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An Investigation into the Non-bulk Rail Freight Transport in Australia

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Abstract

In the last decade freight transport has gained further momentum in Australia, partly through significant demand growth at both domestic and international levels and partly as the result of Australia's long term need for infrastructure decision making. Amongst the freight task, non-bulk freight is the fastest growing freight task in Australia and is forecast to grow much faster than the rate of population growth and the average national GDP growth. However, rail's share in the non-bulk market has declined significantly in the last four decades. This study therefore provides an insight into the efficiency and operational management issues facing by the Australian non-bulk rail sector by focusing on three areas; the level of track compatibility and the relevant operational issues, the demographics of non-bulk freight in Australia and the current status of intermodal terminals in relation to rail connectivity and location. As the result, a more detailed understanding of the current shortages in the Australian non-bulk rail freight sector is achieved and managerial implications are provided.

Key Words : Intermodal, Non-Bulk Freight, Rail Freight, Australia, Container

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I. Introduction

In the last decade freight transport has gained further momentum in Australia, partly through significant demand growth at both domestic and international levels and partly as the result of Australia's long term need for infrastructure decision making. The Australian freight sector accounts for 14 per cent of the national gross domestic product (GDP) (Infrastructure Australia, 2011). Forecasts from the Bureau of Transport, Infrastructure and Regional Economics (BITRE[1)]), generally regarded as Australia's leading transport research organization, suggest that freight transport activity will twofold within the next three decades (BITRE, 2010). Multiplying trade between capital cities, the growth in Australia's population, and increased mining activity all contribute to this growth.

Amongst the Australian freight task, non-bulk freight is the fastest growing freight task in Australia and is forecast to grow much faster than the rate of population growth and the average national GDP growth (BITRE, 2010). However, despite the significant growth in freight demand, rail's share in the non-bulk market has been declining in the past twenty years. According to Woodburn (2012), the development of non-bulk freight is viewed as a key mechanism for rail to achieve a larger share of the freight market.

This study therefore focuses on the non-bulk (intermodal) rail freight market in Australia, which is essential in generating freight for rail in light of the deterioration of traditional industries and development of consuming markets (Woodburn, 2012). Intermodal rail freight can consist of wagons conveying containers, swap-bodies or semi-trailers on flat wagons. However, containers may carry bulk goods (such as grains and minerals) as well as non-bulk. The use of semi-trailers and flat wagons are not as common practice in Australia as they are in North America and Europe (Ballis, and Golias, 2002). In this research the European Union definition of intermodal transport is used as 'the movement of goods in one and the same loading unit (e.g. a container) or vehicle which uses successively several modes of transport without handling the goods while changing modes (OECD, 2002).

1) The Bureau of Transport Economics (BTE) became the Bureau of Transport and Regional Economics (BTRE) with effect from 1 January 2002 and then became the Bureau of Infrastructure, Transport and Regional Economics (BITRE) with effect from 2007. Hence, all references associated with BTE and BTRE are the same organization as BITRE.

In the last two decades, intermodal transport has become a substantial sector of the transport industry. At the same time, an extensive amount of academic literature has become available on intermodal transport and the role intermodal markets in promoting an active role for rail in freight markets to meet economic, social and environmental objectives. Bontekoning et al. (2004) contends that research on intermodal transport is beginning to emerge. However, there is a need for further research into methods and techniques to address the problems in this field. The barriers to efficient intermodal transport have been discussed by Reis et al. (2012), who addresses the advantages and disadvantages of combining rail with other transport modes from an energy use perspective. Although not specifically focusing on rail, Tsamboulas et al. (2007) developed a framework to assess the potential of a specific policy measure to produce a modal shift in favor of intermodal transport for maximum benefit while analyzing all of the relevant dimensions hindering the promotion of intermodal transport. The proposed framework is a valuable tool for policy makers to assess whether a specific transport policy positively affects intermodal transport, by increasing its mode share and assesses competitiveness of intermodal transport to and from a specific region. By identifying recent trends in the British non-bulk rail freight market, Woodburn (2006) indicates that intermodal markets (especially to and from ports and the Channel Tunnel) are potentially better placed to capture the premium logistics traffic for rail than the less-than-trainload (LTL) markets. Woodburn (2012) went on to examine the evolution of the intermodal market and the contribution of different sub-markets to develop an overall growth trend. The evidence shows that the main contributor to the growth of the intermodal rail market in Britain has been deep sea containers on the key inland corridors from the ports.

Janic (2007) developed a model for calculating comparable combined internal and external costs of intermodal and road freight transport networks. This model aimed at internalizing any external costs of transport by analyzing prospective competition between two intermodal and road-only networks from a social perspective. The results indicate that the full costs of both systems decrease more than proportionally as door-to-door distance increases. However, for the intermodal network, the average full costs reduce at a decreasing rate as the quantity of loads rise suggesting economies of scale while within the road-only network they are constant. Dablanc (2009) investigated the regional policies for rail freight services, focusing on the reluctant role of the Local Governments to promote rail in France. This reluctance can be explained under current conditions of limited infrastructure capacity, low productivity levels and a high cost of labor.

