Transdisciplinary Approaches for Twenty-First Century Ocean Sustainability Communication

Ronald E. Rice and Julie A. Robinson

The ocean, Earth's life support system, is under siege. Human actions threaten ocean health at unprecedented scales. No area of the ocean remains pristine or untouched by human activities, from industrialized fishing and aquaculture, oil and natural gas extraction, mineral mining, coastal development, nutrient and toxic pollution, the introduction of pathogens, invasive species, marine transport, overfishing and species extinction, and military testing to perhaps the most destructive of all, climate change (see Jackson, 2008). The interconnectivity and severity of these impacts threaten the very foundation of the ocean food web and consequently pose profound, negative, and irreversible implications for human health and well-being. The International Programme on the State of the Ocean (Rogers & Laffoley, 2011) assessed the combined impacts of ocean stressors such as pollution, warming, acidification, overfishing, and hypoxia and recently concluded that ocean degeneration is occurring much faster than predicted, and similar combinations of factors have been associated with major extinctions.

Given this context, it is unfortunate that, basically, concerning ocean issues, people are only slightly concerned and essentially unaware or uninformed (Edge Research, 2002; Steel, Smith, Opsommer, Curiel, & Warner-Steel, 2005). Media coverage of environmental issues is generally slight and, like all news, subject to corporate and political biases and interests, limits on timing and space, framing, journalistic norms, deadlines, low science journalism training, and low audience interests (Ashlin & Ladle, 2007; O'Donnell & Rice, 2008). In general, the public's knowledge and awareness of ocean topics is negligible, superficial, and unchanging since 1999 (The Ocean Project, 2009). Over a third feel that the environmental issue of ocean health is overstated; people do not associate ocean issues with climate change; and there is little to no awareness of ocean issues apart from the vacation beach.

Solutions to these complex ocean environmental problems, including the need to develop greater ocean literacy (discussed below), seem scarce. But crises, fortunately, can

also create opportunities for new paradigms to emerge such as with the subdiscipline of environmental communication (EC). This is the focus of this chapter. However, we use the term *environmental communication strategy* here instead of *campaign,* which offers a better representation of the dimensions and context for our discussion. Misgivings over the use of the term *campaign* and especially *social marketing* are especially common in environmental circles where debates abound over the role of science and scientists in influencing public opinions, policies, promoting social change, and related threats to the reputation of scientific credibility due to actual or perceived advocacy positions. While this debate is needed, and frankly overdue, the focus of this chapter is to elaborate the synergies that exist among three disciplinary branches: *sustainability science, ocean literacy* (from environmental education), and *communication for change strategies* (from health and development communication) in order to provide a clearer framework for fostering collaboration in developing, implementing, and evaluating more holistically conceived (from a systems perspective), but clearly defined, practical, and applied environmental communication strategies for sustainability (defined below).

With a special focus on ocean systems and sustainability, this chapter summarizes five disciplinary blind spots, portrayed in Figure 16.1, that can impair a holistic view of environmental issues and thus critical components that need to be considered when designing environmental communication strategies for ocean sustainability. The chapter then briefly applies this model to assess one campaign aimed at improving seafood sustainability awareness.

REVEALING AND DEALING WITH BLIND SPOTS IN OCEAN COMMUNICATION THROUGH TRANSDISCIPLINARY APPROACHES

Blind Spot One: The Need to Diagnose the Dimensions of Environmental Problems (Scale, Scope, and Fit)

Environmental communication efforts often fail to adequately address the issues of and between problems, solutions, and change strategies. Scale, in this context, refers to the dimensions of the environmental problem. Scope represents the interface boundaries (systems of governance, time, technology, and effort or technology needed to solve the problem, for example). The principle of fit refers to the variables considered in the communication intervention to avoid or minimize spatial and temporal mismatches relative to the biophysical systems, socioeconomic activities, and governance practices at hand (Young, Osherenko, Ekstrom, Crowder, Ogden, Wilson et al., 2007). Environmental science must inform communication and education efforts by providing diagnoses of the scope and scale of problems (and probability measures, whenever possible) before the best–fit, theory-based change strategy can be determined and for which level—local (individual- or household-level behavior change), regional (community- or industry-level change), or global (national and international governance regimes). Likewise, communication theory can inform strategies for scaling environmental solutions from top-down management approaches to bottom-up individual and community-based approaches, an important focus of sustainability research (see "Blind Spot Three").

