Transparency – Considerations for PPGIS Research and Development

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Abstract: Notions of transparency – what it means, how to measure it, and how these may be space and/or time dependent – should be included in the Public Participation Geographic Information Science research agenda. Transparency of decisions is particularly important when the stakes are high and uncertainties are large – as is the case in complex environmental decisions. In this article, I suggest that decision transparency is a complex topic requiring multiple measures to capture its full breadth and depth. The "Decision Mapping System," which was created for Hanford, a former plutonium production facility owned and operated by the United States Department of Energy, is described. The Decision Mapping System is an example of how to facilitate decision transparency using geographic information and Internet technology.

Introduction

Increasingly, the notion of "transparency" has appeared in academic and popular literature – indeed, three of the four keynote papers for the "Workshop on Access and Participatory Approaches in Using Geographic Information" (Spoleto, Italy, December 2001) mentioned "transparency" in some context. Transparency is often touted as essential for democratic decision-making and public involvement. In the literature, transparency seems to mean that something can be "readily understood," but a formalized definition for transparency and ways to measure if something is transparent are only just beginning to emerge (Florini 1999, Drew 2002, Drew and Nyerges 2004). In this article, I argue that conceptions of transparency – what it means, how to measure it, and how these may be time and/or space dependent – should be included in the Public Participation Geographic Information Science (PPGIS) research agenda.

The project discussed here is focused specifically on the transparency of complex environmental decisions. If people are meant to participate in a decision process, they must first understand several things, such as how decisions get made, what the technical issues are, and how to get information necessary for a decision. These needs are even more important when decisions are complex, when stakes are high (e.g., potential health risks and costs), and when uncertainties are large (e.g., technical difficulty). Such is the case at Hanford – a former plutonium production facility in the State of Washington – and the setting for my research.

This article contains four major sections. First, the Hanford cleanup context is briefly described. Second, the concept of transparency is explored and the beginnings of a framework by which it might be measured are presented. Third, we describe the tool that we developed called the "Decision Mapping System," which uses Geographic Information Science (GIS) and the Internet to promote two-way information exchange among the Hanford decision-makers, active stockholders, and the general public about the Hanford cleanup. Finally, a few key lessons from the research that should be applied to the PPGIS research agenda are highlighted.

The Hanford Cleanup Context

The Hanford site (580 square miles) is located in the southeastern region of Washington State (Figure 1). The site includes nine retired plutonium production reactors, three inactive chemical separations facilities, 177 aging underground storage tanks filled with high level radioactive waste, and many other contaminated facilities. As a result of site operations, intentional "releases," unplanned spills, and chronic leakages, there is widespread radioactive and chemical contamination of soil, groundwater, and the nearby Columbia River ecosystem. Hanford's mission is now entirely related to managing nuclear waste and cleaning up the environment. The U.S. Department of Energy (DOE) manages the Hanford cleanup; however, despite spending over a billion dollars per year for the past 10 years on the cleanup, progress has been slow. Some of the contaminants involved are not only very

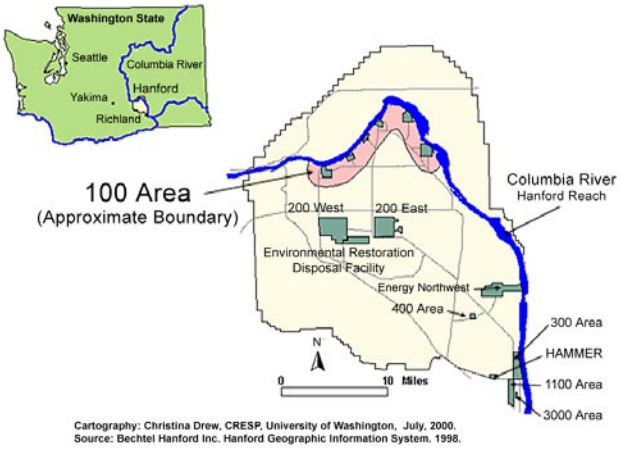

Figure 1

dangerous to humans, but they persist in the environment for long periods of time (sometimes tens of thousands of years). Plus, there is no "easy solution" when it comes to radionuclide contamination – in many cases, we simply do not have the technology to dispose of the materials "safely." And of course, the very question of "how safe is safe" is contested on many levels.

Many people are interested in learning about Hanford and getting involved in its cleanup decision processes, but it is difficult to understand what is happening there and why. For example, complex federal and state regulations have resulted in a vast but poorly organized collection of documents that are difficult to find, obtain, and read. Moreover, decisions are geographically and technically complex, but they are often defined very narrowly, making it a challenge to see how the pieces fit together across space and time. These difficulties boil down to a lack of transparency.

The Importance of Transparency In Complex Decisions

I first became interested in transparency while working with a group called the Hanford Openness Workshops (HOW) (Kern 1998, 1999). This group of diverse stakeholders provided advice to the DOE about the task of sorting through and making "public" the millions of pages of information that were de-classified in the 1990s. The HOW participants frequently paired and interchanged the concepts of transparency and openness. The importance of transparency for this group led my colleagues and me into a review of the environmental and decision-making literature (Drew 2002, Drew and Nyerges 2004).

