NOAA, Society, and the Economy:

An Assessment of NOAA'S Social Science Capability and Needs

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Executive Summary

NOAA provides the science, service, and stewardship the Nation needs to react to and plan for a constantly changing natural environmental. To achieve its mission, NOAA needs to know how people, institutions, and society make decisions that depend on environmental conditions. NOAA also needs to know how society uses the data, science, and products it provides and furthermore, it needs to achieve this understanding with the same scientific rigor it brings to all aspects of its scientifically-based enterprise.

The social sciences[1] can contribute toward achieving NOAA's mission but only if NOAA marshals the resources and capacity to tackle this challenge. In 2003 and again in 2009, the NOAA Science Advisory Board (SAB) found that the representation and utilization of social science in the agency were insufficient, and that social sciences continue to be underrepresented in NOAA's research, operations, and decision making. NOAA committed to this assessment in our response to the 2009 SAB report on Social Sciences, "Integrating Social Science into NOAA Planning, Evaluation, and Decision Making: A Review of Implementation to Date and Recommendations for Improving Effectiveness". Since then, much progress has been made in the development of a social science capacity at NOAA. There is a more wide-spread acknowledgment at the agency that an understanding of the social and economic elements of our work is crucial to effectively carrying out our mission. Yet there are still significant, broad ranging gaps in the social science capacity needed to meet the Agency's mission needs.

Social sciences continue to be underrepresented in NOAA's research, operations, and decision making. (NOAA SAB, 2009)

In this white paper, we set out to understand the degree to which NOAA's social science capacity is sufficient to meet its needs and if not, where more resources and effort need to be invested. To do this, we ask:

- How can social science aid NOAA in achieving its mission?
- What are the immediate and future needs for social sciences, especially within the line offices[2]?
- What is NOAA's capacity for conducting social science?

There are considerable challenges in answering these questions. These include the recognition that social science includes many fields and social scientists may be trained in interdisciplinary disciplines that did not even exist a few years ago. Within the agency, it is difficult to determine

[1] Social science is the process of describing, explaining and predicting human behavior and institutional structure in interaction with their environments (as defined by the NOAA Science Advisory Board), and includes the following disciplines: sociology, anthropology, geography, economics, psychology, political science, and communications.
[2] This assessment includes all of the NOAA Line Offices, NOAA Headquarters and the Office of Marine and Aviation Operations. For the sake of brevity, we refer to this group throughout this assessment as "LOs."

whether a social scientist has the latitude or time to conduct social science. Many social scientists hold managerial and leadership positions. Finally, the most pressing social science needs of the LOs at NOAA differ substantially as does their capability to harnessing social science methods. Combined these challenges make an accurate representation of NOAA's social science capacity and needs difficult. Here we take a first step towards quantifying the Agency's capacity to conduct social science and assessing what the Agency believes are its social science needs, and gaps that should be filled quickly if the Agency is to make good use of social science to meets its public mission.

How can social science aid NOAA in achieving our mission?

Social science is necessary, at some level, in almost every aspect of what NOAA does, from research to operations and decision making. The agency needs to know how people respond to weather forecasts, how they derive benefits from the services provided by coastal and ocean ecosystems, how society and commerce will respond to climate change, and what factors affect the resilience of coastal communities. These are all issues fundamental to NOAA's mission and none of these issues can be clearly understood without social science. NOAA's ability to constantly improve its capacity to meet its core mission requires social science. There are legislative and governmental mandates that explicitly call for social science. These mandates include those related to economic and social data collection, modeling, assessment, and analysis. Social science methods also provide the tools that can help the agency make better decisions about where investments, innovations, and resources can be deployed throughout the agency to better meet its mission goals that are directly related to people.

What is our need for social science?

While each LO serves different constituencies and provides different scientific data and expertise, all of the line offices have the same core needs for social science. The most fundamental of these are:

1. The requirement to provide social and economic data collection and analysis to meet our legal mandates.
2. The provision of the social science data society needs to better understand, manage, and steward the nation's oceans, coasts, atmosphere and climate (e.g. data on ocean and coastal economic conditions, estimates of the impacts of storms, etc.).
3. The need to understand how NOAA affects society (e.g. who uses NOAA data, how, and to what effect; conducting impact studies on management and regulatory actions) in order to:
    a. constantly improve NOAA's science, service, and stewardship (e.g. designing data, tools, forecasts and processes that better meet society's needs);
    b. make strategic and investment decisions; and
    c. better communicate to the public how the agency contributes to the social good.

What is the gap between our capacity and need?

The demand for more social science analysis comes from inside and outside the agency. Congress and OMB frequently ask for information on how NOAA contributes to the performance and effectiveness of the nation's commerce. Regional fisheries management councils, regional ocean planning bodies, and coastal managers demand data on human uses of marine and coastal resources. As private and public sectors become increasingly accustomed to using NOAA science and data, they demand more and better environmental science to manage business and public life.

NOAA leadership at the headquarters and line office levels understand these demands, but the data and science are on missing. Where social science capacity exists, this assessment found that staff is consistently unable to keep up with the growing demand for social science. NOAA is unable to demonstrate quantitatively the effect of its actions on society's wellbeing and economic productivity, even when anecdotal evidence of societal benefits is readily evident. A recent review of the Economic Statistics of NOAA found that there are very few studies that concretely quantify the way in which society utilizes NOAA products and services and even fewer that attempt to value these activities. Additionally, the culture of NOAA has been slowly evolving toward an understanding of how social science must be integrated in order to achieve the agency's mission. Part of the need for social science includes the need to address how the social and economic aspects of what NOAA does are perceived by NOAA leadership, congress, OMB and our partners and constituents.

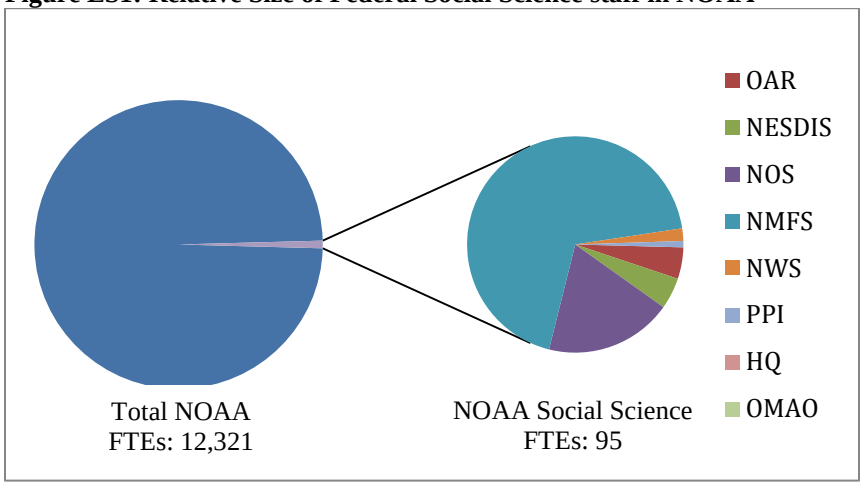
This assessment provides a detailed description of needs and gaps in NOAA's social science capacity required to meet current high-level risks for each line office as well as a vision of a fully operational social science capacity that could be leveraged to improve the capacity and expertise of NOAA to meet its mission goal (Appendix B and Appendix C). The main report focuses on critical and high priority gaps in NOAA social science capacity – gaps that should be filled to meet core NOAA mission goals, and provide strategic information for more effective planning and budgeting. More specifically, social and economic research, data collection, analysis and assessments are needed to meet our legal mandates. Expertise in risk behavior and risk communication is needed to improve weather and climate products, tools to improve coastal resiliency, and processes to mitigate the impacts of coastal storms and hazards. Valuation of NOAA's programs, products, and services, as well as valuation of ecosystem services, is a critical gap that cuts across all of NOAA. Finally, an increased interdisciplinary expertise, that is social science expertise, combined with knowledge and experience in climate science, coastal processes, and/or meteorology would allow NOAA to provide more pertinent and actionable information for decision-makers.

