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All Abroad: The Wicked Problem of Marine Spatial Planning

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All Abroad: The Wicked Problem of Marine Spatial Planning

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Abstract

Marine spatial planning (MSP) has been well accepted in Europe. However, along the coast of the United States, MSP is voluntary and has yet to be fully embraced by all coastal states. The problem of planning for the efficient and effective stewardship of the marine environment is a "wicked problem," one that is difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are often difficult to recognize; for example, there is not a central coordinating authority with voluntary participation of all stakeholders associated with port activities, shipping lanes, commercial fishing, recreational fishing and other uses of the water, extraction of natural resources such as oil and gas.

This paper addresses how a "convergence of goals of all stakeholders" approach can be used to mitigate the "wicked problem'" of MSP in the voluntary system of the United States. We use a case study of the Texas Intracoastal Waterway to address one aspect of the wicked problem: hazards to navigation. The adoption of this non-coercive, flexible approach initiates and maintains stakeholder engagement through the use of an overt but nonthreatening action of a catalyst. This dynamic process shows that voluntary involvement by stakeholders can mitigate at least some aspects of the wicked problem of MSP.

Various methodologies including physical observation, surveys, and analysis of archival data, are used to collect information and engage stakeholders to identify and mitigate hazards. Further, the process creates a dynamic set of best practices of coastal land and water usage. Addressing incremental parts of the "wicked problem" can serve as a template for developing an MSP strategy to protect the marine environment, enhance the marine transportation system, and create safety for all parties.

Keywords: Marine spatial planning, Stakeholder involvement, Wicked problems

Introduction

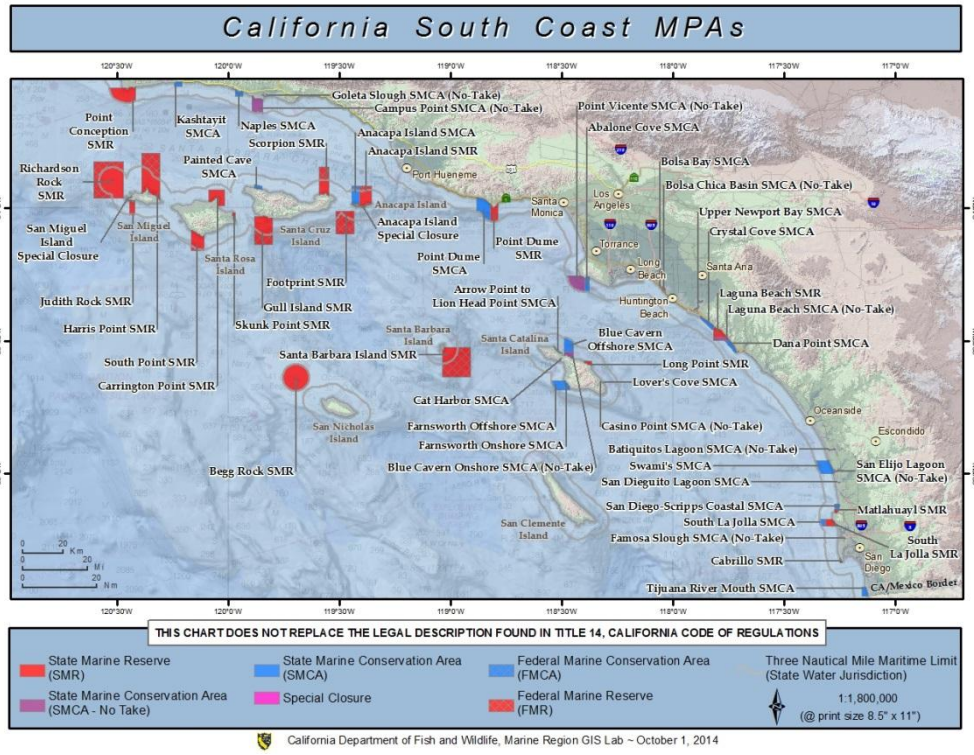
The current context of international ocean governance includes considerable emphasis on the role and integration of marine spatial planning (MSP) for conservation of vulnerable marine species and habitats as well as protection the biodiversity of the marine environment. Ocean resources planning and management challenges are derived primarily from governance, not science. This holds true for MSP.

