

Guiding Principles for Incorporating Technology and ECR

Please note: This draft document was developed during a collaborative working session May 13, 2010 co-sponsored by the U.S. Institute for Environmental Conflict Resolution and the Department of Interior's Office of Collaborative Action and Dispute Resolution. The authoring team will be seeking broad endorsement for these principles within the ECR community and across the federal system.

This is a draft only. For information on process and timelines for comment please see <http://www.ecrtech.net>. (May 24, 2010)

Document Outline

1. Background/Context

This section outlines the procedural context, ("how did we get here?"), starting from the May 2009 National Strategic Planning Session on Technology and ECR, and provides an overview of some of the major outcomes of that session relevant to this initiative.

2. Opportunities & Challenges Associated with using Technology

In this section we want to capture the big changes that current technologies are bringing to ECR processes, and indicate the general benefits and challenges associated with these. These should then be seen to be addressed in the Guiding Principles section, or deferred to the Unanswered Questions section.

3. Guiding Principles

This section starts with commonly understood ADR/ECR principles, and then enumerates implications for technology use and application. These implications are then used to develop Key Considerations in Section 5.

4 Process Design Considerations

This section is not yet complete, but should cover overarching considerations related to process design, and how tech is harmoniously integrated. Please add conceptual content here.

5. Considerations for Incorporating Technology in ECR

This section is intended to offer more depth and practical details, aimed specifically at practitioners (steps for creating similar guidance for "technologists" will be discussed on 5/13). Working from the core of the Guiding Principles (Section 4) we would like to include more specificity organized by tool type.

6 Unanswered questions

This section has not been completed, but should pick back up the larger and more troubling "challenges" (from Section II) that have not been satisfactorily addressed by the Guidelines and Considerations sections. It will include recommendations for further work

7. Summary

To be drafted

1. Background / Context

From May 6-8, 2009, 90 people attended a meeting hosted by USIECR on Technology in Environmental Conflict Resolution (ECR) in Tucson, Arizona. The attendees were drawn from a variety of sources, including the federal government, academia, technology providers, and ECR practitioners. The 3-day meeting resulted in several recommendations, which were captured in the Report from the National Strategic Planning Session ([The Report](#)). One of these recommendations urged the convening of a group to evaluate how technology tools relate to ECR core principles. To this end, a group was formed to meet in Washington DC, at the DOI Office of Collaborative Action and Dispute Resolution on May 13, 2010, to develop a draft of Guiding Principles for using technology during an ECR process. The group used the findings from the Report from the Strategic Planning Session as the foundation for its draft.

First and foremost, the Report emphasized in its preamble that even though the ship is moving and technology is already readily being applied in the ECR field, it is paramount to note that there are important considerations to be had about the use of technology in ECR practices, especially when considering the limitations of a digital divide that exists in society. We recognize that technology, by its nature, can be exclusive and it can disenfranchise groups with limited access, education, generation and/or resources. As we move farther along in applying technology in ECR, we can't exclude people because of the lack of access to technology. After all, increased meaningful engagement is a core principle, so there will continue to be a need to identify new ways of involving people and improving participation, especially to marginalized groups not accustomed to accessing technology.

The Report also enumerated the attributes of technology, describing how it can add value to ECR processes. Among other things, the Report found that technology can enhance communication by getting more information to more people in the same amount of time; improving analysis; enhancing collaborative decision-making; supporting monitoring and management; helping participants discover their assumptions and objectives; and enabling more timely decisions. The Report also noted that technology can improve decision making by, among other things: more efficiently collecting, synthesizing and disseminating information; visualizing change; crossing fragmented organizational boundaries; enabling us to see broader dimensions of problems; empowering the public through user-available information; providing opportunities to test assumptions; and moving towards plans based on adaptive management.

Each of these and other attributes gives participants and practitioners opportunities to improve the decision-making in ECR processes. Yet, there are challenges and responsibilities that are also triggered by the use of technology in ECR processes. A reliance on technology without considering its appropriateness or context could shift focus from ECR's core values to values more associated with the technology itself. Some members of multi-party groups might be more adept than others at using and understanding the technology. How do we know whether the technology is accurate? Do all parties have access to the technology? Was it developed in a transparent fashion? What is the role of a third-party who participates in a process that relies heavily on technology? These and many other questions will arise as group processes increasingly turn to technological tools to help them reach agreement.

One of the key recommendations from the Report is that the use of technology in ECR "should be based on the same core values, principles, and tools that provide reference for the ECR field." The Report reiterates this point in several places, noting that "technology enhances (ECR)...(and) doesn't replace 'carbon-based' ECR practices....," and that the "core principles of ECR are

paramount; ECR values, principles, and ethics should be used in guiding the application of technology to ECR."

This document is an attempt to set out, for practitioners both inside and outside federal agencies, how the use of technology in environmental conflict processes can be guided by these ECR core values. It is envisioned that this document will help to inform and inspire the creation of related documents, however this document alone cannot, and should not, address all these topic areas. This document is not a "how to" guide for selecting technology tools. It is not a guide for technologists. And it is not intended to enumerate the policy changes necessary to enable full use of technology tools. We see a clear need for each of these documents, however, and we invite people to join in developing them.

2. Opportunities and Challenges with Technology

In this section we focus on the big changes that new technology is bringing to ECR processes, and assess what this means in terms of benefits and challenges for the field.

A. Overarching Opportunities

Technology has become a central element of our social connectivity, creating new means of interaction and new networks and communities of interest. Technology enhances communication and presents new opportunities for access to and engagement in environmental and public policy decision making processes. Technology also offers new ways to model and display scientific information that can be used in support of collaborative environmental decision making. Simulation techniques now make it possible to capture the interactions of complex natural and human systems and illustrate likely outcomes and tradeoffs of choices.

Ultimately, with proper application and use, technology leads to improved, more durable resource management decisions. It affords new opportunities for engaging people in managing environmental resources and in doing so, avoiding, mitigating, managing, or resolving environmental conflict. We seek to harness the momentum and benefits of technology's evolution to expand the potential of ECR - consistent with its basic principles. Nevertheless, while technology is profoundly changing the way we practice ECR, the use of technology presents new challenges for decision making processes, challenges that we hope to anticipate by underscoring the necessity for a strong grounding in guiding principles.

Technology helps daylight (need to define) and increase public access to decision-making processes, as well as the information and science, and the policy and legal foundations for these decisions. New technologies are enabling outreach to larger audiences, and, increasingly, extending decision making processes to new audiences.

