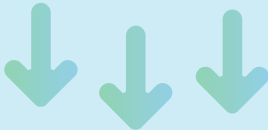
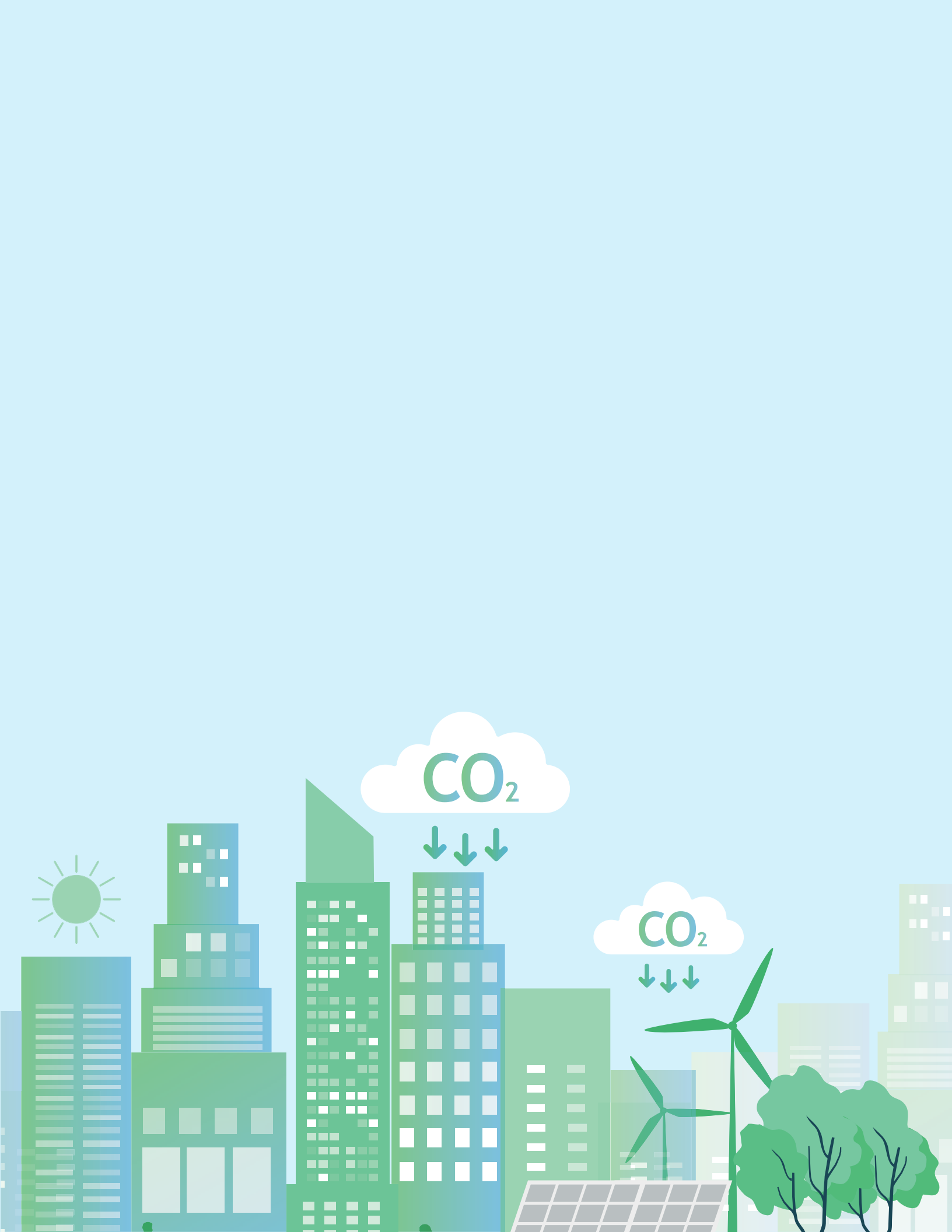


Carbon Reduction Strategy

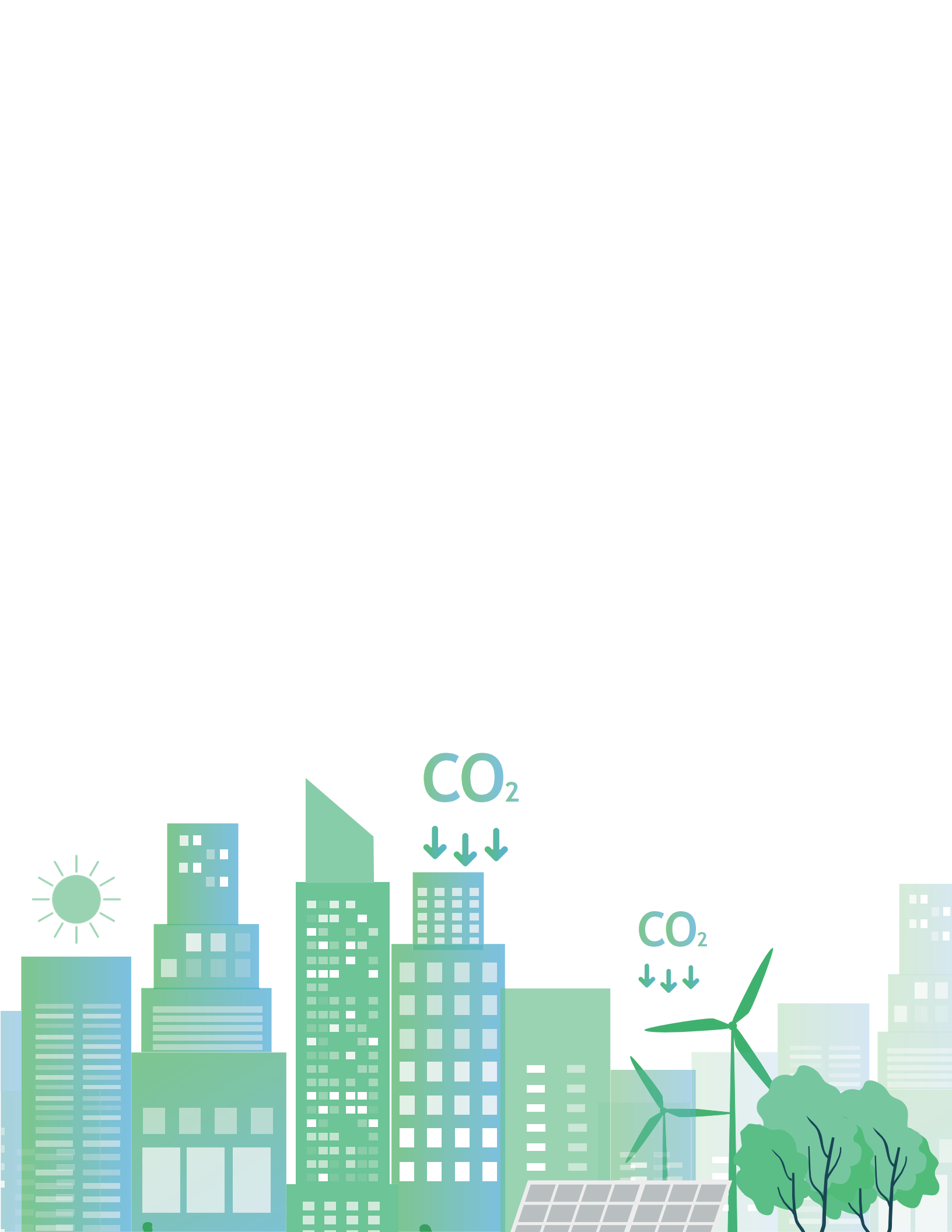
July 2023





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Introduction

The Indiana Department of Transportation (INDOT) has developed this Carbon Reduction Strategy (CRS) to support efforts to reduce carbon dioxide (CO₂) emissions and identify projects and strategies to reduce these emissions within the state of Indiana. This report is developed in accordance with federal requirements and guidance. Appendix A details each requirement and the section that addresses the requirement within this report.

Carbon Reduction Program Overview

The Indiana CRS follows federal guidelines delineated in the Carbon Reduction Program (CRP), established within the Bipartisan Infrastructure Law (BIL) of 2021 and codified in Title 23 U.S.C. Section 175. According to the federal legislation, the purpose of the CRP is to provide funds for projects designed to reduce transportation emissions, defined as carbon dioxide (CO₂) emissions from on-road highway sources.

Indiana expects to receive \$156 million over five years under the CRP. INDOT is required to allocate 65% of these funds to urbanized areas in accordance with their relative share of the state population. INDOT has flexibility to allocate the remaining 35% at the state's discretion. The Consultation with MPOs section below provides a map in Figure 1 illustrating the urbanized areas in the state of Indiana categorized by the CRP funding suballocation population tiers.

The CRP requires each state to prepare a carbon reduction strategy that:

- Supports efforts to reduce transportation emissions
- Identifies projects and strategies that will reduce transportation emissions
- Is appropriate to the population and context of the state

INDOT has developed this Indiana CRS to meet federal requirements and guidelines, while reflecting Indiana's unique path to meet carbon reduction goals and targets.

Organization and Purpose of the CRS

The Purpose of this CRS is to document relevant information related to INDOT's carbon reduction efforts and serve as a guide to future INDOT work. The document is organized into five sections.

- **Section 1: Introduction** - Provides relevant background information and appropriate context for readers.
- **Section 2: Carbon Reduction Strategy Development** - Details the activities INDOT engaged in to develop the CRS.
- **Section 3: Carbon Reduction, Indiana Context** - Describes the context for pursuing carbon reduction in transportation, including definition of transportation emissions, relevant data and trends, policy context, and the roles of public agencies, individuals, and private entities.
- **Section 4: INDOT Projects, Strategies, and Actions** - Lists near-term projects, mid- to long-term strategies, and other INDOT actions that will lead to a reduction in transportation carbon emissions.
- **Section 5: Conclusion** - Provides a brief closing describing INDOT's commitment to carbon reduction efforts.

Carbon Reduction Strategy Development

INDOT developed this Carbon Reduction Strategy by exploring the policy goals and objectives in Indiana's Statewide Long-Range Transportation Plan (LRTP), reviewing the Statewide Transportation Improvement Program (STIP), and engaging with INDOT staff across the organization to identify current and future efforts that support the reduction of transportation emissions. INDOT also consulted with Metropolitan Planning Organizations (MPO) throughout the development of this strategy to better understand local planning contexts and priorities.

Identification of Current and Future INDOT efforts

Federal requirements state the CRS must be updated at least once every four years. INDOT's intent is to integrate future updates of the CRS into Indiana's LRTP. INDOT developed this strategy considering current policy goals and objectives, performance measures, and expected transportation trends identified in Indiana's most recent LRTP which was completed in 2019. The next LRTP update process, which is expected to begin in 2023, will integrate the information in this strategy. Details on how this Carbon Reduction Strategy aligns with Indiana's LRTP goals and objectives can be found in Appendix B.

INDOT also performed a review of Statewide Transportation Improvement Plan projects, the INDOT Scheduling Project Management System (SPMS), and other projects provided by MPOs from their respective Transportation Improvement Plans. This information can be found in the INDOT Projects, Strategies, and Actions for Carbon Reduction section later in this document.

Consultation with MPOs

INDOT developed this strategy in consultation with the MPOs in the state (See Figure 1). INDOT invited all fourteen MPOs to three stakeholder meetings held between September and November of 2022 as detailed in Figure 2. Meeting summaries are included in Appendix C. All meetings were recorded and made available to the MPOs.

INDOT requested input on policy goals and objectives and potential projects and strategies at stakeholder meeting #2 and through a survey implemented at the end of October 2022. A Draft Carbon Reduction strategy was provided to the MPOs for review and comments received were incorporated into the final report.

Figure 1: Indiana Metropolitan Planning Organizations (MPO)

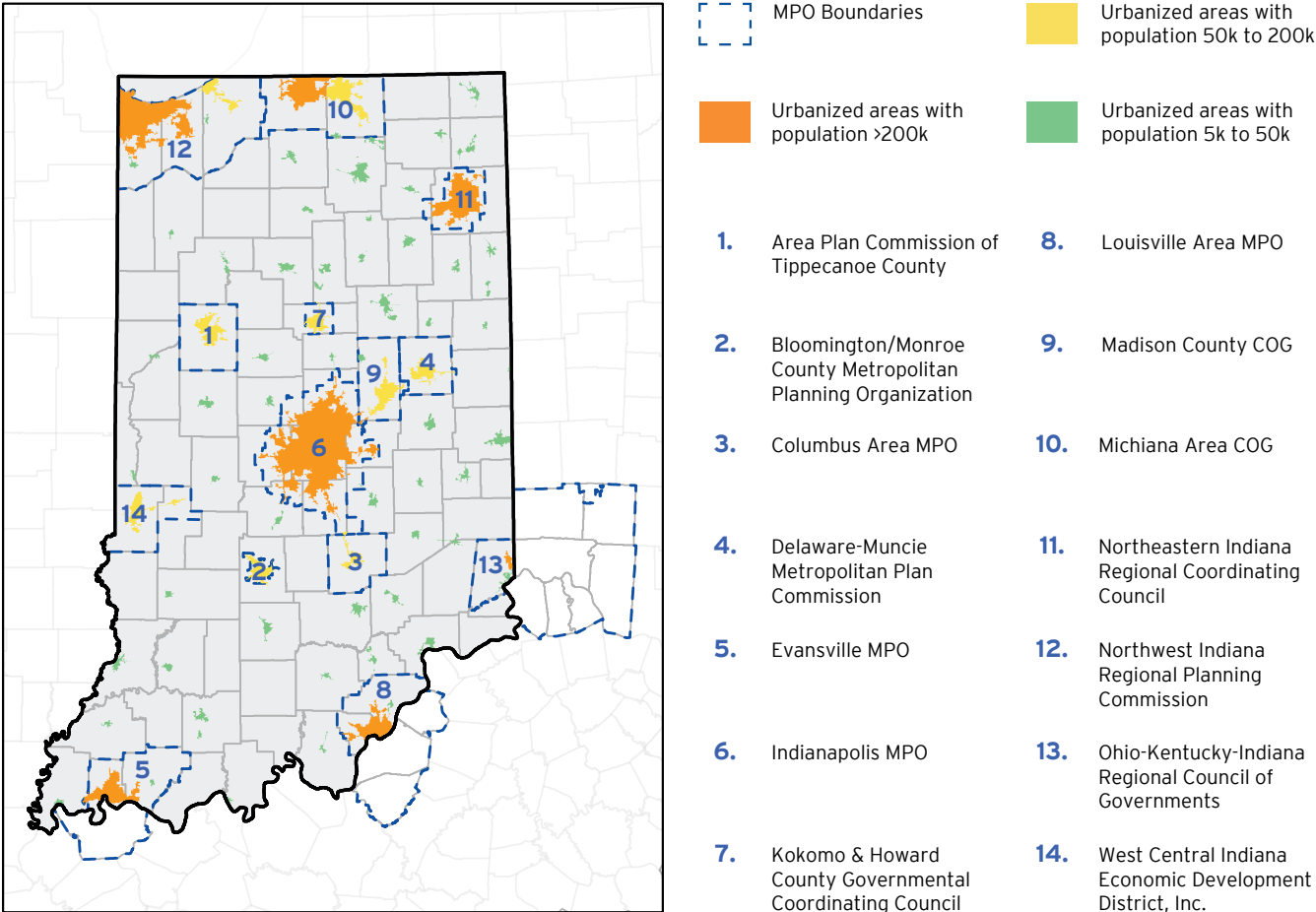
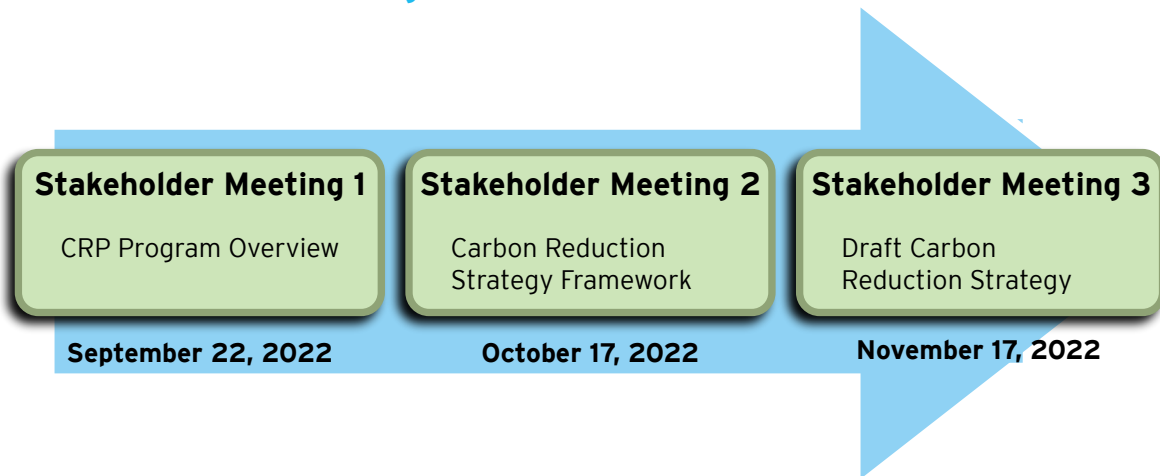


Figure 2: Stakeholder Meeting Timeline



Public Engagement

The Draft CRS was released through the INDOT website on December 15, 2022, for a 30-day public comment period, then extended 15 additional days. Hard copies were available at INDOT District Offices and via mail upon request. Notification of the comment period was made through social media, email distribution lists and newspaper ads. In addition, INDOT requested that MPO partners share the public comment period with their stakeholders, directing them to the website for review and comment. A public comment summary can be found in Appendix D. Additional public engagement related to carbon reduction will continue through the public and stakeholder engagement for the Long-Range Transportation Plan update process set to start in 2023.

Carbon Reduction, Indiana Context

Vehicle emissions can be divided into two general categories: 1) air pollutants, which contribute to smog, haze, and health problems like asthma; and 2) greenhouse gases (GHGs). The primary GHG¹ emitted from the transportation sector is CO₂, more generally referred to as carbon or carbon emissions throughout this strategy.

Methods of Carbon Emission Accounting

Air pollutants and carbon emissions can be assessed through two major accounting methodologies: tailpipe emissions and lifecycle emissions accounting.²

- **Tailpipe Emissions:** Tailpipe or direct source transportation emissions result from the direct vehicle combustion of carbon rich fossil fuels (coal, natural gas, and oil in the form of gasoline and diesel motor fuels). Electric vehicles (EVs) for example, do not combust any fuels directly onboard the vehicle and therefore have zero direct vehicle or tailpipe emissions. This is why EVs are sometimes referred to as “zero emission vehicles” or ZEVs.

- **Lifecycle Emissions:** Lifecycle transportation sector emissions, sometimes referred to as “well-to-wheels” or “cradle-to-grave” emissions, come from many sources over a vehicle’s lifecycle of energy use, including the emissions generated through the manufacturing of the vehicle, as well as the production, distribution, and consumption of fuels powering the vehicle. The concept of lifecycle transportation emissions extends beyond vehicles themselves to include the production and use of construction materials for transportation infrastructure, such as concrete and asphalt. While EVs have zero tailpipe emissions, they do have lifecycle emissions from the energy used in the production of vehicles and the extraction and combustion of fuels for the generation of electricity used to power the vehicles.

Indiana’s CRS focuses primarily on reducing transportation emissions, defined by the CRP as CO₂ emissions from on-road highway sources or tailpipe emissions. INDOT is also working on reducing lifecycle emissions and was recently awarded a Technology and Innovation Deployment Program climate challenge grant to create a benchmark for Indiana asphalt and concrete mixtures and their environmental impacts using Environmental Product Declaration (EPD) reports. INDOT will quantify and compare the quality of asphalt and concrete mixtures with performance testing between current standard specifications for QC/QA HMA, warm mix technology, high Reclaimed Asphalt Pavement (RAP) asphalt mixtures with a recycling agent, continuously reinforced concrete pavements (CRCP), Jointed Concrete Pavement (JCP) and Portland Cement Concrete Pavement (PCCP) Overlays. This program will allow INDOT to improve pavements as well as reduce lifecycle emissions.

