



4 transportation trends

Assessing future trends is a means to identifying future transportation needs. Changes in population, travel patterns, safety concerns, land use development, and maintenance considerations affect the demand for transportation. This chapter provides an overview of key trends that continue to influence transportation decision-making.

DEMOGRAPHICS

Population

According to the 1980 U.S. Census, Indiana had 5.5 million residents. By 2015, Indiana's population had increased to 6.5 million. According to the Indiana Statewide Travel Demand Model (ISTDM, 2018), it is estimated that the state's population will be 7.8 million by 2045—an increase of 42.1 percent and 18.91 percent from 1980 and 2015, respectively. Based on net population growth rate, Indiana's population would increase at a slower pace compared to the fastest growing areas of the country—the South and the West. According to the 2010 Census, Indiana's population grew 6.5 percent from 2000 to 2010, compared to 3.9 percent in the Midwest region and 9.7 percent nationally.

Increased population can create congestion and capacity issues, especially in urban areas. The population of urban areas is expected to increase at an annual growth rate of 0.24 percent through the year 2045. In comparison, the suburban and rural populations are expected to increase at a greater annual growth rate of 1.12 percent and 0.54 percent, respectively, through the year 2045 (ISTDM, 2018). This may lead to longer trip lengths, extending peak commuting times, from suburban to urban. As such, the existing transportation system would need to adapt to continuing demographic changes.



*Note that the base year and planning horizon of the Indiana Statewide Travel Demand Model is 2015 and 2045, respectively.

Household size

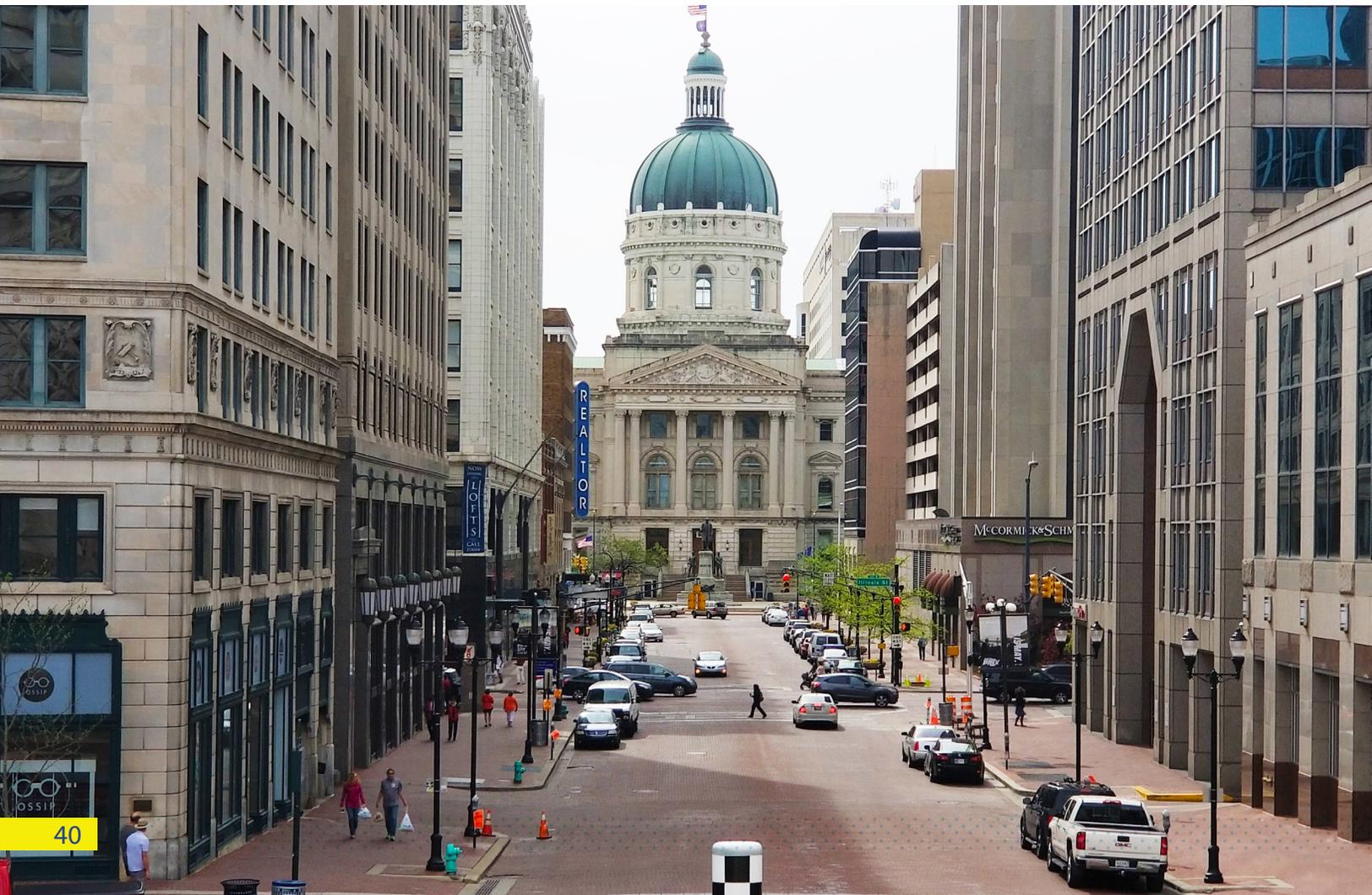
Indiana's average household size (the number of people residing in one household) is expected to decrease from 2.55 in 2015 to 2.44 in 2045 (ISTDM, 2018). This decline is a national trend largely due to the aging of the population with older residents having smaller households and an increase of single head of households, of individuals waiting longer to marry, and of couples having fewer children. Although there would be fewer people per household, the number of households in the state is expected to increase 23 percent from 2015 to 2045 due to population growth (ISTDM, 2018). This may increase per-capita auto ownership and the number of vehicle trips.

Employment

Total employment in the state is expected to increase from 3.6 million in 2015 to 4.7 million in 2045 (ISTDM, 2018). Suburban employment is estimated to increase at an annual growth rate of 1.04 percent through 2045, while urban and rural employment at 0.85 percent and 0.81 percent, respectively. With a greater increase in suburban employment, it may be possible that employers

could relocate for better proximity to localized workforce, altering regional travel patterns and levels. In general, employment growth would likely increase trip lengths and generate more trips, resulting in longer work trips, increased traffic, and congestion.