UNESCO (2015) defines MSP as a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic, and social objectives that usually have been specified through a political process. Characteristics of marine spatial planning include ecosystem-based, area-based, integrated, adaptive, strategic, and participatory. MSP is an essential step toward marine ecosystem-based management, area-based, and focusing on activities within that area, as opposed to focusing on a single sector, species, activity, or concern (Crowder et al., 2006).

Marine spatial planning is not an end in itself, but a practical way to create and establish a more rational use of marine space and the interactions among its uses, to balance demands for development with the need to protect the environment, and to achieve social and economic objectives in an open and planned way. Unlike specific areas for individual activities, e.g., commercial and recreational fishing, lightering, offshore wind farms, coastal defense systems, shipping, tourist industry, oil and gas leasing, MSPs do not have a single-sector focus. Instead, it involves an interconnective planning and management approach.

A number of strategies tangentially relate to MSP. For example, marine protected areas (MPAs) are named, discrete geographic marine or estuarine areas designated by law or administrative action to protect or conserve marine life and habitat. MPAs can include state marine reserves and other areas (see, e.g., California's south coast MPAs depicted below, Figure 1):

Figure 1. *Example of California's State and Federal MPAs and Similar Designations*



One of the pivotal requirements for developing and managing a marine area is cooperation. Axelrod (1984) purports that cooperation is essential when competing interests can destroy or impede the common resource. But, how is cooperation and common vision achieved when each stakeholder uses the resource for his/her own maximum advantage?

This paper addresses how a "convergence of goals of all stakeholders," one of the most critical issues of a wicked problem (see discussion below) analysis, can be used to mitigate the wicked problem of MSP in the voluntary system of the United States and overcome some of the limitations of current MSP methodologies. We use a case study of the Texas Intracoastal Waterway to address one aspect of the wicked problem: hazards to navigation. The adoption of this non-coercive, flexible approach initiates and maintains stakeholder engagement through the use of an overt but nonthreatening action of a catalyst. This dynamic process shows that voluntary involvement by stakeholders can mitigate at least some aspects of the wicked problem of MSP.

In this research, we show how to identify and engage stakeholders toward common beneficial action. The stakeholder engagement process results in the adoption of the "Cooperation Implementation Model." This model engages stakeholders through a nonthreatening action of events and shows how cooperation can lead to viable and sustainable mitigation of the use of navigable water by all stakeholders including vessel operators, land developers, federal, state, and local regulators, and other users leading to more efficient and effective use of the waterways by all parties.

If conventional approaches to massive, complex problems have not adequately and effectively addressed marine environmental problems, what alternative strategy is appropriate? A response to that question is discussed in the next section.

Wicked Problems

Wicked problems are those that are so complex and intractable that they cannot be resolved by rational, systematic processes or by any one solution; in fact, there is no solution, only the possibility of mitigation. Wicked problems present issues that are highly resistant to resolution. At best, a wicked problem can be managed, but always imperfectly and with other areas of concern appearing during the management process. Wicked problems are impossible to solve for many reasons: contradictory or incomplete knowledge; the interconnectivity of the problem with other known or unknown-at-this-point problems with interdependences and multi-causations; the number of people and their varying perspectives involved; addressing one aspect of the problem leading to unforeseen consequences; the instability of the issues; issues sit within the domain of multiple stakeholders and organizations; the environmental, economic, social, and political implications that may be triggered; and behavioral changes that may be necessary.

Wicked problems have no stopping rule; this can be difficult when the problem is associated with complex organizational structure and processes, another characterization of wicked problem. Becker (2002) describes wicked problems as a dense web of interconnecting factors making it difficult to understand how one decision influences another; because wicked problems arise in uncertain circumstances, risk is magnified, thus resulting in increased conflict. Becker (2002) observes that wicked problems involve competing claims with "good outcomes" traded off against "bad outcomes." Rather than solving wicked problems, mitigation and even coping strategies may be necessary to enable positive outcomes, with no ideal solution, but perhaps coping harmonization of the stakeholders and issues.

Marine environmental problems have been grappled with for decades, with increasing urgency as more problems come to light. These problems are wicked: their defining characteristic is that addressing one aspect of a problem reveals another. For example, consider these interrelated concepts, each representing a set of parallel strings: overfishing, oil and gas exploration and production, off-shore wind energy, and hazards to commercial navigation; we can pull one string but, in turn, the other strings are affected in some way. Remember the game of pick-up sticks and attempting to pick up one without moving the other? Wicked problems are similar in its process of picking up sticks and issues – but the issues continually move and have an impact on its neighboring (stick) or associated issue.

