BUILDING THE ROLE OF SCIENCE IN ENVIRONMENTAL POLICY PROCESSES

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The role of science in policy making, specifically in the management of complex socio-technical systems, has been increasing in the past three decades. Particularly in the case of permit processes requiring environmental impact assessment for new projects, such as those covered under the 1969 National Environmental Protection Act (NEPA), science has been the main criteria for sound decision making. However, there is increasing concern over the way how science is used by opposing parties in environmental policy issues with high uncertainty and high stakes as a battleground over what are essentially value conflicts.

This may be attributed in part to how science currently enters the policy process. This chapter considers the possible weaknesses of the traditional science-intensive policy process, specifically its capacity to engage stakeholders, and proposes an alternative process. In the framework outlined below, the role of scientific analysis in decision making includes consideration of stakeholder interests from the earliest stage of framing the policy question to the implementation of policies. The process is based on joint fact-finding that engages all parties.

Science in Environmental Policy

According to Adler et al. (2000), increased public pressure to resolve complex, and often controversial, issues dealing with large-scale natural or engineered systems has caused policy makers to seek better knowledge on which to base their decisions. NEPA gave science a preeminent role in decision-making process in the environmental policy arena through environmental impact assessment processes. As a result, scientists have been actively engaged in the creation and evaluation of knowledge used for policy purposes. In their comprehensive survey of the literature on the general practice of policy formulation and issues surrounding the role of science in policy, Errol Meidinger and Alex Antypas (1996) argue that the role of science has been constantly on the increase in policy processes for complex systems.

The following schematic (Figure 1) is based on a review of science generation processes in academic institutions and government permitting agencies. It demonstrates the flow of knowledge produced in support of the traditional science-intensive policy process.
The figure shows a separation between the science sphere and the public policy sphere in which the decisions are made. In many cases, the scientific and technical complexity of the natural or engineered systems in question necessitates a level of technical and scientific analysis beyond the sophistication of the majority of stakeholders, resulting in their effective exclusion from the process of scientific analysis.

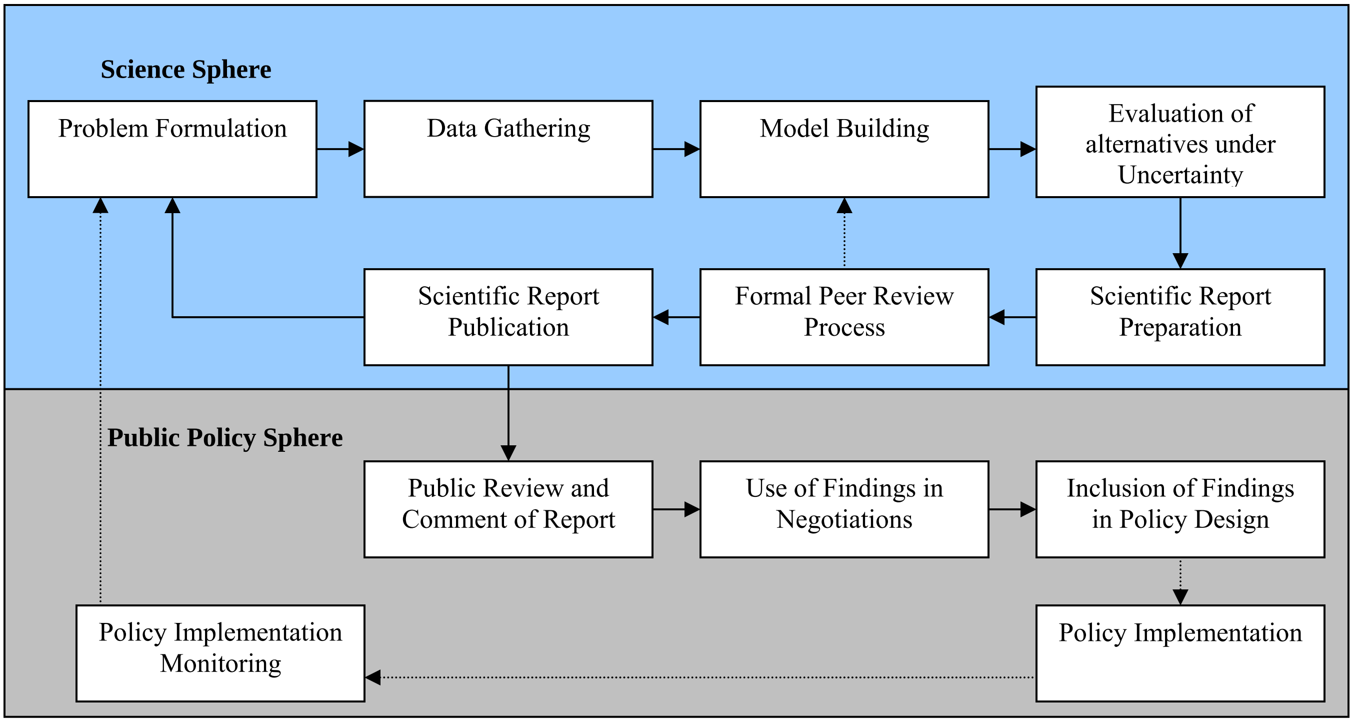

Figure 1. The traditional science generation and flow process. Dashed links indicate steps that may not be followed through, but are theoretically part of the process.

In addition, scientists have been wary of involvement in the actual policy process, fearing that their scientific objectivity might be questioned. However, scientific analysis not directly responsive to stakeholder concerns and knowledge can render scientific input less than optimally relevant to decision making. It also aggravates the adversarial and politicized atmosphere of the process and makes it more difficult to produce good solutions. Scientists traditional base their methods exclusively on rational empiricism while stakeholders are locked into negotiating from a narrow interest-based stance. From such a perspective, they have no choice but to use any part of the science or the uncertainty inherent in the analysis, to further their positions.

