4.0 OKLAHOMA'S INTERMODAL SYSTEM & THE STATE ECONOMY

This chapter provides the connection between the Oklahoma economy and the Intermodal system. It includes a summary of the state economy, stakeholder views of transportation and the state economy, detailed freight flow information, and an identification of the key economic sectors and clusters that rely on the Intermodal system.

4.1 Background Statewide Economic Information

This section summarizes key aspects of the current and projected Oklahoma economy. The data included in this section are not intended to provide a comprehensive economic portrait of Oklahoma, but rather to give a selective portrayal of information most relevant to the identification of intermodal logistics opportunities and challenges, and freight and passenger transportation requirements in general.

4.1.1 Employment

Table 4.1 below portrays Oklahoma employment trends in the aggregate, focusing in particular on major industry groupings that are "transportation intensive" – i.e., sectors for which movement of goods is a significant share of the cost structure of the industries which comprise the sector.

As reported by the US Bureau of Labor Statistics (BLS), total non-farm employment (i.e., "covered employment") in Oklahoma increased 9% between 1995 and 2003. This time period is comprised of two distinct trend patterns: 1) substantial growth between 1995 and 2000, and; 2) post September 11th, 2001 job losses. This trend pattern approximates overall national employment patterns. However, the 2000-2003 job losses in Oklahoma have been somewhat steeper than for the nation as a whole. For the United States, non-farm employment fell 1.4% during the post September 11th period. By contrast, Oklahoma employment fell by 3.7%. Recession-related employment losses in Oklahoma have been concentrated in some transportation-intensive sectors, particularly in manufacturing. Overall, employment losses in goods producing sectors constituted 56% of the total 2000-2003 job losses. There is some indication that Oklahoma is experiencing a more rapid and robust overall economic recovery than the nation: beginning in the third quarter of 2003, state non-farm wage and salary payrolls have expanded 1.7 percent, versus 1.3 percent for the nation.[2]

[2] Oklahoma State University, 2005 Economic Outlook. See http://economy.okstate.edu/oputlook/2005/oklahoma.asp

Table 4.1 Non-Farm Employment in Oklahoma (000s)

Total Non-Farm	1995	1996	1997	1998	1999	2000	2001	2002	2003
	1326	1362	1412	1450	1467	1501	1499	1478	1446
-goods producing	242	245	252	262	263	266	265	245	235
-manufacturing	162	163	169	176	177	178	170	152	143
-warehousing & transportation	44	47	48	50	48	47	47	45	43
- natural resources & mining	30	30	31	30	27	27	29	28	29
-retail trade	159	163	167	172	175	179	175	172	169

Source: US Bureau of Labor Statistics

Farm employment is not reported as part of the standard BLS employment series. However, the Bureau of Economic Analysis (BEA) reports farm employment of approximately 100,000 in 2000, with another 20,000 in agricultural services, forestry, fishing and related activities. Thus, farm and farm-related employment represents about 7.5 percent of combined total farm and non-farm employment in the State.

Although manufacturing employment has fallen over the past several years in Oklahoma, the data suggest that Oklahoma has good potential for stability and possibly even growth in manufacturing, once overall economic recovery is solidified. At the height of the economic peak of 2001, manufacturing employment represented 11.3 percent of total non-farm employment in Oklahoma; nationally, manufacturing employment represented 12 percent of total non-farm employment in 2001. Until the 2001 recession, Oklahoma experienced manufacturing employment increases (1995-2001) of 16,000 jobs, or nearly 10 percent. Nationally, by contrast, manufacturing employment *fell* by 4.6 percent over the same period. As a "right to work" state, Oklahoma may be better able to control labor costs than without such legislation.[3] (Most other states in the region, including Texas, Kansas, and Arkansas, have similar right to work laws, although unionization may be more entrenched in these states than in Oklahoma.)

[3] Okla. Const. art. 23, § 1A. In 2001, Oklahoma became the nation's 22nd Right to Work state after voters approved State Question 695, a constitutional amendment making it illegal for union officials to force workers to join a union or pay any union dues as a condition of employment.

4.1.2 Industry Clusters

While the aggregate data above are revealing of basic trends, a more detailed look at industry groupings and target industry clusters within the Oklahoma economy can provide further insight, and assist in identifying intermodal needs, opportunities and challenges.

Oil and Gas

The traditional economic sectors in Oklahoma have been energy, agriculture, and mining. The energy sector – primarily oil and gas production and related services – represents (together with agriculture) the historical foundation of the Oklahoma economy. Historical "boom periods" in the oil industry, beginning in the 1920s, have historically driven economic growth in Oklahoma. At the same time, because of its "boom and bust" cycle, heavy reliance on oil and gas production has tended to result in a more cyclical economic pattern than might be desired. Petroleum and gas are found in almost every county, but the areas around Tulsa, Seminole, Oklahoma City, Healdton, Kingfisher, and Osage County have the best pools.

Presently, natural gas production has superceded crude oil as the principal fossil fuel industry in Oklahoma. Oklahoma is the second largest producer of natural gas among the fifty states, with an output of 1.7 trillion cubic feet (TCF) in 2002. However, Oklahoma's gas production has fallen from 2.25 TCF in 1990 and Oklahoma's share of the US natural gas market has dropped from more than 11 percent in 1990 to 8.35 percent in 2003.

In terms of future recoverable gas reserves, Oklahoma has two of the top 10 basins in the lower 48 states. The Anadarko Basin (northwestern Oklahoma) with 14.2 trillion cubic feet of potential gas reserves and the Arkoma Basin (southeastern Oklahoma) with 2.5 TCF, represent nearly 9 percent of the total lower 48 reserves. To fully exploit these reserves, Oklahoma will require increased investment in deep drilling below 15,000'. Deep drilling is substantially more expensive than drilling closer to the surface.

As the Oklahoma economy has become more diversified, particularly in the services and financial sectors, oil and gas has become less dominant in the state's economy, thus dampening the "bust" effects which occur when energy prices fall. Currently, natural gas prices have been fairly stable, creating less upward pressure on gas production. Oil prices are currently very high by historical standards, but Oklahoma reserves are expensive to retrieve. Major expansion in the state's oil industry cannot be anticipated.

Oil and gas production places special demands on the transportation system in Oklahoma. Most natural gas and some of the crude oil mined in Oklahoma are transported via pipeline. Numerous oil and gas pipelines cross the state. Many of these are gathering lines run to producing fields; some carry oil and gas to other states. Petroleum, petroleum refining products, and liquefied gases also are transported from Oklahoma by truck, rail and water. In 1998, 1.1 million tons of liquefied gases, coal or petroleum and 1.6 million tons of petroleum refining products were exported by Oklahoma by these modes. Petroleum refining products were shipped from Oklahoma via all three surface modes (51 percent by truck, 36 percent by rail and 13 percent by water).

Transport of drilling equipment to the fields of western and eastern Oklahoma frequently involves oversized loads. These loads may be transported by truck, but special permitting is required, and clearance and other highway restrictions can limit routing choices and reduce speed, thus raising transport costs for this industry. Transport of oversized drilling equipment (and oversized loads in general) by barge, via the inland waterway system is not subject to such restriction, but field locations must be relatively close to the waterway in order to be efficiently served by barge. [4]

Agriculture

Agriculture has also been a pillar of the Oklahoma economy, although boom conditions do not typify this sector as much. Of total agriculture-related employment (both direct and indirect), more than 26 percent (40,000 jobs) are in agricultural processing.[5] Agricultural production and processing comprises 4.5 percent of Gross State Product.[6] Basic agricultural production has increased 38 percent since the mid-1980s, while agricultural processing, which adds value, has increased by over 80 percent since the mid-1980s.

There are approximately 83,000 farms in Oklahoma.[7] While 90 % of these continue to fall within the USDA's definition of small farms,[8] agriculture has shifted focus from independent farming to corporate-based farming, including major increases in high volume, industrialized livestock production.[9] Major agribusiness companies such as Seaboard Farms and Tyson Foods operate extensive hog farming operations, centered around the Oklahoma Panhandle (e.g., in the Guymon area) and in western and parts of central Oklahoma, around Holdenville. In addition to the directly owned and operated agribusiness enterprises, numerous small farms operate under contract with the large agribusiness firms, and may thus be considered virtual extensions of these enterprises. Overall, poultry and hog product production has risen more rapidly than any other commodity within the Oklahoma agricultural economy.

Agricultural output also comprises a major export for the State. In 2002, the State's cash (i.e., non subsidy) farm receipts totaled $3.7 billion, of which $540 million were from foreign export. Oklahoma's top five agricultural exports are wheat, animals and meat, poultry and poultry products, animal feed, and feed grains.[10] Texas County is the largest agricultural producer in the state, measured by value.

Farm products, and food/kindred products, were among the top five commodities shipped to/from/within Oklahoma in 1998, and are projected to remain in the top five as of 2020.

[4] Other oversized loads in Oklahoma currently or will include transport of aircraft components (e.g., wings for the Boeing 7E7 plan, and windmill turbines).
[5] BEA estimates put farm employment at 90,000 in 2000.
[6] US Department of Commerce, Bureau of Economic Analysis, Regional Economic Analysis Division
[7] 2002 Census of Agriculture Oklahoma State Profile, National Agricultural Statistics Service, USDA
[8] The USDA defines a "small farm" as having less than $250,000 in sales per year. USDA, Economic Research Service, "Oklahoma State Fact Sheet", http://www.ers.usda.gov/StateFacts/OK.htm
[9] Nationally, less than 2 percent of all farms account for nearly 40 percent of the value of US farm output. Source: Arthur Capper Cooperative Center, Kansas State University, "Value Added: Opportunities and Strategies", June, 2000.
[10] USDA, Foreign Agricultural Service, "Trade and Agriculture: What's at Stake for Oklahoma". Sept. 2003.

Food/kindred products are projected to become the top commodity shipped to/from/within Oklahoma by value as of 2020. Grain is the largest category of farm products by weight shipped from Oklahoma (4.8 million tons); 90 percent of Oklahoma's grain exports were carried by rail and 10 percent by water. While grain was exported to all domestic regions, the primary destinations were south Texas and the southeastern region of the US.

Value added food processing is an opportunity area where the intermodal transport system will have an important impact on the long term viability of the sector. Value added food processing entails the manufacture of higher value added products from raw agriculture products. Examples include production of ethanol from grain, meat processing and packaging, or manufacture of canola or other edible oils from raw home grown seeds. For some time, most of the value added products from Oklahoma farm produce have been processed outside of the state. While the major livestock agribusiness enterprises, such as Seaboard Farms, now operate vertically integrated operations on site, including meat packing and processing, value added post-processing for much of Oklahoma's agricultural output continues to be done elsewhere. Oklahoma should greatly benefit from the expanded development of a local economy in value added food processing. A switch to higher value added and/or perishable processed foods will necessitate a greater shift toward fast and reliable transport. Increasingly efficient supply chain systems, including efficient truck distribution systems and in some cases even air cargo transport of highly perishable or high cost specialty food items should come more to the fore.

Because of changing demand and deregulation, many rural areas in the United States, especially for those dependent on agriculture, have lost inter-city bus service for individual mobility, and local rural transit systems are limited by funding, thus limiting the availability of employment opportunities.