This research changes the focus from Europe to present an analysis of the non-bulk rail freight sector in Australia by focusing on the geographical features of the railway system, growth and freight distribution. The analysis provides insights into the efficiency and operational management issues facing by the Australian non-bulk rail sector and discusses the implications for the rail sector and policy makers. As confirmed by Hesse and Rodrigue (2004), goods movement and freight distribution are widely under-represented in regional scientific and geographical research. To meet this objective, this paper first places the rail freight activity and policy in Australia into context, focusing on the non-bulk task and the changes that occurred since Australian Rail Track Corporation (ARTC) integration and de-regulation. Section 3 discusses evidence relating to recent changes in the rail's share both as a whole and in the different sub-markets. Section 4 provides an extensive transport geography analysis on how the current network status limits the scope for rail transport in Australia. Within the context of the intermodal market, Section 5 provides the implications and strategies to assist future infrastructure and land use planning. Finally, the research is concluded in Section 6 by providing rail policy implication.

II. Australian Rail Freight Sector and Policy

According to BITRE (2014a), the Australian domestic freight activity totaled almost 600 billion ton kilometers in 2011-12, with 49 per cent carried by rail, 35 percent by road, 17 per cent by coastal shipping, whilst a very small volume (less than 0.1 per cent), of generally high value cargo carried by air transport with a very limited air-rail intermodal activity. The domestic freight task has doubled over the past 20 years, averaging a growth of 3.5 per cent per annum (BITRE, 2007[2)]). BITRE's estimates

2) Transport economic-based data on the domestic freight task is not regularly generated; this is the most current data

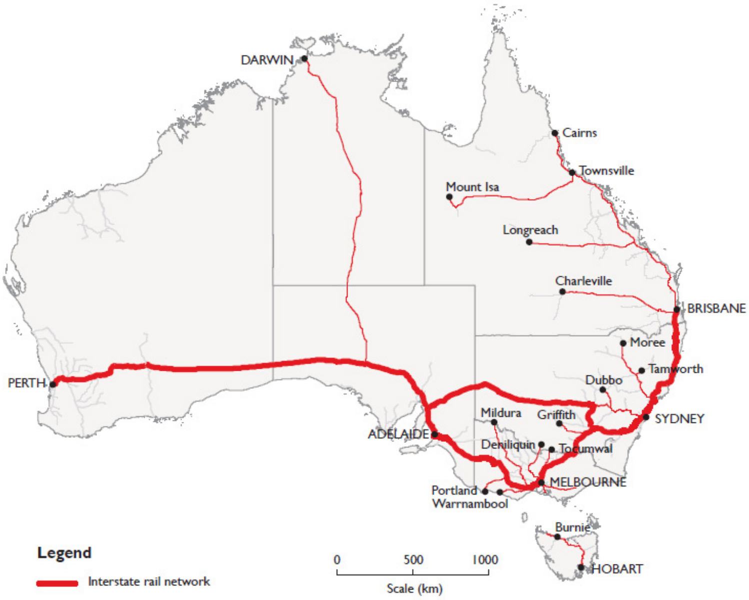
suggest this trend will continue, although with slightly slower growth, growing by about 3.0 per cent per annum to 2030 (BITRE, 2010). In 2006-2007 ton-kilometers on rail exceeded those on road, due to higher average haul distances (Infrastructure Australia, 2011).

Rail freight activity in Australia can be explicitly characterized into two different tasks; bulk and non-bulk. In terms of bulk, 48 per cent of Australia's bulk freight activity is dominated by rail (BITRE, 2009) due to its natural cost effectiveness and economies of scale. Rail moves coal and iron ore from mines in Western Australia and Queensland to their nearest ports for export. Rail also moves other minerals and grains in bulk to ports in smaller quantities. Growth in mining activities has provided capital for the development of rail infrastructure, and accordingly greater rail freight activity. By early 2012, the top three mining corporations in Australia had constructed more than 2,040 route kilometers of railway (BITRE, 2012). As a result of substantial investment and enhancement to track and train capacities, bulk carrier trains in Australia are among the longest and heaviest in the world. For bulk commodities rail infrastructure is integrated with mining operations. With continuous loading/unloading facilities and high volumes, returns on investment are attractive enough for mining companies to fund and invest in dedicated rail infrastructure in Australia.

Shifting the focus to non-bulk freight, the total value of this task measured to almost two per cent of Australia's GDP in 2008, of which the interstate corridors comprised 61 per cent, international chains 34 per cent, and the intrastate chains five per cent, of the total value (Booz & Co, 2008b). In the non-bulk freight task, rail demonstrates a different set of features in terms of competition structure with road, infrastructure management and policy perspectives in different service corridors. Interstate non-bulk rail freight is predominantly divided into two major interstate freight corridors in Australia; the North-South corridor that links the freight movements along the Eastern States between Melbourne, Sydney and Brisbane; and the East-West corridor that transports freight between Western/Southern/Eastern States (Figure 1).

available

<Figure 1> Interstate standard gauge network[3)]



In terms of infrastructure, the railway network comprises of around 33,000 route-kilometers of track, with around ten per cent being electrified. There are 452 route kilometres of track under construction, primary fot he movement of iron ore and coal (BITRE, 2012). According to Australasian Railway Association (ARA), there has been a shortage of investment in the rail sector. This has left the below rail infrastructure in a sub-optimal status which impairs the ability of above rail operators to compete with road transport. Below rail infrastructure condition has a significant impact on reliability and transit time of rail services, with poor track quality and signaling on some corridors meaning trains can only reach an average speed of 45 km/h. This has a significant impact on both the transit time and reliability of service (ARA, 2010). In addition, the management of below rail infrastructure is diverse, both in structure and operation in Australia. ARTC is the primary manager of interstate track, with Kalgoorlie-Perth under management of Brookfield Rail. Yet, the intrastate networks are managed by various State-based entities.

