



**KDOT TRANSPORTATION
EMISSIONS REDUCTION
STRATEGY**



*** KANSAS DEPARTMENT OF TRANSPORTATION**

TRANSPORTATION EMISSIONS REDUCTION STRATEGY



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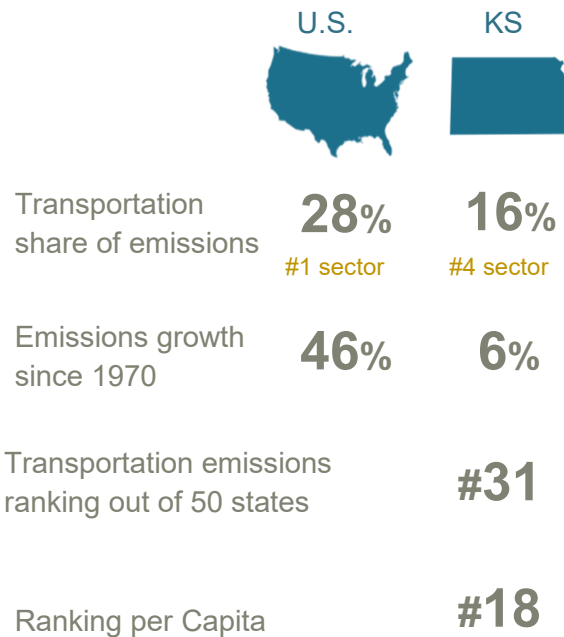
Introduction

The Kansas Department of Transportation (KDOT) Transportation Emissions Reduction Strategy (TERS), developed in collaboration with key partners and stakeholders, provides the framework for addressing emissions related to Kansas’ transportation sector. The TERS addresses federal requirements established under the Carbon Reduction Program (CRP), a new federal program created by the Infrastructure Investment and Jobs Act (IIJA), commonly referred to as the Bipartisan Infrastructure Law (BIL) and administered by the Federal Highway Administration (FHWA).

Federal legislation requires all states to develop a Carbon Reduction Strategy within two years of enactment of the BIL, which authorizes appropriations out of the Highway Trust Fund for certain core federal aid highway and related programs. “Carbon” in this document is shorthand for carbon dioxide (CO₂), the primary Greenhouse Gas (GHG) emitted by human activities. The BIL defines “transportation emissions” as “carbon dioxide emissions from on-road highway sources of those emissions within a State” under 23 U.S.C. 175(a)(2). Figure 1 demonstrates that Kansas’ emissions profile is notably different from that of the U.S. overall. Over one-fourth of GHG emissions in the U.S. are from transportation, compared to less than one-sixth of those in Kansas. In addition, while transportation sector emissions have increased substantially in the U.S. over the past 50 years, especially compared to other sectors, they have remained relatively flat in Kansas. However, Kansas’ per capita transportation emissions are in the top 40 percent among the United States, indicating there is room for improvement concerning the reduction of the state’s transportation “carbon footprint”.

The KDOT TERS is specifically structured to leverage federal funding to meet the needs of Kansans while shrinking this footprint. It provides guidance for evaluating transportation related projects based on their emission reduction potential and points the way toward enhancing and formalizing an ongoing emission reduction program within KDOT that complements, and is coordinated with, similar statewide initiatives.

Figure 1: GHG Emissions, US and KS



Source: Environmental Protection Agency (EPA)



Transportation Emissions Reduction Strategy (TERS) Key Themes and Observations

The federal CRP provides funding to states for the reduction of on-road carbon emissions. In addition to providing new funding, each state transportation department must develop a Carbon Reduction Strategy for the reduction of transportation emissions. The strategies require states to think beyond the prioritization of funding and develop a more comprehensive approach to addressing transportation emissions. During the development of the KDOT TERS, several key themes and observations emerged, as described below.

- **Paradigm Shift:** The TERS does not simply seek to prioritize federal funds but also to identify implementation strategies to advance the effort to reduce transportation emissions.
- **Partnership:** Because transportation partners such as Metropolitan Planning Organizations (MPOs), local governments, and transit agencies are also developing plans to reduce transportation emissions and address sustainability, it is imperative to leverage partnership opportunities.
- **Build on Success:** KDOT and other partners are already implementing projects and initiatives, such as the advancement of truck parking solutions and intelligent transportation systems, that provide the KDOT TERS a springboard for strategy implementation and program growth.
- **Co-Benefits:** Federal CRP eligible projects can often have important co-benefits supporting goals that are not necessarily directly tied to the TERS. Co-benefits are desirable outcomes that may not be direct goals of a certain initiative, such as the workforce development opportunities afforded by the implementation of a new transportation emission reduction technology. The prioritization process should incorporate co-benefits and identify potential opportunities to leverage funding from other programs that co-benefits support.
- **Geographic and Modal Diversity:** It is critically important to recognize differing population densities when determining the applicability and effectiveness of projects that are intended to advance the mobility of either people or freight.
- **Synergistic Federal Programs:** The BIL establishes new programs for resiliency, electric vehicle/alternative fuels, and broadband that align with transportation emission reduction efforts. The KDOT TERS should take advantage of coordination opportunities.
- **Leveraging Available Funding:** Because the BIL expanded the number of federal discretionary grant opportunities, and many of these grant programs include sustainability as a key criterion, projects identified under the TERS may be competitive for federal discretionary grants.
- **Meaningful Change:** The effectiveness of individual projects is an important consideration. Emissions relevant to the KDOT TERS are primarily created by individual vehicle users; therefore, at first glance, one might conclude that success depends on changing behaviors within large groups of individuals. However, many projects can “move the needle” without such a requirement, and the majority of the project types listed later in this document fall in this category. Ultimately, KDOT plans to develop metrics to demonstrate effectiveness. Note that to ensure a meaningful impact, it is also important to assess whether a project’s expected transportation emission reduction would be offset by the carbon expended during its construction.
- **Private-Sector Involvement:** Projects like Truck Parking Electrification present unique opportunities to advance economic development and reduce emissions. Implementation will benefit from collaboration with the private sector.



- **Innovation:** Because of the broad focus on transportation emission reduction and opportunities for research and innovation, agencies like the Kansas Department of Health and Environment (KDHE), as well as public universities and other educational institutions, can be meaningful partners.

Collaborative Approach

The KDOT TERS reflects input received from a wide range of key stakeholders, including the state’s MPOs, local governments, as well as other state agencies. This level of stakeholder collaboration was tailored to Kansas’ specific context and was intended to meet or exceed the statutory requirement, strengthening strategy development.

Program Goals

The TERS is rooted in four key goals developed collaboratively between KDOT staff, MPOs, and other stakeholders. **Safety** is the number one priority, and all KDOT investments funded under the federal CRP will be made considering safety co-benefits. KDOT is committed to investing in transportation that provides **equitable benefits** across the state. **Innovation** focuses on embracing new technologies and approaches to improve traffic flow, reduce congestion, increase safety, and reduce emissions. A core value of the federal CRP is that all projects utilizing these funds must contribute to the reduction of emissions to support a more **sustainable and resilient** transportation network.



Implementation Strategies

The federal CRP provides funding for eligible projects. In addition to identifying the process for prioritizing this funding, the TERS identifies the strategic policies, strategic partnerships, and program strategies, to support the TERS Goals. These strategies will lay the foundation for the agency’s effort to reduce transportation emissions and will allow KDOT to further develop its program.

- Implementation*
Policy Considerations
- Partnership Opportunities
- Program Enhancements

Project Selection Framework

Project selection is not the only focus of the TERS but establishing a project prioritization framework for federal CRP funding is an important element in advancing the strategy. Because industry tools for measuring the transportation emission reduction effectiveness of individual projects are relatively new and evolving, KDOT plans to initially use qualitative measures that can ultimately transition to quantitative measures.

As part of considerations for prioritization, the TERS identifies and categorizes project types that are relevant to transportation emission reduction. In addition, the prioritization framework recognizes that certain types of projects are better suited for certain contexts, such as urban vs. rural, or transportation of freight vs. people. For example, improving public transit or reducing congestion with Intelligent Transportation Systems (ITS) might be more impactful in an urban setting while truck parking, truck parking electrification, and filling gaps in the electric vehicle charging network may be more effective in rural areas.



Noting these considerations, the initial framework is designed to evaluate projects based on demonstrated effectiveness in net transportation emission reduction; geographic applicability; advancement of TERS Goals; and certain program wide objectives including advancing projects or meeting previously identified needs, project readiness, leveraging other resources, and advancing other KDOT initiatives.

Policy Background

Bipartisan Infrastructure Law (BIL)

KDOT developed this TERS in alignment with federal requirements established by the federal CRP, a new federal program created by the BIL and administered by the FHWA. The BIL, also known as the Infrastructure Investment and Jobs Act (IIJA), was signed into law on November 15, 2021. While the BIL increased funding and authorized a wide range of infrastructure investments, it also reauthorized the federal transportation act for five years. Key themes of the transportation section of the BIL include equity, safety, resilience, and sustainability.

In addition to increased funding for transportation, the BIL established several new discretionary (competitive) and formula-based programs. The federal CRP is one of the new formula programs that is allocated to state DOTs and suballocated based on population. The objective of the federal CRP is to reduce on-road emissions through the implementation of statewide strategies and projects. As part of the federal CRP, states must develop and submit a carbon (transportation emissions) reduction strategy to FHWA by November 15, 2023. Additionally, states are required to update their strategy every four years. FHWA encourages states and MPOs to obligate federal CRP funds for projects that advance the goals of the state’s strategy.

BIL Carbon Reduction Program

Under the federal CRP, funds for eligible projects are suballocated based on the relative share of the population in the state. Sixty-five percent of the funding must be suballocated based on population and the remaining thirty-five percent can be utilized anywhere in the state.

Table 1: Federal CRP Suballocations, US and KS

Approximate Five Year Federal CRP Suballocations				
Area Population	Within KS		U.S. Totals	
	\$ Million	Percent of Total	\$ Million	Percent of Total
<5,000	6.7	11%	327	5%
5,000 – 49,999	15.1	24%	1,258	20%
50,000 – 200,000	12.6	20%	1,204	19%
Over 200,000	6.8	11%	1,384	22%
Statewide (any area)	22.2	35%	2,247	35%

Source: US Census, BIL Legislation

Funding under the federal CRP can be used for certain project types and be combined with other funding sources that have important co-benefits, such as safety and congestion relief, while still reducing on-road emissions. The BIL requires all state DOTs to develop a carbon (transportation emissions) reduction strategy, in coordination with the state’s MPOs. Additionally federal guidance encourages DOTs, working with MPOs, to make their strategy “an integral part of their transportation planning process.” This can be achieved by incorporating the



KDOT TERS into future updates of the State Long Range Transportation Plan (LRTP) and Metropolitan Transportation Plans (MTPs).

The TERS must support projects and strategies that promote the reduction of transportation emissions. The BIL also allows States, at their discretion, to quantify the emissions from the transportation sector. Further, States should develop strategies that are appropriate for the population density and context of the state. Details about the fulfillment of BIL requirements can be found in **Appendix A (Federal Requirements)**.

Data Analysis/Baseline Conditions

Emissions Basics

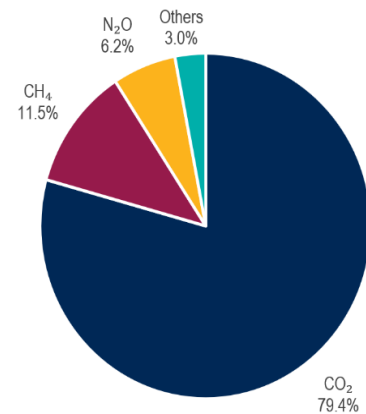
A “Greenhouse Gas” (GHG) is defined as “a gas that contributes to the greenhouse effect by absorbing infrared radiation.” As energy from the sun passes through the atmosphere, most energy is absorbed by the Earth’s surface. The remaining energy is reflected back to space unless absorbed by a greenhouse gas (the “greenhouse effect”). Greenhouse gases trap energy in Earth’s atmosphere that would otherwise be absorbed by the planet or reflected back into space.

Carbon dioxide (CO₂) is the primary GHG emitted by human activities and accounts for nearly 80 percent of U.S. GHG emissions. CO₂ is constantly being exchanged between the atmosphere, ocean, and land surface as it is both produced and absorbed by many microorganisms, plants, and animals (known as the “Carbon Cycle”). Emissions and removals of CO₂ by natural processes have historically tended to balance over time. Since the Industrial Revolution, human activities have substantially contributed to atmospheric CO₂. The main source of CO₂ is the combustion of fossil fuels (coal, natural gas, and petroleum), though other industrial processes and land management are contributors to CO₂ emissions.

National Transportation Emissions

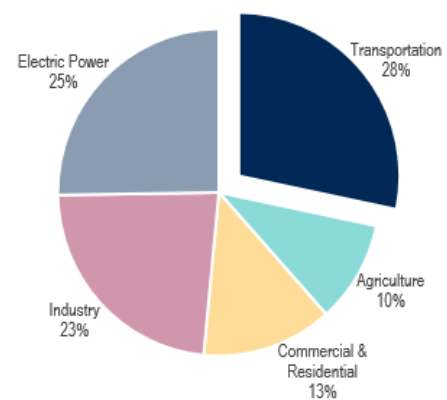
The United States transportation sector is responsible for the largest share of greenhouse gas emissions in the country at 28 percent. While some sectors, such as electric power, have seen their emissions decline as cleaner technologies have replaced high-emitting coal plants, the U.S. transportation sector has not experienced the same dramatic reduction of GHG emissions. This is at least partially due to the steadily increasing number of autos owned by U.S. drivers, which has not been completely offset by fuel efficiency or alternative fuel usage.

Figure 2: US GHG Emissions by Gas (2021)



Source: EPA
CH₄ = Methane
N₂O = Nitrous Oxide

Figure 3: US GHG Emissions by Sector (2021)



Source: EPA

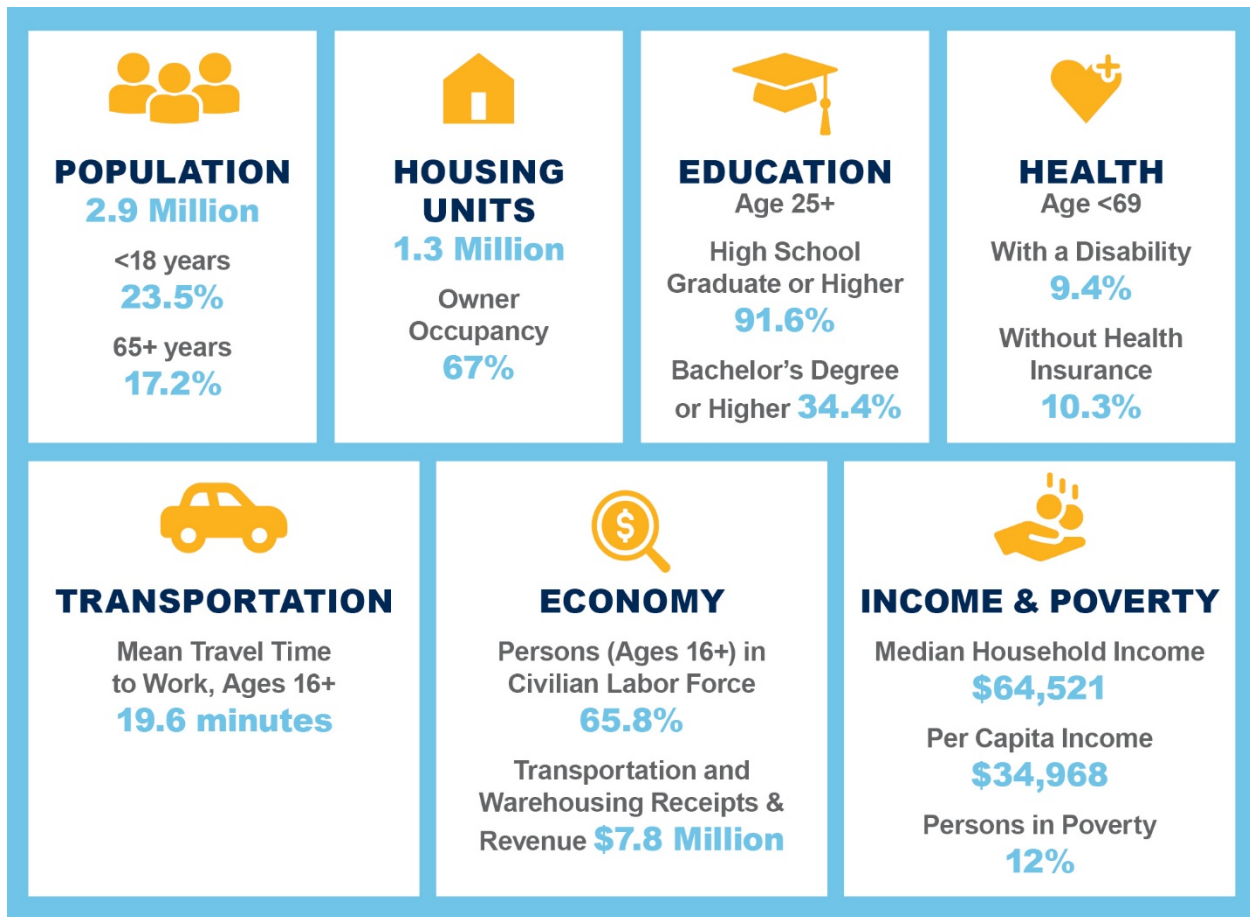


Kansas Perspective

Demographics

The BIL requires transportation emission reduction strategies to be appropriate to the population density and the context of the state. Therefore, the TERS should be considered with an understanding of the demographics of the state. This data can provide some insights into the emissions profile of the state of Kansas, can provide an understanding of what types of improvements may be effective, and can even identify potential co-benefits, for example, whether a project can deliver economic benefits or support workforce development. Figure 4 contains key statistics in the following categories: population, housing units, education, health, transportation, economy, and income and poverty.

Figure 4: Key Kansas Demographics



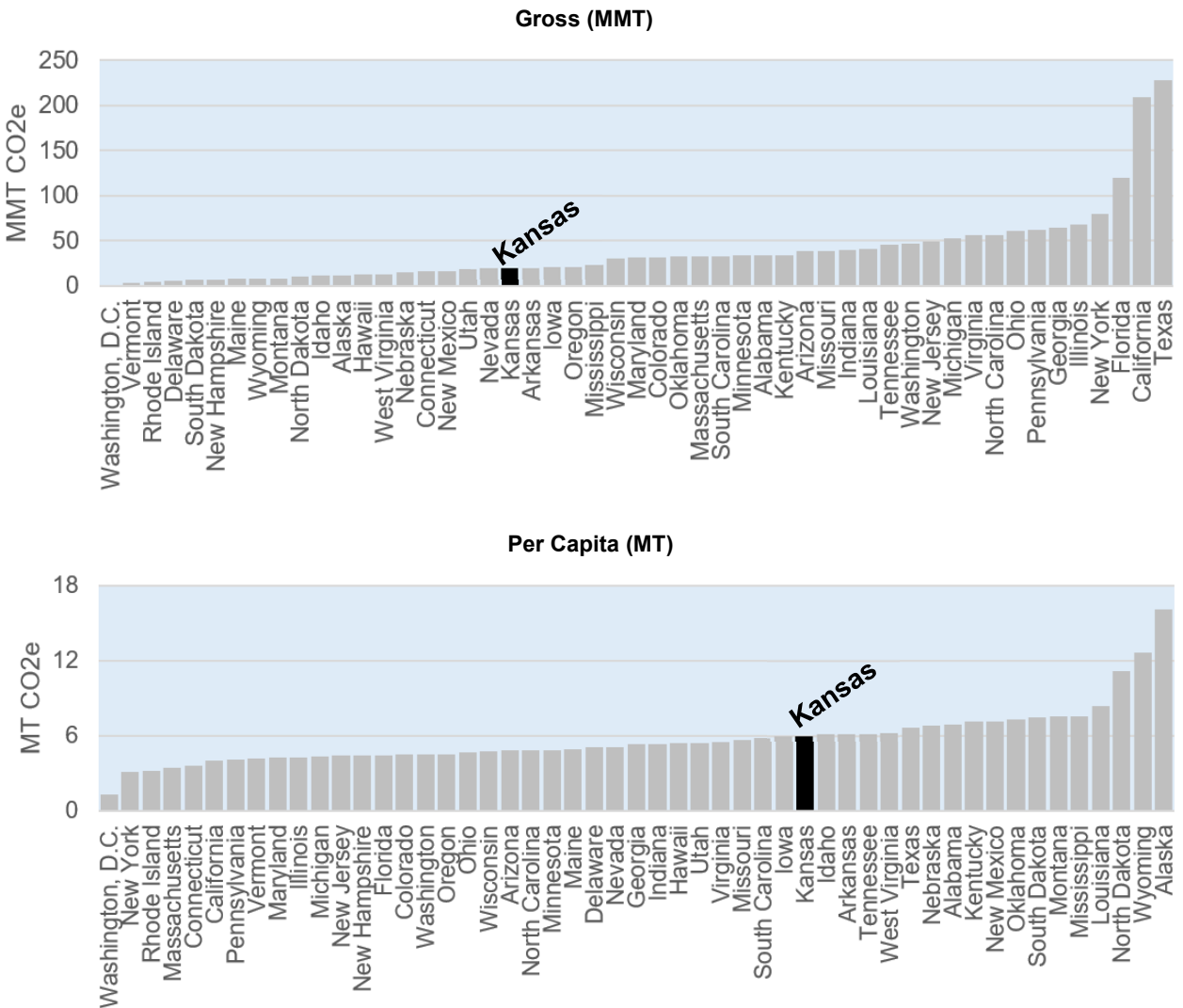
Source: U.S. Census



Emissions

Unlike national emissions, the largest share of Kansas’ statewide emissions comes from the agricultural sector (35 percent). Transportation as a sector ranks fourth (behind agriculture, industry, and electric power), accounting for sixteen percent of statewide GHG emissions. Pre-pandemic emissions data shows Kansas ranked 31st of all 50 states and Washington D.C. in transportation emissions at 19.5 million metric tons (MMT). However, Kansans’ per capita transportation emissions rank 18th nationally at 6.70 tons per person, slightly more than the national average of 6.52 tons per person. (See Figure 5.) Since Kansas ranks 35th in population among the United States, its gross emission ranking is in line with expectations. Also, areas with higher population densities and more robust public transit systems tend to have lower per capita emissions. Therefore, Kansas’ higher per capita ranking is expected given its lower population density and the lack of robust urban transit systems. This is further validated by the geographical difference in gross and per capita emissions within the state as depicted in Figure 5.

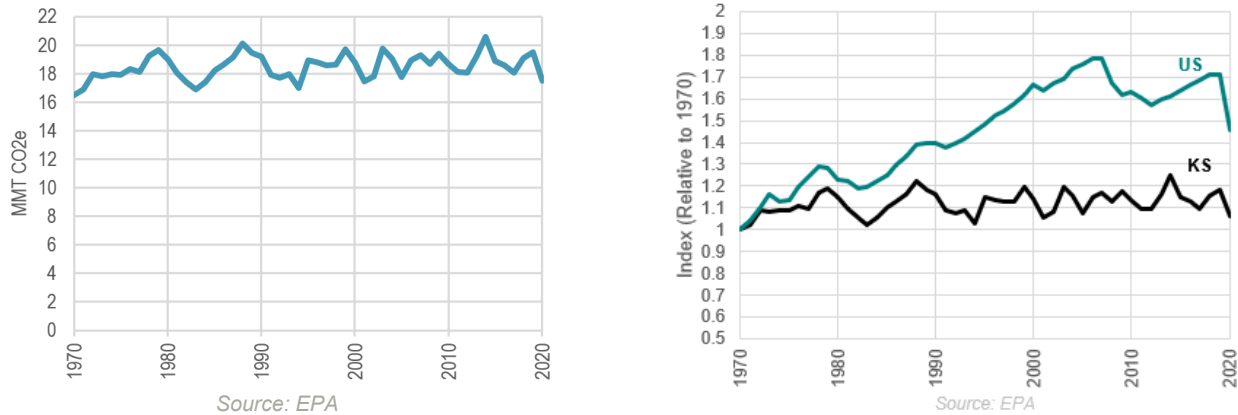
Figure 5. Statewide Transportation Emissions Index





It is worth noting that the state’s transportation emissions have remained fairly steady over the past 50 years (see Figure 6), while those of the U.S. as a whole have increased by nearly fifty percent.

Figure 5: Kansas GHG

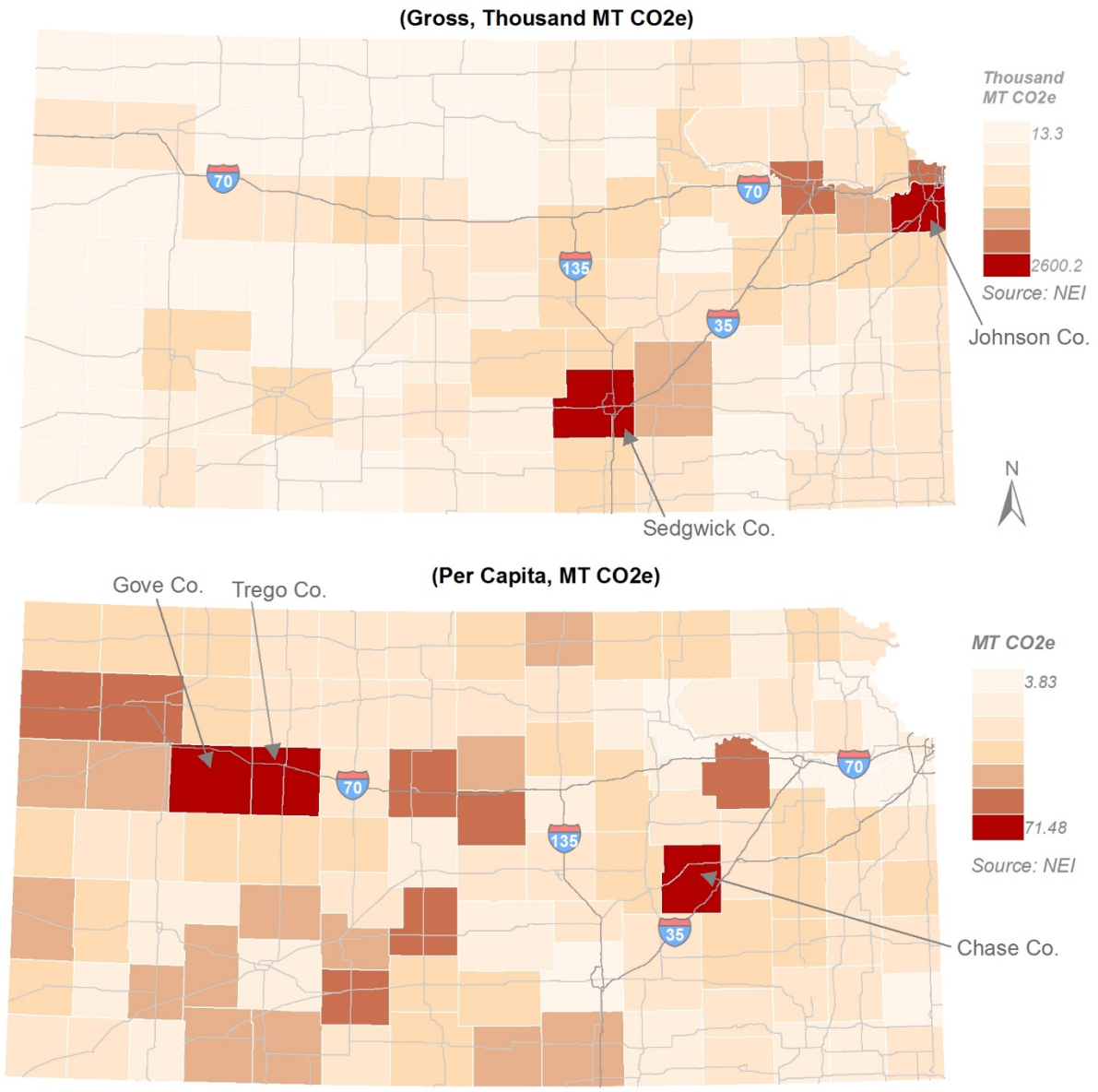


Kansas’ gross transportation emissions are highest in urban centers and along interstates. Johnson and Sedgwick counties lead Kansas counties in emissions at 2.6 and 2.1 MMT, respectively. Counties that contain interstates (I-70, I-35, I-135, and I-335) are also above average for Kansas emissions at the county level. However, counties with the highest gross emissions have low per capita emissions due to higher population, and low population counties containing an interstate are the highest per capita. See Figure 7.

More details about CO₂ emissions data can be found in Appendix B (CO₂ Emissions Data).



Figure 6: Kansas Transportation Emissions (2020)





Engagement Opportunities and Activities

Stakeholder Engagement is a vital component of the TERS, both in development and future implementation, as it provides a unique opportunity for those who call Kansas home to become informed and provide input on transportation emission reduction strategies. While developing the TERS, KDOT worked with stakeholders to generate awareness, guide communication, and identify collaboration opportunities.

Kansas Transportation Stakeholders

KDOT works closely with local and regional partners in delivering on its mission to provide a statewide transportation system that meets the needs of Kansas. Thus, input from, and cooperation with, stakeholders will be an important part of ensuring the success of the TERS.

Kansas is largely rural, but has several urban metropolitan centers located in the eastern third of the state. The transportation characteristics, and therefore the applicable transportation emission reduction strategies, of these two types of areas differ greatly. Figure 8 shows how Kansas' population is distributed among KDOT's six Districts, and also shows the locations and populations of the six urbanized areas, identifying the MPOs that oversee each one. A brief discussion of these two stakeholder categories follows.

Urbanized Areas: MPOs

MPOs play a large role in transportation planning and prioritization for metropolitan areas with populations of 50,000 or more people. Ultimately, more than half of all Kansans live in areas benefitted by MPOs. These organizations provide an important pathway for community education and input and ensure that unique community characteristics are recognized in statewide planning processes. MPOs can also provide leadership and innovation in key policy areas.

