FINAL REPORT

Smart Rivers
2007 Conference

Positioning Inland Navigation as a Powerful Link in the Global Supply Chain

September 16–19, 2007

Seelbach Hilton
Louisville, Kentucky

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Smart Rivers 2007 - Positioning Inland Navigation as a Powerful Link in the Global Supply Chain

Conference Summary Report

September 16–19, 2007
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Louisville, Kentucky

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Executive Summary

Smart Rivers 2007 was the third in a series of conferences between U.S. and European partners for the purpose of discussing ways to improve inland navigation. Both regions are attempting to find solutions to congested roads and railways while providing access to international markets from each respective hinterland. Waterways represent an alternative that can improve overall transportation systems and can possibly support both local and regional economic development. In this framework, waterways have a role in the global framework that complements, rather than conflicts, with other modes.

The meeting was well attended by a wide variety of presenters and attendees, which generated many opportunities to exchange ideas and discuss each region's inland waterway system. The conference attendees stressed the common needs related to improving waterway reliability through not only technologies and improved operations, but also through partnerships and collaboration. The conference provided that forum, as reflected in these proceedings. The accompanying presentations are posted on the PIANC USA website (www.pianc.iwr.usace.army.mil).

While various sessions focused on specific topics, four common themes emerged over the two days of discussions. For the most part, the U.S. and the European experiences appear very similar, but there are notable exceptions related to policy, planning and operational improvements. The four main themes are:

- Increasing traffic on inland waterways represents one solution to partially alleviate future domestic transportation congestion while providing linkages to global supply chains. To be successful, inland water transport must offer service requirements regarding time and flexibility to satisfy shipper demands,
- There are different ways to examine waterway redevelopment in a policy/marketing perspective, including economics and planning tools,
- The need to invest in new technologies is important,
- There are differences between the European and U.S. approaches to improving inland waterway systems.

1. Waterways in Domestic Transportation and Global Supply Chains

The world economy is changing, highlighted by emerging markets, improved transportation and instantaneous telecommunications. In the U.S. and Europe, inland transportation operations are seen as one method to improve domestic shipments while providing important gateway services to international markets. Speakers from both regions expressed the need for reinvestment as critical to maintaining long term economic growth while providing congestion relief on the road and rail networks.

While bulk cargos move along the European waterways, Europe also has a very robust container on barge industry, operating mostly along the Rhine. This corridor has enjoyed tremendous

activity over the past 30 years, beginning with the U.S. Army seeking a secure method of shipping household goods from the coastal ports to army bases located in Germany, with local freight forwarders using the empty containers to generate backhaul moves. Over time, these container services expanded by providing reliable, efficient operations that focused upon the needs of the shipper. The same model is being studied in other parts of Europe, such as along the Danube. However, with the exception of the Rhine, most waterways in Europe are considered to be underutilized with regard to total system capacity, similar to the perception of the U.S. inland navigation system. (In comparing total tonnage carried by mode, the U.S. actually handles a greater share of total freight on its inland system than does Europe.)

In the U.S., most of the inland waterway traffic consists of bulk cargos, (grains, coal, aggregates, etc.) but container on barge services are not a new activity. Container on barge services have operated along the Columbia-Snake River and other coastal regions for decades. Within the last few years Osprey Line began developing container on barge services between the Mississippi River ports and the Gulf Coast ports.

In Europe, the focus appears to be on attracting new cargo to use the waterway system, not necessarily through a reinvestment in navigation structures but in technology and measurements. For example, the Austrian Government is seeking to attract inland navigation between the Black Sea and the Rhine by studying the associated operational costs of new services. Also, the use of performance measures is being studied as one approach to identify waterways that may offer viable transportation services within certain corridors (PIANC InCom Working Group 32).

When considering the relationship of international movements to inland navigation, the inland waterways must provide reliable, cost-efficient services. In some cases, shippers are locating plants, etc., along rivers, with the expectation that water services may be used. Carriers must understand that shippers are demanding water access, and would use water if reliable services were available.

Equally important is the role of ports in this new global system. Ports are seen as the nexus to local and regional economic growth by providing services from hinterland areas to global markets. Ports should seek to collaborate with other regional ports to attract cargo into the system before determining which port gets what share of the new cargos. Furthermore, port leases can encourage the use of inland navigation, as in Rotterdam's current structure, by providing incentives to move more freight along coastal or river systems. Also, port management strategies are evolving, from privatization to reinvestment in port facilities and logistics centers. Inland port facilities can provide basic transportation services or could become logistics centers in their own right, providing not only transportation options, but economic development opportunities also.

2. Many Methods to Understand Inland Waterway Systems

In both the U.S. and Europe, the need to articulate this "new" role of waterways as both an engine for economic development and a viable alternative transportation mode may require a new understanding of waterways. This "new" role can not be distilled into a simple message, as

the recognition and appreciation of waterways must be addressed by government agencies, local public officials, shippers, carriers, and the general public.

Most U.S. participants focused on the aging infrastructure (locks and dams) that supports inland navigation. Most of the system is nearing the end of its design life. The associated unreliability of the system, manifested through several lock closures over the past few years, has resulted in disruptions throughout the supply chains that depend upon those structures. When this occurs, cargo may be diverted to other modes or the shipments are delayed until the lock is reopened. Several recent studies related to lock and dam closures suggests the resulting delays can range into the millions of dollars in economic losses.

There appeared to be some recognition that the shippers do not fully understand the inland navigation component in their transportation planning and operations. The U.S. Maritime Administration (MarAd) is promoting traffic moving onto waterways to alleviate highway congestion. The U.S. Army Corps of Engineers is looking at how shippers plan and depend upon inland navigation, including modal choice and routing decisions in the Navigation Economic Technologies (NETS) program. Several American barge companies are seeking to "transform" from traditional bulk operators to providing reliable, time competitive services tied to mainline routes and coastal ports.

In Europe, similar efforts are occurring, but in a different form. The European Union is mandating that more cargo move along the inland navigation system. The European barge operators also see the need to transform their industry into a more competitive service. In PIANC Working Group InCom 31, the Management of Inland Ports, researchers are studying how ports both develop and attract new business through management and operational activities.

In both regions, there exists a need to understand and to describe the improvements necessary to ensure that the inland waterways are a safe and reliable mode. The U.S. speakers discussed the project approval/selection process for new projects, but most of the focus is now on rehabilitation of existing structures and maintenance. The United States is seeking to make the economic decision process more transparent so that all stakeholders will understand the consequences of taking or not taking certain actions. By undertaking this decision framework with industry participation, it may be possible to develop a methodology for prioritization of the infrastructure improvements needed. Some of these elements involve discussions related to system risks or externalities related to specific items. This approach should be contrasted with the Finnish approach of developing cost benefit analysis for every project and across modes. The Finnish Government strategy provides a forum to understand the total national investment needs related to transportation, something not done within a single mode within the United States.

A few speakers commented on the need to educate the public on the importance of waterways. This involved working with school groups, websites, printed materials and curriculum, and by developing "hands on" demonstrations at natural parks. In Europe, many training and educational materials are posted on the internet related to River Information Services as well as basic waterway research and navigation improvement projects.

3. The Need to Invest in New Technologies to Improve Operations Is Important

The need for reinvestment was identified through many different needs related to inland navigation. The proposed research items covered many different topics, from information systems to environmental considerations and the ongoing work of PIANC on inland navigation.

The New Technologies panel provided an overview of both developing and extending navigation technologies which support the efficiency and safety of inland waterways both in the United States and Europe. Several European speakers presented examples of ways in which their navigation technology services are applied or will be applied to improve the information exchange between vessels and shoreside operators. It is a European goal to develop standards that would allow for information services to utilize a single "window" or portal that improves vessel to shore communications. Aggressive vessel traffic management is extremely important in areas of either high vessel traffic or where an increased risk to vessel operations exists. The Kiel Canal in Germany depends upon an elaborate traffic control scheme based upon Automated Information Service (AIS) exchanges between the vessel and traffic manager. In most cases, the information is then captured and used to assist in vessel and port planning. It can also be used to develop interchanges with other agencies to reduce redundant transmissions and conflicting standards across various agencies. By promoting collaboration between vessel operators, public agencies, and private sectors companies, common operational frameworks are being developed to improve safe vessel operations.

The U.S. panelists expressed the need for improving locks and dams and large capital projects that are critical to maintaining a viable system. As a corollary to efforts in Europe, the U.S. Army Corps of Engineers, U.S. Coast Guard, and National Oceanic and Atmospheric Administration are working to improve the type and quality of information provided to mariners on the inland river system to enhance navigation safety and efficiency. Based on a similar standard to the EU, the "Coastal and River Information System" effort between the Federal agencies is undergoing beta trials in the Louisville, Kentucky area.

PIANC has several related working groups focusing on inland navigation through its Inland Waterway Commission (InCom). In addition to PIANC WG31, WG 32, WG125 (RIS guidelines), PIANC Incom's current research efforts involve examining guidelines to reduce environmental impacts of vessels, developments in automation and the remote control of river works, innovations in navigation lock design, and an inventory of inspection and repair techniques of navigation structures.

4. Apparent Differences between the Two Regions

While both regions are considering the expansion of waterways, the focus on how to incentivize markets to push more cargo to water is different.

The European inland navigation system depends upon much older infrastructure than in the U.S. The system's age (and some relatively smaller navigational channels) tends to limit barge and vessel configurations in some reaches, but this also means that service, not scale, drives barge operations. The European approach supports increasing operations through two main programs.

The first is a broad EU policy to incentivize cargos to move on waterways, which is intended to alleviate some highway congestion. Secondly, the EU seeks to ensure adequate funding for research that improves standards for communications and system performance that could be implemented by the respective member nations of the EU. While some physical expansion of the inland river system is needed, this does not appear to be a viable option to expand system capacity.

This contrasts with the U.S. approach, which is focused upon navigation structures, either through rehabilitation or expansion, and operations (appointment schedules, lockage fees, etc.) through and around these structures. In the U.S., the domestic barge industry is trying to move to a more service oriented operation, by using increased system velocity to attract more time-sensitive cargos. However, without a corresponding investment in improving lock and dam efficiencies, the future for these services may be limited by continual delays at locks and dams. Regarding increasing traffic levels, the U.S. federal government appears to be limited to only promoting the potential of inland navigation when compared to the more aggressive policy stance in the European Union. One speaker raised the question - "if the government treated infrastructure as a business, we would have been out of this business now." This mirrors the sentiment held by many in the U.S. that chronic under-funding of critical infrastructure will make waterways less attractive to shippers.

The European approach focuses more on partnerships between the public and private sectors to assist the ongoing dialogue on improving waterways. These are system wide programs, not focusing on specific waterways, but overall research and policy needs. In contrast, the broader U.S. approach is focused on looking at common points of reference between federal agencies to determine frameworks for collaboration.

In regards to prioritizing modal traffic investment decisions, the European Union recognizes that transportation operations generate both social benefits and costs in addition to simply faster or improved transportation (economic externalities). This includes estimating the social costs of a transportation activity, as the EU hopes to move cargo away from roads onto other modes, including waterways. These considerations of additional externalities are considered important to ensure social (political) objectives are also meet. The U.S. only considers the primary (first order) benefits of a waterways project, without much consideration for other policy objectives, such as reducing roadway congestion or air emissions.

These differences could also reflect the organizational structures of the respective regions. The U.S. organizers, mostly from the Corps of Engineers tended to focus on infrastructural related issues, while the European Group was more involved in operational matters. Some broader coverage across both operations and infrastructure may be necessary to prevent this appearance of regional biases although many of these topics were covered in the Smart Rivers Conference 2006 but by different speakers. (The 2006 conference report is posted on the U.S. Section of PIANC website at http://www.pianc.us.)

5. Future of Smart Rivers

In both the U.S. and Europe, inland waterways provide important transportation access to and from domestic and international markets. The push to increase the use of inland waterways is apparent. The differences exist in regards to how these visions will be achieved. In Europe, the focus is on using technology and policy levers to move more freight to inland waterways. In the U.S., the approach is to increase system reliability, primarily through improving lock and dam performance.

When considering future Smart Rivers conferences, most of the attendees felt a dialogue between the respective regions can assist in establishing a common set of standards and operational approaches. Within this context, the Smart Rivers conference series may provide a forum for participants to continue finding ways to improving inland waterway operations. This focus on cross fertilization of ideas should help both respective regions, in finding both new solutions and partners to promote a more efficient and reliable waterway system.

The next Smart Rivers Conference is scheduled for September 13-16, 2009 in Vienna, Austria. The meeting will be held at the Vienna Town Hall. Organizational activities have already begun to ensure the conference is successful. Smart Rivers will then return to the U.S. in 2011.

Technical Session 1 - Opening Remarks

The initial section set the stage by outlining the status of inland navigation within both the U.S. and Europe. This session also included a presentation on lessons learned in the previous Smart Rivers conference held in 2006.

Moderator
Gary LaGrange, Port of New Orleans

Welcome to Louisville
Brigadier General Bruce A. Berwick, US Army Corps of Engineers

Lessons from Smart Rivers 2006
Arno Hart, RNO Group

Where are "SmartRivers" going? European Perspective
Michael Fastenbauer, via donau

- The inland navigation system is a vital economic and strategic asset, but is often forgotten in matters related to national freight system improvements and efficiencies,
- The inland waterway system is exposed to risks and uncertainties that require resilience to ensure current and future access,
- The growth of Smart Rivers over the past few years speaks of the positive commitment to improve inland navigation in both the U.S. and Europe,
- Regarding waterway use, the U.S. inland navigation community is moving towards an asset systems approach, while the European focus seeks to actively encourage and fund inland waterways operations and increase capacity through innovative technologies,
- Regarding infrastructure improvements, the U.S. perspective focuses on physical assets (locks and dams), while the European perspective is on improving telecommunications and logistics.

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1. Welcome to Louisville and the Ohio River System

The U.S. recognizes that to prepare for a global community and a safer tomorrow, everyone must first understand the vulnerabilities facing the current system: (a) natural disasters, (b) aging infrastructure that will fail if not maintained, and (c) the enemies who wish us ill. These events have created a nexus that has encouraged a discussion on building reliability throughout the entire freight system to mitigate risk to both shippers and carriers. In response, the inland navigation community is examining methods of working with various groups to get the right components together to prioritize investment needs and asset management decisions.

Along the Ohio River, there are over 240,000,000 tons moving annually on the system. A large portion of it is coal going to shoreside power plants, but other commodities move throughout the system. In addition, the Corps must consider the maintenance of pools for water supply and navigation behind the dams. The Louisville District of the U.S. Army Corps of Engineers is looking at the reinvestment needs of the system, as they operate and maintain eight of the twenty Ohio River projects. The District also has two major construction efforts ongoing at the McAlpine locks and dam and the Olmsted locks and dam. In both cases, the Louisville District

struggles with keeping those two locks operating, long past their service life, to maintain the safety and reliability of the Ohio River system.

The Louisville District has begun adopting a systems approach to risk management to ensure that investments are integrated into a whole that preserves and enhances performance and sustainability at the system level. In 2004, the Louisville District began a new program, "Achieving Navigation Systems Acceptable Levels of Risk." to examine resources to reduce risks to the navigation system, and to recover quickly if any outage occurs. The program establishes goals, vision, etc., for the waterway through a collaborative approach among the Corps, industry, and other federal partners, to establish a priority of locks, gates, values, and activities, such as dewatering, dredging, etc., among the various components and activities of the Ohio River System. This process helps identify the critical components of the system. These findings are prioritized to determine the risks to the system in an asset management framework. Further enhancements include developing studies of economic analysis that outline how lock risk may lead to light loading and other operational efficiencies, which can be improved through a sound investment decision. This also includes the development of channel assessment conditions, economic analysis, and quantifying risk and maintenance schedules. There is the development of maintenance standards for structures that should provide guidelines on what actions should be undertaken and when. These standards would serves as a basic "operators' manual" regarding waterway structure, which would help the Corps identify needs, etc. along the inland navigation system.

Regarding river improvements, resiliency must be introduced into the system. This requires the inland navigation community to examine methods of working with involved groups to get the right components together to priorities investment needs, as well as develop a process to prioritize investment and asset management decisions. It is in meetings like this, with the international community of like-minded groups, that components involved in developing such an investment model can be discussed.

Within United States, there exists no national framework or policy goal on water resource issues, but failure is no longer an option. Therefore, America's highest priority investments should address the threats across the spectrum.

2. Inland Container on Barge Movements in Europe

Examining the lessons learned in 2006 set the stage for this conference. The Smart Rivers 2006 meeting focused on integrating the inland waterway system into the 21st century global supply chain. The forum sought an exchange of ideas and technologies between the United States and Europe.

Europe already possesses an extensive and sophisticated waterway network. Despite very high traffic volumes moving along the waterways (mostly the Rhine), potential expansion does exist when comparing the share of waterway use across nations. While inland waterways represent a large volume in certain European countries, they carry only 2 percent of the total traffic in France, and across the entire EU, waterways only carry 6.5 percent of the domestic traffic (compared to the U.S., where inland waterways carry 11% of total domestic movements). The EU is also trying to support increasing waterway traffic in order to reduce roadway traffic and congestion. Container on barge is a viable option along certain corridors, largely supported by a very sophisticated institutional network of carriers and shippers.

Container on barge works in Europe for several reasons. The first reason is that container on barge services can be both viable and sustainable in the long term. It operates here in the U.S., although at a lesser degree. Secondly, the most fundamental component for success is the linkage to a major international port at the mouth of a major river system. For example, in the Rhine\Scheldt\Seine delta, Rotterdam and Antwerp are two of the top five ports in the world. Rotterdam, aware of the linkages to inland markets, supports the development of inland movements through its leasing structures for port terminals. For example, 48 percent of the container moves in Rotterdam involve a barge, and up to one third of all cargo in Rotterdam is moved by barge. Thirdly, container on barge exists where significant concentrations of economic activity are located along the inland waterway area that both consumes and generates large values of containerized traffic. The Rhine flows along the largest economic concentration in Europe. Finally, container on barge must be able to generate economics of scale necessary to offer sustainable and reliable services. For example, within the Rhine system, inland waterways capture 35 percent of the shipments within the corridor. (The first major container on barge user was the U.S. Army, when it first experimented with the use of containers in the 1960s. This was primarily to handle consumer shipments going to army bases in Germany, which required the goods to remain in a secure system throughout the entire voyage. Local freight forwarders repositioned the empty boxes with cargo before returning down the Rhine to Rotterdam.)

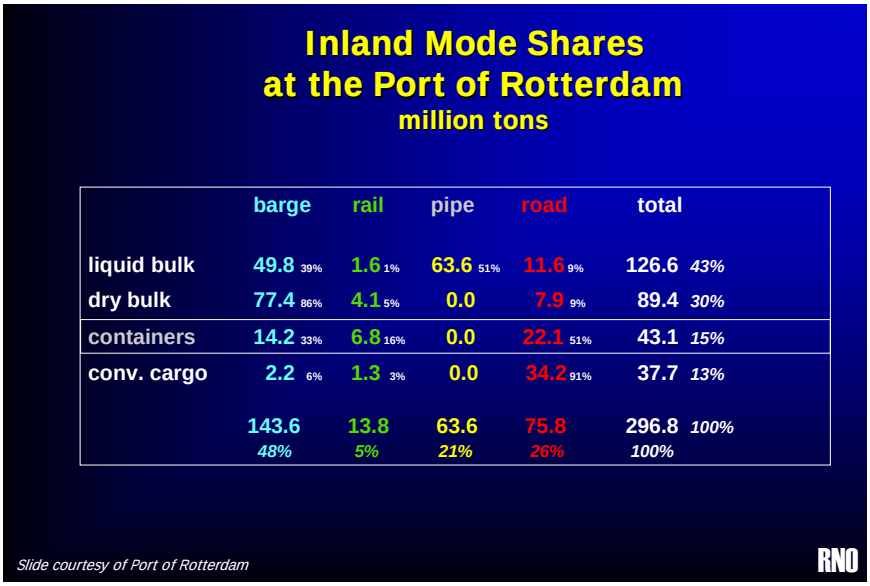

Figure 1. Inland Mode Share at the Port of Rotterdam, in Millions of Tons

Mannheim is a large inland port that benefits from its location along the Rhine, as they operate with a 26-hour turnaround between the port and Rotterdam. Within the region, there are over 24 million people, as well as the largest plant in the world. Mannheim also benefits from the port being located 800 km up river from Rotterdam with no locks to potentially impede container barge traffic. The typical vessel in this service carries 150-200 boxes, largely dedicated to containers, but other cargos also move along the river. The port has two transfer capacities, one as an on-dock rail facility and two as a transfer point to smaller vessels going to shallower inland waterways. Its ability to offer short turn around times for cargo has been just as critical for its success as the size of its local market.

This does not mean the Rhine River will see container traffic growth unimpeded. There exist concerns about how declining rates of snowfall will reduce the available draft for barge operators. The optimal draft is 2 meters, and lower levels can drop efficiencies. The Rhine and the growth of container traffic have flattened out due to capacity constraints along the system. Also, there exist some reliable and rapid trucking services within the corridor. However, waterways can and must be able to continue to provide reliable services, despite concerns over higher fuel and operational costs.

For the Unites States, there are considerable differences in inland waterway operations. Along Mississippi River system, scale is the largest driver of economic activity on the waterways, resulting in more emphasis on bulk shipments. The U.S. also operates with typically larger tows than the European mode, which generates great economics of scale, as these efficiency gains allow for larger movements but less focus on time sensitive cargo.

In Europe, the system focuses more on smaller, service oriented shipments, driven more by velocity and system reliability. The typical operator is a motorized barge between carrying 80 and 90 containers at a time. These barges are smaller and faster, and they represent a lifestyle for their operators. There exist some innovations in ship design, but the focus on the linkage to international gateways is pushing operators to use larger barges while meeting sailing times.

A global supply chain is critical to having a container on barge operation that provides the necessary services and flexibility to satisfy client demands. There are some key points for the development of container on barge services: there must be industrial density, international gateways, short hauls gateway, vessel deployments, and government support and incentives to facilitate and encourage time sensitive container on barge operations. In sum, container on barge must provide the “right type” of vessel to meet a shipper’s expectations for service and time, supported by governments and institutions to ensure a reliable service.

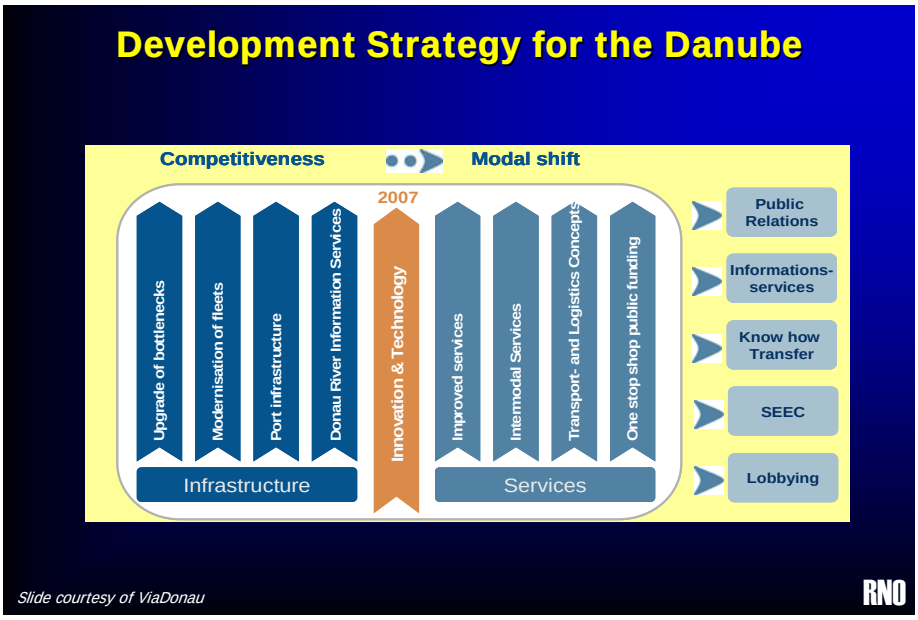

Figure 2. Development Strategy for the Danube

Europe is seeing some loss of waterway traffic to other modes, primarily for international cargo gateways, although certain "underutilized corridors" exist where inland navigation is considered a viable alternative to other transport modes. The Danube represents one emerging inland corridor that enjoys the support of respective EU and national governments in trying to encourage more containers on barge traffic through the system. To improve efficiencies, technology is seen as the lever that will attract cargo to the system. This includes the use of the River Information Services (RIS) that allows for a full information exchange between the barge operator and other government and shipper groups.

