Introduction

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Freight in the Upper Midwest States is a very complex issue with many factors that influence the development of public policy. In an effort to crystallize these of these issues and generate thought and discussion, *eleven* white papers were written on important factors that influence freight and public policy. The authors are members of the research team for Phase II of the Upper Midwest Freight Corridor Study. This document is a compilation of those papers. The logic of their selection and order is simple:

Defining the Problem

The Challenge Ahead is a short paper that draws on the findings of the first phase of the Upper Midwest Regional Freight Study to define why a problem exists, or is in the making, that requires some actions on the part of governments in the region. Growing travel, growing freight movements, congestion, and international competition threaten our economic wellbeing.

Trade between China and the Upper Midwest States is a short monograph on one key aspect of growing freight movements, trade with China. It provides insights for those who have a particular interest in the topic.

Finding Solutions

Solutions can be found in highways, rail and water. Since highway is the mode that is most directly influenced by public agencies, five separate papers are dedicated to it:

- In *The Null Alternative in Highway Capacity and Management*, the author describes the future if no actions are taken. More congestion, slower freight movement, continued fragmentation and economic slow-down are the probable conclusion.
- In *Applying Regular Federal Aids to Highway Freight Capacity Issues*, the paper provides an overview of existing federal programs that might be tapped by the region.
- The paper, *Creating Capacity,* reviews the federal dollars that come to the region, how they are used and the possible impacts of diverting them to freight-related projects.
- In *The Role of Tolls in Moving Freight***,** the author explores the current federal rules on the use of tolls, the experience of other states and regions and the potential for using truck-only lanes as toll facilities.
- In *Using Technology*, the authors explore a number of technologies that might be employed to better manage and utilize existing highway capacity.

Rail transportation and many of the issues related to it are covered in *Railroads and Freight in the Future.* The current state of the rail industry, its probable direction and the possible public policy options to influence that direction are covered.

Maritime issues on the Great Lakes are described in *Great Lakes Maritime Transportation System*. The paper provides a historical perspective, current usage, constraints and public policy options related to the continued and possible expansion of the Great Lakes Marine Transportation system in the Midwest freight corridor.

Intermodal issues are covered in the paper *Encouraging Development of Intermodal Freight Facilities*. Intermodal here refers primarily to truck/rail. The paper looks at the possible benefits of moving more freight by rail using trailer or container on rail. It also outlines some of the constraints that may hinder intermodal expansion and some of the policy options that might deal with those constraints.

Finally, a perennial issue in transportation policy in the public sector relates to investing public funds in non-revenue modes or in facilities that are not owned by the public sector. This paper***,*** *Investing in Non-Revenue Modes*, outlines some of the arguments for and against such investments

Individually, these papers provide the essential background on specific aspects of freight in the upper Midwest. Taken together, as they were intended, the papers provide a primer on freight issues and the policy options that must be considered to deal with those issues. The papers form the basis for regional freight agenda, which is the final product of the Phase Two study.

The Challenge Ahead

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Introduction and Summary

The Upper Midwest faces a significant challenge over the next few years. How the states and the nation respond to this challenge will have a major influence on their economic health in the Twenty-First Century. The freeways, railroads and waterways that have moved the product of our farms and factories for the past forty years are at, or nearing, capacity. This is happening at a time when freight ton-miles (metric ton-kilometers) are projected to increase by as much as 80% over the next fifteen years; and when automobile mileage continues to grow at more than one percent per year. While the resulting grid-lock will be costly, wasteful and inconvenient for the commuter and business traveler, it will be devastating for those businesses that are dependant on reliable, inexpensive transportation to move their raw and finished products.

Figure 1: The Upper Midwest

Freight, which is closely correlated to a healthy economy, moves beyond state and national borders. Our traditional post-interstate era approach to freeway capacity expansion has individual states making some modest improvements to small stretches. It also has each state implementing traffic management and traveler information systems independently. Our traditional approach to rail and water-borne freight is to let the market dictate the services offered. All of these traditional approaches will not meet the challenge that we face over the next decade. They will not produce the capacity or the efficiency needed to move the freight—and people—we will have to move to maintain our economic position.

The states of the Upper Midwest (Figure 1), with the cooperation of the Federal Highway Administration and neighboring Canadian Provinces, have undertaken an effort to define a regional agenda for freight. This includes a review of national policies that might benefit the region, a look at state policies that might be better coordinated, and an effort to better develop plans for regional, complimentary traffic information and management systems, particularly as they relate to commercial vehicle operations. Developing this agenda is one first step in meeting the challenge ahead.

Freight and the Economy

Historically, the volume of freight has tracked very closely with Gross Domestic Product (GDP) and employment. Figure 2: Freight and Economic Activity outlines the experience of the last thirty years of freight and economic activity. Ton-miles (metric ton-kilometers) of freight and total employment track very closely (blue and tan lines). Intercity truck mileage and gross domestic product also track very closely (the red and green lines).

The tie of freight and manufacturing is even greater than that of freight and the general economy. This is significant for the Upper Midwest because the region is more dependent on manufacturing than is the balance of the nation. In fact, 27% of the nation's manufacturing jobs are located within the seven states. The region's reliance on manufacturing is also illustrated by the top commodities shipped, as measured by value. All ten of the commodities are manufactured products, starting with motorized and other vehicles and ending with printed materials.

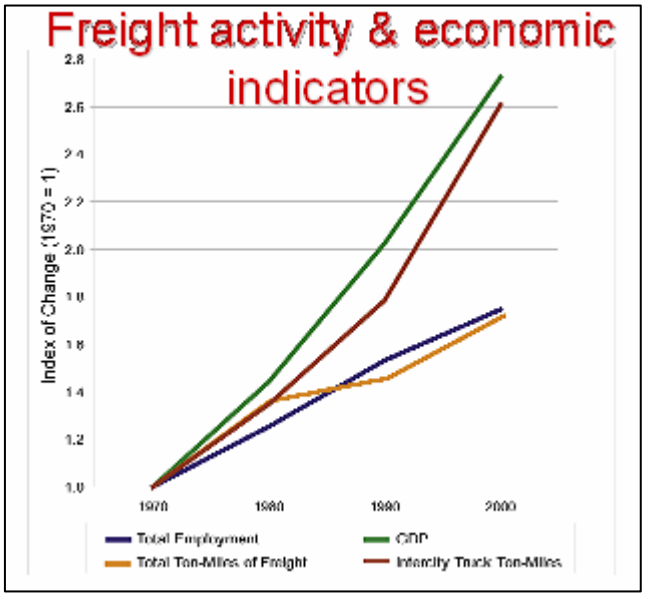

Figure 2: Freight and Economic Activity

Agriculture is also a major force in the regional economy. A look at commodities from the perspective of ton-miles (metric ton-kilometers) illustrates their importance. Five of the ten top ton-mile (metric ton-kilometers) commodities are agricultural, starting with cereal grains and ending with animal feeds.

In total the region has a major role in the national economy. Situated as it is in the center of the country, it connects the coasts and the growing economy of Ontario to the rest of the nation. Overall in the range of 30% of the nation's freight is either destined to or starting from the region. All modes, whether measured by value, tons (metric ton) or ton-miles (metric ton-kilometers), show the same pattern.

The reliable and efficient movement of freight is vital to the economic health of the region. A challenge to that movement is a challenge to our economic wellbeing.

Modal Shares

Freight moves by one mode or another because of one or more of several factors:

- The value of the freight
- The weight of the freight
- The length of the haul
- The dependability of service required

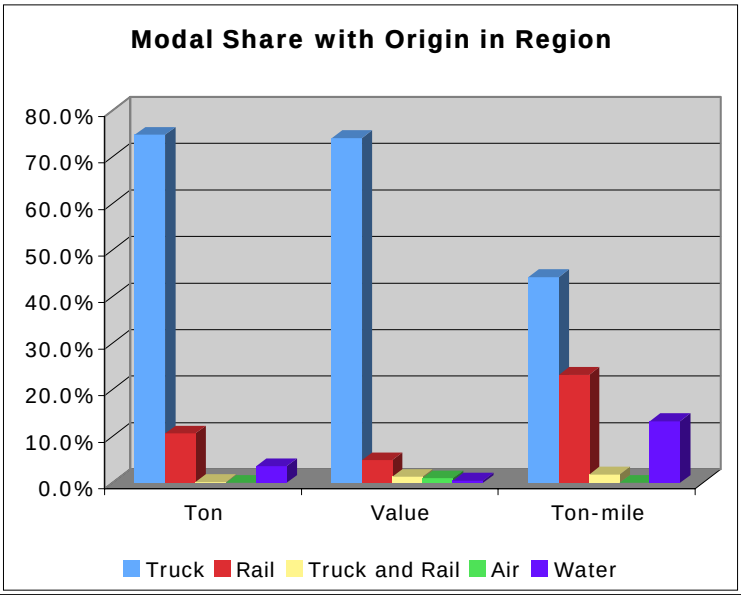

Figure 3: Modal Share with Origin in Region

Typically, high value freight with a high service requirement moves by air or by truck. High weight freight with low service requirements moves by rail or water.

As Figure 3: Modal Share with Origin in Region illustrates, freight in the region is moved predominately by truck. Whether measured by tons (metric ton), value, or ton-miles (metric ton-kilometers), truck is the major mode, carrying 40% or more of the total.

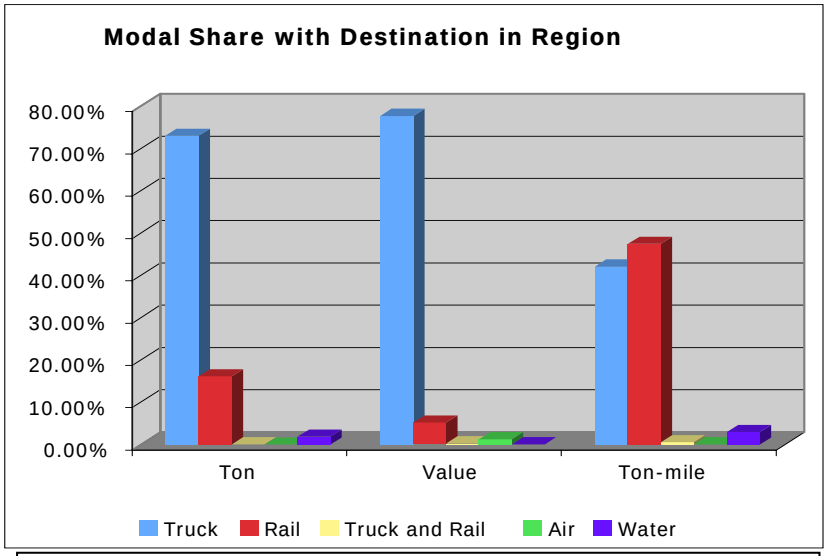

Figure 4: Modal Share with Destination in Region

Perhaps the most striking element in Figure 3: Modal Share with Origin in Region and Figure 4: Modal Share with Destination in Region is the height of the yellow bar representing truck-rail, or intermodal. It now carries a very small proportion of the total freight. The share with an origin in the region is

largely the auto industry and largely destined for Texas and California.

The notion of a seamless, truly intermodal, transportation system has gained support in recent years. Unfortunately, current public and private policies make that vision difficult to attain. The rule-of-thumb used by most shippers is that a haul must be at least 500 miles (805 kilometers) in length before it is economically feasible to use rail. Chicago transit times are also a determining factor for intermodal in this region. That transit time is now measured in days. To be attractive for shippers who have higher service standards that measure must be reduced to hours.

Water is the other mode to be pointed out from the above figures. Despite the fact that the Upper Midwest is blessed with the Great Lakes, the Mississippi, Illinois, Missouri and Ohio Rivers, water carries very small amounts of freight.

Projections of Freight

A number of factors combine to increase the amount of freight moving in our economy. First of all, world trade is growing. Figure 5: Freight and Economic Activity provides an overview of the change in imports and exports for the US and its major trading partners for the ten years ending in 2002.

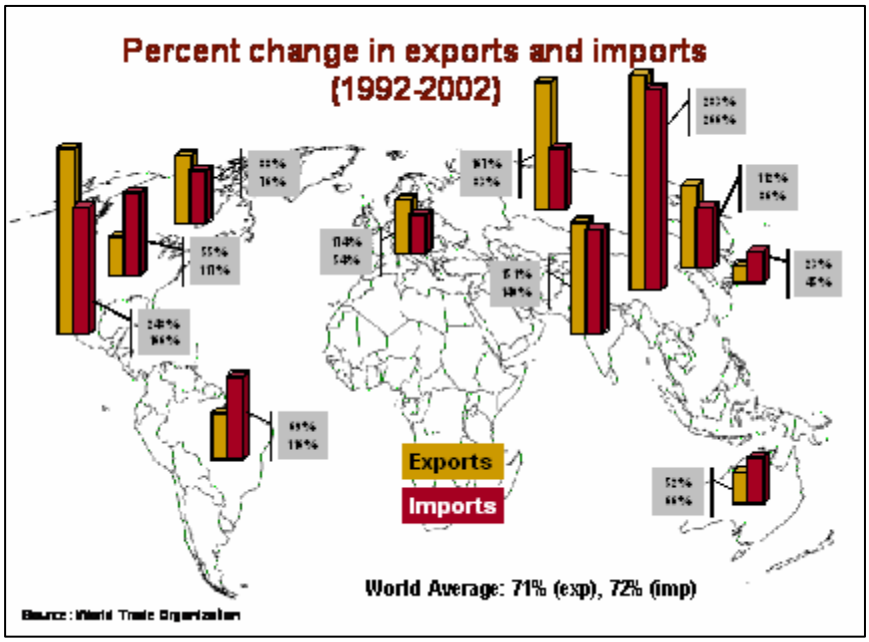

Figure 5: Freight and Economic Activity

For our region the impact of the growing of Ontario economy is significant. Each week thousands of trucks leave Ontario for the states of the Upper Midwest.

Another major change that has taken place is in the nature of manufacturing. Historically, manufacturing was geographically consolidated. The Ford plant at River Rouge in the early Twentieth Century was a good example of such consolidation. Raw materials, in the form of iron ore and coal, entered one end and finished automobiles emerged form the other. Now manufacturing is largely distributed across wide regions. Auto engines might be

made in one state, transmissions in another, instrument packages in still another, bodies in a forth, with assembly in a fifth. All of this requires more extensive and complex freight movements.

Finally, the efforts of retailers and manufacturers to minimize warehousing costs by timing shipments, the just-in-time approach, have placed higher service demands on the transportation system. This in turn has forced more freight to the modes that support higher service levels; generally, this means truck.

