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16. Abstract

The report covers a period of great significance for railroading in the U.S as it contains a number of milestones now shaping the future performance of the industry. The specific subject is improving intermodal service so that it can support state and regional highway planning, now facing severe financial cut-backs as revenue sources become fully committed to bond servicing, user taxes, loose purchasing power and fuel consumption begins to fall. Intermodal traffic grew strongly in the period 1995 – 2007 and UP and BNSF trans-continental routes were improved largely on the back of intermodal demand. Alliances with larger trucking companies strengthened and transportation officials began to ask whether rail could take some of the predicted freight off key highway corridors. This report addresses elements of this question, more especially as it relates to intermodal traffic in Texas and the Southwest. The report comprises the following sections. Chapter 2 considers the changes in rail freight since the Staggers Act, Chapter 3 evaluates Class 1 intermodal service, and Chapter 4 identifies the major trade corridors serving Texas and the Southern region of the U.S. Chapter 5 describes rail bottlenecks on the state rail system that might impact future intermodal growth, and Chapter 6 concludes by examining the strengths, weaknesses, opportunities and threats to rail intermodal service in Texas and the Southern region over the next decade.

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THE POTENTIAL FOR IMPROVING RAIL INTERNATIONAL INTERMODAL SERVICES IN TEXAS AND THE SOUTHWEST REGION OF THE UNITED STATES

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RESEARCH REPORT SWUTC/11/473700-00076-1

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The report covers a period of great significance for railroading in the U.S as it contains a number of milestones now shaping the future performance of the industry. The specific subject is improving intermodal service so that it can support state and regional highway planning, now facing severe financial cut-backs as revenue sources become fully committed to bond servicing, user taxes, loose purchasing power and fuel consumption begins to fall. Intermodal traffic grew strongly in the period 1995 – 2007 and UP and BNSF trans-continental routes were improved largely on the back of intermodal demand. Alliances with larger trucking companies strengthened and transportation officials began to ask whether rail could take some of the predicted freight off key highway corridors. This report addresses elements of this question, more especially as it relates to intermodal traffic in Texas and the Southwest. The report comprises the following sections. Chapter 2 considers the changes in rail freight since the Staggers Act, Chapter 3 evaluates Class 1 intermodal service, and Chapter 4 identifies the major trade corridors serving Texas and the Southern region of the U.S. Chapter 5 describes rail bottlenecks on the state rail system that might impact future intermodal growth, and Chapter 6 concludes by examining the strengths, weaknesses, opportunities and threats to rail intermodal service in Texas and the Southern region over the next decade.

Executive Summary

ES.1 Background

The report covers a period of great significance for U.S railroading as it contains a number of milestones which will shape the future performance of the industry. The specific focus of the study is improving intermodal service so that it can further strengthen state and regional multimodal planning, since new highway capacity faces severe financial cut-backs as revenue sources become fully committed to bond servicing, the user taxes[1] loose purchasing power and fuel consumption begins to fall[2]. Intermodal traffic grew strongly in the period 1995 – 2007 and UP and BNSF trans-continental routes were improved largely on the back of intermodal demand. Alliances with larger trucking companies strengthened[3] and transportation officials began to ask whether rail could take some of the predicted freight off key highway corridors. A summary of the most significant milestones forming the economic and operating environment of U.S railroads between 2006 and 2010 is are follows:

1. Increasing profitability from a variety of successful market segments (not simply intermodal) and strategies to control and cut costs enables companies to meet their cost of capital.
2. Fuel efficiencies enable the sector to be considered by logistics companies over a variety of truck-competitive routes.
3. Cambridge Systematics completed a report on the U.S rail system[4] which estimated the improvements needed on that part of the rail network predicted to carry most of the U.S rail traffic to 2035[5]. Class 1 railroad companies were allocated $ $135 billion over this period and it was calculated that they could fund around $ 96 billion from operations leaving a shortfall of $ 39 million or $ 1.4 billion per year[6]. The study recommended that a national strategy by formed to support increased rail capacity sourced from a variety of financial instruments and beneficiaries. The figure of $ 1.4 billion annually for creating a system that could carry double the 2005 traffic volumes seems quite modest, especially given the magnitude of the last federal initiative to stimulate the economy.

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[1] Principally state and federal fuel taxes and registration fees

[2] Total state consumption fell between 2007 and 2009 from 16.3 to 15.8 billion gallons of gasoline and diesel

[3] Reducing adversarial relations related to truck size and weight legislation

[4] "National Rail Freight Infrastructure Capacity and Investment Study" sponsored by the Association of American Railroads, September 2007

[5] The figure was estimated by the U.S DOT and represents an increase of about 90 percent over the 2005 rail figure.

[6] http://www.camsys.com/pubs/AAR_Nat_%20Rail_Cap_Study.pdf

4. In December 2009, Warren Buffet's investment company Berkshire Hathaway which already had around a 21 percent stake in BNSF reached an agreement to purchase the remaining stock for $ 26.6[7] million, taking his total investment to $ 34 billion[8]. Buffet called it "an all-in wager on the economic future of the United States. I love those bets." This important vote of confidence by arguably one of the most respected financial leaders sealed the transition of U.S Class 1 railroad company success and relevance in the national transportation system.

Independent of fluctuations in the economy impacting demand, operating efficiencies and financial returns, two major issues remain that critically affect railroad operations. These are:

1. Re-regulation which has generated several policy initiatives including an STB restructuring the regulatory process and a rail anti-trust exemption revocation bill.
2. Providing access to passenger rail services on freight networks. This is highly problematic to the major companies who have spent two decades of investment on move freight on long unit trains at speeds up to 65 mph. Amtrak operations have shown the difficulty of moving passenger trains on schedule across freight systems even with the full support on Class 1 dispatchers. The opportunity of implement high speed rail (HSR) systems but only with limited funding has encourages HSR proponents to advocate the use of sections of the freight rail system or right-of-way has created concerns centering on reducing freight reliability, liability issues related to mixed HSR and freight use, freight rail subsidies to HSR operations and forced passenger rail access. The safety issues are highly relevant and it is interesting to note that, across the globe, when rail carried large volumes of both freight and passengers the system was separated[9].

ES.2 Recommendations for Improving Rail Service in Texas

The first decade of the 21 century was one of great change, significance and success for the U.S rail industry. Rail now has an opportunity to grow its share of Texas freight, whether it is linked to U.S domestic markets, international imports and exports, or state transits on key corridors. Improving rail share is critical for Texas in a variety of ways, from improved emissions per ton mile to providing congestion relief at critical highway system bottlenecks. The study reports the following suggestions to remedy current rail

[7] This represented $ 100 per Ordinary share.
[8] http://www.camsys.com/pubs/AAR_Nat_%20Rail_Cap_Study.pdf
[9] It is also worth noting that UP ran into trouble maintaining a trans-con double- driver truck competitive service for UPS and had to abandon the service after numerous freight trains were delayed while waiting in sidings for the faster train to pass.

shortcomings and so allow the rail sector to become a stronger freight mode serving the state economy.

1. Implement Positive Train Control (PTC). This does three things. All of which are crucial to maintaining rail growth in Texas. First, it replaces current controls which, though effective, are rapidly becoming obsolete which will drive up maintenance and replacement costs. PTC also permits shorter headways which benefit system capacity while not compromising safety and so provide a critical impact at important Texas bottlenecks. Finally, it may allow rail dispatchers to move trains more efficiently through major bottlenecks, like Houston. PTC, or a similar acceptable technology, has to be operational by 2015, although some railroads and their association (AAR) are pushing back, using the arguments of adverse cost-benefit ratios and high capital costs, to press for changes. Texas and regional rail freight planners should determine which UP and BNSF tracks will first implement PTR and how that impacts rail productivity and its ability to compete for a higher market share.

   Texas rail planners should then work with railroad companies to investigate how shorter blocks and faster train dispatching can increase specific bottleneck site capacity, such as at key yards and approach tracks around Houston. PTC advanced train dispatching is a less expensive solution to capacity constraints than additional tracks, which can exceed $3 million a mile to meet FRA Class 4 safety standards. PTC is expensive, as noted by the railroad companies, but there may be opportunities for state credits where it mitigates congestion, improves air quality and reduces delays at metropolitan rail-highway grade crossings.

2. Accept Higher Fuel Prices for Freight Modes. Freight planners should incorporate into their investment planning the inevitable rise in petroleum products and fuels. This will create a variety of market and social incentives to use rail or water, when appropriate, to move goods and commodities. The fuel prices, as they did on 2007, will make shippers look at truck-competitive services. The difference is that the trend will be upward and persistent, creating opportunities for intermodal service. NAFTA trade flows, in a 2005 study, were predicted to stay strongly truck-centric over the next twenty years. High fuel prices will insure that logistics staff evaluates rail service, such as double stack on key NAFTA highway corridors like I-35, and I-20 where rail service is competitive. JB Hunt has shown that demountable containers can be shipped either on rail or on a trailer chassis and it is highly likely that other companies will offer similar services. It should also be stated that fuel taxes,

which have remained unchanged since 1993 in Texas must at some stage be increased which will add to the upward movement in prices.

3. Monitor the Intermodal Container Corridors Serving Texas. The rapid rise in Asian manufacturing in the 1990s, especially in consumer goods, drove up container volumes at southern Californian terminals. These served demand in two markets, California itself and the rest of the nation, excluding the hinterlands of several Atlantic and Gulf ports. The non-Californian trade moves mostly on double stack rail and served cities on the UP and BNSF networks directly while boxes were interlined with the three eastern railroads to deliver to markets in the more populous north east centers, so providing a full trans-continental service. In 2011, boxes entering or leaving Texas come on a variety of non-California rail corridors, including ports in Mexico, the Gulf, Southern Atlantic and even Canada. Californian terminals remain critical pieces of the western railroad strategic planning but they will compete with a variety of rail corridors which will strengthen competition and lower transportation pricing. The distribution of demand across the Class 1 system corridors will benefit Texas and its shippers and should be noted and measured in future statewide transportation planning.

4. Support Public-Private Partnerships on Large Rail Investment Projects. The recent success of the proposed Tower 55 investments in Fort Worth should be the prototype for any further massive rail investment packages that result in transportation efficiency and social benefits. The rail industry cannot be expected to undertake these projects without financial support from beneficiaries. Table ES.1 summarizes key investments where rail will seek partners and it should be recognized that each project may well take over a decade before any part of it is undertaken. What Tower 55 shows, however, is that a basic plan should be put into place and updated at regular intervals and that political champions both at the federal and state levels should be kept appraised of the relevance of the work. The 2008 American Recovery and Reinvestment Act (ARRA) funds and related Federal stimulation programs targeted work that could be undertaken quickly[10], generating economic impacts that created measureable benefits like job creation[11]. While it is uncertain that similar legislation will be forthcoming in the immediate future, it is likely that the economic benefits from rail investment in improving intermodal services, with attendant social benefits, will generate or encourage some form of funding for these projects. Plans must be current and compelling, however, if they are to stand a good chance of being selected.

[10] This gave rise to the term "shovel ready" projects, including those that had completed all environmental reviews.

[11] This was subsequently expanded to include job preservation and engineering sector survival.

Table ES.1 Key Intermodal Public Private Partnership Investments

Project	Comments
Houston	Complex and expensive, needing disaggregation into key projects
Laredo-Dallas	Needs to be double-traced with new by-pass loops
Beaumont	New bridge and city by-pass, double-tracked
Tex-Mex Border	Bridges, yards and grade separations into border metro areas
Inland Ports	Critical for Houston, Dallas and possibly El Paso

5. Enable TxDOT Rail Division to Facilitate Improved Freight Planning. The recent Texas State Rail Plan is an important step in moving the importance of rail sector operations from the private domain to a public one where the social benefits of multi-modal operations are explicitly recognized and measured. The growth of urban metropolitan areas, sometimes on a grand scale involving several cities—forming so-called "Mega-regions"—demands that planners take freight issues into their transportation plans. Rail is capable of moving a wide variety of commodities efficiently while meeting stringent air quality standards. Inland ports are already forming the "hubs" of long distance freight flows and the development of cleaner, low or zero emission delivery trucks could herald an era of clean new "hub and spoke" freight delivery systems that fit the needs of growing metropolitan regions. Finally, the state rail Division should provide support for preserving the substantial gains made by Class 1 railroads in the U.S. The Economist magazine recently published a cautionary article pointing out the risks to the "most efficient freight rail system in the world" from proposals to promote high speed rail (HSR) in the U.S[12]. The post-Staggers rail network is now substantially smaller in 2011 and single, bi-directional track comprises over 90 percent of the Texas system. Rail freight trains move at highly regulated speeds within a range that rarely exceeds 70 mph. HSR, for most of the world, means speeds around 180 mph – inconceivable on the current U.S freight system. HSR, to be safe and effective, needs to operate on a defined system, with geometric characteristics which permit safe, efficient and reliable timetables[13]. Moving within metropolitan boundaries may require sharing an expanded freight right of way but sharing actual track between cities is likely to penalize freight while being unable to offer attractive speeds to passengers.

[12] "High-Speed Railroading. America's system of rail freight is the world's best. High-speed passenger trains could ruin it." http://www.economist.com/node/16636101

[13] In 2003, JR Central reported that the Shinkansen's average arrival time was within six seconds of the scheduled time. http://www.railway-technology.com/projects/shinkansen/

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Disclaimer

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. This document is disseminated under the sponsorship of the Department of Transportation, University Transportation Centers Program in the interest of information exchange. The U.S. Government assumes no liability for the contents or use thereof.

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Chapter 1. Texas Railroads: Background and Introduction

Railroads were late coming to Texas and by 1900, less than five percent of the national network (approximately 10,000 miles) - most of it in the east of the state - had been built. Although only 25 percent of the United States system was built after 1899, nearly 45 percent of the Texas network was built between that date and 1932 when the state system reached over 17,000 miles.[14] The network experienced relatively little growth in mileage during the subsequent twenty year period but loss of passenger traffic in the thirty years from 1950, a result of growing air traffic and automobile use, reduced the demand for rail service. This was compounded by rail competition from trucking which benefited from the implementation of sections of the new interstate highway network begun in 1956. Truckers who might have spent 2 hours crossing central San Antonio now could by-pass the city in 20 minutes. As a consequence of these benefits, productivity soared as companies discovered that trucks could travel up to 350 miles in a day rather than the 180 miles when trucks went through city networks. These twin factors created serious financial difficulties for numerous railroad companies and stimulated a spate of rail abandonment and mergers.

The turning point in railroad productivity and transportation relevance came in 1980 with the passage of the Staggers Act[15] which deregulated the industry. This resulted in a new era for the companies as they were now able to compete on the basis of rates as well as service. In addition, the Act also allowed the railroads more freedom in merging, as well as abandoning or selling marginal branch lines. The number of large Class 1 railroad companies serving Texas customers fell from to 3 within two decades, as did the network which shrank over 40 percent to the current size of around 10,700 miles[16]. The largest of these companies – Union Pacific – now dominates the Texas network but under the terms of their merger with Southern Pacific in 1996, both Burlington Northern Santa Fe (BNSF) and Kansas City Southern (KCS) are allowed trackage rights over those parts of the system serving customers who otherwise would face monopolistic service. The current mileage apportionment on the state network is Union Pacific Railroad Company 6,331miles, Burlington Northern Santa Fe Railway Company 4,941 miles and Kansas City Southern Railway Company 908 miles. These numbers include trackage rights – if these are excluded, the Class 1 network falls by around a third to 8,302 miles.

The current basic railroad network comprises a major north-south corridor for NAFTA traffic, three west-east corridors and major terminals in the Dallas-Fort Worth and Houston areas. Two Regional Railroads – Texas Northeastern and Texas Pacifico[17] – have 1,058 miles of track, 19 Local Railroad companies operate over 741 miles of track and 20 Switching and Terminal companies run over 1,003 miles[18]. Therefore 44 companies of varying size operate over a total state network of 10,743 miles of track which grows to 14,982 when trackage rights are included[19]. The primary Class 1 rail network is shown in Figure 1.1 which also provides an

[14] http://www.tshaonline.org/handbook/online/articles/RR/eqr1.html
[15] The Staggers Rail Act Public Law 96-448 1980
[16] Excluding trackage rights
[17] Owned by the Texas Department of Transportation
[18] The Switching and Terminal group contains critical companies like the Port Terminal Railroad Association which serves a variety of key chemical companies and the Port of Houston terminals.
[19] 2008 - see www,freightrailworks.org

estimate of traffic volumes on key segments. The state system has rather little mileage that is double tracked although most segments have sufficient right-of-way to added rail capacity if more is needed.

Figure 1.1: *Key Class I Rail Network in Texas*

1.2 Key Class 1 Rail Network in Texas

Railroads play an important role in supporting the Texas economy and complementing other modes, particularly highways. The operational costs on moving cargo by rail, excluding loading and unloading, make it competitive with trucks for certain commodities where route length exceeds 500 miles. This distance appears to have fallen since the mid-1990s. Morlok estimated the break even for containerized cargo at 600 miles[20] while Resor and Blaze[21] estimated the figure closer to 500 miles. Both researchers agree that around 70 percent of total costs are

[20] Morlok, E.K. and L.N. Spasovic "Approaches for Improving Drayage in Rail-Truck Intermodal Service", http://transportation.njit.edu/nctip/final_report/approaches_for_improving_drayage.pdf

[21] Resor, R.R. and J.R. Blaze, "Short-haul rail intermodal: Can it compete with trucks?" TRR 1873, pp 45-52, Transportation Research Board, Washington 2004.

absorbed by the dray vehicles taking goods to the rail yard and delivering them at the destination and intermodal yard cranes. Railroad companies have perfected moving large quantities of product over longer routes and this impacts Texas in two ways. First, a substantial amount of rail traffic passes across the state bound for other markets. These same corridors also originate and terminate cargo within the state and keep traffic off the highways, as shown in Box 1.1.

Box 1.1: Rail Freight Impacts in Texas

In 2008, 384 million tons of freight originated, terminated or passed through Texas by rail. It would have taken approximately 21.4 million trucks to handle this freight.

Source: AAR, 2010

In 2008[22] around 97 million tons of commodities, on 1.9 million carloads, originated in Texas. The importance of the oil sector is evident when 44 percent of the weight carried was in the form of chemicals and petroleum products. Table 1.1 gives the leading originating cargo which includes intermodal (8.5 million tons) and farm products (5 million tons). It is noteworthy that Texas is currently the leading U.S exporting state and rail plays an important role in the movement of key exported products, particularly farm and food products and intermodal cargo. In the same year a substantial quantity of cargo terminated in the state, 210 million tons - more than double the originating amount. This is unsurprising when the growth in state population and industries is recognized, both combining to drive up demand for freight transportation. The state population grew by over 45 percent between 1990 and 2010 to around 25 million and is predicted to reach 34 million by 2025[23]. Table 1.2 provides a breakdown of terminated products which shows the significance of coal which represented about one third of all the terminating weight carried by rail. Population growth spurred construction of all types – cities, houses, retail, manufacture and distribution schools and highways – which in turn increased the demand for stone, gravel, sand and concrete which was carried by rail over the longer routes.