Technology also provides the opportunity to measure progress - both in terms of whether we've met our goals for public participation (e.g., numbers of people who participate, diversity, accessibility), as well as metrics for the quality of outcomes on the landscape leading to improvements in the management of natural resources. Technology helps track the information, science, values, and assumptions that went into the decision, improving the shared understanding of among participants about the likely outcomes of the decision process. In this context, we also see technology as an important means for measuring and validating our return on investment for using technology within ECR processes.

B. Overarching Challenges

Challenges may result from the technology itself and how people use the technology.

Challenges with Technology

It is certainly true that while technology has the ability to empower, it can also exclude or disempower some individuals or groups. This can result from lack of resources to access the technology or proficiency necessary to be a participant, institutional constraints in utilizing technology, (i.e. security concerns or organizational standards), and lack of comfort with or skepticism about new technology. We need to address the gap between those with access and those without, including providing non-technological solutions for involvement, and ensuring that technology doesn't needlessly over-complicate an issue. And we should acknowledge that proficiency with technology can take time and has differential benefits and costs for stakeholders and participants.

New technology can also impose new burdens and new responsibilities. Training requirements, the need for careful management of information, maintenance of systems, data and software, as well as technology development, may require the creation of new roles and can increase the cost of processes. In addition, as technology provides more opportunities for the public there is an increased expectation that these opportunities be made available. These increasing responsibilities and expectations may contribute to resistance from those averse to change. Moreover, the aspects of technology which some view as beneficial (i.e. increased transparency), may be seen as drawbacks by those who do not value what technology is bringing to the table.

There are also concerns about unintended consequences of new technologies. For example, while enabling greater anonymity, certain technologies may also lead to less accountability. In addition, technology may also serve to generate, rather than resolve, disputes (i.e. through spam, anonymity, or malicious comments). Unintended consequences also arise when dealing with legal and policy constraints. Although developed with legitimate concerns in mind, these may significantly limit the practical use and benefits of certain technologies (i.e. Paperwork Reduction Act, Federal Advisory Committee Act).

Finally, technology itself may represent an implicit bias toward information-based, left-brain ways to addressing and resolving issues, discounting less data driven, more experiential, or right-brain ways of considering issues.

Challenges in the Use of Technology

One of the largest challenges in using technology is knowing when not to use it. This requires a nuanced understanding of the technology and how it does or does not add value to a process. Technology needs to be used strategically, deliberately, and pragmatically to avoid an over-investment of resources. There is a danger of resource availability for technology driving the decision to use it. Technology should be the servant of policy making and not the driver. Technologies should be purposefully chosen to suit the process and goals.

While technology itself can limit participants engagement, the way that technology is applied may also create barriers. Lack of balance in parties' ability to use the technology can influence the balance of power in negotiations. Boundaries need to be established to generate appropriate behavior from participants. In addition, ECR processes may not always be fully representative and the use of technology should not mask this fact. (i.e., more participants doesn't always mean balanced representation)

All tools have limitations, and when using these tools it is critical be clear about what these are and to carefully to pinpoint assumptions inherent in the technology. This involves identifying the proper role of neutral third parties vis-à-vis particular forms of technology.

C. What does technology bring to the table?

Expanding and scaling the process:

Technology provides new means for engaging large numbers of people in every part of a decision process - public engagement, access to and applications of science, joint decision making (governance), the development and evaluation of alternatives, and the implementation, monitoring, and adaptation of resource management decisions. It expands, changes, and provides new flexibility to the way ECR principles can be applied to decision-making; it also expands the role of ECR practitioners - in terms of assessment and engagement techniques, process design alternatives, and more sustained public engagement. This expansion includes outreach to larger segments of the population, through web 2.0 technology (web/phone), and/or large meetings formats (e.g., webcasting, large displays, keypad polling). Many more people can participate actively, while at the same time broadening inclusiveness, geographic reach, diversity, and legitimacy. In addition, these tools deepen the levels of participation, from inform to empower on the IAP2 Spectrum of Participation, encouraging interactive learning and more active and sustained participation.

Challenges arise in terms of ensuring equity of access, providing new methods for achieving effective facilitation, ensuring adequate representation while coping with the potential for interests gaming the system and, perhaps, trade-offs in quantity vs. quality of participation. In addition, agencies and other managers face increased dependence on technology to overcome the asymmetry in communications -- a small number of agency personnel interacting with a much expanded public that expects to be heard, to be seen to be heard, and to affect outcomes. In sum, managers are faced with adapting to these new tools and forms of public engagement, by changing their internal culture, developing new skill sets, and re-interpreting the legal and policy framework.

Making science more transparent and accessible, increasing shared understanding:

All of the resources that we call "environmental" are complex natural and human systems composed of many interacting components. Using simulation techniques tied to visualization and gaming platforms, technology provides new opportunities to create a shared understanding among resource managers, scientists, and the public about ecosystem function and dynamics, and how these systems can be expected to respond to major changes and the likely impact of decisions (e.g., planning scenarios, fire, climate change, other disturbances). This helps lead to greater transparency in the generation and application of scientific knowledge. Moreover, all participants can participate in the development of conceptual models that capture key aspects of natural systems. Their joint development captures current scientific understanding and also citizens' understanding of their landscape, allowing for a deeper understanding and appreciation for the nature of feedback mechanisms in the ecosystem .

Technology both increases access to information, and - increasingly - is creating opportunities for citizens to contribute information. While modeling has traditionally been viewed as the realm of experts, using super-computers, people can now make, share, and access models on the web, across great distances, and they can be dynamic. We are seeing new opportunities for a "collaborative science" - where agencies, NGOs, tribes, and the public are co-creating the information base and the science that is important to environmental decision making and management. An important benefit of the collaborative science engendered is a greater

understanding of both the assumptions that underlie the science use in decision making and a shared sense of the uncertainties inherent in all science.

Yet there are important challenges to the way we develop and utilize this new approach to science. There is significant difficulty in validating and interpreting models, and a need for new protocols about the development and use of citizen science. In addition there are various legal and policy constraints on data accessibility and use which can inhibit the effectiveness of models and simulations. When science and computation are done behind the scenes, as with many models, there may be a tendency to distrust the outputs, or equally to be mesmerized by a complex model and neglect to assess it's quality and applicability to the situation. And as with all applications of technology, disparities in technical capabilities among participants may lead to disparities in participation and influence.

