

Executive Summary

Harmful Algal Research and Response: A Human Dimensions Strategy (HARR-HD) justifies and guides a coordinated national commitment to human dimensions research critical to prevent and respond to impacts of harmful algal blooms (HABs). Beyond HABs, it serves as a framework for developing human dimensions research as a cross-cutting priority of ecosystem science supporting coastal and ocean management, including hazard research and mitigation planning. Measuring and promoting community resilience to hazards require human dimensions research outcomes such as effective risk communication strategies; assessment of community vulnerability; identification of susceptible populations; comprehensive assessment of environmental, sociocultural, and economic impacts; development of effective decision support tools; and improved coordination among agencies and stakeholders. HARR-HD charts a course for human dimensions research to achieve these and other priorities through coordinated implementation by the Joint Subcommittee on Ocean Science and Technology (JSOST) Interagency Working Group on HABs, Hypoxia and Human Health (IWG-4H); national HAB funding programs; national research and response programs; and state research and monitoring programs.

Harmful Algal Blooms (HABs). Harmful algal blooms (HABs) are “proliferations of microscopic algae that harm the environment [and humans] by producing toxins that accumulate in shellfish or fish, or through the accumulation of biomass that in turn affects co-occurring organisms and alters food webs in negative ways. Like much of the world’s coastlines, nearshore marine waters of the US have experienced increases in the number, frequency, and type of HABs in recent years. Freshwaters are also experiencing HAB events” (HARRNESS 2005) (Fig. 1).

Human Impacts of HABs. In their Final Report to the President and Congress, *An Ocean Blueprint for the 21st Century*, the US Commission on Ocean Policy recognizes that HABs are a significant threat to coastal environments and communities (USCOP 2004). The human impacts of HAB events are profound, including illness and mortality resulting from direct consumption of or indirect exposure to contaminated shellfish or fish; lost revenue for coastal economies dependent on seafood harvest or tourism; disruption of subsistence activities; loss of community identity tied to coastal resource use; and disruption of social relationships and cultural practices of families and communities.

National HAB Plan and Legislation. The recent National Plan for Algal Toxins and Harmful Algal Blooms, *Harmful Algal Research and Response: A National Environmental Science Strategy* (HARRNESS), calls for a coordinated, interdisciplinary national research and response program to reduce impacts from harmful algal blooms (HABs) (Fig. 2). By establishing recommendations for public health and socioeconomic research coupled with a comprehensive biophysical research and monitoring strategy, HARRNESS provides information critical to implement the 2004 reauthorization of the Harmful Algal Bloom and Hypoxia Amendments Act (HABHRCA) (PL 108-456). JSOST

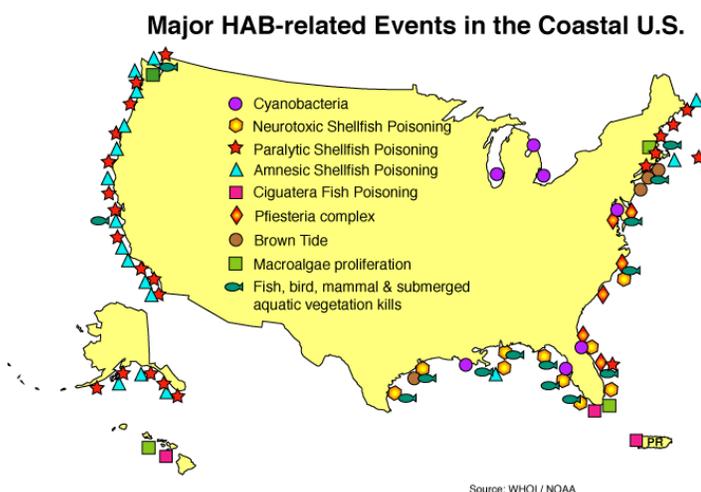


Figure 1. Major HAB Events in the US. (NCCOS and WHOI, www.whoi.edu/redtide/HABdistribution/HABmap.html)