[22] Data from www.aar.org 2010.
[23] State Demographer Data http://txsdc.utsa.edu/tpepp/2008projections/

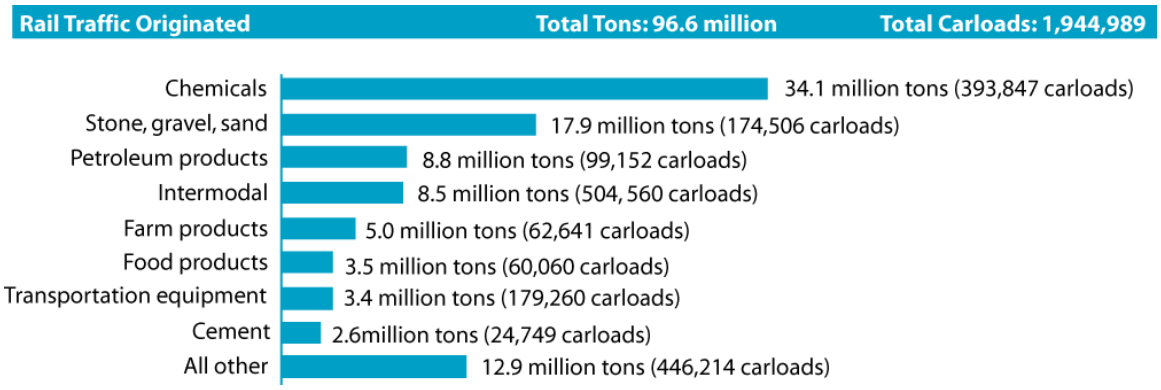

Figure 1.2: *Originating Texas Rail Commodities 2008*

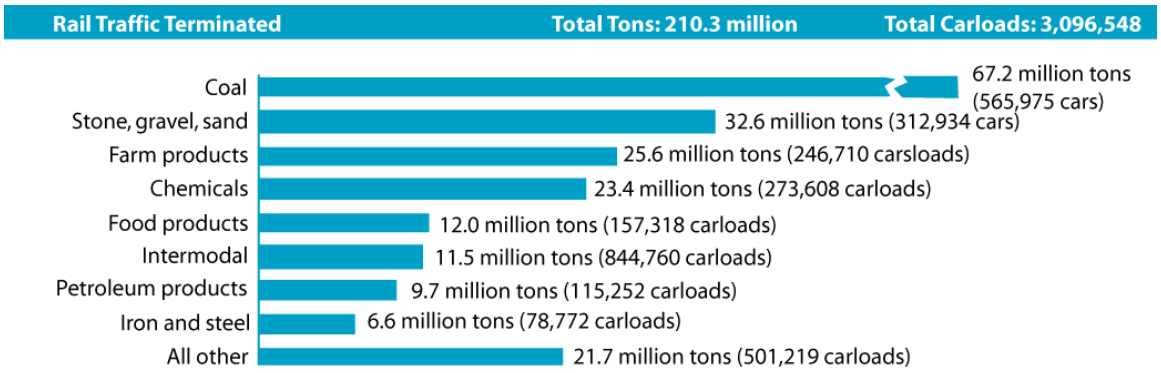

Figure 1.3: *Terminating Texas Rail Commodities 2008*

The year 2007/8 proved to be the high point of freight demand in the first decade on the new century. The period of economic growth and demand for rail transportation was relatively consistent over the period of 1995 to 2007, despite problems related to mergers and the dot.com bubble. Railroad companies were able to adjust to, and benefit from, the rapid rise in fuel prices experienced in 2007. New multi-year contracts negotiated after 2000 took into account railroad demand and fuel efficiencies which while tolerable when the economy was strong attracted scrutiny and complaint after 2007, creating several calls for re-regulation of the industry and stronger reaction from the governing authority, the Surface Transportation Board (STB). As an example, in February 2009 the STB ordered BNSF to repay $ 345 million in reparations and rate reductions to Western Fuels Association and Basin Electric Power Cooperative related to the movement of 8 million tons of coal from the Powder River Basin and their generating plant in Wyoming between 2004 and 2008[24]. This is one of several similar findings, some reversing earlier judgments favoring railroad companies.

The report covers a period of great significance for railroading in the U.S as it contains a number of mile stones which will shape the future performance of the industry. The specific subject is

[24] http://www.progressiverailroading.com/news/article.asp?id=19709

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Chapter 2. Rail Freight – 25 Years since the Staggers Act

Texas railroads benefited from the passing of the 1980 Staggers Act[34] although it took over two subsequent decades to rebuild the industry before they became financially sustainable service providers[35]. Growth in ton-miles and revenues was strongly affected by two segments – first from carrying electric utility coal and in the second decade "double stack" intermodal containers. In addition, Texas maintained healthy commodity growth in grains, finished automotive vehicle transport using tri-level special cars and – for the Gulf coast routes – the chemical trade. Table 2.1 identifies some of the performance metrics, specifically growth rates for tonnage and revenue to year 2000.

Table 2.1: Annual Growth Rates: Tonnage and Real Revenue

	1978-2000	1987-2000
Carload Tons	-0.7%	1.0%
Carload Revenue	-2.3%	-1.2%
Total Tons	1.0%	1.8%
Total Revenue	-1.4%	-0.6%

The first decade of the post-Staggers period saw railroad strategies focused on mergers with complementary or competitive companies with subsequent reductions in network size to emphasize key corridors where new investment would have the highest impact. Trucking remained competitive over shorter routes[36] and Class One companies sought to develop longer corridors, for example on intermodal lanes exceeding 750-mile in length from origin to destination. These lanes improved to allow higher track clearances (generally 20.5 feet above the rail head) enabled rail to compete successfully for the long haul general commodity market. In fact, on the transcontinental corridors between Los Angeles and Chicago, the railway share of truck competitive cargo changed from less than 30% in the nineteen seventies to about 70% by the mid-nineteen nineties[37].

The Class One companies that emerged from the 1982-2000 period of mergers were able to reduce general and administrative costs (G&A) of their component companies. Typically, each railway in such combinations had a 10% to 15% G&A cost component in their systems – a cost that could be reduced with selective combinations of companies. There were, of course, other parallel facility structural changes that could also reduce costs or be used to coordinate main line routes for more market coverage as a so-called "single line" service for customers between new combinations of origins and destinations. All company managers that spearheaded these mega-mergers saw different advantages from the combinations of company assets.

[34] Staggers Rail Act of 1980 (Public Law 96-448)
[35] Defined as covering their cost of capital.
[36] Blaze, Resor and Morlock, TRR Vol 1873, 2004.
[37] ICC merger studies by Blaze– 1992-1995

Box 2.1 gives the latest rail mergers after the passage of the Staggers Act and these four systems handle, at some point, a substantial part of US railway cargo. The balance of traffic comes to, or from, parts of the two major Canadian companies, Canadian Pacific and/or Canadian National, as well as a few large regional railways and more than 500 small short line railway companies. Kansas City Southern – KCS – though the smallest of the Class One railroads in revenue is strategically important for Texas because of its purchase of the eastern corridor of the Mexican National Railroad (FNM) in the 1990s. This carries with it the as yet unfulfilled possibility of a Mexico-Texas railroad corridor carrying both Mexican exports and Asian containerized goods landed at Mexican western ports for US destinations[38]. Texas rail service was adversely impacted during the initial post-merger period, first as a result of the BN-SF merger but, more significantly as a result of the UP merger with Southern Pacific. In the latter, a fast moving paralysis of the new network began in Houston and adversely impacted service and profitability in the state for several months.

Box 2.1: Mega-Merger Elements in 2007

1. Union Pacific – Southern Pacific, UP
2. Burlington Northern – Santa Fe, BNSF
3. Norfolk Southern – Conrail (part), NS
4. CSX – Conrail (part), CSX

Table 2.2 identifies major changes that occurred in the period 1978 to year 2000 when growth was impacted by network reductions from abandonment and operational problems following mergers.

Table 2.2: Class One Rail Metrics and Trends between 1978 and 2000

Metric	Year 1978	Year 2000	Absolute Change From 1978	% from Year 1978
Average Haul in Miles	617	843	226	137 %
Miles of Road Operated	191,698	120,597	(71,101)	63 %
Total Tons Originated (Billion)	1.387	1.738	0.35	125 %
Million of All Carload Types Originated[39]	22.4	27.8	5.37	124 %

[38] See "Emerging Trade Corridors and Texas Transportation Planning," TxDOT Technical Report 0-5973-2, 2010, for more detail on Texas impacts.

[39] Both U.S. and Canadian railroads reported increases in carload freight for the year 2003 as of Dec 27, 2003. Total combined carload volume for 15 reporting U.S. and Canadian railroads was 20,207,480 cars, up 0.3 percent from last year.

Two market segments, in addition to coal, that helped grow additional traffic volumes nationally, though not necessarily in Texas, were ethanol and intermodal. The development of ethanol fuel as a new energy source resulted in higher grain movements and distilled products although this had a limited impact in Texas.

The second was the double-digit year upon year growth in double stacked international and domestic container traffic. The intermodal business has now increased to the 25% to 30% range in some market segment revenues – a big jump from the two decades old metric of 10% to 12% market share. This had a significant impact on the Texas transportation system since substantial volumes of containerized freight (imports and exports) move both across the state and also to major state markets where it is handled at large dedicated terminals, some within Inland Port load centers, like BNSF Alliance at Fort Worth.

The previous two decades of post-Staggers initiatives and investment strategies resulted in most big railway companies earning the cost that they incur to borrow investment capital - roughly about 11% by 2006. This is strategically important because shareholders are more likely to support an investment strategy whose benefits exceed the borrowing costs. Table 2.3 illustrates how earning the cost of capital has improved in recent years for the US rail industry and shows the net railway financial performance in terms of a revenue adequacy test.

Table 2.3: Revenue Adequacy Test

Income per Year			
Year	**Revenue in Billions**	**Adequacy Target**	**Percentage**
2003	$4.078	$4.210	97%
2004	$4.147	$4.295	67%
2005	$6.075	$6.278	97%

Railway companies use a higher level of operating profit in three ways, first it supports a complex program of routine maintenance, second it provides revenue (dividends) for the company shareholders and third resources are available to enhance rail system capacity. In theory, all this is good news for a private company yet there has been strong push-back from key customers (particularly electric utilities) following contract re-negotiations in 2006-2008. This has given rise to threats being made to reregulate the industry in some form, which is being strongly opposed by the AAR and individual rail companies.

Two strategic questions to be considered by shippers, railway managers, and state transportation planners are what constitutes efficient maintenance funding and what level of incremental investment is needed to meet future traffic levels? The first is a simpler calculation since the rail infrastructure condition is known and volumes of axle loads can be calculated from traffic records. Estimated future demand is highly dependent on the assumptions adopted – should they be modest (conservative) or might higher levels of traffic be diverted from highways, for example because of fuel costs, as desired by many state planners? A recent conservative traffic and investment need study, commissioned by the Association of American Railroads (AAR),

estimates that maintenance and bottleneck investments to 2035 would require $135 billion (in 2007 US dollars) to meet what the industry sees as its future customer demand[40]. This study examined the long-term capacity expansion needs of the continental U.S. freight railroads and focused on the 52,340 miles of primary rail freight corridors expected to absorb the bulk of the forecast traffic and therefore the funding to expand capacity. This estimate does not include the annual $7 billion to $9 billion a year that Class 1 railroad companies currently spend on routine track maintenance to remain in a steady state[41]. Improvements to increase either train speed or volumes per 24-hours would be an added capital cost.

On a system-wide basis, BNSF spends 63% of its annual $2.85 billion capital budget (about $1.8 billion) to keep the railway's infrastructure strong by refreshing track, signal systems, structures, freight cars, and upgrading technologies. Figure 2.1 identifies how BNSF internally views the difference between maintenance capital and expansion capital over the past 4 years with a forecast for year 2008. The critical assumption is that traffic will grow largely based upon the recent trends since 2001. That was probably a logical premise at the time but in early 2007 a fundamental change occurred in energy prices. Rail diesel fuel purchased for less than $1.80 per gallon in late 2006 rose beyond $2.80 during 2007. Equally importantly, truckers that purchased diesel fuel at $ 2.25 per gallon were subsequently facing prices in the $4.00 to $4.50 range.

Maintenance itself has changed as densities on key routes have emerged. A recent study[42] indicates that most of the variation in unit maintenance costs among Class I railroads can largely be explained by variation in the degree to which they emphasize renewal and deemphasize ordinary maintenance in their engineering strategies. Renewal maintenance strategies – defined as concentrated, planned, large mechanized track gangs working on track sections with a limited time window – were found to be cost-effective. The study states "Their work is better planned and executed due to engineering management systems and can be programmed in advance so that traffic patterns can be adjusted to provide long track possession windows that maximize resource productivity."

The authors also believe that as train densities increase, track possessions for maintenance may become limited in duration and frequency because track gangs must compete with trains for track time. Capacity expansion may thus have a secondary effect of decreasing unit maintenance cost. This interesting study shows that the line between the separation between maintenance and capital investment may not be as distinct as it was in earlier years.

[40] Cambridge Systematics, National Rail Freight Infrastructure Capacity and Investment Study Report, September 2007

[41] As an example, a railroad might average about $29,000 to $35,000 per track mile annually to maintain FRA Class 4 level speeds.

[42] "Cost Effectiveness of Railway Infrastructure Renewal Maintenance" by G.A Grimes and C.P.L. Barkan Journal of Transportation Engineering, ASCE Vol. 132, No. 8, August 1, 2006.

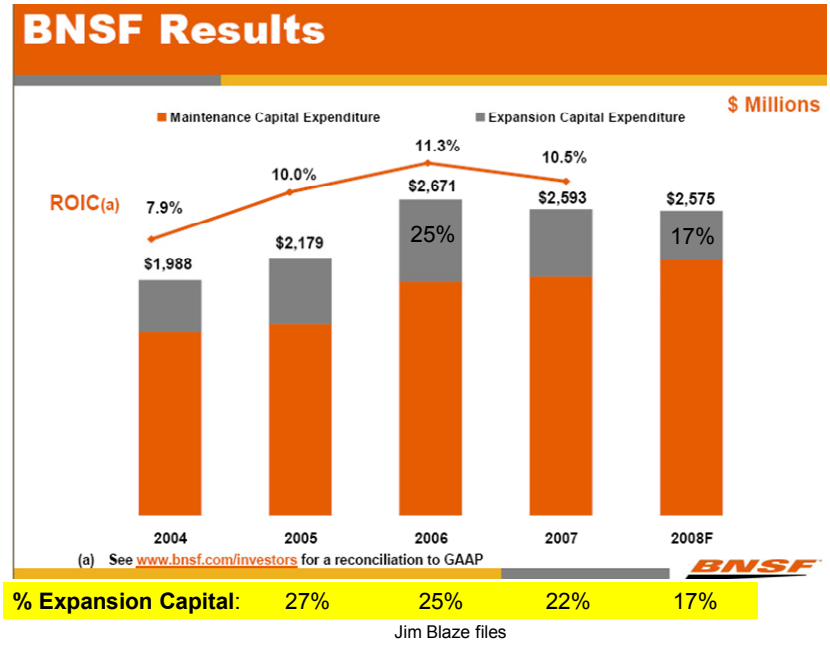

Figure 2.1: *BNSF Capital Expansion 2004-2008*[43]

The railway industry in the period 2000-2007 could be viewed as basing its business model on a paradigm focused on relative fuel costs between rail and truck operations. However, this was not fixed and became more difficult to estimate. Rail fuel costs that in 2007/8 were 10% or less of annual direct operating costs were around 20% in 2008. For truckers, the percent change range was even greater. The models used by shippers to determine freight modal choices were misaligned during periods of high diesel prices and required price and mode changes to supply chains to bring the system towards equilibrium. More demand for rail services by shippers resulted in congestion at the many bottlenecks reported in the 2007 Cambridge Systematics work. At times, some trucking and rail operations required a fuel subsidy to keep costs near break-even, and as rail companies had signed a number of multi-year contracts, net revenue declined. Subsequently, fuel prices fell but energy in its various forms – coal, oil and chemicals – seems to be the key for both business (demand) and operating costs when estimating the future role of rail in the US transportation system.

The US DOT focused on the target year 2035, mindful perhaps of the time period required for typical rail investment and equipment replacement. TxDOT, like other state DOTs, has a 20-year planning cycle and has projects on the books for longer periods so it is safe to regard transportation modes – especially planes, ships and barges – as systems that exhibit long life cycles and therefore long investment periods. The official US DOT forecasts (based on 2005 energy costs) report that railway traffic will grow by around 90%, essentially doubling current demand. This figure only requires an annualized growth rate of less than 3 percent over that period which is a conservative estimate for future rail services given the inability of state DOTs to finance highway capacity improvements. If the rail industry continues to assume that it has only the year 2006 energy advantage, it is probably underestimating its true potential growth.

[43] BNSF PowerPoint, 2009.

A sustainable energy advantage such as described above should mean that railway freight traffic growth should be almost double the annual rate of GDP growth. If that hypothesis is true, it would be a two decade plus growth rate without precedent in US freight railway modern history, even including the years of World War. Put another way, a sustained multiple decade average growth rate for railway freight traffic of 5% or more for all traffic would mean that the railways actually have a chance to regain market share against trucks as a whole. Even though truckers will still be the dominant freight mode come the year 2035, it is realistic (or desirable) to ignore the possibility of a positive overall market share gain in the current projections of railways and DOTs?

Table 2.4[44] shows railway traffic to 2035 based on a small annual increase in intermodal traffic growth (5% normalized average) with a higher growth rate for non-intermodal carload traffic to within the 5% to 6% range – and a consistent range of about 2% a year for coal traffic. Hidden in the unit train and carload traffic are some of the new commodities like ethanol. Assuming four periodic slowdowns in the economy like in year 2008, the US ends with a 135% plus growth in overall railway traffic on a tonnage originated basis. Under this hypothesis, intermodal is the fastest growth market for railways and the carload business next in the period – and become the largest single segment of railway business overtaking coal by the year 2035. This raises several key policy questions for rail and state transportation planners alike.

[44] Based on a series of unpublished ZETA-TECH market forecasts undertaken for private clients in the period 2004 to 2007.