FIGURE 16.1 Ocean communication model for sustainability.
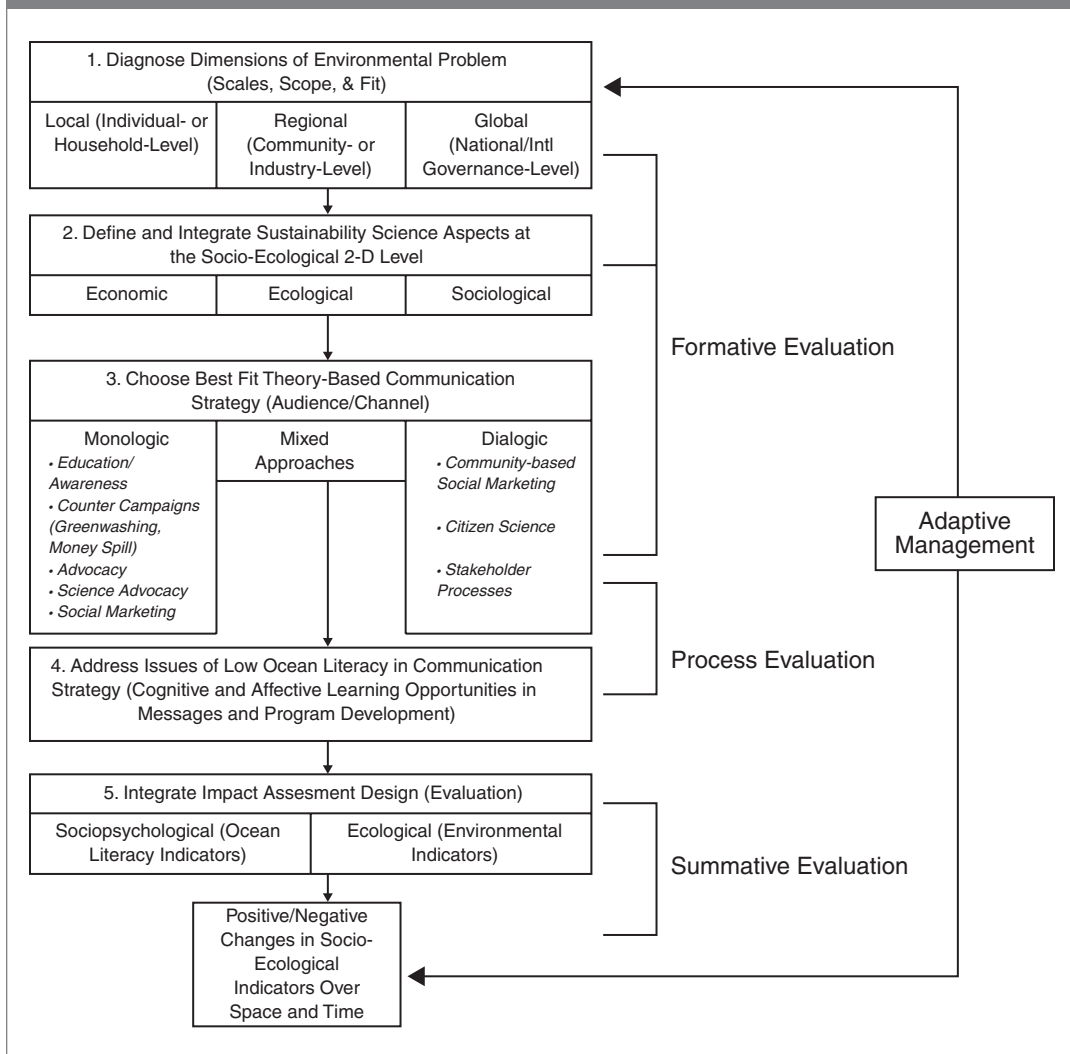
Blind Spot Two: The Need to Define and Integrate Sustainability Science Aspects at the Socioecological Level

development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (United Nations Food and Agricultural Organization, 1995, which extended this into the marine resources arena). While certainly challenging (Filho, 2000), embedding sustainability principles into 21st-century communication strategies is vital for at least two reasons. First, sustainability

science represents a broader spectrum of valuations for deconstructing conflicts around common pool resource use by considering three dimensions—environmental stewardship, economic development, and societal equity (Sikdar, 2003)—intersections among each, and among all three. Second, this three-dimensional sustainability science approach emphasizes sociological, economic, and ecological performance indicators, such as changes in attitudes toward an environmental problem, the market value of an ecosystem resource, and change over space and time.

