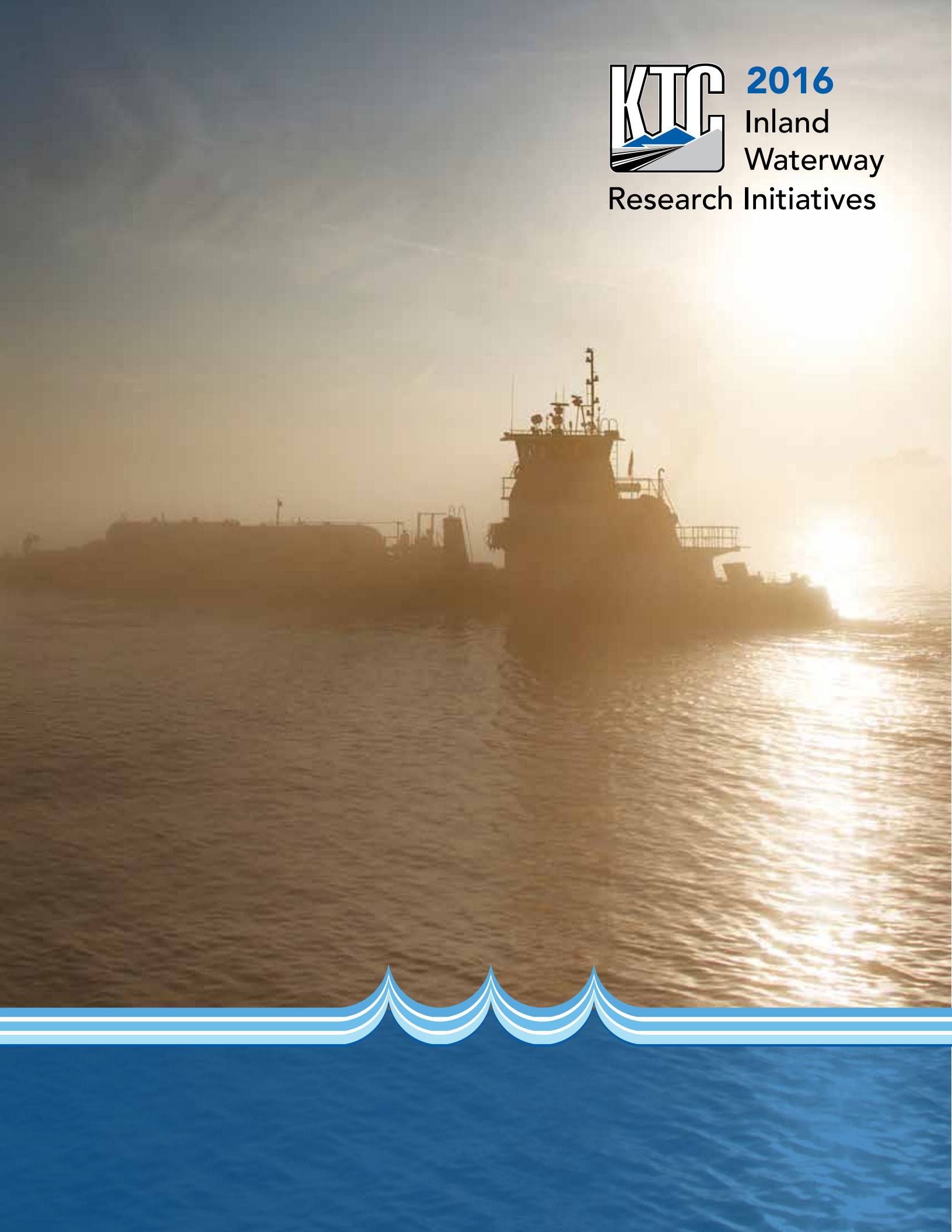

2016 Inland Waterway Research Initiatives

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For more information about this or any other research material by the Kentucky Transportation Center contact

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Since 2010, the Kentucky Transportation Center has built a reputation for timely, accurate, and innovative research on the U.S. inland waterway system. This booklet provides an overview of the Center's completed projects, ongoing work, and future plans to expand its burgeoning inland waterways research program.

Because the inland waterway system will play an essential role in ***shaping the future*** *of transportation, policymakers must develop new strategies to improve its reliability.*

KTC KENTUCKY TRANSPORTATION CENTER

KTC and Inland Waterway System Research

The U.S. inland waterway system (IWS) is the unheralded backbone of the American economy. Each day, barges filled with coal, grain, petroleum, and other valuable commodities glide up and down U.S. rivers delivering goods to manufacturers and other customers. Waterborne transportation is environmentally friendly, releases fewer emissions and airborne pollutants into the atmosphere than other transportation modes, and is the most efficient way to move commodities long distances.

Although the IWS has proven reliable over the past century, much of its infrastructure is rapidly aging and deteriorating. Operations and maintenance have been neglected while funding has poured into other transportation modes.

Researchers at KTC have exhaustively documented the challenges facing key IWS stakeholders in order to identify methods to improve the system.

KTC researchers envision deepening their knowledge and partnerships with stakeholders to help stimulate growth among the numerous industries that depend on a resilient, safe, and efficient IWS.

This booklet summarizes the research initiatives KTC has undertaken since it began working on issues related to the IWS. KTC has committed itself to developing stakeholder-oriented research projects with practical utility. Whether collaborating with public agencies or private industry, the Center's researchers work tirelessly to deliver analysis and knowledge that will improve the operational efficiencies of their partners.

Waterborne Commerce Drives the U.S. Economy

The U.S. inland waterway system is the unheralded backbone of the American economy. Waterborne transportation is a safe, efficient, economical, and environmentally friendly way to move commodities.

KTC has collaborated with the U.S. Army Corps of Engineers, U.S. Maritime Administration, and private industry stakeholders to develop ***policy-oriented solutions*** *for the inland waterway system.*

KTC's Partnerships

KTC has worked with a number of industry partners and agencies, including the U.S. Army Corps of Engineers and U.S. Maritime Administration (MARAD), to demonstrate that the IWS should occupy a central place in discussions about transportation planning and policy. Building on these partnerships, KTC is poised to strengthen its leadership in and knowledge of the IWS. Future KTC-piloted studies will continue to leverage the holistic, multidisciplinary research approach that has been enthusiastically received by government agencies and private businesses.

Recent Partners

- *Department of Homeland Security*
- *Kentucky Transportation Cabinet*
- *Kentucky Waterway Advisory Board*
- *Maysville-Mason County Port Authority*
- *Multimodal Transportation Infrastructure Consortium*
- *National Waterways Foundation*
- *U.S. Army Corps of Engineers*
- *U.S. Coast Guard*
- *U.S. Department of Transportation*
- *U.S. Maritime Administration*

KTC has extensively studied the inland waterway system's role in shaping domestic and international ***freight movements.***

KTC KENTUCKY TRANSPORTATION CENTER

KTC's Initial Research Collaborations

KTC's involvement in waterways projects kicked off in 2010 when MARAD asked the Center's researchers to analyze the IWS's future prospects. This work addressed whether the current system would be able to support an expansion in waterborne commerce as well as steps that should be taken to improve its efficiency. During this project, KTC met with stakeholders throughout the inland waterways industry to understand their needs and concerns. Researchers visited with officials at barge companies, ports, the U.S. Army Corps of Engineers, the U.S. Coast Guard, MARAD, and private companies.

After synthesizing these interviews, researchers devised a concept of operations for an Inland Waterway Shipment Management System (IWSMS). Building on its expertise in the highway motor carrier industry, KTC researchers proposed a system that integrates real-time vessel tracking, electronic manifests, and dynamic routing. Along with improving the efficiency of waterborne commerce, the IWSMS would facilitate better supply chain management. Dynamically managing vessels and shipments will also bolster U.S. economic competitiveness on the global stage and grow the IWS's capacity.

Facilitating Communication

KTC developed the conceptual architecture for an integrated shipment management system to facilitate communication and data transfers between federal agencies, shippers, and carriers.