Unable to connect with stakeholder concerns, scientists are not having a sufficient impact on the dynamics and products of decision making (Susskind 1994). In the case of project-specific environmental impact statements (EISs) prepared as part of a permit process, science can become a proxy battleground among stakeholders who use “their own” science to undermine that of their opponents in a given project, sometimes pressing for litigation with claims of an inadequate EIS. Based on NEPA-related statistics released by the Council of Environmental Quality in 1999, over 42 percent of EISs filed with government agencies in 1997 were litigated. While only two percent of these litigations resulted in court-issued injunctions, many of them delayed projects and strengthened bitterness and resistance towards implementation expressed in different forms by marginalized stakeholders.

Table 1 shows some of the problems created by the current division between science sand the public sphere. These can negatively affect the role of science in decision making and potential solutions to the problem at different stages of knowledge generation and flow.

While scientists blame this on the politicized nature of the public policy sphere and exculpate themselves by asserting they have provided "quality science", the question remains whether scientific analysis that has little bearing on the policy process is indeed good science from a policy perspective. S. Funtowisz (1996) called for a "post-normal" science capable of providing a different kind of problem-solving strategy. Such a strategy would consider the relevant stakeholders and consider their values and knowledge in framing the problem.

Such a process would assess the quality of available information, identify relevant "experts" (both scientific and technical as well as local), determine the range of uncertainties, and choose scientific methodologies based on the values of key stakeholders in the system. It requires engagement of stakeholders in the policy analysis process before the scientific analysis process is completed. According to M. Cahn (2000), "the formal inclusion of stakeholder representatives, and by extension of the public at large, goes far toward resolving the primary tensions between science and policy. Formally linking policy staff and scientists with stakeholders creates an important linkage between technocrats and the public."

Ideal Outcomes

To design an alternative science-intensive policy process, it is important to identify the elements of the ideal outcome. Ideally a "good" or desired outcome would have the following attributes:

● It would produce a package of policies based on the best achievable science agreed upon by the overwhelming majority of key stakeholders affected by the decision.
● The policies would take into account the values and the local knowledge of key stakeholders.
● The policies would actually address the problem at hand effectively over time.
● The policies would be adaptive, capable of integrating emerging scientific data.
● Implementation of the policies would meet little resistance by the affected stakeholders and would produce robust agreements unlikely to provoke extensive litigious action.

All of these attributes point to the value of stakeholder involvement in all parts of the policy process, including the generation and use of knowledge about the system. The next sections outline a consensus-building process that has a greater likelihood of producing such an outcome than the traditional approaches to decision making.

Table 1. Problems in different stages of "scientific analysis" in the traditional environmental policy-making process and proposed solutions

Problems	Process Stages	Possible solutions
Perceived sponsor and/or organizational bias on problem definition, choice of alternatives and findings	All stages in the scientific sphere	Establish independent funding for policy-related research, strong oversight on analysis, and inclusion of stakeholders throughout the scientific analysis process. Elicit stakeholder inputs in choosing alternatives. Use multiple criteria for comparison, refrain from optimization.
Perceived bias in model assumptions	Model building, formal peer review process	Use a wide range of sensible assumptions and incorporate a sensitivity analysis. Agree on an acceptable range of uncertainties with stakeholders. Choose a wide range of reviewers and include reviewer comments and responses to critique in the final report.
Uncertainty in baseline data	Data gathering, model Building	Bound some uncertainties by setting the range of socio-economic system interactions. Provide funding for good initial data, measuring possible impact and change rather than emphasizing baseline conditions.
Uncertainty in relationships between system components	Model building	Encourage early stakeholder engagement and use stakeholder inputs to gain better knowledge of the system. Use stakeholder values to bound acceptable uncertainty. Continuously reevaluate as more is known.
Uncertainty in future projection (Sarewitz et al.2000)	Model building, evaluation	Use scenario analysis to bound possible future developments and draft robust strategies that perform well across different futures.
Exclusion of issues of interest to stakeholders	Problem definition, evaluation of alternatives	Include stakeholders early in the scientific analysis process starting from the problem definition.
Obscure scientific presentation of findings and inadequate explanation of uncertainty	Report preparation, report publication	Use an accessible report format, supported by easy-to-interpret figures and graphs. Maximize communication using new participatory techniques. Elicit input on report format from stakeholders. Explain what parts of the analysis are affected by uncertainty. Stress the existence of uncertainty in other issues and communicate its significance in evaluating alternatives.
Politicization and selective use of scientific findings	Public review and comment on findings; use of findings in negotiation, Inclusion of findings in policy design	Make language as unambiguous as possible and clearly explain the significance of uncertainties and the areas of the analysis they affect to avoid selective use. Promptly respond to media characterizations of the findings to prevent misrepresentation. Include stakeholders early in the process and make the entire process transparent.
Weak stakeholder understanding of the scientific process and findings	Public review and comment on finding; use of findings in negotiation, Inclusion of findings in policy design	Involve stakeholders early in the scientific analysis. Make active efforts to explain the scientific complexity and to consider stakeholder lay knowledge in the process. Create an accessible version of the report with the findings highlighting the issues important for public understanding. Use an accessible report format supported by easy to interpret figures and graphs. Maximize communication using new participatory techniques.
Stakeholder resistance towards implementation	Policy implementation	Adopt a participatory process model from the outset and take stakeholder inputs and interests into account at all stages of the policy-making process. Take into consideration social and political feasibility in addition to technical feasibility of alternatives.
No feedback between policy process and scientific analysis (open system)	All stages of the process	Adopt a participatory process model from the outset and take stakeholder inputs and interests into account at all stages of the policy-making process. Continually improve scientific input during the process. Use scientific models in the negotiation and policy design stage.

Consensus Building and Joint Fact Finding

As most of the previous discussions and many of the recommendations in Table 1 indicate, collaborative approaches to policy making can help ensure that the role of science in the decision making is not undermined by the exclusion of stakeholder interests or of opacity in the process of scientific analysis. According to M. Cahn (2000), "the formal inclusion of stakeholder representatives, and by extension of the public at large, goes far toward resolving the primary tensions between science and policy. Formally linking policy staff and scientists with stakeholders creates an important linkage between technocrats and the public."

