SUMMARY OF "POLICY" BREAKOUT GROUP SESSION

Summarized by Charlie Schweik

Participants:
Charlie Schweik – Leader, Geoffrey Bowker, Cliff Duke, Rich Guldin, Stefan Jensen, Pasky Pascual, Phil Rossignol, Tyrone Wilson, William Sonntag

(with scribe support from Steven Abercrombie)

The goal of this breakout session was to articulate the "policy problem space" related to ecological and environmental information and decision-making. The defined objective was to identify major problem areas and then identify the three biggest issues to report back to the group.

The breakout followed a three step process: 1) reaching a common understanding of what was meant by the phrase "policy problems in eco-informatics and decision-making"; (2) identifying problem areas within this domain; and (3) ranking the top three problem areas. Each will be elaborated on in turn.

Step 1: Achieving a common understanding of "policy problems in eco-informatics and decision-making."

The group settled on the following:

> "Areas for discussion include (but are not limited to) problems that organizations (across all sectors, public, private and nonprofit) encounter because of their policies related to:
>
> 1. *the <u>provision</u> (e.g., financing), <u>production</u>, and <u>maintenance</u> (e.g. data curation/archiving) of eco-informatics tools and information;*
>
> 2. *the <u>use</u> (and possible abuse) of eco-informatics tools or information and their effectiveness;*
>
> 3. *the <u>cross-organizational sharing</u> or not sharing (e.g., privacy, confidentiality policies) (or lack thereof) of eco-informatics tools or information; and*
>
> 4. *the <u>communication</u> (or lack thereof) of environmental management decisions grounded upon eco-informatics-based analysis.*

Step 2: Identifying specific issues related to the four problem areas above.

The group then turned to a discussion of the problems within each of these areas, which will now be described in turn.

1. Problems related to organizational policies regarding the provision (e.g., financing), production, and maintenance (e.g. data archiving) of eco-informatics tools and information.

Problem 1.1. Organizations may not be addressing the "user needs" problem adequately as they develop eco-informatics tools and information.

Participants raised the following issues that relate to this problem.

- It was emphasized in several workshop presentations and in the breakout group discussion that the production of EI tools and information need to begin with an understanding of user needs. In some cases, developers of EI tools or information are not doing this.

- Meeting the user needs is a complicated endeavor. First, user needs are a moving target; their needs develop and change as technology changes. Secondly, defining user needs is a two-way challenge. The users don't necessarily know what they need or want and the developers of EI tools may not know what they need either.

- Some consensus was reached that the producers of EI tools should strive to develop products that will support various user types and that provide capabilities for the user to tailor them to address their particular needs.

- Finally, especially in the context of extremely technical or complex EI tools or information, there often are problems on reaching the decision-maker or analyst user on how to use these products. Related to this is questions about where to allocate organizational resources. For example, is a web-services strategy that assumes the end user will know how to use a tool or piece of information sufficient? Or is there some form of help support system needed? In some instances, end users of EI tools and information may spend significant amounts of time figuring out a problem when the producer might be able to direct them to a solution rapidly.

Problem 1.2. Lots of data are being collected that are then only used once.

Participants reported that this occurs very frequently, and it is extremely costly and inefficient. There is a need for better systems of metadata/storage retrieval systems to ensure that what data are collected or generated are used more frequently.

Problem 1.3. Organizations face a policy dilemma related to what kind of good to treat EI tools and information. Should they be treated as public, or private/toll goods?

On the one hand, EI tools and information could be considered public goods for they have the potential to be used by others outside of the organization. At the same time, there might be important reasons to treat them as a private or toll good, in order to collect some revenue to absorb some of the costs to produce this information.

Problem 1.4. Organizations often lack adequate policies, procedures or technologies to ensure that eco-informatics-based information is preserved and archived. .

The special nature of eco-information – a history of the environmental condition – makes it especially important that much of these data are archived and preserved. For example, one participant noted that in his organization major sets of Landsat historical images were lost because tapes decomposed.

Many organizations lack adequate policies and procedures for doing this, and it is hampered by the current state of "decentralized" processing on desktop computers, and compounded by the speed in which technology is changing.

Judy/Tyrone: This wasn't discussed much in this session or in later sessions I attended, but I believe this is a critical issue (I've seen this data loss situation happen multiple times myself) and it may be something to highlight in the research section, although it is an issue bigger than eco-informatics, although preserving our environmental history seems to be particularly important! Val Gregg also mentioned this as something she thought was important but didn't hear much about.