*This report does not propose **how** NOAA should fill the gaps, but rather only attempts to define them.*

The gaps described in this assessment are provided in terms of personnel, personnel costs and external funding needed to cover immediate risks and to make NOAA social science fully operational. They take into account other sources of capacity, such as partnerships, cooperative institutes, grants, and inter-agency efforts, but recognize that planning, implementation and application of these types of capacity will take a certain amount of in-house capacity and expertise. Furthermore, increasing this capacity does not necessarily require acquiring more in-house staff for NOAA. For example a budget-neutral option to increase capacity could include using attrition and the repurposing of existing positions to fill the gaps or leveraging internal or external grants or partnerships. All references to staff in this report reflect this recognition. This report does not propose ***how*** NOAA should fill the gaps, but rather only attempts to define them.

One way to look at the relative scale of social science in NOAA is through the federal workforce. This does not provide insight with regard to gaps, as was mentioned above, but it does provide some context for the significance of social science in NOAA in terms of the Federal workforce. As can be seen in Figure ES1, there are 95 Social Science staff in 2011, as compared with the total staff of 12,321. Social Science staff were 0.8 percent of the total.

Figure ES1: Relative Size of Federal Social Science staff in NOAA



In the past responses to the SAB, NOAA has been hesitant to commit to filling gaps because it was unclear where social science was most needed and what the required investment would be. With the information contained in this assessment, those decisions can be made from a more informed perspective and strategically included in NOAA's budget and planning processes. As one can see in the Social Science Needs and Gaps section, there is a range of gaps depending on the particular LO. Some have been using social science for years and have a well-developed sense of how social science fits in to their mission. Other LOs have gaps that represent a significant potential for social science data, tools and activities where currently none exist.

What is our capacity for conducting social science?

In-house, federal and contract staff are the cornerstone of the human side of NOAA's social science capacity, but they are by no means the whole story. NOAA's social science capacity also

includes those outside the agency who are supported by contracts and grants, partnerships, cooperative institutes, and inter-agency agreements. Data exist only for one component of NOAA's social science capacity – federal employees in social science job series. While these data are helpful in describing the core of social science capacity, they do not reflect the important role played by contract staff, federal employees who may be involved in social science research or activities but who are not in social science job series, or the external social science resources available to NOAA.

Conclusions and Recommendations

Many of the social science data, analysis, and tools that are required are common across NOAA functions, programs, and line offices. NOAA must continue to do a better job of using its existing strengths in social science to inform research, operations, and decision making across the agency to achieve efficiency and effectiveness. This will require constant improvements in the coordination of existing social science within the lines, better integration of a broad spectrum of social science disciplines in NOAA decision-making, and better organization of social science across the lines. Some new social science capacity must be added, especially in the line offices where social science capacity is now weak or non-existent. High-level social science leadership at NOAA must be permanent, have the ear of NOAA leadership, and be given the resources needed to guide the growing social science capacity of the agency.

Many of NOAA's social science needs are not research oriented, but involve the regular application of social science to decision-making at NOAA...

The major recommendations are as follows:

- *Repurpose the Research Council Social Science Committee to be the NOAA Social Science Committee that will strategically advance, coordinate, and guide NOAA's social science research, operations, and decision making.* This committee would subsume the functions of the existing NOAA Research Council Social Science Committee and would be expanded to include staff knowledgeable about how social science capability is incorporated into operations and decision-making, and that have the ability to identify and leverage opportunities for social science in NOAA day-to-day functions. It would have a dual reporting role to the Chief Economist and to the Research Council.

  The critical aspect of this Committee is an ability to understand how social science capability is incorporated into operations and decision-making and to identify and leverage opportunities for social science in NOAA day-to-day functions. Many of NOAA's social science needs are not research oriented, but involve the regular application of social science to decision-making at NOAA, its partners, and its constituents. Having both research and operations and decision-making expertise on the

social science committee will allow it to make strategic recommendations on how to best utilize social science in NOAA's research, operations and decision making.

- *A Process for Moving Forward.* The first order of business for the NOAA Social Science Committee should be to develop a concrete plan to fill the gaps outlined in this report, to develop a concrete strategy and criteria for the evaluation of gaps, and begin to implement a plan for the following:

    - *Fill Critical Gaps.* Many of the gaps identified put NOAA at risk of not fulfilling its legal mandates and reduce our ability to meet our science, service, and stewardship responsibilities. Strategies should be identified through the SEE and budget processes to fill those gaps as quickly as is feasible, and should be considered for inclusion in a future budget request. In addition, budget neutral options such as integrating efforts across lines to reduce costs, or leveraging or repurposing existing funding and/or grant programs and staff should be considered. For instance an interim alternative may be to fund social, behavioral, and economic (SBE) science studies through the various Cooperative Institutes, and Sea Grant programs.

    - *Periodic Social Science Needs Assessments.* Now that NOAA has been through the process of compiling the information necessary to understand the agency's current social science capacity, needs, and gaps, it will be easier in the future to collect the same information. This will help NOAA determine its status in meeting its social science needs and the trend it is following regarding social science capacity, using this assessment as a baseline. A periodic assessment will be critical to ensuring that NOAA meets its social science needs. The NOAA Social Science Committee should conduct the assessment every two years. Deep dive assessments for critical NOAA offices and programs should also be prioritized and executed.

Introduction

NOAA provides the science, service, and stewardship the nation needs to react to and plan for a constantly changing natural environmental. To achieve this mission, NOAA needs to understand how people, institutions, and society make decisions that depend on environmental conditions. The agency also needs to know how society uses the data, science, and products the agency provides to the country and it needs to achieve this understanding with the same scientific rigor it brings to all aspects of its scientifically based enterprise.

NOAA does not have a long history of integrating the social aspects of its work with its science. The first uses of social science[3] in NOAA were related to very specific notions of how NOAA activities or regulations impacted the public from an economic perspective. Later, social science was applied to cases when the resources for which NOAA is responsible were damaged, to inform how they might be made whole again. Although important, these were very narrow pictures of the social and economic aspects of NOAA's mission. As other applications for social science data, tools and expertise were identified, there came a realization that a more comprehensive approach to social science aspects was needed. This realization arose as a result of additional disciplines being brought to bear, additional issues involving socioeconomic elements being raised, and social science being better coordinated.

In 2003 and again in 2009, the NOAA Science Advisory Board (SAB) found that the representation and utilization of social science in the agency were insufficient, and that social sciences continue to be underrepresented in NOAA's research, operations, and decision making. Progress has been made over the years and there is now a more wide-spread acknowledgment at the agency that an understanding of the social and economic elements of our work is crucial to effectively carry out our mission. However, there are still significant, broad ranging gaps in the social science capacity needed to meet the Agency's mission needs. There have been calls, notably by the Science Advisory Board, for a certain percentage of the agency's total budget to be dedicated to social science. This suggestion, however, was not implemented by the Agency largely because it was not based on any assessment of the need for social science.

