

Wisconsin's Translinks 21 Multimodal Plan: Implications for Census Data Needs

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This case study provides the intercity elements of Wisconsin's Translinks 21 Multimodal Plan. The intercity passenger and freight forecasting techniques utilized are described in some detail. The case study is used to highlight data needs met by the decennial census and other Census Bureau data-gathering efforts. The discussion concludes by stressing the importance of the timely provision of census data to support ongoing state-level modal and multimodal planning activities.

In November 1994, the Wisconsin Department of Transportation (WisDOT) released its Translinks 21 Multimodal Transportation Plan. The Translinks 21 Plan responds to Section 135 of the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) mandating the preparation of a statewide transportation plan considering "all modes of transportation." These ISTEA requirements have forced state transportation agencies to seek out and utilize a wide variety of new data sources, including socioeconomic data provided by the Bureau of the Census. Although statewide highway and airport system plans had been prepared for Wisconsin, WisDOT had no previous experience with statewide multimodal transportation planning. For Wisconsin as well as the many states that in the past have prepared only "policy level" statewide plans, the data requirements associated with the new ISTEA mandate have been challenging.

In this case study the intercity elements of Wisconsin's Translinks 21 Multimodal Plan are provided and the intercity passenger and freight forecasting techniques utilized are described in some detail. The case study is used to highlight data needs met by the decennial census and other Census Bureau data-gathering efforts. The discussion concludes by stressing the importance of the timely provision of census data to support ongoing state-level modal and multimodal planning activities.

TRANSLINKS 21 OVERVIEW

The Translinks 21 Plan was unique in that it was the first statewide multimodal transportation plan prepared by the Wisconsin Department of Transportation (1,2). The Translinks 21 Plan is multimodal in that all modes were analyzed simultaneously, and interactions among modes were specifically accounted for. The multimodal approach taken in the planning process was facilitated by the development of integrated sets of passenger travel and freight shipment data for all intercity modes: passenger rail, freight rail, intercity bus, automobile, truck, air passenger, air cargo, and waterborne freight.

For passenger travel, a multimodal travel demand model was developed to analyze transportation improvements called for in the adopted Translinks 21 Plan. On the freight side, alternative commodity shipment forecasts for each mode were analyzed with the advice of

a Freight Expert Panel made up of private-sector transportation leaders and experts from throughout the state. The results of these multimodal forecasting efforts are described in the following discussion.

PASSENGER TRAVEL FORECASTING METHODOLOGY

The multimodal passenger travel forecasts used in the Translinks 21 Plan were developed using a TRANPLAN-based intercity travel demand model. This model was used to simulate the impact of the introduction of new passenger modes, as well as service improvements in existing modes (2).

The travel forecasting model was developed by KPMG Peat Marwick, McLean, Virginia. It is an integrated two-stage model system that forecasts both total travel demand and mode share. The total travel demand component of the model forecasts "natural" growth stratified by trip purpose (business, recreational) resulting from changes in one or all of the following: population, employment, and income. It also forecasts "induced" or constrained demand resulting from changes in the combined level of service provided by all modes. The zonal network used consists of 157 zones; 112 zones are made up of whole counties and portions of counties within Wisconsin and 45 zones are in adjacent areas of neighbor states (in particular the Chicago and the Minneapolis-St. Paul metropolitan areas).

The mode-share component of the model forecasts the share of the market captured by each intercity passenger mode: automobile, conventional rail, high-speed rail, integrated bus and rail, intercity bus, and air. Travel survey information was used to capture both revealed and stated travel preferences by mode. Origin and destination surveys on Wisconsin highways as well as on-board and terminal surveys of Amtrak, air, and intercity bus travelers were used to capture data on existing revealed travel choices. These surveys generally included questions on trip purpose, origin, destination, and mode of travel. This information was used to develop estimates of existing base-year intercity travel volumes by mode, origin-destination, and trip purpose.

A mail-back survey was distributed at selected highway sites as well as on board trains and at terminal sites for Amtrak, intercity bus, and automobile modes to capture stated mode preferences. This information is essential for forecasting travel on modes not currently available. Travelers were asked to respond to future mode-choice scenarios with varying travel times (speeds), frequencies, and fares. The survey included questions on trip purpose, origin and destination, travel party size, trip frequency, and trip duration. Traveler information regarding home location, household size, automobile ownership, and household income was also gathered. A total of 6,860

preference surveys were distributed with a return rate of 24 percent. A nested logit model was developed using data from this survey to produce mode-share forecasts. A schematic description of the overall model structure is shown in Figure 1.