Wicked problems typically have multiple causal sources and links among them. These may be immediately noticed and integrated into MSP and management. Or there may be long periods of time before evidence of sources

and links become to light. Adding to the complexity is the cumulative impacts that develop over time and space. A regulatory change for one area of a marine space, for example, may trigger impacts on another aspect. Another concern is changing paradigms. The term came into wide use after Kuhn's (1962), *The structure of scientific revolutions*. Paradigms "influence practice in terms of how situations are perceived, what is considered to be of value, and what is viewed as valid and effective action" (Pollack, 2007). It can be subtle but is always pervasive "affecting what is done, how it is done, and why it is done" (Pollack, 2007). Climate change is a prime example of a wicked problem paradigm because there are vast numbers of all types of variables associated with the causes and the effects that will be on the planning board for decades, perhaps generations. Thus, other than running out of time or resources, there is no end to wicked problems. The wicked problem paradigm applied to the MSP can help address some of the current MSP limitations as addressed in the next section.

Why MSP is Wicked

Although there are many complex characteristics of wicked problems, we're concerned herein primarily with stakeholder engagement. Many sectors and stakeholders are involved with the marine environment. Individual sectors such as energy, transportation, fisheries, recreation, and conservation, among others, can vie for the use of the marine area which, in turn can cause conflicts. Thus, the interests and perspectives of multiple stakeholders must be addressed.

Marine Spatial Planning is not a snapshot in time; the context of planning changes continually as new information is developed from, for example, engineering and science. Monitoring can add additional information. Societal needs change as do economic conditions. Even political exigencies can influence planning. These changes influence stakeholders' engagement. Yet another change that can trigger stakeholder issues is discontinuity. If activities are in one region, but the effects are felt in another, or if the impact is not recognized until long after activities have set the chain of events in motion, then additional as well as later stakeholders may be added to the mix. This discontinuity, as with wicked problems, is not linear. For example, temporal and spatial properties may not be recognized immediately as when overfishing occurs. Overfishing may not be recognized until it is too late for some species. Thus, a management system put into place as a result of MSP may later to be deemed inappropriate or ineffective.

As with wicked problems in general, MSP can involve inevitable tensions among the organizations involved when working with stakeholders and organizations, both vertically and horizontally: vertically, for example, when multiple agencies are involved, each with their separate portfolio and jurisdictional responsibility for various aspects of the wicked problem resulting in an administrative hierarchy; and horizontally, for example, when working across organizational boundaries. All of this, of course, is compounded by varying perspective, values, incentives, and accountabilities of the various stakeholders.

From the above discussion, then, we begin to recognize MSP as a wicked problem. What is clear is the critical importance of engaging stakeholders early in the planning process to identify the issues and begin the process of developing an effective MSP strategy. The following section describes this approaching using a case study of the Texas Intracoastal Waterway emphasizing a non-coercive, flexible approach that initiates and maintains stakeholder engagement through the use of an overt but nonthreatening action of a catalyst. This dynamic process shows that voluntary involvement by stakeholders can mitigate at least some aspects of the wicked problem of MSP.

Stakeholder Involvement and the Convergence of Goals of All Stakeholders Approach

The practice of involving stakeholders in planning and implementation of resource management, particularly with a wicked problem such as marine waterway management, is well grounded in research, and cooperation and sharing of vision are necessary among the stakeholder for success in maintaining the natural resource (Flannery and O'Cinneide, 2008). Cooperation can occur when two or more groups face on-going interaction and each party receives mutual gains from cooperation (Axelrod, 1980). A catalyst can help begin discussion for cooperation and may be driven by an event or situation. Further, the catalyst can act as a neutral party in the process so as to not discourage some stakeholder groups from participating (Flannery and O'Cinneide, 2008).

Selecting the appropriate stakeholders relative to the particular marine corridor targeted for MSP is fundamental in gaining useful stakeholder feedback (Pomeroy and Douvere, 2008; Biggs and Matsaert, 1999). Careful selection of stakeholders must be given to ensure that all stakeholders are included without making the process of stakeholder involvement overly complex (Human and Davies, 2010; Pomeroy and Douvere, 2008). Once the stakeholder is identified, s/he must be engaged. When involving stakeholders in any project, it is important to be clear about what is the scope or the degree of a particular stakeholder's involvement and his/her responsibilities. Goals must be defined. It is important for all parties to understand why s/he is being asked to provide input. The timing of stakeholder involvement is also important (Human and Davies, 2010). Careful consideration needs to be given to the stage at which particular stakeholders are engaged in the cooperative process. Sufficient initial research needs to be done with certain stakeholders before all stakeholders can be involved in order to reduce the complexity of the wicked problem. These initial methods to involve stakeholders to achieve the relevant degree of participation are important to the final outcome (Human and Davies, 2010).

