Pathology of the Traditional Science-Intensive Environmental Decision-making Process

Ali Mostashari

Introduction

Due to the complex nature of environmental systems, many decision-making processes formally rely on scientific analysis of the question at hand as a basis for policy design (Adler et al., 2000).
The complexity of the problem necessitates a technical and scientific analysis process, which by its nature excludes the majority of the stakeholders in the given problem. This however as often lead to the ineffectiveness of science in playing its intended role as the central piece of environmental decision-making and moves the process towards an adversarial and politicized atmosphere which is unlikely to produce good solutions. There is increased concern that science does not have a significant impact on the dynamics of the decision-making process and that the final products of the decision-making process may show little inclusion of scientific findings (Susskind, 1994). While scientists blame this on the politicized nature of the 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. It can be argued that changes in the scientific sphere are crucial if science is to be a central piece of the decision-making process. This paper looks at the possible weaknesses of the traditional science-intensive policy process, and how it can be improved so that scientific analysis can play a more important role in decision-making on environmental issues.

The Traditional Science-Intensive Policy Process

Figure 1 shows the ideal flow of information in a traditional science-intensive policy process. Table 1 shows problems that can arise at different stages of the process that can negatively affect the impact of science in the policymaking process.

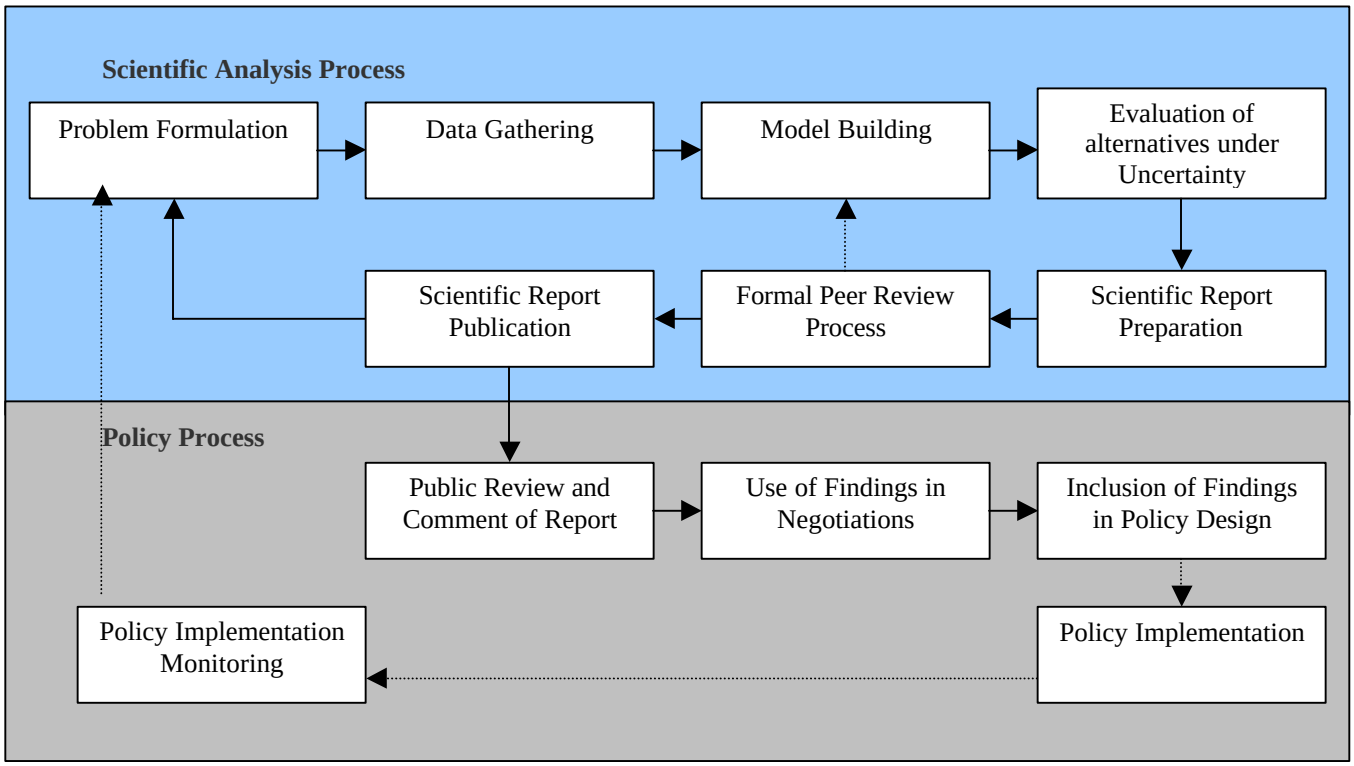

Figure 1 The “traditional” science-intensive policy process. Dashed links indicate steps that may not be followed through.

Table 1. Problems in different stages of the "Scientific Analysis" in the traditional environmental policymaking 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	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 of a wide range of sensible assumptions and incorporate a sensitivity analysis, agree on range of uncertainties with experts representing stakeholders. Choose wide range of reviewers and include reviewer comments and responses to critique in the final report
Uncertainty in baseline data	Data gathering, Model Building	Bounding some uncertainties by bounding social-eco system interaction, provision of funding for good initial data, measuring possible impact and change rather than emphasizing baseline conditions
