

## Retaining the Value of the U.S. Inland Waterways System

by

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## Retaining the Value of the U.S. Inland Waterways System

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### Abstract

The U.S. Inland Waterways System (IWS), consisting of lock and dam sites along the Nation's navigable river channels that are owned, operated and maintained by U.S. Army, has become increasingly unreliable and inefficient. Much of the IWS infrastructure has exceeded its design life and requires increased maintenance, repair, or replacement. Inadequate investment in the U.S. Inland Waterways System (IWS) is negatively impacting the national economy. Recent legislative, policy and process changes do not adequately meet the Nation's need for a reliable inland waterways navigation system. The project defines the problems caused by underinvestment and describes the U.S. Government's current approach to IWS infrastructure investment. It explores the adequacy and acceptability of options aimed at solving the problems. Lastly, this project identifies challenges to implementation of options and makes recommendations for action.

## **Retaining the Value of the U.S. Inland Waterways System**

Prompted by these actual observations, I could not help taking a more extensive view of the vast inland navigation of these United States and the importance of it...would to God we had the wisdom enough to improve them.

—George Washington<sup>1</sup>

The U.S. Inland Waterways System (IWS) is an incredible strategic resource that provides significant economic benefits to the Nation in the form of transportation efficiencies, facilitates movement of materiel that supports national security, and serves as a critical link in the larger national transportation network. The IWS, consisting of the Nation's navigable river channels, and lock and dams that are owned, operated and maintained by the Department of the Army, has become increasingly unreliable and inefficient. Much of the IWS infrastructure has exceeded its design life and requires increased maintenance, repair, rehabilitation or replacement. Underinvestment in the IWS is resulting in lost economic benefits due to transportation delays that drive up the cost of commercial goods, increasing the risk of system failure, and impeding the transport of materiel that supports national defense. These factors hinder the IWS from providing a reliable and low-cost means to transport bulk goods, high-value cargo, and containerized goods to market while generating revenue sufficient for its operation, maintenance, and capital investment. Recent legislative, policy and process changes offer improvements but do not sufficiently address the problems generated by underinvestment. The implementation of innovative financing mechanisms, process changes, and additional authorities could manage, if not solve, these problems. The suboptimal condition and reliability of the IWS has been a concern for the past few decades, so why does the Nation continue to underinvest? What are the current

financing options being considered and are these options adequate? How do various stakeholders view the options? What else should be considered that could lead to solutions? How can public policy theory provide insights into the challenges of implementing these options? These questions will be addressed in this paper, but first, the IWS has to be understood in the context of its value to the Nation.

## Background

The United States is a maritime nation, and for over 240 years the inland waterways have played a key role in the national economic development and serve as a source of U.S. economic strength. Today the IWS remains a critical part of the greater U.S. freight transportation network that includes other modes such as railways, roadways, and pipelines. Private enterprise and state governments initially developed the inland waterways and charged fees for their use.<sup>2</sup> The U.S. Congress directed the U.S. Army Corps of Engineers (the Corps) with development and maintenance of the IWS through the Rivers and Harbors Act in 1824 when this fragmented approach became untenable. The Corps, through its civil works mission to provide safe, reliable and efficient transportation, and the authorities delegated by the Secretary of the Army, has developed the IWS over the past 192 years by dredging the channels and constructing a vast array of locks and dams.<sup>3</sup> Currently, the IWS consists of 228 lock chambers at 187 sites along 12,000 miles of commercially active navigable inland waterways that touch 38 states (see figure 1).<sup>4</sup> In addition to supporting inland navigation, the Corps provides several important services that are consequential to the effective operation of the IWS to include flood risk management, hydropower, environmental stewardship, water supply, and recreation.

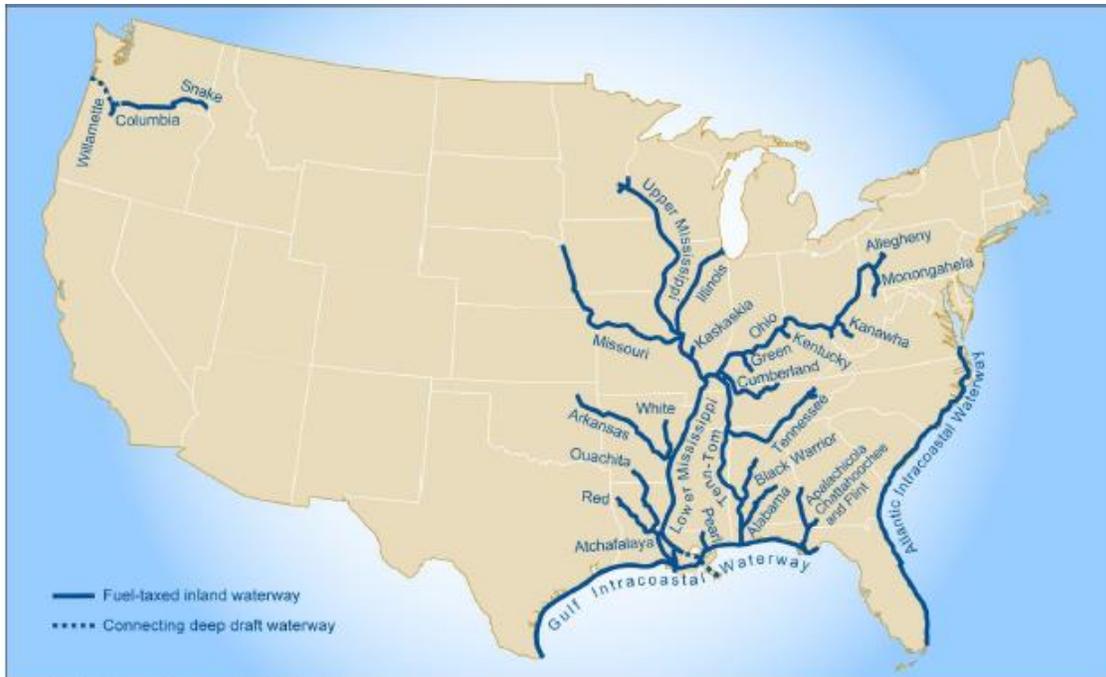


Figure 1. U.S. Inland Waterways System<sup>5</sup>

The majority of IWS infrastructure enjoyed today, however, was built between 1930 and 1980 and the system can be considered mostly complete or “built out.” Further, the Corps’ primary navigation focus has shifted from construction to operation, maintenance and repair (OM&R), henceforth referred to as maintenance, of its IWS infrastructure portfolio. Future IWS capital projects, currently defined as major rehabilitation over \$20 million or new construction, henceforth referred to as construction, are likely to be implemented within the existing project sites.<sup>6</sup>

#### Value of the IWS

The U.S. Government primarily views the strategic value of the IWS in terms of national economic development (NED) benefits and the importance of national defense materiel transported through the system. The IWS is not just a system that adds value by performing a key function, it serves as an economic engine that provides a return on

investment. The barge and tow operators, or carriers, and the companies that pay to ship their commodities, or shippers, generate benefits for the Nation by paying taxes on revenue and profits made by transporting goods to market in a cost-effective manner. The items shipped include high-value products such as petroleum and chemicals, but also commodities that have low value compared to their weight, thus making other modes of transportation comparatively less economical. Over the past several decades, the IWS has transported approximately 20% of the coal used for domestic electricity generation, 22% of domestic petroleum products, 60% of farm exports, and a number of other commodities such as chemicals, metal ore, and construction material.<sup>7</sup>

The IWS is the most efficient and cost-effective means of transportation for bulk commodities when compared to other modes. The IWS carries freight at two-thirds the cost of rail and one-tenth the cost by truck.<sup>8</sup> There are other benefits also. Deleterious air quality impacts are lessened because of fewer fossil fuel emissions resulting from reduced traffic congestion, and less wear on the Nations' surface transportation systems.<sup>9</sup> Savings through lower transportation costs realized by the carriers and shippers are passed on to the consumer, generating a cumulative positive economic impact which enhances the United States' economic advantage over other countries that do not have developed inland waterway systems for shipping bulk goods.