Minerals Mining

Oklahoma's mining economy (not including oil and gas) has been in decline, but remains important to selected parts of the state. In total, mined minerals account for only about 2,000 jobs in direct mining activities, according to the Bureau of Labor Statistics. Mined minerals include coal, gypsum, granite, limestone, aggregates, crushed stone, cement, sand and gravel, clay, glass sand, salt, feldspar, iodine, lime, pumice, and Tripoli (used as an abrasive). Non-metallic minerals (coal included) constitute the largest commodity group shipped to/from/within Oklahoma by weight (63 million tons in 1998, projected to grow to 83 million tons by 2020), and the largest commodity group shipped by rail.

The coal mining industry in Oklahoma, once fairly robust, is much reduced. Since 1980, coal output has fallen by 50 percent. In fact, while Oklahoma has substantial coal reserves covering much of east central portions of Oklahoma[11], the state is overwhelmingly a net importer of coal, primarily to operate its power plants. Most imported coal is brought in by rail from Wyoming via Colorado.

About 1.6 billion short tons of bituminous coal reserves remain in Oklahoma, which contains the most significant deposits of bituminous coal west of the Mississippi River and east of the Rocky

[11] Coal is located along within the Northeast Oklahoma Shelf and parts of the Arkoma Basin, which covers 19 counties.

Mountains. There is potential for these coal resources to provide a basis for some economic growth and commodity export, and much of this could be moved by rail and via the inland waterway system. However, this would require large capital investments by sophisticated mining companies. Production, regulatory, and market issues affect whether or not most coal reserves will be economical to mine. Moreover, current coal importation in large volumes by rail from efficient out of state mines may be a less costly alternative for the state's power producers than mining and transporting coal within the state.

In addition to coal, minerals or mineral compounds such as limestone, aggregates, crushed stone, sand and gravel, and cement are important in parts of southern Oklahoma – for example, in and around Ardmore and Durant.

Oklahoma exported 2.7 million tons of broken stone and 2.3 million tons of Portland cement in 1998, with north Texas as the primary destination (32 percent of the exports) followed by the Midwestern US. Rail carried nearly 100 percent of the broken stone and 24 percent of the Portland cement; 76 percent of the Portland cement was carried by trucks. Indeed, transport of mined minerals (like agricultural products) is most efficient by rail, provided distances are sufficiently great (e.g., greater than 300-500 miles), and access to rail facilities is good.

However, where rail services are not adequate or distances are relatively short, truck becomes the preferred routing. Among Oklahoma's other major exports by weight were potassium or sodium compounds (1.5 million tons), 77 percent of which was carried by trucks. Thus, where rail cannot be used to transport these materials, truck traffic can become intense. In some locations, such as in southern Oklahoma, heavy truck traffic to transport cement, aggregates, and other mined minerals is cited by local economic development and public officials as a major transportation bottleneck and environmental threat.

Aviation/Aerospace

Beyond the three traditional sectors above, Oklahoma has developed a considerable specialization in a number of key industry clusters. Aviation and aerospace industries now comprise the largest industry cluster in Oklahoma: currently, there are some 500 aerospace companies in the State, which account for 143,000 (direct and indirect) employees. Major industry representatives include Boeing, which has sizeable manufacturing plants in Tulsa and McAlester, and American Airlines, which maintains a large Maintenance, Repair and Overhaul (MRO) facility in Tulsa. The Tulsa Boeing plant employs about 1,000 workers; Boeing announced last November that it would bring 500 more jobs to Tulsa for work on wing components for the company's new 7E7 airplane. Oklahoma City is home to the Federal Aviation Administration Logistics Center, which employs 558 full time employees, and 120 contract employees.

Warehousing and Distribution/Logistic

As of 2003, warehousing and distribution – the principal "logistics" enterprises – comprise 3 percent of the total employment base of the state. The Ardmore and Durant areas have become particularly successful sites for the location of warehousing and distribution facilities, including several major discount retailer chains.

Nearly 100 percent of the transportation of goods to and from warehouse-distribution centers is by truck. An important transportation issue there is the need for improved service to bring employees to the warehousing and distribution work sites which have begun to favor the southern Oklahoma location.

Military

Oklahoma is the home of a number of major military facilities of particular, and in some cases unique, significance to the nation's defense. Several of these are major employment centers not only for military personnel, but also for contractors' employees and the civilian populations in their vicinities.

The largest Air Force and military air defense-related facilities are Tinker Air Force Base and the associated Oklahoma City Air Logistics Center (OC-ALC), which is part of the Tinker command. Tinker employs about 24,000 civilian and military personnel. The OC-ALC is one of five depot repair centers in the Air Force Materiel Command. The center manages an inventory of 2,261 aircraft and nearly 23,000 jet engines, and also provides worldwide logistics support for a variety of weapons systems. In 1999, OC-ALC was awarded the largest engine repair contract in history ($10.2 billion over 15 years).

The numerous Air Force and air defense-related operational units within 350 miles of Tinker AFB (the approximate spatial centroid of the state) include:

- Altus Air Force Base, Altus
- Vance Air Force Base, Enid
- US Air National Guard, Tulsa
- Dyess Air Force Base, Abilene, TX
- Barksdale Air Force Base, Bossier City, LA
- Army and Air Force Exchange Service, Dallas, TX
- Ebbing Air National Guard Base, Fort Smith, AR
- Naval Air Station Joint Reserve Base, Fort Worth, TX
- Whiteman Air Force Base, Johnson County, MO
- Little Rock Air Force Base, Little Rock, AR
- Rosecrans Memorial Airport Air National Guard Station, St. Joseph, MO
- Forbes Field Air National Guard Station, Topeka, KS (and Kansas Air National Guard)
- McConnell Air Force Base, Wichita, KS
- Sheppard Air Force Base, Wichita Falls, TX

Gaming

Gaming comprises a major growth industry within the Native American economy. There are 34 gaming establishments listed by the National Indian Gaming Association in Oklahoma. The largest and most visited of these is the Winstar Casino in Thackerville. Winstar, a growing destination site, is located at I-35, Exit 1, just north of the Texas-Oklahoma border. Other major casinos are located in Catoosa, Tulsa, Norman, and Lawton.

In some areas of the US, such as New Jersey, with heavy concentrations of gaming establishments, public and charter transportation – typically longer distance bus services – are

important to the client base of elderly and lower income patrons. An Amtrak station serving the Winstar Casino has been under discussion, although private financing would probably be required.

Other Clusters

Other Oklahoma Department of Commerce (ODOC) defined industry clusters include:

- wind energy
- weather research and tracking
- biomedical research and technology
- tourism

Some of these sectors are also of interest for this study. Wind energy, for example, is a nascent industry with good growth capacity, particularly in the longer run as petroleum and other fossil fuel prices rise and existing reserves become more expensive to extract. The Edmond-based Oklahoma Municipal Power Authority's (OMPA) wind turbines, at the Oklahoma Wind Energy Center northeast of Woodward, provide power for the OMPA electric grid. Bergey Wind Power, in Norman, is the world's leading supplier of small wind turbines. Oklahoma is rated 8th among the fifty states in wind generating potential.[12] Virtually the entire western half of Oklahoma – i.e., west of I-35 – has the potential for substantial wind generating capacity in the future, with the greatest potential just east of the Panhandle. The rural character of the state also provides a positive factor for development of wind energy resources. Wind energy may have important implications for transportation in Oklahoma, as economical wind turbines will be very large. Some modern wind turbines are 72 meters tall and have rotor blades that are about 25 m long. Future windmills may reach higher than 100 m, and their rotor blades may measure 50 m long. Transport of turbine parts, such as towers and blades, will probably require transport of overweight and oversized loads, an important capacity issue facing the Oklahoma highway network.

4.1.3 The Economic Geography of Oklahoma

Metropolitan Areas

Oklahoma City and Tulsa are the principal metropolitan areas and major economic engines in the State. Both metropolitan areas exhibit diverse economies. Together, Oklahoma City and Tulsa comprise about 63 percent of all employment in the State.

Oklahoma City and Tulsa employment trends, by major transportation consuming sectors, are summarized in Table 4.2 below. While employment trends in these two metropolitan areas reflect statewide employment trends, there are some differences, both overall and on a sector basis. Since 2001, total employment in Oklahoma City fell by 3 percent, slightly less than the statewide decline. By contrast, total employment in Tulsa fell by over 6 percent. At the same time, Oklahoma City lost nearly 27 percent of its *manufacturing* employment since 2001, substantially more than the state as a whole. Manufacturing employment in Tulsa fell by 16

[12] Source: *An Assessment of the Available Windy Land Area and Wind Energy Potential in the Contiguous United States*, Pacific Northwest Laboratory, 1991.

percent, a less severe drop than for the state as a whole. Tulsa's manufacturing sector thus appears to have been – if only marginally – more resistant to the effects of the recession than Oklahoma City.

Overall, goods producing activities comprise a greater share of total employment in Tulsa than in Oklahoma City. More than anything else, this reflects the somewhat more rapid diversification of the Oklahoma City economy, which has increasing concentrations of employment in public sector, health care, and business and financial services. In both metropolitan areas, however, service and financial sectors have taken up much of the slack left behind by the recent losses in manufacturing and other goods producing industries.

Table 4.2 Non-Farm Employment in Major Metropolitan Areas (000s)

Oklahoma City	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Total Non-Farm	476.8	492.1	499.8	515.2	528.7	540.2	547.4	540.1	531.7
-goods producing	72.9	73.9	74.7	77.8	79.5	79.8	77.5	69.2	67.1
-manufacturing	49.0	49.3	49.5	52.1	53.1	51.7	48.0	40.9	38.0
-warehousing & transportation	12.9	14.8	15.0	16.0	14.1	14.2	14.1	13.2	12.5
- natural resources & mining	5.7	5.9	6.4	5.8	5.0	5.7	6.5	6.5	6.9
-retail trade	55.7	57.3	58.1	58.9	61.1	63.1	62.1	61.9	60.8
Tulsa									
Total Non-Farm	349.8	360.6	373.7	391.9	395.1	403.5	406.4	397.3	381.4
-goods producing	73.2	73.9	76.8	81.2	80.2	79.7	79.5	74.4	69.3
-manufacturing	51.4	51.8	54.0	56.6	54.6	54.1	53.6	49.4	45.9
-warehousing & transportation	16.2	17.4	17.8	18.7	18.5	18.6	18.4	18.0	17.2
- natural resources & mining	7.7	7.5	7.6	7.7	7.1	6.4	5.3	4.9	4.2
- retail trade	41.2	42.1	43.3	45.5	46.1	47.3	45.4	44.6	43.1

Source: US Bureau of Labor Statistics

Major individual employers in Oklahoma City include General Motors, Tinker AFB, Will Rogers International Airport, the Federal Aviation Administration Logistics Center (Mike Monroney Center) adjacent to the Will Rogers International Airport, United Parcel, and Dayton Tire. The FAA Logistics Center generates economic activity substantially beyond its permanent employment numbers, as aviation personnel from across the United States are regular visitors to the facility for training and other purposes.

