Regionality: The path to a more sustainable water resource future

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ABSTRACT

This article highlights the significant benefits of budgeting, planning, and implementing U.S. Army Corps of Engineers' (Corps) water resources projects on a regional (rather than a project-by-project) basis. The change is required because of two crucial developments. First, the Corps' civil works budget has declined more than 16% in real terms since 2006. As a result of shrinking Corps budgets, critical water resources are precluded from receiving essential maintenance and crucial new projects are prevented from being constructed. Concurrently, the federal government's approach to budgeting, planning and maintaining each individual water resource project needlessly drives up project costs and fails to properly manage our nation's water resource needs. A regional approach to the Corps' projects will extend the Corps' constrained funding by cutting dredge mobilization costs, economically utilizing dredged material throughout regions, and coordinating administrative procedures and regulations across water resource agencies. In doing so, the Corps will be able to meet the nation's water resource needs more effectively and efficiently.

ADDITIONAL KEYWORDS: Beneficial use of dredged materials, dredge mobilization coordination, interagency coordination, systems approach.

America's coastal water resource network is intended to provide substantial protection from severe storms, enable the unencumbered and swift transportation of cargo, and preserve the nation's innate environmental treasures. Yet, essential port, navigation, and coastal storm damage reduction measures have deteriorated into a state of near disrepair. According to the American Society of Civil Engineers' 2013 Report Card for America's Infrastructure, the United States' dams, levees, inland waterways, coastal protection projects, and ports collectively scored a D in condition and performance measures. As of 2013, there are more than 16,000 deficient and high-hazard dams, 52 daily inland waterway shipping delays, and $100 billion worth of urgent levee repairs. Along the East and Gulf coasts, there are only six ports capable of accommodating post-Panamax ships (ASCE 2013). The American Shore & Beach Preservation Association has estimated that the federal government is funding less than one-fourth of the nation's coastal water resource needs (ASBPA Government Affairs Agenda 2009). The immediate challenge facing the nation is not the construction of new water resource projects, but rather the needs to operate, maintain, rehabilitate, and upgrade existing infrastructure (National Research Council 2011).

There simply is not enough federal-state-local funding to meet those needs. The Corps' civil works budget has declined by more than 16% since 2006 (Figure 1). As with all types of infrastructure, water resource needs not met one year cost far more in the future. Currently, there is an estimated $1.7 billion funding shortfall for shore protection projects every year (IWR 2012). Furthermore, there is an approximately $1 billion dollar funding gap inhibiting the Corps from maintaining water resources at a minimally acceptable level and an additional $1 billion deficit preventing the Corps from planning and constructing new measures to address some of the nation's more critical water resource needs (G. Loew, Senior Water Policy Advisor, pers. comm. 2013). There is a cost to be paid for this funding gap. While that figure is difficult to estimate, the financial burden is evident in the added costs of waterborne transportation, disaster relief, and the degradation of coastal ecosystems (ASCE 2013). In addition, the looming threat of sea level rise poses a need to build resiliency into our ports and coastal protection systems (Intergovernmental Panel on Climate Change 2013).

Many of the statutory authorities for the Corps to plan, implement, and manage water resources are focused on specific projects. The most significant statute to emphasize the individual project focus was the Water Resources Development Act of 1986, which required that projects be cost-shared between the federal government and project's state or local government sponsor (Cole *et al.* 2002). That approach is also reflected in the Corps' budget, which is almost entirely based on line-item funding for individual studies and projects. While the elimination of congressional earmarks in recent years has shifted control over which studies and projects are funded from Congress

