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The Coastal Zone Management Act: A Mixed Success

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Abstract

Coastal zones in the United States are becoming overpopulated and underlying ecosystems are being degraded. The ecosystem services that coastal zones provide will be compromised if we follow the current management path. As the population in these areas increases, so too does the amount of non-point source pollution. Integrated coastal zone management programs are needed to address non-point source pollution. Coastal zones are also in peril due to the current projections of sea level rise caused by climate change. A precautionary approach, such as that employed in Australia and New Zealand, must be used to protect coastal zones from the effects of global warming. The Coastal Zone Management Act (CZMA) of 1972 was created to preserve and protect coastal areas from pollution and overpopulation. The purpose of this paper is to examine the effectiveness of the CZMA and the challenges it will face going forward.

Keywords: Coastal Zones, Coastal Zone Management, Non-point Source Pollution, Water Quality, Wetlands

Introduction

Coastal zones are near-coastal waters and the adjacent land areas, including islands, transitional and intertidal areas, salt marshes, wetlands, and beaches. They provide a buffer from storms, filter pollution, provide habitats for marine life and offer areas for recreation and tourism.[1] Many coastal zones are in peril due to the harmful effects of increasing urban expansion, industrial pollution, runoff, and discharge of waste and sewage.[2] The Coastal Zone Management Act (CZMA) of 1972 was created to preserve and protect coastal areas from pollution and overpopulation.

Prior to passage of the CZMA, local governments were unable to control pollution levels in waterways spanning multiple jurisdictions. Without a centralized regulatory body, each municipality could pollute waterways as much as it wanted while downstream municipalities disproportionately bore the effects. The CZMA addressed this problem by creating a partnership between the federal government and state governments to manage land use in coastal zones. The Act created three major programs: the National Estuarine Research Reserve System (NERRS), the National Coastal Zone Management Program (NCZMP), and the Coastal and Estuarine Land Conservation Program (CELCP) (established in 2002).[3]

The purpose of this paper is to examine the effectiveness of the Coastal Zone Management Act of 1972. First, I will explain the context in which the Act was enacted. I will then focus on the particulars of the Act, discussing the three main programs it created. Next, I will consider the successfulness of the Act. The CZMA has had mixed success, but faces numerous difficulties going forward. I will conclude by discussing the challenges that the CZMA faces going forward. Climate change in particular appears to be a forthcoming challenge to coastal zones that will require intense management to preserve the integrity of these areas.

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[1] Coastal Zone Management Act of 1972, Pub. L. No. 92-583, 86 Stat. 1280-89 (1972).

[2] United States. Congress. House. Committee on Public Works. Subcommittee on Rivers and Harbors. (19701971). *Coastal zone management: Hearing, Ninety-first Congress, first session, on H.R. 14845 ... December 3, 1969.* Washington: U.S. Govt. Print. Off.

[3] About the Office for Coastal Management. (n.d.). Retrieved April 02, 2016, from https://coast.noaa.gov/about/; The Coastal and Estuarine Land Conservation Program. (n.d.). Retrieved April 02, 2016, from https://coast.noaa.gov/czm/landconservation/; Coastal Zone Management Act. (n.d.) Retrieved April 02, 2016, from https://coast.noaa.gov/czm/act/.

The CZMA Was Necessary and Part of a Larger Environmental Movement

The CZMA was formed during a time of increasing awareness of the environment. Notably, the Clean Air Act and the National Environmental Policy Act, two ground-breaking environmental policies, were passed in 1970. The Environmental Protection Agency (EPA) was also formed in 1970, and brought further awareness to environmental issues.

In 1969, the Commission on Marine Science, Engineering and Resources recognized that the degradation of coastal zones was a serious problem.[4] Coastal zones were experiencing the effects of rapid industrialization. For example, between 1954-1964, filling, diking, draining and the construction of sea walls destroyed over 35% of salt marshes between Maine and Delaware.[5] These problems were further exacerbated by the large number of people living in close proximity to coastal zones; 53% of the U.S. population lived in cities and counties within 50 miles of coastal zones.[6]

Description of the Coastal Zone Management Act of 1972

The CZMA was established to preserve, protect, develop, and restore the coastal zones of the United States.[7] As shown in Appendix A, 34 out of 35 eligible states currently participate in the program. As of 2011, Alaska is the only eligible state that does not participate.[8] The CZMA established three main programs: NERRS, NCZMP, and in 2002, the CELCP. NERRS is a group of 28 coastal estuaries covering 1.3 million acres designated for protection and study through a partnership between NOAA and coastal states.[9] The NCZMP is a voluntary partnership between the