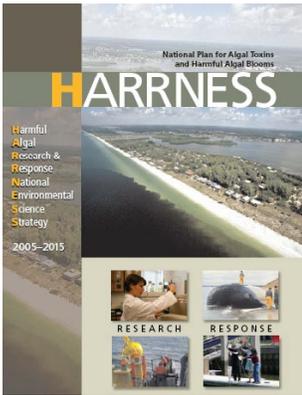


Figure 2. National HAB Plan (HARNNESS)

established the IWG-4H to implement the Oceans and Human Health Act of 2004 and HABHRCA, which requires the President to submit a number of reports to Congress including scientific assessments of coastal and freshwater HABs and hypoxia, a report on HAB prediction and response, and a plan to reduce HAB impacts (see Recommendation 1).

Development of a Human Dimensions Research Strategy. Recent development of the National HAB Plan, coupled with legislation requiring considerable interagency focus on HABs, provides an opportunity to expand areas of HAB research that will better focus national commitments to protect environmental systems, public health, economies, and communities. Recognizing the need for guidance to implement

the recommendations of the National Plan for public health and socioeconomic research, the National Centers for Coastal Ocean Science (NCCOS) of the National Oceanic and Atmospheric Administration (NOAA) convened a multi-agency workshop on the Human Dimensions of HAB Response in September of 2005. The workshop brought together federal, state, and non-governmental partners in the HAB research and response community with a cross-section of specialists in human dimensions areas critical to improve mitigation strategies (including anthropologists, economists, epidemiologists, risk communication specialists, and educators) (see Appendix 2 for a list of workshop participants). A subset of workshop participants developed the following report, *Harmful Algal Research and Response: A Human Dimensions Strategy* (HARR-HD) (see list of contributors above) (Fig. 3).

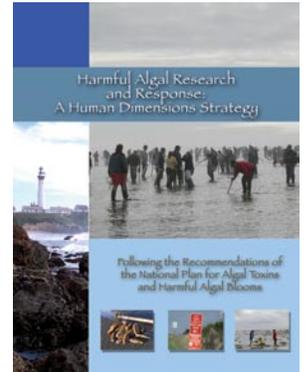


Figure 3. Human Dimensions Research Strategy (HARR-HD)



Figure 4. Organization of the HARR-HD Research Strategy

Human Dimensions Research Strategy. HARR-HD provides a research strategy that expands on the *Public Health and Socioeconomic Impacts* section of HARRNESS. The research strategy puts forth six areas of human dimensions research critically needed to reduce environmental and human impacts of HABs: socioeconomic impacts, public health impacts, recreational and drinking water impacts, risk communication, coordinated approaches to HAB problems, and education and outreach. Within these broad areas, individually authored sections are devoted to more specific research topics essential to achieve recommendations put forth in HARRNESS. Each section states the HARRNESS recommendation it expands, provides an overview of the research topic, outlines research objectives addressing the topic, and suggests an example project to achieve the objectives (Fig. 4). Research objectives and example projects are intended to provide a framework for programmatic development and requests for research proposals (RFPs).

