

Industry Guidebook: Logistics and Transportation



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**Produced for the WEIC Task Force of the Colorado Workforce Development Council by
Corporation for a Skilled Workforce**

Purpose of This Guidebook

This Logistics and Transportation Industry guidebook was developed as a resource for workforce practitioners and intermediaries, and their partners, as they design and implement sector initiatives in their regions. Sector strategies, or regionally targeted industry strategies as they are sometimes known, have become a well established and effective strategy to enhance the economic competitiveness of regions and states. The intent of this guidebook is to provide data, information, resources and trends about the industry sector at the national and state levels; so that public partners can gain a more in depth knowledge of the sector. It is not intended to be a comprehensive listing of all Colorado resources and organizations, but rather a starting point for more research at the state and regional level. Users are encouraged to spend time reviewing this guide and exploring the links to state level reports, industry web sites and other resources. The links are rich with data and industry information, and many change over time as sector trends and issues change. Successful intermediaries and sector public partners should strive to be as knowledgeable as possible about the target industry and its challenges so that they can more effectively communicate with their business partners and better understand the needs of the industry. This guidebook is intended to provide a strong foundation to start you on this journey of sector knowledge acquisition.

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Overview of Industry

Did You Know?

- Governor Ritter established the Transportation Finance and Implementation Panel via executive order in spring 2007 to discern how to meet the growing mobility needs of Colorado citizens while reducing transportation's impact on the environment. This Panel represents an explicit linking by the Governor of transportation growth and environmental stewardship.
- The rail industry faces a huge retirement wave: over one third of all workers are eligible for retirement in the next 10 years, just as demand has jumped. (The average age of a rail worker is 48.)
- The trucking industry has high driver turnover; annual turnover in the single truck load sector can sometimes exceed 100%. Driver costs are the largest expense in the highly competitive long-haul trucking industry, so firms have little leeway to raise salaries. Fleet operators spend around \$5,000 to \$8,000 to recruit and train a new driver,
- Over the last decade, the supply chain profession has expanded rapidly. Graduate schools offer degrees in supply chain management. Professional associations and conferences are popular.

By the Numbers: Transportation and Logistics Employment in Colorado

There were 42,830 people employed in the transportation and logistics industry in Colorado in 2007, an increase of 7% since 2003, 2% less than the state's overall 9% growth rate of.

Truck Transportation

19,029 workers – 51% of transportation and logistics employment in Colorado (0.8% of total employment)
Average weekly wage of \$794
Projected growth of 11.4% through 2016 (compared to 18% across all industries)

Support Activities for Transportation

7,628 workers – 20% of transportation and logistics employment in Colorado (0.3% of total employment)
Average weekly wage of \$764
Projected growth of 17.5% through 2016 (compared to 18% across all industries)

Warehousing and Storage

8,913 workers – 19% of transportation and logistics employment in Colorado (0.3% of total employment)
Average weekly wage of \$870
Projected growth of 29.6% through 2016 (compared to 18% across all industries)

Rail Transportation

3,666 workers - 10% of transportation and logistics employment in Colorado (0.5% of total employment)
Average weekly wage of \$742
Projected growth of 6.2% through 2016 (compared to 18% across all industries)

Source: Office of Labor Market Information of the Colorado Department of Labor and Employment

Introduction

The distribution, logistics and transportation sector is an amalgamation of several distinct, but now rapidly overlapping, industries. This guidebook defines transportation as having two macro levels:

- **The logistics of moving goods:** Distribution, logistics, freight forwarding, warehousing, and supply chain management are all related to the strategy of moving items from place to place. The terms are often used interchangeably but evolve primarily from two key industries: organizing the movement of goods – freight forwarding, and storage of goods – warehousing.
- **The actual modes of transportation:** trucking and rail. This guidebook also includes highway and bridge construction since the actual modes of transportation are so heavily dependent on this sector, and it is significant to Colorado’s economy. Note: We have excluded air travel from this guidebook because the vast majority of the air transportation industry in the state is in the form of commercial passenger travel, and the focus of this guidebook is on the movement of goods, not people.

Industry statistics related to the logistics of moving items are hard to come by because various subsectors are converging. Freight forwarding (NAICS code 4885) is a specific industry with deep expertise in customs brokerage and organizing the logistics of moving freight from one location to another. In recent years, many freight forwarders have expanded into logistics and distribution consulting with the rise of the “supply chain” professional. In the popular press and among industry insiders, distribution and logistics are closely connected and sometimes used interchangeably to describe freight forwarders who offer expanded logistics consulting services or firms who offer only logistics services without the freight forwarding capabilities. Likewise, warehousing companies (NAICS code 493) are seeking to enter the logistics and supply chain area.

From an employers’ perspective, supply chain management is the broadest conception for thinking about moving goods. Many industry groups, conferences, newsletters and educational institutions cater to the supply chain professional, who must understand the modes of transportation and the business strategy related to their choices. A supply chain professional at a particular company – who understands the full supply chain of that company’s products – will hire a freight forwarder or logistics company to work out shipment details needed to move source material to finished product. Depending on the company and industry, warehousing goods in a location may or may not be needed.

The second level of analysis of the transportation industry in this guidebook occurs at the modal level: rail and trucking. Because the rail and truck industries depend so heavily on public roadway construction, and because spending on highway and road construction drives local economic activity, this guidebook also touches on that industry. Poor roadway surfaces cost the industry money because tires wear out faster which increases maintenance costs, while congestion and unsafe road conditions require more time and fuel consumption. Integrated planning for rail and road expansion can improve intermodal transfers of freight. Since road construction requires a local workforce, it is considered to be a stimulus to a local economy.

Colorado Overview

Transportation and warehousing industries in Colorado employ about 47,300 people in around 3,000 companies. Statewide, the industry has combined revenue of about \$4.4 billion; annual payroll is about \$1.5 billion. Trucking is the largest subsector, valued at about \$1.9 billion.