Railways have very strong economies through density in both above and

3) Source:BITRE (2012, p.6)

below-rail operations, implying that incremental traffic volume will have a significant effect on reducing the financial gap (BTRE, 2006b). Hence, pricing strategies are a critical determinant of cost recovery and projected demand, and eventually impact on the economic viability of railway systems (Crozet and Chassagne, 2013). In the recent years, rail infrastructure pricing and access charging systems have been debatable subjects between policy makers, infrastructure managers and users in Australia. As a part of microeconomic reforms implemented by the Australian Government over the past two decades, the deregulation of rail started by vertically separating the above and below rail infrastructure, and creation of ARTC as a single manager of interstate rail networks. However, the deregulation of rail and the creation of the national interstate network have failed to bring integration and instead delivered a system consisting of discrete State Government entities. These systems have complex access regimes, pricing strategies and regulatory mechanisms which were developed in isolation, and are not necessarily based on national interests and enhanced integration, but instead on the vested interests of the respective State Governments (Everett, 2006).

Access by freight trains in Australia is generally priced to recover at least the incremental cost of infrastructure use, which includes the marginal cost of track maintenance (BTRE, 2003). However, in many railway systems in Europe and North America the cost recovery objective is based on the full cost recovery rather than marginal incremental costs. It is critical to recognize that rail freight infrastructure in Australia operates within a comparatively limited passenger market to share its fixed costs, whereas nearly 80 per cent of traffic on interstate road corridors where road and rail compete is comprised of light vehicles (BTRE, 2006b). Productivity Commission (2006) has been instrumental in providing further information on road infrastructure access regimes. Much of Australia's rail infrastructure access is based on a negotiate-arbitrate model, where the access seeker and provider negotiate access but, if negotiation fails, the regulatory body sets an arbitrated charge that falls within the floor-ceiling price band (BTRE, 2003). The owners of the rail infrastructure are obliged, where requested, to provide access to the track to above-rail train operators with fair and reasonable conditions; the terms and conditions as well as the price of such access are regulated by Part IIIA of the *Trade Practices Act 1974* or by relevant state legislation

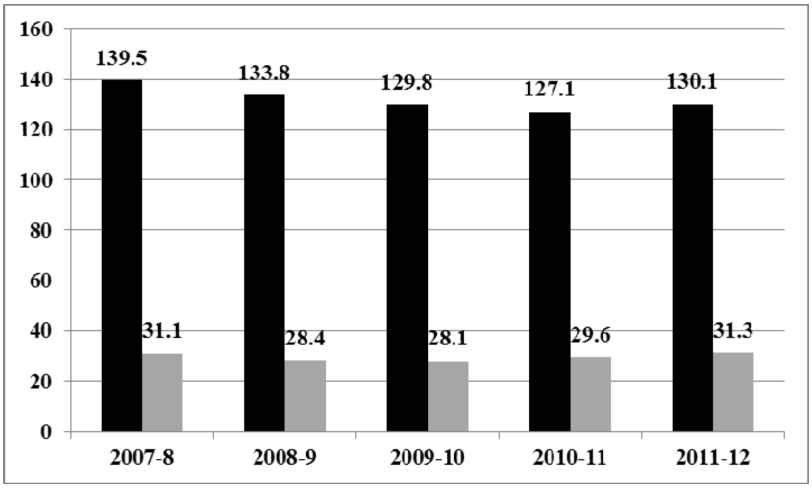
(Wills-Johnson and Affleck (2006). The access pricing has been held down by the ARTC to assist the rail industry in gaining market share (ARA, 2005). However, current charges may not sustain the infrastructure costs in the long-run, and hinder new investment from commercial operators in the rail sector. Further details on infrastructure pricing policies and tactics can be found in *National Competition Policy, (Hilmer, 1993)* and *Progress in Rail Reform (Productivity Commission, 1999)*.

III. Trends of Rail's Share in the Non-bulk Freight Market

In the non-bulk freight task, a modal share on various routes represents the relative competitiveness of the different transport modes. Interstate non-bulk freight is the principal field in Australia where competition between road and rail is very obvious (BITRE, 2009). Amongst freight task, interstate non-bulk freight task is the fastest growing freight task in Australia and is forecast to grow much faster than the rates of population growth and national GDP growth (BITRE, 2010).