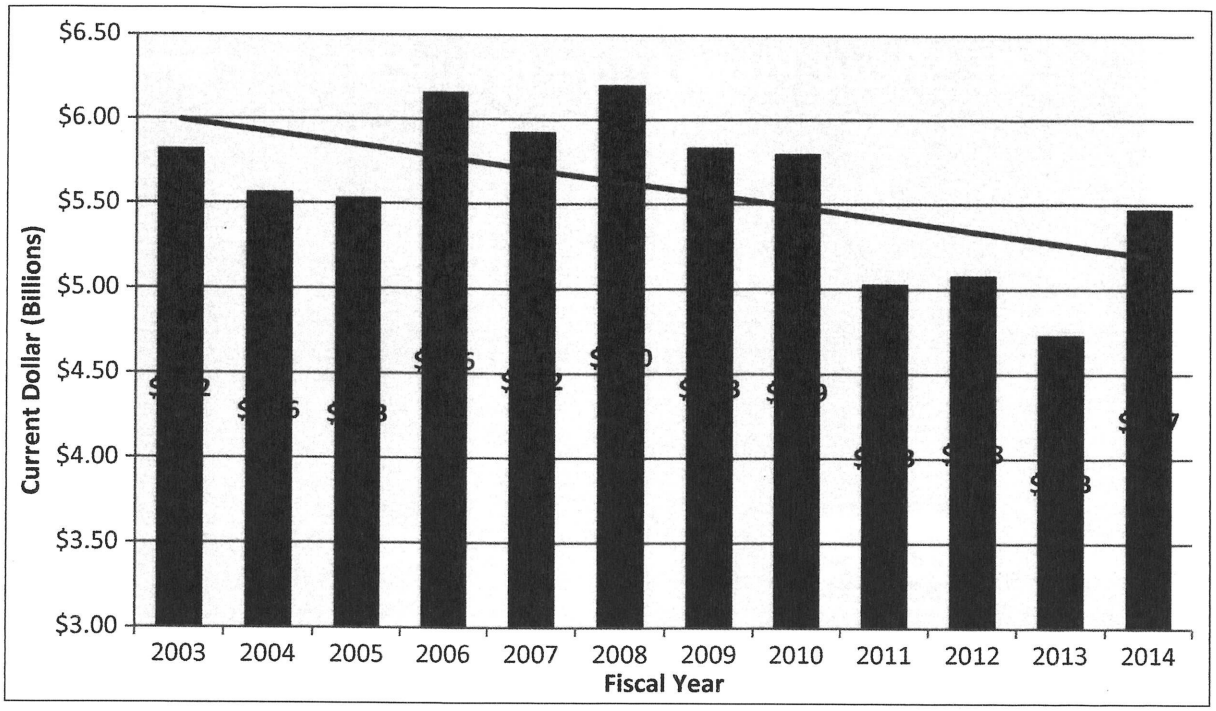

Figure 1: The trend in the U.S. Army Corps of Engineers' Civil Works budget from 2003 to 2014.

to the president, the project-by-project approach has not changed.

REGIONALITY

The concept of using a comprehensive analysis to assess the water resources needs and solutions was first espoused in the Flood Control Act of 1917, which authorized a study of the relationship of flood control projects to navigation, water power, and other resources. What has been referred to as a systems or watershed approach is strongly supported by the scientific literature as well as the Corps own Strategic Plan (Cole *et al.* 2002; USACE 2011a). This systems approach, or what we refer to as regionality, will lower project costs, improve the condition of the nation's water resources, and establish plans for addressing America's water resource needs. Regionality rejects a focus on individual projects and replaces it with a methodology that concentrates on regional, long-term solutions that consider the entire life-cycles of projects (USACE 2011b). Conducting the Corps' water resource operations on a regional basis will lower projects' costs, address societal needs, and accomplish objectives with full consideration given to projects' interdependences. It enables the Corps to more efficiently stretch scarce resources and meet the water resource needs of the populace. Regionality cuts operating costs by coordinating dredge mobilizations, efficiently expending resources among water projects, and streamlining administrative requirements.

COST SAVINGS FROM DREDGE MOBILIZATION COORDINATION

Coordinating dredge operations will lower mobilization and dredge rental costs. Most coastal resource projects require the use of a dredge, either to place sand on a shoreline or to remove sand from a harbor or channel. Each time dredging is required, one or more dredge vessels, landside equipment, and personnel must be mobilized. Coastal dredging mobilization and demobilization costs can amount to $3 million to $4 million per contract, or approximately 10% to 60% of total project costs (W. Hanson, VP Government Relations, Great Lakes Dredge & Dock Co., pers. comm. 2013; Gebert 2010). In addition, some projects require the rental of dredging equipment with costs that can amount to nearly 65% of the total project cost (USACE New Orleans District 2013).

Regionalizing the management of civil works projects can cut costs by reducing the number of dredge mobilizations and amortizing dredge rental costs. Individual projects' dredging cycles can be coordinated by allowing one dredging team to execute multiple dredging operations under one continuous mobilization. Extending mobilizations reduces mobilization costs by as much as 50 percent (W. Hanson, pers. comm. 2013).