Efforts to reduce Indiana’s carbon emissions can have a variety of positive effects for the public and economy, from improving air quality and public health to enhancing energy efficiency and cost-savings for motorists and businesses. INDOT is working with communities and the Indiana Department of Natural Resources (IDNR) to plant more trees in the right of way that can absorb carbon from the atmosphere. INDOT is also developing a program to provide funds for mitigation sites to IDNR to allow them to expand existing environmental sites in the state. This allows for the state to protect more land in already established areas.

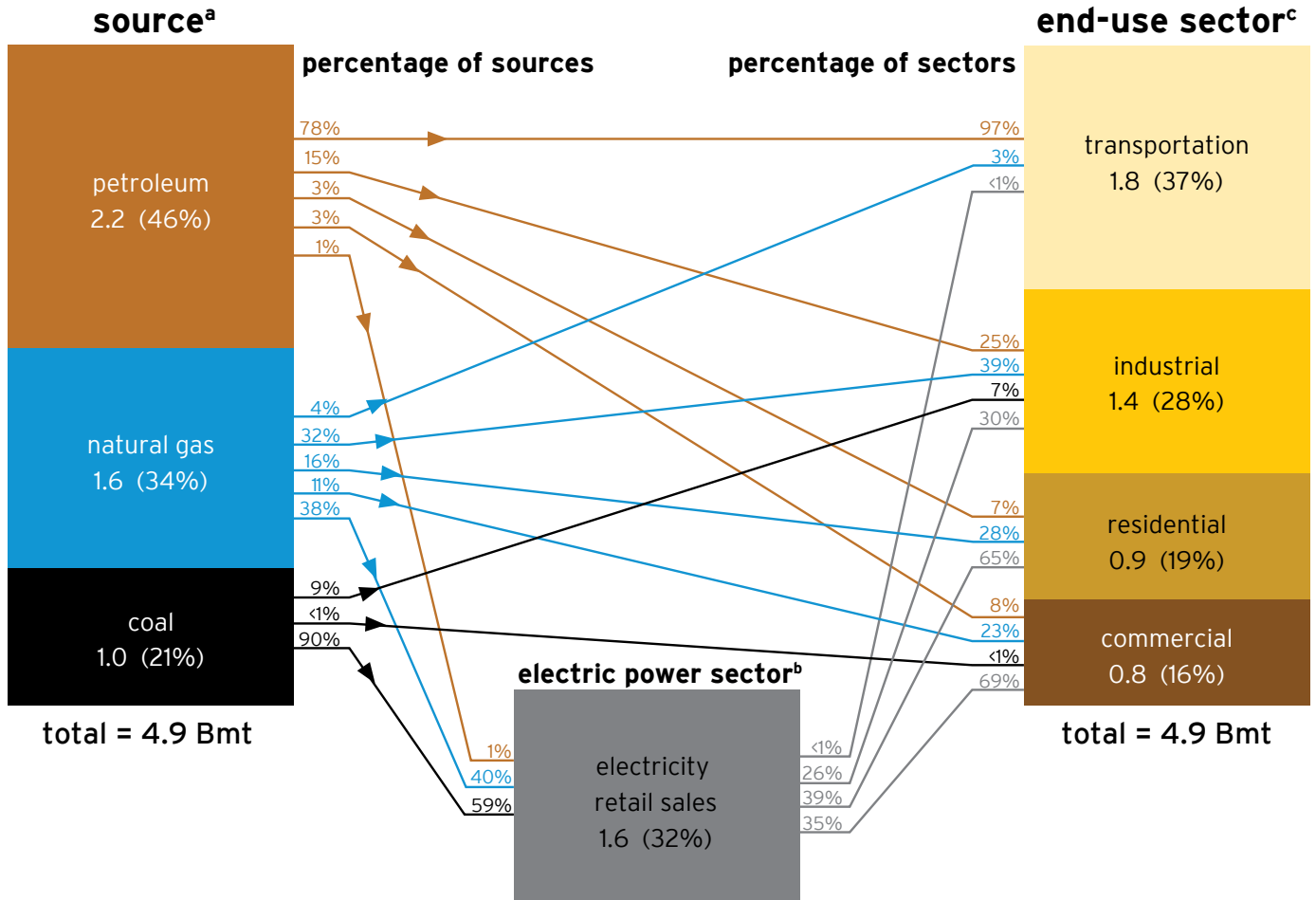
US and Indiana Carbon Emissions by Sector

In the US, 37% of total CO₂ emissions comes from the combustion of fossil fuels to transport people and goods (see Figure 3). In Indiana, 22% of the state’s total CO₂ emissions results from the transportation sector due to the higher use of coal in the state’s current electric generation mix (see Figure 4).

While these total transportation sector CO₂ emissions include on-road, air, marine, and rail emissions, 80% of the transportation sector emissions nationally come from cars, trucks, and buses on the roads (see Figure 5).

Each different transportation sector mode or vehicle type has proportionally different shares of carbon emissions, or carbon intensity, per mile. These differences can be pronounced depending on whether the vehicles are transporting passengers or transporting freight on our highways.

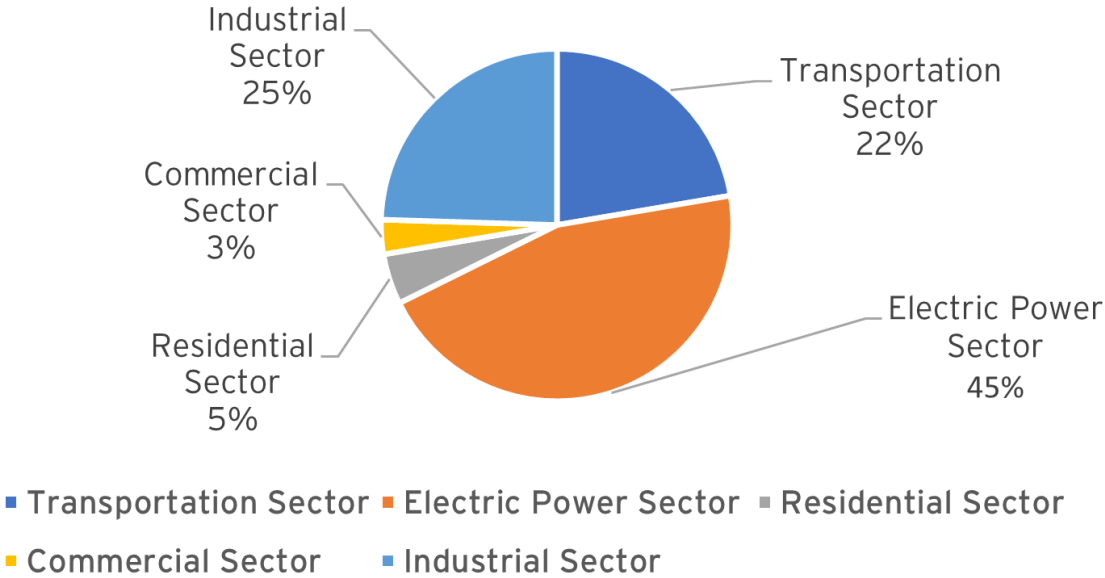
Figure 3: U.S. CO2 Emissions from Energy Consumption by Source and Sector, 2021 Billion Metric Tons (Bmt) of Carbon Dioxide (CO2)



Note: The sum of components may not equal the total due to independent rounding. Includes the relatively small amount of carbon dioxide (CO₂) emissions from geothermal and nonbiomass waste for electric power sector use not shown elsewhere, See EIA's *Monthly Energy Review*, Section 11. See "Extended Chart Notes" on next page.

- a. CO₂ emissions from primary energy consumption. Each energy source is measured in different physical units and converted to metric tons of CO₂.
- b. The electric power sector includes electricity-only and combined-heat-and-power (CHP) plants whose primary business is to sell electricity, or electricity and heat, to the public. CO₂ emissions from electricity retail sales to each end-use sector are equal to the weighted average of fuels used to generate electricity and allocated proportion-ally to the amount of retail sales to each end-use sector.
- c. Industrial and commercial sectors include primary energy consumption by CHP and electricity-only plants in the sector. Includes the CO₂ emissions from the electricity retail sales allocated to each end-use sector.

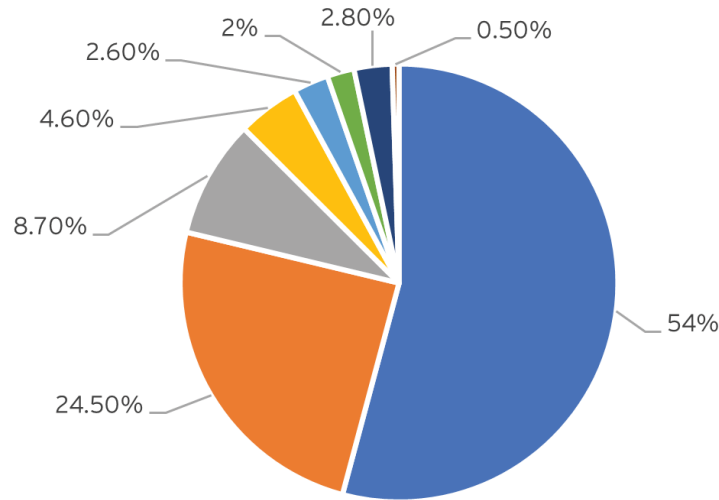
Figure 4: Indiana Carbon Emissions by Sector (Avg. Annual 2015-2020)



Source: HNTB graphic from US EIA Energy-Related CO2 Emissions Data Tables: Table 3: State Energy Related Carbon Dioxide Emissions by Sector, Average Annual Emissions 2015-2020



Figure 5: US Transportation Emissions by Vehicle Type



- Light Duty (cars, small trucks, vans, SUVs, and motorcycles)
- Aviation
- Trains & Buses
- Pipelines
- Commercial Trucks / Freight
- Ships/Boats
- Military (all modes)
- Lubricants

Source: U.S. Energy Information Administration, Annual Energy Outlook 2022 (AEO2022) www.eia.gov/aeo

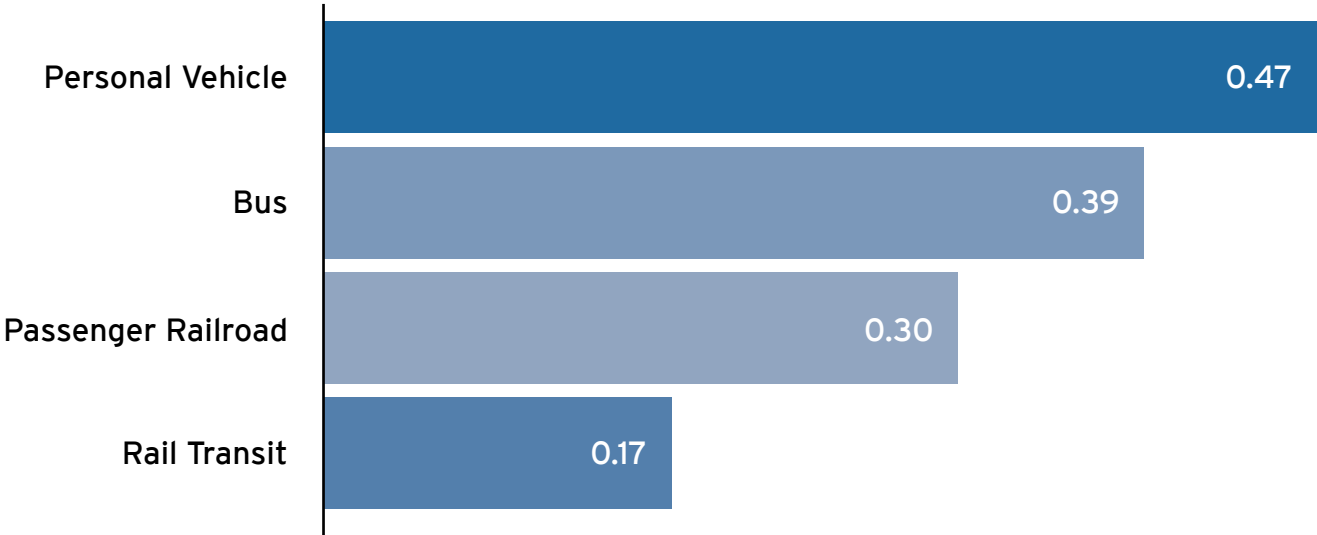
Passenger Transportation Carbon Emissions

Most passenger transportation in the US occurs in personal vehicles, accounting for 81% of all passenger travel in 2019,³ and the use of personal vehicles is higher than the national average in Indiana, as indicated by daily commuter patterns. More than 92% of all commuting trips are made by personal vehicle in Indiana, compared to 85% nationally.⁴ Personal vehicle travel is the most carbon intensive mode of passenger transport, higher than transit bus, air, railroad, and light rail passenger transit as detailed in Figure 6.

Many factors can affect the amount of carbon emissions from passenger vehicle types, but the most common factors include size and weight of the vehicle, the number of passengers on board, the fuel efficiency of the vehicle, and the vehicle fuel source. According to a 2021 US Environmental Protection Agency (US EPA) study of personal vehicles, the most popular size car in 2020 emitted 0.60 pounds of CO₂ per vehicle mile, while a vehicle in the category of large pickup trucks emitted nearly twice that amount - 1.18 pounds of CO₂ per vehicle mile.⁵

Figure 6: US Average Carbon Dioxide Emissions per Passenger-Mile, by Mode of Transportation, 2019

Pounds of Carbon Dioxide per Passenger-Mile



Source: Congressional Budget Office, using data from Bureau of Transportation Statistics, National Transportation Statistics 2021 (November 2021), Table 1-40, www.bts.gov/topics/national-transportation-statistics; Stacy C. Davis and Robert G. Boundy, Transportation Energy and Data Book: Edition 40 (prepared by Oak Ridge National Laboratory for the Department of Energy, February 2022, updated June 2022), <http://tedb.ornl.gov>; and Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020, EPA 430-R-22-003 (April 2022), <https://tinyurl.com/2p8mhpe9>

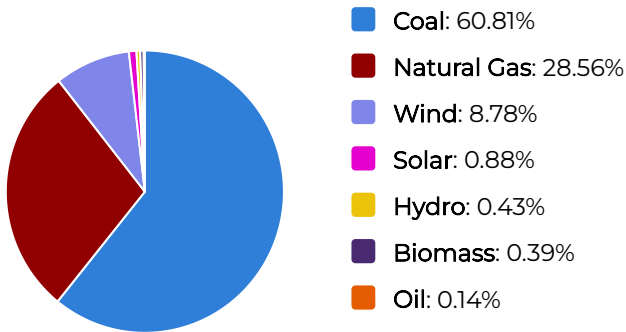
While size, weight, and fuel efficiency are also factors for transit vehicles, the number of passengers on board can have a significant effect on overall emissions. As a general rule, the more passengers a transit vehicle carries at one time, the lower the average pounds of CO₂ per passenger mile. Choosing more fuel-efficient passenger vehicles and encouraging a mode shift to public transportation can provide significant carbon reductions for passenger transportation.

When it comes to personal vehicle use, choosing low and zero emissions personal vehicles can significantly reduce transportation carbon emissions. All-electric vehicles running only on electricity have zero tailpipe emissions. The production of electricity from power plants offset this benefit to some degree, but this varies depending on the type of fuel used. According to the US Department of Energy, electric vehicles in Indiana result in significant carbon reductions even when factoring in electricity production from Indiana utilities and their fuel sources, as detailed in Figure 7.

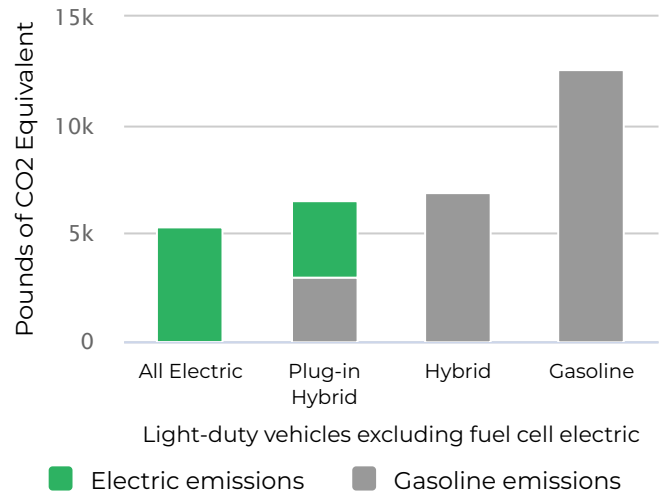
Figure 7: Indiana Electric Power Fuel Sources and EV Fuel Cycle Emissions

State Averages for Indiana

Electricity Sources



Annual Emissions per Vehicle

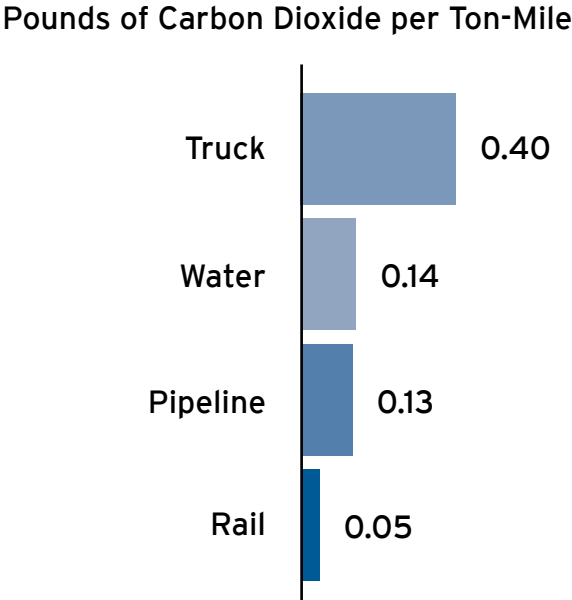


Source: US Department of Energy, Alternative Fuel Data Center, Electricity Sources and Fuel-Cycle Emissions Tool, State Averages for Indiana, https://afdc.energy.gov/vehicles/electric_emissions_sources.html

Freight Transportation Carbon Emissions

The Indiana Multimodal Freight Plan reports 79% of freight tonnage in Indiana is moved by truck.⁶ Nationwide, on-road trucks carry the largest overall share of freight cargo miles traveled, representing 43% of all freight “ton-miles” in 2019.⁷ The amount of carbon emissions it takes to move one ton of freight one mile, or carbon intensity per ton-mile, varies even more greatly by mode of transportation in freight transport than carbon intensity varies by mode in passenger transport, as shown in Figure 8.

Figure 8: US Average Carbon Dioxide Emissions per Ton-Mile of Freight, by Mode of Transportation, 2019



Source: Congressional Budget Office, using data from Bureau of Transportation Statistics, National Transportation Statistics 2021 (November 2021), Table 1-50, www.bts.gov/topics/national-transportation-statistics; and Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2020, EPA 430-R-22-003 (April 2022), <https://tinyurl.com/2p8mhpe9>

As Figure 8 shows, emissions per ton-mile from trucking freight were eight times those from rail. The carbon emissions of truck freight are determined by the fuel intensity of highway travel, combined with the stop/starts of highway traffic. This fuel intensity of trucking is compounded by long engine idling times for trucks as they wait to load and unload cargo, as well as drivers idling their trucks for in cabin climate control and electric power during required rest periods. Therefore, projects such as truck stop electrification and other strategies to substantially lower truck idling emissions can have significant carbon emissions reductions. The greatest potential carbon reductions in freight transportation will involve shifting freight transportation from on-road trucks to more carbon efficient transportation modes.