Long-distance non-bulk freight, predominately carried by rail for the first half of the last century, has since largely shifted to road transport (NTC, 2009). Road freight share has been growing almost sixfold over the last four decades due to significant productivity and technology improvements in both network and vehicles (Kamakate and Schipper, 2009). Except for the long-distance Eastern State capital cities through to the Perth corridor, the intercapital rail freight has grown far less quickly than road freight (Mitchell, 2010). Figure 2 compares the non-bulk freight volumes by road and rail shares between 2007-8 and 2011-12.

<Figure 2> Non-bulk freight task by mode share between 2007-8 and 2011-12[4)]



Freight demand is value derived. The determining factor for the modal shift is whether and to what extent the different modes are able to adapt to new requirements within the transport industry (OECD, 2010). In this sense, the customers' choice of transport service involves a trade-off between various key monetary and non-monetary factors. These include the freight rate, transit time, punctuality, service availability and more recently the environmental impacts of freight service (Witlox and Vandaele, 2005). ARA (2005) states that at normally expected levels of efficiency, 'efficient rail' must offer a significantly lower freight transport cost than road on all interstate corridors; thirty per cent lower in cost on the North-South corridor, and fifty per cent on the East-West corridor. Freight customers have also indicated that, at present, rail is generally cheaper relative to road on many line haul corridors (especially east-west movements) and they have indicated interest in increasing the use of rail for their intermodal freight movements, but cost savings can be offset by longer transit times and poor reliability levels offered by rail (NTC, 2009). Poor reliability and long transit times are regarded as the major reasons for the low use of rail in both North-South and East-West corridors. In 2006, on the North–South rail corridor on-time reliability was approximately 40 to 50 per cent compared with road's 95 per cent to 98 per cent (Ernst and

4) Extracted from Australian Infrastructure Statistics yearbook (BITRE, 2014b)

Young, 2006). However, in the recent years, service levels have generally improved due to both above and below rail infrastructure improvements.

The inability of rail to provide high quality services in terms of speed and punctuality has significantly ruled the rail out of 65-75 per cent of the North- South freight task (ARA, 2010).

IV. A Transport Geography Investigation

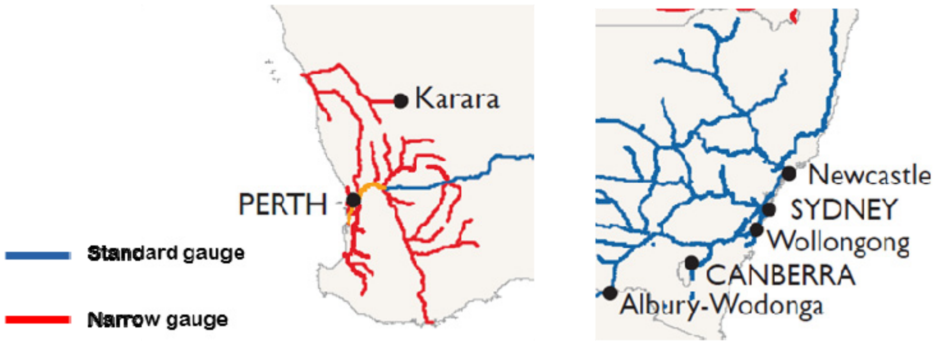
This section first provides a transport geography analysis with a focus on three areas; the level of track compatibility and the relevant operational issues, the demographics of non-bulk freight in Australia, and the current status of intermodal terminals in relation to rail connectivity and location.

1. The Analysis of Railways Used for Non-bulk Freight Movements

In common with the experience in some other countries (United States, Germany, United Kingdom, etc.), Australia's railway network was constructed with three different gauges of broad, narrow and standard across different parts of the system. The railways in Victoria, New South Wales (NSW) and South Australia were constructed using the broad gauge[5)], while Western Australia (WA), Queensland and Tasmanian railways chose narrow[6)] gauge. In particular, the network developed outwards from the state capitals, with cross-border links established only after intrastate lines being developed in the 1990s. While that legacy remains to date in the intrastate sector, interstate trains move across a standardized 1,435 mm gauge (BITRE, 2012). According to Everett (2006), railways were developed exclusively for the intrastate movement of cargo and people, and for linking the capital cities and ports with their hinterland. Thus, to efficiently and reliably move cargo through the nations, track incompatibility is a key impediment for rail industry in Australia as the result of additional handling time and operational costs (Figure 3).

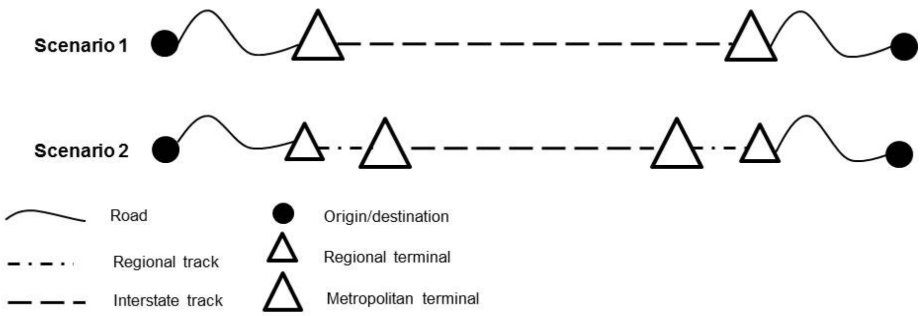
5) Broad gauge size is 1600 mm.
6) Narrow gauge size is 1067 mm.