Major Tulsa employers include Boeing, American Airlines (MRO facility), the Port of Catoosa, and Whirlpool. Both cities also have substantial and growing clusters in higher education, health care services, and financial and business services. Tulsa's economy, as noted, is substantially

oriented toward air and aerospace production and management. There are an estimated 300 aviation and aerospace-related enterprises in Tulsa, employing an estimated 8 percent of the workforce.[13]

Other regional metropolitan centers with aggressive and productive economic development programs include Norman, Lawton, Ardmore, Durant, Stillwater, Ardmore, Durant, and Ponca City.

The Rural Economy

Most of Oklahoma's area is rural. The Oklahoma rural economy, as with all Midwestern rural economies, relies on the production of bulk commodities, such as grains and livestock, and in the case of Oklahoma, natural gas and mined minerals. These commodities comprise a natural market for rail services, but sufficient transport distances are required in order for rail to be efficient.

Key production sub-regions within the rural economy include:

- the Panhandle, ("high tech" hog production; wheat and other grain production)
- parts of central Oklahoma, around Holdenville (hog production)
- the Anadarko basin, which covers about 19 counties in Western Oklahoma (natural gas)
- the Arkoma basin of eastern and southeastern Oklahoma (natural gas)
- Arkoma basin and northeast Oklahoma Shelf (coal)
- southern Oklahoma (mined minerals, aggregates, etc, cement products)
- southern Oklahoma, especially the Ada area (Portland cement)
- south central Oklahoma - Arbuckle Mountain area; Tulsa area (aggregate mines)
- southeast Oklahoma (timber and wood products)
- north central Oklahoma (wind turbines)
- central and western Oklahoma (wheat and other grains)

As also noted earlier, many rural areas in the United States, especially for those dependent on agriculture, have lost inter-city bus service for personal mobility, and commercial trucking has become the dominant form of freight movement. Oklahoma has done a good job of maintaining its rural freight rail systems, having acquired some 900 miles of track, mainly for short line rail services. However, short line railroads operate on very limited margins, which preclude capital investment. Thus, where state funding for the short line railroads is limited, service and maintenance will be constrained. Oklahoma's rural transit program and its Indian roads program have been well conceived, but here again, they are constrained by lack of funds.

Oklahoma's rural areas, in fact, present opportunities for creative economic development. Due to the lack of congestion and low population densities, intermodal hubs that are *not* dependent on close proximity to populated areas (e.g., air cargo distribution facilities) can thrive in rural areas, where noise, road, and airspace congestion are not issues.

Economic Development Corridors

To a great degree, economic development occurs within particular corridors which are defined by the major transportation facility or facilities within the corridor. For Oklahoma, as in most

[13] Estimated by the Aerospace Alliance of Tulsa: http://www.aerospacealllianceoftulsa.com

states, the economic development corridors follow interstates or other NHS routes, either through or circumferentially around the metropolitan areas.

Section 4.3 describes major freight flows in Oklahoma: the commodities shipped, origins and destinations, and the transportation modes employed. In identifying promising niche markets and sectors and logistics hub opportunities, it is valuable to think in terms of the major economic corridors in Oklahoma as well as the transportation facilities that serve them.

In some respects, of course, these economic corridors are defined by the key transportation facilities. Thus, I-35, the major north-south highway route, is a key component of a major economic corridor that serves both Oklahoma's principal domestic exports, but also its existing and potential international markets as a major NAFTA corridor. Through its connections to other Interstate, US and state highways, I-35 provides connectivity to and serves a large portion of the state and many local economies throughout the state are dependent on it.

In terms of domestic markets, and imports vital to Oklahoma's producers and consumers, the north-south corridor through the state also includes two major rail facilities (the BNSF and UP rail lines between Wichita and Kansas City on the north and Fort Worth/Dallas on the south) and other highways (US 81 and US 69, and, to a lesser extent, the Cimarron and Indian Nations Turnpikes).

Major east-west freight flows are concentrated in an economic corridor centering on I-40, serving Oklahoma-Texas (and the southwestern US), providing connectivity to the west and Oklahoma-Arkansas (and the southeastern US-to the east). The eastern-southeastern portion of this economic corridor is also served by the McClellan-Kerr Arkansas River Navigation System, and, to a lesser extent, the Kansas City Southern railroad line from Kansas City to Louisiana and US 412. The central portion of this east-west corridor is a significant component of intrastate freight movement in Oklahoma, among six central Oklahoma counties and connecting with freight flows in the I-44 corridor to/from Tulsa.

That diagonal economic corridor across Oklahoma, served by I-44, accommodates major intrastate freight flows in the Tulsa and Oklahoma City areas and between those two major metropolitan areas, as well as, to a lesser extent, to/from the Lawton area, but also is Oklahoma's major economic link to the metropolitan areas of Missouri and northeast to the Great Lakes and beyond. Other transportation facilities in that corridor include the aforementioned rail lines to/from Kansas City, the BNSF line from St. Louis to Fort Worth, and US 69 connecting from Texas and eastern Oklahoma to/from I-44.

The other major economic corridor located at least partially within Oklahoma is the nationally important freight corridor that cuts diagonally across the northwestern part of the state. The Chicago to California intermodal rail freight line through Woods, Woodward and Ellis counties, serves not only the domestic economy, but provides a major link for the Midwest and western US through the ports of Los Angeles and Long Beach with Asia. US 54 through the Oklahoma panhandle parallels the rail route to the west; although not as extensive or important nationally, it does connect to Kansas, Missouri and Illinois to the northeast and to Texas and Juarez, Mexico on the southwest.

4.1.4 Costs of Doing Business in Oklahoma

Oklahoma's low cost and tax structure represents an important comparative advantage for maintaining and attracting new business. While other Oklahoma factors, such as density of population and size and complexity of markets are not optimal, low business costs are important, and have been successfully exploited by Oklahoma's public and economic development officials. Recently, Economy.com, a major internet economic forecasting and analysis service, ranked Oklahoma as the third least expensive state in the nation to do business. Within that overall ranking, Economy.com finds that the labor cost index for Oklahoma is fourth lowest in the nation; Oklahoma's tax structure is also low compared with other states. While not a state levy, Oklahoma's property taxes tend to be low, especially compared with neighboring states such as Texas. This is important in particular for the warehousing and distribution sector, which requires large expanses of building and parking area to conduct operations.

4.1.5 Future Economic Trends for Oklahoma and Surrounding Area

Recent rates of population and employment growth for Oklahoma have been trending upward at moderate rates, and it is reasonable to anticipate similar growth rates to continue into the foreseeable future. The Oklahoma Department of Commerce has forecast that the state's population will increase by 17.2 percent between 2005 and 2030 – or less than one percent per year.

In fact, Oklahoma may be said to be an edge state, with some of the growth characteristics of rural states of the middle and upper Midwest and Central Plains regions – but also sharing some of the urban growth dynamics of the South and Southwest.

Oklahoma's demographic and employment trends are placed in the national and regional context in Table 4.3. The table compares population and employment growth rates in Oklahoma with the U.S., as a whole, and with surrounding states – Texas, Kansas, Nebraska, Arkansas, and New Mexico.

As seen in the table, Oklahoma's population has grown at a somewhat slower pace than the US as a whole. Oklahoma's neighboring states of Texas and New Mexico, by contrast, have grown far more rapidly than Oklahoma or the US. Oklahoma's neighbors to the north and east have exhibited growth patterns similar to, or even slightly lower than Oklahoma. These states – i.e., Arkansas, Kansas, and Nebraska, reflect a similar demographic dynamic – small and gradual declines in rural population, tempered by relatively rapid growth rates in the major metropolitan areas. Employment growth patterns are similar – Texas and New Mexico have exhibited the high growth dynamic characteristic of these rapidly developing and urbanizing areas. By contrast, Oklahoma shares the slower employment growth patterns more characteristic of its rural Midwest neighbors to the north and east.

Table 4.3 Oklahoma Population and Employment Trends vs. National and Regional Trends (000s)

	Population 1990	Population estimate 2003	% Change, Population	Employment 1995 (nonfarm)	Employment 2003 (nonfarm)	% Change, Employment
Oklahoma	3,144	3,512	11.7	1,334	1,444	8.2
United States	248,980	290,810	16.8	118,210	130,035	10.0
Texas	16,975	22,119	30.3	8,142	9,379	15.2
Kansas	2,479	2,724	9.9	1,213	1,314	8.3
Nebraska	1,579	1,739	10.1	825	903	9.5
Arkansas	2,350	2,726	16.0	1,080	1,146	6.1
New Mexico	1,515	1,875	23.8	687	782	13.8

More specific trends that are likely to define Oklahoma's economic and demographic future include the following:

- Population – Slow to moderate population growth, fueled primarily by foreign immigration, most notably immigrants of Hispanic origin.
- Rural population – decreasing overall population and reductions in land under cultivation, with the exception of areas such as the Panhandle, where agribusiness activity will increase
- Continued geographic expansion of the major metropolitan areas, with substantial or most growth occurring in the periphery – e.g., Moore, Norman.
- Steady growth in employment and output in services, retailing, FIRE, education, and health care, concentrated in the two principal metropolitan areas.
- Zero or small growth in manufacturing overall, but with some sectors experiencing strong growth due to low cost structure and other comparative advantages; growth clusters include aerospace industries, value added food production, fabricated metals, and possibly automotive related manufacturing.
- Warehousing and distribution – growth as NAFTA trade increases and Oklahoma exploits its locational advantages.
- Agriculture – continued growth in agribusiness farming, some reduction in family-owned farming, increased export demand for livestock products and grain; agricultural sector threats from foreign imports, especially due to the weak dollar and free trade agreements. Some trade agreements, such as the Uruguay Round agreements, may lower foreign trade barriers and increase demand for agricultural exports.
- Fossil fuel production – slow to moderate long term growth in natural gas production, with little or negative growth in oil production. Little likely increase in coal mining. Natural gas production to slow somewhat, as the cost of extracting reserves become more costly relative to world supplies.

4.2 Stakeholder Views of the State Transportation/Economic Relationship

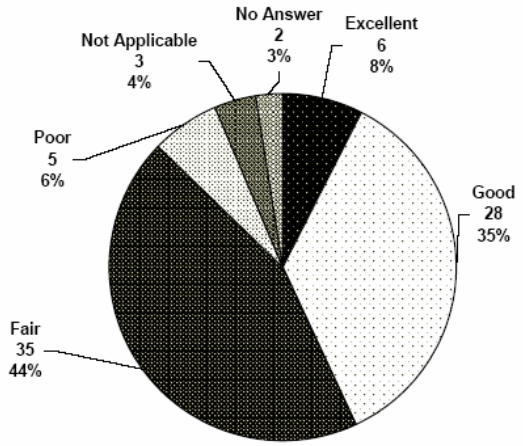
A series of five questions were asked of the mailed survey recipients about the relationship of the State transportation system and the economy. The questions dealt with the efficiency of the transportation system, how well the system supports the economy, how well the system supports the local area/economy of the respondent, what's the best transportation investment to grow the economy and which of five transportation modes best support the current economy and future economic development. A summary of those responses is provided below.