KTC was a lead partner in the ***Multimodal Transportation & Infrastructure Consortium****, a Tier 1 U.S. DOT University Transportation Center.*

KTC KENTUCKY TRANSPORTATION CENTER

MTIC Research Projects and Activities

In 2011, along with Marshall University, the University of Louisville, and Hampton University, KTC was designated a Tier 1 University Transportation Center (UTC). Organized as the Multimodal Transportation and Infrastructure Consortium (MTIC), these universities embarked on an ambitious research agenda to understand the complex relationships between multimodal transportation and U.S.-based economic activity. Many of KTC's MTIC-sponsored research projects focused on the IWS. From 2012 through 2015, KTC researchers studied the IWS from a multidisciplinary perspective while deepening ties with key industry stakeholders through academic and professional conferences.

Nothing exemplifies KTC's commitment to fostering dialogue about the IWS more than 2013's Barge and Rail Symposium: Moving Freight Between Multimodal Systems.

Co-sponsored by KTC and the Transportation Research Board (TRB), this three-day event brought together IWS stakeholders, and featured keynote presentations by MARAD representatives as well as breakout sessions in which researchers from around the U.S. presented their findings on a range of subjects.

Key Accomplishments

- *KTC garnered national acclaim for its work on MTIC-sponsored research.*
- *The Center's staff serves in leadership roles on the TRB Inland Water Transportation Committee and guides its future research agenda.*

Despite being integral to the U.S. economy, the inland waterway system has remained ***underfunded****, which has accelerated the deterioration of its aging infrastructure.*

Economics and Finance Research

Money from the Inland Waterways Trust Fund (IWTF) goes toward infrastructure development and repair projects. However, its balance has dwindled over the past 20 years, leaving many projects unfunded. These investment shortfalls have increased the number of planned and unplanned lock outages, diminishing the IWS's resiliency. KTC has reviewed, synthesized, and proposed new IWTF funding mechanisms to bolster system investment.

KTC has measured the total economic value the IWS adds to the U.S. economy and the potential impacts of maintaining or increasing current investment levels. Annually, the IWS reduces domestic freight costs by $12.5 billion. The IWS also strengthens connections between the regions it serves and the global economy. Continuing to modernize and invest in the IWS will increase economic productivity up to 10% in some areas.

Economic Fact

The inland waterway industry supports over 250,000 jobs in the U.S. and generates over $132 billion in economic output every year.

KTC's staff have certified expertise in ***geospatial modeling****, which they have used to understand and forecast commodity movements in the Ohio River Valley.*

GIS Modeling and Analysis

Recent data collected on the movement, sourcing, and pricing of coal illuminates the struggles of mining companies that rely on coal harvested in the Central Appalachian Basin. Coal sourced from this region is no longer price competitive with natural gas or coal extracted in the Mountain West — now the principal source of coal in the U.S.. KTC researchers showed that carriers and port facilities along the Ohio River should attempt to diversify their shipping portfolios to ward off potential economic losses.

Researchers developed a multimodal GIS-based model, the Integrated Freight Network Model, to understand the consequences of widespread modal shifts for the U.S. economy. They explored the implications of freight, especially coal, being shifted in large quantities from waterborne transport to railways or highways.

Cargo flight from the IWS due to infrastructure outages or systemic inefficiencies would significantly congest key roadways.

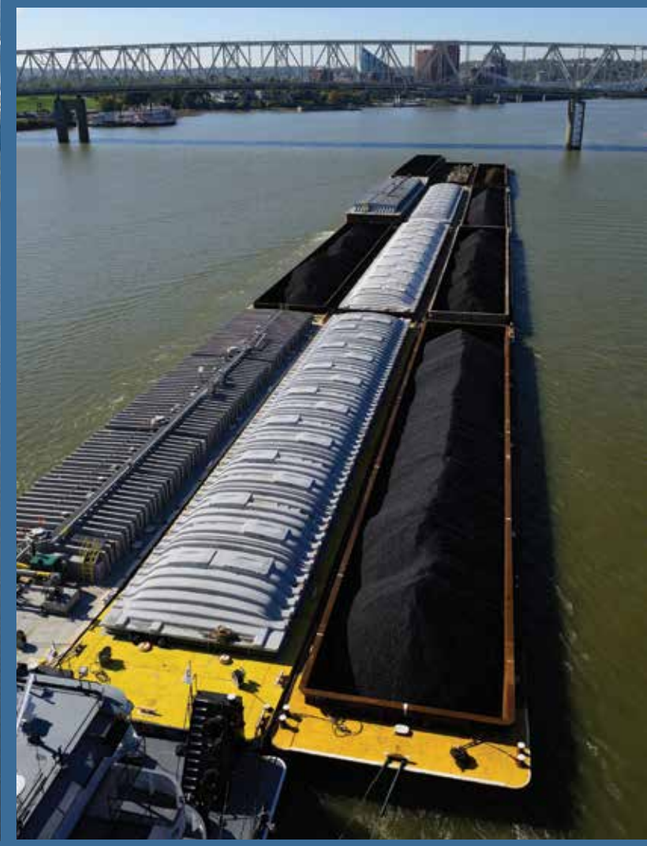
Together, these projects indicated that while coal shipments are declining, they still make up a large proportion of vessel cargo on the Ohio River. If portions of the IWS were shut off to vessel traffic, an unsustainable amount of freight would be rerouted to other transportation modes. Robust operation and maintenance plans are needed to preserve the IWS's resiliency.

Coal's Impact

Using data on coal shipments and consumption, KTC researchers have modeled the vital importance coal has for Kentucky's economy.

*From **statistical modeling** to developing methods for **securing hazardous cargo** on the inland waterways, KTC's expertise is unsurpassed.*

KTC KENTUCKY TRANSPORTATION CENTER



Statistical Modeling of IWS Operations

Resiliency is not just a product of operations and maintenance. Vessel traffic and the ability of carriers to deliver freight on time also influence system resiliency (and perceptions of it). Increases in congestion lessen the reliability of system performance. To understand what factors external from and internal to the IWS affect vessel movements, KTC researchers developed statistical models to predict queuing and lockage times. Drawing from 10 years of data on vessel movement, researchers generated highly accurate regression models, which can be used to predict travel times.

Based on this statistical analysis, researchers programmed a simulation model that lets users visualize traffic patterns. Users can parameterize several independent variables to see their influence on vessel movement. Combined with the Center's GIS-based work, this project demonstrates its expertise in quantitative modeling and analysis — both are essential for developing a holistic understanding of the IWS.

Securing Cargo and Protecting Infrastructure

Building from its expertise in highway transportation security, KTC analyzed the supply chain risks and hazards posed by certain dangerous cargoes (CDCs) that are moved on the IWS. CDCs include some of the most dangerous chemicals shipped on U.S. transportation networks. Monitoring them is critical for enhancing infrastructure and freight security.

KTC researchers surveyed the current regulatory landscape, as well as existing programs and technologies designed to secure CDCs, to develop the architecture of a system that can perform real-time risk monitoring and assessment of hazardous freight. The system dynamically evaluates the risk profile of each shipment to reduce security vulnerabilities and help to eliminate IWS traffic congestion.

*When **inland ports** adopt policies to improve their operational **sustainability**, profitability grows and the environment benefits.*

Bringing Sustainability to the Inland Port Industry

Although many studies have demonstrated that waterborne commerce is environmentally friendly and promotes sustainability, little research has examined what benefits smaller inland river ports accrue from becoming more sustainable. Knowing that sustainability is only attainable if stakeholders throughout the inland waterway industry buy into the concept, KTC researchers examined the sustainability practices of inland ports. Leveraging information collected from coastal and large inland port facilities, researchers designed a sustainability audit template that smaller inland port operators can use to self-assess their organizations. Viewing sustainability holistically, KTC researchers demonstrated that sustainable business practices improve operating margins — which is critical for small ports dotting the Ohio River shoreline. Even under optimal economic conditions, these ports must budget their resources wisely to maintain profitability.

KTC's sustainability audit template for inland river ports can be used by port operators to quickly and accurately measure the sustainability of their operations.