Critics of sustainability science, however, point out that it can mean vastly different things to different people (Hilborn, Punt, & Orensanz, 2004). In some corners of the developing world, for example, sustainability has become associated with neocolonialism; in the nongovernmental organization (NGO) world as a panacea; and in the pragmatic world of resource management, a quaint, but unattainable ideal. However, much of this confusion could be alleviated if an emphasis were placed on clearly outlining the sociopsychological, ecological, and economic goals and metrics of sustainability in planning frameworks. For example, in considering the environmental aspect of Sikdar's (2003) model, resource use or impact indicators for ocean health could be species abundance or the presence and ratio of nutrient pollution in a watershed. Social indicators include predictors of environmental behavior, such as knowledge, attitudes, skills, intention, and efficacy relevant to ocean sustainability (Graedel & Allenby, 2002).

Blind Spot Three: Choosing Best-Fit, Theory-Based Communication Strategies (Audience/Channel)

Broadly speaking, communication theories and models can be characterized as more or less *monologic* or *dialogic* (Mefalopulos, 2008, pp. 22–24). The categorization of the following approaches into these categories is somewhat artificial as there are many forms of each type of campaigns; the modes are not mutually exclusive and can be complementary (shown in Figure 16.1 as "Mixed Approaches").

Monologic Modes

The *monologic mode* is a one-way or linear transmission of information to raise awareness, educate, or persuade. Special care is taken in determining the target audience, the message development and source, and the most appropriate channels of communication.

Awareness, information, and persuasion. For example, strategists might choose to integrate the Elaboration Likelihood Model (ELM) for its power to predict and explain how members of the intended audience may process a message (motivation and ability) and the extent to which they'll think about issue-relevant arguments in a persuasive message. The ELM posits that, when situational and individual factors positively influence motivation, the ability for issue-relevant thinking or the elaboration likelihood will be high and therefore recipients are more likely to follow a central or argument-based route to persuasion. Resulting persuasion is more persistent, resistant to change, and predictive of behavior. When elaboration likelihood is low, however, recipients are more likely to follow the peripheral route to persuasion by "any variable capable of affecting persuasion without

affecting argument scrutiny" (Petty & Cacioppo, 1986, p. 134). These variables may take the form of mechanisms or cues such as social norms, identity, source attractiveness, celebrity, trusted authority, and so forth. Resultant persuasion is more ephemeral. Gaining attention to an issue through the peripheral route may be an important first step in an environmental communication strategy, but achieving long-term, ongoing sustainability objectives requires a more comprehensive approach.

Entertainment–education (E–E) is the intentional placement of education content in entertainment messages to prompt conversations and create socially constructed learning environments in which previously held ideas are evaluated and changes in thinking and behavior occur (Singhal, Wang, & Rogers, Chapter 22). It is important to distinguish between the nonfiction genre of wildlife and natural history films, however, which may be considered and theoretically constructed E–E strategies. Very few films in the wildlife genre incorporate E–E designs. And, there is very little evidence to suggest that wildlife films, though entertaining and in some cases informational, actually promote environmental literacy in viewers (Dingwall & Aldridge, 2006). For example, the classic Cousteau television specials constituted one of the best-known media programs about the ocean. A study of viewer knowledge and attitudes before, directly after, and a few weeks after the broadcast of one of the documentary specials found that knowledge increased significantly and remained high for two weeks but then declined to baseline levels (Fortner & Lyon, 1985). The integration and evaluation of E–E in environmental television programs and films would certainly seem to warrant greater investigation; however, barriers within sectors of the mainstream media industry actually preclude such efforts. New media, unencumbered by some types of these barriers, may be more valuable for developing and disseminating environmental E–E content and for evaluating effects. Also, traditional E–E campaigns may involve quite dialogic components, such as radio show call-ins or performance attendance.