The Federal Highway Administration and several states in the region have done estimates of future freight. Those estimates suggest growth to 2020 in the range of seventy to eighty percent. As noted earlier, freight movements closely track with economic indicators. Recent projections of those indicators for 2020 show a range of growth from 19% to 78%. If the observed correlation holds, growth in the range of 80% would be on the high range of probability, but growth in excess of 50% would seem likely.

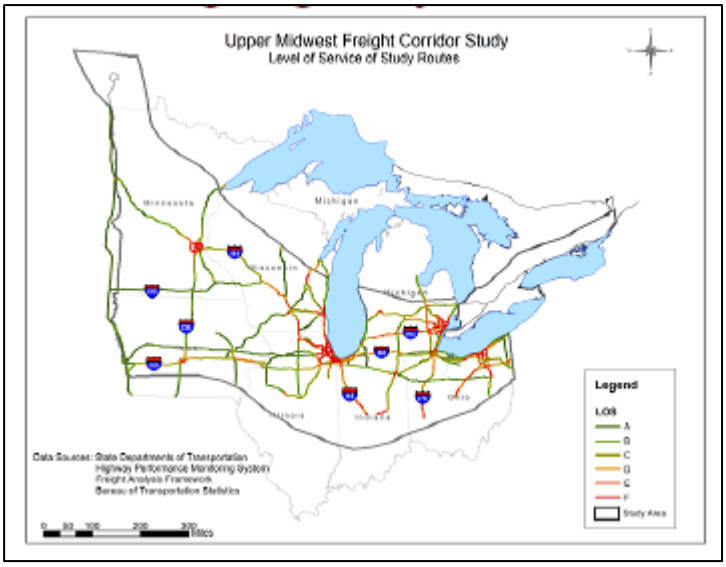

Figure 6: Freeway Capacity

Capacity

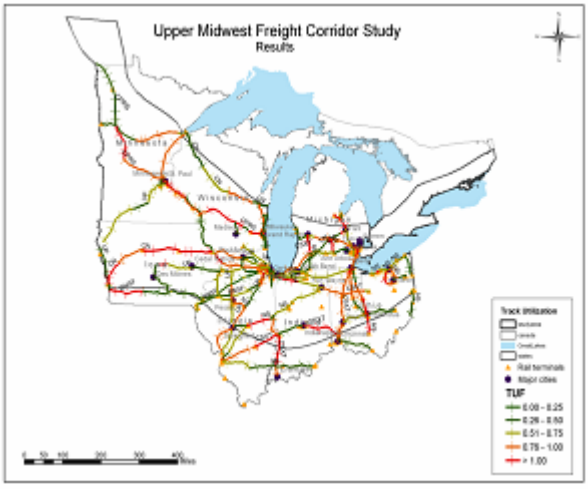

Figure 7: Rail Track Capacity

The first phase of the Upper Midwest study measured the current capacity of the freeways (I-80-90-94), railroads and waterways through the region. All three modes show many links at or beyond capacity.

We would expect red lines, indicating constrained capacity, in the urban areas; but now, as shown in Figure 6, orange and red lines are appearing in the rural portions of the region as well. The rural links that connect the major business centers of the region are nearly all operating at or

near capacity. And this is using 2002 and 2003 data.

Figure 7: Rail Track Capacity provides similar information for the class one railroads in the region. Again, much of the system shows capacity constraints. Both this and the highway measures are conservative. They do not consider terminal constraints or operational features, such as interchanges, that can limit capacity.

The inland waterways also show capacity constraints. Since the locks are the primary capacity constraint, it is a good indicator of the operations of the rivers. Delays of up to four hours per transit are common at each lock on the Upper Mississippi and Illinois. Lack of investment and federal statutes and regulations have also effectively limited the capacity of the Great Lakes.

Conclusions

Pulling all the parts together paints a depressing picture. The demand for the movement of freight is growing. Increasingly, service requirements limit the modal choice to truck. Intermodal movements are very small. And capacity is already constrained.

Figure 8 tries to portray data that is largely unknowable. But let us assume that relative modal capacity relates closely to current utilization. The blue, red, and yellow show that approximate distribution for each of the modes. Together, they represent the total freight capacity available in 2000. Then let us assume that capacity changes as well or slightly better in the next 20 years than it did in the previous 20. In the diagram, both rail and truck show slight increases to the year 2020. Previously, we have seen the growth in freight projected to be in the 50 to 80% range. Exactly how much of current capacity is used is unknown, but a conservative guess would place it at about 85% of highway, rail, and water capacity. Plotting all of these lines produces a conceptual deficit in capacity over the next one or two decades. The question is: Will it become real? And the challenge is to avoid it or manage it.

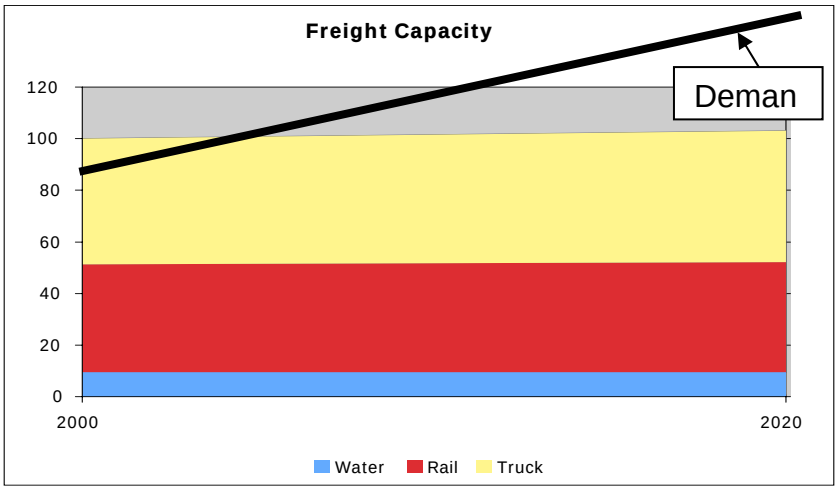

Figure 8: Conceptual Future Capacity

As the region the region considers the future of freight, it will have to evaluate a number of options, many of which will represent major departures from existing policy. Our creativity and courage will determine how well the challenge is met.

The Null Alternative in Highway Capacity and Management

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It has been said that one of the truest forms of insanity is repeating the same actions and expecting a different outcome. In this paper, the writer attempts to envision the most likely outcomes for highway freight transport if current policies and processes are continued in the Upper Midwest. Past experience is the primary guide to the future along with the projections of experts in the field of energy and environment. With this guidance, the outlook is not good. We can expect congestion to get worse, our competitive position to be diminished, fuel consumption to increase, and pollution to be needlessly high.

Capacity

The US has what is often called a system of state-administered, federally assisted highway transportation. Under this system, the federal government provides aids to the states along with broad guidance as to how those aids can be used. Each state makes the decision as to how federal aids and state raised funds will be used to maintain and improve its highway system. In making those decisions, state transportation, and political leaders usually seek to maximize the benefit to their citizens and the impact to their state. They make the best possible decisions for transportation within their borders. Consultation and planning for issues beyond their borders is minimal. Problems that exist within a state are to be dealt with by that state, without regard to the impact that those problems might have for other states. The result for the region and the nation may be less than optimal.

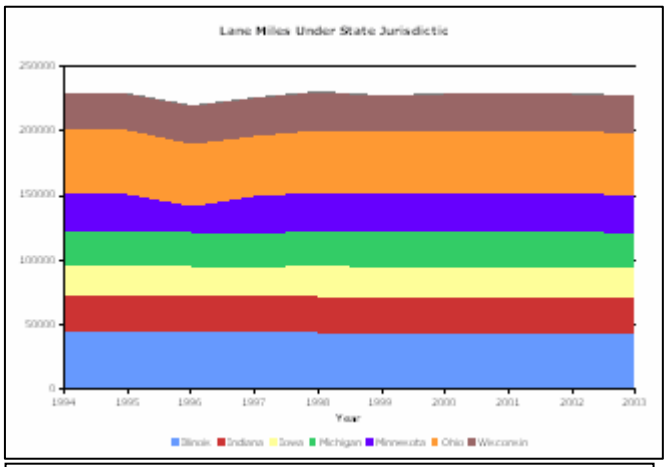

Figure 1: Lane Miles under State Jurisdiction (*1*)

Since the completion of the Interstate Highway System, no mechanism has existed to either facilitate or compel states to develop projects or routes that are consistent and complimentary across state borders. Indeed, since the completion of the Interstate System, much of the emphasis of state departments of transportation has turned to maintaining their highway investments through rehabilitation, reconstruction, or replacement. The result has been a marginal

change in highway lane miles. Figure 1 provides an overview of the change in overall highway lane miles, regardless of facility type, under state jurisdiction in the Upper Midwest. For the past ten years, overall mileage has not changed.

The picture for limited access lane miles (kilometers) is somewhat better. Over the past ten years, limited access lane miles (kilometers) have increased, but at a rate much smaller than overall traffic mileage has increased. This is illustrated in Figure 2.

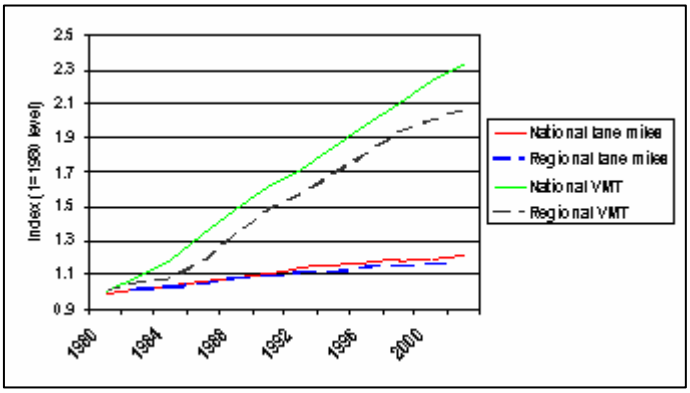

Figure 2: Freeway Lane Miles and changed Vehicle Miles of Travel (*1*)

We might expect this trend to continue into the future under the assumptions of a null alternative. The only major plan currently being implemented within the region that might provide a slight increase is that of the Illinois Tollway Authority. Under this plan, additional lanes will be added to 117 miles (188 kilometers) of toll ways in Northern Illinois and toll collections will be modernized to eliminate many of the currently required stops. Both of these efforts will add to capacity in Northern Illinois, which will benefit much of the region.

We can, therefore, expect under this alternative a very modest increase in highway lane miles (kilometers) through the year 2020. During those same years, even if annual increases continue at what are historically low rates in the range of 1.5%, automobile travel can be expected to increase by about one-third. If freight ton-miles (metric ton-kilometers) increase in those years by 50% or more, as they are now project to do, we can expect nearly twice the number of truck miles (kilometers) on our highways.

Operational Improvements

Freeway
- Transportation management center operations
- Incident management
- Event management
- Ramp metering
- Lane controls
- Managed lanes
- Real-time traveler information
- Electronic toll collection
- Work zone management
- Road weather information systems
- Variable speed limits
- Ramp closures
- Bottleneck removal

Freight
- Vehicle tracking
- Real-time freight information
- Roadside electronic clearance programs

Figure 3: Operational Improvements (*2*)

Technology

Many have argued that highway capacity alone is not the issue. Our focus should be on how well existing capacity is managed and how the factors which contribute to demand are managed. Figure 3, which is an edited version of an FHWA Office of Operations graphic (portions of the original were deleted to focus on operational tools), illustrates this thinking and what options might be considered. Most of the options shown are Intelligent Transportation System (ITS) tools. Indeed, national studies indicate that these tools could contribute to the reduction in congestion in the region. However, the states of the region have not come to agreement on which tools should be implemented, how they should be implemented or what standards should be employed.

The Government Accounting Office, in its review of the FHWA's progress in implementing a national ITS system, concluded that:

> Generally, the promise of ITS as an integrated tool for managing congestion has not yet been met. Although we recognize that [US] DOT cannot always influence ITS investments, limitations of DOT's efforts in goal setting, measuring, and other activities such as evaluating outcomes have reduces DOT's ability to facilitate state and local governments' strategic investment in ITS.

Stated another way, ITS tools may hold promise, but implementation has been slow and inconsistent. Nothing on the horizon would suggest change in the near or mid-term future.

Energy

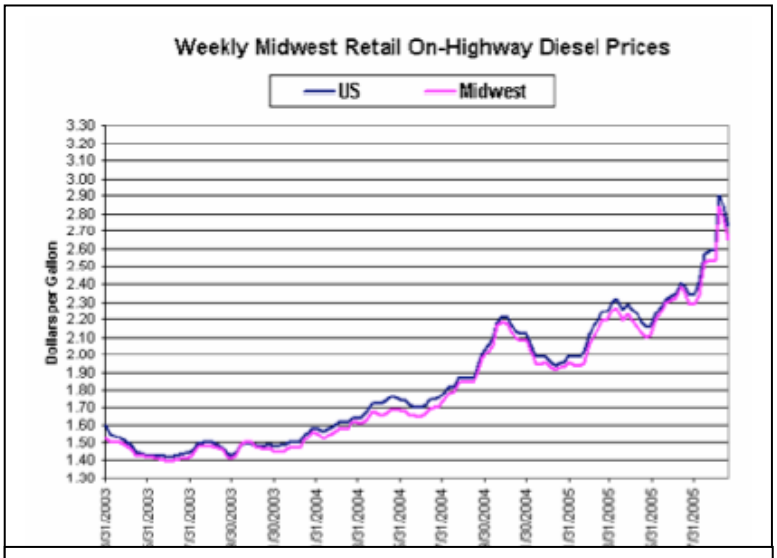

Figure 4: Change in the price of Diesel fuel, 2003 to 2005 (*3*)

If a bright spot can be found in the recent surge in fuel prices, it is in its potential impact on congestion. With fuel prices increasing, people may choose to drive fewer miles (kilometers), canceling trips, or using other modes.

A recent informal poll of fuel retailers reported in the New York Times found that

sales were off an average of 10%. This was when gasoline prices were well over $3.00 per gallon ($0.79 per litter). If the data is sound, this may translate to a 10% reduction in miles (kilometers) of travel. More probably it means that the Hummer stayed in the garage and the Prius got more miles (kilometers), or the tank on the Hummer got refilled at near empty rather than at half full.