Related to this is an organizational policy problem involving analytic process documentation. Organizations may not put a high priority (in terms of resources) on documenting the entire analytical process undertaken to produce EI products. For example, to produce some "final" EI information to support some decision, a whole series of analytic steps and intermediary products might be produced. The analyst who undertakes these processing steps may fail to back up intermediary datasets that were used to develop the final product and also fail to document the procedures used to create such end products. Consequently, should someone later question the information, there may not be a way to backtrack and identify double check intermediate processing. One participant noted that there are some emerging tools that are beginning to do this. The example given was "Analytica".

A participant noted that there are some organizations (e.g., EEA) who have established "knowledge systems" to get at this problem, where data are stored at each of a series of decision-making points storing different levels of evidence at each of the steps.

Problem 1.5. Organizations who work in the capacity of EI data provider to other agencies often get pulled into policy issues that are outside of their traditional jurisdiction.

One participant described a situation where his organization was acting in a role of providing EI information on invasive species to another government agency who was responsible for developing government policies related this ecological problem. The participant described a situation where he felt they were gradually getting pulled into the policy domain that traditionally was the other agency's jurisdiction, even though it was not his intention to do so.

Problem 1.6. The problem of speed or efficiency in the production of EI tools and information.

Organizations often face urgent decision-making situations where the appropriate EI analysis tool or information are not readily available. In some circumstances, the tool, analytic approach and/or information may exist somewhere, but the decision-maker or analyst may not have any idea that it exists (relates to the sharing problems described later). In other cases, the information needed may not exist, and it may take too much time to collect it. The "pup fish" scenario is an example of a case where there is an urgent need to identify a cause of a problem and there is a wealth of data available, but there is a need to identify ways to explore the data to look for potential causes of the problem (fish population decline).

Problem 1.7. Organizations do not always provide enough support or resources for the development of environmental indicators or for the communication of these indicators. (no further explanation is necessary)

Problem 1.8. Organizations sometimes run into difficulties deciding upon appropriate EI indicators, especially when these indicators are (or should be) used by multiple organizations.

For example, what agency or NGO should be the one to establish a standard of what geographic or temporal scales to be used across all different levels of DM? Further, there are problems on how to define conceptually correct indicators. This problem relates to other breakout groups on "Integration" and "Ontologies".

Problem 1.9. How to should an organization prioritize the production of EI information?

Many participants raised the issue of the cost related to collecting EI related data. Information is not costless. There is a critical need for approached on how to operationalize the value of information. Agencies are asking "will the benefits (e.g., utility in decision-making) of the eventual EI information be worth the cost to collect and to analyze? There needs to be rigorous research on how to do this in practice. Judy/Tyrone – this wasn't discussed much later but I think this could be an important issue and one that might be of great interest to partnering agencies.

2. Problems related to organizational policies regarding the use (and possible abuse) of eco-informatics tools or information and their effectiveness;

Problem 2.1. How do you translate from uncertain scientific models to policy decisions that require a legal burden of proof? In other words, how do you determine whether scientific evidence is enough and defensible to justify a policy decision when there is uncertainty in that data?

One participant noted that there are some advances being made in this area, and used Bayesian statistical approaches as an example.

Problem 2.2. Organizations do not always provide sufficient information on the internal logic of an EI tool or model. This may leads to a lack of trust in these tools, or worse, could result in analyses or EI data that are flawed because of end-user misunderstanding issues.

Organizations may not have policies well established on what kinds of documentation should accompany EI tools they develop that describes the internal logic or assumptions contained within this logic.

Following an “open source” approach is one potential solution to this problem, although many end users may not be able to interpret this source so there still may be needs for other documentation that makes the logic more digestible to end users of these tools.

Problem 2.3. How do you protect against users utilizing EI data at inappropriate spatial or temporal scales? E.g., the ecological fallacy problem – inference about an individual based on aggregated group data)

Problem 2.4. In some circumstances, EI tools that might be useful for policy analysis may not be used by decision-makers (or more probably their advisors and analysts) because they (a) take to long (compared to the political cycle); (b) cost too much; (c) are based on too many unrealistic assumptions; or (d) are too complex or technical. And this problem may be more salient at lower levels of government.