It must be emphasized that the model predicts intercity passenger trips only, generally those trips that cross county lines. For example, intercity automobile forecasts do not include local trips, and intercity bus forecasts do not include bus transit trips in urban areas. It also should be recognized that the intercity forecasts provided by the model relate only to trips within the state and to adjoining counties including the Chicago and Twin Cities metropolitan areas. For example, an air trip from Milwaukee to Kansas City was not included in the model forecasts.

CENSUS DATA USED IN PASSENGER TRAVEL FORECASTS

Bureau of the Census socioeconomic data were used to develop independent variables used in the total travel demand component of the model (3). Population data from the Census of Population and Housing was used by the Wisconsin Department of Administration Demographic Services Center to develop county population forecasts consistent with zonal detail of the model. Bureau of the Census County Business Patterns employment data were used by the WEFA Group, Burlington, Massachusetts, a WisDOT subcontractor, to produce total employment forecasts at the county level. Given that the statewide model forecasts intercity trips using a county-level zone structure, journey-to-work and similar data for Urbanized Areas contained in the Census Transportation Planning Package were not directly utilized.

PASSENGER TRAVEL FORECAST RESULTS

During the Translinks 21 process, WisDOT used the intercity travel demand model to compare a set of "plan forecasts" reflecting the passenger travel recommendations in the Translinks 21 Plan with a set of "trend forecasts" (4). The Translinks 21 Plan recommendations included the introduction of high-speed rail (HSR) (125-mph) passenger service between Chicago, Milwaukee, Madison, and the Twin Cities of Minneapolis and St. Paul (5). This recommendation was for 12 round trips per day of HSR service enhanced with pulsed feeder bus connections serving low-density markets and conventional (79-mph) rail service between Green Bay and Milwaukee (see Figure 2). The plan called for intercity bus improvements including essential bus service (two round trips per day) for all com-

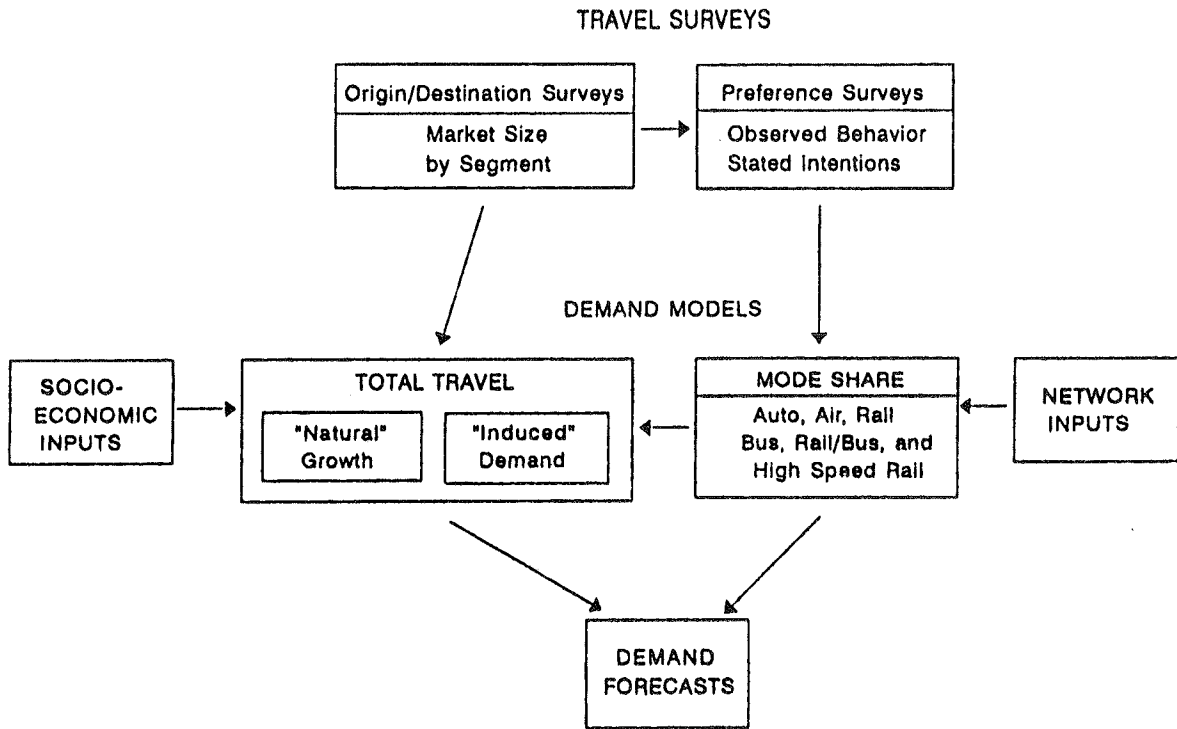


FIGURE 1 Demand modeling and forecasting approach: Translinks 21 intercity passenger analysis.

