OKI
Ohio · Kentucky · Indiana
Regional Council of Governments

ISSUES AND NEEDS ASSESSMENT REPORT

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Introduction to the Freight Issues and Needs Assessment Report

Overview

OKI's freight issues and needs are summarized based on the current and expected future conditions of the region's freight transportation network and the system's strengths, weaknesses, opportunities, and threats. This high-level analysis is a synthesis of the work accomplished to date on this Freight Plan. This report is organized to focus on the current and future freight issues that have, or may have, an adverse effect on the region and what is needed to reduce or avoid them. These needs are generally the first step to identify and focus freight recommendations on solving those specific issues. They will also aid the region in safely and efficiently moving critical regional freight, while improving environmental sustainability and economic competitiveness.

OKI Freight Goals

The OKI freight goals provide the framework for prioritizing efforts to improve future freight transportation in the region. With the goals in mind, evaluating the issues and needs helps to focus our analysis to better address those issues critical to enhancing the future freight movement and resulting economic growth within the OKI region. The freight goals: safety; infrastructure condition; mobility and reliability; environmental sustainability; and economic competitiveness.

Safety Issues and Needs Assessment

OKI's freight safety goal says the freight transportation system should reduce the risk of crashes that cause death or injuries for the traveling public; minimize risks to shipments and property damage; and ensure the safety, health, and well-being of freight employees.

The region's safety issues and needs are outlined by each of the five freight modes: road, rail, river, runway/air, and pipeline.

Road Safety Issues and Needs

Reducing the risk of truck crashes is a priority goal for OKI. Crash reductions will result in lives saved, fewer personal injuries and less property damage, with an increase overall freight movement efficiency. All safety improvements to roads that carry trucks, improve the safe movement of freight. The future of freight roadway safety will be affected by more trucks and passenger vehicles on our region's roadways -- and by aging and deteriorating infrastructure. These future conditions will combine to increase the probability for truck-related crashes.

Other road safety issues center on the movement of hazardous materials, driver access to adequate truck parking locations, older infrastructure not designed for heavier/longer vehicles, and roadway crossings at railroads.

Truck-Involved Crashes

Issues

From 2016 through 2020, truck-involved crashes comprised 6.4% of all crashes in the region. Although truck-involved crashes have dropped 18% over the past five years, the number of truck-involved fatalities and serious injuries has increased. Despite these statistics, most truck-involved crashes (more than 91%) resulted in only property damage, with no injuries reported.

The historic crash data show the I-75 corridor with the heaviest concentration of truck-involved crashes. When looking at frequency, 38% to 47% of the region's total truck-involved crashes over the past five years and 25% of truck involved fatalities occurred in Hamilton County. Total miles of roadway, the number of truck origins and destinations, and truck volumes all impact a county's probabilities for higher truck-involved incidences. Since Hamilton County has the majority of all three of these factors, it is not surprising that it also contains the highest number of truck crashes and fatalities.

Of the total crashes involving trucks between 2016 and 2020, about 27% were at an intersection, 9% indicated a roadway departure, almost 6% were speed related, and four% were in a work zone.

Forecasting truck-involved crashes based on past trends shows an expected increase along the segments that are currently high crash locations. These locations are shown in the table below.

Table 1: Roadway Segments Exhibiting the Highest Number of Truck-Involved Crashes, 2016-2020

Facility Name*	Segment Location	County
I-75 NB	9th St ramp to Freeman Ave ramp	Hamilton
I-71 NB	KY 14 to I-75	Boone
I-75 NB	SR 63 ramp to Greentree Rd	Warren
SR 63	SR 741 to Union Rd	Warren
I-71 NB Fort Washington Way	Elm St to Joe Nuxhall Way	Hamilton
I-275 NB	County Line to SR 1	Dearborn
I-71 NB	Little Miami River to Wilmington Road	Warren
I-75 NB	Interchange with SR 63	Warren
I-74 EB	US 52 (Harrison Brookville Rd) to the County Line	Dearborn
I-71 NB	SR 37 (N Clarksville Rd) to the County Line	Warren

*NB-northbound; EB-eastbound

Source: Ohio-Kentucky-Indiana Regional Council of Governments (OKI). (2022). Ohio Department of Transportation. Ohio Traffic Crash Facts. (2016-2020). Kentucky Transportation Cabinet. Kentucky Collision Facts; Indiana Department of Transportation. (2016-2020). Indiana Traffic Safety Facts. (2016-2020). [Data sets].

Needs

The reduction of truck-involved crashes by addressing the specific root cause specific to each location including options such as:

- Speed enforcement and truck inspection to ensure the safe operation of the trucking fleet operating in the region.
- Signal timing that provides adequate accommodation for trucks to safety negotiate intersections particularly in heavy truck corridors.
- Warning devices (static or dynamic) to alert drivers of slow traffic, sharp turns on roadway or ramps, and limited vertical or horizontal bridge clearances.
- Geometry/widening along those roadways heavily utilized by truck traffic that have older designs and are not compatible to the needs of heavier and longer vehicles.
- Pavement improvement and markings to reduce inadvertent truck operation that may cause unsafe movements.
- Improved truck parking availability to ensure drivers have a safe place to rest and meet federal hours of service requirements.
- Grade crossing safety initiatives to reduce or eliminate the possibility of truck/train conflicts.
- Improved crash reporting protocols for police to ensure data is available to analysts and help improve future safety measures.

Truck HAZMAT-Related Events

Issues
Trucks account for almost all Hazardous Material (HAZMAT) incidences reported for the past two decades. During this time, the number of truck-related HAZMAT incidences has increased by more than 145% and the quantity of HAZMAT released has risen more than 256%. The cost of HAZMAT damages has also increased from $1.2 million for the decade ending in 2010 to over $2.3 million in the decade ending in 2020.

Needs
The reduction of truck-related HAZMAT incidents including those measures that address overall truck crashes as well as:

- Review of response protocols associated with truck-related HAZMAT incidents, specifically along high crash segments.
- Trade school training programs focused on the appropriate transfer and handling of hazardous materials by truck.

Adequate Truck Parking

Issues
The lack of sufficient short- and long-term truck parking infrastructure creates safety and reliability issues across the region. Findings show that trucks arrive to park in designated public and private spaces chiefly from 6 p.m. to 6 a.m. The time they remain parked varies; however, the largest percentage of dwell time is either less than one hour or more than 10 hours. Findings also show that undesignated roadside truck parking on interstates and on/off ramps is more evident outside the I-275 ring. Lack of truck parking has been a high concern in Boone County for several years, due to the growth of e-commerce and air-to-truck cargo deliveries. Recent data shows that Warren and Butler counties, especially along the I-71 and I-75 corridors, are experiencing greater incidents of undesignated truck parking.

The Ohio Truck Parking Study identified high-priority undesignated truck parking clusters in the downtown area, due to last-mile and urban delivery parking issues; and along I-71 and I-75, due to supply-demand imbalance at truck parking facilities. Analysis of truck stops during 2019 showed that about 6,790 trucks parked for an average of about four hours in undesignated locations in this mega-cluster. Truck parking issues in this area have led to 20 truck crashes. The peak number of undesignated truck parking in the Cincinnati mega cluster is between 11 p.m. and 7 a.m. About 65% of trucks parked on undesignated locations in this cluster stopped for short breaks of less than 3 hours, while 27% parked for longer Hour of Service compliance breaks of more than 8 hours. (Source: Ohio Truck Parking Study. Ohio Department of Transportation. (May 2021).)

The Kentucky Transportation Cabinet (KYTC) completed a Truck Parking Study in early 2023. As part of this study, it identified rest areas in Northern Kentucky on I-71/75 Boone County as among the state's highest priority locations for truck parking concern. KYTC is currently looking at expansion options to increase capacity and improve safety.

Needs

There are several needs to be addressed in the region to improve safety and ensure drivers can meet their drive time requirements while continuing to support local businesses and residents with the goods that they need. Needs include:

- Maximize existing truck parking capacity through occupancy detection to provide real-time estimates of the number of free truck parking spaces and dynamic message signage or driver apps to provide that information to drivers.
- Expanded truck parking at existing private truck stops or public rest areas.
- Establish truck parking at new facilities by either building them or allowing non-traditional areas with appropriate space such as weigh stations or big-box parking lots to allow for short and long-term truck parking.
- Funding for detection and information technology, and/or new or expanded truck parking facilities.

Infrastructure Improvements to Accommodate Trucks

Issues

Often, the older infrastructure in our region were designed to accommodate the vehicles of the day. Since trucks have gotten longer and able to carry heavier loads, these roadways are deteriorating faster due to heavy truck traffic and/or are difficult for trucks to negotiate due to limited turning radii, narrow lanes, on-street parking, etc. These routes introduce obstacles such as street signs, utility poles, curbs, sidewalks, etc. that make it difficult for trucks to safely maneuver.

In that same vein, roadways under low bridges can also introduce an impediment to trucks operating safely. Between 2016 and 2020, 16 bridge locations in the region had a combined 100 truck strikes due to lack of sufficient vertical clearance.

Fourteen of those strike locations were at railroad bridge overpasses. The C&O Railroad Bridge in Cincinnati's Madisonville neighborhood traverses Madison Road just east of the Kenwood Road intersection. It experienced the greatest number of truck strikes with a total of 34 from 2016 to 2020. In fact, most bridge locations experienced multiple strikes.

The other strike locations that are non-railroad bridges carry the Little Miami Scenic Trail across Shawnee Run Road (Hamilton County) and the Roebling Suspension Bridge Ramps to and from Court Street in downtown Covington (Kenton County).

Horizontal clearance concerns are noted in half of the truck bridge strike locations. Narrow clearance issues arise from the bridge structure itself, which limits shoulder or travel lane widths. In some locations, bridge piers are in the roadway median further limiting vehicle widths for safe travel.

Needs

- Improvement to the width of narrow roadways with >4% trucks and assessment of these roadways to remove or relocate horizontal clearance obstacles.
- Reduction in number of overhead bridge strikes by using overhead detectors at low clearance locations under 14'6."
- Inventory and study of the effectiveness of current high restriction warning devices and navigation app warnings.
- Raising of low bridges and/or widening passageway underneath to bring roadway up to standard to allow for truck traffic specifically at the 16 bridges where bridge strikes have been recorded.

Roadway/Railroad Grade Crossings

Issues

Roadway-railroad grade crossings pose a safety and mobility issue for trucks and passenger vehicles alike. When crossings are occupied by a passing or stopped train, the delay to roadway users can sometimes be substantial due to the lack of crossing alternatives. In addition, the safety hazards posed by moving trains at the crossing where they could come into conflict with trucks and passenger vehicles is apparent.

The top 10 crossings shown to have the greatest combined negative impact when looking at delay, crossing redundancy, crossing importance and safety are shown in the table below. Butler County is home to the top three, least-safe, least-redundant, highest-delay, and highest-publicly important rail grade crossings for trucks in the OKI region.