Additionally, the IWS and the corresponding network of inland and marine ports support the movement of approximately two trillion dollars in commerce.<sup>10</sup> The current IWS investment trend of \$16 billion over a four-year period from 2016 to 2020 supports approximately \$697 billion in Gross Domestic Product (GDP), 738,000 jobs, and \$872 billion in personal income connected to IWS commerce.<sup>11</sup> The U.S. House of

Representatives' Transportation and Infrastructure Subcommittee estimates over 600 million tons of cargo valued at over \$230 billion will traverse the IWS in 2016 alone.<sup>12</sup>

The Corps' 2015 statistics reveal the annual average net NED benefits of the IWS to be \$8.24 billion toward the U.S. domestic economy and \$2.27 billion in U.S. Treasury revenue.<sup>13</sup>

In addition to economic benefits, the IWS has value in terms of national security. The IWS provides strategic mobility for national defense-related assets, which is more difficult to quantify than economic benefits derived from measurable transportation cost savings. For example, the locks on the Tennessee River and the Tennessee-Tombigbee Waterway navigation channels from Decatur, Alabama through the Port of Mobile facilitate the transport of United Launch Alliance rockets, valued at approximately one billion dollars each, and the Delta IV rocket, which is used for national-security purposes and cannot be transported by other modes.<sup>14</sup> The IWS also serves as the most practical means to transport material used for the operation of nuclear power plants.<sup>15</sup> Although national security assets are not the primary cargo shipped on the IWS, they are an important commodity that is arguably an underestimated source of value.<sup>16</sup>

#### The Authorization and Appropriations Process for IWS Projects

Civil Works projects are authorized once and then appropriated by Congress in a separate process. First, the House Transportation and Infrastructure Committee (T&I) and the Senate Committee on Environment and Public Works (E&PW), through their subcommittees, authorize major rehabilitation and construction projects through a process resulting in a Water Resources Development Act (WRDA), which ideally occurs every two years. Congress is not obligated to appropriate funds to an authorized

project, thus creating the conditions for a backlog of authorized projects. Projects receive appropriations only after they have been authorized. Federal appropriations provide the primary means for investment in the IWS with both tax revenue from the Treasury General Account (unofficially called the “General Treasury”) and revenue gleaned from an excise tax on diesel fuel, which is collected from industry users but controlled by Congress.

The annual budget, authorization and appropriations cycle is a complex process involving many agencies. Although the Corps serves as the Department of Defense (DoD) executive agent for the IWS, it does so at the direction set by the executive branch, specifically the Office of Management and Budget (OMB), and the legislative branch through House and Senate authorization and appropriations committees. The annual budget and appropriations cycle drives the Corps’ IWS mission. The Corps’ funding for the IWS is part of the larger DoD Civil Works Budget which is separate from the Defense Budget. Both budgets compete within the discretionary portion of the Federal Budget. The President’s Budget reflects the Corps’ budget priorities for OM&R, new construction and major rehabilitation projects after the Assistant Secretary of the Army (Civil Works) (ASA (CW)) presents the budget to OMB. The House and Senate Appropriations Committees work with the administration through an iterative process of reviews and hearings to develop an annual appropriations bill. Once authorization and appropriations bills become law, the Corps then funds specified civil works projects. For new construction and major rehabilitation projects, Congress matches funding at a 50-50 cost-share with the Inland Waterways Trust Fund (IWTF) established by the Internal Revenue Code of 1986, except in the rare case when Congress specifies otherwise.

Maintenance requirements are not eligible for IWTF cost-sharing under the current authorities. Congress funds maintenance and construction through the same appropriations act, but using separate budget line items. The Inland Waterways Users Board (IWUB) oversees the IWTF revenue generated from a diesel fuel excise tax imposed on IWS carriers. In cases where Congress appropriates more than the budget request, or when an act is not passed and signed by the president and a continuing resolution is passed to continue operations at the previous fiscal year's funding levels, the Corps develops a Work Plan to allocate the funds, which is ultimately approved by OMB and sent to Congress for information.

#### Underinvestment in the IWS

Despite the value created by the IWS, investment has not kept pace with the demands on the system. The maintenance burden of aging IWS infrastructure is outpacing annual appropriations, new construction projects are taking too long to complete, and construction costs are becoming unreasonable. The average age of the IWS locks and dams is around 60 years, well past the typical design life, and over 60% of the IWS portfolio was constructed more than 50 years ago.<sup>17</sup> The large national deficit and subsequent fiscal austerity measures such as the Budget Control Act of 2011 have created an environment of stiff competition for funding within the discretionary portion of the Federal Budget.<sup>18</sup>

As a result, the United States is spending less on infrastructure as a percentage of GDP than thirteen other peer competitor countries.<sup>19</sup> More specifically, the American Society of Civil Engineers (ASCE) gave the IWS a "D-" or "poor" rating in its most recent periodic infrastructure conditions assessment, consistent with the dismal ratings given over the past two decades.<sup>20</sup> Likewise, the Corps' capital stock value of the Nation's

navigation assets, which includes the IWS, is also declining due to its suboptimal condition.<sup>21</sup> The ASCE estimates the Corps would require \$13 billion by 2020 and an additional \$28 billion by 2040 just to maintain the current state of the IWS, but funding levels as of 2012 only support seven billion dollars by 2020 and \$16 billion by 2040.<sup>22</sup>

Continued degradation of the IWS results in loss of economic competitiveness for the U.S. economy by jeopardizing low-cost transportation. Overall economic losses from outages caused by the poor condition of locks are estimated to have cost the U.S. economy over \$33 billion in 2010 and are forecasted to rise to \$49 billion in 2020, primarily in the form of increased energy costs resulting from the inefficient transport of coal and petroleum.<sup>23</sup> Current investment levels in the IWS, combined with the impacts to the marine ports, are projected to cause loss of business sales totaling \$1.3 trillion and \$95 billion in annual losses to the U.S. GDP by 2020. If major IWS infrastructure components fail, such as Lock and Dam 52 on the Ohio River that supports \$22 billion in commerce annually, or the Chickamauga Lock and Dam on the Cumberland River that facilitates supplying several nuclear power plants upstream, entire segments of the IWS will be shut down to commercial barge traffic.<sup>24</sup> The consequences of these impacts will lead to the degradation of the U.S. economy as a source of national power, and therefore decrease national security and increase domestic fiscal turmoil. Although the IWS is a complex system affected by many factors, to include the effects of nature, economic uncertainty, politics and policy at several different levels, it is useful to view IWS underinvestment as the root cause of two problems: inadequate maintenance of existing infrastructure projects and failure to complete capital projects in a reasonable timeframe.