Countercampaigns to green washing and money spill. Green washing and money spill strategies are used by large corporations to counter the public's negative association with a polluting industry or product. One example of *green washing* is the case of the Exxon Valdez and Deepwater Horizon Gulf oil spills, where Exxon created an extensive public relations campaign to replace the facts and narrative of destruction with a clear signal of quickly dissipating damages and recovering ecology (Ott, 2008). A *money spill* strategy is another type of divergence tactic. Ott describes that in the disaster aftermath in Alaska, "Exxon dumped money into all the communities to hire people for its cleanup. Not everyone worked the cleanup. So there were 'haves' and 'have-nots.' A lot of people thought Exxon purposely created division, because people in oiled towns knew the cleanup was mostly a charade" (p. 240). BP's response to the oil spill in the Gulf of Mexico received similar criticism. Developing effective countercampaigns to green washing and money spill strategies can be very challenging because corporations nearly always have the upper hand in terms of financial and legal resources compared to their victims. However, in a small number of cases, well-organized grassroots activists, especially those philosophically aligned with and supported by the environmental justice movement, have been able to generate sufficient pressure from the base to counter money spill strategies and influence policy makers to adopt proenvironment positions for community health.

Advocacy. Environmental advocacy campaigns are usually conducted by noninstitutional sources (individuals, environmental organizations, community action groups) and seek to change external conditions or governmental or institutional policy or practice (not individual attitudes or behaviors). Environmental advocacy can involve 1) political and legal channels, including political advocacy, litigation, and electoral politics, 2) direct appeal to public audiences, including public education, direct action, media events, and community organizing, and 3) consumers and the market, including green consumerism and corporate accountability (Cox, 2006, p. 244). A major change in environmental advocacy campaigns occurred as a result of the first Earth Day in 1970: a shift from primarily educational to strategic campaigns to achieve specific goals, more participation by citizens, and systematic mobilization of members to create political pressure. Yet, advocacy generates persuasion dilemmas for environmental activists mobilizing public support, such as whether extreme rhetoric and actions are useful (because they can make mainstream groups appear more reasonable and thus acceptable) or damaging (because they give environmentalism a bad name).

Science advocacy. Scientific research results and conclusions are frequently and widely misrepresented in the news, either by heightening the consequences and shortening the time scales or by criticizing the foundational science—even the scientific approach itself. Further, the ways stories or studies are framed foster agendas and legitimize (or delegitimize) particular actions or policies (Ashlin & Ladle, 2007). This raises the paradoxical situation that scientists who wish the public to know more about their (objective, accurate) results through media may see science itself becoming delegitimized in the process. Ladle, Jepson, and Whittaker (2005, p. 231) label this a " 'struggle for legitimacy' between environmentalist and antienvironmentalist groups, with potential negative consequences for public trust in science." Scientists must become engaged in this struggle (Cole & Waltrous, 2007) and implement successful information translation models (Meeson, McDonnell, Kohut, Litchenwahler, & Helling, 2006) (such as developing stories with visuals about scientific research in forms ready for broadcast and print journalists).

Social marketing. Social marketing integrates theory, research, and practice from both social science public communication and commercial marketing campaigns (see Kotler & Lee, 2007; Bracht & Rice, Chapter 20). This approach conceptualizes socially beneficial ideas (e.g., recycling) as attractive, accessible, affordable, and appropriate products. Takahashi (2009) categorizes environmental social marketing articles and campaigns from 1971 to 2006. Bates (2010) organizes her review of ocean campaigns by the primary stages in a social marketing approach: audience analysis; audience segmentation; consumer orientation; theory; appropriate and realistic objectives; message and channel design; and formative, process, and summative research throughout emphasizing the four Ps of social marketing (product, pricing, placement, and promotion). She argues that a primary goal of such campaigns must be to increase public responsibility for ocean resources (e.g., Pew Oceans Commission, 2003). A social marketing approach allows some campaigns (such as the "Give Swordfish a Break" campaign—Brownstein, Lee, & Safina, 2003) to achieve both immediate and wider success.