Additional Factors Affecting Transportation Carbon Emissions

In addition to user behaviors, systemwide transportation emissions also depend on factors such as demographics, socioeconomics, and land use policies that can result in overall changes to the level of travel miles and the congestion on our roads. Although demographic and socioeconomic policies are not controlled by INDOT, it is worthwhile to recognize their effect on the objectives of the carbon reduction strategies.



Demographic Factors: These include variables such as growth, decline, or movement of populations throughout a state effecting how many passengers are traveling in each region and how much freight and goods movement is needed to support those populations. Indiana's latest LRTP (conducted pre-pandemic), projected population and employment increases of 19% and 30% respectively between 2015 and 2045. This type of growth is typically associated with more vehicle trips and longer trips; and Indiana's LRTP estimated that between 2015 and 2045, total vehicle miles traveled (VMT) will increase by 27%. Truck VMT is expected to increase at an accelerated rate, growing by more than 39% between 2015 and 2045.

Post-pandemic changes to both demographic populations and individual behaviors are likely to result in changes to the projections above. More recent demographic projection data forecasts Indiana's population to grow only 9% from 2015 to 2045, and 7% from 2020 to 2050.⁸ In addition, data from the USDOT Bureau of Transportation Statistics describes how the aging population of the United States will affect travel patterns as retirees replace commuting to jobs during peak congestion periods with travel for other purposes at other times of the day.⁹



Socioeconomic Factors: Factors such as where businesses are located, how many workers are employed, from what locations workers travel, and at what times of day worker commutes take place all affect the level of travel miles and the congestion on our roads. In addition to employment factors, other trips for economic activity such as shopping, dining, and entertainment affect travel demand and associated carbon emissions.

As with demographic factors, the pandemic resulted in continuing changes to socioeconomic factors. For example, recent USDOT data noted that working at home grew by 18.6 million people to become second to driving alone as a way to access work. In addition, USDOT data illustrates that e-commerce retail sales have steeply risen in recent years, especially during the COVID-19-year of 2020, when e-commerce accounted for 14.6 percent of all retail sales, up nearly three times its 4.9 percent share in 2011. Increasing e-commerce sales as a proportion of retail sales will have the effect of decreasing shipping distances, which can change trucking operations as an increasing number of trucks are deployed for shorter hauls and last-mile deliveries. This may create greater challenges for mitigating traffic, especially in the approaches to urban areas.¹⁰



Land-Use Policies: Land use policies affect where and what is built as regional populations grow. Land use policies can allow populations and developments to spread over larger geographic areas, sometimes referred to as “sprawl”, or they can encourage more compact development and increase population density. Where populations sprawl, more transportation infrastructure and services are required to reach destinations for work, retail, and recreation. Since destinations are further spread apart, it is more challenging to travel by transit, biking, or walking. Higher VMT are directly associated with less dense forms of urban development. Where land use policy supports denser population growth, the need for long commutes is lessened and it is easier for transportation agencies to offer options for public transit and active transportation facilities, resulting in lower VMT and associated carbon emissions.

Regardless of post-pandemic changes to travel behavior, reducing transportation carbon emissions from on-road sources requires a combination of all of these strategies and actions, from utilizing more efficient and lower emissions passenger vehicles, to reducing VMT through greater use of transit and active modes of transportation, moving freight more efficiently, deploying technology solutions, and supporting policies that strategically reinforce all these projects, strategies, and actions for carbon reduction.

Policy Context

The U.S. government has set a goal of net-zero GHG emissions by 2050, with an interim target of 50-52% reduction below 2005 levels by 2030.¹¹ The national framework also proposes to establish a new national GHG performance measure that will be incorporated into the transportation planning process, with two- to four-year reduction targets set by individual states. In efforts to provide funding to support these GHG emissions goals, among other objectives, Congress has passed the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA), which have respectively created funding such as the Carbon Reduction Program and various tax incentives for the purchase of zero emission vehicles, among other programs. Indiana has not passed legislation to date setting statewide carbon reduction goals or mandating carbon reduction activities from state agencies. However, as later sections of this document detail, the state of Indiana and its executive agencies, such as INDOT, are involved in various activities that support carbon reduction.

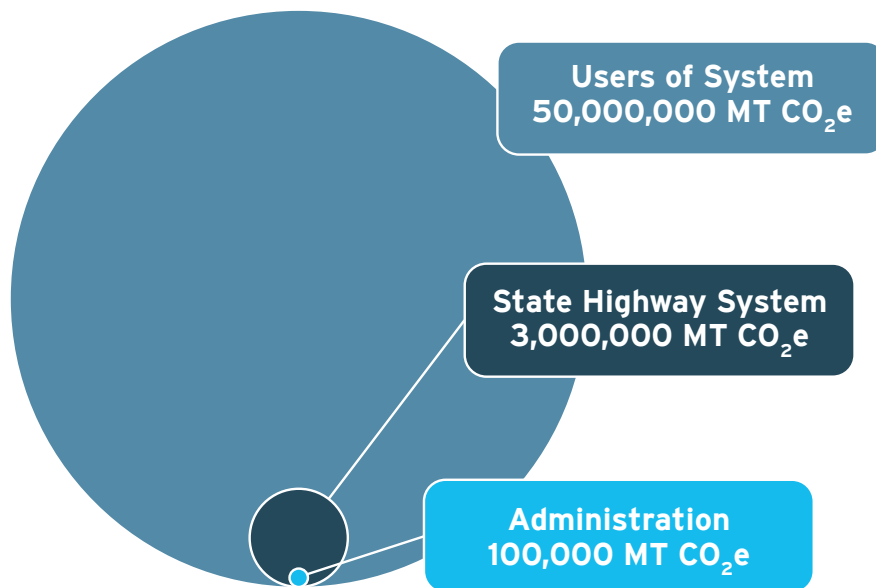
Roles and Responsibilities in Carbon Reduction

Emission reductions in transportation depend on policies and investments from public agencies as well as the decisions made by many different entities and individuals. Transportation agencies can support carbon efficient choices by planning, designing, and building safe and convenient infrastructure and transportation services. Government agencies can also support carbon efficient choices by providing incentives through policies and programs. Public agencies can lead by example, implementing fuel saving programs for employee commutes and other work-related travel and switching to low or zero-emission fleet vehicles.

Beyond transportation agencies and planners, the choices of travelers will affect overall transportation sector carbon emissions. For example, individuals choosing to buy a more fuel-efficient personal vehicle, or a zero-emission vehicle such as an electric vehicle, will lower transportation sector carbon emissions. Even more significantly, individuals choosing public transit, carpools or active modes of transit like biking or walking will reduce passenger vehicle miles traveled and have even greater carbon emission reduction results.

The America Association of State Highway and Transportation Officials' (AASHTO) National Highway Cooperative Research Program (NHCRP) conducted a 2021 study titled "Methods for State DOTs to Reduce Greenhouse Gas Emissions from the Transportation Sector." This report generated a case study compiling data from nine states to generate a "composite state" example of the relative carbon emissions from users of the transportation system. This example can be compared to a typical state DOT's current activities to construct and maintain the system as well as the DOT's administrative operations (buildings and fleets). As shown in Figure 9, approximately 6 percent of emissions¹² – about three million metric tons – is generated from materials and fuels used in the construction, maintenance, and operation of the state's highway infrastructure. About two-tenths of a percent of emissions, or 100,000 metric tons, are generated through state DOT administrative operations, including office buildings and passenger vehicles.

Figure 9: Relative Carbon Emissions of the Transportation System for State Departments of Transportation



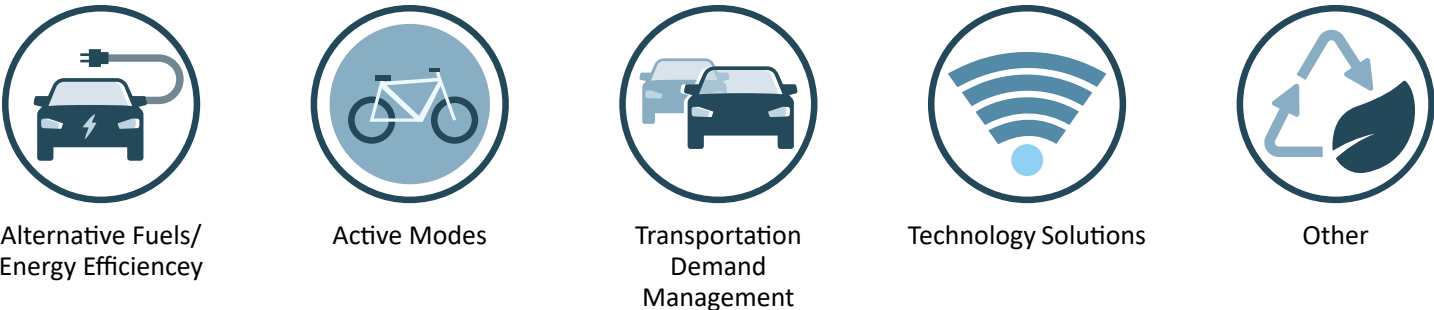
Source: AASHTO National Highway Cooperative Research Program (NHCRP) 2021 study: "Methods for State DOTs to Reduce Greenhouse Gas Emissions from the Transportation Sector"

The elements in the next section, INDOT Projects, Strategies and Actions for Carbon Reduction, are focused on what INDOT can act on directly. A more comprehensive discussion of how INDOT influences carbon reduction through its long-range transportation planning process is found in Appendix B and a comprehensive set of solutions that can lead to carbon reduction is found in Appendix E. These are intended to provide a reference for use by transportation planning teams.

INDOT Projects, Strategies and Actions for Carbon Reduction

In consultation with MPOs, INDOT identified five categories of transportation projects and strategies that can support carbon reduction in Indiana (see Figure 6). Appendix E details specific projects and strategies included in these categories, representing the broad range of transportation solutions available when planning and designing a transportation system that leads to lower carbon emissions.

Figure 10: Carbon Reduction Project and Strategy Categories



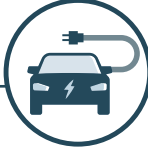




INDOT has identified specific projects and strategies that will support carbon reduction in the near term and opportunities to further develop projects and strategies in the mid- to long-term.

Urban vs. Rural Context

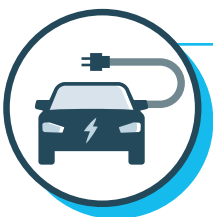
The fabric of Indiana varies from rural to urban and suburban. Many proposed strategies are applicable to all areas of the state but must be designed appropriately to the geographic context. For example, major transit initiatives are most appropriate in urban areas, particularly those that are growing with denser land uses. Bicycle and pedestrian projects can be effective across the state, but their use and design will be different when applied to an urban road network than in a rural network.

Near-term carbon reduction projects and strategies

To identify projects eligible for CRP funds, INDOT performed an analysis of the Statewide Transportation Improvement Plan, the INDOT Scheduling Project Management System (SPMS), and project lists provided by MPOs from their respective Transportation Improvement Plans. A total of **1,493 projects** were found to be potentially eligible across the state, categorized as follows:

- **35 Projects** in the **Alternative Fuels/Energy Efficiency Category** 
- **554** in the **Active Modes Category** 
- **Four** in the **Transportation Demand Management Category** 
- **202** in the **Technology Solutions Category** 
- **698** in the **Other Category** 

Each eligible project was assessed with a qualitative (low - high) scale of carbon reduction potential. Although the analysis is at a planning level, this information will help INDOT and its MPO partners deliver projects consistent with carbon reduction that are already planned or programed in the state.



1. Alternative Fuels and Energy Efficiency

In the Alternative Fuels and Energy Efficiency category, INDOT will leverage nearly \$100 million made available through the National Electric Vehicle Infrastructure (NEVI) program through 2026 by installing Level 3 DC Fast Charge charging stations along all of Indiana’s Interstates and US 31. The stations will be located no more than 50 miles apart along these corridors, providing convenient and equitable charging access in rural and urban areas.

INDOT is also working on installing charging infrastructure at agency facilities. Seven electric vehicle charging stations are slated for installation at each of INDOT’s district complexes and at the Indy subdistrict.

INDOT also has an electrification initiative to transition its fleet to electric or alternative fuels. Some electric vehicles have already been tested and fleet management is currently working to procure a few electric F-150 type of trucks for each of the districts. Solicitations for electric vehicles have been released, sometimes with lack of response from vehicle manufacturers. INDOT is working on establishing a transition timeline that takes into consideration vehicle availability and is considering consultant support for this fleet transition effort.



2. Active Modes

Over 550 active transportation projects will be implemented in Indiana in the near term. Major active mode projects consistent with carbon reduction include the Double Track Northwest Indiana Project, which offers a competitive low carbon transportation option between Northwest Indiana and Chicago by adding a second track to the South Shore Line.

INDOT administers approximately \$100 million in state and federal funds through grant programs providing financial/technical assistance to 63 public transit systems in the state that supports more than 36.6M passenger trips annually.¹³

INDOT also administers the Rural Transit 5311 Program, created to provide public transportation in non-urbanized areas (population of 50,000 or less).

A major commuter rail improvement project is underway in Northwest Indiana. The \$650-million South Shore double tracking project will improve 25 miles of the existing line between Gary and Michigan City, improving service from three Indiana counties to Chicago. When complete in 2024, the South Shore Line will add 14 weekday trains for more frequent service, reduced delays, and improved travel times for users.

INDOT will continue its commitment to investments in the statewide trail system. Indiana has about 3,600 total miles of trails, including local, state, federal, and nonprofit trails that are open to the public. INDOT has a longstanding commitment along with state agency partners such as Indiana's Department of Natural Resources (DNR) to provide access to trails for all Indiana residents. DNR has set a goal to provide a trail within five miles of every Hoosier. State funding is provided by the Next Level Trails¹⁴ Grant Program, overseen by DNR and coordinated with INDOT, to link communities across the state with more opportunities to hike, bike, and ride on trails.

Since its inception, the Next Level Trails Grant Program has awarded \$150 million for 75 projects across the state. On May 11, 2023, Governor Holcomb announced details for the fourth round of the Next Level Trails grant program, providing an additional \$22.5 million to regional projects and up to \$7.5 million to local projects. Eligible applicants include units of government and 501(c)(3) nonprofit organizations.

About 210 bicycle/pedestrian projects that range in scale from local sidewalk improvements to larger trail development projects, such as the Marquette Greenway project, can be implemented in the near term.

INDOT also annually invests \$20 million on the sidewalk improvement program and \$5 million on the ADA Transition Plan to address identified needs and gaps within the pedestrian network.

The United States Bicycle Route (USBR) system designates interstate long-distance cycling routes utilizing multiple types of bicycle infrastructure. INDOT has been approved for over 700 miles of designated routes (USBR 35, USBR 36, USBR 50 and USBR 235) across the state and is pursuing designation for USBR 37.

Through the INDOT SEAT Program, INDOT is partnering with multiple agencies including the Indiana Department of Health, Health by Design, AARP, Indiana DNR, and other interest groups to discuss active transportation needs and opportunities. The group meets every 2-3 months to discuss safety, data sharing, analysis, community workshops, staff training, and other services.

INDOT's Bike IN Safe program promotes safe cycling among youth by distributing helmets to elementary school age children and offering information about rules of the road, how to avoid distractions, and other safety tips.



3. Transportation Demand Management

Although the number of Transportation Demand Management (TDM) initiatives identified as projects in the analysis is limited, TDM is an ongoing activity of INDOT and the MPOs. The Smart Growth and Transportation Demand Management objective of INDOT's Long-Range Transportation Plan is intended to help reduce VMT and reduce on-road carbon emissions. It can also reduce the need for major infrastructure expansion projects (which can be both costly and a major source of CO2 emissions).

Many TDM strategies, such as land use policies and commuter trip reduction, are outside the control of INDOT at a statewide level, but the agency has implemented TDM strategies internally. For example, Governor Holcomb developed a strategy of three days in the office and two days teleworking for majority of the state of Indiana employees for all employees whose job allows them to telework. This allowed INDOT to occupy a smaller footprint by providing shared offices as it reduced the need for travel by employees.

For INDOT's Central Office employees, INDOT also encourages carpooling as a way to decrease congestion, reduce emissions on NO-ZONE action days, and save state employees money, providing special parking areas designated for individuals who carpool.¹⁵ INDOT also offers a Commuter Benefit Reimbursement program to fund transit and vanpool commute options for employees.¹⁶



4. Technology Solutions

Of the total 202 Technology Solutions projects identified, 97 are Intelligent Transportation Systems (ITS) related projects and 105 are traffic signals projects. ITS projects include traveler information systems and traffic management systems, including the deployment of dynamic message signs and traveler information systems along portions of I-69 and I-469 near Fort Wayne. Signals projects primarily involve signals modernization and upgrade work.

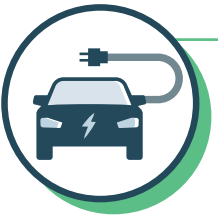
INDOT has implemented electronic toll collection systems on all toll roads in the state, allowing motorists to pass through toll collection locations without the need to stop. In addition to reducing carbon emissions, these systems provide a safer and more comfortable experience for those using the toll roads.



5. Other

Of the projects in the "Other" category, 86 include roundabout projects, and 204 include other intersection projects which have the potential of reducing overall carbon emissions from transportation in Indiana.

Mid- to long-term opportunities for carbon reduction



1. Electric Vehicles, Alternative Fuels and Energy Efficiency

INDOT will continue to leverage any federal funds available through the National Electric Vehicle Infrastructure (NEVI) program beyond 2026 to continue expanding the electric vehicle infrastructure network.

INDOT will coordinate with freight and logistics industry to identify specific projects and strategies that will support reduction of carbon emissions from moving goods in and across the state of Indiana. Under the Research Priorities for 2022-2023 effort INDOT is currently working with Conexus Indiana to identify potential P3 projects to improve congestion at freight-heavy bottlenecks, identify strategies to strengthen the multimodal freight system, leverage third party data sources, and enhance collaboration with the multimodal freight industry. INDOT will incorporate actions identified for reduction of carbon emissions as part of this effort.



2. Active Modes

INDOT is developing an Active Transportation Plan as well as a Performance-Based Practical Design approach with the goal of implementing projects that address performance, surroundings, and life-cycle considerations. This effort includes evaluating options for incorporating bicycle and pedestrian elements into INDOT's corridor planning, project prioritization, and project development processes.

INDOT will continue to evaluate opportunities for improving intercity passenger rail service and coordinate with transit agencies and MPOs to identify opportunities to support new transit projects and strategies across the entire state.

INDOT will continue to support the Next Level Trails Program, the development of the US Bike Route System, and the INDOT SEAT Program. INDOT will coordinate with MPOs to identify additional opportunities to support trail projects throughout the state.



3. Transportation Demand Management

INDOT is exploring development of a statewide commute trip reduction program that will support higher occupancy use of personal vehicles during peak time commute trips, as well as work from home arrangements modeled after the INDOT internal programs for staff.



4. Technology Solutions

INDOT will continue to advance technology initiatives that will help improve traffic congestion and reduce carbon emissions, such as detection at interchanges, installing dynamic message signs at critical interstate diversion points, upgrading message boards throughout the state to provide more real-time information to drivers, and connecting all 2,500 traffic signals on the state network for improved signal timing and issue detection.

INDOT will monitor the impact of ongoing Transportation System Management and Operations (TSMO) efforts on I-465 and I-94 and evaluate the use of these strategies along other congested corridors.



5. Other

When appropriate, INDOT will install roundabouts to replace traditional four-way traffic signals to reduce accidents, traffic delays, fuel consumption, and air pollution, while improving safety, increasing capacity, and enhancing intersection aesthetics.

FHWA research¹⁷ indicates that emission rates at roundabouts can be lower than at intersections, although reductions are varied depending on specific conditions at each location. INDOT currently has 32 roundabouts on the State Roadway Network, with an additional 36 in development. Local jurisdictions have installed hundreds more across the state. INDOT will continue to evaluate opportunities for additional roundabouts on state routes.