Table 2.4: Significant Energy Driven Potential Rail Traffic Growth

Significant ENERGY DRIVEN Potential Rail Traffic Growth

With High Carload Growth	PTC Project Appendix Material			Tons Originated (000)
Year	**Carload - Mixed**	**Unit Train - ALL**	**Intermodal & Autos**	**All Total Tonnage**
2000	783,000	1,027,000	199,000	2,009,000
2002	744,339	1,062,175	181,448	1,987,962
2004	760,052	1,088,895	201,533	2,050,480
2006	837,958	1,116,288	217,768	2,172,014
2008	879,856	1,130,353	227,568	2,237,776
2010	970,041	1,176,019	250,894	2,396,954
2012	1,069,470	1,223,530	277,927	2,570,928
2014	1,069,470	1,248,001	288,906	2,606,376
2016	1,179,091	1,298,420	318,518	2,796,029
2018	1,299,947	1,350,876	351,167	3,001,990
2020	1,433,192	1,405,452	387,161	3,225,805
2022	1,504,852	1,433,561	398,389	3,336,801
2024	1,580,094	1,535,344	439,224	3,554,661
2026	1,742,054	1,597,371	484,244	3,823,669
2028	1,920,615	1,661,905	533,879	4,116,399
2030	2,117,477	1,729,046	588,602	4,435,125
2032	2,223,351	1,763,627	618,032	4,605,010
2034	2,334,519	1,798,900	681,380	4,814,799
Change 2005 to 35	1,653,190	732,371	506,056	2,891,618
Total Growth as %	207.2%	66.4%	241.7%	137.0%

If the hypothesis of energy shifted railway growth is supported, the current planning around the AASHTO and AAR plan would have to be revised upwards. US rail tonnage would require significantly more than the anticipated $135 billion in year 2007 dollars and about $60 to $70 million would be needed to bridge the shortfall.

Planning for increases over an annualized rate of 2-3 percent could focus on making more of the basic network. While it may be accurate that in 2010 the focus should remain on key bottlenecks – see Box 2.2 – much of the network can be enhanced in a variety of cost-effective ways.

In fact, as argued in a previous TxDOT report,[45] in Texas current railway congestion can be mitigated with incremental and targeted smaller

Box 2.2: Capacity on Rail Corridors

A BNSF executive recently stated that 88% of freight rail corridors are operating below capacity, 12% are near capacity and only 1% is above capacity.

Roger Nober, BNSF

[45] TxDOT 0-5068-2 "Planning for Container Growth along the Houston Ship Channel and other Texas Seaports" R. Harrison, Jim Blaze *et al*, February 2007

projects of about 1 mile to 5 miles in length – perhaps longer (16 miles) like the case for the Cajon Pass project in California. However, without regard for the energy differential or any modal split gains made possible by railway technology advancements, Matt Rose of BNSF executive predicts for a year 2035 scenario a "business as usual" scenario would result in almost one third of the network operating above capacity – clearly untenable as a major service provider. Therefore, with a conservative growth forecast, it is clear that added track and train movement capacity will remain an issue to be resolved.

How would railways possibly add tons and ton-mile capacity with only modest capital investments? Examples based on incremental changes benefiting US rail productivity suggested by staff in 2008 at the U.S Transportation Technology Center Incorporated (TTCI)[46] include:

1. Adding 2 loaded wagons per average coal train is the equivalent of 225 trains a year in train capacity.

2. Adding 10 more containers per intermodal train reduces train moves by 1,900 trains a year.

3. Upgrading a thousand miles of track to heavier (35 tonne) axle capacity reduces investment in freight cars and makes more track capacity available since each passing train carries more net cargo.

4. Equipping trains with electronically controlled brakes adds capacity by decreasing the braking distances between trains or between signal blocks.

5. Substituting Positive Train Control (PTC) to supplement existing analog signal systems can increase capacity by using shorter moving smart intelligence blocks between trains.

These signals are expensive to maintain and represent a technology invented about 80 years ago. They are not the future – certainly not if rail demand grows as strongly as it did during 1995 and 2005. However, their mere un-depreciated existence on the rail company balance sheet makes decisions on evolving towards PTC more difficult for private companies.

Further incremental changes suggest enhanced capacity or efficiency on the existing rail network. These include:

a. Using technology to detect car defects like poor axle bearing conditions can also increase capacity by reducing "train failures in route" – as a cause of unexpected train delays.

b. Fuel Conservation practices can add further energy efficiency gains for the railways. A locomotive operating in throttle position 8 burns 210 gallons per hour[47] while in

[46] International Railway Journal, D.J. Semih Kalay, Sept 2008

throttle position 5, the same locomotive would burn only 110 gallons per hour. The practice — which was reviewed to ensure it has a minimal affect on overall network velocity, allows trains on minimal or descending grades to accelerate or maintain speed without burning additional fuel. During tests in 2008, BNSF officials determined the practice cut fuel usage up to 8% on some trains. The railroad consumes about 1.5 billion gallons of diesel annually which makes this figure a large contributor to overall profit and beneficial in terms of environmental impacts.

c. Employing Hot and Cold Wheel Detector System to reduce train accidents. BNSF had 38 hot/cold wheel detection systems in 2008 to help identify defective brake system conditions. The device measures the individual passing wheel temperatures and searches for defects using a centralized hot and cold wheel alarming system.

Projects like the giant Cajon Pass California third main line project are so commercially critical that the railroads self-fund them although they are few in number. BNSF spent more than $90 million to triple-track 16 miles of main line on the Cajon Pass, part of BNSF's Chicago-Los Angeles trans-continental route. The work took place between Keenbrook (near Devore), California, and a point just beyond Summit, high on Cajon Pass in the mountains that separate metropolitan Southern California from the deserts to the east. The goal was simple—to expand capacity on the only BNSF route connecting Southern California with the rest of the network. When this project was completed, BNSF had increased the sustainable capacity of the line to 150 trains per day, which eliminated the bottleneck of trains waiting to traverse Cajon Pass. One of the most difficult parts of a project like Cajon Pass is the process to obtain permits. In this case, a process involving more than 400 permits that would normally take 6 or more years was reduced by cooperative planning to just 29 months. One way to help similar future projects is for federal and state governments to help streamline the procedures.

This chapter briefly described the major changes and key characteristics of the U.S railroad industry after the passage of the Staggers Act. It moved from near bankruptcy to economic health and national transportation relevance, most clearly seen in the purchase by Berkshire Hathaway of BNSF approved by shareholders in February 2010. U.S railroads are arguably the most profitable of all modes and are now in a position to expand business and make a more profound contribution to US growth – well beyond the modest rates used in recent rail demand forecasts. Intermodal is a key market segment because it allows rail to compete with trucks and serve the mega-metropolitan regions predicted to emerge as a result of population growth and this is the subject of the next chapter.

[47] Director of Operating Practices Bob Repola in an item on the "BNSF News" Website, August 2008

Chapter 3. Class One Rail Intermodal Service

3.1 Background

The Industrial Revolution, from the early 1800s onwards, was sustained by new transportation modes, systems and markets. Freight – raw materials and products – moved on multiple modes, each chosen because it had the lowest per ton-mile cost and the specific order of modes (now termed "chain") for a particular product chain was dictated, as it is today, largely by the cost of the transfer between the modes. In the early 1900s, railways experimented with providing storage containers to key customers which could be more efficiently loaded on freight trains[48]at transfer sites. Maritime shipping, however, was unable to capitalize on this method and break-bulk cargoes were loaded on ships using a substantial amount of labor, often with cargo damage and pilfering which raised average transportation costs, measured by labor and time. Therefore, efficiencies were limited to rail networks[49] and had no impact on international maritime trade.

In the 1930s, a service offered by Seatrain of New Jersey experiments moving fully-loaded rail cars into specially-designed, four-deck ships, each fitted with several standard gauge rail tracks. Cars were raised in a cradle, placed on the rails, moved down to the previous car and then tethered for the sea journey. Though more costly and complex than using boxes, the principle was the same as that perfected by Malcom McLean in the 1950s, perhaps because he had seen Seatrain operations firsthand. McLean is regarded as the "father" of the modern intermodal system and his interest in direct loading of cargo already packed into a box began when he observed dock operations handling cargo his trucking firm had taken to the Port of New Jersey in the late 1930s. The idea took many years to develop first because of the Second World War, and then because of the economic growth in the following decade when he took the opportunity to grow his conventional trucking company rather than on innovative systems. Added constraints included a plethora of freight transportation regulations[50], investment needs and technical challenges.

McLean was initially unsure of the preferred intermodal land-sea system and at first wanted to retain the integrity[51]of his semi-trailers and use a roll-on, roll-off marine vessel. He first acquired a small steamship company (Pan-Atlantic Steamship Corporation) so that he could control both the land and sea elements, whether it was for roll-on, roll-off or another system types. In 1955, he learned that demountable stacked trailer bodies[52] were being used on a barge route to Alaska and decided, after further study, that this system was most efficient for his operations. He ordered 200, 33-foot containers from Brown Trailers, and made further orders from what is now the Fruehaf Trailer Corporation. A war surplus vessel was modified to carry 58 of these containers[53] on its upper deck and in April 1956, the Ideal X made what is regarded as the first trip of the modern intermodal age, from New Jersey to Houston. The period of the next 5 years was one of great experimentation comprising container design, the development of a spreader bar

[48] See http://en.wikipedia.org/wiki/Intermodal_freight_transport

[49] This lasted for many decades, New York Central, for example, offered Flexi-van service in the 1950-60 period, comprising a large truck aluminum demountable body (then 33 feet) which could be easily slid to and from the semi-trailer chassis via a railcar mounted turntable moved by a single person.

[50] The most important being those controlled by the Interstate Commerce Committee (ICC) which was central to US transportation regulations until the passage of the Staggers Act.

[51] Typically, truck semi-trailers were non-demountable – body and chassis were one.

[52] Brown Trailer built the order for Ocean Van Lines and each container measured 30' long, 8' wide and 8.5' tall.

[53] Approximately 96 TEU

to lift the containers, deck design and the development of ships specifically designed to stack containers below decks. The first steamship company solely focused on containers – Sea-Land – was formed by McLean who also decided not to patent any of his technical innovations, so making it ultimately possible to have a common standard, set by the International Organization for Standardization (ISO)[54] with dimensions set at lengths of 10, 20, 30 and 40 ft – all at 8.5 feet in height and 8 feet in width. The 20-foot length was eventually chosen to allow the industry to convert the variety of containers into one standard measure, and this is still in use today. Although Sea-Land no longer exists (it was bought first by CSX, then by Maersk in 1999) the legacy is both profound and long-lasting. The development of the global economy would have been substantially slower without the contributions of McLean and associated innovations on other modes.

3.2 Rail Intermodal

One of these was developed on the U.S rail system. The containerships of the 1960s were relatively small (1500 TEU) vessels, and adequate for box volumes, channel depths and modest port volumes. In the early 1970s, however, first volumes and then ship size began to grow and world TEU volumes reached around 40 million by 1975. Many imported products arriving in containers at U.S ports needed to be shipped by rail and exporters also wanted to use this mode on certain routes. Highway trailers were already being moved on rail intermodal service, with a semi-trailer sitting in a well car, anchored at the wheels and sitting on a moveable fifth-wheel, creating the so-called “piggy back” service. Although boxes could be carried in the same way, the crucial breakthrough came when designers figured out that a well car design, articulated into 3 and 5 car sets to give stability and good ride characteristics could, given adequate bridge and tunnel clearances, and carry two boxes – one stacked over the other.

Southern Pacific Railroad, working with McLean, developed the first double stack intermodal car in 1977 which provided the impetus for railroad companies to develop intermodal double stack service as a major business segment. TEU volumes grew relatively slowly until the mid-1980s when SP again worked on a transcontinental service using boxes carried by America President Lines (APL). In 1984, the first double stack unit train left los Angeles for New Jersey, marketed under the name of "Stacktrain", and linking with Conrail to provide the full west-east service. Figure 3.1 shows an APL Stacktrain and intermodal service grew once service was fully implemented, changing railroad business models over the subsequent two decades. It should be remembered that rail intermodal in the early years was dominated by the trailer “piggy back” system but the economic advantages of container double stack operations became so overwhelming that it only needed a surge in container demand to render piggy back hauling to a secondary role. That came not from domestic demand but from Asia – in particular China – in the late 1990s.

The double stack container system changed railway intermodal trailer service from one with around a 10% variable cost profit margin to one with a 35% or better profit margin business segment. In fact, Conrail internal records from the period 1990 to 1992 showed a 140% to 145% long term variable profit margin when a 130% margin was then set as "full cost" recovery[55].

[54] http://www.iso.org/iso/home.html
[55] Personal records, Jim Blaze

Figure 3.1: *1984 APL Stacktrain Double Stack Five Car Set*

A selection of the key changes that combined to make double stack a success during the period 1985 to 2000 were:

1. The simplicity of the original car design,

2. Design modifications (especially tare weight) to raise efficiency,

3. New track with heavier axle loadings raised productivity and container size, and

4. Concentrating resources to raise vertical tunnel and bridge clearances on key Class 1 corridors[56].

3.3 Rail Intermodal – 2000 to 2010

The rail intermodal sector grew strongly in this period, driven by several key factors that have reinvigorated the industry to the point where it is seen by many transportation planners as having a role in reducing future truck volumes on key truck corridors. The factors contributing to this change, not listed in order of importance, are as follows.

1. Asian trade moving through west coast ports provided the economies of scale needed by rail companies to enhance route capacity and service. Around half of the landed box volumes at these ports left the state for mid-west or eastern destinations on rail. Substantial volumes for these ports were derived from linear forecasts of historic growth, including an FHWA forecast of over 70 million TEU passing through southern Californian terminals by 2025. This turned out to be a "false positive" following 2004 labor disputes in the terminals which encourage shippers to develop alternative corridors to move Asian traffic.

2. U.S Third Party logistics companies began to find ways to fill the intermodal trailers and containers – meaning the market began to grow with domestic traffic and not just

[56] Notably Santa Fe, Conrail and Union Pacific- Chicago Northwestern – one example was the Public-Private-Partnership (PPP) between New York State and Conrail to facilitate a true transcontinental route.

ocean traffic. This strengthened when weakness in the U.S dollar boosted containerized exports.

3. Large truckers[57] recognized rail intermodal as a way to reduce their over the highway trucking costs – including driver shortages – by shifting to the advantages of the stacked containers. In some cases this meant taking a business gamble to re-engineer their fleets from long distance rigs and tractors to an urban and regional highway network feeding off of a few strategic long haul rail corridors and load centers. This was a gutsy investment move – without any role being played by federal or state planners.

4. This shift by key truckers had a regional impact on the need for more urban intermodal rail terminals – with some of those terminals appearing in suburban locations as large traffic generators that highway oriented planners never expected. A small number of strategically located large urban terminals fed a range of logistic and value added services at centers that became known as "Inland Ports."[58] These load centers could form critical load centers handling long distance and international freight at the largest urban areas in the U.S.[59]

5. The domestic impact from the overwhelming economic advantages of the double stack technology also caught the traditional railway managers by surprise as growth rates year-to-year for rail intermodal now generally surpassed GDP growth – a noticeable statistical trend for the railroad industry which viewed itself as a "mature" sector whose demand was driven largely by GDP growth. In addition, the conventional railway market view was that the semi-trailer would remain as the favorite of domestic US shippers. After all, went the reasoning, the container was a mode used by international shippers and it probably had a poor future in domestic trade lanes.[60]

6. Table 3.1 shows what actually transpired between 2001 and 2006 in terms of the annual changes in container and trailer moves. The shift from trailers to containers is shown by the relative drop of trailers to less than 40% of the total intermodal market in five years. Moreover, that trend has continued in the intervening period to 2010. Indeed, on some Canadian routes with limits on trains per day, trailers on flat cars are no longer offered because the stacked container trains are simply so much more efficient. But will trailer of flat car service languish for the next 28 years of this

[57] J.B Hunt and Santa Fe offered a premium service for customers using intermodal technology in the late 1990s marketed as the Quantum rail-truck joint service agreement which showed others that it was both feasible and profitable.

[58] The largest exceed 1 million TEU and are co-located with Fortune 500 companies near major metropolitan areas.

[59] These are termed "Mega-regions" by regional planners and around 12 have been identified to date, often combinations of current metropolitan cities such as Dallas - Fort Worth – Austin – San Antonio on the IH-35 corridor.

[60] The AAR persisted for a number of years with a system called the "Iron Highway" which moved complete vehicles - tractor and trailer - over truck competitive lanes on motorized rail cars. Tested in Canada, it was never implemented in the U.S although complete trucks are moved on rail sections within the EU and through Switzerland although it should be recognized that truck costs and toll fees are significantly higher than in the U.S.

report's time horizon? It is difficult to answer since trailers on flat cars are once again returning to the rails during the years 2007/8 as a growth item in the light of diesel fuel prices for truckers.

Table 3.1: Rail Intermodal Shares: Domestic Containers versus Trailers

Container versus Trailers as Railway Intermodal Units

	Containers	% Change	Trailers	% Change
2001	8955		2603	
2002	9312	4.0%	2531	-2.8%
2003	9957	6.9%	2626	3.8%
2004	10994	10.4%	2928	11.5%
2005	11693	6.4%	2380	-18.7%
2006	12282	5.0%	2883	21.1%

AAR Fact Book, 2010

7. The twenty-foot (TEU) container has been replaced rapidly by the international 40-foot long and the domestic 53-foot containers. The higher cubic capacity offered by the now emerging North American standard domestic containers is such an economic advantage that both railways and the third party private intermodal train operators offer much better pricing for shippers who use a longer box. It makes loading the trains less expensive, since any box has a fixed loading and unloading price to bear[61]. In addition to size, many different container types have been introduced to capture a variety of market segments, including "plug in" refrigerated, heavily insulated "cool," extra-high ISO width containers, even experimenting with domestic 53' boxes on some maritime routes.[62]

8. Premium rail intermodal service reliability has improved significantly, for example those run for United Parcel Service (UPS) typically arrive at the destination point with reliabilities in the range of 97 % or greater on strategic long routes. In contrast, the average general merchandise trains typically have an on-time rating in the 80% to 90% range. So intermodal is therefore a more dependable service for those rail customers that have tight supply chain delivery times.

9. The intermodal versus highway trucking break-even "modal shift" distance has fallen based upon these efficiencies and the higher costs of trucking, most evident during the 2007/8 era of high fuel prices. The estimated break-even distances show how intermodal competitiveness has grown over the past few decades.

[61] Stated another way, why would a shipper pay virtually the same to move a 20 or 20 ft container when the same price moves a 53-foot long high cube container?