Dialogic Modes

The dialogic two-way or participatory mode describes discourse, information exchanges, mutual understanding, and consensus development that occur in community-based social marketing initiatives, citizen science programs, or stakeholder-driven processes (Bracht & Rice, Chapter 20; Dietz & Stern, 2002; McKenzie-Mohr, 2010; Mefalopulos, 2008; United Nations Environment Programme, 2007). Three important components of participatory communication are capacity building through personal responsibility, efficacy to deal with environmental threats, and inclusion: Omitting groups from assessments and participation can create resentments, limit valuable information sources, and undermine the legitimacy and outcomes of stakeholder efforts. But, dialogic communication for ocean sustainability is a relatively new concept and requires a strong willingness on the part of designers and participants to fully engage in an often thorny, time-, and resource-consuming process involving conflicting goals. These problems are especially common in fisheries management settings where the primary focus of maintaining reproductively viable fisheries through the management of fishing activities creates conflict and where marine spatial planning relies heavily on science-based modeling and multistakeholder involvement in establishing management zones to protect and restore ocean health through measures such as marine-protected areas.

Community-based social marketing. As we have been arguing, many ocean environmental campaign issues and goals are socially complex and integrated with many other factors, and communities have many potentially relevant resources and motivations for becoming involved. Further, social-psychological principles indicate that behavior change efforts will be more successful if they involve direct interactions with people and are implemented at the community level. Thus, there is a growing emphasis on a community-based approach to social marketing campaigns, from problem definition through interventions (Bracht & Rice, Chapter 20; McKenzie-Mohr, 2010). Jonick, Anderson, Lin, Bruni, Schultz, Groner, and colleagues (2010) applied a community-based social marketing perspective (emphasizing direct contact with individual anglers in their social contexts) to change a single behavior to reduce a specific risk: Release back or stop fishing white croaker from the vast waters of the Palos Verdes Shelf Superfund Site. The central communication strategy was a tip card for identifying the fish and emphasizing the health risks, based on formative evaluation of the audience, the salient fishing locales, costs and benefits, and motivators and barriers. Pre- and postpersonal surveys at the treatment and a control pier also collected measures of actual fish catch and fishing techniques and accuracy in identifying white croakers. The effects were substantial: a 93 % reduction in number of white croakers taken from the treatment pier by anglers compared with a small increase in the control pier and a 22 % decrease in anglers from the intervention site reporting eating white croaker with no change in the control site.

Citizen science and community-based research. The citizen science model links expert input and citizen input in collecting and sharing data. Community-based research (CBR) goes further, by integrating community members (grassroots activists, resource users,

community-based organizations, etc.) in the development of research protocols that are credible, relevant, and transparent to all participants (Mackinson, 2001).

Blind Spot Four: Addressing Issues of Low Ocean Literacy in Communication Strategies (Cognitive and Affective Learning Opportunities in Messages and Program Development)

Educators and policy makers have proposed that tackling the problem of rapidly declining ocean health requires a massive effort toward developing an ocean-literate society—in other words, broad awareness, understanding, and concern among the world's citizenry for the ocean's influence on human health and our influence on the ocean (Cava, Schoedinger, Strang, & Tuddenham, 2005; Pew Oceans Commission, 2003). The Ocean Literacy Network (n.d.) has developed a consensus definition of an ocean-literate person as someone who "understands ocean science, can communicate about the ocean, and is able to make informed decisions that affect the ocean" (see also National Geographic Society, 2006). While ocean literacy is gaining traction in a small number of environmental education circles, it hasn't as yet been well integrated into mainstream science education, informal environmental programs, and communication strategies. As a result, many efforts (and resources) remain directed at increasing ecological awareness and knowledge despite evidence that these objectives alone are insufficient to create enduring behavior changes (Coyle, 2005; Moser & Dilling, 2007).

In a model of environmental citizenship developed by Hawthorne and Alabaster (1999), personal responsibility and locus of control, in addition to knowledge, are prerequisites for individuals to engage in solving environmental problems. Important research on environmental literacy (Bamberg & Moser, 2007) suggests that proenvironmental behaviors are linked both to cognitive understanding (knowledge and awareness of issues) as well as, importantly, affective attunement (attitudes, skills, intention, and efficacy). Further, research from the field of behavior change communication and risk perception has demonstrated the value of considering affective dimensions as predictors of behavior.