Coordinating dredge mobilizations also decreases water resource projects' equipment rental expenses (W. Hanson, pers. comm. 2013). With a regional approach, rental expenses are reduced because water resource operations require fewer and more extended rental contracts. One long-term contract is less expensive than multiple short-term contracts. For example, Dredge & Marine Company LLC bases its dredge rental rates on the length of the rental period. Specifically, rental rates for two-month deployments are 10% of the dredge's value; two- to four-month deployments cost 8% of the dredge's value; and dredge rentals of six or more months are charged 6% of the dredge's value (R. King, sales manager, Dredge & Marine Company, pers. comm 2013). Thus, by eliminating dredge mobilizations and amortizing dredge rental expenses, a regional approach to the Corps' water infrastructure projects will reduce project costs.

DREDGE MOBILIZATION COORDINATION: A CASE STUDY

A regional approach to the Corps' water resource operations will substantially cut the costs of several adjacent Delaware Shore Protection projects. The Rehoboth Beach to Dewey Beach, Bethany Beach to South Bethany Beach, and Fenwick Island beach nourishment projects are located within 20 miles of one another (Figure 2). Despite their close proximity, their Project Cooperation Agreements do not provide for the coordination and consolidation of nourishment cycles (Gebert 2010). For instance, both the Rehoboth to Dewey Beach and the Bethany Beach to South Bethany Beach projects have pe-

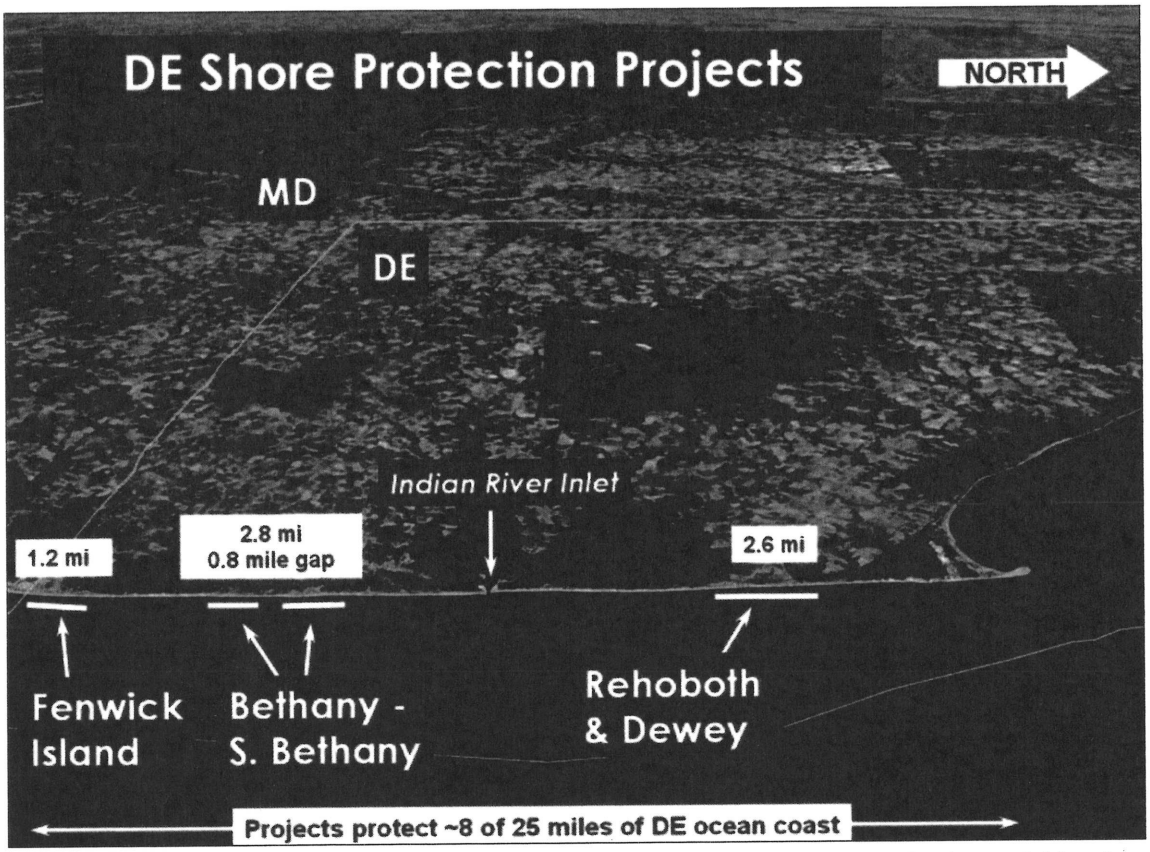

Figure 2: The map shows designated shore protection projects in Delaware.

riodic nourishment cycles of three years that never coincide. In addition, the Fenwick Island beach nourishment project is on a four-year nourishment interval in which dredging operations intermittently coincide and are coordinated with either the Rehoboth to Dewey Beach project or the Bethany to South Bethany operation. The three projects' generally fragmented dredging cycles require a total of 31 nourishment contracts over a 44-year span (Gebert 2010). Due to the absence of dredge mobilization coordination and failure to capitalize on economies of scale associated with the Corps' operations, the contemporary method of conducting Delaware shore protection projects is inefficient.