Next, identification of problem areas in the marine system through stakeholder input and engagement must occur (Taylor Engineering, Inc., 2007). Stakeholders tend to prioritize problems based upon what matters most to them and therefore, they can bring considerable bias to the process, which is often politically motivated, or simply motivated by self-interest. Further, this bias can be a barrier to establishing open dialogue (Human and Davies, 2010).

Because stakeholders can act in self-interested ways and carry certain biases, an independent expert party may be needed to facilitate the stakeholder cooperation process and confirm the problems and options. This independent expert can give unbiased feedback and can facilitate further dialogue and cooperation (Flannery and O'Cinneide, 2008).

As discussion and feedback are occurring among stakeholders, the current regulatory framework for the marine environment must be researched and understood by all stakeholders. This framework provides the boundaries of options available or identifies the need for additional options to preserve and maintain the marine corridor. Once cooperation is established under the framework of current regulation, the stakeholders can begin to establish possible outcomes or recommendations to each other on the marine corridor. Definitions can begin with specific recommendations and mitigation strategies. The interaction of the stakeholders must be an on-going interaction as the economic, social, and political environment of the marine environment changes. Here, the actions of the catalyst can help not only in initiating cooperation but in the maintenance of the cooperation as well for the benefit of the marine environment.

Summarizing the above stages in the cooperation process, the eight stages of the theory of Convergence of Goals of All Stakeholders Approach Model (Cooperation Implementation Model) is proposed:

1. Actions by catalyst encourage engagement in cooperation on the wicked problem in the marine corridor.
2. Identification of the appropriate stakeholders for cooperation occurs.
3. Identification of stakeholder responsibilities for the marine system occurs.
4. Identification of problem areas in the system and goal setting through stakeholder input and engagement occurs.
5. An independent party confirms identification of problem areas and options.
6. Identification of the current regulation framework for action is researched.
7. All stakeholders agree to outcome and recommendations for action.
8. Actions by catalyst encourage continued cooperation.

Marine Spatial Planning's Current Models and the Differences from the Cooperation Implementation Model

The model proposed focuses on the betterment of the wicked problem based on cooperation and goal convergence. MSP has been promoted as a tool for the wicked problem of marine environmental management and as a means of reducing conflict among marine resource users (Flannery and O'Cinneide, 2008). The objectives of MSP include: 1) developing policies and procedures for future development; 2) facilitating the coordination and integration of activities; 3) providing a strategic, integrated framework for all uses that takes into account economic, social, and environmental objectives; 4) maintaining the coastal community; 5) increasing commercial confidence through better

informed decision-making; and 6) enhancing an understanding of the importance of the seascape and associated landscape and safeguarding the quality of that environment.

Current MSP models include several steps: 1) defining the objectives of the plan; 2) developing the plan in a transparent manner; 3) involving stakeholders; 4) achieving coherence between terrestrial and maritime spatial planning; 5) providing relevant data and knowledge base; and 6) incorporating monitoring and evaluation in the planning and management processes (see, e.g., Government of Ireland, 2007). Plan mechanisms are dependent on the intensity of human activity in the area under study (see, e.g., MSSP Consortium, 2005).

Certainly, MSP involves high levels of stakeholder participation. However, there are differences with the model proposed and current MSP models. First, in current MSP models, any implementation of a plan must have a legally binding framework to be effective. In the Cooperation Implementation Model, the outcomes need not be legally binding, but assent is gained through mutually beneficial cooperation and goal convergence. Second, stakeholders have on-going responsibilities in the Cooperation Implementation Model. Third, a catalyst to encourage initial cooperation is needed generally precipitated by an event. And finally, stakeholders must have relevancy to the problem at hand.