Employment by major industry sectors is expected to change through the year 2045 (ISTDM, 2018). Agriculture- and construction-related jobs would increase to 33 percent by 2045. Service sector jobs (e.g., retail, food, professional services, and other services) would increase 38 percent by 2045. This ongoing shift from an industrial economy to a more service-oriented economy could change peak commuting times and/or off-peak travel volumes throughout the day, potentially exacerbating congestion in urban and suburban areas of the state.



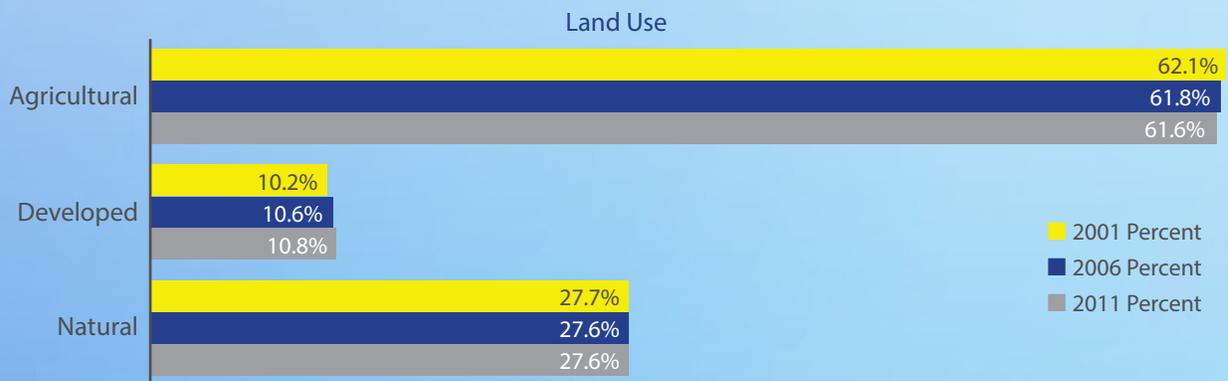
LAND USE DEVELOPMENT

Land use can impact the amount of vehicle travel and the viability of transit, walking, and other modes. Just over 60 percent of land in Indiana is used for agricultural purposes. As shown below, since 2001 there has been a slight decrease in the amount of agricultural land with a corresponding increase in developed land in Indiana. This trend will continue through 2045 and expected to be negligible because the agricultural industry is and will continue to be a large contributor to Indiana's economy.

There is a clear link between land use development and transportation. Land use development can be a driving factor for transportation improvements and, vice versa, transportation improvements can spawn development. In Indiana, this link is made clear in the strategic regional development plans prepared as part of the Indiana Regional Cities Initiative—a program that sets a framework

for neighboring communities to develop regional visions focused on quality of life and economic development. According to the Indiana Economic Development Corporation, as a result of the Regional Cities Initiative, 70 percent of the state's population now lives in a region with a viable plan for transforming its future. In 2015, seven Indiana regions created strategic regional development plans that include more than 420 projects. Some of these projects include:

- Lock on the St. Joseph River in Fort Wayne
- Evansville Regional Airport Update
- Line extension of the South Shore service into Lake County
- Creagor Avenue Greenway in Portland, Jay County



Note: Natural land uses refer to areas that consist of barren land, forests, shrub, herbaceous vegetation, or wetlands.



MODES

Indiana’s transportation system is a network of roadways and bridges, railways, airports, inland waterways and ports, public transit services, and bicycle and pedestrian facilities. The multimodal system is vital to the state’s economy because it facilitates the efficient, reliable, and safe movement of persons and goods.

Roads

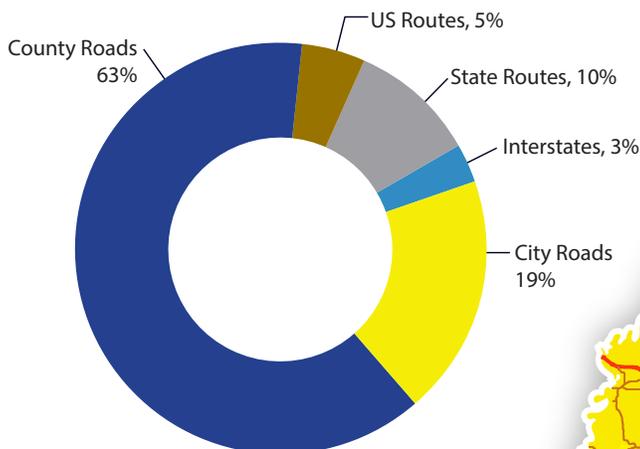
There are several jurisdictions of roadways across Indiana, including interstate highways, U.S. highways, state highways, county roads, and city streets. INDOT is responsible for the construction and maintenance of all roadways—except for county and city roads—and the Indiana Toll Road (I-90).

The Federal-Aid Highway Program provides states money for the construction, maintenance, and operations on the interstate system and other primary and secondary highways. Based on data from the Highway Performance