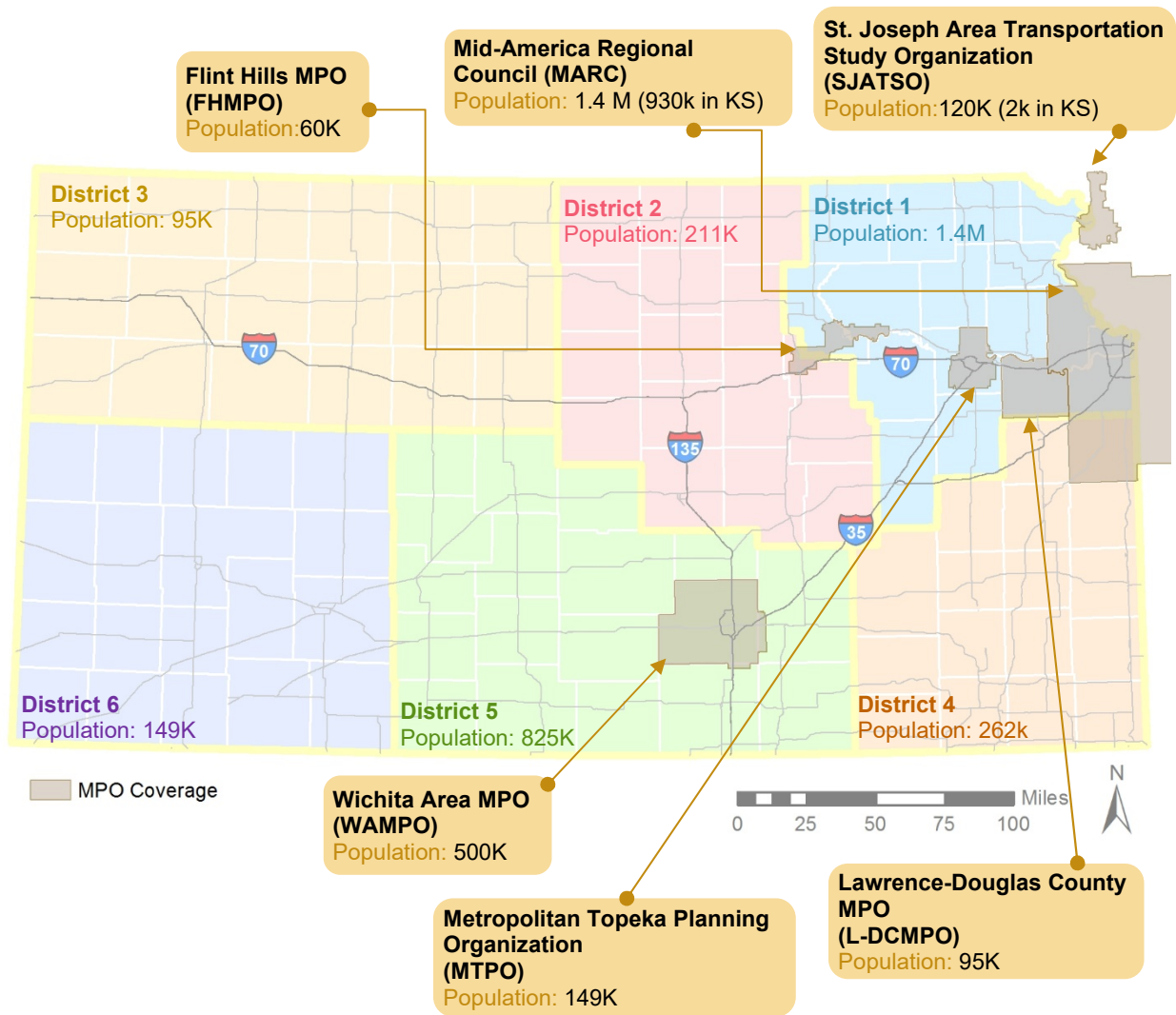
When it comes to advancing active transportation, promoting sustainability, and reducing transportation emission impacts, several of Kansas' MPOs are making important advancements. Many of Kansas' local plans and initiatives regarding climate and sustainability have been developed in urban areas. A summary of recent relevant examples can be found in Appendix C (Local Plans and Initiatives).

Rural Areas

Just over thirty percent of Kansans live in rural areas. While rural areas don't have formal, MPO like organizational connections to KDOT, there are many ways rural stakeholders make their voices heard concerning transportation in the state. For example, KDOT's Local Consult process, conducted at least biennially across KDOT's six Districts, is a forum for local citizens to share regional transportation needs and hear about KDOT's plans and investments in their areas. On a more ad hoc level, KDOT District and Area personnel communicate with their rural constituents regarding ongoing projects, maintenance needs, and more. KDOT is committed to having rural stakeholders play meaningful roles in the transportation emission reduction conversation, including solution development, communicating needs, and understanding local impacts and opportunities.



Figure 7: Stakeholder Geography - KDOT Districts and MPOs





Stakeholder Involvement in the TERS

Core Team

At the outset of TERS development, KDOT formed a Core Team to guide development from the agency perspective. The Core Team consisted of broad representation of Bureaus and Divisions across the organization: Planning, Engineering, Design, Project Delivery, Research, Public Engagement, Multimodal., Environmental Services, Program and Project Management, Field Operations, and Policy. FHWA’s Environmental, Civil Rights and Innovation Coordinator also participated in the Core Team. Areas of input from the Core Team included stakeholder engagement, data collection, goals/objectives definition, TERS themes, implementation strategies, project types, and project election framework development.

Stakeholder Meetings

From May to September of 2023, the Project Team met with a total of 10 stakeholder groups, including representatives from MPOs, state agencies, and Bureaus and Divisions within KDOT itself. See Table 2.

The Project Team provided participants with an overview of the federal CRP and solicited feedback on regional transportation priorities, as well as transportation emission reduction opportunities. Stakeholders assisted with the development of the TERS goals and objectives, provided relevant data, identified potential areas of concern, and provided input on the TERS. To increase awareness and the applicability of stakeholder input, cohort presentations were led by members of KDOT’s TERS development team and included overview materials and progress updates. The primary mode for stakeholder engagement was virtual teleconference meetings.

Stakeholder comments can be found in Appendix E (Stakeholder Comments).

Table 2: TERS Stakeholder Meetings

TERS Stakeholder Meetings, 2023	
May	KDOT Core Team, Round 1
June	MPOs, Round 1 <ul style="list-style-type: none"> • WAMPO • L-DCMPO, SJATSO, FHMPO • MARC • MTPO
August	Kansas Agencies <ul style="list-style-type: none"> • Kansas Department of Health and Environment (two sessions) • Kansas Department of Agriculture
September	KDOT Core Team Meeting, Round 2 MPOs, Round 2 <ul style="list-style-type: none"> • L-DCMPO, STAJSO, FHMPO • MARC and WAMPO Kansas Clean Transportation Council MARC Air Quality Forum Statewide Stakeholder Survey
October	MARC Total Transportation Policy Committee (TTPC) KDOT Secretary of Transportation Briefing



Online Survey

An online survey was created to provide regional transportation and planning leaders the opportunity to provide input on the TERS. The survey was designed to mirror the lines of dialogue and inquiry from MPO presentation and was disseminated via email with background information on KDOT's efforts and a link to federal CRP guidance. To determine the survey's audience, KDOT utilized its existing contact databases and researched public information resources, such as city websites, to identify municipal stakeholders from across Kansas' 105 counties. The survey was also provided to county and state government leaders, and industrial representatives whose service areas have unique transportation needs or impacts.

Given the unique and sometimes disparate qualities of Kansas' many population centers, as well as the emerging nature of the TERS, KDOT sought to decrease survey participation barriers by crafting broad, easy to understand questions with balanced qualitative and quantitative methods of inquiry. KDOT's polling solicited baseline input to create an informed view of community preferences and a framework for future opportunities.

The TERS survey was also designed to be responsive. Applicable questions included "other" categories or fields that allowed respondents to input novel answers not included in pre-populated response lists. Where applicable, open ended response options were incorporated into multiple choice questions. Ranked questions, where the addition of non-scored answers would skew outcomes, maintained set response option lists.

In all, the survey was provided to 822 Kansas stakeholders. A total of 70 respondents submitted feedback, resulting in an 0.085 percent response rate. Using a confidence level of 90 percent, the response rate allows for a 9.5 percent margin of error. This provides an additional lens through which polling conclusions can be considered. Results such as those below, where outcomes or response margins exceed 9.5 percent, may be considered representational. Survey results were analyzed in total for all respondents and then cross-referenced using question outcomes and demographics for additional insights, such as:

- Respondents who voiced support for the expansion of EV infrastructure were 14 percent more likely to be municipal government representatives.
- Across all respondents, three-quarters (71.4 percent) of those who indicated interest in using low-carbon concrete for future projects were municipal government representatives. The remainder were local county leaders.
- Most respondents (66.7 percent) who expressed interest in TERS projects that would electrify semi-truck parking areas to reduce engine idling were business/private enterprise representatives.
- Almost half (47 percent) of the respondents who indicated interest in semi-truck parking electrification were from communities with populations of 5,000 – 49,999. Compared to all respondents, survey takers who chose this option were 18 percent less likely to represent organizations with existing or planned transportation emission reduction goals.
- In aggregate, most (58.6 percent) survey respondents expressed some level of concern about environmental impacts.

Additional cross-respondent survey participation and response outcomes can be viewed in Figure 9. As with the stakeholder meetings, survey feedback was analyzed and used to refine TERS strategies. Interaction with these groups was ongoing; as the TERS progressed, so too did KDOT's dialogue with stakeholders. Additional



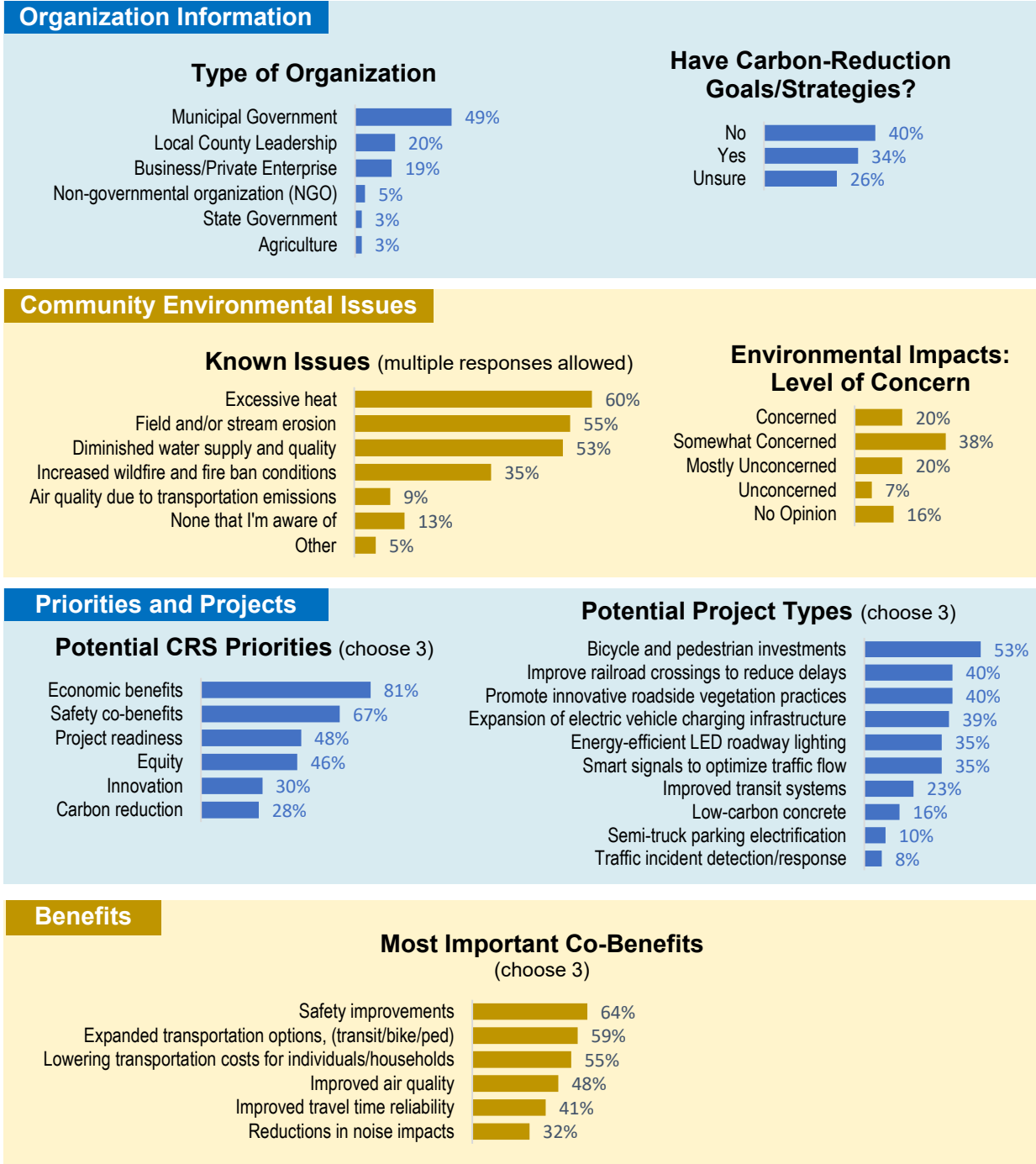
information regarding development of meetings and surveys can be found in the Stakeholder Engagement Plan, included with this document as Appendix D.

Website and Social Media

A project website is also being developed to serve as the TERS's central communications and resources hub. It will include project contact information, existing and upcoming opportunities for collaboration, and links to additional KDOT and State of Kansas resources. KDOT social media will be used to notify the public of the TERS website and its information resources.



Figure 8: Selected Stakeholder Survey Results





Program Goals

The TERS program goals provide an important framework for the development of the strategy itself. In addition to goal setting, some key emphasis areas were identified. The program goals and emphasis areas support the development of implementation strategies and the project selection framework.

Safety

A transportation system that is designed to protect its users, through implementing life-saving programs and infrastructure safety solutions.

Safety is one of KDOT’s priorities; investment decisions under the TERS will consider the safety co-benefits of eligible projects (see definition of “co-benefits” earlier in this document, on page 5). Common projects that can reduce transportation emissions and increase safety include, but are not limited to:

- Active transportation, which refers to non-motorized travel, most often by pedestrians and cyclists. Active transportation improvements focus on increasing connectivity, safety, and comfort for these transportation system users. A related area is complete streets, which support roadways that are designed to accommodate all users safely and efficiently, including non-motorized modes and transit.
- FHWA has proven roundabouts to be a safety enhancement due to their versatility. Roundabouts promote lower speeds which results in traffic calming, improved operational performance (an emissions benefit), and fewer conflict points.

Figure 9: Example of Bicycle Infrastructure



Source: Friends of Lawrence Area Trails

Because there are dedicated federal funding programs for safety and active transportation, many federal CRP projects could leverage other funding opportunities to advance projects. For example, Safe Streets and Roads for All (SS4A) is a discretionary program established by the BIL that provides funds through grants to reduce roadway injuries and deaths. Also, the Transportation Alternatives program is a set-aside under the Surface Transportation Block Grant. Among the eligible uses of Transportation Alternatives funding is walking or bicycling to cut down motorized morning and afternoon commutes while increasing safety and activity levels for students.



Equity

The consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment.

KDOT is committed to investing in transportation that provides equitable benefits across Kansas, supporting areas of historical underinvestment in rural and urban communities, and providing mobility solutions to allow all Kansans to access employment, education, and other destinations that promote the quality of life. Projects that can address historic underinvestment and modal and geographic equity include:

- Public transit, which addresses the mobility needs of people without access to an automobile. Transit can include fixed route bus service, demand-response transit, or fixed guideway transit projects like light rail. KDOT directly supports approximately 145 demand-response transit programs, covering most of the state.
- “Complete streets” is a design philosophy to enhance the safety and mobility of roadways for vehicles, pedestrians, cyclists, and public transit. These projects can also address equity by making investments in areas of historic underinvestment simply because they do not have demand for auto-oriented capacity investments.

Equity should be considered in the context of the Justice40 Initiative, a federal effort by the Biden Administration to deliver “forty percent of the overall benefits of certain federal investments [to] disadvantaged communities...” which is part of *Executive Order 14008, Tackling the Climate Crisis at Home and Abroad*. The Carbon Reduction Program is considered a Justice40 covered program.

One key consideration under the TERS will be addressing geographic equity. Investment decisions must consider the differing needs and applicability of projects based on the population density of an area, especially when identifying and prioritizing projects.

 **Innovation**

Application of new technologies, or new design/ planning / policy approaches to solve problems and improve lives.

Embracing new technologies and approaches can improve traffic flow, enhance reliability, mitigate congestion, increase safety, and reduce emissions. In the context of the TERS, it is best to address these issues without adding lane miles. Innovative technologies can accomplish this by “squeezing” additional capacity out of existing facilities. Ramp metering is one example of this approach, in which freeway on-ramp traffic is regulated to reduce traffic turbulence caused by random surges of merging vehicles. Because the federal CRP is a new program with increasing national and international attention on reducing transportation emissions, there will likely be new and exciting innovations in this area. Many of these will require additional research and testing, creating an opportunity for new pilot projects in addition to ones that are ongoing. Innovative solutions are often driven by emerging technology.

- The emergence of connected and automated vehicles (CAVs) holds promise for improving the safety and efficiency of our transportation system. While the technology is still maturing, there is already an impact on our roadways. Connected vehicles communicate with other vehicles and infrastructure to exchange information between the driver, vehicles, roadside, pedestrians, and bicyclists. CAVs offer the promise of more efficient and safer driving experiences through reduced human error, as well as improved system reliability, which in turn can reduce congestion related to traffic incidents.
- Intelligent Technology Systems (ITS) utilize a broad range of wireless and wireline communication technologies, providing information designed to increase the safety, mobility, and productivity of transportation infrastructure. ITS and CAV each generate and rely on large amounts of data, which in turn can drive additional innovative solutions such as predictive analytics.
- A great deal of research and innovation is also taking place in the area of sustainable materials and construction practices. For example, innovative materials and technologies that facilitate carbon sequestration, the process of carbon being removed from the atmosphere as a part of the carbon cycle, continue to evolve, improving vegetation practices (such as increasing the amount of carbon-absorbing plantings), materials (using more, and also more efficient, carbon-embodied materials), and even carbon-negative technologies (such as renewable natural gas).

Scientific breakthroughs routinely make headlines in various news outlets. Though a breakthrough may seem promising, only a small fraction of these technologies will eventually be successfully commercialized or achieve widespread adoption. A DOT can be an ideal partner in assisting innovative ideas and products by piloting and studying emerging technologies in real world environments and conditions. KDOT’s Innovative Technology Program provides one avenue to leverage state funds for innovative projects.



 **Sustainability**

Satisfying basic social and economic needs, both present and future, and responsibly using natural and financial resources, all while maintaining or improving the well-being of the natural environment.

A core value of the federal CRP is that all projects utilizing these funds must contribute to the reduction of transportation emissions and support a more sustainable and resilient transportation network. Resilient systems are by nature more sustainable because of reduced maintenance costs and longer lifespans. Transportation emission reduction is an important sustainability strategy.

- Alternative fuels present an important approach to sustainable transportation solutions since the combustion of fossil fuels is the leading contributor to CO₂ emissions in the transportation sector. Any fueling method that is derived from a source other than petroleum is considered an alternative fuel. Common examples of alternative fuels are biodiesel, ethanol, and electricity.
- Some less traditional opportunities to advance sustainability include right-of-way plantings and the installation of solar arrays in transportation rights-of-way. Transportation emissions sequestration could be improved by planting vegetation along the right-of-way. In addition, solar panels can also be installed, as highway right-of-way is typically free of trees and other hindering vegetation. These strategies help lessen the impact of the transportation sector, rather than directly targeting emissions.

The sustainability and resiliency benefits of some transportation projects may not always be readily apparent. For example, roundabouts lessen idling emissions from conventional intersections and the traffic flow is more continuous, resulting in fewer backups. Due to their versatile nature, roundabouts can be used at more complex intersections while maintaining safety. In addition, since they do not require signals, they are resilient in times of emergency when power is out. Other solutions include the elimination of rail grade crossings and truck parking electrification, both of which can be safe and sustainable solutions that also reduce emissions by limiting idling.

Figure 10: Kansas' First Solar-Powered Electric Vehicle Charging Station



Source: City of Olathe



Secondary Goals

In addition to the four TERS Goals, a set of secondary goals was identified. Many of these secondary goals may help support one or more of the four primary goals. These secondary goals helped to inform the identification of project types and implementation strategies.

- **Alternative Fuels** that reduce transportation emissions are an important element of sustainability. While electric vehicles garner the most attention in the effort to advance zero emissions mobility, advancements in hydrogen power and biofuels can be part of the overall strategy as well.
- **Rural Solutions** deserve specific consideration. Reducing congestion can be a highly effective way to reduce transportation emissions, but this tends to be an urban solution. The TERS project prioritization framework is careful to integrate consideration of project applicability that can vary depending on the population density of an area.
- **Complete Streets** projects can offer important co-benefits and align with existing KDOT priorities. Complete streets can address multiple modes, improve safety, and in some cases, address equity.
- Addressing **Freight Mobility** can reduce transportation emissions while also supporting economic development. This can be an important way to gain broader support for transportation emission reduction efforts. Since many freight improvements can occur in less heavily populated areas, they can also help support geographic funding equity.
- Addressing **Labor and Workforce Development** can be coupled with major transportation investments. Workforce considerations can present both a needs and an opportunity in areas of innovation (like emissions reduction), which often require new skillsets and training.
- Advancing **Transit** is an effective way to reduce emissions. This can be accomplished by investments supporting a mode shift to transit or converting transit fleets to alternative fuels which is a highly reliable means to reduce emissions per person miles traveled.



Alignment with Kansas Long Range Transportation Plan

A State DOT's “Library of Plans” should be aligned to set a consistent direction. In developing the TERS, the current Kansas Long Range Transportation Plan (LRTP) was analyzed to avoid potential policy conflicts and leverage existing adopted goals and objectives. These can offer support for certain areas of emphasis with the KDOT TERS.

The most recent update of the Kansas LRTP was completed in July 2021, before the requirements of the BIL to create a carbon (transportation emissions) reduction strategy. Nonetheless, the LRTP does, at least indirectly, support the Goals and Objectives of the TERS. Specifically, the LRTP Goal areas of Transportation System Management and Stewardship align well with the TERS. Relevant objectives within the LRTP include:



- Provide the information, infrastructure, and services that **keep people and goods moving**.
- Prepare for and reduce the **impact of disruptive events** [weather related natural disasters or human threats] to make the movement of people and goods more reliable.
- Enhance **transportation choices** for users of all modes throughout the state.
- Leverage **technology** to improve the efficiency of the existing transportation system.
- Make travel easier and more convenient through efficient **connections between and within modes**.
- Support a **safe and reliable multimodal** transportation network.
- Commit that KDOT and transportation partners will “act as a good neighbor and steward for **our natural, cultural, and environmental resources**”.

KDOT will integrate key elements of the TERS into the Kansas LRTP at its next update.



Implementation Strategies

The BIL requires state carbon reduction strategies to “support and identify projects and strategies that support the reduction of transportation emissions.” Recognizing that simply developing a TERS that addresses how to program federal CRP funding is not KDOT’s only means of reducing emissions. KDOT’s TERS is supported by strategic policies, partnerships, programs, and project priorities, as described below.

Policy Considerations

- **L RTP:** Incorporate transportation emission reduction objectives in the update of the Kansas Long Range Transportation Plan.
- **Pilot Projects:** Given the new nature of the federal CRP and innovations in transportation emission reduction, KDOT will explore pilot projects instead of statewide policies in areas such as fleets and facilities.
- **Program Synergy:** Leverage federal CRP funding with other programs such as the Safe Streets and Roads for All, Highway Safety Improvement Program, Promoting Resilient Operations for Transformative, Efficient, and Cost-saving Transportation (PROTECT) Program, Surface Transportation Block Grant – Transportation Alternatives set-aside, and the Congestion Mitigation Air Quality (CMAQ) Program (only applicable to MARC and WAMPO) to the extent there are overlapping eligibility and complementary objectives that can be achieved through these funding sources.
- **Recognize Existing Efforts:** KDOT is already implementing projects that reduce emissions. By creating awareness of the emission reduction benefits of projects beyond those utilizing federal CRP funding, KDOT can build on these efforts and demonstrate a broader impact in terms of reducing on-road emissions.

Partnership Opportunities

- **Partnerships:** Include ongoing input from, and inform, a wide range of key stakeholders, such as MPOs, local governments, transit agencies, universities, and private non-profits, regarding efforts to reduce transportation emissions, deployment of emissions reducing investments, and implementation of Carbon Action Plans.
- **Innovation:** Identify potential research projects and leverage university partnerships to advance innovative transportation emission reduction approaches.
- **Inside KDOT:** Establish an intra-agency working group within KDOT to oversee the implementation of the TERS. Consider including resiliency (Resilience Improvement Plan), sustainability, and electric vehicle (NEVI) deployment as part of the effort to effectively coordinate activities between programs.
- **Inside Kansas Agencies:** Work with key state agency partners, such as the Kansas Department of Agriculture, Kansas Department of Health and Environment, and Kansas Department of Commerce, to establish an inter-agency Transportation Emission Reduction Working Group. For example, efforts to deploy broadband infrastructure through the Office of Broadband Development in the Kansas Department of Commerce represent a key opportunity for inter-agency coordination.



Program Enhancements

- **Administration:** Formalize a transportation emission reduction program within KDOT to implement and monitor the TERS.
- **Monitoring:** Formally monitor progress and continually update the TERS.
- **Low Hanging Fruit:** Accelerate projects that meet eligibility and use funds to advance existing prioritized needs.
- **Effectiveness:** Focus investments with the highest net value/effectiveness in reducing transportation emissions.
- **Feasibility:** Consider ease of implementation when prioritizing funding.
- **Bottom Line:** Prioritize funding for projects that have key co-benefits in the advancement of TERS goals.
- **Leverage Additional Funding:** Develop and support projects with transportation emission reduction benefits that can compete for discretionary grant opportunities.
- **Geographic Equity:** Consider both urban and rural needs in setting priorities.
- **Modal Diversity:** Consider the movement of both people and goods in setting priorities.
- **Measurement:** Begin with qualitative (and simple quantitative) measures of project effectiveness, to ultimately develop an evaluation tool that quantifies the transportation emission reduction benefits of candidate projects.



Project Types

Based on the BIL, FHWA Guidance, research conducted for this TERS, and stakeholder feedback, four categories of projects have been selected for consideration through the KDOT TERS: (1) System efficiency and reliability; (2) Facilities, land management, and materials; (3) Vehicle emissions; and (4) Demand management and mode shift. Each category supports transportation emission reduction and sustainability by focusing on projects and systems within KDOT’s purview that utilize innovative technology to decrease emissions. Going forward, as projects, systems, and technologies are considered in these categories, they will be reviewed in conjunction with the TERS goals of safety, modal and geographic equity, innovation, and sustainability.

It is important to note that not all project examples identified in the remainder of this section may be eligible for federal CRP funding. For example, funding for operations and construction practices or sustainable materials may not be eligible on their own but can be part of an overall strategy or enhance and support another project. This is in line with the state’s approach to the TERS: it is not simply focused on programming / leveraging federal funds, but more broadly on strategies that will move the state’s transportation system, and KDOT as an agency, toward a lower emissions future.





<p>1</p> <p>SYSTEM EFFICIENCY & RELIABILITY</p> 	<p>2</p> <p>FACILITIES, LAND MANAGEMENT, & MATERIALS</p> 
<p>3</p> <p>VEHICLE EMISSIONS</p> 	<p>4</p> <p>DEMAND MANAGEMENT & MODE SHIFT</p> 



System Efficiency and Reliability

Projects that improve system efficiency and reliability can reduce emissions primarily by reducing roadway congestion. These can include ITS, alternative intersections, railroad grade-crossing elimination, and traffic incident management. These types of projects and operational approaches can reduce idling and optimize existing infrastructure, typically without adding new lane miles.

Table 3: System Efficiency and Reliability
System Efficiency and Reliability

System Efficiency and Reliability	
Examples	How Projects Reduce Transportation Emissions
<ul style="list-style-type: none"> • Intelligent Transportation Systems (ITS) • Transportation System Management and Operations (TSM&O) • Traffic Incident Management (TIM) • Traffic monitoring and signage • Intersection improvements/ roundabouts • At-grade rail crossing elimination • Truck parking 	<ul style="list-style-type: none"> • Projects can enhance system reliability and capacity, reducing congestion and incident delays (and therefore emissions due to idling) without new travel lanes. • Improving truck parking availability reduces the time and travel needed to locate space. • At-grade rail crossing elimination projects improve safety, reduce greenhouse emissions, can be designed with elements to address climate change, support responsible land use and transportation design, and support domestic manufacturing.
How Projects Advance TERS Goals	
 Safety	TIM projects improve incident response times and save lives. Intersection improvements and rail-crossing improvements reduce the potential for crashes.
 Equity	Truck parking benefits rural communities by allowing truck staging for better service and economic development in rural areas, and by reducing parking intrusion into communities.
 Innovation	Innovative intersections and connected vehicles and signals are on the front edge of transportation innovation.
 Sustainability	Roundabouts are more resilient since they don't require signals. Technology solutions that avoid major highway capacity expenditures allow state funds to be stretched further.
Additional Considerations	
<ul style="list-style-type: none"> • ITS and TSM&O are effective in densely populated urban areas and highly trafficked freight corridors. • Technology and operational enhancements can be relatively lower cost compared to traditional infrastructure expansion projects. • Larger construction projects may be too costly to fund solely with federal CRP funds. • Need to consider the potential impact of construction on emissions. 	