The Case Study of the Texas GIWW and the Application of the Model

The Cooperation Implementation Model is applied to a case study of the Texas portion of the Gulf Intracoastal Waterway (GIWW). Under the 1975 Texas Coastal Waterways Act, the Texas Department of Transportation (TXDOT) is the state agency charged with fulfilling the non-federal sponsorship of the GIWW in Texas and is charged with the short- and long-term management and preservation of the waterway corridor for commercial traffic vital to the Texas economy. Further, TXDOT is required to continually evaluate the GIWW as it relates to Texas. As a result of a serious allision in 2008, TXDOT began to act as the catalyst in a cooperative effort to preserve the corridor and protect the marine environment.

Initially, appropriate stakeholders were identified based on their use of and contact with the GIWW (Davies and Cammell, 2009). Each stakeholder had various constituencies to whom they owed a duty and these constituents' concerns had to be balanced. In identifying stakeholders, parties impacting navigation are those that affect the "process of planning, recording, and controlling movement of a craft" (vessel) along the waterway (Bowditch, 2002). Two basic categories of stakeholders were identified as those who use, regulate, maintain, and police the waterway; and those who use and regulate the shoreline. These categories included entities such as real estate developers and the economic development organisations in the coastal areas, coastal county governments, port authorities, barge operators, coastal waterborne shippers, the Texas General Land Office (GLO), the United States Army Corps of Engineers (USACE), and the United States Coast Guard (USCG). The general public was represented by its governmental and commercial

organisation. The inclusion and exclusion of stakeholders were confirmed with experts assembled by the TXDOT. Each stakeholder contributed to implementation of cooperation and the definition of his/her/its responsibilities in preserving the GIWW corridor.

The USCG is responsible for policing traffic in the GIWW. The GLO grants permits for residential and commercial shoreline development under the Texas Administrative Code, Title 31. It coordinates this permitting function with the USACE and no permitted structure can impede commercial navigation. The USACE also has jurisdiction over the GIWW permitting structures under 33 USC Chapter 9, Subchapter I, Section 403. Therefore, the USCG, the GLO and the USACE are major regulatory stakeholders in how the GIWW navigation is impacted by shoreline development.

Barge operators are the largest group of commercial navigators in the GIWW. They understand the coastal industry requirements for waterborne shipping in Texas, and their expertise can assist with the development of the proper design of any land development that may impact the waterway. There are two industry associations identified as most important to the discussion of navigation on the GIWW: the Gulf Intracoastal Canal Association (GICA); and the Texas Waterway Operators Association (TWOA). Approximately 80 percent of the operators in the Texas are members of these two organizations. Therefore, the barge operators through these organisations are major stakeholders in GIWW navigation.

County representatives not only permit and police shoreline development, but they also represent the public at large for use of the shoreline. These officials can identify prospective development as well as provide zoning plans and subdivision regulations that may impact GIWW navigation. Coastal commercial developers and the economic development groups are also important stakeholders in maintaining the GIWW corridor. Through their development activities and construction, they may create encroachments that pose a navigation hazard (Taylor Engineering, 2007). Finally, the shippers are important to the discussion of planned development. All of these groups are major stakeholders in how GIWW navigation.

Once stakeholders are identified and an understanding of each of their responsibilities is established, their input and engagement is required to identify problem areas on the GIWW. First, incident data from the USCG are reviewed. Incident data were obtained from the USCG's Marine Information for Safety and Law Enforcement database for the period of December, 2001 through October, 2008. The purpose of this collection was to identify problem areas and to identify reasons for any high level of incidents in particular areas along the GIWW.

In order to collect information about activities impacting the GIWW so as to further identify problem areas, three survey instruments were developed for use with various stakeholders. These stakeholders included four groups: vessel operators, county and local officials, economic development corporations, and all other stakeholders. Vessel operators received a set of questions examining their concerns regarding navigation in the GIWW. The economic development corporations and other stakeholders of developers received separate

instruments relating to their concerns on navigation and requesting information on potential development. County and local officials, port authorities, and navigation districts were surveyed on concerns related to navigation in the GIWW and were asked about development in their jurisdictions and their local permitting processes. All surveys conducted on human subjects complied with 1981 U.S. Policy for the Protection of Human Subjects (Title 45, Part 46).

