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Building Resiliency in America's Coastline

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Building Resiliency in America's Coastline

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The recent global health crisis has justifiably consumed the world's attention, but as economic recovery efforts unfold amidst hurricane season, dialogue is needed to more fully consider alternative approaches to dealing with severe weather, rising seas, and greening both economic and community resilience efforts. Climate change, much like the global pandemic, remains a long-term challenge that requires thoughtful reflection and creative approaches to better solve for the multiplicity of socio-economic and ecological challenges impacting coastal communities domestically and internationally. This is particularly true for those states located along the U.S. Gulf Coast region, an area that has endured repeated frontline set-backs against the battle of rising seas. Given local and state government's limited resources to plan and implement coastal resilience projects, stretched even further by the current health pandemic, now is the time for policy makers to consider new approaches. Resilience-oriented projects, such as the emerging role of dredging to meet coastal resilience challenges, coupled with key legislative policy changes, can best accelerate cost-efficient solutions to coastal protection, preservation, and restoration. This paper explores the role of dredging as a nature-based solution tool, one which can be made more efficient through legislative action and adoption of international best practices.

ADAPTATION AND NATURE-BASED SOLUTIONS

Climate change, particularly rising seas, is too expensive to ignore and doing so will cost the U.S. dearly. According to a recent United Nations report, globally, sea levels rose by about six inches during the last century and continue to accelerate, rising twice as fast this century.¹ Yale Climate Connections estimates that the damage from climate change and rising seas is expected to result in 910 million lost labor hours per year by 2090 – costing \$75 billion per year (Nuccitelli, 2019). The impact is highest in the Southeast where destruction due to lost labor and property are anticipated to exceed \$50 billion annually toward the end of the century (Nuccitelli, 2019). The scenario is no better in the EU where scientists

¹ If emissions and temperatures continue to rise, seas are estimated to rise 3 to 6 feet, impacting many coastal cities: <https://qz.com/1715756/un-ipcc-report-predicts-dramatic-devastating-sea-level-rise-if-warming-continues>.

estimate that climate change is responsible for €20-€60 billion in annual damage (EU Horizon 2020 Expert Group, 2015).

As governments scramble to implement responses to address climate change, nature-based approaches are emerging as a cost-effective tool in helping to mitigate flooding and tidal surge resulting from rising seas. A nature-based approach, often referred to as a Nature-Based Solution (NBS), utilizes natural systems to provide engineering fixes to community challenges, such as flooding and tidal surge. Resilience thinking relies on nature and its corresponding mechanisms, allowing a system to absorb and redistribute disturbances, such as storm surge. That system then adapts and responds through self-regulation as opposed to a hard (infrastructure-oriented) engineering fix, such as a seawall or levee (Walker & Salt, 2006). NBS is a wider ranging concept that helps to solve for a variety of community goals, including conservation, restoration, mitigation and other measures – all building with nature (Sansoglou, Spring 2020). The European Commission refers to NBS as: “Living solutions inspired and supported by nature, which provide environmental, social and economic benefits and help build resilience. Such solutions bring more nature into cities, landscapes and seascapes, through local, resource-efficient and systemic interventions” (European Commission, 2020). A sometimes-overlooked tool in an NBS approach is the utilization of dredged material for coastal adaptation purposes, such as in the creation of barrier islands, berms, sand dunes and beaches to protect coastlines from storm surge and flooding.²

DREDGING AS A NATURE-BASED SOLUTION (NBS)

For many decades, the EU has relied on NBS to address flooding and rising seas caused by climate change, particularly through the utilization of dredging and the strategic placement of sediment. Hard engineering solutions (such as dikes and flood walls) remain important tools for battling flooding, and though they are sometimes used in conjunction with NBS, do not independently represent a resilience-oriented solution. Unlike hard engineering fixes, dredging is a softer and more cost-efficient means of restoring and reinforcing coastal areas against erosion and flooding. Dredging, and the strategic placement of fill, has the additional benefit of being able to strengthen adaptation, resilience and health of the natural environment (EU Horizon 2020 Expert Group, 2015).