This report provides an assessment of social science needs and capacity in NOAA. At NOAA, decisions about the hiring of social scientists and the application of social science to NOAA activities resides largely in the Line Offices (LOs) and the program offices that serve NOAA headquarters. In Appendix B, specific social science needs assessments are presented for each LO[4]. Each assessment includes:

- a description of mandates for social science;
- a quantification of current social science capacity; and

[3] Social science is the process of describing, explaining and predicting human behavior and institutional structure in interaction with their environments (as defined by the NOAA Science Advisory Board), and includes the following disciplines: sociology, anthropology, geography, economics, psychology, political science, and communications.
[4] This assessment includes all of the NOAA Line Offices, NOAA Headquarters and the Office of Marine and Aviation Operations. For the sake of brevity, we refer to this group throughout this assessment as "LOs."

- a statement of need:
    - that addresses immediate risks, and
    - that would makes social science at NOAA fully operational.

This main report summarizes the LO assessments, and presents recommendations for a path to move forward. This summary, including explicit documentation of social science needs and capacity, provides the baseline information the agency needs to properly respond to the SAB's call for increased investment in social science from an informed perspective. This assessment also provides information on the potential consequences of not making these investments.

Background

In April 2009, the NOAA Science Advisory Board (SAB) released a report entitled, *Integrating Social Science into NOAA Planning, Evaluation and Decision Making: A Review of Implementation to Date and Recommendations for Improving Effectiveness* (herear referred to as the 2009 report), based on a review of Social Science in NOAA by the SAB Social Science Working Group (SSWG) in 2007-2008. This work took place against the backdrop of a similar report in 2003, and measured the progress made in implementing the recommendations contained in the 2003 report. The fundamental finding of the 2003 report, that the capacity of the National Oceanic and Atmospheric Administration (NOAA) to meet its mandates and mission is diminished by the underrepresentation and underutilization of social science, was found to still hold true in 2009.

One of the central findings of the 2009 report was that NOAA does not have sufficient knowledge of either its capacity to conduct social science or its need for social science tools, data or expertise. Specifically, the 2009 report found that, "A precise accounting of social science positions within NOAA is difficult because NOAA does not fully understand what constitutes a valid social science presence and moreover lacks a tracking system for social science position categories." In order to address this concern, the SAB included in its assessment: Recommendation 4.2: "NOAA should conduct a formal needs assessment to determine its needs for social science staff and research by program, and determine the appropriate mix of internal and external staffing to meet these needs." In response to these findings and to Recommendation 4.2, NOAA has undertaken the assessment contained herein.

Assessing the Need for Social Science in NOAA

Representatives from each LO were asked to carefully describe how social science is used in their office, where needs exist but remain unmet, and how they envision the optimal application of social science to mission needs within their respective LO. This section summarizes the status, needs, and gaps of NOAA's social science applications, research and activities. Appendix B covers this information in detail for each LO.

Assessing the current social science capacity within NOAA is challenging for several reasons. Social science capacity at NOAA takes many forms. The only available data on social science capacity is from the NOAA Workforce Management Office. While these data are helpful in describing federal employees in social science job series, they do not provide information necessary to identify those federal employees who may be involved in social science research or activities and who are not in social science job series. Additionally, the capacity to conduct social science research and provide social science data, tools, and technical assistance at NOAA is heavily reliant on contract staff, partnerships, cooperative institutes, and inter-agency efforts – about which there is no reliable information. Of these latter categories, no data source exists that is consistent from LO to LO.

How can social science aid NOAA in achieving our mission?

One of the most important questions to ask at the outset of an assessment of any particular capacity is "Why do we need it?" This question can be answered in several ways, but the existence of mandates for social science, or mandates for elements of NOAA's mission that could not be done without social science, is a key piece of information. A quick scan through the Appendix B reveals that social science is, at some level, present in almost every aspect of what NOAA does, from research to operations and decision making. If we were to list all of the mandates that, directly or indirectly, call for social science, the list would go on for pages. For the purposes of this summary, it will suffice to highlight some of the major mandates and policy drivers for social science research and activities.

Legal Mandates. One of the most important reasons for an agency to engage in any specific activity is a legal requirement to do so. For social science, there are several legal mandates that specifically call for social science. These include the following[5]:

- Magnuson Stevens Act
- Regulatory Flexibility Act
- Endangered Species Act
- National Environmental Policy Act
- Coastal Zone Management Act
- National Marine Sanctuaries Act
- Comprehensive Environmental Response, Compensation, and Liability Act
- Oil Pollution Act

The nature of these mandates is inherently related to the interactions between humans and the environment and they require social science information, analysis, and support in order to meet them. They include language that necessitates social science capacity and they cannot be met without this capacity.

There are also a significant number of indirect legal mandates for social science research and activities. These laws call for activities that could not be undertaken without social science information or analysis. Again, this list of drivers covers a broad range of the work in which

[5] This list is not comprehensive or representative. For a complete list, see the individual line office sections in Appendix B.

NOAA engages. See Appendix B for descriptions of the legal mandates relevant to individual LOs.

Strategic Documents. Other factors that influence NOAA's priorities, and particularly the need for social science, are the documents that lay out the Agency's priorities and strategy for achieving our desired goals and outcomes. These documents start with legal mandates and translate them into priorities, goals and objectives. The most significant of these are the *Next Generation Strategic Plan* (NGSP), and the *Annual Guidance Memorandum* (AGM). Both of these documents contain significant references to social science priorities and outcomes.

The Next Generation Strategic Plan (NGSP). The NOAA vision, as described in the NGSP, calls for "*Healthy ecosystems, communities, and economies that are resilient in the face of change*." This vision for the agency describes a state that could neither be achieved, nor measured, without social science research, data, tools, and technical assistance.

NOAA's mission also is made up of integrated societal and economic elements. This can be seen in the language supporting the mission statement. The italic emphasis is included to highlight these elements.

> "NOAA… … supports private enterprise with the information *necessary to sustain economic growth*."
>
> "NOAA is a global leader in understanding the processes by which ecosystems provide *services crucial for human survival* on Earth, and in helping to educate businesses and Federal, State and local decision makers about how the *health of human society* and the health of the environment are interconnected."

Each of NOAA's Long-Term Goals also contain elements that could not be achieved or measured without a strong, well-coordinated social science capacity. The first two goals are Climate Adaptation - described as "An informed society anticipating and responding to climate and its impacts" – and a Weather Ready Nation – described as "Society is prepared for and responds to weather-related events." Without social science, NOAA could not effectively inform society or predict or influence its response to climate and weather-related events, or their impacts. The same can be said for the Healthy Oceans goal – "Marine fisheries, habitats and biodiversity are sustained within healthy and productive ecosystems". The agency ensures healthy and productive ecosystems by managing human influences on those ecosystems. Additionally, one of the ways NOAA measures the productivity of ecosystems is through the services they provide to humans. Again, these elements require social science capacity. Finally, the Resilient Coastal Communities and Economies Goal ("Coastal and Great Lakes communities are environmentally and economically sustainable") could not be achieved or assessed without social science research, tools, data, and technical assistance.