Movement of goods

Freight forwarding & logistics

Freight forwarding (NAICS code 4885) is the arrangement of moving goods from shippers to receivers across international, national and state lines. The industry generates about \$34 billion in annual revenue with about 17,000 companies in the industry. Freight forwarders own no assets like trucks or ships or containers. Rather, they work directly with shippers and receivers to move a customer's goods through the supply chain. They specialize in the document processing – including customs brokerage – needed to move shipments and the logistics planning related to the movement of goods.¹

Over the last two decades, as freight forwarding companies have expanded their expertise to entire supply chains, they have become grouped loosely as the logistics industry. Logistics companies can be thought of as an “outsourcer” supplier that manage a company's supply chain. Many logistics companies contain the expertise of freight forwarding, given their roots, or sub-contract to freight forwarders who specialize solely in freight forwarding. Their primary value proposition is their IT software that optimizes the movement of goods and their expertise in the supply chain of one or more industries. They offer their customers savings on warehousing and transportation costs.

Freight forwarding relies on international trade. The U.S., a net importer, imports about \$2 trillion in goods annually and exports about \$1.2 trillion. In the last ten years, imports alone have doubled.² The industry is dependent on the overall health of the economy. Expect to see a downturn in the industry given the national economy's downturn in the latter part of 2008.

Revenue for freight forwarders is generated from the spread between what they charge to customers and what freight carriers charge them. The major cost basis is cost of fuel, which is mirrored in the rates carriers charge them. IT costs are also significant since many large freight forwarders use scanners, software systems and other technology to track shipments and to optimize shipping routes.

Warehousing

Warehousing represents an additional component of the transportation and logistics industry. Warehousing is a \$20 billion dollar industry annually on a national basis, representing the storage of consumers' personal goods,

Transportation and Logistics Workers

Top 5 Occupations Requiring On-the-Job Training

1. Truck drivers, heavy and tractor-trailer
2. Laborers and freight, stock, and material movers, hand
3. Truck drivers, light or delivery services
4. Industrial truck and tractor operators
5. Office clerks, general

Top 5 Occupations Requiring Experience or Post-Secondary Education

1. First-line supervisors/managers
2. Bus and truck mechanics and diesel engine specialists
3. Transportation, storage, and distribution managers
4. Automotive service technicians and mechanics
5. Electrical and electronics installers and repairers, transportation equipment

Top 5 Occupations Requiring a BA or higher

1. General and operations managers
2. Accountants and auditors
3. Logisticians
4. Training and development specialists
5. Sales Managers

document storage, and inventory storage. (Large companies that maintain their own warehouses are not considered part of this market.) While there are several large chains nationwide, such as Public Storage, for storage of personal items, inventory storage tends to be a more local market. Typically, warehousing companies have revenues of \$1 million dollars on a single, 200,000 square foot facility. The major cost is facility and insurance, since the labor is generally low skilled and paid below average.³

Small businesses can compete effectively since warehousing does not offer any particular economies of scale. Smaller and regional companies often require warehousing services when they lack enough volume to justify the cost of maintaining such infrastructure in-house. This is part of the reason why smaller companies can compete effectively in this market.

Like pure-play freight forwarders, the warehousing industry has evolved in the direction of providing logistics services (the ability to identify, track, and expedite individual items through the supply chain). Many warehouse facilities are considered High Throughput Distribution (HTD) facilities rather than long-term storage buildings, and are especially built for that purpose near airports and major highways.

Modes of transportation

Railroads

Rail is embedded in the distribution and supply chain industry. Intermodal rail traffic refers to moving shipments among vessel, rail and truck without unloading the freight from its container. Rail competes with trucks, barges and vessels to transport commodities and finished goods. Commodities are primarily coal, chemicals and crushed rock. The rail industry is highly concentrated – 50 companies hold nearly 100% of the market. Rails are extremely capital intensive. Maintenance of lines, cars, and other equipment is the major cost driver and source of efficiency. Most rail operators own the land and track their rail cars use; other carriers rent lines. Most freight is moved by diesel electric locomotives moving about 100 railcars. Carriers tend to spend about 40% of their revenue on labor. 10% or more goes to fuel costs, and companies actively hedge their fuel purchases.⁴

Trucking

Like rail, trucking is an integral part of the logistics and supply chain industry. A truck carrier's major customer is a shipper, a company seeking to have its goods transported by truck. The freight forwarding intermediary links the shipper and the

Rail in Colorado

According to the American Association of Railroads, there are about 3,500 rail employees living in Colorado. The average wage is about \$70,000. When benefits are added, compensation comes close to \$100,000.

There are 14 freight rail companies in Colorado – two national operations, and a mix of regional and local operations. Coal represents over three fourths of the tons shipped which originate from Colorado.

Of the tons terminated in Colorado, the breakdown is:

- Coal – 50%
- Non-metallic minerals – 9%
- Glass and stone products – 7%
- Lumber and wood products – 6%
- Food products – 4%
- Other – 25%.

This breakdown mirrors some of the inputs found in light manufacturing in Colorado.

Source: *Railroad Services in Colorado, 2006*.
Association of American Railroads.

trucking company. Unlike rail, trucking is a fragmented industry, driven by consumer spending and manufacturing output. A \$200 billion dollar industry comprised of 110,000 for-hire carriers and 350,000 independent owner-operators, the trucking industry has net profit margins under 5%. The industry hauls over 100 billion of tons annually. This volume represents 60% the overall volume of all commercial freight and 70% of its value. The trucking industry is heavily involved in international trade, as trade with Canada and Mexico represent one third of all international trade.⁵

The trucking industry has two major segments:

- TL – single truckload. This term means that the trucking company transports a single customer’s goods in a full container; in other words, the container is dedicated to one customer. TL trucking is often associated with long haul trucking – cross country driving, multiple overnights.
- LTL – less than truckload. Here, a trucking company fills a container with several customers’ goods and delivers the goods to various locations. Local trucking – within 50 miles from origination to destination – is often associated with LTL, though it is not exclusive.

Local trucking represents 30% of the overall national trucking market; and of that 40% is general merchandise trucking.⁶

Major costs include the trailers, drivers, diesel fuel, and repairs. Commercial trucks represent 3% of all U.S. highway vehicles but account for 20% of all highway fuel consumption. The average single-unit truck gets 9 miles to the gallon; combination tractor-trailers average 6 miles. Trucks are major and expensive assets – \$100,000 or more for a new trailer. Taxes and registration fees run in the thousands of dollars.⁷ According to the Colorado Motor Carriers Association, most of the trucking companies in Colorado are small (less than 10 employees).