Collaboration involves people with diverse interests working together to achieve mutually satisfying outcomes that avoid forceful confrontation in the form of litigation and sabotage. Different collaborative approaches have advocated stakeholder involvement in the policy process at different stages. The collaborative process explored in this paper is the "Consensus Building" approach proposed by Lawrence E. Susskind (1999).

Consensus building is the process of mediating a multilateral conflict that often involves multiple complex issues. Some examples of consensus-building efforts include the international negotiations over limiting chlorofluorocarbons (CFCs) to protect the ozone layer and negotiations about limiting the emission of greenhouse gases (CRC 1999).

An important part of this process is joint fact finding. The purpose of joint fact finding is to develop shared knowledge and agreement about the system and its boundaries and important issues that ought to be considered in the scientific analysis. It is a step by which stakeholders initiate the process of gathering information and analyzing facts, and collectively make informed decisions (Ehrman 1999).

Joint fact finding rests on the following principles:

- The process of generating and using knowledge is a collaborative effort on behalf of decision makers, independent scientists, and other stakeholders and their representative experts from all sides of the conflict.
- Information, expertise, and resources will be shared among all participants.
- Participants are committed to finding a set of solutions to their conflict.

Joint fact finding may fail if one or more of the above principles are violated. It is advisable to initiate a collaborative process before an issue is so polarized that key it is impossible to convince people that a win-win situation is possible (Ehrman 1999).

Reflecting the joint fact-finding approach proposed by J.R. Ehrman and B. L. Stinson (1999), this chapter argues that early stakeholder involvement in the scientific analysis, even as early as the problem definition and framing stage, may help resolve many of the problems that arise in the current process.

Designing an Alternative Science-Intensive Process

The alternative consensus-building process used in this paper follows the steps in Figure 2. The rest of the chapter explicates the different steps of this alternative, highlighting its potential for increasing the role of science in decision making.

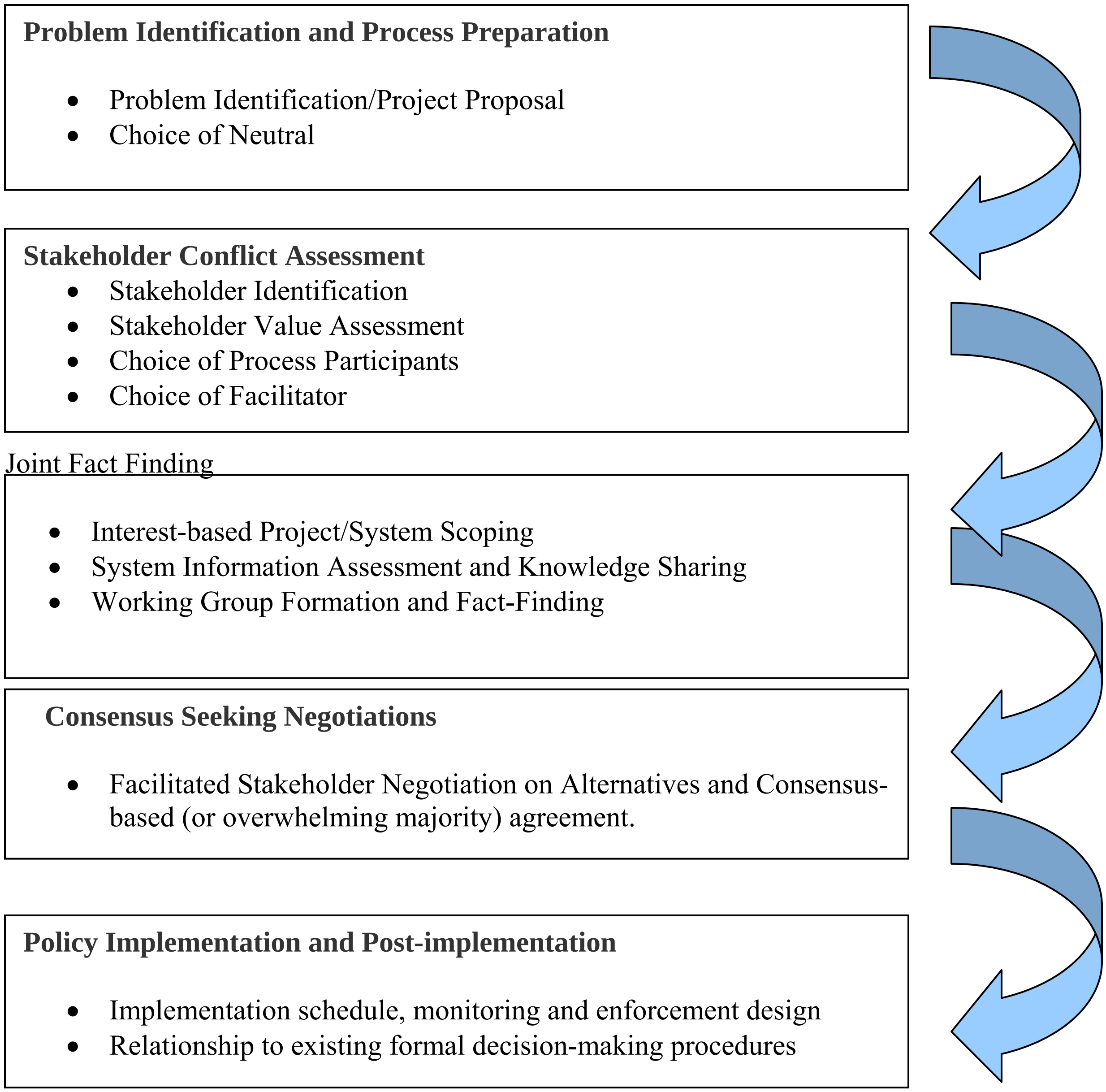

Figure 2. Consensus-building process for science-intensive policy assessment, using a joint fact-finding approach to knowledge creation and use. Based on the Consensus Building Diagram in Susskind et. al (1999).

Problem Identification and Process Preparation

Problem Identification/Project Initiation
Technology-related policy processes start with the identification of a problem in the management of an existing system or the initiation of a new project. There are basically two important types of technology-related policy processes: Strategic resource management and permitting processes.