The efficiency of area/regional transportation systems (see Chart for survey question 5) was ranked Fair (44 percent) to Good (35 percent); that total of 79 percent is somewhat below the efficiency rating for the state transportation system as discussed in Chapter 2.

Respondents to survey question 6 said that the state transportation system did a Fair (41 percent) to Good (44 percent) job of supporting Oklahoma's economy (see Chart for survey question 6). In addition, 73 percent of respondents said that local/regional transportation systems did a Fair (35 percent) to Good (38 percent) job of supporting local/regional economies (see Chart for survey question 7). As to what type of transportation investment would best and most efficiently grow the state economy (see Chart for survey question 8), respondents to this question (22 of those surveyed did not respond to this question) were almost evenly divided in their choices between Moving Cargo (35 percent) and Moving People and Passengers (37 percent).

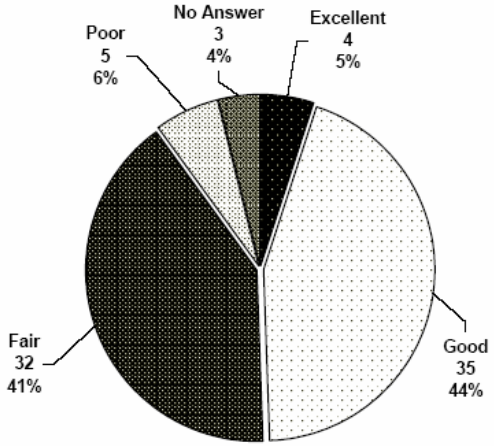
5 - How would you rate the efficiency of the transportation system serving your area/region?

Excellent	6
Good	28
Fair	35
Poor	5
Not Applicable	3
No Answer	2



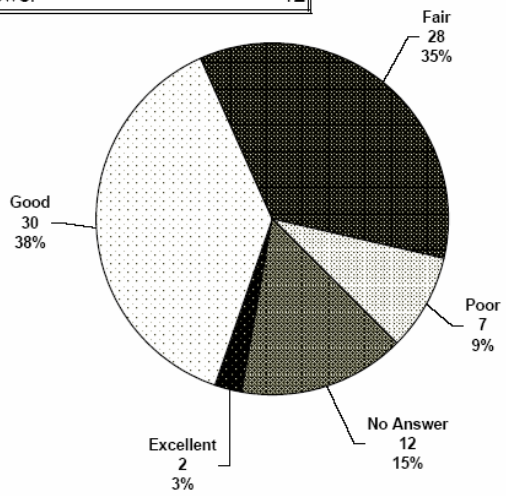
6 - How well does Oklahoma's transportation system support its economy?

Excellent	4
Good	35
Fair	32
Poor	5
No Answer	3



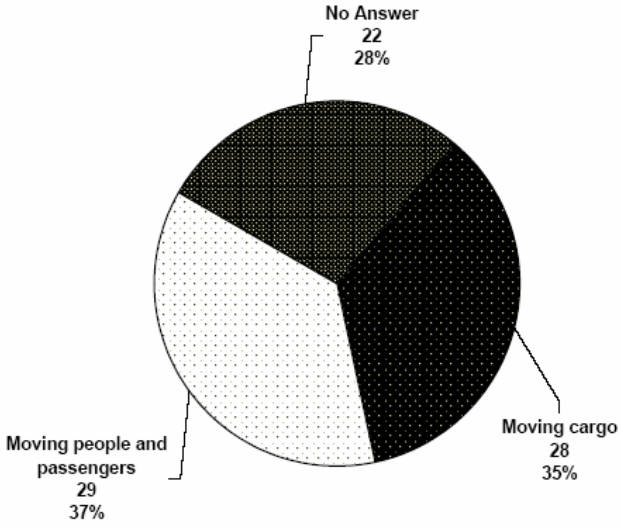
7 - How well does the transportation system serving your area support the local/regional economy?

Excellent	2
Good	30
Fair	28
Poor	7
No Answer	12



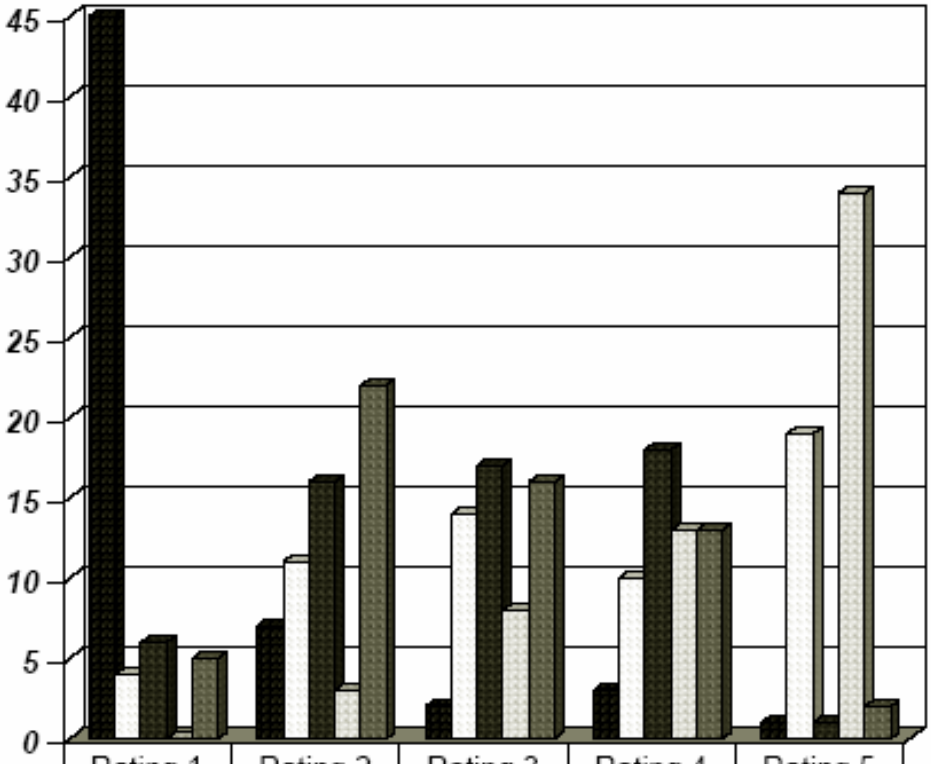
8 - In order to best grow the economy of Oklahoma, which type of transportation investment do you think will give the greatest "bang for the buck"?

Moving cargo	28
Moving people and passengers	29
No Answer	22



Lastly, question 9 asked those surveyed to rank five transportation modes in order of importance to Oklahoma's economy and its future economic development (see the two question 9 bar charts below). A total of 58 survey recipients responded to this question and Highways were ranked the most important type of transportation mode for Oklahoma's economy and future economic development, receiving the highest or "most important" vote by 78 percent of respondents. 90 percent of respondents ranked highways as either "most important" or "second most important" of the five modes. Airports were voted "second most important" by 38 percent of respondents Freight railroads were ranked as "third most important" to the state's economy and future economic development, with a total of 29 percent. The first chart below shows the distribution of votes by rating for each transportation mode and then an overall summary of these results are shown in the second chart with weighted ratings totaled. The weighted results reflect what transportation modes are seen as most vital to the state's economy and growth, and ranks these modes in order of importance to those surveyed.

9 - Please rank each of the following types of transportation with regard to the importance you believe each has on Oklahoma's economy and its future economic development. Please give a 1 to the type that is most important, 2 the second most importance, and so on until you have ranked all five types.

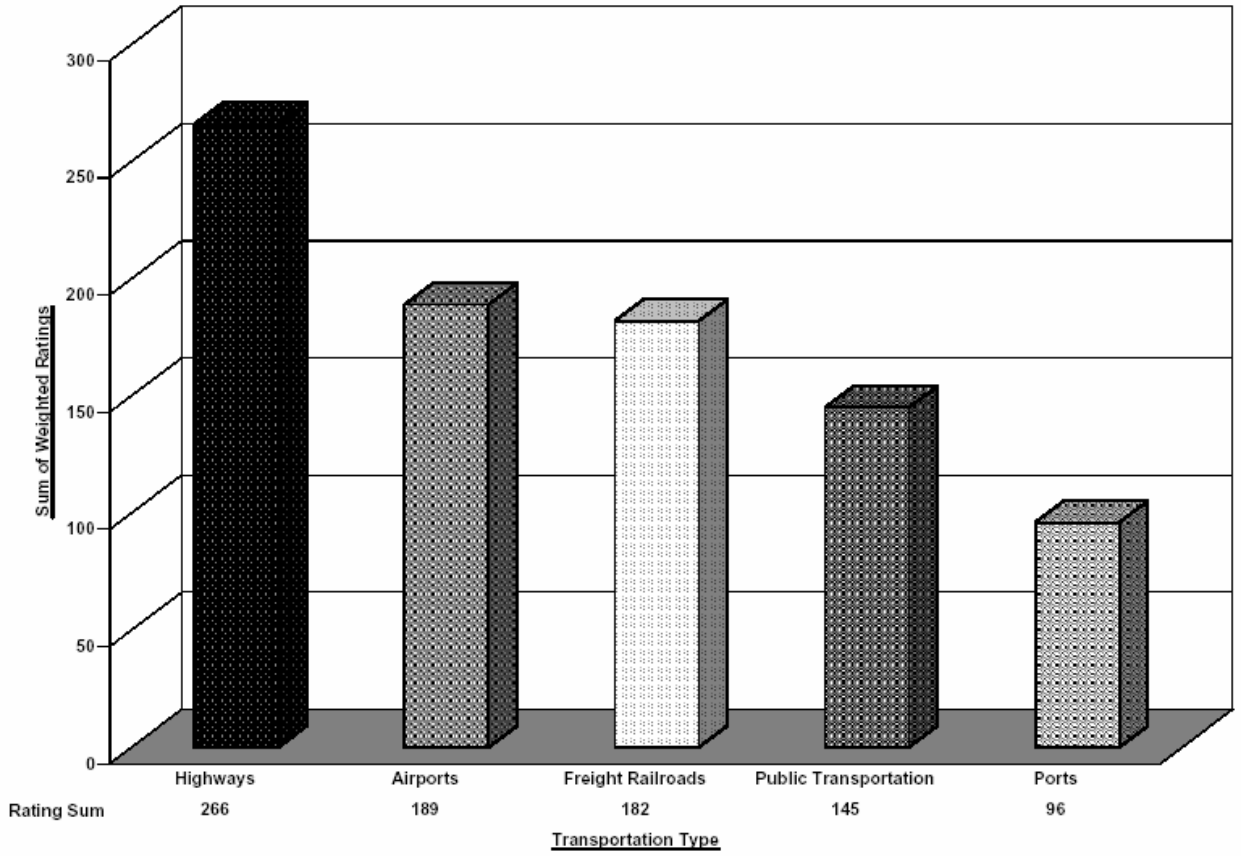


	Rating 1	Rating 2	Rating 3	Rating 4	Rating 5
Highways	45	7	2	3	1
Public Transportation	4	11	14	10	19
Freight Railroads	6	16	17	18	1
Ports	0	3	8	13	34
Airports	5	22	16	13	2

Note: No answers were given for question #9 on 21 of the returned surveys.