One of the great challenges of the current time is integrating catastrophic events into the general management of our natural resources. By definition, both the public and managers alike have little experience with these hitherto uncommon events. And while scientists are making progress developing models to predict when such events might occur, how frequently, and the their impacts on the natural resource being managed, they are at best loosely coupled to the general system modeling described above. (to be included in un-answered questions)

Community Building

A host of social media technologies support building and maintaining new communities of interest, through blogs, online forums, pod-casts, collaboration portals, and tools like Facebook and Twitter. These new virtual communities provide opportunities for asynchronous, non-spatial, readily available and sharable communication tools that increase transparency, engage diverse contributors, capture diverse views, and encourage independent discussions. These new forms of communication encourage round-the-clock engagement, provide continuous information resources, and can significantly reduce administrative costs. Being free or cheap, and readily available, these new forms of communication enable diverse peoples to self organize to share experiences (Flickr), work collaboratively (Wikis) and mobilize to act collectively (citizen science), all without a formal organization. Not only are there tremendous opportunities for diverse people to quickly come together to effectively change their environment, in the process they gain experience in cooperative community building, skills that can be used repeatedly in ever more innovative ways.

Working with and engaging such communities, however, raises new challenges for more traditional organizations and agencies, especially when it comes to sustainable decision making. Increased access leads to increased expectations for round-the-clock participation and responsiveness, and increased agency function and accountability. In addition, the speed with which these communities develops and can lead them to be somewhat fragmented and ephemeral. Practitioners need to be creative in finding collaborative ways to work with such fast moving centers of knowledge and activity.

There are also a host of more traditional social media such as television and radio that can be rethought of and integrated with the newer social media like Facebook and Twitter. Rethinking uses for and integrating traditional and newer social media technologies can potentially enhance social networking and even further expand outreach potential. One example is the evolution of the traditional telephone to web 2.0 technologies represents how we have rethought what a useful phone should do. Web TV and inexpensive distribution of gaming media may represent another opportunity to rethink traditional social media.

Daylighting (define) and enhancing decision capabilities

With new mapping, modeling, and simulation tools, the public can develop new levels of understanding about the likely outcomes of their choices. People can gain a better intuitive understanding of the landscape (spatial, temporal) and can better assess possible implications of decisions. In many planning processes, it is important to look at a range of management alternatives; these new multi-modal tools allow for enhanced visualization, dialogue, and assessment, encouraging a shared understanding of the potential pros and cons of their choices. This allows us to investigate scenarios and address uncertainty (e.g., the impacts of climate change); if we choose a certain management alternative, technology can help us assess whether the path has changed, or the outcomes weren't what we expected.

Another transformative aspect of the new technologies is how enhanced access and participation increases public accountability for decision making. Daylighting is beginning to change the nature of the science, in that it is less commonly commissioned for the pure interest. Given the greater public scrutiny, science is expected to have applications, answer specific questions, address real-world problems. And that science doesn't necessarily provide the answer – it can help narrow down the probable outcomes.

Technologies such as remote sensing and image processing allow for cost effective monitoring over great swaths of the landscape. Citizen science projects coupling human numbers and enthusiasm with geo-location means data can be systematically gathered throughout targeted ecosystems.

The combination of extensive monitoring data and the daylighting of decision processes lead to improvements in decision making on three levels: 1) access to accurate, intelligible, raw data, 2) tracking of decision making (how did the analysis of the data lead to the decision?), and 3) is the decision validated over time through ongoing monitoring and science-based evidence? Collectively, this allows us to move from satisfactory, static solutions to more optimal, dynamic solutions.

This increased access and transparency will raise questions about the accuracy of the data, and the public's ability to link decisions back to assumptions, to track the decision process, afford appropriate opportunities for adaptation, and hold the decision authority more accountable.

Monitoring and Documentation of Processes

Transaction based web sites and other types of technology offer a novel byproduct that in effect can be considered an administrative record of who did what and when. A recording of web or technology based transactions between for example an agency and a constituent can be recorded and used as a basis for quantitative and qualitative analysis of the effectiveness / return on investment of an ECR based process. The procedural transaction analysis can offer insight into how well the technology is performing regarding meeting and accomplishing the ECR Practice Guiding Principles. The results can be used to fine tune and make better recommendations for how to integrate the use of technology to meet ECR practice guiding principles. If these transaction records are designed correctly they can also form the legal NARA compliant basis for an Administrative Record.

Specifically regarding web or technology based transactions involving Daylighting and enhancing decision capabilities (modeling), it is possible to evaluate the tradeoffs among decision options,

because of the ability to determine the likely effects of individual decisions on multiple resources. Monitoring of the consequences of choices can then be used to re-evaluate a decision and can lead to improved outcomes through subsequent decisions. In cases where the data being used in these simulation transactions are designed correctly it is possible to utilize the same IT system and data to monitor and implement the actual land use decision or plan over a long period of time, for example a simulation IT system used in a BLM Resource Management Plan can be used to evaluate and monitor all subsequent EA's associated with the implementation of the Record of Decision, further demonstrating a true and substantial return on investment in using this kind of ECR technology support.

3. Guiding Principles (and their implications for incorporating Technology and ECR)

These guiding principles are intended to take the ECR core principles and relate them to technology. These apply both if you have planned to use technological tools from the beginning, or if you have decided they will be useful when you are in the middle of a process. Does this voice fit w/ the remainder of the document? I like the way this speaks directly to the reader-as-practitioner, but think it might work better to reword to "if tech tools have been incorporated from the beginning..." The following section ("Considerations for Incorporating Technology and ECR") goes into more depth regarding what practitioners should consider when selecting and working with a particular technology. Please note that this is not intended to be a definitive statement regarding ECR principles, but rather focuses on how these relate to the use of technology in ECR.

The foundational documents that informed the drafting of these principles include the Final Report of the May 2009 National Strategic Planning Session on Technology and ECR, IAP2/NCDD Core Principles for Public Engagement, and OMB/CEQ's "Basic Guidelines for Agency Engagement in ECR and Collaborative Processes".

1. Clearly Articulated Process Goals and Design

Identify clear process goals. Good process design should include the principles addressed below and should also consider "OMB/CEQ basic principles for agency engagement in ECR and Collaborative Problem Solving": Informed Commitment; Balanced, Voluntary Representation; Group autonomy; Informed Process; Accountability; Openness; Timeliness; and Implementation. Where possible participants should be involved in developing these goals. Process goals should be clearly communicated to all participants. Clearly articulated process goals should be the foundation of process design, and should be continually referred to and adapted as necessary throughout process implementation.