3. Where are "Smart Rivers" going? European Perspective

It should be noted that when examining container on barge in a global context, the inland waterways represent specific network-market arrangements. Broad comparisons become somewhat problematic at a small level when developing a global view. As integrated water transportation remains a business within a specific corridor, the users along that corridor will be the most knowledgeable about its business model and potential for success. Thus improving systems may be difficult, given differences in geography, legal limitations, etc., that may limit any market or policy actions that advocates an inflexible approach.

Improving system performance in Europe involves combining institutions and technologies, with targeted funding to ensure the policy goals of improving inland navigation are achieved. NAIADES stands for the "Integrated European Action Programme for Inland Waterway Transport", a proposal by the European Commission (EC) that has been adopted by the Member States (Council) and is strongly supported by the European Parliament.

The NAIADES objective is to raise the competitiveness of the inland waterway network and integrate inland waterways into the global logistics chains. NAIADES possesses five main topics: create favorable services for inland waterways that will attract cargoes, stimulate innovation to overcome older fleet stock, promote jobs and skills, improve image, and finally provide adequate infrastructure. Already some of the NAIADES work is underway but the major efforts will be more important in the next few years. There exists a harmonization of standards regarding legislative mandate on technical requirements of vessels, data exchanges, etc., that must be addressed to implement a full system across the European Union. NAIADES will release two policy-related reports in 2008, as well as identify what funding programs are available in Europe. Some of the ongoing work focuses on innovative funding for waterways, as well as harmonizing operational strategies. Finally, there are discussions that NAIADES will develop a support mechanism to get key stakeholder involvement to assist in the policy/operational framework.

The EU is also committing research and funds to encourage more inland waterway research and use through the Marco Polo program. Marco Polo is the European Union's funding program for projects which may resulting in shifting freight transport from the road to the sea, railways and inland waterways. The Marco Polo program also provides for examining modal shifts within a specific corridor to encourage more inland navigation use and to reduce truck traffic on roadways. The current Marco Polo program runs from 2007-13 and features a budget of €450 million Euro. In addition to all 27 EU Member States, companies from Norway, Iceland and Lichtenstein are eligible for funding under the Marco Polo II program. Every year in spring, a call for proposals is the chance to apply for Marco Polo funding. Some € 60 million are available per year, supporting between 35% and 50% of the eligible project costs. There are five different project types: Modal shift actions, Catalyst actions, Common learning actions, Motorways of the sea actions and Traffic avoidance actions. Only projects concerning freight transport services may be supported by the Marco Polo II program. Pure infrastructure projects, research and study projects are not eligible for support. Projects that shift cargo from a non-road mode to another non-road mode are not eligible either.

River Information Services (RIS) represents a joint EU-national process of collecting and making available traffic and transport information to bring "intelligence" to inland waterways. RIS serves to improve safety while enhancing the reliability and efficiency of inland waterway transport. This depends upon RIS’s ability to provide relevant information in an accurate and timely manner to all stakeholders: authorities, skippers, fleet operators, ports, freight forwarders, shippers, etc."

Regarding the future of the Smart Rivers conference, there appears a very strong commitment to learn about common or innovative approaches to improving inland waterway operations. The Smart Rivers conference has grown since its modest beginnings a few years ago. One of the charges, however, is the need to work with shippers and related groups to disseminate the knowledge gained from such meetings. As such, three challenges were presented to the conference participants: Why Smart Rivers?, Which benefits justify the burden of participation?, Who is in a position to guarantee proper organization?. These challenges echoed throughout the meeting, providing a format for discussing the future of the Smart Rivers conference during the Town Hall session.

1. SERVICES – Create favourable conditions for services

- **Attract new markets**
  - Investigate and implement new logistics concepts
  - Support liner services for intermodal transport
  - Improve co-operation between modes and within the sector
- **Encourage entrepreneurship**
  - Attract newcomers
  - Facilitate access to finance for SMEs
- **Improve administrative and regulatory framework**
  - Abolish administrative barriers to IWT development
  - Ensure a level playing field/avoid competition distortions
  - Improve co-ordination between relevant public services

2. FLEET – Stimulate fleet modernisations and innovation

- **Improve logistics efficiency, safety and environmental performance of IWT**
  - Support liner services for intermodal transport
  - Develop and facilitate use of innovative vessel concepts and technologies
  - Encourage use of safety-enhancing technologies
  - Encourage use of eco-efficient engines and renewable energy sources
  - Develop refit concepts for existing vessels

3. STAFF – Promote Jobs and skills

- **Attract workforce**
  - Improve working and social conditions
  - Stimulate labour mobility
  - Create awareness and improve career
  - Enhance cooperation regarding mutual
- **Invest in human capital**
  - Preserve education and training
  - Stimulate life-long learning
  - Enhance entrepreneurial skills

4. IMAGE – Improve image and cooperation

- **Promote inland navigation as a successful partner in business**
  - Support and coordinate promotion activities
  - Influence logistics decision-making by public relations
- **Set up and expand EU IWT promotion and development network**
  - Set up national promotion and development structures
  - Provide political, practical and financial support for promotion centres
  - Appoint national focal points within administrations
  - Integrate national promotion structures and focal points into a European network
- **Monitor trends and developments within the IWT market**
  - Harmonise collection of data at all levels
  - Ensure availability of compatible source data

5. INFRASTRUCTURE– Provide adequate infrastructure

- **Improve multi-modal network**
  - Maintain and improve the European IWT network
  - Foster the mutual understanding of multi-purpose use of waterways
  - Encourage the development of port and transhipment facilities – also in candidate and associated countries
  - (Re)develop industrial sites nearby waterways
- **Implement River Information Services**
  - Support and co-ordinate development and implementation of RIS in Europe

Figure 3. NAIADES – action clusters and measures

Technical Session 2 - Changing Markets - What Drives Cargo On The System?

This section focused on the dynamics that are shaping the future of inland waterway navigation. If navigation is to be considered a reliable and efficient mode, an understanding of the operational needs, as well as the economic drivers, shaping the industry must be understood.

Moderator
Doris Bautch, U.S. Maritime Administration

European IWT Success Stories–Past and Future
Joerg Rusche, European Barge Union

Future of Inland Navigation
Mark Carr, MEMCO Barge Line, Inc.

Navigation Economic Technologies
Wes Wilson, Ph.D., University of Oregon

Developing Container on Barge Business in the U.S.,
Christian O'Neil, Osprey Lines

- Waterways remain important transportation and economic corridors within their respective regions,
- Waterways are seeing increasing competition from other modes for growing additional business as well as serving current customers,
- The relationship between waterways and the customer (shipper) is normally not well understood,
- Different challenges face waterways seeking to develop container on barge services both in the U.S. and in Europe,
- Coastal ports must be connected with inland ports to ensure Container on barge operations are successful,
- Additional research is needed to evaluate the investments necessary to ensure waterways remain a viable mode in the future,
- Communicating the importance of the inland waterways to the general public, shippers and policy makers remains critical

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1. European IWT Success Stories–Past and Future

The European Barge Union (EBU) was set up in 2001, and is the largest non-governmental inland transportation group in the region. The goal of the EBU is to work on developing modal transportation policy, improve inland navigation in Europe, improve coordination between national and regional sections, and exchange knowledge within the organization. The largest country group is the Netherlands, but there are groups in France, Germany, Belgium, Austria, Switzerland, and the Czech Republic. The membership also participates in their respective nations regarding improving inland waterways.

Inland navigation is very important in Europe, with average annual volumes of 440 million tons moving over 125 billion tons/kilometers on the network. This represents 6.5 percent of the total

freight transportation in the region. The inland market carries large volumes of goods, mostly bulks, but containers represent 10 percent of the total volume on the system. The Rhine-Meuse-Main-Danube axis serves as the critical inland waterway corridor in Central Europe, handling the majority of European container on barge traffic.

The growth has been so strong over the past decade that the coastal ports are nearing capacity constraints, despite a downturn in 2006 from increased modal competition. Container on barge shipments are now experiencing severe delays at the coastal ports, (delays can last for up to 16 hours per barge). There are new port projects to develop terminals in both Rotterdam and Antwerp. At the same time, operational costs are going up, as carriers are beginning to place new self-propelled barges in the system. These new self propelled barges can cost up to $6 million for a barge that is 135 meters in length and 70 meters in width. These additional delays and operational costs are passed on to customers, but some cargo has been lost from the price increases.

The European system operates over 36,000 km of waterways and inland ports. German ports handle roughly 2 million TEUs annually through the inland system, primarily along the Rhine. There are operations on the Elbe that have experienced recent growth, although volumes remain relatively small. While Hamburg is receiving more container on barge traffic, terminal congestion is a problem. (Inland containers represent only 2 percent of Hamburg's total container traffic.) Operators are limited by air draft constraints on the Elbe to carry containers stacked two high, while it is possible to stack containers four high moving to Strasberg, and even to stack containers three high on shipments to Basil, Switzerland. There are limited success stories on other coastal ports in France, etc, because of the location of the ports along the Rhine. Currently, there are some studies regarding the shipment of cars and specialized chemicals on the inland waterways, but these new inland movements do require operators to overcome issues related to the economies of scale.

When policy makers understand the "more environmentally friendly benefits" of inland navigation when compared to other modes, it is also apparent to shippers in the EU. In the future, the development of integrated inland water transport, may not only result in a savings of the road asset, but other savings from accident reduction, reducing congestion, lower emissions, and changes in noise and land use patterns. For example, "NAIADES", a new European transport policy is attempting to work on bottlenecks along the waterways to push inland water development forward. For the Rhine/Muese-Mail-Danube Waterway system, NAIADES seeks to increase capacity to five billion tons per kilometer per year, a 30 percent increase from current traffic flows. NAIADES also seeks to reduce transportation costs on a per ton basis by 20-30 percent while simultaneously increasing coordination with neighboring states.

2. Future of Inland Navigation

There is a considerable variety of conditions on the U.S. inland waterways system. Locks and dams are required to create navigable pools on most of the rivers in the system, including the Ohio, Upper Mississippi, Illinois, Arkansas and Tennessee-Tombigbee systems. The Lower Mississippi is an open river. Most rivers, as well as the coastal waterways, require periodic dredging to maintain the navigable channel. One hundred-seventeen of the 240 locks are over 50

years old, necessitating a need for reconsidering the investment in modernizing inland structures and maintaining the system.

Fifty percent of the cost of maritime construction and major rehabilitation projects is financed by a fuel tax, currently set at $.20 per gallon of diesel fuel and yielding roughly $90 million dollars per year. That money is credited to the Inland Waterways Trust Fund. The Administration has escalated the work supported by the Trust Fund. There is a potential that the Trust Fund will be depleted within the coming year, with more funds going out for project work than coming in from fuel tax revenues. In contrast, real spending levels for operations and maintenance have been falling behind the need. When viewing overall spending levels versus needs of the nation to support its industrial base, the U.S. Federal government has reduced its commitment to the nation's inland navigation system.

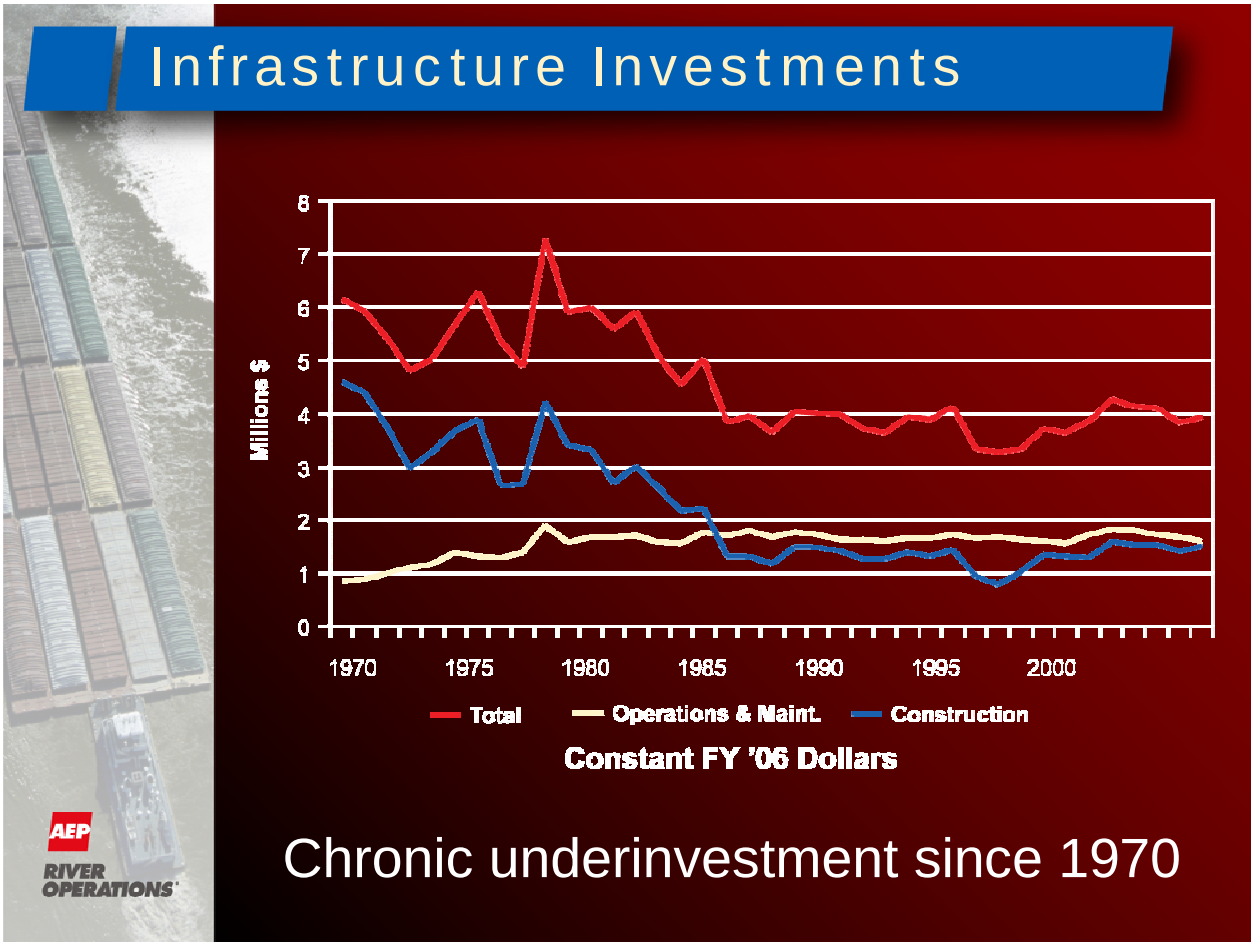

Figure 4. The U.S. Army Corps of Engineers Budget, 1970 to 2007, in Real Dollars

Over the past ten years locks are experiencing increased delays, as both scheduled (announced and planned) and unscheduled outages have increased, leading to additional costs on the system. For example, a study of costs to the industry was conducted after the unscheduled closure of the Greenup Lock on the Ohio River. The resulting costs amounted to a $13 million loss to towing

companies and an additional loss of $62 million to shippers (based on carrier and shipper surveys).

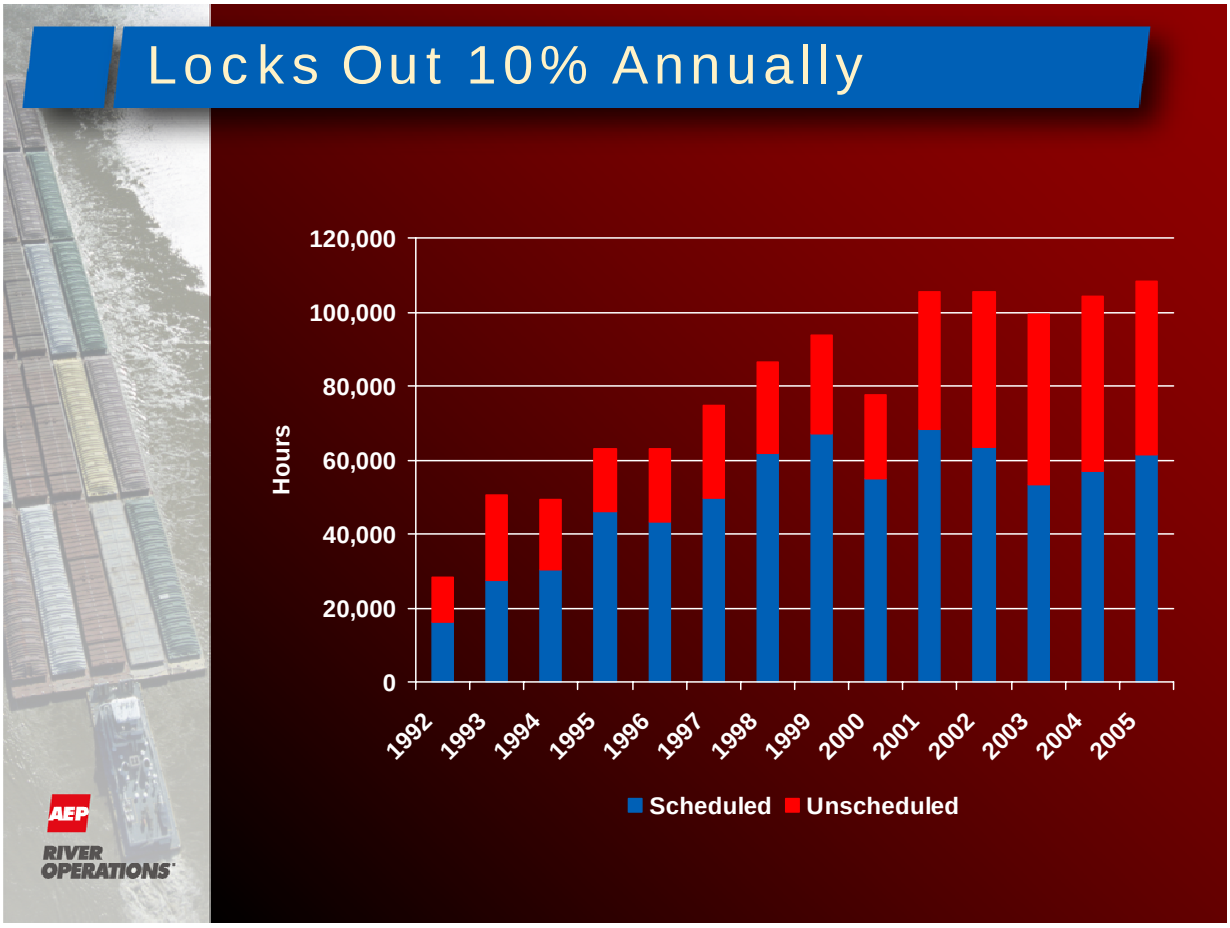

Figure 5. Comparison of Inland Waterway Closures, Scheduled verses Unscheduled, 1982 to 2006.

Part of the challenge is that rivers do not possess the same redundancy as a highway or a railroad. Any disruption means large delays for equipment and system operations, but the largest impact may be on the shippers, who are unwilling to use waterways if the perception of risks is too great when compared to other modes. The goal should be the development of modern and efficient locks that will support our industrial economy.

The priority task forces developed by the U.S. Army Corps of Engineers and industry represent a good step in developing defensible rankings of operations and maintenance investment needs by segment and structure for the inland system.

Maritime interests are raising the awareness among the general public of the inland navigation system. The National Waterways Foundation (NWF) is developing research tools to raise the awareness and profile of the inland river system to the Nation. NWF and the Maritime

Administration of the US Department of Transportation recently completed a study comparing barge, rail and truck transportation of inter-city freight movements. The study highlights that by many measures, including emissions and safety, barge freight is the preferred mode. The industry also developed an educational program, "RiverWorks Discovery," that focuses on the economic, cultural and conservation issues surrounding the great rivers and their watersheds. Over 120,000 children and families have experienced portions of the "RiverWorks Discovery" program at regattas, water festivals and in schools and camps.

3. Navigation Economic Technologies

Within the U.S., the U.S. Army Corps of Engineers has actively sought to improve economic information related to Navigation. The Navigation Economics Technologies program (NETS) goals are to understand the current body of knowledge related to navigation analysis and to examine ways to improve the state of the art/state of practice through new models and tools for planning activities. Economic considerations are critical for the Corps, as all authorizations to proceed on a given project are based upon Benefit Cost analysis. The NETS tools are to be transparent, so that people can understand the data, model and assumptions used in the study. The NETS major work areas include considering different investment needs related to rehabilitation and/or replacing locks and dams, widening and deepening channels, and providing moorings and turning basins.

To accomplish these goals, the NETS program works with academia, the waterway industry, and the shipping industry to try to understand the needs related to the economic data and models necessary to understand the waterway system. The major efforts consist of the following:

1. Theory - The focus is on developing Spatial Equilibrium Models that examine the competitiveness of transport markets related to modal use and availability, locks and congestion, and to develop estimates of spatial competition and market power and welfare economics.
2. Estimation of shipper response – These research areas are examining methods to use new survey data to understand how shippers will respond to system changes. The revealed choice and stated preference model allows the use of survey data to estimate how a shipper will respond to a given choice in routing, time or costs for a shipment activity. The NETS program has developed many different survey instruments linked into these models to estimate shipper demand and elasticity.
3. Traffic Modeling – Traffic models are developed for different levels of economic activity. The Macro-Economic Models primarily involve spatial equilibrium models between broad economic regions. The first model developed was a global grain model of the entire world, which estimates traffic movements between growing and consuming areas. The Regional Routing Model takes these flows and allocates them along specific corridors, as well as looking at modal options within the corridor. Finally, Microeconomic models were developed to examine project specific analysis at a local level. The two major efforts are HarborSym and Navigation System Simulation Model (NaSS). The HarborSym model allows the user to change various operational and berth information to simulate traffic conditions within a ports system. NASS simulates discrete locking and operational patterns of vessels in response to changing outages and shipper responses.

4. Externalities – By using various models, NETS hopes to develop methods of estimating emissions across modes and within regions.
5. Economics of Deep Draft Vessels - The study focuses on the associated costs for both vessel operations and the life-cycle costs, and includes estimating the magnitude of vessel squat within a confined channel.
6. Event studies, appointment systems and tradable permits - These studies focus on developing forensic economic assessments of related events to develop better estimates to assess future economic risks from similar events. The research on Tradable Permits focuses on estimating if a market mechanism could be developed that would allow various carriers and shippers to value their cargo movement within a tradable market with the potential to encourage additional efficiencies within the system.
7. Peer Review - The NETS models and papers undergo a blind peer review process to ensure the related research is transparent while meeting accepted economic analysis.
8. Communications – There is a NETS website (www.CorpsNets.us) and newsletter, with corresponding information on the NETS program.

Future research efforts will focus on replicating the Global Grain model for both coal and petroleum, and reinvesting in the Regional Routing Model to include externalities. NETS will also conduct additional forensic economic analysis of specific waterway events.

4. Developing Container on Barge Business in the U.S.

Osprey Line began operations by providing an alternative transportation network for shippers in the Gulf/Mississippi river region. By recognizing the potential for providing container on barge services in the U.S., Osprey Lines began as a partnership between Cooper T. Smith (a stevedore) and Kirby (a barge line). The company has benefited from the resulting synergies between the companies, highlighting that strategic partnerships are critical in developing innovative solutions.