Finally, NOAA Enterprise Objectives also call for the application of social science to achieve agency objectives. For example, NOAA's Science and Technology Enterprise includes the statement, "Acquire and incorporate knowledge of human behavior to enhance understanding of the interaction between human activities and the Earth system." including historical ecology as

well as history and archaeology. This enterprise goal also includes humans in its definition of "biological components."

The Annual Guidance Memorandum (AGM). The AGM is one of the key strategic drivers for NOAA social science. The purpose of the AGM is to "… focus the agency's corporate attention on near-term execution challenges and a balanced implementation of NOAA's strategy across mission areas given our mandates, stakeholder priorities, and the fiscal outlook." There are several references in the AGM to social science priorities and outcomes that require the use of social science research, data, tools and technical assistance.

One of NOAA's Near Term Execution Imperatives in the AGM is "Evolve NOAA's weather services to become more effective, efficient, and agile." This imperative includes a call to "… improve and streamline operations and create an NWS that continues to lead the Nation's weather preparedness in the 21st century", using the results of a National Academies of Science report[6] which includes improvements to the public's awareness of and response to extreme weather dependent events, which requires a significant and sustained social science capacity. The imperative also calls for the use of "… social science methods to develop and test service enhancements to motivate and support better human responses to warnings."

In the climate arena, social science methods will be needed to effectively adapt to climate impacts. An example of this is the climate Focus Area for Planning: "Strengthen the production and delivery of climate information and services to inform the management of climate-related risks." Particularly relevant is the plan to "… focus cross-line office efforts and partnerships to increase access to authoritative information about the regional-scale impacts of a variable and changing climate on the key societal challenges of water resources, coastal inundation, weather and climate extremes, and marine ecosystems." Another Focus Area for Planning, "Improve ocean and coastal stewardship by focusing habitat efforts in priority areas and demonstrating landscape-scale results," states that "NOAA will increase focus of its and resources for science and conservation actions in targeted areas to maximize benefits to marine resources and communities, especially in fostering economic vitality." An understanding of these benefits to communities and effectively planning to foster economic vitality will require an explicit understanding of the connection between conservation actions, communities and economies.

Finally, in the Focus Area for Planning, "Enhance research and modeling to advance NOAA's mission," the AGM states that "NOAA will determine and forecast socio-economic benefits provided by ecosystems and the impacts of management actions on ecosystems and ecosystem services." This will require the integration of ecological and social science elements to understand how changes to ecological function can affect the socio-economic benefits of ecosystem services.

[6] National Academies of Science, 2012. *Weather Services for the Nation: Becoming Second to None*. Committee on the Assessment of the National Weather Service's Modernization Program; Board on Atmospheric Sciences and Climate; Division on Earth and Life Studies; National Research Council. National Academies of Science: Washington, DC. 90 pp.

Social Science Needs and Gaps[7]

Needs

The LOs differ not only in their mission, but in their experience in the use of social science. As a result, the LOs are at different stages in their thinking about how best to use social science to meet mission goals and internal decision making needs. A comprehensive set of needs for each LO is articulated in Appendix B, however, concise summaries for each line are presented below.

NMFS and NOS each have several mandates that require the use of social sciences to achieve their mission, and as such have been using social science for years. This more mature capacity and these capabilities allow NMFS and NOS to articulate a well-developed description of how social science fits into their mission, and to fully understand what they need in comparison to what they currently have in the way of capacity.

A key responsibility of the NMFS economic and social science capability is to conduct mandated social impact assessments, economic impact analyses, and economic benefit assessments in support of almost 300 Rules each year. In support of these management actions, NMFS is also tasked with designing and managing the commercial and recreational economic and socio-cultural surveys and data collections for each of the 47 federal fishery management plans. In addition, and as discussed in Appendix B, the economic analyses underpinning regulations to protect and rebuild marine protected species and restore habitat must take into account the full suite of benefits (use and non-use) as well as the potential costs to private businesses and households, which results in a very different suite of data requirements and analyses. Further, mandated economic assessments of catastrophic disasters such as Sandy place further requirements on the program. Lastly, as NOAA shifts towards an ecosystem-based management approach, emerging needs for NMFS include new data and models to value ecosystem services and assess the trade-offs from alternative management decisions.

There are many elements of the NOS mission that have a human component. These are difficult to generalize because the missions of the Program Offices are so diverse. However, a good working knowledge of the things NOS does - products, services, processes, or other activities - that require social science can help NOS understand what its needs are and ultimately better integrate the social science expertise that is needed to support those elements. NOS needs social science expertise to conduct socioeconomic research, and to develop tools and analysis that improve decision-making and assess management strategies and regulations across several programs. NOS also needs the capacity to conduct social science surveys to improve products and services, conduct damage assessment and remediation, and to measure the benefits to society from its products and services. In addition, NOS needs economists to assess the economic value of coastal and ocean resources, and to continue to provide the suite of economic tools and viewers that make high profile economic data on the coastal and ocean economy available to the public.

[7] See Table 1 for a summary of capacity and gaps by LO.

The other line offices have far less experience using social science. While social science needs are described in this assessment for OAR and NWS, these LOs have far less experience with social science; their needs are less clearly articulated than those of NMFS and NOS. OAR and NWS also have few clear mandates for social science and as a result less in-house capacity and experience regarding social science.

To best target research and create new knowledge that will benefit society, OAR needs interdisciplinary expertise and capacity that combines physical (e.g. climatology) and biological science expertise with social science expertise to provide actionable science. For instance, the Climate Program Office within OAR needs the expertise and capacity to use social science methodologies to better understand the users of climate information, as well as their needs, to determine how and why they use (or don't use) NOAA climate products, how decision makers could better incorporate climate information into their resource management routines, and how NOAA could better convey climate forecasts and information to decision makers. OAR also needs some increased capacity in the social sciences to effectively coordinate and design extramural research with its partners to meet the research needs that support NOAA's mission.

The two high priority areas where NWS has identified social science needs and gaps are in the areas of Risk Communication/Behavior and Economic Valuation. NWS needs to provide effective communication of risk and forecast confidence in its products and services for better decision-making, and a comprehensive understanding of how its Core Partners (emergency management community, media, etc.) and the public perceive and use data and services. NWS also needs to better integrate social sciences into operational processes so that communication tools and decision support tools incorporate risk communication/behavior concepts before they are operational. Finally, NWS needs a comprehensive understanding of user decision processes and risk tolerances so it can best design forecasts and related products so they can meet the needs of the public, emergency managers, and planners.

Two of the LO's, NESDIS and OMAO, do not have any legal mandates that require the use of social science, and social science is only minimally connected to their mission objectives. Rather, as part of their core mission, they support programs and activities in other LOs that require social science. However, both of these LO's need valuations of their programs, products, and services. Both NESDIS and OMAO need to demonstrate that the way they conduct business achieves the highest benefit to society.

Some needs for social sciences cut across many line offices. For instance, the LOs have expressed the need for a risk behavior and communication specialist to help NOAA design integrated tools and data to improve coastal resiliency and help to mitigate the impacts of coastal storms and hazards. This gap cuts across multiple lines and is listed in Appendix B as a priority need for NOS's Coastal Service Center, OAR's Climate Program Office (CPO), and for NWS. NOAA priorities, including the recovery from Hurricane Sandy and efforts to improve coastal resiliency, future storm assessments, and the development of weather and climate decision support services and systems, would all greatly benefit from an increased capacity to analyze and communicate risk.

