Paper 53 – Traffic and Cargo Trends on U.S. Inland Waterways

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ABSTRACT: The demand for surface freight transportation is growing in the U.S. and worldwide, yet traffic on U.S. inland waterways has been slowly declining for decades. Recent data shows that in some parts of the system the decline is accelerating. In the U.S., waterways are the most underutilized mode of freight transport. Freight movements by rail have increased dramatically, and we have increasing congestion on highways. What is driving the decline in waterway traffic, and how might it be reversed? Could the waterways attract new cargos? Would better intermodal connections increase traffic? Is the reliability of infrastructure (or lack of it) a significant factor? This presentation will present the latest data on both tonnage and cargo and discuss the forces and factors which drive freight movement on the waterways now and in the future.

1 INTRODUCTION

At the time of the American Revolution (1775–1783), it cost as much to move a ton of freight 30 miles inland by land as to move it across the Atlantic Ocean by water (AASHTO 2013). In the U.S., waterways were the first highways, providing easy access to the interior of the North American continent. Rivers made it possible to transport goods and people without major infrastructure inputs, enabling the settlement and development of much of the U.S. As pointed out in a recent book, "The Accidental Superpower", geography, and especially rivers and coastlines, has a lot to do with national development (Zeihan 2014). It happens that the United States—the "superpower" of Mr. Zeihan's title—is blessed with several major navigable rivers, the Mississippi being the greatest. We also have four coastlines, the Atlantic, Pacific, Gulf of Mexico, and the Great Lakes, which are really inland 'sweetwater' seas. According to Zeihan, much else flows from this fortunate accident of geography.

Figure 1 below shows the extent of the modern-day U.S. inland waterway system, which extends for nearly 17,700 km and includes 192 lock sites with 236 chambers. The replacement value of this system is estimated to be over $150 billion. The largest river system is the Mississippi, which is navigable for about 2,896 kilometers from New Orleans, Louisiana, to Minneapolis, Minnesota, and has a large tributary system, including the Ohio River, Illinois River, and Missouri River. The Gulf Intracoastal Waterway is a protected channel along the coast of the Gulf of Mexico, and the Columbia-Snake River system is located in the northwestern corner of the country.

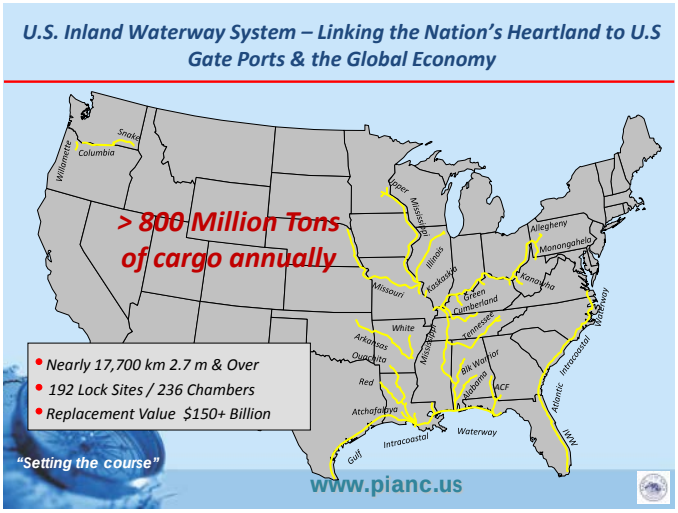

Figure 1. The U.S. Inland Waterway System

2 FREIGHT TRANSPORT IN THE U.S.

Over the past 250 or so years, in addition to developing the rivers, the U.S. has built sophisticated and extensive rail and road transportation networks, and now, in 2015, the

waterways no longer dominate freight movement. Yet they still fill an important role in the transport of certain bulk commodities.

Figure 2 shows the movement of freight in the U.S. by road (red), rail (brown), and waterway (blue). The thickness of the lines indicates the volume of freight moving on those corridors. The Ohio and Mainline Mississippi Rivers stand out as major freight routes.

Figure 2. Freight Flows by Highway, Railroad, and Waterway, 2010

The total U.S. freight and intermodal split trend over the past 30 or so years, measured in ton-miles, is shown in Figure 3. Total freight movement has increased dramatically, but all of this increase has gone to road and rail transport modes. In fact, the ton-miles of domestic waterborne freight have declined, mainly due to the drop in coastwise transport. Internal water transport has remained largely the same.