[4] Klyza, C. M., & Ford-Martin, P. A. (2011). Coastal Zone Management Act (1972). In *Environmental Encyclopedia* (4th ed., Vol. 1, pp. 336-339). Detroit: Gale. Retrieved from http://go.galegroup.com.ezproxy.cul.columbia.edu/ps/i.do?id=GALE%7CCX1918700318&v=2.1&u=columbiau&it=r&p=GVRL&sw=w&asid=cf5191b856a9b173c371e92dadeb74c9

[5] United States. (1972). National coastal zone management act of 1972: Report of the Senate Committee on Commerce on S. 3507: (together with individual views). Washington: U.S. Govt. Print. Off.

[6] United States. (1972). National coastal zone management act of 1972: Report of the Senate Committee on Commerce on S. 3507: (together with individual views). Washington: U.S. Govt. Print. Off.

[7] Coastal Zone Management Act of 1972, Pub. L. No. 92-583, 86 Stat. 1280-89 (1972).

[8] Government Accountability Office. (Photographer). (2014, July 18). Figure 1: Coastal States Participating in the National Coastal Zone Management Program [digital image]. Retrieved from https://www.flickr.com/photos/usgao/14497343859; Coastal Zone Management Programs. (n.d.). Retrieved April 05, 2016, from https://coast.noaa.gov/czm/mystate.

[9] National Estuarine Research Reserve System. (2015, 29 May). Retrieved from http://oceanservice.noaa.gov/ecosystems/nerrs/

federal government and U.S. coastal states that works to address issues such as climate change, ocean planning, and planning for energy facilities and development.[10] It provides states with basic requirements for their coastal management plans; however, states still have flexibility to design unique programs within these parameters.[11] The CELCP program provides matching funds to state governments to purchase endangered coastal and estuarine lands that are ecologically important or have other conservation value.[12]

Coastal Zone Management Act's Mixed Success

The CZMA's original goals were to protect natural resources, manage coastal development, improve coastal water quality, control non-point source (NPS) pollution, and provide public recreational access to the coasts.[13] NOAA rates overall quality of coastal zones using the following indices: water quality, sediment quality, coastal habitat, benthic, and fish tissue contaminants. In 2001, the overall quality of coastal zones was rated at 2.0/5.0, which is considered fair to poor. In 2008 it improved to 2.8/5.0, which is considered fair.[14] In 2011, NOAA removed water quality from its overall focus areas. While this was done to streamline performance measurement systems, it also means that current performance indicators may not provide an overall picture of individual states' performances in relation to all focus areas.[15] However, the CZMA has also provided many opportunities for public access to coastal zones. It has created 470 new access sites, enhanced 730 sites, educated 37,000 people, trained 650 coastal decision makers, and invested $26 million dollars between 2008-2011 into providing public access; these numbers are not insignificant.[16]

[10] About the National Coastal Zone Management Program. (n.d.). Retrieved April 02, 2016, from https://coast.noaa.gov/czm/about/
[11] About the National Coastal Zone Management Program. (n.d.). Retrieved April 02, 2016, from https://coast.noaa.gov/czm/about/
[12] The Coastal and Estuarine Land Conservation Program. (n.d.). Retrieved April 02, 2016, from https://coast.noaa.gov/czm/landconservation/
[13] Coastal Zone Management Act of 1972, Pub. L. No. 92-583, 86 Stat. 1280-89 (1972).
[14] Coastal Zone Management Act Performance Measurement System 2010 Report on Contextual Indicators (Rep.). (2010, December). Retrieved April 2, 2016, from NOAA website: https://coast.noaa.gov/czm/media/contextualindicator2010.pdf
[15] Fennell, A. (2014, July 16). Coastal Zone Management Opportunities Exist for NOAA to Enhance Its Use of Performance Information (Rep. No. GAO-14-592). Retrieved April 2, 2016, from Government Accountability Office website: http://www.gao.gov/assets/670/664806.pdf
[16] The National Coastal Zone Management Program Measuring Performance: Public Access. (n.d.). Retrieved April 2, 2016, from https://coast.noaa.gov/czm/media/czmperfaccess.pdf