KDOT Examples – System Efficiency and Reliability

KDOT has several ongoing or completed projects or initiatives that fall in this category and the sections below describe each in more detail.

Kansas Statewide ITS Plan: This plan is a strategic plan to deploy ITS technologies throughout the state. The Plan uses ITS deployments in rural and urban areas of Kansas as a foundation to determine future needs and integration requirements statewide. The plan also identifies ITS projects and develops a strategy for integrating and mainstreaming ITS into the KDOT structure. The related *Statewide ITS Architecture Integration and Implementation Plan* further articulates the road map for deployments.

Great Plains Rural Freight Technology Corridor: FHWA awarded KDOT a \$6.7 million grant to support the development of a technology corridor between Finney and Thomas Counties in western Kansas. The \$14.6 million project will install 100 miles of fiber optic cable along U.S. 83, a key freight transportation route, serving over 5,000 commercial trucks daily, to deliver advanced technology such as traffic, weather, and operational information to commercial truckers to optimize freight routing. The project will enhance the mobility of truckers along this freight route and reduce congestion in underserved, rural communities.

KanDrive: KanDrive is an interactive web and mobile mapping tool of Kansas roadways, giving users the ability to navigate incidents, construction, traffic speeds, and winter driving at the state, regional, and metropolitan levels. Launched in 2009, KanDrive has increased the efficiency of the state’s roadway network for all types of roadway users.

Cypress Rail Yard Improvements: Improvements to the Cypress Railyard along the Union Pacific Kawbridge Rail Station will rehabilitate 6,839 track feet and upgrade the idle railyard into a transloading facility. Located south of Jay B. Dillingham Memorial Highway, the 1.3-mile railyard crosses 3rd Street and Central Avenue in Kansas City, an area proposed to provide trucking access after the improvements are complete. Starting in September of 2022, the estimated \$4.75 million project will allow freight to transport products in greater amounts and at a quicker rate than trucks, eliminating the need for storage warehouses and decreasing the amount of fuel used in the supply chain process.

Non-KDOT Examples - System Efficiency and Reliability

Variable Speed Limits (VSLs): Speed limits are determined by traffic engineers using a variety of inputs. However, roadway conditions are susceptible to change due to suboptimal conditions. If ideal conditions do not exist and the roadway does not match a driver’s expectations, there is a greater chance that driver error could result in a crash. VSLs are capable of adapting to changing roadway circumstances. According to the FHWA, VSLs can reduce crashes on freeways by up to thirty-four percent for total crashes, sixty-five percent for rear-end crashes, and fifty-one percent for fatal and injury crashes. While this does not explicitly reduce transportation emissions, efficiency gains in the roadway system implicitly reduce emissions by managing incidents, which can cause congestion.





Reversible Traffic Lanes: Reversible traffic lanes are a potential solution to mitigating peak-hour congestion. These types of managed lanes change direction depending on temporal demand. When used on interstates, these lanes are completely separated in the center of a freeway. Arterial roadways utilizing reversible lanes use dynamic signage to inform drivers of the direction of the middle lane, depending on peak or off-peak operation. These lanes may also be used following other lane management strategies. For reversible lanes to be warranted, traffic flow should exhibit or be expected to exhibit an imbalance of 70/30, meaning that traffic is flowing 70 percent in one direction and thirty percent in the other.



Facilities, Land, and Materials Management

Emissions can also be reduced by making transportation related facilities more efficient, managing land to enhance emissions capture, and employing sustainable transportation construction techniques.

Table 4: Facilities, Land, and Materials Management
Facilities, Land, and Materials Management

Examples	How Projects Reduce Transportation Emissions
<ul style="list-style-type: none"> • Energy efficient lighting • Energy efficient structures and equipment • Sustainability certifications • Vegetation management along ROW • Solar panels in ROW (medians and stormwater ponds) • Low carbon emitting concrete • Sustainable construction practices 	<ul style="list-style-type: none"> • Energy efficient lighting and buildings reduce energy consumption and long-term maintenance. • Certain vegetation can serve as emissions sinks (sequestration) • The addition of solar power could help ROWs become emissions negative. • Cement is a major contributor to global GHG emissions; limiting the amount necessary will reduce the embodied carbon of KDOT assets.
How Projects Advance TERS Goals	
 Safety	Concrete that includes Supplementary Cementitious Materials (SCM) is more durable and less prone to failures that can cause accidents.
 Equity	KDOT facilities and operations exist across the entire state, so everyone benefits. This provides equitable benefits across Kansas, supporting areas of historical underinvestment, and providing mobility solutions.
 Innovation	Sustainability in both construction and land management requires the adoption of innovative practices and materials.
 Sustainability	Using native plants along road ROW and mowing less frequently supports healthy biodiversity.
Additional Considerations	
<ul style="list-style-type: none"> • Extensive research by academia and industry have been sustainable pavements materials and designs. • KDOT already has sustainable ROW management programs in place with substantial experience. • KDOT is already replacing streetlights with energy efficient bulbs. • Although sustainable construction may not qualify for federal CRP funding, it is still aligned with KDOT TERS goals and can enhance project benefits. 	



KDOT Examples – Facilities, Land and Materials Management

KDOT Concrete Specifications: During the cement making process, the ingredients are heated in a kiln to 2,700 °F. This requires a large input of energy and releases carbon from the ingredients themselves. The carbon emissions from this process are difficult to abate. Therefore, one of the main strategies to reduce carbon emissions is to use less cement. This can be accomplished through using supplementary cementitious materials (SCMs), which, when included in a concrete mixture, makes the final product stronger and more durable, with less carbon emissions. KDOT already utilizes SCMs, typically replacing between twenty to thirty percent of cement content in a concrete mixture. Furthermore, as of 2022, almost all of the cement in KDOT’s concrete mixtures was type 1L, also known as Portland-limestone cement. This type of cement contains five to fifteen percent limestone, which reduces carbon emissions by approximately ten percent, compared to “standard” type 1 cement.

KDOT Pollinator Program: KDOT has undertaken several initiatives over the last two decades involving right-of-way, plantings, and promotion of pollinator activity. This includes restoring right-of-way to emulate prairie ecology (for at least two decades); developing new seed/wildflower mixes and erosion control practices (2004 and 2017); updating the agency’s mowing policy to allow native wildflowers and grasses to set seed (2008); joining the five state Monarch Highway agreement targeting I-35 for pollinator habitat improvements; and successfully competing for grants to fund plantings and restore habitats (2018 and 2019).

Non-KDOT Examples – Facilities, Land and Materials Management

Materials in General: Every industry is looking for ways to reduce its carbon footprint. Carbon emissions associated with the manufacturing, installation, transportation, and demolition of construction materials are referred to as *embodied carbon*. Combined, concrete and steel account for about fifteen percent of global GHG emissions. The so called “cradle to gate” carbon emissions of construction materials (emissions of raw materials extraction and product manufacturing) are the largest source of emissions from KDOT operations. Innovative projects may have various degrees of risk and benefits wherein potentially “game changing” technologies, materials, processes, or methods, require significant additional evaluation before widespread implementation.





Carbon Capture Utilization and Storage (CCUS): As mentioned in the *KDOT Concrete Specifications* section, due to the process of manufacturing cement being highly carbon intensive and difficult to abate, this makes the industry ripe for the use of carbon capture technologies. While this technology has been used in Europe, it has yet to take root in North America. According to the Global Cement and Concrete Association’s Green Cement Technology Tracker, there are currently only six cement plants in the U.S. that have announced either feasibility studies, demonstration, or pilot projects. According to the EPA’s Facility Level Information on Greenhouse Gases Tool (FLIGHT), the eighth and eleventh highest carbon emitting point sources in Kansas are cement plants (Ash Grove and Monarch).



Vehicle Emissions

These projects reduce emissions by investing in alternative fuels, whether by directly switching to new fuels or providing infrastructure that supports that switch. They can also include vehicle innovations such as connected and automated vehicles.

Table 5: Vehicle Emissions

Vehicle Emissions	
Examples	How Projects Reduce Transportation Emissions
<ul style="list-style-type: none"> • State owned fleet conversion to alternative fuels • EV charging stations • Truck parking electrification • Connected and automated vehicles (CAV) • Diesel retrofits • Scrappage programs 	<ul style="list-style-type: none"> • Alternative fuels are designed to substitute for carbon emitting fuels. • EV Charging stations encourage a more widespread use of EVs. • Truck parking electrification allows truckers access to A/C, internet, and other electrified amenities while their vehicles are powered down. • Connected and/or automated vehicles can theoretically drive more efficiently than humans, saving fuel and getting more capacity from existing roads.
How Projects Advance TERS Goals	
 Safety	A proliferation of EV charging stations helps eliminate the safety concerns that underlie “range anxiety”. CAVs offer the potential to reduce human error and enhance safety.
 Equity	Filling the gaps in the EV network can benefit underserved and rural communities.
 Innovation	Innovation is the foundation for expanding the use of alternative fuels. CAVs continue to be a space for innovation.
 Sustainability	Electric vehicle implementation helps consolidate what are now point source emissions, enabling better emissions management.
Additional Considerations	
<ul style="list-style-type: none"> • Initial investments may be high but will save money over time. • Fleet conversion is more practical than conversion of individually owned vehicles. • Due to proprietary technologies and potential commercial interests, truck parking electrification may be challenged by federal limits in public ROW. • Installing EV chargers in ROW along interstates could make EVs more available to rural areas (need to consider federal limits on commercial activity in ROW) 	



KDOT Examples – Vehicle Emissions

Charge Up Kansas: The National Electric Vehicle Infrastructure Formula Program (NEVI) provides Kansas funding to strategically deploy electric vehicle charging infrastructure and establish an interconnected network to facilitate data collection, access, and reliability. Approximately \$39.5M was allocated to Kansas over five years (about \$8M/year) for electric vehicle infrastructure. The *Charge Up Kansas NEVI Plan* was approved on September 14, 2022, and was created to address the needs of all Kansans.

Non-KDOT Examples – Vehicle Emissions

Hydrogen Fuel Cells: While a thorough explanation of the science of hydrogen fuel cells is beyond the scope of this document, this technology uses hydrogen as an input source to generate electricity, to be used for a variety of applications, while only emitting water vapor. Fuel cells for transportation applications have been in use since the 1960s, when they were used in NASA’s Apollo program. Since then, substantial research and development has taken place to use these fuel cells to power passenger vehicles, commercial trucks, buses, forklifts, and boats. While hydrogen refueling infrastructure in the U.S. is currently limited to California and a single station in Hawai’i, USDOT considers hydrogen fuel cells an important part of the nation’s decarbonization strategy, along with battery-electric vehicles, and other zero-emitting vehicles. In June 2023, the U.S. Department of Energy published the *U.S. National Clean Hydrogen Strategy and Roadmap*. While hydrogen fuel cells are not ideal for all applications, there are some applications, especially large vehicles, commercial trucks, and buses, where hydrogen fuel cells could provide benefits over batteries.





Diesel Retrofits: The KDHE established the Kansas Clean Diesel Program in 2008 to distribute funds from the EPA’s Diesel Emissions Reduction Act (DERA) State Grant Program. This program will provide funding to Kansas entities that operate nonroad mobile equipment and school districts to make fleet improvements to their school buses. This program also hopes to distribute funding in the future from the Volkswagen Environmental Mitigation Trust Fund. While these programs focus specifically on-air pollutants other than GHGs, these cleaner technologies typically bring reductions to GHGs as an additional benefit. As KDHE is a partner of KDOT in the TERS, this program could potentially be a source of collaboration between the two entities.



Demand Management and Mode Shift

These projects focus on reducing the number of single-occupant vehicle (SOV) trips. This can occur by shifting trips to non-SOV modes such as transit, bicycle, and pedestrian trips. Shifting demand can also involve projects and policies that reduce transportation demand through efforts such as carpooling and managed lanes. Travel demand can even be reduced by investments in broadband to enable working from home in rural and underserved areas or telemedicine.

Table 6: Demand Management and Mode Shift
Demand Management and Mode Shift

Demand Management and Mode Shift	
Examples	How Projects Reduce Transportation Emissions
<ul style="list-style-type: none"> • TDM programs (e.g., Carpooling) • Transit • Managed lanes (e.g., High-occupancy, express lanes) • Bike lanes • Multi-use paths • Connecting sidewalk gaps • Telecommuting (Broadband provision) 	<ul style="list-style-type: none"> • Shifts mode of travel from single occupant vehicles. • Influences travel behavior to reduce congestion, especially at peak travel times. • Telecommuting can eliminate vehicle trips.
How Projects Advance TERS Goals	
 Safety	Bike-Ped improvements increase safety for the most vulnerable road users.
 Equity	Multimodal/service improvements can enhance access to jobs and essential services in underserved areas.
 Innovation	Technology and innovative practices can be used to manage demand.
 Sustainability	Bike-Ped and transit are among the most sustainable transportation options.
Additional Considerations	
<ul style="list-style-type: none"> • Managed lanes have the potential for revenue generation. • TDM and multimodal solutions are typically more effective and feasible in densely populated areas. • More research is needed to gauge how much mode shift could be expected, especially for Bike-Ped. 	



KDOT Example Projects – Demand Management and Mode Shift

69 Express: The 69 Express project will construct an additional through lane on US-69 in Overland Park, between 103rd Street and 151st Street, to reduce congestion, improve travel time, and address increased crash frequency along this transportation corridor. Situated on the busiest four-lane highway in Kansas, US-69’s express lane will give drivers a choice to pay a toll and drive in the free flowing lane, improving travel time and reliability while reducing congestion on the existing lanes. By decreasing the amount of stop and go traffic and vehicles idling during peak hours, the amount of fuel and transportation emissions exhausted along the route is expected to be reduced significantly along with increased safety for drivers. The project is currently under construction.

Broadband Equity, Access, and Deployment (BEAD): The National Telecommunication Information and Administration allocated \$451 million in Kansas toward closing the “digital divide”. Underserved locations are defined as those with less than 100 Megabytes per second (Mbps) download and 20 Mbps upload speed, and unserved locations with no internet access, are given priority by BEAD. In August 2023, a Five-Year Action Plan was submitted. Sustainable broadband is critical to the construction of redundant fiber networks, improving infrastructure, improving energy efficiency, and reducing emissions by eliminating copper cables, reducing mining, increasing the ability to work remotely, and cutting down on commute times.

Non-KDOT Example Projects – Demand Management and Mode Shift

Regional and Local Active Transportation: Feedback received in the development of the TERS regularly identified active transportation as one of the most desired improvements that can reduce emissions and provide the co-benefit of improving safety. Because of this strong interest, it is worth recognizing the important efforts to plan for and improve bicycle and pedestrian infrastructure and safety throughout the state. Highlights include the Greater Kansas City Regional Bikeway Plan (2014), the Metropolitan Topeka Planning Organization’s Fast-Track Bike Plan (updated 2020), the Topeka Metro Bikes bike-share program, the Topeka Pedestrian Master Plan (2016), the Lawrence Bikes Plan (2019), the Douglas County-wide Bike Plan (2021), the Lawrence Pedestrian Plan (2022), the Flint Hills MPO’s Regional Connections Plan (2020), the Junction City Active Transportation plan (2020), and the SJATSO (St. Joseph MPO) Complete Streets Roadmap (2021). Through these coordinated efforts, Kansas went from being ranked 47th to 30th in the League of American Bicyclist’s *Bicycle Friendly State Rankings*.



Kansas Projects Funded with Federal CRP Dollars To Date

During the development of the TERS, KDOT began programming federal CRP funds to reduce transportation related emissions and to begin implementing feedback received on TERS strategies. In particular, opportunities arose to work with the Active Transportation Program at KDOT to jointly fund pedestrian access projects in Ashland and Lecompton and to fund the Sternberg Connector in Hays, a 10-foot-wide concrete path.

Additionally, KDOT initiated a federal CRP funded Community Chargers Pilot Program alongside its National Electric Vehicle Infrastructure (NEVI) Program. This Pilot Program is intended to fund electric vehicle charging infrastructure throughout communities in Kansas, particularly in those areas that are not along designated alternative fuel corridors. Locations may include, but are not limited to, downtown corridors, parks, local public buildings, workplaces, and tourist destinations. KDOT staff is currently evaluating project applications and moving towards project selection.

KDOT’s goal is to utilize the available federal CRP funds for projects expected to yield reductions in transportation related emissions while implementing projects in a timely and efficient manner. KDOT staff has been exploring ideas for projects that can be obligated in an expedited timeframe with minimal risks for implementation delay. Federal CRP funds are allocated into a statewide flexible fund for use anywhere in the state and then by population. Since the federal CRP was a new federal program and did not have formal program guidance, KDOT transferred the allowable 50 percent of federal CRP funds for FFY 2022 into other federal transportation programs.

Table 7: KDOT Federal CRP Programming To Date

Project Sponsor	Project Name	Project Description	Federal CRP Programmed Amount
Lecompton	Lecompton Sidewalk Loop*	Construct 5' sidewalks, brick enhancements, crosswalk improvements, and sharrows.	\$467,818
Hays	Sternberg Connector Multi-Use Path Extension	Construct 10' concrete path.	\$1,547,967
Ashland	Downtown Pedestrian Access Improvement Project*	Construct sidewalks, high visibility crosswalks, bulb-outs, lighting, and other streetscape elements.	\$987,924
Total			\$3,003,709

*Jointly funded with Transportation Alternatives funding.



MARC and WAMPO are responsible for programming the TMA (200,000+ population) funds sub-allocated to their respective regions. KDOT has the responsibility to program the statewide flexible funding, as well as the funds allocated to Small MPO areas (with consultation with the MPOs), areas with a population of 5,000-49,999, and areas under 5,000 in population.

MARC and WAMPO have programmed federal CRP funding for the following projects to date. These projects will progress after an amendment to the State Transportation Improvement Program (STIP) is complete at the end of 2023.

Table 8: MARC Federal CRP Programming To Date

Lead Agency	Project Name	Project Description	Total Federal Funding	Funding Programmed by Year	
			Kansas	2024	2025
Kansas City Area Transportation Authority	Electric Buses and Charging Infrastructure and Training	Replace 2 retiring Diesel Buses with 2 Battery Electric Buses, Install 2 Depot Chargers. Includes replacement parts and Workforce Development.	\$1,320,000	\$1,320,000	\$0
Johnson County	“Connecting JOCO” - A Coordinated Public Electric Vehicle Infrastructure Pilot Project	Consists of 17 proposed sites spanning 8 municipalities in the southwest Kansas City metropolitan area.	\$1,320,000	\$1,320,000	\$0
Merriam	Citywide Streetlight LED Upgrades	Replace high-pressure sodium bulbs with LED bulbs in city-owned streetlights, various locations.	\$522,867	\$522,867	\$0
UG/KCK	Northeast KCK Heritage Trail	Complete missing sidewalk connections from Kaw Point to 5th Street, utilizing existing public right-of-way. Connect with Riverfront Heritage Trail and Kaw Point, including direct off-street routes to both Downtown Kansas City, Kansas and the West	\$1,200,000	\$0	\$1,200,000



Lead Agency	Project Name	Project Description	Total Federal Funding	Funding Programmed by Year	
			Kansas	2024	2025
		Bottoms neighborhood in Kansas City, Missouri (KCMO).			
MARC	Johnson Drive Traffic Signal Enhancements	Install network communications, Pan-Tilt-Zoom (PTZ) cameras and traffic signal controllers as part of the Operation Green Light program.	\$157,904	\$157,904	\$0
Overland Park	Sustainable Medians Pilot Project	Convert all turf grass medians along 95th street between Quivira and Mission Road to a sustainable, no-mow plant material.	\$150,000	\$150,000	\$0
Mission	Bike Share in Northeast Johnson County	3 hubs with 10 bikes each in Mission, and 2 hubs with 10 bikes each in Roeland Park.	\$503,046	\$503,046	\$0
Gardner	Gardner Traffic Signal Interconnect	Update traffic signal systems to more efficiently move traffic.	\$240,000	\$0	\$240,000
Overland Park	Driver Feedback Sign Speed Management	Purchase and install solar-powered driver feedback signs at key locations to remind drivers of the posted speed limit vs their speeds.	\$0	\$100,000	\$0
Total Programmed			\$5,413,817	\$4,073,817	\$1,440,000



Table 9: WAMPO Federal CRP Programming To Date

Lead Agency	Project Name	Total Federal Funding	Funding Programmed by Year	
		Kansas	2024	2025
Sedgwick County	Maple Street Pathway	\$39,827	\$0	\$39,827
Bel Aire	53rd St Multiuse Path	\$292,242	\$292,242	\$0
Valley Center	Seneca St Multiuse Path	\$417,310	\$0	\$417,310
Wichita	Multimodal Facility (MMF)	\$1,000,000	\$1,000,000	\$0
Wichita	Redbud Path, Woodlawn to K-96	\$2,234,019	\$0	\$2,234,019
Total Programmed		\$3,983,398	\$1,292,242	\$2,691,156

Future projects will be programmed according to the population distribution required in federal guidance and it will be consistent with the strategies in the TERS.

Project Selection Framework

As part of the TERS, KDOT is initiating a framework to rank and select federal CRP eligible projects according to their emissions benefits. Initially, the framework will primarily utilize a qualitative approach. A more quantitative, data-driven project selection process requires refinement and validation of tools to measure project effectiveness in producing a net reduction of transportation emissions. Therefore, KDOT may develop a more detailed prioritization approach as its program matures, incorporating research and best practices. The criteria below may be considered in evaluating and prioritizing potential projects to be funded with federal CRP funding.

Project Effectiveness

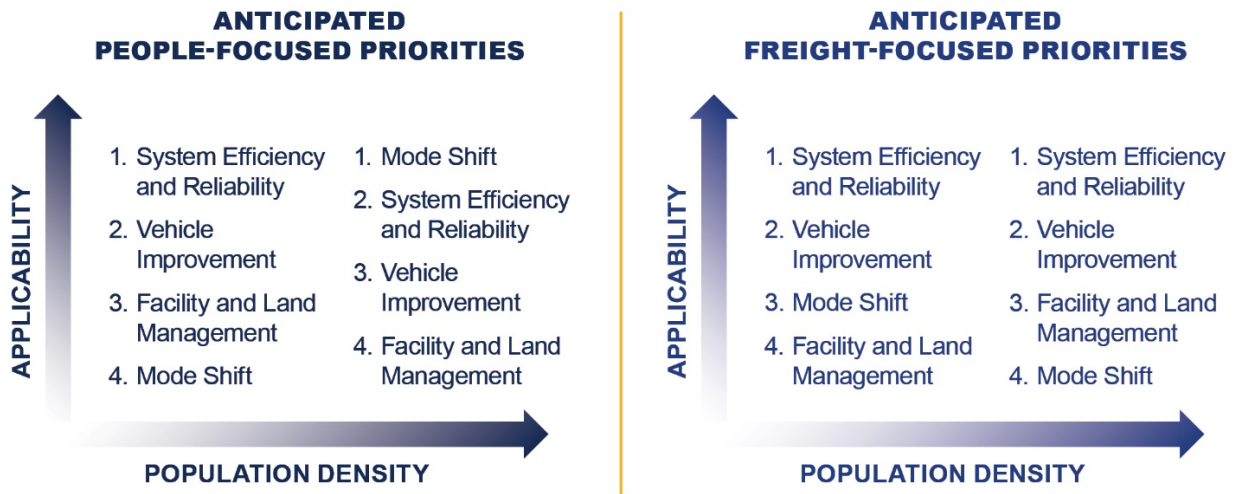
The effectiveness of the project will be measured based on the expected net reduction in transportation emissions, including consideration of the emissions impacts of construction as an offset.

Project Type and Location

The “first filter”, before evaluating a project against the TERS goals, will be to consider the applicability of the project to its proposed geographical context and the type of transportation it represents. Freight and people moving projects will be initially prioritized/scored based on whether they serve urban or rural areas, as shown in Figure 12.



Figure 11: First Filter Prioritization



TERS Goals

The project selection process will consider the extent to which projects advance or include co-benefits advancing the TERS goals of Safety, Equity, Innovation, and Sustainability.

Program Priorities

Certain program priorities have been identified for additional consideration in evaluating projects. These include:

- **Project Readiness:** Priority will be given to projects based on the ease of implementation and whether funding will accelerate or fund an existing need or priorities.
- **Leverage other funding:** Given the limited funding and priority from projects with co-benefits, priority will be given to projects that leverage other funding sources.
- **Advancement of other Programs:** Consideration will be given to whether the project advances a specific KDOT Program (e.g., ITS, Truck Parking) or enhances economic development objectives.



Moving Forward

The TERS is an important step for KDOT, and it will inform future steps that continue to enhance the transportation system and improve the lives of all Kansans. Future TERS evolutions will continue to be informed by consultation with the state’s MPOs and other key stakeholders. KDOT is committed to updating the strategy every four years. KDOT looks forward to an ongoing partnership with FHWA and, more broadly the USDOT, to make the TERS a living document that addresses objectives that align with national priorities and are tailored to Kansas’ needs. While both the source of funding and the strategy document are new, KDOT’s commitment to investing in sustainable and resilient transportation solutions is not.

The following are the key next steps associated with the TERS:

- *Certification:* FHWA acknowledgement that the TERS meets federal CRP statutory requirements.
- *Program Establishment:* KDOT will initiate a formal program to advance sustainability and transportation emissions reduction. The program will track TERS implementation progress, set priorities, and build on and leverage existing partnerships.
- *Project Selection Framework:* KDOT will finalize, pilot, and implement a project prioritization framework based around the goals and strategies set forth in this document, to be applied to Project Types described in detail elsewhere in this document. A primary use of this framework will be to help allocate federal CRP funds.
- *Quantification:* KDOT will begin the development of more quantitative measures to evaluate project effectiveness and refine the project prioritization framework. This will be accomplished by internal coordination of key resources, tracking best practices and research in the area, potentially initiating research efforts, and learning from the work of key transportation partners such as the MPOs in Kansas.
- *Monitoring:* KDOT will continue to monitor progress toward transportation emissions reduction in the following ways:
 - Tracking projects,
 - Leveraging existing state/federal data sources and reporting,
 - Documenting relevant cross-agency efforts,
 - Supporting/observing partner and stakeholder initiatives, and
 - Examining the agency’s own emissions profile over time.



**KDOT TRANSPORTATION
EMISSIONS REDUCTION
STRATEGY**



APPENDIX A:

FEDERAL REQUIREMENTS

(FROM FHWA GUIDANCE APRIL 2022)



CARBON REDUCTION STRATEGIES

1. General: By November 15, 2023, States are required to develop a Carbon Reduction Strategy in consultation with any MPO designated within the State (23 U.S.C. 175(d)(1)). The State Carbon Reduction Strategy shall support efforts to reduce transportation emissions and identify projects and strategies to reduce these emissions. The Carbon Reduction Strategy must be updated at least once every four years (23 U.S.C. 175(d)(3) and (4)). States and MPOs are encouraged to obligate CRP funding for projects that support implementation of the State's Carbon Reduction Strategy.

2. Development: States, in coordination with MPOs, are encouraged to develop their Carbon Reduction Strategies as an integral part of their transportation planning processes, such as by integrating them into the State's Long-Range Statewide Transportation Plan (LRSTP), the MPO's Metropolitan Transportation Plan (MTP), or by developing a separate document which is incorporated by reference into the LRSTP and MTP.

States may request technical assistance from FHWA for the development of their Carbon Reduction Strategy (See 23 U.S.C. 175(d)(5)).

Development of a Carbon Reduction Strategy is an allowable use of CRP funds (see Eligibilities below).

3. Contents: Each Carbon Reduction Strategy shall (See 23 U.S.C. 175(d)(2)):

- A. support efforts to reduce transportation emissions;
- B. identify projects and strategies to reduce transportation emissions, which may include projects and strategies for safe, reliable, and cost-effective options—
 - i. to reduce traffic congestion by facilitating the use of alternatives to single-occupant vehicle trips, including public transportation facilities, pedestrian facilities, bicycle facilities, and shared or pooled vehicle trips within the State or an area served by the applicable MPO, if any;
 - ii. to facilitate the use of vehicles or modes of travel that result in lower transportation emissions per person-mile traveled as compared to existing vehicles and modes; and
 - iii. to facilitate approaches to the construction of transportation assets that result in lower transportation emissions as compared to existing approaches;
- C. support the reduction of transportation emissions of the State;
- D. at the discretion of the State, quantify the total carbon emissions from the production, transport, and use of materials used in the construction of transportation facilities within the State; and
- E. be appropriate to the population density and context of the State, including any metropolitan planning organization designated within the State.

4. Review: Not later than 90 days after the State submits a request for the approval of a Carbon Reduction Strategy, the Secretary will review the process used to develop the Carbon Reduction Strategy and either certify that the Carbon Reduction Strategy meets the requirements of 23 U.S.C. 175(d)(2) or deny certification and specify the actions necessary



for the State to take to correct the deficiencies in the State's process for developing the Carbon Reduction Strategy (23 U.S.C. 175(d)(4)).

ELIGIBILITIES AND COORDINATION REQUIREMENTS

1. General: CRP funding may be used on a wide range of projects that support the reduction of transportation emissions. Projects must be identified in the Statewide Transportation Improvement Program (STIP)/Transportation Improvement Program (TIP) and be consistent with the Long-Range Statewide Transportation Plan and the Metropolitan Transportation Plan(s). (23 U.S.C. 134 and 23 U.S.C. 135)

Projects are subject to requirements under the National Environmental Policy Act (42 U.S.C. 4321 *et seq.*), the Uniform Relocation Assistance and Real Property Acquisition Act of 1970 (42 U.S.C. 4601 *et seq.*), and other applicable Federal laws. Projects funded with CRP funds are required to be treated as projects on Federal-aid highways (23 U.S.C. 175(g)).