INDOT will incorporate strategies that reduce GHG emissions and support carbon neutrality through new material, design, and maintenance strategies for construction projects identified through the Technology and Innovation Deployment Program climate challenge award.

INDOT is in the development stages of a carbon reduction (or GHG reduction) task force, with representatives from around the state. The program is structured to target environmental justice populations, rural farmers, MPOs, and other transportation agency partners.

INDOT will continue to investigate how to reduce carbon emissions through its Roadside Management Program, by reducing fuel intensive roadside management practices and selecting vegetation with higher carbon reduction potential wherever feasible.

INDOT will continue to consider the benefit of native vegetation, reduced mowing, tree retention, and plant selection to help absorb carbon emissions and provide oxygen-producing vegetation.

INDOT will consider potential ways to reduce electrical needs from power plants in facility design. For example, the future Batesville Welcome Center will use solar energy to supplement power to the building, and all welcome center projects utilize daylight harvesting. Additional opportunities for solar energy, along with geothermal energy under favorable conditions, will be considered when appropriate.

INDOT will continue to participate in training and research programs on topics that include carbon reduction strategies, including federal webinars on best practices and strategies for carbon reduction and other GHG, NHI trainings on equity and air quality planning, and conference programs of AASHTO and other professional organizations.

INDOT will leverage its relationship with the Purdue University Joint Transportation Research Program to evaluate potential actions to related to carbon reduction strategies. Current initiatives include:

- SPR 4812: Business Case for Sustainable Transportation in Indiana
- SPR 4706: Electric Vehicles: Public Perceptions, Expectations, and Willingness-to-Pay Across Highway User Groups (Vehicle Classes)
- SPR 4711: Addressing Accessibility, Equity, and Environmental Justice Measures of Infrastructure Facilities in Indiana
- SPR 4810: Feasibility of Utilizing Native Grasses and Other Vegetation In-Lieu of Exotic Cool Season Grasses

INDOT will build off the research described above and explore additional sustainable approaches for managing the state highway system and the public right of way.

Equity Considerations

INDOT is committed to advancing an equitable transportation system for Indiana. Carbon reduction projects and strategies must be appropriate for and take into consideration the needs of vulnerable, historically disadvantaged, or underserved communities across the state. For example, low-income communities might have less access to potentially more expensive alternative fuel vehicles and rural communities might have fewer destinations accessible through active modes such as bicycle and transit. Ensuring carbon reduction projects are sensitive to the context and needs of each community is a critical equity consideration during project selection and development.

Equity



Integrate carbon reduction into the transportation planning process

INDOT will incorporate carbon reduction policy goals and objectives, projects and strategies, and performance measures included in this strategy within the next update of the LRTP. The coordination and public engagement process for the next LRTP update will begin in 2023 and will continue through at least 2025.

Performance measures are essential to understand the magnitude of the challenge, measure progress and quantitatively evaluate success. INDOT uses performance measures and targets to quantitatively determine if policy goals and objectives are moving forward. INDOT currently estimates on-road mobile source emissions reductions through its air quality performance measure. Emission reductions (including carbon emission reductions) are calculated from air quality benefits provided through investments funded through the Congestion Mitigation and Air Quality (CMAQ) federal program.

By 2024 INDOT will incorporate a carbon reduction planning tool into the STIP development process, with the goal of increasing awareness of GHG reduction potential of projects being considered for the program.

INDOT is developing methodologies to assess carbon emissions from state transportation investments (as identified in the Statewide Transportation Improvement Plan). Once developed, the measurement framework will be integrated into future updates of the LRTP and help INDOT make informed decisions about future transportation investments. INDOT is also evaluating how to incorporate carbon reduction measures into the asset management decision-making process. This program will be located under the Deputy Commissioner of Capital Program Management which oversees the Asset Management, Local Program Grant Administration, Multimodal, Engineering, and the System Performance and Transportation Policy divisions. The carbon reduction program will be located under the System Performance and Transportation Policy division to ensure that INDOT continues to grow the plan in project selection and the long-range plan.

Conclusion

INDOT is committed to actively engaging in national efforts to achieve a net-zero transportation system for the United States by 2050. Indiana's expected growth and heavy freight activity across the state are some of the headwinds INDOT will face in achieving this objective. INDOT is embracing this challenge, focusing on leveraging technological advances and deepening partnerships with MPOs, logistics industry, transit agencies and other key stakeholders to deliver a multimodal, safe, and efficient transportation network that leads to carbon reductions across Indiana's transportation system.

Endnotes

- 1 US Department of Energy, Alternative Fuel Data Center, “Direct, Well-to-Wheel, and Cradle-to-Grave Emissions,” accessed 4/4/2023, https://afdc.energy.gov/vehicles/electric_emissions.html#wheel.
- 2 US Department of Energy, Alternative Fuel Data Center, “Direct, Well-to-Wheel, and Cradle-to-Grave Emissions,” accessed 4/4/2023, https://afdc.energy.gov/vehicles/electric_emissions.html#wheel.
- 3 Congressional Budget Office, using data from Bureau of Transportation Statistics, National Transportation Statistics 2021 (November 2021), Table 1-40, www.bts.gov/topics/national-transportation-statistics.
- 4 Bureau of Transportation Statistics, State Transportation by the Numbers, <https://www.bts.dot.gov/sites/bts.dot.gov/files/states2020/Indiana.pdf>
- 5 Environmental Protection Agency, The 2021 EPA Automotive Trends Report: Greenhouse Gas Emissions, Fuel Economy, and Technology Since 1975, EPA-420-R-21-023 (November 2021)
- 6 Indiana Department of Transportation, Indiana Multimodal Freight Plan Update 2018, p. 2, <https://www.in.gov/indot/files/Indiana%202018%20State%20Freight%20Plan.pdf>
- 7 Congressional Budget Office, using data from Bureau of Transportation Statistics, National Transportation Statistics 2021 (November 2021), Table 1-50, www.bts.gov/topics/national-transportation-statistics.
- 8 STATS Indiana, using data from https://www.stats.indiana.edu/pop_proj/index.html
- 9 Transportation Statistics Annual Report 2022, US Department of Transportation, Bureau of Transportation Statistics, <https://www.bts.gov/tsar>
- 10 Transportation Statistics Annual Report 2022, US Department of Transportation, Bureau of Transportation Statistics, <https://www.bts.gov/tsar>
- 11 U.S. Department of State and Executive Office of the President. [The Long-term Strategy of the United States, Pathways to Net-zero Greenhouse Gas Emissions by 2050](#). November 2021
- 12 Measured as carbon dioxide equivalent (CO₂e), a metric measure used to compare various emission sources on the basis of their warming potential.
- 13 <https://www.in.gov/indot/multimodal/multimodal-facts/>
- 14 <https://www.in.gov/gov/files/NextLevel-Connections-facts-sheet.pdf>
- 15 <https://www.in.gov/idoa/state-property-and-facilities/parking-services/carpooling/>
- 16 <https://www.in.gov/spd/openenrollment/commuter-benefit-reimbursement-account/>
- 17 USDOT FHWA. Assessment of the Environmental Characteristics of Roundabouts. Publication No. FHWA- SA-15-071 (2015. Updated 2020)

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Appendix A:

CRS Alignment with Federal Requirements

Requirement	Detail	Reference Section
Prepare CRS in Consultation with MPOs	MPOs were invited to three meetings and asked to share carbon reduction goals and priorities for Indiana	Carbon Reduction Strategy Development on page 2
Support efforts - and identify projects and strategies - to support the reduction of transportation emissions	This strategy details policy goals and objectives as well as projects and strategies that will support Indiana's efforts to reduce transportation emissions.	INDOT Projects, Strategies and Actions for Carbon Reduction on page 15
Be appropriate to population density and context of the State	This strategy includes detail of Indiana's unique context.	Carbon Reduction, Indiana Context on page 4
Develop CRS no later than 2 years after enactment of BIL	Strategy developed in 2022 and finalized in early 2023	Report date on cover page

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Appendix B:

Indiana’s LRTP Vision, Goals and Objectives and Carbon Reduction

Indiana’s Long Range Transportation Plan (LRTP) vision, goals and objectives support reductions of on-road carbon emissions. This Appendix details where and how. Figures B-1 through B-7 identify each of the policy objectives that support carbon emission reductions. The icon next to each objective illustrates which projects and strategy categories (see Appendix C) are aligned with each objective.

Each goal includes a discussion of how efforts made to advance it will result in carbon emissions, including recommendations provided by MPOs. The information in this Appendix will be integrated into the update process for the next LRTP, set to kick off in 2023.

VISION

INDIANA'S TRANSPORTATION SYSTEM WILL BE SAFE, EFFICIENT, INTEGRATED, AND SERVE AS THE FOUNDATION OF THE STATE'S ECONOMIC VITALITY AND QUALITY OF LIFE AND SUPPORT FOR ITS RESIDENTS AND INDUSTRIES.

Indiana’s vision of a safe, efficient, and integrated transportation system supports carbon emission reductions by creating a transportation network that can help Indiana travelers make low-carbon, fuel-efficient choices.

Figure B-1: Safe & Secure Travel

Move Indiana toward zero deaths and reduction of serious injuries by applying proven strategies and enhancing the safety and security of our transportation system for all users.



Share Information: Work closely with local, state, and federal agencies to improve information reporting on transportation and pedestrian crashes, safety risks, and safety trend analysis for the development of comprehensive strategies and solutions.



Support Safety Policies and Laws: Distracted and impaired driving, law enforcement, yield to pedestrian crossing, and share the road and bike lane awareness.



Address Complete Streets/ADA Needs: Integrate sidewalks, curb ramps, cross-walks, pedestrian signals, bike facilities, transit amenities, and traffic calming strategies in identified areas to provide safe and accessible transportation connections and minimize pedestrian and vehicular crashes, injuries, and fatalities.



Targeted Safety Investments and Strategies: Intersection improvements, railroad crossing enhancements, modernized traffic signals, signage, lighting, rumble strips, and other solutions.

A safe and secure system is critical to ensure that zero emission transportation modes, such as walking or biking, are a safe and attractive choice for travelers. Addressing complete streets by integrating pedestrian, bike and transit facilities and traffic calming strategies, improving vulnerable user safety at crossings, and ensuring all vehicles understand safety policies that protect pedestrians and bicyclists of all ages and abilities can enable more travelers to make carbon efficient choices in transportation.

Figure B-2: System Preservation

Go beyond taking care of what we have and maintain our multimodal transportation system and infrastructure in a state of good repair.



Roadway Asset Management:

- Maximize the useful life of transportation assets while considering system performance, costs and impacts to the state's economy, environment, and quality of life.
- Incorporate asset management principles in capital, maintenance and operations decisions to better align ownership and operations of state transportation assets with statewide, regional and local priorities.
- Execute the 10-year Transportation Asset Management Plan and the 20-year Next Level Roads Plan to improve pavement and bridge quality, safety, and mobility.



Smart Growth and Transportation Demand Management:

Study regional smart growth initiatives (mixed land-use development) and demand management strategies such as congestion pricing for efficient use of existing transportation facilities, park and ride facilities, parking costs, ride sharing, time of travel, and telework programs in major metropolitan areas and impacts to transportation demand and physical infrastructure needs.



Local Corridor Consideration:

Work with locals and rural portions of Indiana to develop regional mobility plans and to determine local corridor improvements in an effort to minimize system added capacity and allow for more efficient use of local and INDOT roadway facilities.

Roadway asset management systems support the reduction of on-road emissions when carbon emission criteria are incorporated as part of the decision-making process to prioritize investments. An asset management strategy also decreases emissions in construction by extending the life cycle of an asset and by minimizing work zone delays. Further, INDOT can explore using materials (e.g. concrete and asphalt) developed with higher embedded carbon, helping capture carbon through the lifetime of each asset.

The Smart Growth and Transportation Demand Management objective can help reduce vehicle miles traveled and reduce on-road carbon emissions. It can also reduce the need for major infrastructure expansion projects (which can be both costly and a major source of CO2 emissions).

MPO representatives also recommended incorporating initiatives such as work-from-home programs, transit-oriented development (TOD) initiatives, road diets, and parking reduction programs under this

objective, which are associated with lower VMT per capita. For these strategies, careful consideration of local context is needed.

The Local Corridor Consideration objective supports transportation agency coordination to “right size” transportation investments to improve access to zero emission or fuel-efficient transportation choices (walking, biking and transit) at the local level and reduce the need for major infrastructure expansion.

Figure B-3: Economic Competitiveness and Quality of Life

Enhance the competitiveness of Indiana’s economy as the “Crossroads of America” through strategic multimodal transportation investments, reducing transportation costs, and the safe and efficient movement of people and goods.



- Provide safe and efficient multimodal transportation access to diverse business, recreational, and cultural opportunities in Indiana.
- Work with locals to ensure connectivity of regions and economic centers by various modes of travel.



Logistics Industry Coordination:

Coordinate infrastructure needs with freight carriers, freight forwarders, third-party logistics providers, and other stakeholders, including the MPOs, Conexus Indiana Logistics Council, Indiana Economic Development Corporation, and the Ports of Indiana.

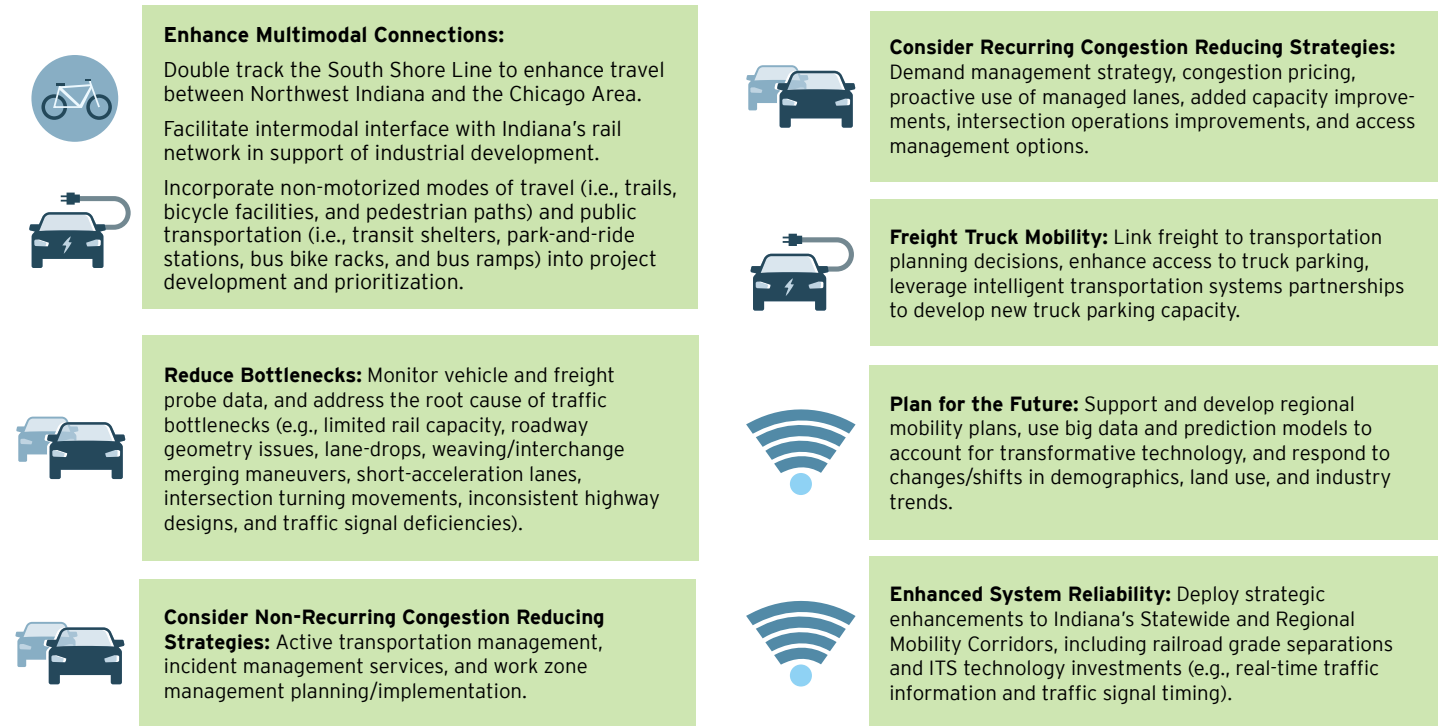
The Transportation Connectivity and Accessibility objective prioritizes a robust multimodal network that includes energy efficient and cost-effective travel options. Investing in multimodal travel options that are more carbon efficient than single occupancy vehicle (driving alone) can support reductions of overall transportation emissions while maintaining Indiana’s economic competitiveness and quality of life.

Coordination with the logistics industry is critical to reduce carbon emissions in Indiana.

On-road freight vehicles produce more carbon emissions per mile when burning carbon intensive fuels like diesel, and freight vehicle miles traveled growth is expected to outpace light duty vehicle miles traveled growth moving forward. Supporting the transportation industry as it transitions to more fuel-efficient or zero-emission vehicles is an effective pathway to reduce emissions without impacting economic competitiveness in the region. INDOT and other public partners can support the freight industry in deployment of alternative fueling facilities and other investments needed for successful transition to net-zero emission freight operations.

Figure B-4: Multimodal Mobility

Maximize the performance of our transportation system, ensuring efficient movement of people, goods, and regional connectivity by enhancing access to different modes of transportation.



Multimodal mobility that ensures safe and efficient movement of people and goods is key to achieving overall transportation system carbon reductions. Transit investments, such as intercity rail and new bus services, can support connectivity at lower emissions per mile of travel. Reducing congestion can help improve traffic flow and provide fuel savings. Focusing on improving freight movement and providing infrastructure that can help freight reduce emissions and transition to zero-emission options is of particular importance for reducing carbon emissions in Indiana. Nonetheless, capacity improvements will need to be evaluated carefully to prioritize investments that add efficient capacity for moving people and goods with less overall carbon emissions. Technology and innovation hold significant potential for improving congestion and traffic flow while reducing single occupant vehicle use and overall vehicle miles traveled per capita.

Figure B-5: Environmental Responsibility

Minimize the potential impacts of the transportation system on the natural and human environment.



Recycling and Waste Programs: Support initiatives, operations, and construction program methods aimed at increasing recycled construction materials and reducing waste, energy usage, air pollution, and impacts to waterways.



Smart Growth: Encourage local smart growth initiatives to support efficient transportation for all modes, conserve energy, reduce motor-vehicle emissions, and future infrastructure needs.



Encourage Active Transportation: Track commute mode shares and miles traveled by mode, support mixed-use development, consider complete streets designs, and look for opportunities to restripe urban roadways with bike lanes (if feasible).



Improved Quality of Life: Partner and coordinate with Indiana Health Department, Department of Natural Resources, and Department of Energy to track health related impacts of transportation decisions and provide input on mitigation strategies to support more active life styles.



Environmental Justice:

Harmonize transportation policies and investments with environmental and socioeconomic issues.

Carbon reduction is core to the goal of environmental responsibility. MPO members recommended adding a more explicit objective about carbon reduction in future LRTP updates during stakeholder meeting discussions. They also noted that strategies that support alternatives to petroleum-based fuels such as electric and other zero-emissions vehicles are also important pathways to reducing carbon emissions in Indiana and recommended they be included as an objective. Related, INDOT's ongoing efforts to improve electric vehicle charging infrastructure support cleaner energy generation for transportation and are important to support the transition to cleaner vehicles. In addition, as technology enables more remote work possibilities, commute trips are becoming a much lower percentage of overall trips. It is becoming more important to gather data and information about all trips and modes that can help transportation agencies better serve active mode users for all types of trips throughout the day.