Strategic Resource Management/Regulation
A government agency with a mandate to manage a system decides to define or redefine resource management strategies after an actual set of problems or a potential future problem is identified either by the public, the media, or the agency's experts. An example of this type of process is the strategic management of air quality in Mexico City, strategic management of spent nuclear fuel in the US, and watershed management in local areas.

Permitting Processes
A developer or a government agency initiating a project has to go through a permitting process for the project. The process includes an assessment of the potential social, economic, and environmental impacts of the project. Available alternatives have to be studied before a permit for the project is issued. The NEPA process for the proposed offshore wind farm project in Nantucket Sound, in Cape Cod, Massachusetts is an important ongoing case.

In either case, there are organizations that can serve as the sponsor or convener of the collaborative process. These organizations may have a stake in a specific outcome, but will be mostly concerned with effective management of the system, or an inclusive public policy process.

In order to make a collaborative process possible, the following must be taken into consideration.

Finding a "neutral turf" for meetings: The location where collaborative meetings take place should be considered neutral by all stakeholders. It should have audiovisual facilities required for the process; be accessible to all and a large enough to seat everyone comfortably. It should be available for as long as the group needs to meet, which can be several months, or even years (Burgess and Burgess 1996).

Securing funds: Consensus building processes can be expensive, as they involve a lot of people over a long period of time, using multiple facilitators, analysts and other neutrals and often outside technical experts. Therefore, significant sources of funds may be needed, which can be supplied by the participants and/or government agencies with mandates, as well as the convener. The important issue here is that the funding not be from one side of the conflict, which may adversely impact the perception of impartiality of the process (Burgess and Burgess 1996).

Choosing a "neutral": The *Neutral* is the person in charge of stakeholder identification and choice, stakeholder conflict, and value assessment. The convener chooses the neutral to perform a conflict assessment for the project. The neutral then assembles a team and starts the stakeholder identification process.

It is wise to choose the facilitator from outside the convening organization. Ideally, he or she will be a professional in the field of negotiation and conflict resolution and have a robust knowledge of stakeholder conflict assessment practices. Given that it is desirable to preserve knowledge in the process, and that stakeholders will interact with the neutral during the conflict assessment process, it would be advantageous for the neutral to be a prime candidate for the facilitator position later in the process, but this doesn't always have to be the case.

Stakeholder Conflict Assessment Stage

Stakeholder Identification

Complex environmental policy conflicts often involve a multitude of stakeholders, some obvious, some less so. The obvious ones are the people who are advocating a project or management strategy and the vocal people or groups who oppose that proposition as well as the government agency mandated to make decisions on the issue. Usually there are a number of other stakeholders who are likely to be affected by any decision (CRC 1998).

The project sponsor or system manager needs to be comprehensive in identifying and prioritizing all relevant stakeholders, including those that are not usually present at the table. All of them will need to be consulted to varying degrees, depending on their impact potential on the system, as well as their potential to contribute to the policy process through knowledge, resources, or compliance with implementation. Stakeholders can be categorized into four groups in terms of their influence or power, stake in the outcome, and knowledge.

1. *Decision makers* include those with a major stake in the outcome and considerable power but with differing levels of knowledge. Decision makers will include representatives from organizations with a mandate to manage some part of the system or issue a permit for a new project. This group also includes organizations with mandates over systems connected with target system if their cooperation is required to effectively manage the system.

2. *Stakeholders with economic or political influence* are characterized by major stakes in the outcome, a medium to high degree of power, and differing levels of knowledge. They include affected industry, private corporations, landowners, labor unions, nationally recognized and highly organized NGOs, and other groups with strong political influence.

3. *Knowledge-producers* do not have much stake in the outcome or any power to affect it, but they possess valuable knowledge on which decisions may be based. They include scientists, engineers, and consultants working in academia; technical consulting firms; local, state, and federal science agencies; the scientific and technical offices of government agencies; and scientific arms of NGOs that have a stake, but no specific mandate, in the process.

4. *Other affected stakeholders* may have a major stake in the outcome, but little power and differing levels of knowledge. These include smaller groups of stakeholders directly or indirectly affected by system management strategies or the proposed project. These can include less organized neighborhood groups, local environmental groups, small business owners, etc.

Such a categorization, while useful as a rough map, should not be the exclusive criteria for selecting stakeholders for participation, given that even smaller actors can sometimes be effective in undermining a process.

Stakeholder Value Assessment

Once a basic stakeholder list is prepared based on the four categories, the neutral (and, if applicable, her team) will design different interviews for each of the stakeholder groups. The interviews will help establish their interests and values regarding the system or project; elicit how they view the system or project; and reveal the issues they would like to have considered in any policy process. At a minimum, the following questions should be asked of all parties in each stakeholder category. The stakeholder categories in parenthesis indicate a category-specific question. The rest of the questions are common to all stakeholders.

- What is their view of the system boundary or scope of the project?
- What part of the system or project are they interested in?
- What is their organizational interest or mandate regarding the system and how does it affect their position on the project or system management strategies? Does their organization favor a pre-defined position, or a pre-defined set of strategies? If so, how does that position serve their interest?
- How does the system affect them at the present and how do they think it will affect them in the future? (stakeholders with influence; other stakeholders)
- What are the most important issues they see with the project or system? What do they think could be done to address these issues?
- What are the institutional relations that govern the system? (decision makers)
- What information do they possess about the project or system? What information do they believe is necessary but missing?
- What capacity do they have for further information gathering? What resources can they contribute to managing the system or to evaluating the project?
- What is the approximate timeline in which the decision must be made? Is the timeline flexible or fixed? Can the decision be staged? (decision makers)
- How would they want to participate in the decision-making process? Would they like to be present at all stages, or be kept informed of all the stages, or would they like to provide feedback once the recommendations are opened up for public comments? What do they think of a joint fact-finding process as an alternative for the decision-making process?
- How does the internal decision-making mechanism work for the organization? Who is the person with the authority to negotiate in a potential joint fact-finding process?
- In their view, what other stakeholders should participate in the decision-making process? Also, who, if not involved, could undermine the quality, legitimacy, or outcome of the joint fact-finding process?