Table 2: Top 10 Public Roadway/Railroad Grade Crossings by Safety, Delay, and Redundancy

Crossing ID	County	City	Roadway	Railroad	Roadway Functional Class	Average Number of Trains per Day	Max Train Speed (mph)	Truck Average Annual Daily Traffic	Proximity to Nearest Grade Separated Crossing (miles)
525193D	Butler	Milford Township	SR 127 (Hamilton Eaton Rd)	Norfolk Southern	Minor Arterial	10	60	923	6.43
525201T	Butler	St Clair	US 127 (Hamilton Eaton Rd)	Norfolk Southern	Major Arterial or Above	10	60	3633	3.59
524966P	Butler	West Chester	SR 747 (Princeton Glendale Rd)	Norfolk Southern	Major Arterial or Above	8	60	2824	0.56
481718T	Hamilton	Anderson	Broadwell Rd	Norfolk Southern	Local	4	40	73	0.79
481714R	Hamilton	Newtown	Round Bottom Rd	Norfolk Southern	Major Collector	3	40	452	2.39

151351P	Hamilton	Madeira	Miami Ave	Indiana and Ohio Railway - Genesee and Wyoming	Major Collector	4	25	590	2.27
152422M	Butler	Trenton	SR 73 (State St)	CSX	Minor Arterial	10	50	1254	2.01
524743Y	Hamilton	St Bernard	Vine St	Norfolk Southern	Major Arterial or Above	11	40	538	0.33
524882U	Hamilton	Evendale	E Sharon Rd	Norfolk Southern	Major Collector	8	60	1254	2.01
525196Y	Butler	Wayne	W Ritter St	Norfolk Southern	Local	20	60	123	5.30

Source: Ohio Rail Development Commission (ORDC) and CPCS. Ohio Rail Crossing Pilot Study: Adaptive Capacity Score Tool and Data Sources Manual. (2020), Ohio-Kentucky-Indiana Regional Council of Governments (OKI). ACS Tool. (2021).

Needs

- Options for rail crossing separation at those crossings that accommodate the heaviest amount of truck traffic.
- Real time in cab information to truck drivers regarding a slow moving or stopped train at crossings and alternative re-routing options and travel times.
- Funding for rail crossing separation.
- Implementation of consistent at-grade crossing blockage and delay data collection to inform freight planning and improvement investments.

Rail Safety Issues and Needs

Nationally, 94% of all rail-related fatalities and injuries occur at rail grade crossings or due to trespassing. Almost all these deaths and injuries are preventable. Since these locations are the primary interaction between the general public, trucks and trains, rail grade crossings receive the greatest attention when it comes to public safety.

Rail Grade Crossings and Rail Trespassing

Issues

Compared to roadway crashes involving trucks, railroad related crossing and trespassing injuries and fatalities are very low. However, rail crossings remain a safety concern particularly when they are blocked by a parked or slow-moving train and emergency vehicles are forced to an alternate, and many times, longer route.

In addition, privately owned railroad right of way is often used as a route for those walking or even driving as a more direct way to their destination. According to the Federal Railroad Administration (FRA), 1,230 pedestrian rail trespass casualties occurred in 2022 nationwide. In Ohio there were 15 trespass-related fatalities and 10 trespass injuries.

Historical data shows 73% of all crashes and 100% of all fatalities between 2016 and 2020 at rail crossings in the OKI region had a safety warning device in place. This crash data, combined with OKI's forecast for growth in road and rail traffic volumes, suggests rail crossing incidences will likely increase in the future without further safety improvements.

Needs

- Improve passive grade crossings to active ones (static warning devices to actuated and physical crossing barriers) through improved and expanded use of crossing control devices, such as bells, flashing lights, and gates at more than 400 public grade crossings in the OKI region.
- Options for rail crossing separation at those crossings that accommodate the heaviest amount of truck traffic.
- Real time in cab information to truck drivers regarding a slow moving or stopped train at crossings and alternative routes and travel times.
- Funding for rail crossing separation.
- Expanded use of technology such as Intelligent Transportation Systems (ITS), which can use dedicated short-range communication (DSRC) and Differential Global Positioning Satellite (GPS) systems, as well as video detection and monitoring to detect crossing blockages to provide first responders with crossing blockages in real-time, so they can modify their emergency routes.

Positive Train Control

Issues

Positive Train Control (PTC) systems are designed to prevent train-to-train collisions, over-speed derailments, movements into established work zones, and movements of trains if switches are left in the wrong position. PTC is in operation from Cincinnati to Columbus and Dayton, along both CSX and NS main lines.

Since PTC is mandatory for passenger rail deployment along existing rail freight corridors, increased adoption throughout the OKI region will largely depend on the future status of improved passenger rail service to and from Cincinnati. The railroads submit annual and quarterly reports to the FRA documenting their progress in implementing PTC.

Needs

- Expanded PTC in anticipation of expanded passenger rail, in addition to heavily traveled, non-passenger rail freight corridors.
- Active and planned PTC enabled rail lines included as an attribute within regional GIS mapping to identify and track.

Safety Threats from Aging Railroad Infrastructure

Issues

Railroads have the responsibility for maintaining and upgrading their own infrastructure. Failure of all railroads to properly invest in aging rail infrastructure would result in decreased safety of workers and the public.

- Class I railroads have more resources than short line and regional railroads enabling them to follow regular maintenance schedules to replace rail, railroad ties and ballast along their system.
- Short line and regional railroads by nature have less rail volumes and less capital for rail maintenance. These rail lines operate at lower speeds and serve fewer customers. Funds set aside for maintenance make up a larger portion of the operators' budgets; and maintenance activities focus on rail operations and safety at rail crossings.

Needs

- Pursuit of state and federal funding opportunities for infrastructure maintenance and upgrades for short line railroads.
- Identification of railroad opportunities to expand the use of safety detection technologies to improve safety by monitoring the condition of rail infrastructure and rolling stock with greater efficiency and reliability.

River Freight Safety Issues and Needs

There were no reportable incidences between 2018 and 2022 along the regional waterway system. This record of safety is expected to remain, as operations continue to transition slowly from the movement of coal to increases in other bulk materials. Since there is expected to be little change in the operations or the maritime freight network, safety systems, training and protocols will also remain to ensure the safe transport of goods via river to, from and through the region.

[H3] Issues

On a rate per ton mile basis, nationwide there is one fatality within the inland marine sector for every 23 fatalities in the rail sector and 155 fatalities in the roadway or trucking sector. Injuries among these sectors equate to one injury in the inland marine sector for every 125 in the rail sector and 2,172 in the roadway sector. These statistics clearly show the safety record of the inland waterway system is very good from a transportation worker standpoint. According to the US Coast Guard, barges are the safest freight mode, reporting no incidences meeting the US Coast Guard's threshold as a significant marine event within the past decade.

Water transportation also has a good safety record in moving hazardous materials. A 2017 study conducted by the Texas Transportation Institute evaluates large spills (of over 1,000 gallons) as a measure of the overall safety of transportation modes. The rate of spills in gallons per ton-mile was found to be similar for both marine and rail transportation. On average, trucks lose 6.06 gallons per one million ton-miles, railcars 3.86 gallons and barges 3.6 gallons per million ton-miles.

Needs

- Safety and HAZMAT training for river pilots and crew by private industry and through trade school programs.

Air Safety Issues and Needs

Air cargo in the OKI region has an extremely safe track record over the past decade. Currently, the movement of people and goods by air is one of the safest freight transportation modes in the United States. The development and trial deployment of new air freight-related technologies will increase the safety of air freight's human employees, the vehicles carrying goods, supporting infrastructure, and the cargoes themselves.

Aircraft Crashes

Issues

As is true today, future air freight technology will require a zero tolerance for the loss of life or injury to humans and minimal damage to cargo. It is extremely important that introducing new technologies that utilize driverless and smaller aircraft will not adversely impact air cargo's historical safety record. However, with technological advances, new and different safety issues present themselves. One such example is the need for battery and software reliability for drone home delivery in urban residential areas to safeguard against crashes in the event of power or navigation failure. The full adoption of these technologies into real world application is uncertain due to the necessary updates to the Federal Aviation Administration's (FAA) rules and regulations associated with new types of aircraft to maintain the excellent safety record of aviation.

Needs

- Revisions to Federal Aviation Administration (FAA) rules and regulations for the advancement of new technologies.
- Evolution of testing and safeguards for advanced electric and unpiloted aviation technologies.
- Establishment of dedicated vertical take-off and landing (VTOL) infrastructure such as communications, takeoff/landing pads, etc.
- Pilot projects to test the infrastructure, market and safety for new aviation technologies.

Future HAZMAT Incidences

Issues

With the rise in air cargo activity, HAZMAT incidences recorded at the Cincinnati/Northern Kentucky International Airport (CVG) have increased 342% over the past decade (2011-2020) when compared with the previous decade (2001-2010). These events are caused either by a defect in the product, its container, or by human error during transport, such as mishaps with forklifts, conveyors, and accidental puncturing or dropping of the item by an employee. The increase is also due in part to the high growth in e-commerce and the increase in shipments of

consumer electronics and pharmaceuticals, many of which contain materials considered hazardous. Air cargo-related HAZMAT events have represented 15% of our region's total HAZMAT incidences over the past ten years.

Needs

- Employment of expanded automation technologies such as advanced package sorting, warehouse transport robots and other Artificial Intelligence (AI) along every step of the air cargo parcel's travel path to reduce the margin of error arising from human contact.
- Employment of technology that can identify hazardous packages and separate them for appropriate handling by designated autonomous vehicles equipped with emergency equipment in the event of an incident.

Future Foreign Object Debris

Issues

Foreign Object Debris (FOD) has been defined by the FAA as "any object, live or not, located in an inappropriate location in the airport environment that has the capacity to injure airport or airline personnel and damage aircraft." FOD may be present on runways, taxiways, aprons, or ramps and can affect an aircraft in a variety of ways including during critical phases of flight, such as take-off. (Source: Federal Aviation Administration (FAA), Airport Safety. (2021). FAA Foreign Object Debris Program). Currently, airport staff inspect their properties on foot or in vehicle surveillance drives throughout the day.

Needs

- Employment of new technologies that enhance airport safety and security, such as robots and/or drones equipped with numerous sensors and cameras, can assist airport staff in monitoring perimeter fence lines for irregularities.

Pipeline Safety Issues and Needs

Issues

Serious pipeline incidents are defined as events which include a fatality or injury that requires overnight, in-patient hospitalization. For the decade ending in 2010, the region had 11 serious pipeline incidences. Looking at the last 10 years, the total has dropped 45% to six serious pipeline-related incidences. Overall, the OKI region is faring better than the nation as a whole, which experienced only a 30% decline in pipeline incidents between 2011 and 2020.