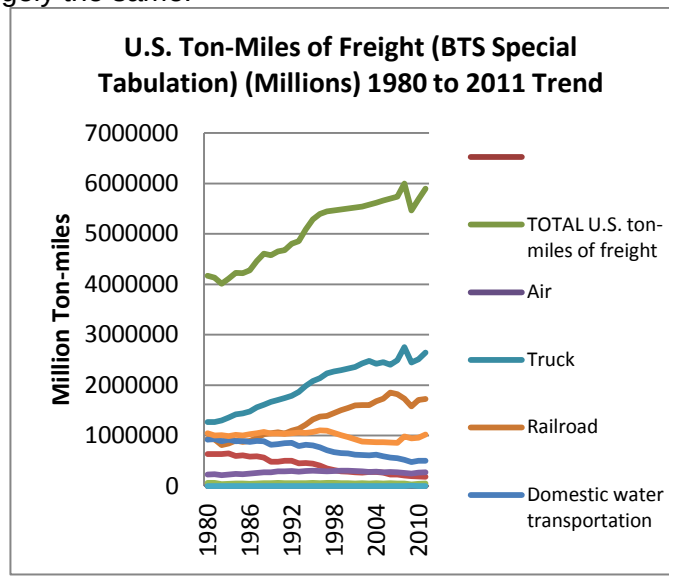

Figure 3. Source: U.S. Department of Transportation, Bureau of Transportation Statistics

3 U.S. INLAND WATERWAY TRAFFIC TRENDS

Traffic on the inland waterway system is key to the navigation business of the U.S. Army Corps of Engineers (USACE), which operates and maintains the locks, dams, and channels. Navigation constitutes about 40% of the annual USACE budget, and these expenses are justified by the national benefits of the waterborne transportation system. These benefits are largely driven by the amount of cargo which it moves, and the transportation savings which are gained by this mode of transport. And it is these benefits which are used to justify operation and maintenance, modernization and expansion of the locks and dams, and dredging of the channels.

Traffic on the locked portions of the inland waterways is particularly important to USACE. Over the last 20 years this traffic has generally been flat to declining slowly, as shown in Figure 4. This is a concern, and it is likely the result of many factors, most of which are external forces.

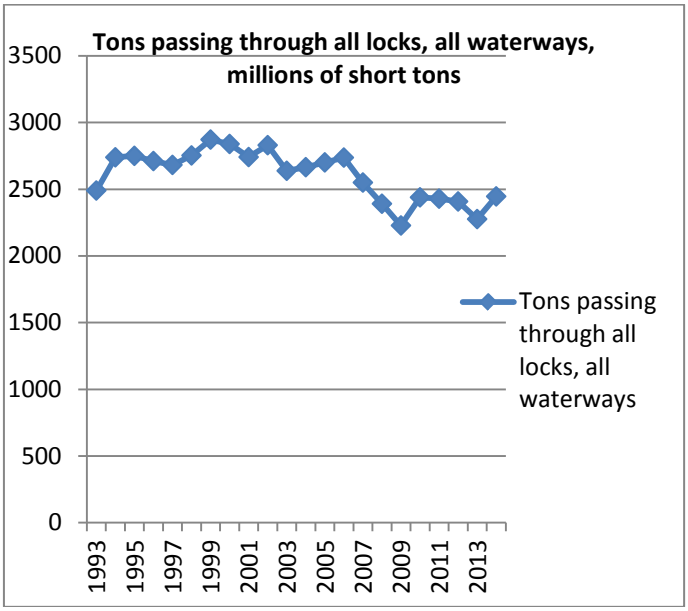

Figure 4. Tons Passing Through All Locks, All Waterways 1992 to 2014

In some important key locks, traffic appears to be declining at an accelerating rate. One of these areas is the Upper Mississippi River. Figure 5 shows the series of locks and dams built by USACE which provide a water stairway for commercial and recreational travel from Minneapolis, Minnesota to the Gulf of Mexico. The existing 9-foot Channel Navigation Project was largely constructed in the 1930s and extends down the Upper Mississippi River from Minneapolis-St. Paul to its confluence