Breakdown of Federal-Aid Highway System

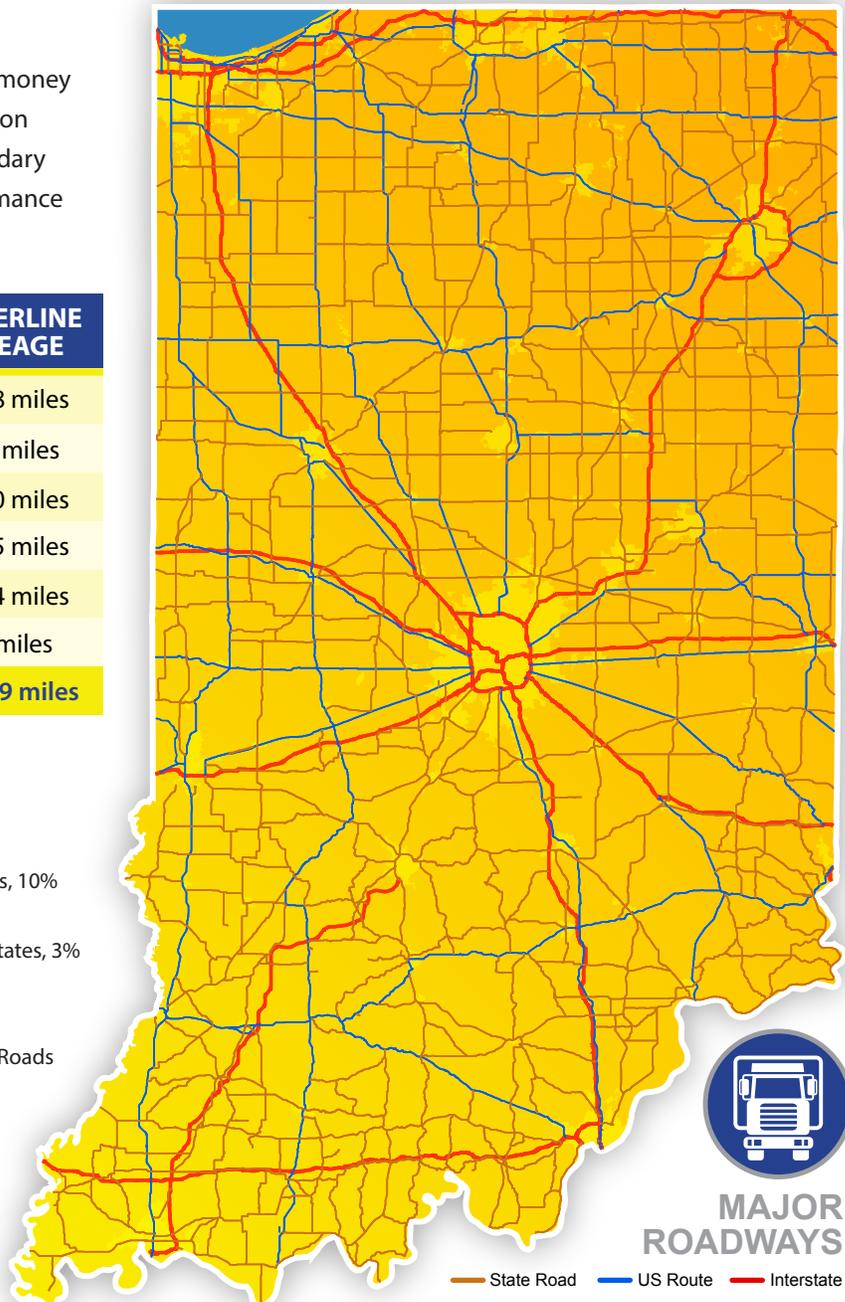
FUNCTIONAL CLASSIFICATION	CENTERLINE MILEAGE
Interstate	1,238 miles
Non-Interstate Freeways & Expressways	272 miles
Other Principal Arterials	2,510 miles
Minor Arterials	2,585 miles
Major Collectors	4,534 miles
Minor Collectors and Locals	30 miles
Total Federal Aid System	11,169 miles

Source: INDOT, 2014



Monitoring System (2016), there are almost 106,000 miles of Indiana roads, which includes 11,169 miles of State-owned routes.

Connected, autonomous, and highly automated vehicle technologies are important innovations that could improve roadway safety and change freight and passenger traffic patterns and congestion. There are significant near-term opportunities to establish a leadership position in the commercial uses of these vehicles (i.e., truck platooning on Indiana interstates). Therefore, the Innovation Hub for Connected and



Autonomous Transportation Technologies, a joint research effort led by Purdue University in partnership with private-sector businesses and government agencies (including INDOT), will focus on expanding the research and on the potential for economic development opportunities.

Bridges

There are over 19,000 bridges in Indiana, which is the 11th highest number of bridges in the U.S. based on the National Bridge Inventory (2017). In 2018, less than three percent of all INDOT-maintained interstate, U.S. highway, or state route bridges were rated as structurally deficient.

Breakdown of Bridge Counts

INDOT BRIDGES	
Interstate	1,427
Non-Interstate NHS	1,326
Non-NHS	2,969
Border Bridges	25
OTHER BRIDGES	
NHS Non-INDOT	268
Local Bridges	13,276
Total Federal Aid System	19,291

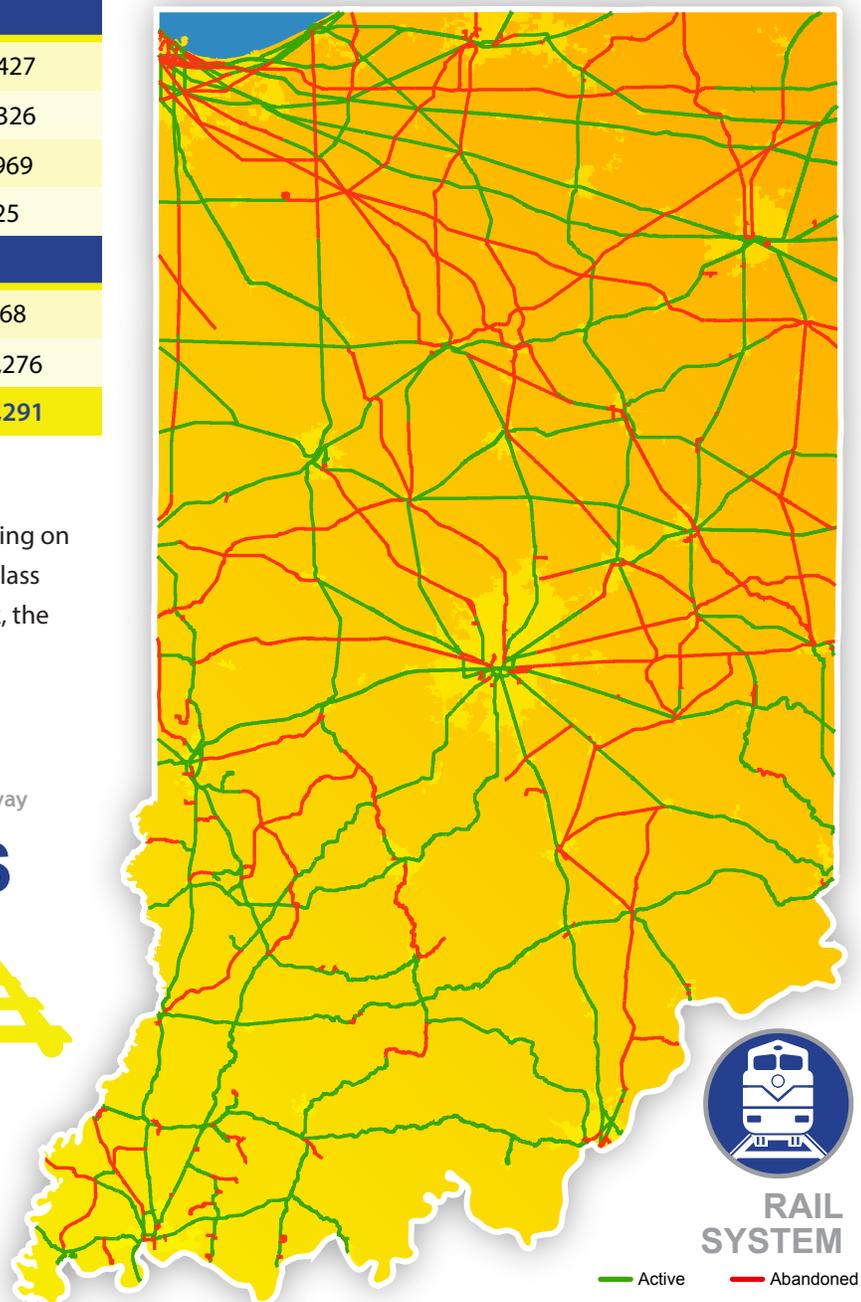
Freight Rail

Railroads are categorized as Class I, II, or III depending on annual operating revenues. Of the 2,457 miles of Class I railroads or 60 percent of the Indiana rail network, the breakdown of rail operations are as follows:



According to the Indiana Multimodal Freight Plan Update, there are approximately 1,504 miles of Class II and III railroads, collectively, or 38 percent of the Indiana rail network.