Carbon reduction can also be achieved during construction of transportation infrastructure, which is currently embedded under the Recycling and Waste Programs objective. For example, more fuel efficient and zero emissions vehicles can help reduce on-road emission during construction. Greener materials can also support Indiana carbon emissions reductions. INDOT, in partnership with the Indiana chapters of the American Concrete Pavement Association (ACPA) and Asphalt Pavement Association has secured a federal climate challenge grant under the Technology and Innovation Deployment Program (TIDP) to implement sustainable pavement approaches that advance the knowledge and practice of designing, constructing and maintaining more sustainable pavements.

The final report for this grant will include strategies to reduce GHG emissions and achieve carbon neutrality through new material, design, and maintenance strategies for projects that can be integrated into Indiana's carbon reduction efforts. INDOT is reducing carbon emissions of its operations through its overhauled Roadside Management Program, which supports more native species and reduces the need for mowing and other carbon intensive maintenance activities. Trees

and other vegetation in the right-of-way can help capture carbon and support Indiana's path to net-zero emissions by 2050.

As mentioned for previous goals, encouraging active transportation and smart growth can also help reduce on-road carbon in Indiana.

The environmental justice and improved quality of life objectives relate to carbon reduction priorities since the resulting impacts of carbon emissions in the atmosphere impact quality of life and can place greater burdens on historically disadvantaged or vulnerable communities. Aligning transportation investments with improved health and environmental justice outcomes can lead to carbon emission reductions and help minimize adverse impacts to vulnerable communities.

Figure B-6: New Technology and Advancements

Develop and deploy advanced transportation technologies and embrace a broad-based, comprehensive research program to plan for the future.



New Online Platforms: Consider the potential effects of new technology (e.g., grocery and restaurant delivery services, drone flyovers, integrated electronic payment, dynamic ride sharing programs, and guided public transit systems) in future transportation decision-making and system demands.



Big-data: Evaluate and deploy the use of big-data throughout the INDOT process, including transportation planning, data collection, asset management, survey work, construction, system monitoring, crowd sourcing, and public outreach.



Unmanned Aerial Vehicles (UAVs): Use of drones and UAVs for efficient non-intrusive asset inspections, field checks, and emergency response support to minimize disruptions and to enhance coordination and sharing of information.



Automated Transportation: Consider and plan for potential impacts of autonomous, connected vehicles, and truck platooning technologies on safety, transportation demand, roadway design, infrastructure needs, human behavior, and policies.



Sharing of Information: Work with auto and truck manufacturers to share data (e.g., traffic signal timing and vehicle information, such as speed, hard braking, acceleration, and wiper usage) for advanced roadway maintenance and improvements.

Technology and innovation in transportation are important elements to meeting future traveler needs while reducing carbon emissions from the overall system. New online platforms, big-data and an increased focus on sharing of information among public and private sectors can support more efficient management of the transportation network and help reduce carbon emissions. Improving data quality and better understanding the relationship between VMT and land-use can improve decision making that leads to a future transportation network with lower overall emissions. Bureau

of Motor Vehicle (BMV) data can help in evaluating progress and predicting trends related to the transition to electric and other zero-emission vehicles registered in Indiana.

New technologies such as Unmanned Aerial Vehicles and Automated Transportation offer new ways to solve transportation challenges and reduce carbon emissions. Over the next 30 years, innovation will be key to achieving all Indiana transportation objectives while simultaneously offering solutions to reduce on-road transportation emissions. For example, INDOT in cooperation with the Ohio DOT is conducting a pilot of autonomous vehicle technologies along I-70 from Indianapolis to Columbus, OH.

Figure B-7: Strategic Policy Actions

Address multiple goal areas through key policy initiatives.



Performance Management: Use of performance measures and targets to inform decision-making and show progress toward meeting national, statewide, regional and local goals (e.g. VMT per capita, on-road emissions).



Open Decision Making: Make transportation system decisions through processes that are inclusive, engaging, and supported by data analysis and meaningful public input.



Integrating Operations: Develop a regional operations plan and corridor operations plan to better focus cost-effective and efficient transportation systems management and operations solutions at the regional and corridor level.



Public-Private Partnerships: Examine the potential for a public-private partnership to design and construct key multimodal projects and system maintenance.

The objectives included in this goal support carbon emission reductions through better measurement of emissions, improved decision making that prioritize carbon reductions, more efficient operations of the system, and leveraging private investment for delivering a network that supports reductions in carbon emissions.

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Appendix C:

Stakeholder Meeting Summaries

**Indiana Department of Transportation
Carbon Reduction Program
Stakeholder Meeting #1 Summary**



Date & Time: Thursday, 9/22/2022, 9:30 a.m. ET

Attendees:

Ohio-Kentucky-Indiana Regional Council of Governments (OKI)

- Andy Reser

Evansville Metropolitan Planning Organization (EMPO)

- Brooke Vorbeck
- Pam Drach

Northeastern Indiana Regional Coordinating Council (NIRCC)

- Jeff Bradtmiller

Bloomington/Monroe Co MPO (BMCMPPO)

- Pat Martin

Michiana Area Council of Governments (MACOG)

- Leah Thill
- Allyson Ragan

Northwestern Indiana Regional Planning Commission (NIRPC)

- Scott Weber
- Charles Bradsky
- Kathy Luther

Indy MPO (IMPO)

- Andrew Swenson
- Cole Jackson
- Annie Dixon

Federal Highway Administration (FHWA)

- Michelle Allen
- Steven Minor

Indiana Department of Transportation (INDOT)

- Alison Shaner
- Frank Baukert
- Paul Boone
- Jay Mitchell
- Roy Nunally
- Jason Casteel
- Laura Hilden
- Korey Chu

HNTB (Consultant Team)

- Loreana Marciante
- Mallory Duncan
- Jack Sinton

Key Questions and Discussion Topics

- Loreana Marciante from INDOT's consultant team (HNTB) presented an overview of the Federal Carbon Reduction Program and INDOT's plans to develop a Carbon Strategy in consultation with Metropolitan Planning Organizations.
- INDOT is requesting project information from current capital programs to identify eligible projects. Projects are not being selected or prioritized for the CRP as part of this effort, projects will only be evaluated for alignment with CRP eligibility criteria and goals and will help inform the development of Indiana's Carbon Reduction Strategy.



- Project information should be submitted in digital format (any GIS format is preferred but excel will work as well). Project information should be submitted as soon as possible but no later than October 14th, 2022.
- At a minimum, we are looking for a description of the project and its location. Additional information such as cost and expected benefits are also welcome. MPOs can also pre-screen projects, if feasible. If not, the INDOT team will screen the list for eligibility.
- **Kathy Luther** shared NIRPC has a NOFO going out next month soliciting for new CRP projects. Response: Any information that can be provided before this effort ends (November 2022) will be incorporated into the Carbon Reduction Strategy.
- Two more additional meetings will take place with stakeholders (October and November). Carbon Reduction Strategy framework will be discussed at the next meeting and the Draft Carbon Reduction Strategy will be shared for stakeholder feedback during the third and final meeting.



Indiana Department of Transportation Carbon Reduction Program Stakeholder Meeting #2 Summary

Date & Time: Monday, 10/17/2022, 1:00 p.m. ET

Attendees:

Kentuckiana Regional Planning
& Development Agency (KIPDA)

- Jeremeih Shaw

Madison County Council of
Governments (MCCOG)

- Varu Musunuri

Federal Highway Administration
(FHWA)

- Steven Minor

Columbus Indiana Bartholomew
County Planning

- Laura Thayer

Northwestern Indiana Regional
Planning Commission (NIRPC)

- Scott Weber

Indiana Department of
Transportation (INDOT)

- Alison Shaner
- Frank Baukert
- Paul Boone
- Brandon Burgoa
- Roy Nunally
- Jason Casteel
- Laura Hilden
- Catherine Seeley

Evansville Metropolitan
Planning Organization (EMPO)

- Brooke Vorbeck
- Pam Drach

Indy MPO (IMPO)

- Annie Dixon
- Andrew Swenson

Northeastern Indiana Regional
Coordinating Council (NIRCC)

- Jeff Bradtmiller

Terre Haute Metropolitan
Planning Organization

- Ryan Wickens

Michiana Area Council of
Governments (MACOG)

- Leah Thill

Tippecanoe County
Metropolitan Planning
Organization

- Timothy Stoshine
- Doug Poad

HNTB (Consultant Team)

- Loreana Marciante
- Andrew Conley
- Mallory Duncan
- Lacey Duncan
- Jack Sinton



Key Questions and Discussion Topics

- Andrew Conley from INDOT's consultant team (HNTB) presented an overview of carbon dioxide emissions from transportation sources across the nation and at the state level. This includes an overview of federal targets for emissions reductions and projected carbon emissions trends.
- Loreana Marciante from INDOT's consultant team (HNTB) presented on the development of a Carbon Reduction Strategy and project categories that may qualify for Carbon Reduction Program funding. This also includes a description of how these project categories align with INDOT's Long Range Transportation Plan (LRTP) goals and objectives
- Breakout group sessions discussed two questions:
 1. Are there other elements not already included in the LRTP goals and objectives that your organization believes should be considered when thinking about carbon reduction goals for Indiana?
 2. What types of projects and strategies (from the five categories or others) does your organization consider important to support carbon reduction goals in Indiana?
- 1. Discussions on question 1 included the following topics for consideration in developing goals and objectives of the carbon reduction strategy:
 - o Green Building Materials can be emphasized as an element of transportation construction projects.
 - o Alternatives to petroleum-based fuels are important. Promoting EVs is an important way to reduce carbon emissions from transportation. Additional considerations for EV infrastructure include:
 - Equitable distribution of charging infrastructure.
 - The grid's ability to support the needed growth in electric vehicle adoption and the need for a "cleaner" grid to increase the reductions of carbon emissions in the power sector from transportation electrification.
 - The average age of a vehicle in Indiana is about 12 years old. Transitioning to electric vehicles will take time in Indiana.
 - o Smart growth, TDM, road diets, transit oriented development, and parking reduction were discussed as important components to support carbon emission reductions. But there is not a one-size-fits-all approach and strategies should align with local context and priorities. Policy and program based solutions, such as work-from-home strategies and incentives can also support reduction in carbon emissions.
 - o Improving data quality and transportation modeling approaches is important to better understand the interaction between VMT and land-use. This information can lead to better planning and decision making related to transportation investments that reduce VMT such as designing better connections from employment/ jobs and home. Accessing BMV data to better evaluate progress on electric vehicle adoption and VMT traveled by vehicle class can also help develop better strategies.



2. Discussions on question 2, included the recommendation of the following projects and strategies as important in achieving carbon reduction in Indiana:
 - EV charging
 - Active transportation modes – including multimodal, first-mile/last-mile transportation, and micromobility.
 - Employer shuttle programs.
 - Roundabouts and other intersection improvement projects that could decrease congestion without adding new capacity.
 - The category of “alternative modes” should be changed to “active modes” to align with how MPOs currently communicate these types of projects.
- Following the breakout session, groups reported back to the entire meeting.
- INDOT continues to request project information from current capital programs to identify eligible projects. Projects are not being selected or prioritized for the CRP as part of this effort, projects will only be evaluated for alignment with CRP eligibility criteria and will help inform the development of Indiana’s Carbon Reduction Strategy.
 - Project information should be submitted in digital format (any GIS format is preferred but excel will work as well). Project information should be submitted as soon as possible if it has not been already.
 - At a minimum, we are looking for a description of the project and its location. Additional information such as cost and expected benefits are also welcome. MPOs can also pre-screen projects, if feasible. If not, the INDOT team will screen the list for eligibility.
- One additional meeting will take place with stakeholders (November). The Draft Carbon Reduction Strategy will be shared for stakeholder feedback during this third and final meeting.



Indiana Department of Transportation Carbon Reduction Program Stakeholder Meeting #3 Summary

Date & Time: Thursday, 11/17/2022, 11:00 am ET

Attendees:

Evansville Metropolitan
Planning Organization (EMPO)

- Brooke Vorbeck

Indy MPO (IMPO)

- Annie Dixon
- Andrew Swenson
- Cole Jackson

Kentuckiana Regional Planning
& Development Agency (KIPDA)

- Jeremeih Shaw

Madison County Council of
Governments (MCCOG)

- Varu Musunuri

Michiana Area Council of
Governments (MACOG)

- Leah Thill

Northwestern Indiana Regional
Planning Commission (NIRPC)

- Scott Weber
- Kathy Luther

Northeastern Indiana Regional
Coordinating Council (NIRCC)

- Jeff Bradtmiller

Ohio-Kentucky-Indiana Regional
Council of Governments (OKI)

- Andy Reser

Terre Haute Metropolitan
Planning Organization

- Ryan Wickens

Tippecanoe County
Metropolitan Planning
Organization

- Michael Thompson

Indiana Department of
Transportation (INDOT)

- Alison Shaner
- Frank Baukert
- Brandon Burgoa
- Roy Nunally
- Jason Casteel
- Laura Hilden
- Catherine Seeley
- Louis Feagans
- Jay Mitchell

HNTB (Consultant Team)

- Loreana Marciante
- Jack Sinton



Key Questions and Discussion Topics

- Loreana Marciante from INDOT's consultant team (HNTB) presented an overview of the content in INDOT's draft Carbon Reduction Strategy.
- Loreana Marciante highlighted changes that have been made to projects and strategies as a result of MPO input. These projects and strategies are meant to be a high-level discussion as to what *could be done* to support carbon emission reductions. The Strategy Implementation section details specific activities INDOT is or plans to engage in.
- A suggestion was made about including tree-planting along the right-of-way. The team will add to the draft strategy. INDOT welcomes additional suggestions from MPOs on potential or specific projects and strategies that could be included in the Draft CRS report.
- A question asked about the timeline for strategy implementation. No timeline is specifically outlined as of now, but the first action is to develop a performance measure and targets for carbon reduction in accordance with federal policy and guidelines. These targets will inform the development of a more specific timeline in the future.
- Jack Sinton from INDOT's consultant team (HNTB) discussed the project assessment portion of the analysis. Updates were given as to the number of projects from INDOT as well as the MPOs that were deemed either eligible or conditionally eligible for CRP funding. Conditionally eligible projects are those that may be eligible, but project description is does not currently provide enough detail to determine whether all applicable eligibility criteria are fully met. Some of the conditionally eligible projects might require the calculation of carbon reduction to become eligible.
- Each eligible or conditional project was also assessed qualitatively for its carbon reduction potential. The assessed CO2 reduction potential is based on state and federal studies on the emissions reduction impacts of different types of projects. The qualitative score (low to high on a five point scale) is assigned on the basis of the type of project, the project's geographic scale, and the type of road (Interstate, State, or Local) the project is performed along. Projects that receive an "N/A" score did not have enough detail in the description to associate the type of project with a carbon reduction level.
- The carbon reduction potential estimate is different from the carbon reduction calculation required by FHWA to approve funding for projects that would eligible only if the project can demonstrate a reduction in on-road vehicle emissions. The FHWA has not yet released guidance on how to demonstrate these emission reductions.
- The Excel-based tool that HNTB has developed to determine the high-level eligibility and CO2 reduction potential of projects was discussed. HNTB will send the tool and analyzed projects back to MPOs that had submitted projects to be considered. The tool is interactive, and inputs can be adjusted to include a higher level of detail to obtain better estimates as to project eligibility and CO2 reduction. A user guide and methodology will be included with the tool.
- INDOT will be releasing the Draft Carbon Reduction Strategy to the public in December 2022 for a 30-day comment period. MPOs will receive an advance copy via email. INDOT requests that MPOs share the announcement of public release of the draft with their members and stakeholders.

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Appendix D:

Public Engagement Summary

INDOT received 48 public comment entries between December 15, 2022 and January 30, 2023. Some respondents submitted more than one entry, therefore thirty-nine of the comments were from distinct individuals or organizations, while one comment was submitted anonymously.

Most of the comments were supportive of taking action on carbon reduction, but at least three comments oppose INDOT taking action on this topic in general. Many respondents shared broad support on the types of strategies included in the plan. There was also significant support for active transportation, including bicycle and pedestrian facilities, public transit, micro-mobility in urban settings, and a very specific recommendation to add an E-Bike Ring facility surrounding a city. As a result of some of these comments light rail/commuter trains and inter-city transit are included more explicitly as types of projects and strategies in this final draft (see Appendix E). A few respondents voiced support for land use decisions that would support active transportation. In contrast, one respondent expressed opposition to density, mixed-use planning, transit-oriented investments or road diets.

Respondents also support vehicle electrification or fuel efficiency strategies (tax credits for fuel efficient vehicles and for repair training and equipment, EV incentives, electrification of INDOT's fleet, etc.), and alternative fuel sources. One respondent opposes hydrogen and another opposes natural gas as transportation fuels. Respondents also support clean energy investments for the state, and at state facilities (e.g. solar on INDOT's rooftops or along highways). Recommendations in this area sometimes refer to state legislative action (tax incentives) or actions within the purview of other public or private entities (e.g. large scale wind or solar investments). Some respondents suggested the addition of "green programs" to increase plantings in the right of way, which is now included as part of Appendix E. Other respondents support technology solutions.

Over a quarter of the respondents oppose adding new capacity to the transportation system (e.g. oppose new terrain highways such as the Mid-States Corridor, oppose new travel lanes, support road diets, etc.). Some respondents also expressed opposition to congestion pricing. A few respondents noted a few minor corrections, which have been addressed in this final plan. Due to requests for further clarification and context, the section Carbon Reduction, Indiana Context is now expanded.

A detailed list of all comments is included in the following pages.