Uncertainty in relationships between system components	Model Building	Early stakeholder engagement and use of stakeholder inputs to gain better knowledge of the system. Use of extra-organizational expert knowledge to bound uncertainty.
Uncertainty in future projection (Sarewitz et. Al,)	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	Inclusion of 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 impact to avoid selective use. Promptly respond to media characterizations of the findings to prevent misrepresentation. Include stakeholders from early on in the process, make entire process transparent
Weak Stakeholder Understanding of the Scientific Process and Findings	Public review and comment on findings, Use of findings in negotiation, Inclusion of findings in Policy Design	Early involvement of stakeholders in the scientific analysis. Active efforts to explain the scientific complexity and consideration of stakeholder lay knowledge in the process. Create an accessible version of the report with the important highlights for public understanding of the issues considered. 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	Change the process towards a more participatory process from the beginning and take into account stakeholder inputs and interests 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	Change the process towards a more participatory process from the beginning and take into account stakeholder inputs and interests at all stages of the policy-making process. Continuing improvement and input of science during the process. Use of scientific models in the negotiation and policy design stage.

An alternative process

As many of the recommendations in Table 1indicate, early stakeholder involvement in the scientific analysis process, even at from the problem definition stage onwards may help in solving many of the inherent problems of the current process. An alternative policy process could entail the engagement of stakeholders along the entire process, specifically from the problem definition and scientific modeling stage of the environmental system in question through the end of the policymaking process. Figure 2 illustrates the different components of the proposed policymaking process.

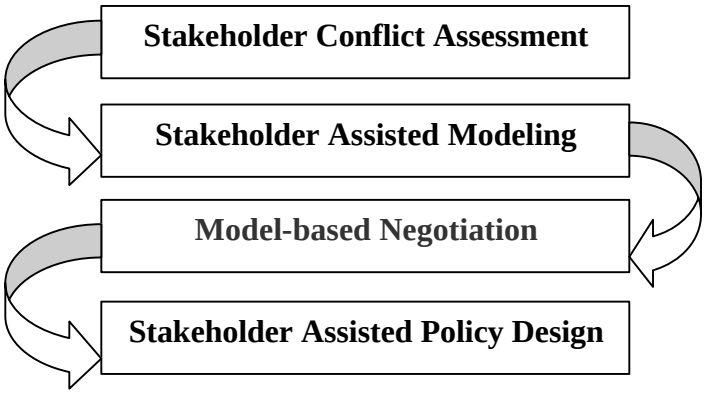

Figure 2 Stakeholder-Assisted Scientific Analysis and Policy Design Process

In the following sections we will discuss each of these steps in more detail.

