a decision-maker's guide to using science

SCIENCETOACTION

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Purpose of this guidebook

Recognizing the importance of informed decisions and the differences between the scientific and decision-making processes, this guidebook provides practical tips on how to best bring these worlds together. In doing so, this guidebook emphasizes the roles of facilitating, synthesizing, translating, and communicating science to inform conservation action. It is geared toward the perspective of scientists and decision-makers working in tropical developing nations and focusing on marine resource management issues. However, the concepts are applicable to a broad range of scientists and decision-makers worldwide.

SCIENCETOACTION

What is a decision-maker?

A decision-maker is someone who selects a course of action among several choices that is followed by government, businesses, or other stakeholders. Decision-makers occur at all scales. The owner of a global supermarket may decide to only sell sustainable seafood. However, the family member responsible for food decides which stores to patronize and which products to buy. A nation's parliament may endorse an international convention calling for more marine managed areas (MMA) while a village chief may set the timeline and boundaries for a MMA in his community. All of these individuals make decisions that affect the sustainability of marine resources.

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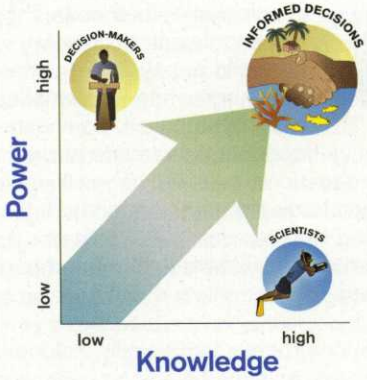
Why work with scientists?

Creating social change and solving environmental problems requires both knowledge and power. Scientists have knowledge, but typically limited authority to change behavior. Decision-makers have power, but may lack in-depth knowledge of particular problems. Linking these two groups brings knowledge together with power to make informed decisions that can drive social change.



Why is feeding science into decision-making so difficult?

Scientists and decision-makers come from two different worlds with varying objectives, languages, and processes. While scientists are motivated by discovery and often judged by their peers based on their publication rates and journal status, decision-makers are under pressure to make immediate decisions and are accountable to their constituents on numerous issues.

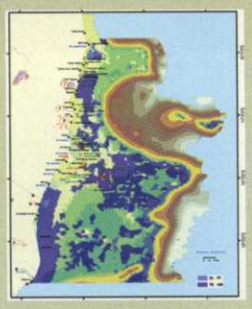
In order to examine questions critically, scientists typically have a particular area of expertise, such as the carbon storage rates of mangroves or the economic cost-benefits of tourism. In contrast, decision-makers are responsible for numerous issues ranging from health care to climate change and are, therefore, typically generalists who have to consider not only the latest science on a particular issue, but also the economic, cultural, health, and political impacts of their decisions.

While scientists typically conduct research over a period of years, decision-makers often need answers within one hour to one week.

Both scientists and decision-makers are accustomed to being sought after—scientists for their expert knowledge and decision-makers for their decision-making power. As a result of their differing objectives, expertise, and timelines, scientists and decision-makers have limited capacity and time to seek each other out, understand each other, and collaborate.

Science supports adaptive management

Abrolhos, Brazil



Priority areas in blue.

Habitat mapping conducted by CI and Universidade Federal do Espírito Santo, documented that Abrolhos has the largest reef system in the South Atlantic—seven times larger than previously documented. These scientific insights spurred discussions with the government agency, Chico Mendes Institute (ICMBio), about expanding the area of MMAs in the Abrolhos region. Through a stakeholder participatory process facilitated by ICMBio and CI, data from the habitat mapping, ecological, and socioeconomic monitoring and cross-shelf studies were used to identify priority areas for conservation in the Abrolhos Bank, which are currently being implemented.

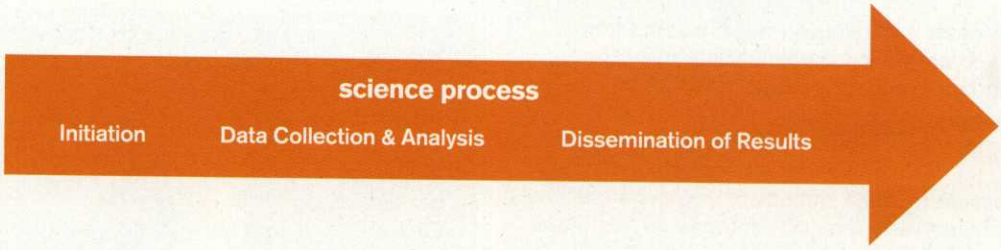
The Science Process

A scientist—whether an anthropologist, economist, biologist or physical oceanographer—systematically tests hypotheses. Scientists may conduct research to address specific questions, such as the resilience of a population to disturbance, or conduct monitoring to determine the effects of management decisions on nature and human well-being.