No.	Comment
1.	I am disappointed to see that light rail/commuter trains are not specifically mentioned in this Strategy. Certainly cities the size of Indianapolis, Evansville, Fort Wayne, and South Bend could benefit from light rail commuter lines from the suburbs to downtown areas. It is easy to imagine commuter rail running from Lebanon and Noblesville for example to downtown Indianapolis and the closer suburban areas. Please incorporate light rail commuter transportation in this Strategy.
2.	We have enough energy under our feet to last for hundreds of years and the cleanest vehicles in the world. There is no reason to limit, ration or change our way of living to accommodate environmental elites who's only desire is to control the lives of every person in the state. This is just the beginning of controls which will lead to economic and social collapse in Indiana. If Indiana does not stand against this foolishness we will be subjugated and oppressed by it. These rules are for me not the government who will live as they please unaffected by these rules. When I see every Federal and State vehicle electrically powered then I will consider your suggestions.
3.	I'm an engineer, working in the Semiconductor and Auto Industry for 37 years. Much of the reduction in Tailpipe emissions and gas consumption is focused on EVs and Charging Infrastructure. However, newer gasoline technology already deployed, such low displacement, direct-injection, turbocharged vehicles are being ignored. For example, there are many cars now that will average 50mpg on the highway, such as my 1.4L VW Jetta. The \$35M in discretionary monies, should be allocated towards State Tax Credits for purchasing Vehicles with over 40mpg Highway ratings. Indiana, being a State where consumers travel long distances often, would see an immediate benefit. While the EV Charger infrastructure is important, this only helps consumers that can afford \$70k cars. A VW Jetta sells for \$22,000. Questions were brought up with the EV Charging Plan submitted to USDOT in September about the income challenged and minority benefits. A tax credit for purchasing a very high mileage vehicle, would benefit those in the lower income brackets, and the Urban poor.
4.	<p>With Electrical Utilities responsible for the lions share of Carbon Emissions, Indiana should allocate monies for Urban Areas for reduction in Usage.</p> <p>On the Generation Side, rural populations often oppose Wind and Solar farms. This must be changed or overruled. Monies should be assigned to Matching Funds Grants to REMCs to add Solar and Wind generation. REMCs should be incentivized to generate Eco friendly energy to push back into the grid for Urban populations.</p>
5.	There should be no new terrain highway's. No mid states corridor
6.	Part of the strategy needs to be not building any new terrain highways in the state including the Mid-States Corridor. Thank you.
7.	No new roads should be built. We need to keep up existing roads and if need make updates to accomplish this goal.
8.	<p>The biggest opportunity not discussed in this document is what I call "The E-Bike Ring." Use a compass to draw a circle with a 10-15 mile radius around your city and that's your E-Bike Ring. The E-Bike Ring is a perfectly comfortable distance for someone with an e-bike to travel if the path is safe. If you can get private vehicle users to switch even a small percentage of their weekly trips to an e-bike, you're going to remove a lot of vehicle miles from your infrastructure. Take Indianapolis - the biggest problem with our e-bike ring is that only the North point of the compass is remotely safe for bike-based travel thanks to the Monon trail. Every other direction is a disaster. The focus should be inducing bike travel by building safe commuting routes quickly and this should be done during repaving projects by removing free parking lanes (why does the state maintain infrastructure for temporary storage of private property? it's insane!), reducing vehicle travel lane widths from 12ft to 10ft, and by replacing existing paint only bike lanes on both sides of the road with a single wider bike lane that is protected by (at minimum) flex posts.</p> <p>If making these inexpensive and minor updates does NOT induce demand, you can easily go back to what you've always done and pave over the entire city eventually.</p>

No.	Comment
9.	<p>Table 3, Congestion Pricing: this strategy serves to double-penalize commuters and individuals who MUST make trips during peak hours. Sitting in traffic is already a nuisance for most drivers and those who can avoid it already do—making them pay in addition is simply adding insult to injury for those who must travel roadways during peak times. It's also likely to simply divert traffic from freeways onto local roadways to avoid additional costs.</p> <p>Table 5, Other: all of the strategies are about simply reducing carbon emission output. What about “green” programs, such as ensuring tree and wildlife buffers along roadways and included in the design of all new projects? Typically these are very straightforward to include along bicycle and pedestrian paths running parallel to roads anyways. Put simply: can we please plant some trees??</p> <p>Figure 10: regarding the South Shore Line. There is essentially no service for most of southern Lake County (MPO 12) to reach the South Shore Line. If you want to take the train to Chicago, you either have to get to Gary and leave your vehicle (or get to a bus stop and leave your personal vehicle) in what is unequivocally an unsafe area. Safety and security around public transit hubs is critical to encouraging more people to take public transit.</p>
10.	Not building new roads would be a good start, as well as improving the ones we have.
11.	While this plan outlines the mission of the CRS well, it falls behind in some areas. It lacks detail and nuance on how Public Transportation can help reduce carbon emissions. It gives the same weight to both automobile reductions and public transit as a way to reduce emissions. An example of this is in this sentence "...and choosing to ride a bus or in a carpool with other riders can result in less total emissions than if everyone made the same trip in their own vehicle." where the implication is that transit and carpooling are both equal strategies to reducing emissions, when this is not true. This draft also explains how both tailpipe and life cycle emissions are aspects of transportation pollution, but it does not explain how much each pollution source contributes to vehicles. Although electric vehicles do not use fossil fuels directly, both gas-powered cars and EVs have life cycle pollution. It is important to understand how much both types of vehicles pollute before investing into them. This is not explained well in the plan.
12.	STOP building new roads to reduce carbon output. STOP the mid-state corridor. Save our farmland instead of building a road we don't need. Look at how much a new road will destroy land that we can't replace. Fix the roads we have and stop building more.
13.	As part of the Carbon Reduction Plan, you should stop building new highways and focus more on public transportation. You might begin by taking the proposed Mid-State Corridor plan off the table and focus more on public transportation such as rail.
14.	Why are you following the lead of elitists (and hypocrites, when you count Leonardo DiCaprio and John Kerry who fly their own planes!) who push the flawed theory of global warming existing and that it's bad? Stop drinking the Kool-Aid!
15.	i know Indiana is under a federal request for this action. i am opposed to any action on this matter. i believe the governments thoughts on climate are based on fraudulent data, at least no cost to Indiana residents should be incurred in this matter.
16.	Will there be an action item list that is developed based on this plan? Who is charge of overseeing the implementation of this CRS? How will it monitored for success or failure? How will the modes of active transportation be tracked? How will the performance-based practical design approach be incorporated into bicycle and pedestrian elements? Does INDOT have a list of roundabouts on the State Roadway Network?
17.	B1 - Annie Dixon is listed as being in FHWA; she is actually serving as staff for the Indianapolis MPO. Correct on other meeting minutes.
18.	There were a few good spots in here, but I am very concerned you are trying to avoid the best ways to reduce emissions. You specifically at one point say you want to add lanes to two of the interstates. This is after an earlier statement where you acknowledge induced demand is a problem on our roads. There are corridors that trains would be able to help with traffic and emissions all while being faster than a car. You guys ignore that option and talk a lot about technology helping. We already have most of our solutions which are public transportation and dense urban living and you seem to gloss over that. Stop putting all your effort into highways and actually be a department of transportation.

No.	Comment
19.	<p>This strategy is based on Indianapolis and other large cities. Hoosier rural areas are still relied upon to generate dirty energy from coal and natural gas, so that you folks in Indianapolis can drive electric cars. Until that strategy changes, you can count on people like me to fight you to keep our rural areas as clean from pollution as you are.</p>
20.	<p>The report mentions that electric generation mix with coal is inflating the electric power sector's portion of the carbon emissions. As more facilities transition to gas/solar/wind, how does this change the % split?</p> <p>Where and how much growth in pop/employment occurred from 2005-2015? What about VMT growth? How might this inform GHG work?</p> <p>What is the fleet split in Indiana and how does that present opportunities/challenges for this work?</p> <p>What about work from home?</p> <p>What are the potential consequences of shifting to EV/FC vehicles, especially for our current fleet mix and freight VMT? How could this affect our transportation asset management plans?</p> <p>What existing projects/programs from across the state/region have been successful in the five carbon reduction strategies? And what have been successful from a DOT level?</p> <p>On page 19, you mention that you performed a qualitative scale of carbon reduction potential. Will this be included in the STIP/LRTP? I recommend that you include a summary of that analysis of the current LRTP/STIP in this document. I also recommend you break out the number of projects by category. Another chart should show the breakdown from 1-5 on the low to high scale for number of projects and amount of total funding for the projects.</p> <p>What is the timeframe for developing the GHG targets? What happens if you don't meet these goals?</p> <p>Land use is critical to reducing the demand for automobile trips. How will INDOT insert itself into these conversations at the local level about land use? Is there another state agency that should be a partner with INDOT to address land use?</p> <p>Will the statewide TDM be updated to capture the GHG generated/reduced by INDOT projects?</p> <p>How often will this strategy be updated?</p>
21.	<p>The mentions of 'alternative' fuels concern me. As a small segment to explore and research sure, but they should not be a large focus. Hydrogen has not panned out and really inherent to itself never will. The largest portion of commercial Hydrogen on the market is produced as a byproduct of fossil fuel extraction. Because of the energy intensive production, storage, and conversion hydrogen is about as inefficient as ICE vehicles. At least it burns clean...</p> <p>I was surprised there was no mention of using the right of ways for roadways as opportunities to expand solar and transmission. I would like to see that done.</p> <p>I would like to see an explicit goal for Indiana state municipal vehicles to be completely carbon free as the post office just announced. There should be a commitment to not purchase any more ICE vehicles by the state from now on. Or at least from some close date and onwards.</p> <p>Needs to be explicitly stated that a transition to EV's must be accompanied with modernization of the grid and moving away from fossil fields. No new fossil fuel infrastructure should be built in this state, especially concerning electric utilities.</p> <p>I would like to see how the state will encourage and incentivize the installation of solar over buildings, roadways, parking, and garages.</p> <p>Was a carbon tax / rebate on ICE vehicle registrations explored at all? Seems like the state can take advantage of BMV registration fees in order to incentivize the transition as well as incentivize manufacturers to produce lighter vehicles (better for our roads and less energy intensive).</p>

No.	Comment
22.	<p>If INDOT is sincere in Carbon Reduction Strategy, do you really believe that building any new terrain highway in the state (including the Mid-States Corridor) supports this strategy? Please stop letting the rich influence INDOT and do the right thing!</p> <p>If anything, use our state's funding wisely and repair the roads we already have. That alone will save driving time and reduce our carbon footprint!</p>
23.	<p>To truly achieve the goals put forth to reduce carbon, a shift in thinking regarding active transportation needs to take place. All carbon-neutral transportation is not the same. Electric cars still have a much greater toll on quality of life and the environment than active transportation and transit. Creating protected bike networks in urban areas, providing electric cargo bikes for urban delivery and e-bike incentives to encourage people to purchase electric bicycles would do more to reduce carbon in Indiana than any of the other strategies with the exception of increasing access to public transit.</p> <p>Articles: https://www.peopleforbikes.org/news/electric-cargo-bikes-deliver-big?eid=126641 https://bikebiz.com/e-bikes-can-cause-significant-modal-shift-according-to-review-of-more-than-100-studies/ https://usa.streetsblog.org/2022/08/29/vermont-is-the-first-state-in-the-u-s-to-offer-an-e-bike-rebate-is-yours-next/ https://electrek.co/2022/11/29/another-us-state-adds-electric-bike-subsidy-this-time-with-up-to-1700-rebate/ https://www.washingtonpost.com/transportation/2022/12/19/denver-ebike-program/</p> <p>Please make active transportation and public transit significant priority over expanding highways. Not only is it less expensive (by a significant amount), it has much more impact per \$ spent not only in terms of carbon reduction but in health and quality of life and efficient use of resources.</p>
24.	<p>While your goals are lofty, the state should *not* be taking an active role in attempting to make driving a frustrating experience, as this document states. This appears to be following the urban planning fads of trying to force density and use policy to nudge us to abandon driving for transit. I'm especially concerned about policies that would eliminate/increase fees for parking "when transit is available" and the multiple areas in the document where it states INDOT is going to attempt to actively reduce VMT (which can usually only be done by trying to make driving difficult through reducing throughput of transportation corridors, reducing the number of driving lanes, "traffic calming" by reducing speed limits, et al) and has a stated policy of not increasing highway capacity. In our growing areas, especially the growing suburban areas near Indianapolis, increased road/highway capacity is a must, especially to relieve bottlenecks such as the long-neglected stretch of I-465 south of I-70 and at Allisonville Road, where it chokes from five lanes to three. INDOT is considering a "road diet" of U.S. 40 near where I live in New Palestine to cut it from two travel lanes to one *precisely at the time* when the population of the area is about to explode and traffic counts are reaching the critical level where two travel lanes in each direction will be needed.</p> <p>Density and mixed-use planning are useful in urban areas, but they essentially serve a small number of people who want a transit-oriented lifestyle. That is not the majority. Most Hoosiers prioritize good schools, space and four walls of their own - *especially* when they have children in the home - and need to get around via car. Transit is not really useful in the low-density suburbs where the majority of people in Central Indiana live, and trying to force density and transit on those who have specifically chosen a low-density lifestyle is not going to work. Not to mention, a large chunk of the state's population does not live in urban areas, and relies on automobile travel to get from farm to town or from their small town to the local county seat where the grocery store, et al, are. "Complete streets," density and transit-oriented development aren't really going to do much for them. And in our growing suburban areas, increased road capacity is going to be needed to accommodate the residents and businesses.</p> <p>Allow markets to work and allow the transition to EVs *when the technology is ready,* but understand that planning decisions need to reflect how we live and move, not attempt to direct those decisions. Planning may be top-down, but decisions are made bottom-up, by individual families and people weighing the costs and benefits of each action. You can attempt zone for TOD, density and "smart growth" all you wish, but the actual decision-makers are the people buying the houses and cars. This document is really concerning because it tries to fit that decision-making into a box made by urban planners, not the actual citizens of the state who you are serving.</p>

No.	Comment
25.	<p>First, I would like to applaud the efforts by INDOT with your Carbon Reduction Strategy draft. There are several positive steps identified that I hope will get implemented. There are also some areas I have concerns about and other items that were not addressed and should be considered.</p> <ol style="list-style-type: none"> 1. INDOT needs to challenge and not accept old textbook methods of analysis and adapt to the changes over the years with types of vehicles and vehicle sizes in order to better address road and traffic engineering especially now with regards to how it affects the carbon footprint. Today's engineers need to find ways to improve existing infrastructure to assist in climate mitigation. I would recommend reaching out to organizations like the Congress for New Urbanism and Strong Towns who are working on these same goals. 2. What is missing in this document is the need to focus on improving existing roadways before any new roads or highways are built that will end up encouraging more traffic and emissions. Building new highways will be far more destructive to our environment and climate. Several projects in the plan will NOT support efforts to reduce transportation emissions. 3. While Reducing Total Fuel Consumption is a needed step, relying on increased use of biking and walking will actually result in insignificant gains. I am all for more bike and walking opportunities but unfortunately in a car centric world it will be hard to break old habits. I favor more effort be concentrated on bus and carpool promotion. 4. Page 9, Table 1: While alternative fuels are a worthwhile initiative, I question natural gas being included since it still requires fossil fuels which we need to dramatically reduce our dependence on. 5. Page 10, Table 3: Transportation Demand Management is all positive and should be a key part of the strategy. 6. Page 10, Table 4: Technology Solutions - all of this is great. INDOT should tackle the low hanging fruit that can have an immediate impact such as adaptive signals. INDOT should also study where traffic signals can be removed to help the flow of traffic. 7. Page 11, Table 5: Roundabouts need to be properly constructed to allow for the size of vehicles and truck traffic. Most I have seen use old dimensions to construct and result in more accidents. 8. Page 12: Alignment with LRTP Goals & Objectives - While I agree with this there are statements in the LRTP that are far loftier and more unrealistic like move to zero deaths. Great goal but with all the distracted and impaired driving today that won't happen. I am all for safety enhancements. Work Zone Safety Enhancements are definitely needed. I have experienced first-hand when I live in Ohio injury and road crew worker deaths due to drivers speeding and not adhering to warnings. 9. Page 13, Figure 8: System Preservation - Roadway Asset Management. This is key! Maximize the useful life of transportation assets while considering system performance, costs and impacts to the state economy, environment and quality of life. Every proposed project needs to be evaluated and analyzed with this criteria, especially new terrain projects like the Mid-States Corridor. 10. Anything that can be done to help reduce vehicle miles traveled and reduce on-road carbon emissions is needed, but again INDOT needs to be smart about it when even thinking about adding more lanes or building new highways. 11. Page 14: Coordination with the logistics industry is critical to reduce carbon emissions. This strategy identifies several opportunities without building new roads. The logistics industry needs to step up and deploy practices that will dramatically reduce carbon emissions. 12. Page 15: There is a key statement that in my perspective gets overlooked - "address the root cause of traffic bottlenecks" such as inconsistent highway designs and traffic signal deficiencies. 13. There it is - Minimize the potential impacts of the transportation system on the natural and human environment. <p>I will stop now.</p>

No.	Comment
26.	<p>I did not realize I could submit more than one response, so here is my continuation -</p> <p>1. Page 16, Figure 11: Environmental Responsibility - It states in the paragraph titled Practical Design Approach - use collaborative decision-making. Important statement here is defining who the collaborative stakeholders are. It needs to include the broader public that would potentially be affected. Every aspect in this section is critical to follow and not be overly influenced by big business and deep pockets.</p> <p>2. Page 18, Figure 13: Strategic Policy Actions - There are two specific statements I would like to address.</p> <p>Open Decision Making - Make transportation system decisions through processes that are inclusive, engaging, and supported by data analysis and meaningful public input. First, INDOT is not the expert on climate changes, mitigation, carbon sequestration and needs to seek inputs from climate scientists, environmental scientists and engineers. Meaningful public input needs to seriously include plenty of opportunity for public input prior to any major study.</p> <p>Public-Private Partnerships: Today this is NOT being managed as it should. Public input again needs to be done at various stages of any project, prior to starting a proposed study. If a study is warranted, then during various phases there should be opportunity for public input. An example I reference over and over again is the Regional Development Authority formation and that it is NOT a true public-private partnership. A prime example is the Mid-States Corridor where a small group of private businesses that want the highway for their business develop a story on why it is needed and how it will benefit the region, with no supporting facts, and "sold" the local government entities to help fund the study with no opportunity for the public to weigh in.</p> <p>3. Page 19: Strategy Implementation - I have worked on business strategies and market strategies over my professional career. What is missing in this draft is setting timelines. Example 1 - Develop carbon reduction performance measures and targets is an excellent strategy but unless dates are set, there is no accountability to get it done. Example 2 - Identify early opportunities for carbon reduction again needs to state the identified list with timelines.</p> <p>In summary, there is a lot of positive opportunities identified in this draft strategy. Before finalizing, it needs to include more specific steps, prioritize actions and set timelines if INDOT and the entire transportation sector is going to meet the needed and essential carbon reduction goals. You definitely have some strong headwinds with the expected growth in freight activity across the state. Please, don't let that stop progress.</p> <p>Thank you for taking my comments and please add these to the other comments I sent previously.</p> <p>Mark Nowotarski Jasper, IN</p>
27.	<p>Building more new terrain roads is not the answer . More "Electric Vehicles, Alternative Fuels and Energy Efficiency",and more "Technology Solutions" . It is the 21st century ! Most existing traffic control systems cause more problems than they fix !</p>

No.	Comment
28.	<p>Dear Sirs;</p> <p>The draft INDOT Carbon Reduction Strategy (CRS) is disappointing. The Strategies high-lighted by INDOT are to talk about making reductions without offering any real programs actually reducing carbon emissions. It offers past programs and ideas which have had little impact on highway usage. What is especially disappointing is the failure of INDOT to offer strategies and programs for INDOT reducing its carbon usage. INDOT is one of Indiana’s largest operators of motor vehicles burning large amounts of carbon fuels. It should set the example by leading efforts at reducing carbon usage by actually reducing its carbon usage.</p> <p>The need for Carbon Reduction is not just an environmental/climate change issue. It is a national defense issue. In recent years, the USA has fought two wars with Iraq over access to Kuwaiti and Iraqi oil. It is fighting an ongoing War on Terrorism against opponents who are partially funded by the profits from selling oil on the international market. The current Russia-Ukrainian War has disrupted the international oil market contributing to this year’s high inflation. The Russian war efforts are funded by the profits of selling their oil to other nations. Reducing our use of fossil fuels would reduce the profits which are funding the current wars and future wars.</p> <p>INDOT should commit to Carbon Reduction Strategies with measurable goals of achieving real carbon reductions. These would include:</p> <ol style="list-style-type: none"> 1. Commit to achieving the national goal of having 50% of the INDOT vehicle fleet battery electric by 2030. There are increasing numbers of battery electric cars, light-duty trucks like pick-ups, medium-duty trucks, and heavy-duty trucks available today or coming on the market soon. Report every year on your progress by the different categories of vehicles. <ol style="list-style-type: none"> a) INDOT needs to examine its current normal vehicle usage for what is actually needed in range and capacity during normal Summer construction season usage. How do the needs change during the Winter snow plowing season? Can the special needs of snow plowing be accommodated by revising plowing plans to provide more frequent refueling/recharging? It is reported by battery electric car owners, making long-distance trips, that the more frequent recharging stops leave them less fatigued at the end of the day. How many snow plow driver traffic accidents occur where driver fatigue is a factor? b) The Carbon Reduction Strategy should include a chart of the prices INDOT has paid for gallons of gasoline and diesel fuel versus what it has paid for kilowatts of electricity. BEVs are more efficient energy users. They do not lose 60% of the energy released by exploding gasoline or diesel fuel out the exhaust pipe and through the radiator. BEVs do not idle when stopped in traffic. The heating and air conditioning systems are independent of the motor. A driver leaving them on, while he runs into a store for a drink, snack, or restroom break, does not deplete the battery. c) Review and adjust bid documents to account for any higher purchase costs of BEVs are often offset by their lower operating and maintenance costs. Many of the BEVs are new designs or adaptations of existing designs. Include in requests for bids language requiring bidders to demonstrate that the bid BEV can accommodate the extra equipment INDOT normally installs on similar purchased vehicles, like snow plows, additional lights, and radios. 2. Commit to equipping all INDOT district and sub-district facilities with adequate numbers of Level 2 and DCFC chargers, and trained mechanics with the necessary tools for supporting a 50% BEV fleet by 2030. Give priority to the facilities serving the largest metropolitan areas with their air pollution problems and restrictions. Air pollution problems that INDOT operations contribute to. <p>Thank you for your consideration of the ideas provided here.</p> <p>Sincerely,</p> <p>Glen R Boise</p>