2. Program Evaluation: States are encouraged to incorporate program evaluation including associated data collection activities from the outset of their program design and implementation to meaningfully document and measure their progress towards meeting an agency priority goal(s). Title I of the Foundations for Evidence-Based Policymaking Act of 2018 (Evidence Act), Pub. L. No. 115-435 (2019) urges federal awarding agencies to use program evaluation as a critical tool to learn, to improve equitable delivery, and to elevate program service and delivery across the program lifecycle. Evaluation means "an assessment using systematic data collection and analysis of one or more programs, policies, and organizations intended to assess their effectiveness and efficiency." Evidence Act § 101 (codified at 5 U.S.C. § 311). Credible program evaluation activities are implemented with relevance and utility, rigor, independence and objectivity, transparency, and ethics (OMB Circular A-11, Part 6 Section 290).

Evaluation costs are allowable costs unless prohibited by statute or regulation, and such costs may include the personnel and equipment needed for data infrastructure and expertise in data analysis, performance, and evaluation. (2 CFR Part 200).

3. Eligible Activities: Subject to the general eligibility requirements described in Section E.1 of the Carbon Reduction Program Implementation Guidance memorandum dated April 21, 2022, the following activities are listed as eligible under 23 U.S.C. 175(c):

A. a project described in 23 U.S.C. 149(b)(4) to establish or operate a traffic monitoring, management, and control facility or program, including advanced truck stop electrification systems;

B. a public transportation project eligible for assistance under 23 U.S.C. 142 (this includes eligible capital projects for the construction of a bus rapid transit corridor or dedicated bus lanes as provided for in BIL Section 11130 (23 U.S.C. 142(a)(3));



C. a transportation alternatives project as described in 23 U.S.C. 101(a)(29) as in effect prior to the enactment of the FAST Act,³ including the construction, planning, and design of on-road and off-road trail facilities for pedestrians, bicyclists, and other nonmotorized forms of transportation;

D. a project described in section 23 U.S.C. 503(c)(4)(E) for advanced transportation and congestion management technologies;

E. a project for the deployment of infrastructure-based intelligent transportation systems capital improvements and the installation of vehicle-to-infrastructure communications equipment, including retrofitting dedicated short-range communications (DSRC) technology deployed as part of an existing pilot program to cellular vehicle-to-everything (C-V2X) technology;

F. a project to replace street lighting and traffic control devices with energy-efficient alternatives;

G. development of a carbon reduction strategy (as described in the Carbon Reduction Strategies section above);

H. a project or strategy designed to support congestion pricing, shifting transportation demand to nonpeak hours or other transportation modes, increasing vehicle occupancy rates, or otherwise reducing demand for roads, including electronic toll collection, and travel demand management strategies and programs;

I. efforts to reduce the environmental and community impacts of freight movement;

J. a project to support deployment of alternative fuel vehicles, including— (i.) the acquisition, installation, or operation of publicly accessible electric vehicle charging infrastructure or hydrogen, natural gas, or propane vehicle fueling infrastructure; and (ii.) the purchase or lease of zero-emission construction equipment and vehicles, including the acquisition, construction, or leasing of required supporting facilities;

K. a project described under 23 U.S.C. 149(b)(8) for a diesel engine retrofit;

L. certain types of projects to improve traffic flow that are eligible under the CMAQ program, and that do not involve construction of new capacity; (23 U.S.C. 149(b)(5) and 175(c)(1)(L)); and

M. a project that reduces transportation emissions at port facilities, including through the advancement of port electrification.

Other projects that are not listed above may be eligible for CRP funds if they can demonstrate reductions in transportation emissions over the project's lifecycle. Consistent with the CRP's goal of reducing transportation emissions, projects to add general-purpose lane capacity for single occupant vehicle use will not be eligible absent analyses demonstrating emissions reductions over the project's lifecycle. For example, the following project types may be eligible for CRP funding:



Sustainable pavements and construction materials

Sustainable pavements technologies that reduce embodied carbon during the manufacture and/or construction of highway projects could be eligible for CRP if a lifecycle assessment (LCA) demonstrates substantial reductions in CO₂ compared to the implementing Agency's typical pavement-related practices. The LCA Pave Tool can be used to assess the CO₂ impacts of pavement material and design decisions.

Climate Uses of Highway Right-of-Way

Projects including alternative uses of highway right-of-way (ROW) that reduce transportation emissions are also eligible. For example, renewable energy generation facilities, such as solar arrays and wind turbines, can reduce transportation emissions. And, biologic carbon sequestration practices along highway ROW to capture and store CO₂ may demonstrate potential for substantial long-term transportation emissions reductions. State DOTs Leveraging Alternative Uses of the Highway Right-of-Way Guidance provides information on these practices.

Mode Shift

Projects that maximize the existing right-of-way for accommodation of nonmotorized modes and transit options that increase safety, equity, accessibility, and connectivity may be eligible. Projects that separate motor vehicles from pedestrians and bicyclists, match vehicle speeds to the built environment, increase visibility (e.g., lighting), and advance implementation of a Safe System approach and improve safety for vulnerable road users may also be eligible. Micromobility and electric bike projects, including charging infrastructure, may also be eligible.

States should work with the FHWA on eligibility questions for specific projects. The CMAQ Emissions Calculator Toolkit is an available resource for estimating the CO₂ emissions benefits of certain projects.

5. Consultation and Coordination:

Coordination in Urbanized Areas

Before obligating funds for eligible projects in an urbanized area that is not a transportation management area, a State must coordinate with any MPO that represents the urbanized area prior to determining which activities should be carried out under the project (23 U.S.C. 175(e)(4)). The State and MPO must also use their documented public involvement processes, including their process for seeking out and considering the needs of those traditionally underserved by existing transportation systems, such as low-income and minority households, who may face challenges accessing employment and other services (23 U.S.C. 450.210(a)(1)(viii) and 450.316(a)(1)(vii)).

Consultation in Rural Areas

Before obligating funds for an eligible project in a rural area, a State must consult with any regional transportation planning organization or MPO that represents the rural area prior to determining which activities should be carried out under the project (23 U.S.C. 175(e)(5)).



The State and MPO must also use their documented public involvement processes, including their process for seeking out and considering the needs of those traditionally underserved by existing transportation systems, such as low-income and minority households, who may face challenges accessing employment and other services (23 U.S.C. 450.210(a)(1)(viii) and 450.316(a)(1)(vii)).



**KDOT TRANSPORTATION
EMISSIONS REDUCTION
STRATEGY**



APPENDIX B:

**CO₂ EMISSIONS
DATA**

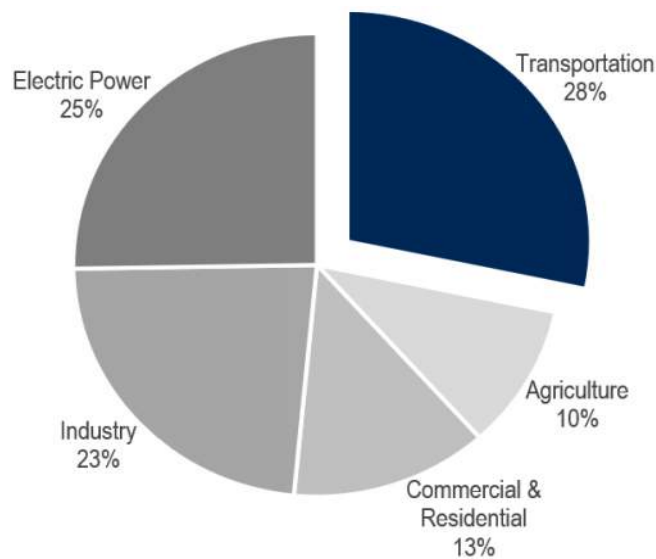


Introduction and Context

The United States transportation sector is responsible for the largest share of greenhouse gas emissions in the country at 28 percent. The Bipartisan Infrastructure Law (BIL) established a source of funding for state Departments of Transportation (DOTs) to reduce transportation emissions. Each DOT, in collaboration with Metropolitan Planning Organizations (MPOs), is required to develop and submit a Carbon Reduction Strategy (CRS) to the United States DOT (USDOT) by November 15, 2023 and update the strategy every four years.

While some sectors, such as electric power, have seen their emissions decline as cleaner technologies have replaced high greenhouse gas (GHG) emitting coal plants, the United States transportation sector has not experienced the same dramatic reductions. Ahead of state-level carbon reduction strategies, in January 2023, *The U.S. National Blueprint for Transportation Decarbonization* was released, outlining high-level national goals, challenges, and strategies as a joint venture between USDOT, US Department of Energy (DOE), US Environmental Protection Agency (EPA), and US Department of Housing and Urban Development (HUD).

Figure 1. U.S. GHG Emissions by Sector (2021)

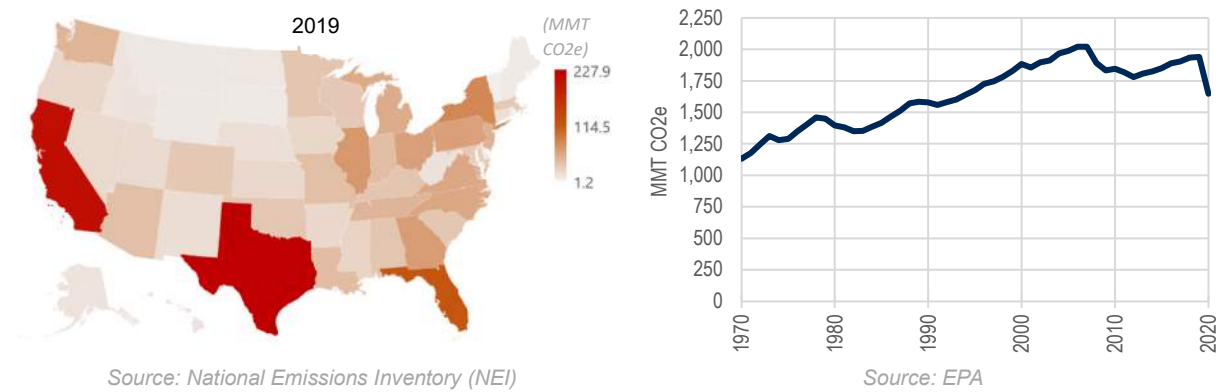


Source: EPA



Counting and inventorying GHG emissions is voluntary in a CRS, but Kansas DOT (KDOT) has chosen to do so. As seen on the right side of **Figure 2**, U.S. transportation emissions hit an all-time-high in 2007 at two billion metric tons. Emissions decreased from 2008-2012, largely due to recession, but steadily increased until COVID-19 quarantines intervened, and stay-at-home orders drastically altered transportation for millions of Americans. Unlike other sectors – such as industry and electric power, where the largest emitters are single facilities – transportation emissions come from tens of millions of individuals. There is no “silver bullet” for GHG reduction in the transportation sector; strategies to reduce emissions are complex, nuanced, multi-faceted, and intertwined (one strategy may increase or reduce the efficacy of another).

Figure 2. United States Transportation Emissions

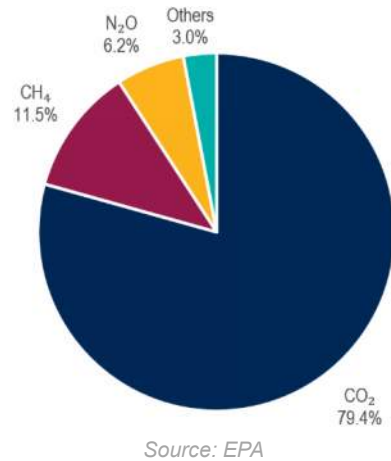




Greenhouse Gases

A “Greenhouse Gas” (GHG) is defined as “a gas that contributes to the greenhouse effect by absorbing infrared radiation.” As energy from the sun passes through the atmosphere, most solar energy is absorbed by Earth’s surface. The remaining energy is reflected back to space unless absorbed by a greenhouse gas (the “greenhouse effect”). Greenhouse gases trap infrared energy in Earth’s atmosphere that would otherwise radiate back to space. There are three main greenhouse gases and one class of multiple gases containing fluorine that are associated with anthropogenic sources (human generated); Carbon Dioxide (CO₂), Methane (CH₄), Nitrous Oxide (N₂O), and Fluorinated Gases (HFCs, PFCs, NF₃, and SF₆). To compare emissions and the effects from each gas, a multiplier, known as “Global Warming Potential” (GWP) is applied to the mass of emitted gas, which uses CO₂ as a reference. The unit of the resulting values is known as CO₂e, or “Carbon Dioxide Equivalent.” Each greenhouse gas and their prevalence in the transportation sector is discussed below.

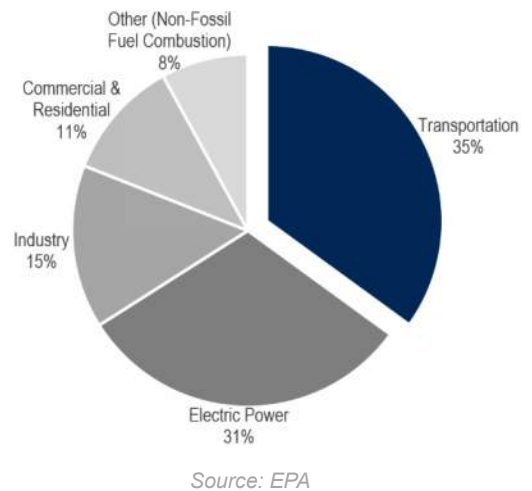
Figure 3. U.S. Greenhouse Gas Emissions by Gas (2021)



Carbon Dioxide (CO₂)

Carbon dioxide is the primary greenhouse gas emitted by human activities and as illustrated in **Figure 3**, accounts for nearly 80 percent of anthropogenic GHG emissions. Carbon dioxide is constantly being exchanged between the atmosphere, ocean, and land surface as it is both produced and absorbed by many microorganisms, plants, and animals – known as the “Carbon Cycle”, which includes many other molecules which contain carbon. Emissions and removals of CO₂ by natural processes have historically tended to balance over time. However, since the time of industrial revolution, human activities have substantially contributed to atmospheric carbon dioxide. The main source of carbon dioxide is the combustion of fossil fuels (coal, natural gas, and petroleum), though other industrial processes and land management are contributors to CO₂ emissions. Nationally, the transportation sector accounts for the highest share of CO₂ emissions, as seen in **Figure 4**. Because CO₂ is the primary greenhouse gas, its GWP is 1.0, and “CO₂ Equivalent” (CO₂e) is used as the “unit” GHG of which the other GHGs are compared.

Figure 4. U.S. Carbon Dioxide Emissions by Economic Sector (2021)





Methane (CH₄)

Methane is the second-most-emitted greenhouse gas and accounts for roughly 12 percent of anthropogenic GHG emissions. Nationally, the main source of methane emissions are leaks in natural gas systems, livestock, and the decay of waste in landfills. Transportation is not a main source of methane emissions as the combustion of fossil fuels does not produce relatively large quantities of methane. Methane has a shorter lifespan when compared to other greenhouse gases, though its potential to absorb energy and contribute to warming gives it a GWP of 25 to 28, making it a more potent greenhouse gas than carbon dioxide.

Nitrous Oxide (N₂O)

Nitrous Oxide accounts for about six percent of total GHG emissions, but only 40 percent of nitrous oxide emissions come from anthropogenic sources. Nitrous oxide plays an important role in the nitrogen cycle, as many biological processes require nitrogen, but molecular nitrogen (N₂) is generally unreactive. The main source of nitrous oxide is agricultural soil management, accounting for 73 percent of emissions. The next four most common sources account for between four and five percent of emissions each are – combustion, wastewater treatment, manure management, and transportation. Nitrous Oxide generally remains in the atmosphere for over 100 years and has more warming potential than either methane or carbon dioxide, with a GWP of 256 to 310.

Fluorinated Gases (CFCs, HFCs, SF₆, NF₃)

Unlike the other GHGs, fluorinated gases are a class of no less than 29 gases containing fluoride, are not found in nature in significant quantities, and have no role in biological processes or element cycling. While some industrial processes, such as aluminum and semiconductor manufacturing, can emit fluorinated gases, these emissions are small compared to the most common use: refrigerants. The best-known fluorinated gas, Dichlorofluoromethane (CCl₂F₂), more commonly known by its commercial name, Freon™ was banned in 1987 at the Montreal Protocol for depleting the ozone layer in the upper atmosphere. The transportation sector contributes to fluorinated gas emissions through leakages and disposal of air conditioning systems in vehicles. Because of this, emissions from transportation sector related fluorinated gas emissions from the are incredibly difficult to quantify and estimate. For this reason, they are typically not estimated and considered negligible, sector wide. Fluorinated gases can remain in the atmosphere for tens of thousands of years and are generally orders-of-magnitude stronger, in terms of energy absorption, than the other GHGs. The GWP of fluorinated gases ranges from 12 (HFC-161) to 23,500 (SF₆), so despite being emitted in smaller quantities, the effects on climate make gases from this class potentially the most potent GHG, in terms of long-term effects.



Emissions Scopes

GHG emissions are commonly categorized into “scopes” based on the level of control that an organization has over the specific emissions source. The three scopes as defined by the organization known as GHG Protocol (the industry standard for emissions accounting) are:

Scope 1 – Direct emissions, generated by an organization onsite (e.g., emissions associated with fuel combustion in boilers, furnaces, vehicles).

Scope 2 – Indirect emissions, generated offsite to produce energy. (e.g., electricity, district steam, cooling)

Scope 3 – Indirect emissions, upstream and downstream activities that support an organization (e.g., transportation and production of construction materials, employee commuting, business travel, waste generated in operations)



Data Sources and Methodology

For the purposes of this inventory, emissions data has been collected from various sources. When available, emissions data from the EPA's National Emissions Inventory (NEI) 2020 data set was preferred. In some case, emissions data were estimated directly using data provided by KDOT, and the estimation methodologies are discussed in their respective sections.

EPA National Emissions Inventory (NEI)

The NEI is a compilation of U.S. emissions of criteria air pollutants (CAP), hazardous air pollutants (HAP), and greenhouse gases (GHG) at the county level. The NEI is released every three years, with the latest release being in March 2023 of emissions data for 2020. It is recognized that this data is influenced by the COVID-19 pandemic, and therefore likely underestimates or overestimates typical emissions, but it is useful for making geographic comparisons as well as grasping the general order-of-magnitude of Kansas transportation emissions. Estimates use internationally accepted methods outlined in Intergovernmental Panel on Climate Change (IPCC) guidance and United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines. On-road mobile emissions are modelled using the latest edition (version 3) of EPA's Motor Vehicle Emissions Simulator (MOVES) model using inputs from state, local, and tribal (S/L/T)-submitted activity data. If no S/L/T data was submitted, inputs for MOVES were estimated based on data from the Federal Highway Administration (FHWA), US Energy Information Agency (EIA), and other data sources. For Kansas, the latter methodology was used as no county or state agency submitted data for NEI calculations and modelling.¹

Greenhouse Gas Emissions and Sinks Inventory

The EPA provides emissions data similar to that provided by the NEI in the Greenhouse Gas Emissions and Sinks Inventory, but the data has been aggregated to the state and national level. For the purposes of this document, data from this report was used for figures and graphs comparing emissions across economic sectors, state-level emissions across time, and comparisons between states.

Kansas Department of Transportation (KDOT)

KDOT provided data on their vehicle fleets, facilities, and pavement construction activities. These datasets were used to calculate KDOT's share of state-level emissions. More information on these datasets and emissions calculation methodologies are given in the *KDOT Operations* section.

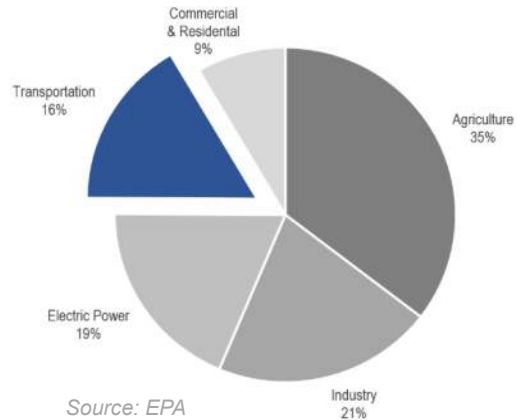
¹ For a more detailed explanation of NEI On-Road Mobile Emissions methodology, please refer to 2020 NEI Technical Support Documents: <https://www.epa.gov/air-emissions-inventories/2020-national-emissions-inventory-nei-technical-support-document-tsd>



Overall Kansas Emissions & National Rankings

Unlike national emissions, the largest share of Kansas' statewide GHG emissions comes from the agricultural sector (35 percent) as illustrated in **Figure 5**. Transportation ranks fourth of five economic sectors, accounting for 16 percent of statewide GHG emissions. Unlike US emission trends, which have exhibited a steady rise since 1970, Kansas emissions, while being slightly higher than they were in 1970, have remained relatively constant in this time period (**Figure 6**). When compared against every state; shown in **Figure 7**, Kansas ranks well below the 50-year national average trend of emissions growth.

Figure 5. Kansas GHG Emissions by Sector (2019)



As seen in **Figure 8**, pre-pandemic emissions data indicates that Kansas ranked 31st highest of the 50 states and Washington DC in transportation emissions at 19.5 million metric tons carbon equivalent (MMT CO₂e). However, Kansas' per-capita transportation emissions rank 18th nationally, at 6.70 metric tons carbon equivalent (MT CO₂e) per person, slightly more than the national average of 6.52 MT CO₂e.

Figure 6. Kansas Transportation GHG Emissions (2019)

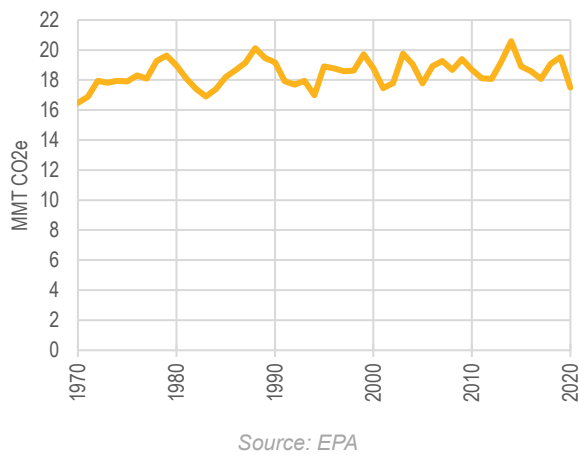


Figure 7. State Transportation Emissions Index

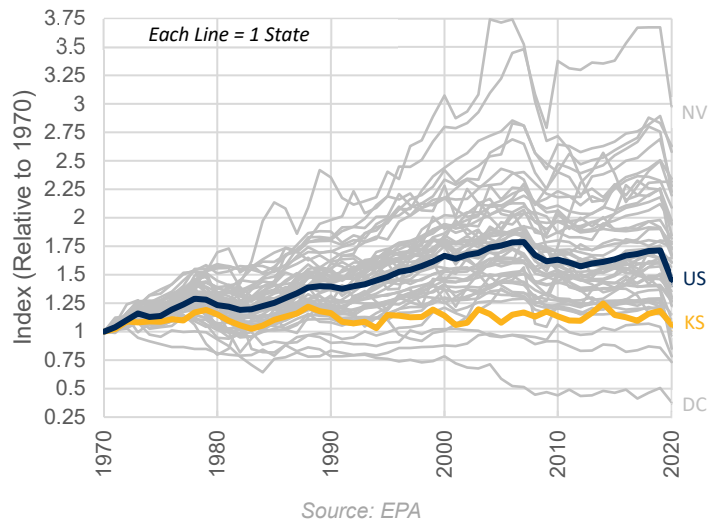
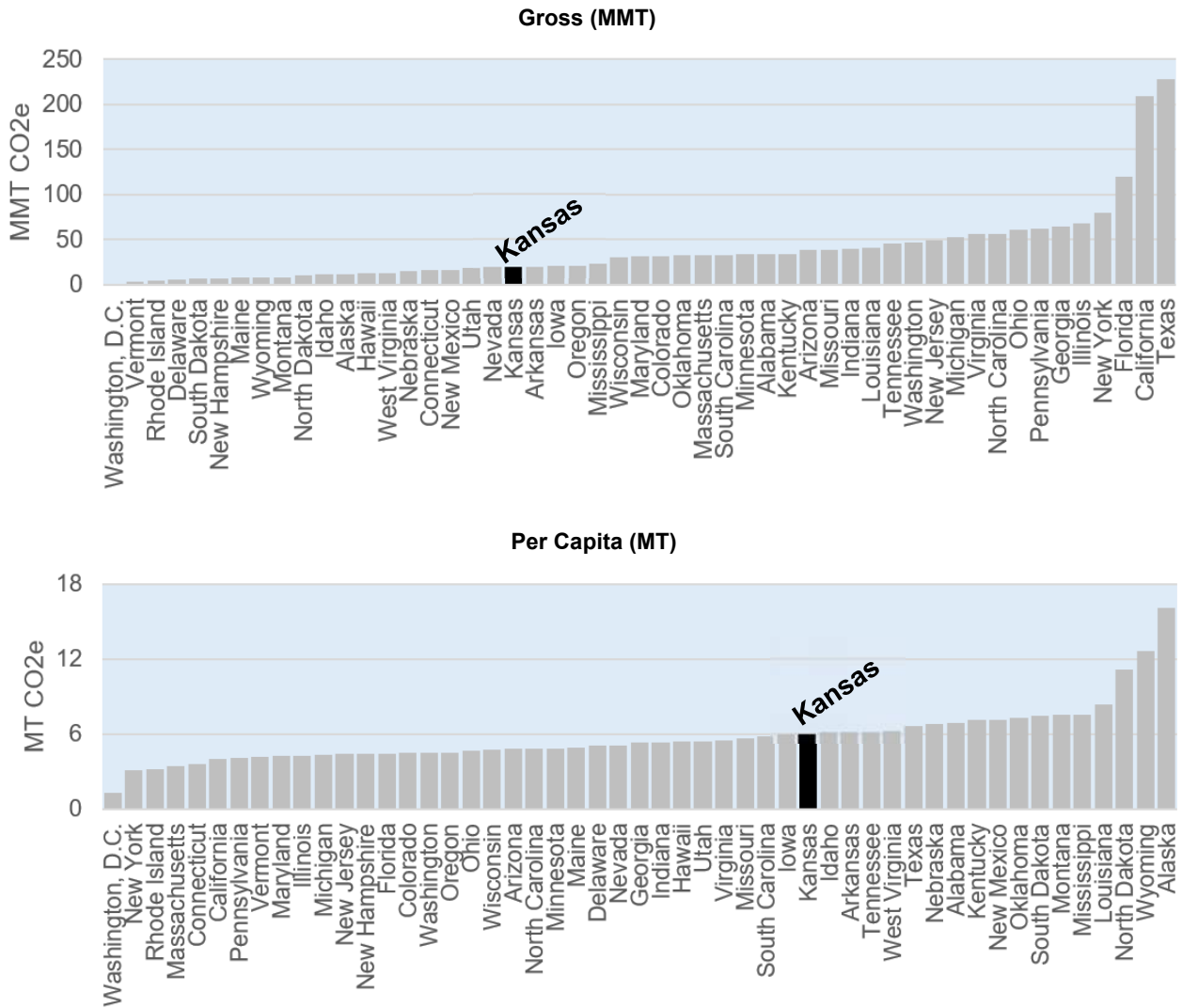




Figure 8. Statewide Transportation Emissions Index

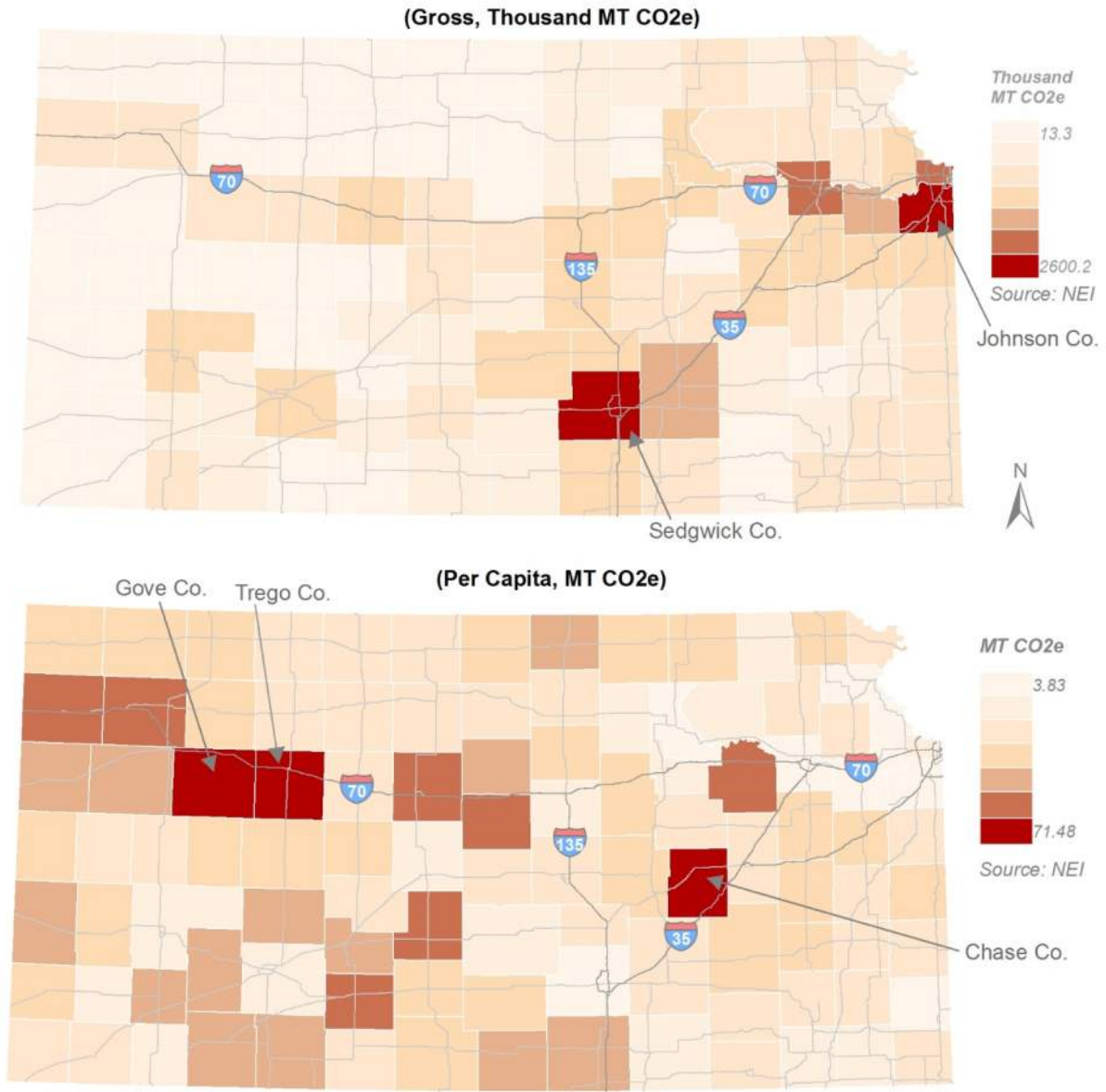


Source: EPA

As one would expect, Kansas’ gross transportation emissions are highest in urban centers and along interstates. As seen in **Figure 9**, Johnson and Sedgwick lead Kansas’ counties in emissions at 2.6 and 2.1 MMT, respectively. Other counties with above average emissions all contain interstates (I-70, I-35, I-135, and/or I-335). On a per-capita basis, however, the highest-emitting counties have low per-capita emissions due to higher population, and low-population counties containing an interstate are the highest per capita.