The NERRS network of 28 coastal areas has cumulatively preserved 1.3 million acres of estuaries.[17] A recent study comparing NERRS sites and non-NERRS sites found that water quality and biological condition indicators scored consistently higher for NERRS than for non-NERRS sites.[18] The study concluded that setting aside NERRS areas to help preserve the integrity of natural-resource components is effective and can provide valuable reference sites for comparison with other estuarine areas.[19] These areas however, are subject to environmental stress and biological impacts outside of their boundaries that illustrate the limitations of the NERRS program.[20]

The CZMA's effectiveness in controlling non-point source pollution has been limited. NPS pollution such as runoff, precipitation, atmospheric deposition, drainage, seepage or hydrologic modification,[21] cannot be sourced to a particular polluter. Nitrogen and phosphorous runs off into waterways causing large algal blooms and creating hypoxic zones.[22] Downstream states bear the brunt of the problem as they are unable to control upstream pollution, which hinders effective coastal zone management. We now know that employing the precautionary principle of preventing pollution before it enters waterways, is a more effective way to control NPS pollution. When Congress reauthorized the CZMA in 1990, it identified NPS pollution as a major factor in the continued degradation of coastal zones, recognizing the challenges of managing this factor.[23]

The CZMA must also find ways to adapt and to mitigate the effects on coastal zones of sea level rise caused by climate change. Many coastal states and communities have taken action to prepare for and adapt to climate change by restoring natural storm buffers and incorporating climate change into their restoration

[17] National Estuarine Research Reserve System. (2015, 29 May). Retrieved from http://oceanservice.noaa.gov/ecosystems/nerrs/

[18] Balthis, W. L. et al. (January 01, 2015). An Integrated Assessment of Habitat Quality of National Estuarine Research Reserves in the Southeastern United States. Integrated Environmental Assessment and Management, 11, 2, 266-275.

[19] Balthis, W. L. et al. (January 01, 2015). An Integrated Assessment of Habitat Quality of National Estuarine Research Reserves in the Southeastern United States. Integrated Environmental Assessment and Management, 11, 2, 266-275.

[20] Balthis, W. L. et al. (January 01, 2015). An Integrated Assessment of Habitat Quality of National Estuarine Research Reserves in the Southeastern United States. Integrated Environmental Assessment and Management, 11, 2, 266-275.

[21] What is Nonpoint Source? (2016, January 5). Retrieved April 02, 2016, from https://www.epa.gov/polluted-runoff-nonpoint-source-pollution/what-nonpoint-source

[22] Nonpoint Source Pollution Pollutants from Nonpoint Sources: Nutrients. (2012, December 3). Retrieved April 02, 2016, from http://oceanservice.noaa.gov/education/kits/pollution/010nutrients.html

[23] Guidance Specifying Management Measures For Sources Of Nonpoint Pollution In Coastal Waters (Rep.). (1993). Retrieved April 2, 2016, from http://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=200139L3.txt

plans.[24] Coastal cities have also built and repaired dikes, seawalls, and other structures to protect cities from erosion and storms.[25] These communities have mapped coastal hazards and developed emergency response plans to take sea level rise into account.[26] However, given the problems caused by recent natural disasters, there is still more that can be done. Recall the effects of Hurricane Katrina on New Orleans and much of the Gulf Coast in 2005. A recent study found that there was a lack of organization and large gaps in knowledge for decision making in local coastal zones in Louisiana prior to the hurricane.[27] This suggests that there was room for improvement in Louisiana's Coastal Zone Management Program (CZMP).[28] Louisiana is not alone in facing such challenges, other coastal states could enhance their management plans by more comprehensively considering the effects of climate change.

Oregon is another state whose CZMP could be improved. Oregon officials were first notified in 2001 that they needed to create tighter non-point source pollution regulations.[29] In 2009, the Northwest Environmental Advocates sued NOAA and the EPA over their failure to enforce the CZMA.[30] Although the Oregon Board of Forestry voted in November 2015 to further restrict logging near streams in the western part of the state, NOAA and the EPA noted that Oregon still had management gaps in its forestry sector.[31] In March 2016, the EPA and NOAA notified the state that it was being denied $1.2 million in federal funding for