## Inadequate Maintenance

Maintenance of the IWS is routinely required to decrease the risk of dam failures, maintain navigation channel dimensions, and keep locks operating reliably. However, the Corps' budget for this mission was reduced drastically after the majority of the IWS construction build-out phase ended in the 1980s and the maintenance budget has steadily declined over the last 30 years.<sup>25</sup> Decreased operational reliability results in system performance declines that create delays, which in turn, raise the cost of transportation and are ultimately passed on to the consumer, reducing the overall economic benefits of the system. According to ASCE, approximately 90 percent of the locks on the IWS in 2009 experienced unscheduled delays for various reasons, and the Corps' data show both scheduled and unscheduled outages increased from 51,492 hours in 1993 to 131,793 hours in 2015 (figure 2).<sup>26</sup>

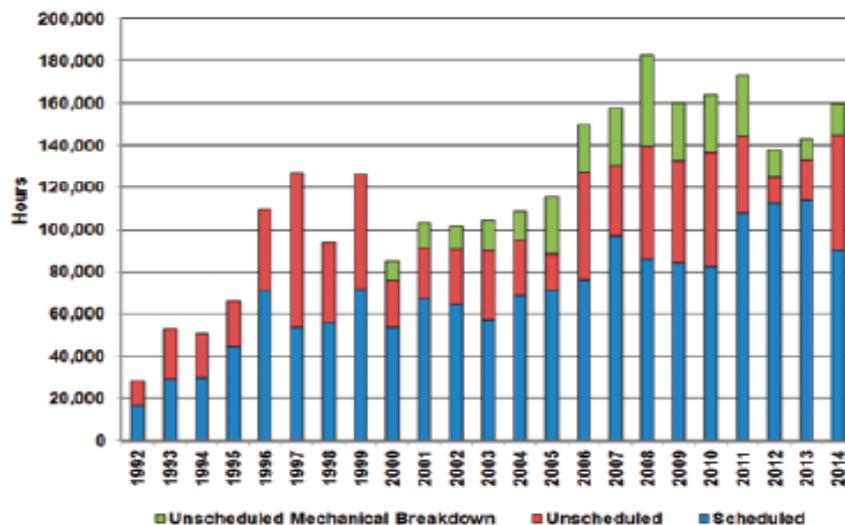


Figure 2. IWS Lock Chamber Delays (hours)<sup>27</sup>

Current funding levels primarily support a reactive “fix-as-fail” approach while deferring routine maintenance, which is suboptimal when compared to a less-costly active

approach. The fiscal year (FY) 2017 budget request of \$631 million for Operation and Maintenance (O&M) funding showed a small improvement over the past decade's average of approximately \$591 million. This figure still falls short of previous requests and does not provide the means to maintain the IWS adequately, despite the recent positive trend for congressional markups beyond the requested amount.<sup>28</sup>

#### Failure to Complete Capital Projects

The construction of new structures through capital investment in the IWS is warranted when repair of existing locks and dams become infeasible or inefficient. Furthermore, the industry trend toward larger barge configurations and potentially increased demand for waterborne commerce caused by the recent completion of the Panama Canal expansion are driving the requirements for bigger locks chambers. For instance, replacing a 600-foot lock chamber with a modern 1200-foot chamber would be feasible if the economic benefits gained through passing more barges per lockage outweighed the cost of construction. In this case, transportation efficiencies provide economic benefits by avoiding lost time from breaking tows into several smaller configurations and reducing traffic congestion caused by tows waiting to pass through the lock.

The current track record for completing capital projects in a reasonable period and within cost estimates is not good. The annual congressional funding cycle requires yearly review of priorities which result in inconsistent funding for IWS projects. This inefficient practice, albeit an infrequent one, results in a start-and-stop phenomenon that leads to numerous contractor mobilization and demobilization costs and causes contractors to increase their contract prices to hedge against uncertain funding levels. In previous years, the Corps typically completed major IWS infrastructure projects in just

over six years with cost growth averaging around 30 percent. Due to the current inefficient incremental funding process adopted in the mid-1980s, some projects have taken up to 20 years to complete at twice the estimated cost.<sup>29</sup> For example, the new 1200-foot McAlpine Lock on the Ohio River in Louisville, Kentucky, took ten years to complete compared to a similar lock project just upstream which took three years to complete in 1961.<sup>30</sup> Similarly, the Olmsted Lock and Dam on the Ohio River near Olmstead, IL, which will replace two failing locks and their wicket dams built over 80 years ago, is still under construction more than a decade later. It has incurred inflation-adjusted cost increases of approximately one billion dollars due to a variety of unforeseen engineering, construction, and contracting challenges, but largely because of inefficient annual funding.<sup>31</sup> After authorization in 1988, the Corps planned to complete the Olmstead project in ten years at the cost of \$775 million. Currently, the Corps is projecting completion in 2018 at a final cost of \$2.9 billion. These examples serve as evidence that the current funding mechanism is problematic.

The FY 2017 budget request of \$243 million for construction showed a small improvement over the past decade's average of approximately \$201 million, which would only fund one capital project, the Olmsted project. As with the FY 2017 O&M request, this request does not provide the funding required to replace decrepit or obsolete infrastructure, even with Congress' expected markups.<sup>32</sup> The current model is not sustainable and necessitates new thinking about the underinvestment problem.

#### Understanding the Underinvestment Trend

There are several reasons that could explain underinvestment in such an undisputedly valuable resource as the IWS. The most obvious and addressable reason is competing demands for an increasingly smaller discretionary budget. The most vocal

groups expressing concern over the condition and investment level of the IWS are industry users and the relevant government agencies. Lack of public pressure on government lawmakers caused by the relatively low visibility of the waterways compared with highways, rail, and non-transportation-related public works could also explain the continued trend of underinvestment. The IWS is a complex system involving infrastructure with many complicated components, which could hinder mutual understanding of the problems and solutions. For example, the problem of deficient levels of IWS funding could be confused with inefficient execution of funds. The annual appropriation and authorization process, however, contributes to inconsistency with project prioritization, especially when new projects with higher benefit-to-cost ratios (BCRs) than current and ongoing projects are introduced into the queue of authorized projects. Lack of unity of effort between the federal government and industry users driven by opposing views of responsibility for the maintenance, repair and capital investment in the IWS serves as another potential reason for underinvestment. The Obama administration appeared to support shifting this burden to user groups as indicated consistently in annual budget requests. Besides a small fuel tax rate increase in 2015, Congress has consistently denied user fees and other measures aimed at reducing the federal burden for the industry user groups and, instead opts to fund the IWS with current annual Treasury and IWTF revenue.<sup>33</sup> IWS key stakeholders and decision makers recognize the problems and impacts caused by underinvestment and several practical options have appeared on the legislative agenda as potential solutions.

### Funding Options for the IWS

There are numerous funding strategies and tools available to facilitate investment in public infrastructure at the federal, state and local levels, but this paper analyzes

some feasible options for federal implementation and explores their acceptability by the key stakeholders associated with the IWS. They are: continuing the status quo system; user-financing; and two potential financing options that leverage private financing and debt financing.