[62] . In 2007 AAPL introduce one service with these boxes which required the cellular ships of the route to be "re-racked" to accommodate the additional 6 inches in width.

a. 900 miles in the 1970's,[63]
b. 700 miles in the 1980's,[64]
c. 550 miles in the 1990's,[65] and
d. 450 miles in the current period.[66]

These distances are driven by the intermodal cost trade-offs which, in its most basic form, shows the essential costs of the different modal combinations. The truck movement has fixed driver, fuel and other mileage related vehicle costs to bear. As diesel fuel prices and driver shortage issues increase, the variable costs make some parts of the railway intermodal model more competitive, adjusted for both time and service characteristics[67]. The railway intermodal cost model has to process the costs of a dray pick-up and intermodal lift-on terminal price, together with an intermodal lift-off terminal charge and final delivery costs. The actual rail operational cost is also incurred, although generally at a favorable cost per mile basis, even after paying the railway for locomotives, wagons, crews, fuel, and track use.[68]

10. The resulting profitability and traffic increases of the past decade caught the attention of Wall Street investors and transportation planners from Washington to State DOTs and MPO's. But, even with this growth picture, the recent strategic wisdom has been that trucker market share in critical corridors like I-10 will never realistically see much relief from the railway competition. Double stack technology, even with the advantage of heavier axle loadings and the new savings from "scheduled railroading", has not been sufficient to convince planners that railway relief for highway corridors can be achieved. Claims of a million trucks shifted in the Crescent Corridor[69] sound huge – but are actually relatively small when compared to the trucking base that already exists in this 1,400 mile long corridor.

This conservative conclusion could change with higher energy prices and growing congestion on highway networks starved of capacity enhancements because of falling fuel revenues and higher construction costs.[70] The thesis is that the higher energy costs, combined with a highly efficient railway operation will narrow the intermodal and highway trucking break-even point and raise rail intermodal share.

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[63] Conrail data – J. R. Blaze

[64] Morlok, Edward K., and Sammon, John P. "Summary of research results in University of Pennsylvania study on reducing intermodal drayage costs and improving service quality on Conrail". (Working Paper IMSP WP90-1.1, 5 pages) 1990.

[65] R.R. Resor and J.R. Blaze "Short Haul Rail Intermodal – Can it compete with Trucks?" Transportation Research Record 1873, National Academy of Sciences, 2004.

[66] Estimated for Texas corridors by the authors.

[67] Over a shorter distance rail intermodal takes longer and (typically) has a lower on-time service rate when compared with over –the-highway service.

[68] Social costs are not counted in the basic model which is unfortunate since loads taken by rail rather than highway extend highway pavement life and reduce air pollution and noise.

[69] The line, proposed by Norfolk Southern in 2007 is a major intermodal corridor running between Louisiana and New Jersey. http://en.wikipedia.org/wiki/Norfolk_Southern_Crescent_Corridor

[70] Many state DOTs barely have sufficient revenue for maintenance, let alone new highway lane miles.

A significant vote of confidence in both the future of the railroad industry in general, and intermodal in particular, came on November 3, 2009, when Berkshire Hathaway, already a major stockholder announced that it would acquire the remaining 77% of BNSF that it did not already own for $100 per share in cash and stock - a deal valued at $44 billion. The company is investing an estimated $34 billion in BNSF and acquiring $10 billion in debt and takes the company off the New York Stock Exchange.[71] This move, by one of the shrewdest and most successful investors in recent history, allows BNSF managers to pursue strategies away from the spotlight of Wall Street quarterly reports and fund manager questions. This act, probably more than any single event since 2000, signifies the current success of the Class One rail model and the likelihood of future growth and an enhanced role for rail in the U.S transportation system, notwithstanding the severe global recession that negatively impacted all other transportation modes.

3.4 The 2008 – 2020 Economic Recession

Global markets received a double setback in the years 2006 to late 2009. The first came with the rapid increase in oil prices and with it the fuel for all transportation modes. The second and more serious impact came with collapse of several key banks, which drove down global consumption and raised prices of those financial services essential to global trading, including letters of credit and similar instruments. These economic difficulties in the consumer and service markets caused global trade to fall, first with containers and autos, followed by raw materials. A more complete description[72] details many complex, but inter-related, elements that triggered and then fueled the collapse, while actions by the U.S government to stimulate the economy ranged from a bail out of several major banks, the full takeover of General Motors and the passing into law of the $ 850 billion American Recovery and Reinvestment Act (ARRA)[73]. The percentage fall in volume was substantial as shown in Figure 3.1, although it is noted that the strong rebound predicted for late 2009 by IHS Global Insight turned out to be more muted.

[71] http://myprogressiverailroading.com/blogs/jstagl/archive/2009/11/04/the-buzz-on-buffet-s-bnsf-buyout.aspx
[72] http://en.wikipedia.org/wiki/Financial_crisis_of_2007%E2%80%932010
[73] For a U.S government insiders account, see http://www.brookings.edu/economics/bpea/~/media/Files/Programs/ES/BPEA/2009_spring_bpea_papers/2009_spring_bpea_swagel.pdf

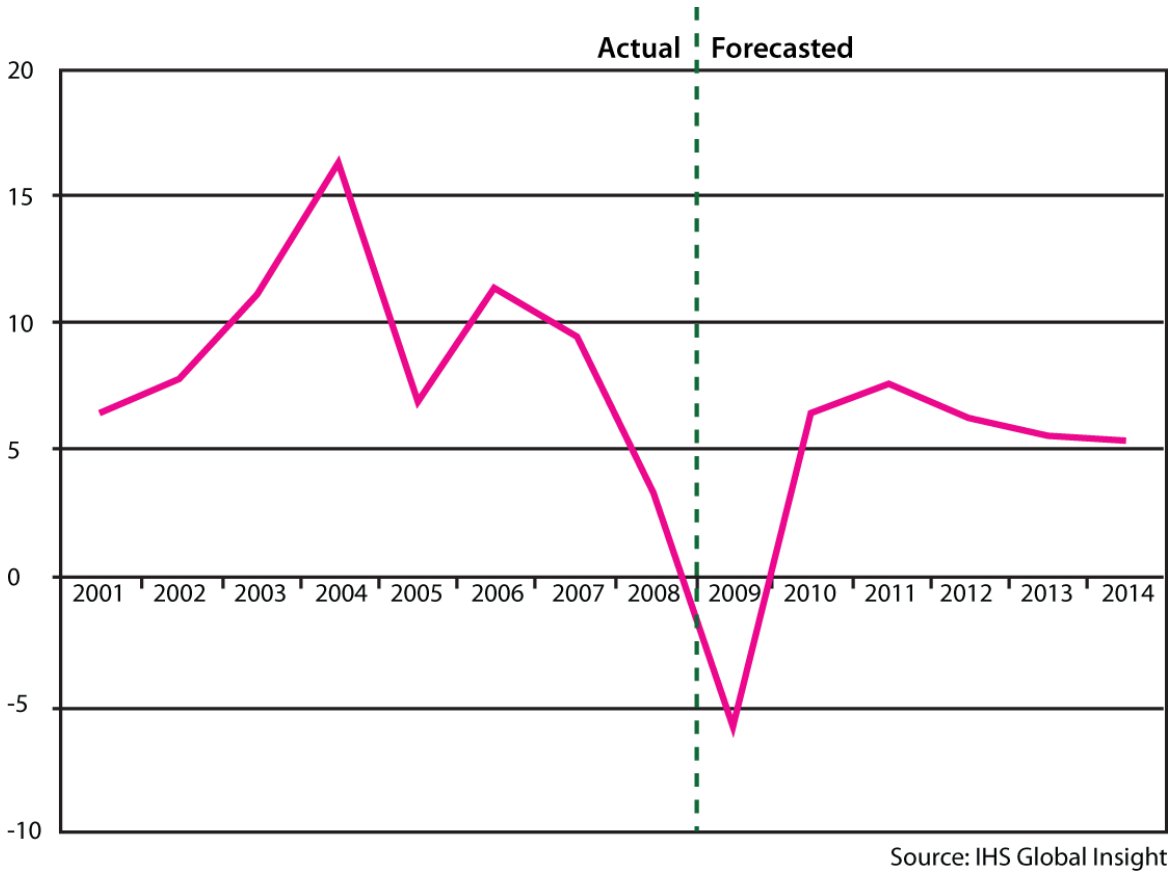


Figure 3.2: *Actual Global Trade 2001–2008 and Forecasted Trade 2009–2014*

An unanswered question at the time of writing is how long the current recession will last and whether the recovery will be "V" shaped as predicted by IHS Global above, or "U/W" shaped as suggested by Professor Nouriel Roubini, who gained notoriety for predicting the scale of the 2007 global financial troubles. Roubini, of the Stern School of Business at NYU, stated[74] that the basic scenario is one of a U-shaped economic recovery where growth is going to be below trend for the advanced economies with a small, but rising, probability that if they do not get the exit strategy right, the global economy could end up with a relapse and a double-dip recession. In any event it is likely that trade volumes, particularly in the Western Hemisphere, will face a modest recovery and that shippers will have a variety of competing routes and corridors (and very competitive transportation providers) over which to send their business. Southern Californian ports, having enjoyed quasi-monopolistic powers over Asian freight for around a decade, are now encountering diversion to other corridors and were reported in a recent Journal of Commerce article to be looking for more cooperation from railroads on marketing and pricing to win back customers.

The fall in what had been strong merchandise trade growth brought with it a reprieve that, under different circumstances, would be enviable. In early 2009 the United States enjoyed congestion free ports, unclogged rail lines, copious availability of transport worker labor, and modest energy

[74] Roubini is extensively quoted, see, for example, http://www.bloggingstocks.com/2008/10/18/nyus-dr-doom-nouriel-roubini-says-u-s-recession-could-las/

prices. For the logistics community, amidst the gloom of cargo and short term revenue forecasts, has come a realization that this slowdown could be seen as a second chance to rethink trade corridor development and re-emerge with a more balanced, sustainable system of supply chains. Under the earlier paradigm, trade was expected to shift to alternative corridors because of absolute capacity constraints that would leave shippers with no choice. Alternative corridors were thus seen as a last minute bypass to prevent the overburdened veins of trade from bursting. Under the new paradigm, shippers can more fully weigh the current and future attributes of trade corridors to determine which options best suit their long term interests in terms of time in transit, reliability, service level, and connections with related industries.

The conventional wisdom of much of the last decade that containerized seaborne trade with Asia would continue to grow unabated led to projections that U.S. West Coast ports would be overwhelmed by unrelenting import growth. By using linear growth rates these projections showed future U.S. containerized imports rising to unsustainable post-2020 levels that would require multiple new terminals as well as the possible conversion of some existing bulk ports to containerized operations. In 2007, as containerized volumes began to slow as a result of higher fuel prices, the focus of trade corridor research shifted away from designing systems to meet unrelenting growth. Rather than projecting what total trade will be in 15 or 20 years through assumed linear growth rates, the transportation planner must instead ask "what are the critical demand thresholds? What systemic factors must change for shifts to occur and how are these conditions recognized?"

Central to any economic improvement will be the recovery of the financial system, stable stock and currency markets, and a return to confidence among personal shoppers. Why is this important to transportation? The answer is simple. Transportation is a derived service activity and dependent on levels of economic activity being maintained within certain agreed limits to allow modes to reach financial viability. All transportation companies, including railroad companies, must manage a dynamic business model to determine a reasonably stable balance between supply and demand. Currently there is overcapacity in the entire transportation sector, and not simply in the marine container and auto sectors.

3.5 Final Thoughts

It would have been hard to find a 1990s transportation specialist who would have put rail at the head of any 2010 ranking of transportation modes based on their ability to address the vortex of challenges faced since 2006 – *yet, this is the case*. Air freight was one of the earliest modes to see a fall in demand[75], forcing a reduction in supply when DHL withdrew its ambitious growth strategy[76]. The U.S trucking sector, adversely impacted by the earlier higher fuel prices, saw many bankruptcies irrespective of company size and a substantial reduction in supply and vehicles and trailers were laid up. Even the perennial shortage of drivers was considered by the Bureau of Labor Statistics to have disappeared in 2008/9[77]. Marine transportation was, if anything, in the worse financial state of any mode. Overly optimistic forecasts of demand and the

[75] While total demand fell, shippers also switched from air to premium marine-rail chains.
[76] See http://www.huffingtonpost.com/2008/11/10/dhl-closing-us-service-ce_n_142765.html
[77] http://www.bls.gov/opub/ils/trucking.htm

logic of scale economies, combined with attractive shipbuilding prices in Asia encourage many of the leading global steamship companies to place orders for large containerships, some exceeding 11,000 TEU in capacity[78]. The consequences of this are shown in Figure 3.3 which suggests that over capacity will plague the sector for some time, perhaps leading to disequilibria which will make supply chain pricing less predictable.

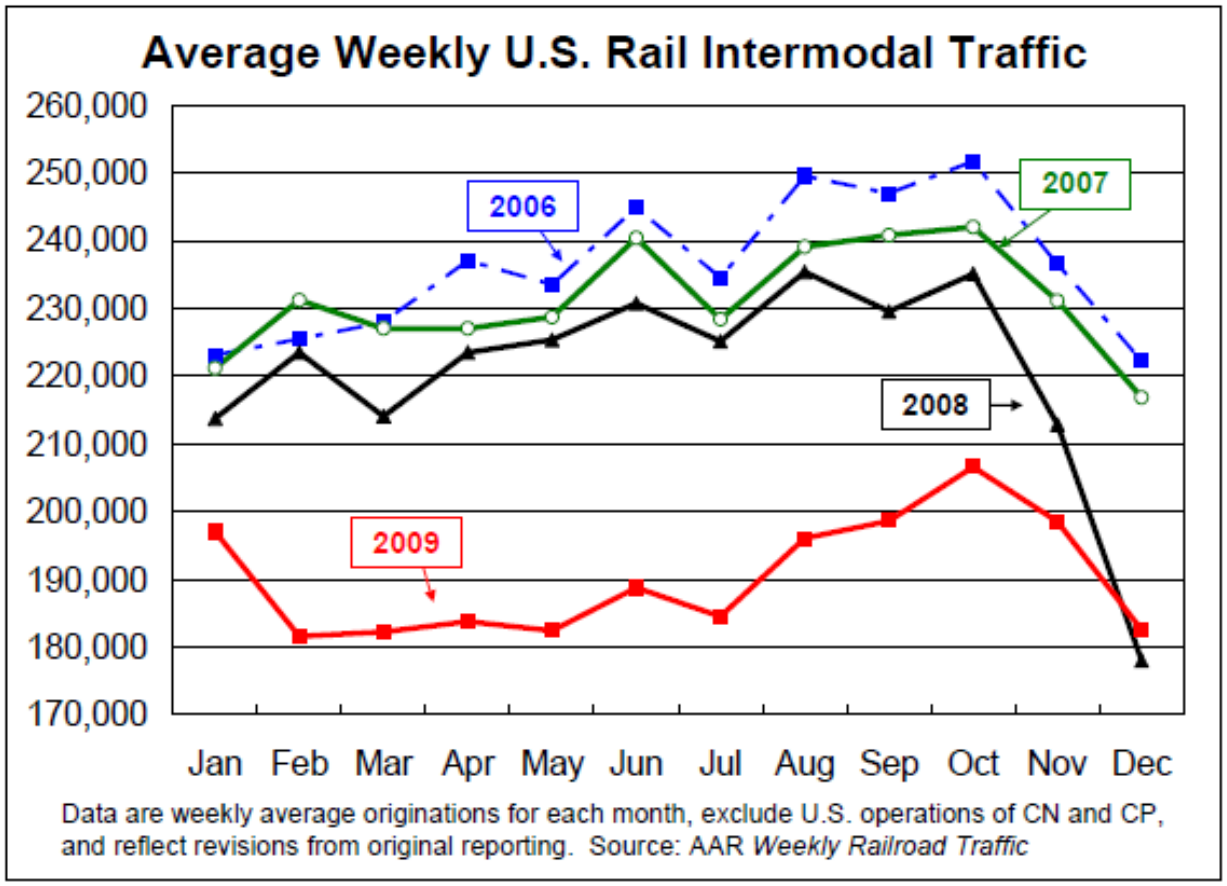


Figure 3.3: *Annual Intermodal Traffic Data for the Period 2006-2009*

So, where does rail intermodal lie? First, it appears that all Class One railroad companies had effective and immediate plans to address the consequences of a downturn in the economy. These focused on cutting costs, improving service and continuing investments (on a lower level) on key routes to address issues including routine maintenance, capacity, safety and innovation. AAR reported rail employment fell to 147,000 by the end of 2009 and 449,000 cars were being stored at a wide variety of locations on the Class 1, 2 and 3 networks by early 2010.

[78] Panamax vessels max-out around 5000 TEU (with deck racks), large post-Panamax at around 8000 TEU while in 2006 the Emma Maersk became the largest container ship with a nominal capacity of 11,000 TEU (all boxes fully loaded) although in 2010 a sister ship Ebba Maersk carried 15,011 TEU on an east Mediterranean route.

The authors believe that good news outweighs the bad news, although many in the industry remain concerned as 2010 began, as seen in Box 3.1. The good news included better prices in new contracts[79] (particularly coal) and a more efficient railway system, since congestion had been significantly reduced at key bottlenecks. In addition, rail benefited from an export led trade growth, much of it related to agricultural products. The overall business model still allowed companies to approach, or meet, their cost of capital. Earlier, mention was made on a potential "double dip" U.S recession which is still casting a shadow over investment markets, employment and consumer confidence.

Box 3.1: BNSF in 2010

The Economic Recession impacted the fourth quarter of 2008 and all of 2009, dropping carloads to levels not seen since 1988 and intermodal volumes to 2002 numbers. 2010 will be a real challenge and success depends on volumes beginning the climb back over the year.

Dennis Kearns, BNSF, January 2010

The next chapter focuses on Texas and considers the potential for rail intermodal to grow and offer truck competitive service over key trade lanes in the state. This is particularly important as a recent highway needs analysis study[80] indicates a severe reduction in the financial capacity to add new highway lanes over the coming two decades and with it the likelihood of higher trucking, auto and social costs for the region.

[79] This was a point of contention with some utility companies which stimulated calls for more regulation and brought a number of cases to the STB, including one in July 2009 which fined UP $ 100 million payable over 10 years for rates charged to the Oklahoma Gas and Electric Company, STB Docket 42111.