> One example provided was the lack of use of landuse change models by local or regional planners. The data collection needs of these models may be so time and resource intensive and take so long to construct that by the time the model application is completed a new political regime may be in place and the entire decision-making environment may have changed. Because of this, it may be deemed not worth the effort to even embark on the modeling endeavor..
>
> Another participant seconded this and said in his agency, the two models that he knew of that cost a lot were not used. They were too ambitious or more complex. This issue was later supported in the “Greybeard” session in a discussion of model parsimony.

Problem 2.5. Organizations who provide eco-informatics tools and data do not always place enough priority and resources on education and training of end-users of eco-informatics tools or information.

> One example of this mentioned by a participant was his efforts to utilize Landsat imagery to analyze landcover change and the difficulties he had in trying to remove noise in the “raw” data (e.g., radiometric calibration, and atmospheric effects) to produce on-the-ground reflectance data. The procedures to do this were not easily found (this was over five years ago, and this situation might be much better now) and the participant has seen landcover classification maps where these noise remain in the end products that are being used to inform policy and management decisions.

3. *Problems related to the organizational policies regarding cross-organizational sharing or not sharing (e.g., privacy, confidentiality policies) (or lack thereof) of eco-informatics tools or information*

Problem 3.1. The co-production problem in EI tool and information development.

First, participants noted that there are two levels of cooperation between organizations: sharing of tools or EI information and co-production of tools or EI information. Collaboration might be more complex in co-production situations compared to sharing situations.

Organizations tend to want to avoid paying for the develop an ecoinformatics tool or information if there is another organization also involved. One group member referred to this as a “tragedy of the commons” problem. And indeed, it is the classic free rider problem in collective action theory.

In addition, organization policies often act as barriers to the co-production of eco-informatics tools or datasets. For example, if there is no recognition for the hard work to undertake a cross-agency collaboration in EI tool or information production or sharing in employees performance reviews, employees may be less interested in undertaking such endeavors.

Another policy barrier to sharing or collaboration is the policy related to the type of good EI tools or information are assigned (e.g., public, private, toll). Another way this was articulated was “closed” versus “open” access policies. Intellectual property rights was another way participants referred to this issue. The field of genomics was one example that was brought up. This was already discussed in Policy problem 1.3.

Some participants noted that some of the barriers to collaboration and sharing are not direct policy decisions, but rather deeply embedded in the cultural and social norms within the organization and historical practices. A path-dependency type problem. Others noted that there are other social capital-related barriers that might lead to some formal or informal policies blocking collaboration, such as a lack of trust between actors or organizations

Another barrier discussed was the problem of who establishes standards (especially in the context of international sharing circumstances) related to EI data collection, etc. If two organizations have different preferences about how a concept should be articulated or measured and can’t agree (perhaps because of ramifications to existing intra-organizational systems) then how is this issue resolved?

Some participants mentioned that there are some examples where organizations are overcoming some of these problems. For example, “Communities of Practice” are being identified in particular interest domains who are developing collaborative agreements based on formal contracts or simply through a common interest and some established social norms that are helping to overcome some of these collective-action problems.

In domains outside of EI there are also examples of distributed participants are overcoming this problem. Cases of open source software development are one prominent example. There is a critical research need to understand what types of incentives and disincentives work to encourage cross-organizational co-production or sharing of information where this is critically needed (e.g., multiple agencies that are both involved in the management of environmental settings, such as the Park Service and the Fish and Wildlife Service, for example). This issue was a prominent one in the Breakout II discussions on “human centeredness.”

Related to this, one participant mentioned that European agencies may have some insight into this since they appear to be placing more emphasis on open source collaboration in government software in general. Another participant noted that some “Communities of Practice” are capitalizing on Wiki technology to enhance their communication and sharing of information.

Problem 3.2. When considering whether to share information with other groups or organizations, organizations often run into complications because of their need to protection of sensitive public data or to protect the privacy interests of people or property that the data refers to.

Examples of this were ecological information such as a location of an endangered Orchid in which sharing that might lead to a situation where someone goes out and tampers with it. Another example was the Forest Service FIA plots where there has been a great deal of trust provided by the private land owners who have plots on their land and that the sharing of this data and later misuse of this data could cause problems in the social capital that has been established between the agency and the private land owners.

The privacy problem is particularly difficult in situations where one is sharing geographic data. With non-geographic data, some masking of the data might be done to protect privacy. With geographically explicit data, how can that be done?

Problem 3.3. Ensuring appropriate use when organizations share EI information or tools.