### The Status Quo

The current system of relying on General Treasury and IWTF revenue for resourcing the IWS defined by the decades-old budgeting, authorization, and appropriation processes and authorities could, in concept, result in acceptable investment levels. However, the problems with the IWS are evidence that the status quo system is problematic. The Federal government funds approximately 90 percent of the IWS through General Treasury revenue, making it the Nation's most heavily-subsidized transportation mode for maintenance and construction.<sup>34</sup> The Obama administration continued to request suboptimal funding levels because of the current environment of fiscal austerity, but current budget constraints may not explain the low resourcing level since the budget requests for the IWS have not changed significantly over the past decade (figure 3).<sup>35</sup>

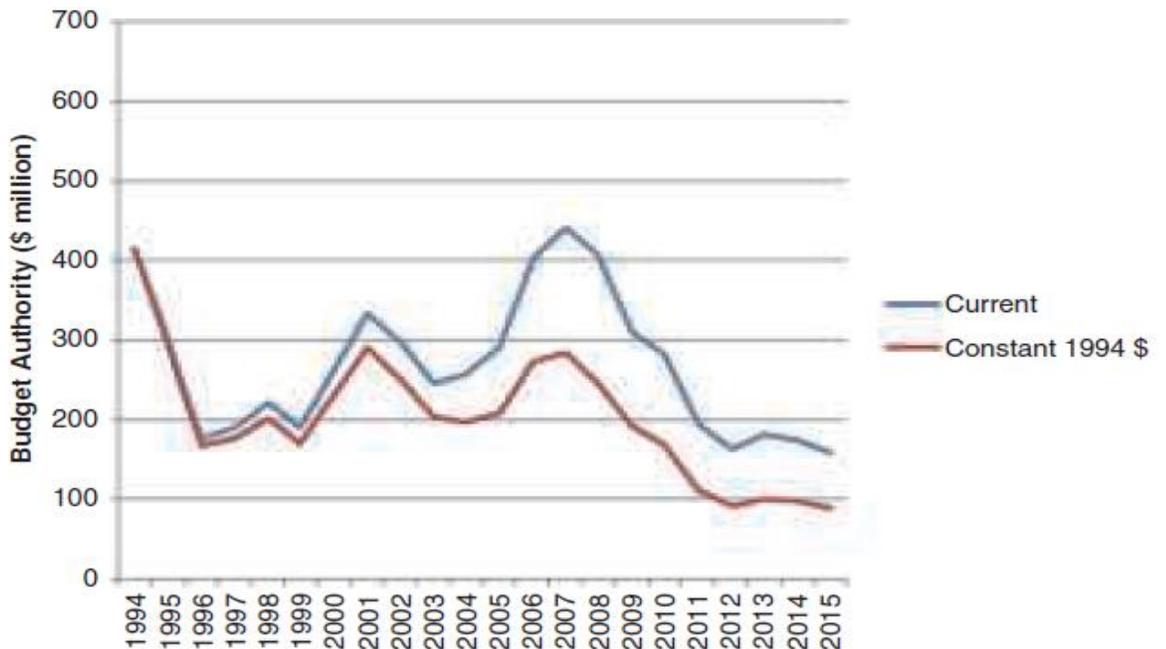


Figure 3. Corps Budget Authority Trend for the IWS<sup>36</sup>

In the last two budget cycles, Congress has increased funding above the budget request, and while this is a positive trend, significantly higher resourcing levels still are needed. WRDA 1986 established IWTF revenue as the controlling factor for IWS capital investment by requiring a 50/50 match with General Treasury revenue.<sup>37</sup> With this constraint in effect, legislation would be required to invest higher levels of General Treasury revenue toward capital projects. For example, where this already occurred is the Olmsted lock and dam project, which received a cost-sharing adjustment of 85 percent General Treasury revenue and 15 percent IWTF revenue in the 2014 Water Resources Reform and Development Act (WRRDA) (see figure 4). Moreover, notwithstanding the 2014 Achieving a Better Life Experience (ABLE) Act, which raised the IWTF fuel tax, it has not generated sufficient revenue to fund the needed level of capital investments.<sup>38</sup> Before the ABLE Act, the IWTF was the limiting factor in the cost share. The General Treasury share is now projected to be the limiting factor.<sup>39</sup>

Additionally, the IWTF cost share only applies to capital projects and rehabilitation projects over \$20 million and does not contribute to maintenance activities, which at present constitute approximately 75 percent of the requested inland navigation budget needs.<sup>40</sup> Any future changes to maintain relative investment levels will require new legislation since current law does not automatically index the IWTF tax for inflation.

Despite the Corps' efforts to streamline prioritization, planning and delivery for both maintenance and capital projects to make better use of existing funding, the IWS still requires additional investment to continue the current level of performance and reliability.<sup>41</sup> Other options to increase investment levels that shift risk from the taxpayers to the IWS users and beneficiaries, which include developing user-fee-based revenue streams and alternative financing options, are needed. Under the current approach, system users are not incentivized to embrace options that shift risk away from taxpayers and toward themselves. However, the current constrained fiscal environment and chronic underinvestment in the IWS are driving efforts to seek alternatives to the status quo.

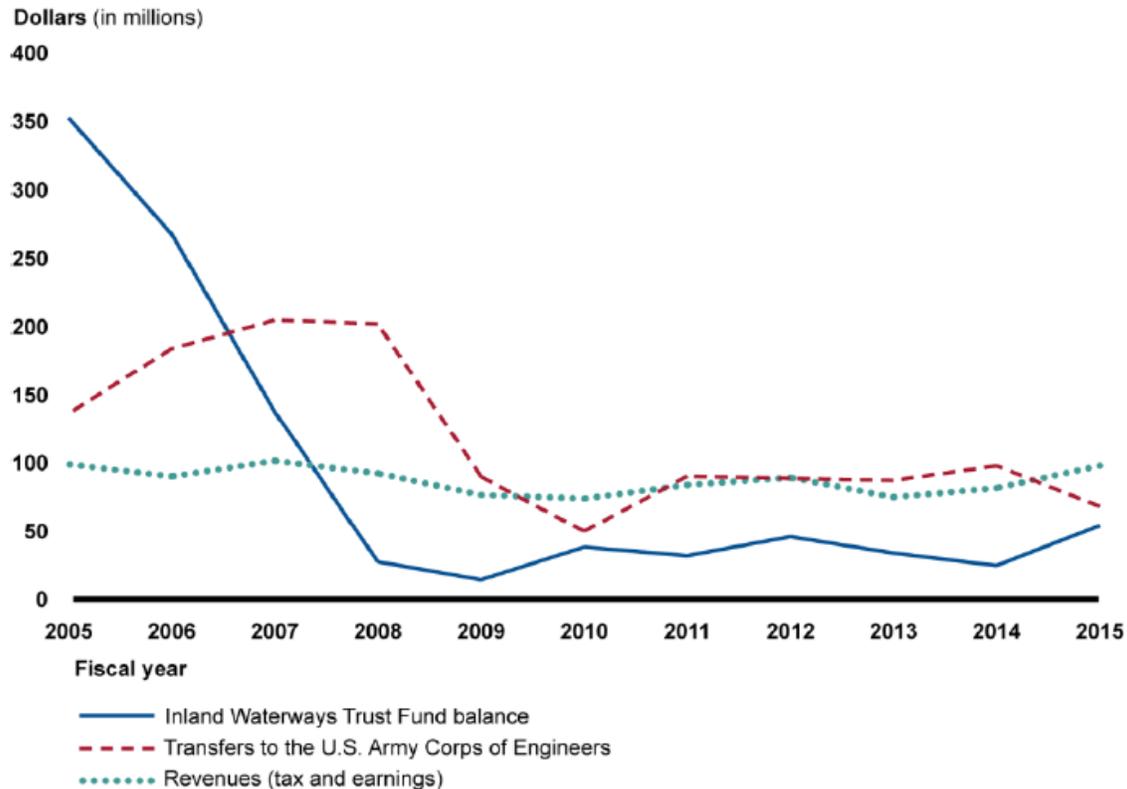


Figure 4. Inland Waterways Trust Fund Trend.<sup>42</sup>

### User-Financed Option

A user-financed option involves reinvesting revenue generated from the revenue streams associated with IWS usage. Government-wide studies aimed at reducing the deficit have recommended a user-fee approach as a feasible way to decrease reliance on General Treasury revenue for maintenance and capital investment in the IWS.<sup>43</sup> As far back as 1978, Congress proposed to shift the financial burden of the IWS to user groups through revenue generating mechanisms other than the IWTF tax.<sup>44</sup>