[80] Full details and reports can be found at http://texas2030committee.tamu.edu/

Chapter 4. Major International Trade Corridors Serving Texas

International trade corridors are inherently simple and should be kept simple for planning purposes, though the elements—modes and operations—are dynamic and driven by commodity needs, cost, speed, and reliability. This needs to be recognized by planners and policy makers who should monitor these factors to maintain an understanding of changes in corridor choices being made by shippers serving U.S. import and export markets. This study differentiates corridors running through Mexico from the rest of the world for a number of key reasons. First, the impacts of U.S.–Mexico surface trade flows on the Texas transportation system are largely felt on five highway and three rail corridors in the state. This chapter addresses those corridors—traditional and emerging—that significantly impact Texas and require a maritime segment in the corridor. The term "impact" covers not simply those routes that serve Texas locations but also recognizes that the state, because of its size, supports corridors used by shippers moving trade through the state to other U.S. locations, like Chicago or Kansas City.

The definition of a transportation corridor used for non-NAFTA business should also be kept simple. There are numerous individual port to port links that serve Texas—there are 12 deep-water state ports—but these are best left to the Texas port authorities to decide how they best fit the needs of shippers. The corridor definition chosen for this study is the exporting or importing country or region and the U.S. gateway selected to first process goods into the nation. If that gateway is out of state, the details of the land corridor are also given. The one exception is the new Canadian gateway at Prince Rupert, which is treated as a U.S. transportation corridor because a majority of its traffic is bound for U.S. markets. The order of the country or origin to U.S. port sequence in corridors in the chapter is based on shipping criteria—volume and value—as reported by the Bureau of Transportation Statistics.

All of the corridor options under consideration are for intermodal maritime and rail options. Thus, the cargoes under consideration are all relatively tolerant of long transit times. Furthermore, it has been demonstrated throughout the course of the energy spike and subsequent recession that shipper needs in terms of transit time are rather malleable provided that services are reliable. Of the corridors under consideration only two options, Southern California and the Panama Canal, are currently considered vital to Texas containerized trade from Asia. None of the alternative corridors currently make up a significant percentage of trade volumes. Of the remaining options some, such as Punta Colonet, are not utilized because they have no infrastructure while others, such as Prince Rupert, are not utilized to serve Texas simply because the time of delivery and transportation costs are significantly less favorable when compared with established corridors.

Figure 4.1 shows the variety of intermodal trade corridors serving Texas companies—whether the goods are imports or exports. The subsequent subsections of the chapter describe each corridor in terms of transit time, recent development and state-wide planning considerations.

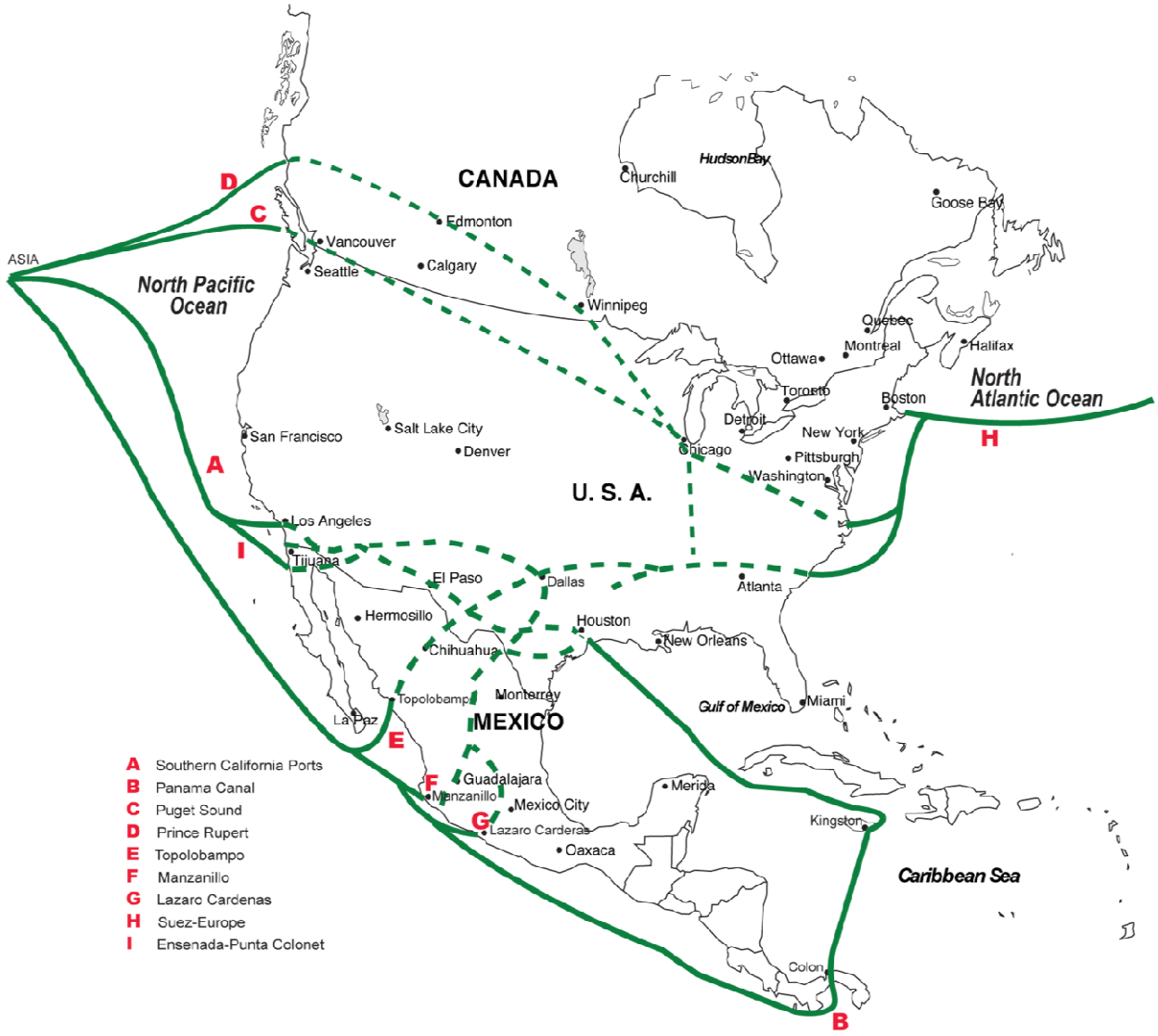


Figure 4.1: *Intermodal trading corridors serving Texas*

4.2 Asia–West Coast Intermodal Trade Corridor

Corridor Overview: *(see point A in Figure 4.1*) This corridor remains the dominant option for most shippers in transporting containerized cargo from Asia to the Texas market. It offers the greatest flexibility and overall fastest transit times under current conditions. The corridor also offers varying service levels that correspond to different shipper demands including premium rail service and approximately one-third of containers now move via on-dock rail. The Port of Los Angeles is in the process of adding additional on-dock rail capacity. It is also chosen by many shippers due to the pre-existing location of warehousing in the Southern California region. For

simplicity the nearby Ports of Los Angeles and Long Beach, sometimes referred to as the San Pedro Bay Ports, are referenced as a single entity.

Total Transit Time from Hong Kong to Houston: 18–22 days including at least 11 days sailing, 2 days port clearance and rail loading, and 6 days on rail. The Union Pacific advertises an average time of transit of 4.4 days and that 90% of shipments are delivered within 5.7 days. For Dallas, the average time of shipping is 2.9 days and 90% of shipments are delivered within 3.7 days. BNSF currently offers two levels of service for intermodal cargo moving between Los Angeles and Texas destinations. The fastest "E" service quotes delivery to the Alliance intermodal yard in 55 hours (or 2.3 days) in April 2009. This is a Trailer on Flat Car (TOFC) service. The standard service "P" is 79 hours (3.3 days) and deliveries are sent out six days per week. Delivery time to Houston is only available with service level "P" and is 105 hours (4.3 days). Shipments to Houston are sent three times a week.

Key trading Partners: People's Republic of China, South Korea, Japan, Taiwan, Southeast Asia

Key West Coast Ports of Entry: Los Angeles, Long Beach, Oakland

Recent Developments: Heavy landside congestion in the Los Angeles area and lack of sufficient dockside rail complicating traditional truck-rail connections created significant problems in the efficiency of the corridor prior to the falloff in container demand in late 2008. Emerging bottlenecks along the Union Pacific and Burlington Northern Santa Fe transcontinental rail corridors have also been significantly alleviated though not eliminated; the Union Pacific advertises an average time of transit of 4.4 days and that 90% of shipments are delivered within 5.7 days. For Dallas, the average time of shipping is 2.9 days and 90% of shipments are delivered within 3.7 days. BNSF currently offers two levels of service for intermodal cargo moving between Los Angeles and Texas destinations. Delivery time under the fastest service level is for Trailer on Flat Car. Both of these lines are undergoing capacity enhancement. For the BNSF the most critical bottleneck is the Abo Canyon near Belen, New Mexico. BNSF had originally hoped to construct a second main line through the canyon that would allow speeds to be increased from 40 to 50 MPH. After examining the cost and environmental implications, a 40 MPH alignment was chosen. BNSF concluded that "savings and transit time did not justify the construction of a potential 50 mph alignment" (Magistro 2005). Cost implications from a legal battle of the port's controversial implementation of a "Clean Trucks" program to replace older dray trucks and would ban owner-operators has taken on new urgency in the face of the reduction in cargo.

Statewide TxDOT Planning Considerations: There are currently major inflows of Asian containerized goods to Texas population centers through two transcontinental rail corridors. A substantial amount of through traffic that does not terminate in Texas also passes through the

state. Connections with inland ports in Dallas and San Antonio are drivers of growth. In late 2008 and early 2009, the San Pedro Bay ports had the sharpest drop in volume of any port complex in the country. While data from August 2009 showed that container volume was down by 16.5% for the Port of Los Angeles compared with the previous calendar year, the port has yet to generate reliable estimates as to which regions of the country or states have seen the sharpest volume drop (Dijk 2009). The same holds true for the Port of Long Beach, which only tracks the total TEU volume (down 25% as of August) but does not have estimations of where in the country the cargo is headed. The closest approximation of the relative importance to Texas container volumes from the Ports of Los Angeles and Long Beach was a study performed for the Alameda Corridor Authority. The study, which relied on 2005 data, estimated consumption based upon population in different regions of the country. The consultant estimated that Texas directly consumed 11.2% of the ports of Los Angeles and Long Beach total international trade volume. In 2005, this equated to $28.68 billion of which $23.69 billion was imports and $4.99 billion was exports (BST Associates 2007). The Port of Los Angeles uses a proxy container value of $35,000 per TEU. If that assumption is applied, it would mean that the Texas direct consumption share of cargo originating from the Port of Los Angeles or the Port of Long Beach in 2005 was slightly over 800,000 TEU.

The expansion of the Dallas Logistics Hub (DLH) with the addition of a BNSF intermodal terminal located near to the existing Union Pacific Terminal at Wilma has the potential to further improve the attractiveness of Texas as a logistics platform, even for cargoes whose ultimate destination lies outside of the state. In May of 2008, the BNSF purchased 198 acres of land within the DLH for the construction of an intermodal terminal. With the economic slowdown, BNSF has elected not to begin construction on the terminal until economic growth resumes. Should BNSF decide to begin construction, the new terminal could be expected to open within 3–5 years.

4.3 Asia–Panama Canal–Houston

Corridor Overview: *(see point B on Figure 4.1)* The intermodal marine and rail corridor linking Asian hubs with Houston and, by extension, other destinations in Texas is one of the most promising emerging trade routing options for Texas needs. This corridor offers several potential advantages for shippers in that it allows a shipper to move containerized cargo by a single mode from the port of departure to the port of arrival. In most cases, for deliveries to Texas markets, the final delivery from Houston is performed by truck. Thus, for shippers who do not wish to utilize intermodal rail, the all-water Panama Canal route is a realistic option. Under current conditions, there has not been a consistent economic cost advantage in choosing the all-water route, yet the existence of this option is seen as generally favorable for preventing any one provider from gaining undue market power.

The Asia–Panama Canal–Houston corridor can be divided into two classes: 1) direct calls in which the string includes an Asian port of loading or departure along with Houston and 2) transshipment port strings in which the port of transshipment is either in the Panama Canal Zone (Port of Manzanillo or Port of Balboa) or a hub in the Caribbean. Currently an analysis of containership strings shows that Kingston, Jamaica, and Bahamas are the most important transshipment hub for cargo moving to and from the Port of Houston. The use of transshipment hubs in lieu of direct calls carries some advantages. For example, in order to justify a direct call from an Asian port to the Port of Houston, a significant volume of containers is required. A far smaller amount of cargo is required to justify a feeder delivery between a Caribbean hub, both due to smaller vessel size and the fact that cargo transshipped from these hubs has been consolidated from multiple origins. The same feeder vessel that delivers containers from Asia, for this reason, can simultaneously deliver cargo from Europe and South America, thereby allowing for more regular shipments than would be possible without the hub and spoke function provided by the Caribbean.

Time of Transit: The time required to deliver a container from Hong Kong to Houston or most other destinations within Texas is 21 days under normal conditions. Potential delays of up to one day can occur at the Panama Canal locks, particularly if the vessel does not secure a reservation slot.

Current Service Providers: CMA-CGM through direct call, other carriers via transshipment

Key Ports of Entry: Barbours Cut, Bayport

Landside Considerations: Most containerized cargo entering Texas via the Port of Houston and bound for termination within Texas is not expected to be rail competitive in the near term. Truck traffic generation from Asian cargo flows will be significant in the Houston area and to a lesser extent on road corridors linking Houston with San Antonio and Dallas.

Statewide Planning Considerations: The Panama Canal showed surprising resiliency in boosting total TEU throughput when transit peaked in 2007 despite projections that the Canal had reached capacity. In the first quarter of FY 08, the Canal actually saw its first decrease in total transits and a subsequent improvement in processing time tied in large part to the weakening U.S. economy (Maritime Global Net 2008) The recent increase in toll rates by the Canal authority may also be a factor in slackening demand for the canal prior to the opening of the new locks.

Recent Developments: China has been one of the key drivers of growth for the Port of Houston intermodal terminals. Increased growth of trade with Asia was central to the justification to build the Bayport terminal. The need to deliver large volumes of consumer goods to growing markets in central Texas was a central reason for the decision of Wal-Mart and Home Depot to locate

major distribution centers near Houston and the decision of a major liner service to call Houston directly from China. Since starting in 2006, the CMA-CGM PEX3 service connecting Hong Kong and Houston has become a mature string using some of the largest vessels currently in operation capable of navigating the Panama Canal.

Aside from the CMA-CGM services, there is currently a lack of services that arrive at Houston after loading directly at Asian ports. Therefore, the role of Asian trade services with the Port of Houston remains essentially the same as it did before Bayport opened—an important component of the total business but still a secondary market to the ports major trading partners of Europe and Latin America. While Houston has a more balanced trading system with ports in East Asia than do ports on the West Coast, the Port still has far greater trade parity with Europe and Latin America. For example in 2007, the most recent year for which data is available, Port of Houston containerized imports from East Asia eclipsed exports by a factor of 3 to 1: 172,164 TEUs of imports and 54,540 TEUs of exports (Port of Houston Authority 2009). In addition, it should be noted that while the Port of Houston imports a wide variety of cargo types from China, the vast majority of its exports are a narrow band of commodity types derived from the petrochemical industry, principally resins. Therefore, if these commodities were removed from the total cargo mix, the balance for containerized trade between the East Asia and the Port of Houston would be similar to that of other containerized ports such as Los Angeles.

The fact that many of the ships from Asia that call at the Port of Houston return partially empty means that the export potential for these commodities is limited for the Chinese market. If a new carrier from China were to start calling Houston directly from the same ports of loading called by the PEX3, they would face the same problem of not being able to find sufficient return cargo unless calling at a different market or a port that would transship to other Asian markets, i.e., Hong Kong. Alternatively the transshipment market for Asian destinations to Houston is also subject to uncertainty. In late 2008, Maersk announced that it would abandon its lease at the Kingston container terminal which serves as a transshipment point for Houston cargo, due in large part to unacceptable levels of congestion. The total container volume of Kingston fell by 9% to 1.8 million TEUs in 2007 (Leach 2008). This is important because larger vessels can "load center" at locations such as Kingston and transship containers destined for Houston through a "hub and spoke" system using smaller ships that can serve ports constrained by channel depth.

The lack of available return cargo is problematic because the tolling structure of the Panama Canal is set so that the empty return vessel will pay fees analogous to a loaded vessel. This is an extra cost that container carriers that send large container vessels directly to Houston must bear, in addition to the costs of the extra sailing time. Some carriers have argued that the Panama Canal authority should either cut its rates or at a minimum modify the rate structure so that empty returns are not as costly. So far, the canal authority is resisting these calls and is pressing ahead with planned rate increases in order to continue the funding of the expanded locks.

4.4 Puget Sound–Transcontinental Corridor

Key Trading Partners: China, South Korea, Japan, Taiwan, Thailand

Key West Coast Ports of Entry: Seattle, Tacoma, Vancouver, Portland

Corridor Overview: *(see point C in Figure 4.1)* The Pacific Northwest has emerged as a close competitor for the Ports of Southern California in delivering cargo from Asia to Chicago and the East Coast. As a relative newcomer to serving extended hinterland destinations, the Ports in the Pacific Northwest have been judged to have a tenuous hold on cargo market share when compared with the Ports of Los Angeles and Long Beach. A 2008 study on the elasticity of shipments through the Pacific Northwest concluded that even a small $30/TEU increase in container unit cost vis-a-vis alternative ports could cause a loss of market share in favor of Southern California for markets east of the Rockies (Leachman 2007). The corridor is currently not used by a substantial number of shippers for deliveries to Texas due to significantly greater overland distance when compared with Los Angeles and Long Beach. A shipper may choose to utilize the Puget Sound ports; however, if they have pre-existing distribution infrastructure in the region that would counteract higher transportation costs.