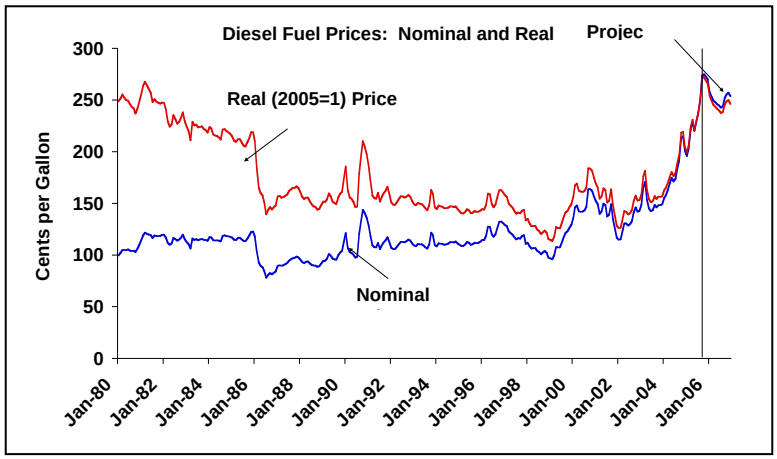

Figure 5: Real versus Nominal: Price of Diesel Fuel (*3*)

We would normally assume that a price jump of about 100%, as illustrated in Figure 4, would bring about significant changes in behavior. In fact, fuel prices are much higher than they have been in the recent past, but they are comparable to historic levels. Figure 5, contains information on the nominal (the-current or actual dollar value) and real (inflation adjusted value) price of diesel over the last 25 years. In 1980, the real price of a gallon (litter) of diesel was $2.50 ($0.66), not much less than it is in 2005.

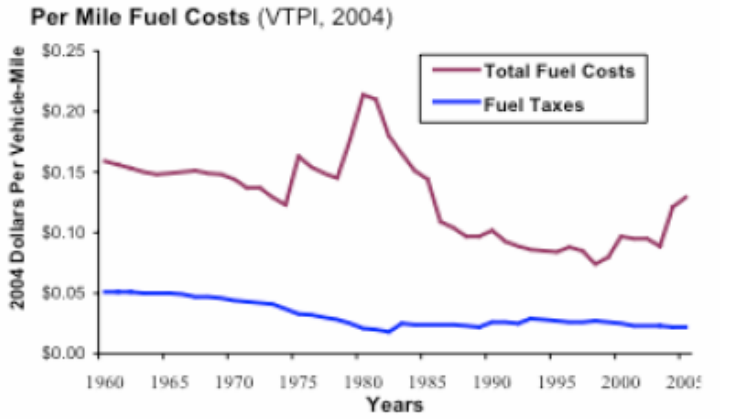

Figure 6: Per Mile Fuel Costs (*4*)

Another way to look at price is how much we spend to drive a mile (kilometer). Again, as shown in Figure 6, we are at historically low levels. The real price of fuel is comparable to what it was in the past and our vehicles—at least automobiles—are much more efficient.

Finally, to understand the consequence of rising fuel prices on travel, we have to consider the economic concept of elasticity. How much does a change in price change consumption? The answers in the literature are all over the map, but Goodwin and Hanly (Transport Review, May 2004) did a review of past empirical studies of the issue and found that a real, continuing, price increase of 10% would cause:

- Traffic to fall by 1% within a year
- Traffic to fall by 3% in about 5 years
- Fuel consumption to fall by 2.5% within a year
- Fuel consumption to fall by 6% in the long run

The reason for the smaller change in traffic than in fuel consumption is the expected increase in the efficiency of fuel use—the Hummer is parked.

All of these changes provide a new base from which growth will occur. At this point it is impossible to tell what the continuing price rise will be. Production has risen and prices are falling. But even a 30% lasting real rise would produce only about a 10% real reduction in traffic in the long run. Therefore, it does not seem reasonable to rely on price change to cure traffic congestion.

Air Quality

The Upper Midwest has a number of areas that are classified by the Environmental Protection Agency as non-attainment that is they have dirtier air than the federal standards deem to be healthy. Figure 7 is a map showing non-attainment and maintenance counties in the US.

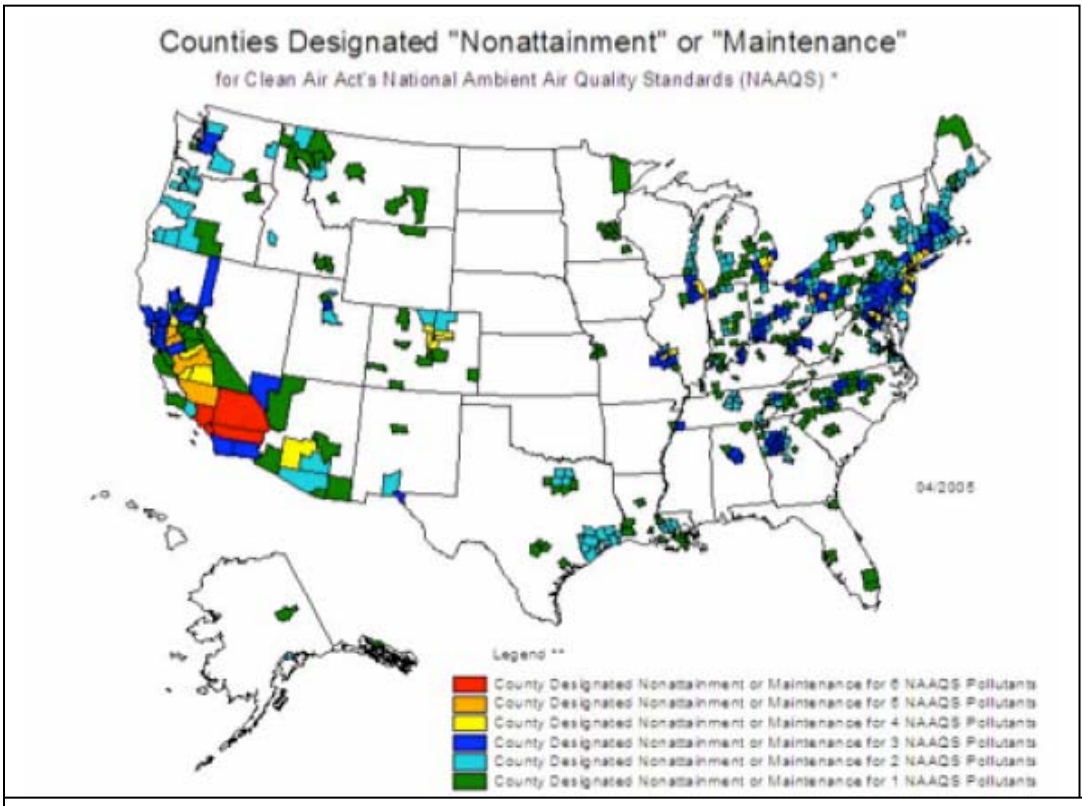

Figure 7: Air Quality Non-attainment or Maintenance Areas (*5*)

From the perspective of freight, the major pollutants are nitrous oxides (NOx) and particulates, the product of diesel engines. Chicago, Detroit, Indianapolis, St. Louis, and much of the Ohio River Valley are non-compliant with particulate standards. NOx is one of the gases that produce ozone, so it is problematic in many parts of the region.

The EPA did a study of the impacts of freight on air quality in several urban areas around the country, including Chicago and Detroit. Figure 8, which outlines the proportion of road pollutants attributed to trucks, is from that study.

Comparison of Heavy-Duty Truck Emissions in the Six Study Regions, 2002

Region	NOx (tons)	as % of total on-road NOx		VOC (tons)	as % of total on-road VOC		PM-10 (tons)	as % of total on-road PM-10		CO (tons)	as % of total on-road CO
Baltimore	29,081	49.7%		1,416	5.8%		734	N/A		13,232	3.9%
Chicago	96,291	57.4%		6,500	10.9%		**2,641**	**62.6%**		58,330	6.0%
Dallas-Ft. Worth	53,718	50.4%		2,174	4.1%		884	38.3%		20,229	2.3%
Detroit	**98,195**	**62.8%**		5,374	8.8%		2,382	N/A		62,805	5.6%
Houston	64,590	54.7%		2,408	5.6%		1,256	47.7%		20,117	2.7%
Los Angeles	130,341	49.4%		**14,839**	**11.0%**		2,210	31.3%		**121,776**	**9.1%**

Figure 8: Pollutants Attributed to Trucks (*6*)

Note that in Chicago and Detroit, 57% and 63%, respectively of the road-derive NOx is attributed to trucks. In Chicago, 63% of the road-derive particulates are attributed to trucks. In both cities, about 6% of the on-road carbon monoxide, a greenhouse gas, comes from trucks. So trucks are major contributors to unhealthy air.

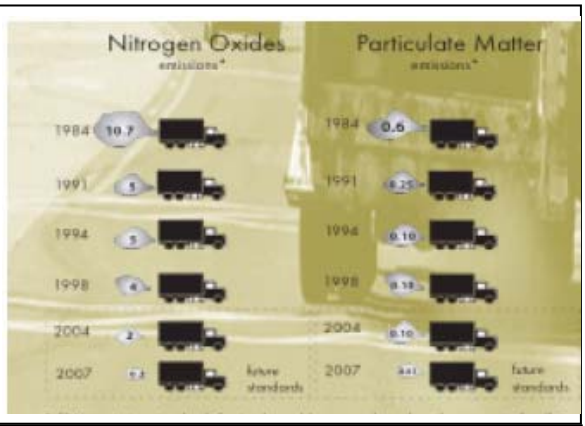

Figure 9: Truck Pollutants (*7*)

Logically we can expect more trucks operating in more congested conditions to be a greater source of pollution. Fortunately, better engines and cleaner fuels are reducing the pollution caused by trucks. Figure 9 graphically illustrates the past and projected change in pollution by trucks. By 2007, emissions from individual trucks will be only a small fraction of what they were in the

past. But more trucks, operating under less favorable conditions will pollute more than they might under better operating conditions.

We have all experienced the problem of exhaust when we were driving in a cue during rush hour or at a highway crash or work zone. The amount of exhaust in those situations is not only a function of the number of cars and trucks. It is a function of how they are operating. An engine operates most efficiently from both the perspective of fuel consumption and of emissions at slightly below highway speeds. At low speeds and at very high speeds, engines pollute much more than they do at moderate speeds. Congestion will cause more pollution.

Greenhouse gases are another type of pollutants. These gases, primarily CO and CO2 from transportation, contribute to global warming. According to the Department of Energy and the EPA, the US contributes 23% of the total World emissions of carbon. Thirty-two percent of the US total comes from transportation. (Note this is 1995 data. Current allocation will be somewhat different.) As shown in Figure 10, freight trucks account for 16% of the transportation emissions, which is larger than what is the case in the large cities, shown in Figure 8. Water and rail transport account for another 5%.

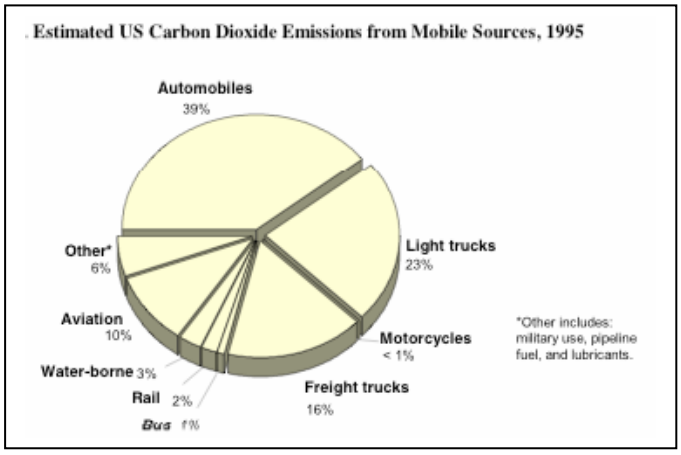

Figure 10: US Carbon Dioxide Emissions from Mobile Sources

Engines and fuels are getting cleaner, particularly as it relates to the precursors of ozone. But progress has been slower in reducing greenhouse gases. More vehicles and more congestion will serve to frustrate—not totally cancel--the progress of technology in meeting this challenge. We may not have as much gunk in the air as we might have had, but we will have more than we want to have.

Conclusions

Using the past to glimpse the future is somewhat risky, but it's the best tool we have. The region has not kept pace in providing highway capacity to meet demand in the past. Under the null alternative, we have little reason to expect a change in the future. The region has not implemented (or even agreed on what should be implemented) technologies to manage congestion. Following existing policies and processes, there is little reason to expect a change in the future.

Therefore, as truck and auto volumes of travel increase, it is reasonable to assume congestion will also increase.

Some have argued that increased fuel prices will act as an unintended congestion pricing mechanism, delaying or reducing congestion. The real price of fuel, which is within historic bounds, and the continuing decline in the energy cost of driving do not support this position, nor does the little that we know about the price elasticity of fuel. Therefore, we should expect congestion.

Motor vehicles emit toxins into the air. Nitrous oxides, and volatile organic compounds cause ozone and carbons cause global warming. Technology has reduced the amounts emitted by autos and trucks and is expected to continue to produce cleaner vehicles into the future. Unfortunately, more vehicles operating under more congested conditions will tend to offset much of the advances to technology.

References

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2 Federal Highway Administration, Office of Operations, *Traffic Congestion and Reliability: Linking Solutions to Problems*, at http://www.ops.fhwa.dot.gov/congestion_report/chapter4.htm#table4_1

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Creating Highway Capacity

Mary Ebeling, Midwest Regional University Transportation Center

The challenge of creating capacity to move the growing volume of freight in the Upper Midwest will remain one of the primary preoccupations of shippers, haulers, and policy makers for the foreseeable future. Because the current transportation infrastructure, including highway, rail, air, and water, is reaching or exceeding capacity and is difficult to expand, decision makers and planners will likely look towards innovative new programs as another way to increase capacity without adding new infrastructure. This white paper will focus on federal programs, as established in the SAFETEA-LU legislation, that provide opportunities to create and/or expand freight capacity throughout the Upper Midwest region. Information on funding levels, approval processes, and federal formula funding is also considered.

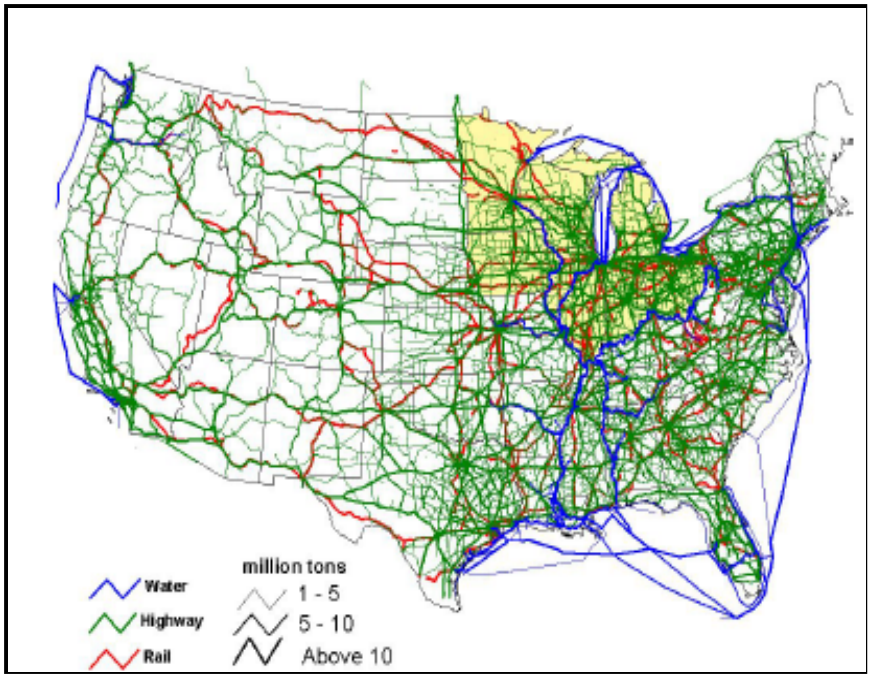

Figure 1: Link Tonnages, 1998

Figure 1 shows tons of freight transported by road, rail, and water and clearly depicts the critical importance of the Upper Midwest in the Nation's freight network. In addition to freight origination in the region, freight moving between the east and west coasts is likely to pass through the Upper Midwest. This image suggests the area is becoming a bottleneck for freight movements.