Implications for Technology Selection and Use

- Ensure that process goals, not the tools themselves, drive the selection and use of technology tools. Technology should be selected to meet a specific need. Attempt to review available technology with a broad and representative group of participants, and make intentional and informed decisions about which technologies are appropriate.
- Choose the simplest tool that will meet the needs of the group. Incorporate tools in ways that they are most likely to facilitate the work of the group, rather than create a distraction.

- Facilitators and mediators supporting the process should learn as much as possible about the technologies, including understanding any biases, assumptions and uncertainties involved, and clearly communicate all known biases, assumptions and uncertainties to the parties.

2. Impartial Process

Principled conflict resolution is built on the cornerstone of process impartiality. Whether a process is facilitated by a third-party neutral, or is self-organized, the process itself should not offer advantages to any one party over another, nor should it be biased toward a particular outcome.

Implications for Technology Selection and Use

- Facilitators and mediators supporting the process need to understand how technological tools were developed, the tools' strengths, biases and limitations, and how to incorporate them in an impartial manner.
- Take measures to mitigate the impact of knowledge gaps. Identify parties that unwilling or unable to use technology. Assess whether measures such as training, education, assistance, or transparency can be used effectively. Ultimately, the process should be designed to meet the parties where they are, rather than mold the parties to fit the process.
- Through consensus, groups should strive to adopt technology tools that are understandable and usable by all. How tools were developed, how they work, and the roles they play in a process should also be understood by all group members.

3. Inclusiveness and Accessibility

Ensure balanced and voluntary representation of concerned interests. All parties should be willing and able to participate and select their own representatives. Participants should have access to.....need language from Cindy here!

Implications for Technology Selection and Use

- Choose technology that is accessible and appropriate for all concerned groups, particularly minority and disadvantages communities. The technology should not be an obstacle to participation.
- Support participant use of the technology throughout the process. Ensure necessary training is provided and support is available. Where possible, choose technologies that will be used repeatedly in the course of the full process to reduce time invested in learning to use the tools.
- Ensure that any unavoidable differences in the ability to use technology among members of a group is understood and accepted by the group.

4. Openness and Transparency

Clearly articulate and communicate to all participants all process goals, mandates, or constraints that create process "sidebars".

Clearly articulate the roles of the convener(s), the role of the mediator or facilitator, and other key parties. Uphold confidentiality rules and agreements as required for particular proceedings. Seek agreement on how to share, test and apply relevant information (scientific, cultural, technical, etc.) amongst participants; ensure relevant information is accessible and understandable by all participants.

Implications for Technology Selection and Use

- Strive, where appropriate, to leverage the capacity of technology to share information with the many, rather than restrict it to the few. [ALT: Ensure that technology makes information open and transparent.]
- Ensure technology tools and any supporting data or information are available to all participants. Ensure all data are accompanied by metadata describing methods of collection and analysis, known confidence or associated error, and the origin and location of original data.
- Where the data is complex and deep, provide sufficient explanation and analysis to make clear its relevance and implications to the process
- Be clear about assumptions and limitations of the technology being used. Ensure that parties understand who developed a given model or other tool, why the model or tool was originally developed, and the assumptions on which the model or tool is based. Discuss amongst the group the basis for the assumptions, how they were developed, whether there are alternate assumptions that could be used in the model.

5. Accountability

Participate in the process directly, fully, and in good faith; be accountable to all participants, as well as agency representatives and the public.

Implications for Technology Selection and Use

- Strive to ensure that technology will enhance a party's ability to be responsive to those to whom the party is accountable.
- Ensure that information about how the technology was developed, and by whom, is made available to parties.

6. Meaningful Engagement and Implementation

To be meaningful, engagement should effect outcomes and should be part of a process that can lead to implementable decisions. Parties should commit to identify roles and responsibilities necessary to implement agreement. Parties should agree in advance on the consequence of a party being unable to provide necessary resources to implement an agreement.

Implications for Technology Selection and Use

- Consider how technology will play a role in the implementation of any agreed actions or outcomes.
- Ensure the desired technology is available when needed for timely decisions and outcomes.

7. Quality Dialogue

Create an environment that builds trust and respect among all parties –by valuing their contributions and time. Trust and respect between parties is a prerequisite condition for effective dialogue. Building trust can also improve the community’s ability to deal with future conflicts.

Implications for Technology Selection and Use

- Ensure that all spaces (physical and cyber) created for discussion and community building are managed so that all participants feel respected and secure.
- When using online tools be aware of privacy and anonymity concerns.
- Ensure that all interfaces are attractive and easy to navigate. Where possible provide multiple interfaces that respect the knowledge and time commitments of the participants.
- Make it easy for people to access and navigate tools quickly and simply.

4. Process Design Considerations

Process Design

Note: This is an incomplete section - please indicate key concepts that should be included

This will be a place to delineate some key considerations for designing a process that merges ECR and Technology, and will expand on the following points:

- Participants who believe a process is fair are more likely to be willing to live with the results even if they might not fully agree.
- Process design should begin with articulating process, content, and outcome goals and assessing the substantive, procedural and relational issues:
- Only once process, content, and outcome [PBW] goals have been articulated should the group begin developing specific strategies and selecting tools.
- Tech tools are likely to be part of an integrated suite of interventions that are used in any given process (just as we now use a suite of lower tech tools for communication --e.g. e-mails to those that use it, and US mail to those who don't)
- Validation of the initial process, content, and outcome goals should occur regularly, especially during the early phases of the process as more individuals and groups become engaged and involved
- Assessment of the effectiveness and appropriateness of using tools should be built into the process design so that mid-course corrections can be made as needed.
- Although there are many ways to think about this, process goals generally refer to the immediate process; content goals generally refer to the information or materials needed during the immediate process or that will be produced as a result, like the content of an analysis or report; outcome goals generally refer to desired consequences or products of the process, whether improved relationships, specific types of agreements, changes on the ground, or other consequences.

5. Considerations for Incorporating Technology and ECR

In this section we look at Tool Categories and determine which of the technical Implications of ECR principles from Section 3 are most relevant and explain why.