An example of a program that included an evaluation of cognitive, attitudinal, and behavioral measures was the Cairns Section (of the Great Barrier Reef in Australia) campaign. Between 1985 and 1991, this study tracked changes in infringement and public participation in review of zoning plans to support for management practices, the reduction of fish catches, and wiser use of reef resources (Alder, 1996). It also collected cost data to assess the relative costs and benefits of education (measured through a total awareness score based on recalling any of a wide range of media and messages about the park) versus enforcement (via a stratified random sampling of infringement surveillance) in helping to protect the Cairns Section of the Great Barrier Reef. Although public use of the reef did not change over time, awareness of the park's existence and total awareness significantly increased. All but one of the measured attitudes improved significantly. While education costs increased and exceeded enforcement costs overall, costs per direct contact were around 10% of the cost of each infringement detection. Meanwhile, although infringement declined during the first three years, it leveled off after that.

Blind Spot Five: The Need to Integrate Impact Assessment in Designs (Evaluation)

In considering the sociopsychological aspects of Sikdar's three-dimensional sustainability model, ocean literacy measures should be included in the design and implementation of environmental communication strategies along with other cross-cutting metrics. Unfortunately, a review of environmental education programs by Flemming and Easton (2010) concluded that a majority of those failed to include routine evaluations, and there is a widespread lack of rigorous program design (see also Takahashi, 2009; and evaluation chapters in this book).

EXAMINING THE CASE OF SUSTAINABLE SEAFOOD USING THE OCEAN COMMUNICATION MODEL

Industrial-scale fishing, which became prominent in the early 19th century, is leading to serial depletion of target species (Seafood Choices Alliance, 2008). Further, as one target species is removed from an ecosystem, fishing efforts are often redirected toward a different species, called *fishing down the food web,* a clearly unsustainable practice. Thus, campaigns seek to change consumer behavior, including using sustainable fish identification and the *buycotting,* or boycotting, of unsustainable species products. A related awareness campaign approach encourages adding *eco-labeling* (such as dolphin safe symbols) to the Marine Stewardship Council's development of fishery sustainability criteria (Jacquet & Pauly, 2007). We apply our Ocean Communication Model to the Seafood Watch campaign initiated in 2000 (Kemmerly & Macfarlane, 2009).

Step 1: Diagnose Dimensions of Environmental Problem (Scales, Scope, and Fit)

Seafood recommendations produced by the Marine Stewardship Council and Seafood Watch are based on an assessment of the overall health of a commercial fish stock considering multiple variables and vast amounts of scientific data reviewed and synthesized through expert analyses. Because catch reporting methods and accuracy can vary widely by agency and country, recommendations are more frequently being oriented at smaller scales with care given to educate consumers about the regional distinctions.

Step 2: Define and Integrate Sustainability Science Aspects at the Socioecological 2-D Level

As a buycott campaign, Seafood Watch was designed to leverage consumer (individual) spending to support more ocean-friendly fisheries (mostly targeted at local and industry levels). It reflects three dimensions of sustainability: consumer behaviors, market incentives, and environmental objectives. The globalization of fisheries and associated issues

(lack of traceability, relabeling, illegal catches), however, preclude direct and easy correlations between consumer behaviors and improved ocean health, so effects can only be assumed instead of directly measured (Kemmerly & Macfarlane, 2009, p. 410). This complex situation represents a mismatch of sorts between the scale and scope of the problem and fit of the communication solution,

Step 3: Choose Best-Fit, Theory-Based Communication Strategy (Audience, Message, and Channel)

Kemmerly and Macfarlane (2009) do not mention a specific theory-based model underlying the development of Seafood Watch, yet the design reflects a classic monologic awareness, information, and persuasion approach with some social marketing aspects included. Visitors to the Monterey Bay Aquarium are the primary audience and represent the first point of campaign contact for the message that "fishing practices worldwide are damaging our oceans—depleting fish populations, destroying habitats and polluting the water . . . [but that] informed consumers can help turn the tide" (Monterey Bay Aquarium Seafood Watch, 2010). The prescription is provided in the form of a free, wallet-sized printed guide to sustainable seafood choices for consumers (also available through a website—http://www.montereybayaquarium.org/cr/cr_seafoodwatch/download.aspx— and recently a mobile phone app) as well as tools that provide specific information on problems and solutions and specific activities that promote self-efficacy and provide a road map for action with a trigger or prompt that is available at the time of entry ticket purchase and a reduction in barriers at the point of action by working with restaurateurs, the seafood industry, and other organizations in the sustainable seafood movement to increase knowledge and available options.