<Figure 3> Narrow regional gauge in WA and standard regional gauge in NSW[7]



To explain the effects of track incompatibility within this study, two different scenarios have been proposed. In the first, both origin and destination locations are located in capital cities or in proximity to national interstate network. In other words, freight is carried on a uni-track system with road transport providing local pick-up and delivery (PUD) between point of origin/destination and rail terminals. In this case track incompatibility is not relevant as transshipment is not needed between different gauges and shunting operation is sufficient. In the second theory, if either the destination or the origin location is located in a regional area rather than in proximity to an interstate network, track incompatibility is an issue for carrying freight by rail (Figure 4).

<Figure 4> Effect of track incompatibility on rail freight movement



Source: Authors

7) Adapted from BITRE (2012, p.7)

Although it is not clear what percentage of non-bulk freight is carried using each of the above scenarios in different states[8] - 11.2 per cent in Melbourne for example (Shipping Australia, 2011) - rail fails to retain its cost advantage due to extra transshipment needed to shift between the regional track and the interstate track if freight origin and/or destination locations are not located in the proximity to the interstate network. In the areas where regional track is standard size (for example, some parts of New South Wales), shunting-only operation has significantly lower costs than transshipment. Nevertheless, adding a transshipment stage will significantly affect the time-based attributes of rail freight service (discussed in Section 3).

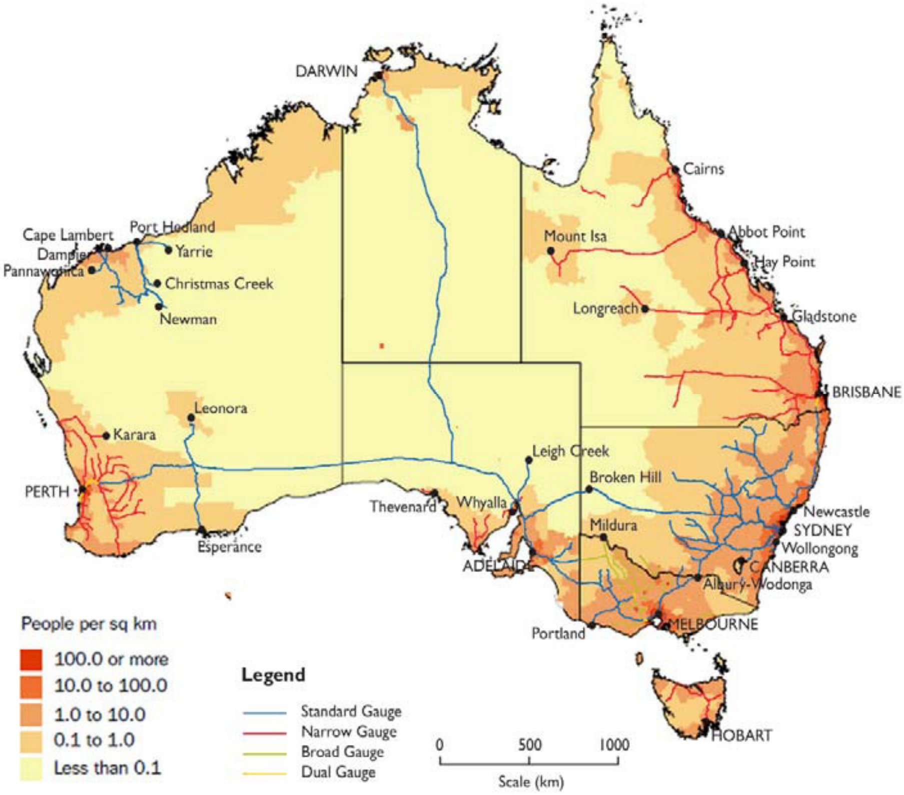
2. The Demography of Non-bulk Freight Demand

To study the non-bulk freight market from the demand distribution and demographic features, it is critical to have a clear understanding of the nature of cargo and the principal geographical movements. The non-bulk freight market can essentially be considered as two separate entities, intermodal which refers to the conveying goods in unitized loads or full-train-load (FTL), and the LTL (Woodburn, 2006).

In Australia, non-bulk freight flows predominantly consists of two major sub-markets; the freight carrying between ports and ports' hinterland (generally intermodal), and those generated from domestic production facilities and carried interstate/intrastate to the final customer (both intermodal and LTL). According to Ng and Gujar (2008) non-bulk freight is mainly imported goods or agricultural products. The Deloitte (2011) study has also recognized Woolworths, Bunnings, Coles and Colgate-Palmolive as the main cargo generators in the Australian non-bulk market. Therefore, for the purpose of this study population is used as the determining factor of demand distribution for non-bulk freight movements. This involves the use of full and empty containers. Figure 5 presents the combined map of rail network and the population density in 2010.

8) Data is not available for all States.