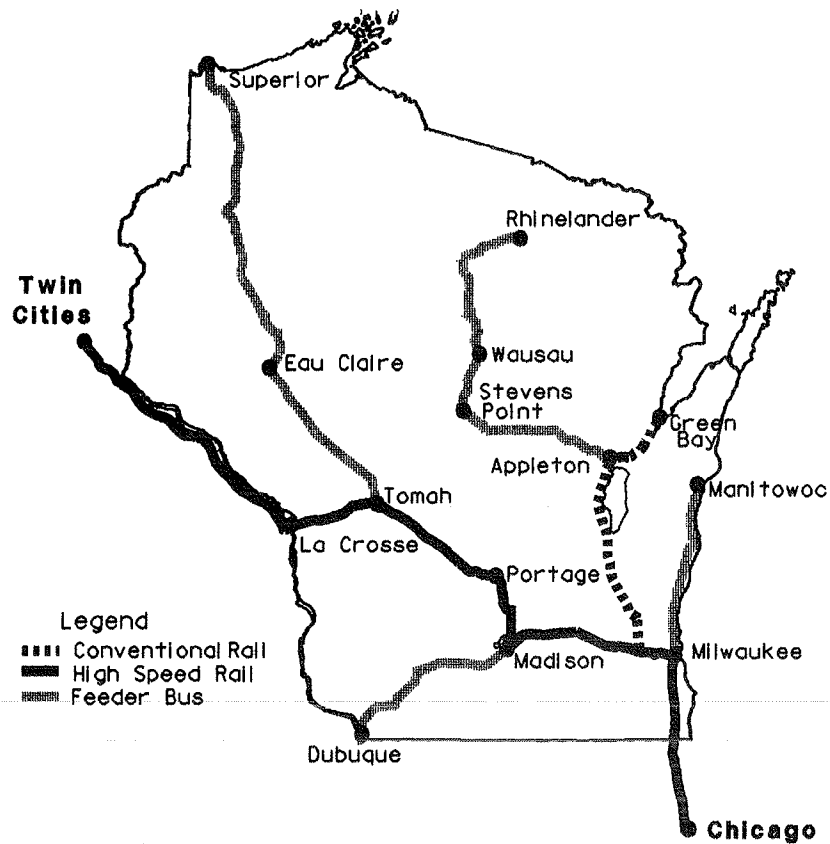


FIGURE 2 Translinks 21 intercity passenger rail plan.

TABLE 1 Translinks 21 Travel Demand Forecasts: 2020 Intercity Passenger Trips

Mode	1995	2020 Trend			2020 Plan		
		Trips	Difference	% Increase	Trips	Difference	% Increase
Auto	327,832,000	405,063,000	77,231,000	23.6	402,365,000	74,533,000	22.7
Air	1,064,000	1,358,000	294,000	27.6	557,000	(507,000)	-47.7
High Speed Rail	0	0	0	0.0	5,400,000	5,400,000	*
Conventional Rail	421,000	522,000	101,000	24.0	400,000	(21,000)	-5.0
Feeder Bus/Rail	0	0	0	0.0	52,000	52,000	*
Intercity Bus	460,000	550,000	90,000	19.6	527,000	67,000	14.6
Total	329,777,000	407,493,000	77,716,000	23.6	409,301,000	79,524,000	24.1

* New Service

and Green Bay to 12.4 and 6.5 percent on Interstate 90-94 at Mauston between Madison and the Twin Cities. Data on these and other segments are shown in Table 3. In summary, intercity passenger transportation services, such as conventional Amtrak trains, HSR, or intercity buses, will have limited potential to significantly reduce intercity automobile traffic on most highway routes.

Continuing the analysis of travel forecasts for the remaining modes, conventional rail ridership was lower in the plan forecast when compared with the trend forecast (see Table 2) as a result of upgrading existing conventional rail service in the Chicago-Milwaukee corridor to high-speed service as called for in the Translinks 21 Plan (8). Some, but not all, of this reduction is offset by new conventional rail service being provided in the Milwaukee-Green Bay corridor (see Figure 2).

Intercity bus travel increased under both trend and plan forecasts (see Table 1). However, overall bus ridership was lower in the plan forecast even though it is

based on a new essential bus service program for all communities with populations greater than 5,000. This lower bus ridership is the result of a diversion of bus travelers on existing high-density routes to new passenger rail services also called for in the plan. The separate feeder bus-rail forecast (see Tables 1 and 2) is for ridership on a new feeder bus service associated with planned rail service improvements.