Figure 9. Kansas Transportation Emissions (2020)





Kansas By Mode

For the purposes of the national emissions inventories, the transportation sector is defined as comprising of vehicles whose primary purpose is transporting people and/or goods from one location to another. Vehicles whose primary purpose is not transportation are classified in the sector of their primary use, such as highway vehicles, agricultural equipment, recreational equipment, etc. (Summarized in **Table 1**). Not all transportation modes are under the purview of KDOT’s CRS, which only includes highway vehicles and rail. While the CRP guidance focuses specifically on “on-road highway emissions”, rail emissions have been included as rail is, on average, four times more efficient at moving a ton of freight than trucking. Maximizing rail’s ability to reduce emissions by shifting freight from truck to rail is a potential strategy to pursue, therefore rail was included as a “mode of interest.”

All of the modes within the scope of the baseline GHG inventory and their associated emissions have been summarized in Table 2, organized by mode, class, and fuel type.

Table. 1 Mobile Emissions Sources

Transportation	Non-Transportation
Highway Vehicles *	Agricultural Equipment
Rail *	Construction & Mining Equipment
Aircraft	Lawn & Garden Equipment
Ships & Boats	Logging Equipment
Lubricants	Recreational Equipment
Pipelines	

** Items under the purview of KDOT’s CRS*

Table. 2 Kansas GHG Emissions by Mode

Mode	Class	Fuel Type	Emissions (MT CO ₂ e)	Percentage
Auto	Light Duty	Gasoline	9,647,934	55.5
Auto	Heavy Duty	Diesel	5,613,386	32.3
Railroad	All	Diesel	1,288,893	7.4
Auto	Light Duty	Diesel	424,256	2.4
Auto	Heavy Duty	Gasoline	382,992	2.2
Auto	Light Duty	Ethanol (E-85)	18,223	0.1
Auto	Heavy Duty	Compressed Natural Gas (CNG)	5,953	0.03

Source: NEI



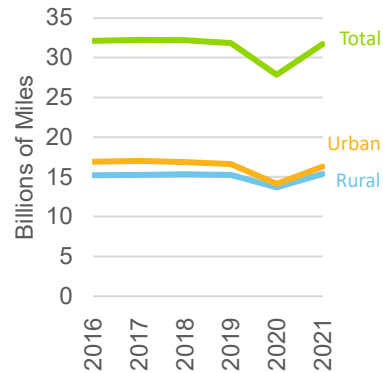
Automobiles

The direct combustion of fossil fuels by on-road vehicles accounts for the vast majority of transportation emissions, even when modes omitted from the scope of this inventory are included. For the purposes of this inventory, motor vehicles emissions are discussed using their NEI classifications and have been classified as passenger vehicles, commercial, transit, and miscellaneous.

Except for 2020, due to stay-at-home orders during the pandemic, Kansas vehicle-miles travelled (VMT) generally ranges between 31.7 billion and 32.3 billion, averaging 32.0 billion, annually (**Figure 10**). While the Kansas highway system is comprised of significantly more rural lane-miles than urban lane-miles, VMT is generally more evenly split between rural and urban, with urban roadways typically slightly edging out rural in total VMT.

Nationally, the average age of vehicles has been increasing since it was first measured in 1969, when the average automobile’s age was 5.1 years. By 2022, the average age of a light-duty vehicle on the roads was 12.2 years, with the average passenger car’s age being 13.1 years and light truck’s age being 11.6 years. Using registration data provided by Kansas Department of Revenue (KDOR) (**Table 3**), the average age of a passenger car in Kansas is 12.9 years and trucks is 16.7 years. The average age for all registered Kansas vehicles is 14.2 years, two years older than the national average. As personal vehicle fleet ages, engines become less efficient, emitting more GHG.

Figure 10. Kansas VMT (2016-2021)



Source: FHWA

Table 3. Kansas Vehicle Registration (2023)

Vehicle Class	Registrations	Avg. Age
Passenger	1,527,526	12.9
Trucks	688,508	16.7
Motorcycles	81,381	16.8
Motorized Bicycle	3,412	18.2
Truck Tractor	1,449	24.2
Bus	374	24.5
Total	2,302,650	14.2

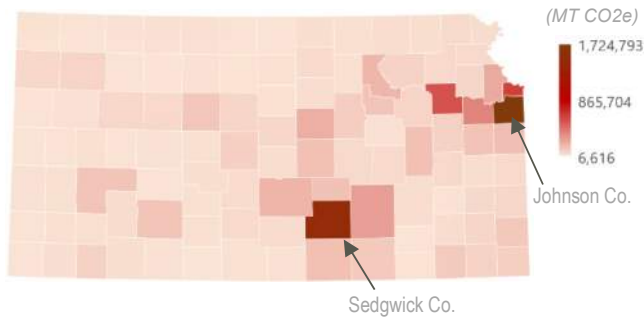
Source: KDOR



Passenger Vehicles

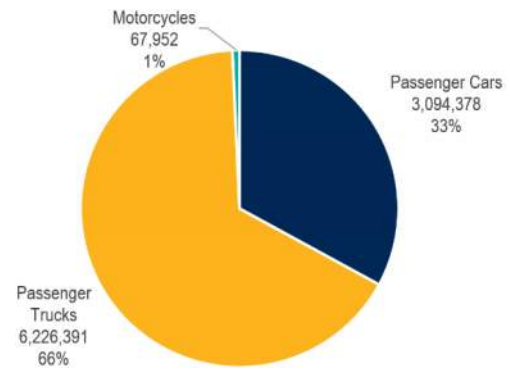
Passenger vehicles are defined as vehicles designed primarily to carry 10 or fewer passengers that are not used as a commercial truck. As seen in **Table 3**, Kansas has over 1.5 million vehicles registered as “Passenger Vehicles.” This definition of “Passenger Vehicles” includes both cars and (non-commercial) trucks. Overall, passenger vehicles contribute the largest share of GHG emissions in Kansas’ transportation sector with 9.4 MMT of CO₂e, 54 percent of transportation emissions within the scope of the CRS. Of the gross passenger vehicle emissions category, passenger trucks (whose definition includes SUVs), is the highest emitter with over 6.2 MMT CO₂e, a reflection of the growing and dominant market share of this vehicle class. Passenger cars account for 3.1 MMT CO₂e. Motorcycles are a small fraction, at 68,000 MT. See **Figure 12**.

Figure 11. Passenger Vehicle Emissions (2020, Gross MT)



Source: NEI

Figure 12. Passenger Vehicle Emissions by Vehicle Class (2020, Metric Tons)



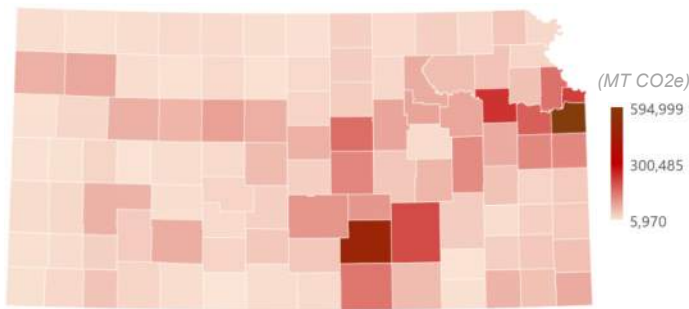
Source: NEI



Commercial Trucks

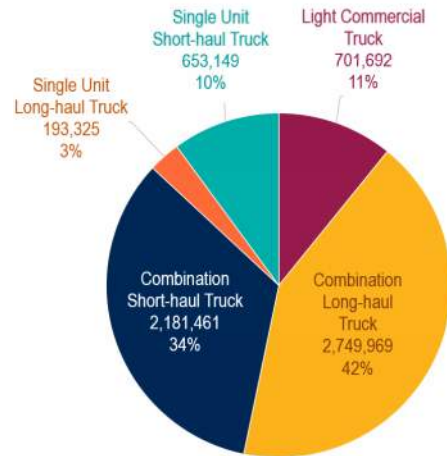
Kansas, as an agricultural state, generally exports more than it imports. Interstates I-70 and I-35 are the state’s two most important freight corridors, moving freight through and within the state. Emissions effects of commercial trucks moving through the state are proportionately noticeable in low-population counties, making these counties the highest per-capita emitters in the state. Commercial truck traffic is expected to continue to grow. These trucks account for 6.5 MMT CO₂e, 37 percent of emissions, and is broken down in **Figure 14** by truck classification.

Figure 13. Commercial Truck Emissions (2020, Gross MT)



Source: NEI

Figure 14. Commercial Truck Emissions by Vehicle Class (2020, MT)

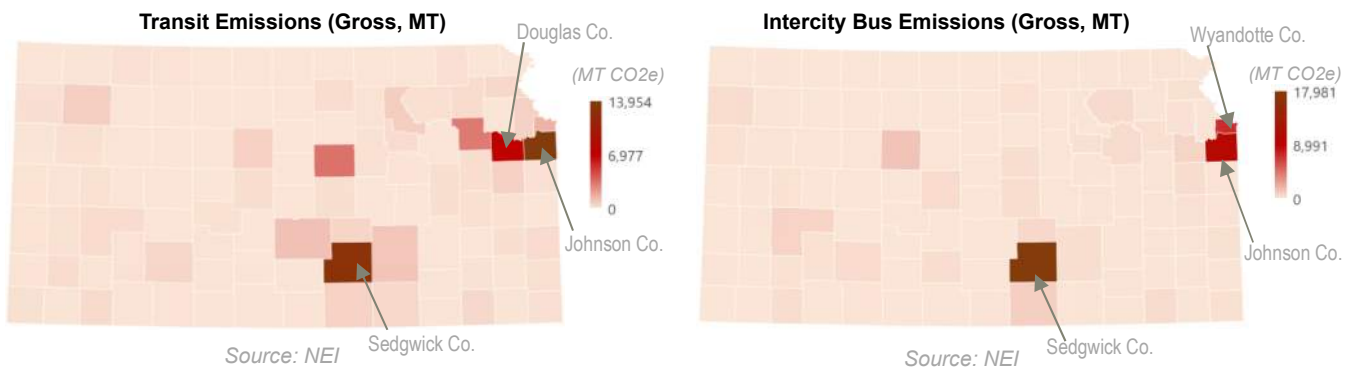


Source: NEI

Transit and Intercity Bus

Kansas is home to six transit agencies whose operations are large enough for the Federal Transit Administration (FTA) to require full reporting of data for the National Transit Database (NTD). Kansas City Area Transit Authority (KCATA), Johnson County Transit, Wichita Transit (WT), Topeka Metropolitan Transit Authority, the City of Lawrence, and Kansas University (KU) Parking & Transit. Approximately 1.6 million Kansans, (54 percent of the state population) live in counties supported by one of these six transit agencies. KDOT supports 145 smaller direct response transit agencies in rural areas, covering most of the remaining counties. While NEI data provides emissions for “transit buses” per county, rural transit operations provided by cutaway vans, passenger vans, and cars are not attributed as “transit” emissions, although they are implicitly included elsewhere in NEI data. Considering this, Kansas transit emissions – as reported by NEI and mapped in **Figure 15** – can be thought of as a lower bound and account for 55,000 MT CO₂e, 0.32 percent of Kansas transportation emissions.

Figure 15. Transit and Intercity Bus Emissions (2020)

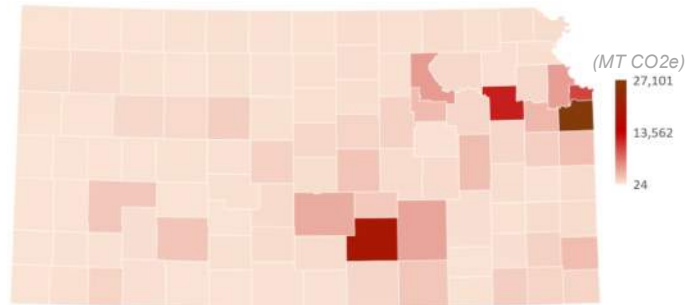


While some transit agencies may offer intercity bus service (e.g. KCATA’s K-10 Connector), the vast majority of intercity bus service is run by private-for-profit companies, such as Greyhound. Intercity bus service has the potential to serve population groups that might not otherwise have long-distance travel options at affordable rates. Kansas intercity bus emissions account for 45,000 MT CO₂e, 0.26 percent of Kansas transportation emissions.

Miscellaneous Vehicles

NEI data includes emissions data for three additional, specific vehicle classes; school buses, refuse trucks, and motor homes. Emissions follow general trends seen in other modes and vehicle classes – larger population counties emit more. School buses account for 110,906 MT CO₂e, 0.64 percent of Kansas’ total transportation emissions; refuse trucks account for 12,396 MT CO₂e, 0.07 percent of total emissions; motor homes account for 13,370 MT CO₂e, 0.08 percent of total emissions.

Figure 16. Miscellaneous Vehicle Emissions (2020)



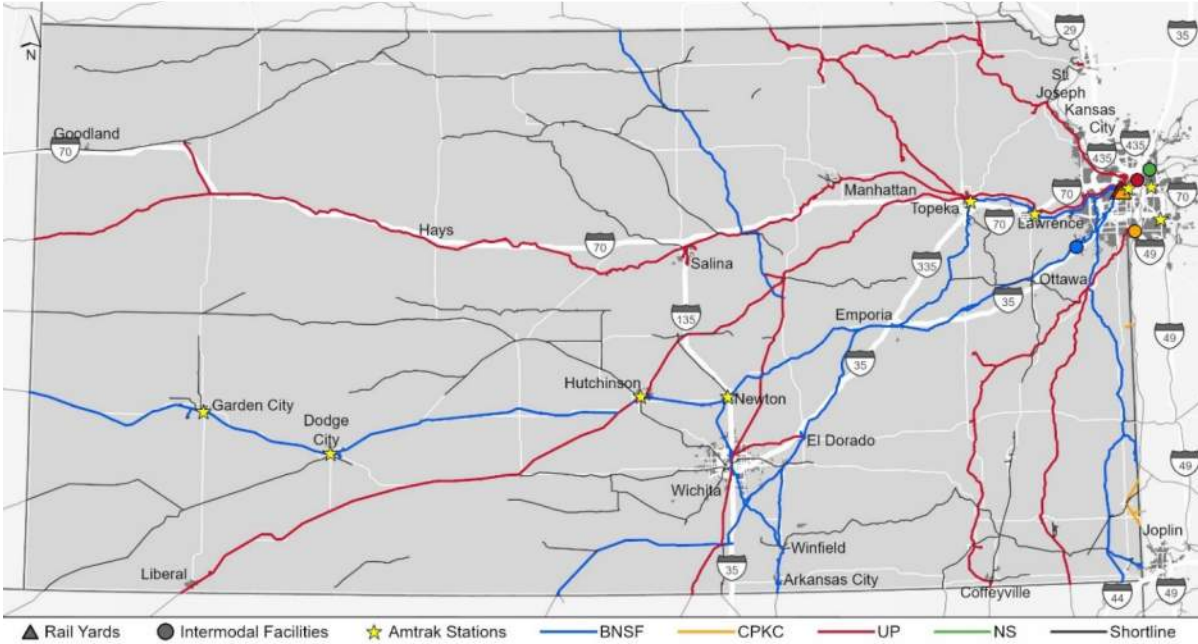
Source: NEI



Rail

With over 4,700 miles of track, Kansas ranks sixth among US states for total railroad track-miles. For regulatory purposes, the Surface Transportation Board (STB) classifies railroads as Class I-III, depending on revenue thresholds. Kansas is served by five Class I railroads, three Class II railroads, nine Class III railroads, and two switching/terminal railroads. Both switching/terminal railroads are joint ventures between multiple railroad companies to support interchange of railcars between lines. Though Amtrak, as a passenger rail company, is not classified using STB classifications, has been included in the list of Class I railroads.

Figure. 17 Kansas Rail System Map



Source: Redrawn by HDR from KS State Rail Plan

Table 4. Railroads Operating in Kansas (by size)

Railroad Name (Reporting Mark)	Operating Track-Miles	STB Class
Union Pacific (UP)	2,172	I
Burlington Northern Santa Fe (BNSF)	1,632	I
Kansas & Oklahoma Railroad (KORR)	833	II
Amtrak (AMTK)	473	I
Kyle Railroad (KYLE)	432	II
South Kansas & Oklahoma Railroad (SKOL)	350	III
Cimarron Valley Railroad (CVR)	183	III
Garden City & Western Railway (GCW)	36	III
V&S Railway (VSR)	25	III
Canadian Pacific Kansas City (CPKC)	21	I
Blackwell Northern Gateway Railroad (BNGR)	18	III
Blue Rapids Railroad (BRR)	9.7	III
Boot Hill & Western Railroad (BH&W)	9.6	III
Wichita Terminal Association (WTA)	6.7	III
New Century AirCenter Railroad (JCAX)	6.1	III
Hutchinson Transportation Company (HUTX)	4.8	III
Kaw River Railroad/Kansas City Terminal Railroad (KAW/KCTR)	3.6	III
Norfolk Southern (NS)	3	I
Missouri & Northern Arkansas (MNA)	2.8	II

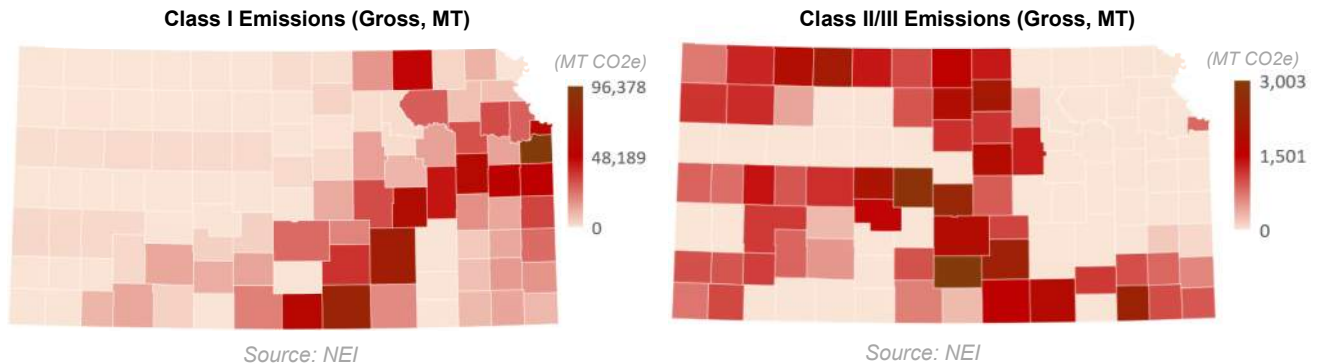
Source: KS State Rail Plan



Freight Rail

In 2020, Class I railroads moved over 5.7 million carloads, and Class II/III railroads moved almost 162,000 carloads. The majority of this freight, nearly 86 percent, is pass-through, meaning it neither originates nor terminates within Kansas. Commodities that do originate and/or terminate in Kansas have been summarized in **Table 5**. The most common commodities that originate and/or terminate in Kansas are intermodal. Intermodal commodities are long-haul shipping containers that are carried by multiple modes – usually truck or boat in addition to rail, where rail carries the “middle mile”.

Figure 19. Freight Rail Emissions



For this inventory, rail emission data was sourced from NEI data, though unlike vehicle emissions data, it is estimated as non-point, non-road sources. Class I railroad operations account for 1.22 MMT CO₂e, seven percent of Kansas transportation emissions. Class II/III operations account for 63,000 MT CO₂e, 0.37 percent of transportation emissions. Railroad operations in Kansas account for three percent of US railroad emissions. Nationally, railroads account for approximately only two percent of transportation emissions. If modes that have been omitted from KDOT’s CRS scope (non-starred items in Table 1) are omitted from national data, rail’s share of national emissions rises to only 2.5 percent, meaning that railroads in Kansas have an above-average share of transportation emissions. This is in part due to above-average track-miles in Kansas and below-average population density.

Table 5. Overview of Freight Rail in Kansas

Originating in Kansas	
Commodities	Carloads
Intermodal	187,900
Farm Products	165,400
Other	37,200
Chemicals	29,000
Food Products	24,600
Glass & Stone	14,400
Total	458,500
Terminating in Kansas	
Intermodal	203,700
Coal	61,000
Other	59,600
Chemicals	17,500
Glass & Stone	14,000
Food Products	12,600
Total	365,400

Source: KS State Rail Plan



Passenger Rail

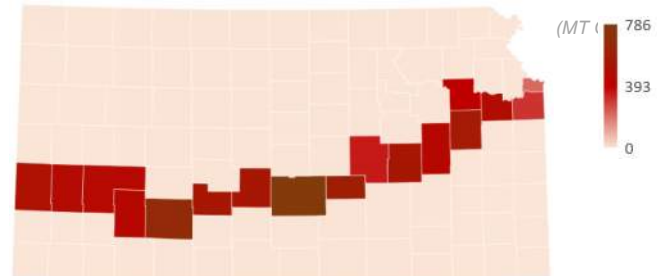
Kansas is served by a single Amtrak route, the Southwest Chief, which carries passengers between Chicago and Los Angeles. Two trains run daily across 473 miles of BNSF track. Pre-pandemic, the Southwest Chief carried an average 351,000 passengers annually from 2015-2019. Kansas has six Amtrak train stations: Dodge City, Garden City, Hutchinson, Lawrence, Newton, and Topeka. Despite most of Kansas' Southwest Chief stops being scheduled in the middle of the night, in 2019, there were over 46,000 boardings and alightings at these stations. In recent years, there have been proposals and a movement to expand the Heartland Flyer service – which currently runs from Fort Worth, TX to Oklahoma City, OK – further north to connect with the Southwest Chief in Newton, Kansas. It should also be noted that Amtrak is currently in the process of replacing its aging General Electric Genesis locomotive fleet with new Siemens Chargers (**Figure 20**), which are more efficient with substantial emissions reductions. The new Chargers will reduce Amtrak's locomotive mobile CO₂ emissions by approximately 10 percent, with 90 and 95 percent reductions in nitrous oxide and particulate matter (not a GHG). Passenger rail accounts for a very small amount of Kansas' emissions at 7,600 MT CO₂e, 0.04 percent of total emissions.

Figure 20. Amtrak Train with Siemens Charger Locomotive



Source: Cummins Inc.

**Figure 21. Passenger Rail Emissions (2020)
(Gross, MT)**

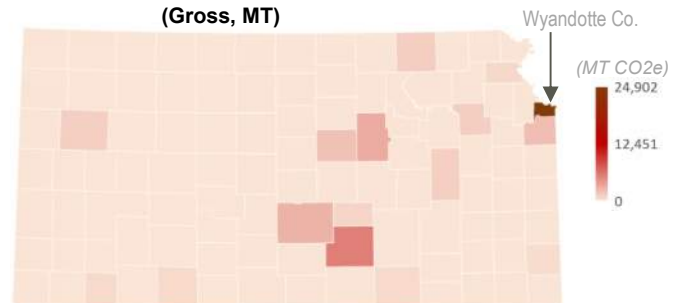


Source: NEI

Rail Yards

NEI facility data included data on rail yards (**Figure 22**). Emissions estimates are derived from switch engine counts and fuel use directly provided by Class I railroads. For Class II/III railroads, rail yard emissions are included in line haul emissions. Rail yards account for 48,000 MTCO₂e, 0.28 percent of transportation emissions. With Wyandotte County – home to the Argentine (BNSF), Mill Street (KAW/KCTR), and Armourdale (UP) yards – leads the state in this emissions category.

**Figure 22. Rail Yard Emissions (2020)
(Gross, MT)**



Source: NEI



Active Transportation

Kansas’ bicycle network, as reported by KDOT in their 2023-2025 State Bicycle Map is outlined in **Table 6**. Studies of the effects of new cycling and active transportation infrastructure and their potential for GHG reduction are mixed. Most of the literature shows that new infrastructure provides a net benefit to society and is cost-effective, particularly promoting an active lifestyle and reducing public health costs. The potential for mode shift, however, is sensitive to specific siting and design - the facility may not be optimal for commuting or replacing vehicular trips. Substituting trips that would have been otherwise been made by car, reducing GHG emissions, have been shown to generally be a low percentage of usage, even when optimized for automobile trip substitution. Active transportation facilities are typically used for recreational purposes, and likely have a much lower potential for mode shift in rural areas than in urban areas.

Table. 6 Active Transportation in KS

Facility	Miles	Description
Bike Routes	438	A roadway or bikeway designated by the jurisdiction having authority, either with a unique route designation or with signs. A recommended road for a bicycle to travel on. It may be an exclusive path or lane but can also include portions of roadway known to be safer for cyclists. Bike routes are exclusively found within city limits.
Bike Lanes	166	A portion of roadway that has been designated for preferential or exclusive use by bicyclists by pavement markings and, if used, signs. It is intended for one-way travel, usually in the same direction as the adjacent traffic lane, unless designed as a contra-flow lane.
Bike Paths	962	Specially created pathways separated from vehicular roadways. Can be exclusive for bicycles but are typically multi-use trails. Can be found within city limits or between jurisdictions as intercity facilities.
U.S. Bicycle Routes (USBR)	493	National long-distance cycling route. Utilizes off-road paths, bicycle lanes, and low-traffic roads. Kansas hosts 480 miles of USBR 76 (one of the original two USBR) and 13 miles of USBR 66 (follows the former U.S. Route 66 Highway). It is also noted that the entirety of USBR 76 within KS is also designated as part of the TransAmerica Trail, travelled by dual-sport motorcycles and other off-road vehicles, in addition to cyclists.
American Discovery Trail	570	A system of recreational trails and roads that form a coast-to-coast hiking, biking, and equine trail across the middle of the US. The only non-motorized coast-to-coast trail.
Rail Trails	306	A shared-use path, either paved or unpaved, built within the right-of-way of a former railroad. There are 27 rail-trails in Kansas, with 152 miles of potential rail trails identified.

Source: KDOT

Note: Mileage has not been added together as a total because it would result in double counting



KDOT Operations

KDOT’s own vehicle fleet, facilities, and maintenance/construction operations are also a contributor to Kansas’ total GHG emissions, although a relatively small proportion.

According to National Cooperative Highway Research Program’s (NCHRP) publication *Methods for State DOTs to Reduce Greenhouse Gas Emissions from the Transportation Sector* and *Reducing Greenhouse Gas Emissions: A Guide for State DOTs*, “Emissions associated with construction, maintenance, and operations of the State’s highway system are about six percent of the total, and emissions from the DOT’s administration (buildings and light duty fleets) are about 0.2 percent.” (This statement refers to DOTs in general, not KDOT in specific.) KDOT’s emissions inventory, when classified using scopes, is characterized as follows:

- Scope 1 emissions are generated from direct combustion of fuel for its vehicle fleet, construction activities conducted directly by KDOT, and natural gas burned in its facilities for heating.
- Scope 2 emissions are generated from electricity from KDOT’s facilities.
- Scope 3 emissions are generated from the embodied carbon of pavement materials, transportation of construction materials, and construction activities by contractors employed by KDOT.

KDOT Fleet

While the emissions of KDOT’s vehicle fleet are implicitly included within NEI estimates, it is necessary to isolate its emissions to quantify the transportation emissions directly associated with the agency’s inventory. To this end, KDOT provided data for its fleet, which includes 982 light-duty vehicles, 865 of which use gasoline, 37 use diesel, and 80 use E-85 (flex fuel). KDOT provided statistics – including description, quantity, fuel type, average annual miles per unit, average fuel efficiency, average annual fuel per unit, and average age – for 37 distinct classes of vehicles in their fleet (e.g. Midsize Utility 4WD, Passenger Van 1-ton). No data for heavy-duty vehicles was provided from KDOT.

The calculation of greenhouse gas emissions from KDOT fleet vehicles was completed using three equations. CO₂ emissions are calculated by applying an emissions factor to the amount of fuel combusted (**Eq. 1**). CH₄ and N₂O emissions are slightly more complex than CO₂ emissions and require vehicle class and age of vehicle to determine an emissions factor to multiply by miles travelled (**Eq 2**). GWP factors are used to convert to CO₂e (**Eq 3**). Due to the small size of KDOT’s fleet, NEI data is impractical in this context. Notably, this methodology differs from the NEI data and does not use MOVES. Nevertheless, this approach yields a dependable estimate. 2023 emissions factors from the IPCC Fourth Assessment Report (AR4), were utilized.

$$\text{Eq. 1, } CO_2 \text{ Content} = [\text{average annual fuel per unit}] * [\text{units}] * [\text{Emissions Factor}]$$

$$\text{Eq. 2, } CH_4 \text{ and } N_2O \text{ Content} = [\text{average annual miles per unit}] * [\text{units}] * [CH_4 \text{ or } N_2O \text{ Emissions Factor}]$$

$$\text{Eq. 3, } CO_2e \text{ Conversion} = [CH_4 \text{ and } N_2O \text{ Content}] * [\text{Global Warming Potentials}]$$

KDOT’s vehicle fleet is estimated to emit 1,350 metric tons of CO₂e.