Valuation of NOAA's programs, products, and services is a critical need that cuts across all of NOAA. Valuation of our fleet services, and our satellite programs is a critical need for OMAO and NESDIS as well as for the Line Offices they support. Valuation of our ports products and services, of hydrographic surveys and nautical charts, of marine planning and effective coastal management strategies, and the value of improved water quality to human health and society all serve NOAA's mission. Valuation of ecosystem services and NOAA's ability to identify the best investments in the stewardship of natural capital aligns with Administration efforts to understand and leverage the value of environmental capital, and is needed to implement ecosystem-based management and increase the resilience of coastal communities and economies. Valuation of our programs, products, and services can also help NOAA to make strategic and effective investment decisions.

Indeed, much of NOAA's work requires the integration of science, stewardship, and service across the line offices. Not surprisingly, the core needs for social sciences described by the LOs also exist at a higher level to fulfill the needs of these enterprise level activities. NOAA Headquarters and its Office of Program Planning and Integration need social science to communicate NOAA's value, to design strategies to guide the work of the entire organization, and to produce NOAA-wide social science information that meets the same high standard as other data at the agency. The corporate level need for social science at NOAA is greater than the sum of the line office needs.

Gaps

As NOAA's uses of social science vary widely across LO's, so do the major gaps in social science expertise. Some of these gaps pose a high risk for NOAA and hinder our ability to fulfill legal mandates and to effectively provide the science and services the nation needs to plan for and react to a constantly changing environment. Others gaps have left NOAA incapable of adequately quantifying and communicating the societal importance of it science and services. These valuations of the societal impact of NOAA are needed to inform Congress of the value that NOAA contributes to society, to allow NOAA to better plan and manage our fiscal resources, and to constantly strive to produce science, service and stewardship that improves the wellbeing of the nation. Here we summarize the major gaps in social science capabilities across NOAA. For full descriptions, please see the LO sections in the Appendix B.

The gaps described in this assessment are provided in terms of personnel, personnel costs and external funding needed to cover immediate risks and to make NOAA social science fully operational. They take into account other sources of capacity, such as partnerships, cooperative institutes, grants, and inter-agency efforts, but recognize that planning, implementation and application of these types of capacity will take a certain amount of in-house capacity and expertise. Furthermore, increasing this capacity does not necessarily require acquiring more in-house staff for NOAA. For example a budget-neutral option to increase capacity could include using attrition and the repurposing of existing positions to fill the gaps. All references to staff in this report reflect this recognition or leveraging internal or external grants or partnerships. This report does not propose ***how*** NOAA should fill the gaps, but rather only attempts to define them.

While NMFS has substantial social science capacity (96 staff including federal and contract), its needs for social science are great and the line office has identified gaps in social science that are critical and put NOAA at risk if not filled. In FY12, the NMFS Economics & Social Science Research budget line was cut 30% from $10.7M in FY11 to $7.4M in FY12. This decrease was roughly equivalent to the Program's increase in FY10. Accordingly, the Program's budget priorities identified and the rationale behind them are much the same as those identified in the FY10 President's Request: 10 staff and funding for data collection and the development of social and economic decision support tools. While the funding was cut, the need for these resources increased, further widening the gap. In particular, the number of Rules issued by NMFS has not declined and the number of catch share programs, a market-based approach to management that requires substantially more economic assessments, increased. Gaps also include the need for funding to advance development of decision support tools that assess the economic impacts of commercial and recreational fishery regulations, enabling the Agency to work "smarter", i.e., more cost-effectively. In addition, three national-in-scope decision support tools NMFS currently has underway support marine spatial planning or, more specifically, fishing ground closures (FishSET); a recreational fisheries economic decision support tool for evaluating management options (BLAST); and a social indicator / community profiling web-based tool that support social impact assessments. These decision support tools will aid in rigorous assessment of the trade-offs from marine spatial management strategies that restrict fishermen's access to fishing grounds, provide essential information for making allocation decisions, and improve assessment quality, while reducing the time required to run an assessment 20- fold, dramatically reducing labor costs.

With current capacity, NOAA Fisheries cannot meet legal mandates requiring economic and social impact assessments with current resources. Given the economic and social data collection, modeling and assessment requirements for supporting Rulemaking, it is clear that current staff is stretched too far and cannot keep pace with these demands. ***Currently, the Agency is only meeting 55% of its commercial fisheries economic data collection requirements and roughly 30% of its recreational fisheries economic data collection requirements.*** NMFS needs to dedicate 10 additional staff to meet its current goals.

Similarly, NOS has a moderate and widely distributed social science capacity (28 staff including federal and contract staff). However, at the same time, NOS has a very high demand for social science and, as a result, the line office identifies a gap in social science capacity of 14 staff. This lack of capacity translates into the inability of program offices to meet the requirements of specific social science mandates. Gaps in staffing affect regional capacity to conduct social science in support of National Marine Sanctuary management, response and restoration functions, and general capacity to address the economic and behavioral aspects of community resiliency relative to changes in ecological condition, as well as coastal storms and hazards (a gap also reported by OAR and NWS). Further, NOS does not presently have the capacity it needs to estimate the societal benefits of NOS products and services, including the value of coastal and ocean research (an agency-wide gap). Finally, NOS lacks the social science capacity to quantify and value ecosystem services and, thus, is challenged to fully understand and help steward coastal and marine environmental capital, and to provide the tools and products needed for ecosystem-based management, both of which align with Administration priorities.

OAR's assessment of its social science gaps reflects a lack of interdisciplinary expertise rather than pure social science. OAR must dedicate at least two additional social science in order to provide: more pertinent and actionable information for decision-makers; capacity to increase public understanding of the impacts of climate change and the health impacts of poor air and water quality; the information available to support preparation, adaptation, management and/or response to changing climate and environmental conditions; and specific information for planning by sector and region. Social science capacity is currently inadequate to best identify, coordinate and develop social science research to support NOAA's mission - a gap for OAR.

The NWS also lacks a robust social science capacity. NWS especially lacks the interdisciplinary social science capabilities required to best fulfill its mission. NWS does not have the internal capacity in personnel or funding to develop a comprehensive understanding of how the public perceives and uses weather data and services or to incorporate societal impacts into the forecast process. Additionally, NWS does not have the social science capacity to estimate the societal value of NWS products and services; to understand and communicate risk behavior; and to estimate the economic impacts of weather events. NWS requires a minimum of three social science staff in order to begin to close the gap in its social science capacity. NWS has been able to fill some of the gaps by collaborating with external partners on research areas relating to risk communication, however the ability to get the research into operations and the lack of dedicated funding to social science has stymied the growth.

Social science has traditionally fallen outside of the perceived purview of NESDIS and as a result it has a very small social science staff. Nevertheless, it is increasingly clear that the line office has a growing need for social science (an estimated 12 social science staff) and does not have the capacity to meet these needs. NESDIS lacks the social science capacity that can help the line office design environmental satellites to collect the data most needed by society. NESDIS also does not have sufficient social science capacity to quantify, monitor, and communicate the value of its goods and services

OMAO's does not have any social science capacity. It lacks the ability to assess the economic and social aspects of its emergency preparedness and response support functions, technical standards development, and educational activities. OMAO also cannot adequately quantify the social benefits that arise from its processes, products and activities. Nevertheless, OMAO does not need a full-time in social science, but could make use of social science capacity elsewhere at NOAA.