Existing Federal Programs

SAFETEA-LU includes a variety of programs and tools that could assist in creating additional capacity for freight in the Upper Midwest. A regional coalition must become familiar with funding, project approval processes, and the impact of guarantee dollars on the ability of our transportation system to meet the region's freight shipping demands.

National Corridor Infrastructure Improvement (Corridors) Program (§1302)

Capacity improvement and congestion management for the Interstate Highway System create some of the greatest opportunities for managing highway solutions that facilitate and improve the flow of freight along the nation's highways. The Corridors Program allocates funds to the states to make improvements in nationally significant corridors that are likely to promote economic growth and foster trade. States must apply to the federal government in a competitive bid process to be awarded funds through this program. Funding levels for the Corridors Program are appropriated from the Highway Trust Fund. Authorized funding levels in SAFETEA-LU are as follows:

- $194,800,000 for fiscal year 2005;
- $389,600,000 for fiscal year 2006;
- $487,000,000 for fiscal year 2007;
- $487,000,000 for fiscal year 2008, and;
- $389,600,000 for fiscal year 2009.

Project approval process

Under the Corridors Program, projects on the National Highway (Interstate) System that promote national and international trade and economic growth, and can be completed within a five-year period are given priority for funding. Selection factors considered in the legislation during the approval process include:

- The extent to which the project corridor provides a link between two existing segments of the Interstate System;
- The extent to which a project will facilitate major multi-state or regional mobility and economic growth;
- The extent to which commercial vehicle traffic in the project area is projected to increase;
- The volume of international freight traffic in the corridor;
- The extent to which the improvement will decrease congestion;
- The anticipated reduction in travel time through the freight corridor as a result of the project;
- The value of cargo moving through the area
- The extent to which federal funds are leveraged by the project.

But projects funded through this program are earmarked in SAFETEA-LU. Five projects of particular interest to Upper Midwest Freight stakeholders are:

- IL Construction of the U.S. I-80 to I-88 North-South Connector in Illinois - $152,000,000
- IL Construction of Route 34 Interchange and improvements in Illinois – $55,000,000
- IN I-80 Improvements - $10,000,000
- MN Falls-to-Falls Corridor - $50,000,000
- WI Construction and reconstruction of the U.S. Highway 41 corridor between Milwaukee and Green Bay, Wisconsin - $30,000,000

Many of the criteria noted in the project approval process portion of this discussion are met by the challenges and opportunities currently manifest in the Upper Midwest, making the region a good candidate for funding through the Corridors program Particularly, provisions to encourage capacity building in areas with significant international trade should draw the attention of states along the Canadian border. A regional freight coalition's proposed projects would be attractive under the criteria for the promotion of multi-state regional economic growth.

Projects of National and Regional Significance (§1301)

In a manner similar to the Corridors Program, this program provides funds for projects that include efforts to improve freight mobility and thus provide regional and national economic benefits. To achieve this goal, SAFETEA-LU establishes a program to award grant money to states, on a competitive basis, to address the need to complete transportation projects that result in economic benefits and improve the safe and secure flow of goods, people, and services along the National Highway System.

Project approval process

Eligible projects under this section of SAFETEA-LU include those that will incur costs expected to equal or exceed either $500,000,000, or seventy-five percent of federal highway funds apportioned to the state in the most recent fiscal year for the state in which the project is located. This program provides funding for any surface transportation project that is eligible for federal assistance and includes freight rail as well as highway freight transportation projects.

Projects are awarded in a competitive bid process; however, special consideration is given to proposals that effectively do the following:

- Leverage federal investment by incorporating non-federal funding into the budget, including monies from public/private partnerships.

- Use new technologies, including ITS.
- Help protect the environment.

In addition, funding is available over the life of a project, beginning with preliminary engineering through construction.

Projects funded through this program are already earmarked. Five projects designated through SAFETEA-LU are of particular interest to Upper Midwest Freight stakeholders:

- IL Construction of O'Hare, Bypass/Elgin O'Hare Extension - $140,000,000
- IL Mississippi River Bridge - $150,000,000
- MI Planning, design, and construction of a new American border plaza at the Blue Water Bridge in or near Port Huron, MI - $20,000,000
- VA, WV, OH Heartland Corridor Project including multiple intermodal facility improvements - $90,000,000
- WI Reconstruction of the Marquette Interchange, Milwaukee, WI - $30,000,000

As the above list displays, states in the Upper Midwest have already begun to take advantage of this program. Regional stakeholders should continue to take advantage of this program, particularly since it focuses on capacity building and congestion reduction with an eye towards economic development and freight movement.

Truck Parking Facilities (§1305)

This program addresses the shortage of long-term parking for commercial motor vehicles (trucks) on the nation's National Highway System. This program seeks to construct new parking facilities and to increase available parking at existing sites, including highway rest stops, park and rides, or other similar facilities. Funding for the Parking Facilities program comes from the Highway Trust Fund. SAFETEA-LU earmarks $6,250,000 per year from 2006 through 2009 for this program.

Increasing available truck parking on the National Highway System will benefit capacity by providing truck parking spaces for the increasing numbers of trucks that will be entering the highways in the Upper Midwest. These funds are not yet earmarked, which provides an opportunity for Upper Midwest freight stakeholders to take advantage of this program.

Freight Intermodal Distribution Pilot Grant Program (§1306)

The purpose of the Freight Intermodal Distribution Pilot Grant Program (FIDPG) is to facilitate and support intermodal freight transportation initiatives at the state and local levels to relieve congestion and improve safety and to provide capital

funding to address infrastructure and freight distribution needs, primarily at inland ports and intermodal freight facilities. SAFETEA-LU sets funding levels for the FIDPG program at $6,000,000 for each fiscal year from 2006 through 2009.

Project approval process

To receive monies through this program, states must submit a grant application to the Secretary of Transportation. Priority is given to funding projects which:

- Reduce congestion into and out of international ports in the U.S.
- Demonstrate ways to increase the likelihood that freight container movements involve freight containers carrying goods, and;
- Establish or expand intermodal facilities which encourage development of inland freight distribution centers.

By reducing congestion, increasing the number of containers actually carrying freight, and improving or constructing new distribution centers, the FIDPG program may facilitate the improvement of freight-carrying capacity for highway-system freight as well as intermodal freight. These funds are not yet earmarked, which provides an opportunity for regional freight stakeholders to take advantage of this program.

Coordinated Border Infrastructure Program (§3203)

The coordinated boarder infrastructure program seeks to distribute funds to border states to improve the mobility of freight and motor vehicles across the border between the United states and Mexico and the United states and Canada. Funding from this program can be applied to a number of eligible uses, including:

- Improvements to existing transportation and support infrastructure;
- Construction of highways and related safety facilities;
- Operational improvements (electronic data interchange, telecommunications, etc.) that expedite freight movements;
- Modification to regulatory procedures that expedite cross-border freight movement, and;
- International coordination of freight movements pertaining to cross-border movement of freight and motor vehicles.

Funding Levels and Eligibility Criteria
Funding for this program is distributed by formula. The funding breakdown by year is as follows:

- $123,000,000 for fiscal year 2005;
- $145,000,000 for fiscal year 2006;
- $165,000,000 for fiscal year 2007;
- $190,000,000 for fiscal year 2008, and;
- $210,000,000 for fiscal year 2009.

Projects funded through this program are already earmarked. Two projects, one in Michigan and one in Minnesota are of particular interest to Upper Midwest Freight stakeholders. The funding levels are as follows:

- Michigan $20,871,373
- Minnesota $3,749,666

Funding is available for projects in Canada or Mexico, if a U.S. border state proposes a project to facilitate cross-border trade. Facilities may be constructed in these countries if the appropriate local government in Canada or Mexico can guarantee that the facility will be constructed using equivalent U.S. construction standards and that the new infrastructure will be properly maintained to facilitate trade. States in the Upper Midwest sharing borders with Canada can capitalize on this program to improve efficiency and infrastructure at their border crossings.

Freight Planning and Capacity Building Program (§5204)

This new program funds research, training, and education to support freight transportation planning. Funding for this program comes through the Training and Education funds and is set at $875,000 a year from 2006 to 2009.

Research targeted towards strategic planning for infrastructure improvements, congestion mitigation needs, and technologies to enhance freight movements across the country would be of particular interest and benefit to a regional freight coalition in the Upper Midwest. This program could potentially interact with the National Cooperative Freight Transportation Research Program (§5209). The development of a national research agenda for freight offers numerous opportunities to develop recommendations for capacity-building programs.

National Cooperative Freight Transportation Research Program (§5209)

Could potentially interact with the Freight Planning and Capacity Building Program. An advisory committee chosen to represent the different stakeholders in freight transport will be selected to develop a national research agenda for this program. The advisory committee should work cooperatively with researchers involved in the Freight Planning and Capacity Program to promote programs that aid in creating capacity for the freight industry. This program is funded at $3.75 million per year for 2006-2009. The funding comes from Surface Transportation Research funds.

Impact of Formula Funding

The question of the impact of formula funding on the states of the Upper Midwest is a complicated one that is not easy to answer. In short, formula funding refers to the formula the federal government uses to determine the amount of money from the federal gas tax it returns to the states. This tax, collected in the individual states at the pump, funds the Highway Trust Fund. According to FHWA staff, a full analysis of the impact of this money on freight programs has not yet been completed but eligibility relative to freight has not changed from TEA-21. However, FHWA has issued a summary of how these monies will be distributed. Selections from this summary are included here to help in considering funding levels and options for building freight capacity. For a more detailed discussion of funding through SAFETEA-LU, please visit http://www.fhwa.dot.gov/safetealu/summary.htm.

Equity Bonus – Federal-aid highway funds for individual programs are apportioned by formula using factors relevant to the particular program. After those computations are made, additional funds are distributed to ensure that each state receives an amount based on equity considerations. In SAFETEA-LU, this provision is called the Equity Bonus (replaces TEA-21's Minimum Guarantee) and ensures that each state will be guaranteed a minimum rate of return on its share of contributions to the Highway Account of the Highway Trust Fund, and a minimum increase relative to the average dollar amount of apportionments under TEA-21, and that certain states will maintain the share of total apportionments they each received during TEA-21. An open-ended authorization is provided, ensuring that there will be sufficient funds to meet the objectives of the Equity Bonus.

Relative Rate of Return – Each state's share of apportionments from the Interstate Maintenance, National Highway System, Bridge, Surface Transportation, Highway Safety Improvement, Congestion Mitigation and Air Quality Improvement, Metropolitan Planning, Appalachian Development Highway System, Recreational Trails, Safe Routes to School, Rail-Highway Grade Crossing, Coordinated Border Infrastructure programs, the Equity Bonus itself, along with High Priority Projects will be at least a specified percentage of that state's share of contributions to the Highway Account of the Highway Trust Fund. The specified percentage, referred to as a *relative rate of return*, is 90.5% for 2005 and 2006, 91.5% for 2007, and 92% for 2008 and 2009.

Concluding Thoughts

Table 1, below, shows the range of federal programs available through SAFETEA-LU. From the perspective of creating new capacity for freight, there are a wealth of possibilities. For example, Projects of National and Regional Significance and the Corridors Program, although fully earmarked in the legislation, include projects that promise to improve capacity for freight

movement in the Upper Midwest. There is clearly a fair amount of funding available that could be used to enhance the region's freight capacity. However, the manner in which this funding is currently being used focuses on the efforts of individual states. While projects constructed by individual states may improve infrastructure, they are unlikely to address system-wide deficiencies or capitalize on opportunities across the region. Projects proposed by a multi-state coalition, such as a regional coalition of the Upper Midwest Freight stakeholders, hold greater potential for funding projects that not only get constructed, but contribute to enhancing freight movement at a regional level.

Table 1: Freight Capacity-Building Programs in SAFETEA-LU

Program	Section	Infrastructure	Congestion Mitigation	ITS/Data Management	Highway	Multi-modal	International	Research
Projects of National and Regional Significance	§1301	X			X			
Corridors Program	§1302	X	X		X			
Coordinated Border Infrastructure Program	§3203	X	X	X		X	X	
Freight Intermodal Distribution Pilot Grant Program	§1306	X	X	X		X		
Interstate Discretionary	§1113	X	X	X	X	X		
Bridge Discretionary	§1114	X	X	X	X	X		
Truck Parking Facilities	§1305	X	X		X			
Freight Planning and Capacity Building	§5204							X
National Cooperative Freight Transportation Research	§5209							X

Reference

1. Adapted from FHWA SAFETEA-LU summary: http://www.fhwa.dot.gov/safetealu/summary.htm

Applying Regular Federal Aids to Highway Freight Capacity Issues

Ernie Wittwer,-Wittwer Consulting

When the prospect of new transportation initiatives is discussed, the billions of dollars that the federal governments provide the states and the flexibility that the states have in using those aids is noted with the implication that they already have dollars that they can use for this new purpose. Indeed the states of the Upper Midwest will receive in the range of five billion dollars per year through 2009 under the recently passed surface transportation act. Figure 1 provides an overview of the amounts that will be apportioned to each of the states under the new act. The overall trend is for an increase in funding in the regular apportionments.