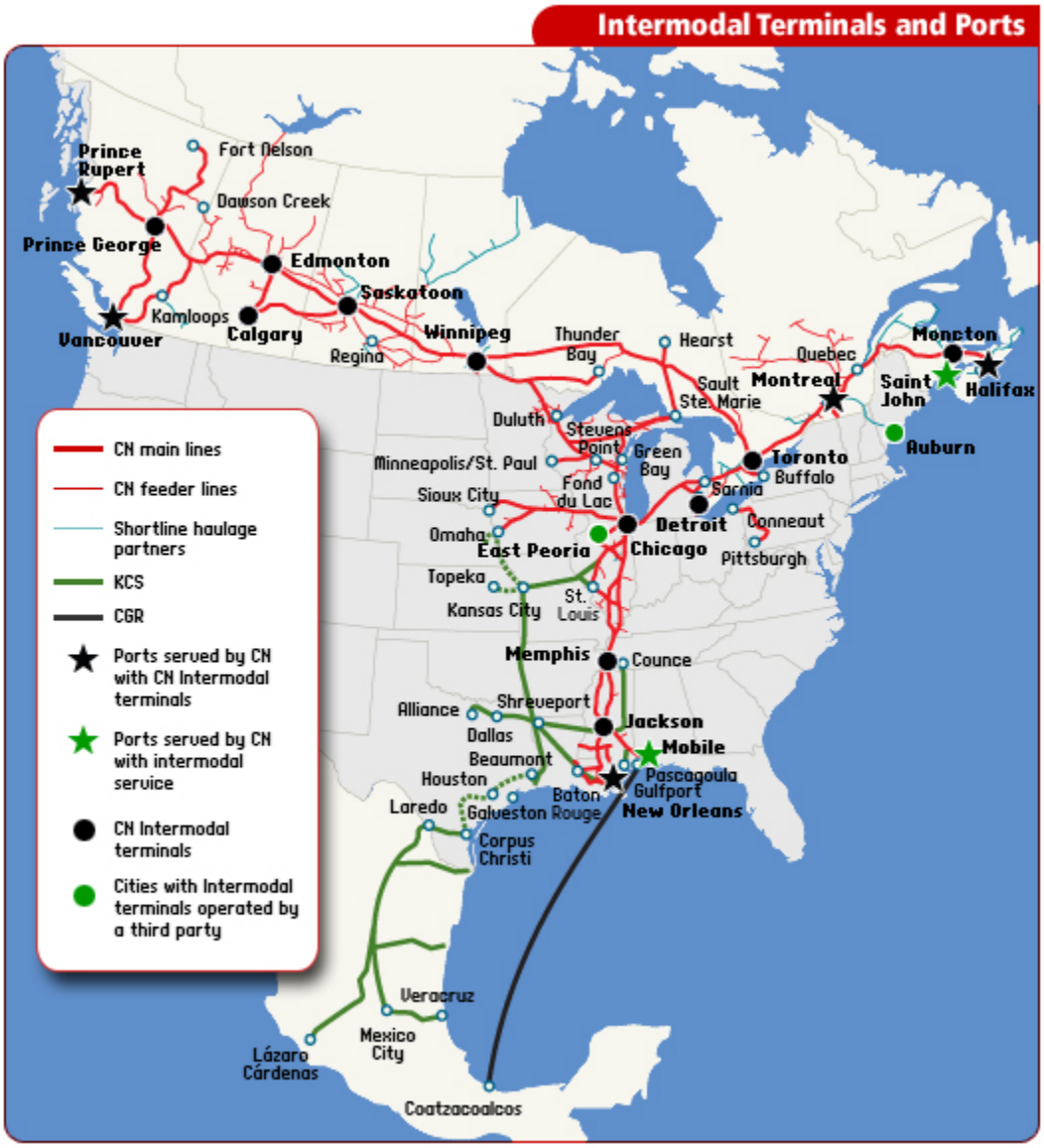
Landside Considerations: Heavy use of on-dock rail serving the Midwest and East Coast has meant less community pushback to port expansions. TEU growth since 2000 at Tacoma peaked in 2007. The following year, container volumes fell by 5% (Dibenedetto 2007) and, as with most U.S. terminals, capacity was substantially higher than container demand. Volume declines in late 2008 and early 2009 have not been as severe as at the Ports of Los Angeles and Long Beach. A stronger export profile for Seattle and Tacoma, when compared with that of Los Angeles and Long Beach, has been credited for some of the Ports' resiliency (Cunningham Report 2009).

Statewide Planning Considerations: Increased use of Northwest ports headed for Chicago and the northeast would lower the number of through trains from Los Angeles entering Texas. There is a lower chance that cargo entering at Puget Sound ports would directly enter Texas. The conditions under which a temporary shift from Los Angeles/Long Beach to Puget Sound as a port of entry would be an elevation in marine transportation cost combined with a depression in rail cost. There are several potential routing options for Puget Sound to Texas corridors, none of which are posted on the railroads' regular schedule. The most viable possibility would be to route cargo via Kansas City. The rail distance for this shipment is approximately 1,000 miles longer to Dallas than the analogous routing through Los Angeles/Long Beach. Because the rail distance disadvantage is greater than the marine distance advantage, it can be concluded that this corridor will likely remain a secondary option for the majority of shippers to Texas. Yet it is plausible that a combination of favorable rail contracts, dray and distribution arrangements, and maritime contracts could compel a minority of Texas shippers, or national shippers with a Texas branch, to choose a port in the Pacific Northwest as a principal port of entry for Asian imports.

4.5 Asia–Prince Rupert–Chicago Corridor

Key Ports of Entry: Fairview container terminal at Prince Rupert with Canadian National rail connection to Chicago and Memphis.
Key Trading Partners: Korea, Japan, and China

Landside Considerations and Critical Features: *(see point D in Figure 4.1)* The Prince Rupert port of entry is unique among major container terminals in North America due to exclusive reliance on rail; see Figure 4.3. Canadian National retains a monopoly on inland movements from the port. The corridor experiences few inland constraints with the exception of those tied to climate.



Source: Canadian National

Figure 4.2: *Canadian National Network Serving Prince Rupert*

Corridor Overview**:** Prince Rupert provides the fastest port of entry for Northeast Asian strings from the perspective of the ocean carrier. It connects with an underutilized rail line run by the Canadian National (CN). While the rail distance between Prince Rupert and Texas is unlikely to make it a strong option for direct Asia–Texas shipments, it is already taking significant volume away from other West Coast ports of entry, which may ease systemic congestion, particularly if the U.S. economy recovers. Prince Rupert also serves as an important "proof of concept" that a bypass port that does not provide a local truck-dependent market can attract a container string. Another point to be made from the Prince Rupert example is that the provision of service by a single rail carrier has not been a significant impediment. COSCO was the first major container carrier to commit to a weekly call to the Prince Rupert terminal with the first ship arriving on October 31, 2007. A second weekly call was added in the summer of 2008 (Cargo Business News 2009).

Transit Time from Hong Kong to Texas: Under current conditions, a shipper moving product between Prince Rupert and Texas would require a 10-day direct sailing time from Hong Kong to Prince Rupert, 5 days rail transit time to Chicago, 2 days interterminal time, and 6 days transit to Dallas for a total time in transit of 23 days. The CN is also advertising its express service to Memphis, which it estimates at 133 hours (Casey 2009).

Of all of the truly "alternative corridors" to the Port of Los Angeles and Long Beach that were proposed in the first part of the decade and for which new infrastructure was required, the Port of Prince Rupert and its connection to Chicago via the Canadian National Railways is arguably the corridor that has most closely approximated the original vision. The first phase of the Fairview Container terminal opened in late 2007 and has now seen its first full year of operation in which it handled 181,890 TEUs from 78 vessel calls. This works out to 2,331 TEUs per vessel call. The terminal's current capacity is 500,000 TEUs per year. The opening of the terminal was fortuitously timed for the Port as it helped compensate for a drop-off in other mainstay cargo types such as wheat.

Prince Rupert did not suffer the impacts of the economic crisis as immediately as the Ports of Southern California. Despite the fact that container volume is below some expectations held prior to the crisis, the port is still ramping up its services and as a result the nominal total TEU volume for 2009 is still higher than it was in 2008. According to Prince Rupert officials, the TEU volume through August 2009 was 151,554 TEU, which was significantly higher than the 2008 YTD volume. If current trends continue, the Port estimated that its first phase terminal would be operating at 50% capacity by the end of 2009. Of the current volume, approximately 30% was destined for Canada while 70% was destined for the United States. The majority of the U.S. cargo was to terminate, at least for the rail portion of its journey, in Chicago, where a minority of U.S. shipments are reloaded and sent all the way to Memphis. The Port Authority expects that

the rail shipping time to Memphis will be reduced substantially once a new bypass around Chicago is completed.

In January of 2009, the Canadian National completed the acquisition of the Elgin and Joliet short line railroad circling Chicago that will allow the Canadian National to route its trains through the Chicago area at higher speed and with less impact on the urban area. The acquisition was controversial as it will result in greater train activity along the previously underutilized railway that will adversely impact some neighborhoods. Nevertheless, the Surface Transportation Board (STB) approved the acquisition from U.S. Steel (Traffic World 2009). With the Chicago bottleneck greatly alleviated, the Canadian National's corridor from the Port of Prince Rupert to the rest of the country was cleared of a major impediment.

Currently, four double-stack Canadian National train sets serve the Port of Prince Rupert, all of which could theoretically make the 8-day transit time necessary to serve Texas. There are three routing options that can potentially utilize the Prince Rupert Port of entry to Dallas: through Superior, Wisconsin connecting to the Union Pacific; through Jackson, Mississippi handing off to the Kansas City Southern; and through Chicago handing off to the Union Pacific. Canadian National representatives stated that the service through Superior was the fastest and most reliable option for a service to Texas. While this is slower than service through Los Angeles, when the additional sailing time to the Port of Los Angeles from an origin as south as Pusan, South Korea is factored in, the total time in transit becomes comparable. The comparison may become more favorable, from a time standpoint if a not from a distance standpoint, once the Chicago bypass is complete.

Statewide Planning Considerations: If a shipper chose to use the Port of Prince Rupert for Texas destinations, the cargo could enter Texas by truck from Memphis or Jackson or by rail through interlining with KCS at Chicago. CN intends to use the Pigeon Industrial Park in Memphis as the main distribution hub in the south. Cargo would likely be trucked from Memphis thereby placing truck traffic on I 30.

4.6 Topolobampo–Presidio Corridor (proposed)

Key Ports of Entry: the Ports of Topolobampo, Mazatlan, and Guaymas

Trading Partners: Asia and South America

Corridor Overview: *(see point E in Figure 4.1)* Directly to the east of the Baja Peninsula there are several small cargo ports at Guaymas, Mazatlan, and Topolobampo. None of these ports currently have substantial container handling capability, yet planners have envisioned the possibility of locating a container port at one of these ports and thereby creating a closer point of entry for traffic bound for Texas or, alternatively, Arizona. If container handling ability was established at one of these facilities, a viable landside corridor to Texas would still need to be

established. This is made more challenging by the extremely mountainous topography between this section of the Mexican Pacific and the border. Until recently both the rail and highway linkages between this part of the Pacific Coast and the U.S. border were deemed inadequate for large scale cargo movements to the United States (Ochoa 2005). The lack of access for this part of the country to other regions of Mexico as well as the United States was one of the key reasons for the Mexican government's decision to complete the Mazatlan–Durango highway. This project, which has been underway in some form since 1996, involves the modernization of 232 kilometers of highway between Mazatlan and Durango and would represent the last link in a modern highway connection that runs to Monterrey and the U.S. border. The completion of the highway is expected to reduce total transit time between these two cities by more than 50% and make the route more capable of handling truck traffic. Upon completion of this corridor, shippers will be able to more easily transport cargo from the state of Sinaloa and Durango. In addition, cargo arriving at multiple ports along the northern Pacific coast of Mexico will have the option of using this transversal to cross the mountains. The routing would likely be favored by Sinaloa-based shippers of agricultural products. The prioritization by the Mexican federal government for mega-projects such as Punta Colonet and the Mazatlan–Durango highway has curbed enthusiasm for smaller projects such as the Port of Topolobampo. While funding has been approved by the federal government to deepen the channel, there is no concrete proposal for a major container handling terminal under the Mexican National Infrastructure plan through either public or private funding.

Landside Considerations: The rail system linking the port of Topolobampo to Chihuahua is underdeveloped and the rail carrier, Ferromex, has indicated that it does not propose significant capital investment into the line. The rail connection from Guaymas to Tucson would feed the UP transcontinental line. Steep grades leading out of Topolobampo would limit maximum train length. Tunnel restrictions would likely require single stack trains.

Statewide Planning Considerations: Successful corridor utilization would require improvements in the Texas–Pacific line leading to San Angelo via Presidio. Volume would likely be lower than on other corridors due to constraints at various points within Mexico. The impacts on truck traffic would likely be minimal.

Manzanillo–Ferromex Corridor

Port of Entry: The Port of Manzanillo in the State of Colima, Mexico

Trading Partners: Japan, China, Korea, South America, United States

Corridor Overview: *(see point F in Figure 4.1)* The Port of Manzanillo is Mexico's largest container port. For a decade, Manzanillo held a near monopoly on container movements on the Mexican Pacific Coast. This status emerged due to the fact that Lazaro Cardenas, the other port capable of handling significant numbers of containers on the Pacific Coast, had no efficient road

linkage to the Mexico City area and the pre-privatization rail service was too inefficient to meet the demands of intermodal carriers. Thus, Manzanillo emerged as the principal gateway for Asian containerized trade moving to Mexico. In 1995, the Port handled only 86,938 TEUs per year. However, after 1995, Stevedore Services of America (SSA) took control of the main container patio through a government-issued concession. They equipped the port with modern container handling equipment, and the volume of the Port has grown every year since then and it has now reached the status of a major container port. In 2007, the Port's volume was roughly equivalent to that of the Port of Oakland, which is the United States' 4th largest container port. Manzanillo's growth since 2005 has been particularly impressive. Volumes grew from 874 thousand TEUs in 2005 to a 2007 level of 1.4 million TEUs. This surge of growth in the last 2 years occurred despite the opening of the first phase of the competing Lazaro Cardenas Hutchinson Port Holdings container terminal in the state of Michoacán, which had been expected to take a substantial amount of cargo away from the Port of Manzanillo.

Landside Considerations: Manzanillo is located in the middle of an urban area; however, convenient on-dock rail at the SSA container terminal has resulted in limited dray impacts in the immediate port area for those containers that are able to be cleared by rail. On the other hand, there has been little attempt to separate the rail corridor from crossings used by the population. As a result, outbound trains have a significant impact on traffic in the urban area and the city has made attempts to limit the number of trains that the port can send out in the course of a day, thereby limiting the overall penetration of intermodal service. The limitations on train throughput leaving the port due to congestion in the city of Manzanillo has led to time restrictions on train movements that hinder overall corridor capacity. The shortest distance for intermodal shipments delivered between the Port of Manzanillo and Texas would be to utilize trackage rights on KCS-Mexico for part of the journey and enter the U.S. at Laredo. The alternative routing, which stays on Ferromex track and crosses at Piedras Negras, is longer and slower.

Statewide Planning Considerations: As the Port of Manzanillo has grown in volume over the last few years, there has not been comparable investment in rail infrastructure. For this reason, while the volume of the containers at the port has increased sharply, the percent of containers cleared from the port by rail has fallen. Without sufficient rail capacity to even meet domestic demand, it is not possible under present conditions for the Port of Manzanillo to serve as a gateway for containerized in-bond shipments to destinations in the United States. The Port of Manzanillo is currently proposing a substantial upgrade to the rail infrastructure serving the Port that would allow rail shipments to bypass the city of Manzanillo. However, this project is in the early planning stages and would require funding, the extent of which is not currently available with the Port's current funding sources.

The underdevelopment of the rail corridor leading from the port to the interior and the lack of planning to improve the corridor by Ferromex currently means that a significant role of this corridor for Texas-bound trade is unlikely. While the Port of Manzanillo has efficient dockside

operations and an ambitious expansion program, the landside connection has become the limiting factor. Therefore, it is likely that the hinterland of the Port is being reduced to the greater Guadalajara region. No shippers were identified who were seriously considering the Manzanillo gateway to serve destinations in Texas.

4.7 Lazaro Cardenas –KCSM corridor

Ports of Entry: The Post-Panamax equipped container terminal at the Port of Lazaro Cardenas in the State of Michoacán.

Trading Partners: China, South Korea, Japan, Peru and Chile

Corridor Overview: *(see point G in Figure 4.1)* In September 2007, the Port of Lazaro Cardenas opened its long awaited container terminal capable of handling Post-Panamax vessels. Since its opening, the container volume at Lazaro Cardenas has increased substantially; however, most of this growth has come from modestly-sized container vessels, not Post-Panamax. The Port has seen a steady increase in traditional 3,000 to 4,000 TEU vessel strings diverted from the capacity-challenged Port of Manzanillo. In September of 2008, *Lloyd's List* reported that the Chilean line **Compañía Sud Americana de Vapores** (CSAV) service switch from Manzanillo to Lazaro Cardenas is responsible for a substantial percentage of the change in cargo volume for 2008. It should be noted that the CSAV service switched to the Lazaro Cardenas terminal, which is less efficient than the SSA-operated concession terminal in Manzanillo. The need to handle substantial container volumes at the general use docks at Manzanillo is a phenomenon that emerged following the concession to SSA in order to accommodate shipper demands for additional container handling capacity at the Port of Manzanillo. The principal lines currently serving the Lazaro Cardenas terminal are APL, Maersk Line, Cosco Group, and Hapag-Lloyd. Lazaro Cardenas saw the arrival of a fourth container crane capable of serving Post-Panamax vessels in October of 2008 (Lloyd's List 2008).

An interview with the Port Director of Lazaro Cardenas illustrated the close connection between rail service and the Port's success. According to former Director Palos Najera, approximately two-thirds of the cargo that enters the Port destined for the Mexico City area is currently delivered by rail, with the remaining one-third delivered by truck. This is a particularly relevant statistic given that the truck distance between Mexico City and Lazaro Cardenas, while significant, is not so extreme as to make rail the automatic default choice. A small minority of deliveries are destined for locations north of Mexico City, including San Luis Potosi and Monterrey. These deliveries go almost exclusively by rail. The port does not have specific statistics on cargo that is ultimately destined for Mexico versus cargo that is destined for reassembly and exported to the United States or another country.

Landside Considerations: KCS, under its Mexican division KCS de Mexico, is spending $80 million on developing its rail terminal at the Port of Lazaro Cardenas. This terminal will provide the landside equivalent to complement Hutchinson Port Holdings' investment in a marine container terminal to be supplied with Post-Panamax cranes (El Economista 2008). Unlike KCS, which is fully committed to the Lazaro Cardenas port of entry as its gateway to Asia, Hutchinson is involved in several of the projects along the Mexican Pacific Coast, most notably the delayed Punta Colonet project. The Secretaria de Communicaciones y Transporte (SCT) infrastructure plan for the year 2007–2012 calls for substantial investments in ports of different scenarios. Under the pessimistic scenario, the Mexican Government calls for $4.2 billion in port investments. Under the more optimistic scenario, the government expenditure is expected to be $1.5 billion when compared with $5.1 billion from the private sector or $6.6 billion total. This second scenario is seen as the more likely to reflect reality. Under the final scenario, dubbed very optimistic by the SCT, the public sector would dedicate $2.3 billion to marine enhancements and these investments would be supplemented by $7.8 billion in private dollars in order to create a total of $10 billion over the 5-year period. Kansas City Southern saw earnings rise significantly in 2007 and subsequently invested $200 million on its Mexican corridor projects linking the Port of Lazaro Cardenas to the United States in 2008. These investments included the acquisition of 35 modern locomotives. In addition, KCS "plans to construct a new rail bridge at Nuevo Laredo and another at Matamoros" (Cargo News Asia 2008). Despite a recent falloff in volume, the outlook for the Lazaro Cardenas corridor is favorable, especially for shippers who already have a strong presence in Mexico.