with the Ohio River and up the Illinois Waterway to the Thomas J. O'Brien Lock in Chicago. It includes 37 Locks and approximately 1,200 miles of navigable waterway in Illinois, Iowa, Minnesota, Missouri and Wisconsin. There are more than 580 manufacturing facilities, terminals, grain elevators, and docks that ship and receive tonnage in the Upper Mississippi River basin (USACE St. Louis District 2012). Grains (corn and soybeans) dominate traffic on this part of the system. Other commodities, mainly cement and concrete products, comprise the second largest group.

Figure 5. The Upper Mississippi River Locks and Dams

Figure 6 shows the traffic trends for Locks and Dam 25 from 1992 to 2014. This is a strategically important lock, located near the confluence of the Illinois and Missouri Rivers. Lock and Dam 25 is located in Winfield, Missouri at Upper Mississippi River mile 241.4 (see Figure 5). The lock was put into operation in 1939. A $52 million major rehabilitation was completed at Lock and Dam 25 in 1999. However, the system's 600-foot locks do not accommodate today's modern tows without splitting and passing through the lock in two operations. This procedure requires uncoupling barges, which triples lockage times and exposes deckhands to increased accident rates.

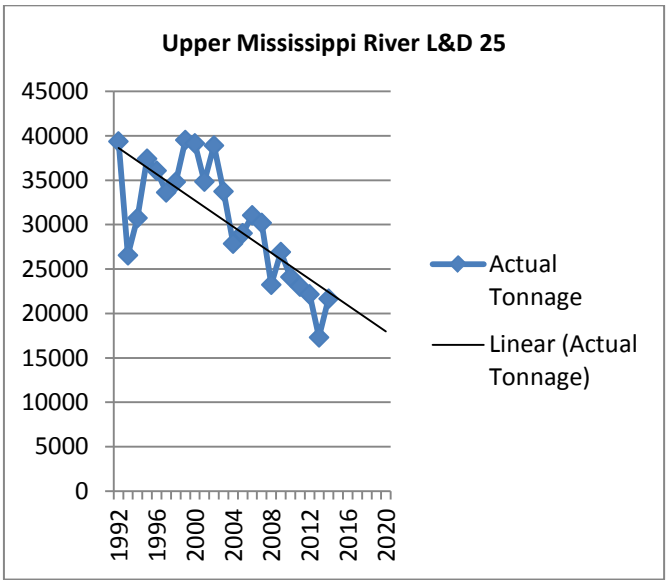

Figure 6. Upper Mississippi River Lock and Dam 25 Traffic Trend 1992-2014

The Ohio River is another major inland waterway corridor in the U.S., with a series of locks and dams as illustrated in Figure 7. The dominant cargo on this part of the system is coal, and many power plants are located directly on the river to facilitate the delivery by barges.

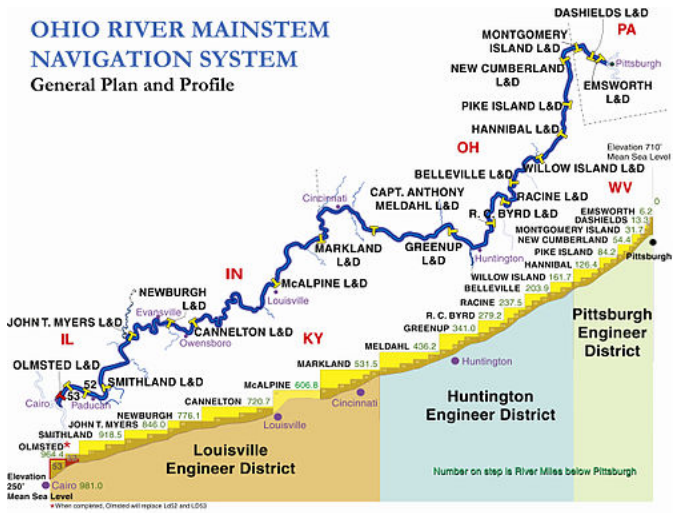

Figure 7. The Ohio River System

A key Ohio River lock and dam is 52, which is located near the confluence of the Ohio and Mississippi Rivers. Traffic moving through this lock is declining as well (Figure 8), although not as dramatically as the Upper Mississippi locks shown above.