Total ratings (1-5) by mode all equal 58. Percent comparisons are based on that total.

9 - Please rank each of the following types of transportation with regard to the importance you believe each has on Oklahoma's economy and its future economic development. Please give a 1 to the type that is most important, 2 the second most importance, and so on until you have ranked all five types.



Note: To calculate the sum of ratings for each transportation type, ratings were weighted by a multiple between 1 and 5 (5 for ratings of #1, 4 for ratings of #2 and 1 for ratings of #5, etc). The totals were then added together to equal the "Rating Sum".

4.3 Freight Flows

Commodity flow information can provide insight into the logistics possibilities and intermodal requirements for Oklahoma. This section updates freight flows information compiled as part of the 2000 Intermodal Element Study. Freight flows data are not well organized at the national level, and thus considerable time and effort must be made to collect the most current information – generally from private sector data services. For this section, we have relied on newly published and readily available data at the federal level, supplemented by freight flows data collected in 2000. It is unlikely that the overall freight flows patterns have changed significantly since 2000. However, unlike the 2000 Report, this section seeks to assess the implications of freight flows for the Oklahoma economy and its future intermodal investment options. It also is used to help generate new ideas with respect to logistics opportunities.

4.3.1 Top Commodities Shipped to/from/within Oklahoma

Commodities[14] shipments can be assessed in terms of weight and/or dollar value. Table 4.4 shows the top five commodity groups by weight and value in 1998[15] and projected for 2020.

Non-metallic minerals were by far the largest commodity group by weight (63 tons) shipped to/from/within Oklahoma in 1998, and are projected to remain so in 2020 (83 tons). Farm products (28 million tons in 1998; projected to be 34 million tons in 2020), food and kindred products (22 million tons in 1998; projected to be 50 million tons in 2020), coal (19 million tons in 1998; projected to be 21 million tons in 2020) and chemicals and allied products (16 million tons in 1998; projected to be 29 million tons in 2020) round out the top five commodity groups by weight.

Not only are food and kindred products projected to becoming the second largest commodity group by weight in 2020, they are projected to become the top commodity group by value, growing from $21 billion in 1998 to $78 billion in 2020. Although non-metallic minerals and coal constitute a large share of shipments by weight, they slip completely off the chart of top commodities by dollar value.

Conversely, secondary/warehouse-distribution traffic and transportation equipment, although not large in terms of tonnage, are high in terms of value. Secondary traffic is defined as freight flows to and from distribution centers or through intermodal facilities. No commodities are assigned to this intermediate step in the transportation process. Secondary traffic shipments were valued at $16 billion in 1998 and projected to grow to $69 billion in 2020. Transportation equipment shipments were valued at $26 billion in 1998, projected to grow to $50 billion in 2020.

[14] Different data sources use different industrial and commodity classification codes; as a result some commodities may appear with somewhat different names in the descriptions and tables that follow, or, in rare cases, may appear in some sources and disappear in others.

[15] Rail data are available on an annual basis through 2002; however, the most recent comprehensive and comparable data for trucks/highways are from 1998. Therefore, for consistency, 1998 is currently the standard year for "current" freight data. [An economic/truck census was taken in 2002; data from that source are expected to become available beginning in 2005.]

Table 4.4 Top Commodities Shipped To/From/Within Oklahoma

Commodity	Tons (millions)		Commodity	Value (billions $)	
	1998	2020		1998	2020
Nonmetallic Minerals	63	83	Transportation Equipment	26	50
Farm Products	28	34	Food/Kindred Products	21	78
Food/Kindred Products	22	50	Chemical/Allied Products	17	50
Coal	19	21	Secondary Traffic	16	69
Chemicals/Allied Products	16	29	Farm Products	10	16

Source: "State Profile – Oklahoma," Office of Freight Management and Operations, Federal Highway Administration, http://ops.fhwa.dot.gov/freight/freight_analysis/, 9/29/04[16]

The other top five commodities by dollar value include chemicals and allied products (valued at $17 billion in 1998, projected to reach $50 billion in 2020) and farm products (worth $10 billion in 1998 and projected to be worth $16 billion in 2020).

4.3.2 Transportation Modes and Markets by Weight and Value

Table 4.5 shows the key transportation systems involved in moving freight to, from and within Oklahoma and the distribution by domestic or international destination.

In the 22 years between 1998 and 2020, freight tonnage is projected to increase by 67 percent, but value will increase by 202 percent.

In 1998, trucks carried 78 percent of all freight tonnage (87 percent of value); by 2020 truck freight is projected to grow by 73 percent, grow slightly as a share of all freight tonnage (80 percent), and increase in value by 200 percent -- but to decline slightly in share of total value (86 percent).

Rail freight, projected to grow by 45 percent between 1998 and 2020, already grew 26 percent from 1998 to 2001.[17] Rail freight is projected to increase in value by 136 percent between 1998 and 2020. However, as with truck freight, rail freight is projected to decline as a share of total value, from 8 percent to 6 percent.

The increase in share of total value (replacing the declining shares of truck and rail) will be in air cargo – projected to increase in 2020 by 328 percent over 1998 value – representing an increase in air cargo's share of total value from 5 percent to 7 percent.

[16] USDOT's Freight Analysis Framework (FAF) information on freight flows is based on freight transportation data from both public and private sources, notably the 1993 Commodity Flow Survey (CFS), a public data set, and Reebie Associates' proprietary Transearch data set. Because of data gaps, some of the FAF freight flows were synthesized by using models. The FAF describes domestic and international freight movements within the United States, by commodity and mode, on a network of FAF transportation facilities for 1998 (base case), 2010, and 2020. The FAF projections of commodity volume and value are based on proprietary economic forecasts developed by DRI-WEFA, Inc. (now Global Insight, Inc.).

[17] Rail waybill data 1998-2002 to/from Oklahoma

During the same 22 year period, international shipments will more than double, and increase in value by 300 percent, but still represent less than 5 percent of total value.

Table 4.5 Freight Tons and Value by Mode and Market

State Total	Tons (millions)			Value (billions $)		
	1998	2010	2020	1998	2010	2020
	219	304	367	140	263	424
By Mode						
Air	<1	<1	<1	7	17	30
Highway	171	241	296	122	228	366
Other*	<1	<1	<1	<1	<1	<1
Rail	44	56	64	11	18	26
Water	4	6	7	<1	1	2
By Destination/Market						
Domestic	210	290	348	135	252	403
International	9	14	19	5	11	20

Source: FHWA Office of Freight Management and Operations
* e.g., pipeline

4.3.3 What Oklahoma Produces and Sends Out Into the World

Some 75 million tons of goods originated in the three Business Economic Areas (BEA's) that are primarily located within Oklahoma and cover most of the state – Western Oklahoma BEA, Oklahoma City BEA (including Lawton), and Tulsa BEA – in 1998. Manufacturing employment in Oklahoma (approximately 10 percent of total jobs in the state) is concentrated in Oklahoma City (Oklahoma, Canadian and Cleveland counties) and Tulsa (Rogers, Tulsa and Creek counties).

Approximately 45 percent of the goods originating in the three BEA's was destined within or among the three BEA's, and 55 percent was "exported" to domestic markets outside Oklahoma.

Oklahoma's primary exports included:

- Grain – 4.8 million tons
- Warehouse and Distribution Center – 3.3 million tons[18]
- Soybean Oil or Products – 2.7 million tons
- Broken Stone – 2.7 million tons
- Portland Cement – 2.3 million tons
- Petroleum Refining Products – 1.6 million tons
- Miscellaneous Industrial Organic Chemicals – 1.5 million tons
- Potassium or Sodium Compound – 1.5 million tons
- Liquefied Gases, Coal or Petroleum – 1.1 million tons
- Miscellaneous Waste/Scrap – 0.8 million tons

[18] As noted in section 3.2.1, no commodities are assigned to freight flows to and from this intermediate step in the transportation process

- Minerals: helium, gypsum, zinc, copper, silver
- Meat Packing
- Food Processing
- Machinery Manufacturing (construction, oil equipment)

4.3.4 Who are Oklahoma's Customers?

Some 40.9 million tons of freight were shipped to US domestic markets from Oklahoma in 1998. The distribution of that freight by the six largest regions was as follows:

South Texas –9.3 million tons (grain 35 percent, warehouse and distribution center 11 percent, soybean oil or by-products 8 percent)

North Texas –7.7 million tons (broken stone 32 percent, Portland cement 10 percent, warehouse and distribution center 8 percent)

Northeast –6.9 million tons (soybean oil or by-products 10 percent, warehouse and distribution center 8 percent, Portland cement 7 percent)

Southeast –6.0 million tons (grain 13 percent, soybean oil or by-products 8 percent, miscellaneous waste or scrap 6 percent)

North (Midwest US) –6.0 million tons (Portland cement 13 percent, warehouse and distribution center 8 percent, miscellaneous industrial organic chemicals 8 percent)

Northwest –1.7 million tons (industrial organic chemicals 8 percent, potassium and sodium compounds 7 percent, industrial inorganic chemicals 6 percent)

4.3.5 Transportation Systems that Carry Oklahoma's Exports

Trucks: Transport 100 percent of the shipments to warehouse-distribution centers, 96 percent of liquefied gases, coal or petroleum, 89 percent of soybean oil/products, 86 percent of miscellaneous industrial organic chemicals, 77 percent of potassium/sodium compounds, 76 percent of Portland cement, and 51 percent of petroleum refining products. Table 4.6 shows the amount of freight carried by truck from Oklahoma's three primary BEAs to the Dallas/Fort Worth BEA (North Texas) and each US region.

Rail: Transports 100 percent of broken stone, 90 percent of grain, 36 percent of petroleum refining products, 24 percent of Portland cement, 23 percent of potassium or sodium compound, 14 percent of miscellaneous industrial organic chemicals, 11 percent of soybean oil or products, and 4 percent of liquefied gases, coal or petroleum.

Water: Used to transport 99 percent of miscellaneous waste/scrap, 13 percent of petroleum refining products, 10 percent of grain, and less than 1 percent of liquefied gases, coal or petroleum.

Air: Used to transport less than 1 percent each of miscellaneous industrial organic chemicals, and potassium or sodium compounds.

Table 4.6 Outbound Oklahoma Truck Freight

Tons									
Origin BEA	**To Dallas-Fort Worth BEA**	**To South Texas Region**	**To West Texas Region**	**To South-west Region***	**To North-west Region**	**To North Region**	**To North-east Region**	**To South-east Region**	**From Oklahoma to All Regions**
Tulsa	2,293,923	1,889,302	351,031	663,922	651,313	2,486,800	2,703,976	1,590,292	12,630,559
Oklahoma City	1,781,311	2,930,805	394,108	588,447	418,373	1,654,368	2,396,035	1,669,743	11,833,190
Western Oklahoma	70,254	173,528	89,452	87,998	94,860	248,078	116,485	151,204	1,031,859
Total	4,145,488	4,993,635	834,591	1,340,367	1,164,546	4,389,246	5,216,496	3,411,239	25,495,608

Source: TRANSEARCH DATABASE, from Reebee Assoc. 1998
*excluding West Texas

4.3.6 Imports to Serve Oklahoma's Industries and Consumers

Some 58 million tons of freight terminated in Oklahoma in 1998. Thus, Oklahoma imported considerably more than it exported (40.9 million tons). [In some cases, Oklahoma imported some of the same general category of commodities that it exported. This may primarily be attributable to general commodity classifications used in the data sources, which do not distinguish at this level between, for example, the type of petroleum refining products that Oklahoma exports versus the petroleum refining products that it imports. However, it may also be attributable in part to markets and distribution patterns to/from/within different portions of the state.]