Due to increased long-haul competition and rising fuel, labor, and insurance costs, small and mid-sized trucking companies (revenues under \$30 million) are struggling to compete with large national carriers. According to the American Trucking Association (ATA), the number of truckloads managed by small and mid-sized carriers has fallen 25 percent over the past five years, despite overall industry growth. Owner-operators must evaluate each route to assess whether the compensation offered can cover the cost of fuel.

Highway and Street Construction

Bridges, highways and streets are the foundation of the trucking and rail industry. In the U.S., about 10,000 companies provide highway and street construction services, with combined annual revenues of about \$70 billion. The construction industry is fragmented: 70% of the market is held by companies with less than 250 employees. A typical company has \$5 million of annual revenue and fewer than 50 employees.

Nationally, road construction work consists 55% of new construction, 30% of alterations or reconstruction and 15% of maintenance and repair. New street and highway construction can involve complicated engineering, and skilled operations like earthmoving, grading, and bridge, curb, sidewalk, and water drainage system construction. Engineering design work is important for new construction.

Road construction – both new roadways and resurfacing – is primarily funded through federal road building dollars which are distributed at the state and local level. Municipalities mainly contract for street repaving; states for most new highway construction. Construction companies acquire almost all of their business by bidding on fixed-cost contracts. The large companies often win a bid to be general contractor for a project and may hire smaller local companies to perform parts of the project. Large projects may be awarded under contracts that allow additional costs, because of the uncertainty of the

obstacles that may be encountered, but projects like repaving are almost always of the fixed-cost variety.⁸

This is largely a local business with few economies of scale or technical complexities to encourage consolidation. Most contracts are fairly small and local marketing is important in acquiring them. The typical small construction company does light new construction work or maintenance work.

Because roadway work tends to be seasonal, most companies engage in other work over the winter months such as snowplowing, and maintain only a small core of workers during those months. Consequently, many companies maintain a core of skilled employees and hire additional ones as needed. Construction workers have relatively high hourly earnings, averaging over \$20, about \$4 more than the national wage.⁹

Industry Trends and Challenges

National Trends

Sustainability convergence

The consumer marketplace, public policy, and federal regulation are driving continued focus on how transportation options impact environmental sustainability. There are several national, inter-related trends around energy efficiency which impact transportation and logistics from a number of different levels:

- **Input level:** fuel usage by quantity and type
- **Movement of goods level:** supply chain reduction on the carbon footprint
- **Transportation construction level:** support of all types of carbon emission reduction policies and strategies

The rise in fuel prices and continued demand for transportation intensify the energy related trends.

Increasing cost of fuel

Since Hurricane Katrina in 2005, oil and gas prices have been steadily rising, topping \$140 a barrel in summer 2008. Since oil is used in virtually every manufacturing process and is a primary cost driver in transportation, the private sector has experienced a major increase in its cost basis, irrespective of industry sector. Private sector companies have begun to generate increased demand for renewable energy, in conjunction with their move to improved energy efficiency. Even with the current downturn in oil prices in the latter part of 2008, the public and private sector assumes that oil costs will increase long term.

Managing carbon footprint of supply chains

As companies look to make their supply chains more energy efficient in order to meet internal and external stakeholder demands to be more sustainable, all aspects of the supply chain are coming under review. A recent survey of best practices in the supply chain industry revealed that a large percentage of companies are implementing or have implemented sustainability initiatives. The top five reasons for doing so were:¹⁰

- Desire to be a thought leader in this area
- Rising cost of energy/fuel
- Competitive advantage/differentiator
- Current or expected government compliance
- Rising cost of inbound and outbound transportation

The most common effort taken by companies looking to “green” their supply chain was to redesign aspects of the logistics transport system. Similarly, the companies most effective at greening their supply chain had deep visibility into understanding the role warehousing and distribution methods had on their energy usage. For example, companies thought about their warehouse strategy not just from a cost of inventory or shipping point of view, but also in terms of how much energy usage it took to store and move inventory.

The public sector is also partnering with the private sector in making the supply chain/transportation area more environmentally sound. In 2004 the Environmental Protection Agency (EPA) launched SmartWay, a voluntary program for transportation and logistics providers to support environmentally cleaner and higher fuel efficiency transportation options. As the EPA describes it, the SmartWay brand identifies products and services that reduce transportation-related emissions. The brand signifies a partnership among government, business and consumers to protect the environment, reduce fuel consumption, and improve the air quality for future generations.

Shippers, freight forwarders, logistics companies, truck and rail carriers and others can join the Transportation Partnership. Partners commit to reducing their carbon footprint with specific goals and timelines. The growth of the program over the last four years signifies the value that the transportation industries are attaching to reducing their environmental impact.

For more information, visit <http://www.epa.gov/smartway/transport/become-partner>.

The implications of this shift to “green” supply chain are profound. It could mean the following:

- Reduced use of trucking unless the truck industry is perceived to be more energy efficient and environmentally friendly.
- Increased demand on the rail industry since it can ship more goods with less fuel consumption.

Increased use of technology

Both the rail and truck industry have increased their use of technology to track shipments and to track the location of their trains and trucks. Sophisticated software and GPS technology are being leveraged to optimize truck route fuel and time efficiency. The increased use of technology can also be used to provide information for metrics that track “green” supply chains.

Funding for transportation infrastructure shrinking

The transportation infrastructure is a key driver to the truck and rail industry. When poor infrastructure falls apart, like the bridge in Minneapolis last summer, the industry is negatively impacted. State and national fuel tax revenue has not kept up with the pace of inflation, meaning that states are losing purchasing power for transportation maintenance and construction. In parallel, raising motor fuel tax is politically impossible next to high gas prices. As a result, states are looking to other models of funding.¹¹

- The state of Washington is experimenting with taxing miles traveled rather than gas consumption. The concept of this proposal is to match fees to road usage rates. The challenge is that the incentive to use more gas efficient or hybrid vehicles is reduced.
- States are managing construction costs through use of bidding processes that combine bids for design and construction. These agreements are known as “design-build” or “design-build-maintain.” States find that these agreements can increase the construction process speed and lower costs.
- Increasing use of privatization of roadways. States are considering leasing public roadways – often toll roads – to private companies in exchange for upfront private sector payments, which the state can then use to fund other projects, including transportation projects.

Increased funding for transportation is considered to be an economic stimulus because jobs and work are generated within the state or region. Given the backlog of deferred maintenance of transportation infrastructure, additional funds means projects and work being generated immediately (there is no lack of work needed to be done).