[24] Adaptation Examples: Coastal Areas. (2016, February 23). Retrieved from https://www3.epa.gov/climatechange/impacts-adaptation-renamed/coasts-adaptation.html.
[25] Adaptation Examples: Coastal Areas. (2016, February 23). Retrieved from https://www3.epa.gov/climatechange/impacts-adaptation-renamed/coasts-adaptation.html.
[26] Adaptation Examples: Coastal Areas. (2016, February 23). Retrieved from https://www3.epa.gov/climatechange/impacts-adaptation-renamed/coasts-adaptation.html.
[27] Norris-Raynbird, C. (2011, August). Local CZM Capacity Pre and Post Hurricanes Katrina, Rita, Gustav and Ike: A Comparison Study (Rep.). Retrieved April 2, 2016, from Louisiana Sea Grant College Program website: http://www.laseagrant.org/wp-content/uploads/Local-CZM-Capacity-final-report.pdf
[28] Norris-Raynbird, C. (2011, August). Local CZM Capacity Pre and Post Hurricanes Katrina, Rita, Gustav and Ike: A Comparison Study (Rep.). Retrieved April 2, 2016, from Louisiana Sea Grant College Program website: http://www.laseagrant.org/wp-content/uploads/Local-CZM-Capacity-final-report.pdf
[29] Profita, C. (2016, March 11). Feds Cut Oregon Funds Over Failure To Protect Coastal Waters From Logging. Retrieved April 04, 2016, from http://www.opb.org/news/article/feds-cut-oregon-funds-for-failing-to-protect-coastal-waters-from-logging/
[30] Jaquiss, N. (2016, March 11). Feds Strip $1.2 Million in Grant Funding From Oregon, Citing Failure to Protect Forests From Logging. Retrieved April 04, 2016, from http://www.wweek.com/2016/03/11/feds-strip-1-2-million-in-grant-funding-from-oregon-citing-failure-to-protect-forests-from-logging/
[31] Profita, C. (2016, March 11). Feds Cut Oregon Funds Over Failure To Protect Coastal Waters From Logging. Retrieved April 04, 2016, from http://www.opb.org/news/article/feds-cut-oregon-funds-for-failing-to-protect-coastal-waters-from-logging/

failing to protect coastal streams from logging under the CZMA.[32] Oregon's Department of Forestry noted that its pollution regulations in forests could be improved and that by the end of 2016 new rules regarding logging in streams will be created.[33]

Coastal Zone Management Could Be Improved

Coastal zone management faces many challenges going forward. Recent events have shown that the growing impacts of climate change will negatively affect coastal areas. Rising populations will put further stress on coastal communities, which effective management will need to overcome. Federal spending on Coastal Zone Management should consider the effects of climate change on coastal zones and act proactively to ensure that coastal zones are protected from sea level rise. The United States could benefit from looking to foreign precedent to improve its coastal zone management policies.

In New Zealand, regional and territorial policymakers are responsible for avoiding and managing risks to coastal zones. This system is mandated by both the Local Government Act of 2002 and the Resource Management Act (RMA) of 1991. The 2010 New Zealand Coastal Policy Statement, a policy under the RMA, requires the government to conduct managed retreats, meaning that buildings in areas that are likely to be at risk of damage from sea level rise and other coastal hazards should be relocated or removed.[34] While building coastal protections structures may be an appropriate alternative approach in some situations, it does not fit in with the sustainability values of managing the country's coastal zones.[35]

The Australian government also provides funding for coastal adaptation projects, including the abandonment of some coastal areas that will become too costly to maintain in the long

[32] Profita, C. (2016, March 11). Feds Cut Oregon Funds Over Failure To Protect Coastal Waters From Logging. Retrieved April 04, 2016, from http://www.opb.org/news/article/feds-cut-oregon-funds-for-failing-to-protect-coastal-waters-from-logging/

[33] Profita, C. (2016, March 11). Feds Cut Oregon Funds Over Failure To Protect Coastal Waters From Logging. Retrieved April 04, 2016, from http://www.opb.org/news/article/feds-cut-oregon-funds-for-failing-to-protect-coastal-waters-from-logging/

[34] Young, R. (2013, October 31). A Year After Sandy, the Wrong Policy on Rebuilding the Coast. Retrieved April 02, 2016, from http://e360.yale.edu/feature/a_year_after_sandy_the_wrong_policy_on_rebuilding_the_coast/2705/ ; *New Zealand Coastal Policy Statement 2010* (Rep.). (2010, November). Retrieved April 2, 2016, from New Zealand Department of Conservation website: http://www.doc.govt.nz/documents/conservation/marine-and-coastal/coastal-management/nz-coastal-policy-statement-2010.pdf