User-fee-based revenue sources could include per-lockage fee charges, segment fees similar to highway tolls, charging for IWS derivative functions such as water supply usage or recreation fees, charges based on cargo weight, annual vessel usage or licensing fees, or any combination thereof.<sup>45</sup> The advantages of user-fees are

less dependence on the annual federal government processes that prioritize and appropriate funds, and generating funds directly at the point of need.<sup>46</sup> A user-fee system could also result in a clear indication of the most-used locks and infrastructure by pinpointing user-fee locations.<sup>47</sup> There are disadvantages as well. Imposing user fees could result in diminished economic development, traffic diversions that could reduce shipping production, and increases in the cost of shipping that would either decrease shipper and carrier profits or increase the price of goods and commodities to the consumer.<sup>48</sup> Additionally, not all IWS infrastructure locations are suitable for effectively generating revenue through user fees. Low-use locks could struggle to generate sufficient revenue for maintenance and capital improvements, thus requiring mitigation through continuing subsidies from the General Treasury, cross-leveling revenue generated by higher-use infrastructure, or divestiture.

Over the past decade, various administrations have requested the authority for the Corps to charge user fees, which indicates the belief that users should pay for the IWS, thus freeing up more of the discretionary portion of the Federal Budget for other priorities.<sup>49</sup> Congress consistently has not agreed with the request for the Corps to charge and retain, or “ring-fence,” user fees in subsequent budget resolutions, thus indicating a viewpoint that general taxpayers should bear the majority of the financial burden. Additionally, while the Water Resources Reform and Development Act (WRRDA) of 2014, Section 2004(b), requires the Corps to study and recommend revenue sources for the IWS within one year of enactment, Congress still has not appropriated funds to execute the study.<sup>50</sup>

The current system provides a significant economic benefit to industry user groups that impose the most costs on the IWS. Their heavy influence in Congress could explain the historical rejection of user fees. The IWUB, which advises Congress on IWS issues from the shippers and carriers' perspectives, advocates against user fees since their profits and competitiveness with other transportation modes could be negatively affected.<sup>51</sup> Instead, the IWUB supports maintaining the IWTF as the only additional source of revenue to the General Treasury.<sup>52</sup> In recent letters to Congress, consortia of IWS industry users argue that the user fees recommended in WRDA 2016 legislation are unfair because, unlike highway tolls, there are no alternatives to the IWS since there is only one inland river system.<sup>53</sup> These groups further argue that they already pay their fair share for the IWS through the current IWTF fuel tax and any additional tolls would place shippers and carriers at a competitive disadvantage.<sup>54</sup> Some user groups recognize that user fees will always be a reasonable consideration, but encourage the Corps and administrations to look elsewhere for revenue such as recreation, water supply and hydropower concessions that exist as by-products of the Corps' navigation mission.<sup>55</sup> To further complicate a user-fee-based solution, taxpayer advocacy groups argue to Congress that the IWS industry users do not share enough of the financial burden to maintain the system which, at approximately ten percent, is the least of any other transportation mode.<sup>56</sup>

If Congress authorizes user-fee-based revenue mechanisms, the American taxpayer could ultimately pay for increased levels of investment because the price of goods shipped through the IWS will likely be passed on to consumers from the industry users. If an effective user-financed system results in sufficient increases in IWS

investment, the IWS could eventually provide greater cost advantages for all stakeholders through increased economic benefits. An effective user-fee-based revenue stream, even if it is not wholly sufficient to increase investment levels, is key to the implementation of other potential financing options.

### Alternative Financing Options

Alternative financing concepts are not new and have proven viable since the early 19<sup>th</sup> century for inland waterway projects like the Erie Canal, which involved partnerships that leveraged financing from private companies with public agency funding and authorities.<sup>57</sup> Although unlimited variations of alternative financing tools exist, the primary concept under consideration today are formal agreements called public-private partnerships (P3s), and public-public-private partnerships (P4s), henceforth referred to in this paper as P3s. The basic concept of a P3 agreement is to attract private investment at the beginning of a project and combine that contribution with public agency investment at the state or local level to own, operate, finance, maintain or construct infrastructure. To implement the agreement and execute the project, the private partners create project companies that enter into formal agreements with the public entity. Benefits of P3s include lower initial project cost due to up-front funding, utilization of more-efficient private sector delivery processes, leverage of private sector innovation, lower costs over the project life cycle, and risk sharing between the private partner and the government.<sup>58</sup> The profit potential and degree of risk the private partner accepts depends on its level of investment. The financial risk is less for a private partner that only operates and maintains an infrastructure project than for a private partner that also designs, builds, and finances a project.<sup>59</sup> For a P3 project to be financially viable, there must be a return on the investment provided by annual

availability payments from General Treasury appropriations, user payments, or some combination thereof. The current annual appropriations cycle results in insufficient investment levels. Therefore, additional project investment in the form of increased tax revenues, user fees or other revenue sources is a critical component for a successful P3 project. Although the IWTF fuel tax revenue is generated by private industry users and applied toward public infrastructure like a P3, it is tightly controlled by Congress and should not be confused with current P3 concept discussion.<sup>60</sup>

The highway transportation sector has used P3 tools successfully for years at the federal and state levels, to include the two billion dollar Capital Beltway high occupancy/toll (HOT) lane project.<sup>61</sup> Yet, only a small number of projects, to include highway and IWS projects, would be suitable for a P3.<sup>62</sup> Although Canada, Australia, and the United Kingdom have routinely used P3 tools effectively for years, their use is not as prevalent in the United States.<sup>63</sup> In fact, the WRRDA 2014, Section 5014, authorizes the Corps to implement a P3 pilot program to demonstrate the effectiveness and efficiency of leveraging the private sector for water resource projects. Congress has not yet appropriated funds for the demonstration program or for the Water Infrastructure Finance and Innovations Authority (WIFIA) in WRRDA 2014, Section 1043(b) that allows the Corps to make loans to private partners.<sup>64</sup> Therefore, the Corps is forced to explore the effectiveness of P3s in demonstration projects using its existing authorities and budget.<sup>65</sup> Enabling legislation and subsequent appropriations could generate additional IWS P3 projects, but currently, there is only one Corps IWS demonstration project in development on the Illinois Waterway, as a result of WRRDA 2014, designed to repair and upgrade several locks and dams over a 7-10 year period.