No.	Comment
29.	<p>This document is completely toothless if any (car travel) lane expansion projects move forward after this document is finalized.</p> <p>It's time for road diets. This document outlines the need. Do it.</p>
30.	<p>I am in full support of the stated goals of increasing active modes of transportation, reducing transportation demand and land use consideration into account. I am glad INDOT is focusing beyond personal automobile use and freight carries when setting its goals. I am excited my primary mode of transportation, the bicycle, is being considered and invested in.</p>
31.	<p>I would like to see INDOT take a more serious approach to micro-mobility in the most urban settings. This can include: Bikes, e-bikes, electric scooters, electric skateboards, and Segway products. There had been unprecedented rates growth of micro-mobility in other large cities, not just the largest, Denver is a great example. Creating larger bike lanes, as well as more could ease congestion and incentivize others to take micro-mobility.</p>
32.	<p>I am glad to see the state acknowledging the need to address human-induced climate change in this document, which appears to want to lower carbon emissions. I am also confused, because while I read this document, the "added travel lanes" along I-65 are nearing completion in Tippecanoe County. This interstate project will obviously add more carbon emissions in my county - the exact opposite of what this document represents! I want to see fewer added lanes and more investment in public transportation. Make it harder for people to drive, not easier!</p>
33.	<p>Thank you for putting this out. I am especially encouraged to see walking, biking, and transit emphasized in your key pillars. Indiana has a lot of room to improve here. There are entire sections of my town that are choked off to people without cars, unless you walk on the shoulder of a busy state highway.</p>

No.	Comment
34.	<p data-bbox="175 239 298 268">Part 1 of 3</p> <p data-bbox="175 296 483 325">To Whom it May Concern:</p> <p data-bbox="175 348 1515 537">We appreciate the opportunity to provide feedback on the Indiana Department of Transportation's Draft Carbon Reduction Strategy. The Electrification Coalition (EC) is a nationally recognized non-partisan, non-profit organization that is focused on achieving the mass adoption of electric vehicles (EV) through a combination of stakeholder engagement, technical support, direct implementation, and policy support to facilitate the deployment of EVs on a mass scale in order to combat the national security, economic, and public health impacts associated with the nation's dependence on oil.</p> <p data-bbox="175 560 1477 749">We applaud Indiana for taking a crucial step in outlining a path toward a decarbonized future and including EVs in this blueprint. EVs are one of the best alternatives for achieving carbon reduction while bolstering economic prosperity and public health. The electric power sector is a scalable source of energy with existing infrastructure. The fuels used to generate electricity are diverse and domestic, and electricity prices exhibit long-term stability. Below are several strategies outlined in our AchiEve Model Policy Toolkit that we recommend for Indiana to begin this transition to an electrified future.</p> <p data-bbox="175 772 488 802">Policies to electrify fleets.</p> <p data-bbox="175 825 1507 1045">Executive orders are a powerful tool for driving transportation electrification. Governors have used executive orders to highlight and facilitate electrification, both for state-government fleet vehicles and across the transportation sector. Many executive orders establish fleet mandates and incentives requiring a fixed percentage or growing share of new vehicle purchases to be hybrid, electric, and/or alternative fuel vehicles. Other executive orders support electrification by requiring improvements in the fleet's overall fuel economy or other mechanisms to reduce state-wide transportation emissions. Ideally, these mandates and programs focus on easing adoption barriers for battery electric and plug-in hybrid vehicles.</p> <p data-bbox="175 1068 1498 1257">Advocating for the electrification of fleets owned or leased by states is an effective way to put the importance of prioritizing clean transportation into the public spotlight and raise visibility. Because electricity is significantly less expensive than gasoline per mile, and because EVs require much less service, EVs save taxpayers money. Many states have utilized total-cost-of-ownership (TCO) analyses (e.g., DRVE Tool) to show the savings benefits of EVs, and some have required the use of TCO analysis when planning future vehicle purchases.</p> <p data-bbox="175 1281 1498 1470">Some examples of fleet electrification executive orders may be found in Pennsylvania and Rhode Island. Pennsylvania requires all state agencies to replace 25 percent of their light-duty fleets with PEVs by 2025 and evaluate opportunities for both vehicle-miles-traveled reduction and incorporation of new technology. Rhode Island requires that at least 75 percent of state motor vehicles be alternative fuel vehicles and the remaining 25 percent be hybrid electric vehicles. By 2025, 25 percent of state motor vehicles must be zero-emission vehicles. If it is of interest, the EC has a State Fleet Mandate Template available.</p> <p data-bbox="175 1493 837 1522">Utilizing federal funds for transportation electrification</p> <p data-bbox="175 1545 1503 1734">Even before the passage of the Bipartisan Infrastructure Law and the Inflation Reduction Act, there were numerous federal programs that may be leveraged to expand transportation electrification. The Congestion Mitigation and Air Quality (CMAQ) funds, the Federal Highway Administration's (FHWA) Surface Transportation Block Grant (STBG) program and National Highway Performance Program (NHPP), the Office of Energy Efficiency and Renewable Energy's (EERE) Clean Cities Program and the State Energy Program, and many more.</p> <p data-bbox="175 1757 591 1787">The CMAQ program, ... (continued)</p>

No.	Comment
35.	<p>Part 2 of 3</p> <p>established in 1992 and administered by FHWA, is a flexible funding source for state and local governments to address areas that have been deemed nonattainment or maintenance by the Environmental Protection Agency in regard to the national ambient air quality standards as set by the Clean Air Act. The funds can be used toward qualifying transportation projects targeted at reducing emissions. CMAQ funds can be utilized by INDOT to install charging infrastructure currently ineligible under the National Electric Vehicle Infrastructure (NEVI) program, to electrify buses, and accelerate deployment of clean vehicle technology in the medium- and heavy-duty sector.</p> <p>FHWA's STBG program and NHPP can be used for EV chargers in association with truck parking facilities as well as fringe and corridor parking facilities. State investment banks can also use funds from these programs to offer loans and credit enhancement products.</p> <p>The Department of Energy's EERE has two funding opportunities for EV charging infrastructure: the Clean Cities Program and the State Energy Program. To receive funding, applicants must apply for open, competitive grants</p> <p>More information on federal opportunities available to the state may be found on the EC's new Federal Funding Tool which is currently being developed and updated as new program guidance becomes available. The Tool will detail how federal-level programs can be combined and potentially stacked with other programs that are applicable to the city level. We look forward to sharing this resource with INDOT, along with our Practical EV Infrastructure Policy Checklist, soon.</p> <p>Legislative policies to encourage and enable vehicle purchase</p> <p>As INDOT outlines in their draft plan, increasing purchase incentives (i.e. tax rebates) for EVs has a significant effect on total EV sales, particularly among lower- and middle-income consumers who may not be able to afford higher upfront costs, even though they will save money on fuel and maintenance. As the price of batteries declines and economies of scale for manufacturing EVs are realized, as seen in the EV manufacturing increases in Indiana, purchase incentives will no longer be needed. However, EVs are not yet at the mass-market stage and therefore financial incentives help consumers make the switch.</p> <p>Many states offer purchase incentives; rebates, particularly when offered at the point of sale, are the most effective. To address equity concerns, some states set eligibility tiers or limits based on income or vehicle price (MSRP). For instance, Pennsylvania offers a \$2,000 rebate for battery electric vehicles (BEV) and \$1,500 for plug-in hybrids (PHEV) based on the purchaser's household income. Delaware provides businesses, individuals, and government entities up to \$2,500 for the purchase or lease of a new BEV, and \$1,000 for a PHEV with an MSRP not to exceed \$60,000.</p> <p>If it is of interest, the EC has a Vehicle Purchase Rebate Template available.</p> <p>Another policy of note is direct sales, or the freedom to buy. Freedom to Buy legislation enables EVs to be available for purchase directly from the auto manufacturer in a state. In some states, only auto dealers are eligible to sell vehicles, which forces companies that only make EVs and not gasoline-powered vehicles to apply within that state for certification to sell directly to consumers. In addition, some states go a step further and prohibit EV-only manufacturers from servicing the EVs of their customers. The prohibition on the freedom to buy to consumers by manufacturers hurts consumers who want to purchase EVs, as it limits the ability of the consumer to see the EV in a showroom, ask questions, and do a test drive. Several states, including Utah and Wyoming, have authorized the sale of EVs directly to consumers.... (continued)</p>

No.	Comment
36.	<p>Part 3 of 3</p> <p>By enabling the ability for consumers and fleet operators to directly purchase the EV of their choice in Indiana, you are eliminating barriers and allowing upholding free market principles as well.</p> <p>INDOT's Carbon Reduction Strategy is a first step in the transition to an electrified transportation future. We encourage Indiana to be bold and seize the moment to prepare the state for this transition. We thank you for your continued leadership and we look forward to working with you. If you have any questions, please contact me at nmiller@electrificationcoalition.org.</p> <p>Sincerely,</p> <p>Nick Miller</p> <p>Policy Analyst, Electrification Coalition</p>
37.	<p>Hello and thank you for authoring the Carbon Reduction Strategy for Indiana.</p> <p>Thank you for considering my comments and questions. I am in favor of electric vehicles and building infrastructure to support them on the roadways and rest stops for private vehicles and city/county/state vehicles and machines. The leaders of the State of Indiana should be proactive in implementing technology solutions to support clean renewable energy for all. We should be able to utilize the existing technology and get to work on reaching for higher goals and possibilities for infrastructure that will be used to electrify the state of Indiana quickly and successfully.</p> <p>Walking and riding bikes would improve the lives of many Hoosiers offering health benefits like exercise and cleaner air by reducing CO2 production. Offering better public transportation that is safe and reliable would be another improvement like electric railways. Pedestrians and cyclists need safe access to transit with additional and improved routes around the state.</p> <p>Offer incentives to Indiana business and state/local/county government to allow their workers to work from home for those employees with jobs that would allow that option.</p> <p>Set up infrastructure now for solar, wind and clean renewable energy that can be sent through the grid and STOP relying on fossil fuels like coal and gas for electricity. I want to charge my electric vehicle in my garage and know that it DOES NOT come from dirty coal and dirty gas.</p> <p>Please improve the roads and bridges and infrastructure that already exist. Please do not implement the new proposals for new terrain projects like the Mid-States Corridor Project. This is such a wasteful, wasteful plan that is a shameless and insidious attempt to line the pockets of anonymous supporters of this project. New construction will generate an enormous amount of Greenhouse Gasses, just what we need to avoid. Improve the existing infrastructure and use concrete from Lehigh, Mitchell, IN.</p> <p>https://heidelbergmaterials.us/home/news/news/2022/08/31/lehigh-hanson-receives-u.s.-doe-funding-for-feed-study-of-carbon-capture-project-at-its-new-lehigh-cement-plant-in-mitchell-indiana</p>

No.	Comment
38.	<p>The Alliance for Automotive Innovation (“Auto Innovators”) appreciates the opportunity to provide comments on the Indiana Department of Transportation’s (INDOT) draft carbon reduction strategy (CRS) to support efforts to reduce carbon dioxide emissions.</p> <p>By 2030, the auto industry will have invested more than \$500 billion in electrification, and IHS Markit predicts there will be 130 electric vehicle (EV) models (PHEV - plug-in hybrid EV, BEV - battery EV and FCEV - fuel cell EV) available in the U.S. by 2026. Auto Innovators and our members are committed to working with all sectors and policymakers to achieve the goals of reduced carbon emissions and increased electrification in the transportation sector, but for the state to accomplish its stated goal, it will need a detailed plan, robust funding, and strong leadership from the Governor, legislature, and state agencies. State actions to implement programs and policies that support and encourage EV buyers are critically important, and Indiana’s commitment is needed to do its part in providing the necessary conditions to help support an expanded EV market.</p> <p>Through the first three Quarters of 2022, 3.1 percent of new vehicles sold in Indiana were electric vehicles. Automakers are investing hundreds of billions of dollars in battery production facilities, battery supply chains, and EV production facilities. The U.S. Congress is also investing in infrastructure, manufacturing, and battery supply chain through the Inflation Reduction Act (IRA) and Infrastructure Investment and Jobs Act (IIJA). States will need to do the same to incentivize both the vehicles and the infrastructure.</p> <p>In the draft report, INDOT identifies three complementary pathways to reduce total tailpipe emissions for on-road vehicles: 1) reducing fuel consumption; 2) switching to low/zero emission fuels for on-road vehicles such as using electric vehicles; and 3) reducing vehicle miles traveled (VMT).</p> <p>Auto Innovators and our member companies want to be partners with states, to support policies that promote a clean vehicle future and to work with other stakeholders (utilities, construction trades, home builders, equity firms and more) to ensure that everyone has access to new, clean vehicle technologies and the infrastructure to support it. To make these goals a reality, there are many important complementary measures needed for success. For example, but not limited to:</p> <ul style="list-style-type: none"> • State fleet adoption of EVs; • Consumer awareness campaigns; • Convenient and affordable access to EV charging and hydrogen refueling stations; • Building codes addressing new construction and retrofit requirements for EV-ready residential and commercial parking; • Ensuring the low-moderate income (LMI) community has enhanced access to EVs and charging infrastructure in these areas; • Grid resiliency and utility electric rates that provide low-cost EV charging; • State action on low carbon fuel standard (LCFS). <p>Indiana should avoid policies like punitive EV registration fees which will discourage consumers from making the switch to EVs. To be meaningful, it is critical that states develop and implement plans that send the right signals to consumers to make the switch to EVs.</p> <p>Expected Federal Activity</p> <p>While INDOT considers a range of state policies, it should be aware of activity at the federal level which will likely overlap with state considerations. The Biden administration released a U.S. National Blueprint for Transportation Decarbonization, a joint report developed by the Departments of Energy, Transportation, Housing and Urban Development and EPA.</p> <p>Decarbonization in transportation is achievable but success requires unprecedented coordination among every level of government, private industry, community-based organizations and stakeholder groups.</p>

No.	Comment
39.	I believe that Indiana should have a more balanced approach to funding transportation infrastructure. For decades, the state has invested almost exclusively in highways, with little consideration given to more efficient and environmentally friendly alternative modes. For most Indiana residents there are few, if any, options for transportation other than an individual driving alone in an automobile.
40.	Tax credits or rebates for purchase of information technology or training or equipment, specifically geared towards the maintenance and repair of EV and Hybrid vehicles. They're coming and our repair sector must be ready.
41.	<p>The Hoosier Environmental Council is submitting the following comments on INDOT's draft Carbon Reduction Strategy (CRS). Our organization represents thousands of Hoosiers concerned about the impacts of climate change in Indiana, and who are engaged in state and local policy activities concerning energy production and consumption, transportation, land use, and natural resources conservation.</p> <p>The draft CRS describes the pathways for emissions reductions, and the actions needed to reduce transportation-related greenhouse gas emissions. It also relates how elements of the 2045 Indiana Long Range Transportation Plan should contribute to the goals and outcomes of the Carbon Reduction Strategy.</p> <p>We agree with this statement on page 6 of the CRS: "Efforts to reduce transportation carbon emissions can have a variety of positive effects for the public and economy, from improving air quality and public health to enhancing energy efficiency and cost-savings for motorists and businesses."</p> <p>We recommend the plan do the following:</p> <ol style="list-style-type: none"> 1. While the CRS presents an overview of carbon emissions from transportation, and the categories of actions needed to reduce emissions, it is lacking in identifying specific action steps and timelines, many of which can and should be initiated now. What's more, sources of information and data should be clearly identified. 2. The CRS should provide a more detailed quantification of Indiana transportation based GHGs and per capita emission data. 3. The CRS would also benefit from a more robust analysis of population, travel, and economic trends that will affect transportation emissions in the future. For example, not all areas of Indiana are expected to grow in population at the same rate; some areas of the state have been losing population. There are also geographic differences in vehicle travel, and where this travel occurs - on interstates, state highways or local roads, which may be either rural or urban. The Indiana University Business Research Center forecasts population growth for Indiana to the county level. See also https://www.incontext.indiana.edu/2022/may-jun/article2.asp. <p>We also note that the 2045 INDOT Long Range Transportation Plan was completed in 2019, so was based on information available prior to the pandemic that does not necessarily represent current demographic or societal conditions present today, such as the trends related to increased numbers of people working at home.</p> <p>The description of trends in vehicle miles traveled should also examine more fully the geographic and functional differences depending on where the travel takes place or on what type of road it takes place on. It should consider existing commuting patterns by counties and regions.</p> <p>It should identify the relative mode shares of travel for motor vehicles, buses, bicycles, walking, or public transportation.</p> <ol style="list-style-type: none"> 4. On page 8 of the CRS is a discussion of transportation choices and their effect on transportation emissions. But in many areas of Indiana, it is the lack of transportation options, not personal preference, that determines the transportation choices of Hoosiers. Many residents may not be able to choose to use public transit, or intercity bus or passenger rail, or bicycle, because these options are not available to them. They also may not be able to choose to carpool or utilize a high-occupancy vehicle lane, for the same reason. The draft Strategy should examine the availability of or lack of choices in the state. For example, INDOT's Indiana Intercity Bus Needs Assessment and Service Evaluation 2021 demonstrates that many communities and regions of the state are not served by intercity bus service (see map on page 46). <p>NOTE: We are emailing our full comments since this form did not accept the full text of our comments.</p>

No.	Comment
42.	<p>Indiana Trails Response to INDOT’s Carbon Reduction Strategy</p> <p>Praises:</p> <p>With projected population and job growth, increased fuel consumption to accommodate such growth is not sustainable, and must be reduced - Indiana Trails supports investments to increase transit, walking, and biking infrastructure.</p> <p>What percentage of INDOT’s budget will be used to address increased transit, walking, and biking infrastructure? Does this percentage show earnestness by the Department in encouraging active transportation?</p> <p>Indiana Trails applauds INDOT for recognizing the power of active transportation as a way to support carbon reduction. We look forward to the opportunity to work with INDOT to help promote active transportation.</p> <p>Integrating the Carbon Reduction Strategy into INDOT’s Long-Term Transportation Plan will ensure that carbon reduction is part of a holistic plan for Indiana’s transportation future.</p> <p>Indiana Trails supports the development of mixed-use, dense, and transit-oriented development practices as part of the Land Use strategy for carbon reduction.</p> <p>“A safe and secure system is critical to ensure that zero-emission transportation modes, such as walking or biking, are a safe and attractive choice for travelers. Addressing complete streets by integrating pedestrian, bike, and transit facilities and traffic calming strategies, improving vulnerable user safety at crossings, and ensuring all vehicles understand safety policies that protect pedestrians and bicyclists can enable more travelers to make carbon efficient choices in transportation.”</p> <p>Indiana Trails applauds INDOT and its efforts to set performance measures and commit to meeting those goals.</p> <p>Indiana Trails is excited to hear that INDOT is open to Public-Private Partnerships to design and construct multimodal projects.</p> <p>Indiana does have an interurban railroad with the South Shore Line in Northern Indiana. We would like to see INDOT help ensure that other urban areas also have access to similar services.</p> <p>Concerns:</p> <p>The idea of developing a carbon reduction plan isn’t coming from the Indiana state legislature, the Governor’s office, or even the INDOT commissioner. The carbon reduction plan is a federal mandate forced upon the state, thus we suspect that buy-in from the Department, Governor’s office, and Indiana legislature is very low.</p> <p>Indiana is a pass-through state for many trucks traveling from Canada to Mexico (I-69), east to west (I-64, I-70, I-74, I-80, I-90, I-94), and Chicago to points south (I-65), there are a lot of truck vehicle miles traveled (VMT) in Indiana. These numbers are projected to increase by 39% between 2015 and 2045. Are Hoosiers expected to offset this increase increased pollution by themselves? How will INDOT help retard Truck VMT growth within the state?</p> <p>The goal of the carbon reduction plan is to reduce greenhouse gas (GHG) emissions to net zero by 2050, with an interim target of a 50-52% reduction below 2005 levels by 2030. From 2005 to 2021 Indiana’s population increased by over 4 million people (6,278,616 to 6,805,985) - thus more people and presumably more goods need to be transported around the state. With 2030 being only 8 years away, drastic action must be taken to meet the interim target, much less the 2050 goal. Can INDOT lead to such a drastic change in carbon emissions?</p> <p>By comparing the transportation sector to the electric power sector and the industrial sector, it seems INDOT is trying to divert attention from its responsibility. If other sectors are responsible for a larger portion of the carbon emissions, why should INDOT work so hard to reduce carbon emissions for which they have control and are responsible?</p> <p>While this strategy calls for the planning of the impacts of autonomous vehicles and truck platooning technologies, there currently exists no such solution, and any expected answer is decades away. Reliance upon the development of this technology will not help Indiana meet its 2030 or 2045 goals.</p> <p>See Second Part</p>