[35] *New Zealand Coastal Policy Statement 2010* (Rep.). (2010, November). Retrieved April 2, 2016, from New Zealand Department of Conservation website: http://www.doc.govt.nz/documents/conservation/marine-and-coastal/coastal-management/nz-coastal-policy-statement-2010.pdf

run.[36] This funding can come in the form of Coastal Adaptation and Protection (CAP) grants. CAP grants are available to local governments, state government agencies, aboriginal land councils, and other corporate entities that are directly involved with coastal management. Eligible projects include those that provide: coastal monitoring, adaptation planning, asset management, coastal adaptation, and coastal maintenance.[37] When applying for these grants, applicants are instructed that the number one priority for adaptation strategies is to avoid development in areas that are affected by coastal hazards. The second priority is a planned or managed retreat similar to New Zealand's policy. The third and fourth priorities are accommodation and protection from coastal zone hazards.[38] While Australia is attempting to avoid new development in coastal zones, the United States continues to build along the coasts.

After Hurricane Sandy, the U.S. Army Corps of Engineers spent $5 billion on shore protection projects, mostly putting sand onto beaches. The Army Corps of Engineers will have to put approximately 20 to 30 million cubic yards onto beaches, the equivalent of filling an 80,000-seat football stadium about 10 times.[39] This is just a Band-Aid in the face of the real problems that coastal zones are facing. In order to more effectively manage coastal zones, the CZMA should require states to work to restore ecosystems rather than trying to engineer coastal zones.[40] Acting in a precautionary rather than an reactionary manner, would be much more effective. Under this Act, there has been limited funding towards coastal mitigation projects. In 2015, NOAA's National Coastal Zone Management Program allocated only 16%, or $11.4 million federal and $18.7 million matching funds to coastal states for projects aimed at mitigating coastal hazards (See Appendix B for a full breakdown of the spending allocation).[41]

The spending bill that the Republican-dominated House of Representatives passed in June 2015, defunded many organizations and agencies conducting climate science research. Under this bill,

[36] Young, R. (2013, October 31). A Year After Sandy, the Wrong Policy on Rebuilding the Coast. Retrieved April 02, 2016, from http://e360.yale.edu/feature/a_year_after_sandy_the_wrong_policy_on_rebuilding_the_coast/2705/

[37] Coastal Adaptation and Protection (CAP) grants. (n.d.). Retrieved April 04, 2016, from http://www.transport.wa.gov.au/imarine/coastal-adaption-and-protection-cap-grants.asp

[38] *Coastal Infrastructure Coastal Adaptation and Protection Grants 2015/2016* (Rep.). (n.d.). Retrieved April 4, 2016, from The Government of Australia Department of Transport website: http://www.transport.wa.gov.au/mediaFiles/marine/MAC_P_CAP_2015_16_Grant_Brochure.pdf

[39] Young, R. (2013, October 31). A Year After Sandy, the Wrong Policy on Rebuilding the Coast. Retrieved April 02, 2016, from http://e360.yale.edu/feature/a_year_after_sandy_the_wrong_policy_on_rebuilding_the_coast/2705/

[40] Young, R. (2013, October 31). A Year After Sandy, the Wrong Policy on Rebuilding the Coast. Retrieved April 02, 2016, from http://e360.yale.edu/feature/a_year_after_sandy_the_wrong_policy_on_rebuilding_the_coast/2705/

[41] NOAA's National Coastal Zone Management Program Funding Summary 2015 (Rep.). (n.d.). Retrieved April 5, 2016, from NOAA Office of Coastal Management website: https://coast.noaa.gov/czm/media/funding-summary.

NOAA's budget was cut to $5.2 billion, which is $270 million below its current spending level.[42] With a decreased budget, it is more difficult to provide grants to states to fund their coastal zone management programs. Additionally, the budget cuts will make it increasingly difficult for NOAA to advise and oversee state management plans.

Coastal zones have affected both national and local economies in the United States. Coastal zones counties account for 48% of total GDP and 42% of total employment.[43] One study found that a 0.1 increase per meter in wetland continuity reduces property damages for an average affected area in Southeast Louisiana (including New Orleans) by $99-$133.[44] Another study found that an increase in the percent of water or wetlands that surround a coastal property has a significant positive effect on price. It further noted that a change of 100 fecal coliform counts per 100 mL changes property prices by about 1.5%, illustrating the connection between the effect of water quality and local economies.[45] The economic effects of the CMZA also extend to public beaches. Those who live near coastal zones are willing to pay more for high quality beaches with characteristics such as low tide beach width and dune width.[46]

With half of the U.S. population in coastal zones, it is important to address the issue of climate change in these areas through effective coastal zone management programs.[47] The impacts of climate change will exacerbate the problems that coastal zones already face including: shoreline erosion, coastal flooding, and water pollution affecting both manmade infrastructure in these areas and coastal ecosystems.[48] Coastal areas are sensitive to sea level rise, increasing frequency and intensity of storms, and precipitation increases.[49] The population