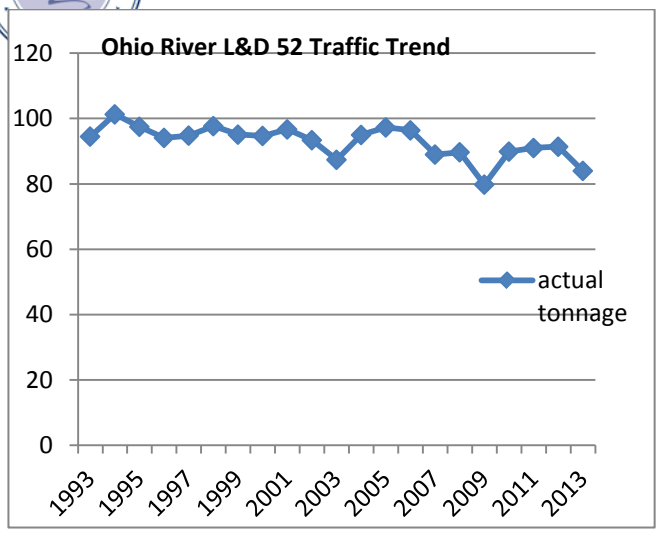

Figure 8. Ohio River Lock and Dam 52 Traffic Trend 1993 to 2013

So what is driving these declines in waterway traffic? It is not very clear, but some possible factors include:

- Stagnant U.S. and global economies since the 2007 recession;
- Shift in the U.S. economy from a manufacturing base to a knowledge base;
- Diminished demand for coal, both domestically and abroad, due to increased concerns around air quality and climate change.

Reversing these trends will not be an overnight achievement. It will depend upon an overall improvement in the global economy, accompanied perhaps by increased oil and petroleum production in the U.S. – both for domestic consumption and for export.

Another key could be the ability to attract new cargoes to the waterways. While the traffic has been dominated by bulk commodities in the past (see Figure 11), the potential for shipping more diverse cargos via container-on-barge still exists. Waterways can make a much stronger argument around sustainability than can the competing modes of rail and truck, so this could be another opportunity to increase traffic on the inland waterways.

4 AGİNG INFRASTRUCTURE

Another factor which may be contributing to the decline in traffic, especially on the locked portions of the inland waterway system is the fact that the infrastructure which supports the U.S. inland waterway system is aging, with more than half of the locks and dams already older than their design life of 50 years (Figure 9). With proper maintenance, these structures can last, and do last much longer. However, maintenance needs are currently not being met due to limited funding, and the system's age is showing, as illustrated in Figure 10 which shows the trend in downtime on the system. The 20 year trend for both scheduled and unscheduled downtime is up, even though recently both indicators have dropped significantly.

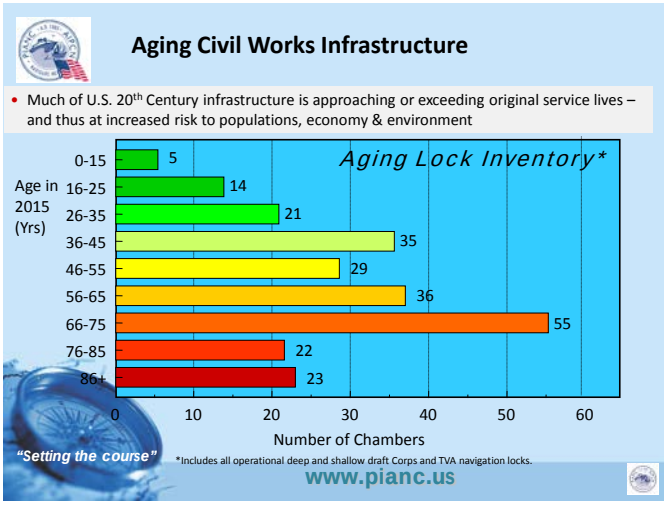

Figure 9 Aging Locks in the U.S.