Until recently, PPI has lacked the basic social science capacity needed to fulfill its role in social science leadership at the agency, including its advisory capacity to senior NOAA leadership. PPI has not had a full-time, permanent federal Chief Economist or other senior social scientists since 2007. Without a full-time senior social scientist, PPI has been unable to develop and implement an innovative, NOAA-wide economic and social science research agenda that advances the Departments goals and NOAA's most pressing valuation and social science needs. PPI also has not been able to adequately represent NOAA on the many inter-agency committees that require a Chief Economist or equivalent. PPI has not always been able to provide NOAA leadership with the economic and social science data it needs to communicate with Congress and the public.

Furthermore, because of the wide ranging nature of social science at NOAA, PPI requires more than just a Chief Economist or its equivalent. PPI needs a staff of senior economists (2 staff) and 2 more junior staff who can work with the Chief Economist and the line offices to better coordinate social science and social science capacity across the agency. PPI also needs a small, but capable senior staff to conduct research, provide leadership for cross-line office initiatives, and to prepare NOAA-wide materials that communicate the societal importance of NOAA.

Social science, especially the ability to understand and communicate the value of NOAA, has become part of an ongoing and high-level need for NOAA HQ. Nevertheless, there is no permanent social science position at HQ. NOAA HQ finds that it needs at least two dedicated social science that can provide risk assessment and risk communication expertise, assist with education assessments, and help leadership manage for and communicate the societal value of NOAA's products and services, as well as studies about NOAA's user behavior.

Table 1 (below) provides a summary of the gaps identified by the LOs in Appendix B and summarized above. These gap estimates provide the personnel, personnel costs and external funding needed to cover immediate risks and to make NOAA social science fully operational. They take into account other sources of capacity, such as partnerships, cooperative institutes, grants, and inter-agency efforts, but recognize that planning, implementation and application of these types of capacity will take a certain amount of in-house capacity and expertise. These estimates reflect this recognition.

Table 1. Summary of Social Science Capability and Gaps *

	Current Capability			Gaps					
				Covering Immediate Risks			Fully Operational		
	Staff	Staff Funding	External Funding	Staff	Staff Funding	External Funding	Staff	Staff Funding	External Funding
OAR	8	1,125	17,480	2	300	8,250	21	3,150	17,280
NOS	29	3,220	1,853	14	1,568	2,900	42	4,704	5,960
NMFS	96	11,900	6,680	10	1,600	6,680	56	9,280	6,680
NWS	3	336	1,104	1	112	250	30	3,360	2,000
NESDIS	6	694	700	5	560	350	12	1,344	2,000
PPI	3	538	-	1	150	-	5	750	400
NOAA HQ	1	112	120	3	336	300	2	224	1,000
OMAO	-	-	-	-	-	-	-	-	-
Total	**145**	**17,925**	**27,937**	**36**	**4,626**	**18,730**	**168**	**22,812**	**35,320**

* For a detailed breakout of this information, see Appendix A. All funding figures are in thousands of dollars.
Staff Includes both federal and contract staff.

Advancing social science at NOAA in the current budget climate will necessarily be an iterative process. There are additional needs identified in Appendix B as well as detailed information on the requirements for a fully operational social science structure at NOAA, however, we have presented here the most critical needs and requirements to meet our legal mandates and most effectively achieve our mission. It should be noted that this assessment is not intended to be a budget exercise, but rather to provide a list of priority gaps that need to be filled through strategic planning and budgeting processes. It is also important to note that this assessment was based

largely on FY11 funding and staffing levels, and budgets have declined sharply since then, in some cases significantly increasing existing gaps.

Current Capability

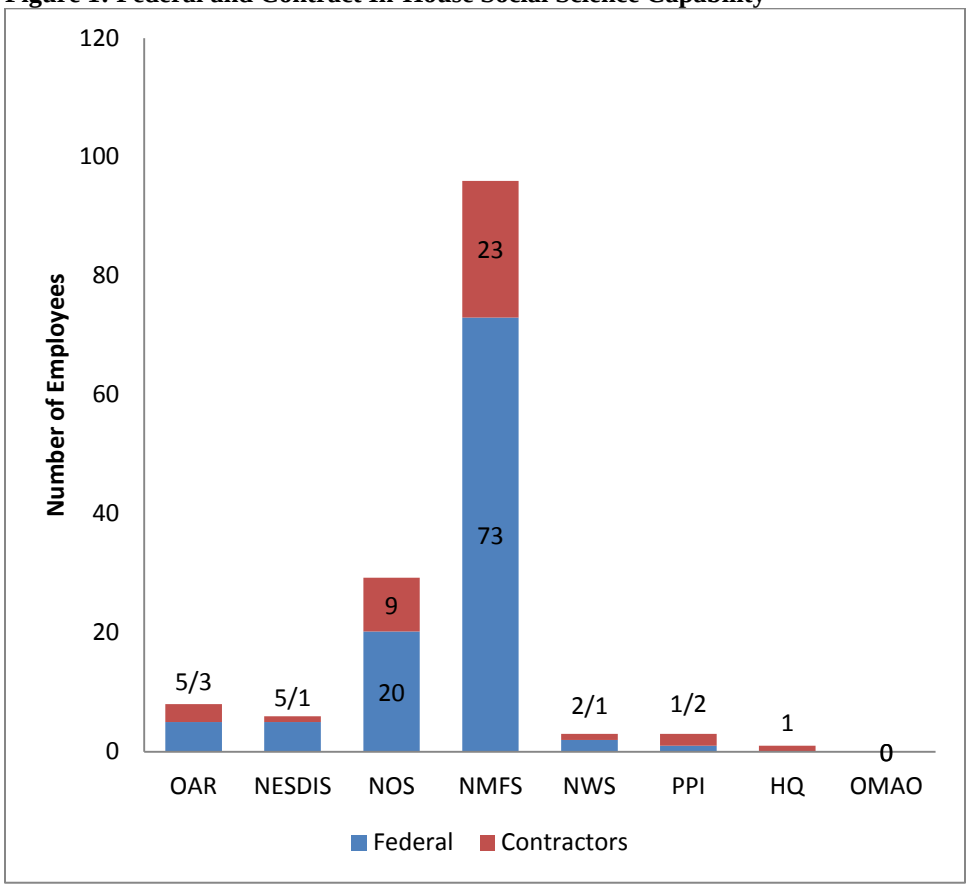
To provide a more complete picture of social science capacity at NOAA, we worked with the social science leads of each line office to document Federal employees and contractors who actively participate in social science activities.

In-House Capacity. For the purposes of this assessment, we define in-house capacity as federal employees or contract staff who conduct or support social science research, provide social science data, provide or maintain social science tools, or provide social science technical assistance (whether or not they are in social science job series). The data in Figure 9 (below) were compiled from the workforce management data and the respective knowledge of the Social Science Committee. This is a more accurate picture of in-house social science capacity than that provided in Figure 1.2 (Federal Employees in Social Science Job Series) for three reasons: 1) it includes federal employees who are not in social science job series that participate in social science research and activities, 2) it includes contract staff, and 3) it does not include federal employees in social science job series who do not participate in social science research and activities.