The science process traditionally includes:

- **planning phase**—a hypothesis, an explanation for an observed phenomenon, is defined and research methods are identified;
- **data collection and analysis**—primary data are collected and analyzed by the research team; and,
- **results dissemination**—results are shared through peer-reviewed publications and presentations at academic conferences.

Increasingly, the scientist's traditional role of collecting and analyzing his own data is being redefined. The concept of a scientist has expanded to someone who also synthesizes existing datasets and draws on knowledge from "gray literature" (materials that have not undergone the peer-review publication process). Scientists work in universities, government agencies, nongovernmental organizations, and the private sector.



Scientist tailors research plans and results to local context

Locally Managed Marine Areas, Fiji

When Josh Drew first contemplated a doctorate in 2004, he had no idea two years later he would be sitting in a remote Fijian community, talking with a village chief about how fish population connectivity is analogous to village-to-village family ties. Typical of most academic scientists, Josh focused first on defining a hypothesis. His adviser was examining genetic connectivity throughout Indonesia and was interested to investigate to what extent Fiji was genetically distinct and whether there was intra-connectivity within the Fijian archipelago. Through an initial grant from the U.S. National Science Foundation, Josh began investigating this hypothesis. In planning his research, Josh refined his methodological approach, but also reached out to in-country NGOs to determine how his research might build on existing work and how it might be tailored to management initiatives in Fiji. Over the subsequent two years, Josh worked with Wildlife Conservation Society and then with CI to ensure active community engagement from initiation through result dissemination, including returning to the villages to highlight the key messages using posters he developed with CI and Partners in Community Development Fiji to highlight his main points and spark discussion. These dialogues, facilitated by the Fiji Locally Managed Marine Area Network—a partnership of government authorities, non-government organizations, community leaders, academic institutions and private sector bodies—led to greater village interest in MMAs, including ultimately, the establishment of new LMMAs in Nagigi, Yadua, and Beqa.

Tip 1. Communicate information needs

Many scientists want to do research that will contribute to decision-making. However, without guidance from decision-makers they are left to presume what will be useful based on their perspective of policy issues. Decision-makers are the best people to advise scientists regarding what information is needed. Information requests might include habitat maps, trade-off analyses of management options, or economic valuations. For example, if a new marine managed area is being considered, then maps of critical nursery grounds or sacred sites may be important.

While individual decision-makers can tell a scientist what they think is needed, the results are more likely to be relevant and more widely used if consensus is achieved by the key decision-makers. Scientists may be engaged in these discussions to advise on what is feasible and suggest what might be useful based on studies elsewhere, but policy objectives need to be the driver. Consensus might be achieved through an advisory council or through workshops bringing together the major stakeholders (government agencies, user groups, non-government organizations, scientists) to discuss policy objectives and subsequently information needs.

As needs arise, it is critical that they be conveyed to the scientists so that they can plan their research around them. Otherwise, once scientists have secured their funding and planned their research it is much more difficult to make significant changes. Suggestions to convey these needs to scientists include:

- posting priority information needs through science and conservation-oriented websites, newsletters, blogs, listserves and/or bulletin boards;
- promoting needs through relationships with a few scientists who can also post as well as discuss informally with colleagues; and,
- communicating needs through government agencies that issue permits to scientists (e.g., fisheries department).

Development motivates targeted science

Owen Anchorage, Western Australia

In Western Australia, scientific research was motivated by decision-makers committed to minimizing impacts. Cockburn Cement dredges shell sand for production of cement and lime, and there was concern regarding the potential impact on seagrass meadows and habitat. The state government required that Cockburn Cement establish that dredging would have minimal impact on marine habitats, or that they could be rehabilitated. Cockburn Cement initiated research in 1994 and has spent over AUS$9 million to date to support research on seagrass function and growth, micro-propagation, planting/transplanting techniques, and ecological function of seagrass. The research, rehabilitation, and shell sand mining continue, and the process has resulted in strong relationships between state government, the mining company, and researchers, leading to effective management of these marine resources and a well-informed public.

Dredging channels in Owen Anchorage.

Tip 2. Partner with scientists

Perhaps the most efficient and effective way to access and use science is to engage scientists directly in decision-making. Establishing relationships with scientists directly can greatly facilitate conveying the key relevant messages for decision-making. The more engaged scientists are in this process, the more likely knowledge will contribute to decision-making and also the more likely they and their colleagues will tailor their future research to management needs.