Total passenger travel increased 24.1 percent in the plan forecast and 23.6 percent in the trend forecast relative to 1995 (see Table 1). In 2020 there were about 1.8 million more trips under the plan forecast than under the trend forecast (see Table 2) as a result of new trips induced by the provision of new modes and services. The induced travel in the plan forecast was largely the result of new HSR service allowing individuals to take trips they otherwise would not have taken. New conventional rail and intercity bus service had similar effects, although not of the same magnitude.

TABLE 2 Modal Interaction Comparison: Plan Versus Trend Forecasts (2020 Intercity Passenger Trips)

Mode	Year 2020		Difference	% Change
	Trend Trips	Plan Trips		
Automobile	405,063,000	402,365,000	(2,698,000)	-0.7
Air	1,358,000	557,000	(801,000)	-59.0
High-Speed Rail	0	5,400,000	5,400,000	*
Conventional Rail	522,000	400,000	(122,000)	-23.4
Feeder Bus/Rail	0	52,000	52,000	*
Intercity Bus	550,000	527,000	(23,000)	-4.2
Total	407,493,000	409,301,000	1,808,000	0.4

* New Service

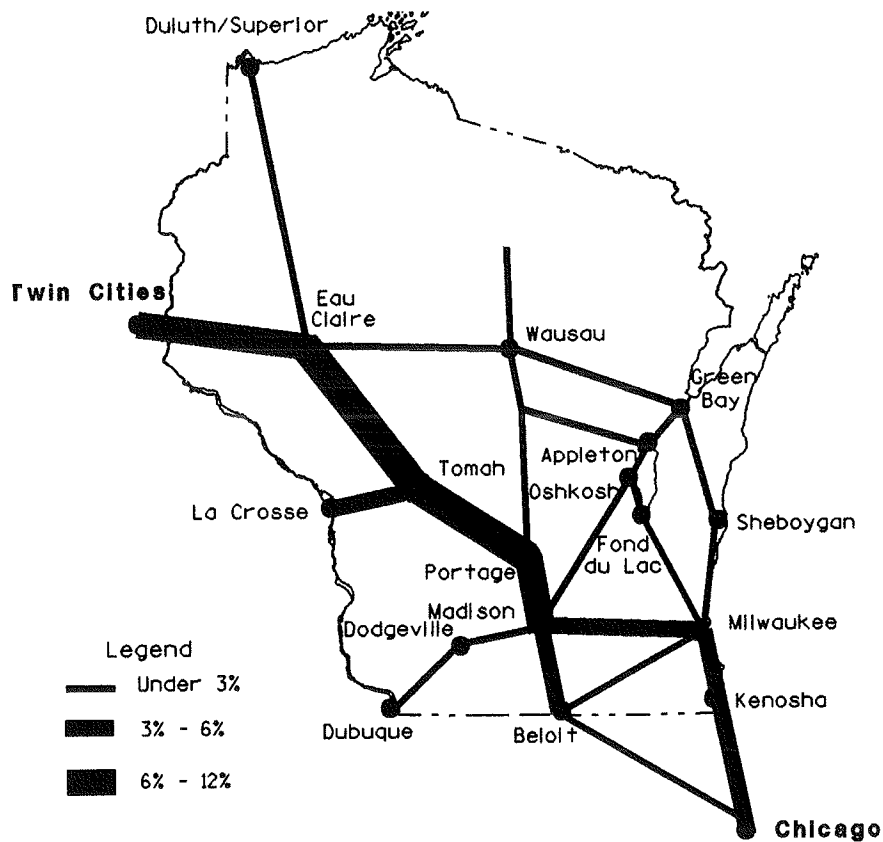


FIGURE 4 Impact of adopted plan on trend automobile forecast, 2020: percent reduction in intercity automobile volume.

**FREIGHT COMMODITY ANALYSIS
METHODOLOGY**

The multimodal freight commodity shipment analysis undertaken during the Translinks 21 planning process relied on the input of a Freight Expert Panel made up of private-sector transportation leaders and experts rather than on a deterministic model. The resulting multimodal

forecasts were market driven in that they reflected private-sector industry trends and were not based on specific public-sector service improvement investments as was the case with passenger travel (8).