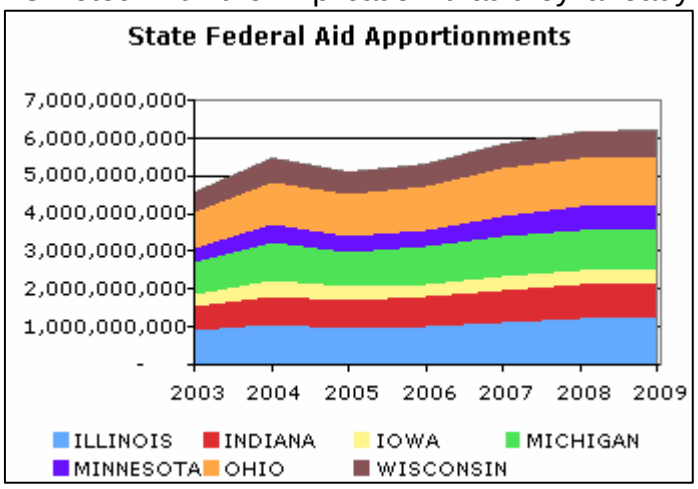

Figure 1: Federal Aid Apportionments to the States of the Region (*1*)

Two cautions should be applied to this data. First of all, apportionments are always larger than useable dollars. Typically, the appropriations process reduces the funding by as much as 20%, so Figure 1 portrays the highest amounts that might be received. Secondly, as shown in Figure 2, the purchasing power of the dollar is constantly being eroded. Even Figure 2 uses projections of the consumer price index that do not capture the impact of the recent surge in oil prices. Since construction prices, particularly for paving and earthmoving, are heavily influenced by the price of fuel and asphalt cements, we can expect the real purchasing power of future federal aids to be constant at best.

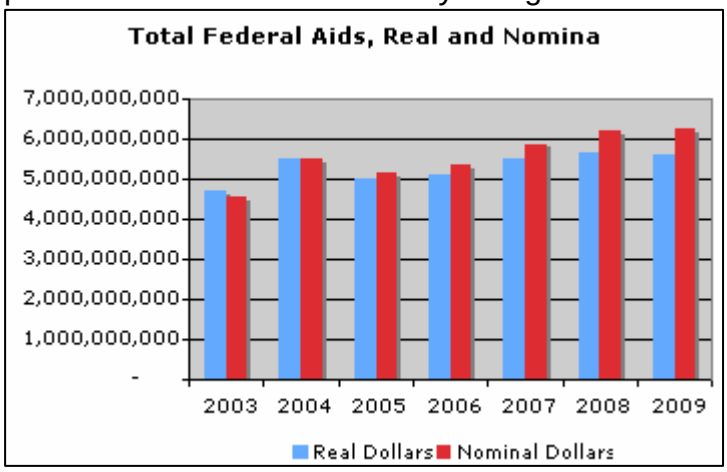

Figure 2: Real and Nominal Federal Apportionments for the Region (*2*)

While five billion seems like an enormous resource, the demands on the states of the region are also enormous and the federal resource was

anticipated in the investment planning for the region. States normally develop their investment plans, or programs, on a five to eight year cycle. They must anticipate both state and federal resources in each future budget period of the planning cycle. Rarely will they underestimate the resources that will be available, so the federal dollars have already been anticipated and assigned to projects. Those projects are associated with the needs of the region. Any use of regular federal aids for an initiative in freight will require that some existing regional needs be abandoned or postponed. Additional resource will be required if this emerging need is to be met.

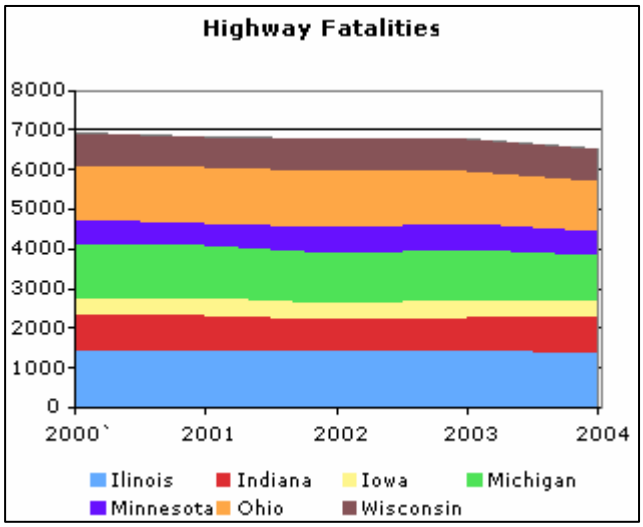

Figure 3: Highway Fatalities in the Region (*5*)

Safety is a priority of all of the agencies in the region. Yet, as shown in Figure 3, nearly 7,000 people lost their lives on the roadways of the region in each of the past five years. The trend line, such as it is, is downward; but this safety issue confronting transportation agencies in the region remains significant.

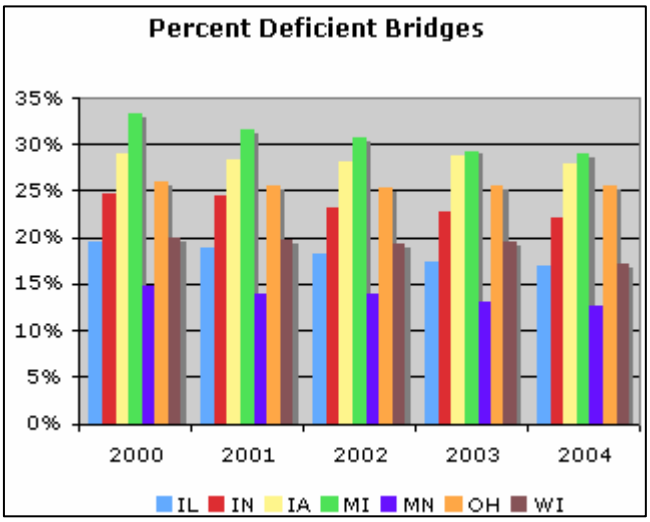

Figure 4: Defiant Bridges in the Region (*3*)

Safety is not the only demand upon the resources of the region. Despite a recent downward trend in some states, 22% of the bridges in the region remain deficient, as shown in Figure 4.

These bridges could be structurally deficient such that they cannot carry expected loads, or they may be functionally deficient because they are too narrow or poorly aligned with the surrounding roadway. In either case, they pose some safety threat to the traveler.

Figure 5 contains information on the smoothness of the rural National Highway System. The figure shows the distribution of the pavements into categories of pavement roughness, as measured by the international roughness index, (IRI). The smaller the number, the better the pavement. The bulk of the pavements are in the less than 119 categories, indicating reasonable ride quality, but about 8% of the total remain in the greater than 145 categories, the categories that probably would not pass the seat test if you drove them at the speed limit.

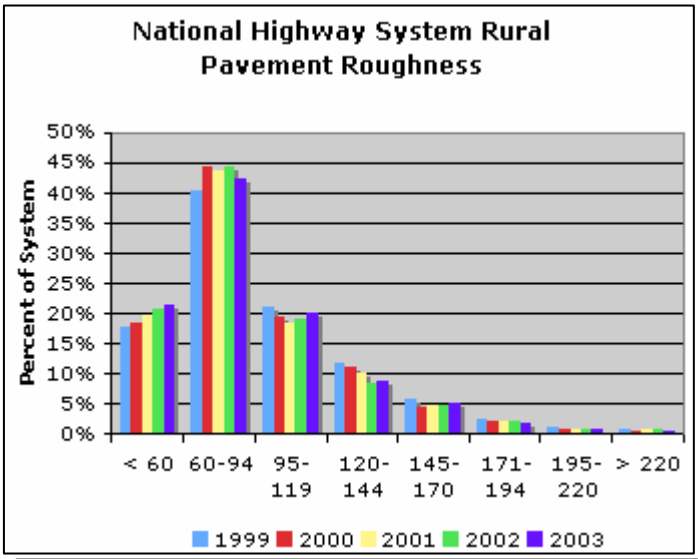

Figure 5: Pavement Roughness on the Rural National Highway System (*3*)

In addition to safety and the condition of the highway system in the region, the states must respond to ever increasing demands in the use of the system. Figure 6 gives a measure of congestion in some of the major urban areas in the region. The measure is daily freeway traffic by freeway lane mile (kilometer). This is a simple measure of the use to which available capacity is being put. All of the cities show major increases in traffic per lane. For example, Chicago had 12,600 vehicle miles per lane mile (12,600 vehicle kilometers per lane kilometers) in 1982. In 2003, it has 19,500 vehicle miles per lane mile (19,500 vehicle kilometers per lane kilometers), a 55% increase in 21 years.

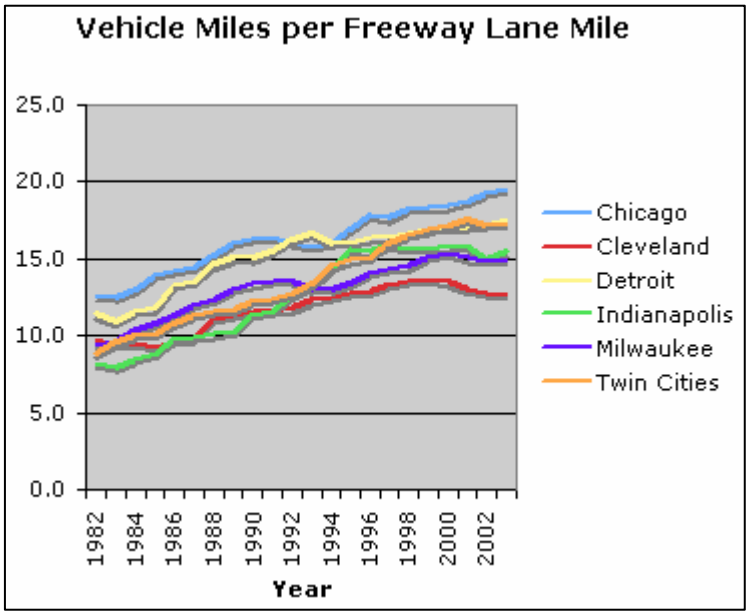

Figure 6: Urban Congestion (*4*)

In summary, the states in the region do get significant levels of funding from the federal government and they do have flexibility in how those dollars are used. Unfortunately, the states have significant needs and demands that they must

use these resources to meet. The safety of the system, its structural integrity and the growing demands placed upon it all require resources. While federal regulations would allow "regular" federal funds to be used for freight-driven initiatives, such use would come at the expense of existing activities needed to keep the entire system operating. New resources will be needed if the demands of freight are to be met.

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Using Highway Technology

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Introduction

The Upper Midwest faces a variety of problems within its transportation network. There is a growing pressure for roadway systems to operate more efficiently in the face of increased congestion, more vehicle-miles (vehicle-kilometers) traveled, and a deteriorating infrastructure. The historical response to such problems has been expansion of the roadway's capacity. This solution is no longer as feasible, and now pressure has fallen on technology to maximize the efficiency of the current infrastructure.

Various highway technologies are available to facilitate safety and security, operational efficiency, administrative efficiency, and regulatory compliance of freight transportation. Many of these technologies are already implemented in several of the Midwest states.

CVISN

The Commercial Vehicle Information Systems and Networks (CVISN) integrates existing information systems with communication technology and standards. The objective is to improve safety, efficiency, administration, and regulatory compliance of commercial vehicle operations. CVISN has three major components: safety information exchange, electronic credentialing, and electronic screening.

Safety Information Exchange

Safety Information Exchange (SIE) is a centralized database that gathers information about commercial vehicles, such as driver and vehicle data and safety history. This information is then used by state agencies and law enforcement to determine which vehicles should be inspected and which ones should receive their credentials. SIE data gets entered, updated, and made available nationwide in less than one hour. SIE helps enforcement and regulatory compliance programs become more resourceful in maintaining commercial vehicles. For example, the technology can aid law enforcement in identifying high-risk vehicles for more in-depth inspection.

Electronic Credentialing

The process of electronic credentialing includes registering operators, registering and titling vehicles, checking insurance, collecting and distributing fuel taxes, issuing oversize/overweight permits, issuing licenses and permits to haul

hazardous materials, and collecting federal heavy vehicle use taxes. The states process the applications using a combination of manual and automated systems. Motor carriers generally use some type of credentialing system software on their computer to prepare and submit applications electronically. The state agency's system then processes the data. The processing includes error checking, cross-checks with other databases, fee calculations, invoicing, payment, and issuance of the appropriate decal, sticker, plate, or paper document.

Electronic credentialing makes organizing and retrieving of credentials very efficient. In conjunction, the system promotes safer roadways for all travelers by ensuring shippers are complying with regulations. This reduces cost and time to freight carriers, taxpayers, and end users.

Electronic Screening

Electronic screening is a system that monitors the weight of commercial vehicles. It works in conjunction with Radio Frequency Identification (RFID) transponders which are mounted onto commercial vehicles. These transponders communicate driver and vehicle information to receivers at weigh stations and border crossings. Compliant carriers are signaled to bypass the weigh stations, gain entrance to a port, or to expedite border crossing.

Figure 1: Electronic Screening of a Commercial Vehicle (*6*)

Electronic screening technology saves processing time at weigh stations and border crossings, which means it promotes fuel efficiency. Actual weigh station traffic is reduced, giving law enforcement agents more freedom to focus on extreme offenders. It improves traffic flow along the highways while requiring no expansion of the existing highway infrastructure. Electronic screening technology has low costs to the user with each transponder costing an average of about $40. The cost of the electronic screening equipment, however, is about 1.5 million dollars per weigh station, which is a huge burden on state DOTs.

Weigh-in-Motion (WIM)

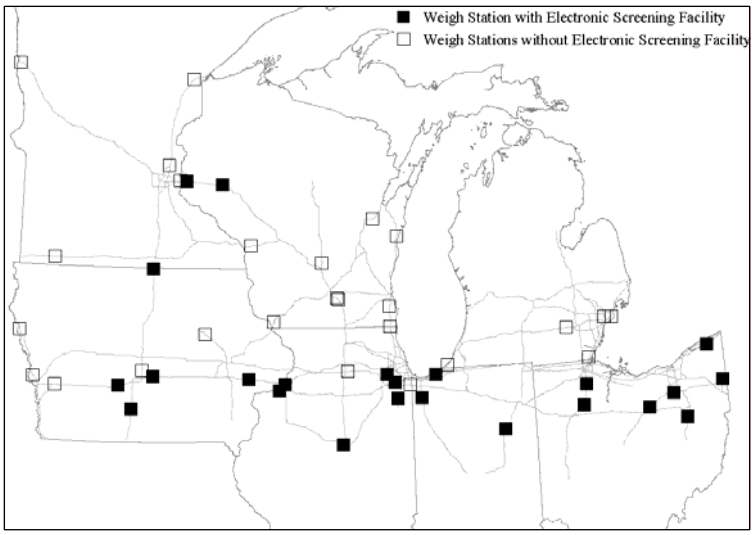

Figure 2: Weight Enforcement Facilities in Upper Midwest Region Study Corridor (*1*)

WIM systems record truck axles and gross vehicle weights as vehicles drive over a plate sensor. These sensors measure a truck's gross weight, axle weights, axle spacing, speed, and vehicle classification. This sensor is located within the road and allows vehicles to pass through without stopping. The system can handle a commercial vehicle driving at speeds of up to 55 miles per hour (89 kilometers per hour) over the sensor. WIM is used for collection of statistical data, support of commercial vehicle enforcement, roadway and bridge cost allocation, and traffic management. These systems can be portable, semi-permanent, or permanent depending on their use. Electronic screening facilities include WIM. Figure 2 shows weigh stations within the corridor, some of which have WIM capabilities.