The Dutch, in particular, since the 1990s, have utilized dredging and sediment management to achieve a greater degree of harmony between engineering for community defense against rising seas and simultaneously providing ecological and recreational growth opportunities. The pivot towards designing with nature, instead of against it, has made adaptation approaches more sustainable, durable and cost-effective. Perhaps nothing demonstrates this more than the examples of De Haan Beach, located in Belgium and the Sand Engine, located off the south coast of the Netherlands.

² It is important to note that not all experts agree that dredging should be considered an NBS. One reason for this disagreement centers around uncertainty attributed to source conditions and the process/technique by which sand-like material is dredged from a specific source.

CASE STUDIES OF NATURE-BASED SOLUTIONS AND EU ADAPTATION STRATEGIES



De Haan Beach, Belgium, before (right) and after investment (left).

Case Study 1: De Haan Beach, Belgium

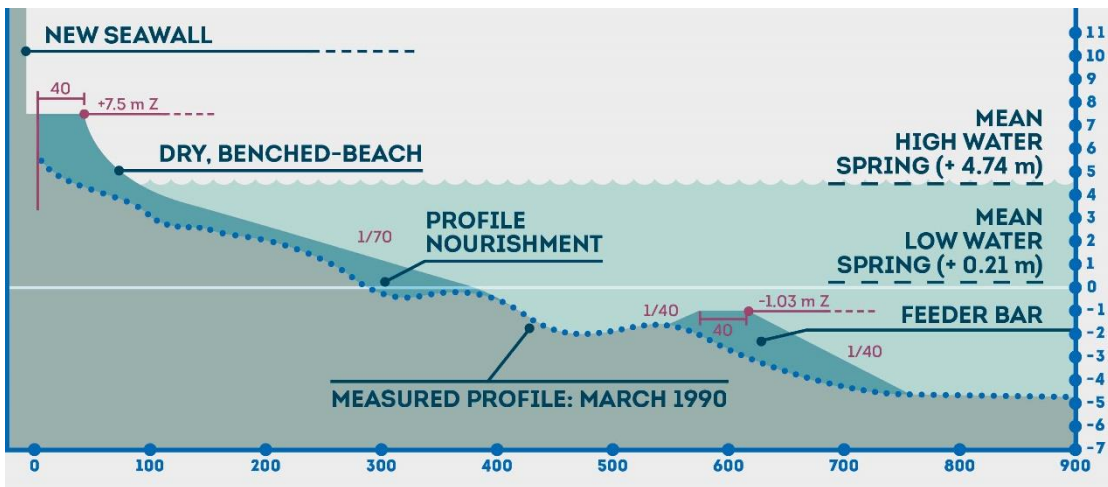
One of the earliest examples of dredging and NBS in the EU is exemplified by the beaches of De Haan, Belgium - a historically popular seaside resort situated along the southern portion of the North Sea coastline.³ De Haan, challenged by seasonal flooding, needed a solution to coastal erosion that protected the local community but went beyond hard infrastructure fixes to better support recreation and sustainability practices. In 1990, the city considered a more adaptive strategy – sand management – that relied on natural systems to repair and restore shorelines, dunes and beaches.

Engineers and policy makers alike essentially adopted an early NBS mindset; they utilized dredging and strategic sand placement to more efficiently restore and enlarge beaches and dunes. Dredging was used to create a subtidal feeder bar/berm to nourish beach restoration. Creating the feeder berm required dredging 600,000 cubic meters of sand (via hopper dredge) along with another 800,000 cubic meters for onshore re-building purposes – at a total cost of approximately €10 million.