The Federal Highway Administration predicts that highway congestion will get worse in the future, so alternative modes must be developed now to provide future benefits. This means that inland waterways in the U.S. may provide some future relief to certain shippers. For Osprey, this means a shipper handling international cargos moving between coastal ports and inland markets. The cargos are discharged directly into/from terminals, from where the cargo moves to another vessel or market.

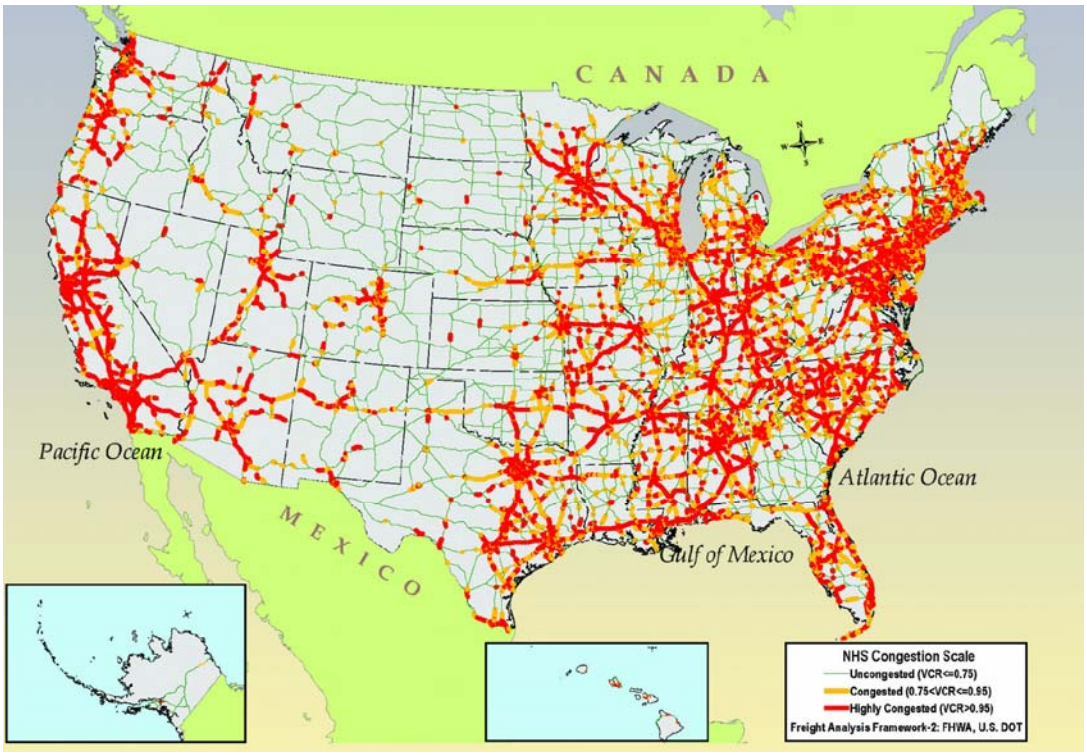

Figure 5. Forecasted Highway Congestion, 2025.

On the maritime side, port terminals must provide operations and vessels that offer reliable fixed schedules to overseas markets. The right equipment, coupled with access to horsepower, is critical to providing fixed schedule services. The ability to have greater speed would be a luxury, but with the current technology, container on barge can operate within the existing point-to-point operational framework by managing sailing reliability. From an operator's perspective, this is critical, as inland navigation needs system improvements designed to increase performance in order to ensure that services remain viable in the future.

Truck volumes are increasing rapidly around coastal U.S. ports, and inland navigation may provide some benefits to coastal ports by reducing local truck movements. The use of container on barge does reduce trucks in the terminal area, as the cargos generally move to and from the stacking areas. Inland navigation may provide additional benefits beyond congestion, including reduced emissions, improved system efficiency, and maritime workforce opportunities. However, the system must also be cost effective, reliable, and predictable for these benefits to occur. To service the international containerized market, the container must move in a timely manner to meet sailing schedules of deep-sea vessels.

There is already a lot of infrastructure in place along the waterway system that handles bulk and break bulk cargos, and these can be modified or operated differently for container services. There currently are no highly-automated container terminals along the U.S. inland waterways, as the market does not support this investment at this time. Osprey sees flexible capacity as being more important in the future, but operations do require extreme planning to manage the corresponding time and equipment issues.

This is somewhat different from European operations perspective, where inland navigation has grown because of disincentives to use highway and rail shipments, forcing shippers to the waterways. In the United States, we do not have the same programs that put disincentives on other modes and consequently push cargo to waterways. Success will depend on the extent to which reliable inland container on barge shipments can be synced with deep-sea ocean carriers to satisfy shipper expectations. Shippers will ultimately use the services, not through subsidies, but through a recognition that container on barge services provides benefits or cost savings. It requires extreme planning to manage all the various parts of a container on barge operation, but it can be done.

Technical Session 3 - Promoting A Sustainable Inland Navigation System - Systems Perspectives

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Moderator
Anne Sudar Cann, U.S. Army Corps of Engineers

The Environmental Perspective of the Rhine,
Margriet Schoor, Rijkswaterstaat

Status of Inland Water Assessment in the U.S.,
William T. Harder, US Army Corps of Engineers

Container Development in Constanta/Danube Waterway,
Gerhard Gussmagg, via donau

Barge Operations on the Columbia-Snake River,
Ken O'Hollaren, Port of Longview

The presenters were asked to discuss sustainable Inland Navigation systems. Because of the different uses of water, this included environmental, maintenance, and operational perspectives. During this session, three river systems were discussed (the Rhine, the Columbia-Snake, and the Danube). Each river system has specific challenges and the broad discussion on assessing Inland Waterway investment, highlighted the challenges in examining improvements to inland navigation.

- Waterways are a complex system, and must not only serve commercial freight movements, but must also do so in an environmental friendly manner,
- Environmental restoration of inland navigation channels often requires innovative solutions to promote habitat formation,
- Inland markets are sensitive to changes in supply and demand, often outside of the river system itself,
- The ability to clearly articulate the investment needs of the river system is essential in communicating current and future budgetary requirements,
- The inland navigation activities depend upon identifying cargos and offering reliable, flexible transportation options for shippers.

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1. The Environmental Perspective of the Rhine

The Dutch Rhine connects the Port of Rotterdam with the rest of Europe. (One third of the Rhine actually flows into Germany, with the remaining two thirds flowing into The Netherlands.) Currently, the Rhine handles 165,000 ships a year and over 160 million tons a year. Recognizing the Rhine's importance across many facets, Dutch policy focuses on increasing flood protection, inland water transportation, and balancing the ecological water potential. The focus on integrating water resources for multiple uses becomes more important based on the new EU Water Framework Directive. The new policy seeks to make water as clean as possible, both chemically and ecologically. While 2015 is the directive's goal, 2027 is the target date for full implementation. Improving the environmental system of the Rhine River presents the Netherlands with many challenges to restore and develop a sustainable ecosystem that will continue to provide navigation access.

Through most of the Netherlands, the Rhine is canalized with levees for flood protection. The use of groyne fields improves bank stabilization and species growth but also assists in carrying sediments downriver. The cumulative effect is that a sustainable ecosystem is hindered by the canalization and structures along the Rhine which assist navigation.

Figure 6. Sectional Hydrographical Profile of the Rhine in the Netherlands

As such, most of the aquatic life along the Rhine system needs shallow water conditions, but some slope velocities and scouring can limit the quality and quantity of aquatic habitat. Along a river system, different plants and animals require various types of turbidity and organic material to support sustainable communities. The challenge becomes how to separate navigation activities from environmental habitat within the same waterway.

Some solutions seek to provide sustainable habitat and include annual floods along the Rhine, while others see the development of more micro ecosystems along riverbanks and floodplains. The four main solutions being investigated are fish passages, parallel side channels, channels within the groyne field, bank revetment and removing riprap along the banks. (There is over 180 km of riprap in the inland system in the Netherlands.) While navigation requires larger channels, the potential for side channels and fish passages appears promising based on current research.

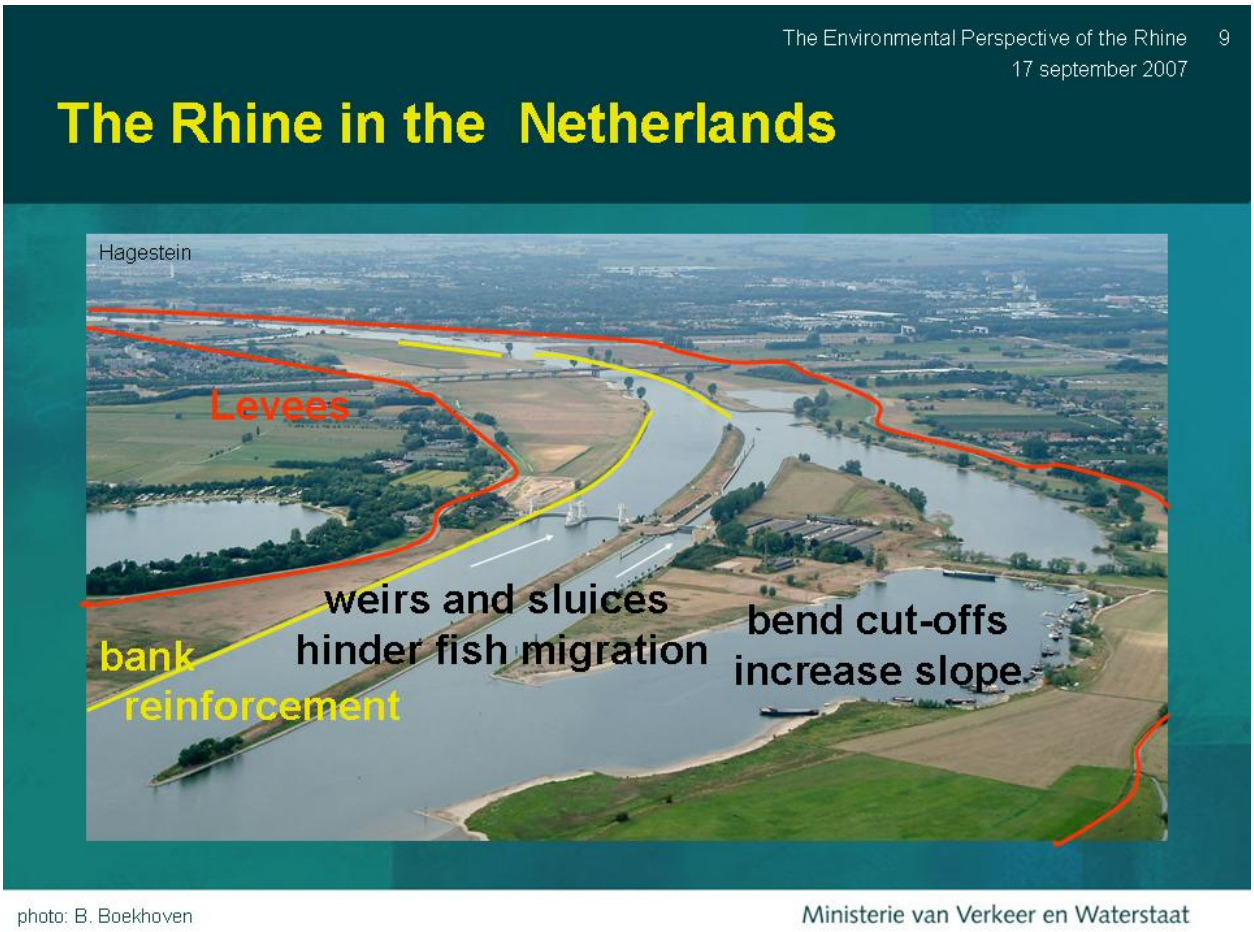


Figure 7. Structural Approaches to Improve Marine Habitat

Other pressures on the Rhine exist. Recently, invasive species from Eastern Europe have been observed in the Netherlands system. Also, climate change may potentially affect the high and low discharges of the Rhine, and create additional riverbed degradation in certain areas. However, the Netherlands believes that through balancing side channels and flood protection, it may be possible to develop a sustainable environmental system that serves the needs of the navigation industry.

2. Container Transportation on the Danube Waterway

A recent study funded by the Austrian and Romanian Transport Ministries entitled Project COLD, "Container Liner Services on the Danube Waterway" sought to understand the potential development of container on barge operations along the Danube from the Black Sea. Most of the container traffic passes through Northern European ports before heading into Central Europe, but the Austrian and Romanian Governments want to evaluate if alternatives to North European ports exist.

There are 2 million TEUs moving along the Rhine, representing the bulk of the 3 million TEUs that move on the European system. Some of that cargo goes to France along the Seine and the

Rhône. While inland transport has grown throughout Europe, container transport along the Austrian Danube has declined over the past few years. The lower use can be attributed to limited infrastructure investment and impedances in the former Yugoslavian region. Going west, inland traffic experiences lockage problems as well as competitive rail services. (There exist 65 locks between Vienna and Rotterdam.)

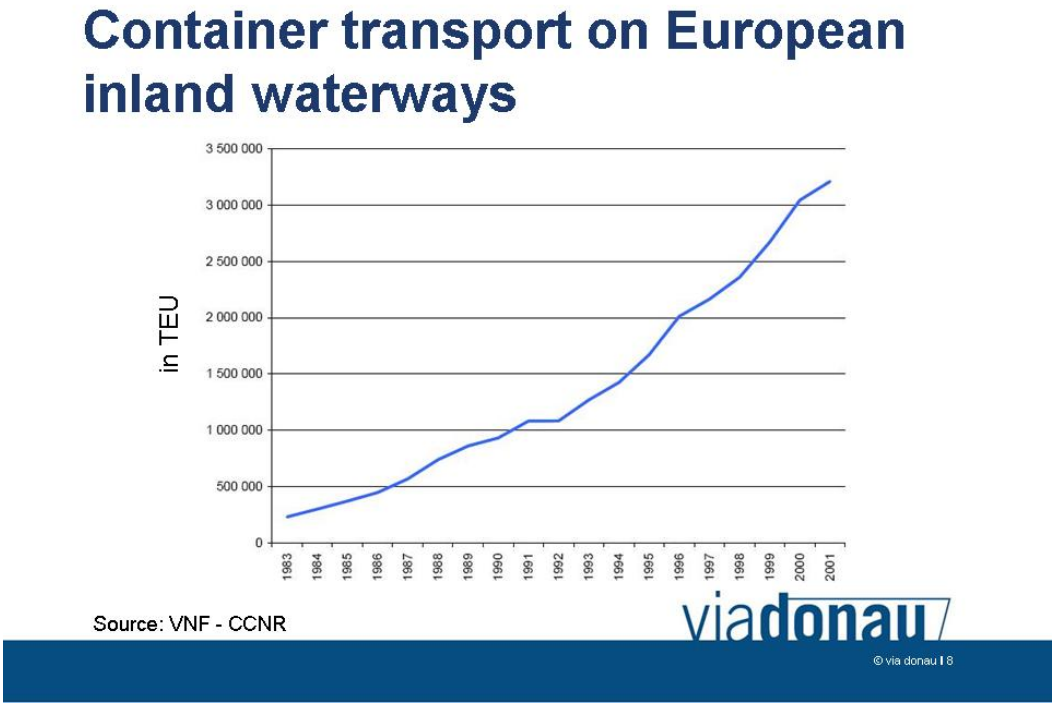


Figure 8. Container Transport on European Inland Waterways. 1983-2001

Austria possesses the largest market for containers, followed by Hungary and Slovakia. Currently, most of the containers moving into the region arrive at the North Sea Ports, mostly through Rotterdam and Hamburg, but also through Koper and Bremen. The corridor competes heavily with rail and truck services. (There are only five locks from Vienna to the Black Sea.) Most of the major ports along the Danube are also national capitals, and could be the drivers for developing container services.

The study's objective was to examine the potential for utilizing the Port of Constanta and the Danube for new container traffic services. In the past, there existed no container hub on the Black Sea comparable to Rotterdam or Antwerp for generating international containers. Within the last few years, container traffic has increased along the Black Sea region. Between 1995 and 2005, container traffic along the Black Sea ports increased from a very small base to over 1.76 million TEUs. Container traffic is forecasted to grow, with levels reaching 3 million TEUs in 2010 and 5 million TEUs in 2015. Constanta is the largest container port in the Black Sea, but it only began operations in 2003. The port, ranked as the 85th largest container port in the world, has seen dramatic growth recently from services with Asia.

The market analysis provided the inputs to develop several scenarios to evaluate if the container liner services would provide viable services regarding time, costs and capacity. Under the first scenario, using the available fleet, the all-water routing of a round trip scenario from Krems to Constanta would involve three weeks. The convoy, a self propelled vessel and a barge would operate a weekly service with a 120 TEU capacity. The second scenario used an adapted container vessel that operates a 16-day service between Krems and Constanta. A self propelled vessel and a barge would have a 220 TEU capacity, and while tripled stacked on deck, would still be able to sail under the bridges along the waterway. When compared to the rail option between the same markets, the costs of the two modes would be similar. If inland navigation operators can use larger barges, the rates would shift in favor of waterways.

Further analysis estimated the benefits of a theoretical supply chain that begins in Shanghai and ends at Krems. The study included surveys of various ocean shipping lines in the region regarding modal competitiveness, rates and other operational issues. Transit times for imports were slower when compared to Northern European ports, but the export times were shorter primarily because of the additional sailing around the Iberian Peninsula on return voyages to Asia. In the base scenario, rail and waterways provided comparable costs and transit within the Danube corridor. By using the optimized fleet (vessels deployed to optimize for carrying capacity), a significant cost advantage existed, as import shipment costs were lower by an estimated 11-14% than rail, while exports were 20-23% lower. There was a third benefit, as inland navigation generated 16% less carbon dioxide emissions per container than rail.

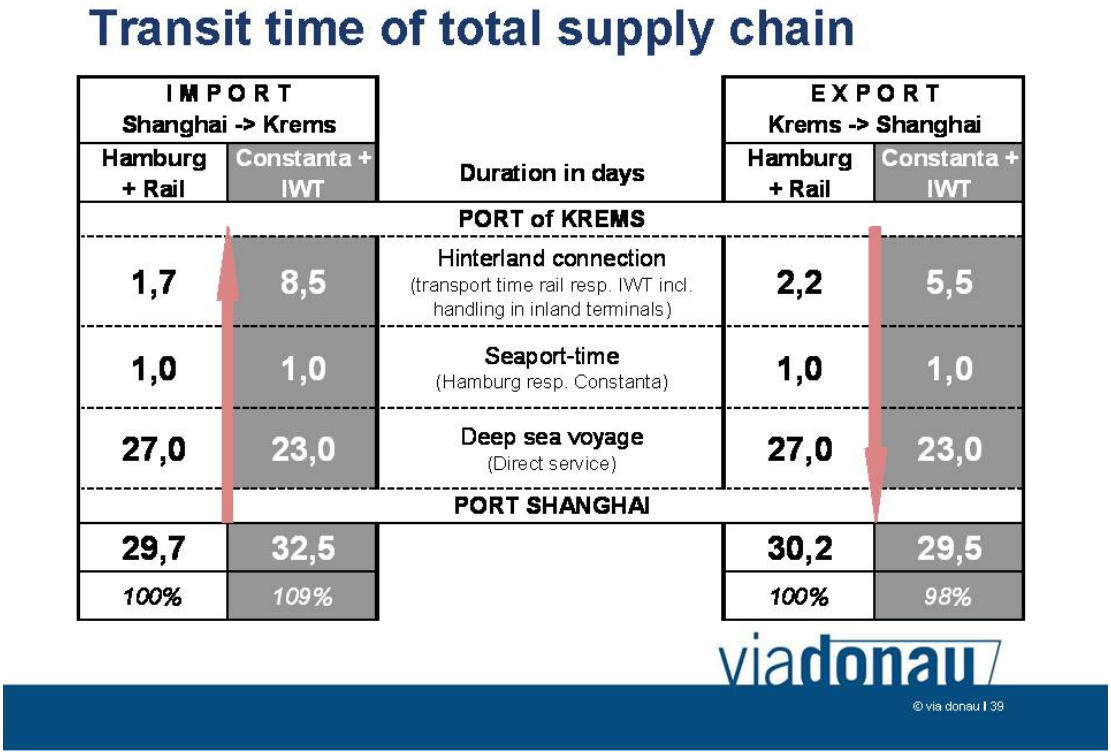


Figure 9. Transit Time of Total Supply Chain between Shanghai and Krems for Railways and Inland Navigation Shipments

The research suggests the use of waterways represented a potential cost advantage in central Europe, and additional benefits would occur when larger vessels enter service. The next steps related to the COLD Study involve the distribution of the report and finding overseas carriers interested in developing this waterway corridor. In addition, there will be additional studies conducted on vessel and fleet use. One company ordered the optimized barge from China, hoping to begin services next year. The final report is available at www.viadonau.org/cold.

3. The Columbia Snake River System

The Columbia and Snake rivers function as a system, integrated because of the markets and flow of traffic. Longview is a deep-sea port and the first port that connects to the interstate system in the Columbia-Snake river system, representing the second largest inland navigation system in the U.S. The Snake River System consists of four locks. Ice Harbor was the first dam constructed along the Snake in 1962, and the Lower Granite was constructed in 1975, so this is a fairly new navigation system when compared to other parts of the U.S.. The dams were originally proposed to develop hydropower, but both navigation and irrigation benefited from the project, which enabled the development of inland water navigation from the Pacific to Lewistown Idaho. (There is an elevation change of 740 feet from the mouth of the river to Lewiston, Idaho.) Currently there are 36 ports along the Columbia Snake system of 360 river miles, which includes eight locks along the Columbia, four on the Snake, and 14 feet of draft from Portland to Livingston, Lewiston. Currently, there is 40 feet of draft from Portland to the deep sea.

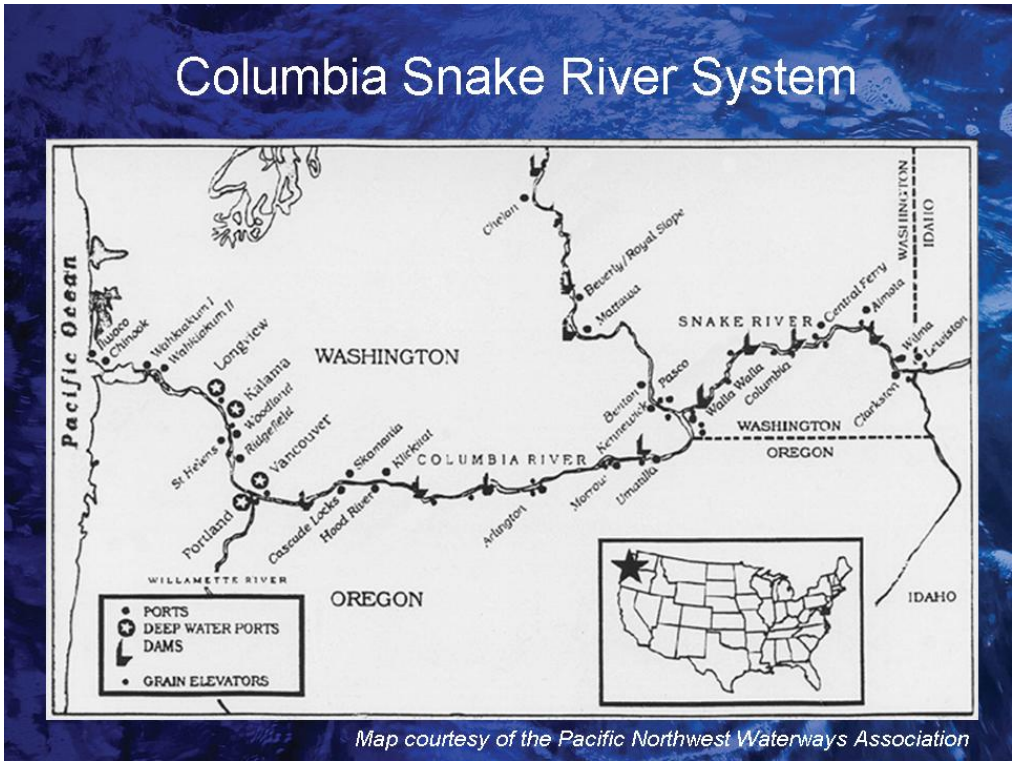


Figure 10. Map of the Columbia Snake River System.