Sixty-seven percent of pipeline incidents over the past decade were caused by excavation or outside force damage that involved objects, such as vehicles and equipment, hitting the buried pipe. According to PHMSA, this is the most common cause of pipeline incidents. Improper or unauthorized digging near a pipeline can be prevented. This is done by contacting "Call Before You Dig!" centers prior to excavation, so that underground pipeline locations can be marked prior to any ground disturbance.

Over the past 20 years, only two incidences involved poor or faulty pipeline conditions. These two incidences were attributed to pipeline material composition, a weld, or an equipment failure. In accordance with 49 CFR § 192.703, each segment of pipeline that becomes unsafe must be replaced, repaired, or removed from service.

Needs

- Increased awareness of safety resources such as "Call Before you Dig!" centers to prevent pipeline breeches from excavation activities.
- Engagement with pipeline owners to advance partnership opportunities that improve safety such as pipeline coatings, robotics for inspections, and remote sensing and GIS imaging technologies.

Infrastructure Condition Issues and Needs Assessment

The OKI's infrastructure condition goal states that the preservation, maintenance and optimization of the region's existing freight transportation systems and infrastructure is a core value. The state of good repair is improved through the use of advanced technology, performance management and innovation.

The region's infrastructure condition issues and needs are outlined by each of the five freight modes: road, rail, river, runway/air, and pipeline.

Road Infrastructure Condition Issues and Needs

Improper or inadequate maintenance of the freight infrastructure poses a threat to the region. Overall, the region's roadways are maintained to a state of good repair. And, although the region saw increases in good and fair bridge conditions, each county reported an increase in their percentages of bridges in poor condition between 2014 and 2020. Further degradation of the region's bridge infrastructure could result in reduced weight limits and delays in freight movement resulting from longer alternative routes.

Pavement Condition

Issues

The Federal Highway Administration (FHWA) determines performance ratings of good, fair, or poor condition for pavement. These metrics quantify pavement condition based on roughness and cracking for all pavement types; rutting for asphalt pavement surfaces; and faulting or misalignment between slabs for jointed concrete pavement surfaces. Roughness affects travel speeds, safety, comfort, and transportation costs, as poor conditions could lead to vehicle damage. Cracking, rutting and faulting are considered surface indicators of structural deterioration in different pavement types.

For most OKI counties, and as road hierarchy transitions from interstate to state route, more centerline miles are reported to be in poor condition. Dearborn County has the highest percentage of interstate centerline miles in good condition at 86%. The other OKI counties have a balanced of good and fair interstate pavement conditions.

As for U.S. routes, half of the counties have a higher percentage of pavement in fair condition than pavement in good condition. Campbell County (14%) has the greatest percentage of poor condition U.S. Route centerline miles.

A state route pavement study shows that more centerline miles are in fair condition with slight increases in poor condition for some counties. Kenton County has the greatest amount (20%) of state routes in poor condition. While Dearborn County's State Route 1 (SR 1) is not included on the NHS network, it was reported to have more than 95% of its pavement in fair condition in 2020.

As automated trucks are introduced to our roadways, their ability to "see," "read," and interact with roadway markings, signage, and traffic signals through use of cameras, sensors or other technological advances will be vital to their safe and unimpeded travel. As a result, attention to regular maintenance of shoulders and other infrastructure will be needed. Such maintenance would include everything from regularly scheduled clearance of roadway debris and stranded vehicles from shoulders to roadside and intersection vegetation control or pruning. This will also likely require increased maintenance budgets and, potentially, the introduction of new advancements in materials and products to support enhanced preservation.

Needs

- Maintenance of freight corridors and connecting infrastructure to a state of good repair to increase safety and reduce damage to vehicles and cargo.
- Exploration of options to utilize Highly Modified Asphalt Binder (HiMA) or other advanced pavement materials for increased pavement longevity specifically along heavy truck corridors.
- Exploration of federal funding opportunities to accelerate pavement improvement projects and increased maintenance budgets to support future technologies.

Bridge Conditions

Issues

With more than 2,000 bridges in the OKI region, 490 of which are located along the National Highway System (NHS), maintaining their safety and functionality is critical to keeping people and goods moving. Poorly maintained bridges can limit their use by heavier trucks or even result in complete closure, requiring drivers to take longer or less direct routes.

All counties in the OKI region -- except Clermont, Kenton and Warren -- had a greater percentage of their bridges in good condition in 2020 than they did in 2014. In addition, every county except Warren has a greater percentage of bridges in fair condition today than seven years ago. However, all OKI counties reported an increase in their percentage of bridges in poor condition in 2020.

As for the Brent Spence Bridge, condition reports for 2014 to 2020 show all portions of the bridge in fair condition, except for one portion cited as poor in 2016. During this time, the bridge was repaired and painted, which likely explains why the 2016 "poor rated" section does not appear in more recent reports.

Needs

- Exploration of increased funding opportunities for bridge maintenance.

Rail Infrastructure Condition Issues and Needs

Issues

With nearly 500 miles of freight rail, 786 public and private at-grade crossings, 195 railroad bridges, and about 137 trains traveling in the region daily -- which is forecasted to increase -- maintenance of our rail infrastructure is critical to the safe, efficient, and environmentally sustainable economic competitiveness of this mode.

Although every OKI county contains some portion of the region's 479 total miles of freight rail, the two counties of Hamilton (32%) and Butler (25%) combined contain over half of the region's total rail miles.

The region is home to two Class I railroads and four short lines all of which have varying infrastructure needs and issues. A variety of tracks, facilities and signals are designed to transport rail freight safely and efficiently.

As private entities, the railroads themselves are responsible for rail improvements. Competitive considerations are often considered when sharing information related to capacity or operational improvements with those outside the companies. Therefore, a complete picture of the regional rail freight improvement program is not available to OKI.

However, there are rail improvements that require support, coordination and/or funding from public sources, as they possess a strong public benefit. Such publicly funded projects are aimed at improving rail freight safety and mobility in the region, such as where the railroads intersect with the public roadway network.

For the smaller railroads, Indiana and Ohio Railway (IORY), Central Railroad of Indiana (CIND), Cincinnati Eastern Railroad (CET), and Indiana Eastern Railroad (IERR), and to some extent the Class I railroads (CSX and NS), infrastructure maintenance is a fundamental challenge.

Railroads are trying to adhere to maintenance schedules to keep their infrastructure in a state of good repair: replacing rail, rail ties, and ballast on a rotating schedule. This proactive planning improves rail infrastructure and reinforces the need for a reliable, annual funding plan that encompasses maintenance costs and potential larger rehabilitation improvements. However, new developments -- lack of domestically produced welded steel rail, costs associated with installing shorter sections of steel rail, and increased costs of ballast stone -- continually arise to challenge the railroad industry and restrict the ability to make maintenance and improvement projects.

Needs

Rail maintenance projects identified by railroads through discussions held for this freight plan include:

- Additional track at the Cincinnati Eastern Railroad transload terminal in Milford, Ohio
- CSX crossing elimination at Gilmore Road in Fairfield, Ohio
- CSX Grade Separation improvement at Symmes Road in Fairfield, Ohio
- Improved truck access to/from CSX Queensgate Yard

- CSX Spring Grove Avenue railroad bridge widening/replacement
- An increase in the number of train locomotives and need for them to be new, more efficient
- Increased inventory of box cars
- New runaround track at Queensgate Yard
- Hillside stabilization of KY 6335 (formerly KY 8) from Tower Hill south to KY 445 in Campbell County which serves as the upper side of CSX's main line track

River Freight Infrastructure Condition Issues and Needs

Issues

The OKI region has a vast river freight network comprising 156.2 miles of commercially navigable riverfront and bordering six of OKI's eight member counties. The region spans 87.3 miles along the Ohio River and seven commercially navigable miles on the Licking River in northern Kentucky. The United States Army Corps of Engineers (USACE) maintained depth for a waterway to be commercially navigable is nine feet. Channels are dredged depending on the need to accommodate loaded barge movements.

Although the Captain Anthony Meldahl Locks and Dam is the only lock and dam located within the OKI region, the region is situated in the Markland Pool -- the name attributed to the body of water located on the Ohio River above the Markland Locks and Dam. The Markland lock and dam is beyond the OKI regional about halfway between Cincinnati and Louisville and provides the upper pool in the OKI region providing access to the Miami, Licking and Little Miami rivers. Since its completion in 1964 there have been no major improvements. The Meldahl Dam had a major improvement in 2017, its first since opening in 1962. There are no plans to make additional improvements before 2050, the planning horizon year of this freight plan. Table 3 presents the projected years that each dam's lock miter gates will reach "F" conditions and projected years that the gates will be replaced. For each miter gate, the projected year for replacement is three to 68 years beyond the gate's "F" condition projection.

Table 3: Condition and Maintenance Schedule for Federal Locks

	Projected Year Lock Miter Gates Reach "F" Condition				Projected Year for Miter Gate Replacement			
	Main		Auxiliary		Main		Auxiliary	
	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream	Downstream	Upstream
Markland	2012	2012	2023	2023	2080	2081	2031	2029
Captain Anthony Meldahl	2017	2060	2020	2070	2020	2087	2032	2082

Source: United States Army Corps of Engineers (USACE). (2021). National Inventory of Dams. [Data sets] and Ohio River System Fact Sheets. (April 2020).

The lifespan of a river barge is on average about 25 to 30 years with good maintenance, with the average age currently between 12 and 15 years. At an average cost of $400,000 per vessel, owners maintain their barges on a regular basis.

The average age of a tug in the United States is over 40 years old with actual age depending on extent of use and level of maintenance and overhaul, with diesel being the exclusive engine fuel. The cost of a new tug varies a greatly between $750,000 to $10 million depending on the length, class, engine power, and other specifications.

Equipment is required for transferring commodities to and from barge. Since there are no public ports in the OKI region, terminal owners are responsible for purchasing and maintaining their own equipment. Much of the handling equipment at terminals is past its life expectancy but kept in operation by terminal employees. In the past several years, cleaner, more efficient equipment such as cranes, material handlers, and conveyor systems have come onto the market. As the cost of repair from frequent breakdowns, work delays, and lack of replacement parts -- private barge terminal operators are slowly replacing outdated equipment as budgets permit.

Needs

- Scheduled maintenance for the Markland and Meldahl locks and dam systems to ensure the flow of barge traffic.
- Exploration of funding opportunities for private terminal operators to offset the repair and purchase of new equipment through federal grants (such as CMAQ) aimed to reduce emissions from tug and on-dock operations.

Air Infrastructure Condition Issues and Needs

The maintenance of airport infrastructure is critical to safe and efficient air cargo transport. The OKI region's eight public airports have a combined 14 runways of various dimensions, pavement types and conditions. Every three years, the FAA requires airports receiving federal funding to review and make needed improvements to every paved surface, including runways, taxiways, and gates or plane parking spots.