KDOT Facilities

KDOT provided an inventory of all 991 facilities owned and managed by the agency. There was no energy usage information that could be used to directly calculate emissions (i.e., electricity, natural gas, water, refrigerants). This inventory was correlated with a 2012 study performed by KU/KSU in which energy consumption data provided by KDOT was used to directly calculate emissions for 122 building complexes. The correlation assumes that KDOT's energy consumption from facilities found in the KU study has remained roughly the same. Using statistical analysis, square footage data from the 2023 KDOT facility inventory was used to build a mathematical model to estimate emissions. GHG emissions from water usage and refrigerants were not considered in this model (generally a small percentage of emissions). Therefore, actual emissions are likely to be higher than estimated, though considerable retrofits or renovations performed by KDOT since the KU study may balance out the exclusion of water and refrigerant emissions. Without detailed energy, water, and refrigerant usage data, only an order-of-magnitude estimation is possible.

While KDOT owns 50 more buildings in 2023 than in 2008-2010 when the KU study was performed, decarbonization within Kansas' electrical grid (especially in its CH₄ and N₂O emissions) has dramatically curbed KDOT's GHG emissions from facilities. KDOT's facilities are estimated to emit a combined 4,400 MT CO₂e; 2,600 tons from electricity and 1,800 MT CO₂e from natural gas.

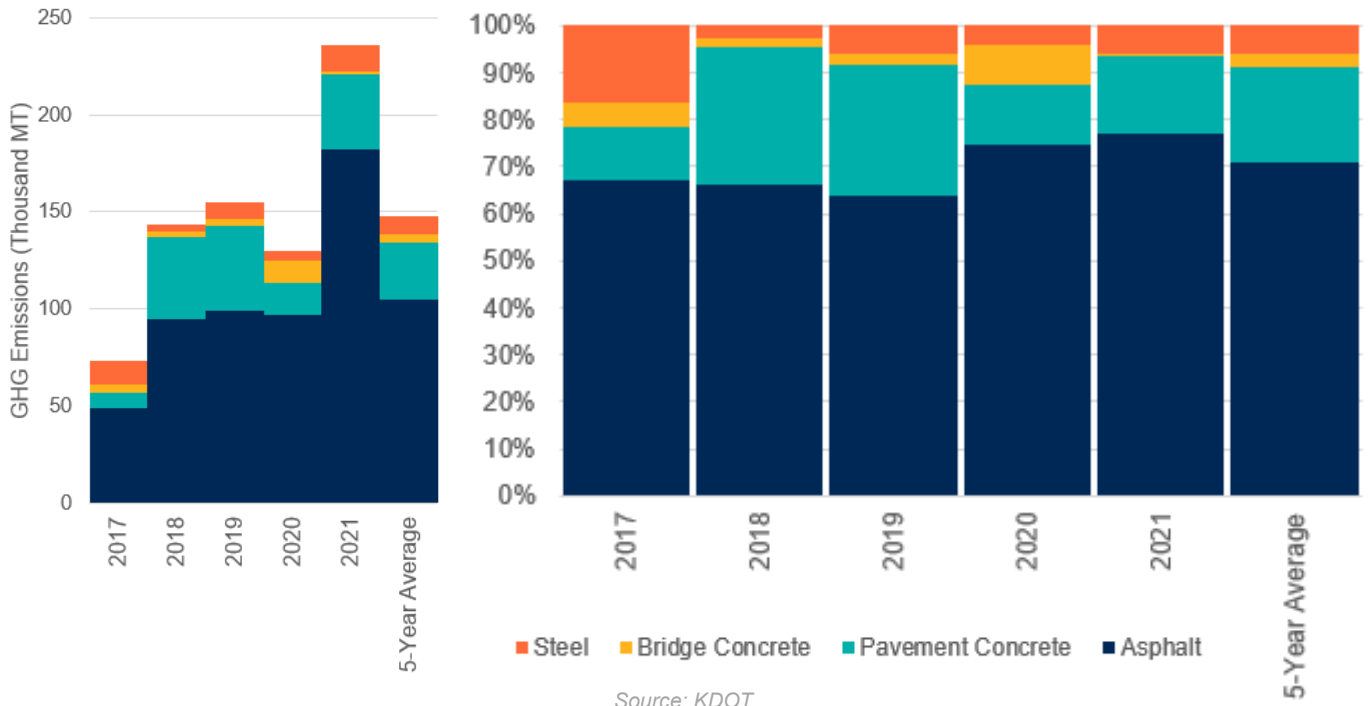
KDOT Construction Materials

Scope 3 is the broadest scope of emissions – indirect emissions that are the result of activities from assets not owned or controlled by a reporting organization, but that the organization indirectly affects in its value chain. A comprehensive Scope 3 inventory for KDOT would involve 15 categories of upstream and downstream activities, such as waste generated in operations, employee commuting, and purchased goods and services. Collecting data for a comprehensive inventory can be time-consuming and expensive. Few state DOTs have completed large-scale Scope 3 emissions inventories (California, Oregon, and Washington State being the notable three). For the purposes of the KDOT inventory, only the embodied carbon emissions of three construction materials – asphalt, concrete, and steel – have been investigated.

Using datasets provided by KDOT and emissions factors found in industry average environmental product declarations (EPDs) from representative trade associations (American Institute of Steel Construction, Concrete Reinforcing Steel Institute, National Asphalt Pavement Association, Portland Cement Association), GHG emissions from these materials were calculated for 2017-2021. As shown in **Figure 23**, emissions ranged from 73,000 to 236,000 MT CO₂e, averaging 147,500 MT CO₂e. Asphalt was the largest emitter – representing, on average, 71 percent of emissions. In 2021, hot-mix asphalt emitted 182,000 MT CO₂e alone, 16 percent more than the 5-year average. Concrete is the second highest emitter, accounting for 23 percent of emissions.



Figure 23. GHG Emissions for Selected Construction Materials (2017-2021)





**KDOT TRANSPORTATION
EMISSIONS REDUCTION
STRATEGY**



APPENDIX C:

LOCAL PLANS AND INITIATIVES



KDOT Transportation Emissions Reduction Strategy: Local Plans and Initiatives

The purpose of this document is to summarize relevant emissions-reduction, climate action, and sustainability plans and initiatives of local and regional entities in the state of Kansas, especially as those plans relate to transportation. The document is organized by metropolitan region and includes plans by the relevant Metropolitan Planning Organizations as well as known plans by local municipalities. Note that the focus of this document is on plans explicitly about the topic areas listed in the first sentence of this paragraph. Many agencies have documents, such as Comprehensive Plans, that touch on these areas, but typically not at the level of detail or specificity that this paper is seeking. This overview of local plans and initiatives focuses on documents developed since 2010 and does not include documents superseded by the adoption or endorsement of other plans.

Area: Kansas City

Counties: Johnson, Leavenworth, Miami, Wyandotte

MPO: Mid-America Regional Council (MARC)

MARC and Climate Action KC (a local non-profit with a focus on emissions reduction) partnered to create the Kansas City Regional Climate Action Plan (CAP), which aims for the Kansas City region (KC) to have net zero emissions by 2050. The CAP was adopted in 2021 and was developed to promote climate resilience and equity in KC by providing guidance for cities, counties, and local communities. In addition to five counties in Missouri, five counties in Kansas have adopted the CAP: Douglas (even though technically not part of MARC), Johnson, Leavenworth, Miami, and Wyandotte. Community engagement and participation was vital for the development of the CAP. The CAP focuses on eight (8) sectors: transportation, food systems, industry and resource management, resilient communities, energy generation, finance and innovation, urban greening, and buildings.

The four CAP goals for the transportation sector are:

- Reduce vehicle miles traveled (VMT) per capita
- Shift the regional [public and private] fleet to low- and no-emission vehicles
- Shift trips to affordable, equitable, and safe mobility options
- Improving the transportation system so it is resilient to the shocks and stresses of climate change

Johnson County, the largest county in Kansas and part of the MARC region, recently conducted an updated inventory of Greenhouse Gas (GHG) emissions, demonstrating an overall reduction of 30 percent, but a small increase of two (2) percent in the transportation sector, between 2013 and 2023. This finding indicates that transportation may be lagging behind other sectors, and that there is potential room for additional improvement. In 2022, Johnson County became the 25th local government in the world to achieve Gold certification in the U.S. Green Building Council's Leadership in Energy and Environmental Design (LEED) for Cities rating system.

Additionally, Johnson County has established a Sustainability Committee to focus on GHG emissions, ecology, water, natural systems, solid waste management, quality of life, and transportation. The Committee is working toward a fleet that uses alternative fuels, and the County has installed Electric Vehicle charging stations throughout the county for public use.



The Metropolitan Energy Center (MEC) is a Kansas City-based nonprofit organization committed to reducing GHG emissions and combatting climate change. The MEC was founded in 1983 to help local governments, communities, businesses, and individuals reduce their emissions, thus improving air quality. Environmental health, economic resiliency, and resource efficiency are the main focuses of the MEC. As part of its purview, MEC focuses largely on the transportation and building sectors, as they are the two largest contributors to GHG emissions. The Kansas City Regional Clean Cities Coalition is MEC’s flagship sustainable transportation program, advocating for alternative fuels. Non-transportation MEC programs include the Energy Solutions Hub and Project Living Proof.

Wichita

Counties: Sedgwick, Butler, Sumner

MPO: Wichita Area Metropolitan Planning Organization (WAMPO)

Although conversations with WAMPO staff have indicated that carbon/climate/sustainability planning is underway, WAMPO has not yet made the development process public. Staff have indicated that they are awaiting the outcome of KDOT’s Transportation Emissions Reduction Strategy to help guide the next steps. WAMPO has implemented public surveys on three relevant subjects: Metropolitan Transportation Plan 2050, Electric Vehicles, and Coordinated Public Transit – Human Services Transportation Plan. Although not explicitly tied to a future emissions reduction plan or related document, this effort can glean information about alternative transportation modes, alternative energy options, and other potential transportation policy directions that can support an emissions-reduction agenda.

Of note, the City of Wichita is one of 150 cities around the globe to be LEED-certified and has held this certification since November 2015.

In addition, Wichita Transit, the largest transit system in Kansas, published its Wichita Transit Climate Action Plan in 2022. The plan’s goal is to transition the Wichita Transit fleet to battery-electric vehicles by 2040. Currently, the agency is having difficulty securing grants and other funding to achieve this goal.

The MEC, discussed in the Kansas City Area initiatives section above, also oversees the Central Kansas Clean Cities Coalition, which is based out of Wichita. This program focuses on the unique resources and economies of rural Central and Western Kansas and helps ensure that underserved communities have equal access to clean fuels.

Area: Topeka

County: Shawnee

MPO: Metropolitan Topeka Planning Organization (MTPO)

Although MTPO does not have an explicit emissions-reduction, climate-action, or sustainability plan, its Metropolitan Transportation Plan – *Futures 2045*, released in 2022, includes Sustainability, Livability, and the Transportation Land Use Connection as guiding principles.

The Topeka City Council established the Topeka Sustainability Advisory Board (TSAB) in 2008. TSAB’s 2022 Report included several transportation recommendations, including the replacement of city owned vehicles with electric vehicles, making non-auto transportation a larger priority by implementing the City’s Complete Streets and Bikeways master plans, and supporting the transit system including avoiding service reductions.



Area: Lawrence

County: Douglas

MPO: Lawrence-Douglas County Metropolitan Planning Organization (L-DC MPO)

The City of Lawrence and Douglas County are working to adopt a Climate Action and Adaptation Plan. The five guiding principles to be integrated into the plan are as follows:

- Achieve net-zero greenhouse gas emissions through a fair and just transition for all communities and workers.
- Create jobs with livable wages to ensure prosperity and economic security for all people.
- Invest in the infrastructure and industry to sustainably meet the challenges of the 21st century.
- Secure for all people for generations to come: clean air and water, climate and community resiliency, healthy food, access to nature, and a sustainable environment
- Promote justice and equity by stopping current, preventing future, and repairing historic oppression of Indigenous peoples, communities of color, migrant communities, de-industrialized communities, depopulated rural communities, the working poor, women, the elderly, the unhoused, people with disabilities, and youth.

Climate Action is the first phase of the plan, including strategies to limit and lessen all GHG emissions. The next phase, Climate Adaption, will aid communities in preparing for and preventing the effects of climate change. The plan is expected to be adopted in 2023. While this plan is developed, the City and County are acting as parties to the MARC Climate Action Plan.

In addition, *Transportation 2050*, the Metropolitan Transportation Plan (MTP) recently prepared by the L-DC MPO, outlines the following objectives with regards to sustainability:

- Increase the percentage of trips made using active, shared, and low carbon transportation modes to reduce vehicle miles traveled.
- Minimize negative environmental impacts by reducing transportation-related greenhouse gas emissions and by designing projects to avoid, minimize, or mitigate impacts to water and air quality and habitat.
- Maintain a transportation planning process integrated and coordinated with land use, water, and natural resource planning and management.

Strategies to help achieve these objectives include transitioning publicly funded vehicle fleets to zero emission vehicles and planning for implementation of public electric vehicle charging infrastructure.

The University of Kansas (KU) has placed a strong emphasis on campus sustainability, particularly focusing on energy conservation in campus buildings, recycling, and promoting the use of bicycles. KU has also constructed its first sustainable parking lot, which features native shade trees, a rain garden, LED lighting, and light-colored, porous pavement. The lot is able to improve the quality of stormwater runoff by filtering out sediment and pollutants.



Area: Manhattan

Counties: Riley, Geary, and Pottawatomie

MPO: Flint Hills Metropolitan Planning Organization (FHMPPO)

Although FHMPPO is undertaking many initiatives that have positive emissions-reduction benefits (most notably in the Active Transportation area), it does not currently have an explicit emissions-reduction, climate-action, or sustainability plan in place. In recent conversations, FHMPPO has indicated its intention to incorporate elements of climate-related planning into the metropolitan planning process, and that the agency will be following KDOT's lead in the transportation area.

Also worth noting in the region is Kansas State University's (KSU) Sustainability Strategic Action Plan (2014). The plan laid out a 10-year vision to improve campus and community-wide sustainability, and included steps to increase sustainability in academics, operations, leadership, and the campus as a whole. Areas outlined in the Plan include buildings, energy, water, climate change, grounds, transportation, purchasing, dining, and sustainability-focused classes. Specific to transportation, the Plan encourages the campus to be more bike-friendly and provide multi-modal transportation to reduce fuel consumption and lessen vehicle emissions. In addition to providing additional transportation options, the Plan also suggests that K-State transition to a more efficient campus fleet. Annual progress reports were completed for the first five (5) years of the plan's operation, and then for its most recent 10-year progress report. A notable update indicates that the Flint Hills Area Transportation Agency (FHATA) made a fixed-loop bus route available to students, faculty, and staff.

Area: St. Joseph

County: Doniphan

MPO: St. Joseph Area Transportation Study Organization (SJATSO)

A small portion of the SJATSO area is in Kansas. Although SJATSO does not have an emissions-reduction, climate-action, or sustainability plan, the MPO did perform a 2018 assessment of the sustainability of its infrastructure and the sustainability provisions of its 2040 MTP in preparation for its 2045 MTP update. The assessment used FHWA's INVEST tool. SJATSO set goals to:

- Develop quantifiable measures for sustainability within the MTP that can be incorporated into an implementation matrix
- Better highlight the connection between public health and regional economics to the transportation system [e.g., exploring ways to include public health goals, and strategies for achieving them, in coordination with multi-modal efforts]
- Analyze vulnerabilities in the transportation system that can be strengthened to improve resiliency to extreme weather and climate considerations
- Improve the connection between SJATSO's Title VI program to sustainable policy and design decisions, emphasizing the impact of decisions on the vulnerable populations within the metro
- Champion tools such as INVEST and encourage member communities to apply additional levels of analysis to the local decision-making process

SJATSO's 2045 MTP does include Environmental Protection among its nine goals and objectives.



Summary

Table 1 summarizes the local planning efforts described in this document.

Table 1: Local Plan Summary

MPO	Population (2020 Census, all Counties with any portion in MPO)	Has an Emissions / Climate / Sustainability Plan?	Relevant MTP Goals	Related Activities
MARC	1,396,636 (MO + KS)	Yes	Reduce VMT Shift the regional fleet to low- and no-emission vehicles System resilience	Johnson Co is LEED-Certified, planning for alt fuels fleet, and has installed EV charging MEC – Kansas City Regional Clean Cities Coalition
WAMPO	397,532	No	Protect and enhance the environment Promote energy conservation Emphasize the preservation of the existing transportation system	LEED-Certified MEC – Central Kansas Clean Cities Coalition
MTPO	304,067	No	Replacement of city-owned-vehicles with EVs Prioritizing non-auto transportation Supporting the transit system	City's Complete Streets and Bikeways Master Plans
L-DC MPO	118,784	MPO – No City/County – In Progress KU – No	To achieve net-zero greenhouse gas emissions through a fair and just transition for all communities and workers	Party to MARC Climate Action Plan
FHMPO	132,905	MPO – No KSU – Yes	Provide a multi-modal transportation system Focus on sustainable development when making transportation strategies	
SJATSO	120,274 (MO + KS)	No	Develop quantifiable measures for sustainability Improve connection between Title VI program and sustainability policy / design	2018 INVEST analysis



**KDOT TRANSPORTATION
EMISSIONS REDUCTION
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APPENDIX D:

PUBLIC INVOLVEMENT PLAN

2023



Introduction

This Public Involvement Plan (Plan) outlines how the KDOT Department of Transportation (KDOT) and HDR will conduct engagement activities for the KDOT Transportation Emissions Reduction Strategy (TERS). It defines the inclusive methodologies and resources that will be used to connect with stakeholders, generate public awareness, guide public communication, and identify collaboration opportunities. It also specifies the TERS team members who will direct activities and their roles and responsibilities. This Plan is intended to be a living document and will be updated as TERS elements, including branding and messaging, are identified.

The Project team will accomplish the Plan's engagement and polling initiatives by identifying communication goals and pathways to completion. The Plan directs activities for stakeholder collaboration, messaging, public involvement, and media relations. It provides guidelines for in-person and online engagement, stakeholder and public relationship management, polling activities, and comment resource and data management.

Project Description & Background

The Carbon Reduction Program (CRP) is a new federal program, created by the Bipartisan Infrastructure Law, that will provide Kansas with \$63 million in funding to develop emission reduction strategies and help reduce transportation-related emissions through infrastructure improvement and planning projects.

To support this effort, KDOT is developing a statewide TERS to identify projects and strategies that can measurably reduce emissions from on-road highway sources.

This strategy is being developed cooperatively and incorporates the following goals:

- **SAFETY** – Safety is our number one priority and all investments under the federal CRP will be made considering safety co-benefits.
- **EQUITY** – KDOT is committed to investing in transportation that provides equitable benefits across the state, supporting areas of historical underinvestment, and providing mobility solutions to allow all Kansans to access employment, education, and other vital destinations.
- **INNOVATION** – Embracing new technologies and approaches to improve traffic flow, reduce congestion, increase safety, and reduce transportation emissions.
- **SUSTAINABILITY** – A core value of the federal CRP is that all projects utilizing these funds must contribute to the reduction of transportation emissions and support a more sustainable and resilient transportation network.

Investments identified in the TERS may be selected for federal CRP funding or other applicable federal programs under the Bipartisan Infrastructure Law (BIL) – such as the National Electric Vehicle Infrastructure (NEVI) and Transportation Alternatives (TA) programs.

The communication tools and procedures outlined in this Plan provide a unique opportunity for those who call Kansas home to become informed and provide input on emission reduction strategies.



Communication Goals



Engage stakeholders from the State of Kansas, KDOT, Metropolitan Planning Organizations (MPOs), and county and municipal representatives, to obtain feedback that informs strategic initiatives and outreach.



Manage expectations by communicating TERS components and objectives in a transparent and relatable manner.



Collaborate with key stakeholders and local partners to drive equitable participation.



Utilize inclusive, accessible, and consistent methodologies for public outreach, engagement and polling.



Develop a TERS brand, including messaging and visual identity, to relay core elements to stakeholders and public.



Make public information detailing TERS needs and benefits, future milestones and engagement pathways.



Roles & Responsibilities

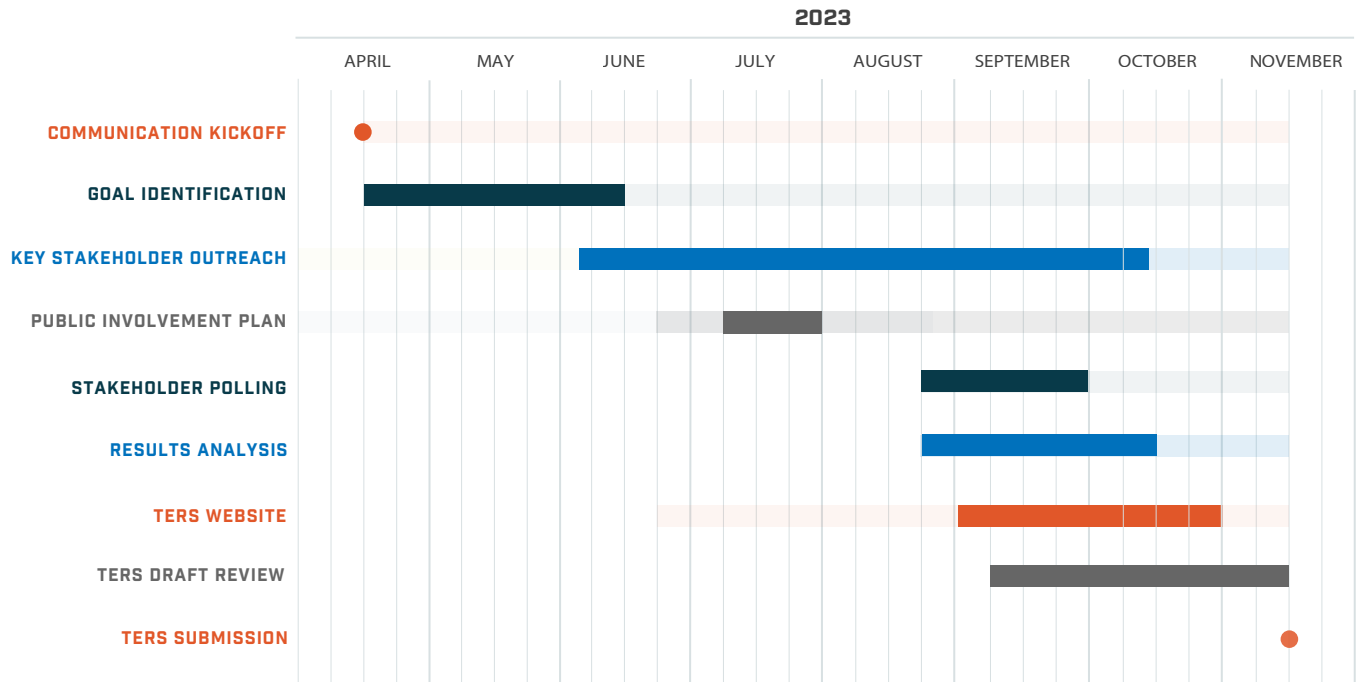
The following is a list of the Project team members who will support public and stakeholder outreach and communication:

NAME	ORGANIZATION	ROLE
Michael Moriarty	KDOT	Chief of Transportation Planning
Allison Smith	KDOT	Project Manager
Eleanor Matheis	KDOT	Transportation Planner
Jennifer Schwaller	HDR	Consultant Project Manager
Brad Thoburn	HDR	Policy & Strategy Advisor
Christopher Kinzel	HDR	Technical Support
Chris Deffenbaugh	HDR	Public Involvement Lead
Sam Cicero	HDR	Public Involvement Support
Drew Watts	HDR	Branding Lead
Christina Rodriguez	HDR	Web Development
Maggie Newlin	HDR	Graphic Design



Anticipated Project Schedule

The KDOT TERS must be submitted to the FHWA on or before November 15, 2023.





Outreach Methods

The unique nature of the federal CRP and the anticipated breadth of the TERS present KDOT the opportunity to collaborate with stakeholders and obtain their feedback.

HDR will mitigate potential communication risk factors through the use of straightforward language, equitable participation methods, and defined polling and input opportunities. Equitable participation included the use of online polls to determine stakeholder's preferred meeting times and the development of a statewide survey, provided to stakeholders in municipal, county and state government roles.

BRAND & VISUAL IDENTITY

HDR collaborated with KDOT to create a project brand that is specific to Kansans, conveys a sense of optimism and opportunity, and establishes guidelines for material development and conveyance. The TERS brand, which was applied to this Plan, was informed by existing KDOT brand standards, program objectives, and stakeholder input.

PRESENTATION MATERIALS

Virtual, interactive presentations will be the primary platform through which the Project team conveys information to Stakeholders. HDR will provide KDOT with all presentation materials in advance of stakeholder meetings. As detailed in the following section, live polling features will be incorporated into stakeholder presentations so as to vary the format and obtain actionable input.

POLLING

Survey polling will be a primary method for gathering the opinions of stakeholders and public participants. This input will provide the Project Team a pathway to inform and advance the TERS so that it aligns with the current and future needs of Kansas.

For the KDOT Core Team and key stakeholders, polling will be an ongoing effort, with live polling incorporated into virtual presentations and a comprehensive survey provided to stakeholders closer to the conclusion of the TERS.

For the broader stakeholder contingent, which includes representatives from municipalities across the State of Kansas, a comprehensive online survey will be developed and disseminated. The survey will seek input on many of the same TERS topics posed to key stakeholders, as well as requests for community-specific information.

Polling will seek to:

- Understand respondents expectations
- Identify priorities
- Enhance ongoing communication and collaboration



PROJECT WEBSITE

HDR will work with KDOT to create a TERS website that provides educational and online engagement opportunities to stakeholders and interested members of the public.

The public-facing website will serve as the Project’s central communications and resources hub. The site will contain overview information for the federal CRP, Kansas-specific insights on transportation-related emission impacts, and links to additional information. The website will also include a comment form and information on how to connect with Project representatives.

The TERS website will:

- Be built using design, security, and user data best practices.
- Utilize a modern, intuitive interface that is easy to navigate.
- Highlight existing and upcoming opportunities for public collaboration.
- Direct users to submit feedback via an online comment form or email address.
- Be accessible by search and KDOT and IKE websites.

The TERS website will receive ongoing updates to reflect key Project milestones. Content and graphics will meet the accessibility standards set by the Americans with Disabilities Act (ADA) and Web Content Accessibility Guidelines.

SOCIAL MEDIA

Published through KDOT’s existing platforms, TERS-related social media posts may be used to provide the public with information and a pathway to provide feedback and connect with Project Team members.

The TERS’s social media strategy will focus on promoting awareness of the initiative and engagement opportunities. HDR will work with KDOT to understand preferred communication methodologies.

Responses to posts will be used to refine the social media strategy. HDR will generate social and traditional media reports that aggregate outcomes.

TRADITIONAL MEDIA

Future media inquiries and response will be the sole responsibility of KDOT. HDR will direct all requests or inquiries received from outside media entities to the appropriate Project Team member for evaluation and response.

The Project Team will be provided with direction and materials to support public and media interactions. Materials will include safety instructions, FAQs, and talking points.

ONGOING STAKEHOLDER ENGAGEMENT

The Project Team will identify stakeholders for inclusion and collaboration at the state agency, county, and municipal levels. HDR has developed, and will continue to manage, a contact matrix that identifies stakeholders, includes their contact information, and establishes cohort groups for TERS group interactions.



The Project Team will seek consultation with the following state agencies to help inform the TERS:

- KDOT leadership
- Kansas Department of Health and Environment (KDHE)
- Kansas Department of Agriculture (KDA)
- Kansas Corporation Commission (KCC)
- Kansas Department of Administration
- Kansas Department of Commerce (KDC)
- Kansas Water Office
- Kansas Public Transit Association (KPTA)
- Kansas Native American Affairs

The Project Team will host stakeholder meetings with Kansas Metropolitan Planning Organization (MPO) members. Their feedback on the transportation needs of, and ongoing planning efforts within, urban areas with populations greater than 50,000 are accounted for within the TERS. The following organizations will be included in MPO discussions:

- Mid-America Regional Council (MARC)
- Lawrence-Douglas County Metropolitan Planning Organization (LDCMPO)
- Wichita Area Metropolitan Planning Organization (WAMPO)
- Metropolitan Topeka Planning Organization (MTPO)
- St. Joseph Area Transportation Study Organization (SJATSO)
- Flint Hills Metropolitan Planning Organization (FHMPO)

The roles and responsibilities of stakeholders include, but are not limited to:

- Participating in the TERS process starting with the development of Goals and Objectives
- Providing data that may be relevant to the TERS
- Identifying potential areas of concern
- Providing meaningful input on the TERS

Individuals and organizations identified for participation in the TERS stakeholder meetings are uniquely qualified to give feedback on potential emission reduction strategies and provide insight into transportation needs and opportunities at the state, county and/or municipal levels. However, given the relative newness of emission reduction planning and specific requirements for state DOTs within the federal CRP, not all stakeholders will possess commensurate levels of insight. To increase awareness and the applicability of stakeholder input, cohort presentations will be led by project leads and subject matter experts, and will include overview materials and progress updates.

The primary mode for stakeholder engagement will be virtual teleconference meetings. HDR will coordinate and schedule the meetings, update and maintain presentation materials, provide



stakeholders with agendas and necessary pre-meeting information, and capture stakeholder feedback for analysis and inclusion in the TERS.