<Figure 5> Population distribution and railway network by gauge[9)]



Most of Australia's population is concentrated in three widely separated coastal regions- the South-East and East, and the South-West. Population in these regions is concentrated in urban areas, particularly the capital cities. According to the World Bank (2011), population density in 2011 was an average of three people per square kilometer across the whole of Australia. Most railways in Australia are concentrated around capital cities and ports, extending into regional areas and mines using different gauges. Despite the fact that commercial viability of rail is dependent on high volumes travelling long distances (Hanssen et al., 2012), the current market situation with small flows over short distances combined with track incompatibility significantly limits the scope for rail to be a favorable mode of transport. This is particularly true for the Australian regional areas with a gauge different than the interstate standard gauge and generating very small freight volumes.

9) Adapted from Australian Bureau of Statistics (2012) and BITRE (2012, p.7)

Interstate movement of freight from the more populated states of NSW, Victoria, Queensland and South Australia to/from Western Australia, Northern Territory is another subject of interest in the transportation economics contexts. Western Australia, with its population of 2.1 million, is approximately located in a distance of 2,700 km to Adelaide in South Australia. Freight volumes do not necessarily support the rail's maintenance and operational costs, thereby offering a weighty competitive advantage to road transport for both interstate movements in shorter corridors. Following the same reasoning, the 230,000 population of the Northern Territory is located at a distance of 3,000 km from Adelaide. For the case of Australia's island state of Tasmania, a lack of physical land connection to the mainland offers no scope for rail in the interstate task. The population of Tasmania is 0.5 million, with only 300 km separating the north and south, considering the PUD tasks road is the preferable mode of transporting non-bulk freight for the Tasmanian intrastate movements. At the same time, outdated rail infrastructure (both above and below rail) and short distances means that freight traveling along congestion-free roads has ruled rail out of the field.

Another impeding factor to the use of rail in Australia is the existence of ports in the proximity of freight markets. Each region has its own port to serve the hinterland which provides opportunities for both coastal and international shipping to place competitive pressure on intermodal rail operators in the interstate market. This competition is more pronounced in the East-West corridor where maritime transport has cost advantages over rail (BITRE, 2009).

3. Australia's System of Intermodal Terminals

In recent years, a number of studies have been conducted by both industry and academic sector on the context of intermodal terminals in Australia (Sirikijpanichkul et al., 2007). Two broad themes can be identified from these documents. First, there are studies investigating the establishment of new terminals or development of existing ones, including estimation economic and regional outcomes of project. The second main area is linked with addressing the operational aspects of terminals such as capacity constraints, locational issues and existing logistical practices. By reviewing the two study groups, a number of factors can be observed that hamper the efficiency of intermodal terminal system in Australia. Table 1 represents a summary of impeding factors against terminal efficiency in Australia.

<Table 1> Impediments to the efficiency of intermodal terminal system in Australia

Impeding factor	*Source*
Terminal congestion	(BTRE, 2006a; Infrastructure Australia, 2011; Meyrick and Associates, 2006)
Poor terminal design and location	(Booz & Co, 2008b; Deloitte Access Economics, 2011; John Hearsch Consulting, 2008)
Inefficient terminal operation	(NTC, 2009; BITRE, 2009; ARTC, 2006)
Poor communication and adversarial relationships between terminal operators and rail/road operators	(NTC, 2008; NTC, 2009; Booz & Co, 2008a)
High and inconsistent terminal charges	(BITRE, 2009; Booz & Co, 2009; Meyrick and Associates, 2006)

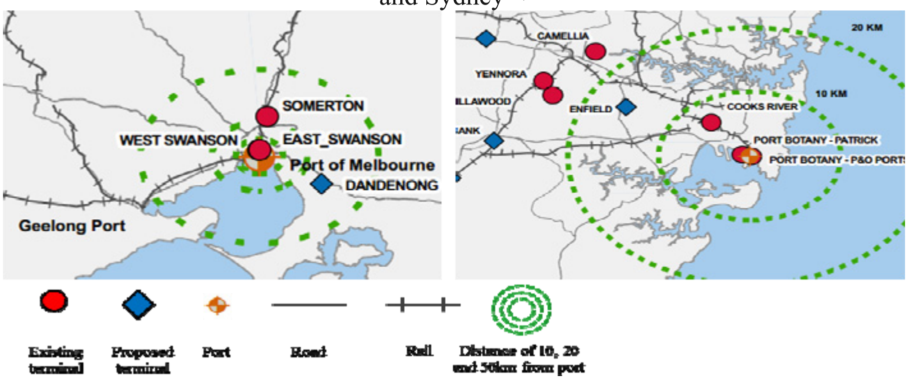
Source: Various

There are two distinctive subsystems for intermodal terminals in Australia: a port-based system that predominantly handles international imports/exports and the system that is concerned with the interstate and intrastate movements of non-bulk freight. There is no definitive rule to entirely differentiate these systems. In some states such as Queensland and Victoria, the intrastate terminal system was constructed to integrate the regional gauge passing the inner hinterland with the interstate network. A number of terminals, Yennora in Sydney for example, play a critical role in both interstate and intrastate systems. To a significant extent these systems increasingly operate independently of each other (Meyrick & Associates, 2006). However, the domestic subsystem has failed to fully integrate the intermodal chains in Australia due to a number of major productivity and integration obstacles (presented in Table 1). The efficiency of transfer between different modes in the terminals can have a significant effect on transport costs and service times (Kozan, 2006). There are various factors that influence the efficiency of the terminals within the intermodal chains such as ease of connectivity to the transport network or knowing as the location, terminal design, operational practices and the system involved with coordinating different players.