Tools Categories

1. Surveys / polling / comment collection & analysis

2. Social Networking
3. Web forums / email lists
4. Trade off Analysis / Decision Aiding / Online deliberative tools
5. Modeling /simulation
6. Visioning /Scenario development / Mapping / Visualization
7. In-Meeting Tools / Synchronous Online Meeting Tools
8. Project Management / Scheduling
9. Implementation and Monitoring
10. Governance Support

It should be noted that many of these tool categories overlap with each other, and some online collaborative workspaces (e.g. Ning, Google Sites, SharePoint, ProjectSpace, box.net) integrate many of them together for improved each of use. Also, technology is not static, and tools are evolving all the time – in several years, this list may be out of date, and there may be whole new categories of tools available.

1. Surveys / polling / comment collection & analysis

What it is: Gathering input from a pool of respondents by asking questions and categorizing and ranking their responses

How it works: Surveys are distributed, filled out by respondents, and processed into easily intelligible reports

Overarching considerations: Surveys can sometimes be over-complex, collecting more information than can be used. They may also collect sensitive information that generate problems with project partners, such as federal agencies who are subject to stringent restrictions on collected data. Surveys can also be designed in a manner that biases the results toward one outcome or the other. Survey design experts should be consulted to ensure these vulnerabilities are avoided.

Considerations relating to technology guiding principles:

1a. Ensure that process goals, not the tools themselves, drive the selection and use of technology tools... make intentional and informed decisions about which technologies are appropriate.

Surveys and polls are excellent ways to learn about the needs of everyone involved in the dialogue. The information gathered can be enormously helpful to facilitators wanting to design their processes around the true needs and perspectives of the participants.

1b. Choose the simplest tool that will meet the needs of the group. Incorporate tools in ways that they are most likely to facilitate the work of the group, rather than create a distraction.

Polls are easily understood and commonplace technology readily comprehended by users. Care must be taken not to overdesign survey instruments to collect data that is either unusable or confused. Surveys should also not be so long as to frustrate users or cause them to either abandon filling out the survey, or provided ill-considered responses just to get it over with.

1c. Choose technology that is accessible and appropriate for all concerned groups, particularly minority and disadvantages communities. The technology should not be an obstacle to participation.

Surveys and polls are easy to distribute to extended groups, and are a relatively easy way for individuals to participate in a particular dialogue. Well designed, simple surveys are some of the best ways to solicit extended participation from a wide variety of groups.

1d. Strive, where appropriate, to leverage the capacity of technology to share information with the many, rather than restrict it to the few.

Because surveys can be easily distributed to wide groups, there is great potential to use this tool to achieve this goal. However, be careful not to distribute a survey to a smaller segment of the involved population that may share a particular perspective or bias. Surveys must be deployed carefully to ensure the insights they generate are not unique artifacts of the target population.

1e. Ensure technology tools and any supporting data or information are available to all participants. Ensure all data are accompanied by metadata describing methods of collection and analysis, known confidence or associated error, and the origin and location of original data.

Results of surveys should be made transparent, with accompanying results data. This is important to preserve trust in the transparency and accuracy of individual survey instruments.

1f. Accompany deep data with deep analysis.

Don't just put survey results out there and presume everyone will be able to translate them. Results must be analyzed in a rigorous, impartial manner for surveys to be valuable.

1g. Be clear about assumptions and limitations of the technology being used. Ensure that parties understand who developed a given model or other tool, why the model or tool was originally developed, and the assumptions on which the model or tool is based. Discuss amongst the group the basis for the assumptions, how they were developed, whether there are alternate assumptions that could be used in the model.

Work with process participants on survey design, and ensure there is agreement that a survey is needed and that it will cover an appropriate sample.

1h. Ensure the desired technology is available when needed for timely decisions and outcomes.

Don't deploy a survey and have it hang out there for an extended period of time. That may undercut participant trust and confidence in the results. Instead, have a focused period of deployment with a predefined start and end, matched with messaging urging participation.

1i. Ensure that all interfaces are attractive and easy to navigate. Where possible provide multiple interfaces that respect the knowledge and time commitments of the participants. Make it easy for people to access and navigate tools quickly and simply.

Surveys should be well designed, easily intelligible, and user friendly. Badly designed surveys may generate user frustration and generate biased results.

2. Social Networking

What it is: Online tools that facilitate the interaction and communication between individuals, organizing them into multiple communities of interest. Think of Facebook, LinkedIn, Twitter, Ning, etc.

How it works: Individuals register themselves as users of these platforms and provide basic profile information to identify their interests and background. The users can then join different groups or conversation threads based on what interests them. Messages, photos, and other information can be exchanged between users on both a public and private basis. These systems enable users to connect with both people they know and those they don't.

Overarching considerations: Social networks can be very powerful in spreading information, finding new and interested participants, and getting feedback from widely dispersed individuals. They can also create distraction by empowering users to "follow their noses" away from the key topics at hand. Process designers should be attentive to leveraging social networks in a way that generates value without diluting the focus of the group.

Considerations relating to technology guiding principles:

2a. Choose the simplest tool that will meet the needs of the group. Incorporate tools in ways that they are most likely to facilitate the work of the group, rather than create a distraction.

Social networking platforms can be very fun ways to interact with a group online, but care must be exerted to ensure the platform does not become a distraction from the work of the process. Often social networks empower individuals to hop from item to item as their interest dictates, making it hard for a facilitator to maintain a group's focus. Participants may enjoy social networks, and will ask to leverage them, but process designers must ensure that their use moves the objectives of the process forward.

2b. Facilitators and mediators supporting the process should learn as much as possible about the technologies, including understanding any biases, assumptions and uncertainties involved, and clearly communicate all known biases, assumptions and uncertainties to the parties.

No social network should be deployed that the facilitators do not understand, or are not comfortable within. Facilitators must invest the time to gain full awareness of the environments they introduce into their processes, or they risk having those environments move the discussion into venues where the facilitator cannot follow.

2c. Choose technology that is accessible and appropriate for all concerned groups, particularly minority and disadvantaged communities. The technology should not be an obstacle to participation.

2d. Strive, where appropriate, to leverage the capacity of technology to share information with the many, rather than restrict it to the few.

Social networks are great ways to get the word out, because information can be disseminated to a smaller group that then passes it along to their extended networks. Their design is very open and accessible, which encourages participation. The flip side of that is that once information makes its way onto a social network, it is almost impossible to corral; so facilitators must be careful what information is put into the social network in the first place.