After about one year, the feeder berm proved successful - little sand was lost through erosion and the natural nourishment of the intertidal beach was strengthened. The combined act of a feeder berm and enhanced beach nourishment resulted in decreasing levels of erosion which reduced the need and corresponding costs for additional sediment. The engineers concluded: “Instead of trying to maintain the existing structures, working in harmony with natural forces appears to be a more adequate and effective way of achieving coastal protection” (HAECON -Harbour and Engineering, p. 12). Dredging and strategic sand management practices resulted in better flood protection and a wider beach that now continues to attract a wide variety of flora, fauna, tourists and recreational enthusiasts alike (HAECON -Harbour and Engineering).

³ Case study information and historical photo (at time of construction) extracted from work prepared by Haecon-Harbour Engineering Consultants <http://www.euroSION.org/shoreline/1dehaan.html>; Photo of De Haan Beach left source: Spectator Life, Cook, William Feb. 2020.

Diagram 1. Relative position of feeder bar, beach and dry benched beach at De Haan Beach



The strategic placement of the feeder bar provides sand nourishment to the beach, enlarging and protecting the area through natural systems (De Haan, Belgium). Source: adapted from *New Developments Along the Belgium Coast*, Challier, Roger. Jan 1995.

Case Study 2: The Sand Engine, the Netherlands



The Sand Engine

Since the 1990s, dredging as an NBS continues to be applied and studied throughout the EU. The North Seas’ Sand Engine, situated on the south coast of the Netherlands at Ter Heijde, is perhaps one of the most notable international best practices of NBS due to its scale.⁴ Like De Haan, the Sand Engine utilizes dredge material and natural systems to strengthen flood defense infrastructure through the re-

⁴ The Sand Engine is one of the largest sand management projects. Photo and table source: <https://oppla.eu/casestudy/17630>.

construction of shorelines and habitat. In 2011, Dutch engineers seeking to create a balance between nourishment and defense of the coastline, dumped 21.5 million cubic meters of sand into one spot (at a cost of €70 million) and allowed natural tides to move dredged sediment to restore coastal areas lost to erosion (OpplaEU).

Annually, one million cubic meters of sand spreads out along the Dutch coast from the Sand Engine, which has created over 3,500 acres of new beach and dunes. Sea currents and wind continue to push sand in different directions, but what has transpired is a coastline with a larger riparian edge (especially along the western and eastern shores) that protects the coastal community from flooding due to storm surge and rising seas. The Sand Engine works slowly with no reliance on hard infrastructure. As a result, sand, plants and marine life adapt and flourish – over 40 species of birds nest or hunt along the shore and the Sand Engine boasts more bio-diversity than adjacent beach areas (Baurick, 2020). After 20 years, the Sand Engine is expected to have disappeared entirely - the idea is to allow nature to shape natural defense (OpplaEU). The result is a constantly evolving eco-system characterized by new coast lines and dunes that solves for coastal flooding and community protection while fostering new natural habitats without relying on annual beach/sand replenishment costs.

The Sand Engine is a great example of a nature-based solution, as it is a living laboratory of constant study, assessing: wind, tidal currents, morphology (how sands move), dune creation, habitat restoration and animal diversity. Scientists monitor the Sand Engine by utilizing lasers to measure sand movement along with tides, animal migration and habitat formation. This information, and corresponding technology platforms, are often shared across user groups including government lifesaving agencies, recreational enthusiasts and curious community residents.⁵ The Sand Engine has become another feather in the Dutch cap on working with nature instead of against it, exemplifying how to restore eco-system function while managing for social, economic and environmental adaptation needs.