[42] Yehle, E. (2015, May 19). NOAA: House Bill Would Slash Spending on Climate Research, Coastal Programs. Retrieved April 02, 2016, from http://www.eenews.net/greenwire/2015/05/19/stories/1060018807

[43] Kildow, J. T., Colgan, C. S., Johnston, P., Scorse, J. D., & Farnum, M. G. (2016). State of the U.S. Ocean and Coastal Economies 2016 Update (Rep.). Retrieved April 5, 2016, from Middlebury Institute of International Studies at Monterey National Ocean Economics Program website: http://www.oceaneconomics.org/download/

[44] Barbier, E. B., Georgiou, I. Y., Enchelmeyer, B., & Reed, D. J. (January 01, 2013). The Value of Wetlands in Protecting Southeast Louisiana from Hurricane Storm Surges. Plos One, 8, 3.

[45] Leggett, C. G., & Bockstael, N. E. (January 01, 2009). Evidence of the Effects of Water Quality on Residential Land Prices. International Library of Critical Writings in Economics, 1, 234, 164-187.

[46] Landry, C. E., & Hindsley, P. (December 08, 2010). Valuing Beach Quality with Hedonic Property Models. Land Economics, 87, 1, 92-108.

[47] Fennell, A. (2014, July 16). Coastal Zone Management Opportunities Exist for NOAA to Enhance Its Use of Performance Information (Rep. No. GAO-14-592). Retrieved April 2, 2016, from Government Accountability Office website: http://www.gao.gov/assets/670/664806.pdf

[48] Climate Impacts on Coastal Areas. (2015, February 23). Retrieved from https://www3.epa.gov/climatechange/impacts/coasts.html.

[49] Climate Impacts on Coastal Areas. (2015, February 23). Retrieved from https://www3.epa.gov/climatechange/impacts/coasts.html.

living along coastal zones it expected to increase by 11 million over the next seven years, which will further stress surrounding ecosystems.[50] Projections indicate that coastal zones will only face more stress in the coming years, which puts increased importance on coastal zone management.

More effective management strategies could include facilitating state partnerships to reduce NPS pollution. Multi-state partnerships would enable more effective management of coastal zones. One example of this is the Chesapeake Clean Water Blueprint which in 2010, brought together six Chesapeake Bay states, Washington, D.C., and the federal government to restore the health of the Bay.[51] A peer-reviewed study from the Chesapeake Bay Foundation found that the Chesapeake Bay watershed is currently valued at $107 billion annually. When the Blueprint is fully implemented, the region will realize $22 billion in additional annual benefits, the majority of them generated by upstream land uses.[52] The results of this partnership have yet to be seen, but successful implementation could set an example for other coastal waterways.[53] These partnerships would allow for coastal zone management programs to better control NPS pollution.

Conclusion

The Coastal Zone Management Act of 1972 was created for states to effectively manage the quality of their coastal zones. These zones provide valuable ecosystem services and are also economically productive, contributing to approximately 50 percent of the total annual GDP in the United States.[54] As populations in these areas increase and the effects of climate change become more pronounced, coastal zone management needs to adapt to respond effectively to environmental stress factors. Actions have been taken to consider the impacts of climate change on coastal zones. The White House announced in 2014, that $1.5 million would be available to states under the CZMA to assess how climate change

[50] NOAA, U.S. Census report finds increases in coastal population growth by 2020 likely, putting more people at risk of extreme weather. (2013, March 25). Retrieved April 05, 2016, from http://www.noaanews.noaa.gov/stories2013/20130325_coastalpopulation.html

[51] 2014 State of the Bay (Rep.). (2015, June). Retrieved April 2, 2016, from Chesapeake Bay Foundation website: http://www.cbf.org/document.doc?id=2289

[52] Phillips, S., & McGee, B. (2014, October). The Economic Benefits of Cleaning up the Chesapeake (Rep.). Retrieved April 5, 2016, from The Chesapeake Bay Foundation website: http://www.cbf.org/document.doc?id=2258

[53] 2014 State of the Bay (Rep.). (2015, June). Retrieved April 2, 2016, from Chesapeake Bay Foundation website: http://www.cbf.org/document.doc?id=2289

[54] Coastal Zone Management Act Performance Measurement System 2010 Report on Contextual Indicators (Rep.). (2010, December). Retrieved April 2, 2016, from NOAA website: https://coast.noaa.gov/czm/media/contextualindicator2010.pdf

may exacerbate challenges to coastal zone management.[55] But more can be done. The United States continues to build in coastal areas that will soon see their demise as sea levels rise. Employing the precautionary principle to cease construction in areas prone to flooding would further coastal zone management goals. Additionally, creating interstate partnerships to control non-point source pollution will enhance coastal zone management and will strengthen the Coastal Zone Management Act's reach.