2e. Ensure the desired technology is available when needed for timely decisions and outcomes.

Choose a social network that is robust enough to be available when participants want to leverage it. If conversations break out in a social network environment and then subsequently become inaccessible due to a data outage, that be immensely frustrating to participants, who might ascribe inaccurate intention to the outage. Once a commitment is made to a social network, the etiquette of social networking (e.g. transparency, accessibility, responsibility, lack of anonymity) must be maintained.

2f. Through consensus, groups should strive to adopt technology tools that are understandable and usable by all. How tools were developed, how they work, and the roles they play in a process should also be understood by all group members.

Process coordinators must be able to support those participants who might not be fully comfortable in a social networking environment. Coordinators must be willing to answer questions, troubleshoot points of difficulty, and introduce new participants to others so as to get them involved in the online conversation. A short statement from the facilitator explaining why

a particular social network is being introduced into a process may also help to build understanding among all group members.

2g. Ensure that all spaces (physical and cyber) created for discussion and community building are managed so that all participants feel respected and secure. When using online tools be aware of privacy and anonymity concerns.

Social networks have generated privacy concerns in the past, so it is important that facilitators be up front in addressing the issue and indicating how information shared on the network will be accessible by others. In some cases it is possible to build a sub-area within a social network that is accessible only by a particular group -- if the group is dealing with sensitive information, it may be useful for the facilitator to create such a secure environment to ensure all participants feel secure.

3. Web forums / email lists

What it is: A structured online communication format where messages are posted by individuals and archived and organized chronologically.

How it works: Participants in the web forum or email list can review all postings at their leisure and respond to individual posts. Messages can be distributed over email, and recipients of each email can respond by sending an email to the overall group. Users can self-select which forums are most relevant to them and how they want to receive information (e.g. email, text message, etc.) and how frequently they want to receive updates.

Overarching considerations: Over time, web forums and emails lists have the tendency to become stale and lose relevancy. Active maintenance, regeneration, and management are necessary to ensure these tools remain current and useful.

Considerations relating to technology guiding principles:

3.a Choose the simplest tool that will meet the technical needs of the process. Ensure the tool does not distract parties' attention.

Assess how most of the key participants access information, and what type of information will need to be shared through out the process. Based on that, choose the simplest communication platform that can reach the vast majority of the expected participants in a mode they are accustomed to using. If a few individuals might have barriers in using that technology, keep in mind it can be more effective to provide alternative modes to provide the same access, rather than find a more complex new multi-modal single technical solution. For instance, having dependable, highly available phone support combined with physical distribution of media can provide appropriate access to individuals that might not have internet access, or are uncomfortable with the chosen hi-tech tool.

3.b Support participant use of the technology throughout the process. Ensure necessary training is provided and support is available.

Whatever solution you choose to be the main communications platform for the project, ensure training is available, no matter how simple you believe the tool to be. If people request training, view this as an opportunity to discover hidden problems with the tool.

3.c Strive to ensure that technology will enhance a party's ability to be responsive to those to whom the party is accountable.

Choose web forums where alerts can be set so that those who have more responsibility and are accountable to others will not miss communications specifically addressed to them. Make sure such people are trained on how to respond to such "push" services.

3.d Ensure the desired technology is available when needed for timely decisions and outcomes.

Once a tool is established as the main support for communication, the parties must plan for that tool to be available throughout the process. It is very disruptive to close a communications channel mid-stream (unless its to migrate to an agreed superior channel). Protocols on how to proceed in the case where the tool is unavailable should be agreed on in advance. At the very least, some means should to available to report on the status of the tool when it itself is unavailable.

3.e Strive to ensure that all spaces (physical and cyber) created for discussion and community building are managed so that all participants feel respected and secure. When using online tools be aware of privacy concerns.

The more central a technology is to the core communication conduit of the process, the more important it is to make sure the tool is safe from malicious hackers and the tone of participants' interactions stays within agreed upon bounds. This may mean that the practitioner may have to provide some moderator ship to contributions. Just as in a physical meeting, it is very important to collaboratively establish clear ground rules of behavior before the tools is first made available for use. Moderating the interactions can vary from gentle reminders of the ground rules to removing contribution rights for some participants. It is important to understand how well candidate tools support such moderator functionality.

4. Trade-Off Analysis / Decision Aiding / Online deliberative tools

What it is: Tools to organize and synthesize criteria and display in common space; tools to perform trade-off analyses to develop or display individual or group preferences among options/alternatives. Tools that help groups or multi-party disputants come to a decision.

How it works: Structures criteria and how various options perform on those criteria, ask individuals or groups to develop weighting schemes to compare alternatives by aggregating scores. Software gathers preferences from the process participants through a series of assessment questions. Once all preferences are collected and quantified, the platform suggests a mathematically determined outcome.

Overarching considerations: Analyzing and depicting trade-offs, aiding decisions, and facilitating on-line deliberation require appropriate technology for participants and appropriate transparency for the degree of controversy.

Considerations related to technology guiding principles

4a. Choose the simplest tool that will meet the needs of the group. Incorporate tools in ways that they are most likely to facilitate the work of the group, rather than create a distraction.

4b. Choose technology that is accessible and appropriate for all concerned groups, particularly minority and disadvantages communities. The technology should not be an obstacle to participation.

4c. Facilitators and mediators supporting the process need to understand how technological tools were developed, the tools' strengths, biases and limitations, and how to incorporate them in an impartial manner.

4d. Be clear about assumptions and limitations of the technology being used. Ensure that parties understand who developed a given model or other tool, why the model or tool was originally developed, and the assumptions on which the model or tool is based. Discuss amongst the group the basis for the assumptions, how they were developed, whether there are alternate assumptions that could be used in the model.

4e. Strive to ensure that technology will enhance a party's ability to be responsive to those to whom the party is accountable.

5. Modeling /simulation

What it is: Modeling is any representation of connectivity between elements in a system. Simulation models predict what will happen under certain conditions.

How it works: Assumptions are developed, connections between different elements are mapped, relationships between elements are describe with formal logic (mathematically) or other logic, decisions on how to display the results or the interaction

Overarching considerations: Note this section has not been completed- please indicate any suggestions for this section.