The intercity freight planning effort began with the development of a county-level commodity flow data set for all modes. This commodity flow data set was prepared by Reebie Associates, Greenwich, Connecticut,

TABLE 3 Impact of Adopted Plan on Trend Intercity Automobile Forecast, 2020

Route		Reduction in Trend Forecast	
		Intercity (%)	Total Traffic (%)
I-90/94	Madison to Portage	6.6	4.2
Hwy 18/151	Madison to Dodgeville	0.5	0.3
I-94	Madison to Milwaukee	5.5	4.4
I-90/94	Portage to Tomah	12.4	6.5
I-94	Kenosha to Milwaukee	2.9	1.9
I-90	Beloit to Madison	5.1	3.9
Hwy 29	Wausau to Green Bay	0.3	0.1
Hwy 41	Fond du Lac to Milwaukee	1.3	0.6
Hwy 51	Portage to Wausau	2.5	1.4

and analyzed by Wilbur Smith Associates, Columbia, South Carolina. The commodity flow data base was built up from federal sources such as the Interstate Commerce Commission (railroad) waybill sample, the U.S. Army Corps of Engineers *Waterborne Commerce of the United States*, "Waterborne Commerce Statistics," and FAA *Airport Activity Statistics of Certified Route Air Carriers 12 Months ending December 31, 1992*, supplemented with proprietary truck data from Reebie Associates Motor Carrier Data Exchange.

The resulting data set provided commodity information at the three-digit Standard Transportation Commodity Classification (STCC) level of detail. The data set also provided origin, destination, and trip length information among 106 county zones in Wisconsin and neighboring states and 68 regional zones variously made up of states, Canadian provinces, and Bureau of Economic Analysis (BEA) analysis areas. Year 2020 forecasts of these commodity flows were developed using county-level two-digit Standard Industrial Classification (SIC) employment forecasts developed by the WEFA Group. These trend forecasts based on forecast economic activity, however, did not explicitly recognize changes in modal preference by shippers.

The plan forecast used in the Translinks 21 Plan was based on a truck-rail intermodal scenario developed with the advice of the Translinks 21 Freight Expert Panel. In this case, trend forecasts of truck and rail modes were refined to specifically address rapidly emerging truck-rail intermodal partnerships. Through these partnerships, state and national rail and trucking companies have entered into agreements to shift the linehauls of long-distance truck moves onto rail, utilizing intermodal container, trailer-on-flat-car, and new RoadRailer technologies.

A survey of the expert panel members and other commerce and shipper organizations throughout the state was used to identify future changes in truck-rail intermodal use; haul-distance break points; service frequency characteristics necessary for diversion from truck to rail; and the relative divertability of specific commodities in the commodity flow data base. This survey was used by the expert panel to establish 500 mi as the minimum distance for future intermodal moves. The panel also established a minimum frequency threshold of four departures and arrivals per day for intermodal trains consisting of at least 50 containers or trailers per train moving 1.3 million tons per year. On the basis of survey results, the divertability of specific commodities in the data base was classified as high (100 percent), medium (75 percent), low (25 percent), or not divertable (0 percent).

The commodity flow data base was then analyzed to find truck moves with trip lengths greater than 500 mi with origins and destinations in Wisconsin. These

movements were diverted to the rail mode as applicable by applying the above percentages to specific commodity groups. Geographic locations were then identified where counties or groups of counties within Wisconsin would generate the 1.3 million tons of intermodal shipments per year (see Figure 5). These locations were then used to identify future intermodal trade lanes, and the diverted tonnages were assigned to specific rail lines in Wisconsin using a TRANPLAN assignment methodology. Similarly, truck commodity flows were assigned to the state trunk highway network and converted to equivalent truck volumes to assess the impact of intermodal diversion on future highway needs.

This information was used to develop a freight rail classification scheme (see Table 4 and Figure 6). This classification was used along with unit costs to estimate private- or public-sector investments required through year 2020 to improve the current state freight rail system to meet the specific standards (9).

CENSUS DATA IN FREIGHT COMMODITY ANALYSIS AND FORECASTS

Data gathered by the Bureau of the Census were critical in development of the Translinks 21 multimodal freight analysis. Data developed in the last comprehensive Census of Transportation in 1977, especially the 1977 Commodity Flow Survey, were particularly critical because these data provided a benchmark for the development of state-level multimodal commodity flow data sets such as that used in Translinks 21. The 1993 Commodity Flow Survey currently being prepared as a part of the 1992 Census of Transportation, Communications, and Utilities is the first comprehensive update of these data since 1977. This survey is being funded by the U.S. Department of Transportation through its Bureau of Transportation Statistics (BTS). Like the 1977 survey, the data are being developed for substate regions, in this case 89 National Transportation Analysis Regions (NTARs) representing one or more BEA economic areas. The 1993 Commodity Flow Survey and regular updates to follow will be essential in preparing, maintaining, and updating state-level multimodal plans like that prepared by Wisconsin as well as conducting a variety of other modal and policy-level freight planning activities.