Sub-Industry Trends

Logistics Trends

Convergence

The previously discrete sectors of warehousing, freight forwarding, and logistics consulting/planning are converging at a rapid pace with the rising importance of holistic supply chain management profession and its increased value to the private sector. The trends outlined above in sustainability convergence are important drivers in logistics convergence as well.

Rail Trends

Increasing demand

Advances in technology and container movement have driven growth in the intermodal freight forwarding industry. Total freight volume is expected to increase by 70% by 2020. With the rising gas prices, more carriers are moving freight by rail. In addition, rail is more environmentally friendly than trucking. One gallon of fuel can move freight over 400 miles. The rising demand for more carbon efficient supply chains means that rail freight is likely to increase. As a result, rails are operating near capacity, and even the installation of new track lines will not meet continuing demand.¹²

Dependence on a few large customers threatens profitability

The possible reduction of coal transport due to increasing use of renewable energy resources threatens revenue generation. Trains ship about 65% of the nation's coal, the vast majority of which is used to generate electricity. As more companies and localities shift to renewable sources, or federal regulation limiting the use of coal increases, demand for coal could decrease. Likewise, rail moves about 70% of all U.S. manufactured cars. For rail companies whose major customer is automotive companies, the significant decline in this industry threatens profitability as well.¹³

Use of biofuel expected to increase

Biofuel can be used in locomotives with relatively minor modification. Biodiesel can reduce carbon emissions by 15% per route. The EPA has a requirement to reduce sulfur emissions from the current unlimited quantity to under 15 parts per million by 2012.¹⁴

Trucking Trends

Rising fuel prices threatens volume and profitability

Fuel prices are surpassing labor costs for smaller truckers, resulting in a decline in smaller, owner operated outfits due to high costs of fuel.

Increasing use of biofuels & energy efficiency

In the transportation sector, the trucking industry is a significant contributor to the emission of global green house gasses. As companies look to make their supply chains more energy efficient to meet internal and external stakeholder demands to be more sustainable, the trucking industry's carbon footprint is increasingly being considered. The trucking industry has been increasing its fuel efficiency and reducing carbon emissions over the last 15 years, but major investment and

innovation in this area remains. The increasing focus and efforts being put in place by the consumer marketplace, public policy, and federal regulation are driving continued innovation in this area. Innovation is occurring at the fuel level in terms of improved manufacturing of biodiesel and at the truck machinery level in terms of new design elements.

Trucks can increase efficiency by reducing drag while driving and consuming less fuel with these methods:¹⁵

- Improved tire technology to reduce drag on the road
- Improved aerodynamic shapes (side skirts, for example)
- “Plugging in” trucks overnight to power electrics, heating and cooling rather than using an idling engine

Further, the private sector is increasingly replacing diesel with biodiesel in its trucking fleets. This change is discussed further in the next section.

Trends in Colorado

State policy linking transportation to environmental stewardship

The Colorado environment mirrors many of the same national trends described above. The Governor issued an executive order aiming to reduce greenhouse gas emissions in Colorado. According to the Governor, the transportation sector accounts for 23% of the greenhouse gas emissions in the state.

In spring 2007, Governor Ritter established the Transportation Finance and Implementation Panel via executive order to discern how to meet the growing mobility needs of Colorado citizens while reducing transportation’s impact on the environment. This Panel represents an explicit linking by the Governor of transportation growth and environmental stewardship.

The Panel’s report- released in 2008- argues through its recommendations for ultimately reducing vehicle emissions and increasing mass transit/mobility options. During 2008, the Panel has been touring Colorado to build support for increasing funding for transportation to implement its recommendations. A 2006 CDOT study concluded that a \$48 billion investment in transportation systems between now and 2030 would generate a \$60 billion dollar benefit.

The state’s transportation context is outlined below:

- Colorado’s transportation system is at serious risk of deterioration.
 - ◆ 40% of state highways are in disrepair.
 - ◆ Over 100 bridges are structurally deficient.
- Transit agencies across the state face a revenue shortfall and will meet less than *half* of expected demand in 2030. The funding situation is worsening due to constitutional limits on taxes and greater fuel efficiency.

In spring 2007, Governor Ritter established the Transportation Finance and Implementation Panel via executive order to discern how to meet the growing mobility needs of Colorado citizens while reducing transportation’s impact on the environment.

- ◆ The Colorado Constitution requires that 100% of revenue from taxes, licenses and registrations be used for public highways of the state. However, state law prohibits increasing the state fuel taxes.
- ◆ State motor fuel tax is 22 cents per gallon for gasoline and 20.5 cents on diesel. A rise in gas prices does not increase motor fuel revenue because the tax is tied to number of gallons sold, not sale price. Thus, as cars become more fuel efficient and consume less gas, motor fuel tax revenue can decrease.
- ◆ Transfers from General Fund make up an increasing percentage of the state's Highway Users' Trust Fund, the principle account for transportation funding. This source of revenue is volatile since it depends on the health of Colorado's economy overall.
- ◆ Similarly, the revenue collected by the federal Highway Trust Fund has not kept pace with construction inflation, so Colorado faces both receiving less money from the federal government and decreasing purchasing power.
- ◆ Transit systems gather revenue through sales tax and other funding streams, but revenue is not keeping up with increasing fuel, labor and equipment costs.
- Construction costs are driving upward.
 - ◆ The Colorado Construction Cost Index shows an *annual 6.4%* increase. Asphalt and concrete continue to rise in price due to global demand.
- Usage of Colorado's roadways continues to increase due to population increases.
 - ◆ In 2006, 28.6 billion miles were driven on roadways, a 60% increase from 1990.
 - ◆ Congestion increases commuters' time and increases road deterioration rates.

Several of the Panel's recommendations are highlighted below:

- Maintain existing infrastructure first. Population and vehicle usage has increased dramatically, increasing congestion and road deterioration. Maintenance efforts are badly needed just to keep up.
- Improve shoulders on roadways to increase safety for all and increase bicycle and pedestrian options.
- Develop a strategic mobility program. Such a program explores the mobility of people and goods across the state and among regions. It enhances a focus on transit options. The panel recommended increased inter-regional rail options if such revenue is available.
- Consider new funding streams through new taxes or fees.