IWS stakeholders such as the IWUB and the Waterways Council Inc. user advocacy group support the concept of private industry investment in the IWS using P3s, but paradoxically they do not support the imposition of lock user fees and other user-fee-based revenue streams that make P3s feasible.<sup>66</sup> Taxpayer advocacy groups also support P3s since these agreements shift a portion of the project funding burden to the private sector, although taxpayers could see an increase in the price of consumer goods passed on by shippers and carriers if they are forced to pay IWS user fees.<sup>67</sup> Congressional control of project prioritization through the annual authorization and appropriation processes could be usurped by P3 private partners willing to provide up-front financing, which could explain Congress' reluctance to support fully the P3 approach.<sup>68</sup> Finally, P3s are not suitable for every infrastructure project, and it remains to be seen if the P3 approach is a viable solution to increasing IWS investment.

The sale of municipal bonds, or "debt financing," is another alternative financing option used by other federal, state and local agencies to generate revenue for operation, maintenance and capital investment in infrastructure, to include in the transportation sector.<sup>69</sup> The United States is unique in that its private citizens and companies can invest directly in the municipal bond market to fund infrastructure projects while most other countries rely on central or private banks to fund infrastructure.<sup>70</sup> The executive branch has recently proposed an array of debt financing tools to generate up-front funding for federal, state, and local infrastructure projects and to stimulate infrastructure investment.<sup>71</sup> Debt financing is relatively unknown for inland waterway projects and the Corps currently does not have the authority to use this tool, unlike other federal infrastructure agencies. However, WRRDA 2014, Section 2004(a),

requires the Corps to study the benefits and implications of issuing federally-tax exempt bonds secured against the available and projected proceeds of the IWTF within one year of enactment.<sup>72</sup> Yet, Congress has not provided the appropriations necessary for the Corps to begin this study.<sup>73</sup>

Bonds are heavily used at the state and local levels to provide revenue for short-term needs that are paid back to investors over time with interest.<sup>74</sup> The means to pay back investors could come from the U.S. General Treasury, but since federal investment in the IWS has been uncertain and insufficient, a more reliable method to repay debt purchased by private investors would have to come from alternate revenue sources, such as user fees or some other forms of concession.

Viewpoints on the use of revenue bonds differ depending on the type of bond, but in general, the Obama administration supported the use of bonds and made occasional recommendations to Congress to advance infrastructure interests in that regard. Congress, however, demonstrated a reluctance to support bond sales for the IWS by not funding the WRRDA 2014 provision to study this option. In addition, Congress seemed to view the diverse array of bond options proposed by the Obama administration as undercutting its control of infrastructure, which it viewed as an inherent governmental responsibility.<sup>75</sup> Taxpayers appear to support municipal bonds for infrastructure because they offer a stable, predictable return on investment while assisting the Nation with financing critical projects that, in the case of the IWS, will ultimately boost the economy and lower the cost of consumer goods. Municipal bonds also provide an investment incentive to investors since they are exempt from federal

income tax, but they still require financial backing by either the General Treasury revenue or a user-fee-based revenue stream.<sup>76</sup>

As with the P3 approach, IWS shippers, carriers and industry groups that represent them would support debt financing as long as they are backed by availability of payments from the U.S. Treasury and not through new user fees. Congress' resistance to user fees has resulted in a decrease in the usage of bond financing for infrastructure projects among agencies that have the authority to use them.<sup>77</sup> Still, there are some federal agencies that have used debt financing successfully for decades.

The idea of the IWS as a bond issue is not farfetched. The Tennessee Valley Authority (TVA) provides an example of how a federal infrastructure organization can self-finance its operation, maintenance, and capital investment needs through debt financing.<sup>78</sup> The Tennessee Valley Authority Act of 1952 provides the TVA with its authorities to sell public debt to reinvest in operations, maintenance, and for making capital improvements.<sup>79</sup> The TVA has the authority to sell electricity generated by its dams to consumers and retain the proceeds, unlike the Corps' that provides transportation but does not have the statutory authority to charge or retain fees for the use of the IWS. The study of the TVA's authorities and processes could serve as a useful example in which to develop new enabling legislation that could be applied to the IWS.

### Recommendations

Since Congress creates laws, programs, and agencies and appropriates funding, many practical solutions fall within its purview.<sup>80</sup> Increasing investment in the IWS through the status quo option is feasible, but improbable. Most feasible options will require authorities to generate and fence user-fee-based revenue streams to sustain

adequate maintenance and capital investment in the IWS, which will necessitate modification of current law that prohibits tolling on navigable waterways.<sup>81</sup> The executive branch, to include the ASA(CW) and the Corps, should urge Congress to appropriate the funding required to comply with the requirements in WRRDA 2014, Sections 2004(a) and (b) to study the efficacy of debt financing and options for alternate revenue streams. In addition to Section 2004(a), the TVA financing structure and their authorities granted through the Tennessee Valley Authority Act of 1952 should be studied to glean insights from the use of tax-exempt bonds to self-finance water resource infrastructure. The executive branch should urge Congress to consider including the measures proposed in the FY 2017 budget request in future legislation consisting of annual per-vessel user fees and a requirement to fund 25 percent of IWS maintenance activities with IWTF revenue instead of using the IWTF only for capital improvements.<sup>82</sup> Some IWS infrastructure, particularly locks that experience high usage, could prove viable for P3s and therefore, Congress should appropriate funds for the Corps for the development of WRRDA 2014, Section 5014 demonstration projects. Finally, the annual budget cycle results in uncertain appropriations for civil works projects in contrast to the multi-year appropriations for military construction projects that offer predictability to construction contractors. Congress should implement previous recommendations in future legislation granting authority for the Corps to study the feasibility of applying multi-year appropriations to the IWS.<sup>83</sup>

Overcoming the legislative and executive tension to implement any of the aforementioned recommendations presents a significant challenge. Models based on political science theory could help the Nation's executive-level leadership and

lawmakers develop insights and the political will necessary to make legislative changes that increase investment in the IWS. Although statisticians George Box and Norman Draper are famous for their quote “all models are wrong, but some are useful,” they also assert that models provide an approximation of reality and, therefore, could be useful in solving the problems associated with the IWS.<sup>84</sup>

### Challenges to Implementing Options

Political scientist Donald Kettl offers his punctuated equilibrium model (see figure 5) to explain the conditions necessary for a government bureaucracy to change the status quo system. Kettl observes that government naturally makes incremental decisions but drastic changes to the system are abnormal, even with the knowledge of well-defined problems that will result in imminent crises.<sup>85</sup> According to Kettl, the status quo system within the U.S. Government requires a major crisis-producing event or “shock” to achieve the political unity required to pass significant legislation to solve major problems. Even after a system shock, the strong forces toward incrementalism within government result in backsliding from the “new normal” toward the status quo.<sup>86</sup>

In the context of water resources infrastructure, Kettl uses Hurricane Katrina (2005) as an example of a major crisis-generating event that shocked the system. The destructive aftermath of Katrina galvanized the executive and legislative branches toward consensus, resulting in a massive \$14 billion supplemental appropriation that provided efficient, up-front funding to the Corps for the New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS).<sup>87</sup> This massive system of levees, floodwalls, canal closure structures, floodgates and pumping stations addressed the pre-Katrina deficiencies in the system that resulted in flooding and increased New Orleans’ protection from future hurricanes. Although the deficiencies in the storm

protection infrastructure were well-known before Katrina, the incremental approach did not produce the investment needed to make the repairs necessary to withstand the category three hurricane for which the system was designed.<sup>88</sup> Like the deficient pre-Katrina system, the unreliable and degraded condition of the IWS has been an issue for decades, but the status quo system has proven incapable of producing significant changes. According to the punctuated equilibrium model, Katrina produced the shock that resulted in a one-time, event-driven change in the form of the massive supplemental appropriation.