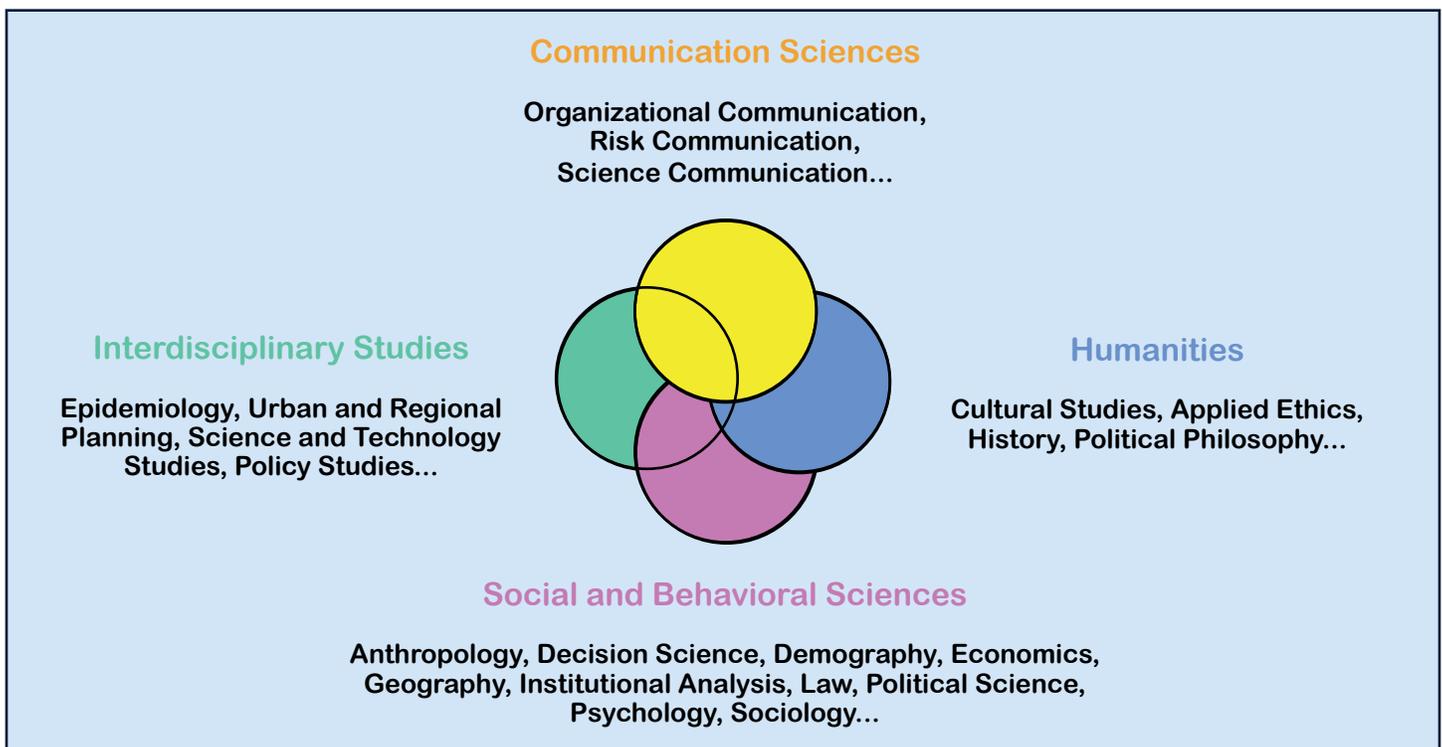
Since HARR-HD has not been widely reviewed by an external social science community, it should be

viewed as an important first effort to stimulate and guide routine integration of public health, sociocultural, and economic researchers and research programs into national efforts to implement HARRNESS and HABHRCA – especially the non-economic social sciences such as risk communication, anthropology, and sociology, which are under-utilized relative to their essential role.¹ Diverse human dimensions disciplines are integral to reducing impacts from HABs and, more generally, supporting coastal and ocean resource management (Fig. 5).

Benefits of Public Health and Socioeconomic Research for HAB Response

Substantial investment in public health and socioeconomic research is needed to enable resource management and public health agencies, affected sectors and communities, and biophysical scientists to develop and implement coordinated, effective responses to HAB events on regional and local scales. This report de-

Figure 5. Diverse Human Dimensions Disciplines Integral to Coastal and Ocean Resource Management



¹For example, based on data provided by NOAA’s National Center for Sponsored Coastal Ocean Research (CSCOR), from 1999-2004, the Ecology and Oceanography of Harmful Algal Blooms (ECOHAB) interagency HAB research program allocated zero funds to the non-economic social sciences, e.g., anthropology, sociology, risk communication, and institutional analysis (not including epidemiology). To provide a point of reference, ECOHAB was committed to spending roughly \$65M from 1997-2007.

scribes human dimensions research critical to achieve the following benefits anticipated by implementation of HARRNESS and HABHRCA.