The main commodities are grain (the largest gateway for wheat exports), wood chips, containers and petroleum. Most of the barges that operate in the Columbia-Snake are shallow, flat-bottomed hulls with limited capacity when compared to barges operating along the Mississippi River system. In the past, a unique trade existed where barges flowed downstream loaded with grain and returned loaded with petroleum. This backhaul traffic is changing, as barges now must be double hulled to meet the new regulations for handling petroleum products.

Portland handles 46,000 containers, 10,000 of which arrived from the river last year. Most of the export containers include beans, lentils, animal feeds and wood pulp. Container on barge services have declined over the last few years, when Portland lost several deep-sea liner services that handled these containerized cargos moving down the river.

There are three main issues in the Columbia-Snake system. One, the Snake River dams make navigation difficult along the corridor, as the locks and dams are used not only for irrigation and hydropower, but also for fish migration. There are groups who want to breech or remove the dams along the Snake River to assist in fish passage. The Columbia Channel is now being dredged from 40 feet to 43 feet after waiting 18 years to get approval, which is necessary to handle the larger vessels expected to call in the future. The entire channel dredging project will be completed within the next three years. Finally, the jetties at the end of the Columbia need to be repaired. These jetties were constructed in the early 1900's, and need to be retrofitted to ensure safe passage into the Columbia River.

4. Navigation Asset Management - Optimizing the Nation's Investments

To develop reliable infrastructure, it is also important to evaluate the investment needs for a river system. This requires managing multiple assets (lock, dam, jetty, etc.,) to optimize long term viability and day-to-day operations to ensure an acceptable level of performance while minimizing risks. Four years ago, the Corps began looking at evaluating its operations across its different areas of responsibility, including navigation, to better communicate its needs to the Office of Management and Budget (OMB). (OMB seeks to understand the real costs and benefits to the Nation associated with any investment by the Federal Government, including navigation improvements.) This led to a need to properly show the value of proposed investments and to explain what any proposed investment means in terms of economic development. To demonstrate this, the Corps must determine the total user perception of needs to ensure some degree of integrity to develop and maintain the waterways. This approach seeks to identify any results as a single system, not a series of small pieces, which more accurately reflects how users understand the system, and makes the process more transparent.

The Corps is looking for smart investments, especially those which will reduce risks through improved performance. A life cycle perspective (with five to 25 year considerations) provides the Corps with a series of tools to determine the asset needs, considering what is required to study, build, operate, and ultimately, retire that asset. A key objective for Fiscal Year 09 is to look at risk reduction, economic and life safety impacts, and to develop for each of the major systems a method to prioritize investment needs by an algorithm that can be verified by outside experts, while maintaining acceptable levels of performance.

Within the U.S., the Corps is attempting to develop a new process tied to a five-year development plan, supported by industry input. With its industry partners, the Corps conducted many workshops to develop the necessary performance indicators in considering asset management strategies. There must be a reliability performance standard for every node (of which there are 64 in the Great Lakes and 67 along the Ohio River), with a ranking system ranging from "A - No Compromise" to be an "E - Extreme Compromise", with each gradient designating a relative degree of risk. The optimized budgetary goal is to get each system to an accepted level of service within five years. For the Ohio River, optimal spending between Fiscal Year 2008-2012 will improve performance from 24% to 58% reliability. Along the Great Lakes, the 33% navigation performance would increase to 95% (mostly through dredging).

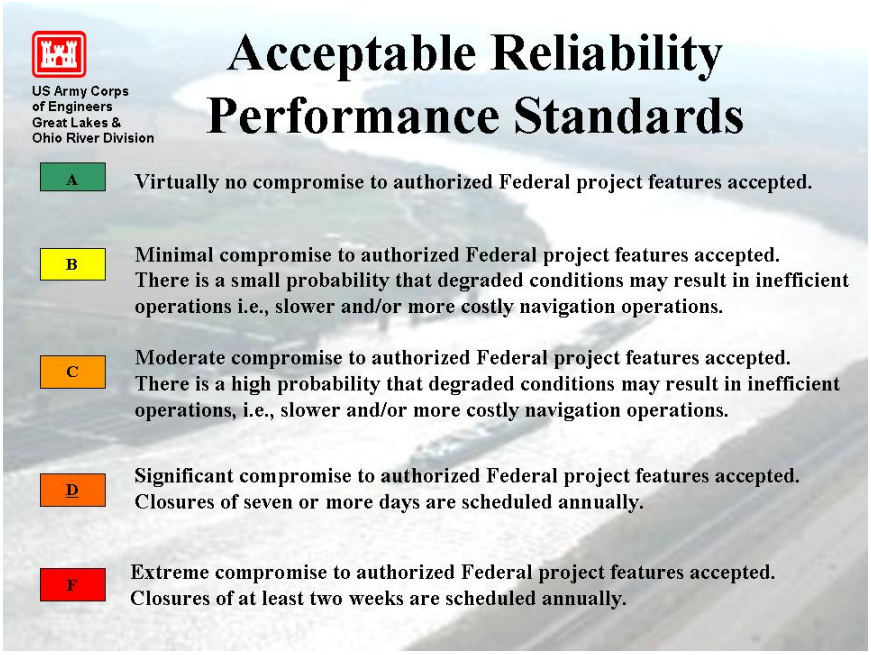


Figure 11. Acceptable Reliability Performance Standards

The Corps wants to estimate the incremental outcomes for each project related to its National Economic Development benefits. When the Corps seeks to apply this business model, it needs to evaluate a number of factors: the lowest total cost or construction costs; shortest construction schedule; the service life rotational pattern; and an interrupted or continuous from start to finish construction schedule. These scenarios depend upon forecasting programs to justify the right level of spending against anticipated needs. Currently, the Corps is conducting three different case studies on Marmet, the Lower Mon, and Olmstead to document project construction performance in three case studies and to identify lessons learned that would help shape future Navigation investments.

The mismatch between revenue streams and funding requirements is also resulting in additional foregone benefits to the nation. For example, when project funding is uneven, there are associated startup costs and other activities that must begin before the project can resume. Furthermore, these delays result in economic losses throughout the entire system that would use that facility.

The Corps, with its partners, is changing the way it is doing business by seeking to address the systems in a common framework. The use of economics and ongoing risk assessments may shed light on determining an optimized construction business model that is acceptable to the stakeholders and decision makers.

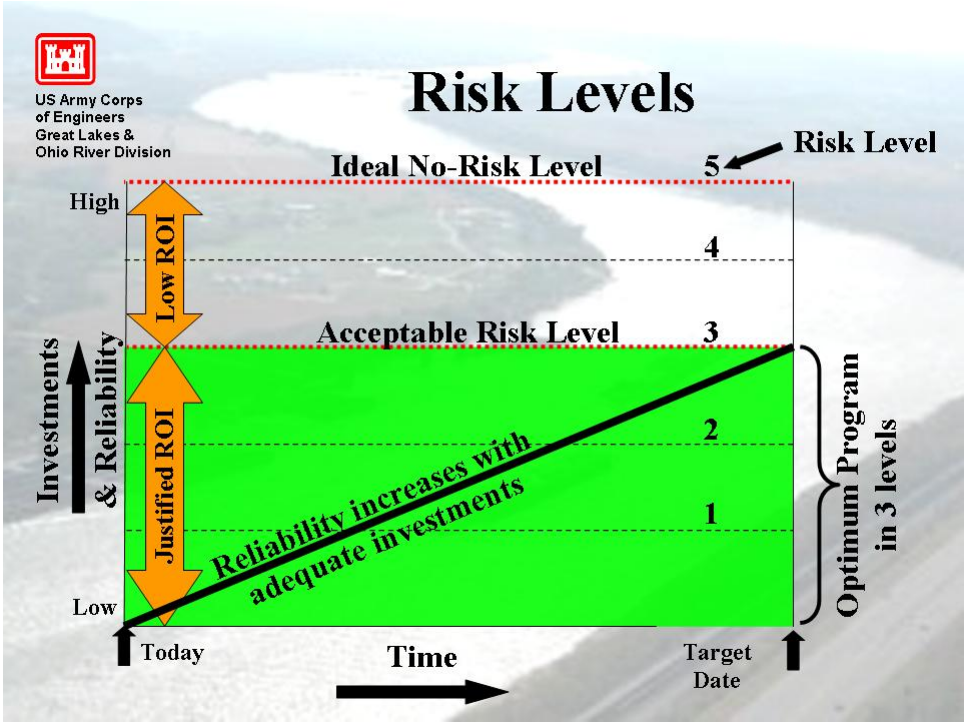


Figure 12. Relationship to Risk Levels and Program Considerations

Technical Session 4 - Policy Comparisons And Project Determinations – How Are Local Projects Done?

This section presented different considerations related to local infrastructure projects. By looking at specific inland projects (the Ohio River and the Chickamauga Lock), the panel also explored some additional areas of research related to understanding the economics underlying project investment considerations. One panelist discussed how to evaluate local projects within the national policy framework. The final presentation presented a challenge regarding the changing dynamics of the global marketplace, and its ability to structurally change the relationship between markets and infrastructure needs.

Moderator
Dan Mecklenborg, Ingram Barge Company

Ohio Mainstem Study,
Mark Hammond, US Army Corps of Engineers

Externalities and Project Approval,
Larry Bray, University of Tennessee Transportation Center

Finnish Waterway System,
Olli Holm, The Finnish Maritime Administration

Waterways and Economic Development Organizations,
Scott Hercik, Appalachian Regional Commission

- Many different considerations exist for determining local project studies, but the movement to a larger systems analysis remains difficult,
- The ability to evaluate local projects within a systems perspective helps identify both general and specific project and program needs,
- Non technical decision makers may provide guidance for investment needs, forcing the adopting of measures that may require new analytical tools,
- The economic tools necessary to evaluate modal projects have been applied in other settings, but additional research is required to apply these to the inland navigation projects,
- The changing world market will force a global perspective on local planning that did not exist in the past, and access to global markets will be paramount to long term success.

1. Finnish Waterway System Investment

Finland is a small country and foreign trade is seen as its key to long-term growth, making waterways vital to the nation's economy. The Finnish navigation system consists of a long string of traffic channels in a dense network through various archipelagos. It is the only nation where all major seaports freeze during the winter. The Finnish Maritime Authority is responsible for over 8171 km of coastal waterways, 8021 km inland waterways and 39 lock channels. There are also privately owned facilities in Finland, including 1808 km of coastal fairways and 1520 km inland waterways.

Beginning in the late 1980's, the Finnish Ministry recognized it had to develop a methodology to consider the relative investment needs across the transportation modes. Each mode had independently developed guidelines, resulting in the Ministry being unable to compare the relative merit both across various modes and within the same traffic mode. The Ministry developed some general guidelines for assessment, outlining specific reporting under national guidance. Each agency then developed their own guidelines under this broad initiative. The Finnish Maritime Authority (FMA) issued its new guidelines in 2005. When compared to other modes, waterway investment is straightforward, as the focus is only on goods movement, and by not including passenger traffic, there is less impact on other modes and land use. The only exception is for estimating the benefits of large inland waterway investments.

To develop the impact assessment, FMA looks at the decreasing transportation costs, environmental factors (air emission, noise, etc.), safety improvements, cost changes to operators (VTS, pilots), changes in waterway maintenance costs, and other elements as required. The guidelines also use the impact assessment to prove if a proposed project is feasible and determine what is the best project to be developed. They also estimate a cost-benefit analysis based on a 30-year service life with a discount rate of 5%. FMA developed its own mode of vessel costs to somewhat isolate the model from ongoing swings in costs and rates. There exist no estimates for regional benefits, as all benefits must be national, although considerations of jobs and other local items are considered.

Unit cost of air emissions (euro/tonne): open sea, coastal channels, inland waterways, ports

Type of emission	Open sea (Baltic Sea) €/tonne	Coastal channel €/tonne	Inland waterway €/tonne	Port €/tonne
CO	0.4	2	23	19
HC	137	153	197	148
NO_x	301	397	569	1 062
Particles	3 410	5 610	9 580	26 880
CO_2	32	32	32	32
SO_2	327	547	684	2 283

Figure 13. Unit Cost of Air Emissions used for Transportation Project Consideration in Finland.

In this decision-making process, several planning processes exist. There is a 10-year development plan, where projects are listed by order of importance, a four-year action and

economic growth plan, a project proposal tied to the national budget, and finally, a government decision on the proposed investment. Three environmental permitting authorities review these proposals after they are approved by the National Government to complete the authorization process. For an actual project, the permitting procedure may take up to five years. Because of the resultant time lags, it is possible the Benefit Cost Ratio will have changed over the corresponding approval process, requiring new calculations. As such, it is critical to have unit costs comparable over time to make these revised estimates. For waterways, the largest incremental benefit is the savings in transit times. The normalized unit costs across the modes becomes the key point in developing the general evaluation framework. Despite this process, the political decision may still be passed on for recommendation, but the present procedures provide information that decision makers are comfortable with in developing national infrastructure plans.

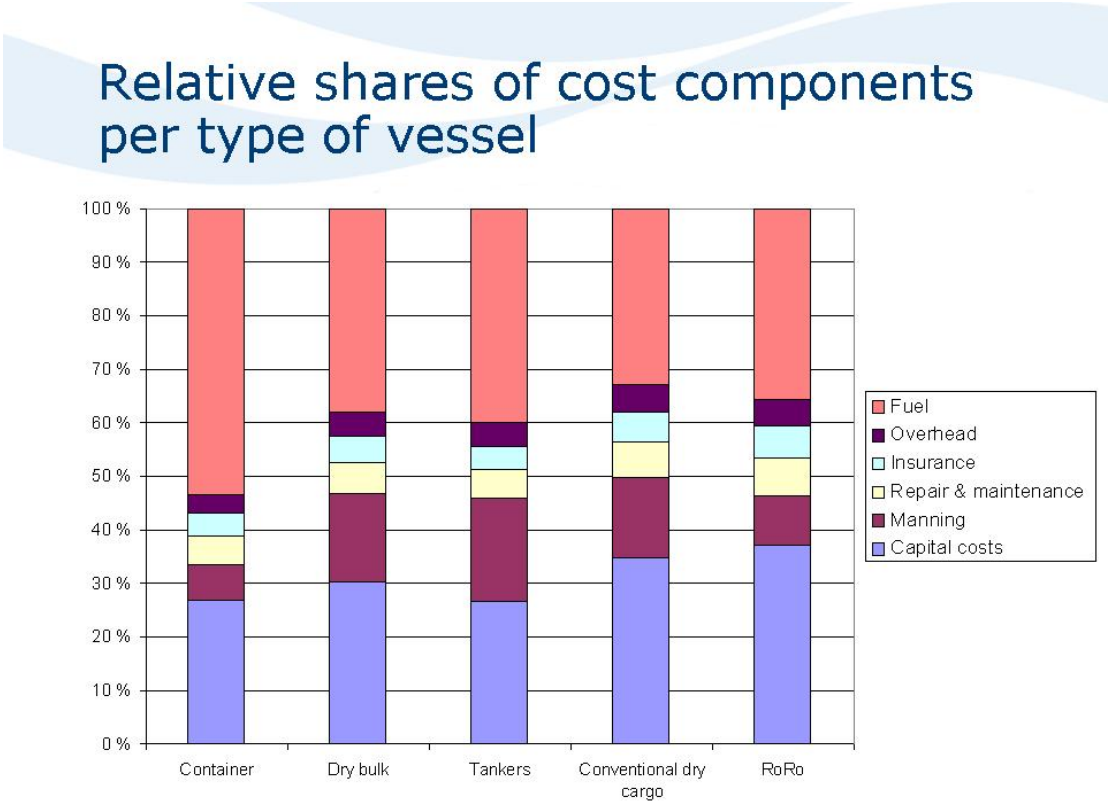


Figure 14. Relative Shares of Cost Components for Vessels Used in Finnish Navigation Project Studies

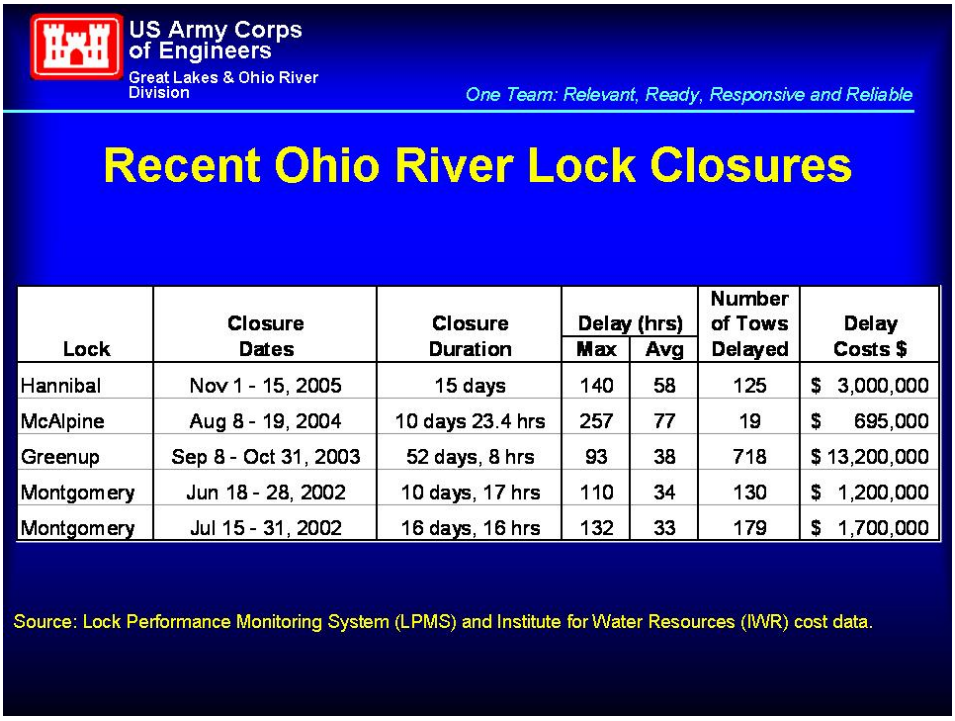
2. The Ohio River Main Stem Study

The primary purpose of the Ohio River Main Stem System Study is to develop a 50-year investment roadmap for the Ohio River navigation system. The Ohio River System Investment Plan (SIP) is the roadmap that seeks to balance system reliability, lock expansion, and environmental sustainability that meets National Environmental Protection Act (NEPA)

Requirements. The report estimates the cumulative cost and benefits of the asset needs identified in the study.

There are 20 navigation structures (locks and dams) along the Ohio River with some pools over 80 miles long to support 9 feet of navigational draft. The Ohio River has two typical lock configuration types, both of which have two lock chambers, a main chamber and a smaller ancillary chamber. The main investment needs along the Ohio River are driven by delays associated from the main system chamber lock closures. (The associated closures also result in delays when barges use the smaller ancillary locks.) These closures are driven mostly by the aging infrastructure, as most locks along the Ohio River System are operating beyond their estimated 50-year design life. The Emsworth, Dashields and Montgomery locks and dams are much older, and are still operating at 85 years old.

Occasionally, the Corps has to close the locks to do routine maintenance, etc., but there are also unscheduled lock closures due to failures. The delays associated with closures have large costs, for any closures can create severe ripple effects throughout the system as firms continue to operate but are unable to rely on the waterway system. Even if the shippers know that a closure is planned for a future period, shippers still expect the lock to become available when it is scheduled to return to full operational status. For example, The Greenup main chamber closure, which occurred September 8 to October 31, 2003, resulted from the chamber being dewatered for inspection and repair work for a planned three-week closure. However, severe damage to the miter gates resulted in the chamber not being operational for seven weeks. The additional, unexpected four week closure resulted in delays that averaged more than 38 hours per tow and cost the towing industry in excess of $13 million in delay costs alone. These costs exceeded the estimated $4 million loss from the scheduled three-week closure, with an estimated $30 million loss to shippers and other users. In the long run, unscheduled closures were actually more damaging, as industry suffers from the unexpected delays and the Corps suffers from the perception that money is going into repairs that have not been planned.



Lock	Closure Dates	Closure Duration	Delay (hrs) Max	Delay (hrs) Avg	Number of Tows Delayed	Delay Costs $
Hannibal	Nov 1 - 15, 2005	15 days	140	58	125	$ 3,000,000
McAlpine	Aug 8 - 19, 2004	10 days 23.4 hrs	257	77	19	$ 695,000
Greenup	Sep 8 - Oct 31, 2003	52 days, 8 hrs	93	38	718	$ 13,200,000
Montgomery	Jun 18 - 28, 2002	10 days, 17 hrs	110	34	130	$ 1,200,000
Montgomery	Jul 15 - 31, 2002	16 days, 16 hrs	132	33	179	$ 1,700,000

Figure 15. Estimated Costs from Recent Ohio River Lock Closures

The Corps Planning process used on the Upper Mississippi River was critiqued by the National Academy of Sciences (NAS). The NAS recommended the Corps improve the understanding of forecasts and uncertainty, assess nonstructural alternatives, explore the better integration of engineering, economics and environmental inputs, understand the sensitivity of barge traffic to rate, and bring ecosystem sustainability needs into its long range forecasts. These critiques have been applied to the development of the Ohio River Navigation Investment Modal (ORNIM). ORNIM provides a system perspective related to structural reliability and economics within a single integrated investment framework. ORNIM has three elements: Lock Risk Models, Waterway Supply and Demand Model, and Optimal Investment Model. Each element allows the user to specify a given set of inputs and investment strategies that the model will optimize for different levels of investment over time at each project at a component level.

How does ORNIM work in the Corps planning process? The Corps evaluates projects by comparing "with" and "without" project conditions, namely, does the proposed project result in benefits to the Nation versus simply doing nothing (without project condition). The project evaluation moves from a base of regular maintenance, component replacements, rehabilitation, and structural improvements. With each step, there is a focus on becoming more proactive, and as such trying to optimize the entire system. By having a series of forecasts, the Corps could examine incremental improvements to the system necessary to meet the anticipated traffic demand and expected maintenance schedule. Environmental effects will be considered at both a site level but also along the entire system.

ORNIM becomes but one tool for the Corps when considering projects, but it is apparent that the current program delivery formulation remains problematic. The Ohio River expects more traffic in the future but there is a possibility that navigation services will degrade from more system disruptions without a more proactive maintenance schedule. By providing tools and inputs into the costs and returns associated with various project needs, it is assumed that service levels can be maintained, or improved, through aggressive maintenance programs.

3. Externalities and Project Approval

When considering a transportation project, oftentimes a third party may receive either a net benefit or cost from the project, but these groups are not necessarily included in the project consideration. For example, when considering road projects, air emissions and noise are considered to be externalities. Externalities thus represent a wide variety of costs and benefits which are not included in either prices or rates, and could be considered a proxy "social cost" to the broader community.

The U.S. normally only considers first order (or primary) benefits and costs, limiting project considerations to only estimates of reduced travel time or some other easily quantifiable measure. Externalities cannot be considered in a project if the Benefit/Cost ratio (B/C) is less than one. (Projects with a Benefit Cost Ratio greater than one are assumed to provide more benefits from the associated costs associated from the project and thus improve the overall national economy. Projects with a Benefit Cost ratio less than one are assumed to actually cost more than the resultant benefit, and are a loss to the economy.) Despite this limitation on the use of externalities for waterway projects, oftentimes questions concerning the second order costs and benefits of a project are being considered.