As can be seen in Figure 1, the majority (66 percent) of NOAA's in-house social science capacity resides in NMFS, with 96 employees. Of these 23 employees (24 percent) are contract staff. Twenty percent (29 employees) reside in NOS, with nine of those employees (31 percent) being contract staff. OAR, NWS, NESDIS, PPI and NOAA Headquarters, each have less than five percent of NOAA's social science in-house capacity. OMAO does not have social science capacity, but utilizes the capacity in the LOs when needed.

For additional information on NOAA's federal social science workforce, see Appendix C.

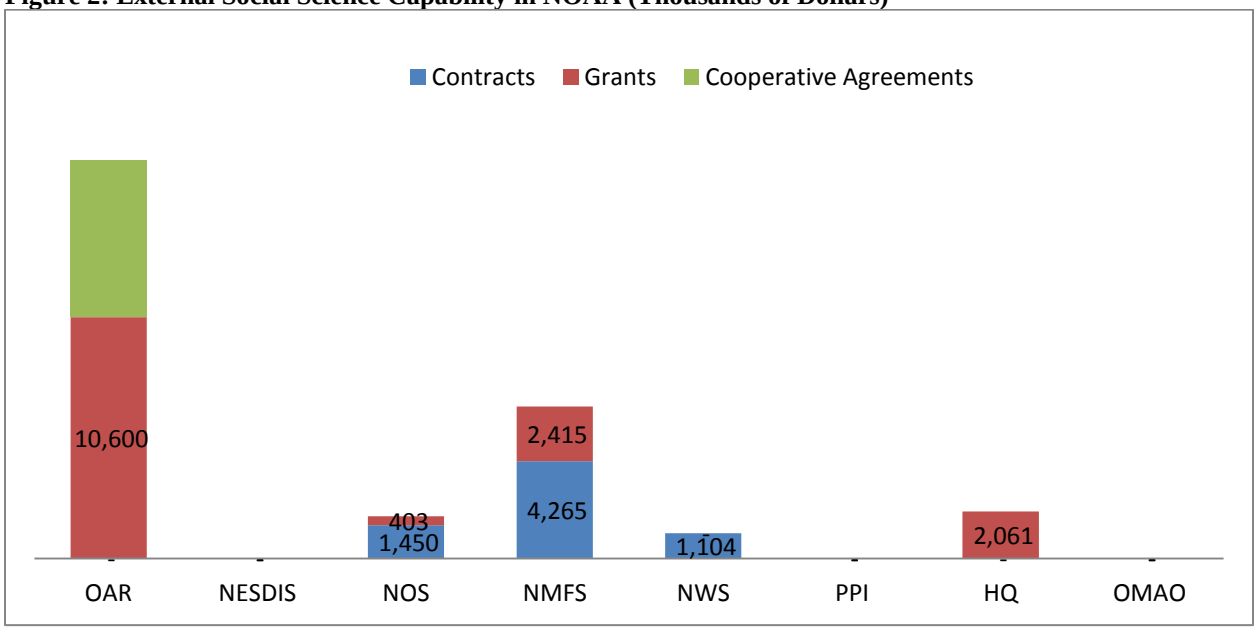
Figure 1: Federal and Contract In-House Social Science Capability



External Capability. The discussion above concerned NOAA's social science capacity that exists in the form of employees. Another significant source of its capacity is accessed through contracts, grants, and cooperative agreements. There has been significant discussion over the years on what the appropriate mix between in-house and external should be. Certainly not all of NOAA's social science work need be done by in-house employees, however it may be true that contracting out social science is not the most efficient or effective way of conducting that work. One reason is that, when work is contracted out or conducted through grants, there is no institutional memory related to what was done or how the work was used. In any case, the information contained in Figure 2 (below) is a snapshot of what NOAA's external social science capacity looked like in FY11.

As can be seen in Figure 2, most of the external social science funding resides in OAR, with over $17 million (60 percent). NOAA Fisheries funds approximately $6.6 million (23 percent) in external social science of which about two-thirds is contracts and one-third is grants. Following these offices, about seven percent of external social science funds is in NOAA headquarters, six percent in NOS, and four percent in NWS. For detailed discussion of these amounts, please see the individual LO sections in Appendix B.

Figure 2: External Social Science Capability in NOAA (Thousands of Dollars)[8]



Social Science IDIQ. One example of external social science expertise in NOAA is the Indefinite Delivery, Indefinite Quantity (IDIQ) Social Science contract in NOAA's Coastal Services Center. This open-ended contracting vehicle provides a fast and easy way for federal government entities to acquire social science services from the private sector. The products developed through this contract must be used to support local, regional, and national coastal management efforts. Two contractors, Eastern Research Group, Inc., and Booz Allen Hamilton, Inc., were competitively selected for this multiple-award, five-year vehicle. Task orders are placed under the contract, and the two contractors compete for individual task awards. Services provided under the contract include analyses such as demographic, market economic, and social network analyses; assessments such as needs and social assessments, and evaluation; and tools and methods such as focus group design and implementation, nonmarket valuation, risk communication, and community-based social marketing. Examples of work performed through this IDIQ include:

- *Fisheries Socio-Economic Monitoring Instrument Design*. Developed two fisheries surveys for the Northeast region, one with permit holders and vessel captains, and a second with vessel crew. (NMFS)
- *Hurricane Forecast Improvement Program Socio-Economic Research and Recommendations*. Assessed user needs for wind information, including the types of information, format, and delivery by audience type and provided recommendations from the research on communicating tropical cyclone hazard predictions and how this affects segments of the at-risk populations by testing developed products. (NWS)
- *Adapting to Rising Tides*. Provided process design, coordination, and meeting development support for the project, provided economic analyses for asset vulnerability, and recommended next steps for roll-out of the project's products to communities. (NOS)

[8] The grant amount for OAR includes cooperative agreements.

Cooperative Institutes. The vehicles described above are those through which the majority of external social science work takes place, however there are other vehicles that are used now and have significant potential for future use. One of these is Cooperative Institutes (CI). Currently, the use of cooperative institutes is not widespread in terms of social science work. However, there are several examples of the use of CI's for social science, notably in OAR where CI's are used in support of the Regional Integrated Sciences and Assessments (RISA) centers. But it remains true that NOAA can benefit significantly from vehicles other than in-house capacity, contracts and grants.

Partnerships and Inter-agency Relationships. Another area which is critical for NOAA to make progress in meeting its social science needs is partnerships with states, local governments, Non-Governmental Organizations (NGOs), industry; and with other federal agencies with common aspects of our respective missions. To use taxpayer dollars in the most efficient way, and particularly in the current budget environment, joining forces to achieve a common objective, or coordinating a common need for data, tools or allows NOAA to accomplish much more than the agency could on its own. Additionally, a close working relationship with our partners will provide insights into the broader context in which we work, allowing NOAA to be more productive and effective. NOAA has many partnerships and inter-agency relationships related to social science and they vary significantly by LO. These are identified and discussed in detail in Appendix B.

Social Science Disciplines. NOAA's efforts to understand the broad social and economic implications of the agency's impact and mission cannot be accomplished without a broad range of social science disciplines. Historically, NOAA, through specific language in legal mandates, has focused its social science capacity on estimating the economic impacts of environmental resource damages and on understanding the economic implications of fishery regulations. As NOAA's culture has evolved to the point where there is recognition of the need for a more well-rounded understanding of the wider social implications of NOAA's mission, the agency has made progress in increasing the diversity of social science disciplines it utilizes. There is still a great need for economic analysis, data, tools and technical assistance, but in order for these elements to be meaningful, they need to be viewed in the context of society, our culture, our behavior, and our values.