As stated by Roso (2011), a close dry port (an intermodal terminal with direct rail connection to seaport) is a potential solution for seaport terminal congestion as well as for better seaport inland access based on short haul rail. In this sense, Sydney has the most extensive intermodal terminal system in terms of rail connectivity to the port. However, at present, only one dedicated freight railway existed in Port Botany. Freight trains travelling beyond the dedicated freight track, including trains servicing the intermodal terminals at Leightonfield, Yennora or Minto, share the same network with highly prioritized passenger trains. At the same time, curfews in many parts of the network (especially North Sydney) restrict freight trains, causing misalignment between the rail operators and stevedores which impedes the terminal productivity levels. The intermodal terminal system in Victoria is comparatively less developed that in NSW (see Figure 5). A key issue for the Port of Melbourne, as the largest container port in Australasia, is the quality of rail access to the on-dock terminals (Meyrick & Associates, 2006). The freight trains travelling through the Port of Melbourne are loaded and unloaded outside the dock terminals because of the complexity of its rail gauge system and the lack of infrastructure to accommodate port shuttles, adding extra transshipment cost land time to the freight service.

In addition, the distance of 20 km between the urban intermodal terminals serving the Port of Melbourne is too short to ensure economic viability of rail shuttles (Figure 6). Roso (2013) states that besides the price-quality ratio of competing traffic modes, the competitiveness of intermodal road-rail transport depends on geographical and demographical conditions. In the cases of Sydney and Melbourne, current distances between intermodal terminals serving the interstate trains and seaports are noticeably short.

<Figure 6> Current spatial developments of intermodal terminals in Melbourne and Sydney[10]



10) Source: Booz & Co

It is worth mentioning that intermodal terminals in the hinterland of Port of Melbourne were developed in competition with the port itself, as the port did not have any interest to invest, while the inland facility for the Port Botany in Sydney was designed to perform a complementary task for the port, leading to a higher level of integration (Roso, 2013).

For the case of Brisbane, Adelaide and Fremantle ports, rail connections and integration with hinterland terminals are not sophisticated enough to ensure interoperability (Meyrick & Associates, 2006). The situation is comparatively different in Tasmania. The Northern Tasmanian ports are well-connected to state's rail network. However, complex trading relationships and low volume have led to a competitive market and oversupply of intermodal infrastructure.

V. Key Planning Recommendations

By analyzing the three research themes in the former section, a more detailed understanding of the current inefficiencies and infrastructure shortages facing by the non-bulk rail freight sector in Australia is achieved. This was the main purpose of this study, and the findings have implications for management and the planning decisions of key rail industry players in Australia and for policy makers.

In relation to the issue of track incompatibility, a significant amount of investment is required for track standardization to enable rail capture larger market share of freight within regional areas. However, there are number of reasons that do not justify the investments in regional track standardization in short term. First, the sizes of regional markets are considerably small. This is particularly true as the economic viability of railways is largely dependent on volumes. Second, the current population growth and patterns demonstrate a shift from regional areas to metropolitan cities. Besides that, non-bulk freight needs road for its PUD legs, adding a significant cost to the overall journey rate. By contrast, as the non-bulk freight demand is projected to grow over the next three decades, standardization of gauges will substantially reduce the operating costs across state borders and encourage competition among above rail operators. The standardization of gauges also introduces mobility and flexibility benefits for the use of above rail assets enabling operators to move rolling stocks, locomotives and wagons around the nation to more effectively meet the demand changes and utilize rail assets.

The evidence shows that the share of rail in the North-South corridor which comprises the primary non-bulk freight market in terms of value and size is considerably smaller and is forecast to stay steady in the absence of any efficiency improvements. Given the growing population, rising fuel cost and placement of carbon tax schemes in future rail industry must be prepared to embrace the opportunities by providing enhanced service levels.

A number of track and terminal enhancement options exist for this corridor, particularly in ports and congested parts of the network. This will improve reliability levels and transit times which are the key customers' concerns with use of rail by reducing the number of stops and the time trains spend in passing loops. Investment in passing loops will also remove significant impediments on current train length restrictions (1,500m in many parts of North-South corridor), boosting train capacity and enabling rail to offer a substantial cost advantage over road. Yet, the decisions on track development and capacity improvements must be made in balance with the ability of intermodal terminals to handle the additional modal share.

In addition to the cost elements, the overall journey time and service availability (in terms of frequency and network coverage) are critical factors to define the competitiveness of transport modes. Although the concept of a close intermodal terminal should bring numerous benefits to the actors and users of the transport system, various infrastructural, environmental, institutional and land use impediments exist. The previous section discussed the current proximity of seaports to their adjunct intermodal terminals in Australia which does not necessarily ensure operational cost recovery of the rail, while congestion and competition for the use of limited infrastructure significantly affects the quality of rail freight service. Although the opening new intermodal facilities such as Moorebank in Sydney potentially boost terminal capacity in the short-term, the capacity of both rail and road infrastructure is inadequate to accommodate the increasing throughput.