The Panels' report outlines these future trends:

- Increase in Vehicle Miles Traveled (VMT). This measure – how many miles are traveled – is commonly used in the transportation and environmental stewardship arena. The goal of both is to reduce the VMT, which is increasing due to a mismatch of where people live and where they work, causing them to drive further from home to work.
- Transportation strategies must align with the state's energy reduction goals. Transportation represented 23% of all greenhouse gas emissions in Colorado – the second highest category after electricity consumption.

For more information on this panel and its reports, visit <http://www.colorado.gov/governor/blue-ribbon-transportation-panel.html>

Greening Colorado Government

Governor Ritter's "Greening Colorado" is a related effort. In April, 2007 Governor Bill Ritter, Jr., signed the Greening of State Government Executive Orders which charge state departments, agencies and offices to take a position of leadership in the new energy economy. State government will reduce energy consumption, increase the use of renewable energy sources, increase the energy efficiency and decrease the environmental impact of the state vehicle fleet, implement environmental purchasing standards and reduce waste and increase recycling.

The Greening Government goals Colorado seeks to achieve by June 30, 2012 are:

- 20% reduction in energy use
- 20% reduction in paper use
- 10% reduction in water consumption
- 25% volumetric reduction in state vehicle petroleum consumption

The reduction in state vehicle petroleum consumption includes a number of measures: increasing the number of vehicles in the fleet which are hybrids or flex fuel (can run on E85 or biodiesel) capable, increased purchasing of biofuels, improved routes, and increased use by employees of mass transit. Since the state had almost 4,000 vehicles in 2006,¹⁶ the scale of its efforts has a distinct impact on the private sector – for example, the need for more biofuel manufacturing and distribution capacity and a strong automotive sector.

Growing biofuel sector to support transportation

Colorado's biofuel industry – biodiesel is especially relevant – is growing rapidly. Biodiesel is made from animal fats or vegetable oil. Biodiesel is mixed with regular diesel to produce B20 (20% biodiesel) or left alone as B100 (100% biodiesel). It requires no major modification of diesel engines to use it instead of regular diesel.¹⁷ Ethanol gasoline is commonly made from corn, though there is heavy research interest in second generation ethanol gas, made from non-food stock grains such as switchgrass. This type of ethanol gasoline is known as cellulosic ethanol. Colorado has a number of research and investment activities related to cellulosic ethanol.

To support the biofuel industry and increase adoption of biofuels by consumers, the Governor's office runs a **Biofuels Coalition** (GBC) which represents Colorado organizations, businesses, government agencies, environmental groups, and others that are involved in the production, distribution, promotion, and usage of biodiesel and ethanol. The GBC aims to educate Colorado's almost 300,000 vehicle owners about the benefits and availability of E85 and biodiesel. Nearly 100 stations are currently open and selling E85 and/or biodiesel, 75% of which received support from the GBC. In 2007, the stations reporting to the GBC sold 2.614 million gallons of biofuels. From January 1st-June 30th, 2008, 3.74 million sold gallons have been reported. Additionally, the GBC wants to maximize the number of installations of E85 and biodiesel pumping facilities within Colorado by furnishing funds that will go directly for equipment. The GBC makes grants available to fueling stations.

<http://www.colorado.gov/energy/renewables/governors-biofuels-coalition.asp>

The logistics sector, along with other companies with big truck-based supply chains, is making the switch to biodiesel. For example, Corporate Express US Inc., part of the Dutch-based Corporate Express NV, announced in 2008 that it was fueling the majority of its delivery truck fleets in Colorado and Kansas with Blue Sun's Fusion B20 biodiesel – an ultra-low sulfur fuel comprising 20% virgin oilseed-based biodiesel, from renewable US-grown crops – and 80% petroleum diesel. Blue Sun is a Colorado based

company. Because Fusion B20 is a cleaner fuel, Corporate Express expects that it will help reduce truck engine wear and also improve miles per gallon on its trucking fleet. Blue Sun's Fusion B20 biodiesel can be used in conventional compression-ignition engines that were designed to be operated on diesel fuel, making it a direct substitute for traditional petroleum diesel. The company will use the fuel in its trucks built after 2004.¹⁸

Colorado Springs' investment in biodiesel represents city-level use of biodiesel, which it has been using in its fleet since 2003. Colorado Springs was ranked by Government Fleet Magazine as the top municipal biodiesel fleet in the nation in 2008. The city beat out San Francisco and Austin, Texas, for the award. The magazine also awarded the city 17th in its overall rankings of public sector fleets using alternative fuels. Since 2003, more than 2,400 pieces of that city's equipment have run on biodiesel, consuming almost 1.6 million gallons of B20 biodiesel. That represents the equivalent of more than 5 million pounds of carbon dioxide avoidance into the atmosphere, or 491 passenger cars not driving for one year.¹⁹

As in the rest of the nation, Colorado investor interest and public fascination with ethanol fuel has cooled considerably over the last two to three years with increased disinterest in using corn-based ethanol. Also, the positive effect of high gasoline prices making renewable energy attractive disappeared with the dramatic decrease in gasoline prices in late 2008. In 2007, Panda Ethanol announced it would build a plant in Yuma, but it has yet to close on financing. Other plants in Colorado are holding their own, however. Yuma Ethanol, for example, has contracted with agri-giant Archer Daniels Midland to market 50 million gallons per year of its product. It has arrangements with local farmers to buy corn and with feedlots to sell distillers grain (an animal feed), shielding the plant from some of the economic fluctuations experienced elsewhere.²⁰

Next generation ethanol – think cellulosic ethanol – is still primarily at the research and demonstration stage. In August, 2008, Vancouver, British Columbia- based Lignol Energy Corp. announced it will locate its cellulosic ethanol demonstration plant in Grand Junction. The \$88 million plant, which received a \$30 million dollar grant from the DOE, will convert beetle-kill and other wood residues into motor fuel. It will be operated by Suncor Energy (USA) Inc.²¹ The Colorado Agricultural Value Added Development Board of the Colorado Department of Agriculture has awarded \$150,000 in Advancing Colorado's Renewable Energy (ACRE) grants to organizations for biodiesel-related projects. In partnership with Colorado State University in Fort Collins, Colo., the International Center for Appropriate and Sustainable Technology (iCast) in Lakewood, Colo., was awarded \$100,000 to assist with the implementation of two farm-scale oilseed crushing and biodiesel production facilities. During the past two years, iCast has been using a mobile biodiesel demonstration unit, dubbed Seeds Into Diesel (SID), to educate farmers and ranchers in Colorado and Wyoming about how to make biodiesel on the farm.²²