[55] Fact Sheet: Taking Action to Support State, Local, and Tribal Leaders as They Prepare Communities for the Impacts of Climate Change. (2014, July 16). Retrieved April 02, 2016, from https://www.whitehouse.gov/the-press-office/2014/07/16/fact-sheet-taking-action-support-state-local-and-tribal-leaders-they-pre

Appendix A

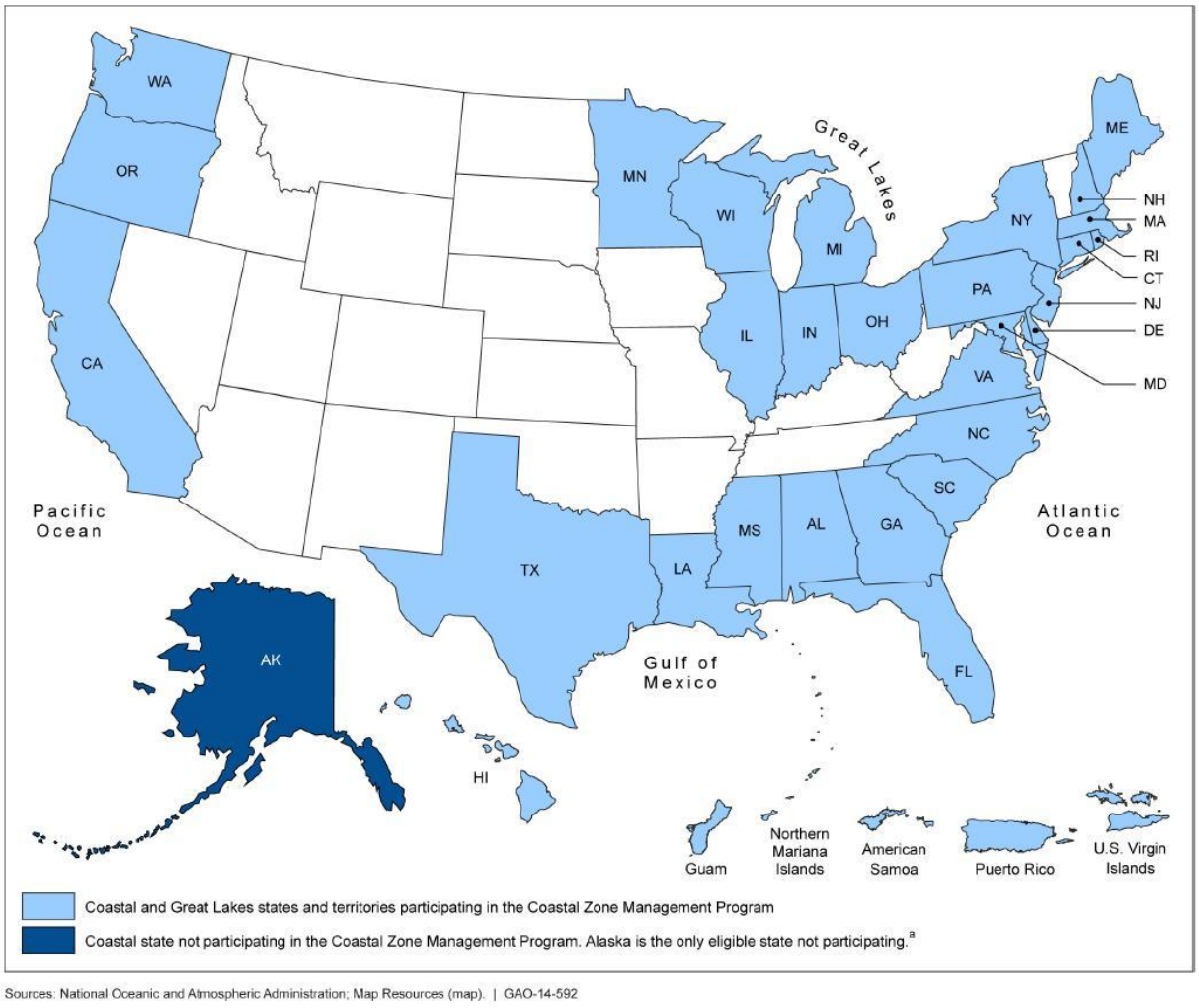