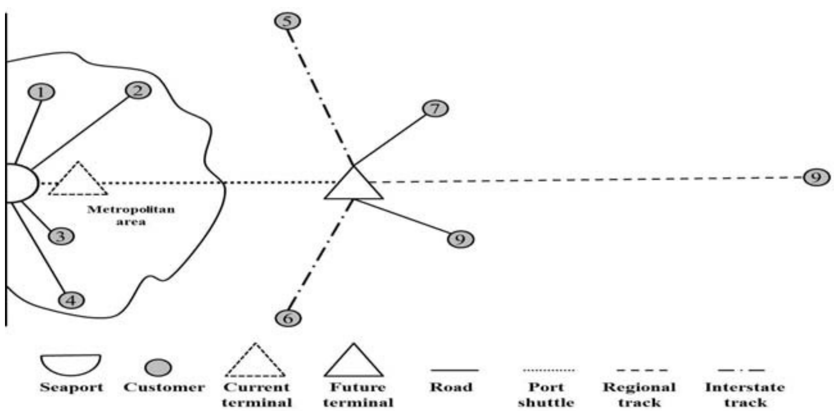
For example, if a single large customer, such as Woolworths, was to shift its Brisbane-Melbourne intercapital movements from road to rail, it would be difficult to meet the additional volume given the current capacity constraints in North Sydney (Deloitte, 2011). The Melbourne-Sydney leg of journey could be carried with the current infrastructure, but the Sydney-Brisbane leg could not be carried in an efficient manner leading to longer transit time and poor punctuality levels.

The growing demand for freight transport, congestion and bottlenecks at chokepoints such as metropolitan Sydney and Melbourne, together with limited land available for expansion of current terminals, requires a system to effectively ease the traffic concentration. This issue may become even more important in the future as the competition from passenger trains for using the below rail infrastructure in the urban areas becomes more intense, with the passenger trains being given priority. This is particularly true for the freight with origin or destination ports.

As customers increasingly rate ports on their hinterland accessibility, ports such as Melbourne and Sydney need to improve their access to areas outside of their traditional hinterland. This requires more collaboration for relocation of intermodal terminals with high capacity rail corridors to ports to better serve the port-based freight flow, facilitate interstate movements, and to offer a greater range of logistics services. The relocation also releases land which could be utilized for the further development of rail access to ports.

A decentralized system will significantly ease congestion in metropolitan areas, better serve the inner hinterland freight markets, improve connectivity to the interstate network and subsequently provide a larger scope for rail to operate in the port-based container market (Figure 7).

<Figure 7> Decentralized terminal development strategy



A very good set of examples are the midrange dry ports of Liege and Brussels supporting the competitive position of Flemish seaports in Belgium. Since there are differences in terms of infrastructure, urban growth patterns and freight movements between Australian port-capitals, the spatial development and the degree of decentralization must be in balance with the above factors.

VI. Policy-Related Implications

Efficient infrastructure is essential for a sustainable, integrated and productive freight transport market in Australia. To undertake a productive non-bulk freight task, greater intermodal infrastructure is required to create seamless interaction between different modes. However, the fragmented and poorly maintained rail infrastructure inhabits its ability to incorporate this. Historically, road and rail freight infrastructure policy, planning and investment have been undertaken in isolation from each other, even in competition with each other. In other words, planning decisions and policy have been made by mode rather than using an integrated attitude to optimize the use of infrastructure capacity. As a result, infrastructure standards are not adequate in Australia to ensure inter-operability across the rail industry, but also between rail and other transport modes. The current lack of integrated supply chain thinking for the development of intermodal terminals and other infrastructural elements is a potential threat to meet the future demand. Road and rail industries must ensure that their internal planning policies and decisions are consistent with the broader national land freight strategies and objectives as indicated in the AusLink Green and White Papers, rather than focusing exclusively on their competitive position in different corridors. Economic and operational regulations, especially in the areas of infrastructure pricing and funding, must be developed and applied equally to all transport modes to minimize biased competition and to maximize the use of infrastructure and resources. This is the role of government at its different levels to encourage efficient mode choice by public awareness of social, economic, and environmental inputs that a particular transport mode offers to the freight market, and the subsequent users.

Government must ensure there is no regulatory barrier hindering the movement of rail industry toward a more productive business environment. To date, however, government has failed to meet these objectives. In addition, the deregulation of the rail market in Australia has opened new doors to private sector during the last decade, a main concern is having a strategic appraisal plan to ensure government and private sector work together to manage the conflicts of interest on the funding and ownership decisions.

In conclusion, the economic viability of a successful non-bulk freight system in Australia requires the collaboration of all parties in the freight markets to work toward sustainable solutions. It is important that these players do not see others as threats to their businesses, but instead as a source of enhanced integration and cost efficiency in long term. Any mode-specific policy to improve the competitive position of a particular transport mode in the non-bulk market is not always successful, since it typically fails to consider the altitudes of other key players in this market. These objectives must be attained by believing that productivity would attain from the implementation of an integrated strategy at a national level, rather than a mode-specific and State-biased approach for the freight industry.*

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