TVA (Tennessee Valley Authority) began work on externalities by looking at the Chickamauga Lock, a lock owned by TVA in the Chattanooga, TN area, which was failing. In response to the lock failure, TVA interviewed shippers to evaluate their shift from inland barge to road traffic. TVA considered that trucks would be the primary alternative mode, and may result in traffic increases in an already congested city; so there may be a net benefit to the system if this lock is improved and trucks are kept off the roads. In doing the study, TVA sought to estimate the externalities, something everyone had discussed, but no one had done yet on a waterway project. The study team found that the data for externalities comparisons were not available and had to be developed. (The study approach has been used for other Corps projects, and is now being considered to review a project in the Pittsburgh area.)

For the Corps, the guidelines for estimating externalities are outlined in "Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies". The Corps focus on economic development in the Principles and Guidelines (P&G) does not consider environmental externalities, and any change in the P&G would require changes from OMB or the P&G standards themselves. However, other studies have discussed non-primary benefits. The National Academy of Public Administration discussed the incorporation of externalities in feasibility studies in a recent "Prioritizing America's Water Resources Investments: Budget Reform for Civil Works Construction Projects at the U.S. Army Corps of Engineer", published in February 2007. The study critiqued the Corps for not using externalities

while other Federal Agencies have been more successful in using externalities in their project analysis. The Corps is evaluating a review of externalities related to a potential closure on a lock in the Pittsburgh region.

Based on comparable studies on the highway activities, the Chickamauga study considered five categories: pavement damage, crashes, congestion, incidents, and air pollution. To consider water transport efficiency, TVA ran its TVA River Efficient and Fuel Tax Model to estimate the resulting fuel costs and benefits of running waterway cargo through Chickamauga. (The model runs analysis for every river and river segment based on the fuel tax use.) Operationally, any modal transfers must occur during daylight hours, and the highway traffic through Chattanooga has increased dramatically over the past few years. (The model has been peer reviewed, and is being used by other Federal agencies, as the model produces the only river level fuel costs and efficiency on a segment level. Since that study was performed, other models and data have been developed.) Most of the resulting impact of a 180-day lock closure resulted mostly in highway congestion and increased incidents, with little corresponding damage to the pavement system. The resulting cost was based on traffic use forecasts developed by the Tennessee Department of Transportation. A more complete discussion on this project was published as "Impact of Increased Truck Traffic Due to Chickamauga Lock Closure", by Transportation Research Board (July 2000).

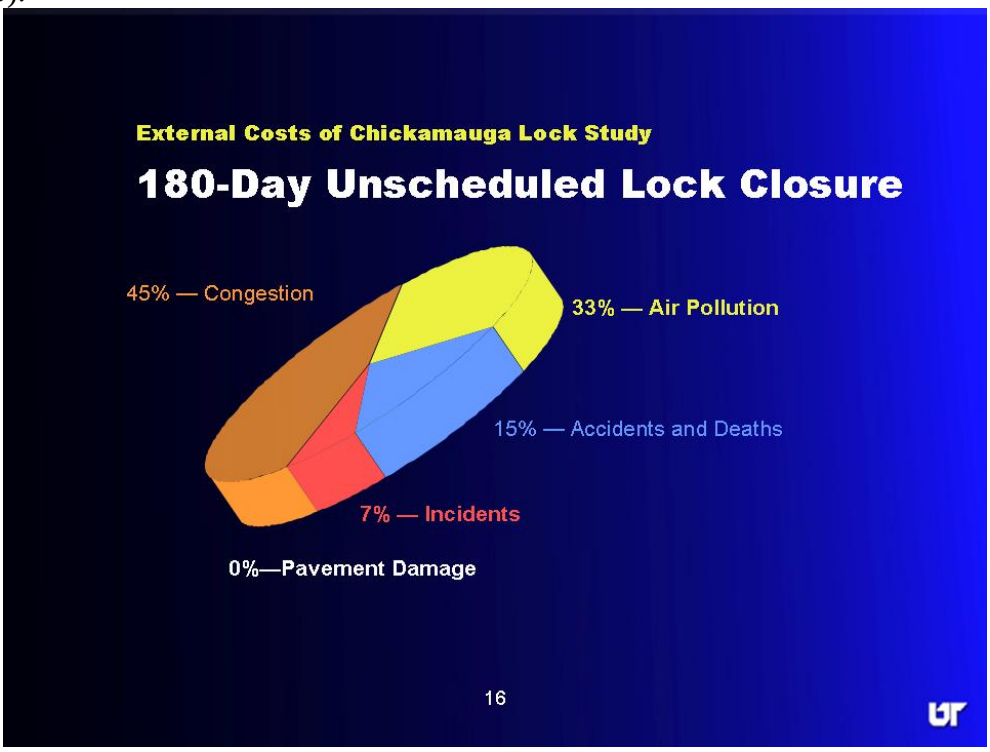


Figure 16. Estimated Costs from a 180 Day Unscheduled Lock Closure at the Chickamauga Lock

But there are other externalities to consider, such as air emissions. Based on two medical journals, Environmental Protection Agency (EPA) provided TVA with two different estimates on

the costs associated with carbon reduction. The EPA is using MOBIL6 for a study in Pittsburgh, where they are considering the benefit/costs related to social costs of air-quality. EPA is also attempting to estimate the social cost of a project (BENCOST model). The American Association of State Transportation Officials (AASHTO) publishes its guidelines in the "A Manual of User Benefit Analysis for Highways, 2nd Edition (updates 1977 edition). EPA has expressed its support regarding the Pittsburgh study and its application for other modal analysis.

Externalities as a research effort might result in new guidance on multimodal emission estimates. There is also the need to look at the discount rate used to estimate the proper evaluation of national capital stock repair and reinvestment. There are two recommendations: one that the externalities may be a catalyst for identifying new studies that may be necessary, and that the Corps should hold a symposium on the state-of-the-art in the cost estimation of transportation. There needs to be some discussion concerning developing a framework for doing modal analysis and comparing models for examining externalities to prevent double counting in the project approval process.

4. Waterways and Economic Development Organizations

There are thirteen states in Appalachian regional commission (ARC), engaged in common economic development issues, of which intermodal traffic and the global supply chain issues are very important. These states normally lead international delegations to promote trade and transportation in the region. These states are also thinking about how one can put the local or regional inland waterway system into a global economy. Referencing the book "The World is Flat", local agents now operate in a global economy with competitive pressures.

In the United States, the first truly national economy developed after a national transportation network. The world is getting flatter through the ability to have efficient telecommunications, the global intermodal transportation network, and finally the emergence of developing countries and new consumer markets.

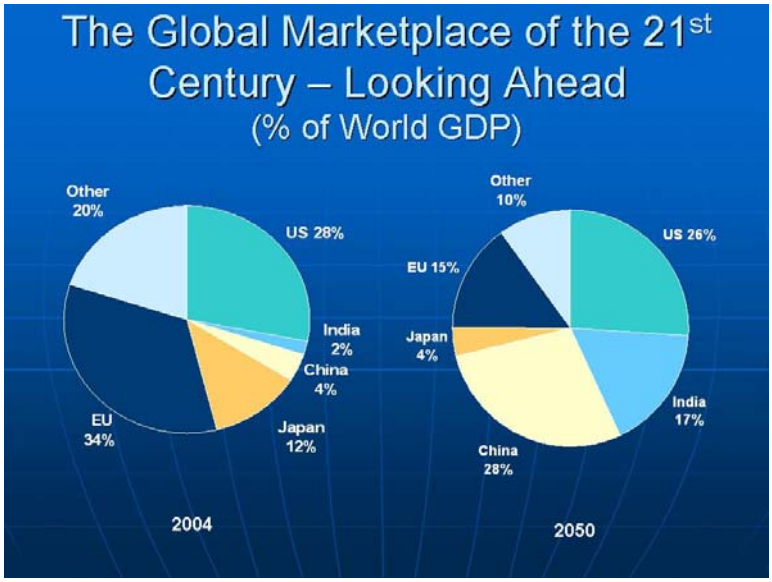


Figure 17. Comparison of Global Economic Growth, 2004 to 2050

Transportation will shape the various economic opportunities within a region, which directly translates into jobs and prosperity. For the United States, international trade will continue to transform our economy. It is predicted that by 2050, half of the U.S. economy will be directly involved in international trade. This correlates with the growth of transportation systems, when forecasts call for a 70% increase in total domestic movements and a doubling of international trade. At this same time, cargos on average are moving over longer distances while more goods are moving throughout the system. As distance changes, so does the economics of transportation. The change not only influences the traffic, but potentially the modes that may competitively service that market.

In the old days, competition across the street was limited to putting something on a truck and driving it across the street. Last year, the railroads received more profit from intermodal, the first year that coal was not the leading commodity for U.S. railroads. The railroad is now becoming a part of the global supply chain, as much so as our roads and ports. The ports represent the crush of the new global economy before it enters our domestic system. Inland waterways in the U.S. are not integrated well into the global supply chain. This explosion of traffic is occurring at the ports, but it has not occurred in inland navigation. Inland transportation has not benefited fully from this new market reality.

Inland navigation could be connected to the global supply chain without any additional constraints on the system in other modes. National economic development needs to provide access to global markets. That would enhance competitiveness and attract new commerce to the area. If this is not found in the area, there exists a potential loss even to its existing businesses that are no longer free from this hyper-competitive market. Access is a powerful force behind economic development. For example, the Virginia Port Authority created an inland port in Western Virginia. Today, the inland port is booming, as businesses have located there because of the inland port, but also the related businesses lead to new private investment in the area.

In the 1960s, the national debate recognized the Appalachian Region was not tied into the national economy as the interstates went around the region. The Appalachia Regional Network was formed to provide access to domestic markets, but today, it must be tied into global markets. Within the Appalachia Region, most recognize the system provides a model for people to view growth in trade as contingent upon transportation access to those markets. Telecommunications, the supply chains, and expanding markets, have worked to make the world smaller, but also more competitive. Competition forces the examination of transportation as a key for growth. However, most decision makers at the public level are not concerned so much with the use of barges, but with the creation of jobs and economic development. The inland waterway system, by providing access, can serve to provide opportunities to regions that may allow economic growth to occur.

Technical Session 5 - Reliability And System Use

To ensure the inland waterways provide the service levels demanded in today's market place, it is important to understand new technologies that offer solutions to improve system performance. System reliability is seen as one critical component to increase system capacity, ensure safe passage and minimize risks throughout a waterway, lock, dam, or canal. This panel discussed technologies currently being deployed in Europe and the U.S.

- Congested inland waterways require very aggressive management and planning to avoid accidents and unexpected delays during vessel crossings,
- The deployment of new and better communications standards between vessel and shoreside operations are being employed for both safety and general traffic management operations,
- The technologies to implement these standards are being tested and used in Europe and the U.S.,
- The development of data exchange standards have and will require extensive coordination to be successful, but most see this as a critical step towards improving navigation.

Moderator
Helen Brohl, U.S. Committee on the Maritime Transportation System

e-Maritime and River Information Services,
Lea Kuiters, Rijkswaterstaat, Transport Research Center

USACE Approach to Information Technology,
James E. Walker, US Army Corps of Engineers

River Information Services in Europe,
Juergen Troegl, via donau

Kiel Canal System,
Michael Winkler, U.S. Army Corps of Engineers

1. River Information Services in Europe

Europe, like the U.S., has congested road and rail networks that may provide opportunities for waterway navigation. Waterway traffic does require more operational technologies to match the transformation of the information on the shipper side and to allow the transportation of cargos that require a higher level of transport quality. This requires some degree of modernization of the inland navigation system for transportation decision makers. At the same time, a focus on increased used of waterways requires that government and local authorities support inland waterway transportation to capture these potential safety benefits and modal efficiency gains that may result from new technologies and information services.

The nature of shallow water coastal ports and deep-water ports, inland water ports, national and regional laws and regulations are all different, with little interoperability between them regarding standardized interfaces. In 2002, PIANC issued River Information Service (RIS) guidelines, which was the first time users discussed a common framework across this diverse industry**.** The guidelines outlined four main areas. The first focused on developing Fairway Information Services such as electronic navigational charts, notices to skippers (mariners), and water level information. The next module, based on understanding the current conditions, focused on traffic management operations, including tracking and tracing and lock management. Thirdly, the guidelines examined safety related services, such as reporting dangerous cargo on a real or near-real time basis and vessel movements to assist in collision avoidance. Finally, other related

transportation components were developed for applications beyond the waterway operations, such as providing estimated time of arrival and port/terminal planning or supporting logistics operations.

To provide these services at an international level in harmonized way requires a framework for common standards. Therefore RIS related standards have been developed through European Expert groups, representing both industry and government officials, under the supervision of the European Commission. The initial focus remained on identifying existing technologies that can be developed or adopted more readily. Most of the standards are based on existing technologies already used in maritime navigation and are downwards compatible. Current standards for Electronic Navigational Charts were developed through an ECDIS standard, an AIS standard for vessel tracking and tracing, and a Notice to Skippers standard. Regarding dangerous cargo, the International Ship Reporting standard was adopted.

In 2005, the European Commission outlined through Directive 2005/44/EC that a harmonized River Information Services (RIS) would be developed. The Directive required the member states to implement the necessary legal framework for implementing RIS, and to standardize equipment and data exchanges. Furthermore, the Directive sought to outline the minimum requirements for actually adopting RIS programs throughout the diverse inland waterway system.

One of the main technologies is the Inland ECDIS standard which defines Electronic Navigational Charts for inland navigation. Inland ECDIS charts contain geographic information in vector format and have an object database for the storage of additional information. Finally Inland ENCs are easy scalable, have automatic adaptation of the content according to the user needs, and provide extended object information e.g. on traffic signs supported by pictures. All data focused on information which is related to navigation. (The images below compare a satellite image to the vector maps of a waterway used for navigation operations.)

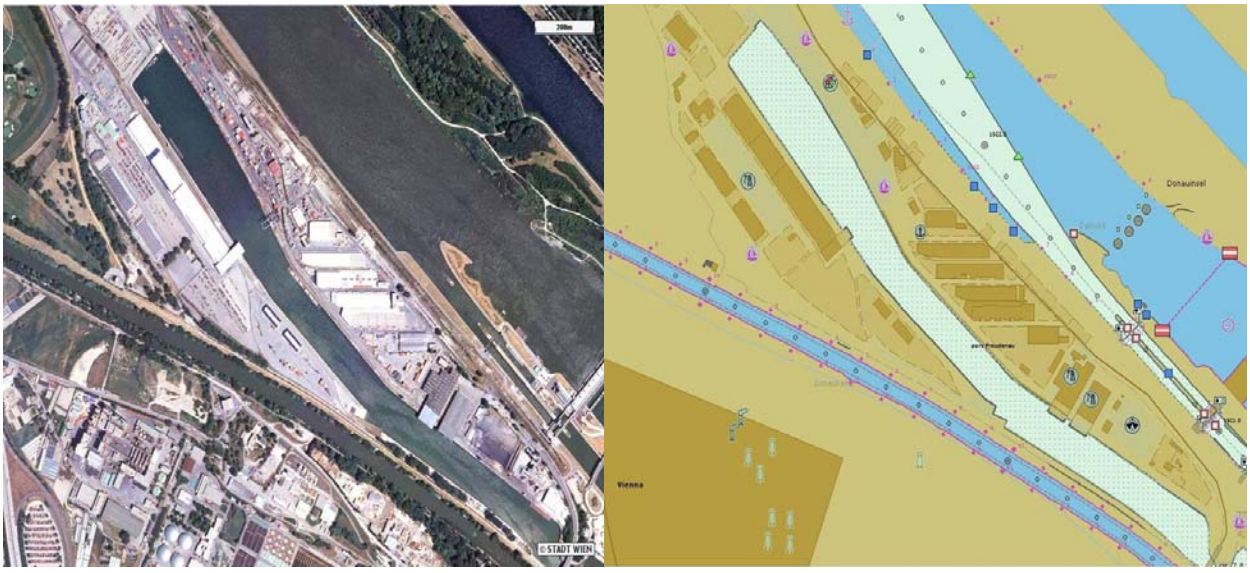


Figure 18. Comparison of Satellite Image to Navigation Chart.

Another successful example is the development of an Inland AIS standard. The inland AIS has a reporting rate of every two seconds, which can be adjusted based on local traffic and weather conditions. Furthermore, additional information exchanges include information on the vessel, water levels, the estimated time of arrival and the number of mariners on board the vessel. Currently a test and performance standard is being developed in order to have certified Inland AIS transponders on the market. To possibly expand RIS throughout Europe common research and implementation projects like COMPRIS, IRIS Masterplan and IRIS Europe have been set up. The most recent IRIS Europe involves the harmonized implementation of main RIS elements between the following member states: France, Belgium, the Netherlands, Austria, Slovakia, Hungary, Romania and Bulgaria with active supporting countries Croatia, Serbia, Ukraine and Czech Republic. The development/implementation schedule across the various member nations reflects the growing recognition that RIS will become more valuable to improve efficiencies and system reliability. There still exists the need to move away from pilot projects towards full implementation, but by developing links to and/or providing opportunities for stronger involvement of logistics users, RIS provides a very workable tool to improve reliability and safety.

2. e-Maritime and River Information Services

River and coastal navigation have similar data transference needs for safety and vessel operations. Both are a part of today's global supply chain and co-modality will assist in developing overall waterborne transport activities. Today's information flow regarding vessel movement is often fragmented, with many authorities requesting information from the vessel, oftentimes with different agencies requiring the same information but at different time or formats.

MarNIS, started in November 2004, is a research program funded as an EU Integrated Projected. MarNIS currently involves 56 partners from 30 countries, and includes representatives from the ministries of transportation, industry representatives, private universities, etc., coordinated through the AVV Transport Research Centre of the Dutch Ministry of Transport, Public Works and Water Management. The MarNIS project objectives are to improve the safety and efficiency of the maritime transport and the protection of the environment, improve efficiencies and reliability of information flows, develop new proposals for administrative and procedural changes, and finally, to develop proposals for new legislation.

The MarNIS project is based upon three main areas – traffic measures at sea, information management onboard the vessel, and port traffic management. Traffic measures at sea are defined by Maritime Operational Services (MOS) as managing the high-risk vessels at sea, as well as basic operational service needs, to prevent incidents or accidents. The Port Traffic Management is focusing on local weather and port conditions. The Systems approach examines voyage planning and emergency response on vessels and ongoing vessel communication/ information flows. Developing a Vessel Tracking Management (VTM) system is important, especially for smaller ports that may not have or need a full Vessel Tracking System. MarNIS builds upon existing systems and technology to enable the necessary information exchanges required to provide information on vessel operations, even at these smaller ports.

The MarNIS focus is to develop an integrated framework, built upon the current European system that allows information exchange between the necessary maritime authorities (SAFE SEANET). This system will be expanded, through MarNIS, into a fuller network to allow more information exchanges with ports and industry. As such, these projects are assisting in developing an E-Maritime concept for the European maritime community, which will assist in developing new services and data architecture to link the various stakeholders through standardization and information exchanges. The E-Maritime concept also includes efforts to ensure that the legislation and regulation framework necessary to implement the recommended system exists. Current plans call for a demonstration project to be completed by September 2008 to evaluate both the usability of the service and the related user costs to adopt this standard.

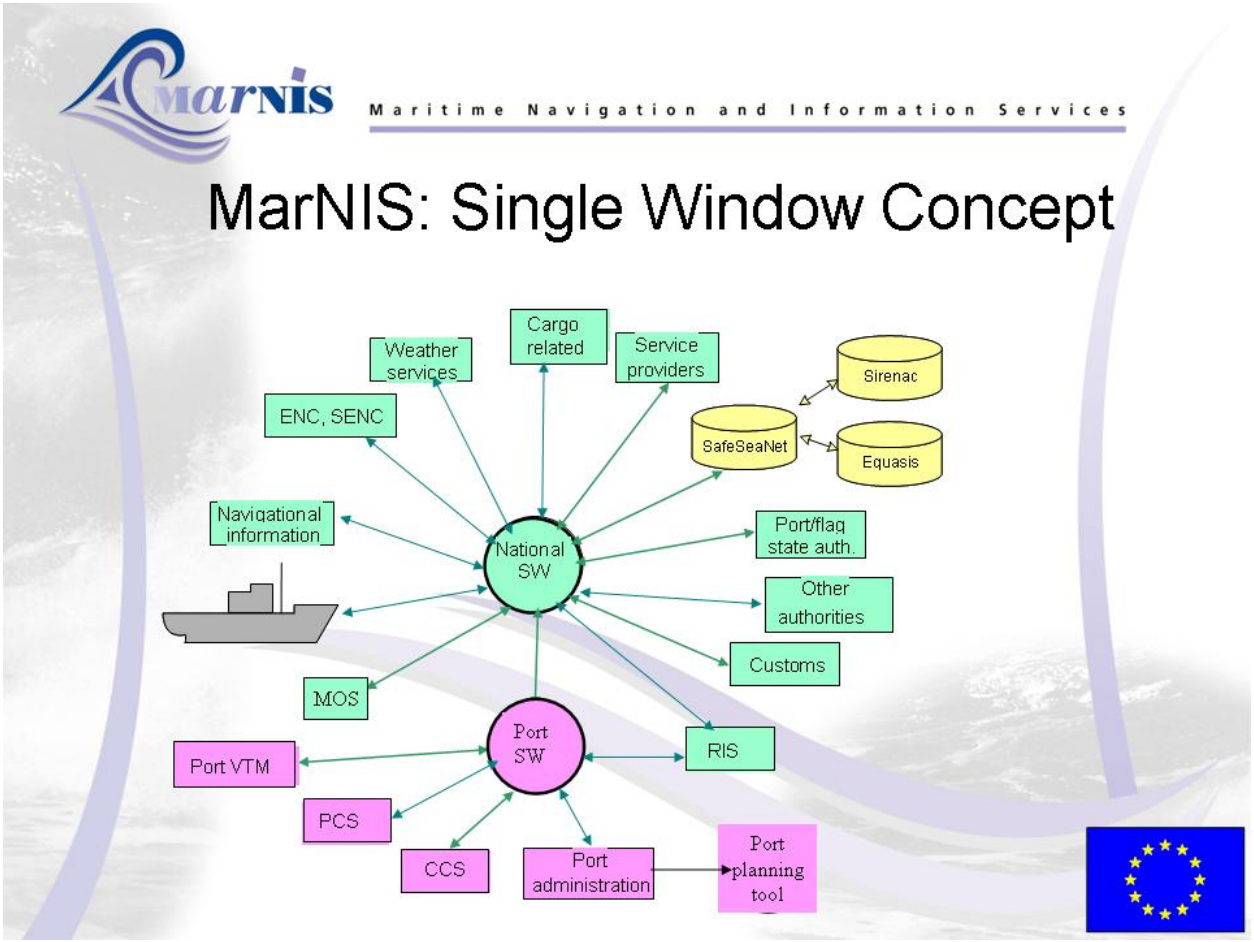


Figure 19. MarNis Single Window Concept for Operational Data Standards

The MarNIS E-Maritime Concept, Focus 2012, is examining three main elements – Maritime Operational Service, Information Management and VTM in port, to be developed into a common system. MOS builds upon existing search and rescue and vessel traffic management, to examine ways to look at the vessel information from AIS, Long Range Information Technologies and other sensors to develop a full picture of all vessels operating in a waterway. This includes identification of local conditions to both the vessel and to the responsible authorities. As an example, high-risk vessels (passenger, hazmat or damaged vessels) must pass information but

they must be aware of dynamic and stable conditions within the waterway. These differences may or may not allow vessels to operate in that channel under certain circumstances in a proactive manner.