4.8 Victoria to Rosenberg Connection

On the U.S. side of the border, there has also been a significant infrastructure enhancement with the restoration of the line on which service had previously been discontinued connecting Victoria and Rosenberg. The restoration of the line cost KCS $173.5 million and will save 67 miles of rail distance for trains moving between Laredo and Houston. The attractiveness of the connection is enhanced by the fact that KCS will no longer need to pay trackage rights to use UP track over this corridor and the savings in transit time, estimated at 4 hours, may make the corridor more attractive for shippers of time-sensitive cargoes (Boyd 2009).

4.9 Asia–Panama or Suez Canal–East Coast

Corridor Overview: *(see point H in Figure 4.1)* While the principal focus on alternatives for emerging intermodal corridors that could impact Texas transportation patterns in the future have focused on new West Coast options or the potential of direct deliveries from Asia to the Port of Houston through the newly expanded Panama Canal, there is another distinct option that cargo could be routed to an east coast port of entry and subsequently railed to Texas. This option would

entail a longer marine distance for most Asian origins, yet it would result in a shorter overland distance on the comparatively underutilized East Coast rail corridors. An intermodal option through the Port of Savannah, for example might be viable for shipments from India via the Suez Canal or even via the Panama Canal for shippers who have an additional justification, such as a distribution center, near the port.

Key Ports of Entry: Hampton Roads (Maersk Terminal), Charleston, Savannah, Jacksonville

Trading Partners: Southeast Asia, India, Taiwan, and Singapore

Landside Considerations: Improvements such as the addition of intermodal yards along the Heartland Corridor route will improve the efficiency of shipment to Chicago on the Norfolk Southern rail network, although the location of these intermodal yards has caused opposition from property owners.

Statewide Planning Considerations: The greatest impact will result if a reverse pendulum routing via the Suez Canal is established. If successful, this could lead to additional strings to East Coast ports such as Charleston and Savannah. Cargo could arrive to Texas by means of the CSX or Norfolk Southern rail corridors. The Suez heartland route could lead to some diversion of cargo that would otherwise enter Texas from the West. The Port of Savannah saw a 20% increase in TEU volume in 2007 to 2.6 million TEUs and is poised to become a more important load center for liner services seeking to make deliveries to Gulf Coast States without entering the Gulf (Port of Savannah handles record level of TEUs in 2007 n.d.).

4.10 Punta Colonet (proposed)

Corridor Overview: *(see point I in Figure 4.1)* The proposed port and rail connection at Punta Colonet can be described as a sub-corridor of the broader Asia–West Coast routing option because, if developed as currently envisioned, it will share many of the key characteristics with the existing West Coast intermodal connection. From the perspective of Texas, cargo that comes through Punta Colonet would be similar to cargo emanating from both Los Angeles and Long Beach. Nevertheless, there would be a few key distinctions.

The first distinctive characteristic of cargo emanating from Punta Colonet is that it would be unlikely to use any rail line other than the Union Pacific. The Union Pacific alignment is more conducive to a proposed connection with Punta Colonet than is the BNSF given that the UP line runs closer to the border in the area where the Punta Colonet connection is projected to cross. Another feature of future Colonet traffic that would make it distinct from traffic using the existing southern California gateways is that this corridor would only be a viable option for shippers who intend to deliver containerized cargo, unbroken and unaltered, to a major inland intermodal hub such as Dallas-Ft. Worth or Chicago. While this type of cargo shipment is a very important component of the total cargo profile for the Ports of Los Angeles and Long Beach, it is not the only type or even the dominant type of cargo shipment handled by the port complex.

Rather, shipments are divided into those destined for captive markets in and around the Los Angeles Long Beach area, those that are destined for transloading centers but ultimately destined for a market outside of California, and finally cargoes that will be transferred, usually by rail though not exclusively, to interior markets. (Leachman, Port and Modal Elasticity Study 2005)

The market competition between the Ports of Los Angeles/Long Beach and the future Port of Punta Colonet would not be a competition among equals because the Port of Punta Colonet could not effectively serve these first two markets. Thus, despite its close proximity to the Ports of Los Angeles and Long Beach, the Port of Punta Colonet would not truly compete with these two port facilities in the same way that they compete with each other. Rather, Punta Colonet would compete more directly with Prince Rupert and, to a lesser extent, the ports of the Pacific Northwest. In a comparative analysis of the roles played by the different West Coast gateways, Leachman and Associates argued that traffic flows to the ports of the Pacific Northwest were more elastic in the long run than those to the San Pedro bay, in large part due to the scale economies and large captive market offered by the latter (Leachman 2007). Along these same lines, demand at Punta Colonet would be elastic and could only be successful if it could offer distinct advantages over alternative corridors in terms of lessened congestion, and lower land and labor costs compared with other "alternative" corridor options such as Prince Rupert.

Under one estimation, the shippers most likely to use a direct shipping model, in which there's little to no reconsolidation near the port of arrival, are shippers of low value per unit of weight commercial goods that are nonetheless containerized. For this reason, the analysis showed that the type of shippers most likely to utilize a direct shipment method were "large nationwide shippers of furniture and building materials" such as Home Depot and Lowes (Leachman, Elasticity Analysis of Asian Imports Through the Ports of Seattle and Tacoma 2007). For large shippers of other high value per unit of weight cargo types, an alternative transloading strategy is proposed that would likely not favor new corridor options such as Punta Colonet due to the lack of distribution infrastructure.

As of the publishing of this report, many of the basic facts surrounding the potential development of the Punta Colonet corridor were still uncertain. After suffering what appeared to be a fatal blow with the emergence of the financial crisis in the fall of 2008, Luis Tellez, the Secretary of Communications and Transportation, declared the project all but dead in January of 2009, shortly prior to his leaving this position. In the summer of 2009, the Colonet project again emerged as a priority, yet pronouncements by the SCT have avoided specifics as to when construction may actually begin (Milenio 2009).

Key Ports of Entry: The future port of Punta Colonet in Baja California, the nearby port of Ensenada

Trading Partners: Key trading partners would likely be from Asia and South America.

Landside Considerations: There is a continuing dispute over land rights around the new terminal. The full proposal includes plans for an entire city built in the vicinity of the port that would eventually include significant distribution capability. Distribution and other value-added

industries would be added in the years subsequent to the opening of the marine terminal. Thus, the landside impact would grow in complexity as the terminal matures. For the rail connection to the U.S. system, there is opposition on the U.S. side from agriculturalists who object to potential acquisition of land through eminent domain. Another concern is that if Punta Colonet train traffic is added to an already congested UP line in Arizona, it may simply shift the bottleneck east. Presently, the status of the partnership between marine and landside interests is not solidified. A consortium between Hutchinson port holdings and the Union Pacific Railroad broke down in 2007 due to the inability to find agreement with residents of Yuma, Arizona to accommodate the future rail crossing.

Statewide Planning Considerations: If eventually developed, the net impact would be to increase utilization of the UP transcontinental corridor east of California, leading to possible complications for El Paso. There are opportunities to develop partnerships with inland ports along the UP corridor such as the Dallas Logistics Hub. Given the significant infrastructure challenges as well as the uncertain economic climate, the potential for Punta Colonet to have a significant impact on cargo flows in the intermediate future is slight. On the other hand if the Mexican government decides to double down on the project, this may divert resources from other infrastructure priorities thereby slowing their timelines for completion.

Summary

This chapter described the current characteristics of the main trade gateways for goods entering the U.S. and traveling either through or to Texas. The severe economic recession noted in the previous chapter has caused total international trade to fall and resulted in loss of market share at many of the larger U.S. gateways serving transportation land corridors. Prince Rupert is likely to have a modest impact in Texas, although it will be able to serve Memphis with Korean goods effectively and this may have a "trickle down" effect for those shippers serving Texas. One major gateway that deserves TxDOT vigilance is Norfolk, Virginia because its new terminal is capable of servicing the largest containerships now operating and its landside link with the Heartland corridor can take goods to the Philadelphia region (via Columbus Inland Port) and the Chicago markets using a shorter, faster, and cheaper rail route. If Post-Panamax megaships serve Norfolk as planned, shipping costs from Asia to the Atlantic coast would fall. This in turn may take business away from the trans-continental rail routes (which pass through Texas) now serving West Coast terminals that not only face future competition from emerging corridors but from gateway competitors nearer to home now eying their business. Class One railway companies can be expected to strongly compete and part of this will be addressing shortcomings in their currents networks. Those in Texas are the subject of the next chapter.

Chapter 5. Study Findings and Recommendations

The project began in 2006 by posing a simple question—could the Class 1 railroad system be improved to the point where it could capture a higher share of NAFTA traffic? It was posited because two policy arguments made in 2006 suggested this was difficult, if not impossible. The first reflected the failure to gain NAFTA share over the period 1995 to 2005 when rail intermodal service grew market share over many other important trade corridors. NAFTA corridors, as espoused by McCray and others[81], remained resolutely in the trucking domain especially for imports. The second was output from the NAFTA trade modal split model used by Cambridge Systematics[82] to estimate NAFTA growth to 2020 on seven key state corridors which reported that rail would not grow market share significantly over that time period.

This study finds that this view was vulnerable to several dynamic changes which occurred over the subsequent multi-year period to 2011. These included a fuel crisis (2006/7) which favored shipping by rail, the global recession of 2008/9 which demonstrated that the rail business model was stronger than the trucking model, the vote of confidence in the rail sector made by the outright purchase of Burlington Northern Santa Fe by Berkshire Hathaway in late 2009, and the current highway funding crisis across U.S states which severely limits the ability of state Departments of Transportation to build new capacity for autos and trucks on the highway system[83]in general or the key freight corridors serving trucks[84] in particular. These events argue that increasing rail share of state and regional freight traffic is both cost effective and socially desirable.

Even NAFTA flows, many of which are on short non-rail competitive route lengths[85], could grow market share substantially if diesel reaches $5 a gallon, especially on the crucial Laredo-San Antonio-Dallas-Kansas City-Chicago corridor.

The proposed outline for this one year study focused on rail planning to boost the then current level of service by examining a range of investment plans, from those undertaken by the railroad companies to large public-private undertakings, typically made where substantial investments were needed to resolve crucial system bottlenecks. This outline was superseded by the TxDOT recent Rail Plan[86] which now details these in some detail.

The ability to change focus to report a larger and more complex view of regional rail operations is a more useful outcome of the work and supports a powerful argument for integrating rail needs more fully into DOT planning. Moreover, several new issues face the rail industry in its efforts to

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[81] Dr. John McCray coined the term "Rivers of Trade" early in his body of NAFTA research – cited in the LBJ School PRP Number 113 entitled " US-Mexico Trade and Transportation: Corridors, Logistics Practices and Multimodal Partnerships" 1995 http://www.utexas.edu/research/ctr/pdf_reports/PRP_113.pdf

[82] Texas NAFTA Study Update, Final Report, Cambridge Systematics 2007 ftp://ftp.dot.state.tx.us/pub/txdot-info/library/reports/gov/tpp/nafta_study.pdf

[83] 2030 Committee, "It's About Time: Investing in Transportation to Keep Texas Economically Competitive" http://texas2030committee.tamu.edu/

[84] In Texas, over 70 percent of the trucks use less than 20 percent of the on-system lane-miles (2030 Committee)

[85] Several of the corridors examined in the Cambridge study had no, or weak, rail competition.

[86] http://www.txdot.gov/public_involvement/rail_plan/default.htm

stay efficient and profitable. It is not now simply a question of handling growth in demand and preserving market share on key corridors.

Table 5.1 details the most important issues now facing the industry, not ranked in order of importance, as it determines strategies for the next decade.

Table 5.1: Key Issues Facing U.S Railroads 2009-2011

Issue	Comments
Regulations	Remains a critical policy focus throughout period
U.S. Economy	Proponents advocate rail ROW or actual use of system
High Speed Rail	Proponents advocate rail ROW or actual use of system
Positive Train Control	Poor cost-benefit analysis
Hazardous Cargo	Common carrier, high potential liabilities
Network Growth	Bottlenecks, double track or longer trains
Metropolitan Growth	Megacities, speed, noise and safety
Truck Competition	Higher truck size and weight legislation
Alternative Corridors	Panama Canal, megaships
Climate Change	Favors rail as a mode but not coal, the major revenue earner

Source: Grey 2009 and Authors

These issues can be grouped into two; comprising first those that pose a threat to profitability and growth of rail—which must be countered—and second those that argue for the importance of freight rail over the next three decades of transportation planning.

Threats: Re-regulation is arguably the most important concern in 2011 rail strategic policy making, together with the importance of economic recovery. Rail has established crucial market shares in key areas of U.S freight flows, particularly coal, containers and agricultural products. Some contracts are multi-year, especially the movement of coal to public utility locations where electricity is generated. In mid to late decade renegotiations, rates were agreed which favored rail and a question arose as to the equity of these negotiations when the election of President Obama altered the political balance of the industry governing body – the Surface Transportation Board. This issue is complex because while a fixed contract may favor rail in the early years, costs can escalate and so tip the balance in favor of the rail customer. Nevertheless, because there are so few Class One railroad companies, some corridors service can be viewed as quasi-monopolistic and unfair. The STB has issued a number of rulings favoring utilities and requiring rail companies to return part of the past payments back to the customer[87]. Some politicians have gone further and argued that the industry should have a measure of "re-regulation" focusing on the basis of multi-year prices. The rail industry regards this as a key threat to their current business model and is fighting to prevent it from taking place.

[87] This comes under the general heading of "rate reasonableness" – for a detailed understanding see http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5084095

Support for high speed rail (HSR) initiatives in the American Recovery and Reinvestment Act (ARRA) legislation[88] created an ambivalent response from an industry not wanting to fight simultaneous issues. However, HSR use of freight right of way, even when available and appropriate (which most of it is not), condemns the service to lower overall HSR speeds than those in the rest of the world. Freight trains operate below 70 mph, can turn on sharp curves and, due to the mass of the typical freight train, are unable to climb much over a constant 2 percent grade. HSR, on the other hand, can climb a steep grade but is severely limited by sharp curves. Speed differential on shred right of way are another cause for concern. The HSR debate is currently constrained to basic planning in all but a handful of U.S corridors and is likely to remain so given the funding challenges facing government, state and private rail companies. This issue is taken up in further detail in the next section.

Threats also arise as a consequence of the rapid growth of some U.S metropolitan areas whose boundaries, since 1993, have created a small but growing urban resentment to higher train numbers. Issues range from traffic delays when trains cross slowly at grade, to an increasing perception of noise, particularly air horns at night[89] and finally outright encroachment by developers on rail right-of-way—the subject of a 2011 NCFRP study nearing completion[90]. Moving hazardous cargo through growing metropolitan areas creates unease on both the rail company and the community, yet there is little that can be done in the immediate future. Barge and pipeline transit are arguably safer modes yet have a limited landside reach. Trucks are less safe than rail and truckers can refuse hazardous cargo whereas rail, as a common carrier, cannot. It is an area, however, where there is a likelihood of resolution through STB and higher pricing. The final threat is a simple one, namely a "double dip" economic recession. Average cost curves can be lowered by increasing traffic volumes and that is the best hope for a strong rail industry capable of serving a growing regional economy.

Strengths. The current U.S rail system can be significantly improved with relatively modest investments of system-wide improvements, as shown by the Cambridge Systematics review of U.S Class 1 rail investment needs out to 2035. The report showed that the difference between what the private companies can put into system improvements and the needs to remove the most critical bottlenecks was modest—compared with highway investment[91]—at $1.4 billion at 2007 prices[92]. Urban planners are recognizing the value of improved freight rail systems as demonstrated by the recent wide based financial support for critical rail bottlenecks, like Tower 55 in the Fort Worth area.

Transportation planners at federal, state and urban levels now recognize the significant role that rail has in the current and future U.S freight system. Truck diesel engine emissions, since 2002, have been subjected to three significant changes in federal law. These covered engine management (2002), exhaust gases (2007) and nitrous oxides (2010) making current engines incredibly clean compared with similar engines built a decade earlier. Rail diesel engines will

[88] See http://www.fra.dot.gov/pages/2153.shtml
[89] Some cities have requested a "noise free" horn policy during peak night hours, raising safety risk.
[90] See http://144.171.11.40/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=2667
[91] http://www.camsys.com/pubs/AAR_Nat_%20Rail_Cap_Study.pdf
[92] The Dallas "high 5" interchange was completed in 2005 for around $260 million, so the rail needs gap is the financial equivalent of 5 complex urban interchanges in similar prices.

benefit substantially from the lessons learned even though they are already producing lower emissions per ton mile than trucks. In addition, locomotive and car weight is not a critical element in train weight as it is in truck gross weight, which must meet federal and state laws. A locomotive could, for example, pull a compressed or liquefied[93] natural gas tanker car which would provide an alternative, cleaner, fuel to diesel. This desirable attribute links to a variety of benefits—both operational and social—but it also is likely to impact the demand for as key commodity carried by the rail sector, namely coal.

Coal, most recently joined by containers, is a key sector in the U.S rail business and has been its top earner since deregulation. The principal customers are electric utility plants which burn coal and create a variety of gases as a consequence. These gases are a major constituent of global air pollution and the related issues surrounding global warming. Thus, while the rail industry is on track to becoming much cleaner, it may lose revenue from diminished coal traffic as alternative energy sources compete successfully with current generation plants. The social benefits from cleaner rail operations are profound, measureable and socially desirable, all important factors given the rapid expansion of U.S metropolitan or mega-regional areas where all forms of pollution will inevitably become highly scrutinized and possible regulated.

Railroad and trucking companies have worked hard to provide a competitive multi-modal system on key corridors and the growth of the global economy is creating many more corridors to those early trans-continental Asian routes linking Southern California with the North-eastern markets. As this report demonstrates, there are at least seven such corridors serving Texas alone. This supports a "vision" of U.S freight systems where rail is the preferred option over 800 miles, feeding metropolitan and large urban areas through sophisticated terminals that are part of larger logistical networks. These corridors can be improved in a variety of ways, including installing positive train control, longer sidings, grade separations, new terminals and even double or triple tracking.