Kentucky's Inland Waterway Capacity

- P — COMMERCIAL PORTS
- MAJOR CITIES
- 1 — NAVIGABLE WATERWAYS
- HIGHWAYS

NAVIGABLE RIVERS

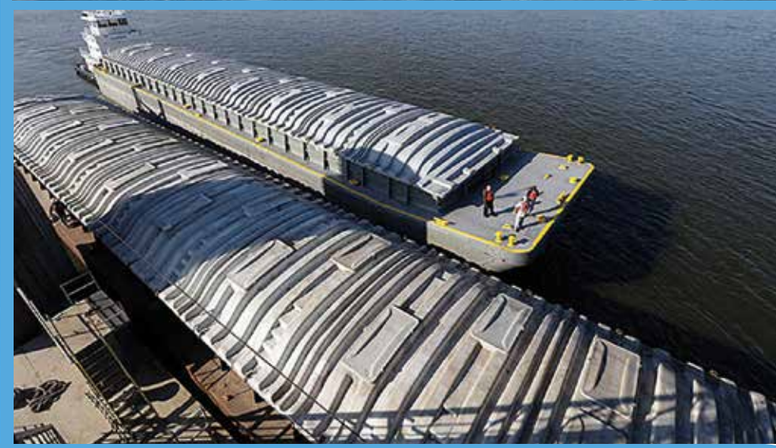
1. UPPER MISSISSIPPI
2. LOWER MISSISSIPPI
3. TENNESSEE
4. GREEN
5. CUMBERLAND
6. KENTUCKY
7. BIG SANDY
8. OHIO

Barges And The Bluegrass

- *12 public river ports, 8 adjacent river ports and numerous commercial ports*
- *1500+ miles of navigable waterways*
- *Seaman's Church Institute maritime training facility & 23 barge companies*

Through research on ***workforce development*** *and its emerging* ***business partnerships****, KTC is growing the inland waterways industry.*

KTC KENTUCKY TRANSPORTATION CENTER



Improving Workforce Recruitment and Development

Often, the IWS's reliability is gauged in terms of infrastructure dependability, but focusing only on physical infrastructure misses a key system component — and the foundation of carrier operations — the workforce that oversees and manages vessel movements. Workforce stability has been problematic for carriers, with many suffering frequent staff turnovers. Combined with an aging cohort of pilots and supervisors, the industry is at a turning point and will need to implement strategies to recruit and retain new workers. To solve this problem, KTC researchers suggested expanding training programs at community colleges and technical schools. Military veterans remain an untapped demographic as well. Recruiting veterans into the inland waterway industry holds immense potential and will help stabilize and grow a dependable and conscientious workforce.

Creating Partnerships to Stimulate Economic Growth

KTC remains engaged in inland waterways research and has recently branched out to directly assist clients with business analysis. In 2015, the Maysville-Mason County Port Authority commissioned KTC to study whether a port could succeed in the area. KTC researchers investigated socioeconomic conditions, transportation infrastructure assets, and historical commodity shipment data.

Maysville - Mason County PORT AUTHORITY

They also conducted site selection analysis to identify land suitable for the proposed facility. Given the anticipated growth in freight movement within the region and across the country, researchers concluded that building a new port may open up economic opportunities that have been unavailable.

Timeline of Inland Waterway System Research Initatives

2010

June 2010

MARAD White paper: Inland Waterway Shipment Management System
Presentation on diverse overlapping needs of IWS community

December 2010

Inland Waterway Research Gap Analysis
Meeting with various inland waterways stakeholders

2011

September 2011

Panama Canal Expansion Impact Study
Discussion on the possibilities associated with the expansion of the Panama Canal for the inland waterways

October 2011

MTIC Award
Tier 1 UTC awarded to KTC and its partners

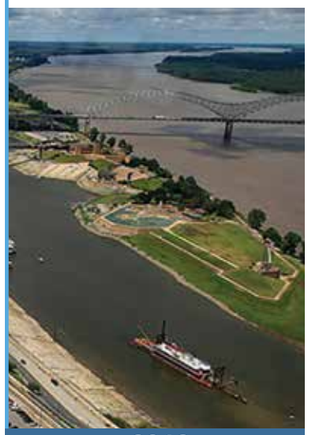
2012

January 2012

TRB Inland Water Transportation Committee
Research Presentations made to the Inland Water Transportation Committee

June 2012

MTIC Research Projects Begin



2013

January 2013

TRB Inland Water Transportation Committee
Research Presentations made to the Inland Water Transportation Committee

August 2013

Barge & Rail Symposium: Moving Freight between Multimodal Systems
A KTC/TRB co-sponsored event hosted in Louisville

October 2013

American Society of Transportation and Logistics Port Sustainability
Invited presentation

December 2013

Workforce Development Inland Waterway Operational Model

June 2013-January 2014

MARAD Working Groups
Operational framework & infrastructure groups

2014

March 2014

Inland Waterways Funding Mechanisms Synthesis

May 2014

AASHTO Summer Meeting
Invited Research Presentations

December 2014

National Waterways Foundation Study: Inland Navigation in the U.S.: An Evaluation of Economic Impacts & the Potential Effects of Infrastructure Investment

Certain Dangerous Cargoes Analysis

June 2013-January 2014

MARAD Working Groups
Operational framework & infrastructure groups

2015

January 2015

TRB Inland Water Transportation Committee Integrated Freight Network Model
Facilitated Session to establish future research agenda

August 2015

Economic Impacts of the Tennessee-Tombigbee Waterway: Advisory Committee

October 2015

Maysville-Mason County Port Authority Assessment
Feasibility Research Assessment conducted for the Port Authority of Maysville-Mason County

2016

January 2016

TRB Inland Water Transportation Committee
Research Presentation to establish a future research agenda

What Distinguishes KTC

Nationally recognized expertise in IWS operations

Commitment to interdisciplinary analysis

Trusted relationships with IWS industry partners

Record of delivering exceptional products on nationally funded projects

Responsive multidisciplinary research team that is attentive to client needs

Since 2010, KTC researchers have completed 12 nationally funded studies on different aspects of the inland waterway system, a number of projects funded at the local and regional level, presented findings at research conferences, and assumed leadership roles in key transportation organizations.

Building on the expertise it has amassed, KTC's researchers stand ready to ***anticipate, investigate, and solve critical problems*** *facing the inland waterway system — now and in the future.*

Building Expertise for Future Research

KTC has rapidly established itself as a source of high-quality research on every dimension of the IWS. From scrutinizing the implications of regulatory and policy shifts to building sophisticated models of vessel movements, KTC's in-house expertise now rivals universities and research centers that have conducted inland waterways research for decades. That the Center has become a nationally recognized leader in waterways research is a remarkable feat — it testifies to the remarkable energy that KTC's researchers have poured into their work over the past six years. But many questions about the IWS's future are still unanswered. With surface transportation networks becoming more fragile and less resilient every day, identifying creative policies and strategies to increase the IWS's reliability has taken on greater urgency. Although this will be a challenging task, it is one that KTC's researchers will enthusiastically tackle head-on.

KTC has staked out productive and collaborative relationships with a number of key stakeholders—Public agencies, port authorities, and shippers and carriers that depend on the IWS to conduct business. The Center looks forward to deepening these relationships and forging new ones as it continues to expand its footprint in the industry. KTC's foremost commitment is to delivering applied research products that will motivate action and create a more resilient IWS—one that will facilitate and sustain commercial activity into the next century. Having established a new standard for inland waterways research, KTC is poised to continue delivering thoughtful and transformative products that will not only benefit the IWS, but create a more sustainable multimodal transportation network in the process.

Research Briefings

Project Summaries — Background, Findings, and Recommendations

The following pages summarize key projects KTC's researchers have completed since 2010. Each summary provides background on project objectives and findings as well as recommendations that were issued in light of researchers' conclusions. Readers are encouraged to contact KTC if they want to request more information on a specific project, or if they have research needs they would like to address collaboratively with the Center's staff.

EXCELLENCE IN MOTION

An Intermodal Network Model of Coal Distribution in the United States and its Economic Implications for the Inland Waterway

INTRODUCTION

Despite government agencies gathering copious data, the multimodal pathways of energy commodity movements in the U.S. are not well understood. There are two primary reasons for this. First, transportation analysis is typically done on one mode at a time. And second, states generally focus on commodity movements within or close to their transportation networks. This limits geographic understanding of origin-to-destination movements that are national or international in scope. Thus, transportation agencies lack knowledge of commodities' spatial movements. This stymies analysis of volume-to-capacity ratios on various transportation modes and the economic consequences of modal shifts for shippers, carriers, and infrastructure networks.