The following are a few mechanisms to facilitate this partnership:

- Science advisory councils provide a systematic process for soliciting feedback while acknowledging the members' service.
- Informal, one-on-one inquiries facilitate timely advice.
- Contracts or memoranda of understanding provide a formalized means of soliciting feedback, and solidifying a relationship.

Identifying the scientists with the appropriate expertise to a particular policy can be time-consuming. Instead, by developing long-term trusted relationships with a few experts on a breadth of issues (e.g., economics, climate change, ecology), decision-makers can tap into expertise as needed. These trusted experts can be extremely valuable given the short turn-around needs of many management decisions. They can also serve as portals to additional expertise. For example, if a hotel development is being considered, the decision-makers can seek advice from ecologists and economists, who might also recommend incorporating advice from experts on tourism best practices.

Accessible science underpins conservation

Sulu-Sulawesi Seascape, Philippines

For several years, scientists from University of the Philippines and other local academic institutions conducted biophysical studies in the Sulu-Sulawesi region. In 2005, CI began working with them, providing funds to do targeted work and feeding their results into a marine protected area (MPA) priority planning process engaging over 100 partners including local government units (LGUs), NGOs, and community groups. These results were translated into key messages, which were then discussed with communities. Witnessing the ecological and socioeconomic benefits and challenges of MPAs, other LGUs are now requesting—and even providing counterpart funding for— scientific studies to inform the establishment of new MPAs. As a result, CI is seen less as a funder and more as a technical advisor and translator of science into understandable, useful information for decision-making.

Together, scientists and practitioners raise awareness

Locally Managed Marine Areas, Fiji

The concept of the Yambula Management Support Team (YMST) emerged as Fijian communities expressed interest in enhancing the management of their natural resources. In response, the Fiji Locally Managed Marine Area Network recruited a team of scientists and community members experienced with LMMAs to travel to 5 communities to share their observations and experiences regarding MMAs. In the case of Yadua Island—one of the first areas visited—the discussions led to the villages proposing a permanent LMMA and a temporary LMMA in their surrounding waters. The YMST continues to work with the communities, raising awareness regarding science-based best practices and ensuring that new development projects are within conservation guidelines.

Tip 3. Plan and fundraise together

An important way of ensuring research is designed to inform decision-making is to plan the research with the scientists. Planning from the beginning allows for clarification of respective interests and expectations, including:

- When do the scientists anticipate being able to share results, even preliminary findings? It is important to highlight critical decision-making dates, such as budget deadlines, that the scientists may not be aware exist.
- What materials will facilitate influencing the decision-making process, such as photographs illustrating key points, a one-page summary of the key messages with clear recommendations based on the scientific analysis, or a short presentation?
- What level of certainty is needed? Scientists are accustomed to a statistical "95% confidence interval", which means they are 95% certain the results are accurate. This level may be much higher than the needs of decision-makers, which may simply be what the scientists, based on their experience and analysis, believe to be the situation and best course of action.

It is important to articulate in writing the agreed plans with the scientists. Scientists traditionally prepare a research plan. Co-authoring sections that go beyond the traditional hypothesis, methods, and budget to describe the transfer of the research to policy issues can ensure both parties are pursuing the same objectives. These sections might discuss the anticipated relevance of the research to policy issues, target audiences, communication strategy, and supporting materials. It is also important to ensure a portion of the budget (15% is recommended for most studies) is allocated to science communication, which may include travel expenses to return to the region, the scientists' time, meeting costs, and the planning and production of printed and online communication materials.

If this joint planning process is started early enough, the scientists and decision-makers can fundraise together. Joint fundraising can be a powerful means of gaining support since donors are increasingly prioritizing the application of science to management needs, which a joint proposal demonstrates.

Decision-makers drive science priorities
Birds Head Seascape, Indonesia

Following extensive community consultations, the Kamana Regency in southern Birds Head Seascape (BHS) was established as a marine protected area, based in part on studies of perceptions, resource use, and ecosystem mapping. Recently, the *bupati* (regency head) discussed with CI the need for specific socioeconomic, ecological, and geophysical data to inform decision-makers concerned with rezoning of the area. Consequently, when funding from the Walton Foundation became available to World Wildlife Fund scientists for community-focused socioeconomic monitoring in BHS, they agreed to prioritize Kamana as a study site.

Tip 4. Engage in science

To help build the connection between scientists and decision-makers, decision-makers can become engaged in data collection and analysis. While they may not be able to serve as a full member of the research team, they can visit and witness some aspects of the data collection and analysis. By participating in data-gathering workshops and providing feedback on analysis tools, they can provide input and gain more understanding of the research. As a result, they are more likely to use the information in decision-making. This engagement is also an opportunity for building the relationship between scientists and decision-makers.