The Project Team will guide participating stakeholders through an interactive presentation that provides background on the federal CRP and TERS, information on KDOT's role, and the anticipated process for project completion. Throughout each presentation, Stakeholders will be provided opportunities to ask questions, provide feedback, and complete interactive polls.

All stakeholder meeting feedback will be captured for internal team analysis. While outcomes and survey results may be incorporated into public-facing materials, stakeholder's names will not be displayed with their responses.

A complete stakeholder contact matrix is included as Appendix A.

Response Protocols

This Plan outlines methodologies for inclusive stakeholder engagement and collaboration activities. Owing to the unique nature of the federal CRP, expectation management will be key to its success.

RESPONSE PROTOCOLS

Upon receipt, each stakeholder inquiry will be given unique consideration. Response language and supporting materials will not be publicly disseminated until approved by KDOT. Inquiries and proposed responses will be directed to Allison Smith (Allison.Smith@ks.gov) and Eleanor Matheis (Eleanor.Matheis@ks.gov) for content review and approval.

Once inquiry responses have been approved by the Project Team, HDR will be responsible for drafting and providing responses to KDOT for consideration. HDR will also track and record all TERS-related public and stakeholder input.

Anticipated public inquiry and TERS communication and engagement platforms include, but are not limited to:

- KDOT Communications contact resources
- Existing KDOT and IKE web resources
- The TERS project website
- The TERS email address, KDOTemissionreduction@ks.gov
- KDOT social media platforms
- Direct interaction with TERS team members

KDOT will be responsible for tracking and responding to traditional and social media feedback. HDR will support the development of media materials.



Appendix A - Key Stakeholder Matrix



Kansas Stakeholders

In addition to MPOs, meeting invitations were sent to a diverse list of state agency stakeholders. Only those individuals able to participate are included in the matrix.

Organization	Name	Title or Role
Metropolitan Planning Organizations (MPOs)		
Wichita Area Metropolitan Planning Organization (WAMPO)	Chad Parasa	Transportation Planning Manager
Wichita Area Metropolitan Planning Organization (WAMPO)	Ashley Bryers	Transportation Planning Manager
Mid-America Regional Council (MARC)	Ron Achelpol	Director
Mid-America Regional Council (MARC)	Tom Jacobs	Chief Resilience Officer
Mid-America Regional Council (MARC)	Karen Clawson	Principal Planner/Air Quality Program Manager
Flint Hills MPO	Jared Tremblay	Planning Manager
Metropolitan Topeka Planning Organization (MTPO)	Carlton Scroggins	Transportation Planning Manager
Lawrence and Douglas County MPO (LDCMPO)	Jessica Mortinger	Transportation Planning Manager
St. Joseph Area Transportation Study Organization (SJATSO)	Max Schieber	Transportation Planner
St. Joseph Area Transportation Study Organization (SJATSO)	Joshua Stevens	Transportation Planner
Kansas Department of Transportation (KDOT) CRS Core Team		
KDOT	David Schwartz	Asst. Director Planning and Development
KDOT	Cliff Erlich	Environmental Services
KDOT	Mark Wendt	Environmental Program Administrator
KDOT	Robert Fuller	Maintenance
KDOT	Dan Wadley	Bridge Engineer
KDOT	Ryan Bowman	Road Design Leader
KDOT	Ames Howard	Public Involvement Specialist
State Agency Stakeholders		
Kansas Department of Health & Environment (KDHE)	Douglas (Doug) Watson	Unit Chief, Monitoring and Data
KDHE	Kathleen Waters	Environmental Program Administration Supervisor
KDHE	Jennifer Nichols	North Central Environmental Administrator
KDHE	Jaime Wilson	Northeast Environmental Administrator
KDHE	Allison Herring	South Central Environmental Administrator
KDHE	Wade Kleven	Southwest Environmental Administrator
Kansas Department of Commerce	Craig VanWey	Manager
Kansas Department of Agriculture	Heather Lansdowne	Director of Communications
Kansas Water Office	Amelia Nill	Coordinator



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APPENDIX E:

STAKEHOLDER COMMENTS

2023

KDOT CRS Core Team Meeting

Meeting Date: 5/8/2023 10:00 AM

Location: KDOT HQ - Topeka, KS

Participants:

David Schwartz, KDOT
Cliff Erlich, KDOT
Char Norville, KDOT
Mark Wendt, KDOT
Robert Fuller, KDOT
Dan Wadley, KDOT
Ryan Bowman, KDOT
Mike Moriarty, KDOT

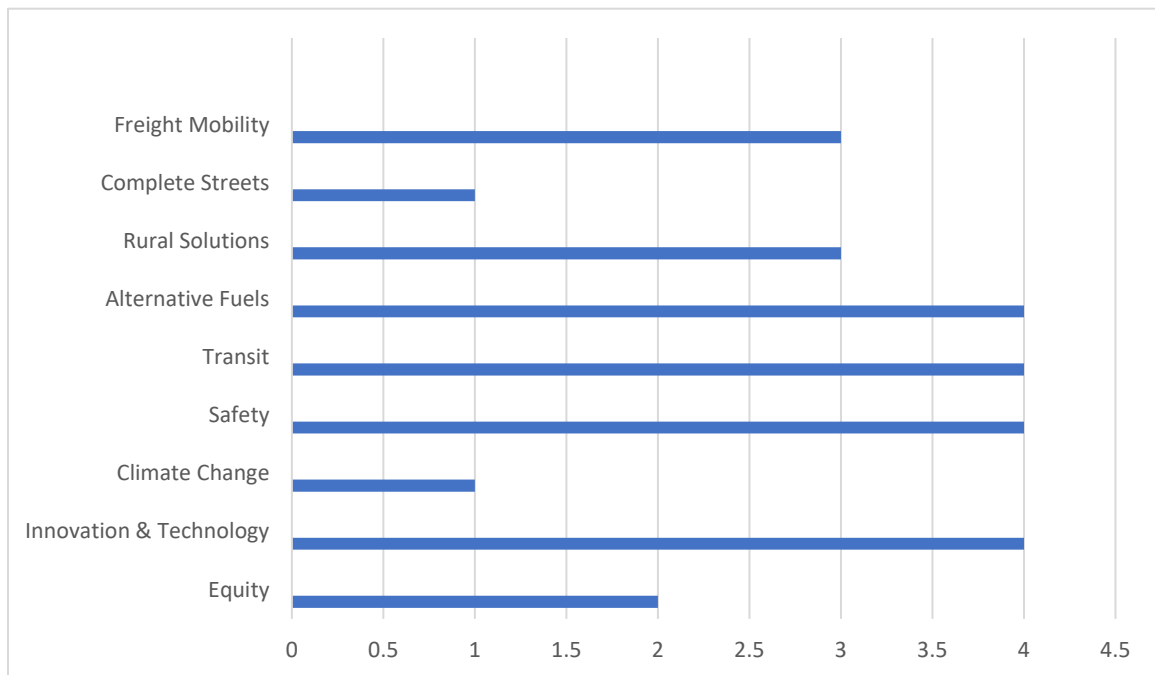
Allison Smith, KDOT
Eleanor Matheis, KDOT
Jennifer Schwaller, HDR
Eric Beightel, HDR
Christopher Kinzel, HDR
Simon Sun, HDR
Chris Deffenbaugh, HDR

Notes

1. Following introductions, the KDOT Project Team reviewed the meeting agenda and noted key items for discussion, including:
 - a. Review of the federal CRP
 - b. Development of the CRS framework
 - c. Potential CRS goals and objectives
 - d. Identification of preliminary strategies
2. An overview of the federal CRP and CRS was provided. Specifics included:
 - a. Funding apportionments
 - b. Eligible project types
 - c. Parameters for strategy development
 - d. Key dates toward completion
 - e. Parameters for CRS
 - f. Strategy requirements
 - g. MPO consultation requirements
 - h. Additional stakeholder and public engagement opportunities
3. Data collection will play a critical role in CRS development. The Project Team provided an overview of dataset sourcing, received and anticipated, and methods for utilization.
 - a. Available data will be used to set emissions baselines.
 - b. Datasets will also help determine orders of magnitude for strategy and project enactment.
4. The presentation was paused for questions and/or discussion.
 - a. A Core Team participant asked if there would be a public comment period.
 - i. Public comment is not required and will be contingent on schedule.
 - b. A question was about how emissions baselines would be adjusted for pandemic-related discrepancies.
 - i. Strategy development will take into consideration pre, during, and post-pandemic results.
 - ii. Plan has to be updated every four year; opportunity to refine.

5. Policy discussion
 - a. How do we want to capture the idea of equitable distribution?
 - b. Innovation and technology
 - c. Development of resilient programs for implementation
 - d. Safety must remain the #1 priority for a transportation agency
 - e. New transit opportunities, as applicable
 - f. Alternate fuels and opportunities to join other, similar programs
 - g. Labor and workforce development

6. The Core Team was presented a list of policy areas and asked to identify those they believed would be most immediate for determining strategy.



7. A Core Team member noted the opportunity to expand public understanding by expanding on the Rural Solutions policy to provide advanced insight for the Agricultural sector.

8. Core Team members were asked if the CRS should set targets for future reductions in transportation-related emissions. Participants responded that:
 - a. Coordination other state agencies considering carbon reduction, such as KDHE, will help determine goals.
 - i. The project team confirmed KDHE would be engaged as part of the CRS.
 - b. Identifying targets may not be possible until the CRS and similar state carbon initiatives have been decided.

9. The Core Team was asked how projects should be selected.
 - a. Project need should be the primary driver on project selection, with application of carbon reductions driving innovation.

10. Meeting participants were asked how best the CRS could be communicated to the public once it was finalized.
 - a. KDOT's role is to be a leader and partner with other agencies and communities to collaborate.
 - b. Assure stakeholders and the public that KDOT will not be changing the way it does business.
 - c. Knowing that sensitivities may exist around certain topics, make sure to consider rural and urban audiences when conducting outreach.

11. The Project Team provided an overview of next steps, specifically upcoming stakeholder events and updates on progress.

KDOT CRS MARC Meeting

Meeting Date: 5/8/2023 10:00 AM

Location: Virtual

Participants:

Ron Achelpohl, MARC
Tom Jacobs, MARC
Karen Clawson, MARC
Allison Smith, KDOT
Eleanor Matheis, KDOT

Jennifer Schwaller, HDR
Brad Thoburn, HDR
Simon Sun, HDR
Chris Deffenbaugh, HDR
Samantha Cicero, HDR

Notes

1. Following introductions, MARC asked that KDOT consider making presentations to its Air Quality and Total Transportation Policy Committee.
 - a. The Project Team confirmed it would be happy to support
2. the KDOT CRS Project Team (Project Team) reviewed the meeting purpose and provided an overview of the federal Carbon Reduction Program (CRP), including:
 - a. Apportionment formula and funding allocations
 - b. Eligible project types
 - c. A timeline for development of the KDOT Carbon Reduction Strategy (CRS)
3. The Project Team provided an overview of its anticipated approach to the CRS:
 - a. There are guidelines but no hard/fast rules to CRS development
 - b. Defining goals and objectives
 - c. Avoiding hot button topics and supporting stakeholder and public understanding of the new program
 - d. Being mindful of creating a plan that is actionable
4. CRS specifics were expanded upon, specifically:
 - a. Pathway to identify projects and strategies that:
 - i. Reduce traffic congestion through development of alternatives
 - ii. Support lower-emission transportation options
 - iii. Review construction opportunities
5. The Project Team shared emissions data for Kansas that showed:
 - a. KS transportation emissions over the past 50 years
 - b. KS emissions by state and per capital
 - c. KS vehicle registration and age of vehicles
 - d. Emissions by county
 - i. The state emissions per-capita data shows disproportionate impact to individuals in rural areas near major highways
6. The Project Team discussed anticipated public involvement activities, including:
 - a. Ongoing MPO coordination and follow-up presentations
 - b. Anticipated use of online survey to gather input from county stakeholders
 - c. MARC asked what level of coordination was required with other agencies

- i. Kansas Dept. of Emergency management will be spoken to, as well as Commerce and KDHE
 - ii. MARC suggested adding Parks Dept.
 - d. MARC asked how overall strategies across different departments would be banked.
 - i. Climate Action Plan will speak with CRS
 - ii. There will be some overlap but CRS is discrete relative to transportation
 - iii. The CRS will identify co-benefits that mirror similar carbon reduction funding programs within KS
7. The Project Team stepped through each of the anticipated primary goals of the CRS. Feedback from MARC included:
- a. Important to note that equity applies to income and geographic location relative to benefits
 - b. Recurring theme that identifying equity within a project unlocks additional funding opportunities
 - i. Important not to impose disproportionate burdens
 - ii. Stakeholder survey will be used to connect with statewide stakeholders and solicit input on regional needs and priorities
 - c. Low-embodied carbon has been discussed along other source material options and will be examined
 - d. Messaging on public health has been well received
 - i. Reducing heat islands have shown multiple benefits
 - e. Partnerships exist with municipal organizations that are interested in investing in complete streets and bike/ped
 - f. Consider TDM more broadly than just transit – jobs access is an issue in parts of the state
 - g. Will the plan be programmatic and less focused on area-specific changes?
 - i. KDOT confirmed, yes
 - h. A couple other strategies in MARC plan that weren't mentioned
 - i. Support for fleet conversion to EV
 - ii. Car sharing in areas where transit is not viable
 - iii. New park & ride facilities
8. Next steps were discussed
- a. Project Team will incorporate MARC's input
 - b. Data collection will continue; KDOT will reach out if addition KC area data is needed
 - c. KDOT will reach out to schedule follow-up presentation to MARC on CRS progress
 - d. Project Team will follow up to schedule MARC air quality and total transportation committees

KDOT CRS Presentation to WAMPO

Meeting Date: 6/14/2023 10:30 AM

Location: Virtual

Participants:

Chad Parasa, WAMPO
Nick Flanders, WAMPO
Ashley Bryers, WAMPO
Michael Moriarty, KDOT
Allison Smith, KDOT
Eleanor Matheis, KDOT

Jennifer Schwaller, HDR
Eric Beightel, HDR
Christopher Kinzel, HDR
Simon Sun, HDR
Chris Deffenbaugh, HDR
Sam Cicero, HDR

Presentation

1. The CRS Project Team provided an overview of the call agenda, noting the importance of:
 - a. Reviewing the federal CRP
 - b. Reviewing similarities and opportunities across both agency's carbon reduction programs.
 - c. This is the first MPO meeting. There will be additional consultations in the future.
2. Through the BIL, the formula-based CRP was established to reduce transportation emissions from on-road sources.
 - a. Review of funding apportionment
 - b. There is flexibility to transfer up to 50% of funds to achieve objectives
3. Funds are directed to certain types of projects but flexibility if substantiation of carbon reduction benefits
4. Overall approach
 - a. Define goals and objectives
 - b. Speak with stakeholders to identify third-rail issues
 - c. Obtain valuable feedback and seek consensus
 - d. Population density is a primary consideration
 - e. Strategy is due to FHWA by November 15
 - f. Encouraged to incorporate into LRTP
5. Strategies will look at ways we can reduce single occupant travel and facilitate lower-emission construction
6. CRS must support carbon emissions in Kansas
 - a. State may choose to quantify goals
 - b. Whatever strategy is developed must be aligned with population density and regional context
7. Discussion of projects that will improve traffic flow and capacity without adding lanes.
 - a. ITS, system management, travel demand, automated vehicles
 - b. Other types of projects would shift to no-or-low mode
 - c. Money can also be used to develop the strategy itself

8. Timeline for KDOT is to submit the CRS plan to FHWA by Nov. 15.
 - a. FHWA provides a framework for the CRS but KS has leeway to set its standards and strategy
9. KDOT discussed development of dataset baselines to better understand existing conditions.
 - a. By-state, KS is in bottom third for transportation emissions; per-capita, KS shifts to the upper third percentile
 - b. Examined age of vehicle registrations – majority are passenger cars with an average age of 12 years
 - c. More granular level includes emissions by KS county and includes impact from major roadways, such as I-70
10. The anticipated stakeholder feedback process was reviewed
 - a. There are unique opportunities for outreach
 - b. Equity and inclusivity are central to the process
11. WAMPO volunteered that it is going through a carbon reduction process and is aware of the CRP requirements.
 - a. Also interesting to see urban areas compared to rural and prioritization of both
12. The Project Team provided an overview of its approach to strategy development, including goals and objectives.
 - a. Important to accomplish KDOT's goals and FHWA priorities
 - b. Safety, Innovation, Equity, Sustainability
 - c. Continue to advance identified goals and objectives with stakeholder feedback
 - d. Identify third-rail issues that could present with a new program that has timelines.
 - e. Focus on productivity,
 - f. Avoid shelf-filling prophecies; create an actionable plan
 - g. Informed approach includes stakeholder education and collaboration
13. Strategy must:
 - a. Most basic level - support carbon reduction strategies
 - b. Identify projects and strategies
 - c. Focus on congestion reduction, low emission options, facilitate less-carbon-intensive approaches to construction
14. Items to keep in mind:
 - a. Option to quantify total carbon emissions from the production, transport, and use of materials in the construction of facilities
 - b. Need to create a strategy that is appropriate for the state and recognizes relative impacts for urban and rural areas
15. Stakeholder coordination and engagement provide pathways to collaboratively works statewide.
 - a. Reduce barriers to access
 - b. Ongoing opportunities for stakeholder interactions and development
16. KDOT reviewed primary CRS goals and priority areas: safety, equity, innovation, and sustainability.
 - a. Goals align with FHWA guidance
 - b. Safety of all users will always remain a priority, as will equity.
 - c. Funding can also be used to leverage overlapping programs that share co-benefits – energy efficient lighting on roadways, bike/ped, grade separation
 - d. Equity, including disadvantaged communities, and geographic equity, and barrier elimination are being considered within primary goals
17. The Project Team asked if WAMPO had input on primary goals.
 - a. WAMPO noted that the goals make sense
 - b. If we can use carbon reduction to increase safety – win/win

- c. At grade crossings with long delays are a positive application
 - d. Important to balance qualitative and quantitative protocols
 - e. On engagement, WAMPO's team is good at public involvement and stating common goals
 - i. Happy to collaborate on a common cause and pass along information
 - f. Broad questions include:
 - i. How do you quantify mode shifts?
 - ii. How do we transfer these benefits into cost amounts?
18. The Project Team quickly previewed anticipated secondary CRS goals
- a. Solar arrays and species diversification/pollinator, advanced sequestration programs
 - b. Alternative fuels and rural strategies have multiple tie-ins
 - c. Build off KDOT NEVI program
 - d. Public demand and/or acceptance central to success
 - e. Complete streets a good example of solution that works in rural and urban areas
 - f. Labor and workforce is not unique to CRS; all BIL programs designed to identify opportunities
 - g. Noted that KDHE ranked the "expand transit solutions" third-most important solution for rural and urban areas.
 - i. Provides path to address equity and access

Discussion/Q&A

1. WAMPO volunteered that they like all the proposed goals and see opportunities for each.
2. There's tremendous opportunity for WAMPO and KDOT to work together.
3. Increased transit is a great way for low-income households to save money, create opportunities.

KDOT CRS Presentation to Metropolitan Topeka Planning Organization (MTPO)

Meeting Date: 6/30/2023 10:30 AM

Location: Virtual

Participants:

Carlton Scroggins, MTPO
Allison Smith, KDOT
Eleanor Matheis, KDOT
Jennifer Schwaller, HDR

Brad Thoburn, HDR
Christopher Kinzel, HDR
Chris Deffenbaugh, HDR

Notes

1. Following introductions, the KDOT Project Team reviewed the meeting agenda and noted key items for discussion, including:
 - a. Review of the federal CRP
 - b. KDOT need to identify carbon reduction projects
 - c. Potential CRS goals and objectives
 - d. Completed and upcoming efforts
 - e. Identification of preliminary strategies
2. An overview of the federal CRP and CRS programs was provided, including:
 - a. BIL formula and allocations
 - b. Eligible programs, projects, and strategies
 - c. Key dates toward completion
 - d. FHWA guidance, including MPO and stakeholder consultation
 - e. Additional stakeholder and public engagement opportunities
 - f. Selection of actionable strategies
 - g. Public education
3. Data collection will play a critical role in CRS development. The Project Team provided an overview of, and context regarding, datasets.
 - a. Data sourced from national and state inventories
 - b. Insights include average age of private vehicle in KS (12 years) and total vs. per-capital emissions
 - c. Upcoming dataset report will be provided to KDOT
 - d. Datasets will also help determine orders of magnitude for strategy and project enactment
4. Stakeholder engagement initiatives for the CRS were presented:
 - a. MPO input germane to branding, messaging, and public understanding
 - b. State-wide stakeholder survey will be disseminated
5. Presentation paused for questions and discussion.
 - a. Carlton noted:

- i. Comparisons between the CRS and other, available grants for street infrastructure
 - ii. Topeka has had success winning transportation alternative (TA) grants
 - iii. TA and cost share grants for multimodal transportation could have great tie-ins with Kansas CRS
 - iv. Topeka's TMPA were given the Low-No Emission Grant and used it to purchase three electric buses that will replace combustion engine fleet.
 - v. Topeka is looking to add EV charging stations around the city
 - vi. The City has completed the third update of its online bikeways system, established in 2012
 - vii. City has earmarked a portion of its half-cent sales tax to improve grant outcomes, many of which align with CRS
6. KDOT reviewed primary CRS goals and priority areas.
 - a. Safety will always remain a priority, as will equity.
 - b. In addition to urban and rural designations, CRS will look at project applicability and potential synergies
 - c. Technology and innovation are increasingly drawing focus
 - i. CRP presents an action point to advance responsive traffic response and project delivery
 - d. Development of resilient programs for implementation
 - e. Innovative habitats
 - f. Projects that increase resiliency.
 - g. Labor and workforce development
7. The Project Team quickly previewed the secondary goals
 - a. Consistent with guidance from FHWA
 - b. Still working to understand relationships to primary goals
 - c. A lot of transit agencies are weighing EV against alternative fuels
 - d. Working closely with state-wide partners will help KDOT understand infrastructure needs and opportunities to move needles
 - e. Complete streets and transit solutions have direct co-benefits with primary goals
 - f. Freight is crucial to economic health; improvements can be applied cross-regionally
 - g. Supporting the labor pipeline is a win/win
8. KDOT asked if Topeka has established carbon reduction targets
 - a. Carlton responded no, they had not.
 - b. Focus has been on multi-modal transportation
 - c. MTA grants would benefit from this
 - d. Recently adopted a Complete Streets Advisory Committee that is reviewing new project opportunities

9. Carlton mentioned he was excited about the CRS and would obtain and share input from his MPO partners, federal highways, KDOT and community stakeholders that have an interest in advancing transportation projects.
10. KDOT asked if for insight on any third-rail issues.
 - a. There can be some pushback on multi-modal projects, which is not unique to their community
 - b. Safety issues and modifications aren't a problem but traffic-flow restrictions tend to receive public pushback.
11. The Project Team provided an overview of next steps, specifically upcoming stakeholder events and updates on progress.

KDOT CRS Presentation to State Agencies

Meeting Date: 8/07/2023 2:00 PM

Location: Virtual

Participants:

Craig VanWey, KDC
Heather Lansdowne, KDA
Amelia Nill, KWO
Allison Smith, KDOT
Michael Moriarty, KDOT
Eleanor Matheis, KDOT

Jennifer Schwaller, HDR
Brad Thoburn, HDR
Christopher Kinzel, HDR
Chris Deffenbaugh, HDR
Samantha Cicero, HDR

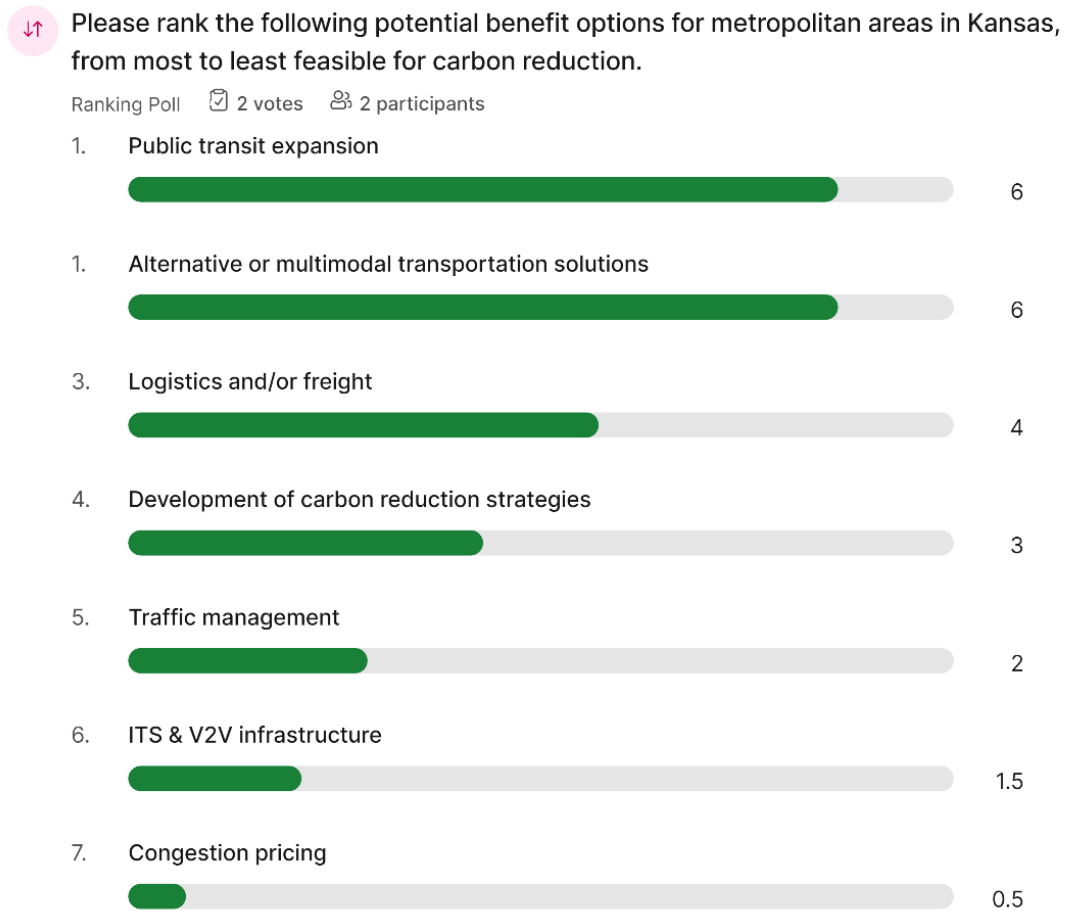
Presentation

1. During introductions, the KDOT Project Team noted that the call was meant to be interactive and participation was encouraged.
2. KDOT introduced the call agenda then provided an overview of the federal CRP.
 - a. A couple new programs, including the CRP, that's aimed at reducing carbon-reduction impacts from the transportation sector.
 - b. Formula programs have requirement for apportionment of funds relative to population density
 - c. For CRS:
 - i. 65% allocated based on population
 - ii. Remaining 35% can be allocated anywhere in state based on opportunity
 - d. Over the life of the BIL, KS will receive \$63M
 - e. Broad list of projects that can be considered
 - i. Capacity projects - ITS, system management, travel demand management
 - ii. Moving people away from single-occupant travel – transit or bike/ped investments
 - iii. Cleaner vehicles and resource electrification
3. KDOT's strategy is due to FHWA on November 15, 2023
 - a. Requirement to speak with MPOs
 - b. Strongly encouraged that CRS be incorporated into state LRTP plans
4. A live
5. An overview of the federal CRP and CRS programs was provided, including:
 - a. CRP, created under BIL, creates new programs that require informed approach
 - b. This is a formula grant, aimed at reducing carbon emissions from on-road transportation emissions
 - c. Funding needs to be spread based on geography and population
 - d. Review of apportionment formula
 - e. Expectation of continuing the program beyond FY26
6. Discussion of projects that will improve traffic flow and capacity without adding lanes.
 - a. ITS, system management, travel demand, automated vehicles
 - b. Other types of projects would shift to no-or-low mode
 - c. Money can also be used to develop the strategy itself

7. Timeline for KDOT is to submit the CRS plan to FHWA by Nov. 15.
 - a. FHWA provides a framework for the CRS but KS has leeway to set its standards and strategy

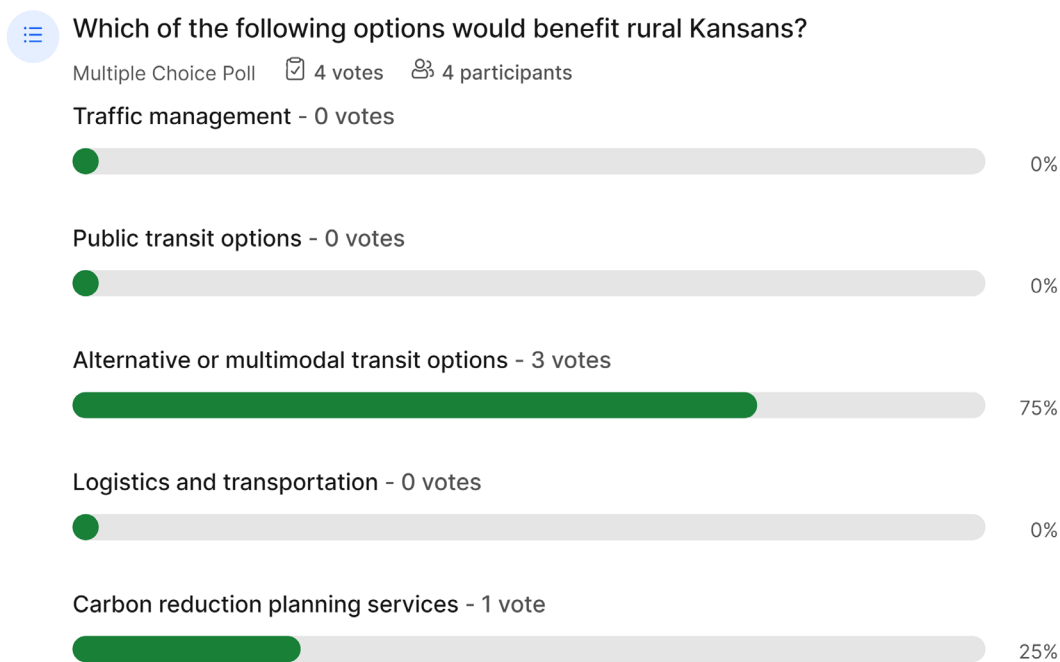
8. Using a presentation-embedded, live polling application, stakeholders were able to scan a QR code and provide interactive feedback to two questions.
 - a. The first question asked stakeholders to rank a predetermined list of potential benefit options for metropolitan areas in Kansas. Results below in Figure 1.
 - b. The second live polling question asked, “which of the following options would benefit rural Kansans. Results below in Figure 2.