Case Study 3: Gulf Shores Barrier Islands: Ship Island

Unlike the EU, the U.S. embrace of dredging as a nature-based solution evolved more slowly, and though not as prolific, continues to influence many coastal restoration initiatives, particularly in the Gulf Coast states. One of the larger coastal protection projects, representing many of the same characteristics utilized by the Dutch, is the State of Mississippi's Coastal Improvement Program (MsCIP).⁶ This initiative seeks to restore multiple barrier islands along the Gulf Islands National Seashore all of which serve to protect the U.S. Gulf Coast from storm surge while providing critical habitat to an array of birds, fauna and marine life. The barrier islands (most notably Ship Island) located approximately eleven miles south off the coast of Gulfport and Biloxi, Mississippi have lost between 24%-64% of their total landmass since

⁵ The sharing/knowledge economy, particularly the water sector, has become big business for the Dutch -the water sector has resulted in generous knowledge-sharing exporting €7.6 billion in expertise in 2018. Additional information on the Sand Engine extracted from Kingdom of the Netherlands website and video: <http://nl.intheusa.com/sand-engine/>. Table source: <https://oppla.eu/casestudy/17630>.

⁶ Case study information can be found at: <https://www.cakex.org/case-studies/large-scale-restoration-barrier-island-systems-and-cultural-resource-protection-through-sediment-placement-gulf-islands-national-seashore-mississippi>; photo by Trevor Reid.

1848, mostly as a result of navigational dredging and erosion resulting from major hurricanes such as Hurricane Katrina (Reid, 2020).



Ship Island

The United States Army Corps of Engineers (USACE), employing international best practices, worked to restore the barrier islands through a nature-based solution that, like the Dutch, utilizes sediment nourishment (dredging) and morphology to help fill-in barrier island gaps. The USACE strategically positioned sediment in key drift zones, allowing currents to naturally spread sand to re-nourish the barrier islands. Since 2011, half a million cubic yards of sand have been pumped into the western portion of Ship Island. According to a 2014 Environmental Impact Statement, future dredging and nourishing costs are expected to exceed \$368 million (five times higher than that of the Dutch Sand Engine). Though the project was deemed a success, more dredging and strategic placement of sediment is needed to fill-in the remaining eastern and western portions of Ship Island (Reid, 2020).

As the above case studies illustrate, dredging is a key nature-based solution tool for many coastal restoration initiatives in both the EU and the U.S. However, dredging in the U.S. is much more expensive than in the EU. De Haan Beach utilized 1.4 million cubic meters of sand at a cost of €10 million. The Sand Engine utilized 21.5 million cubic meters of sand at a cost of €70 million. Compare this to Ship Island in the U.S., which utilized 19 million cubic yards (or 14.5 million cubic meters) of sand at a cost of \$368 million (equating to approximately €308 million). The U.S. example is a fraction of the size of EU projects but four to five times the cost.

THE HIGH COSTS OF NBS IN THE U.S.: LOUISIANA

Louisiana and the Gulf Coast states, like the Netherlands, rely on dredging to fortify shorelines and barrier islands lost to erosion from climatic action. The State of Louisiana, in particular, loses 29 square miles of land annually, equating to over 910,000 American football fields since 1930 (Lifsey, Andrew 2016). Dredging projects have helped to restore land loss; however the cost of doing so has steadily increased and remains a challenge for barrier island and marsh restoration activities.

In 2010, the Louisiana Coastal Protection and Restoration Authority (LCPRA), concerned about increasing dredging costs for coastal recovery efforts, commissioned an economic study which confirmed

that restoration efforts were under threat of consistent, accelerating per-unit dredging cost increases (Cohen, et al., 2011).⁷ A 2014 U.S. Government Accountability Office (GAO) report further revealed that dredging costs have indeed sky-rocketed. In 2003, the USACE spent \$170 million for hopper dredges to remove 66 million cubic yards of material. Yet in 2012, the USACE spent \$370 million on hopper dredges to remove only a slightly higher amount (72 million cubic yards) of sediment. Within ten years, prices for dredging increased 117% while the amount actually dredged increased by only 9% (United States GAO, April 2014, p. 9). Both studies attributed much of the cost increase to rising fuel, labor and steel prices. However, price increases were also attributed to a lack of competition among a small group of domestic (dredging) bidders, including “a national dredging community that has very little capacity for additional projects” (Cohen, et al., 2011, p. 1).