Improvements continue to be planned and made on roadways surrounding CVG to accommodate truck traffic related to air cargo. However, as air freight technology develops, new infrastructure demands will arise for airports having the desire to meet the needs of the industry's disruptive future market opportunities, as well as for our transportation network as a whole to address deficiencies which will enable the new technology to be implemented. As new air cargo technologies come to fruition, CVG—and potentially the region's other seven public airports—will need to consider what new infrastructure demands may arise.

Vertical Takeoff and Landing Aircraft

Issues

Vertical takeoff and landing (VTOL) aircraft can launch vertically like a helicopter before transitioning to long-range flight. While there are many applications of VTOL technology, within freight, they will likely serve as a combination of middle mile and last mile functions. VTOLs consist of technology allowing remote human operation, potentially from a centralized hub with multiple operators, or they may operate autonomously with a pre-programmed flight path.

One of the primary advantages VTOLs offers is the smaller footprint required for take-off and landing compared to traditional aircraft. This eliminates the shortcomings of shorter runways at non-primary airports. Though runway length is not a hindrance with VTOLs, there are other improvement improvements necessary.

Needs

VTOLs will require a combination of the following infrastructure to operate.

- **Vertiports:** New launching space will need to be constructed at existing airfields or new locations.
- **Air traffic control:** VTOLs will likely rely on FAA existing systems and practices for managing air traffic.
- **Communications and GPS:** For VTOLs operating autonomously or remotely, new vertiports will require the availability of low-latency communications and GPS signal for aircraft to maintain connectivity with control centers and orient themselves accurately.
- **Charging Infrastructure:** For electric and hybrid VTOLs, charging infrastructure will be similar to other forms of electrified mobility, requiring high-voltage power, a nearby substation, and potentially on-site energy generation and/or storage to support high-consumption, rapid charging demands.
- **Traditional access and building infrastructure:** At the basic level, VTOLs used for cargo applications require the traditional infrastructure to facilitate the movement of goods. This includes truck access for pickup and delivery, depending on which end of the trip may require a ground movement. Requirements also include supportive land and zoning regulations for the storage of and distribution of goods.

Uncrewed Aerial Vehicles

Issues

Uncrewed Aerial Vehicles (UAVs) (or “drones”) can be used primarily for short trips transporting parcels typically weighing five pounds or less between modes or for last and first mile transport. Technology firms are continuing to explore UAVs’ ability to transport larger and heavier loads up to 500 pounds.

Currently, UAVs must follow rules of operation which require human operation within sight distance. In this manner, they are self-contained and can be deployed directly from a delivery truck or other vehicle by one operator to multiple nearby destinations. The reduction or elimination of overhead obstructions such as power lines through undergrounding or burying them in trenches may serve beneficial to adoption especially in urbanized areas.

Needs

- Revised aviation rules and regulations to allow UAV piloting beyond line of sight for qualified pilots.
- Advancement of technology to increase payloads and range of UAVs.

Pipeline Infrastructure Condition Issues and Needs

Issues

Pipeline infrastructure repair and maintenance is the responsibility of the owner. Most pipelines are located underground in rights-of-way (ROW) or adjoining property easements that have been acquired by or granted to the pipeline company. Along these pipelines are pump stations for liquids and compressor stations for natural gas; storage and distribution facilities; and automated control facilities to manage the product movement and to maintain safety. Should a pipeline fail, a drop in pressure triggers the closure of specific sections to minimize damage. Pipeline infrastructure requires ongoing maintenance, planning and new technologies to help the industry shift from being reactive to proactive.

Needs

- Understand the needs of pipeline owners and identification of opportunities to assist in maintaining regional pipeline infrastructure to a state of good repair including the consideration of introducing new technological advancements.

Mobility and Reliability Issues and Needs Assessment

This goal pertains to system performance and how well commodities can move with greater speed and less congestion to improve efficiency. This includes the mitigation of freight bottlenecks, improved capacity, and other measures that ensure reliable travel times and deliveries, while providing resiliency of the freight transportation network against the impacts of extreme weather events and other potential impacts such as security threats.

The region's mobility and reliability issues and needs are outlined by each of the five freight modes: road, rail, river, runway/air, and pipeline.

Road Mobility and Reliability Issues and Needs

The OKI region's quality of life and economic competitiveness are closely related to the degree to which the road network can provide an acceptable level of mobility. Other modes such as rail, river, air, or pipeline may be involved in various legs of a cargo's journey, however trucks remain the dominant freight mode for making first- and last-mile deliveries. On-time, reliable delivery is critical to business success, not only to keep customers satisfied, but to minimize labor, fuel, and other expenses -- which can make or break a company's bottom line. Truck volumes have increased across the OKI region over the past decade threatening a continuing decrease in mobility and reliability for truck deliveries.

Truck Bottlenecks

Issues

The Brent Spence Bridge (BSB) Corridor in Cincinnati from Western Avenue/Liberty Street southbound to the bridge reported the highest, most unreliable 2021 AM peak truck travel time in the OKI region. The northbound approach to the bridge from Dixie Highway in Fort Mitchell to Covington's Pike Street exit has the second highest, most unreliable 2021 AM peak truck travel time in the region.

Table 4: Top 5 Truck Bottleneck Corridors by AM Peak Travel Time, 2021

Corridor	County	Facility	Direction	Location
Brent Spence Bridge	Hamilton	I-75	Southbound	Western Ave/Liberty St (Exit 2A) to BSB
Brent Spence Bridge	Kenton	I-71/I-75	Northbound	Dixie Hwy (Exit 188) to Pike St (Exit 191)
I-75 at The Reagan	Hamilton	I-75	Southbound	Galbraith Rd (Exit 10) to Paddock Rd (Exit 9)
I-471 into Downtown	Campbell	I-471	Northbound	US 27 (Exit 2) to KY 8 (Exit 5)
I-275 at Wards Corner	Clermont	I-275	Westbound	Wards Corner Rd (Exit 54)

Source: The Ohio-Kentucky-Indiana Regional Council of Governments. Regional Integrated Transportation Information System (RITIS), National Performance Management Research Data Sets (NPMRDS) 2021 PM3 Reporting. (2021).

AM Peak truck bottleneck projections for 2050 look much different than 2021 as they are all focused on the region's northeast corner and the I-75 corridor in Butler and Warren counties. This is due to the expected benefit of implemented improvements to the BSB, I-75, I-475 and I-275.

Table 5: Top 5 Projected Truck Bottleneck Corridors by AM Peak Travel Time, 2050

County	Facility	Direction	Location
Butler	I-75	Eastbound	Between mile post 39.4 and 40.7
Butler	I-75	Southbound	Between mile post 18.3 and 17.3
Warren	I-75	Northbound	Between mile post 32.3 and 29.5
Warren	I-75	Eastbound	Between SR 123 and 38.2
Warren	I-75	Northbound	Between mile post 33.2 and 36.4

Source: Ohio-Kentucky-Indiana Regional Council of Governments (OKI) Travel Demand Model. 2022 Freight Plan Analysis. [Data set].

Of the top five truck bottleneck corridors for the 2021 PM peak travel time, the northbound I-75 segment in Fort Mitchell tops the list while the southbound BSB corridor in Cincinnati is third. The almost one-mile, northbound I-75 segment in Kenton County has the highest of all 2021 The PM Cincinnati BSB bottleneck extends a half mile farther north than its AM bottleneck. The second worst PM peak truck bottleneck is the I-71 southbound approach into downtown Cincinnati.

Table 6: Top 5 Truck Bottleneck Corridors by PM Peak Travel Time, 2021

Corridor	County	Facility	Direction	Location
I-75 in Fort Mitchell	Kenton	I-71/I-75	Northbound	Dixie Hwy (Exit 188) to Pike St (Exit 191)
I-71 into Downtown	Hamilton	I-71	Southbound	Montgomery Rd (Exit 5) to Reading Rd (Exit 2)
Brent Spence Bridge	Hamilton	I-75	Southbound	Hopple St (Exit 3) to Ezzard Charles Dr (Exit 1)
I-275 in Crestview Hills	Kenton	I-275	Eastbound	I-71/75 (Exit 84) to Turkeyfoot Rd (Exit 81)
I-75 at the Norwood Lateral	Hamilton	I-75	Northbound	Mitchell Ave (Exit 6) to Norwood Lateral (Exit 7)

Source: Ohio-Kentucky-Indiana Regional Council of Governments. Regional Integrated Transportation Information System (RITIS), National Performance Management Research Data Sets (NPMRDS) 2021 PM3 Reporting. (2021).

Similar to AM Peak, the PM Peak truck bottleneck projections for 2050 again look much different than 2021 as all but one of the top five are locations in the northeast corner of the region along the I-75 corridor in Butler and Warren counties. The outlier is southbound I-71 in Boone County near the rest area.

Table 7: Top 5 Projected Truck Bottleneck Corridors by AM Peak Travel Time, 2050

County	Facility	Direction	Location
Warren	I-75	Westbound	Between mile post 39.2 and 40.9
Warren	I-75	Southbound	Between mile post 29.5 and 32.4
Butler	I-75	Southbound	Between mile post 26.2 and 28.7
Warren	I-75	Westbound	Between mile post 34.4 and 36.3
Boone	I-71	Southbound	Between mile post 179.8 and 178.5

Source: Ohio-Kentucky-Indiana Regional Council of Governments (OKI) Travel Demand Model. 2022 Freight Plan Analysis. [Data set].

Needs

- Advance the BSB corridor project to include a new span and connections to regional and interstate roadways specifically for freight movement.
- Address and alleviate future regional highway freight bottlenecks at I-72 in Warren County, I-75 in Butler County, and I71 in Boone County.
- Identification of new truck count locations and consistent data collection to inform future freight planning and improvement investments.

Weigh-in-Motion/Weigh Station Bypass

Issues

Truck delay caused by weight checks conducted by the states at weigh stations to ensure adherence to roadway weight guidelines, and any necessary permitting.

Needs

Weigh-in-motion/weigh station bypass technology would eliminate the need for trucks to pull over at weigh stations. Such technology could require:

- Inductive loops to indicate when a truck has entered and exited the weigh station, which may also measure vehicle length or assess the vehicle classification.
- Embedded scales or roadway sensors to weigh trucks as they pass, which may include a variety of sensor types to indicate weight.
- License plate recognition camera to confirm measured weight against allowable weight for the vehicle and capture evidence of violations.
- Communications backhaul and back-office platform to collect and analyze the data from each type of infrastructure above and if necessary, send notifications of violations to police. For weigh station bypass facilities, this will also include a platform for trucking companies to input information for verification at individual weigh stations.