OBJECTIVE

Analyze coal movements throughout the transportation system and discuss the economic consequences of coal production's steady decline in the Ohio Valley.

SCOPE

Investigate: 1) the role that railways, waterways, and highways play in moving coal from its source area to point of use; 2) the implications these movements have for the U.S. economy; 3) optimal routes for coal shipments based on a rate structure that accounts for the costs of shipping by each mode; and 4) the long-term economic and transportation implications of declining coal production.

Report Completed: January 2016

For further information concerning this or any other report please contact:

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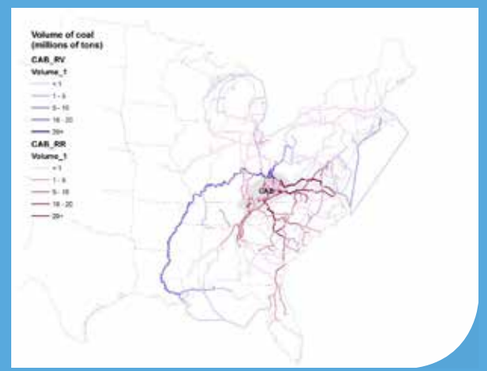
In Cooperation with:
Multimodal Transportation and Infrastructure Consortium, through the Research and Innovative Technology Administration's University Transportation Center

An Intermodal Network Model of Coal Distribution in the United States and its Economic Implications for the Inland Waterway (cont.)

METHODOLOGY

- Collect data on the sourcing and transportation of coal
- Use ArcGIS's Network Analyst to model coal movements and analyze their flows across a network with assigned impedances
- Analyze the effects of falling coal production on Kentucky's economy and the Ohio River Corridor



CONCLUSIONS

The model and available statistics reveal the majority of coal mined in the U.S. originates from the Powder River Basin. Compared to other sources — principally, the Appalachian Basin — coal from this region is significantly less expensive, thus giving it a comparative advantage. Both Texas and Illinois, the two largest coal consuming states, obtain virtually all of their coal from the West or from within state. Appalachian Basin coal serves domestic and export markets primarily in the East and Southeastern U.S. Only the Ohio River provides significant movement of Central Appalachian Basin coal to the west and south. There is little reason to believe consumption of coal sourced from the Appalachian Region will bounce back — it is simply too expensive and difficult to transport to market compared to coal harvested from the Mountain West.

RECOMMENDATIONS

This work demonstrates the potential for using integrated models to analyze data from the energy sector. One benefit: Freight planners could identify energy transportation corridors of significance. Models could also be used to analyze the movement of other commodities, which could let industry stakeholders identify and tap into new markets. The shift away from coal and toward natural gas as a primary energy source argues indicates that coal extraction in the Central Appalachian Basin will remain depressed, which could produce negative economic consequences for transportation industries. Carrier and port facilities will need to adopt a more diversified shipping portfolio to accommodate for these losses. It is possible that the loss of coal will open up opportunities for other commodity shipments on the Ohio River and over other inland waterways.

Excellence in Motion

EXCELLENCE IN MOTION

Assessment of Regional and Global Waterways Infrastructure Upgrades: Associated Impacts on Kentucky

INTRODUCTION

The expansion of the Panama Canal will likely reconfigure global shipping routes. More ships will be able to take advantage of the waterway and the time and fuel savings that come along with using the route. Importers stand to reap enormous cost savings, shipping companies will benefit from using less fuel, and ports located along the Gulf Coast and Eastern Seaboard of the U.S. will see dramatic increases in the amount of container cargo passing through them.

OBJECTIVE

Explore what the Panama Canal expansion means for the global shipping industry, with a particular emphasis on how it may instigate industry restructuring. Determine what consequences the expansion will have on the state of Kentucky's inland waterway system (e.g., the Ohio River).

SCOPE

This report: 1) details the history and significance of the Panama Canal; 2) describes how the canal's expansion has been justified; 3) provides an overview of U.S. port infrastructure and its ability to receive and process large container vessels; 4) identifies projects underway at port facilities along the Gulf Coast and Eastern Seaboard that expand their ability to handle containerized cargo; 5) considers how Kentucky is linked to major ports, Kentucky's Marine Highway system, and the traffic on those waters, and 6) reviews potential outcomes for the United States as a whole and for Kentucky in particular.

Completed: October 2011

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Assessment of Regional and Global Waterways Infrastructure Upgrades: Associated Impacts on Kentucky (cont.)

METHODOLOGY

- Literature synthesis of four topical areas to forecast the most probable impacts of the Panama Canal expansion for the U.S. and Kentucky:
  - o Upgrades to the Panama Canal and the global shipping fleet
  - o Current infrastructure at U.S. coastal and regional deep draft ports
  - o Gateways to Kentucky
  - o The balance of imported and exported goods currently traveling on Kentucky's waterways

CONCLUSIONS

The study looked at four possible scenarios that may arise from the expansion of the Panama Canal, and the associated infrastructure upgrades that would be necessary for the inland waterway system to capitalize on the changes. The expansion of the Panama Canal has the potential to significantly alter the routes that commodities take from East Asia to the United States. Currently, Kentucky's inland waterways are primarily used to import and export bulk cargo, including coal, aggregates, agricultural and forest products, and iron/steel. However, if ports on the Gulf Coast begin to receive Post-Panamax container vessels, Kentucky's inland waterways may begin to see containerized cargo. The expansion of the Panama Canal may impact shipping patterns in number of ways. The future of shipping could look substantially similar to patterns today or there could be a complete makeover of global shipping routes. In any case, Kentucky may see a changing river transportation composition that will impact the lives of many Kentuckians whether they are aware of transportation changes or not.

RECOMMENDATIONS

Because there is significant uncertainty over what the Panama Canal expansion will mean for global shipping patterns and whether containerized cargo will make inroads onto the inland waterway system, ports and shipping companies should remain aware of the potential ramifications. These industries should examine all shipping scenarios to gain understanding.

EXCELLENCE IN MOTION

Audit Template for Inland Port Sustainability

INTRODUCTION

Large coastal and inland ports throughout the United States and around the world have aggressively pursued new policies and practices to enhance their sustainability. Sustainability is a somewhat amorphous concept, and has been defined in numerous ways. Within the context of ports, it refers to following an operational model that improves environmental performance and strengthens ties with surrounding communities while ensuring long-term financial viability. While there are certainly moral and ethical arguments made for why sustainable practices are beneficial, if implemented systematically they can increase a port's economic bottom line. Despite the growing use of sustainable practices at larger facilities, little research has examined whether small inland ports, which usually operate on tight budgets, can benefit from sustainable business practices.

OBJECTIVE

Identify sustainable business practices currently used at large coastal ports that can be downscaled to improve small inland port operations. Develop an audit template small ports can use to self-assess their current performance and identify new measures they can implement to enhance sustainability and profitability.

SCOPE

Researchers comprehensively reviewed the sustainability practices adopted by large port facilities, through a combination of literature reviews and onsite visits. Additionally, 13 inland ports along the Ohio River were investigated to determine port officials' engagement with sustainable business practices. Based on these onsite interviews and the background literature, researchers developed a simple audit template that port facilities can use to rapidly assess to what extent sustainable practices are integrated into their operations. The template offers inexpensive, straightforward practices that could yield large gains in sustainability and improve overall financial conditions.

Completed: July 2014

For further information concerning this or any other report please contact:

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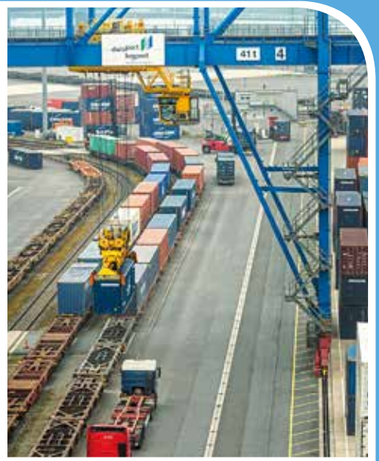
In Cooperation with:

Multimodal Transportation and Infrastructure Consortium, through the Research and Innovative Technology Administration's University Transportation Center program.