Commodities of at least 1.0 million tons imported included:

- Coal – 16.0 million tons
- Warehouse and Distribution Center – 5.8 million tons
- Petroleum Refining Products – 1.7 million tons
- Prepared or Canned Feed – 1.6 million tons
- Liquefied Gases, Coal or Petroleum – 1.5 million tons
- Grain – 1.4 million tons
- Flour or other Grain Mill Products – 1.1 million tons
- Broken Stone – 1.0 million tons
- Plastic Matter or Synthetic Fibers – 1.0 million tons

4.3.7 Where the Domestic Imports Come From

When compared with the export distribution described in section 4.3.3, it is evident that Oklahoma's trade balance with other US regions is considerably skewed by direction. Thus, Oklahoma tends to export primarily to the south – to North Texas and South Texas – and import primarily from the northwest, southeast, and north/northeast.

Much of the freight imported from the northwest is one commodity from one location: coal from Wyoming's Powder River Basin.

The domestic sources of freight flows by the six largest regions of the US are shown below:

Northwest – 15.5 million tons (coal 83 percent, potassium and sodium compounds, nut or vegetable oils 2 percent each)

Southeast –12.5 million tons (warehouse & distribution center 17 percent, broken stone 8 percent, fertilizer 7 percent)

North (Midwest US) – 11.7 million tons (coal 24 percent, warehouse and distribution center 12 percent, flour 7 percent)

Northeast – 9.0 million tons (warehouse and distribution center 11 percent, grain 7 percent, electrometallurgical products 5 percent)

South Texas – 4.5 million tons (liquefied gases, coal or petroleum, petroleum refining products 15 percent each, warehouse and distribution center 12 percent)

North Texas – 3.2 million tons (prepared or canned feed 18 percent, warehouse and distribution center 16 percent, soybean oil or by-products 8 percent)

4.3.8 Transportation Systems that Carry Freight Destined for Oklahoma

As with exports, the modes used to transport freight to Oklahoma are stratified to a considerable extent by the type of commodity carried.

Trucks: Transport 100 percent of freight from warehouse and distribution centers, 99 percent of prepared or canned feed, 96 percent of liquefied gases, coal or petroleum, 72 percent of petroleum refining products, 57 percent of flour or other grain mill products, and 50 percent of plastic matter or synthetic fibers.

Rail: Transports 100 percent of coal (89 percent of imports from the Northwest are by rail), 99 percent of broken stone, 96 percent of grain, 50 percent of plastic matter or synthetic fibers, 43 percent of flour or other grain mill products, 22 percent of petroleum refining products, and 4 percent of liquefied gases, coal or petroleum.

Water: Used to transport 6 percent of petroleum refining products and 4 percent of grain.

4.3.9 Freight Movement Through Oklahoma

Some 450 million tons of freight move through Oklahoma - 4.5 times as much freight as that which originates in or is destined for Oklahoma. A majority of freight flows (57 percent) move in a general north-south direction (as opposed to east-west). About 32 percent of truck traffic on USDOT's Freight Analysis Framework road network involved trucks traveling across the State of Oklahoma to other markets.

Through freight movement by mode was predominantly by:

- **Rail:** coal 25 percent, grain and mixed freight (FAK: Freight All Kinds) shipments 9 percent each, plastic matter or synthetic fibers and broken stone 7 percent each.
- **Truck:** warehouse and distribution goods 5 percent, potassium or sodium compounds, miscellaneous agricultural chemicals, liquefied gases, coal or petroleum, flour or other grain mill products 3 percent each.

4.3.10 Intrastate Freight Flows

Some 34 million tons of freight moves between or within Oklahoma's BEAs, 93 percent of that by truck. Intrastate freight flows between the major BEA's are comprised of the following:

- 9.8 million tons within the Oklahoma City BEA
- 8.1 million tons from the Oklahoma City BEA to the Tulsa BEA
- 7.6 million tons from the Tulsa BEA to the Oklahoma City BEA
- 6.9 million tons within the Tulsa BEA

4.3.11 Freight Flows to/from/within Oklahoma by Rail and Truck

Figure 4.1 shows freight flows (by weight, in tons) by rail to, from and within Oklahoma. While there is some distribution throughout the country, particularly to Iowa, Illinois, Indiana and Ohio and through the southeast, freight movement by rail is quite concentrated to/from areas near to Oklahoma. Except for the major coal movement from the Powder River Basin, large freight movement to/from Oklahoma is predominantly north-south and largely confined to/from eastern Kansas, the southeastern tip of Nebraska and Kansas City to the north and Dallas to the south. However, were this figure to include through rail traffic, at least one more major rail line would be prominent (see section 4.3.12).

Figure 4.2 shows freight flows by truck to, from, and within Oklahoma. While the distribution is far more extensive, and particularly so throughout Texas, Kansas and the eastern half of the country, major truck flows are still pretty concentrated in the immediate vicinity of Oklahoma – to/from southern Kansas, through Missouri to Illinois, through Arkansas and northern Mississippi, and through eastern Texas (north-south) to Houston. Figure 4.2 also shows state-to-state flows to/from Oklahoma by weight. Major trading partners with Oklahoma are Texas and Kansas. The second tier of trade partners includes Missouri, Arkansas and Georgia. Other measurable freight flows by truck are to/from Louisiana, Alabama, Illinois, Indiana, Michigan, Ohio, Nebraska and California.

Figure 4.3 shows the combined (international plus domestic) freight flows to, from, and within Oklahoma. With the addition of the international routes, major corridors or extensions of domestic corridors are evident to/from Canada through Illinois and Ohio, to/from Mexico through central Texas, and to/from Asia through the ports in Southern California.