In the context of water resources infrastructure legislation, no major changes were made to the status quo system after Katrina to increase investment in the Nation's infrastructure system, which Kettle defines as "backsliding." Applying Kettle's model, the status quo system is not suitable for generating the level of investment needed to change the declining condition of the IWS. A shared understanding within the government that a harmful shock is required to cause significant change could prompt lawmakers and the bureaucracy to implement effective legislative solutions before a major lock chamber or other IWS infrastructure component fails catastrophically.

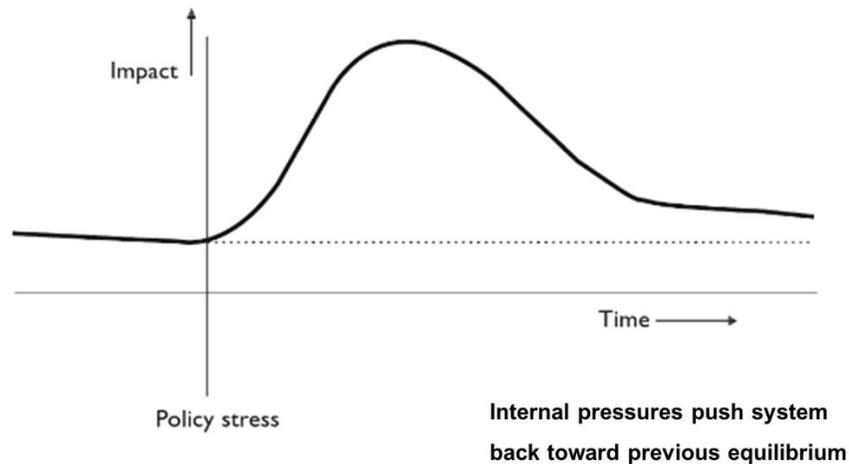


Figure 5. Punctuated Equilibrium Model<sup>89</sup>

John Kingdon, another political scientist, advances a theory that offers an explanation of the conditions necessary to move an issue from relative anonymity into the spotlight of the political agenda. The myriad of issues and interests competing for a place on the legislative docket and the tension between the executive and bicameral legislative branches in the U.S. political system inhibit beneficial legislation that would not be debated in an autocratic form of government.<sup>90</sup> Kingdon introduces the concept of the “policy window” as an opportunity for items to move onto the legislative agenda when at least two of three categories or “streams” labeled “problems,” “policy,” or “politics” converge (see figure 6).<sup>91</sup> Problems, such as budget crises, compete for legislative attention and the problems perceived as the most critical stand the best chance of being added to the agenda. The problems associated with the IWS appear to be well-known within government, and stakeholders appear to share an understanding of the value of IWS. Therefore, the IWS problem stream, according to Kingdon’s theory, could be poised to help create a future policy window. The proposal aspect of Kingdon’s

theory refers to the technical solutions or options available from the various stakeholders that seek entry into the political system.<sup>92</sup>

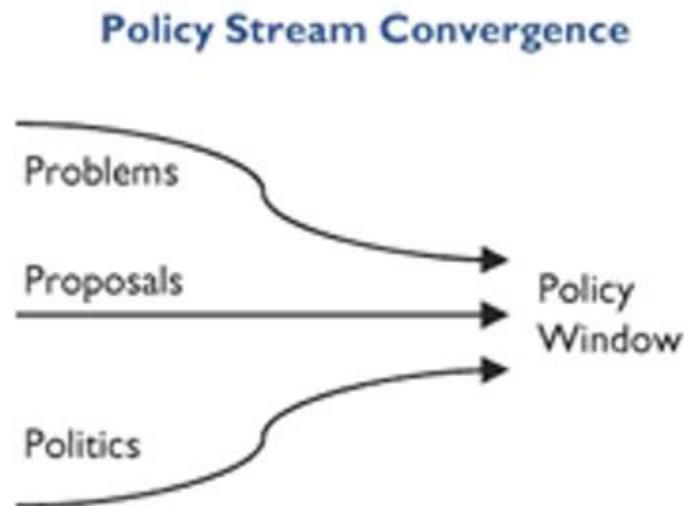


Figure 6. Policy Streams Converging to Create Policy Windows<sup>93</sup>

Regarding the IWS, there are many proposals advanced by numerous stakeholders offering feasible options to increase investment and solve the problems caused by underinvestment. However, considering the large number of proposals advanced over the past decades, and the fact that very few are incorporated into legislation, it is possible that the proposal stream is too confusing or diluted to produce successful agenda items. The politics stream refers to the political climate and influence that affects an item's chance of landing on the agenda.<sup>94</sup> Kingdon asserts that changes in presidential administration, the national mood, and partisan composition of Congress are key factors that affect the political stream.<sup>95</sup> The 2016 election of a Republican president, a Republican majority in both the House and Senate and the national enthusiasm regarding the potential for increased economic prosperity could generate an unprecedented political stream.<sup>96</sup> A policy window could emerge by combining the future

political stream with the current problem and policy streams, which then could set the conditions required to pass enabling legislation that boosts IWS investment.

Although the president has great influence over the execution of the bureaucracy, the power of Congress over policy supports the concept of a “policy entrepreneur” within Congress to couple the streams and support enabling legislation.<sup>97</sup> The history of the ITWF fuel tax provides a relevant example of a policy entrepreneur. In 1976, Republican Senator Pete Domenici of Arizona, a member of the Senate Public Works Subcommittee, pursued a two-year effort to advance an IWS user fee proposal onto the legislative agenda. He saw user fees as a logical means to finance repairs to Lock and Dam 26 on the Mississippi River and other Corps projects that were experiencing delays due to mechanical failure caused by recurring insufficient maintenance budgets. Even decades before Domenici decided to address IWS investment, user-fee-based proposals had failed to make the legislative agenda due to the heavy influence of industry user groups that wanted to avoid higher transportation costs.<sup>98</sup> Domenici capitalized on the opportunity to couple the problem stream with the political stream provided by the incoming Carter administration, who supported user fees as a means of sustaining adequate IWS investment consistent with the policy for rail and highway systems.<sup>99</sup> The Revenue Act of 1978 finally included user fees after the threat of a veto from President Jimmy Carter. However, those user fees were a lesser form than were originally envisioned, which we know today as the IWTF fuel excise tax which supports less than 10 percent of the IWS investment needs.<sup>100</sup> Not only does Senator Domenici’s example serve as a reminder of the long-standing controversy surrounding IWS user fees proposals, but it also underscores the need for a policy

entrepreneur from within Congress to maneuver controversial legislation through a complex process.<sup>101</sup>

Finally, to gain public support for IWS increased investment, the policy entrepreneur and other national-level leaders need to effectively advance common a narrative that counters that of the usual IWS stakeholders. Public visibility on the issue of IWS investment is especially important if the status quo option continues to be the primary path forward, which requires the public to bear the majority of the investment burden. One way to accomplish this is to link IWS investment to economic recovery in a way that is understandable to the public that inhabits the river corridors and basins instead of asking the public to accept the large step linking their personal economic well-being to National Economic Development benefits of the IWS and lower-priced goods resulting from transportation efficiencies.<sup>102</sup> Increased IWS investment should be linked to actionable regional strategies for economic development that resonate by associating them with jobs and local economic prosperity.<sup>103</sup> Presently, no such national-level narrative or strategy exists to effectively communicate the importance of IWS investment in the public.<sup>104</sup>