Audit Template for Inland Port Sustainability (cont.)

METHODOLOGY

- Literature reviews focused on sustainability principles and their application in the port context
- Visits to 11 large coastal and inland port facilities, where key officials and environmental officers were interviewed to understand why they are pursuing a sustainability agenda, what steps they have taken so far, and determine what lessons learned could be applied to small inland ports
- Repeat visits to 13 public ports along the Ohio River to assess officials' understanding of sustainability, what role it could play in shaping future business considerations, and how the examples set by large ports could be downscaled to meet the unique operational profiles of small facilities
- Continued refinement of an inland port sustainability audit template, which was developed during ongoing consultations with inland port operators



CONCLUSIONS

There is significant variation among ports in their interpretation of sustainability. Some port officials associate the term with environmental concerns, while others have marshalled the concept to justify improving relationships with surrounding communities. Many ports, because they lack financial stability, have not explicitly introduced policies to improve their sustainability. In this case officials express skepticism that sustainable practices will not benefit their long-term financial security and prosperity. Nevertheless, analysis reveals that ports with fully integrated sustainable practices have enjoyed the most significant financial windfalls. Based on numerous interviews, it is clear that enhancing port sustainability cannot be done entirely in-house. Unless a port receives buy-in from stakeholders (e.g. barge operators, motor carriers, nearby communities, and members across multiple supply chains), new sustainability policies are unlikely to succeed. Bearing this information in mind, a holistic audit template was developed that takes into account all dimensions of sustainability. This template was developed through numerous iterations and proved useful for officials at smaller ports interested in a tool to that could be used to quickly evaluate operational sustainability and identify new policies that could generate financial savings.

RECOMMENDATIONS

Port officials can use this research's findings and the audit template to evaluate where their business operations currently stand and decide what sustainability practices are most appropriate for their facilities. Ports can use audit template data to identify any gaps in data collection that need to be filled to more thoroughly assess sustainability performance. Conversations with port administrators at facilities with robust sustainability initiatives brought out the importance of establishing a sustainability office and hiring staff who are tasked with overseeing sustainability performance. This will help the port communicate their efforts to stakeholders, carriers, government agencies, and other stakeholders. It is also important for port officials to form partnerships with stakeholders, discuss audit findings, and coordinated responses to sustainability challenges.

EXCELLENCE IN MOTION

Barge and Rail Symposium: Moving Freight Between Multimodal Systems

OVERVIEW

Symposiums and conferences provide attendees with a valuable space where they can meet another, exchange new ideas, and discuss the results of their ongoing work. These conferences are particularly important for multidisciplinary fields. Although knowledge rapidly develops in transportation fields, too often conversations do not take place between individuals who occupy different research niches. Thwarted communication delays efforts to implement new solutions to urgent, everyday problems.

Because there were no regularly scheduled conferences devoted to intermodal freight movements, KTC convened the 2013 Barge and Rail Symposium. Bringing together a cross section of stakeholders from government, industry, and universities, this conference facilitated discussions between individuals who carry out research on the U.S. inland waterway system and on rail networks, as well as with businesses that rely on these transportation modes. With freight transportation as its focal point, the 2013 Barge and Rail Symposium established a collegial environment in which new bonds were forged between major stakeholders and researchers as they discussed challenges and opportunities associated with transporting freight economically, efficiently, and sustainably.

Along with vibrant research presentations and informative keynotes from leading government officials, participants at the Barge and Rail Symposium visited a number of facilities that are an integral part of multimodal freight networks, such as the McAlpine Locks and Dam, to gain firsthand knowledge of their daily operations. The 2013 Symposium balanced insightful presentations with hands-on field experience, gave attendees a memorable experience and, more crucially, set the stage for future collaborations between researchers and public and private stakeholders.

Date: August 14-16 2013

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In Cooperation with:
Multimodal Transportation and Infrastructure Consortium, through the Research and Innovative Technology Administration's University Transportation Center program.

Barge and Rail Symposium: Moving Freight Between Multimodal Systems (cont.)

OVERVIEW (cont)

News of the conference later appeared in UKNow, a digest of the most important news and happenings affecting the University of Kentucky. Subsequently, Kentuckians for Better Transportation, an organization dedicated to improving all facets of transportation in the Commonwealth of Kentucky, highlighted the Symposium's success and the contributions it made towards expanding discussions about multimodal freight transportation.

CONFERENCE EXAMINES THE RELATIONSHIP BETWEEN MULTIMODAL TRANSPORTATION SYSTEMS

From August 14-16, leading representatives from private industry, government, and academia gathered at the Brown Hotel in Louisville for the 2013 Barge and Rail Symposium. This inaugural symposium provided an opportunity for invited presenters and experts on multimodal transportation to present cutting edge research focused on improving the speed and reliability of freight movement via inland waterway and rail. The symposium fostered a productive exchange of ideas and laid the groundwork for exploring the sustainability and long-term viability of the United States' multimodal freight networks.

Sessions covered a variety of topics related to the past, present, and future of multimodal transportation. One critical theme: leveraging knowledge about how transportation systems' interactions and interdependencies can streamline freight movement. Many of the presentations confronted tough but rewarding questions about what steps are needed to bolster the multimodal efficiency of the nation's inland waterways and rail infrastructure.

In addition to presentation sessions, participants visited the Kentucky Railway Museum, McAlpine Locks and Dam, The Falls of the Ohio, and American Commercial Lines' Jeffboat Manufacturing facility. These invaluable excursions gave attendees direct insight into the daily operation of the multimodal transportation systems that serve as critical links in the nation's supply chains.

"We could not have been more pleased with the success of this conference," said Dr. Joe Crabtree, Director of the Kentucky Transportation Center at the University of Kentucky. "The turnout was even greater than we had anticipated, and there was a wonderful exchange of information and ideas among the participants. I was particularly pleased to see the excellent interaction and cooporation that occurred among folks representing the different modes."

The symposium was made possible through partnerships between the Transportation Research Board, The Multimodal Transportation & Infrastructure Consortium, and the Kentucky Transportation Center. Conference sponsors included American Commercial Lines, Genesee & Wyoming, Global Transporation Consultancy LLC, Patriot Rail and the University of Louisville. Their generous support helped to make the Barge and Rail Symposium a tremendous success.

Press release

EXCELLENCE IN MOTION

Inland Navigation in the United States: An Evaluation of Economic Impacts and the Potential Effects of Infrastructure Investment

University of Kentucky & University of Tennessee

INTRODUCTION

Historically, navigation along the inland waterways has played an integral role in freight transportation. Recent trends indicate the inland waterways will continue to occupy an even more central position in freight movement. But the continued reliability and concomitant economic value of inland navigation depends on a new generation of supporting infrastructure. Without strategic investments, the inland waterway's reliability will suffer due to increased lock closures. Investments will require adequate fiscal resources as well as a far-reaching national policy vision that capitalizes on the comparative efficiencies of all freight transport modes.

OBJECTIVE

Evaluate commercial navigation's economic contribution to the U.S. economy, both as it is currently structured, and as it might be after greater infrastructure investment.

SCOPE

Navigation is critical to various industrial processes. The study attempted to discern the economic implications of the current inland navigation system and forecast what role it could play if sufficient infrastructure investments were made. The study: 1) quantified the total economic value of commercial inland navigation tin the U.S., which is based on the inland waterway system's current infrastructure; 2) forecasted how this value will change if future investments are only enough to maintain current system performance; and 3) projected the future economic values if proposed improvements to navigation system capacity are made and 4) projected performance under traffic demands that are comparable to current levels of freight movement.

Project Completed: November 2014

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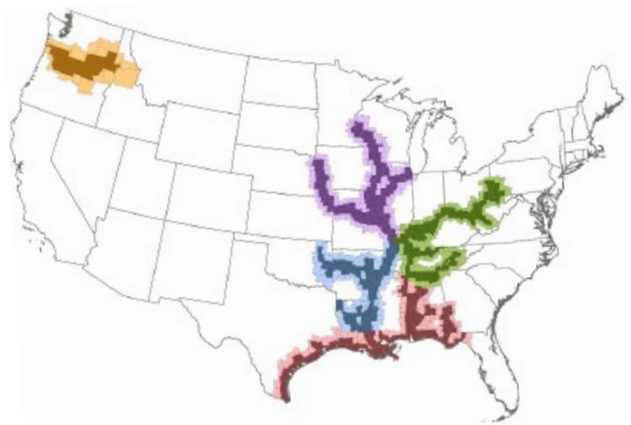
Sponsored By:
The National Waterways Foundation

Inland Navigation in the United States: An Evaluation of Economic Impacts and the Potential Effects of Infrastructure Investment (cont.)