Each of the LOs has a need for different mix of social science disciplines, but all of NOAA needs to ensure that the economic and social implications of their missions are addressed and needs to understand the societal impacts, including the value of products, services and activities.

Conclusions and Recommendations

While substantial and growing, NOAA's social science capacity is generally insufficient to meet the needs of the agency. Social science at the agency is inconsistently applied across the line offices and not well integrated into NOAA's mission in the broad sense; it is limited in our research and operations and almost entirely lacking in our decision making. If NOAA hopes to meet the societal challenges of the 21st century, it cannot continue to operate with a social science capacity that barely meets the needs of the 20th century. That means NOAA must

increase the resources it devoted to social science, both internally and externally, and improve the integration of social science into all of NOAA service, science, and stewardship activities.

The gaps in social science at NOAA also include a lack of integration of social science with NOAA's natural sciences and engineering and a lack of coordination of social science across the agency. NOAA's existing social science power is embedded deep within the LOs and programs and currently is not well-harnessed at a corporate level. In order to resolve these issues, the agency needs to address the gaps contained herein, but also must examine its social science enterprise from a holistic "One NOAA" viewpoint in order to understand how the various social science functions fit together (See Figure 11), and the ways in which NOAA affects society. This must be done at both the LO level and at a NOAA-wide, corporate level.

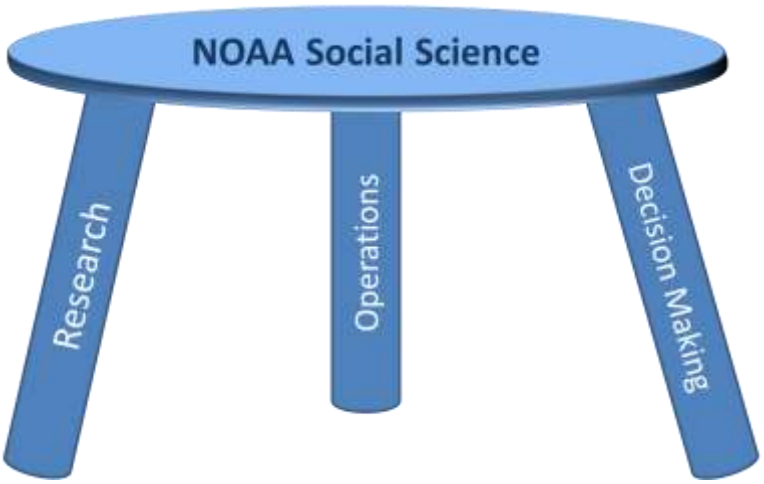


Figure 3. NOAA's Social Science Functions

While social science at NOAA had its start in the very specific application of social science methods to address legal mandates, the social science expertise now needed by the Agency are not necessarily unique to any particular NOAA function. Social science techniques and expertise within one line office or program could easily be transferred to others. NOAA must make best use of the social science capacity distributed throughout the agency. This will take strong leadership in the social science realm. The ad hoc nature of social science leadership at NOAA must become permanent, strong, and be capable of consistently guiding coordinated and integrated social science research, application, and communication.

This assessment was conducted to fulfill a request of the Science Advisory Board, but it does not end there. NOAA leadership needs to take concrete steps to address the gaps in social science identified by this assessment. These gaps are well-known and have been the subject of previous SAB reviews. Each line office, indeed corporate and headquarters level programs, will find different ways of filling these gaps. In some cases, gaps should be filled with new hires. In other cases, gaps may be filled by transitioning positions from non-social science to social science or by allowing the many social scientists now in non-social science job descriptions to apply their social science training to decision-making at the agency. Some gaps will be filled by improving the coordination of social science within and across line offices. Other gaps will be

filled by hiring senior level social scientists (e.g. SL or ST) to guide social science research and application at NOAA, the Sea Grant College Program, the Cooperative Institutes, and with other external partners. In some situations, gaps in social science can be filled by offering social science training workshops to those scientists engaged in providing products for known general public uses so that they may contribute social science feedback on their products/forecasts.

In addition to concrete steps to fill the human gaps in NOAA's social science capacity, NOAA should regularly assess whether its social science capacity is sufficient to meet its mission goals. To accomplish these goals of immediate and sustainable improvement in NOAA's social science capacity, NOAA should commit to a process in which it can utilize the information contained in this assessment to build an effective social science capacity that will be sufficient to meet NOAA's needs. This will involve the social science community working with leadership and the programs to ensure that the social science capacity is adequate to meet the requirements of NOAA's mission.

The need for social science will always exist at NOAA and meeting that need will be an ongoing endeavor. This assessment is a first step on the path to improving the agencies effectiveness at meeting societal needs by better social science research and application. Here we propose concrete steps to begin this journey - recommendations that will maintain the current momentum for better social science in service of the agency.

Recommendations: Social Science for a Better NOAA

The major recommendations are as follows:

- *Repurpose the Research Council Social Science Committee to be the NOAA Social Science Committee that will strategically advance, coordinate, and guide NOAA's social science research, operations, and decision making.* This committee would subsume the functions of the existing NOAA Research Council Social Science Committee and would be expanded to include staff knowledgeable about how social science capability is incorporated into operations and decision-making, and that have the ability to identify and leverage opportunities for social science in NOAA day-to-day functions. It would have a dual reporting role to the Chief Economist and to the Research Council.

  The critical aspect of this Committee is an ability to understand how social science capability is incorporated into operations and decision-making and to identify and leverage opportunities for social science in NOAA day-to-day functions. Many of NOAA's social science needs are not research oriented, but involve the regular application of social science to decision-making at NOAA, its partners, and its constituents. Having both research and operations and decision-making expertise on the social science committee will allow it to make strategic recommendations on how to best utilize social science in NOAA's research, operations and decision making.

Many of NOAA's social science needs are not research oriented, but involve the regular application of social science to decision-making at NOAA...

- *A Process for Moving Forward.* The first order of business for the NOAA Social Science Committee should be to develop a concrete plan to fill the gaps outlined in this report, to develop a concrete strategy and criteria for the evaluation of gaps, and begin to implement a plan for the following:

  - *Fill Critical Gaps.* Many of the gaps identified put NOAA at risk of not fulfilling its legal mandates and reduce our ability to meet our science, service, and stewardship responsibilities. Strategies should be identified through the SEE and budget processes to fill those gaps as quickly as is feasible, and should be considered for inclusion in a future budget request. In addition, budget neutral options such as integrating efforts across lines to reduce costs, or leveraging or repurposing existing funding and/or grant programs and staff should be considered. For instance an interim alternative may be to fund social, behavioral, and economic (SBE) science studies through the various Cooperative Institutes, and Sea Grant programs.

- *Periodic Social Science Needs Assessments.* Now that NOAA has been through the process of compiling the information necessary to understand the agency's current social science capacity, needs, and gaps, it will be easier in the future to collect the same information. This will help NOAA determine its status in meeting its social science needs and the trend it is following regarding social science capacity, using this assessment as a baseline. A periodic assessment will be critical to ensuring that NOAA meets its social science needs. The NOAA Social Science Committee should conduct the assessment every two years. Deep dive assessments for critical NOAA offices and programs should also be prioritized and executed.