In developing the county-level commodity flow data base and forecasts used by Wisconsin in the Translinks 21 Plan, Reebie Associates used a wide variety of Census Bureau data. Current Industrial Reports were used to confirm the year-to-year growth of selected industries. The Annual Survey of Manufactures was used to obtain information on industrial activity by state. Trade data

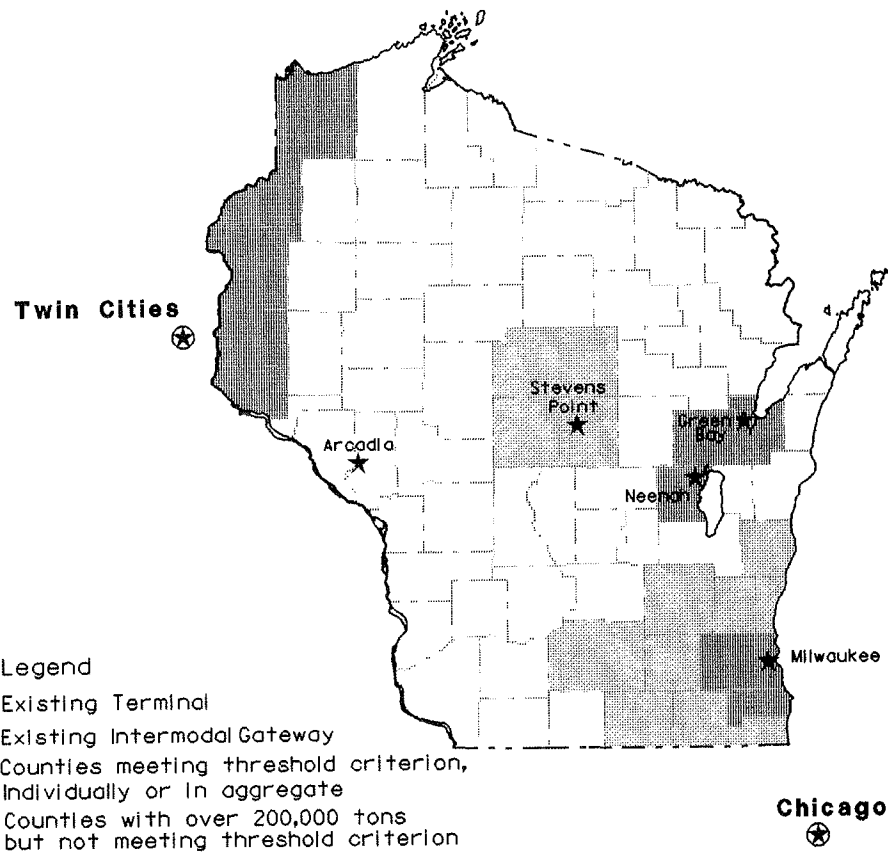


FIGURE 5 Counties with potential new intermodal traffic in 2020: traffic in excess of 200,000 tons (500-mi case).

TABLE 4 Translinks 21 Freight Rail Route Standards

Category	Type	Description	Standards
Backbone	Main Line	Main lines connecting gateways: Chicago, Twin Cities, Green Bay, Superior, Sault Ste. Marie.	40 MPH. Traffic > 25 mil. gross tons/yr; double or single track with long sidings; basic train control systems. Active grade crossing warning devices.
	Intermodal I	Serving WI regions generating ≥ 1.3 million net intermodal tons/yr. by 2020.	60 MPH. Frequency ≥ trains per day @ 50 units/train; add sidings; basic train control systems. Active grade crossing warning devices.
	Intermodal II	Serving WI intermodal container facilities ≤ 1.3 million tons/yr.	40 MPH. Same capacity and safety improvements as Intermodal I.
	Passenger Rail	Existing or planned routes.	60 MPH. Basic train control systems. Add sidings ≥ 4 trains/day. Active grade crossing warning devices.
Secondary	Local 1	Carrying ≥ 25,000 carloads and connecting to Main lines.	40 MPH.
	Local 2	Providing in-state service and/or carrying 86 - 25,000 carloads.	10-25 MPH.
	Local 3	Providing in-state service and/or carrying ≤ 85 average annual carloads.	10-25 MPH.



FIGURE 6 Translinks 21 freight rail route classification.

from the Bureau of the Census for the United States, Mexico, and Canada were used to obtain up-to-date statistics on volumes, commodities, and geography of international import-export activity. Information was derived from both the traditional foreign trade data sets and the newer surface trade data collected by the Census Bureau and provided under a special agreement and with funding from BTS. Data from the 1990 Census of Population and Housing was used to make allocations of consumption. Data from the Bureau of the Census County Business Patterns was used by the WEFA Group to develop county-level employment forecasts.