These findings are reinforced by a more recent 2015 report from the Water Institute of the Gulf, which revealed that the amount of USACE dredged material has remained the same over 10 years, yet the average unit cost has nearly doubled from \$2.86 per cubic yard in 1999 to \$5.10 per cubic yard in 2009 (Clark, Bien, & Wilson, Sept 2015). The Water Institute of the Gulf notes that project costs for dredging are directly affected by the availability of having modern, efficient equipment (dredging vessels) especially for larger 100 plus acre projects. Essentially, a lack of competition among the U.S. dredging industry has resulted in increased dredging prices made worse by a limited amount of innovation and development in new hopper dredges.

The U.S. dredging situation differs greatly from what is occurring internationally, especially in the EU and Asia. Internationally, the amount of material dredged and the price of dredging as a per unit cost has decreased since 2000, primarily due to larger capacity and innovation in hopper dredges, including better fuel efficient technology (Cohen, et al., 2011). Unfortunately, the same level of innovation has not happened in the U.S. hopper dredge fleet, primarily as a result of protectionist policies that limit investment in the construction of new and improved hopper dredge vessels.

U.S. CHALLENGES TO DREDGING AS A TOOL OF NBS: JONES ACT AND DREDGING ACT

New policy approaches are needed to limit the inefficiencies (such as high per-unit costs) that currently characterize the U.S. dredging sector. The largest obstacles to reducing these inefficiencies lies in re-thinking current U.S. protectionist policies, namely the Jones and Foreign Dredge Acts.

Currently, both the Jones Act (or Merchant Marine Act) of 1920 and the Foreign Dredge Act of 1906 prohibit foreign built and chartered or operated dredges from competing in the U.S. The Jones Act focuses on protecting U.S. interests in the transportation of goods and materials (known as cabotage), while the Dredging Act restricts the use of dredgers to those vessels that are U.S. built, U.S. owned, U.S. flagged and U.S. staffed. Essentially the act prevents any dredging from a foreign built, chartered, owned or crewed vessel.⁸

⁷ An analysis prepared for Proceedings of the 2011 WEDA XXXI Technical Dredging Conference noted that reported unit costs for marsh projects ranged from \$1.75 to \$10 per cubed meter and that costs were increasing for placement of dredged sediment.

⁸ Today, vessels must be 75% U.S. owned, 75% U.S. crewed, and assembled entirely in the U.S.

Protectionist policies, such as the Jones and Dredging Acts, created a U.S. economy which is off limits to foreign vessels that can provide much cheaper and more efficient dredging options. These acts directly support the U.S. domestic dredging industry, which as a result, now faces minimal competition and thus has little incentive to innovate to meet growing dredging demand needed for coastal restoration projects. Both the Jones and Dredging Acts were passed under the pretext of national security with the intent being to strengthen and protect domestic shipbuilding in times of war and emergencies. However, the result directly threatens national security as we now have a beleaguered, non-competitive U.S. dredging industry characterized by a lack of investment in new technology and new hopper dredge vessels.⁹

The U.S. wasn't always like this. Between 1899-1949, the United States Army Corps of Engineers (USACE) built 150 dredges to support America's dredging needs. But investment in dredging technology decreased substantially in the 1960s and 1970s when privatization of the dredging sector occurred (Biven, 2019). Throughout the 1970s, USACE saw a significant decrease in their budget for dredging and instead moved towards contracting with U.S. dredging companies to build vessels – mostly retaining its own dredging fleet to perform services if the contract price to dredge exceeded the government estimate by 25% (Lifsey, 2016). Since this time, a number of other statutes and acts (the Oceans Act of 1992; the Energy and Waters Appropriations Act of 1995; and the Water Resources and Development Act of 1996) have helped to eliminate foreign competition, resulting in a further reduction of government dredging to the benefit of the U.S. domestic dredging market (Lifsey, 2016).