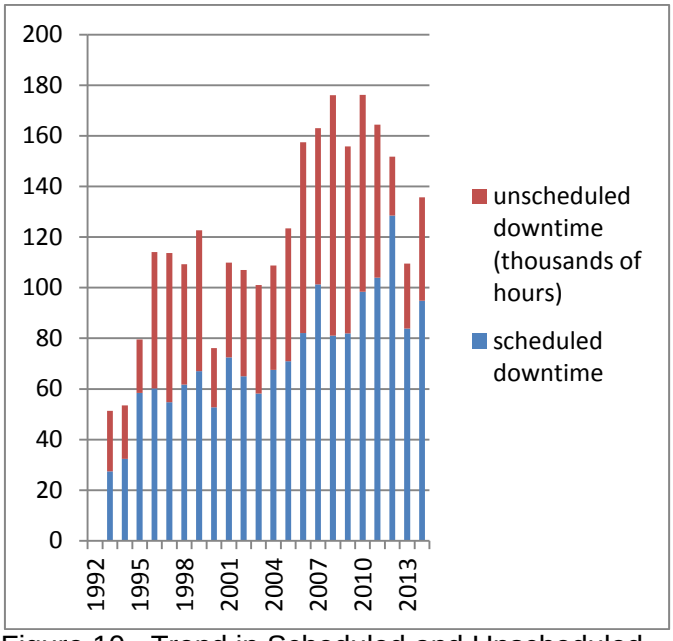

Figure 10. Trend in Scheduled and Unscheduled Downtime at U.S. Locks

Even though overall traffic passing through the locked portions of the system is declining, there are still bottlenecks of congestion. Two indicators of congestion – the percentage of vessels delayed and the average delay—are at fairly high levels and trending upward. About 50% of the tows were

delayed in 2014, and the average delay was about 2 hours.

We know that reliability is very important to shippers, and these increases in downtime, particularly the unscheduled outages, along with increasing delays, reduce reliability. Less reliability makes the inland waterways less attractive and less competitive with other modes of freight transport.

5 CHANGİNG CARGOES AND OUTLOOK FOR THE FUTURE

Figure 11 shows the current mix of cargo on the U.S. inland waterways. One thing stands out – it is mostly fuel, with petroleum constituting 35% and coal another 23%. So trends in future energy supply and demand, and in types of energy used, are likely to impact cargo on the inland waterways.

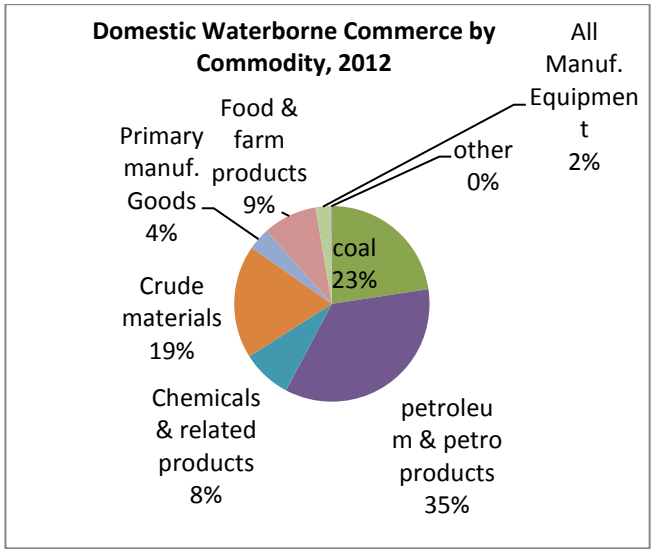

Figure 11. Types of Cargo on the U.S. Inland Waterways in 2012

As U.S. oil production suddenly surged with the advent of hydraulic fracturing, the volume of crude oil moving on the waterways increased as well. Existing pipelines and rail networks could not handle it all, so the overflow is being transported on barges. Figure 12 shows the sharp increase in barge shipments of crude oil in the Midwest and Gulf Coast since 2013. An increase in petroleum movements on all U.S. Waterways shows up also in the Waterborne Commerce Statistics, shown in Figure 13.