FREIGHT COMMODITY RESULTS

The intercity freight commodity forecasts used in the Translinks 21 Plan were market driven in that they reflected private-sector industry trends and were not based on specific public-sector service improvement investments, as was the case for passenger travel. The Translinks 21 Plan forecast that over all modes, 485.3 million tons of freight would be shipped in 2020 (see Table 5). This tonnage represents a 58.4 percent increase over 1992. The truck mode had the largest share

of total commodity shipments, with year 2020 shipments of 237.5 million tons, an increase of 49.8 percent over the planning period. Freight rail had the second highest share of total shipments but a higher forecast growth rate of 72.8 percent between 1992 and 2020. The waterborne mode was a distant third with forecast shipments of 51.4 million tons shipped in 2020. The high-value cargo shipped by air was the smallest in tonnage but had the highest forecast increase of 214.6 percent.

A comparison of the initial trend forecasts with the plan forecasts used in the adopted Translinks 21 Plan illustrates the interaction of the expert panel and the commodity flow analysis methodology.

As shown in Table 5, the initial trend forecast growth rates for truck and freight rail were 53.1 and 68.3 percent, respectively. They were driven by independently forecast growth rates of state industry sectors and reflected no explicit change in modal preference. The plan forecasts for truck and rail based on the previously described intermodal analysis and reviewed by the Freight Expert Panel and selected for the Translinks 21 Plan were 49.8 and 72.8 percent, respectively.

The impact of forecast truck-rail intermodal activity on forecast modal shares is shown in Table 6, where

TABLE 5 Translinks 21 Freight Tonnage Forecasts by Mode: 2020 Tonnage

Mode	1992	2020 Trend	% Increase	2020 Plan	% Increase
Truck	158,512,000	242,664,000	53.1	237,515,000	49.8
Rail	113,463,000	190,910,000	68.3	196,059,000	72.8
Water	34,254,000	51,363,000	49.9	51,363,000	49.9
Air	123,000	225,000	82.9	387,000	214.6
Total	306,352,000	485,162,000	58.4	485,324,000	58.4

trend forecast modal shares are compared with those under the plan forecasts.

The rail share of forecast shipments increased from 39.3 percent under the trend forecast to 40.4 percent with the plan forecast. The truck modal share decreased from 50.0 to 48.9 percent. This relatively modest impact on aggregate shares is due to the fact that the majority of freight traffic travels too short a distance to make economical use of intermodal transportation services. Similarly, on a state-wide basis, the plan forecasts showed that truck-rail intermodal movements would capture a relatively modest 2.1 percent of what had been previously truck-only moves.

The Translinks 21 analysis also identified those specific corridors in which intermodal activity is most likely to increase through the year 2020. As shown in Figure 7, the impact of forecast intermodal trends is concentrated on highway corridors in the southern and eastern portions of the state where truck traffic moving from Green Bay through Chicago to the east and from Green Bay through Beloit and Dubuque to the west would be diverted on rail to Chicago-area intermodal gateway terminals. After a rail-to-rail interchange in Chicago, the shipments would then move either east or west. In these intermodal corridors the impact on truck volumes was more significant than the aggregated totals.

Translinks 21 estimates of reductions in truck vehicle counts in these corridors as a percent of total intercity truck and total traffic volume range from 6.9 and 0.7 percent, respectively, on Highway 26 from Janesville to Waupun to 14.1 and 1.5 percent on I-43 from Beloit to Milwaukee. Table 7 provides more specific information on these and other corridors, both in terms of percent

reductions in truck traffic and in terms of reductions in total traffic. It is important to recognize that on major Wisconsin highways truck counts as a percent of total traffic range from 10 to 20 percent. Thus, although the expansion of intermodal activity may have a relatively significant impact in terms of reduced truck traffic, it will generally have a much smaller impact in terms of total traffic as is demonstrated by the data in Table 7.

The initial trend forecast for air cargo was similarly refined using forecasts developed in a concurrent statewide air cargo study conducted by WisDOT. This refined forecast was based on a more detailed analysis of emerging air cargo trends. The resulting plan forecast predicted a 214.6 percent increase in air cargo tonnage through 2020 (see Table 5). Although this is an extremely high growth rate, air cargo maintained a share of less than 1 percent of total tonnage under either forecast, as shown in Table 6.

The Translinks 21 Plan forecast for the waterborne mode was a trend forecast of 49.9 percent over 1992 levels. The expert panel agreed that underlying industry and sectoral economic trends driving this forecast were the best indicators of the future growth of this mode. Its share of total tonnage was 10.6 percent, as shown in Table 6.