In effect, bad U.S. protectionist policy has limited competition and now just a few dredging companies provide the majority of U.S. dredging work. Since 1977, the U.S. federal hopper dredge fleet decreased from 14 to 4 vessels. Between 1978-1988, private industry built 14 hopper vessels but between 1989-2019, this sector built only 2 hoppers (Biven, 2019). The total U.S. hopper dredge fleet of 19 vessels as of 2019, as illustrated in Table 1, pales in comparison to what exists internationally.¹⁰

Table 1: Hopper Vessel Dredging Capacity: U.S.

Total U.S. Hopper Dredge Fleet as of 2019

U.S. Dredge Company/Agency	Hopper Dredge Fleet (vessel number)
USACE	4
Great Lake Dredge and Dock	5
Manson	4
Dutra Group	2
Cashman	1
Weeks Marine	3
TOTAL	19

⁹ For a fuller discussion of Jones Act protectionist measures and corresponding impacts, see <https://www.cato.org/project-jones-act-reform>.

¹⁰ Table 1 data reflects information up to 2019. Data derived from: (Biven 2019).

Since 2000, the building of larger vessels has decreased significantly because the domestic build requirements remain onerous and costly. Both the Jones and the Dredging Acts have created a situation where labor and material to build new vessels in the U.S. is quadruple the cost of building in other countries (Lifsey, 2016). This finding is confirmed in a recent Congressional Research Services report, which found: “Some 91% of the 911 vessels built in U.S. shipyards between 2007 and 2017 were sold domestically, suggesting that U.S. shipyards compete infrequently with foreign shipyards on price or vessel characteristics” (Frittelli, 2019, p. 8). As a result, the production of ships in the U.S. is less than 1% of that in S. Korea, China and Japan (Grabow, 2018).

In addition to U.S. dredges being few in number, they are also more expensive than their EU counterparts to construct. U.S. built vessels cost between \$190M-\$250M compared to \$30M in the EU (Grabow, Manak, & Ikenson, 2018; Collis & Fenili, 2018) and the average age of a U.S. hopper dredge is older than those found in the EU – the average age of a Jones Act vessel is 30 years. This is even more striking when you compare investment in shipyards. In the U.S., there are 7 main shipyards, while in the EU there are 60 - the majority of which are producing larger hopper vessels greater than 150 meters (Grabow, Manak, & Ikenson, 2018). U.S. shipyards have become reliant on government military contracts, which accounted for 70 percent of the shipbuilding and ship-repairing industries’ revenues in 2014 (Grabow, Manak, & Ikenson, 2018). Private sector investment in new vessels, particularly hopper dredges, has significantly decreased and continues to pale in comparison to international competitors, putting the U.S. shipbuilding market, and associated jobs, at a significant disadvantage.

Table 2 summarizes the vast difference in the U.S.’s highest capacity hopper dredge vessels compared to that of one EU country, Belgium.¹¹

Table 2: Dredging Vessel Capacity: U.S. vs. Belgium

U.S. Hopper Dredges		Belgium Hopper Dredges	
Name	Highest Capacity (cubic yards)	Name	Highest Capacity (cubic yards)
Glenn Edwards, Manson	13,500	Congo River, DEME Group	39,487
Stuguesant, Dutra Group	9,870	Pearl River, DEME Group	31,561
Ellis Island, Great Lakes Dredge and Dock	15,000	Christobal Colon, Jan De Nul	60,000
		Vasco da Ganna, Jan De Nul	43,000

As both Tables 1 and 2 illustrate, the dredge firm Great Lakes Dredge and Dock is the largest dredging firm in the U.S., but still pales in size comparison to EU competitors. In fact, the combined capacity of the U.S. fleet is less than a single EU dredging vessel. Dredging is critical for coastal protection and defense against climate change, yet the U.S. lags way behind other countries in total hopper dredge

¹¹ Table 2 illustrates capacity as of 2016. Data source: (Andrew Lifsey 2016). Additional information on international capacity comparisons can be found at www.cato.org.