Colorado boasts several research efforts aimed at transportation innovation, including fuel cells, biofuel production and other technologies. The National Renewable Energy Laboratory (NREL) hosts the Center for Transportation Technologies and Systems (CTTS), which works toward developing advanced vehicle and fuel technologies and moving them from research and development to the marketplace. Its mission is to reduce the nation's dependence on foreign oil supplies, while improving air quality, by developing and demonstrating innovative technologies that allow alternative fuels and advanced vehicle systems to supply a significant portion of the nation's transportation needs. In Denver, the University of Colorado at Boulder (CU), Colorado State University (CSU), the Colorado School of Mines (CSM) and the US Department of Energy's National Renewable Energy Laboratory (NREL) formed the Collaboratory in February 2007. The purpose of the collaboration is to perform research in the development of new energy technologies and to transfer these discoveries as rapidly as possible to the marketplace. The Collaboratory formed the Colorado Center for Biorefining and Biofuels research center, known as C2B2.

The center will develop new biofuels and biorefining technologies and transfer these advances as rapidly as possible to the private sector. Private sectors partners in C2B2 include Chevron, ConocoPhillips, Dow Chemical Co., Shell Global Solutions, GreenFuel Technologies Corp., Range Fuels Inc., Solix Biofuels, PureVision Technology, Copernican Energy, Rocky Mountain Sustainable Enterprises and Blue Sun Biodiesel.

Growth of intermodal transportation for people and goods

Metro Denver's experience with the Transportation Expansion Project (T-REX) project over the last decade exemplifies several of the trends in transportation and logistics discussed above. T-REX added 19 miles of light rail and improved 17 miles of highways and bridge infrastructure in southeast Denver, connecting the region's two largest employment centers – the Denver Tech Center and Denver's Central Business District. The project framework featured multi-agency collaboration and public/private partnerships. The project used a design-build framework, which allowed for completion two years early and under budget. The project simultaneously planned for road upgrades and mass transit build-out. On the workforce development side, the T-REX project also included a significant student internship program.

City and urban planners, economic developers, and transportation officials are increasingly developing mass transit plans to support higher density locations where people can work and live locally. Sometimes called “new urbanism,” this way of thinking seeks to reduce suburban sprawl, resulting in more mass transit, more “walkable” cities, and reduced auto use. In 2004, Colorado voters passed RTD's FasTracks plan. A \$7.9 billion investment, FasTracks will build out Metro Denver's entire mass transit system by 2016, adding 122 miles of rail rapid transit along six new lines, extending existing routes, and expanding the regional bus network. For more information, visit <http://www.rtd-fastracks.com/main> 1.

The Rocky Mountain Rail Authority is considering development of a high-speed intercity train network across Colorado. The authority's \$1.5 million feasibility study will determine whether a train system capable of traveling up to 125 mph can be financed and operated along the major east-west and north-south travel corridors of the state. The authority has outlined about 600 miles of basic routes, potential stations, and the types of trains it will study, based on meetings with officials and planners from along the routes. The skeleton map of the system indicates a line going between Denver International Airport and Grand Junction, paralleling Interstate 70, and another stretching between Trinidad and Cheyenne, parallel to Interstate 25. There are 17 major stations to be studied, with 27 secondary stations. Five potential spur lines emanate from the I-70 corridor to reach Aspen, Craig, Leadville, Breckenridge and Central City- Black Hawk.²³ For more information, see <http://rockymountainrail.org/>.

A development plan for TransPort, a proposed multi-billion dollar transportation and cargo center located southeast of Denver International Airport, was approved in 2006. The 5,000-acre development will serve as a hub for companies shipping and receiving cargo by air, road, or rail in Metro Denver. Its industrial and rail-served development areas support a wide-range of distribution strategies.

Workforce Issues

Rail and Trucking

There are some similarities in the truck and rail workforce. Employees in both sectors work in industries that operate 24/7 and require extensive travel, aside from drivers in the local trucking segment. Unions are active in both industries. 80% of all rail workers are unionized.

Unlike trucking, pay in the rail industry is typically 40% higher than the national average. Part of the high pay in the industry is due its 24/7 nature, where workers often work long shifts, weekends, and overnights. Also, many jobs in the rail industry are skilled, requiring certification and extensive training. In trucking, long haul drivers make significantly more money than local truck drivers, again due to the overnights and extended travel aspects of the job.

Turnover in the industries differs significantly in its causes. Rail underwent a significant contraction in the last several decades and as a result hired very few workers. Now, rails face a huge retirement wave: over one third of all workers are eligible for retirement in the next 10 years, just as demand has jumped. (The average age of a rail worker is 48.) Trucking, on the other hand, has undergone massive expansion in the 20 years, with extensive cost competitiveness. While unions are present in the industry, the existence of independent owner-operators keeps wages low.

Common Challenge: Workforce Shortage

In rail, demand for rail is growing at the same time that many rail workers are nearing retirement. At the same time, rail has a poor image as a career choice, further compounding rail's ability to hire new workers. Like manufacturing, rail has a relatively unpopular image in the general public. It is not considered by many to be an attractive job, let alone offer a career.

Rail companies provide conductor training at the cost of about \$20,000 for new hires. The training typically lasts 12-15 weeks.

- Some companies have found success by hiring from the ex-military pool. Rail companies are targeting ex-military types as potential employees because they are familiar with the vital importance of safety rules and operating on a 24/7 schedule.
- The industry is also running a public relations campaign called "Freight Rail Works." <http://www.freightrailworks.org/> which highlights rail's "clean" and "green" qualities.

The trucking industry has high driver turnover; annual turnover in the single truck load sector can sometimes exceed 100%. Driver costs are the largest expense in the highly competitive long-haul trucking industry, so firms have little leeway to raise salaries. Fleet operators spend around \$5,000 to \$8,000 to recruit and train a new driver, yet fewer people want to join an

Tapping New Worker Pools

Trucking companies have begun to target baby boomers to meet their future workforce needs. Baby boomers tend to be safer drivers, are more aware of their driving limitations, and are more dependable, according to employers. Unlike flight pilots, truck drivers face no required retirement age. Baby boomers are drawn to the industry because it pays well, the job provides an opportunity to "see the world," and they can often travel with their spouse. In fact, many baby boomer truck drivers are couples.

industry with a demanding lifestyle and little chance for career progression. Turnover in the less-than-truckload and local trucking industry is much lower, around 15%.