METHODOLOGY

- Quantify the current value of the inland waterway's contribution to the national economy
- Use Regional Economic Models, Inc. (REMI) software to model the long term effects of losing inland waterway transportation in regions around the U.S. (including the Ohio, Upper and Lower Mississippi, Gulf Intracoastal, and Pacific Northwest)
- Estimate the impacts of system modernization using REMI



CONCLUSIONS

The U.S. inland navigation system, through its annual movement of millions of tons of freight, reduces nationwide freight costs by approximately $12.5 billion. The system is responsible for 250,00 jobs and $132 billion in output that would not otherwise exist, and reduces the need for U.S. railroad capacity by up to 20%.

RECOMMENDATIONS

Modernizing the inland waterway system's infrastructure requires only modest investment and would ensure the availability of current waterway capacity for future generations. Some regions could see a 10% increase in the existing productive impacts of waterways. Directing investments toward the system would be in the long-term economic interests of the U.S.

Inland Waterway Operational Model and Simulation Along the Ohio River

INTRODUCTION

The U.S. inland waterway system is a critical network that transports raw materials and commodities from where they are produced to manufacturers and consumers. Compared to moving freight with trains or on the highway system, the inland waterways are a more economical, efficient, and environmentally friendly choice. However, key pieces of infrastructure, such as locks and dams, are deteriorating. Tight operations and maintenance budgets are the cause, and there are only limited funds available to make necessary repairs. As a result, the aggregate number of hours shippers and carriers lose to scheduled and unscheduled lock outages has gone up. For shippers and carriers to make informed decisions about when and where to deploy freight on the river, they require knowledge of the factors that significantly influence transit times and how the system responds to lock outages.

OBJECTIVE

The IWOM objective is to provide the U.S. Army Corps of Engineers, shippers, carriers, and other interested parties with access to a robust method that predicts when river conditions will arise on the river that significantly impact lockage times and queue times (i.e. how long a vessel has to wait after it arrives at a facility to lock through).

SCOPE

The purpose of this report was to: 1) develop a comprehensive profile of the Ohio River that explains of how it is integral to U.S. economic security; 2) identify salient river characteristics and variables that influence the water flow through the main channel, which impacts vessels' capacity to navigate; 3) use the research (along with a 10-year data set encompassing over 600,000 observations to develop an Inland Waterways Operational Model (IWOM).

Completed: November 2014

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Inland Waterway Operational Model and Simulation Along the Ohio River (cont.)

METHODOLOGY

After qualitatively reviewing different features of the river system that affect vessel traffic, this report outlines two approaches to modeling inland waterway system behavior – a discrete event simulation (DES) model which uses proprietary software, and the IWOM. Although the DES produced robust findings that aligned with the historical data, it did not offer an ideal platform to distribute knowledge to stakeholders. Indeed, this is the major drawback of the DES, since a critical objective of this project is to generate usable information for key stakeholders who are involved with inland waterway operations. Conversely, the IWOM is a preferable option, since it relies on statistical analysis – in this sense, it is more of an open-source solution. The IWOM uses linear regression to determine key variables affecting variation in lockage time. The final model accounts for over two-thirds of the observed variation in lockage times from 2002-2012, the study period. This means that the difference between predicted values and observed delay times is significantly less than how the delays vary around the composite average seen in the river system.

CONCLUSIONS

The IWOM confirmed that variations in river conditions significantly affected vessel travel times. For example, river discharge —the direction a vessel moves up or down a river - meaningfully influences lockage times. The freight amount a vessel carries, which is represented by the amount of draft and newness of a vessel, influences lockage times. Larger vessels with more draft tend to wait longer and take longer to complete their lockage, so the IWOM will be less successful at predicting delay times. Because of greater instability in delay times, only a modest amount of variation was explained by the model. Spillover from one vessel to the next was difficult for the simulation to account for, and therefore required additional logic. Once completed, the IWOM was used to parameterize a simulation model. This provided a graphical representation of vessels moving along the river. Model users have the capability of adjusting the effects of different variables to anticipate how the system may react or to discover changes in vessel traffic patterns. This information will be of great use for stakeholders wanting to gain a better understanding of why lockage times will increase or decrease, why delays emerge, and how traffic flows are impacted on the river. In programming a simulation model, users will be able to visualize and intuit what causes vessel travel times to vary.

RECOMMENDATIONS

Several system components remain under-explored because they were beyond the intent of this project. To achieve a fully calibrated (and validated) model of the entire river system, it will be necessary to develop more accurate modeling techniques to understand what factors affect the speed of vessel movements between lock and dam facilities (i.e. within river pools). Current simulations rely heavily on statistical averages and probability density functions that do not represent the full complexity of vessel behavior. Future research could refine the IWOM for better understanding of pool travel times.

Inland Waterway Shipment Management System White Paper

INTRODUCTION

Although the U.S. inland waterway system has been a critical network for transporting goods and commodities throughout the country, policymakers typically dedicate more attention to highway motor carriers and railroad companies. The U.S. Maritime Administration (MARAD) has prioritized development of the U.S. marine highway system to facilitate economic growth and refocus efforts on overlooked infrastructure assets.Research on logistics and supply chain management strategies is needed to help industry stakeholders realize that current practices on the inland waterway system can lead to potential growth.

OBJECTIVE

Articulate a detailed plan to significantly enhance the inland waterway system's operational characteristics. This information will aid rapid expansion of waterborne navigation and commerce.

SCOPE

This project developed a concept of operations for an Inland Waterway Shipment Management System (IWSMS) that coordinated the use of real-time tracking, electronic manifests, and electronic route plans to let stakeholders better utilize the inland waterway system and improve supply chain management.

METHODOLOGY

- Performed background literature review on supply chain management, logistics, and transportation security
- Reviewed strategies to monitor vessels in real time, telematics technologies, and systems adopted by highway motor carriers
- Applied systems engineering principles to conceptualize and delineate the operational parameters of a tracking system dedicated to the inland waterways

Completed: June 2011

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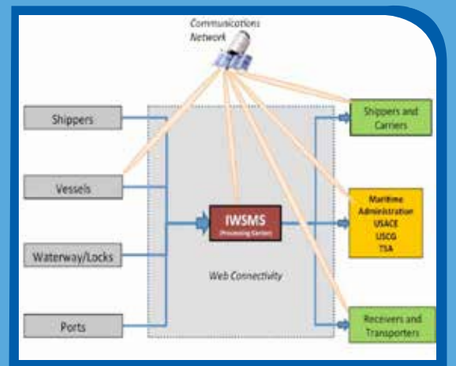
Inland Waterway Shipment Management System White Paper (cont.)

CONCLUSIONS



Inland waterway stakeholders enhanced the capabilities of river networks and demonstrated its great potential to various industries. But the methods used to exchange information about shipments remain cumbersome. Often, barge companies and port terminals have poor communication and tracking systems in place, which produces logistical bottlenecks. The IWSMS will monitor and track individual barges, standardize electronic manifests, and generate detailed route plans for each barge. After data processing, shippers, carriers, TSA, the U.S. Army Corps of Engineers, U.S. Coast Guard, and MARAD would be able to observe real-time traffic displays, determine what materials — and in what quantities — a barge is carrying, infrastructure utilization rate, and receive status updates on individual shipments. Industry stakeholders can leverage this knowledge to optimize freight movements and to identify any potential supply chain trouble spots before they impede shipments and trigger systemic disruptions.