### Conclusion

The IWS is a well-developed strategic asset that provides significant value to the Nation in terms of economic development and strategic mobility for national security assets. Congress and the executive branch understand that the IWS has become increasingly unreliable because of decades of underinvestment and that continued neglect jeopardizes its economic viability. The current system of funding is incapable of sustaining adequate investment levels on a recurring basis. The legislative and executive impasse is periodically broken when the system is shocked, resulting in

unified action to solve a particular problem, typically through a supplemental appropriation. Increasing the IWS investment to adequate levels in a sustainable manner requires enabling legislation to change the existing authorities and laws. No single solution will be universally acceptable to IWS stakeholders. The Corps alone cannot fix underinvestment with their current authorities and internal process streamlining. Congress is best-positioned to provide the necessary legislative solutions with support from the executive branch. A policy entrepreneur within Congress is needed to marshal the competing interests between the executive and legislative branches and the various IWS stakeholders to champion solutions that increase investment. Understanding the political science theories advanced by Kettl and Kingdon can help draw attention to the obstacles and potential solutions to the funding problem. The IWS continues to be a significant contributor to the national economy in the 21<sup>st</sup> Century and retaining its value will ultimately be determined by future investment.

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<sup>66</sup> Jill Jamieson, "P3 and the Funding of our Nations' Inland Waterways," March 25, 2016, <https://www.linkedin.com/pulse/p3-funding-our-nations-inland-waterways-jill-jamieson> (accessed December 16, 2016); The Horinko Group, "Proposed Public-Private Partnership Projects," 92.

<sup>67</sup> Reinhardt and Utt, "Public-Private Partnerships."

<sup>68</sup> Ibid.

<sup>69</sup> California Legislative Analyst's Office, "Frequently Asked Questions about Bond Financing," February 2007, [http://www.lao.ca.gov/2007/bond\\_financing/bond\\_financing\\_020507.aspx](http://www.lao.ca.gov/2007/bond_financing/bond_financing_020507.aspx) (accessed December 13, 2016).

<sup>70</sup> Patrick Sabol and Robert Puentes, "Building Better Infrastructure with Better Bonds," April 22, 2015, 3, <https://www.brookings.edu/research/building-better-infrastructure-with-better-bonds/> (accessed December 19, 2016).

<sup>71</sup> Ibid. This article contains definitions and explanations of the primary products available on the U.S. municipal bond market.

<sup>72</sup> *Water Resources Reform and Development Act of 2014*, Section 2004(a), H.R. 3080, 113th Cong. 2<sup>nd</sup> Sess. (June 10, 2014), 72-73, <https://www.gpo.gov/fdsys/pkg/BILLS-113hr3080enr/pdf/BILLS-113hr3080enr.pdf> (accessed December 18, 2016).

<sup>73</sup> Belk, "Implementation Guidance for Sections 2004(a) and (b) of WRDA 2014."

<sup>74</sup> U.S. Department of Treasury, "Expanding our Nation's Infrastructure," 5.

<sup>75</sup> Sabol and Puentes, "Building Better Infrastructure with Better Bonds," 7.

<sup>76</sup> U.S. Department of Treasury, "Expanding our Nation's Infrastructure", 5.

<sup>77</sup> Ibid. Bond sales increased during the credit bubble of 2006 and the American Recovery and Reinvestment Act of 2009.

<sup>78</sup> "The Tennessee Valley Authority (TVA) in the 1950s," linked from *The TVA Home Page* at "About TVA," <https://www.tva.com/About-TVA/Our-History/The-1950s> (accessed November 15, 2016).

<sup>79</sup> *Tennessee Valley Authority Act of 1959*, Public Law 86-137, 86th Cong. (August 6, 1959), 280-285, <https://www.govtrack.us/congress/bills/86/hr3460> (accessed December 7, 2016).

<sup>80</sup> Donald F. Kettl, *System Under Stress – Homeland Security and American Politics*, 2<sup>nd</sup> ed. (Washington, DC: Congressional Quarterly Press, 2007), 137.

<sup>81</sup> Rivers and Harbors Appropriations Act of 1902, Title 33, Navigation and Navigable Waters, Section 565, (June 13, 1902), 115, <https://www.gpo.gov/fdsys/pkg/USCODE-2011-title33/pdf/USCODE-2011-title33.pdf> (accessed December 18, 2016); Lambert et al., "P3/P4 Solutions for Inland Waterways," 6.

<sup>82</sup> U.S. Army Corps of Engineers, "President's Fiscal 2017 Budget for U.S. Army Corps of Engineers Civil Works," <http://www.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/651818/presidents-fiscal-2017-budget-for-us-army-corps-of-engineers-civil-works/> (accessed December 18, 2016); U.S. Office of Management and Budget, *Budget of the United States Government, Fiscal Year 2017* (Washington, DC: U.S. Government Printing Office,

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<sup>83</sup> Inland Marine Transportation Systems, *Capital Projects Business Model Final Report*, 78.

<sup>84</sup> George E.P. Box and Norman Draper, *Empirical Model-Building and Response Surfaces* (New York: John Wiley & Sons, 1987), 424.

<sup>85</sup> Kettl, *System under Stress*, 130.

<sup>86</sup> *Ibid.*, 132.

<sup>87</sup> U.S. Army Corps of Engineers, "Hurricane & Storm Damage Risk Reduction System," May 2016, <http://www.mvn.usace.army.mil/Missions/HSDRRS/> (accessed November 14, 2016).

<sup>88</sup> Kettl, *System under Stress*, 73-75.

<sup>89</sup> *Ibid.*, 135.

<sup>90</sup> Kingdon, *Agendas, Alternatives, and Public Policies*, 84-85.

<sup>91</sup> *Ibid.*, 86-87.

<sup>92</sup> *Ibid.*, 87.

<sup>93</sup> Harvard Family Research Project, Harvard Graduate School of Education, "Evaluation Based on Theories of the Policy Process," *The Evaluation Exchange* XIII, no. 1 (Spring 2007): 6, <http://www.hfrp.org/evaluation/the-evaluation-exchange/issue-archive/advocacy-and-policy-change/> (accessed December 19, 2016).

<sup>94</sup> Kingdon, *Agendas, Alternatives, and Public Policies*, 87.

<sup>95</sup> *Ibid.*

<sup>96</sup> Trump election campaign rhetoric articulating support of public-private partnerships and increased investment in infrastructure. Donald J. Trump, "2016 Campaign Infrastructure Vision," <https://www.donaldjtrump.com/policies/an-americas-infrastructure-first-plan> (accessed November 23, 2016).

<sup>97</sup> Kingdon, *Agendas, Alternatives, and Public Policies*, 88.

<sup>98</sup> *Ibid.*, 13.

<sup>99</sup> *Ibid.*

<sup>100</sup> *Ibid.*

<sup>101</sup> *Ibid.*, 12.

<sup>102</sup> McGinnis, "Observations on U.S. Waterway Modernization."

<sup>103</sup> *Ibid.*

<sup>104</sup> Ibid.