • Good employee management to avoid heat exhaustion

Governments need to show more support for green technologies such as solar and wind power. Increasing the awareness of these technologies would allow companies to better consider these options. Minimising waste, especially by considering different production methods and materials would go far in reducing costs.

Being prepared for different types of weather is something transportation companies must consider. Alternative routes must be identified in order to avoid possible delays. Improving employee management on hot days by providing more breaks or installing cooling systems could help to avoid heat exhaustion.

Demographical Challenges

Challenges	Potential Solutions
Ageing population	• Good employee management • Job rotation (i.e. moving older employees to different work areas) • Additional training

Adapting to Australia's ageing population is becoming increasingly important every year. Reservations must be made for older employees as the trend of a later retirement age continues to impact companies. Job rotation and additional training can help older employees adjust to different jobs without being forced to leave.

Legislative Challenges

Challenges	Potential Solutions
Funding disagreements	• Lobbying groups to ensure infrastructure projects are carried out with minimal disruption
Quarantine	• Better planning • Ensure most recent information is available • Be aware of regulations

Lobbying the government to ensure projects are completed is a difficult task and something that has failed on some occasions in the past. However, the efforts of lobbyists can make a difference.

Quarantine restrictions can be overcome purely by knowing what the restrictions are. Being well prepared for importing goods and being aware of the regulations would help companies greatly.

Technological Challenges

Challenges	Potential Solutions
Additional costs	• Better forecasting/planning • Look at different technological options • Joint/cooperative purchases with other companies (e.g. suppliers)
Lack of integrated systems	• Ensure systems are compatible • Better collaboration within the supply chain
Dependence on technology	• Use back-up systems
Resistance to change	• Better employee management • Provide support and training
Adjusting to new technologies	• Better planning • Take implementation in stages • Additional support and training

While collaboration in the supply chain may be difficult, it can reap many rewards. Good relationships between suppliers and customers help speed up business processes, increase trust and lead to economic savings. Integrated systems would be extremely beneficial.

Good planning when implementing new technology is a must. Good employee management by providing the necessary amount of training and support also helps in the adjustment phase.

Other Challenges

Challenges	Potential Solutions
Rising fuel prices	• Improved driver training to improve fuel economy • Partnering with fuel companies to reduce costs • Determine the most economical transport modes (e.g. rail, shipping) • Improve/increase vehicle maintenance to improve fuel economy
Maintenance work	• Additional planning • Be aware of changes, road closures as a result of maintenance works
Oversized shipments	• Improved planning • Consider different transport modes

Improved driver training to help improve fuel economy and vehicle maintenance can lead to significant financial savings in the long run. Investment and ongoing costs are reduced. The courier mentioned in the interview that the use of lower revs, higher gears and higher tyre pressures have helped to improve fuel economy. These strategies are relatively easy to implement. Considering different transportation modes may also help to reduce costs.

The solutions mentioned above could be implemented by different entities including governments, companies, employees and the general public. In the end it is up to each one to determine whether implementing the different solutions is going to be worthwhile.

This thesis has given a special insight into Australian logistics and presented many different logistics challenges. It has also used many different examples to illustrate them. The case study, in particular, gives a good, practical understanding of the challenges facing an individual in Australia's largest city. The solutions mentioned may provide some answers to the problems encountered.

There will always be challenges facing the logistics industry in Australia. Domestic logistics alone is filled with challenges, while international logistics presents companies with even more. Some challenges will be overcome over time while new challenges will continue to present themselves. It is important to remember that each challenge presents a different problem and there may be one or more ways to overcome it. This may involve a long and costly procedure or there may be a simple fix. It is necessary to be aware of the challenges faced and continually look for new ways to overcome them.

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Appendices

Appendix 1: Interview Questions

1. How would you describe your job?
2. What kind of tasks do you carry out?
3. How long have you been working in this field?
4. Where does your work take place?
5. Has your job changed over the years? In what way has it changed?
6. What kinds of logistics challenges do you face in your job?
7. How has the advancement of information technology affected your job? Has it created additional challenges?
8. Are there any particular challenges that you face daily? Describe them.
9. What challenges are there currently that were not evident previously?
10. Is there a challenge you can think of that you have reacted to in recent times?
11. Can you think of some challenges that you might expect to arise in the coming years?
12. Can you think of any possible solutions to the challenges you have mentioned?

Appendix 2: Interview Answers

1. I work as a contract courier (self employed) for a small courier company at Mascot (suburb of Sydney). I work an eight hour day, usually from 8 am to 4 pm, delivering high risk freight; mainly mobile phones. My vehicle is a Mitsubishi 1 tonne van.

2. My day consists of a loosely based set run which takes most of the day. I usually do deliveries only, although pick-ups can occur.

3. I commenced the job as a courier on 28/3/1996, so 15 years of experience, having had no prior experience. It took about 12 months to get into a rhythm.

4. I pick up the goods for my run from a warehouse at Alexandria before sorting them out in order of delivery. 80% of my work is in the CBD of Sydney, the remaining 20% on Sydney's lower North Shore (North Sydney, Cremorne, Neutral Bay and Mosman).

5. For the first 6 years of being a courier I worked "ad hoc", which means I picked up goods from point A and delivered them to point B. It involved a lot of kilometres travelled, longer working hours and I was paid per job only. For the past 9 years I have worked on an hourly hire basis.

6. The major logistics challenge today is the weight of items. The Transport Workers Union (TWU), of which I am not a member, states that the delivery of any item weighing more than 20kg must be performed by 2 men. This is somewhat impractical, for example, a television weighing approximately 28 kg. Having worked in the industry for so long I have developed special techniques of doing this without injuring myself.

7. The difference using information technology as compared to, say, 10 years ago, is that there is very little paperwork involved now. All deliveries and pick-ups are recorded on a hand held barcode scanner. Originally the scanners were quite large and heavy and nicknamed "bricks". They are now small and light enough to fit in your pocket. A mobile phone is still a necessity for certain jobs, e.g. private addresses.

8. Deliveries in the city can be a challenge because a lot of buildings have a security lockout on certain floors. When using the lift a swipe card is required for access. This means contacting the concierge, security personnel, dock master etc. This results in lost time. In some instances a job cannot be performed at all and requires rebooking.

9. The main challenge today is the security of goods. My van has a compulsory alarm and central locking system as well as tinted windows. Carrying high risk freight for the company I subcontract requires that my van has no company logos, i.e. it is plain white and I do not have a uniform with a logo.

10. To keep costs down! The rising price of fuel (approximately $1.60/L for 98 octane) required a change of driving style. This included using lower revs, higher gears and higher tyre pressures (less rolling resistance).

11. Traffic congestion. Although the number of vehicles travelling in the CBD has remained basically the same for the past 5 years, the introduction of cycleways and bus only lanes has hampered traffic flow. Poor traffic light synchronisation has also resulted in more traffic jams.

12. Get rid of the cycle lanes and better synchronise traffic lights to maximise traffic flow.