For ports, MarNIS will develop four main modules: a general description of the port, accident statistics or hazards to navigation, a VTM Strategic advice and a cost/benefit report. The general description outlines the basic terminal and waterway characteristics, as well as information on general vessel operations. The accident statistics will be developed with the pilots, vessel operators and local port authorities to outline hazards to navigation, based on historical information or questionnaires, to provide more dynamic information to plan vessel operations. These two modules will provide information for the third module, which aims to develop models to improve port and vessel operations. This information provides inputs into a cost/benefit tool to evaluate the system improvement as a planning tool, while also identifying the potential costs of these improvements to the port or vessel operators. The VTM is also examining the use of Portable Pilot Units to assist in understanding dynamic underkeel clearance and berthing operations.

MarNIS and RIS are related through the development of data exchange standards across different authorities and operational needs, as the EU sees the need for standards for both inland and deep-sea operators. Together, the information provides a mechanism to examine fairway operations where both inland and deep-sea vessels operate to improve traffic management and enforcement. However, the information will also assist in multimodal transport management as well as traffic statistics for planning purposes. The MarNIS and RIS will contribute to developing standards among waterway users for information exchange through a common architecture. The information will provide the necessary insights to assist in harmonizing legislation between the waterway modes, but also with other modes and other legislative requirements. More information is posted at http://www.marnis.org.

3. USACE Approach to Information Technology

The Coastal River and Inland Services (CRIS) represents a collaborative effort between multiple Federal Agencies, (the Corps, Coast Guard and National Oceanic and Atmosphere Administration (NOAA). One effort involves the development of electronic navigation charts. To date, 70% of the inland navigation miles of the United States have already had electronic charting, with the remaining 20% under development and 10% not being processed at this time. The final navigation charts are expected to be released in 2009. Regarding Automatic Identification System (AIS), the U.S. Coast Guard is the lead agency in implementing this within the United States.

The Coast Guard has worked with the Corps to develop a two-way communication standard between the respective federal government agencies and the vessel. The AIS System enhances the exchange of information to the vessel, including lock condition, real time current and wind velocities, river stage and navigation safety information. Many of the research items presented from the Europe speakers mirror the U.S. approach regarding the use of information to improve system operations.

The U.S. Government is now requiring all agencies to report on the condition of their assets. One of the Corps' major efforts involves assessing the maintenance needs of inland navigation structures. We also monitor the number of accidents related to vessel operations that cause damage to Corps structures. There is a need to both protect the navigation structure as well as the vessel, while improving vessel operations. The Corps started Inland Navigation Safety Initiatives with a goal to reduce the number of allisions and damages to locks/dams and vessels. While several research programs are underway, two of the most promising are the Real Time Current Velocity System and the Lock Distance Measurement System.

The Real Time Current Velocity (RTCV) system will provide information to the towing industry on navigating conditions (wind, water, and currents) prior to the vessel arriving at the lock. This information aids the towing vessel operator in planning and executing his approach to the lock. There are locations where certain water and wind conditions increase the difficulty of a safe approach. At one problematic location the recommended engineering solution involved extending the lock wall at a cost of 14 million dollars. An RTCV was installed at this problematic location at a cost of about $75,000. The towing industry representatives were very pleased with the results. If the RTCV could improve safe navigation and overcome the need to construct the lock wall extension, the $14M saved could place RTCV's at 3/4 of the 240 locks operated by the Corps. The industry benefits from better operational information, while the Corps can apply its constrained maintenance resources to focus on reliable operation at more locks.

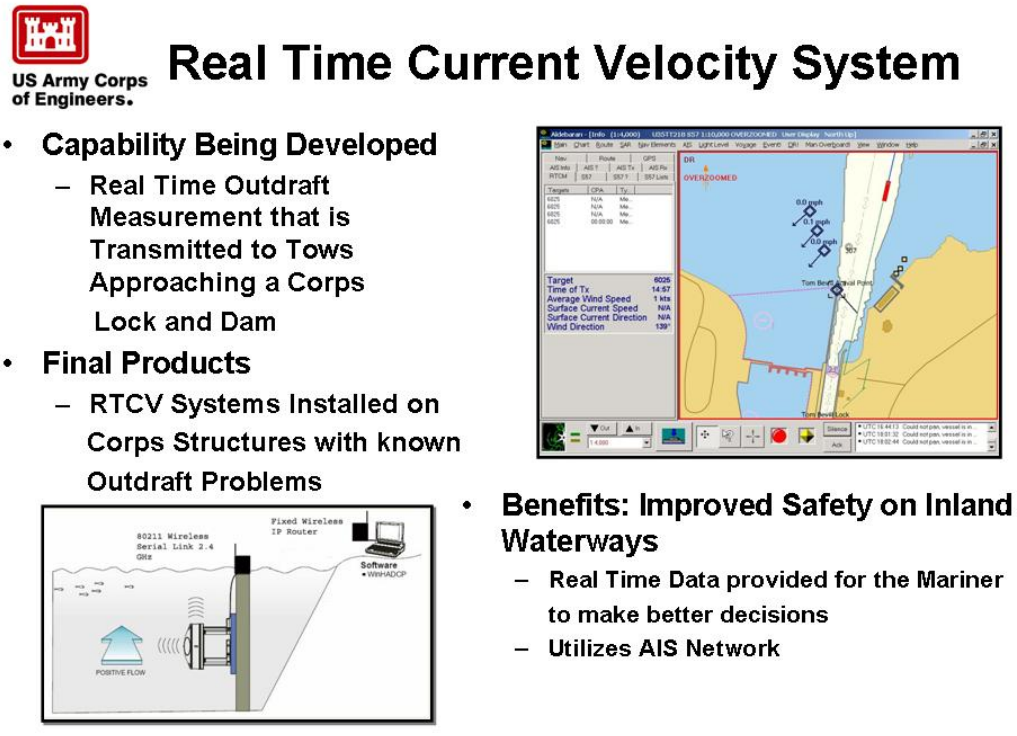


Figure 19. Real Time Current Velocity System Overview

The Corps is also examining Lock Distance Measurement System to provide users with an accurate measurement between the lock and the vessel by utilizing lasers and reflectors. The concept is simple and very low cost; a laser would provide the distance from the guard wall to the tow. Once the laser was turned on it would search for a target within a predefined area. Once the laser locked onto the target it would track the target all the way into the lock. The laser can begin tracking a target 1700 meters away. The system would provide real time information on distances to the lock and navigation structures to assist the vessel operator during lockages.

Compared to Europe, the United States has to contend with standards across government agencies, and the legal framework becomes very cumbersome. The Committee on the Marine Transportation System (CMTS) consists of 13 independent Federal Agencies, and five White House Offices, with some oversight of the Maritime Transportation System. The CMTS members are seeking to find common areas that will leverage federal resources to benefit overall navigation efficiency and safety. Clearly, all agencies wish to improve waterways. The USACE, US Coast Guard, and NOAA are the lead agencies in the Navigation Technology Integration Team, which has helped provide the platform for the data transfer to the towing vessels.

4. Kiel Canal System

Michael Winkler presented the material based on his recent tours to Europe and his prior work with Mr. Pfister. It appears most of the work in Europe will occur here in the United States after the Coast Guard adopts the new AIS standards and the implementation of CRIS. Within the U.S., AIS remained the missing link to improve real time vessel communications, and the implantation of this standard will revolutionize reliability, safety and operations along the inland waterway system. In Louisville, the U.S. Coast Guard will have the first operational AIS facility at an inland navigation facility within the first six months of 2008.

In Europe, the barge's wheelhouse has a single monitor that integrates AIS with radar, DGPS and other navigation data into a single image overlaid with the electronic charts. This provides a method to develop a fail-safe system to validate the information on the system.

To illustrate how this is used, the development of the Kiel Canal management system was presented. The Kiel Canal is the most heavily used canal system in the world, handling 41,000 lockages in 2006, providing a shortcut between the Baltic and the North Sea. The Kiel Canal is roughly 100 kilometers long, but provides an alternative to sailing around Jutland. At the narrowest points, the Kiel Canal system is 40 m wide. The "Big Locks (New) consist of two chambers with a length of 310 meters and 42 meter width. The "Small Locks (Old)" are two chambers of 125 meters and a width of 22 meters. These locks are old, with the Big Locks at 93 years old and the Small Locks are 112 years old. With the narrow, old infrastructure and high traffic demands, all vessels transiting the Kiel Canal require onboard AIS to ensure safe navigation and operational control. If a vessel does not have AIS onboard, they are required to rent a portable unit.

Figure 20. Picture of the Vessels on the Kiel Canal

There are five base AIS stations along the Canal, ensuring a high degree of system redundancy. The redundancy includes the base station and control center to provide for any loss of system operations. The Kiel Canal depends upon real-time data, which operators use to manage ships and actively anticipate and manage vessel movements within the Channel. By actively playing out all the traffic scenarios, the Chanel Authority can balance when vessels need to start and stop to allow various vessels to transit through the Channel. The Channel also continuously broadcasts traffic reports, similar to traffic reports at major cities, identifying vessels by direction through the port and various conditions. The system in the Kiel represents one approach needed in the U.S., where the user gets information on vessel, traffic stream and operations to the benefit of all.

The operator sees many different items – time distance, database information on the vessel, crew and cargo, as well real time information on water conditions. The authority models the whole traffic system before assigning any vessel movement, similar to string diagrams used in the railroad networks in a Time – Distance display. The location along the channel, as well as location information about locks, bridges and ports/terminals along the channel, and passing areas are identified on the top three horizontal lines. The Kiel Entrance is located on the left, and the Brunsbüttel entrance is on the right. All vessels move diagonally from the point of entry to the expected departure point. Any ship that may provide restrictions is flagged as a red line, while narrower vessels are represented as a black line. Red Circles indicate where traffic will stop if necessary. The three lines refer to the all the ports where one can embark or depart along the channel. There is a time line (horizontal red line), representing both previous (above the line) and anticipated movements (below the line).

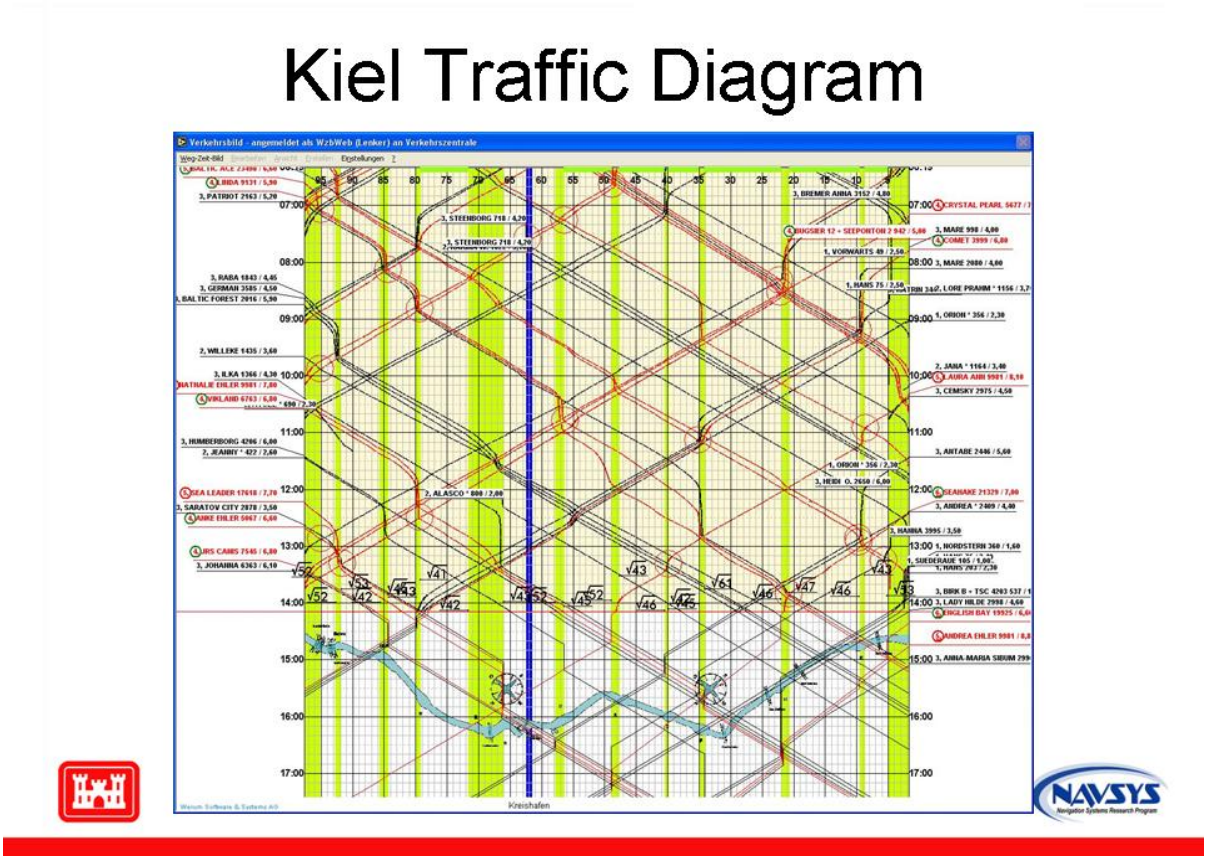


Figure 21. String Diagram Used to Plan Vessel Movements along the Kiel Canal

Technical Session 6 - PIANC Activities – Port Management In Europe

This Section provided an introduction to the current work of PIANC's Inland Navigation Commission (InCom). Two recent working group updates, Working Group31 - Inland Port Management) and Working Group 32 - Performance Measures were presented.

Moderator
James R. McCarville, Port of Pittsburgh Commission

Inland Navigation Commission Overview,
Ian White, Ian White Associates

Organization and Management of River Ports, Port of Paris Profile
Yves Morin, Port of Paris

Performance Indicators for Inland Waterways Transport,
Reinhard Pfliegl, Ph.D., AustriaTech

- Performance indicators, developed across modes, may assist decision makers in understanding modal use,
- Port management is evolving, as firms are more interested in investing in transportation facilities while the public sector seeks to use private investment to improve maritime facilities,
- Port management structures are diverse, but have clear implications regarding terminal development and operational format,
- PIANC InCom seeks to provide international guidelines on navigation related activities.

1. Inland Navigation Commission Overview

InCom is the Inland Waterways Commission of PIANC, which seeks to understand inland navigation activities. InCom's members come from many nations: Austria, Belgium, Canada, Finland, France, Italy, the Netherlands, Spain, Sweden, the United Kingdom and the United States. InCom is aggressively seeking to add members from developing countries to serve on InCom and the working groups.

PIANC's main work occurs through Technical Working Groups, which consist of experts nominated by member nations to research and develop state of the art guidelines for the practitioner. There is a role for PIANC to serve as a forum for dialogue, communication, networking, and in sharing common standards in both a scientific and a pragmatic manner. Because of the very common issues related to vessel operations, cargo tracking etc., this could lead to some degree of common standards across both the Atlantic and Pacific Oceans. Furthermore, many can benefit from learning what others have attempted in the past and in developing pragmatic solutions related to navigation projects.

Currently, there are six active Working Groups within InCom, which are presented as follows. Other related InCom work areas include innovative cargo vessel design, safety of inland navigation, alternative bank protection measures, and fish passage design.

InCom 27 – Guidelines to Reduce Environmental Impacts of Vessels. The objective of the working group is to collect, evaluate and develop a set of guidelines on methodologies available for quantifying physical effects at temporal and spatial scales pertinent to ecological endpoints and to recommend management guidelines. The report, soon to be released, focuses on the relationship of the environment to vessel operations, a very timely topic. Lead by Germany, the report seeks to understand how to mitigate environmental actions resulting from scouring, vessel wash, etc., on inland water systems. This report should provide more information for having effective discussions between environmentalists and inland navigation interests. This report will assist in defining what the true impacts may be from vessel operations for such discussions, and consider the emissions, traffic and other tradeoffs related to environmental impact.

InCom 28 – Developments in Automation and the Remote Control of River Works. The aim is to organize and exchange information on the international experience in the area of automation of river works (dams, locks, mobile bridges, etc.) and the remote control of these facilities. Given the very high costs of staffing structures, remote control through innovative technologies may reduce labor requirements while increasing lock availability. Lock availability and system capacity will remain a critical component that may need to be more aggressively managed in the future. The study is expected to be released next year.

InCom 29 – Innovations in Navigation Lock Design. The objective is to establish a comprehensive review of the modern technologies and findings of recent research used to design and build navigation locks since the last PIANC WG report was published in 1986. The paper seeks to highlight recent projects while examining guidelines for the design stage and also to consider maintenance and operational requirements. The study also hopes to consider ways to improve lock operations with either new or improved structures. The WG's goal is not to condense all the available data within a single report but to provide a comprehensive list of all the available references. These references have to be evaluated, compared and critiqued by the WG in order to give engineers, designers and authorities a reference guide allowing them to access relevant information to solve to their problems.

InCom 30 – Inventory of Inspection and Repair Techniques of Navigation Structures. The work will consist of collecting and compiling information on the methods, tools, materials, and equipment that are used in the preservation and maintenance of these structures. The study will also examine ways to assess risk, so that comparisons between structures can be estimated.

InCom 31 – Organization and management of river ports. The objective is to analyze the public and private partner roles and missions at river ports around the world. This working group will collate the different practices and inform PIANC members about current state-of-the-practice in the organization of “port systems”. Lessons learned in this collective data will provide very practical information on evaluating effective port development related to river transport. For example, the report will present useful references for port authorities in fields such as safety on

the river, or ownership of logistic areas, etc. It will be also useful for private companies, which are looking for new fields of development in the port area.

InCom 32 – Performance indicators for inland waterways transport. The objective of this working group is to set common definitions, standards, and measurements to encourage industry-wide adoption of harmonized performance indicators and best practices to improve performance within the inland navigation industry. This working group seeks to gather input from the entire logistics chain to define what are important expectations and metrics for performance on inland waterway systems. Performance measures may be one method to encourage the use of waterways by shippers.

2. PIANC InCom WG 31 – Organization and management of river ports

PIANC's interest in ports is driven by a need to understand the economic and political options related to port operations. PIANC Working Group 31 began with a broad objective, to examine river ports and their wide range of management structures, understand the efficiencies of the various port structures, and finally to identify the relative strengths and weaknesses of these port management structures. The report hopes to develop tables representing the various port management structures by sector, such as private port authorities, waterside factories, quarries, and maritime companies.

Various models exist for managing terminals and port complexes, including varying degrees of public and private participation, with each party having different goals. A local authority may develop the port to provide local job opportunities and tax revenues. State agencies may want to control land use by keeping some land in the maritime industry instead of going to other non-maritime activities, in addition to creating jobs and taxes. As an example, often the port serves as the historical center of town, but also as a potential economic or cultural asset so there may be a desire to keep maritime activities located within that area. Currently in Europe, there is a focus on privatizing port facilities, primarily to provide opportunities for reinvestment in a port area without expending public funds. These firms are responsible for arranging their own maritime activities for their own cargo but they may also provide opportunities for other cargos. There have been examples of seaports or other deep-sea shipping investors setting up inland ports or a rail or logistics operator in charge of a multimodal hub, both wanting to develop inland sites for distribution and to manage inland transportation networks.

So far, the working group has held several meetings in European ports and hopes to learn more about U.S. ports with this visit. Other elements will be developed as the study group continues its research. The Working Group seeks to understand how the various forces may potentially reshape port management options in the future.

Table 1. The Following Ports Considered by the Working Group:

Visited	*Planned Visits*
Paris – France	Pittsburgh - USA
Duisburg – Germany	Memphis -USA
Basel- Switzerland	Luxembourg - Luxembourg
Vienna – Austria	Rotterdam – the Netherlands
Krems – Austria	Strasbourg – France
	Londres – United Kingdom
	Belgrade - Serbia
	Liège - Belgium

WG 31 sees a need to look across ports to understand how the system can be improved. Based on these preliminary visits, the working group proposes some major section headings. The major section headings are: Land Ownership, Status of Port Management Establishment, Land Use, Real Estate, Infrastructure Ownership, Superstructure Ownership, Land Leases, Rail Transport, and Key Factors for Success.

The Working Group recognizes that land ownership determines the port's operational and financial structure, but most ports in Europe are, and have been, historically owned by the public sector. There exists little private ownership of ports, although private terminals do exist. State ownership has served to reduce the loss of land for non-maritime activities, and this provides land as a future transportation buffer. There is a move towards more private-sector leadership. Ports are managed through a mix of private and public facilities, which can lead to different operational approaches to develop the port traffic. The scope of the port operation does reflect the level of government involvement. For example, the Port of Paris is managed by the French Government, which results in a broader national focus, while other ports, such as Basel, are managed completely by the local government. Divergent perspectives may create additional tension between other groups within the region or lead to limited development to accommodate other national development needs.

There exist more private sector ownership options today than in the past, as more private terminal operators want their own dedicated facilities. There are more firms interested in operating in the port area (shippers, river operators, global logistics firms, and local operators).When a river port or terminal is operated by a company handling cargo for other companies, its scope and interest tends to be very broad, and considerations for logistics and market access are critical. River ports and terminals operated for their own cargo tend to focus only on access to local community and transportation networks once the cargo moves to/from the water. Finally, a port may focus on developing into a full service logistics center, of which barge traffic may be only one part of the overall development of an inland logistics center.

Most hard infrastructure (rail, roads, quays, and platforms) is owned by the public authority. There are exceptions, as ports in Paris, Duisburg, and Basel are operated by lessees. Railroad facilities are owned by the appropriate national railroad operator (in Europe), the port and the lessee, depending upon its location and function in the port area. The lessee would own or maintain the railhead in the terminal, the port may own the short tracks needed to access the port's terminals, and the railroad would be responsible for the main line and principle terminal.

The Working Group is seeking answers to many related questions. First, what are the key factors for success in inland port areas? Do inland ports want to have better state control of maritime land, or more private influence for better management? Is there one port management model that may provide guidance for other ports, regarding how to attract logistics companies and create permanent long-term leasing of ports? How can ports attract logistics activities, which not only generate additional traffic and create jobs, but could also weaken the relative position of the Port Authority to determine its own development? Finally, what is the mix of leasing options that will provide the most flexibility for space to attract new customers into a port area?

3. PIANC InCom WG 32 – Performance Indicators for Inland Waterways

InCom Working Group 32 is relatively new, seeking to look at the operational needs of waterway users. PIANC believes that modal performance measures have the potential to assist in global supply chain management schemes. The same performance measures may show capacity, reliability and application for intermodal transport decision makers, while also showing compatibility with other modes. There is also a need to put advanced transportation systems into the inland waterway transportation system to ensure the system becomes or remains a viable mode for shippers. The ability to develop and report information on river transportation consistent with other modal indicators will be a major focus of the working group.

There exists a need for waterways to be considered a component of the global supply chain. By focusing on capacity and reliability, performance measurements can be used in identifying system use and methods related across different modes to provide information to the supply chain manager to design their supply chain related to costs, reliability and risks. These performance indicators can utilize data collected from the transportation network itself to outline the use and characteristics of the waterway system. As such, these performance measures should also include comparisons to other modes in a manner that provides some degree of accountability, recognizing that different routing choices exist. For any routing choice, different sections can be used. The industry can determine its routings, etc., based on this common framework of data on risks and reliability. This additional information would satisfy a missing gap currently available to logistics professionals to understand system operations across modes.