The state ranks 4th in the nation in the number of operating railroads, 7th in carloads handled, and 10th in tons handled. Each year, 1.5 billion tons of freight travel through Indiana, making it the 5th busiest state for commercial freight traffic. By 2040, freight flow is expected to increase by 60 percent. Trains carry a wide variety of cargo, mostly manufacturing inputs (e.g., metals, paper, and plastics) and bulk commodities (e.g., grains, coal, fertilizer, and gravel).



Rail Traffic in 2015

COMMODITY	ORIGINATED FROM INDIANA		TERMINATED IN INDIANA	
	CARLOADS	PERCENT	CARLOADS	PERCENT
Coal	170,100	23%	284,200	35%
Primary Metal Products	111,500	15%	74,700	9%
Grain	82,600	11%	N/A	N/A
Food Products	79,800	11%	N/A	N/A
Transportation Equipment	77,700	10%	N/A	N/A
Other/Unknown	228,600	30%	452,900	56%

Source: Association of American Railroads

Intermodal facilities are defined as terminals that provide for the transfer of freight from one transportation mode to another, as the freight moves from origin to destination.

Three major intermodal facilities serve Indiana in moving products to and from the rail system and other modes. CSX operates two of these facilities. The Indiana Rail Road (INRD) and Canadian National (CN) operate the other facility which connects Vancouver, British Columbia, and Indianapolis. This facility allows shippers to bypass the rail intermodal bottleneck of Chicago, thus enabling faster service to Indianapolis with no truck transfers between rail carrier intermodal ramps.

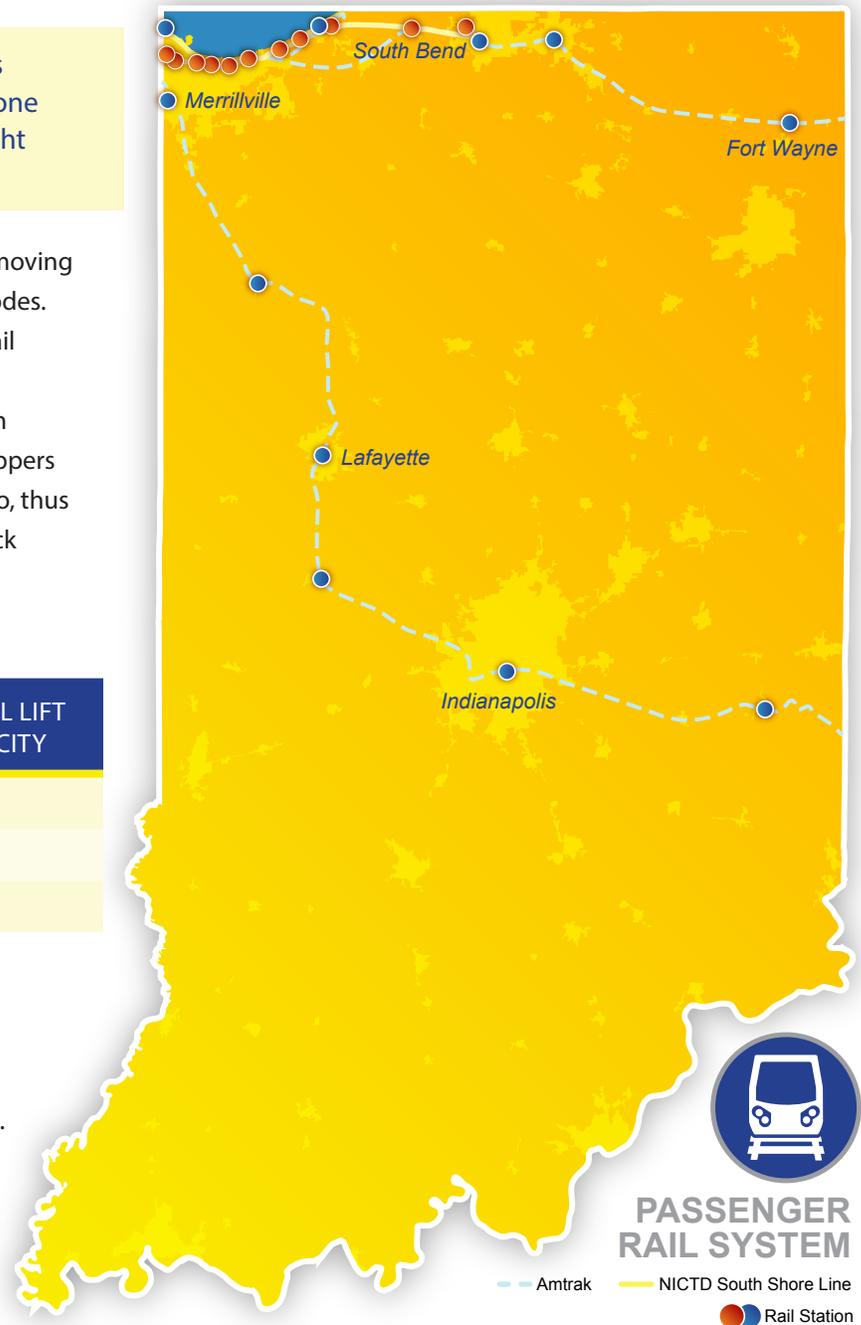
Truck/Rail Intermodal Facilities

NAME	SERVING RAILROAD	ANNUAL LIFT CAPACITY
Avon	CSX	100,000
Evansville	CSX	31,000
Indianapolis	CN, INRD	24,000

Source: Indiana State Rail Plan

Passenger Rail

In Indiana, there are approximately 413 miles of passenger rail primarily owned by freight railroads. Of this trackage, the Northern Indiana Commuter Transportation District (NICTD) operates 90 miles of commuter rail between South Bend and Chicago.



Intermodal connectors are those public roads that provide the first and last mile connection between major intermodal facilities and the National Highway System.