1) Stakeholder Conflict Assessment

A helpful preparatory step for this new process is stakeholder conflict assessment (Susskind et al., 1999). This step allows identifying the relevant stakeholders, mapping their substantive interests, and beginning to scope areas of agreement and disagreement among them. It also provides information to the expert analyst about the mental maps (their perception of the system) of the relevant stakeholders. In this stage, input is sought from the stakeholders on what the important performance metrics for the system could be, how they view system interactions and what elements of the system they see as crucial. Using this initial information, the expert analyst can then construct an initial set of feedback structures for the modeling process.

2) Stakeholder Assisted Modeling

In this stage the expert analyst creates an initial qualitative-visual representation of the system based on stakeholder inputs and presents model to stakeholders using tools such as system dynamics that can be used to link scientific models with stakeholder input interfaces (Vennix, 1996). Analyst highlights the role of the stakeholders in coming up with the relationships in a report that describes the interactions in the easiest terms. In the next stage, analyst and Stakeholders shape and refine model together by adding necessary details and challenging relationships between system elements. Analyst only acts as technical gatekeeper, making sure the model is constructed on a sound scientific basis. Performance metrics for the system are agreed on. Analyst presents final modifications to stakeholders, and highlights key uncertainties in the modeling to be taken into consideration in the policy design stage.

3) Model-based negotiation

Using the model created in the previous step, a series of strategies based on combinations of policy options brainstormed by the group are simulated and their consequences analyzed. Using a multiple criteria trade-off analysis based on the agreed performance metrics the more effective strategies are assessed for social,

political and economic feasibility, again jointly with stakeholders. Expert analyst acts as facilitator in discussions.

4) Stakeholder-Assisted Policy Design

The stakeholder-created model is then used as a negotiation tool among stakeholders. The best strategies are looked at from an implementation perspective, and an analysis of cost distribution on the different actors is performed. The analyst creates a report on agreements in the policy design process and present the report to the stakeholders. The analyst also looks at those strategies rejected in the policy design stage, which were considered effective strategies in the modeling stage. Stakeholder brainstorming is used to design implementations strategies for agreed policies. An implementation schedule is drafted and stakeholders endorse the final document.

Summary

In the current "traditional" science-intensive environmental decision-making process, the scientific analysis process is effectively separated from the policy process. Scientists blame the weak role of science in the decision-making process on the politicization of the policy process and the lack of scientific understanding on the part of decision-makers and stakeholders. In this paper, an effort was made to highlight some of the failure modes of the traditional process at different stages and to propose individual solutions to each. Based on the analysis, the paper argues for an alternative policy-making process with early stakeholder engagement from the beginning of the scientific analysis process. It proposes to facilitate the interactions between scientists, experts, decision-makers and other stakeholders by means of a common conceptual modeling framework that can visualize the complexity of the system and highlight the complex interactions of the system components in an accessible manner without compromising on the quality of the science.

References

Adler, P.S., Barrett, R.C., Bean, M.C., Birkhoff, J.E., Ozawa, C.P., and Rudin, "Managing scientific and technical information in environmental cases: principles and practices for mediators and facilitators." **,** E.B, 2000

Sarewitz, D., Pielke, R.A., Jr., and Byerly, R., Jr., (eds.), *Prediction: science, decision making and the future of the nation*, Island Press

Susskind. L.E., The need for a better balance between science and politics: in *Environmental Diplomacy*, 1994, p. 63-78

Susskind L.E and Thomas-Larmer, J., "Conducting a Conflict Assessment", Chapter 2 of *Consensus Building Handbook,* , Sage Publications; (August 1999)

Vennix, J., *Group Model Building : Facilitating Team Learning Using System Dynamics*, John Wiley & Sons; (August 1996)