SUMMARY AND CONCLUSIONS

Summarized in this paper is the intercity forecasting methodology used in Wisconsin's Translinks 21 Multimodal Plan; associated Bureau of the Census data needs are highlighted. From this case study it is clear that a wide variety of Census Bureau data is required to produce a state-level multimodal plan that captures the interactions between and among modes.

Bureau of the Census data needed for statewide multimodal planning include

- Census of Population and Housing;
- County Business Patterns;
- Census of Transportation, Communications, and Utilities (in particular the Commodity Flow Survey);
- Selected Current Industrial Reports;
- Annual Survey of Manufactures or Census of Manufactures;

TABLE 6 Share of Total Freight Shipments, 2020

Mode	Trend (%)	Plan (%)
Truck	50.0	48.9
Rail	39.3	40.4
Water	10.6	10.6
Air	0.0	0.1
Total	100.0	100.0

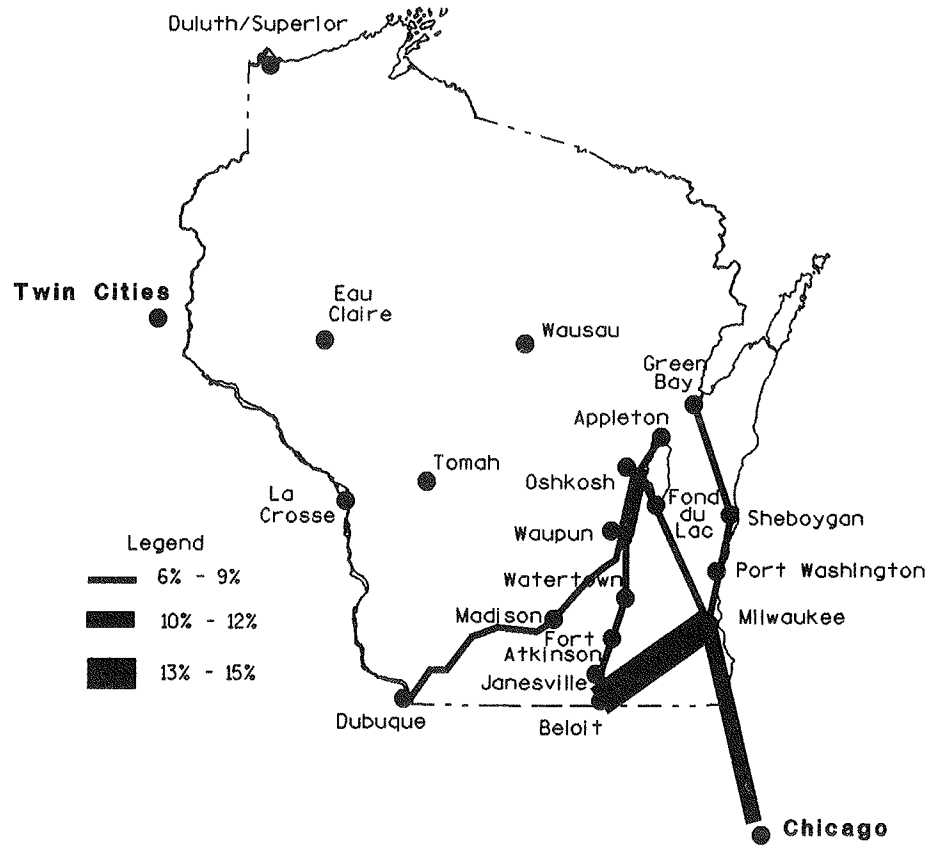


FIGURE 7 Impact of adopted plan on trend truck forecast, 2020: percent reduction in intercity truck volume.

- Foreign trade data; and
- Surface trade data.

Because state-level plans focus on intercity travel, which is dominated by business and recreational travel instead of travel within Urbanized Areas, state multimodal plans are less likely to directly utilize the journey-to-

work and similar data included in the Census Transportation Planning Package. However, because ISTEA requires that statewide plans incorporate the results of metropolitan planning organization plans in Urbanized Areas, these more detailed data are also ultimately essential to comprehensive statewide transportation planning.

TABLE 7 Impact of Adopted Plan on Trend Truck Volume Forecast, 2020

Route		Reduction in Trend Forecast	
		Intercity Truck (%)	Total Traffic (%)
I-43	Beloit to Milwaukee	14.1	1.5
I-43	Milwaukee to Green Bay	8.3	0.9
Hwy 41	Milwaukee to Fond Du Lac	7.4	0.5
Hwy 41	Fond Du Lac to Oshkosh	8.8	0.2
Hwy 26	Janesville to Waupun	6.9	0.7
Hwy 26	Waupun to Oshkosh	11.0	1.1
I-94	Illinois Line to Milwaukee	11.4	1.0

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