RECOMMENDATIONS

To implement the IWSMS, a five-phase plan was developed. These phases include:

- Optimization of Intermodal Transfer
  - *To improve the communication between motor carriers and barge companies, a dynamic monitoring system will be implemented that tracks vehicles at 15-minute intervals. Motor carriers can use this knowledge to better forecast when a shipment will arrive at a port, reducing intermodal transfer times.*
- Locks and River Information Systems
  - *This step will open up communication between lock operators and carriers. The system will inform lock operators of the number of expected barges and their estimated time of arrival. Lock operators will also be able to enter status updates about current conditions at their facilities.*
- Shipment Manifest System
  - *The shipment manifest system will house data about each shipment's contents and will be accessible to consignees, port facilities, locks, downriver carriers, and governmental agencies. Relocating all shipment information to a centralized system will simplify data collection efforts — having data in one place will eliminate the redundancies that arise when shippers and carriers are required to fill out multiple forms with the same information, which they are currently obligated to do.*
- Inland Waterway Shipment Management System
  - *The finalized IWSMS will house shipment manifests, coordinate barge tracking, and store route plans for all commercial vessels. The result will be a comprehensive logistics management system that public and private stakeholders can take advantage of.*
- Public and Private Security
  - *Dynamic shipment tracking will improve inland waterway security and enable government agencies like the Transportation Security Administration to focus on vessels moving high-risk goods which, if released, could pose threats to nearby communities and the environment.*

EXCELLENCE IN MOTION

Inland Waterways Funding Mechanisms Synthesis

INTRODUCTION

The 12,000 miles of commercially navigable inland waterways is a vital part of the U.S. multimodal freight network. Each year, over 800 million tons of goods and commodities are transported on rivers and lakes. Although inland waterways lack the visibility of other modes, shippers can transport bulk commodities in a relatively inexpensive and environmentally friendly method. The Inland Waterways Trust Fund (IWTF) provides financial support for the inland waterways system. To ensure this transportation mode remains an attractive option for shippers and that it accommodates future growth, critical infrastructure must be in good repair to ensure the safe, efficient, and timely passage of commercial vessels.

OBJECTIVE

Develop a comprehensive review of the inland waterways system's financial prospects and proposed funding changes and reforms. Examine current performance levels, which indicate how funding allocations are affecting the system.

SCOPE

This research analyzed IWTF data from the past 30 years to: 1) determine the number of infrastructure projects that have been completed, 2) define the effects of an unchanging fuel tax on available project funds, and 3) predict future system performance under a range of funding scenarios.

METHODOLOGY

- Analyzed fluctuations in IWTF revenues and balances from 1980 to the present
- Identified proposed funding reforms that could transform the IWTF's current revenue structure
- Reviewed the current state of inland waterways infrastructure

Project Completed: November 2014

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Inland Waterways Funding Mechanisms Synthesis (cont.)

CONCLUSIONS

IWTF balances have declined over the past 30 years, limiting the number of infrastructure projects that can be undertaken. This decline can be explained in part by fuel taxes, which have remained at the same level from 1995 until 2015, when a small increase was approved. Over this period, the dollar's purchasing power declined, which left a mounting backlog of projects and an IWTF that was stretched too thin. Reforms have been proposed to alleviate these problems, including additional fuel tax increases, changing the cost share structure, tolling of locks and dams, and introducing license fees. Finding a lasting solution is imperative because measures of system performance indicate the number and duration of lock outages — scheduled and unscheduled — have crept upwards, suggesting the inland waterways are a less reliable mode of transportation than they once were. Unexpected lock closures pose significant problems for carriers and shippers. They drive up shipping costs, reduce the competitive advantage the inland waterways enjoy over alternative modes, and idle freight shipments. Falling IWTF balances and increased outages are part of an alarming trend. However, opportunities abound to correct these problems.

RECOMMENDATIONS

Some proposals have advocated changes to the U.S. Army Corps of Engineers' budget projects and the methods used to prioritize maintenance and repair projects. Policymakers need to carefully consider the full list of possible reforms identified by this research and investigate which options are most workable in the current political environment. Tackling these issues through constructive policy reforms provides a starting point to change the current funding regime. Positive solutions are necessary to secure the inland waterway system's future resiliency.

EXCELLENCE IN MOTION

Integrated Freight Network Model: A GIS-Based Platform for Transportation Analyses

INTRODUCTION

The models currently used to analyze the behavior of transportation are usually mode specific — rather than being fully integrative, they focus on one mode (i.e. railways, highways, or waterways). Lack of integration severely hampers efforts to analyze the intermodal movement of freight. The need exists to develop a comprehensive GIS-based model of the three primary surface transportation modes and the influence of intermodal connectivity on their operations. Such a model would provide highly detailed information about shipping costs, transfer costs, traffic volumes (including non-freight auto traffic), and network interconnectivity properties.

OBJECTIVE

Conceptualize, build, and implement an integrated and nested GIS-based model of highway, rail, and inland waterway freight networks. The resulting model will be national in scope and provide detailed information about intermodal connectivity in Kentucky.

SCOPE

This project will: 1) construct a GIS-based model of multimodal transportation networks in the U.S., 2) analyze intermodal connectivity in the state of Kentucky, and 3) understand the economic and transportation consequences of applying modal substitutions on the primary surface freight modes as well as on multiple commodities.

Completed: January 2015

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Integrated Freight Network Model: A GIS-Based Platform for Transportation Analyses (cont.)

METHODOLOGY

- Collaborate with research partners to design the model's administrative form and data sharing properties
- Compile metadata guidelines
- Solicit and process data received from partners (e.g., state transportation agencies, U.S. Army Corps of Engineers)
- Use ArcGIS Network Analyst to draft preliminary GIS model and review with partners
- Conduct a pilot test to examine the effects of modal substitutions on freight transportation network behavior

CONCLUSIONS

After building the GIS-based model, an exploratory analysis studied what the potential impacts would be if approximately half of the freight currently transported by barges on the Ohio River were shifted onto trucks and Kentucky's highway system. Roads in the northeastern and western parts of the state, which are heavily used by coal trucks, would suffer greatly from increased congestion. The integrated freight network model highlighted that roads originating in the Western Coalfields would experience explosive growth in freight transport, with an increased proportion of trucks to overall vehicle traffic.

RECOMMENDATIONS

The final model can be used to analyze shippers' decision-making processes and offer guidance on which transportation mode would produce optimal results. Modal choices affect how freight volume is distributed across the freight system. Further refinement and adoption of the model can aid stakeholders in their quest to realize greater overall efficiency within the freight system. Greater efficiency, in turn, will yield monetary and non-monetary benefits, such as improving fuel and air quality, reducing congestion, lowering the cost of goods, improving the business climate, lowering public sector costs, and improving transportation network safety. Dramatically shifting the amount of freight moved on each mode could ameliorate infrastructure bottlenecks, air quality, fuel efficiency, and safety, all of which are objectives of transportation planners.

EXCELLENCE IN MOTION

Marketing and Economic Development Analysis for the Maysville-Mason County Port Authority

INTRODUCTION

Recent projections point to an increase in the amount of goods shipped on the Ohio River. To accommodate shipment of these goods, additional multimodal infrastructure development will be necessary. The proposed Maysville-Mason County Port presents an opportunity to accelerate growth in the Buffalo Trace Area Development District (BTADD). Due to untapped commercial development, the region is well-poised to meet the demands of additional industries. Developing a port facility is expected to create jobs, stimulate supplier support industries, and generate additional tax revenues to the surrounding five counties — Bracken, Lewis, Robertson, Fleming, and Mason.

OBJECTIVE

On behalf of the Maysville-Mason Port Authority, examine the business potential for a port in Maysville and prepare background information that could be used in marketing materials and other initiatives.

SCOPE

This project: 1) reviewed the BTADD's economic characteristics, demographics, and transportation infrastructural assets; 2) identified the suitability of local industrial properties for port construction; and 3) analyzed shipping trends on the Ohio River.

METHODOLOGY

- Reviewed infrastructure, demographics, and commodity shipments
- Examined port structure options
- Administered a survey to businesses located in the BTADD that asked about current shipping methods and their level of interest in using a port facility
- Identified funding opportunities the Port Authority could tap into for infrastructure development

Completed: September 2015

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Sponsored By:
The Maysville-Mason County Port Authority

Marketing and Economic Development Analysis for the Maysville-Mason County Port Authority (cont.)