Virtual Weigh Stations

Figure 3: Virtual Weigh Station Camera (*7*)

Virtual weigh stations have WIM scales installed along the highway mainline that are monitored remotely. An overview camera collects the vehicles license plate number. After the data and plate number are collected, the information can be sent to either a portable laptop or office computer to be monitored and/or regulated. Trucks are identified by automated images that record the USDOT number on the sides of their cabs. These images and sensor data are electronically communicated to a control center. Trucks that violate the scale requirements are stopped and inspected at portable scale inspection sites. Virtual weigh stations are being widely embraced and deployed for their cost benefits. The cost of a virtual weigh station is between $100,000-150,000, substantially less than a fixed weigh station. A major benefit of a virtual weigh station is that habitual offenders can be identified remotely, which can make the roadways safer and limit violators. Indiana is the only state in the Upper Midwest

that is currently deploying these stations, though virtual weigh station deployment is a high priority of the Gary-Chicago-Milwaukee Corridor.

Freeway Management Systems

Freeway Management Systems (FMS) are used to inform transportation agencies of traffic volumes, traffic speeds, road conditions, and other related data. The systems utilize a variety of ITS tools such as closed circuit television cameras (CCTVs) and in-pavement traffic sensors. Administrators can use the data to inform the public of road and traffic conditions through dynamic signage, web sites with real-time data, and highway advisory radio stations. A functional FMS can aid in the deployment of maintenance and police vehicles, identify areas of obstruction, direct future capacity expansion or technology deployment strategies and location, and mitigate congestion without expanding capacity. The system can also assist in informing the public of important events like Ozone Action Days.

Funding for FMS can come from a variety of sources. Urban areas designated as non-attainment regions for National Ambient Air Quality Standards (NAAQS) under the Clean Air Act often have access to Congestion Mitigation and Air Quality (CMAQ) funds. Other funding can be drawn from the Surface Transportation Program and Interstate Maintenance Federal funding sources.

FMS is one of the few areas in which states have successfully shared technology benefits and responsibilities across the border. For example, the Ohio-Kentucky collaboration on Cincinnati's FMS funding, deployment, and management demonstrates that cooperation between states in using highway technology is attainable.

Asset Tracking Applications

An asset tracking system involves an assortment of technological devices. These devices can track trucks, trailers, containers, cases, or pallets. See Figure 4 for asset tracking technology implementations for freight shipments. Asset tracking coordinates telecommunications technologies, sensors, and simple bar codes and labels. These applications ensure shipments are moved from start to end safely and securely. Asset tracking is particularly helpful for

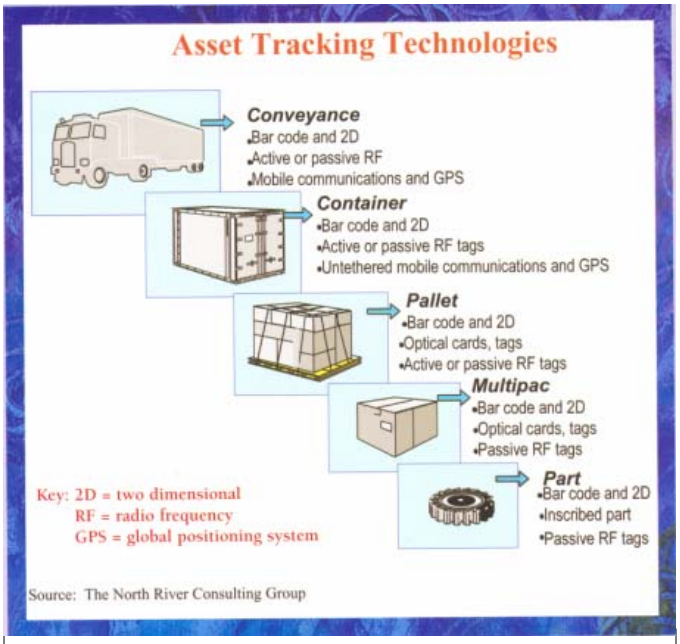

Figure 4: Asset Tracking Technologies for Hazardous Loads (*2*)

shipments that are carried by multiple modes of transport. For example, a container may be shipped from a plant on a flatbed truck and then loaded onto a rail car, and then back onto a truck for the final leg of its journey. The tracking device on the container would ensure there was no tampering of the shipment. These devices are very important for material handling and anti-theft, which protects the public from threats such as shipments of contraband or potential terrorist weaponry.

HAZMAT Tracking

HAZMAT tracking is a serious concern within homeland security. Hazardous materials have the potential to be targeted by terrorists due to the rare and potentially volatile nature of the cargo. HAZMAT tracking uses GPS and communication applications. The GPS can track the cargo or vehicle to see if they stray from the pre-specified route. If this happens, an alert is dispatched. There are other technologies such as a panic button and intelligent on-board computers. Panic buttons send emergency alerts via satellite or terrestrial communications. Lastly, an intelligent on-board computer can disable the vehicle's motor in the case of a security breach. HAZMAT tracking is often coupled with biometrics to verify operator identification. A biometric login can verify the identity of the driver.

Biometrics

Biometrics technologies are used to improve security. Unique physical characteristics such as the iris, fingerprints, retina, voice, and face are used to authenticate identity. At the Charlotte-Douglass Airport, iris scanners are used to verify the identity of airport employees, TSA, vendors, etc. through an eye-pass system. To establish this system, a photo of the eye is taken and converted into a unique digital signature. Other benefits to biometrics besides safety include are time and cost savings. Biometrics applications streamline checkpoints before the cargo is shipped, saving time and money. The system processes background and clearance checks for the operator faster through computers versus the manual paper work that was filled out and processed.

Radio Frequency Identification (RFID)

RFID uses radio waves to identify different cargo. This technology is already used at existing weigh stations for e-screening. There is an RFID tag which utilizes a microchip and an antenna. The microchip stores a unique serial number that is transmitted to a reader by the antenna. This application is used at weigh stations for e-screening and at toll booths for toll collection. The RFID tags are very inexpensive, generally costing less than $15. On the other hand, there are some disadvantages to RFID systems. The standards of RFID are still under development. The range of the RFID tag is limited to about 10 feet (3 meters) and high range tags, which broadcast farther, cost more.

E-Seals

Figure 5: E-Seal Attached to Freight Trailer (*5*)

E-Seals are disposable RFID transponders for container doors. Law enforcement and customs officials use expensive readers to track E-Seals' movements along highways, borders, and ports. The E-Seal transmits the container's ID number to a reader within an inspection station. The seals are readable at mainline speeds. If the container has been tampered with, a message will appear on the reader. The inspection station can then use the information to determine which containers should be inspected. When a container has left the country this information is posted on the internet for tracking purposes. This application can increase efficiency and security at border crossings. One application of E-Seals, used by the Department of Agriculture, is the tracking of in-transit containers of restricted foods. E-Seals, however, are not widely used within the country. A major problem with E-Seals is the lack of standardization in transponder frequencies. This not only causes problems within the US but makes it hard to coordinate with other countries.

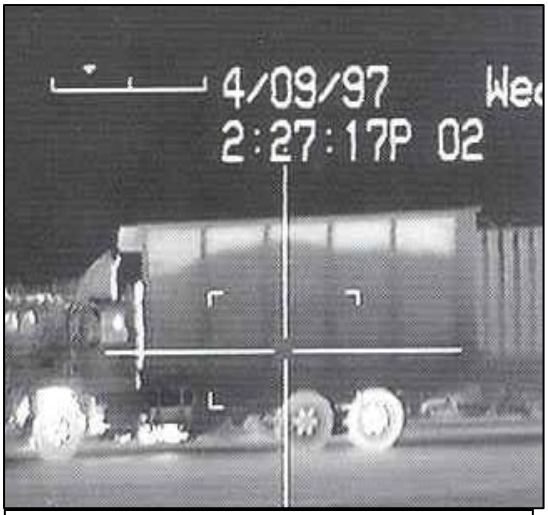

Figure 6: IRISystem Detecting Inoperable Brakes on the Vehicle (*3*)

Infra-Red Inspection System (IRISystem)

IRISystem detects disconnected brakes on commercial vehicles. This system uses heat sensors to check if the brakes of the vehicle are operational. Figure 6 shows a commercial vehicle with one axle of non-operational brakes. The white wheels are warm, which means the brakes are functional. The dark wheels' brakes are not in operation. Disconnected brakes make a commercial vehicle easier to drive and handle, which is why some drivers unhook them. The cost for one unit is about $300,000. IRISystem exhibits a significant increase in identifying problematic vehicles and out-of-service orders. This system is implemented at weigh stations and the vehicles can be screened at around 10 miles per hour (16 kilometers per hour).

Vehicle and Cargo Inspection System (VACIS)

VACIS uses a non-intrusive gamma ray imaging system. The system is mounted within a truck. Short wavelengths with high energy concentrations penetrate thicker and denser materials than x-rays. Additionally, gamma rays are more cost effective and reliable. This system is implemented through homeland security grants and is frequently used to look for weapons, contraband, and other potentially dangerous objects entering the country. Illinois is the only state in the upper Midwest that has this system implemented. The major drawback to this system is its high cost. Each system costs about $1,500,000.

Identification and Monitoring of Radiation in Commerce Shipments (IMRicS)

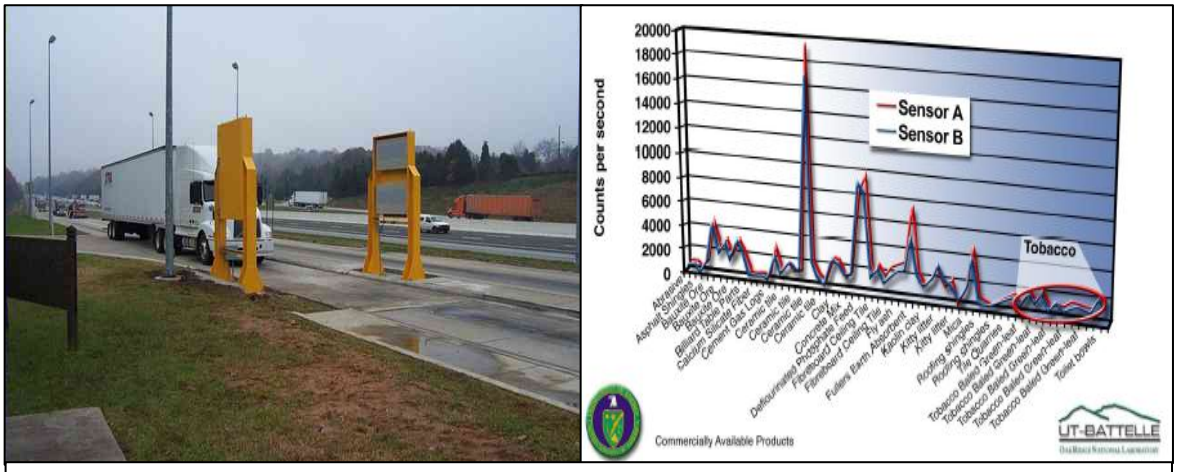

Figure 7: IMRicS System and Cargo Representation of Radiological Signatures (*4*)

IMRicS systems send commercial vehicles through radiological sensors prior to stopping on a static scale. The cargo within the vehicle is detected by a radiological signature. Some of the signatures trigger alerts indicating potential illegal goods. Vehicles that are flagged are then subject to further inspection. This system is still within the development stage at Oak Ridge National Laboratory. Figure 7 shows a truck entering the IMRicS system. The graph to its right shows the radiological signatures for different types of cargo. State law enforcement officers can use IMRicS to crack down on shippers who are transporting illegal freight.

Fatigue Management Technologies (FMT)

Every year many drivers get injured or die due to fatigue-related accidents. It is difficult to validate this problem, because it is difficult to determine if the driver involved in a crash was fatigued or drowsy. FMT consists of many different types of technology applications to alert drivers and detect possible fatigue. One system detects eye closure by using infrared monitoring. The camera sits on the

dashboard and is directed at the driver's eyes. It gives continuous feedback on the alertness level of the driver and sounds an alarm when eye closure is detected. Another application tracks lane markings along the roadway. The system alerts the driver when the vehicle moves from the lane center. There are many other devices that measure sleep needs and control center steering.

Implementation of Technology

Figure 9 shows a distribution of the implemented technologies in each state. The Upper Midwest is a leader in transportation technology usage with some states deploying technology beyond electronic screening.

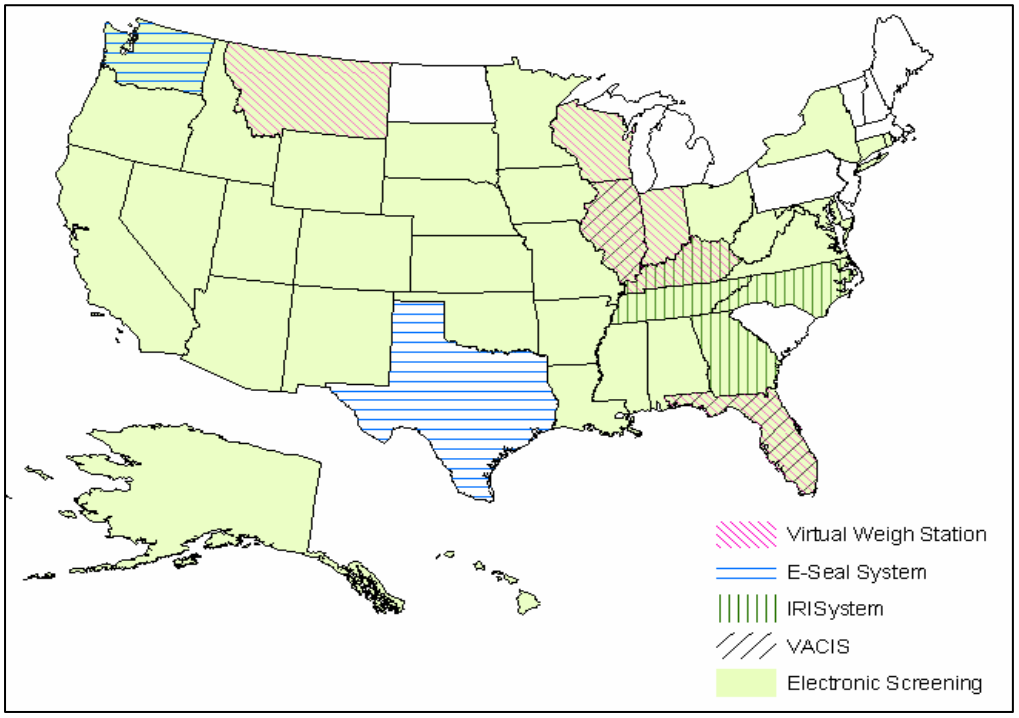

Figure 9: Technology Application Implementation (*1*)

Table 1 shows a quick recap of the technologies status in development and the area of focus.