Number of Intermodal Connectors on Indiana's Highway System

8 Port Terminals

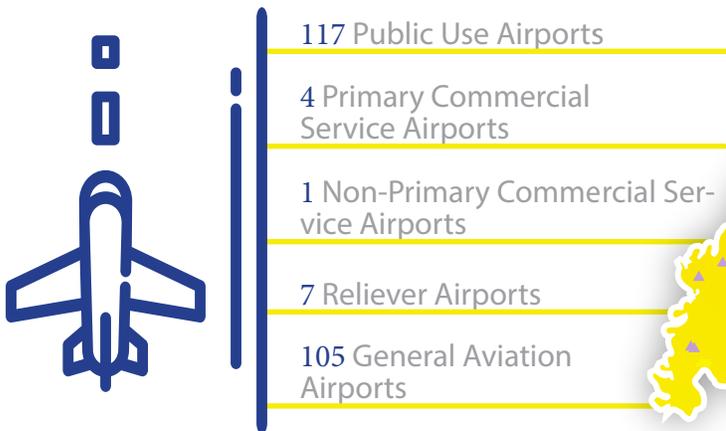
3 Rail/Truck Terminals

5 Air Cargo Hubs

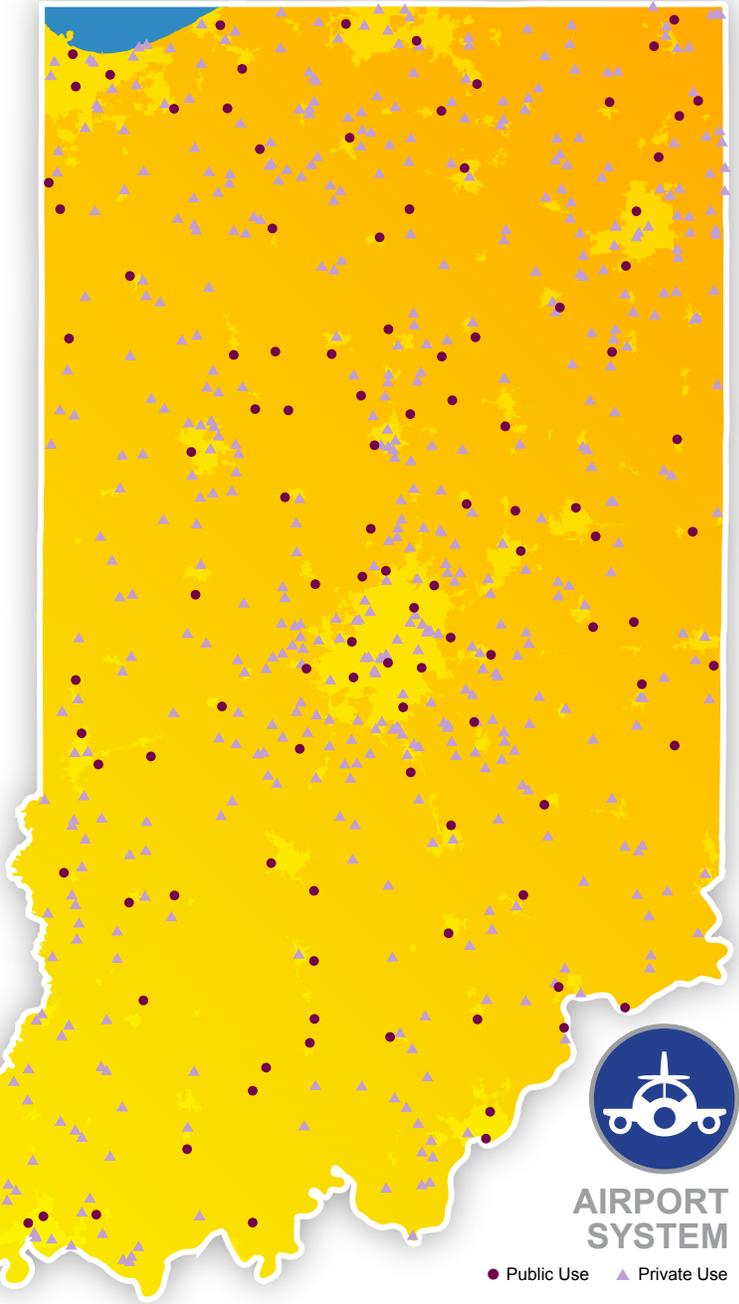
Source: USDOT FHWA BTS: Freight Facts and Figures 2017

Aviation

Indiana has approximately 117 public use airports, including four primary commercial service airports, one non-primary commercial service airport, seven reliever airports, and 105 general aviation airports. The airport system provides critical services to enhance the quality of life, health, safety, and welfare of Indiana residents and local businesses.



2. Fort Wayne International Airport (FWA)
3. South Bend International Airport (SBN)
4. Evansville Regional Airport (EVV)
5. Purdue University Airport (LAF)



Indianapolis International Airport (IND) is Indiana's largest commercial service airport with nearly 4.2 million enplanements in 2016, which ranks 45th in the U.S. IND is served by 10 airlines with nonstop service to 50 destinations on dozens of daily departures, and is also home to FedEx Express' second largest air cargo hub which, as a result, places it among the world's largest airports by annual air cargo tonnage throughput. The remaining top five busiest airports in Indiana are:



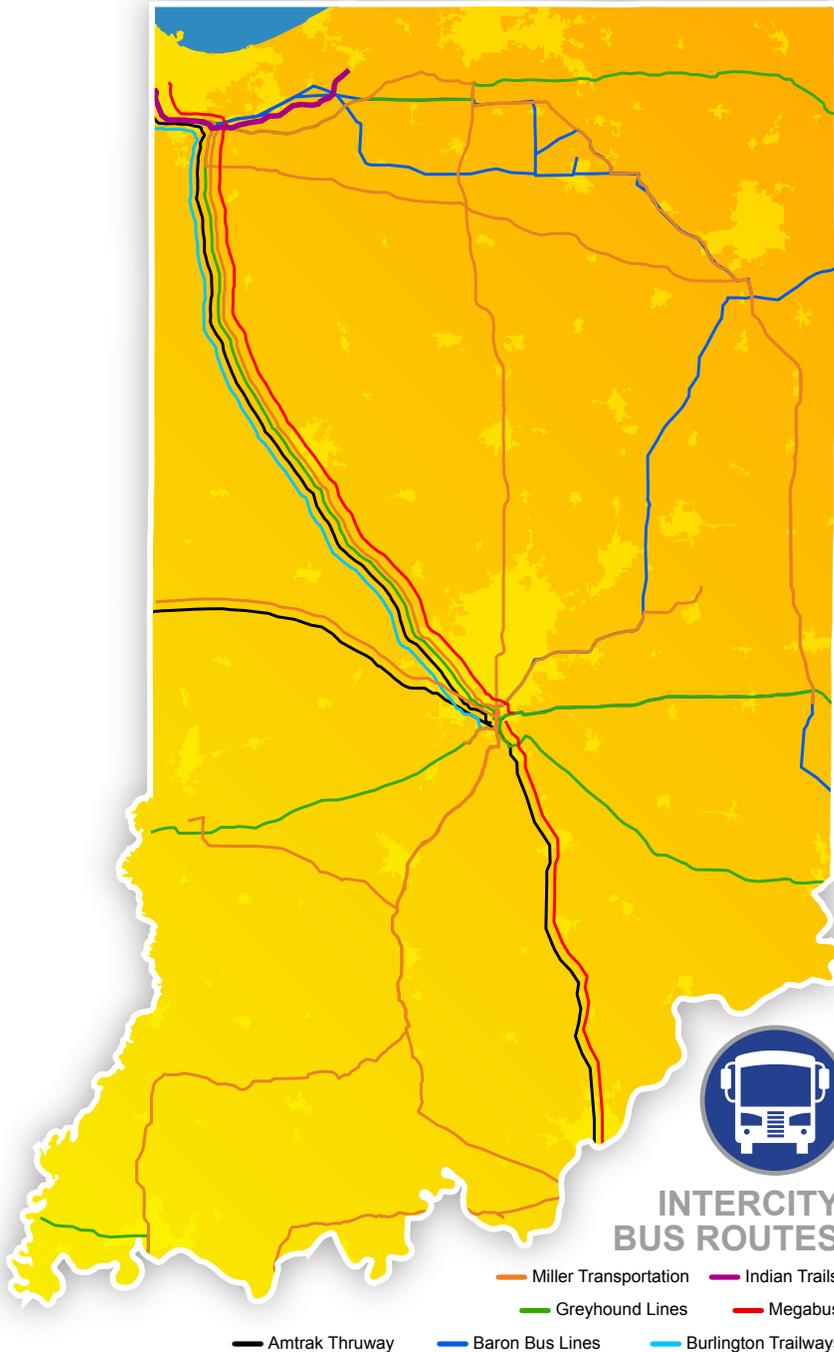
Public Transit

There are 21 urbanized and 44 rural transit systems providing service in Indiana. Indiana transit systems reported over 32.9 million passenger trips and covered over 47.2 million total vehicle miles in 2017. The largest transit agencies (more than two million boardings per year) include: Bloomington Transit, NICTD in the Chicago Region, Indianapolis Public Transportation Corporation (IndyGo), CityBus in Lafayette, and Transpo in South Bend.

Intercity bus service in Indiana is provided by five national and regional carriers: Burlington Trailways, Greyhound Lines, Indian Trails, Lakefront Lines, Megabus (Coach USA), Barons Bus Lines, Miller Transportation, and Amtrak Thruway.

Bicycle and Pedestrian

As alternative modes of travel, bicycle and pedestrian facilities are a valuable part of the transportation network in Indiana, effective in helping to attain social, environmental, land use, and energy conservation goals.



Bicycle and pedestrian facilities consist of multi-use trails, shared use paths, bicycle routes, and sidewalks.

3,600 MILES
Public Trails Statewide

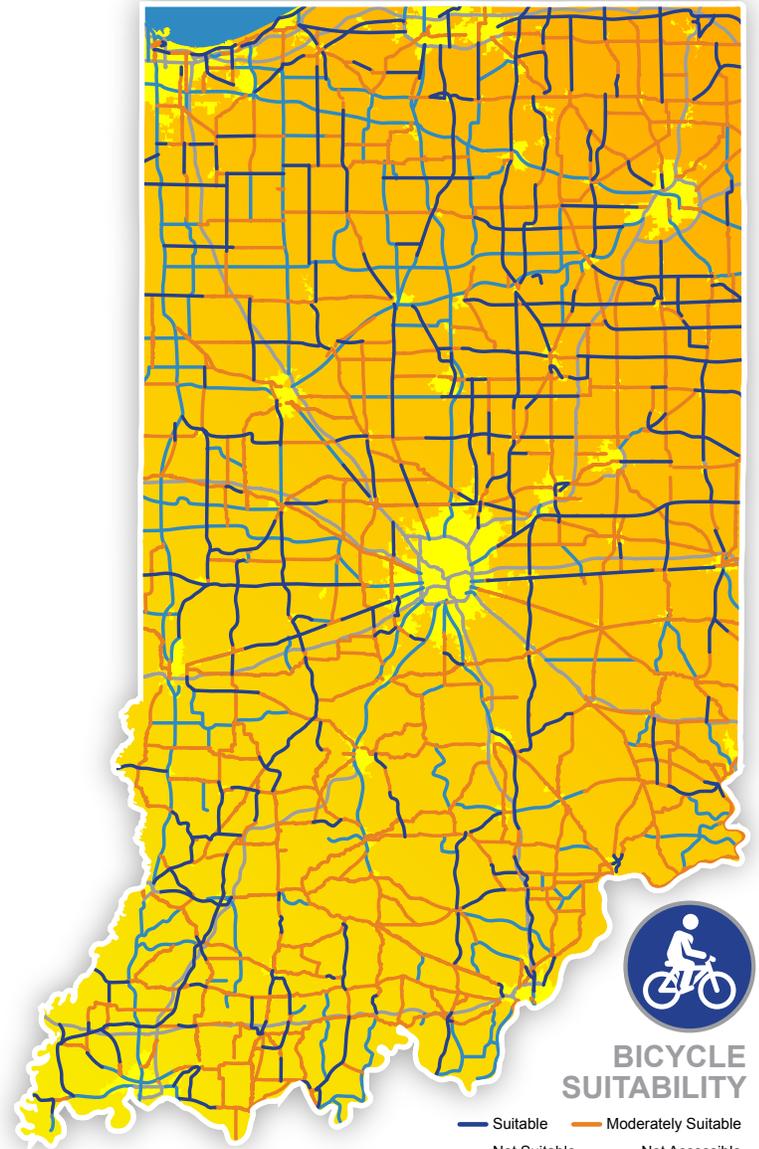
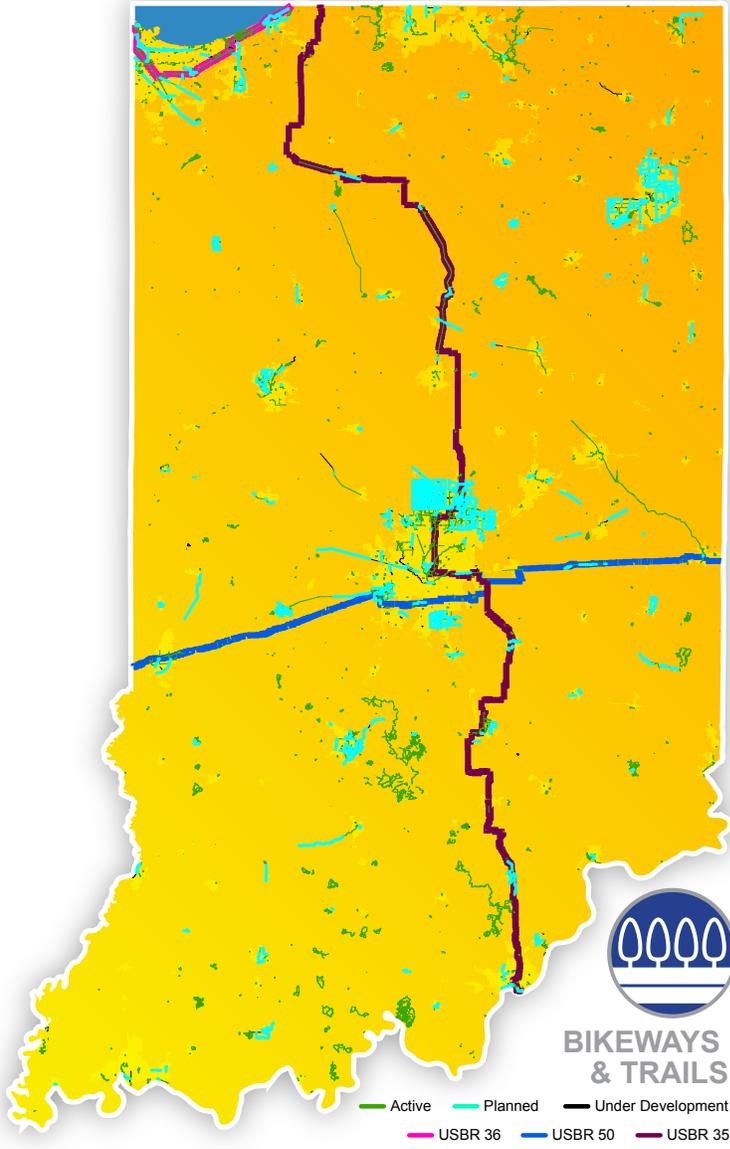
According to Indiana Department of Natural Resources (DNR), there are over 3,600 miles of public trails in Indiana. This includes natural surface hiking trails, hard surface trails for biking and hiking, and equestrian trails. There are approximately 1,214 miles of planned trails, 2,273 miles of potential trails, and 107 miles of trails currently under development.