For each project or system, questions specific to the system should be substituted whenever appropriate. The neutral then synthesizes the interviews into a conflict (value) map that can be used by the different stakeholders to understand the scope of values, interests, and knowledge held by other stakeholders.

Choice of Process Participants
The answers to the questions in the previous step, along with the initial categorization of stakeholders, should provide a basis for selecting participants for the collaborative process. Stakeholders not included in the initial interviews but mentioned by a considerable number of other stakeholders should be contacted and interviewed. Stakeholders in each category should be ranked according to their importance to the process and chosen based on the criteria of authority, political power, intensity of interest, potential for knowledge contribution, potential for resource provision, and potential to undermine agreements if excluded.

Selection is made on a case-by-case basis, but given the structure of the collaborative process, the proceedings would be most effective if the number of participants were limited. While there is no fixed limit to the size of the group, too many people can result in unmanageable group dynamics, while very small groups can result in many of the different stakes not being covered by those present. There should be a balance among the four categories of stakeholders in the core group present at all stages in the process.

While it is imperative to have the most crucial stakeholders participate in the core group from the very beginning, less critical stakeholders who can contribute to particular stages should attend the relevant meetings. Some may be chosen to participate in all stages of the process; others may be asked to provide feedback in different stages and be kept informed. If at any time a key stakeholder is identified who has been left out they should be consulted and possibly included in the process. The process should be designed so that inputs from stakeholders not directly participating could be considered for inclusion at any time.

Once selected, stakeholders are invited to participate in the collaborative process. Many of the selected stakeholders will be skeptical about whether or not to participate in the process, unsure of how it might benefit them. It is the task of the neutral to present a compelling case for the benefits of the collaborative process. Selected stakeholders should be invited to attend the introductory session, at which the decision whether or not to proceed with a collaborative process is made. Given that they still have the option not to participate after the introductory session, many selected stakeholders may agree to attend. Before the introductory session, the neutral provides the selected stakeholders with a list of all the participants and with a synthesis of the interviews so that individual participants can understand the interests, concerns, and positions of other participants, categorized under each set of questions.

Choice of Facilitator
In the first joint meeting of the joint fact-finding process, participants come together for an introductory session aimed at building initial trust and getting to know other stakeholders and their interests and points of view. The convener presents some background material on the basics of the consensus-building process, and explains what the group can expect as an outcome of such a process. The group of stakeholders jointly decides whether or not to proceed with the process. Individual stakeholders may opt out

of the process. If the remaining participants choose to proceed with the willing group of participants, the group can then proceed to choose a neutral facilitator (who can be the neutral chosen previously by the convener or any other person agreed on by the group).

The facilitator is the person responsible for managing the dialogue among stakeholders in all subsequent stages of the collaborative process. The ideal facilitator for such processes should be competent in negotiations and conflict resolution theory and practice; have a basic understanding of the system or project in question; and be regarded by stakeholders objective and neutral regarding the outcome. Once chosen, the facilitator initiates the next stage of the collaborative process, joint fact finding.

Once the facilitator is chosen, the ground rules for the process have to be set. These include how sessions will be conducted, how decisions get made, and how communication between sessions is established. It may also be useful to establish a neutral information repository in which all members may place information about the system and proposals for strategies and alternatives.

In a consensus-based process, the usual decision-making rule is by agreement among all those present. While some parties may not agree with individual decisions, a consensus is sought on the package of decisions produced by the whole group. Given that this may enable one party to sabotage the process, it would be useful to agree to accept the decision of an overwhelming majority. In other words, consensus is actively sought and encouraged, but it is not the prerequisite for reaching final agreements.

Joint Fact-Finding

Science formally enters the policy process at the joint fact-finding stage. The participation of experts from all sides of the conflict, in addition to experts from independent government agencies and NGOs, can do a lot to establish the credibility and objectivity of the science produced for a specific policy question.

Interest-based Project or System Scoping

The first step in the joint fact-finding process is to determine the scope of the problem to be studied. The scope determines where the system boundaries lie and what issues and areas need to be addressed. The boundaries can both circumscribe the geographical area covered and identify which components of the system to address. In the case of permit processes, participants need to agree on how many or what type of alternatives to consider.

Traditional environmental impact assessments mainly focus on risk assessment in defining project scope, but stakeholders might choose to consider benefits resulting from alternatives as part of the scope. A good example is the case of the proposed offshore wind farm in Nantucket Sound, a project in which the benefits of clean energy could be weighed against potential risks in the scope of the scientific analysis.

Non-risk related issues such aesthetic and social effects of a project may not require scientific analysis, but gauging their impacts would require expert knowledge. The impact of erecting wind turbines in Nantucket Sound on tourism or real estate prices could be compared to the effects of similar projects in other regions. The group can decide whether to include these considerations in the scope of the problem. It is critically important to address the actual concerns of NIMBY advocates. Unless these concerns are met, proponents are likely to emphasize the uncertainty of scientific findings, making it difficult to reach final agreement

Project scope will be heavily affected by who is present at the table in the collaborative process. While decision makers are legally required to define a minimal scope for the problem, scientists must be satisfied that the scope is sufficient or achievable. Other stakeholders will try to address their own concerns in the scope (NRC 1986). Usually, different stakeholders highlight the parts of the system that are of direct interest to them, or those which, if analyzed, would favor their positions. This is essentially a value-based judgment, and can result in conflict.

The challenge for the facilitator is to reframe or redefine the issues in terms of interests, which are usually negotiable, rather than positions, values, or needs, which usually are not (Rebori 2000). This is called "interest-based" framing, and is an approach proposed by Roger Fisher and William Ury (1991). They argue that focusing on interests rather than on positions increases the possibility of a robust agreement, since it may be possible to find a solution which satisfies both parties' interests. Once the underlying interests are identified, they will be discussed in the group. The opposing sides will be more motivated to take those interests into account if they feel that their interests are also being taken into consideration. The aim of discussions is to find possible solutions that satisfy as many interests as possible (Fisher and Ury 1991).