An independent party confirmed the identification of problem areas and options. Problem areas were identified by stakeholders; the USCG incident data were reviewed and evaluated by the Texas Maritime Academy faculty members. Further, as part of selecting the areas to be inspected, the entire charting system of the Texas GIWW was reviewed using the Nautical Charts of the Texas Golden Waterways: the Texas Maritime faculty members were provided access to two vessels meeting industry standards (verified by GICA members) that are typically found on the GIWW. The faculty teams sailed the length of the area. The problem areas identified by the various stakeholders were rated as high, medium, and low areas of concern for navigation. Each faculty evaluator was provided the same rubric for low, medium, and high.

Current regulatory framework for action was researched by collecting permitting procedures data from the various federal, state, and local jurisdictions involved with shoreline development including the USACE, GLO, the Texas coastal counties, the large coastal cities, and all navigation districts that directly border the GIWW. The purpose of collecting these data was to determine current standards, regulations, and structural forces for the evaluation of the shoreline development projects; and to develop a current standards template to communicate to all stakeholders. Because the USACE is given authority to regulate certain activities in the nation's waterways under 33 Code of Federal Regulations, Part 320, permits are needed for any construction in the waterway. Actual permit sites data along the Texas portion of the GIWW for the period of September 2007 to June 2009 were examined.

The GLO administers the Coastal Management Program in the state of Texas, the purpose of which is to improve the management of the state's coastal natural resource areas and to ensure the long-term ecological and economic productivity of the coast (Texas GLO, 2009). The provisions dealing directly with waterfront structures are found in Texas Administration Code, Title 31 Natural Resources and Conservation, Part 16 Coastal Coordination Council, Chapter 501 Coastal Management Program, Subchapter B Goals and Policies, Rule Section 501.24 Policies for Construction of Waterfront Facilities and Other Structures on Submerged Lands. Archival data on the GLO permitting and regulation processes on shoreline development were collected from its website (Texas GLO, 2009). GLO personnel also provided information and clarification on regulation practises of shoreline development along the GIWW.

Based upon survey results and physical inspection, information on the counties' standards, regulations, and practises was requested from the Texas coastal countries. The methods of collection of data from the various counties and port authorities included personal interviews, email requests, phone interviews, and website information review. Texas cities and other

municipalities also enforce ordinances regarding construction in their respective jurisdictions. The authority over construction along the GIWW by navigation districts varied by district charter and appeared dependent on the ownership of submerged lands around the district. The information from navigation districts was requested in a similar manner as from the coastal counties. Only two navigation districts responded and, therefore, this information was limited.

The outcome of this Cooperation Implementation Model was a report of the recommendations for action. All stakeholders reviewed the final draft of the recommendations before publication and dissemination. Each statement in the final plan received stakeholder consensus. Finally, the continued dissemination of the recommendations to the stakeholders by TXDOT constituted actions by the catalyst that encourages continued cooperation.

Encouragement of Continued Cooperation

The TXDOT continues to encourage engagement in cooperation on transportation corridor preservation and maintenance in various ways. All reports are available on the TXDOT website. Various stakeholders meet with industry members at the industry organisations' annual meetings. Further, TXDOT holds an annual meeting for the stakeholders to discuss issues of transportation corridor maintenance and preservation. The catalyst, TXDOT, the industry, and the permitters suggest that the use of the Coastal Coordination Council (a 12 member interagency board that administers Texas' federally approved Coastal Management Program [CMP]) may provide this venue. The venue of continued cooperation could review development with regard to the master plan potentially creating a "best practices" for the GIWW and better evaluating "reduction in navigable capacity."

Conclusions

The results of this model show that marine spatial planning involving horizontal and vertical stakeholders, in this case, maintaining the waterway, can occur through stakeholder interactions where they voice concerns, define goals, engage for action and find consensus on recommendations. The case study provides an engagement process for stakeholder using the marine environment, a critical component of MSP and management. The process of this model begins with a dialogue of better cooperation among governmental permitters and developers with a focus on clustering and density of development along the waterways. Additionally, the case study provides a template to demonstrate how cooperation among developers, governmental agencies, and the maritime industry maintains and preserves the GIWW for its primary use of moving goods effectively and efficiently.

This project was a voluntary approach to solving a wicked marine environment problem. Existing U.S. federal, state, and local agencies often do not have the authority to hold other government departments or agencies accountable, or to require them to comply with a plan. Pre-existing inter-

agency conflict may also lead to a reluctance to share power and collaborate with other agencies (Flannery and O'Cinneide, 2008). This case study provides an example of how voluntary cooperation and collaboration can begin to lessen marine use problems. In turn, this information can be of value to future MSP.

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