No.	Comment
43.	<p>Second Part:</p> <p>Indiana Trails Response to INDOT's Carbon Reduction Strategy</p> <p>Objections:</p> <p>While this plan promotes alternative fuel vehicle adoption, it does not mention the promotion of alternative fuels. The infrastructure providing alternative fuels is imperative to adopting said alternative fuels. The market can drive the adoption of alternative fuels and alternative fuel vehicles only if the infrastructure exists.</p> <p>Managed Lanes sound like a way to add more lanes promoting the use of more vehicles and increasing carbon emissions.</p> <p>Every time lane or lane mile is added to a highway, it encourages more vehicles.</p> <p>How can INDOT promote the use of more transit when the legislature has opposed the expanded use of light rail?</p> <p>This plan focuses a lot on reducing congestion as a means of reducing carbon emissions while ignoring proven solutions to take vehicles off the road - specifically rail:</p> <p>This plan does not address intercity rail as a means to reduce carbon emissions.</p> <p>This plan does not address commuter rail as a means to reduce carbon emissions.</p> <p>Under Freight Truck Mobility there is no discussion about developing drive-on, drive-off facilities with freight railroads to provide high-frequency point-to-point transportation of truck-borne freight connecting major population centers. Such a solution would take trucks off the roads and reduce carbon emissions via diesel or gas reductions in use.</p> <p>This plan does not adopt the California Air Resources Board emissions standards which many states already follow and almost all automobile manufacturers follow for automobiles sold in those states. Requiring emissions testing for license plate renewal is a burden that citizens from many other states already comply with. Requiring emissions testing for license plate renewal would help constrain the number of emissions from light-duty vehicles which INDOT acknowledges are the largest contributor to carbon emissions in transportation.</p> <p>Apart from planting native vegetation along road right-of-ways to reduce mowing and to help absorb carbon emissions, there is extremely little discussion about how to offset carbon emissions as a strategy to reduce net carbon emissions.</p> <p>Traditionally, in construction projects, most oxygen-producing, carbon-absorbing vegetation is destroyed to make way for new roads, bridge footings, temporary construction camps, and more. Included in this destruction are well-established trees. As a requirement for developing new construction projects, INDOT should include a plan to plant and restore enough trees to more than offset the loss of carbon-absorbing timber.</p> <p>See Third Part</p>

No.	Comment
44.	<p>Third Part</p> <p>Indiana Trails Response to INDOT's Carbon Reduction Strategy</p> <p>Suggestions:</p> <p>Indiana Trails recommends that INDOT assumes a carrot-and-stick approach to promoting and using alternative fuels such as B100, E85, and Hydrogen.</p> <p>B100 is a direct replacement of diesel fuel that could be implemented now with grants made available to fuel station owners to help them adapt to appropriate fuel storage standards for B100. INDOT would ask the legislature to implement an additional tax on any station not providing B100 by a specific date - presumably before 2025. By switching to biodiesel the US Department of Energy believes that carbon emissions could be cut by 74% over petroleum diesel. Encouraging the growth of B100 source plants could be a boon to Indiana farmers.</p> <p>According to the US Department of Energy, Indiana only has 233 stations that provide E85 as an option for refueling. Ethanol production through diverse high-starch and quick-growing plants could be a boon to Indiana farmers.</p> <p>Three car manufacturers currently offer hydrogen-powered fuel cell electric vehicles (FCEV). Unfortunately, Indiana has zero locations where these cars could refill. Indiana could provide a forgivable loan to fuel stations that build hydrogen pumps at their station. The exhaust for an FCEV is water.</p> <p>Policy changes made today will take time to effect change in the marketplace tomorrow. Thus to hit targets set for 2030, changes need to be made today so that consumers can alter their behavior in time to reduce carbon emissions.</p> <p>With the statements in this document concerning the promotion of walking and cycling as well as the preservation of the current transportation system, there should be no reason that another bridge should be built within Indiana, or connecting Indiana to any other state that does not have active transportation accommodations. This includes the I69 bridge between Evansville and Henderson, or the repurposing of the southbound US-41 bridge for active transportation.</p> <p>Building and designing a new bridge that does not accommodate active transportation or non-motorized transport, a substantial percentage of our population is harmed twice - first by limited mobility and accessibility and second by absconding with their tax monies.</p> <p>This plan suggests that limited rail capacity may be a root cause of traffic bottlenecks. Considering that Indianapolis has extremely limited rail capacity, we would agree that major investments must be made in rail to better serve central Indiana and reduce traffic bottlenecks on interstates, highways, and surface streets in central Indiana.</p> <p>Work with DNR to acquire land that could be used to plant carbon-capturing vegetation offsetting further carbon emissions.</p> <p>In pursuing the development of right-of-ways, nobody knocks down oxygen-producing, carbon-absorbing trees like INDOT, and nobody can bulldoze greenspace like INDOT and contracted developers. What is INDOT doing to restore and expand lost forests and green space?</p> <p>INDOT can promote the deployment of rooftop solar units and/or wind generators at parking garages, truck stops, rest stops, distribution centers, and government buildings.</p> <p>Promote the adoption and use of electric and other alternative fuel source school buses, and airport/hotel shuttles.</p> <p>Truck stops and rest parks that are resting places for truckers need to have electric plug-ins (like campgrounds) so that truckers do not have to burn diesel fuel to keep heaters going in the winter and air conditioning operating in summer. INDOT could work with truck manufacturers to ensure that truck heaters and air conditioners may take advantage of available electric plug-ins.</p> <p>Indiana Trails is concerned that motorists driving at excessive speeds on the Interstate are excessive contributors to carbon emissions. Perhaps a closer working relationship with Indiana State Police can help reign in excessive speeds.</p> <p>See Fourth Part</p>

No.	Comment
45.	<p>Fourth Part:</p> <p>Indiana Trails Response to INDOT's Carbon Reduction Strategy</p> <p>Suggestions:</p> <p>With Indiana being the home of several excellent engineering schools, such as Purdue and Rose-Hulman, Indiana could also be the home of new companies developing hydrogen-based FCEVs.</p> <p>Conclusion:</p> <p>Indiana's Carbon output in 2005 was 45.3 million metric tons of carbon dioxide. In 2020, Indiana reduced its carbon emissions to 35.9 million metric tons of carbon dioxide - a value most likely impacted by the pandemic as 2019's emissions were 39.1 million metric tons of carbon dioxide. To meet the goals of this program Indiana must reduce its carbon emissions to 22 million metric tons of carbon dioxide by 2030 and be net neutral by 2050.</p> <p>This Carbon Reduction Strategy would have been an excellent starting point 10-15 years ago. Indiana Trails believes that this strategy includes a lot of programs and ideas that will move the needle in small increments but need time to become effective. Just about every program listed should already be in existence, and INDOT should be seeking groundbreaking solutions to meet this massive problem. With the strategy and the meager funding behind the legislation, Indiana Trails fears that INDOT will not be able to meet its stated goals. Indiana Trails appreciates the direction this strategy will take the state. However, Indiana Trails feels that the plan will be ineffective in its ability to make much of a change within 8 years. Additionally, Indiana Trails believes this strategy is not aggressive enough to meet the 2050 goals.</p> <p>Indiana, with its tremendous automotive and rail history, must once again position itself to be a technology leader in those transportation sectors-this time in the area of clean technology.</p>
46.	<p>There is a great need to first calculate emissions from transportations, to set targets and benchmark progress to move from a draft phase. Freight emissions reduction solutions can find direction in novel solutions that create shared value between stakeholders. Infrastructure for bikes and shared transit are currently poor and can be greatly enhanced. I am a biker and proper drainage and maintenance of future bike roads would be a great benefit for increased biking in wetter wintry months. Furthermore, this plan does not address increased transportation activity impacts on biodiversity. I am happy to talk more! - Ethan Scott</p>

No.	Comment
47.	<ul style="list-style-type: none"> • PDF p. 13, Table 2: Active Modes: In the second row pertaining to bicycle facilities, another strategy not mentioned is the opportunity to increase adoption of bicycle trips through incentives like rebates for e-bikes. Several states are already implementing similar programs, including California, Colorado, Connecticut, Hawaii, Massachusetts, and Washington state. Perhaps including this within the first row of Table 1: Electric Vehicles, Alternative Fuels and Energy Efficiency (Electric Vehicles (EV) Adoption and Charging Infrastructure). If so, explicit mention of e-bikes in addition to EVs would be sufficient. • Same page, Table 2: Transit is rather vague in this context; In addition to public bus/paratransit (typical throughout the state), will this strategy also consider commuter rail (e.g., South Shore), Amtrak, and intercity bus services? • PDF p. 16, under Figure 7: Safe & Secure Travel: Address Complete Streets/ADA Needs In addition to implementing Complete Streets principles in physical design, INDOT should also ensure that construction detours or other temporary routes under the agency's (or their contractors') purview are accessible to all modes where possible. • PDF p. 16, under Figure 7: Safe & Secure Travel: Implement the 4Es of Safety: Education, enforcement, engineering, and emergency responses Enforcement in the traditional sense often results in disproportionate impacts to low-income and/or persons of color, which in turn, poses an equity concern. Additionally, traffic stops (especially on high-speed roadways) create an incredibly dangerous environment for law enforcement officers. When considering enforcement strategies, will INDOT and/or the State of Indiana look to self-enforcing roadway design in combination with efficiencies gained by implementing automated enforcement and ticketing? When thoughtfully deployed, automated enforcement removes conscious or unconscious human bias and eliminates dangers to both the traveling public and law enforcement. • PDF p. 18, last sentence of first paragraph under Figure 9: "...can support reductions of overall transportation emissions while maintaining and enhancing economic competitiveness and quality of life." The addition of "enhancing" acknowledges the fact that places with robust multimodal access, especially for those traveling by means other than personal motor vehicle, have better overall health outcomes and are highly desirable for private development. • PDF p. 18, second sentence of second paragraph: "On-road freight vehicles produce more carbon emissions per mile when burning carbon intensive fuels like diesel, and freight vehicle miles traveled growth is expected to outpace light duty vehicle miles traveled growth moving forward." Revising this sentence could be more effective; as it currently reads, it's a little unwieldy—maybe just striking both occurrences of the word "growth"? • PDF p. 19, under Figure 10: Multimodal Mobility: Finish what we've started Added capacity should not be an objective in a carbon reduction strategy, specifically expanding I-65 and I-70. This seems to be in direct conflict with several stated objectives throughout the document: <ul style="list-style-type: none"> - The first entry in Table 5: Other (p. 11): Traffic flow improvements that do not add vehicular (single occupancy) capacity... that can improve traffic flow and reduce congestion without adding general-purpose capacity that tend to increase SOV and VMT. - And the System Resiliency objective under Figure 7: Safe & Secure Travel (p. 16): Reduce vulnerability to various threats and risks (e.g., severe weather, acts of terrorism, and cyber-attacks) and ensure redundancy and reliability to meet essential travel needs. - The Local Corridor Consideration objective under Figure 8: System Preservation (p. 17): Work with locals and rural portions of Indiana to develop regional mobility plans and to determine local corridor improvements in an effort to minimize system (...) Cont. in next comment submittal.

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48.	<p>Cont. from last comment:</p> <p>(...) added capacity and allow for more efficient use of local and INDOT roadway facilities.</p> <p>As a means of reducing carbon, consider for example, Amtrak’s 2021 Connects US Plan (see pp. 46-53), which proposes major frequency enhancements to passenger rail service between Indianapolis, Chicago, Louisville, and Cincinnati. INDOT’s support of improved, efficient passenger rail in Indiana would alleviate SOV traffic (especially on I-65 through the state) and free-up existing capacity for freight traffic, negating the need for added lanes and saving funds that could be better spent on safety and/or maintenance projects.</p> <p>Typos:</p> <ul style="list-style-type: none"> • PDF p. 5, in the last line of the first paragraph of the Executive Summary, Metropolitan Partner Organization (MPO) partners should read Metropolitan Planning Organization (MPO) partners. • Same page, first line of second paragraph, emitted from the on-road vehicles—strike the. • Consistency issue on various pages: CO2 vs CO2 • PDF p. 18, third line of first paragraph under Figure 9: Economic Competitiveness and Quality of Life, “...single occupancy vehicle (driving along) can support...”—is “driving along” supposed to say “driving alone”? • PDF p. 25, in the first line of the third paragraph under 3.5 Other, “describe” should be past tense. <p>Note: If preferred, please contact me via email to receive a Word document of Health by Design’s comments. Thank you for your time and consideration.</p>

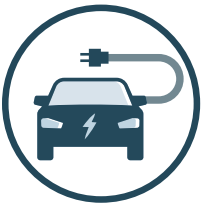
Appendix E:

Potential Projects and Strategies for Carbon Reduction

In consultation with MPOs, INDOT identified five categories of transportation projects and strategies that can support carbon reduction in Indiana (see Figure E-1).

Each category includes specific projects and strategies detailed in Tables 1 through 5. This list conveys the broad range of transportation solutions available when planning and designing a transportation system that leads to lower carbon emissions. INDOT and its partners can use this list to identify specific projects and strategies appropriate to each geographic area and to the unique needs of travelers in each area of the state when planning for transportation investments.

Figure E-1: Carbon Reduction Project and Strategy Categories.



Alternative Fuels/
Energy Efficiency



Active Modes



Transportation
Demand
Management



Technology Solutions



Other

Table E-1: Electric Vehicles, Alternative Fuels and Energy Efficiency

Potential strategies that support electric or alternative fuel vehicle adoption or improve overall energy efficiency and lower carbon fuel sources for the transportation network.	
Electric Vehicles (EV) Adoption and Charging Infrastructure	Programs that support and incentivize adoption of EVs. Includes tax rebates, preferential parking spots, access to high occupancy facilities, etc. Programs or projects that result in increased installation of EV charging infrastructure and support energy generation with lower carbon emissions (solar, wind, etc.).
Alternative Fuel Vehicle (AFV) and Infrastructure	Programs that support other alternative fuel vehicles and infrastructure such as hydrogen, natural gas, or propane, especially on heavy duty vehicles where no market ready options to electrify are available. Includes strategies that improve vehicle emissions for infrastructure construction programs.
Freight Emission Reductions	Strategies that support improved freight movement (without increasing single occupancy vehicle capacity). Projects that help freight vehicles reduce emissions and save fuel, including electric charging and alternative fueling facilities.
Emission Reduction at Port Facilities	Programs that reduce emissions from idling freight vehicles and port equipment (such as cargo handling equipment).
Diesel Engine Retrofits	Truck engine retrofits that improve fuel efficiency and reduce vehicle emissions
Energy Efficient Lighting and Equipment	Projects that replace lighting and other on-road equipment with more energy efficient models.

Table E-2: Active Modes

Potential strategies that encourage active transportation such as walking, biking, and transit.	
Pedestrian Facilities	Infrastructure that supports safe and secure pedestrian travel, including sidewalks, trails, pedestrian crossing amenities (signalized crosswalks and intersections, curb ramps, pedestrian overpasses, etc.)
Bicycle Facilities	Infrastructure that supports safe and secure bicycle travel, including separated bike lanes, trails, bicycle crossing amenities (signalized intersections with bicycle signals, bicycle overpasses, etc.)
Transit	Investments that support efficient transit operations and higher transit ridership.
Shared Mobility	The availability of shared bicycle, scooter or on-demand shuttle services can support door-to-door connectivity from a suburban transit hub to a final destination further than is convenient to walk or connect travelers taking short trips urban environments that is difficult to serve with fixed-route transit.

Table E-3: Transportation Demand Management

<p>Potential strategies that reduce demand for travel on roadways by incentivizing reduced trip making and higher occupancy modes of travel.</p>	
Managed Lanes	<p>Lanes separated from general-purpose lanes managed to benefit the flow of traffic and the overall capacity of the system. Some examples included higher occupancy vehicle (HOV) lanes, high-occupancy toll (HOT) lanes, or special use lanes such as truck only lanes. Operational rules are established to determine eligibility (e.g. zero-emission vehicles or high occupancy vehicles only), pricing and controlled access points.</p>
Congestion Pricing	<p>Road pricing charged in heavily congested areas to incentivize travel at off-peak hours.</p>
Electronic Tolling	<p>Systems that reduce bottlenecks and congestion at tolled facilities by more rapidly executing the toll transaction through wireless technology.</p>
Land Use	<p>Mixed use, dense, and transit-oriented development practices support reduced travel demand on roadway infrastructure. Higher parking fees or parking restrictions when transit, walking or biking are readily available can also reduce demand on roadways.</p>
Commute Trip Reduction	<p>Programs that support commutes to work in higher occupancy modes such as carpools, vanpools, employer-based shuttles or employer subsidized transit programs. Work-from-home programs also remove the need to commute.</p>

Table E-4: Technology Solutions

<p>Potential strategies that improve traffic flow, traffic throughput and reduce demand on the transportation network through advanced technology for operations and communications. Critical to success of all technology solutions are investments in communications network as well as data management, analytics and visualization capabilities.</p>	
Traffic Management Facilities	<p>Traffic monitoring, management, or control facilities.</p>
Adaptive Signals	<p>Systems that adjust traffic signal timing to optimize traffic flow.</p>
Intelligent Transportation Systems	<p>Infrastructure-based intelligent transportation systems capital improvements (e.g., traffic signal control systems, ramp metering, dynamic message signs, connected vehicle infrastructure).</p>
Advanced Transportation Technologies	<p>Advanced traveler information systems, collision avoidance technology, transportation management technologies, automated and connected vehicle infrastructure, integrated payment systems, shared-use and on-demand mobility applications, integration with energy systems, parking reservation systems, etc.</p>

Table E-5: Other

Projects or programs that can demonstrate a reduction of carbon emissions when implemented.	
Traffic flow improvements that do not add vehicular (single occupancy) capacity	Intersection improvements (such as roundabouts or other operational improvements), breakdown and merging lanes, or other infrastructure improvements, that can improve traffic flow and reduce congestion without adding general-purpose capacity that tend to increase single occupancy vehicles and VMT.
Calculated Carbon Reductions	Using proven methodologies (e.g., lifecycle analysis and travel demand models) to calculate how changes in policies or programs will result in reduced carbon emissions in Indiana.
Sustainable Construction	Strategies that reduce on-road emission from construction equipment and use materials that require less carbon emissions to produce.

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Indiana Department of Transportation - Carbon Reduction Strategy