1,214 MILES
Planned Trails Statewide

Three U.S. Bicycle Routes span Indiana, stretching a combined total of 600 miles.

As shown, the statewide suitability map shows current roadway suitability for bicycling by advanced and basic adult cyclists. It takes into account road conditions and the factors that impact bicyclists' level of comfort and safety.





Inland Waterways and Ports

Indiana's inland navigable waterways, the Ohio River and Lake Michigan, provide a viable system for transporting bulk commodities, thereby decreasing the burden placed on railroads and highways. There are five locks and dams and 225 maritime terminals in Indiana. Steel mills and other industries are provided the transportation option to use cost-effective methods for receiving raw materials (e.g., iron ore, coal, limestone) and shipping finished products (e.g., grain, aggregate, fertilizer, and petroleum products). The value of commodities coming through the maritime transportation system is approximately 59 million tons, worth \$10 billion.

The Ports of Indiana is the statewide port authority, operating three ports in Indiana—Burns Harbor, Jeffersonville, and Mt. Vernon.



The three ports combined generate over \$328 million of total state and local taxes and more than \$7.8 billion in business revenue annually. The ports also support more than 600,000 jobs and over \$3.8 billion in total wages and salaries.

Nationwide, Indiana ports rank 11th in maritime trade with approximately more than 11 million tons of cargo shipments per year; thus, together they play a major role in the state's economy.



CORRIDORS

Major corridors are a key part of the overall framework for the multi-modal transportation system. These corridors were determined by considering the statewide mobility corridors and corridors with major projects along them. For a brief description of each corridor, refer to Chapter 5.



MOBILITY

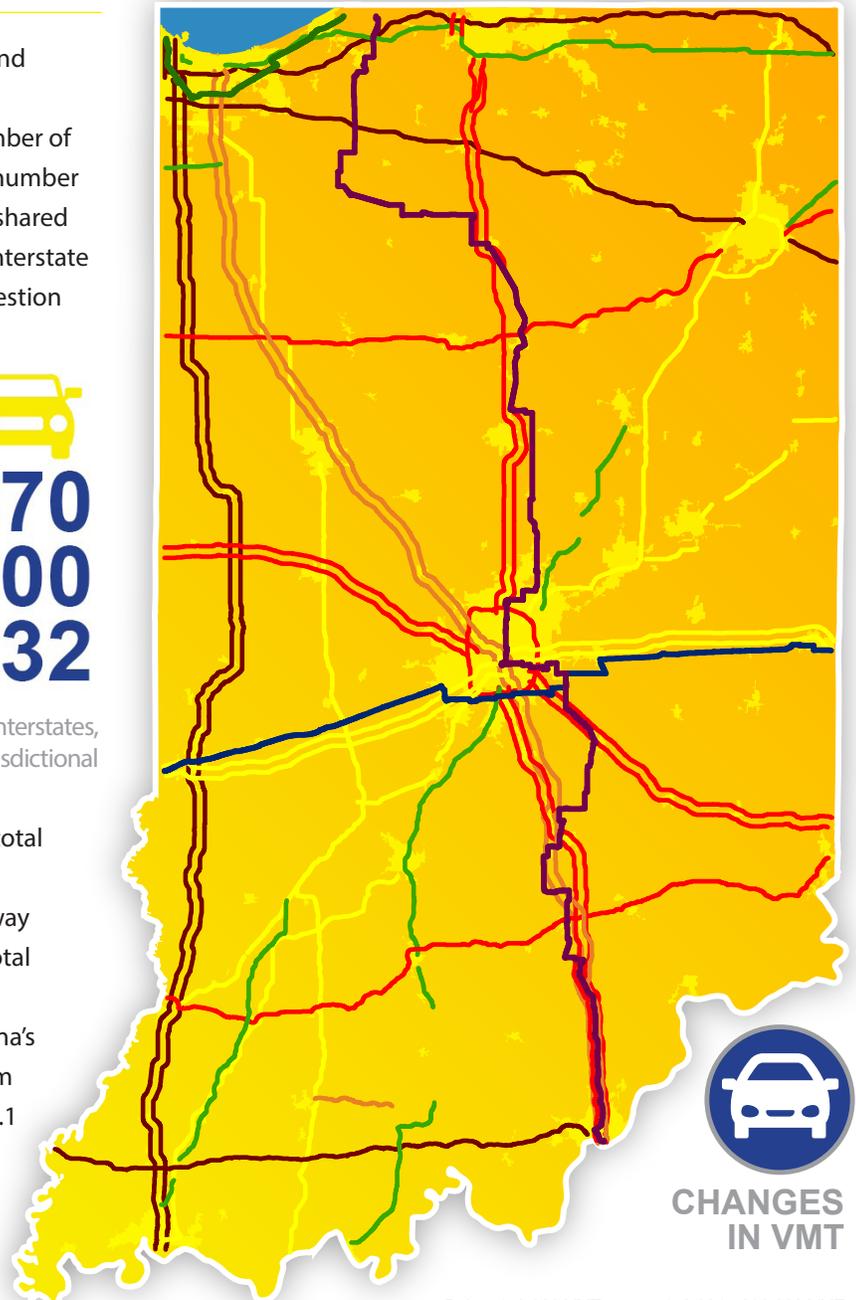
Several complex factors influence travel patterns and choices, such as fuel costs, job location and other services, land use, and changes in the size and number of households. Smaller household size increases the number of trips due to limits in transportation access (e.g., shared vehicles, carpooling). More people are relying on interstate and state highways for local trips. As a result, congestion issues may be most noticeable on highways.