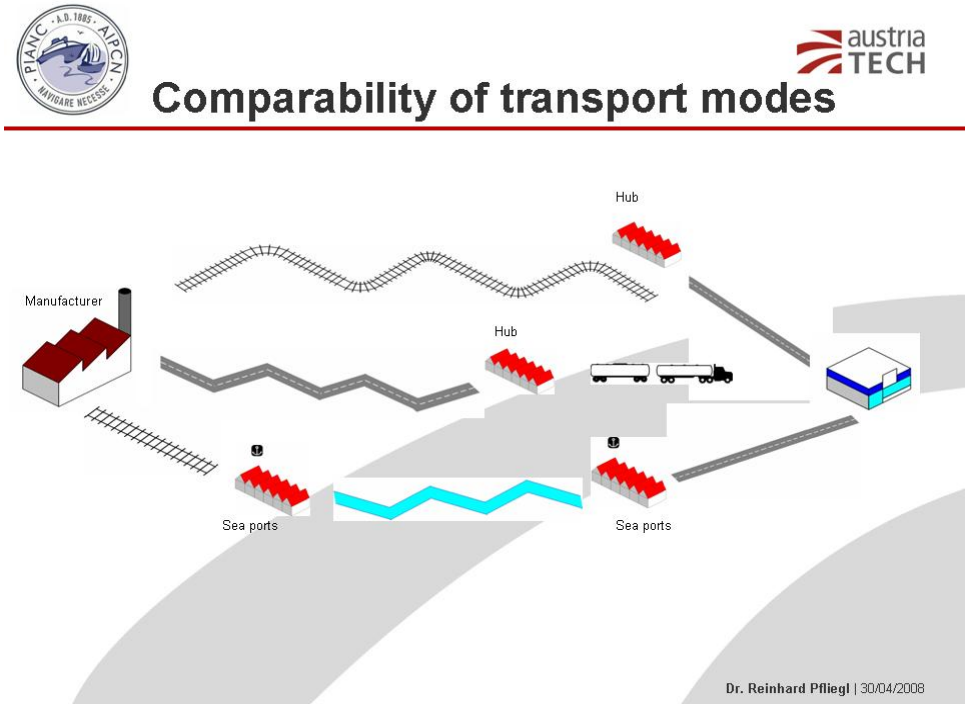


Figure 22. Comparability of Transportation Modes in a Supply Chain

The model and data must be neutral to provide information that is believable and accepted to manage costs and risks. The related tools that are processing the data must be transparent and verifiable. Performance measures must also be SMART – Specific, Measurable, Attainable,

Realistic, and Time-Sensitive. As a supply chain is generally designed to operate for several years related to the product's life cycle and the associated investment in plants and equipment, the system does not dramatically change everyday. Inland waterways must be included in the discussions early in the framework to serve as a potential alternative mode. This requires that measurements be developed in a consistent framework, based on measuring what is measurable, that provides information regarding what elements should be controlled, and effectively meet user needs.

There exist a variety of areas that can be considered in waterway performance indicators:

Mobility and reliability can focus on average travel time and some basic coefficients related to travel variability,
Cargo and Passengers may report on tonnages and number of passengers,
Safety and Security report on the number of accidents or related exposure risks,
Integrated Computer Transportation Systems outlining investment in River Information Services to manage and control waterway traffic,
Environmental indicators may include information on emissions by mode or number of people subjected to noise pollution,
Economic Development could estimate the number of related jobs,
Long-Term Costs Efficiency may report on life cycle costing as well as traffic use by equipment/terminal type,
Facilities and Infrastructure could report on the number of weirs or percent of vessels in good service,
Ports may include information on capacity, facility type and years of service.

Performance is a vital and ongoing process that must be managed. The Performance Management Cycle (PMC) is a closed cycle that contains six successive stages. The first step, identifying the critical areas of performance, provides the framework that requires additional data and tools to provide the necessary report to assist in decision making. The second step focuses on establishing the benchmarks themselves that will be used to determine if the desired outcomes can be estimated and reported. The third step seeks to develop the information systems necessary to generate the appropriate data in a timely manner for reporting purposes. The fourth step reports and interprets the information to identify improvement needs to meet the desired benchmark. In the fifth step the firm makes the appropriate changes based upon the performance information. The sixth step revises the relevant benchmarks and/or data needs to ensure the strategy can be evaluated over the PMC. All benchmarks and data collection strategies have to be revised on a regular basis to maintain a high quality performance management system.

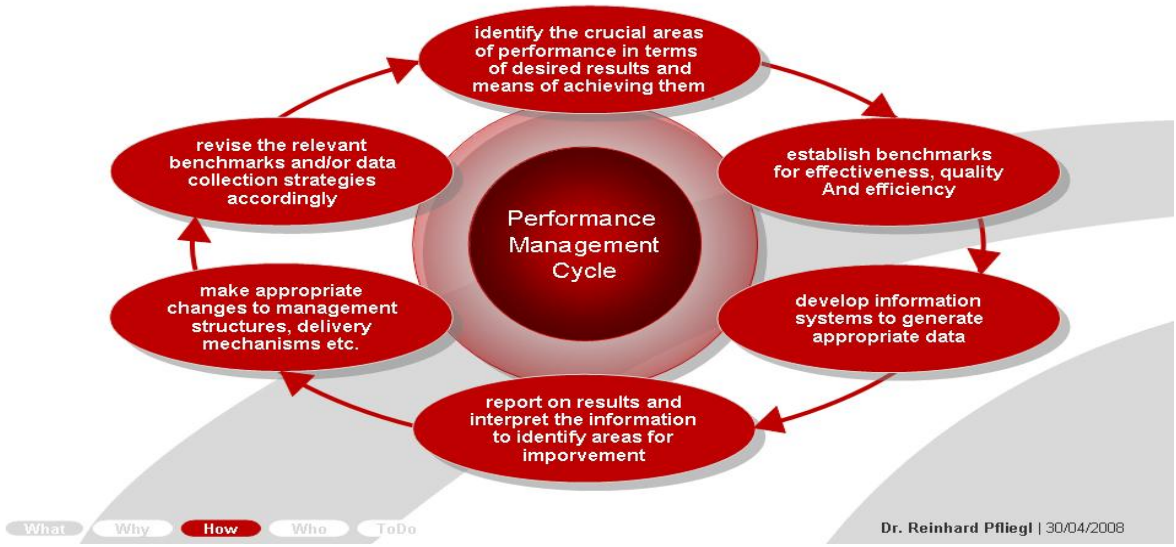


Figure 23. The Performance Management Cycle

Performance measures exist for other modes. The Air Freight industry may examine the cargo received by a forwarder or broker. The firm may examine the average on-time delivery of cargo, the quality of broker's paperwork by the number of missing documents or uncompleted forms, etc. For the trucking industry, a few examples may include comparisons between forecasted costs and actual costs, the average road user costs, and user satisfaction with the road system. For rail, performance measures may report information such variables as on-time train performance, safety risks based on accidents per million train miles, and network delay. The United Parcel Service uses social indicators to reflect its accountability to both its customers and its staff, through reports of injuries per 200,000 hours and charitable contributions as percent of profit. Finally, environmental indicators may include emission estimates by mode, including emission of greenhouse gases, or the average fleet age. Across all transportation modes, there appear to be some potential common elements, but no set framework has been developed to date.

The Working Group has outlined its main tasks through its Terms of References (TOR) to PIANC and identified the need to improve the overall performance of the Inland Waterway Networks by setting up common definitions and measurements. These efforts must be encourage industry adoption, so that both the navigation industry and other users will find the performance measures helpful in determining the capacity and reliability of the inland waterway system. The developed benchmarks must be integrated into a six-step process to provide some manner of developing and validating criteria related to indicators, data and tools, across various waterway segments. The Working Group's goal is to publish a final report by fall of 2009, but some

intermediate reports may be published during 2008. The intermediate reports will be very important in understanding what tools and data are necessary for implementation, especially related to questions on the availability of River Information Services, to provide broad performance measures.

Technical Session 7 - Future Challenges To Industry

This Section focused on the dynamics that are shaping the future of inland waterway navigation. If navigation is to be considered a reliable and efficient mode, an understanding of the operational needs, as well as the economic drivers, shaping the industry must be understood. Three views are presented: discussing the research needs necessary to improve operations, which included software being used in Belgium; how barge companies are looking at services to attract and retain cargos; and finally the role of inland ports to support cargo and economic development.

Moderator
Larry "Butch" Brown, Mississippi Department of Transportation

Software Tools for Lock Planning,
Pascal Verlinden, TINC Associates

Transforming a Barge Company into a Transportation Company,
Michael Ryan, American Commercial Lines

Future Research on Inland Navigation—A European Perspective,
Michael Fastenbauer, via donau

The Role of Deepsea Ports to Inland Ports,
Don McCrory, Port of Memphis

While the topic is fairly broad, some main themes appeared during the session:

- Barge companies must be "more" than barge companies, they must be 21st century logistics firms, by becoming more customer focused,
- Inland and coastal ports must work together to attract and retain business along the waterways,
- Ports should work on securing what is best for the customer, not the port, to ensure the system benefits from shippers committed to making waterways a reliable transport mode,
- New software and planning tools exist to improve lock planning and channel performance,
- European Policy Directors are aggressively funding research on inland waterway innovations to ensure the EU maintains is competitiveness in the future.

1. Barge Lines Transforming into Innovative Transportation Companies

Many shippers do not recognize waterway transportation as a viable alternative and not aware that barges can be the most economical, fuel efficient, and environmentally friendly mode of transportation. There are many opportunities for barge lines to expand into new markets, but current conditions of fewer barges in operation and slack capacity will require an increase in equipment velocity. The inland waterway is similar to a railroad network, and looking at it this way requires a new focus on cargo seeking to move, not sitting idle. Barge lines should "go after" a percentage of the shipping base - say 10 to 20 percent of it. With this more modest approach, waterway transportation can be attractive to shippers and transportation agents who must cut transportation costs to generate revenue for other business areas.

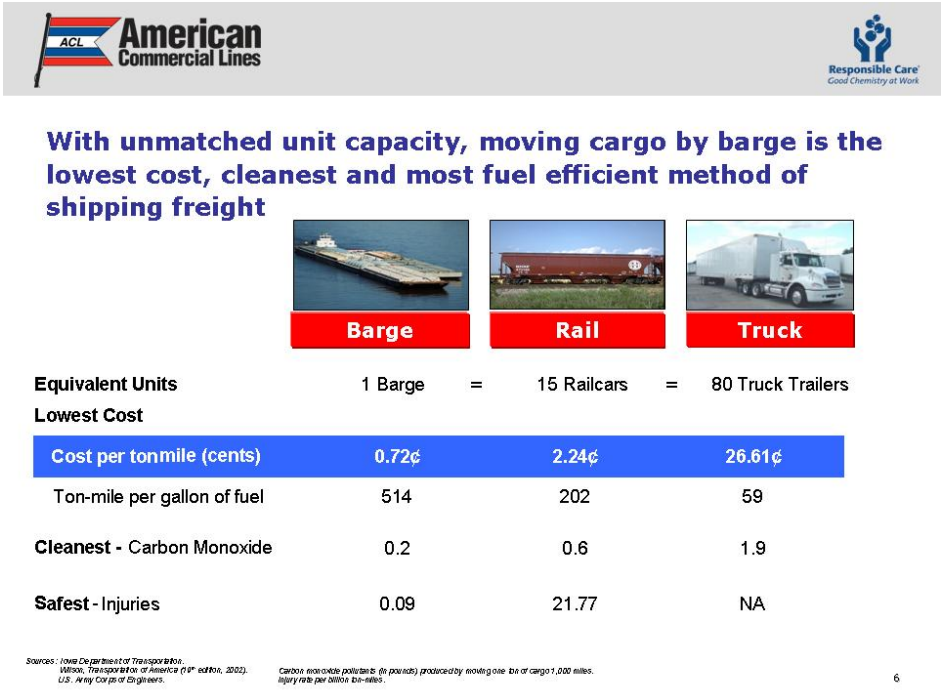


Figure 24. Modal Comparisons for Costs, Emissions and Safety.

American Commercial Lines (ACL) is transforming itself from "just a barge company" to a transportation company. (ACL has two business lines: a transportation division that operates barges and a manufacturing division that builds barges.) Two years ago, the level of production at JeffBoat, ACL's manufacturing division, was one fourth of today's levels. This was before JeffBoat began focusing on lean manufacturing, resulting in more reinvestment into facilities and the work environment. ACL's Core Values are Safety, Customer Focus, Innovation, Integrity and Value. Customer Focus was not on the list five years ago, but ACL, like other transportation companies, is moving from an internal focus to an external focus. Transportation service providers need to avoid the trap of feeling good about things, which can lead to losing business when shippers begin to feel forgotten. Without the customer, there is no need for barge operations. Shippers must be able to identify some tangible value to using the waterway system.

ACL wants to work with more scheduled shippers, as these customers operate more consistently throughout the year with less seasonal variability. However, these shippers want to work with service providers and transportation partners, not "just barge companies," to ensure that they are receiving the level of service they expect. The long-term future of ACL depends upon focusing on three broad areas: achieving current potential, organic opportunities with existing services and markets, and inorganic growth from innovation and new opportunities. Goals include development of manpower, equipment utilization, and environmental standards. The focus on inorganic growth will lead to the development of new markets for the inland waterways. Developing service schedules for these new markets will be critical, as they currently depend upon reliable scheduling. Eighty percent of ACL's business moves between Baton Rouge and Cairo, operating much like a trunk line in a rail network. Even with on-time schedules, the model depends upon equipment moving to remain productive. For example, cargo that moves 15

days, sits for 10 days, and then moves again is too inefficient to spark future growth along the waterways. Once service schedules are developed, ACL will seek to attract more business, as well as support its current customers, as a reliable transportation service alternative. Partnerships with other transportation companies will be critical to maintaining reliable service.

Identifying shippers' needs remains critical, more so as various groups are imposing standards related to exposure and risks throughout the entire supply chain. ACL, as a member of the American Chemistry Council's Responsible Care© Partner program, seeks to provide environmental compliance and safety for hazmat shipments, normally a distinction given to rail and trucking operations. The waterways shipping industry has a responsibility to seek recognition for its achievements in safety and environmental stewardship and to develop customer service and sales forces that provide shippers with the services and guarantees they require.

Containers on barges and door-to-door shipments of specialized exports represent new business for the inland waterways. Assuming that waterway traffic is a blank slate, a solid base of commodities operating within the system would be a good starting point for envisioning the industry's future.

2. Future Research on Inland Navigation—A European Perspective

Current EU policy remains very committed to developing inland waterway transportation for environmental reasons, but there is a new focus to ensure Europe's international competitiveness. The 7th Framework Programme for Research and Technological Development of the European Union (FP7), places a bigger commitment, and with more countries than in the past policy cycles, to improve waterway operations. Current EU policy considers FP7 will assist in maintaining the EU's leadership in the global knowledge economy. The main activities must create European added value by operating in a trans-national framework, beyond traditional national research programs, to ensure collaboration with research universities, labs and the private sector, to the benefit of all.

Given recent improvements in European Road and Rail systems, waterways must be innovative to remain competitive, but challenges exist. Waterways also recognize that they need to maintain a niche in the global competition framework while overcoming aging fleets and infrastructure challenges. Areas of research must include River Information Services and new vessels and structures that could alleviate or improve these operational challenges. The sector cannot look inward, but must explore possible technology transfers from other transport sectors, such as an improved proposal from deep-sea ports and vessel operators, engines and exhaust treatment from the automotive industry.

With support of the EU, the "Waterborne Technology Platform" has been established as a forum where all stakeholders from the waterborne (sea and inland) sector define and share a common medium and long term vision of the development of the sector. The Waterborne Technology Platform focuses on discussing the needs across the various users to create a common vision for the year 2020, and developing a strategic research agenda and implementation plan to meet that goal. These three elements are then incorporated into the EU FP-7 program. The three priorities

are: 1) Safe, sustainable and efficient waterborne operations; 2) A competitive European maritime industry; and 3) Manage and facilitate growth and changing trade patterns.

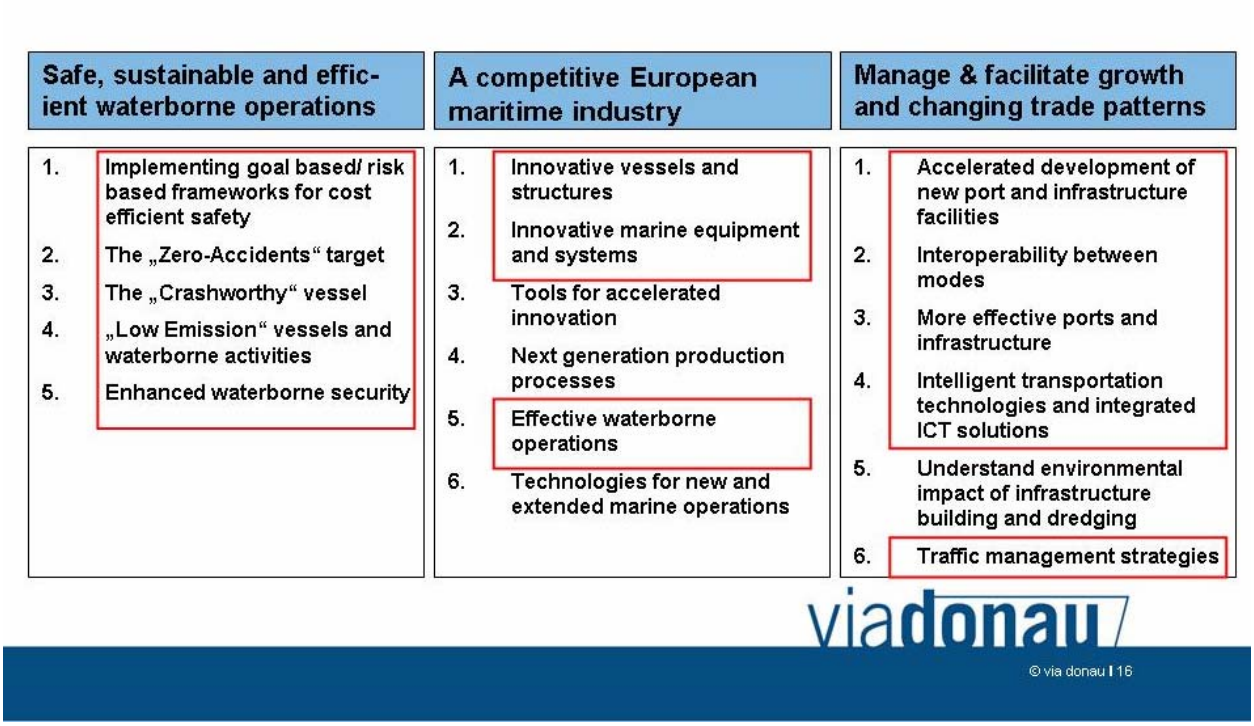


Figure 25. Waterborne Research and Development Needs

Waterborne platform priority research should identify both short and long-term needs but also consider a wide spectrum of activities. For example, inland waterway currently provides environmental benefits when compared to other modes. Although roadway emissions are growing at a greater rate than maritime emissions, road transport is making the required investment to burn cleaner fuels. Does this mean that the inland waterway operators should also focus on using low sulfur fuel to remain environmentally “friendlier”? Further, the inland community recognizes a need to provide information for non-technical specialists. The creation of the “Inland Navigation e-Learning System”, INeS, serves as a free, web-based “e-Learning” system to raise awareness of inland waterways. INeS presents information relevant for teachers and new intermodal professionals through various programs related to waterways, inland vessels, ports and terminals, RIS, market organization, intermodal IWT, and policy and law. The information is posted on the INeS website (http://www.ines.info). In sum, EU recognizes research on IWT becomes critical for meeting EU goals, preformed in a collaborative and systematic manner.

3. Lock Management Software

TINC Associates develops software and systems related to traffic management and logistics. Recently TINC developed a lock management system called FlexiLock. FlexiLock program provides information to traffic controllers by assisting in the planning of vessel movements and voyage slots. This program was developed by the Belgium Flemish waterway authorities to provide River Information Services to provide harmonized information and improve operations.

Because of the transference of information from the vessel to the traffic controller, a harmonized system to improve efficiency and safety can be developed for a local port or channel. The software can provide a traffic simulation overview, including an automatic identification of vessels and facilities, locking process support, automatic advice for planning, registration of actions and times. For other users, the system can develop statistics as well as be integrated with other management or decision support tools, as the software platform is highly configurable to allow for data and operational information to flow between various users.

A demo of the FlexiLock system was presented regarding the management of the Albert Canal in the Antwerp area. The canal was built between 1930 and 1939, and became operational in 1946. It is 149 kilometers with six locks and three chambers. FlexiLock is developed from local information, outlining port areas, terminals, turning basis, etc., to identify all navigation obstructions or operational constraints. FlexiLock also incorporates river draft and wave height to ensure safe navigation. The platform depends also upon understanding vessel traffic patterns, including operational speeds and other operational metrics. For a given vessel, from its current position and speed, the software allows the traffic controller to predict trajectories and to recommend various actions. The traffic operator benefits from a system view of all vessels moving upstream and downstream, including information on the vessels estimated arrival at a lock.

This collected information is combined with other maritime information to ensure the vessel can move through the lock system. All vessel information is configured to ensure a seamless AIS data exchange occurs (the user can also input vessels not registered with the system). The system is very flexible, allowing for different lock and canal configurations to be used. The system also integrates information from VTS systems as well as from each lock to ensure that the vessel and the lock are both notified when a vessel can move into a lock. The resulting vessel information can be stored and processed at off-site processing centers to generate lock plans or other planning and operational decisions.

4. Linking Inland Ports to Coastal Ports

Memphis operates like most ports, with the only difference being its relative volume and location. Although not every port has the same input or outbound production, all can potentially handle many types of inbound and outbound cargos. Differences exist between the relative inbound and outbound shares among the larger ports in the Mississippi-Ohio River System. For example, 74 percent of Huntington's traffic is outbound while 48 percent of Pittsburgh's cargo is inbound. 82 percent of St. Louis's cargo is outbound, while for Memphis, inbound cargos account for 73% of all shipments. The difference between ports is sometimes based more upon time and freight costs to serve the industries that require that service profile. Memphis benefits from its proximity to the interstate system and the city is served by five class I railroads. One of the largest benefits to the Port is that there are no locks and dams going to New Orleans, resulting in larger tows on the river.

The world market needs to connect to inland ports, and the deep-sea ports remain the critical element. Deep-sea ports have greater volumes of cargos moving to and from the world markets and the growing consumer markets are actually at the end of the deep-sea ports. The deep-sea port advantage is that at least everything will be in one deep-sea ship, not pieces of barges or equipment as in the inland system.

The modal decision is really based on how important time is to the shipper along the corridor. Memphis can reach a deep-sea port within 80 hours by barge when compared to 24 hours by rail or 8 hours by truck. This does not mean that inland ports always look at water as a solution, but try to work with the shipper to work not necessarily on rates, but on getting the best transportation service they can get. The port is more concerned if there is a slow down in one mode, not necessarily just waterways, as ports also serve as a local catalysis for economic development. When considering new plant locations, more companies want to have an inland waterway option, as evidenced by NuCor which now always locates new plants where water, rail and highway access are available.

But inland ports must also look at working with other modes to develop potential services. The Port of Memphis is working with the Port of Prince Rupert, British Columbia, to develop a new intermodal network. Trains will depart from Prince Rupert, and working with various railroad operators, will move cargo eastward through Chicago into Memphis for distribution in the Southeast. It is 96 hours from Prince Rupert to Chicago, which is actually one day closer when compared to an intermodal movement from California to Chicago. The 96 hour movement from Prince Rupert to New Orleans is slightly more then the all water movement from Memphis to New Orleans. This may represent a new opportunity for Memphis, as containers may be repositioned onto barges and moved via waterway to other port areas. Memphis had to develop the experience with container on barge, some through transloading, before the port could really develop into an inland container facility. Ports must work with Third Party Logistics firms (3PL's) to ensure the port "gets out of their old mold of operations".

For both deep-sea ports and shallow water ports, there exists a need to develop common marketing opportunities, to sell themselves as part of a larger transportation system. Memphis has these relationships with New Orleans and Baton Rouge, and tries to work with other ports.