Improved Protection of Human Health

- Understanding how audiences perceive and respond to HAB information will enable communication strategies that prevent exposure and disease.
- Collecting epidemiological information describing the extent of exposure and prevalence of HAB-related illnesses will inform public health decisions in anticipation of and response to HAB events.
- Developing strategies for case reporting, including approaches that do not require patient interaction with the medical community, will improve accuracy of disease incidence assessments and focus exposure prevention strategies.
- Identifying susceptible populations will further focus exposure prevention strategies.
- Identifying effective regulatory, institutional, and participatory strategies will facilitate short-term response to algae-contaminated water and incorporation of algal toxin standards into water quality standards.
- Assessing public perceptions of algal toxins in affected drinking and recreational waters, and the extent of public support for increased monitoring, will inform water quality monitoring and short-term response strategies.

Improved Prevention of and Response to Sociocultural and Economic Impacts

- Identifying demographic groups most vulnerable to sociocultural and economic impacts of HAB events will focus prevention and mitigation efforts.
- Conducting a baseline assessment of agencies and partners integral to current prevention and mitigation efforts, and identifying effective strategies for coordination, will inform development of effective partnerships on local and regional scales.
- Understanding how communication of HAB forecasts, threats, and other information mediates public perceptions and behaviors will suggest communication strategies effective for prevention and mitigation of human impacts.

Assessments of Sociocultural, Economic, and Public Health Impacts

- Establishing formal, standardized data collection will enable accurate assessments of the sociocultural,

economic, and public health impacts of HAB events on local and regional scales. Impact assessments will justify investment in HABs and, as recognized by the National Environmental Policy Act (NEPA), are critical to select effective prevention and response strategies.

Improved Coordination for Research and Response

- Analyzing the coordination of agencies and stakeholders on regional and local levels will provide lessons learned, models of effective partnership for research and response, and strategies for avoiding unnecessary duplication of activities and funds.

An Educated and Informed Public

- Engaging communities to foster awareness of HABs and trust in resource management agencies will stimulate stewardship of coastal ecosystems and responses to HAB events that minimize sociocultural, economic, and public health impacts.

Assessments of the Benefits of HAB Forecasts

- Assessing the effectiveness of HAB forecasts for reducing sociocultural, economic, and public health impacts will enable public agencies to demonstrate the value of their research investments.
- Assessing the economic value of HAB forecasts will enable agencies and community groups to evaluate and measure the benefits of mitigation and outreach.

Decision Support for Policy Makers, Coastal Managers, and Others

- Economic analysis identifying value trade offs fundamental to policy and management decisions will support identification and selection of policy frameworks and management approaches for preventing and mitigating environmental and human impacts of HABs.
- Economic and sociocultural assessments documenting human use patterns in and interactions with HAB-affected environments will enable coastal managers to design strategies to prevent or mitigate HAB impacts on individuals and communities.

Improved Development and Transfer of Technologies

- Assessing the needs of coastal managers, educators, public health personnel, and other decision makers will guide the development and delivery of tools to

effectively assess, prevent and respond to environmental and human impacts of HABs, e.g. clinical tools for diagnosing HAB illnesses.

Cross Cutting Value of HARR-HD

The value of HARR-HD extends beyond HABs to provide a framework for human dimensions research critical to measure and promote the resilience of coastal communities to multiple hazards, including cumulative and episodic human impacts (such as pollution and oil spills) in addition to chronic and episodic natural events (such as droughts and hurricanes). Accordingly, HARR-HD provides a model for developing human dimensions research as a cross-cutting priority of coastal hazard research and mitigation planning, a goal of the Joint Subcommittee on Ocean Science and Technology (JSOST) established at a recent public workshop informing development of a national Ocean Research Priorities Plan (ORPP) (http://ocean.ceq.gov/about/docs/JSOST_nathaz.pdf).