investment.¹² As a result, the U.S. loses out on both direct and indirect jobs created when shipyards design, build, repair and maintain hopper dredges.¹³

According to the Heritage Foundation, the EU handles over 90% of the world's open bid dredging because the EU possesses and invests in more efficient technology.¹⁴ Within the last decade, the Netherlands and Belgium alone invested €15 billion in new dredging technology, while the U.S. invested only \$1 billion (McLernon, April 2018). Because of this, the international consulting firm, Samuels International Associates, estimates that European dredgers, if permitted access to the U.S. market, could save U.S. taxpayers \$1 billion annually on current projects (Grabow, Manak, & Ikenson, 2018).

Recent research by the Center for Strategic and International Studies (CSIS) in Auction Theory further supports the idea that opening competition to more foreign bidders would lower per unit dredging costs and thus lower the amount paid by the Corps of Engineers for dredging, saving both local and federal government resources which could be re-deployed elsewhere. "Less expensive dredging means that more dredging projects can be completed at the same cost, expanding the benefits for ports and surrounding communities" (Collis & Fenili, 2018, p. 14). Add to this the fact that a Dutch company, Van Oord, recently estimated that even with the use of U.S. crews and support vessels, the company could provide large U.S. dredge projects three times faster and for 60% less than current practices (Baurick, 2020). Essentially, to the detriment of U.S. taxpayers, bad protectionist policy has created a dredging situation characterized by high/increasing costs and labor inefficiencies. The U.S. dredging sector would experience more investment and significant output gains if protectionist policies were more fully liberalized.¹⁵

POLICY FIXES AND RECOMMENDATIONS

There is no greater region in the U.S. in need of policy fixes to support foreign dredging and ongoing coastal restoration work than in Louisiana and the adjacent Gulf Coast region. As earlier noted, Louisiana relies on dredging to support many coastal restoration efforts, including shoreline and barrier island preservation. Since Louisiana is disappearing at a rate of one American football field every 100 minutes, the equivalent of 144 American football fields per day, nothing should be more paramount than incentivizing investment in dredging to reduce costs for coastal restoration.¹⁶

In 2012 the Louisiana Coastal Protection and Restoration Authority (CPRA) rolled out an ambitious coastal restoration plan that will take an estimated 50 years and over \$50 billion to complete. According to a recent update to the CPRA 2017 Master Plan, there will be 17 new dredging projects totaling over 14,000 acres in size, requiring 83.5 million cubic yards of (dredged) sediment – this equates

¹² A 2014 GAO report substantiates these findings noting that, among other reasons, decreasing levels of competition in the dredging market since 2002 are attributed to unavailability of hopper dredges with engines that can meet state specific air quality standards. Source United States GAO, April 2014.

¹³ Loosening market access restrictions on foreign vessels may actually help bolster the fortunes of U.S. shipyards, as there will be more vessels in domestic waters, and these vessels will require repair.

¹⁴ Heritage Foundation notes that the U.S. dredgers suffers from overcapacity and a lack of innovation: <https://www.heritage.org/trade/commentary/113-year-old-law-hurting-american-ports>.

¹⁵ A 1993 USITC report notes that the maritime sector, particularly dredging, could experience significant output gains (over \$3B) if the Jones Act was liberalized - prices would decrease and lower costs would stimulate domestic production and investment in new projects.

¹⁶ Lake Pontchartrain Basin Foundation, www.lpbf.org.

to an investment of \$1.08 billion dollars in coastal projects to reduce storm surge-based flood risk to communities.¹⁷ Dredging will again be a key component of this plan, but greater efficiencies (and perhaps more dredging projects) would be realized if foreign dredges were allowed to perform this work at a fraction of the U.S. cost.

Policymakers, during this time of global economic crisis, now more than any other time in history, must look for solutions that curtail costs while creating the greatest social, environmental and economic benefits. As Louisiana exemplifies, coastal restoration costs are expensive and require a complex mix of private, state, federal and local resources.¹⁸ As local public coffers continue to get stretched, especially during the COVID-19 recovery, existing protectionist policies that drag down domestic investment and drive up costs must be re-considered.