This problem was also raised in one of the speaker sessions, where the speaker noted that it is a serious mistake to make geographic datasets available without prominently attaching the associated metadata.

Problem 3.4. A lack of metadata or ontologies may be a barrier to sharing or collaboration of EI information and tools.

In some instances, organizations might be interested in sharing information but may be hindered because inadequate metadata have been developed to communicate what the datasets represent. In the context of EI tools such as models, there may a similar interest to share but there may be inadequate documentation (e.g., ontologies) that would promote model sharing and integration with other models.

This problem is probably driven at least in part by a lack of attention in organizations to develop either a carrot or a stick approach for encouraging data owners to produce and maintain the metadata. Examples of “carrot” approaches might be employee performance rewards or positive recognition in Community of

Practice situations. “Stick” approaches might be executive order type of mandates with negative consequences to the employee if they are not followed.

4. ***Problems related to organizational policies regarding the <u>communication</u> (or lack thereof) of environmental management decisions grounded upon eco-informatics-based analysis.***

<u>Problem 4.1</u>. Organizations sometimes do a poor job communicating pressing issues that have been discovered through EI analysis to decision-makers or the public.

This is, in part an information diffusion problem via the use of the media and other mass communication approaches. An example of this was articulated in a plenary session, where a speaker discussed the current problem of Oak death.

<u>Problem 4.2</u>. Organizations or policy-makers are sometimes caught off-guard by some environmental or ecological problem, and may find themselves facing real difficulties addressing the problem because little or no data exist to help understand and respond to the problem. Or, there may be some data available, but the data exhibit a linear trend when in fact the pattern is more complex that that.

The question here is whether there are any EI-related tools and techniques that can help with this kind of situation. Decision-making under great uncertainty situations.

<u>Problem 4.3</u>. There are sometimes problems or ethical issues encountered because of organization policies or legislative mandates on what can or cannot be communicated to the public.

One participant noted a situation where the Oregon legislature actually passed some law that put some constraints on what could be communicated to the public about some scientific EI issue.

Step 3. The ranking the top three problem areas

The Policy breakout discussion concluded with an attempt to rank the top three problem areas as requested by the workshop organizers. There was a real hesitancy in our group to do this, for fear of dropping an important problem. Ultimately, we tried to do it because we knew it was an input to the breakout sessions that followed. But the group felt that some of these problems were context sensitive, and in one circumstance one problem could be really serious, and in another circumstance another problem might be the most serious.

We selected four problem areas to report back on. Listed in no particular order of importance:

<u>Problem 1.1</u>. Organizations may not be addressing the “user needs” problem adequately as they develop eco-informatics tools and information.

Problem 2.1. How do you translate from uncertain scientific models to policy decisions that require a legal burden of proof? In other words, how do you determine whether scientific evidence is enough and defensible to justify a policy decision when there is uncertainty in that data?
Problem 2.3. How do you protect against users utilizing EI data at inappropriate spatial or temporal scales? E.g., the ecological fallacy problem – inference about an individual based on aggregated group data)

Problem 3.1. The co-production problem in EI tool and information development.

Other non-problem related discussion material that I felt should be left in this summary

During the discussion, people made some points that were related to problems but would not necessarily be classified as problems. In general, they are related to the use of EI information for decision-making and may be useful for the part of the report having to do with defining decision-making. I list these below in no particular order.

The point was made that EI for policy may not necessarily mean getting information directly to the decision-makers, but rather getting information to their advisors. Secondly, EI information for decision-making is not necessarily for "the solution," but rather it is sometimes used simply to have the policy-maker ask the right questions which them might drive new research agendas to understand the environmental problem or issue better.

In addition, one participant emphasized that there was a distinction between "Risk assessment" and "Risk management" where the former is more using EI and scientific information, whereas the latter is working with these "facts" but also requiring the decision-maker to dealing with other social or political elements in addition to these "facts."

Another participant made the point that it may be unrealistic to believe that senior decision-makers will rely solely on facts, tools and knowledge to make their decision, even with perfect information. Other factors influence the decision-making process that are outside of the EI domain.

Another point made in this breakout group related to DM in general was that there is often resistance in the policy or decision-making environment to "over-define" a problem. Providing too many facts sometimes creates resistance in DM environments. Here there is what might be called a "cultural split" between scientists and the decision-makers or policy-makers where scientists feel the need for almost a "beyond a reasonable doubt" conclusion whereas policy-makers just need enough information to ensure it was the "right decision" or to simply minimize risk.