Coordinating the dredge mobilizations of these three Delaware shore protection projects considerably decreases the life-cycle costs of the projects. Simply adjusting these projects' nourishment cycles to ensure they occur on the same year will allow each project to be executed with one continuous mobilization. These relatively minor modifications to dredging cycles and coordination of the Delaware shore protection dredging operations will eliminate 17 dredge mobilizations and reduce the cumulative project cost by 10-15 percent (Gebert 2010).

BENEFICIAL USE OF DREDGED MATERIAL

The current practice for disposing of sediment obtained from channel dredging wastes both money and sand. In accordance with statutory requirements (33 USC; Chapter II, Part 335; Sec. 335.4), dredged sediment from harbors, inland navigation ways, and other Corps projects is disposed of on a least-cost basis (Rosati 2004; Water Resource and Development Act of 2007; 33 C.F.R. §335.52). This least-cost disposal procedure only takes into account an individual water resource project's expenses, not the alternative uses of the sediment by other water resource projects in the region. As a consequence, 70% to 80% of the Corps' dredging projects dispose of valuable sediment in preapproved confined areas, upland disposal sites, or in open water (US EPA 2007). In turn, some of these disposal sites fill and require intermittent dredging.

Rather than dumping sediment in offshore disposal sites, this dredged material could be used to complete various other Corps' projects that require sediment. Reusing sediment in this fashion (often referred to as beneficial use) can markedly reduce the aggregate costs of multiple projects and preserve valuable sources of sand (US EPA 2007). Beneficial use of dredged material involves redistributing dredged sediment from port, waterway, and channel dredging operations for some other productive use. Productive beneficial use projects include environmental restoration operations, coastal resiliency measures, and levee reinforcement projects, just to name a few (US EPA 2007). Unfortunately, a project-by-project approach coupled with the management of navigation and other business lines as distinct functions within the agency is an impediment to placing dredged material on nearby shorelines or in retention piles where it can be used at a later time. When a channel is dredged, for example, funds from the "Operations & Maintenance" (O&M) budget account are used. As stated above, it is standard practice to dispose of that sediment in the least costly manner possible. However, if it is proposed to place the sand on a nearby shoreline, there is an additional cost that will be charged to the same O&M account. Given budget constraints, there is a natural inclination to resist efforts that will require more funds from that account.

BENEFICIAL USE: A CASE STUDY

The beneficial use of dredged material from the Oakland Harbor 50-foot channel deepening project substantially

reduced the costs of the Middle Harbor Enhancement Area (MHEA). In 1999, the Water Resources and Development Act authorized the beneficial use of nearly all of Oakland Harbor's dredged sediment. Nearly 5.8 million cubic yards of sediment was required to construct the MHEA. Had beneficial use not been employed in this case, a dredge operation to acquire this amount of sediment would have cost $33.1 million, or $5.70 per cubic yard (A. Paniccia, Oakland Harbor Project Manager, pers. comm. 2013). However, because all of the sediment for the MHEA was obtained from the Oakland Harbor operation, both projects saved considerable money. The elimination of an entire dredge operation saved the MHEA $33.1 million (San Francisco Bay Conservation and Development Commission *et al.* 2012). Without this cost savings, the project would not have been implemented (A. Paniccia, pers. comm. 2013). In addition, the MHEA was the Oakland Harbors least cost disposal site. Employing beneficial use in this instance saved the Oakland Harbor project $82.5 million (A. Paniccia, pers. comm. 2013). Thus, employing beneficial use of dredged material between the MHEA and the Oakland Harbor project saved cumulatively $115.6 million (San Francisco Bay Conservation and Development Commission *et al.* 2012).

INTERAGENCY COORDINATION

Unnecessarily overlapping and duplicative water resources' administrative and regulatory requirements raise operational costs and impede a quick and seamless implementation of water resource projects. Water resource project management and regulatory issues often stem from insufficient coordination among state and federal regulatory agencies, an unsatisfactory level of information sharing among stakeholders, and an inadequate amount of input from nonfederal sponsors (USACE 2011b). For one, state and local government's lack of regulatory coordination and cohesion elevates operating costs and hinders timely project implementation. Water resource projects must fulfill regulations for multiple federal and state agencies prior to commencing operations (USACE 2011b). Often, these agencies' water policies and regulations are inconsistent or unnecessarily duplicative, leading to avoidable delays and additional expenses (USACE Civil Works Directorate 2010).