System Representations and Strategy/Alternative Generation

<u>System Representation</u>

Once the scope of the analysis is agreed on, it is time to determine the current status of the system including all the components and issues that affect it. Participants often overlook issues which are important to others, but are not to themselves. When stakes are high, the number of issues that people think are part of the problem tends to increase. However, if the most important issues are not identified, it will be impossible to develop solutions to the conflict that will successfully resolve it (CRC1999). There are basically two main issues to be addressed at this level: Have all the important issues been identified? Should all the issues that stakeholders consider important be part of the analysis?

In addressing the first question, it is important to have a set of stakeholders at the table sufficiently diverse to explore the issues comprehensively. The role of scientists in this stage is crucial, since many of the salient issues may not be obvious. However, analysis of all the issues raised may take more time than has been allotted for the process. While it is imperative to be as inclusive as possible, there is no easy way to avoid this. Essentially, the inclusion of issues should result from an overall agreement by the group that the issue is important enough to be considered. The facilitator must make sure that the group considers each issue carefully to avoid alienating stakeholders whose proposed issues may not be included in the scientific analysis.

It is important to capture the relationships between the different issues in the system and to represent links among the different components. A systems-thinking approach called Stakeholder Assisted Modeling and Policy Design (SAM-PD) by Ali Mostashari and A. Sussman (2003) could be used for this purpose. It uses a causal loop diagram to identify the links of different components in the system visually. Color coding is added to identify areas of important uncertainty or disputed knowledge. A visual system representation for a fish population management system in a river basin is shown as an example in Figure 3. However, it is up to the facilitator and the group to agree on the methodologies to use for this task.

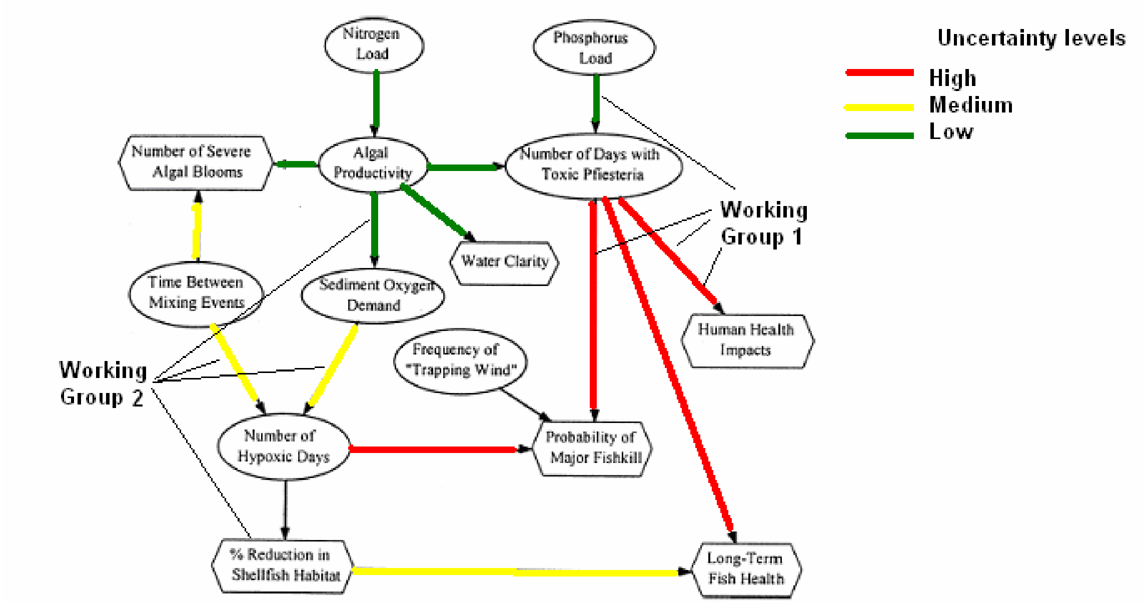

Figure 3. Causal loop representation of the estuarine response using a SAM-PD approach. (Each of the links could be assigned to scientific working groups). Based on a representation in Borsuk et al. (2001)

An important part of this step is to identify what information is required to assess the system in its current state and the potential impacts of the new project or proposed management strategies.

In this stage the following questions have to be answered by the group using the cumulative knowledge of the participants:

● What data is needed to describe the current status of the system?
● How much of this information is available?
● If some data exist, are they sufficient to make an informed assessment of the decision?
● If not, what type of data is required to make such an assessment?

- What are the uncertainty levels and what levels of uncertainty are acceptable for such an assessment?
- How can further baseline data be acquired, and what resources are available within the group to obtain additional information that will build an assessment of the system that is acceptable by the stakeholders? (Rebori 2000)

The presence of representative stakeholders, decision makers, and scientists can provide a clear picture of who in the group has information, expertise, or resources that could be used to assess the system. Going back to the first two principles of joint fact finding mentioned in the introduction, this can be one of the strengths of the joint fact-finding process compared to traditional processes.

<u>Strategy or Alternative Generation</u>

The generation of alternatives is usually done in a brainstorming process overseen by the facilitator. Brainstorming is a collaborative technique for generating new and innovative ideas and solutions to a problem. A facilitator initiates brainstorming by asking the parties to suggest ideas for solving the problems identified in the scoping process. Judgment of the merits of the proposed solutions or strategies is withheld until later. The facilitator usually lists the ideas in a way that is visible to the participants, helping them keep track of what has been said, and building on earlier suggestions. This often results in creative solutions to problems that no one person or side would have been likely to develop on their own (CRC 1999).

Once all the ideas have been expressed, the facilitator helps the group narrow down the alternatives to a manageable size by grouping related proposals together and bringing the solutions to a uniform level of analysis. The participants develop and implement a joint strategy for answering the key policy questions, based upon mutually acceptable methodologies. At this point participants do not have to agree on the methodologies for every issue. Their primary goal is to clearly separate the issues upon which they can agree from those still subject to debate. Points of mutual agreement can help form a basis for continuing the analysis of disputed issues (CRC 1999).

As in all other stages, the role of the facilitator is crucial in the success of the process.