Dredging is an obvious tool for nature-based solutions, but archaic protectionist measures must be re-assessed to allow these efficiencies to manifest. A repeal of the Foreign Dredge Act and/or the granting of waivers to the build requirement of the Jones Act is critical to strengthening efficiencies, reducing dredging costs and incentivizing investment in more dredging projects that directly benefit coastal resilience.

In particular, waivers, exemptions, or carve-outs should be granted to foreign dredges that are utilized to support coastal restoration initiatives. Precedent exists for the granting of Jones Act and Dredge Act waivers - the U.S. President has the authority to issue such an action in the name of national defense and has done so already.¹⁹ In 2017, President Trump waived Jones Act restrictions for ten days to allow a Norwegian ship to provide supplies from New Orleans to Puerto Rico after Hurricane Maria. In fact, since 1989, at least 133 specific vessels have been granted Jones Act waivers by Congress in 16 separate legislative acts (Frittelli, 2019). This same approach could be applied to the Dredging Act - allowing foreign dredges to operate (for a certain time period) domestically to work on major coastal restoration and resilience projects. Waivers could be limited to large, nationally significant coastal restoration projects (where more costs efficiencies would be realized), protecting domestic U.S. businesses from foreign competition in the inland waterways. Additionally, waivers could be restricted to U.S. allies and friends, including signatories to existing trade agreements. Doing so would enhance levels of tech-transfer, operational know-how and result in significant project cost savings, while limiting access to those countries which offer reciprocal benefits to U.S. dredgers.

Furthermore, policymakers should consider waiving Jones Act U.S. build requirements (essentially withdrawing the Dredging Act) and allow the use of foreign built dredges in the U.S. Currently, the U.S. already relies on foreign engineering and components to build U.S. dredges, but more leniency should be allowed for other portions such as the hull and super structure (Grennes, 2017). Dredges are built to restore coastlines and navigational channels; they are not intended as war time vessels and should thus not be subject to onerous Jones Act build requirements. This reasoning is not new and is reinforced by a 2010 congressional research analysis that recommended dredges be removed from the Jones Act domestic build requirements as they do little to contribute to the

¹⁷ Cost estimate includes habitat restoration. Over the past 20 years, Louisiana has spent more than \$817 million on dredging for barrier islands and coastal headlands: https://www.nola.com/news/environment/water_ways/article_0a50735a-5e56-11ea-a7ee-eb8087416f63.html.

¹⁸ In Louisiana, coastal restoration and dredging comes from an array of public-private sources, including: State surplus funds, CIAP, CWPPRA, LCA + WRDA, GOMESA, BP and funds generated through the RESTORE Act.

¹⁹ CATO Institute <https://www.cato.org/project-jones-act-reform>.

strengthening of U.S. national (war time) interests.²⁰ Allowing foreign dredging in and of itself may not be a complete panacea to U.S. coastal challenges, but it's certainly a good start towards creating more coastal resilience and a higher level of project efficiency, saving money for local governments and taxpayers alike.

The U.S. dredging community has an important role to play in battling climate change. However, the status quo is simply not enough - U.S. coastal communities deserve more protection and investment from rising seas. The solution is to implement policy tweaks that can lower dredging costs and incentivize more innovation, investment and knowledge transfer. Now is the time for U.S. policymakers to consider changes to archaic protectionist policy, so that more U.S. coastal communities, like those in the EU, can benefit from nature-based solutions that will protect shorelines from the ravages of climate change for generations to come.

²⁰ For additional information on Jones Act build requirement recommendations, see Ronald O'Rourke, Congressional Research Service, Leases of Foreign-Built Ships, Background for Congress, 2010: <http://fas.org/sgp/crs/weapons/RS22454.pdf>.

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