Step 4: Address Issues of Low Ocean Literacy in Communication Strategy (Cognitive and Affective Learning Opportunities in Messages and Program Development)

The Monterey Bay Aquarium's environmental education mission "to integrate the relationships between personal actions and the oceans into its messaging" (Kemmerly & Macfarlane, 2009, p. 399) is well embedded in the Seafood Watch strategy. As such, the campaign aims to increase the knowledge and awareness of sustainable seafood issues among aquarium visitors but also attempts, through interactive science exhibits and the seafood pocket guide, to build skills and motivations to empower consumers to follow through with conservation actions.

Step 5: Integrate Impact Assessment Design (Evaluation) With Sociopsychological Indicators, Environmental Indicators, and Resources

More than 32 million pocket guides have been distributed since the launch of Seafood Watch (Monterey Bay Aquarium, 2009). While the program materials highlight planning,

collaboration, and evaluation as adaptive tools, a specific theory-based communication strategy was not elaborated in the early design.

Referencing the ELM, for example, it could be predicted that an involved audience such as aquarium visitors would be more likely to have sufficient motivation and ability to attend to and process the campaign message through a science-based argument (central channel of persuasion). Interestingly, a comparative analysis of pre- (on-site surveys) and post- (telephone interviews) tests with 400 interviewees four months later reflect ELM-like outcomes:

> 91 % of respondents reported that the pocket guide had influenced their thinking or awareness. . . . The pocket guide helped to educate them, made them more aware of issues or the status of a particular type of seafood, made them question where their seafood comes from and how it was caught, or verified their own beliefs on the subject. (Kemmerly & Macfarlane, 2009, p. 403)

Respondents indicated they not only used the guides to make their own decisions and change their buying habits but also to help educate others (by showing them or giving them the guide or helping with seafood purchase decisions).

The Monterey Bay Aquarium's (2009) survey results indicate that Americans believe their seafood choices impact ocean health and that they are willing to pay more for healthy, sustainable seafood; it also reports that print media coverage of sustainable seafood issues increased eightfold between 2002 and 2008. However, an absence of ecological indicators reflecting related changes over time precludes the possibility of determining the real effectiveness of these campaigns on ocean sustainability. Further, the amount of manipulation in the seafood market renders "seafood wallet cards and other related tools . . . ineffective in fulfilling their aims" and "the Monterey Bay Aquarium conducted a self-study that revealed no overall change in the market and that fishing pressures have not decreased for targeted species" (Jacquet & Pauly, 2007, p. 301).

Therefore, while the Seafood Watch campaign has clearly made substantial and important inroads in raising consumer awareness and influencing buying behaviors, direct correlations between the intervention and positive sustainability outcomes are elusive. However, applying the ocean communication model in a Seafood Watch-type planning framework might lead to the development of a regional scale pilot (linking sociological and ecological indictors such as promoting a specific consumer buying goal linked to a measurable, local seafood indicator) to evaluate campaign effectiveness. Pilot results could inform how to scale up the campaign over space and time or whether, in fact, the campaign goals are actually achievable and how to best use organizational resources.

Conclusion: The Holistic View

Modern ocean health problems are becoming increasingly complex, and solutions involve difficult socioeconomic trade-offs. An effective communication strategy to reach diverse

goal audiences and secure difficult-to-achieve sustainability outcomes requires planners and researchers to accurately identify the linkages between the ecological, physical, economic, and social aspects (including values) related to a particular environmental issue. Consequently, 21st-century environmental communication efforts require more substantive strategies than simple monologic (silver bullet or knowledge-deficit) designs relied upon in former decades. Responding effectively to the challenges posed by today's crises demands the transdisciplinary convergence of social and environmental science perspectives to formulate innovative, theory-based communication models and assessment techniques, such as those presented here.

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