Training for truck drivers is generally provided by private training schools. The courses are typically 4-6 weeks long and cost several thousand dollars. Schools offer their own certifications. Typically recruitment for employees is done through advertising, especially on the internet.

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Job Spotlight: Heavy Truck and Tractor-Trailer Drivers

Heavy truck and tractor-trailer drivers operate trucks or vans with a capacity of at least 26,000 pounds Gross Vehicle Weight. They transport goods including cars, livestock, and other materials in liquid, loose, or packaged form. Many routes are from city to city and cover long distances.

Long-distance heavy truck and tractor-trailer drivers spend most of their working time behind the wheel but also may have to load or unload their cargo. This is especially common when drivers haul specialty cargo because they may be the only ones at the destination familiar with procedures or certified to handle the materials. Auto-transport drivers, for example, position cars on the trailers at the manufacturing plant and remove them at the dealerships.

Truck driving has become less physically demanding because most trucks now have more comfortable seats, better ventilation, and improved, ergonomically designed cabs. Although these changes make the work environment less taxing, driving for many hours at a stretch, loading and unloading cargo, and making many deliveries can be tiring.

A commercial driver’s license (CDL) is required to drive large trucks. Training for the CDL is offered by many private and public vocational-technical schools. Completion of a program does not guarantee a job. Some programs provide only a limited amount of actual driving experience. People interested in attending a driving school should check with local trucking companies to make sure the school’s training is acceptable.

Advancement opportunities for truck drivers are limited. Truck drivers can advance to driving runs that provide higher earnings, preferred schedules, or better working conditions. Local truck drivers may advance to driving heavy or specialized trucks or transfer to long-distance truck driving. Working for companies that also employ long-distance drivers is the best way to advance to these positions. Few truck drivers become dispatchers or managers.

Many long-distance truck drivers purchase trucks and go into business for themselves. Although some of these owner-operators are successful, others fail to cover expenses and go out of business. Owner-operators should have good business sense as well as truck driving experience.

Source: 2008-2009 Occupation Outlook Handbook, Bureau of Labor Statistics

Engineering/construction

Demand for engineers, architects, builders and the like remains strong. Architects, planners, and engineers tend to work in business services industries such as engineering and architectural management firm. Machine operators, welders, pavers and the like tend to work for a construction firm.

Supply chain/logistics

Warehouse Workforce

Because of the buildup of business inventories in advance of the holiday selling season, industry employment peaks in fourth quarter and then falls in January. If a company is warehousing retail goods, the seasonal swing in jobs could be more than 20%. Because of the training required, companies prefer to hire the same seasonal workers every year.

Jobs in the warehousing subsector are less skilled and considered less desirable. A study by the Workforce Boards of Metropolitan Chicago found that jobs in this area were considered to be unexciting and underpaid, and incumbents who were dissatisfied with their job tended to view the industry overall negatively. Yet the industry faces a skilled labor shortage.

Supply Chain Workforce

Over the last decade, the supply chain profession has expanded rapidly. Graduate schools offer degrees in supply chain management. Professional associations and conferences are popular. According to the Supply Chain Management, a professional association magazine, the industry sees the following workforce demands as outlined in the graphic below.

EXHIBIT 3

Future Skills and Capabilities for Supply Management Professionals



Soft skills and cross cultural skills are closely linked. As supply chains become ever more global, supply chain managers will increasingly work with staff in different countries, speaking different languages. Likewise, cross functional skills will gain importance. Supply chain professionals need to understand the specific market category – toys, for example – as well as the supply chain process associated with making, shipping, and selling toys. Often, potential employees will have depth in one area and not the other. Companies then use rotational programs to increase employees' knowledge and depth.

Graduate degree programs in this specialty are available at an increasing number of universities. Professional organizations offer a mix of conferences, webinars, and online courses. Some professional

associations, such as the Institute for Supply Management, also offer industry certifications - see <http://www.ism.ws/certification/?navItemNumber=4891>.

Colorado Technical University offers an MBA in Supply Chain Management.

<http://www.ctuonline.edu/online-degree-programs/online-masters-degree-logistics-supply-chain-mba/>

Job Spotlight: Diesel Service Technicians and Mechanics

Diesel service technicians and mechanics repair and maintain the diesel engines that power transportation equipment. Some diesel technicians and mechanics also work on other heavy vehicles and mobile equipment, including bulldozers, cranes, road graders, farm tractors, and combines.

Increasingly, diesel technicians must be versatile to adapt to customers' needs and new technologies. It is common for technicians to handle all kinds of repairs, working on a vehicle's electrical system one day and doing major engine repairs the next. Diesel maintenance is becoming increasingly complex, as more electronic components are used to control the operation of an engine. For example, microprocessors now regulate and manage fuel timing, increasing the engine's efficiency. In modern shops, diesel service technicians use hand-held or laptop computers to diagnose problems and adjust engine functions.

A large number of community colleges and trade and vocational schools offer programs in diesel engine repair. These programs usually last from 6 months to 2 years and may lead to a certificate of completion or an associate degree. Formal training provides a foundation in the latest diesel technology and instruction in the service and repair of the equipment that technicians will encounter on the job. Although formal training programs lead to the best prospects, some technicians and mechanics learn through on-the-job training. Generally, technicians with at least 3 to 4 years of on-the-job experience will qualify as journey-level diesel technicians. Employers prefer to hire graduates of formal training programs because those workers are able to advance quickly to the journey level of service.

Experienced diesel service technicians and mechanics with leadership ability may advance to shop supervisor or service manager, and some open their own repair shops. Technicians and mechanics with sales ability sometimes become sales representatives.

Although national certification is not required for employment, many diesel engine technicians and mechanics find that it increases their ability to advance. Certification by the National Institute for Automotive Service Excellence (ASE) is the recognized industry credential for diesel and other automotive service technicians and mechanics.