- Dynamic message signage to indicate when a weigh station is open or closed and provide instructions to drivers.
- In-vehicle device to provide drivers indication of when bypass has been granted.
- Weigh-in-Motion Policy: While Ohio currently uses weigh in motion sensors to collect traffic statistics, these are not currently used to bypass weigh stations. Enabling their use for this would require not only a broader policy framework for their implementation but the creation of detailed business rules describing how permissions would be granted and when enforcement would occur (similar to tolling business rules).
- Multi-agency work group: Engagement with one or all state DOTs and law enforcement organizations within the OKI region will be required to site, manage, and enforce weigh-in-motion stations.
- Data privacy and security standards: Similar to freight traveler information, any information collected by a weigh-in-motion/weigh station bypass system must protect the proprietary information of shippers.

Advanced Roadway and Truck Technology

Issues

The use of automated trucks can provide increased efficiency. These technologies include truck platooning which utilizes a combination of Connected and Autonomous Vehicle (CAV) technologies to establish connectivity between multiple trucks, with a front driver making driving inputs and following trucks automated to replicate these inputs in real time, enabling drastically shorter headways. In addition to offering safety and efficiency benefits for carrying heavier truckloads and higher truck volumes, truck platooning results in fuel savings, reduced driver fatigue, and increased roadway capacity.

As automated trucks are introduced to our roadways, their ability to "see," "read," and interact with roadway markings, signage, and traffic signals through use of cameras, sensors or other technological advances will be vital to their safe and unimpeded travel. In the future more attention to regular maintenance of shoulders and other infrastructure will be needed. Such maintenance would include everything from regularly scheduled clearance of roadway debris and stranded vehicles from shoulders to roadside and intersection vegetation control or pruning.

Needs

- Introduction of infrastructure for connected vehicles such as high contrast pavement striping, improved and standardization of roadway singing, enhanced GPS signaling particularly in urban areas.
- Harmonization of connected vehicle and platooning statutes among the Ohio, Kentucky, and Indiana.

Freight Traveler Information

Issues

To avoid roadway congestion, construction delays or other emergency events, freight traveler information applications use real time data to allow drivers and operators to make informed trip planning decisions to achieve greatest efficiency. However, current technologies are not perfect. Improvements in accuracy and rerouting are needed to ensure drivers are not guided to roadways with geometric, clearance or other obstructions. In addition, routing through residential areas, school zones and other non-freight areas should be avoided. Furthermore, other benefits can be achieved including freight-specific trip planning, drayage optimization, and dynamic eco routing to minimize fuel consumption and emissions.

Needs

Continued development of the following will enhance the quality and consistency of freight traveler information systems:

- Data standards: Consistency and standardization of common data and messaging formats from state to state and jurisdiction to jurisdiction.
- Data privacy and security standards: Protection of personally identifiable information (PII) and routing data for private companies is especially critical for freight users.
- Data sharing agreements: Formation of regional or statewide data platforms will require data sharing agreements among the political subdivisions involved.

Rail Mobility and Reliability Issues and Needs

Much of the coordination necessary between railroads and public agencies revolves around addressing issues at rail grade crossings. Railroads would like to eliminate as many grade crossings as possible, while doing so could potentially impact traffic flow to roads within local communities. The balance between rail freight movement and roadway mobility continues to be a challenge and is expected to remain one for the foreseeable future.

Short Line Railroad Constraints

Issues

In addition to the maintenance needs associated with the regional short lines, they also have infrastructure constraints that prevent them from maximizing the payload associated with 286K-pound rail cars, which also results in lower operating speeds. Upgrading rail and the supporting infrastructure would enable these rail lines to pick up and deliver these heavy loads with direct rail connections between the customer and Class I railroads, eliminating the need for intermediary trucks or multiple railcars/train trips.

Needs

- Identification of corridors and explore funding options for upgrading short line rail infrastructure through grants or low interest loans.

Rail Chokepoints

Issues

Not counting rail grade crossings, there are a few rail chokepoints in the region due to limited infrastructure capacity and growing volumes. The Indiana and Ohio Railway operates within a bottleneck associated with the single, north- and southbound mainline track that provides the only access into and out of Cincinnati thereby restricting rail movements to one train at a time.

In addition, CSX has indicated that the physical constraints of the Spring Grove Avenue Railroad Bridge delays trains during periods of high peak rail traffic. Two rail tracks to the north and south of the bridge narrow to a single track. Currently, CSX is addressing this chokepoint by implementing operational modifications to circumvent limitations and assist in minimizing train travel time delays.

Needs

- Exploration of design and funding options with The Indiana and Ohio Railway on developing sidings or other additional track to improve capacity to meet needs.
- Exploration of design and funding options with CSX for improvements to the Spring Grove Avenue Bridge.
- Identification of training, deployment locations, and funding needs for the advancement of future rail technologies to improve mobility and reliability.

River Freight Mobility and Reliability Issues and Needs

It is widely understood by those that know the region's waterway cargo system that it has excess capacity. The reliability of the system depends on many factors that are beyond the control of operators such as water levels, lock maintenance, and severe weather events impacting terminal facilities.

Issues

The reliability of the system is critical, particularly during agricultural harvest when perishable grains are carried by barge for domestic and international transport. The industry has refined its operations during this time of high volumes over decades through coordination with brokers and third-party logistics providers (3PLs) that specialize in agricultural products. It is expected that these efficiencies will continue to be improved as new distribution channels are opened.

The Captain Anthony Meldahl Locks and Dam is the only lock and dam in the OKI region, however due to the long distances needed to realize the efficiency of river shipping, barge capacity limitations along Mississippi and Ohio River lock and dam network have a significant impact on river freight movement. This is due to the need for longer barges to be broken up before entering locks and then reassembled after.

In addition, in recent years there has been reduced reliability of region's connectivity to global markets via U.S. inland waterway network due to extreme weather conditions (e.g., drought conditions causing low water levels on Mississippi River).

Needs

- Exploration and partnerships to expand lock capacity and identify operational efficiencies throughout the inland waterway system to benefit the mobility and reliability of OKI regional shippers and carriers.

Air Mobility and Reliability Issues and Needs

CVG is not impacted by major air traffic congestion nor is the airport slot-controlled which is when congested airports have arrival and departure times set for aircraft due to capacity constraints. CVG is not near capacity due to its four runways.

Issues

According to airport representatives, air cargo capacity may be constrained by the ability to move cargo to and from the airport and surrounding air cargo-dependent businesses. The Brent Spence Bridge has been specifically noted as a major capacity constraint hindering the movement of air cargo by delaying time-sensitive products throughout the region. As the only threat facing the region's air cargo capacity is that of drayage or the ability to accommodate future shipment growth between CVG and delivery generation and termination points, new technologies are helping to identify ways to optimize regional freight flow volumes.

Needs

- Exploration of opportunities to pilot test the Freight Advanced Traveler Information System (FRATIS) for CVG cargo operations to reduce unproductive miles, fuel consumption, and emissions while also demonstrating improvements in driving time utilization and productivity.
- Data storage and analysis technology to manage and monitor drayage operations.
- Establishment of dedicated vertical take-off and landing (VTOL) infrastructure such as communications, takeoff/landing pads, etc.
- Exploration of funding opportunities to support the growth in general cargo at CVG.

Pipeline Mobility and Reliability Issues and Needs

Issues

Forecasts predict that pipelines will only become more important to the reliable delivery of gas and liquid commodities for commercial, industrial, and residential uses. The ability of pipelines to transport HAZMAT gas and liquid products safely and reliably is critical as an alternative to rail and trucks.

Needs

- Understanding of the pipeline industry and identification of opportunities to ensure safe and reliable goods movement including the consideration of introducing new technological advancements.

Environmental Sustainability Issues and Needs Assessment

Today greater importance is placed on strategies that promote effective and efficient use of natural resources that reduce adverse environmental and community impacts. Decreasing mobile source emissions, noise pollution, and non-renewable fuel usage exemplify approaches that have a beneficial effect on the region's quality of life and that promote a more sustainable future.

The region's environmental sustainability issues and needs are outlined by each of the five freight modes: road, rail, river, runway/air, and pipeline.

General Freight Environmental Sustainability Issues and Needs

The push for more environmentally neutral freight options is backed up by national, state, and local policies and funding for initiatives. The largest threat to achieving regional sustainability goals is if those various levels of government roll back some of these environmental initiatives, making it more financially costly to implement more carbon neutral freight movement options.

Issues

Sections of the OKI freight network that are close to rivers that are susceptible to flooding. This impacts businesses and the ability of freight to move on roadways, rail, and rivers. It also has the potential to impact water quality as industrial sites are flooded and contaminants as drawn into waterways.

Most often, freight-oriented businesses are in areas that are in close proximity to the freight transportation network which includes freight railroads, interstates, airports, waterways and pipelines. This network we rely on to move goods is a significant source of noise and atmospheric pollution. Freight networks are also located in and around neighborhoods that are home to lower income residences because the unavoidable negative impacts result in lower real estate values…where lower income residents are able to afford to live. The networks, built over time, have segmented neighborhoods and created areas that have been economically and environmentally disadvantaged for decades and have been disproportionately impacted by the adverse effects of freight and other traffic.

The Justice40 Initiative is aimed to invest in these communities to create better environmental and economic conditions by reducing adverse environmental threats and create employment opportunities, for them to be able to live healthier and more economically secure. Through this initiative the federal government commits to deliver 40% of the overall benefits of federal climate, clean energy, affordable and sustainable housing, clean water, and other investments to disadvantaged communities that are marginalized, underserved, and overburdened by pollution.

Needs

- Inventory of industrial properties within flood zones and their susceptibility to adverse environmental impacts resulting from flooding.

- Exploration of freight projects that support Justice40 initiatives for environmental equity and funding opportunities.
- Tracking of freight projects that address the eight key areas for Justice40 disadvantaged communities and to what extent they are addressed and how they can be enhanced to further the key areas (climate change, clean energy and energy efficiency, clean transit, affordable and sustainable housing, training and workforce development, the remediation and reduction of legacy pollution, health burdens and the development of critical clean water infrastructure).

Highway Environmental Sustainability Issues and Needs

On environmental sustainability, two factors tend to dominate the conversation when it comes to the road freight – that is the impact of truck operations upon 1) air quality and 2) hazardous material spills.

Truck Emissions

Issues

Under provisions of the Clean Air Act Amendment (CAAA), the U.S. Environmental Protection Agency (EPA) re-designated OKI's Ohio counties as being in attainment for ozone under the new 2022 ozone standard. Northern Kentucky is in moderate nonattainment. Nonattainment means that the area is not meeting the national ambient air quality standard. Ozone is formed through photochemical reactions created when sunlight reacts with volatile organic compounds, or VOCs, and oxides of nitrogen (NOx). VOCs and NOx occur from incomplete combustion of fossil fuels.