Figure 4.1 Rail Flows To/From/Within Oklahoma

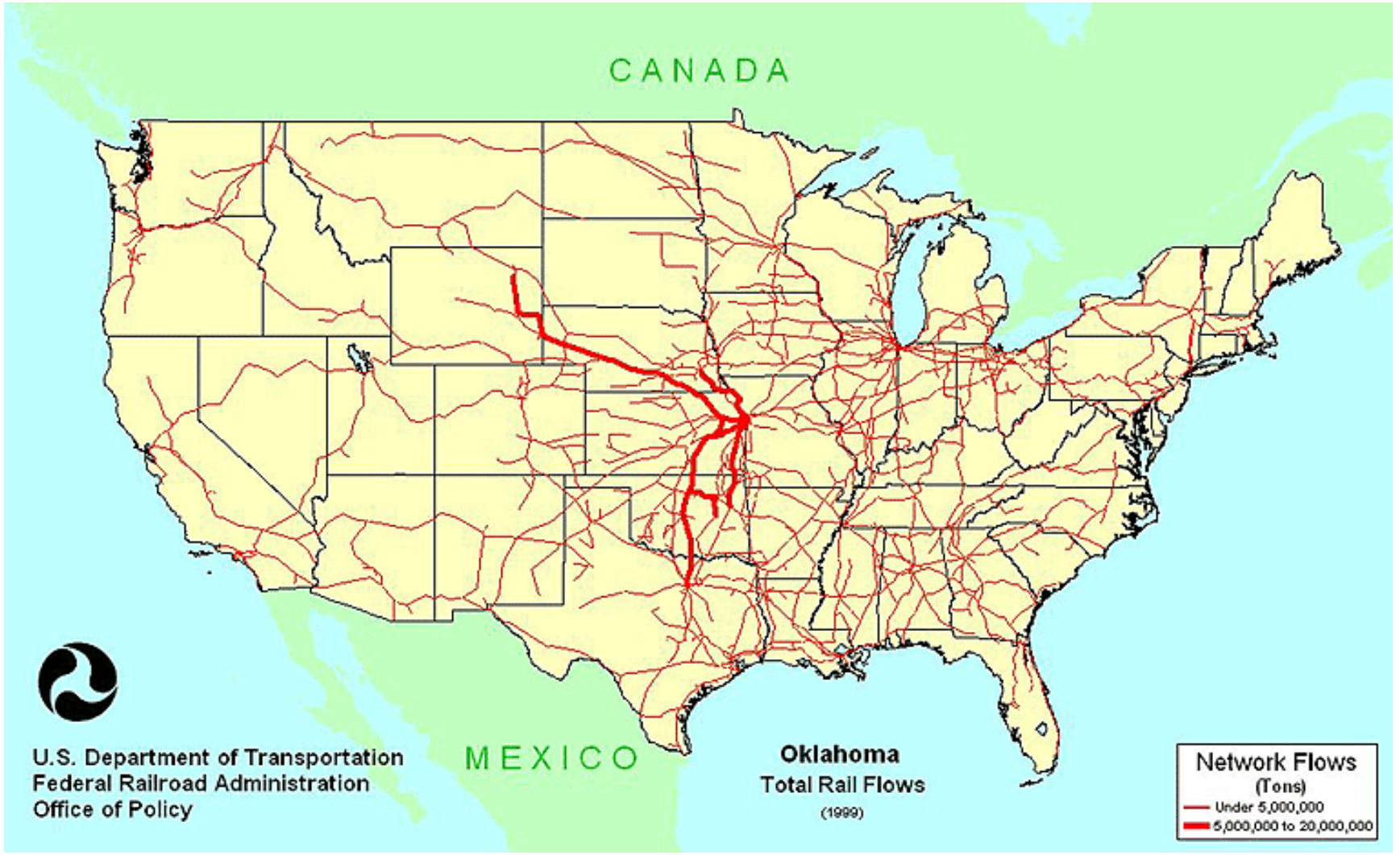


Figure 4.2 Domestic Freight Flows To/From/Within Oklahoma by Truck

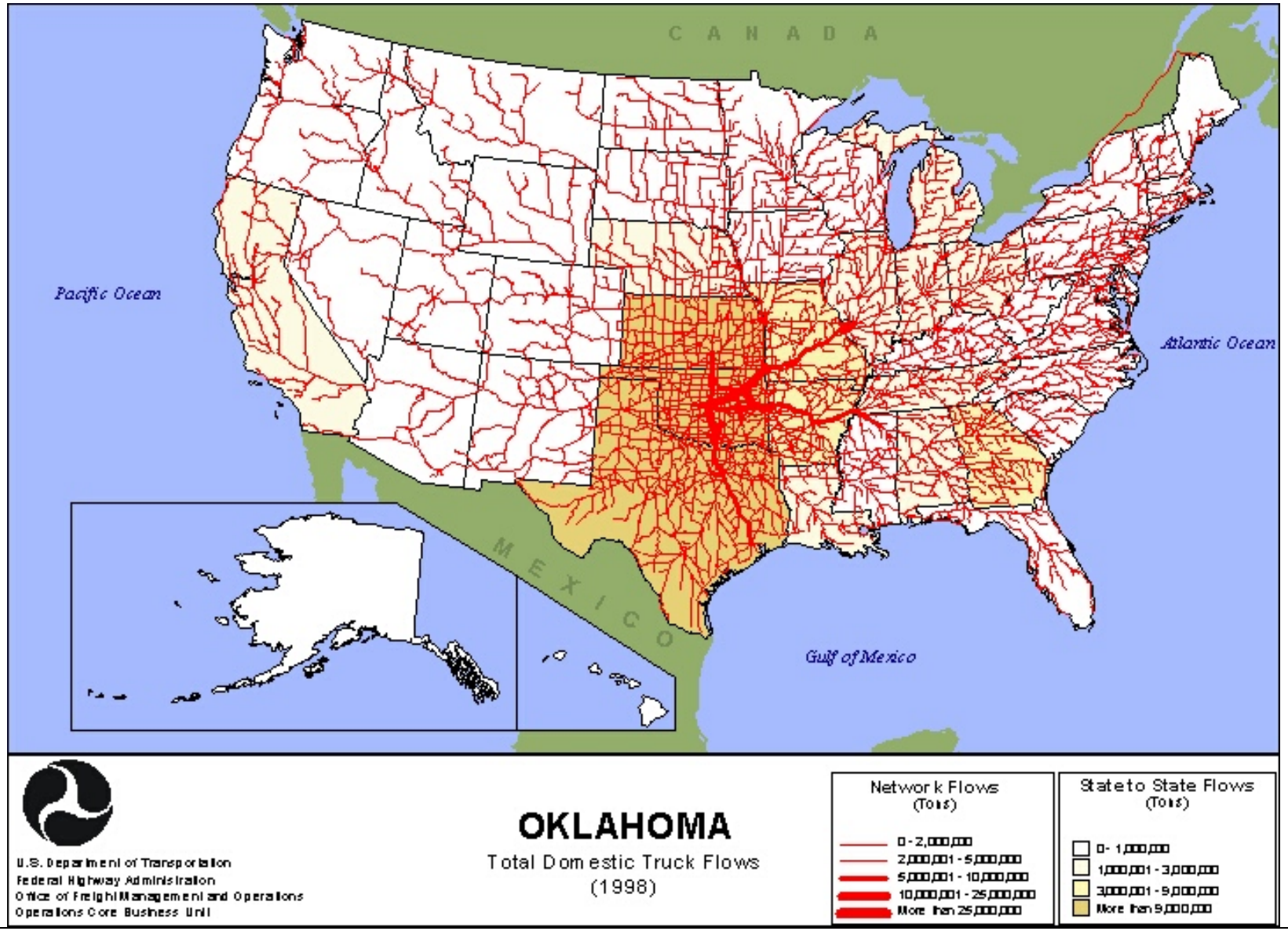
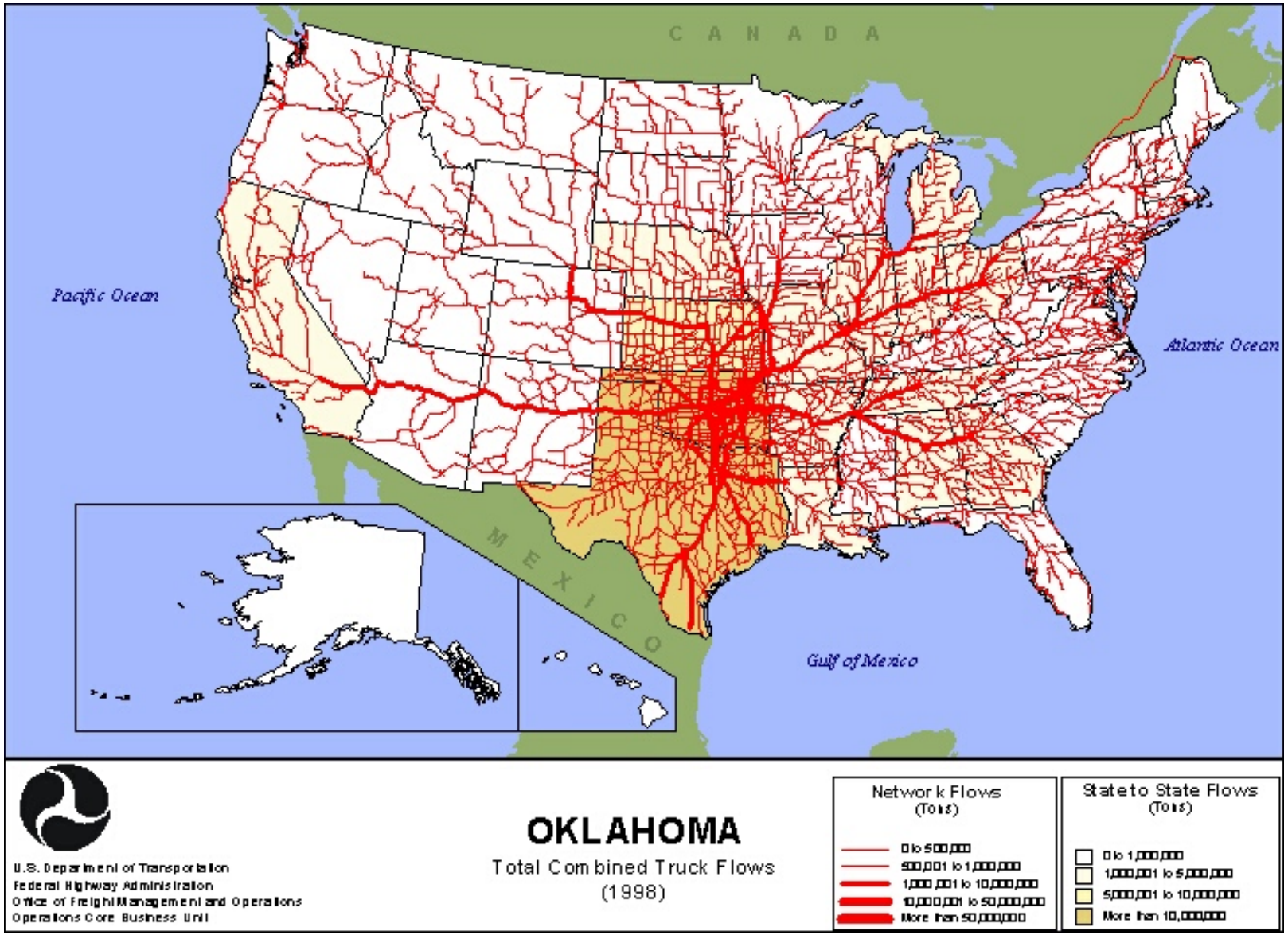


Figure 4.3 Domestic and International Freight Flows To/From/Within Oklahoma by Truck



4.3.12 Oklahoma Freight Flows Relative to US Freight Flows as a Whole

Oklahoma is considerably more truck dependent relative to the nation as a whole. Some 87 percent of freight tonnage carried to/from/within Oklahoma is carried by truck compared with about 70 percent nationally. Shipments to/from Oklahoma via truck represent 12 percent of the AADT (truck) on the USDOT freight analysis road network[19] – an outsize proportion of the nation's truck freight movement. Moreover, as noted in section 4.3.9, approximately 32 percent of truck traffic on USDOT's freight analysis road network involves through truck traffic to/from other markets.

Table 4.7 shows the amount and value of goods transported by all modes in the US in 1998. Over 15 billion tons of goods, worth over $9 trillion were moved in 1998. The number of tons is expected to grow by 70 percent by 2020 and to more than triple in value to nearly $30 trillion.

Table 4.7 US Freight Shipments by Tons and Value

Mode	Tons (millions)			Value (billions $)		
	1998	2010	2020	1998	2010	2020
Total	15,271	21,376	25,848	9,312	18,339	29,954
Domestic						
Air	9	18	26	545	1,308	2,246
Highway	10,439	14,930	18,130	6,656	12,746	20,241
Rail	1,954	2,528	2,894	530	848	1,230
Water	1,082	1,345	1,487	146	250	358
Total Domestic	13,484	18,820	22,537	7,876	15,152	24,075
International						
Air	9	16	24	530	1,182	2,259
Highway	419	733	1,069	772	1,724	3,131
Rail	358	518	699	116	248	432
Water	136	199	260	17	34	57
Other[a]	864	1,090	1,259	NA	NA	NA
Total International	1,787	2,556	3,311	1,436	3,187	5,879

Source: FHWA Office of Freight Management and Operations

[a] Includes international shipments via pipeline or unspecified

[19] The FAF road network draws on state-specific databases and data from federal road inventories The network includes the National Highway System (NHS) and totals over 274,154 miles of equivalent road mileage (3436 "dummy" centroid connector links -- from trip origin/destination points to a nearest FAF road link -- are added to the FAF network of road links for network modeling purposes). The data set covers the 48 contiguous States plus the District of Columbia.

By 2020, the US-based transportation system is expected to handle nearly 26 billion tons of cargo. International freight volumes are projected to nearly double.

While the movement of bulk goods, such as grains, coal, and ores, comprises a large share of the tonnage, lighter and more valuable goods, such as computers and office equipment, make up an increasing proportion of what is moved.

Oklahoma is part of the national supply chain for major commodity categories, and the major types of commodities transported (in tonnage) to/from/within Oklahoma are similar to the top five commodities nationally: gravel/crushed stone, coal, gasoline/aviation fuel, non-metallic minerals, cereal grain. That raises the question of how much Oklahoma may be able to influence freight trends through state intermodal or other transportation improvements, if these trends are to some extent driven by the national economy. It also suggests that Oklahoma examine what might be done to better serve its more unique commodity niches, such as soybean oil and products (high value export) and prepared/canned feed (import).

The parallels between Oklahoma and the nation as a whole are not quite so striking in terms of highest value commodities; the nation's top three commodities by value are 1) electronics equipment and components, 2) motorized or other vehicles, and 3) misc. manufactured products. Oil and gas production and products were excluded from the national economic census/transportation statistics that provided these rankings.

Of 10 major external challenges named by the trucking industry in a national study,[20] only one – urban congestion and travel time reliability – relates directly to state transportation systems. Strategies listed for addressing congestion and travel time reliability, in addition to capacity improvements, included: improved information systems giving advance warning and improved incident management procedures to reduce the effect of incidents; real time traffic information systems; and integrating carrier route planning systems with measures of travel time reliability. The same study cited national shifts in the market: growth in time-sensitive delivery requirements, growth in intermodal/containerized freight; and demands for new information technologies.

The top three external challenges cited were: rising insurance costs, hours of service rule changes, and fuel price variability. Recent innovations in truck stop provisions and accommodations might indirectly address effects of the service hours rule and other external challenges.

Figure 4.4 shows rail freight flows for the nation as a whole. As noted above, the BNSF Railway (BNSF) intermodal line, which cuts through Oklahoma's Ellis, Woodward and Woods counties, carrying a major share of the Los Angeles (ports) to/from Chicago rail freight traffic, appears prominently in this figure, along with the aforementioned major north-south lines of the BNSF and Union Pacific (UP).