CONCLUSIONS

Because of anticipated growth in regional and national freight traffic, new multimodal infrastructure development will be required. The inland waterways system remains underutilized and can handle additional capacity. In the coming years, an investment in growing infrastructure will expedite the movement of goods. The development of a port in Maysville can spur economic growth, create job opportunities, and situate the town as a key node in a growing national and regional freight network.

RECOMMENDATIONS

The final report identifies the Charleston Bottom site as a potential location for port development. It has easy rail and highway access, is partially cleared, and lies near the 500-year floodplain. While the land is currently owned by CSX, the company is willing to work with the Maysville-Mason County Port Authority to facilitate transfer of ownership. The Port Authority should explore acquiring this property and determine what steps would be needed to develop port infrastructure on the site. KTC produced a brochure for current partners and prospective clients that highlighted the benefits of the BTADD and what economic opportunities a new port would offer the community. Marketing efforts should focus on widely distributing this brochure and aggressively reaching out to current and potential businesses. Further, the port authority would be well-served by developing a website where interested parties can obtain more information about the BTADD and the proposed port. Constructing the new port will require tapping into new funding sources. One option the Port Authority could pursue is a TIGER Discretionary Grant. The construction will proceed in several phases, beginning with the property transfer and going through the National Environmental Policy Act (NEPA) process. Later phases will focus on capital improvements, such as site clearing, installing loading facilities, and constructing paved roads to the site.

Security and Supply Chain Risk for Shipments of Certain Dangerous Cargoes on the Inland River System

INTRODUCTION

Because of their chemical properties, if certain dangerous cargoes (CDCs) were accidentally or deliberately released into the surrounding environment, the repercussions would be grave. Substantial loss of life and property, ecological damage, and catastrophic economic consequences would likely ensue from a release. Shippers often rely on the inland waterways to move CDCs. Compared to shipments moved via trucks or rail cars, the quantities of CDCs loaded on to barges are much larger. Loads of high-risk materials float past major cities everyday, which introduces security threats to densely populated urban centers. There is an urgent need to reduce the security vulnerabilities associated with CDC movement on the inland waterways. Government agencies require tools which enable them to track CDCs in real time and they need new methods to dynamically assess risk.

OBJECTIVE

Identify the security risks posed by the movement of CDCs on inland waterways. Compare those risks to security vulnerabilities that CDCs encounter when shipped on alternative transportation modes (e.g., highway and rail). Describe the policies federal agencies have instituted to prevent deliberate or accidental hazardous materials releases.

SCOPE

This project: 1) reviewed the current regulatory landscape, existing security programs, and technologies designed to track CDC movements; 2) explored risk management strategies for high-security-risk materials transported on railways and highways; 3) conceptualized and identified the potential benefits of extending real-time tracking and dynamic risk assessment to the inland waterway system.

Completed: June 2015

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Security and Supply Chain Risk for Shipments of Certain Dangerous Cargoes on the Inland River System (cont.)

METHODOLOGY

- Detailed literature review and regulatory analysis of inland river CDC management, related technologies, and inland river domain awareness
- Structured interviews with officials from the U.S. Coast Guard, U.S. Army Corps of Engineers, and private industry stakeholders

CONCLUSIONS

The quantity of CDCs moved on the inland waterway system has steadily increased. A number of maritime security regulations and systems have evolved to address the security risks posed by transporting CDCs. For example, the Marine Transportation Security Act became law in 2002, and the U.S. Coast Guard began tracking CDC shipments at its Inland River Vessel Movement Center — this program, however, is now inactive. Technologies exist to dynamically track CDCs. The U.S. Coast Guard's Automatic Identification Systems (AIS) provide one means of accomplishing this. Problematically, current Coast Guard maritime domain awareness programs and systems do not extend to the inland rivers. They are focused almost entirely on coastal waters. The U.S. Department of Transportation requires shipments of CDCs to be accompanied by shipping papers, and while there is a trend toward using electronic shipping papers, this practice has not fully taken hold. A dynamic tracking and management system would establish a centralized point for monitoring CDCs and for coordinating the delivery and distribution of electronic manifests and shipping papers.

RECOMMENDATIONS

The U.S. Coast Guard and other federal agencies need to expand and strengthen CDC domain awareness on the inland waterways. One way to aid this effort is the implementation and adoption of a comprehensive CDC security system that dynamically tracks vessels carrying hazardous materials, quantifies shipment risk associated with individual vessels, and contains documents related to chain-of-custody control. It is also important to focus on the movement of CDCs through high threat urban areas, as well as loading and offloading operations. Implementing a centralized CDC monitoring location will aid in understanding the movement of dangerous cargoes via inland river.

EXCELLENCE IN MOTION

Workforce Assessment of the Inland Waterway Industry: A Survey of Current and Future Training and Personnel Needs

INTRODUCTION

The inland waterway industry is confronting a human resources crisis. Its workforce is rapidly aging, and successfully recruiting new people into the industry has proven challenging. Skilled positions, such as river pilots and captains, will be hit especially hard, as many people who currently occupy them are nearing retirement. The industry must identify new ways to recruit, train, and retain personnel for the very demanding jobs that will soon be open. New personnel must have the ability to acquire the new skills and knowledge, needed to occupy positions tasked with significant responsibilities. Although many people have the ability to serve as deckhands, successful river pilots and onboard supervisors must have an intuitive grasp of spatial relations, demonstrated leadership abilities, and a range of technical workplace skills.

OBJECTIVE

Specify ideal hiring profiles for candidates who would excel in a variety of professional positions at barge companies on the inland waterway system.

SCOPE

The inland waterway industry finds recruiting successful workers to be a difficult task. Captains and onboard supervisors must have a working knowledge of various legal rules and regulations that apply to river navigation. Employees in leadership roles must be able to handle paperwork and related documentation pertaining to shipping activities. These personnel should be proficient with sophisticated navigation and communication equipment. They also need soft skills, as barge companies seek personable people to train and interact with young deckhands and other coworkers.

Completed: July 2013

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Workforce Assessment of the Inland Waterway Industry: A Survey of Current and Future Training and Personnel Needs (cont.)

METHODOLOGY

- Literature review focused on the employment history of the inland waterway industry
- Quantitative analysis of data collected by the U.S. Coast Guard, U.S. Army Corps of Engineers, and the American Waterways Operators
- Semi-structured interviews with industry leaders and barge company officials
- Observation of mariners' professional environment
- Qualitative assessment of workforce training and education practices and onsite visits to institutions (e.g. community colleges and technical schools that offer maritime coursework)

CONCLUSIONS

Rivers are dangerous and challenging workplace environments. The most demanding jobs within the inland waterway industry are generally occupied by skillful and conscientious individuals who excel at teamwork, who are adaptable to new situations, and who can improvise solutions when unexpected challenges arise. Captains and onboard supervisors are not frequently hired from outside a particular company. Rather, candidates tend to be promoted from within. As such, it is imperative that these companies make prudent decisions when hiring entry level personal — today's deckhands will be tomorrow's river pilots. Some barge companies have implemented programs to recruit graduates of university maritime academies and fast track them into the steersman programs to become pilots. This model has gained purchase, and it may be possible to replicate -if more training is developed within academic programs. Community colleges could play a larger role in training pilots, engineers, and supervisors, and thus, reduce the amount of time it takes a worker to earn a pilot's license. Community college students currently receive few benefits from the use of sophisticated simulator programs such as the one at Seaman's Church Institute in Paducah, Kentucky. In Europe, simulators are used to accelerate training of river pilots; this training model could be extended to the development of inland river pilots in the U.S.

RECOMMENDATIONS

Successful inland waterway industry employees are responsible, adaptable, can quickly grasp new knowledge, build new skill sets, and perform well in team-oriented settings. River pilots and onboard supervisors must also demonstrate a penchant for leadership. KTC found that barge companies would be well-served by recruiting military veterans since they are likely to have the skills conducive to occupational success. Because barge companies have not yet tapped into this demographic, there is significant room for growth. Additionally, more resources should be dedicated to creating robust training programs at community and technical colleges. These institutions have a sound track record of turning out barge company employees who excel and move up through the ranks quickly. To satisfy increasing demand, barge companies and these institutions should collaborate on specialized curricula that fast tracks students wanting a career in the inland waterway industry. This will ensure courses teach the exact skills required for workers to excel once they get into a barge setting.

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