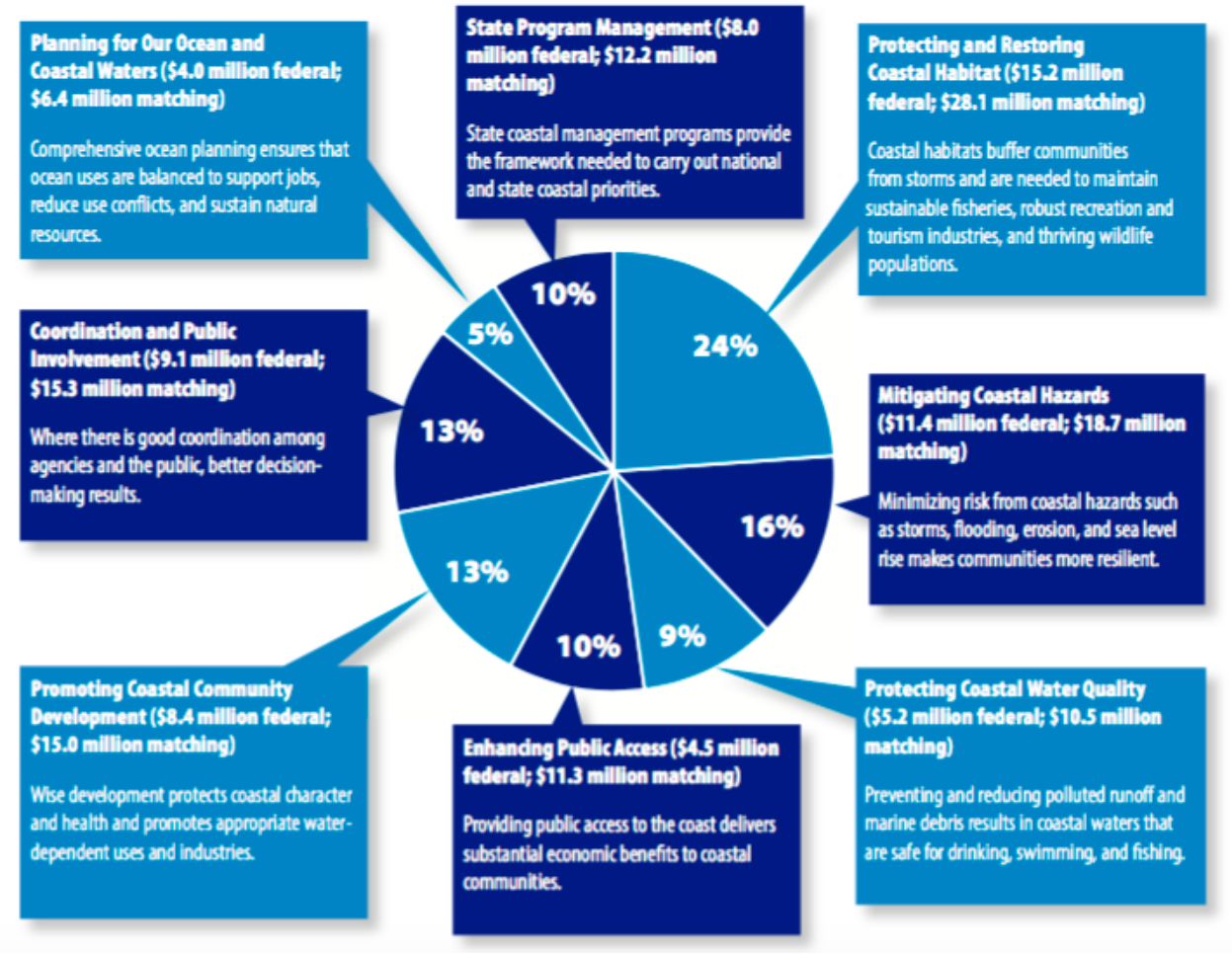


Figure 1: Coastal States Participating in the National Coastal Zone Management Program.

Alaska is the only coastal state that does not participate in the Coastal Zone Management Act of 1972.

Source: US Government Accountability Office Flickr

Appendix B



Source: NOAA's National Coastal Zone Management Program Funding Summary 2015