Table 1: Maturity and Focus Areas of Technology (*1*)

Status	Technology	Driver	Vehicle	Cargo
Widely Tested and Deployed	GPS & Wireless Communication		X	X
	Hazmat Tracking	X	X	X
	WIM		X	
	RFID		X	
	Electronic Screening		X	
Tested by Limited Deployment	Virtual Weigh Station		X	
	Biometrics	X		
	VACIS			X
	IRISystem		X	
Under Development or in Testing	Fatigue Management Technology	X		
	E-Seal			X
	IMRicS			X

Each technology focuses within an area of safety, security, and/or enforcement. Table 2 displays the different technologies within these categories and lists an approximate cost with each.

Table 2: Highway Freight Technology Applications and Cost (*1*)

Technology	Safety	Security	Enforcement	Fixed Cost
Fatigue Management Tech.	X			$
E-Seal		X	X	$
RFID		X		$
WIM			X	$
Virtual Weigh Station			X	$
Biometrics		X		$
GPS/Wireless Communication		X		$
Hazmat Tracking	X	X		$-$$
IRISystem	X		X	$$
Electronic Screening			X	$$$
VACIS		X	X	$$$
IMRicS	X	X	X	$$$
$=<$300K $$=$300-1M $$$=>$1M				

Barriers to Regional Coordination

There are many significant barriers to regional coordination in technology deployment and management. Interviews with Commercial Vehicle Operations (CVO) experts highlighted several obstacles that need to be effectively confronted in order to create an atmosphere in which regional cooperation can work.

- *There are limited clear benefits to regional cooperation.* Most transportation agencies are concerned primarily with the freight traffic within their jurisdiction. Both congestion and infrastructure damage are viewed as localized problems with localized solutions. There is logic to this mindset. As transportation administrators are called upon to maintain high levels of service despite an aging infrastructure, increasing traffic volumes, and shrinking funding, they must look to their own area of responsibility before considering the larger good of the region. Allocation of funds to regional projects with regional benefits is constantly taking the back seat to projects with easily quantifiable local benefits.

- *Agencies differ in policy directions.* Even within states, there are significant disputes that arise due to different perspectives and directions. For example, weight enforcement in Minnesota is a coordinated effort between the Department of Public Safety's Pro-Rate Division, the State Patrol, and the Department of Transportation's Freight and CVO Office. All approach the table with different agendas, different performance measures, and most importantly different priorities. Without incorporating a uniform policy direction, any plans for regional cooperation are unlikely to succeed. In addition, developing a uniform policy direction for a wide variety of stakeholders with significantly different structures is a serious challenge. There is a lack of quality plans that produce trustworthy, realistic assessments of the benefits that regional cooperation can foster.

- *Regulations are not standardized across borders.* In order to utilize regional technologies, states must agree on what they desire from their transportation system. Regulations reflect differing ideologies that would be sources of conflict in regional cooperation. On an operational level, differing regulations create problems with enforcement, credentialing, and licensing. While it may be a huge efficiency boost to issue one permit to a freight hauler for the entire Upper Midwest, this is impossible if every state in the region has different regulations on when, where, and at what weight the driver can operate.

- *The current culture of transportation management does not foster cooperation.* Several CVO experts mentioned that one of the biggest challenges to regional cooperation was simply finding people willing to try it. Locating agency champions for regional deployment of technology with support from their upper management will be essential for overcoming barriers. Unfortunately, there is a significant opposition to the notion of change within transportation agencies. Cooperation beyond one's borders has never been part of the job for most transportation administrators. It has been viewed as unrealistic, ineffective, and extracurricular. In order to foster the long term vision and dedication that a regionally deployed technology infrastructure would demand, the culture of transportation

management must adapt to incorporate a broader view of the transportation system.

- *Agencies lack the trust necessary to share information and technology management responsibility.* For a public agency, sharing of responsibility has traditionally meant losing direct control. This is one reason why transportation agencies are hesitant to trust other agencies. One state DOT has no guarantee that another state DOT is applying the appropriate standards and scrutiny to data. States frequently disregard data that comes from sources they have little experience with. Unfortunately, other state DOTs typically fall into this category. This lack of trust is not limited to public relationships. Private firms are also resistant to cooperative efforts due to trust concerns. The desire of private firms to protect proprietary information mandates caution. Additionally, a tradition of overestimating the benefits of transportation improvements has created skepticisms amongst private firms that must be addressed to gain their trust.

Interestingly, there are few technological hurdles that arose during conversations with CVO experts. The challenges that must be overcome in order to effectively share information which can increase efficiency in regulatory enforcement, credentialing, and freight movement are minimal. Most barriers to regional cooperation are products of the culture, traditions, and structure of transportation administrations rather than technological limitations.

Funding is obviously of great importance when considering regional cooperation. All of the aforementioned barriers limit the amount of funding state DOTs are willing to dedicate to regional projects. Once the barriers of perspective, policy and regulation differences, culture, and trust have been effectively addressed (not that anyone is holding their breath), it is reasonable to expect to see an increase in the funds state DOTs are willing to contribute to regional scale technology deployment.

Opportunities for Regional Cooperation: The Low-Hanging Fruit

Cooperative technology management would aid the push to standardize regulations, leading to increased efficiency and lowered administrative costs. States could greatly benefit from the increased ability to share information across state lines. A regional database with real-time data would improve efficiency in weight enforcement, safety, security, and congestion mitigation. All of these advances are possible through coordinated efforts. Regional cooperation, a perceived option now, will become a necessity. The issue is whether the Upper Midwest begins to take action now, or waits until regional coordination is no longer an option, but a necessity.

There are several possibilities of how to proceed in developing a regional technology deployment and management strategy. Listed below are several ideas intended to foster discussion and thought.

- *Discussion between CVO experts throughout the Upper Midwest should be a regular component of technology planning.* CVO experts within the Upper Midwest region frequently interact at conferences and other professional gatherings. Yet there is rarely a defined component of technology planning that promotes communication between states as an essential element for effective deployment and maximum results. By fostering interstate communication, the benefits to regional cooperation will become clearer and the barriers to coordination will lower. For example, weight enforcement facility sites are frequently located at state borders, rather than dispersed evenly along corridors. This pattern leads to concentrated weight enforcement and delays at borders and long stretches of highway without any enforcement. The placement of weigh stations at borders is often unneeded, particularly when the neighboring states have similar weight regulations. Communication between CVO experts prior to deployment could help prevent inefficient allocation of resources before they are fixed in place.

- *Involving freight companies can promote the benefits of a regional perspective.* It is important for state DOTs to understand that political boundaries are of far less importance to freight carriers than they are to the government. By bringing freight companies into policy development forums, the interests of the users of the transportation system can begin to take precedence over the interests of the administrators. Freight companies are motivated, efficient, and often have access to the latest technologies. For example, Fatigue Management Technologies (FMT) will likely move from the Federal government into the hands of private freight carriers. If individual states in the Upper Midwest wish to encourage the use of such technologies because of their impacts on highway safety, the states will benefit from a regional approach. It is harder for a single state to enact and enforce a regulation on FMT usage than it would be for a region. By involving freight companies, state transportation administrations can learn about the latest technologies and methods and, through dialogue with the private sector, identify reasonable and effective regulation strategies. Engaging freight companies is not an easy task, given the reservations and skepticisms they frequently have with the public sector. But counting freight carriers' interests and input will ultimately help the Upper Midwest to remain a competitive region for freight movement.

- *The Upper Midwest should solicit the Federal government to play a stronger role within the regional plan.* The Federal government has the potential to provide the states of the Upper Midwest with a regional vision.

This vision can be backed by funding that ensures the effective implementation of a regional technology program. The Federal government provided states with a strong vision of the potential for CVISN. They are frequently praised for their role in getting the program off the ground. Yet their failure to provide the necessary funding throughout the development of CVISN is one of the reasons behind the lackluster adoption of the second phase of the program. States in the Upper Midwest need to recognize that the Federal government's involvement can be crucial to large-scale programs. The states should actively pursue Federal involvement in areas of concern such as security and safety. If the Federal government can perform with endurance in both the visioning *and* funding of a regional technology program, the program will have a far better chance of seeing the light of day.

- *Freeway Management Systems should operate on a corridor scale.* By extending metropolitan ideas about traffic management along interstates, the benefits that are realized on a local level for local trips can apply to the longer trips typical of freight carriers. The compatibility of technology should not be an obstacle to gathering information. Standardized databases can easily adapt data into a usable format. Most importantly, this regional coordination opportunity can use currently deployed technologies as a platform, limiting the need for capital start-up funding. Information that is collected from an FMS informs state DOT monitoring centers of traffic accidents, traffic flows, and congestion along the roadways. This information could be shared between state DOTs to notify them of other states' problems. Issues of congestion and traffic flow interruption impact a corridor. They do not stop at a state border. When state DOTs receive such data from other states, they can then warn their drivers of upcoming delays and possible detours through dynamic signage and other advisory tools.

- *The consistency of CVISN components within the Upper Midwest states should be enhanced.* By improving communication between states through CVISN technology, states will be able to strengthen law enforcement, safety, and security. In addition, by incorporating electronic credentialing and screening within all the states, the Upper Midwest's roadway system could gain a significant advantage. Other transportation networks unable or unwilling to integrate their technological communications would operate less efficiently, giving a competitive edge to the Upper Midwest. CVISN technologies could be extremely helpful in maintaining security, obtaining better safety and operational efficiency of the roadways, and achieving better regulatory compliance across state lines. One benefit is that freight carriers would face fewer delays for unneeded inspections. A compliant vehicle that was inspected in Indiana could be waived through Illinois without inspection delays. This would create more time for enforcement officers to target genuine offenders.

Additionally, consistent CVISN components would provide a platform to integrate regional electronic credentialing. Commercial vehicles would benefit from time and cost savings under such a program. Reduced paperwork, lower administration fees, and fewer processing delays would be the greater result of regional electronic credentialing. All in all, both private and public stakeholders would profit from an increase in CVISN consistency.

- *Improving regional shipping integrity could provide better homeland security while at the same time protecting shippers.* Intelligent freight technologies can help protect freight carriers against theft, shipment of contraband, and terrorism. Increased security can generate significant economic advantages for freight carriers in the form of lowered insurance costs, higher consumer confidence, and increased reliability. In order for surveillance to be effective, it must operate on a regional scale. Non-compliant and potentially dangerous shipments do not remain within state lines. Interstate coordination can ensure that if a shipment attracts suspicion for any reason within a state, the shipment will not escape scrutiny the moment it crosses a state border. If the Upper Midwest has communication protocols and procedures to coordinate the tracking of suspicious or potentially dangerous shipments (similar to those tracked under HAZMAT), the entire region can monitor its roadway networks collectively. Intelligent freight technologies have received increased attention following the events of 9/11, particularly those which prevent shipments from being tampered with. For example, E-seals ensure that the container has not been tampered with. RFID can track packages to ensure shippers have not deviated from assigned routes.

- *A regional vehicle-based surveillance system could benefit the Upper Midwest by providing detailed road network traffic flows.* Through coordination with state and local law enforcement, freight carriers, and cellular phone companies, state DOTs may be able to cooperatively establish a regional information-sharing, real-time database of the movements of commercial vehicles. Existing technology can connect law enforcement officials through use of their 911 database, freight carriers through GPS-linked cellular phones, and state DOTs who monitor commercial vehicle movement. This vehicle-based surveillance system could provide accurate, real-time travel data. This data could supplement existing strategies to identify and manage congestion problems. The GPS data would easily integrate with Geographic Information Systems (GIS) for a variety of administrative and analytical functions. This standardized surveillance system could use technologies already deployed under the CVISN program as a platform, making regional cooperation possible. By operating the system on a regional scale, states would lower the barriers to information-sharing across borders and gain access to accurate, real-time data for the entire network.

Conclusion

The possibility of regional cooperation in technology deployment and management is one that the region could benefit greatly from exploring. The progress of ITS and other transportation technologies has significantly lowered the barriers and costs to regional cooperation. By working to create a system-wide technology deployment strategy, every transportation agency in the region could see improved efficiency. As usage and congestion of the current national highway system increases, any efficiency progress can be a competitive boost to the Upper Midwest's transportation system and economic well-being.

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The Role of Tolls in Moving Freight

Mary Ebeling, Midwest Regional University Transportation Center

Introduction

If one accepts the conclusions of recent studies predicting an increase in congestion on the national highway system then it becomes apparent that new strategies must be developed to manage freight's impact on the country's transportation system.

Tolling strategies are a possible mechanism to relieve congestion caused by freight traffic. They can also facilitate freight movement, thereby providing economic benefits. If the region chooses to employ these tools it must be done on a region-wide basis to help improve the flow of freight through the region. In other words, to get a regional benefit, toll strategies should be deployed at a regional level.

Federal Rules and Tolls

Federal rules and programs for toll roads are delineated in the new transportation bill, SAFETEA-LU. This discussion gives a brief overview of existing federal rules concerning tolling as codified in SAFETEA-LU and investigates different tolling strategies that the Upper Midwest states should consider to benefit regional freight movement.

SAFETEA-LU (§1604) provides states with increased flexibility to use tolling not only to manage congestion, but also to finance infrastructure improvements and maintenance. Tolling programs in SAFETEA-LU, while not freight specific, can be used to manage freight as well as motor-vehicle traffic.

SAFETEA-LU provides the following programs for states to launch tolling projects on a pilot or demonstration basis.

- *Interstate System Construction Toll Pilot Program.* Under this program, the Secretary may permit a state or compact of states to collect tolls on an Interstate highway, bridge, or tunnel for the purpose of constructing Interstate highways. This program is limited to three projects in total (nationwide).

- *Interstate System Reconstruction and Rehabilitation Toll Pilot Program.* Established in TEA-21 and continued in SAFETEA-LU, this program allows up to three interstate tolling projects for the purpose of reconstructing or rehabilitating interstate highway corridors that could not be adequately maintained or improved without the collection of tolls.

- The *Value Pricing Pilot Program* is continued in SAFETEA-LU. The program supports costs of implementing up to fifteen variable pricing pilot programs nationwide to manage congestion and benefit air quality, energy use, and efficiency.