It is estimated that trucks contribute about 66% NOx and 75% PM2.5 of the region's 2019 total on-road mobile emissions. The greatest source of truck emissions does not occur from delay or congestion, but rather from the high number of vehicle miles trucks travel in, out, within, and through the OKI region.

When emissions caused by truck delay are examined as a percentage of total truck emissions, not surprisingly, it is higher than the percentage from all vehicle emissions. However, except for VOC levels in Butler and Hamilton counties, air pollutants originating from truck delay comprise 10% or less of all 2019 truck emissions.

Forecasts show that county-level motor vehicle NOx emissions are expected to decrease by as much as 84% between 2020 and 2050. This includes both passenger cars as well as trucks. However, the adoption of more fuel-efficient technologies is expected to be slower by trucks moving freight. As a result, trucks as a source of NOx in the OKI region is expected to increase in overall share of emissions by as much as 25% or more.

Needs

- Opportunities to reduce the number of truck vehicle miles traveled through various means including, but not limited to commodity shifts to other modes and origin-destination analysis of trucks and corresponding land use policies.
- Adoption of alternatively fueled trucks through federal, state and local financial incentives such as rebates.
- Electrified truck pilot project along a route with frequent (several trucks per day), consistent, short haul routes.
- Consideration of truck needs when siting EV charging or hydrogen fueling stations.
- Idle restrictions at truck parking locations.

Truck HAZMAT Transport

Issues

Trucks account for nearly all the region's HAZMAT incidences reported for the past two decades. From 2001 to 2020, the number of truck-related HAZMAT incidences has increased by more than 145% and the quantity of HAZMAT released has risen more than 256%. The cost of HAZMAT damages was over $2.3 million from 2010 to 2020.

Needs

- Review of response protocols associated with truck-related HAZMAT incidents, specifically along high crash segments involving trucks.
- Trade school training curriculum focused on the appropriate transfer and handling of hazardous materials by truck.

Electrified or Alternative Fuel Truck Corridors

Issues

Alternative Fuels Corridors are designated by the FHWA to establish a national network of charging and fueling infrastructure along national highway system corridors. FHWA's three primary goals for the Alternative Fuels Corridor network are to:

- Accelerate equitable adoption of Electric Vehicles (EVs), including for those who cannot reliably charge at home.
- Reduce transportation-related greenhouse gas emissions and help put the United States on a path to net-zero emissions by no later than 2050.
- Position U.S. industries to lead global transportation electrification efforts and help create family-sustaining union jobs that cannot be outsourced.

More than 2,600 miles of Alternative Fuels Corridor lane miles have been designated within the OKI region. More than 40% of those have been for electric vehicle (EV) charging infrastructure. No lane miles have been designated in the region for hydrogen fueling infrastructure.

Short haul and consistent truck movements provide regional opportunities for increasing efficiency and environmental sustainability of freight movement. In 2050, the area

encompassing CVG is forecasted to have the highest number or concentration of average daily total truck trip origins and destinations. Further analysis performed as part of this freight plan revealed specific corridors whose truck movements create potential corridors for truck electrification due their predictability, repetitiveness, and short distances.

Medium-duty trucks, such as last mile delivery, will likely be the first to adopt electrification, while heavy-duty trucks will require improvements in battery range before becoming feasible for long-haul trucking.

Compared to light-duty vehicles, heavy-duty trucks require significant power levels to charge quickly. Fast charging heavy-duty trucks will require power levels similar to large-scale industrial users.

Table 7: Roadways Exhibiting Greatest Potential as Electrified or Alternative Fuel Truck Corridors Serving CVG

Facility Name	General Location	County	Type of Businesses
KY 16, I-275	KY 16 in Latonia	Kenton	Fuel Storage and Transport
I-71	SR 123 to Warren County Line	Warren	Farm Production and Agriculture
I-75	Around SR 123 interchange to Warren County Line	Warren	Machine Manufacturing
I-71/I-75	Around the I-71 and I-75 Split	Boone, Kenton	Metal, Steel, and Machine Manufacturing
I-74, I-275	I-74 from the Dearborn County Line to SR 1	Dearborn, Boone	Wholesalers, Auto Repair Shops, Farm Equipment Suppliers

Source: American Transportation Research Institute (ATRI). (2021-2022). [Data set].
Alt Text: Table includes four columns for Facility Name, and Origin/Destination by General Location, County, and Type of Business. Five rows include the data values for these four columns for roadways showing opportunity as alternative fuel truck corridors serving CVG.

Needs

- Large-scale adoption of alternatively fueled vehicles by the trucking industry.
- Partnership with existing service stations and truck stops to ensure future fuel infrastructure is not a barrier and future fuels are available at locations that are currently familiar and convenient to drivers.
- Determination of next step needs in the identification of suitable charging sites as is currently being done as part of National Electric Vehicle Infrastructure Formula Program ("NEVI Formula"), through working with freight users and local utilities to identify candidate sites for future medium- and heavy-duty charging.
- Advocate for discretionary federal funding to advance future fuel adoption and supporting infrastructure.

- Fast charging heavy duty trucks will require fueling stations with high-voltage power supply (within proximity of high-voltage, three-phase power lines), nearby substation (to reduce the cost of new charging infrastructure), and power generation capacity as a whole for electrification of a large portion of the transportation fleet.
- Lane-mile designations for hydrogen fueling infrastructure.

Rail Environmental Sustainability Issues and Needs

On average, trains are three to four times more fuel-efficient than trucks, moving one ton of freight 470 miles on one gallon of diesel fuel. Rail moves 40% of the nation's freight tonnage while emitting only 0.6% of all greenhouse emissions and 8% of all freight emissions. The American Association of Railroads estimates that shipping by rail instead of trucks reduces greenhouse gas by 75%.

Rail HAZMAT Incidences

Issues

Rail related HAZMAT incidences account for only 4% of all incidences in the OKI region between 2001 and 2010, and only 1% for the period of 2011 to 2020 from 68 from 2001 to 2010, to 2011 to 2020. The number of rail HAZMAT incidences in the region decreased by almost 40% between 2001 and 2020. Recent HAZMAT incidences in Ohio have focused the nation's attention on the safe transport of HAZMAT by rail. Due to the large quantity of rail freight in the region, OKI must do what it can to ensure the safe transport of this important cargo.

There are three major areas of risk associated with the movement of HAZMAT by rail: derailments, tank car rupture, and regulatory oversight.

Derailments are not necessarily directly related to the movement of HAZMAT but are a significant risk for spills that result from tank car ruptures that result. Ruptures can also occur when struck by vehicles, heavy equipment, or other rail cars. Regulatory oversight is the responsibility of the Public Utilities Commission of Ohio (PUCO) and Federal Railroad Administration (FRA).

Needs

- Review of response protocols associated with rail-related HAZMAT incidents.
- Trade school training programs focused on the appropriate transfer and handling of hazardous materials by rail.
- Expansion of railroad use of safety detection technologies to improve safety by monitoring the condition of rail infrastructure and rolling stock. With OKI regional rail freight volumes forecasted to increase, expanded use of maintenance-related rail technologies, have the potential to improve safety and operations through improved railroad maintenance.
- Research on tank rail car safety.

Train Horn Requirements and Quiet Zones

Issues
Noise pollution is a concern throughout the region. Freight sounds may not all be able to be mitigated such as trucks on the interstate, aircraft takeoff and landing, etc. Train horns are one freight noise impact that have opportunities to be curbed.

Needs
- Improvements to quality of life through the decline in freight-related noise pollution from the introduction of new technologies and policies.
- Prioritization of potential quiet zones and take the necessary steps to meet the criteria for their designation and explore funding options for implementation.

Lower and Zero Emission Locomotives

Issues
All railroads are slowly replacing older locomotives with newer, more efficient ones. Railroads are exploring up to 100% renewable diesel and biodiesel in existing locomotives, which could quickly and dramatically reduce carbon emissions by 20 to 25%. Future lower and zero-emission technologies include hybrid, hydrogen fuel cell, and electric locomotives.

Needs
- Exploration of appropriate application and funding opportunities to assist railroads in upgrading locomotives with low and zero emission units.

River Freight Environmental Sustainability Issues and Needs

Issues
Nearly all river shipping transport vessels and onshore material handling and transport equipment are powered by diesel fuel. Barges can move one ton of cargo 576 miles for the same amount of fuel it takes a rail car to carry the same amount of cargo 413 miles or a truck to haul it 155 miles. This means that given the same fuel, a barge can move product almost 40% farther than rail and 272% farther than trucks. River transport also generates fewer emissions than rail or truck per ton-mile in all four pollutant categories. Barge tows also emit 28% less carbon dioxide (CO2) than trains and 73% less than trucks, resulting in a significantly healthier impact on air quality.

Needs
- Exploration of opportunities to support engine replacement or complete replacement of older tugs and landside material handling equipment.
- Fast charging barge tugs will require various locations along the inland waterway system with high-voltage power supply (within proximity of high-voltage, three-phase power lines), nearby substation (to reduce the cost of new charging infrastructure), and power

generation capacity as a whole for electrification of a large portion of the transportation fleet.

Air Environmental Sustainability Issues and Needs

In terms of environmental sustainability, two factors tend to dominate the conversation when it comes to air cargo – these are air quality and noise levels.

E-viation and Air Quality

Issues

Between 2 and 3% of total air emissions are a result of global air transportation. As part of the CVG 2021-2025 Strategic Plan, the airport has set out to implement a sustainability management plan that expands initiatives focused on more sustainable business practices that would reduce consumption and waste.

CVG and some of its air cargo partners are interested in electrified regional aircraft that would make short trips between Cincinnati and other nearby metropolitan areas, such as Nashville. These types of routes are historically difficult for airlines to make profitable, given shorter flight times. Adoption of this technology is forecasted to occur in the next five to 10 years.

CVG is permitting Beta Technologies, a manufacturer of all-electric aircraft, and other tech firms to conduct testing of UAV and VTOL technologies.

Needs

- Revision of FAA rules and regulations to allow for changes to line-of-sight rules for qualified pilots.
- Testing and safeguards made to advanced electric and unpiloted aviation technologies.
- Establishment of dedicated vertical take-off and landing (VTOL) infrastructure such as communications, takeoff/landing pads, etc.
- Pilot projects to test the infrastructure, market and safety for new aviation technologies.
- Technological advancements to increase payloads and range of UAVs.

Future Fuel Supply Infrastructure

Issues

Fuel for cargo jets at CVG is transported primarily by pipeline and, to a lesser degree, trucks. Between 2016 and 2019, fuel supplied by pipeline increased over 52%. CVG's continued cargo growth will increase fuel demand in the future. The airport is consuming more sustainable aviation fuel (SAF), which is a certified to the same specification as Jet A. But it is made of primarily renewable feed stocks that have a lower carbon intensity than kerosene-derived fuels and can use the same fueling infrastructure.