A key element of a move away from the current dependence on trucking is the adoption of full cost pricing espoused by many economists over the past 50 years. Simply put, though a new system like HSR may require public support over much of its life, an existing system should pay its full range of costs including monetized benefits where appropriate. Using this approach, though rail prices will rise, trucking would rise much faster since the provision of highways is often subsidized by other vehicle classes, vehicle congestion is largely unpriced as is their contribution to urban air pollution. Higher transportation costs would alter the concentration of suburbs and diminish urban growth, change the demand for transportation fuels. Though lying in the future, these measures would strengthen demand management rather than trying to finance a growing gap between needs and funding.

This section supports the position that a vibrant rail sector, capturing new technologies and working closely with the trucking industry is an essential component of any future transportation system. The next section examines how rail service might be improved in Texas.

[93] Super cooled to minus 260, natural gas takes up to 600 times less space than in its gaseous state, making it easier to transport.

5.2 Recommendations for Improving Rail Service in Texas

The first decade of the 21 century was one of great change, significance and success for the U.S rail industry, as this report has noted. Rail now has an opportunity to grow its share of Texas freight, whether it is linked to U.S domestic markets, international imports and exports, or state transits on key corridors. Improving rail share is critical for Texas in a variety of ways, from improved emissions per ton mile to providing congestion relief at critical highway system bottlenecks. The study reports the following suggestions to remedy current rail shortcomings and so allow the rail sector to become a stronger freight mode within the state.

1. Implement Positive Train Control (PTC). This does three things. All of which are crucial to maintaining rail growth in Texas. First, it replaces current controls which, though effective, are rapidly becoming obsolete which will drive up maintenance and labor costs. PTC also permits shorter headways which benefit system capacity while not compromising safety and so provide a critical impact at important Texas bottlenecks. Finally, it may allow rail dispatchers to move trains more efficiently through major bottlenecks, like Houston. PTC, or a similar acceptable technology, has to be operational by 2015, although some railroads and their association (AAR) are pushing back, using the arguments of adverse cost-benefit ratios and high capital costs, to press for changes. Texas and regional rail freight planners should determine which UP and BNSF tracks will first implement PTR and how that impacts rail productivity and its ability to compete for a higher market share.

   Texas rail planners should then work with railroad companies to investigate how shorter blocks and faster train dispatching can increase specific bottleneck site capacity, such as at key yards and approach tracks around Houston. PTC advanced train dispatching is a less expensive solution to capacity constraints than additional tracks, which can exceed $3 million a mile to meet FRA Class 4 safety standards. PTC is expensive, as noted by the railroad companies, but there may be opportunities for state credits where it mitigates congestion, improves air quality and reduces delays at metropolitan rail-highway grade crossings.

2. Accept Higher Fuel Prices for Freight Modes. Freight planners should incorporate into their investment planning the inevitable rise in petroleum products and fuels. This will create a variety of market and social incentives to use rail or water, when appropriate, to move goods and commodities. The fuel prices, as they did on 2007, will make shippers look at truck-competitive services. The difference is that the trend will be upward and persistent, creating opportunities for intermodal service. NAFTA trade flows, in a 2005 study, were predicted to stay strongly truck-centric over the next twenty years. High fuel prices will insure that logistics staff evaluates rail service, such as double stack on key NAFTA highway corridors like I-35, and I-20 where rail service is competitive. JB Hunt has shown that demountable containers can be shipped either on rail or on a trailer chassis and it is highly likely that other companies will offer similar services. It should also be stated that fuel taxes, which

have remained unchanged since 1993 in Texas must at some stage be increased which will add to the upward movement in prices.

3. Monitor the Multiple Container Corridors Serving Texas. The rapid rise in Asian manufacturing in the 1990s, especially in consumer goods, drove up container volumes at southern Californian terminals. These served demand in two markets, California itself and the rest of the nation, excluding the hinterlands of several Atlantic and Gulf ports. The non-Californian trade moves mostly on double stack rail and served cities on the UP and BNSF networks directly while boxes were interlined with the three eastern railroads to deliver to markets in the more populous north east centers, so providing a full trans-continental service. In 2011, boxes entering or leaving Texas come on a variety of non-California rail corridors, including ports in Mexico, the Gulf, Southern Atlantic and even Canada. Californian terminals remain critical pieces of the western railroad strategic planning but they will compete with a variety of rail corridors which will strengthen competition and lower transportation pricing. The distribution of demand across the Class 1 system corridors will benefit Texas and its shippers and should be noted and measured in future statewide transportation planning.

4. Support Public-Private Partnerships on Large Rail Investment Projects. The recent success of the proposed Tower 55 investments in Fort Worth should be the prototype for any further massive rail investment packages that result in transportation efficiency and social benefits. The rail industry cannot be expected to undertake these projects without financial support from beneficiaries. Table 5.2 summarizes key investments where rail will seek partners and it should be recognized that each project may well take over a decade before any part of it is undertaken. What Tower 55 shows, however, is that a basic plan should be put into place and updated at regular intervals and that political champions both at the federal and state levels should be kept appraised of the relevance of the work. The 2008 American Recovery and Reinvestment Act (ARRA) funds and related Federal stimulation programs targeted work that could be undertaken quickly[94], generating economic impacts that created measureable benefits like job creation[95]. While it is uncertain that similar legislation will be forthcoming in the immediate future, it is likely that the economic benefits from rail investment in improving intermodal services, with attendant social benefits, will provide some form of funding for these projects. Plans must be current and compelling, however, if they are to stand a good chance of being selected.

[94] This gave rise to the term "shovel ready" projects, including those that had completed all environmental reviews.
[95] This was subsequently expanded to include job preservation and engineering sector survival.

5. Enable TxDOT Rail Division to Facilitate Improved Freight Planning. The recent Texas State Rail Plan is an important step in moving the importance of rail sector operations from the private domain to a public one where the social benefits of multi-modal operations are explicitly recognized and measured. The growth of urban metropolitan areas, sometimes on a grand scale involving several cities—forming so-called "Mega-regions"—demands that planners take freight issues into their transportation plans. Rail is capable of moving a wide variety of commodities efficiently while meeting stringent air quality standards. Inland ports are already forming the "hubs" of long distance freight flows and the development of cleaner, low or zero emission delivery trucks could herald an era of clean new "hub and spoke" freight delivery systems that fit the needs of growing metropolitan regions. Finally, the state rail Division should provide support for preserving the substantial gains made by Class 1 railroads in the U.S. The Economist magazine recently published a cautionary article pointing out the risks to the "most efficient freight rail system in the world" from proposals to promote high speed rail (HSR) in the U.S[96]. The post-Staggers rail network is now substantially smaller in 2011 and single, bi-directional track comprises over 90 percent of the Texas system. Rail freight trains move at highly regulated speeds within a range that rarely exceeds 70 mph. HSR, for most of the world, means speeds around 300 kph (180 mph) – inconceivable on the current U.S freight system. HSR, to be safe and effective, needs to operate on a defined system, with geometric characteristics which permit safe, efficient and reliable timetables[97]. Moving within metropolitan boundaries may require sharing an expanded freight right of way but sharing actual track between cities is likely to penalize freight while being unable to offer attractive speeds to passengers.

Table 5.2: Key Intermodal PPP Investments

Project	Comments
Houston	Complex and expensive, needing disaggregation into key projects
Laredo-Dallas	Needs to be double-traced with new by-pass loops
Beaumont	New bridge and city by-pass, double-tracked
Tex-Mex Border	Bridges, yards and grade separations into border metro areas
Inland Ports	Critical for Houston, Dallas and possibly El Paso

[96] "High-Speed Railroading. America's system of rail freight is the world's best. High-speed passenger trains could ruin it." http://www.economist.com/node/16636101

[97] In 2003, JR Central reported that the Shinkansen's average arrival time was within six seconds of the scheduled time. http://www.railway-technology.com/projects/shinkansen/

5.3 Summary

This study is the earliest of several related Region 6 UTC sponsored projects addressing freight system components and their potential integration to provide planners with effective policy and planning insights into private sector transportation companies. Work to date includes the development of a rail mechanistic model to enable planners to critically estimate fuel and operating costs for main line Class 1 operations[98], freight and mega-regions[99] and low or zero emission distribution vehicle deliveries in urban areas[100]. This work integrates with earlier work funded by TxDOT on Inland Ports[101] which can be based on Class 1 service, as with the case of Alliance at Fort Worth, or clustered distribution activities of the type proposed by the City of Austin[102].

The work reported strongly supports the enhancement of rail freight service in the U.S in general and Texas in particular. An effective, efficient and balanced multimodal system based on the inclusion of social benefits and costs supports sustainable economic growth. The final recommendation is to link the modal components together in a single cost model which would allow planners to replicate, at the basic level, the operations of logistical departments and companies who manage the supply chains of companies that use the services provided by the various modal providers.

[98] "The Potential for Improving Rail International Intermodal Services in Texas and the Southwest Region of the United States," SWUTC Project 473700-00076.
[99] "Mega-Region Freight Movements: A Case Study of the Texas Triangle," SWUTC Project 476660-00075.
[100] "Hybrid Distribution Trucks: Costs and Benefits," SWUTC Project 476660-00080.
[101] "Incorporating Inland Port Strategies into TxDOT Planning," TxDOT Technical Report 5-4083-01-1, July 2005.
[102] The City has identified land between Bergstrom Airport, SH 71, IH-35 and SH 130 which would be served by trucks.

Appendix A: NAFTA Trade and Texas Rail Service

A.1 Rail Traffic

This Appendix identifies and comments on the key factors affecting the demand for, and transportation of, major NAFTA traffic types on the Texas Class One railroad system. More than 75 percent of NAFTA rail flows between Mexico and the U.S pass through Texas gateways and this is likely to grow with improvements to crossing systems and capacity scheduled for future investment.[103] Recent research undertaken before the economic slowdown[104] concluded that rail capacity would be unable to handle most of the projected growth in NAFTA trade but several factors were held constant which the authors believe will change to enhance rail service.[105] Three major factors supporting the continued growth on rail demand are (a) improved rail networks in both Mexico and the U.S making rail more competitive with trucks, (b) the growth of inland ports in Mexican metropolitan areas serving auto manufacturers and finally (c) multi-year cooperation and investment between U.S. and Mexican rail providers to strengthen efficiency and border gateway security.[106]

NAFTA traffic was broken into autos, grain, chemicals, intermodal, and carload business. The period 2010 to 2035 was split into three smaller periods, starting with one from 2010 to 2015 where investment is broadly known and where current improvement programs are underway or scheduled will be completed by 2015. This is then followed by a decade of growth, stimulated by a gradual economic recovery, the growth of exports and a political recognition that the NAFTA signifies the best hope of all three signatories for economic health and political stability. The final decade to 2035 will contain the date when China displaces the U.S as the largest single country economy—although not bigger than NAFTA. The human resources of Mexico, the natural resources of Canada and the industrial strength of the U.S combine make the region a formidable economic block in the twenty first century global arena.

Table A.1 provides a rating assessment using a simple scoring system for these traffic groups in the three time periods up to 2035. The ratings are: 1 very poor, 2 poor, 3 average, 4 good and 5 very good, and are based on profitability rather than volume though high demand is seen as the precursor to revenue growth that meets cost of capital.

[103] These include a new rail bridge in Laredo, increased capacity at Pedras Negras and a new system removing at-grade crossings in Juarez which will allow 7/24 operations.
[104] Cambridge Systematics NAFTA Traffic Update, undertaken for TxDOT and published in 2006
[105] These factors include the removal of key bottle necks, longer trains, positive train control and double tracking key segments of the state system.
[106] In 2010 all boxes entering the U.S from Mexico are subject to gamma inspection processes.

Table A.1: NAFTA Class One Railroad Ratings 2010 to 2035

Rail Traffic					
	Grains	Chemicals	Intermodal	Carload	Autos
To 2015	3 Weak dollar and growing Mexican population	4 Pre-eminence of Gulf Petro-chemical sector	3 West coast traffic via Mexican pacific ports	3 Shippers stay with cars, rather than boxes	4 US economic recovery stimulates light auto and truck exports
To 2025	3 Increase based on Texas and Mexico population growth	4 Texas locations New plants High demand	5 US demand at highest levels India joins Asia	2 Commodity switch to containers	4 Mexican auto component sector grows
To 2033	3 World competition grows but so does demand in Mexico	4 US and World demand plus US imports	5 Macro-economic factors, diminish US demand, but still high	2 Small segment, new car designs may emerge to improve service	4 Chinese auto manufacturers begin locating key plants in Mexico

A.1.1 Autos

Mexico will remain an important auto and component producer over the period 2010 to 2035 and will use increasing levels of rail service for both imports and exports. Ford is building the highly-acclaimed, new Fiesta model which draws components in and finished autos out, transported by truck to Mexican markets and by tri-level rail services to U.S. destinations. The U.S. auto industry will distribute its production across the nation and will build auto and light trucks that have small profit margins in Mexico. Global out-sourcing might be limited by rising fuel prices and carbon legislation which will encourage production nearer final markets. University of Texas at San Antonio Professor John McCray recalled[107] that the same statement of "everything going abroad" took place in the late 1980s when Japan produced of a wide range of competitive capital goods. While China has a much larger workforce[108] than Japan, wages will rise and Chinese auto companies may move production of some models to Mexico, much as Sony did with TVs to Baja California in the early 1990s. All auto exports to the U.S. will be transported by rail from 2015 onwards.

[107] Personal correspondence May 2010

[108] While this is currently correct, the "one child" policy may create shortages during the period to 2035

A.1.2 Grains

In the first period, demand for grains and the impact of grains on railroad operations are regarded as relatively mature and therefore stable – and this includes Mexican markets. The annual growth levels reached in the 2003-2005 set the basis for this demand which can probably be grown at a modest rate, not exceeding 4% per year. In the period 2015-2025, the demand for grains is likely to increase at a somewhat larger rate due to population growth in both Mexico and Texas and the demand for grain-fed livestock for both the national and international markets. In the period 2020-2035, the world supply of grain may slow demand for U.S. grain to a level that is average to slightly below average growth rate of the previous decade. However, during this period there will be periods of shortages – like the current one for Russian grain – which will drive up demand for rail transportation. Grains will remain an important part of the Class One railroad business and it is expected that grain terminal efficiencies, both at U.S. load centers serving grain production and at export points like deep water ports will continue to support rail business.

A.1.3 Chemicals

In the period to 2015, there is likely to be a higher than average U.S. demand for chemicals transported by rail. Notwithstanding the current concern about chemicals and other hazardous materials moving by train through metropolitan areas the fact remains that the chemical production will largely remain at their current locations, which makes Texas a major rail business focus in the chemical industry for the immediate future. And this is likely to increase in the period to 2020, since some of the new plants proposed by chemical companies are in Texas (new and extensions of existing plants) and demand should therefore remain high, particularly from growing U.S. and Mexican populations. In the period from 2020-2035, this demand should continue due to the traditional distribution of chemicals, particularly in the Gulf region, and importation of chemicals produced at other locations in the world and moved globally into the United States markets through deep water ports, including those in the Gulf. In summary, chemicals will remain a critically important part of the marketing strategies of Class One railroads in Texas; although it is perhaps less relevant than the other traffic groups in the land based NAFTA trade patterns.

A.1.4 Intermodal

Intermodal will continue to be a major element in Class One operations in the period 2010 - 2020, thus rating a high score in terms of business impacts. As other non-Asian countries become stronger members of the global marketplace (especially India) the need for international cargo movements will remain high. In the period 2020 to 2035, the major factor likely to diminish this demand in the U.S. are changes in the macro-economic picture, perhaps resulting in lower per capita disposable incomes. However, within the 25 year period, intermodal is likely to remain a critical transportation system and as such will remain important to profitable rail operations.

A.1.5 Car Load

This is likely to grow at a modest rate given the switch to intermodal in shipping, and particularly containerized traffic. This is reflected in the modest scores for the period to 2035; although it is recognized that car load traffic to Mexico is a significant part of rail operations and is likely to remain so for much of the period under review.

A.2 Factors Driving Rail Share of NAFTA Trade 2010-2035

This section looks at the factors within the three time periods that frame railroad operations as they relate to NAFTA trade flows in the period 2010-2035. These are shown in Table A.2, where the factors are summarized.

Table A.2: Factors Driving Railroad Operations Serving NAFTA Trade 2005-2030

Factors	
To 2015	Demand to offer passenger services Tower 55 improvements Longer sidings, longer trains Positive train controls Re-regulation threats impact rates Improved locomotive engine emissions
To 2025	Core business stronger (See Table 1) Metro by-pass corridors Double track Laredo-Austin New gateway at McAllen El Paso gateway improvements Greater Class One track sharing Houston system improvements
To 2035	Core Business remains strong (See Table 1) Congested rail system at key bottlenecks Super-terminals at Megaregions Improvements to Laredo gateway Asian presence in Mexico drives NAFTA trade

A.2.1 2010 to 2020

In this time period, it is likely that the rail core business becomes even stronger and railways become more profitable with higher levels of revenue to partner with other entities benefiting from improvements to rail systems. It is likely that there will be at least one or two metropolitan by-pass corridors in Texas and it is also possible that UP will double track its Laredo to Austin system. There may also be a new rail gateway of modest proportions at McAllen, which would link east to the UP line on the Gulf. In this period, there should be substantial improvements to the rail gateways at El Paso, which will impact rail operations in the western part of the state. There may also be greater Class One trackage sharing arrangements, which could lead to joint investments in rail lines where there is mutual interest—just as Norfolk Southern did with Kansas City Southern late in 2005. Finally, it is likely that some variant of the Trans-Texas Corridor may start to impact transportation systems in the state and this could include rail, thus increasing rail capacity.

A.2.2 2020 to 2030

Rail core business in the U.S. remains strong, but it is operating over a congested rail network. This does not cause substantial transfers to other modes like trucking, since trucks will also travel over highly congested highways during many hours of the day, even on the rural interstate system. The growth of extremely large Texas metropolitan areas—now termed "Mega-Regions" by many urban planners—suggests that large super-freight terminals may be developed at the edge of these metropolitan areas, where land prices are less expensive than other parts of the metro areas. During this period there is likely to be substantial improvements to the downtown Laredo–Nuevo Laredo gateway across, perhaps including a new bridge with relocation of downtown facilities on both U.S. and Mexican sides. Finally, NAFTA trade levels out as other global markets are developed and its relevance defined by its share of U.S. foreign trade, both imports and exports begins to diminish. However, in addition to the domestic movement of Mexican traffic into the U.S. there may be one or two major Mexican rail corridors handling inbound traffic in the way that traffic is currently carried across Los Angeles/Long Beach to the Texas markets. This would necessitate substantial capital investment but it is likely that within this time period, services will be offered on a scale that will actually begin to make an impact to the Asia-US patterns of trade.