- The new *Express Lanes Demonstration Program* will allow a total of fifteen demonstration projects through 2009 to permit tolling to manage high levels of congestion, reduce emissions in a nonattainment or maintenance area, or finance added interstate lanes for the purpose of reducing congestion. Automatic toll collection is required. This program encourages the use of electronic tolling that is compatible across regions and states. Developing this type of system will be a great improvement in efficiency for all road users, including freight shippers. The Upper Midwest Freight coalition can benefit from this type of interoperability in tolling to reduce freight congestion on highways.

These programs can be used by the Upper Midwest Regional Freight Coalition to both manage congestion on the highway system through road pricing and raise funds for highway maintenance and improvements. Funding for express lanes with electronic toll collection promises to establish infrastructure that will offer significant efficiencies for shippers and could benefit freight movement through the Upper Midwest.

The Upper Midwest states can use these programs to their advantage if they choose to implement tolling programs *(1)*. It is imperative that the Upper Midwest Freight coalition plan any future toll projects jointly. Only by planning projects with an eye to current and future regional congestion issues will a complete and fully functional freight tolling program be established in the region.

Creative Uses of Available Tolling Opportunities

Now that these programs are in place and road pricing is gaining more attention in highway planning circles, what should be done in the Upper Midwest to capitalize on the new opportunities for road pricing made available through SAFETEA-LU? How can the states in the Upper Midwest region use what is being learned through these new programs to improve freight movement through the region? Should the Upper Midwest states convert existing lanes to toll lanes or construct new, dedicate toll lanes? The following are some suggestions of ways the Upper Midwest Freight partners could use tolling to manage congestion and increase freight flows through road pricing.

Figure 1: New York's E-ZPASS System (*2*)

Electronic Toll Collection

This tool is an automated way to pay tolls without stopping at a toll booth through the use of an electronic transponder. It is most often implemented on existing highway lanes, rather than through construction of new lanes.

Electronic toll collection technology has been available for more than ten years. In the past few years this time-saving tool has gained increasing acceptance and the benefits of this technology are being realized. The **New York State Thruway**, which is funded through users' tolls, has been a leader in implementing electronic tolling technologies. The E-ZPASS program provides truckers with incentives to use the E-ZPASS system through offering discounts on the necessary transponders that allow trucks to use the electronic tolling system.

The Thruway further encourages use of electronic toll collection by offering reduced toll rates for vehicles using the E-ZPASS system. Commercial vehicles get a five percent discount over the standard toll rate for using E-ZPASS. Volume discounts further decrease Thruway tolls for truckers.

Open Lanes

With open lane, or open road, tolling, drivers do not need to pass through a toll booth and do not need to slow down to pay their toll. Like electronic toll collection, open lanes can be used with existing infrastructure or with newly constructed toll lanes.

The **Illinois State Toll Highway Authority** is currently in the process of constructing an open-road tolling system that holds great potential for reducing congestion and therefore providing time savings to shippers. Open-road tolling allows truck drivers with an electronic transponder (e.g. I-PASS or E-ZPASS) to use the new open lanes *and* benefit from an

Figure 2: Ariel View of Open Lanes on Illinois Toll Highway *(3)*

agreement with the Illinois Trucking Association to give these truckers preferential toll rates. Truck drivers using Illinois' I-PASS receive discounted congestion pricing during the night time and off-peak daytime hours. The goal of this system is to simultaneously facilitate movement of freight while managing traffic congestion during peak periods.

It is important to note that tolls for trucks on the Illinois Tollway vary not just with distance traveled and time of day, but also by axle. Table 1 displays the breakdown of tolls for shippers based on both number of axles and time of travel.

Table 1: Toll Table for the Illinois Tollway *(5)*

TRUCKS & TRAILERS			
PEAK	2 AXLE 6 TIRES	3-4 AXLES	5+ AXLES
I-PASS & CASH 6 AM - 9 AM 3:30 PM - 6:30 PM	$1.50	$2.25	$4.00
DAYTIME NON-PEAK			
I-PASS WEEKDAY NON-PEAK & DAYTIME WEEKENDS	$1.00	$1.75	$3.00
CASH	$1.50	$2.25	$4.00
OVERNIGHT			
I-PASS & CASH 10 PM - 6 AM	$1.00	$1.75	$3.00
*Rates reflect typical mainline toll plaza rates that can vary by location.			

Some of the additional savings to shippers using I-PASS include *(6).*

With I-PASS alone:

- Commercial vehicle operators who currently use I-PASS are reducing their travel time by up to 20 minutes for a round trip, using a trip on I-294 between Indiana and Wisconsin as an example.
- Truckers spend less time on the road in traffic, and can spend less on fueling and operating their rigs.
- Truckers save $25 for every 15-minute reduction in trip time, (The Midwest Truckers Association). For example, truckers can save as much as $333 per month if they take 10 round trips using I-PASS on the full length of the Tri-State Tollway (I-94/294) compared to operating on roads with manually operated toll booths.
- Vehicle operators experience savings due to less wear and tear on vehicles (engines, tires etc.) due to harsh braking and acceleration.

*With I-PASS funded road improve*ments (*1*):
The Toll Highway Authority anticipates that trucks will save even more with improvements included in the state's Congestion-Relief Plan. These improvements are funded through tolls collected with I-PASS. The following planned improvements will reduce travel times:

- Rebuilding/restoring 90 percent of the Tollway system
- Widening 117 miles of existing roads
- Tearing down 20 mainline toll plazas and replacing them with Open Road Tolling
- Building the long-anticipated I-355 South Extension

These time savings promise to increase efficiency and promote economic development. Illinois is a partner state in the Upper Midwest Freight Corridor Study and this effort can be expanded and built upon to create a regional approach to address congested areas that have become problematic for moving freight through the region.

Truck-Only Open Lanes

In addition to these two options, some state departments of transportation have begun planning for the construction of separated truck-only lanes on their sections of interstate in order to meet the predicted growth in truck-traffic volume. These types of projects include efforts in Texas to build the Trans Texas Corridor that incorporates existing highways and new construction to create a statewide highway network with truck-only toll lanes. In addition, the "STAR Solutions" project proposed by the Virginia Department of Transportation (VDOT) calls for construction of truck-only toll lanes on I-81 through the Shenandoah Valley. Both projects are facing significant opposition from impacted communities and environmental groups. The project proposed for I-81 in Virginia will be discussed in more detail here.

Figure 3: Ariel View of proposed I-81 Truck-Only Open Lanes in Virginia. *(4)*

Under Virginia's 1995 Public-Private Transportation Act (PPTA), which encourages Virginia agencies to enter into partnerships with private-sector interests, the VDOT has contracted with STAR Solutions to increase the

capacity of I-81. STAR has proposed creating truck-only lanes, as well as some minor upgrades to the local freight-rail system. The project will be funded initially through a package of public and private-sector funds, and is ultimately envisioned to be self-sustaining through tolls.

Virginia's I-81 project remains in the planning stages and is controversial for a variety of reasons. The proposed project is on a section of I-81 that runs through environmentally and culturally sensitive lands. The tourism industry, which is an economic force throughout the Shenandoah Valley, remains wary about the future impacts of adding four additional lanes of highway through an area marked by high-quality watersheds and civil war battlefields. Additionally, public watchdog groups question the viability of the toll revenue projects generated by STAR.

The problems VDOT has experienced should provide a caution to other agencies considering construction of this type of large infrastructure project. It is important to accurately gauge public sentiment and take federal regulations such as environmental requirements fully into account before proceeding too far with an infrastructure project of the scale of the one being planned for I-81.

Congestion Pricing

Congestion Pricing refers to variable road pricing, which charges higher prices under congested conditions and lower prices at less congested times and locations. This strategy is intended to reduce peak-period vehicle trips. Congestion pricing can be utilized with any toll-road option. It provides another powerful tool to manage congestion and free valuable space on the highway. By decreasing congestion and improving travel times freight movement becomes more efficient. Shippers can also choose to move freight at non-peak times, thereby lowering their costs.

Industry Issues with Toll Lanes

Not surprisingly, the trucking industry views the possibility of increasing numbers of toll roads with skepticism, asserting that placing tolls on highways will simply divert traffic to arterial and local roads and place an undo burden on the industry. This outcome is unlikely to occur to the extent many in the industry claim. If road prices are set appropriately, truckers will benefit through congestion management more than they would by rerouting to slower-speed roadways. Recent studies have shown that proper use of tolling can provide an appropriate incentive to the freight industry and increase productivity through enhancing the level of service on the interstate highway system (*7*).

Perhaps the lesson the Upper Midwest Freight stakeholders should take from the industry cautions is to coordinate with the trucking associations well in advance of proposing a tolling project. By including this important group in

discussions from the beginning, the industry will be able to voice concerns and perhaps come to agreements that benefit the states and improve freight movement while minimizing harm to the industry.

The Role of Privatization

Recently the private sector has become more involved in the discussion of tolls on the interstate. Private firms are showing interest in constructing and managing toll roads for states seeking to establish a toll structure for their highways. Most of the information coming from this sector has supported the use of road pricing to reflect the true cost of trip making. Different groups have also suggested this strategy would manage congestion and improve the flow of freight.

The precarious nature of our current highway funding system is yet another argument put forward in favor of implementing tolls on the interstate. States and municipalities are having difficulty maintaining existing infrastructure and funding new road projects under the current system. To address this impending funding crisis, some transportation consultants have suggested tolling highways to not only more closely reflect the true cost of using the roads, but, importantly, to help fund roadways. Many of the same consultants suggest that the improved roads should be constructed by private corporations that would then charge a toll to recoup their costs and maintain the infrastructure (*8)*. A caution should be noted in regard to this strategy. Any agreement with a private firm to construct and manage a toll road should include language allowing the contracting states to construct additional travel lanes on parallel, publicly managed roads if traffic volumes warrant. In addition, the Illinois Tollway and the New York Thruway examples discussed here suggest that states are capable of managing their own toll roads. There is no one-size-fits-all solution to who should manage a toll road, and this decision should be made based on the information specific to the state or region contemplating instituting a tolling strategy.

The opinion of the private sector is not unanimous, however. A variety of citizens and non-profit groups are questioning the benefit of the construction of additional toll lanes on the highways. Others are skeptical of the validity of any tolling scheme, citing the gasoline tax as their fare share payment into the highway system. It is clear that regardless of the need and utility of tolling congested highways, the debate concerning this practice will continue into the foreseeable future.

Environmental and Social Issues and toll lanes

Environmental surveys must be conducted for public road projects that use federal or state monies and/or involve federal or state permits. Contracting with

private firms does not eliminate this requirement. Planned projects requiring additional travel lanes, such as the I-81 project, will clearly result in environmental impacts along the highway corridor. By constructing new travel lanes there is a high probability that new traffic will be generated, increasing carbon monoxide and greenhouse gas emissions that need to be addressed. The additional lane width from adding new toll lanes, either optional or truck-only, will create barriers for wildlife, potentially further degrade waterways, and in urban areas can further marginalize neighborhoods through which an interstate highway travels. The environmental and social costs of any project proposing construction of new travel lanes must seriously consider these issues early in the planning process in order properly assess these impacts. Doing this early allows alternatives to be considered before significant time and money is invested in a particular project, and allows for the development of the best possible alternatives.

However, there are certain environmental benefits from the installation of open-road and electronic tolling systems. This technology significantly reduces wait times and bottlenecks caused by delays at staffed toll booths. This benefit cuts down on emissions from idling at toll booths.

The Debate about Tolling Truck Lanes

Despite some of the benefits, current thinking on the use of toll lanes for trucks is mixed. In general, the experience with road pricing has been inconsistent at both the state and national levels. Freight shippers as well as private citizens historically have balked at the suggestion that they pay a fee to use public roads. However, as our highway system becomes increasingly congested and funding for maintenance and construction becomes diminished, policy makers and transportation planners have turned to tolling and variable congestion pricing as a way to manage travel choices and behavior. The different perspectives on the tolling question come from several different camps: the trucking industry; the private sector; state DOTs; and the federal government. It is helpful to compare the pros and cons of tolled lanes for freight side by side.

The benefits of tolled truck lanes include:

- Safety enhancements gained with truck-only lanes safety by limiting interactions between large trucks and automobiles;
- Reduction in congestion increases productivity;
- Capacity expansion with additional highway lanes;
- Modification of highways designed for truck lanes to accommodate heavy vehicles;
- Construction, maintenance, infrastructure improvement funded through tolls;
- Management of traffic through variable pricing, and;
- Restrictions on double and triple trailer might be lifted for truck-only lanes, allowing more freight to be transported more efficiently.

Some of the negatives associated with tolled truck lanes include:

- Potential for diversion of traffic onto local roads (particularly if the toll lanes are mandatory for trucks);
- Optional tolled truck lanes could be underutilized if cost-conscious industry does not see significant economic benefit to toll lanes and therefore avoids using them;
- Potential for political opposition since much of the public resists tolls on public roads;
- Potential for Industry opposition since view as double taxation;
- Potential for significant harm to environmental and cultural resources;
- Potential to contribute to overall traffic growth through additional lanes (induced demand);
- Possible difficulty implementing projects requiring additional lanes due to significant and understandable public opposition;
- Probably high price tag of projects requiring additional lanes, and;
- Potential that most toll-lane projects will not separate automobile and freight traffic, thereby negating the safety benefit.

Recommendations

The pros and cons of tolled highway lanes tell a tale of the opportunities and barriers associated with implementing this type of road pricing on public highways. Documentation of increasing congestion, particularly in moving freight along the highways in the Upper Midwest, points to a clear need for a regional coalition to address this issue proactively, not after it becomes a crisis. Tolling highways is a viable option to help manage and improve freight flows through the region. Using electronic tolling and open lane tolling technology is probably the most viable of the options discussed here. Construction of additional highway lanes takes time and imposes significant financial, environmental, and social costs. Electronic tolling technology can be installed more quickly and at far less expense than constructing traditional staffed toll booths while providing efficiencies through reductions in trip times. Tolling in general provides additional funding to maintain and improve roadways as well as manage congestion.

Looking forward, the Upper Midwest Regional Freight stakeholders need to consider the range of tolling options available to them. By weighing the different choices, a strategy to improve freight movement in the region that includes some form of tolling may emerge as a good choice for the states. Any effort along these lines must be embarked on as a cooperative effort, between the states in the region, the freight industry, the private sector, and the public. This effort must include an objective, technical analysis of trucking industry metrics, additional research on tolling and traffic flows, and the collection of additional data to complement the list of pros and cons to tolling. By working cooperatively, the Upper Midwest has the best chance of addressing system-

wide issues with freight movements. A well functioning network throughout the region will provide benefits to all the states since movement of goods and services through the Upper Midwest will enhance the economic potential of each member of the coalition.

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