Furthermore, the sharing of data, personnel, and expertise across state lines, administrative agencies, and the Corps' internal structure is inadequate (United States Government Accountability Office 2010; USACE Civil Works Directorate 2010). The various water resource agencies affiliated with Corps' operations have limited personnel to conduct the regulatory reviews required by federal law. Finding ways to consolidate expertise will reduce delays in project execution. Finally, while nonfederal sponsors pay one-half of the costs of a project feasibility study, they are, in fact, treated as a junior partner during the study process (Carter 2013). However, nonfederal sponsors have a particularly keen interest in identifying the community's water resource needs and conveying the local citizenry's dispositions (Shabman 2012). This insufficient consideration of nonfederal sponsors' input in the Corps' process hinders the Corps' ability to design projects that maximize societal benefits.

Interagency coordination will streamline water resource projects' implementation and cut the Corps' operating costs. Interagency coordination facilitates collaboration among fractured state and federal agencies, spurs the exchange of water resource information, and integrates the nonfederal sponsors' perspectives and recommendations into the Corps' operating procedures.

Under this administrative structure, government agencies are enabled to collaborate and consolidate regulatory requirements (USACE Civil Works Directorate 2010). In doing so, water resource projects will be streamlined and regulatory expenses will decline substantially. For example, a regional environmental approval process can be established. Rather than requiring Corps projects to navigate federal and local environmental regulation permits and procedures, if a state's environmental benchmarks are more stringent than those of the federal government, then the state policy applies. Streamlining of this nature is currently used by the Corps to develop programmatic environmental impact statements and nationwide permits.

Interagency coordination will promote the sharing of water resource statistics and research among stakeholders (USACE Civil Works Directorate 2010). Sharing water resource information in this manner will lower the administrative burdens on all entities involved and thus quicken the pace of project execution and decrease administrative expenses.

Finally, nonfederal sponsors inclusion in the Corps project implementation procedure ensures that the Corps' operations meet the needs of the community to the greatest extent possible. In effect, including non-federal sponsors' interests ensures that the Corps' finances are spent wisely.

INTERAGENCY COORDINATION: A CASE STUDY

Interagency coordination between the Corps and the U. S. Bureau of Reclamation (BOR) on the Folsom Dam project saved both agencies substantial time and money on their respective projects. Sacramento California's Folsom Dam falls under the administrative purview of both the Corps and BOR. In accordance with its federal mandate, the Corps is obligated to retrofit Folsom Dam with sufficient flood protection measures to protect the surrounding populace (U.S. Dept. of Interior and USACE 2007). For this purpose, in 2005 the Corps had planned to execute a standalone outlet modification and dam rise project that would take an estimated 18 years to complete and cost approximately $1.729 billion (USACE *et al.* 2006). The BOR, on the other hand, has statutory authority to not only operate the dam, but also to maintain the dam's structural integrity (U.S. Dept. of Interior and USACE 2007). Rather than executing their respective projects and missions independently, the Corps and the BOR consolidated these operations and administrative objectives into a single project (USACE *et al.* 2006). In doing so, economies of scale associated with bundling water resource operations were fully realized. The Joint Federal Project between the Corps and the BOR cut aggregate project costs by $1 billion and reduced the projects work schedule by seven years (USACE 2011b). Thus, interagency collaboration between the Corps and the BOR substantially decreased the Folsom Dam construction cost and streamlined the projects implementation.

CONCLUSIONS

In light of a decreasing budget for the U.S. Army Corps of Engineers and inefficient operating procedures, it has become more urgent to implement a regional approach to planning, budget-

ing, and implementing water resource projects. Conducting the Corps' water resource operations on a regional basis will lower project costs and address Americans' water resource needs. Rather than executing individual water resource projects in a piecemeal fashion, a regional approach will encourage the Corps and its state and local government partners to aggregate projects into one or more regional plans, thereby reducing operating costs and prioritizing projects on a needs basis. These coastal regionality cost savings are a product of coordinated dredge cycles, regional sediment management, and interagency coordination. Such practices decrease mobilization and dredge rental expenses, efficiently expend resources among water resource operations, and streamline administrative requirements.

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