6. Visioning /Scenario development / Mapping / Visualization

What it is: Any modeling or data visualization tool that allows you to portray the result of the model or the data in a map or image

How it works: Create a model or simulation, output is displayed visually, alternatives can be compared and different displays compare

Overarching considerations: Regarding technology specifically an overarching concern is recognizing that learning / teaching people how to use the technology / software to run the models is different than learning / teaching people about the subject matter that they are modeling. When considering using this type of modeling technology you should strive to match the level of complexity of the modeling software with the level or required understanding of the subject matter your ECR process requires. The level of required understanding of the subject matter should lead in the consideration of the appropriate technology.

Considerations relating to technology guiding principles

6a. Ensure that process goals, not the tools themselves, drive the selection and use of technology tools. Technology should be selected to meet a specific need. Attempt to review available technology with a broad and representative group of participants, and make intentional and informed decisions about which technologies are appropriate. (Clearly Articulated Process Goals and Design)

If you have simple concepts and relatively simple subject matter used in your modeling generally you will want simple graphic user interfaces (GUI), fewer functional features or use cases in your software resulting in fewer scenario choice options.

6b. Facilitators and mediators supporting the process should learn as much as possible about the technologies, including understanding any biases, assumptions and uncertainties involved, and clearly communicate all known biases, assumptions and uncertainties to the parties.

(Clearly Articulated Process Goals and Design)

This will generally involve the same two learning steps, first the facilitator must know and understand how to use the software interface itself. This will require understanding biases and assumptions used in the model. Secondly the facilitator must thoroughly understand the modeling subject matter to be able to commentate intent and help explain and compare various results.

6c. Be clear about assumptions and limitations of the technology being used. Ensure that parties understand who developed a given model or other tool, why the model or tool was originally developed, and the assumptions on which the model or tool is based. Discuss amongst the group the basis for the assumptions, how they were developed, whether there are alternate assumptions that could be used in the model. (Openness and Transparency)

A primary concept in scenario modeling is the ability to change assumptions, values and variables in the linear statement or algorithm used in the scenario modeling. Therefore it is incredibly important to be able to identify where these opportunities exist in various models and what the implications are for changing those values in a scenario generation and comparison exercise.

6d. Ensure technology tools and any supporting data or information are available to all participants. Ensure all data are accompanied by metadata describing methods of collection and analysis, known confidence or associated error, and the origin and location of original data. (Openness and Transparency)

Implementing scenario type tools requires two distinct types of learning / training. Adding data lineage and GIS type metadata to the learning curve can become overwhelming when combined with learning a new piece of software and potentially a new subject matter for most participants. Given that this data is necessary in demonstrating confidence it should be thoroughly complete and logically organized for discovery if necessary, but not necessarily a central focus of discussion.

7. In-Meeting Tools / Synchronous Online Meeting Tools

What it is: Software programs that can be utilized during a face-to-face meeting by the facilitator and participants to get clarity or make decisions. Online synchronous tools enable participants to convene a meeting online and share presentations, ask questions, share desktops, or jointly edit a document in real time.

How it works: In meeting tools often focus on brainstorming or gathering quick feedback from groups. For instance, a facilitator can ask participants to suggest topics that need to be addressed at the beginning of a meeting, and for five minutes all the participants can visit a form on their personal laptops and submit suggestions. After five minutes, the facilitator hits refresh on their computer at the front of the room and all the suggestions are aggregated and presented anonymously. Then the facilitator asks the participants to rate each suggestion by importance from 1-5. The participants go down the full list of suggestions and rate each one, and with a click at the front of the room the facilitator has a list of the top ten ideas based on all the accumulated votes. What might have taken two hours with flipcharts and dot rankings is done in ten minutes. Another example is dynamic polling, where each member of the audience is given a knob to indicate their agreement with the speaker, and they can twist from “agree” to

“disagree” based on their reactions, while a computer aggregates the feedback from all participants and displays it on a real-time graph.

Synchronous online meeting tools are very common in business contexts, particularly sales and marketing. Most systems (e.g. WebEx, Livemeeting, Placeware) enable all of the parties on a conference call to access a particular web page during the call. The web page may enable the presenter to display a powerpoint presentation and flip through it, so that all participants can see the slides, or it may enable the presenter to share his or her desktop so that they can take certain actions or run applications while everyone on the call watches. Control of the presentation or desktop can also be delegated to members of the call so that they can “drive” the slides or application in question.

Overarching considerations: Synchronous in-meeting and online meeting tools can be quite helpful, but they do impose more structure on what might otherwise be free-form interactions within a group. Ensure that the tools are not too prescriptive and controlling, because if they are perceived as too directive, it may generate frustration among participants that weakens their commitment to the process and urges them to create alternative channels for communication.

Considerations relating to technology guiding principles:

7a. Choose technology that is accessible and appropriate for all concerned groups, particularly minority and disadvantaged communities. The technology should not be an obstacle to participation.

7b. Strive, where appropriate, to leverage the capacity of technology to share information with the many, rather than restrict it to the few.

Online meeting technologies can be excellent ways to enable participation from individuals who simply cannot attend face-to-face meetings for whatever reason. However, they depend upon relatively powerful computers and fast internet connections. Do not presume that the people who respond first with questions or assertions are the only ones interested -- there may be others who are disadvantaged by their technology, and facilitators must endeavor to involve them as well.

7c. Ensure the desired technology is available when needed for timely decisions and outcomes.

Make sure that your online meeting technology is robust, so that it can support every user who attempts to engage through it. Few things are more frustrating than coming to a conference call or an online meeting only to be told the acceptable number of users has already been reached. Also ensure that the platform will not go down in the middle of an important presentation or conversation.

7d. Ensure that all spaces (physical and cyber) created for discussion and community building are managed so that all participants feel respected and secure. When using online tools be aware of privacy and anonymity concerns. Take the time to educate your participants about how online meeting technologies work, and how they can raise their hand, ask a question, or engage the presenter.

7e. Choose the simplest tool that will meet the needs of the group. Incorporate tools in ways that they are most likely to facilitate the work of the group, rather than create a distraction.

Do not feel the need to deploy every feature or flow available in a synchronous in-meeting platform or an online meeting environment. Sometimes the basic feature set is more than adequate for the purposes of a particular meeting or discussion.

7f. Strive, where appropriate, to leverage the capacity of technology to share information with the many, rather than restrict it to the few. Online meetings are a great way to share information beyond a core group of usual suspects. Sometimes convening an online meeting is a great way for a facilitator to demonstrate inclusiveness even if the information has already been shared in face-to-face fora.