Inland ports also need to work with the 3PL's to raise the awareness about waterways as remain a viable option for certain shipments. When compared to coastal ports, inland ports tend to be located closer to production or distribution areas. For example, Memphis can reach 60% of the consumers by truck overnight and within 3 days, serve the rest of the country. As evidence of its geographical location, Memphis averages 1-2 Chinese groups a month at the port, visiting simply to know how the Port of Memphis conducts business and what markets the port serves.

Ports should also actively understand potential customers' needs, rather than forcing them into the port. The competition between deep sea ports can be very tough, as there are limits in securing large leaseholders. Most inland ports are landlords, focusing on terminal use and leases, so the inland ports tend not to be as aggressive as coastal ports. Inland ports should be more cooperative, seeing the need to share some cargo with regional ports, but let the market determine where the cargo should go, not directing the cargo through a certain terminal. It does not really work to have someone feel they are forced to the inland port, as they may be hesitant to use that service or expand their current operations if the port did not really listen to their initial request for services. In this manner, the inland system can offer the world more transportation options, if the focus is on working together.

In the end, Memphis is only as good as the deep-sea ports that connect to the Port. Both the deep-sea and inland ports need to work on common marketing, as well as linking hinterland connections. Ports need to think about how they work in a global competitive structure, and this can serve a key to developing international trading opportunities within the U.S.

Technical Session 8 - Town Hall Meeting

During this session, the moderators each reported out a few interesting facts from their respective sessions. The audience was encouraged to ask questions and provide information and their suggestions concerning the Smart Rivers conference or thoughts on navigation and waterways. This section also highlights key asides made during the conference related to improving waterway operations.

Participation and Scope

- Need to get more participation from shippers, as most of participants are from the public sector, ministries of transportation, and waterways and ports. This will be critical to ensuring the correct standards and programs are developed to push navigation into the 21st century supply chain.
- Expand the scope of Smart Rivers to include participation from other inland waterways, such as the Saint Lawrence Seaways, Canadian or other developed nations or even from developing countries.
- This has been a good discussion, but there need to be champions for the Smart Rivers conference to go forward.
- Smart Rivers should work on the supporting the discussion of why inland waterways matter, and to develop a larger pool of users, shippers involved in improving the system.
- Are there ways to encourage young professionals to attend this conference?
- Need to involve international standards groups for some of the discussions related to safe commerce.
- Within the U.S., there exists no technical conference on inland navigation systems, which is a big gap, despite the number of specific conferences on dredging, etc.

Potential Research Topics or Session Topics

- The EU's involvement in how NAIADES is assisting in the development of inland waterway traffic to develop a high level discussion on the policies that influenced these decisions.
- How does the transformation of the supply chains over the past last five years change the use of inland waterways?
- There need to be better estimates of how inland navigation compares to other modes, of which performance indicators is one component. This will help tell the story of why inland navigation matters, and if not, what is needed to develop these services.
- Some discussion on new vessel designs, including high-speed inland navigation options, while expanding the technological innovation to improve operations.
- Future conferences should consider more discussions on international logistics for local ports and shippers.
- Some discussion regarding an economic perspective of combining risks and safety.
- More discussions on RIS implementation and standards.

General Observations on Inland Waterways

- While everyone agrees institutional awareness is critical, it remains difficult to rise above parochial interests. For example, there are over 200 coastal ports in the U.K., all of which are so busy fighting for cargo through their docks that they ignore the potential to work together to improve overall traffic.
- When comparing the U.S. to English navigation systems, the U.S. is examining structures that are only 50 years old, when compared to most of the structures in England which are over 200 years old but still had to meet common safety standards.
- Waterways should look at their role in the global framework as complementary, not conflicting, with other modes.
- From an environmental perspective, there exist concerns over fish passage and locks, exotic species, the need to have both shallow water for habitat versus faster water for inland navigation. There no longer exists "navigation only projects", as these projects now encompass many different things in both regions.
- There should be more focus on looking at waterways from a systems perspective, not necessarily a government or port official's perspective, to determine what innovation is required.
- The much-needed dialogue to link inland ports to the coastal ports has not really occurred in the U.S. U.S. ports should encourage, through their leases, inland waterway activity as Rotterdam requires.
- The EU seems to be more policy driven to improve systematic navigation operations, while the U.S. appears to focus on engineering based solutions at the critical chokepoints in the system.
- The U.S. should consider looking at the use of externalities in the Benefit/Cost ratio. Omission of these may be leading to an undervaluing of the asset.
- If the U.S. used ton-mile as a performance measure in examining system use in addition to travel savings, it may result in more non-highway projects being considered for national transportation funding.
- No longer are waterways isolated. While the vessel itself may not cross oceans, the cargo does.
- In the U.S., environmental issues are always treated in a reactionary, contentious, and ad hoc manner. There appears to be no focus on trying to develop a common framework for sustainable navigation projects.
- There needs to be more industry involvement in explaining the decision-making process of logistics and navigation improvements, especially to the non-technical specialist.
- The U.S. does not have the same proactive focus that exists in Europe regarding inland navigation, as there exists no framework to improve productivity and reach expected outcomes.
- The Inland Waterways community needs to educate people as to the value of waterways to the nation.
- The irony is that shippers do not seek to necessarily improve the navigation system, as they depend upon the navigation industry to improve itself by learning from other regions and activities.

Sean T. Connaughton - Luncheon Presentation

Maritime Administrator, U.S. Maritime Administration

Promoting America's Marine Highway

Today in America, most people see congestion and truck volume as a national transportation problem. The challenge is that they do not even think about the waterways as being a part of the U.S. transportation system.

While domestic transportation is also moving along the system, much of the growth of traffic along the main port areas and interstate routes such as I-10 and I-95 reflects the nation becoming more dependent upon international trade. The growth in international trade will also lead to an increased focus on ports and port development, which may result in a focus on the development of new facilities and alternatives, such as container on barge or Short Sea Shipping. Freight transportation is growing fast, but so is the cost of transportation. The U.S. Department of Transportation's National strategy seeks to reduce congestion by focusing on urban partnerships, public private partnerships, corridors of the future, reducing border congestion, reducing Southern California freight congestion, and increasing aviation capacity. Many people do not even consider the inland waterway system as part of the freight system, despite the need to expand the linkages between fast growing coastal ports and inland markets.

The nation should be going back to the future, and focus on the waterways, which provided the backbone of America's transportation system. Even here in Louisville, the proximity to the Falls of the Ohio lead to the development of Louisville area. The City is located along the Falls of the Ohio, and prior to the development of a lock structure, cargo was unloaded from one barge and carried around the Falls and put onto a new barge to move along the Ohio River. The Administration wants to raise the perception that waterways can be used to go around bottlenecks in the system. He also said that waterways should move more cargo, and the need to incentivize this will be especially useful if new capacity can be added to an overall national transportation system which is starting to experience capacity constraints. This is important as the costs of transportation are growing faster than other costs.

The Secretary of Transportation has a freight action plan. There are many initiatives, looking at how to work with transportation corridors to improve freight performance. This also includes the use of waterways to alleviate highway congestion, not only along inland system, but also in the coastal areas and the Great Lakes. The need is to change how people consider waterways in the transportation system.

Another goal at Marad is to change how "we at Marad" think about freight issues, and what can be done to help or proactively stimulate the private sector into developing more waterway traffic. Marad supports promoting America's Marine Highway, but needs to talk to the industry to evaluate what Marad is doing right, what do we need to do to improve the system, and what can be done to improve operations. There are examples. Clearly, the Osprey service has been very successful as well as Columbia Coastal along the East Coast. The Cross Sound Ferry in New York represents as another potential Marine Highway project. This service operates in the Port

of New York to Connecticut. This is expected to reduce up to 25,000 truck movements a year, saving a 200-mile round trip and 10-15 hours per trip, while generating fuel savings and emission benefits and also overcoming concerns over driver shortages.

There are barriers to success, and the following list mainly addresses coastal services: the competitive disadvantage of the Harbor Maintenance Tax, the 24 hour advance notice rule, and the additional fees for lifts, and other actions. There are some policy considerations about removing the Harbor Maintenance Tax for coastal shipments moving on container on barge. There exists a lack of awareness concerning Marine Highway benefits, such as the availability of existing financing for new investment, the ability to partner with state and local authorities. Also, the shippers and carriers need to understand how to use these new services, if offered, as well as support the need to reinvest in adequate port infrastructure. We need to focus on the handling of waterway assets, while promoting the benefits to the environment and the reducing of emissions.

Marad is also looking at increasing shipments on inland waterways by the U.S. military, especially given the fact that certain installations are potentially accessible by inland waterways and inland shipping is considered a secure method of shipping certain cargos. In the future, the marine industry's biggest challenge may be simply the loss of land accessible for maritime use, to uses such as condominiums or shopping destinations at the water's edge. For some areas, environmental issues are actually the real issue, not transportation activity or economic activity, that is restricting port and vessel development.

What is Marad doing regarding changing perceptions about using inland waterways? Marad sees that success in developing new inland navigation opportunities ultimately involves changing the shipper's perspective. Shippers are looking for a transportation system that is redundant, with adequate labor and no congestion, but costs must be competitive and services must meet expected performance. Recently, several shippers are thinking about system redundancy, primarily in response to the West Coast port shutdown, but also other national disasters. The hazardous cargo shippers seem very willing to discuss inland waterways, considering costs and security when compared to truck shipments. Marad has also worked on local governments, especially local governments and Metropolitan Planning Organizations (MPOs). MPOs, funded by federal, state and local funds, are responsible for improving transportation within their region. As such, MPOs exert considerable influence on freight infrastructure development and are interested in looking at maritime operations to alleviate bottlenecks within their specific regions.

Marad wants to engage various groups across the navigation community. Marad sees a policy timeframe associated with current legislative cycle that will fund Marine Highway programs, potentially up to $2 million in construction loans. Marad produced a promotional video entitled "The American Marine Highway". In our recent agency realignment, we have set up 10 gateway offices in our largest port cities, such as Seattle and Miami. The Agency is engaged in ongoing talks with the Environmental Protection Agency, as well as talks with local groups to ensure that local support exists for maritime projects, and to have local groups consider the legislation and regulatory issues necessary to encourage the use of water resources. Marad is working with the I-95 Coalition on studies on improving freight movement along that corridor. Marad is also working on cross-border problems especially with the Mexican Government.

By building the Marine Highway, Marad hopes to contribute and participate in expanding freight systems, while providing economic growth and job creation, and increasing opportunities for public private partnerships. Overall, everyone sees that congestion will only increase over time, requiring shippers and carriers to examine new modal alternatives. Marad sees opportunities in promoting waterway use, but this depends upon some role of the federal and local government considering ways to providing assistance, without direct subsidies, in developing or expanding inland navigation or coastal domestic movements.

Major General Don T. Riley - Luncheon Presentation

Director of Civil Works, U.S. Army Corps of Engineers

Inland Waterways for the 21st Century: Developing a Common Vision for Uncommon Success,

This is an interesting time to be in water industry. In the United States, most of our infrastructure is exceeding its design life but the future of the inland navigation infrastructure reflects a larger problem. Twenty years ago, the American Society of Civil Engineers issued a report that ranked total navigation infrastructure as a "B". Today, total infrastructure ranks as a "D" and navigation infrastructure ranks as a "D-". We received a grim reminder of this infrastructure crisis last month, when the I-35 Bridge collapsed in Minnesota. The Corps operates 842 bridges, and is working with DOT to review these bridges for structural integrity.

Regarding aging infrastructure, most of our locks and dams are older than the I-35 Bridge, which was completed in 1967. Concerning inland locks and dams, 24 locks experience over two hours of delay per lockage. Of these locks, seven have average lockage delays of four hours, and three locks with average delays of six hours. These operational windows are not acceptable, especially since unscheduled downtime has doubled since 2000. Of these 24 locks, only five currently have replacement projects underway, and another five are authorized for work. This means that 14 of the 24 locks are not currently being reviewed or considered. While this is driven by financial constraints, we must do what we can, considering these delays have increased since 2000. The Assistant Secretary of the Army sees the push for more operations and maintenance within the current budget, and has even made this a priority to secure the assets we already have in the nation's navigation system.

There are other challenges, such as security, and the Corps has assessed our critical structures and identified over 250 infrastructure protection engineers. Also, the Corps must preserve our natural resources, as demonstrated by our work on the Upper Mississippi and the Missouri River. The Corps does not think it should be the only leader to justify what is needed, but it is the responsibility of the entire nation. We need new partners to go forward that focus on systems.

The approach in the U.S. is different from Europe, and here there is more focus placed on developing a transparent, collaborative process. Water resources in America are spread among different government agencies and departments. The Committee on the Maritime Transportation System represents a new collaborative format going forward, but it has its restrictions. We need to ensure the balance across the industry and to try to ensure that budgets are equality distributed across all river corridors. There is a draft national strategy for the Cabinet level maritime transportation system being vetted right now. This new format will allow the U.S. to address risks and response assessment across the member agencies. The work is to allow the agencies to look at being good environmental stewards, but also to develop common budgets across the agencies in the future. This involves some common research efforts, including developing an assessment of the current maritime system including data collection and performance measurements.

Both the Corps and the industry need to encourage innovation. There are four actions for change: the systems approach; assessment of risk; communicating risk to the public, and ensuring the highest level of professionalism. Most people only think of a river as a single entity, but in reality, its uses and expectations are very broad. The waterway demands incorporation of elements of space, function, and time and only through an adaptive management strategy can we learn how these actions can be influenced. Regarding time, we must consider the lifecycle costs of the system, including how the costs and the system will change over time, and what anticipatory engineering is necessary to correct system problems in the future. The Corps wants to develop a national maintenance standard for waterways as one way to reduce the accidents while seeking low-cost solutions on improving operations, of which the real-time current velocity system represents just one application. This will involve working with the industry on locating activities and targeted project improvements. Both the Corps and industry need to look at the sample technologies to assess what is needed.

This must also involve working with OMB to rank investments across the portfolio system. In the past, those who exercised the loudest set of lungs normally got the funding, but we must now develop methodologies that allow for an examination of the system components and the relationship of each to the whole. This forces a move from decisions based upon perceived need to strategic or tactical decision methodologies. This also provides the potential for more investment in waterway infrastructure when the justifications are understandable.

The Corps is examining the improvement of economic modeling, which would allow the Corps to have a common perspective on the waterway use, especially when the future is so uncertain. The Navigation Economic Technology (NETS) program is trying to expand the bottom-line knowledge of the economic working of the navigation system. We must improve our forecasts and linkages to the system. Corps economists need to understand how changes in the system will change when origin and destinations change. There is a HarborSym for examining coastal navigation projects, while NaSS and other studies on how shipper response is related to congestion or lock closures. Waterways are a Rubik's cube, as one item can change many different elements in a study, and the role of including tributaries makes this even more complicated. These models are not proprietary and are open for all to use, and there is a newsletter for updates. Regarding models, we may never be right as economics always need more data and improvements over time, but decision makers need to make a decision regardless of the status of the models.

Appendix 1 – The Future of the U.S. Inland Navigation System - Meeting the Challenges – Workshop Report

An interactive workshop on the future of the U.S. inland waterway system was held on Sunday, September 16, 2007 in conjunction with the (the 3rd Annual) Smart Rivers 2007 Conference in Louisville, Kentucky. This forum brought together waterway transportation interests from continental Europe and the U.S. to share ideas and exchange best practices on navigation system planning, design, construction and operation.

In a too-short 4-hour session, some 30 participants from the U.S. and Europe contributed to a facilitated dialogue and discussion of the challenges facing our vital commercial waterways. Recognized leaders in the U.S. waterway research and practicing communities presented topics on various aspects of the system, as a basis for stimulating discussion and sharing of ideas among the participants. Topics broadly encompassed the U.S. inland waterways system's strengths and weaknesses, and opportunities and threats presented for the future.

This synopsis summarizes the presentations, and discussions and contributions from workshop participants, and presents a road-map for future actions by waterway stakeholders to meet the challenges and carry the system into the 21st century.

1. Breadbasket to the World – Dr. Dennis Wichelns

After welcoming participants and providing a preview of the afternoon's events, Dr. Dennis Wichelns, Professor of Economics at Hanover College, Indiana, gave a thought-provoking presentation on the future grain needs of the Developing World, estimated at 2 Billion tons of cereal grains consumed annually by 2050. With much of this demand to be met by imports from the developed countries, Dr. Wichelns gave solid evidence that much of the needed food supply would likely come from the U.S. While current U.S. grain exports total some 90 Million tons annually, the projected 2050 figure is nearer to 300 Million tons. A robust, efficient inland waterway system is critical to meeting this pressing world need.

2. System in Decline – Mr. David Grier

Unfortunately, as the American Society of Civil Engineers' tri-annual Infrastructure Report Card has documented, the condition and reliability of the U.S. inland waterway system is in decline, rating a D+ in the latest 2006 report card. David V. Grier, USACE Institute for Water Resources, Virginia gave participants some of the insights gained over the past decade from his leading research into the role our inland waterways play in the economic prosperity of the U.S.

Waterborne transportation is, by far, the most economical and "greenest" mode for transporting bulk cargos such as grains, minerals, oil and coal, and construction products such as cement and aggregates. These cargos are handled at over 1000 terminals that line the U.S. inland and intracoastal waterways. Some 70 % of soybean exports and 62 % of corn exports, from the U.S.

move by barge. About 20 % of the utility coal supplied to U.S. power plants travels by waterway. And over 350 Million tons of petroleum products move along the U.S. waterways annually.

But the waterway infrastructure is simply too tired and worn out to keep up. More than half of the locks operating in the system today are over 50 years in age. USACE civil works appropriations to fund needed construction, rehabilitation, and Operations and Maintenance (O&M) costs on the system have declined in current dollars from $6 Billion a year in 1970 to $4.5 Billion in 2006. O&M budgets have been flatlined at less than $2 Billion a year for that entire 35-year period, so most of this funding decline has come at the expense of new construction and rehabilitation. The decline in real dollar terms is even more precipitous.

These funding shortfalls have led to a default strategy of "fix-as-fail" for prioritizing scarce funding to address the needs. In the most recent 5-year period from November 2002 through July 2007, no fewer than 15 major lock and dam complexes have required emergency repairs. Three of these arose from a major closure or industry accident. On top of the emergency repair problems, we see steadily increasing "downtime" at the Nation's locks, as unscheduled maintenance needs outpace scheduled maintenance.

3. Green Means "Go" – Doesn't It?

One standard barge "tow" (= 15 barges of 1500 ton capacity each) carries the equivalent freight of 2 and 1/4 100-car unit trains (each unit train is a mile long), and 870 26-ton semi trucks (stretching for some 35 miles over our clogged highways). The corresponding savings in fuel consumption, and associated benefits of reduced air emissions and greenhouse gases, is considerable. The U.S. citizen is missing out on a potentially large economic and environmental benefit that would be associated with switching cargos from these higher-cost, polluting modes to waterways. Why aren't the market forces driving these modal shifts?

4. The Tower of Babel – Dr. William A. McAnally

Dr. William A. McAnally, Professor and Transportation Researcher at Mississippi State University, thinks there are some very good reasons why these shifts have not taken place. They have to do with a number of factors, but a few can be singled out as the major ones in play:

- Institutional – The U.S. federal government's approach to transportation has evolved along different pathways, with a multitude of agencies having overlapping (or worse, non-intersecting) responsibilities and interests tied to a particular mode;
- Metrical – It seems that each mode of transportation has developed its own nomenclature and metrics for assessing the performance of its systems, and these metrics often do not translate well across modes (the Tower of Babel effect); and
- Professional - While there may be broad understanding and agreement among engineering and business professionals as to what constitutes "sound transportation

design principles" (e.g., safe, cost-effective, reliable, environmentally sustainable, secure…), there is no consensus on the priority or trade-offs that inevitably must be made when these guiding principles are conflicting. Does our ethical compass provide guidance on the way forward?

In response to these issues, workshop participants contributed to two brainstorming sessions facilitated by Dr. McAnally, providing their inputs on **Principles** of sound navigation design, and rationalization of **Metrics** that are used to measure transportation system performance. These exercises brought home the fact that there is no easy, formulaic approach to comparing and contrasting different transportation modes with an eye toward overall improvement of these complex systems. While we have a number of tools at our disposal for conflict resolution (e.g., legal and regulatory process, stakeholder agreement, risk assessment), two that stand out as achievable in our daily work are focusing on measurable outcomes, and following the principles and guidelines of professional ethics.

5. Consensus Works – Mr. Chuck Spitzack

After a short refreshment and networking break, at which continued dialogue on the provocative workshop topics took place, Chuck Spitzack, Regional Project Manager of the USACE's Upper Mississippi River Navigation and Ecosystem Sustainability Program (NESP) provided his insights into techniques for bringing together multiple stakeholders around a contentious set of issues and objectives.

By partnering with key stakeholders representing diverse governmental, environmental, and economic interests, NESP has achieved a "shared vision" for the future of the Upper Mississippi River System, through which the long-term sustainability of the economic uses and the ecological integrity of the watershed are assured. Leading-edge approaches which this collaboration (Imagine - the Corps and the Nature Conservancy on the same side of the issue!) has developed include: restoration of aquatic vegetation through water level management; adaptive management of ecological systems; and development of total river resource management plans.

Implementation of the NESP study recommendations is on hold, pending Water Resources Development Act (WRDA) authorization and Congressional funding.

6. Navigating by Moral Compass – Dr. William A. McAnally

A final brainstorming session on **Ethical dilemmas** that we face as professionals committed to improving the world we live in was facilitated by Dr. McAnally. While many professions, including civil engineering, espouse a Code of Ethics for their practice, it is generally left up to the individual to apply his or her own "moral compass" in the day-to-day work environment. The August 2005 failing of the New Orleans levee and flood control system has become a poster child of how political and economic considerations can overwhelm even the best intentions and strongest commitment to ethical practice.

7. Where Do We Go From Here? – Mr. Nick Pansic

At times it seems like the challenges of the U.S. inland waterways are like the weather – everybody talks about it, but nobody does anything about it. In a facilitated wrap-up session, Workshop Coordinator Nick Pansic of MWH polled the participants for their ideas on action items – both personal and as system stakeholders – to take away from this Workshop. Some of their ideas are summarized below.

- As a profession, the engineering community needs to do a better job of communicating to the public and other stakeholders and influencers the challenges and risks to the inland waterway system. We can learn from marketing expertise within major ad agencies and shippers such as Wal-Mart and Target;
- We have much to learn by the examples of successful European practices in building, supporting, and marketing national waterway systems;
- Each of us should make a short list of things that we can do as individuals and as members of organizations to address challenges of the waterway systems.
- Waterways interests must find a way to connect with those of the "competing" modes of air, truck and rail, to the benefit of all. It is not an "us or them" proposition, but "we";
- Financing the waterway system can be viewed as an ethical challenge, in terms of deciding who benefits and who pays;
- Incremental decision-making may cause losing track of original goals and objectives;
- Educators can do a better job of teaching risk assessment, so that future decision-makers will be better equipped to make decisions under the inevitable conditions of uncertainty;
- The American Society of Civil Engineering (ASCE) Infrastructure Report Card must become a more credible and effective tool for changing investment priorities in U.S. infrastructure;
- Public should be better informed on the positive environmental impacts of waterborne transport; and
- Engineers have a key role to play in helping to find ways to deliver government services at a reasonable price.

8. Next Steps

Perhaps the most effective actions that can follow this Workshop are a blend of individual and group actions. As individuals, we can make a difference by communicating within our own sphere of influence, with our clients and business associates, the challenges we face and some suggestions for changing the situation for the better.

As professionals and members of various organizations, we can get involved in technical and policy committees that strive to publish and support some of the perspectives identified above.

Most importantly, we can get outside of our comfort zone and reach out to the public and non-technical stakeholders to build consensus and partnerships for maintaining and improving our Nation's vital transportation infrastructure.

Smart Rivers 2007 Organizing Committee

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