Note: Does not include all roadways; VMT estimates cover interstates, US and state highways, as well as a selection of non-state jurisdictional highways.

Vehicle miles traveled (VMT)—which refers to the total number of miles traveled by every car on Indiana’s roadways—can place great demands on the roadway infrastructure. Due to the anticipated increase in total population, the total number of miles being driven statewide will grow. According to the ISTDm, Indiana’s overall VMT is projected to increase 27 percent from 2015 to 2045. Truck VMT is expected to increase 39.1 percent between 2015 and 2045, while personal VMT is forecasted to increase 23.2 percent. The VMT in rural areas is greater than the combined VMT in urban and suburban areas. The number of roadway miles in Indiana is increasing at a much slower rate when compared to VMT.

From 2010 to 2045, the total number of roadway miles is projected to increase by 1.2 percent (ISTDM, 2018). Traffic congestion is linked to population and VMT growth; as a result, travel time is projected to increase significantly.



CHANGES IN VMT

— Below 150,000 VMT — 150,001 - 300,000 VMT
— 300,001 - 500,000 VMT — 500,001 - 800,000 VMT — Over 800,001 VMT

DAILY DELAY in Vehicle Hours



DAILY COST Associated with the Daily Delay



SAFETY

Understanding the trends in crash incidents, especially severe crashes resulting in serious injury or loss of life, will help to develop performance measures (see Chapter 7) related to safety and focus more funding for significant safety improvements in the future. INDOT's Office of Traffic Safety administers safety programs/policies and improvements that aim to reduce the frequency and severity of severe crashes on the state highway system and local roads. Most of the recent long-range transportation plans prepared by metropolitan planning organizations in Indiana also discuss future improvement plans to address roadway safety issues. Examples of improvements that facilitate safety include railroad at-grade crossing upgrades,

crossing closures, grade separations, roadway design enhancements, and public awareness and education campaigns.

Based on data from the Fatality Analysis Reporting System, the fatality rate per 100,000 residents was 12.38 in 2016, compared to 14.24 in 2006—roughly 13 percent decrease. The fatality rate per 100 million VMT was 0.99 in 2016, compared to 1.27 in 2006—roughly 22 percent decrease. Additionally, according to the Indiana State Rail Plan, 146 fatalities occurred at highway-rail crossings between 2006 and 2016—with a high concentration in northwest Indiana.

Number of Fatalities

YEAR	PASSENGER CAR	LIGHT TRUCK	LARGE TRUCK	MOTORCYCLE	BUS	OTHER VEHICLE	PEDESTRIAN	PEDCYCLIST	OTHER NON-MOTORIST	TOTAL
2006	395	269	27	110	0	3	73	21	4	902
2007	358	310	24	122	1	7	59	15	2	898
2008	378	215	12	131	0	4	54	18	8	820
2009	292	208	17	111	0	5	50	7	3	693
2010	327	220	11	111	0	7	62	13	3	754
2011	308	208	25	118	0	6	62	11	13	751
2012	309	209	19	152	2	6	59	15	10	781
2013	321	224	16	115	4	9	76	14	5	784
2014	258	238	15	124	1	11	78	12	8	745
2015	326	245	16	108	0	9	96	12	5	817
2016	329	249	14	101	0	17	85	19	7	821
2017	527	71	8	138	3	17	102	9	21	896
2018	456	78	9	104	1	8	101	101	21	799

Source: National Highway Traffic Safety Administration



MAINTAINING THE SYSTEM

INDOT is charged with maintaining the roads and bridges on the state highway system and approaches maintenance duties through an asset management process. INDOT continually collects data on the existing conditions of its roads and bridges to help evaluate projections of future conditions and transportation investment decisions. Transportation asset management is a strategic approach with the goal of identifying which programs and projects might provide the best long-term benefit. It is about making informed decisions for the system by understanding the life-cycle costs and benefits and revenue funding constraints.

For pavement preservation, INDOT considers the following types of treatment programs:

- **Maintenance:** Activities that include localized upkeep, select patching, and chip-seals and crack sealing of existing pavement.
- **Functional:** Capital improvements related to pavement smoothness.
- **Minor Structural:** Large capital improvements related to pavement smoothness and small structural projects.
- **Major Structural:** Large capital improvements related to significant structural projects.
- **Modernization:** Large capital improvements related to significant geometric and structural projects.

Work Programs for Bridge Preservation

WORK PROGRAM	TYPICAL PROPOSED PROJECTS	DEVELOPMENT TIMEFRAME
Long-Term Call Program	Bridge replacements and major bridge component rehabilitation and reconstruction.	5-7 years
Short-Term Placeholder Program	Deck overlays and replacements, bridge painting, and culvert lining. They may require some environmental permits, but do not require right-of-way or railroad permits, or utility relocation.	2-3 years
Bridge and Culvert Preventive Maintenance Agreement Program	Deck patching, joint replacement, thin deck overlay, scour protection, railing repair, and culvert repair.	18-24 months