7g. Ensure that all interfaces are attractive and easy to navigate. Where possible provide multiple interfaces that respect the knowledge and time commitments of the participants. Make it easy for people to access and navigate tools quickly and simply. Online meeting environments and in-person synchronous tools often have a bewildering array of options that are sometimes difficult for participants to grasp. It is worth the extra investment to secure tools that can be rapidly learned, and focused down on the core set of needed functionalities.

8. Project Management / Scheduling

What it is: Software that aids in designing and managing overall processes, from deadlines to meetings, and coordinates calendars

How it works: Users create a master timeline with deadlines, tasks, expected completion dates and components, milestones, responsible parties, approvals, and workflow. The system displays the project components in the cascading order of their implementation, facilitating the overall management of the process.

Overarching considerations: Project management and scheduling should reflect the risk and complexity of the project and the communication needs of participants.

Considerations related to technology guiding principles

8a. Choose the simplest tool that will meet the needs of the group. Incorporate tools in ways that they are most likely to facilitate the work of the group, rather than create a distraction.

8b. Choose technology that is accessible and appropriate for all concerned groups, particularly minority and disadvantaged communities. The technology should not be an obstacle to participation.

8c. Support participant use of the technology throughout the process. Ensure necessary training is provided and support is available. Where possible, choose technologies that will be used repeatedly in the course of the full process to reduce time invested in learning to use the tools

8d. When using online tools be aware of privacy and anonymity concerns.

9. Implementation and Monitoring

What it is: Tools that enable groups to implement and monitor ongoing processes and their outcomes, both administratively and for effectiveness and return on investment and for quantitative and qualitative evaluation of scenario outcomes and final decisions and or plans.

How it works: A majority of the technology being discussed in this document facilitates transactions between a constituent of a process and an agency or entity engaged in an activity. A transaction is generally a constituent sending data or an answer / response to an agency or entity or an agency or entity sending data or a question to a constituent of the activity. Monitoring technology in general “records” these transactions in a data base. The data base can then be examined and analyzed to determine if the gross sum of activity transactions resulted in a pre determined desired outcome.

Overarching considerations: There are two overarching considerations in using implementation and monitoring technology. Legal requirements for keeping public records and privacy issues and requirements must be considered. Before implementation and monitoring can take place the variables and thresholds that determine success / RIO and failure in a process or process result must be predefined and built into the technology solution.

9a. Through consensus, groups should strive to adopt technology tools that are understandable and usable by all. How tools were developed, how they work, and the roles they play in a process should also be understood by all group members. (Impartial Process)
Identifying the role monitoring technology plays in the process is paramount and often the disclosure of monitoring is required. Participants need to be told their transactions are being recorded prior to engaging in an activity as a part of their consideration for participating in that activity.

9b. Strive to ensure that technology will enhance a party's ability to be responsive to those to whom the party is accountable. (Accountability)
Monitoring technology is often the only way that accountability can be objectively evaluated. Monitoring technology uses a transaction based account of activity to specifically describe adherence to goals and accountably to responsible parties.

9c. Consider how technology will play a role in the implementation of any agreed actions or outcomes. (Meaningful Engagement and Implementation)
Implementing the result of an ECR based activity can take many forms and in the case of, for example, a land use plan, often times the data and technology systems developed for use in the ECR activity can be used in the implementation to monitor and track progress toward goals of the actual implantation activity of a land use plan as physical changes to the landscape are implemented.

9d. When using online tools be aware of privacy and anonymity concerns (Quality Dialogue)
Many public process and activities have specific rules laws and regulations regarding the collection and monitoring of public participation activity. In general full disclosure of monitoring activity to all parties will help insure trust and integrity in the activity and allow persons to make informed choices about participating in monitored activity.

10. Governance support

What it is: These are tools that look to capture and daylight the decision logic itself - how the chosen outcome was arrived at from the available data.

How it works: After all the scientific modeling and data analysis is done, decision makers need to apply decision logic in deciding how to proceed - this is the governance provided by the decision makers. These tools help structure, elucidate, validate and communicate the decision logic used

to make the actual decision. In typical planning processes, where alternative plans are created as part of the process, these tools are used to capture the logic of how a particular alternative comes to be recommended. Examples of structured decisions logic are weighted multi-criteria hierarchies and legal decision trees.

Overarching considerations:

If a governance support tool is to be used to document the decision logic, that the decision should be made as early in the process as possible, as it will effect the science and data gathering used in the process. Shoehorning the data after the fact will generate barriers.

Considerations relating to technology guiding principles:

10a. Facilitators and mediators supporting the process should learn as much as possible about the technologies, including understanding any biases, assumptions and uncertainties involved, and clearly communicate all known biases, assumptions and uncertainties to the parties.

Governance tools are most visible in the formulation of the record of the decision, and yet can influence the entire process. Therefore practitioners need to fully understand the logic and limitations of the selected tool, so they can answer key questions that arise early in the process about how the tool will be used later.

10b. Support participant use of the technology throughout the process. Ensure necessary training is provided and support is available. Where possible, choose technologies that will be used repeatedly in the course of the full process to reduce time invested in learning to use the tools. The idea that you might select a tool to formally help with and document the final decision may be novel to managers and scientists, as well as the public. Therefore training and education on all fronts will be required. Use of the tool early in the process on sub-problems or hypothetical decisions can greatly aid everyone in learning how the tool actually works and what can be expected of it..

10c. Strive to ensure that technology will enhance a party's ability to be responsive to those to whom the party is accountable

By collaboratively designing the data requirements for the governance tool, participants are telling the agency staff what data will need to be generated during the research stage of the project for a decision to be made towards the end of the project. So it is important that clear metrics are developed with the agency's science team to avoid last minute data shortfalls. The agency staff will have other research goals of their own, but by delivering the data that was requested by the participants, the agency is seen to deliver on its promise of collaboration.

10.d Ensure that all interfaces are attractive and easy to navigate. Where possible provide multiple interfaces that respect the knowledge and time commitments of the participants.

Since governance tools generally consume results data from modeling and other research, they don't contain much of the raw data that was generated from the science and management analysis. It is therefore critical to provide clear linkages from the high level results data in these tools to the models and reports where that data was generated. For instance, an MCDS (Multi-criteria Decision Support) decision framework might have deep links from its criteria descriptions to appropriate places in an online copy of the DEIS. Participants can quickly drill down from results data in the governance tool to discussions in the DEIS of the research that generated that data.