Working Group Formation and Fact Finding

Once the group agrees on the alternatives to be explored, working groups are established to explore the baseline status of the system and the potential impact of strategies or alternatives. For smaller problems two to three working groups may be sufficient; in a more complex technical system more working groups may be required. Working groups should incorporate different stakeholder interests, so that no working group is considered representative of a particular stakeholder view. While it is impossible to explore all the issues with the full group, it is important that the full group remain engaged in some form in the joint fact-finding process.

Questions that will shape the working group structure are:

● What additional data will be needed to assess the impact of the new project or proposed strategies?
● If new data are necessary, who will collect it?
● Who pays for data collection?
● How will outside experts be selected?
● What methodologies should be applied?
● Who will manage the data gathering and coordination?
● What kind of information repository will be necessary?
● Will the collected information become public knowledge or kept confidential until agreements are reached?
● What are the time frames for collection, analysis, and reporting?
● Who will own the data once it id collected? (Rebori 2000).

The basic fact-finding committee is formed from expert members of each of the conflict parties, independent experts, and decision makers having some knowledge about the issues. The group will identify the important facts and elicit relevant knowledge from the literature and other sources the group considers acceptable. This kind of collaborative approach will stimulate a level of interaction unlikely if each expert represented only their respective interests. The objective is to shift away from "adversarial science". (Schultz 2000).

This process is very likely to produce a reasonable amount of factual knowledge about the system in question. The next problem is to agree on what information is relevant to decision making. In high-stakes, highly uncertain science-intensive conflicts, disputed facts lie largely in the most uncertain areas. They can bring the process to a halt.

To keep the process going, the working groups must produce a new document synthesized from available literature that reflects not just where consensus was achieved but also where factual issues remain in dispute or where there is irreducible uncertainty. This kind of bottom-up approach, in addition to giving the group a definite goal, enables the group to focus on facts instead of on positions. It encourages invention or consideration of new solutions (Schulz 2000).

Each working group should report to the full group on a regular basis. The whole group can provide feedback on whether or not to proceed with further studies. Effective factual communication allows non-experts to offer fresh insights, forcing experts to examine a set of problems in a new way. Confronting other points of view about the system can lead stakeholders to a better understanding of the system (Schulz 2000).

It will probably take several sessions for each working group to produce results deemed sufficient for decision-making purposes. At that point, the facilitator and the working groups will draft a combined document summarizing and synthesizing all findings and alternatives. The final document is then presented to the stakeholders for evaluation. Often, the document will be accompanied by a variety of scientific and technical computer models that can assess the impact of different strategies or alternatives.

Negotiating Consensus-based Agreement

Once the working groups have submitted the final report, and before actual evaluation by the full group, it is important to agree on objective analytical criteria. Objective criteria include factors that are used to evaluate a decision or possible outcome. They will help move the group from joint fact-finding mode to decision-making mode. People usually support objective criteria during a collaborative process because criteria are not tied to specific positions (Rebori 2000). However, these criteria would probably be based on the performance metrics that the stakeholders have specified in the previous steps. Objective criteria can be categorized into technical, social and community, and value-based criteria (Godschalk 1994).

Technical Criteria

To test alternatives, the group can establish criteria such as levels and coverage of service, performance standards, resource requirements, or degree of project impact. For example, in the case of a new offshore wind power, technical criteria might include the amount of electricity produced, the amount of greenhouse gas emissions prevented, cost of electricity produced, the number of potential bird fatalities, number and severity of navigational problems, number of fish affected, whale population changes in the area, etc.

Social and Community Criteria

These can measure the societal and economic impacts of the strategies or project. In the case of offshore wind power, social criteria could include net employment change, change in real estate prices, change in tourism revenue, changes in fisheries income, etc.

Value-based Criteria

These criteria are the hardest to identify, much less quantify. They can incorporate some NIMBY values, as well as other sociopolitical values. While it may be difficult to compare alternatives on the basis of these criteria, they must be captured in the form of negotiable items. In the case of offshore wind power, these criteria could include the number of visible wind turbines on the horizon, the height of the turbines as seen from the shore, the number of lights that can be seen from the shore (all aspects of the aesthetic value of a pristine ocean view). In many NIMBY arguments the issue is mostly binary in nature, but it may be possible to address the concerns of some of the groups in terms of objective criteria.

As indicated in the previous section, it is useful to build fact-finding models in which assumptions underlying each package of alternatives can be evaluated easily. Many of the alternatives may be invented after the stakeholders have a better picture of the system as revealed in the final fact-finding document. In this process, scientists and experts remain with the full group to help them assess the impacts of the different alternatives. For this purpose it is useful to have an integrative model of the entire system which can predict the impact of one change on the different components of the system simultaneously, thus capturing some of the complex dynamics that a system may exhibit. Using an overall systems framework and an adequate system representation it is possible to integrate the knowledge created into one coherent model. While some aspects of the alternatives may not be quantifiable, it is useful to see their qualitative impacts on the system (Mostashari 2003).

Using the joint fact-finding document and the models, the group then considers the most promising alternatives identified in previous steps. Participants examine its costs and benefits from different stakeholder perspectives and explore any barriers to implementation. They make their evaluation based on the objective criteria agreed on previously. However, the main focus at this point will be on uncertainties about the system that the working groups were unable to reduce to generally acceptable levels.

There are two ways to proceed in this stage. One is to devise experiments that may provide greater certainty and knowledge on the issue. The other is to proceed regardless of the uncertainties, and negotiate contingent agreements specifying actions to ameliorate the potential consequences of the problem to risk levels acceptable to the entire group. The former will probably serve as a good delaying tactic for those interested in stalling the project, as it will be costly and time consuming to do in most cases. The latter is normally undesirable for decision makers and in case of permit processes may pose additional risk for the developer.

As indicated previously, the goal of the consensus-building process is not to reach agreement on every single issue, but to agree as a group on an acceptable package of alternatives. As in all other negotiations, success or failure to agree depends on individual participants' best alternative to a negotiated agreement (BATNA). Ideally, the facilitator and the evolving group dynamics will shape the BATNAs to favor agreement. If the process can be sustained for a long time, investments in time and resources and the development of personal relationships in the course of collaboration should help create momentum toward a consensus-based agreement.