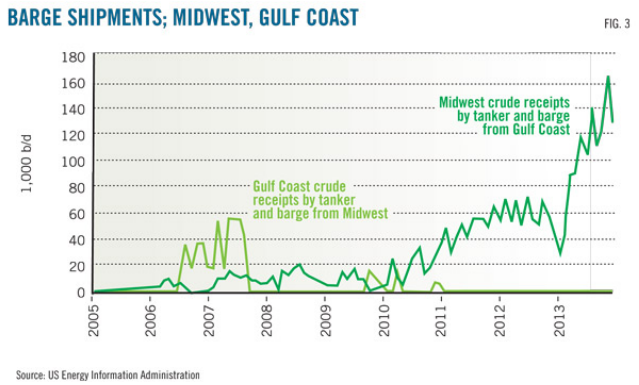

Figure 12. Barge Shipments of Crude Oil, Midwest, Gulf Coast

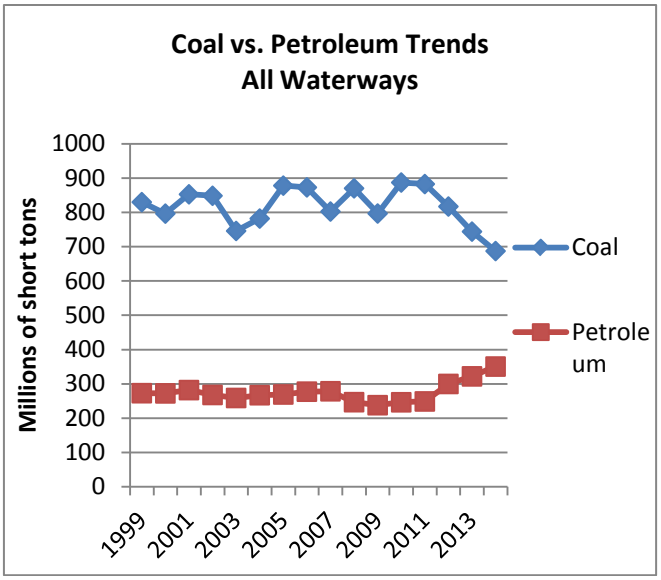

Figure 13. Coal vs. Petroleum Trends on U.S. Inland Waterways

Source: U.S. Army Corps of Engineers, Waterborne Commerce Statistics

While petroleum has increased recently, coal shipments have been dropping. And the short term outlook for coal is bleak. U.S. coal producers have been impacted by competition from natural gas, and tougher environmental rules. Lower coal demand for domestic consumption and exports is projected to contribute to a 75 million short ton (MMst) decline in production for 2015 (U.S. Energy Information Administration 2015). Slower growth in world coal demand, lower international coal prices, and higher coal output in other coal-exporting countries have led to a two-year decline in U.S. coal exports.

But there can be, and usually are, surprises. Most forecasts turn out to be wrong. One striking example of this in the energy sector is the U.S. petroleum consumption surprise. U.S. petroleum consumption is going down. It was lower in 2014 than it was in 1997, despite the fact that the

economy grew almost 50 percent over this period. Actual consumption in 2014 was 6.4 million barrels per day below the 2003 projection of 2014 consumption. This is called the "25 percent consumption surprise for 2014" (Executive Office of the President 2015). And it isn't just that people are driving more fuel efficient cars, vehicle miles traveled have also fallen. People are actually driving less. Rising fuel economy explains about 25% of the consumption surprise and the reduction in vehicle miles traveled explains the remaining 75%.

There was also a petroleum production surprise of 3.4 million barrels per day – due to the fracking boom. But the 'consumption surprise' is nearly twice as large as this unexpected increase in production (Executive Office of the President 2015).

6 CONCLUSION

Waterways are currently the most underutilized, and underappreciated, mode of freight transport in the U.S. The upside of the declining traffic is a lot of unused capacity. The existing inland waterway system could handle substantially more traffic, especially new cargoes like container-on-barge, which may involve more frequent but smaller tow sizes, and can utilize the smaller lock chambers.

The overall trend of increasing freight movement is not likely to change in the foreseeable future, and waterways can play a vital role in relieving pressure on the other modes. We've seen this recently with the surge in crude oil shipments. Better intermodal connections, coupled with modern information technology to track shipments and monitor traffic, will help not only the waterways, but the entire freight system to be more efficient and able to accommodate the increasing demands of the future.

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