Figure 4.5 shows truck freight movement for the nation as a whole. Projected truck flows for 2020 would show a notable increase in truck traffic along the I-44 corridor between Oklahoma City and the northeast corner of the state.

[20] "Evaluation of US Commercial Motor Carrier Industry Challenges and Opportunities," IFC Consulting for FHWA, 2003

Figure 4.4 Freight Flows by Rail – 1998 (tons)

Federal Railroad Administration

Figure 4.5 Freight Flows by Truck – 1998 (average daily volumes)

Federal Highway Administration
Note: Alaska and Hawaii are at a different scale than the continental United States.

4.3.13 Major Freight Corridors in Oklahoma

As noted in previous sections, major rail freight corridors include the north-south BNSF and UP corridors between Wichita and Kansas City on the north and Fort Worth/Dallas on the south and the major intermodal line cutting across Oklahoma en route between Los Angeles/Long Beach and Chicago. Other major rail freight corridors include the BNSF line from St. Louis to Fort Worth and the Kansas City Southern (KCS) line from Kansas City to Louisiana.

Available rail freight flow data does not distinguish among specific rail lines (for proprietary reasons).

Major highway freight corridors identified[21] include:

National Corridors
I-35
I-40
I-44

Regional Corridors
US 54
US 69 (from I-44 to Texas line)

Statewide Corridors
Cimarron Turnpike
Indian Nation Turnpike
Muskogee Turnpike
US 75
US 412

Highway freight corridors of statewide significance are defined as those that carry 10 million tons or more per year. The approximate amount of freight carried in these corridors in 2000 was:

- I-35 (20 million tons north of the Logan/Payne county line, 30 million tons south of that point)
- I-40 (30 million tons between the Texas state line and the Caddo/Canadian county line, 50 million tons between the Caddo/Canadian county line and roughly the Pottawatomie/Seminole county line, 20 million tons between the Pottawatomie/Seminole county line and roughly the midpoint of its route through Muskogee county, and 30 million tons between roughly the midpoint of its route through Muskogee county and the Arkansas state line)
- I-44 (40 million tons between the Missouri state line and Tulsa, 20 million tons between Tulsa and Oklahoma counties, and 10 million tons south of Oklahoma county)
- US 54 (10 million tons through the panhandle)
- US 69 (20 million tons immediately south of I-44 increasing to 40 million tons between Pittsburg county and the Texas state line)
- Cimarron and Muskogee Turnpikes (10 million tons)

[21] "Oklahoma Statewide Intermodal Transportation Plan: Freight Report," TranSystems Corporation for Oklahoma Department of Transportation, 10/2000

- US 75 (10 million tons between I-44 and I-40)
- Indian Nation Turnpike (10 million tons between I-40 and US 69)
- US 412 (10 million tons between I-44 and the Arkansas state line)

Truck freight (in tons per year) was projected for 2025, and additional corridors of statewide significance are expected as a result, including portions of US 70 and US 81, another portion of 412 and 64 west of I-35, and the southern portion of the Indian Nation Turnpike. Projected 2025 freight[22] by corridor is:

- I-35 (40 million tons north of the Logan/Payne county line, 50 million tons south of that point)
- I-40 (60 million tons between the Texas state line and the Caddo/Canadian county line, 100 million tons between the Caddo/Canadian county line and roughly the Pottawatomie/Seminole county line, and 40 million tons between the Pottawatomie/Seminole county line and the Arkansas state line)
- I-44 (60 million tons between the Missouri state line and Tulsa, 40 million tons between Tulsa and Oklahoma counties, and 20 million tons south of Oklahoma county)
- US 54 (40 million tons)
- US 69 (40 million tons immediately south of I-44 to approximately the Arkansas River in Wagoner county, 70 million tons between the Arkansas River and the Pittsburg/Atoka county line, and 90 million tons between Pittsburg/Atoka county line and the Texas state line)
- Cimarron and Muskogee Turnpikes (20 million tons)
- US 75 (20 million tons between I-44 and I-40)
- Indian Nation Turnpike (20 million tons between I-40 and US 69, 10 million tons between US 69 and US 271 to the Texas state line)
- US 412 (20 million tons between I-44 and the Arkansas state line)
- US 70 (10 million tons between western Carter county and US 69, and between the Indian Nation Turnpike and the Arkansas state line)
- US 81 (10 million tons between US 64 and I-40, and between I-44 and southern Stephens county)
- US 64/412 (20 million tons between US 81 and the Cimarron Turnpike)

This represents enormous growth and a strain on the state's highway system. Several sections of these highways are already rated as being in poor or fair condition, and there are many structurally deficient or functionally obsolete bridges along these routes.[23]

[22] Statewide Intermodal Freight Report, 2000
[23] Oklahoma Department of Transportation Planning & Research Division GIS Management Branch, July 10, 2003, and October 1, 2004

4.4 Key Economic Sectors/Clusters

Given Oklahoma's current and trending economy, the characteristics of its freight flows, its current transportation system, and other factors, economic growth sectors most likely to benefit from selected and perhaps strategic intermodal improvements have been identified. These sectors, discussed below, may also provide opportunities for intermodal logistics hub developments in Oklahoma. Logistics hub opportunities on a modal basis – i.e., for air cargo, rail freight, and waterway – are explored in greater detail in Chapter 5.0.

4.4.1 High Value-Added Agricultural Production

As noted in previous sections of this report, high value-added agricultural production has been designated by the ODOC as a targeted industry cluster for economic development. Value added food processing entails the manufacture of higher value added products from raw agriculture outputs. Examples include production of ethanol from grain, meat processing and packaging, or manufacture of canola or other edible oils from seeds. While major agribusiness firms such as Seaboard farms are vertically integrated enterprises, including meat packing and processing, much of this processing of Oklahoma agricultural output continues to be done outside of the state.

Oklahoma should greatly benefit from the expansion of a local economy in value-added food processing. Increased higher value-added and/or perishable processed foods will necessitate a greater shift toward fast and reliable transport. Increasingly efficient supply chain systems, including efficient truck distribution systems and in some cases even air cargo transport of highly perishable or high cost specialty food items should come more to the fore.

4.4.2 Industrial ("High Tech") Livestock Production

Oklahoma will need to consider the specific transportation needs of high tech livestock production, which has become a major economic presence in the Panhandle area. This may include increased or improved rail freight service to these areas, as well as a more comprehensive supply chain and transportation study for this sector. The potential for specialized high volume-truck to rail hub facilities for livestock should be investigated, including the potential for a direct tie-in with UP's transcontinental route through the Panhandle. The potential for public private partnering in this area may be substantial.

4.4.3 Military Logistics

Oklahoma may gain considerable economic advantage by leveraging the existing military – particularly Air Force – infrastructure in the State. The Oklahoma City Air Logistics Center at Tinker AFB may be a catalyst for additional development in the Oklahoma City area. Indeed, studies and other efforts are underway to complement the Tinker Logistics Center operation with the development of an Oklahoma Maintenance, Repair and Overhaul Facility (MROTC) jointly with the Tinker AFB. That proposal would construct a 360-acre facility to provide technology-

based solutions for commercial and military aging aircraft and engines. The MROTC would be a joint development between the private sector, the military, and the Oklahoma Industries Authority. In addition, the State may wish to explore, in partnership with the US Defense Department, other military logistics centers developments, such as in Tulsa, where there is a critical mass of both civilian and military aerospace activities. Consolidation of such facilities in Oklahoma holds the promise of delivering increased efficiency within the growing need for military logistics solutions.

4.4.4 Aviation and Aerospace "After-Market"

The civilian aviation "after-market" – airplane maintenance and overhaul – is an important industry cluster in Oklahoma, and may provide a good niche opportunity, especially in Tulsa, where airplane maintenance and overhaul is conducted by American Airlines, and where Boeing has a major production facility. The potential for outsourcing other carriers' maintenance has been discussed, and should be explored. The extent to which this facility has excess capacity, or could be expanded, could be explored in the context of potential additional users. Clearly, new business models will need to be explored, particularly as American Airlines, together with the other traditional airlines, are experiencing financial difficulties and downsizing. As noted above, the Tinker MROTC proposal, if advanced, would represent another opportunity for exploiting this advantage, in this case in Oklahoma City. Air facility needs to enhance these opportunities must be studied.

4.4.5 Warehousing and Distribution

Warehousing and distribution activities have blossomed close to the Texas border and along the I-35 NAFTA Corridor. The Ardmore and Durant areas, for example, have been highly successful in attracting large retailer distribution centers, such as Dollar Tree and Big Lots, but there is substantial capacity for growth and development of this sector. The location of facilities close to Texas takes advantage of cost of business "border differentials," and all locations south of I-40 have the potential to capture some regional distribution activities serving North Texas. Most of the major retailers, such as Home Depot and WalMart, however, will continue to prefer to locate their major regional hub distribution centers in Texas, as the population and urbanization there are much greater, the Port of Houston is proximate, and intermodal rail service from the west coast ports is available. From those major distribution centers, the big retailers truck their goods to Oklahoma. I-35 is one of the key corridors in NAFTA international trade, and the nation's major surface trade link with Mexico. It also serves a major role in freight transportation for the domestic market, and the volume of trucks on the portion of I-35 between Oklahoma City and Dallas is second only to portions of the route between San Antonio and Waco. Oklahoma will benefit from close coordination of its transportation plans with those of bordering states, especially Texas, so that volumes of north-south truck and rail freight can be consistently accommodated to, from and through Oklahoma. Improved east-west highway links, including enhanced highway capacity for trucks, between these distribution centers, and Oklahoma's sub-regional economies as a whole, and the I-35 Corridor is crucial to the increasing viability of this sector and for the economic growth potential served by this corridor.

4.4.6 Energy Production and Field Servicing

Currently, transport of oil and gas is readily accomplished within the existing Oklahoma transport system. However, the industry may be somewhat hampered by difficulties associated with the transport of oversized drilling equipment and machinery. Drill field equipment, which is also an important manufacturing sector in Oklahoma, can and does move efficiently via barge on the waterway system to selected oil and gas fields, but would benefit from a more relaxed treatment of oversized loads on the highway system. Most oil and gas fields are not proximate to the waterway system, although some transport cost savings may be incurred by providing for efficient intermodal transfer of oversized loads from the waterway to truck for transport to more distant oil and gas fields. Wind turbines, a potential long term growth sector, would require similar relaxed treatment of oversized truck loads in the future, to the extent that this industry becomes more viable. As wind energy is most likely to be concentrated in the northern and western parts of the state – away from the inland waterway system – transport of oversized and overweight loads via truck become an even more critical need to be addressed.

4.4.7 Gaming

While most of the 30-plus Indian owned gaming facilities are small and in rather rural locations, several, most notably the Winstar casino and resort, have the potential to become very important regional destinations. Winstar's proximity to the Texas border provides a large customer market for this facility, particularly as gaming is not (yet) legal in Texas. Enhanced public transportation service and intermodal connectivity linking the nearby Amtrak line to Winstar may be pursued in the form of public-private partnerships to serve Winstar and other large gaming facilities.