The list of alternatives is then narrowed down to one package of solutions, which are fine-tuned until all the parties at the table can agree. A helpful strategy is for each participant to propose several possible packages that are acceptable to them. Once all the packages are proposed, the group can work together to develop several variations in an attempt to develop a mutually preferred alternative. In this way, an agreement can be packaged without requiring anyone to make imbalanced concessions. Given the difference in priorities, it should be possible to find ways to accommodate most participants' interests (ODRC 2000).

For contingent agreements to succeed, participants have to develop a basic level of trust. Such agreements must be documented with great care to ensure that they are not misused by any side, given that they are many times not part of the conventional agreement documents. In the end, if a consensus is not reached, an overwhelming majority can also be sufficient for the agreement to be accepted.

Even if the participants themselves can reach an agreement, stakeholders at large must till be satisfied that it meets their needs. It is imperative for stakeholder representatives to communicate with their constituencies frequently during the processes of analysis and decision making. Representatives of stakeholder groups must ensure that their constituents understand the reasoning behind the decisions and have access to the analysis performed by the group. This is a difficult task, given that non-participants have not developed the same level of understanding or trust necessary to understand why the agreed-upon package is the best possible agreement they can get. If any one of the groups represented in the consensus-building process disagrees at this stage, they will unlikely to sign the agreement, and it may well fall part (CRC 1999). Clearly, the skill of the facilitator can be the key to success. If sufficient alternatives are generated in the previous steps, the facilitator has a more leeway to highlight areas of possible agreement.

The "Single Text Method" of drafting a written agreement is a useful way to reach closure. In this method, the group works on the agreement by moving through a single document together, with the facilitator either assigning preparation of the text to an expert who is not a stakeholder, or through having a small group of stakeholders prepare a draft on behalf of the entire group. The draft has no legal status until the group reviews and refines the draft to reach agreement on a single final text. Agreement reached on any section of the document is considered tentative until a final agreement on the entire document is reached. This prevents individual stakeholders from presenting alternative drafts, which can derail the process of reaching an agreement (ODRC 2000).

If an agreement is reached, the group has to decide on an implementation schedule, allocate resources, and divide responsibilities among the different participants.

Policy Implementation and Post-implementation

Implementation Schedule, Monitoring and Enforcement Design

Once the basic elements of an agreement are found, the design of the implementation phase and monitoring must be made. There is often so much emphasis on reaching the agreement that the implementation phase receives too little attention, a fact that can erase all of the achievements of the collaborative process (ODRC 2000). The implementation schedule, resource commitments by the individual stakeholders within the specified timeframe, and optionally contingent clauses need to be refined and spelled out in a written document. Agreements on all issues should be considered binding by the parties.

Relationship to Existing Formal Decision-making Procedures

One of the most important questions asked about the collaborative approach is how they interact with existing decision-making procedures, such as the NEPA process. While the collaborative process should not be limited by the time constraints of formal processes, it can enhance the formal process at any stage. For example, in the NEPA process, this can happen when agreement is reached:

<u>Before the EIS Draft is Issued</u>

It would be very useful to have the scoping agreements of the collaborative process ready before the permit-issuing agency determines the scope. (Even later the final document outlining the joint fact-finding results can serve as the basis for the EIS draft.) The developer could also attach a copy of the final agreement document for the permitting agency, which may also have been part of the collaborative process.

Normally, in order for such an agreement to be ready before the draft EIS is issued, the collaborative process must begin shortly after the developer has filed an application for the project. The permit-issuing agency may offer such a collaborative option to the developer, or the developer may initiate the process in the hope that it might lead to a more favorable outcome, possibly preventing litigation and other delaying actions. Many developers have to spend so much time drafting a "litigation proof" EIS that additional expertise and resources spent in reaching collaborative agreement may be far less.

After the Draft EIS is Issued

At this stage, the agreement can help refine the final EIS to reflect many of the achievements of the collaborative process. This reduces the possibility of future litigation by opposing parties, thereby reducing uncertainties for all stakeholders.

When a Lawsuit or Appeal has been Filed

If the agreement is reached while an appeal is pending, the appeal may be retracted or the provisions of the collaborative agreement might be entered into the record of the decision. If the agreement includes contingent provisions that are not enforceable by the decision-making authority, separate enforceability provisions have to be defined and separately monitored by the parties in an additional agreement (ODRC 2000).

However, in the long term, and with more successful cases being recorded, the collaborative process may become an officially recognized model for decision making , offered as an option to the developer and the stakeholders.

Conclusion

This chapter examined the role of joint fact finding as a way to bring stakeholders and scientific experts together. The objective is to increase the role of science in the decision-making process by making it more relevant to the concerns of the stakeholders. Each of the topics discussed above deserve vigorous in-depth study.

Although joint fact finding is not a silver bullet that will eliminate conflict in science-intensive processes, it can reduce many of the problems associated with data, credibility of experts, and advocacy or adversarial science. The goal of joint fact finding is to enable all stakeholders to understand the system and its problems in order to make informed decisions based on common interests (rather than dogmatic positions) and to create robust and stable agreements. As such it is a mutual social learning experience, where non-experts learn about the technical aspects of a system, and experts learn to look at issues not only in terms of pure science, but also in terms of the human and social impacts of the system. An atmosphere of and mechanism for creative dialogue will produce more possibilities for mutual gain.

However, the actual implementation of joint fact finding faces serious challenges. It is difficult to get independent scientists to venture into the policy sphere, where their objectivity may be blemished. It is also challenging to bring stakeholders with power differentials, with different levels of technical knowledge, or with irreconcilable mistrust of other stakeholders to the table for a creative process. Like any other collaborative process, the realization of benefits for joint fact finding depend on the abilities of the facilitator, the timing for initiating the process, the design of the ground-rules, the system at hand, and the stakeholder groups.

Still, even when no agreement is reached the collaborative process outlined above can benefit stakeholders. As issues and facts become more clearly defined, stakeholders gain a better understanding of the system and other stakeholder interests, which may improve relationships among the opposing parties (Buckle and Thomas-Buckle, 1986).

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