Figure 1.



(Continued)

Figure 2.



9. KDOT provided an overview of its approach to CRS completion, specifically:
 - a. Continue to advance identified goals and objectives with stakeholder feedback
 - b. Identify guardrails
 - c. Develop plan that is actionable rather than conceptual
 - i. Expectation is CRS will be reflective of path and people
 - d. Informed approach includes stakeholder education and collaboration
 - e. CRP requires feasibility within/across the state
 - f. Total carbon emissions from transportation may be quantified
10. The Project Team provided an overview of its approach to dataset collection and usage, and displayed three charts: emissions in Kansas over the past 50 years; state rankings for overall carbon emissions, state rankings for per-capita emissions.
 - a. Data sourced from national and state inventories
 - b. KDOT has data on auto registrations (avg. age of vehicles in KS)
 - c. Working to get additional information, such as construction emissions
 - d. In more rural areas, information from large facilities will support solutions
11. After reviewing datasets, KDHE asked if adjustments would be made for deviating carbon emission during 2020 COVID pandemic.
 - a. It has been noted and Project Team is being careful to apply appropriate baselines
 - b. To the greatest degree possible, KDOT will rely on latest datasets and identify anomalous factors
12. KDHE asked if, in rural counties scoring higher on the per-capita emissions, age of vehicle fleet would play a role (older, less efficient vehicles).
 - a. KDOT noted that KDHE's question was intriguing and additional attention would be given
 - b. Based on strong data relationships, the major contributors are major transportation facilities running through counties with low populations
13. A quick overview of anticipated stakeholder engagement activities was provided.
 - a. CRS is dependent on KDOT leadership
 - b. MPO and agency meetings will continue with future updates provided

- c. Final engagement step will be CRS website where public can view strategy document
14. KDOT reviewed primary CRS goals and priority areas.
 - a. Safety will always remain a priority, as will equity.
 - b. Funding can also be used to leverage partner grant applications
 - c. Equity, including disadvantaged communities, are being considered within primary goals
 - d. Sustainability and resilience present KDOT and KDHE opportunity to explore partnerships
 15. The Project Team quickly previewed anticipated secondary CRS goals
 - a. Alternative fuels and rural strategies have multiple tie-ins
 - b. Build off KDOT NEVI program
 - c. Public demand and/or acceptance central to success
 - d. Complete streets a good example of solution that works in rural and urban areas
 - e. Labor and workforce is not unique to CRS; all BIL programs designed to identify opportunities
 - f. Noted that KDHE ranked the “expand transit solutions” third-most important solution for rural and urban areas.
 - i. Provides path to address equity and access

Q&A

1. KDHE introduced the Emissions Reduction and Mitigation Plan (E-RAMP), developed in consultation with KS Governor’s office.
 - a. Includes \$3M to produce two plans, first of which is their Priority Action Plan (PAP), due on March 1, 2024.
 - i. Intent is to identify shovel-ready projects that will reduce emissions.
 - ii. First phase supports the development of state plans to reduce emissions
 - iii. Second phase will result in identification of high priority, implementation-ready measures
 - iv. Stakeholder engagement also key for success
 - b. Second plan is Comprehensive Action Plan (CAP), due Summer 2025
 - c. EPA has not yet released scoring
 - d. KDHE working with Bureau of Air on support
 - e. Will also be working with Wichita State to do outreach and coordination
 - f. Good chance NEPA clearance will be required for project funding
2. KDOT asked if, within KDHE’s plans, they are developing strategies that should be compared for compatibility.
 - a. KDHE is looking at the goal of reducing emissions across the state, including Greenhouse Gas.
 - b. Plans will be based on project metrics and target neutral
 - c. Have identified sister state agencies to be included in plan for potential funding
 - i. Will expand to municipalities and state sources
 - ii. Include gen. public, tribes, and NGOs
 - d. KDOT CRS will include partnerships to maximize impact and opportunity; look for aligned or related benefits.
3. KDHE noted past work with large, single-source emitters in select Kansas areas altering carbon impacts so that transportation may now be top contributor.
 - a. Emissions from transportation is an emergent priority
4. KDHE will coordinate with Allison Smith, KDOT, to share insights.
5. The Project Team concluded the call with a review of the anticipated schedule and next steps.

KDOT CRS Presentation to KDHE, Session 1

Meeting Date: 8/02/2023 1:00 PM

Location: Virtual

Participants:

Douglas Watson, KDHE
Kathleen Waters, KDHE
Allison Smith, KDOT
Eleanor Matheis, KDOT

Jennifer Schwaller, HDR
Christopher Kinzel, HDR
Simon Sun, HDR
Chris Deffenbaugh, HDR

Presentation

1. During introductions, KDHE noted they had begun working on a pollution reduction grant and were planning to reach out to state agencies soon. Call is well-timed.
2. KDOT provided an overview of the call agenda, noting the importance of:
 - a. Reviewing the federal CRP
 - b. Reviewing similarities and opportunities across both agency's carbon reduction programs.
3. An overview of the federal CRP and CRS programs was provided, including:
 - a. CRP, created under BIL, creates new programs that require informed approach
 - b. This is a formula grant, aimed at reducing carbon emissions from on-road transportation emissions
 - c. Funding needs to be spread based on geography and population
 - d. Review of apportionment formula
 - e. Expectation of continuing the program beyond FY26
4. Discussion of projects that will improve traffic flow and capacity without adding lanes.
 - a. ITS, system management, travel demand, automated vehicles
 - b. Other types of projects would shift to no-or-low mode
 - c. Money can also be used to develop the strategy itself
5. Timeline for KDOT is to submit the CRS plan to FHWA by Nov. 15.
 - a. FHWA provides a framework for the CRS but KS has leeway to set its standards and strategy
6. Using a presentation-embedded, live polling application, stakeholders were able to scan a QR code and provide interactive feedback to two questions.
 - a. The first question asked stakeholders to rank a predetermined list of potential benefit options for metropolitan areas in Kansas. Results below in Figure 1.
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Figure 1.

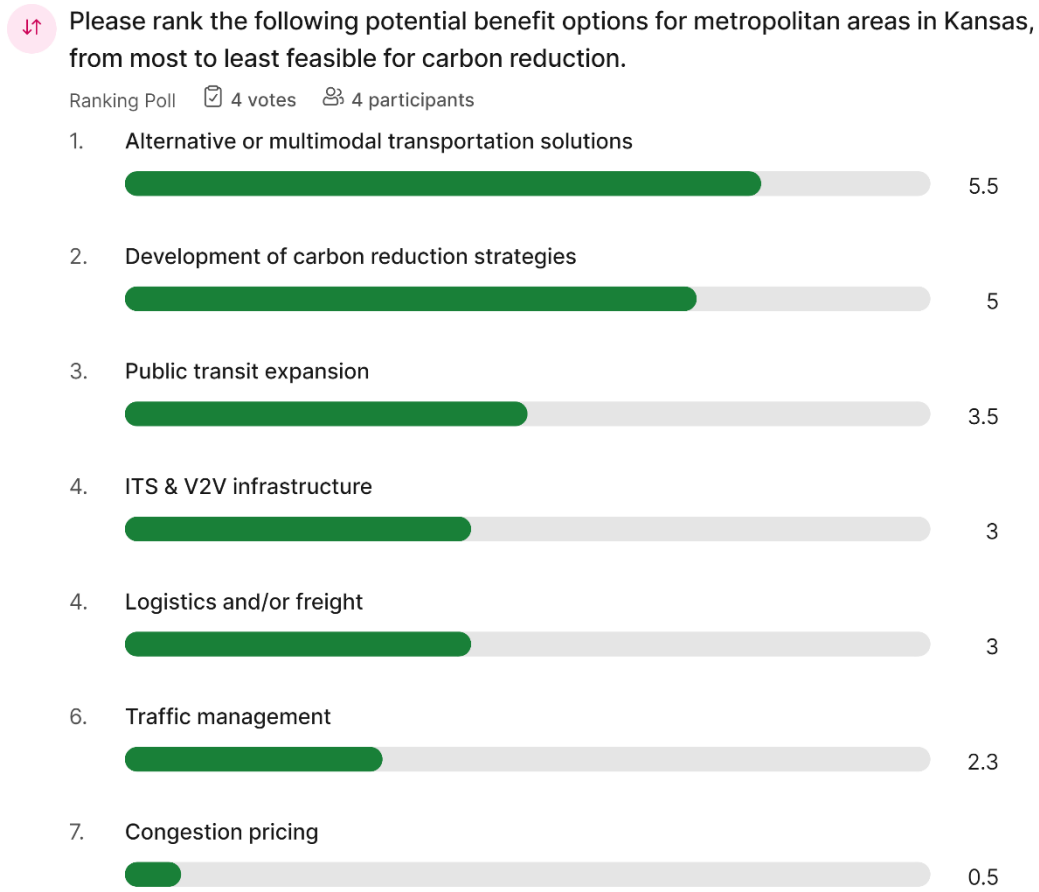
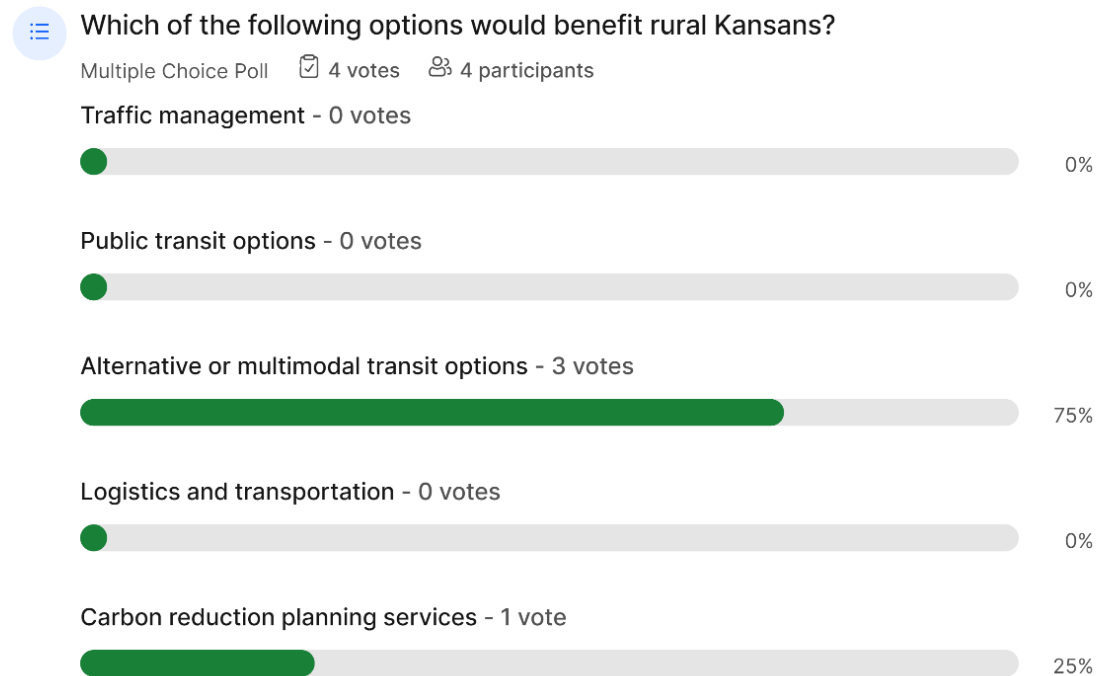


Figure 2.



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 - b. Identify guardrails
 - c. Develop plan that is actionable rather than conceptual
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13. The Project Team quickly previewed anticipated secondary CRS goals
 - a. Alternative fuels and rural strategies have multiple tie-ins
 - b. Build off KDOT NEVI program
 - c. Public demand and/or acceptance central to success
 - d. Complete streets a good example of solution that works in rural and urban areas
 - e. Labor and workforce is not unique to CRS; all BIL programs designed to identify opportunities
 - f. Noted that KDHE ranked the "expand transit solutions" third-most important solution for rural and urban areas.
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Q&A

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 - d. KDOT CRS will include partnerships to maximize impact and opportunity; look for aligned or related benefits.
3. KDHE noted past work with large, single-source emitters in select Kansas areas altering carbon impacts so that transportation may now be top contributor.
 - a. Emissions from transportation is an emergent priority
4. KDHE will coordinate with Allison Smith, KDOT, to share insights.
5. The Project Team concluded the call with a review of the anticipated schedule and next steps.

KDOT CRS Presentation to KDHE, Session 2

Meeting Date: 8/07/2023 10:00 AM

Location: Virtual

Participants:

Allison Herring, KDHE
Jaime Wilson, KDHE
Dan Wells, KDHE
Jennifer Nichols, KDHE
Wade Kleven, KDHE
Allison Smith, KDOT

Eleanor Matheis, KDOT
Jennifer Schwaller, HDR
Brad Thoburn, HDR
Chris Deffenbaugh, HDR
Sam Cicero, HDR

Presentation

1. During introductions, KDHE noted they had begun working on a pollution reduction grant and were planning to reach out to state agencies soon. Call is well-timed.
2. KDOT provided an overview of the call agenda, noting the importance of:
 - a. Reviewing the federal CRP
 - b. Reviewing similarities and opportunities across both agency's carbon reduction programs.
3. An overview of the federal CRP and CRS programs was provided, including:
 - a. CRP, created under BIL, creates new programs that require informed approach
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 - c. Funding needs to be spread based on geography and population
 - d. Review of apportionment formula
 - e. Expectation of continuing the program beyond FY26
4. Discussion of projects that will improve traffic flow and capacity without adding lanes.
 - a. ITS, system management, travel demand, automated vehicles
 - b. Other types of projects would shift to no-or-low mode
 - c. Money can also be used to develop the strategy itself
5. Timeline for KDOT is to submit the CRS plan to FHWA by Nov. 15.
 - a. FHWA provides a framework for the CRS but KS has leeway to set its standards and strategy
6. Using a presentation-embedded, live polling application, stakeholders were able to scan a QR code and provide interactive feedback to two questions.
 - a. The first question asked stakeholders to rank a predetermined list of potential benefit options for metropolitan areas in Kansas. Results below in Figure 1.
 - b. The second live polling question asked, "which of the following options would benefit rural Kansans. Results below in Figure 2.

Figure 1.

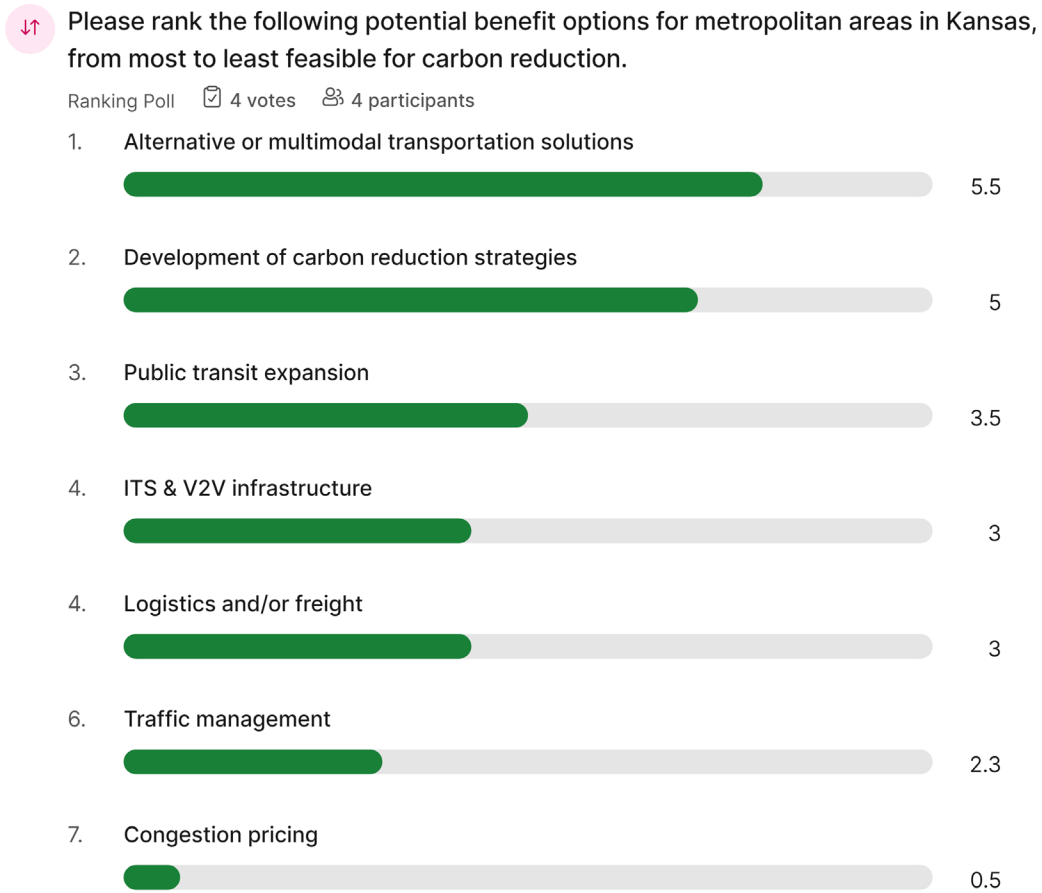
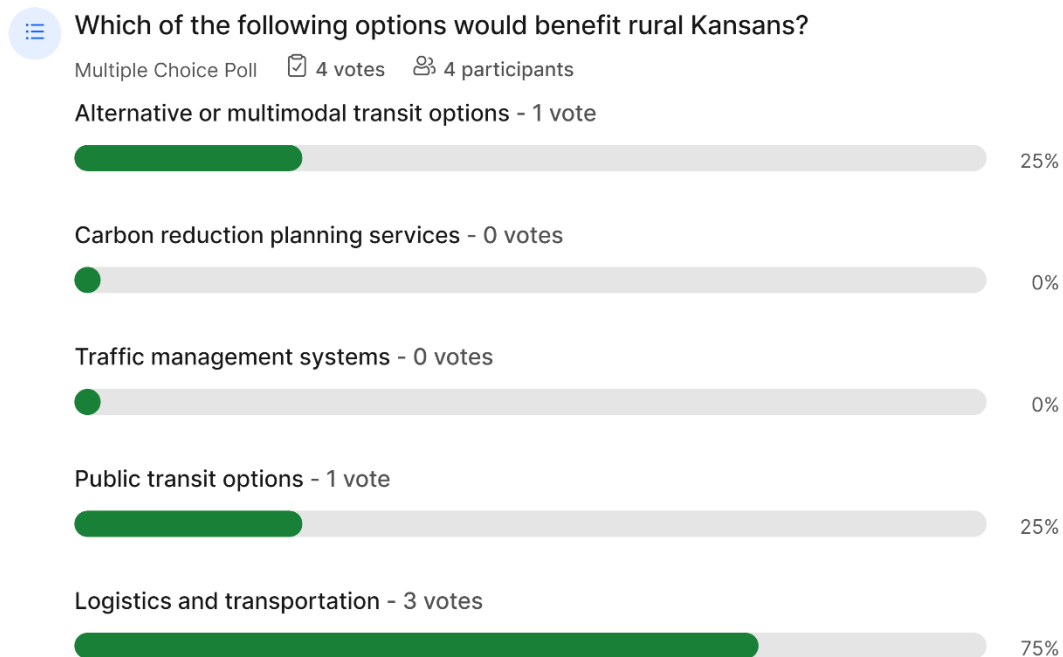


Figure 2.



7. KDOT provided an overview of its approach to strategy development, including goals and objectives.
 - a. Continue to advance identified goals and objectives with stakeholder feedback
 - b. Identify third-rail issues that could present with a new program that has timelines.
 - c. Focus on productivity,
 - d. Avoid shelf-filling prophecies; create an actionable plan
 - e. Informed approach includes stakeholder education and collaboration
8. Strategy must:
 - a. Most basic level - support carbon reduction strategies
 - b. Identify projects and strategies
 - c. Focus on congestion reduction, low emission options, facilitate less-carbon-intensive approaches to construction
9. Items to keep in mind:
 - a. Option to quantify total carbon emissions from the production, transport, and use of materials in the construction of facilities
 - b. Need to create a strategy that is appropriate for the state and recognizes relative impacts for urban and rural areas
10. KDOT discussed development of dataset baselines to better understand existing conditions.
 - a. By-state, KS is in bottom third for transportation emissions; per-capita, KS shifts to the upper third percentile
 - b. Examined age of vehicle registrations – majority are passenger cars with an average age of 12 years
 - c. More granular level includes emissions by KS county and includes impact from major roadways, such as I-70
11. Stakeholder coordination and engagement provide pathways to collaboratively works statewide.
 - a. Reduce barriers to access
 - b. Ongoing opportunities for stakeholder interactions and development
12. KDOT reviewed primary CRS goals and priority areas: safety, equity, innovation, and sustainability.
 - a. Goals align with FHWA guidance
 - b. Safety of all users will always remain a priority, as will equity.
 - c. Funding can also be used to leverage overlapping programs that share co-benefits – energy efficient lighting on roadways, bike/ped, grade separation
 - d. Equity, including disadvantaged communities, and geographic equity, and barrier elimination are being considered within primary goals
 - e. Justice40 considerations
 - f. Technology and innovation is an area where there have been interesting advancements – traffic flows, ITS, smart signals, incident detection, proactive management, and predictive analytics, low-carbon materials
 - g. Sustainability and resilience present KDOT and KDHE opportunity to explore partnerships
 - i.
13. The Project Team quickly previewed anticipated secondary CRS goals
 - a. Solar arrays and species diversification/pollinator, advanced sequestration programs
 - b. Alternative fuels and rural strategies have multiple tie-ins
 - c. Build off KDOT NEVI program
 - d. Public demand and/or acceptance central to success
 - e. Complete streets a good example of solution that works in rural and urban areas

- f. Labor and workforce is not unique to CRS; all BIL programs designed to identify opportunities
- g. Noted that KDHE ranked the “expand transit solutions” third-most important solution for rural and urban areas.
 - i. Provides path to address equity and access

Discussion/Q&A

1. The Project Team circled back to the primary and secondary goals to see if there were any questions.
 - a. KDHE participants said goals seem well developed
2. To implementation, it will be interesting to see how public and private will work together. Transit could be a big help but public embrace may be lacking.
 - a. Outreach will be an important component
 - b. Work with municipal transit boards to spread effective messaging
 - c. Provide bus service to major employers who may be located outside city boundaries
3. Major metro areas are bumping up against their ozone standards.
 - a. Emphasizing how CRS could support ozone levels would bring city buy-in
4. Primary focus in western Kansas has to do with water availability, quality, and conservation. Could be a tough sell to shift emphasis to carbon reduction. Not seen as much of an issue by rural residents.
 - a. Online CRS survey will engage transit boards
 - b. Primary population is farmers/ranchers, all of whom operate large equipment
 - i. Cautious approach will pay dividends
 - c. School buses cover ground in rural areas – could be an effective target
 - d. Plan, objectives, and outcomes should make clear CRS is not a regulatory requirement
5. KDHE asked if some traffic congestion projects were already being implemented.
 - a. Almost all these strategies are occurring; funding allows them to be accelerated
 - b. Good examples: NEVI program, US-69 toll lane
6. The Project Team concluded the call with a review of the anticipated schedule and next steps.

Stakeholder Comments Submitted via CRS Survey

Survey period: 09/11 – 09/20

Location: Online

Survey Q5 asked respondents to describe the transportation-related carbon reduction planning goals or strategies their agency or administration had or would be undertaking. The question was open-ended, and stakeholders provided the following responses:

1. Working with communities on alternate types of transportation and also on weatherizing and improving households' energy efficiency
2. Douglas County is currently drafting a climate action plan
3. Not sure of what plan the City of Topeka has in place.
4. We are finalizing a Climate Action and Adaptation Plan for formal adoption, it includes a section on Mobility, climate mitigation goals and related strategies.
5. Biofuels production
6. Regulations regarding the transporting of agricultural equipment, vehicles and implements of husbandry must be practical. Consideration should be given to the type of use, practice and design of the equipment, vehicle or implement. Regulations should also recognize the unique characteristics of agricultural transportation, distance to markets, seasonal needs, and the need to maximize efficiencies in transport. We encourage the use of roadside reflective flexible markers to reduce damage to farm equipment.

We encourage flexibility in axle and bridging limits for trucks transporting commodities at harvest from field to the first market or point of storage. Our purpose is to carry loads which are more compatible with the vehicle design.

We support infrastructure improvements on two-lane, class B highways (as defined by KDOT), such as adding slow traffic passing lanes or converting them to four-lane highways. Project priorities should also include secondary roadways to allow safe and efficient transport.

We oppose the adoption of vehicle emission standards or the regulation of the carbon intensity of transportation fuels if they have a long-term, negative impact on the production and use of renewable fuels or an adverse economic impact on agriculture.

We support legislative and regulatory approval for an increased octane fuel standard utilizing higher blends of ethanol to help automobile manufacturers meet fuel efficiency standards and reduce their carbon footprint.

We oppose carbon emission related taxes or fees on horsepower of vehicles and

equipment used for agricultural production.

7. Replace current fleet with Hybrid/Electric vehicles.
8. Promote DC fast charging in small towns, and get businesses and government to install level 2
9. Safe Routes to School and Trails initiatives
10. Carpooling, bicycling routes through the county, low emission vehicles
11. Increase bike and pedestrian paths in city.
12. Working with MARC on a sustainable places study on Lexington and 83rd Street to address transportation modes and better connect the community
13. The City is constructing a new work of hike and bike trails.
14. We developed a strategic plan and the community desires a city that is designed, built, and operated in ways that use resources and the environment efficiently and equitably.
 - a. MODERNIZATION
 - i. 1.1 Modernize technology, software, and systems.
 - ii. 1.2 Provide safe, reliable, and up-to-date equipment and facilities to employees. An enhanced network of infrastructure...where neighborhoods and districts have well-maintained transportation networks, reliable water and sanitary services, and environmental mitigation efforts to preserve the natural environment.
 - b. MOBILITY
 - i. 3.1 Fund the City's Bicycle and Pedestrian Systems Plan.
 - ii. 3.2 Support and enhance "last mile" transportation.
 - c. INFRASTRUCTURE
 - i. 3.4 Continue to maintain city streets.
 - ii. 3.5 Implement the Stormwater Master Plan.
 - iii. 3.6 Implement Water and Sewer Master Plans.
 - d. RESILIENCY
 - i. 3.7 Address flooding and pursue mitigation efforts.
 - ii. 3.8 Establish a community resiliency committee.
 - iii. A strong sense of place where housing, recreation, cultural offerings, and education cater to all ages to create vibrant, attractive, safe, and unique destinations throughout the City.
 - e. LIVABILITY
 - i. 4.1 Complete a housing study and implement policy strategies.
 - ii. 4.3 Continue preservation planning.
 - iii. 4.4 Analyze cost-of-living throughout the community.
 - f. RECREATION

- i. 4.5 Develop and adopt a Comprehensive Parks and Recreation Master Plan (CPRMP)."

15. We develop, construct, own and operate public EV charging facilities.
16. More walking trails, sidewalk improvements, and bike trails
17. Putting in charging stations
18. Provide EV charging stations at City facilities and encourage EV charging stations within private developments. Encourage the use of solar panels, require glass recycling for new multi-family.

Survey Q12 asked respondents "Do you have any additional thoughts or questions about the Carbon Reduction Strategy?" The question was open-ended and stakeholders provided the following responses:

1. Can we look at partnering to create a policy, that would ENCOURAGE businesses to promote remote work to limit unnecessary emissions?
2. Our county open space plan could partner with KDOT to discuss right of way options for open space and recreation.
3. Most tiny communities like ours (586 population) are so overwhelmed with maintaining required services to our public, there is no manpower, money or interest in taking on other projects.
4. Working with the package Delivery industry (UPS, Fedex, Amazon, on demand providers, etc) to provide more drop box locations in rural areas to prevent the excessive travel for deliveries especially in rural unincorporated areas. These pick-up stations could be hosted in excess KDOT right of way. The carbon reduction impact could be tremendous, in addition to the rural road impact reduction.
5. Need to open access to cleaner burning biofuels
6. KDOT should coordinate with electric utilities, both retail providers and Transmission Owners (they aren't always the same entities) to electrify commercial fleet. They'll need to stand up charging infrastructure and the retail utility will need to implement a rate structure that provides the incentive to utilize EVs with Vehicle to Grid technology. This would shift a significant portion of load off-peak, provide an excellent storage opportunity, and enhance the resilience and reliability of our grid. This requires leadership from the Executive Branch.
7. I do not believe having survey questions that only have six responses and requiring people to choose 3 responses provides an actual accurate response, especially if this

requires people to choose options they do not agree with.

8. EV vehicle economic incentives.
9. The EV tasks are upside down. more vehicles than power to supply them and totally unorganized and unreasonable recharging infrastructure regarding who owns it, who supplies it, where located, who charges for it and collects and administers and maintains the equipment and software. Vandal proof??
10. Electric vehicles are not practical in rural areas that require long travel distances on a daily basis. Takes too long to charge and adds many hours onto an already long day with many miles.