The current fuel for air operations is stored on site and at a fuel farm located south of Covington along the Licking River about 15 miles from the CVG cargo area. Fuel is carried via truck daily by about 20 trucks making the trip. Such short and frequent trips may be accommodated by electric trucks to reduce truck emissions and increase efficiency.

Needs

- Adequate infrastructure to meet future fuel demand including an adequate supply of kerosene-based Jet A, as well as alternative fuels and energy sources that are rapidly evolving such as sustainable aviation fuel (SAF).
- Exploration of opportunities for electrified/connected trucks to transport fuel to and from CVG.

Aviation and Noise Levels

Issues

Federal Aviation Regulation (FAR) Part 150 covers guidelines for airport noise compatibility planning. CVG and Cincinnati Municipal Airport-Lunken Field (LUK) are the only two airports in the OKI region that must comply with this regulation, based on aircraft size and volume in operation at their facilities. Both airports have a longstanding commitment to addressing noise levels and their public impacts.

Needs

- Monitoring of noise impacts.
- Implementation of strategies contained in the Noise Compatibility Program (NCP) to reduce the impact of noise on the communities surrounding CVG including the use of new technologies as they develop.

Pipeline Environmental Sustainability Issues and Needs

Issues

On the surface, given the large volume increases forecasted for OKI's pipelines by 2050, the probability for environmental impacts most likely will increase. However, considering the region's excellent safety record for significantly reducing pipeline spills the past twenty years, as well as advances in pipeline technology, industry analysts say that our pipeline network will help make freight transportation more environmentally sustainable and resilient.

The largest increase in pipeline volume by 2050 is expected in basic chemicals (217%) -- which includes natural gas. Natural gas pipeline and installation leaks pose a serious problem to community health and safety, and the environment. Natural gas is 70 to 90% methane, a potent greenhouse gas and major contributor to climate change.

In the future it is anticipated that the pipeline network will be used in assisting carbon capture, utilization, and storage initiatives by transporting carbon dioxide safely from emission locations

to permanent storage or end use locations. For these reasons, our current and future expanded pipeline network will continue to play a critical role in providing an integrated future energy system.

Needs

- Exploration of opportunities to deploy technological solutions for pipeline owners to detect and prevent leakages and ruptures.

Economic Competitiveness Issues and Needs Assessment

The transportation network is critical to the economic vitality of the region by enabling national and global competitiveness, productivity, and efficiency. Harnessing the region's transportation assets and offering strong performing multi-modal freight options support business retention, expansion, and attraction.

The region's economic competitiveness issues and needs are outlined by each of the five freight modes: road, rail, river, runway/air, and pipeline.

General Freight Economic Competitive Issues and Needs

Issues

Between 2015 and 2050, the combined population of all eight counties is expected to grow an additional 11%, from 2 million to 2.3 million. A growing population will generate increased freight activity including e-commerce, which attracts companies (such as Amazon) to locate warehouses close to CVG for central access to regional population.

Key regional industry sectors such as construction and manufacturing have good access to the river, rail and pipeline networks which is one of the key considerations for existing businesses to stay and new employers to locate in the region.

Needs

- Maintenance and expansion of existing infrastructure to meet growing freight demand from all five modes.

Freight-Related Employment

Issues

Among other impacts to the movement of freight and the regional economy, the lack of sufficient workforce across all the modes has an impact on reliability of freight movement as well. Since regional freight-related employment is expected to decrease by 2.2% between 2020 and 2050, shippers and carriers may not have the workforce necessary to reliably and efficiently move goods due to the lack of freight handlers, mechanics, drivers/operators, etc. which may in turn threaten the region's economic competitiveness.

Freight-related employment is considered those jobs in sectors that are heavily reliant on the movement of goods. These sectors include:

- Agriculture, Forestry, Fishing and Hunting
- Mining/Utilities/Construction
- Manufacturing
- Wholesale Trade
- Retail Trade

- Transportation and Warehousing

In lieu of the region's freight employment decline forecast, five OKI counties are expected to experience an increase in freight employment (Boone, Campbell, Clermont, Dearborn, and Kenton). Butler, Hamilton, and Warren counties are expected to experience a decrease. Campbell County is expected to see the highest freight employment growth at 13.2%, while Warren County shows the greatest decline at -9.7%, followed by Hamilton (-4.9%) and Butler (-4.2%).

Freight stakeholders have indicated that they are currently experiencing shortages in workers, resulting from the availability of other less physically demanding occupations and are more in line with regular daytime schedules. Given the expected increase in freight throughout the region and the decrease in number of workers in freight occupations, this concerning nexus could have a significant impact on the economic competitiveness of the region.

Needs

- Trade school programs to encourage high school graduates to pursue and be prepared for freight transportation trades.
- Campaign of freight-related interests to highlight freight employment opportunities and benefits.

Federal Freight Funding

Issues

Through the Infrastructure Investment and Jobs Act (IIJA) a wide variety of additional opportunities for discretionary funding grants are available for the region to address critical freight improvements to strengthen economic competitiveness. The freight programs within the law include:

- National Highway Freight Program (NHFP): Includes new freight planning policy, a new National Highway Freight Network (NHFN), and new formula funding for freight projects. To be eligible for NHFP funds, freight projects must contribute to the efficient movement on freight on the NHFN and be identified in State freight plans.
- Multimodal Projects Discretionary Grant Program (MPDG): Allows the use of one application to apply for up to three separate USDOT funding opportunities: MEGA, INFRA, and Rural Surface Transportation Grant.
- MEGA Grant Program: Program is aimed to support large, complex projects that are difficult to fund by other means and likely to generate national or regional economic, mobility, or safety benefits.
- Infrastructure for Rebuilding America Grants (INFRA): Financial assistance to nationally and regionally significant freight and highway projects that align with the program goals of safety, efficiency, and reliability of the movement of freight and people, generating national or regional economic benefits, improving connectivity between modes of

freight transportation, and addressing the impact of population growth on the movement of people and freight.

- Rural Surface Transportation Grant Program (RURAL): Supports projects to improve and expand the surface transportation infrastructure in rural areas to increase connectivity, improve the safety and reliability of the movement of people and freight, and generate regional economic growth and improve quality of life.
- Rebuilding American Infrastructure with Sustainability and Equity Program (RAISE): Provides funds for investment in road, rail, transit, and port projects that promise to achieve national objectives.
- National Highway Performance Program: Provides funding related to the condition and performance of the Interstate System and NHS.
- Surface Transportation Program Block Grant Program (STBG): Provides flexible funding for projects on any federal-aid highway, on bridges on any public roads, and on bridge and tunnel inspection and inspector training. Eligible freight projects also include bridge clearance increases to accommodate double-stack freight trains, capital costs of advanced truck stop electrification systems, freight transfer yards, and truck parking facilities.
- Congestion Mitigation and Air Quality Program (CMAQ): A flexible funding transportation improvement program to support transportation projects that reduce mobile source emissions in areas designated by the US EPA.
- Diesel Emissions Reductions Act (DERA): Program is to achieve significant reductions in diesel emissions and exposure, particularly from fleets operating in areas designated by the Administrator as poor air quality areas.
- Highway Safety Improvement Program: Supports projects that improve the safety of road infrastructure. These projects could add capacity; improve alignment or operations, such as intersections and curves; or make road improvements, such as signing, pavement markings, or adding rumble strips.
- Motor Carrier Safety Assistance Program (MCSAP): Funds projects to improve driver safety and reduce the number and severity of crashes, injuries and fatalities involving commercial motor vehicles.
- High Priority Grant Program: Designed to provide federal financial assistance to new project(s) that will have a positive impact on CMV safety.
- The Transportation Infrastructure Finance and Innovation Act (TIFIA): Provides federal credit assistance in the form of direct loans, loan guarantees, and standby lines of credit to finance surface transportation projects of national and regional significance.
- Consolidated Rail Infrastructure and Safety Improvements Program (CRISI): Funds Capital Project development and implementation under the FRA to improve the safety, efficiency, and reliability of intercity passenger and freight railroads.
- Railway-Highways Crossing Program: Program provides funds for the elimination of hazards at railway-highway crossings.
- Railroad Crossing Elimination Program (RCE): Provides funding for highway-rail or pathway-rail grade crossing improvement projects that focus on improving the safety and mobility of people and goods.

Needs

- Tracking and prioritization of freight project opportunities by determining their readiness for construction/implementation, funding commitments, and their merits matched to the various IIJA discretionary grant programs available for freight projects.

Transitioning Global Energy Market

Issues

A global energy market that is in transition could create threats to the international freight transportation system ranging from a reduced tax base to reduced investment in infrastructure. As seen during the COVID pandemic, supply chains are streamlined and susceptible to disruptions. Energy prices directly influence the cost of transporting goods to, from and within the OKI region.

Needs

- An assessment of the OKI region's industrial base, their energy needs and sources, and their ability to whether supply chain disruptions.

Modal Competition

Issues

As the use of advanced aircraft technology takes hold, the use of VTOLs opens the door for opportunities outside of large commercial airports. Use of this technology at typically non-commercial facilities or to replace aircraft feeder services could reduce airport activity and associated revenue at conventional air cargo facilities.

The trucking industry is looking to change the regulations on the size and weight restrictions of freight moving on the region's roadways. Heavier and longer loads by truck would have the effect of making some shipments of heavier bulk goods more feasible on trucks, with most of these commodities currently being shipped by rail.

In addition, Hyperloop systems are being designed and tested to move cargo at air travel speeds and reduced costs. The systems being explored are designed to be driverless and require fewer support personnel than air cargo transport. Products shipped via Hyperloop will need to be contained and be lighter in weight, similar to air cargo.

Needs

- Exploration of modal shifts that can economically support the needs of shippers and receivers while reducing the number of trucks on regional roadways.

Road Economic Competitiveness Issues and Needs

Trucks carry most of the region's freight by both weight and value. In 2017, trucks carried 67.5% or 116.6 million tons of all freight tonnage in the OKI region. Almost 37% of truck tonnage is transported entirely within the eight-county area. Trucks deliver a variety of commodities critical to keeping businesses in the Tristate running. Gravel, nonmetal mineral products, gasoline, waste/scrap, and foodstuffs top the list of commodities having the highest tonnage transported within the OKI region by truck.

At 96% of the total truck tonnage and 84% of the total truck value, most of the region's truck freight is domestic. In 2017, the value of freight handled by trucks in the region was $189,807 million, or 74.3% of the region's total freight value. Commodities used to serve the advanced manufacturing industry comprise almost 34% or $64.2 billion dollars of the total value of truck freight for the OKI region.