Source: 2008-2009 Occupation Outlook Handbook, Bureau of Labor Statistics

Resources

State Associations

Colorado Motor Carriers Association. The object of the Association is to encourage friendly relations between members; to establish uniform rules and regulations; to foster and advance safety upon the public roads and highways; to disseminate information and statistics valuable to the member of all of the several natural conferences of the industry and to promote cordial relations with the public and national, state and municipal authorities in matters of common interest to the industry.

<http://www.cmca.com/index.html>.

The **Denver Transportation Club** is a non-profit corporation that contributes time, materials, money, and instructions in connection with numerous college credit-level courses in Transportation and Logistics through the Community College of Denver; stimulates public interest in legislation regulations, and other matters of importance to the transportation industry; sponsors seminars and awards scholarships. http://www.denvertransportation.org/index.php?p=about_us

Colorado Contractors Association. The Colorado Contractors Association, Inc. (CCA) represents the firms who construct basic infrastructure: airports; light rail facilities; bridges and dams; highways and streets; parking lots; underground utilities such as phone, fiber optic, water, gas and sewer lines; power and telecommunication transmission centers; wastewater and storm water pipelines; and wastewater treatment plants. <http://www.coloradocontractors.org/>

National Associations & Institutes

Rail and Trucking

Association of American Railroads. AAR members include the major freight railroads in the United States, Canada and Mexico, as well as Amtrak. Based in Washington, DC, the AAR is committed to keeping the railroads of North America safe, fast, efficient, clean, and technologically advanced.

<http://www.aar.org/Homepage.aspx>

American Association of State Highway and Transportation Officials (AASHTO) advocates transportation-related policies and provides technical services to support states in their efforts to efficiently and safely move people and goods. <http://www.transportation.org/>

Commercial Vehicle Training Association. CVTA is the national trade association representing private truck driver training programs. CVTA currently represents 180 driver training sites nationwide. Truck driving schools across the United States and Canada look to CVTA for advocacy, legislation, advice and camaraderie, while prospective students look to CVTA to find the best trucking schools in their state.

<http://www.cvta.org/>

American Trucking Associations. The mission of the American Trucking Associations is to serve and represent the interests of the trucking industry with one united voice; to influence in a positive manner Federal and State governmental actions; to advance the trucking industry's image, efficiency, competitiveness, and profitability; to provide educational programs and industry research; to promote safety and security on the nation's highways and among industry drivers; and to strive for a healthy business environment. <http://www.truckline.com/pages/home.aspx>

Professional Truck Driver Institute. A nonprofit organization, PTDI develops uniform skill performance, curriculum, and certification standards for the trucking industry and awards course certification to entry-level truck driver training courses and motor carrier driver-finishing programs. Its goals are to advance truck driver training, proficiency, and professionalism and to put quality drivers on the roads. <http://www.ptdi.org>

Supply Chain and Logistics

Council of Supply Chain Management Professionals (CSCMP). The Council of Supply Chain Management Professionals is a worldwide professional association of supply chain management professionals. CSCMP exists to: 1) Provide opportunities for supply chain professionals to communicate in order to develop and improve their supply chain management skills; 2) Identify and conduct research which adds to the knowledge base of supply chain theory and practice; 3) Create awareness of the significance of supply chain to business and to the economy. The organization has local Roundtables. <http://cscmp.org/Default.asp?XX=1>

Institute for Supply Management. ISM's mission is to lead the supply management profession through its standards of excellence, research, promotional activities, and education. ISM's membership base includes more than 40,000 supply management professionals with a network of domestic and international affiliated associations. ISM is a not-for-profit association. <http://www.ism.ws/> In partnership with Arizona State University, it runs the CAPS research center at <http://www.capsresearch.org/>

Supply Chain Council. The Supply-Chain Council has close to 1,000 corporate members world-wide and has established international chapters. The Supply-Chain Council's membership consists primarily practitioners representing a broad cross section of industries, including manufacturers, services, distributors, and retailers. <http://www.supply-chain.org/>

Warehousing, Education and Research Council (WERC). Warehousing Education and Research Council is a professional organization focused on warehouse management and its role in the supply chain. WERC is where distribution experts come together to share practical knowledge and professional expertise with the aim of improving individual and industry performance. www.werc.org

Centers

Colorado Center for Biorefining and Biofuels. In Denver, the University of Colorado at Boulder (CU), Colorado State University (CSU), the Colorado School of Mines (CSM) and the US Department of Energy's National Renewable Energy Laboratory (NREL) formed the Collaboratory in February 2007. The Collaboratory formed the Colorado Center for Biorefining and Biofuels research center, known as C2B2. The center is a cooperative research and educational center devoted to the conversion of biomass to fuels and other products. <http://www.c2b2web.org/>

Intermodal Transportation Institute at the University of Denver. The Institute offers an Executive Master's Program that awards a Master of Science in Intermodal Transportation Management from the University of Denver; partners with industry, government, and the public to promote the development of a seamless, 21st century, North American transportation system for both passengers and freight; and partners with Mississippi State University in NCIT, the National Center for Intermodal Transportation, collaborating in research, education, and technology transfer programs and activities. <http://www.du.edu/transportation/>

National Center for Intermodal Transportation. NCIT focuses on the assessment, design, and development of planning methodologies and tools, technology, and human resources needed to improve intermodal connectivity, capacity and to reduce congestion in our nation's transportation system. The NCIT seeks to improve the capacity and capability of the workforce to meet the challenges of the increasingly complex passenger and freight transportation system. Congestion, competition, capacity, and conservation are the major challenges facing the US transportation system that can be met with the adoption of a serious commitment to intermodalism. <http://ncit.msstate.edu/>

National Renewable Energy Laboratory. NREL hosts the Center for Transportation Technologies and Systems (CTTS), which works toward developing advanced vehicle and fuel technologies and moving them from research and development to the marketplace. Its mission is to reduce the nation's dependence on foreign oil supplies, while improving air quality, by developing and demonstrating innovative technologies that allow alternative fuels and advanced vehicle systems to supply a significant portion of the nation's transportation needs. <http://www.nrel.gov/vehiclesandfuels/ctts.html>

Rocky Mountain Institute. Rocky Mountain Institute® (RMI) is an independent, entrepreneurial, nonprofit organization that fosters the efficient and restorative use of resources to make the world secure, just, prosperous, and life-sustaining. <http://www.rmi.org/>

Rail industry campaign: **Freight Rail Works!** <http://www.freightrailworks.org/>

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