Impact of E-Commerce on Trucking

Issues

The American consumer shift from brick-and-mortar shopping to online e-commerce has had a huge impact on fueling the growth of trucks on all roadways of all types. Nationally, e-commerce comprised about 5% of all U.S. retail sales in the fourth quarter of 2010; 8% in 2015; and 16% in 2020. This shows how e-commerce growth has accelerated in the second half of the decade – having doubled in five years. This trend creates everything from more demand for large trucks to keep distribution centers stocked -- and ready for same-day, overnight deliveries -- to smaller trucks on our local, neighborhood streets delivering a single box to our front doors. (Source: United States Department of Commerce. United States Census Bureau News. Quarterly Retail E-Commerce Sales. (2021).)

Needs

- Identification of opportunities to expand the use of electrified delivery vehicles to reduce emissions for local shipments.
- Identification of areas with high concentrations of e-commerce activities and prioritize them for potential VTOL operations for local deliveries.

Truck Parking

Issues

According to the American Trucking Research Institute (ATRI), U.S. drivers lose $4,500 in productivity each year due to the lack of adequate truck parking

Needs

There are several needs to be addressed in the region to improve safety and ensure drivers can meet their drive time requirements while continuing to support local businesses and residents with the goods that they need. Those needs include:

- Maximizing existing truck parking capacity through occupancy detection to provide real-time estimates of the number of free truck parking spaces and dynamic message signage or driver apps to provide that information to drivers.
- Expansion of truck parking at existing private truck stops or public rest areas.
- Establishment of truck parking at new facilities by either building them or allowing non-traditional areas with appropriate space such as weigh stations or big-box parking lots to allow for long-term and short-term truck parking.
- Funding for detection and information technology, and/or new or expanded truck parking facilities.

Brent Spence Bridge

Issues

For more than a half century, the OKI region has been impacted by congestion along the I-75/71 Brent Spence Bridge (BSB) Corridor. The Ohio Department of Transportation (ODOT) and KYTC define the BSB Corridor as the eight miles of Interstate 75 (I-75) and Interstate 71 (I-71) spanning from the Western Hills Viaduct in Hamilton County to just south of Dixie Highway (US 25) in Kenton County. In 2022, OKI estimated that the BSB carries freight worth about $378 billion annually.

FHWA estimated that the total cost of congestion for all vehicles traveling the 9.2-mile BSB Corridor (from the Interstate 275 interchange in Kenton County to the Western Hills Viaduct in Hamilton County) was $26.3 million a year. (Source: Federal Highway Administration (FHWA). (2018). National Performance Management Research Data Sets (NPMRDS). [Data set].)

In 2020, the bridge was closed for 41 days due to a serious truck crash and explosion, which damaged a large section and required immediate repairs. As part of Transport Ohio, ODOT's statewide freight plan, a study was conducted of the BSB's closure. Findings showed that more than 13,250 trucks were re-routed, which increased truck trips by nearly 13 minutes and the median trip distance by about 17.6 miles. Further, the study estimated that the BSB closure resulted in about "$23.46 million in additional operating costs to the trucking industry." (Source: Ohio Department of Transportation (ODOT). Transport Ohio, Existing Freight System Performance, Working Paper 5. (2021).)

There is growing regional optimism that Ohio and Kentucky are closer than ever to constructing a companion bridge to the BSB. This confidence has been buoyed by the award of $250 million in federal funding from the National Infrastructure Project Assistance (Mega) Program.

Needs

- Continued advancement of the BSB project to be completed as quickly as possible with truck needs addressed as one of the top priorities of the project.
- Identification of opportunities as part of the project (such as VTOLs or truck platooning) to reduce the number of trucks and/or increase truck shipment efficiency.

Rail Economic Competitiveness Issues and Needs

Issues
Although rail freight will continue to have a competitive advantage over trucking for certain commodities due to weight and volume of certain products and the cost effectiveness of transporting over long distances, new threats continue to arise for rail that hinder the mode's economic potential.

New proposed federal legislation being advocated by the trucking industry would increase the size and weight that trucks would be permitted to carry, making rail freight less competitive. In addition, during the COVID pandemic and related spikes in e-commerce, trucking increased its share of all goods movement. Service issues during that time hindered the railroad industry. Railroad companies are currently addressing these issues through a major focus on hiring of rail employees, customer service, and delivery reliability.

Although railroad employment is expected to increase nationwide from 76,500 to nearly 80,000 workers in the next 10 years, conversations with railroad companies for this freight plan revealed that finding new employees in the region has been difficult. This is due to the competition for younger workers among other industries, including the trades, warehousing, and distribution. Because trains operate 24 hours a day, 7 days a week, rail operators cite challenging working conditions as the primary reason, making it difficult to recruit new employees.
(Source: United States Bureau of Labor Statistics (BLS). Occupational Outlook Handbook: Railroad Workers. September 8, 2022.)

Needs

- Trade school programs/curriculum to train potential rail employees to operate and maintain existing and advanced train technology equipment.

River Freight Economic Competitiveness Issues and Needs

Excess River Freight Capacity and Cost ($/ton-mile)

Issues
To be an effective choice for shippers, the total cost of handling by barge must be better than truck or rail. Barge movements include the cost of transport and equipment, such as barges, tugs, tug fuel (and surcharges), loading and discharging equipment and labor, and piloting labor.

Much of the roadway and rail freight network is operating near capacity, however there is excess capacity for moving freight on the Ohio River. The introduction of Container-On-Barge (COB) operations could provide a commodity modal shift from rail and/or road to barge. COB

can help to not only reduce road and rail congestion, but also reduce the cost of moving goods via a more cost effective ($/ton-mile) river mode.

Although very few COB operations are active in the nation's inland waterway system, it remains a hot topic within the U.S. maritime industry. COB depends on sufficient customer demand and will be driven primarily by the private sector. The trucking industry's pricing and shorter delivery times is a challenge to COB from gaining a foothold.

It is an industry-wide assumption that the future trend will be increases of COB operations. One reason is the nationwide truck driver shortage. The OKI region has an added asset for COB adoption, the proximity of the Ohio River to major Class I railroad container movement corridors. COB movements are expected to be interregional, or shorter moves, where multiple customer cargos can be combined to fill a barge for efficiencies-of-scale.

Needs

- A market assessment for containerized river shipments in order to make a business case for investing in COB operations and infrastructure.
- Exploration of opportunities to economically move COB shipments along the inland waterway system.

Limited Properties with Direct River Access

Issues

Although there are over a hundred miles of riverfront in the OKI Region, competition for the riverfront among different uses limit what is available for freight movement. Due to the considerations necessary to move goods on the river (such as relatively-level shore access, truck access to site, close proximity to regional highway network, access to rail, etc.) available sites are limited for this use and hamper the region's ability to expand the river shipping network.

Needs

- Establishment of a statewide entity to advocate, invest and support safe and efficient maritime freight activities for the economic well-being of Ohio residents and businesses.
- Examination of local jurisdictional land use/zoning along Ohio Riverfront properties and work to remove conflicting uses and support historically industrial, maritime freight activities.
- Engagement of economic development agencies to assist in the marketing and consideration of riverfront parcels for river freight related activities.

Steady Supply of a Trained Workforce

Issues

Finding new employees in the region has been difficult due to the competition for younger workers among other industries such as the trades, warehousing, and distribution. On average, median wages in the water occupations are higher than those in other occupations.

Employment within the water transportation occupations is expected to generally remain unchanged over the next 10 years. River transport representatives cite working conditions as the primary reason it is difficult to recruit new employees. Because water operations are 24/7, water shipping workers' schedules may vary to include nights, weekends, and holidays. More recently hired employees without seniority are expected to work the least desirable shifts, and longer hours. This creates a challenge for barge fleeting and terminal operators in the near future.

Needs

- Trade school programs/curriculum to train potential river shipping employees to operate and maintain existing and advanced river technology equipment.

Air Economic Competitiveness Issues and Needs

Issues

Air cargo plays an important role in the economic development of our region. As one of three Express Global Super-hubs for DHL and the first Amazon Air Hub, CVG growth is being fueled increasingly and significantly by air cargo. With its impressive air cargo growth over the past decade, CVG has soared in international, North American, and national status as a top cargo airport.

As a part of Cincinnati/Northern Kentucky International Airport (CVG) five-year (2021-2025) Strategic Plan, solidifying and growing the airport's status as an "epicenter of e-commerce" remains a driving force. CVG's future strategic growth includes several components:

- Increasing air operations for express service, landside improvements, and expansion.
- Maintaining and expanding a competitive advantage for high value goods and increase modal share.
- Retaining and supporting air cargo businesses.
- Diversifying through increased general air cargo movements.
- Enhancing air maintenance and repair operations.
- Improving landside connectivity for more efficient operations.

Several new air cargo-related technologies are discussed under each of the other four freight transportation goals. An added economic benefit of new technology results from the reduction in operational costs associated with air cargo. Whether through the advancement and adoption of more sustainable fuels, delivery time savings through drayage optimization, or more efficient and safe removal of flight obstructions, technology speaks to air cargo's bottom line. Cost savings offer the opportunity for air cargo operators to pass on savings to customers or invest additional funds to achieve a constant flow of freight advancements that perpetuate improved safety, infrastructure maintenance, mobility and reliability, environmental sustainability, and economic competitiveness throughout the OKI region.

Needs

- Continued coordination among regional planning partners and CVG operations and technology staff to ensure regional landside connectivity is capable of accommodating CVG growth plans in terms of capacity and efficiency.

Pipeline Economic Competitiveness Issues and Needs

Issues

The value of commodities transported by pipelines is expected to increase overall when adjusted for recent (2022) spikes in inflation, however the commodity mix is expected to change. Pipeline forecasts from the United States Department of Transportation's Freight Analysis Framework (FAF) show an expected increase of 49% in tonnage by 2050. The greatest increase is anticipated in basic chemicals (217%), which includes natural gas. Drops in volumes of gasoline (-60%) and fuel oils (-36%), once again, point to the anticipated supply and demand for these commodities -- where fossil fuels are expected to decrease in use. This drop comes as residents and businesses shift to more environmentally friendly options, and manufacturing processes produce products more efficiently.

Due to the private ownership of pipelines and the proprietary nature of the capacity and plans for capacity improvements, it is difficult for OKI to know the needs associated with the movement of increased commodities via pipeline.

With pipelines transporting greater volumes of commodities, more investments into new materials, time-saving maintenance technology and data analytics are expected to define this sector in the coming decades. Thus, the economic competitiveness and benefit of future pipeline -- as a freight transportation mode -- will arise from it serving as a safer, cleaner, more sustainable, and more reliable transport of gas and liquid products, which our region will continue to require.

Needs

- Work with pipeline owners to better understand how the public sector can assist with ensuring the appropriate capacity and what, if any, assistance is required.
- Trade school programs/curriculum to train potential pipeline employees to operate and maintain existing and advanced pipeline infrastructure.