We found that in many cases, organizations and the literature declare transparency to be essential for public decision-making in democratic societies. Specifically, transparency is praised for leading to more informed choices, permitting evaluation, strengthening institutional credibility, and promoting efficiencies in terms of long-term cost savings, efficient resource allocations, and less duplication (Drew 2002, Drew and Nyerges 2004). Despite the prominence of the term, prior to our analysis, no one had proposed any performance measures or other criteria for its evaluation. In general, the literature suggested that a transparent decision was one that "allows people who are interested in a decision to understand what is being decided, why, and where."

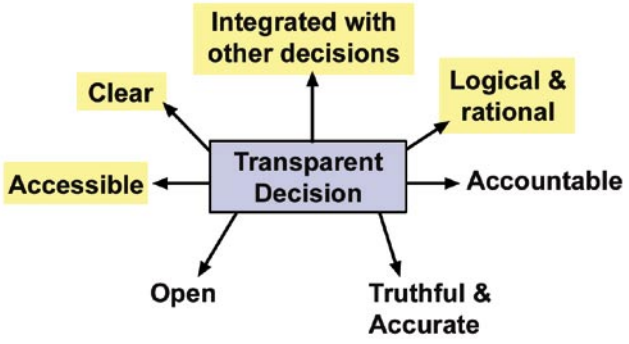

Figure 2

In addition, seven key concepts stood out in the literature as having a particularly close association with transparency. The concepts include: clarity, accessibility, integration with other decisions, logic and rationale, accountability, truth and accuracy, and openness (Figure 2).

These components of transparency, which can also be thought of as goals, are further described in Table 1. The bullets initiate a robust measurement framework for evaluating transparency – each can be used to devise a specific question to help in an evaluation. For example, parts of this framework were used to evaluate the transparency of a document (Drew and Nyerges 2004) and a Web site (Drew 2002). From this diverse list of potential transparency criteria, we conclude that transparency itself is a complex topic and multiple measures are needed to express its full breadth and depth. Major sources influencing our framework include Lodge 1994, the U.S. DOE 1994, the IMF Working Group 1998, Buiter 1999, the Council of the European Union 1999, Florini 1999, the IMF 1999, Issing 1999, Kern 1999, Stiglitz 1999, and Katz 1999. Fuller accounts of this literature and how the framework was developed are available elsewhere (Drew 2002, Drew and Nyerges 2004).

THE DECISION MAPPING SYSTEM AS A TOOL TO PROMOTE TRANSPARENCY

Before we explore the concept of transparency, we thought about how several information structures (some geographic, some not) could be used to support decision processes. Much of the complexity of Hanford cleanup information relates to risks – what are they, where are they, and what can/should we do about them? A key question for me has been: how can risk information be structured in a way that makes it easier for people to participate in a decision process?

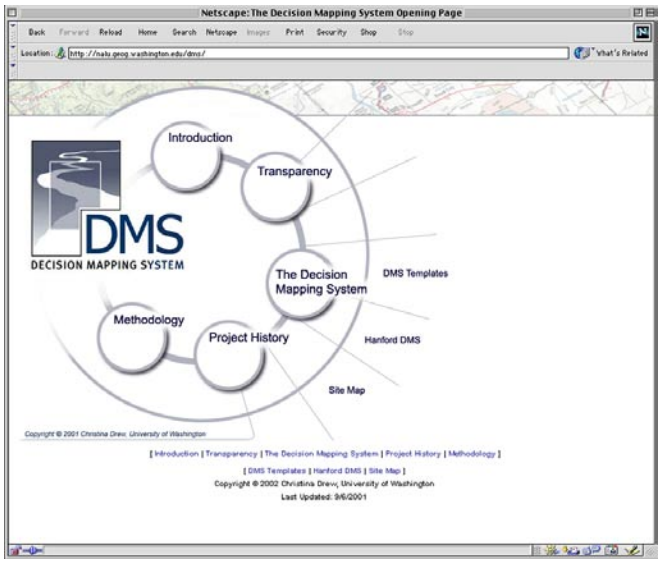

Figure 3

Table 1: Measuring Transparency

Clear
- Comprehensible/Intelligible
- Unambiguous
- Easily detected
- Easily seen/heard
- Visible (no hidden meanings)
- Precise and simple
- Contains minimal jargon

Integrated
- Comprehensive (process fully laid out/full disclosure)
- Takes a "big picture" view - shows decision in context to related decisions
- Consolidated – described in a single document
- Provides logical referencing system pointing users to additional information and source documentation
- Contains detailed table of contents and indices

Accessible
- Allows citizens to have access to important meetings of government officials
- Allows citizens to request and receive government documents
- Makes of detailed documentation and databases available
- Promotes two-way access to information (stakeholders have access to government legislation, and government has access to stakeholder values)

Truthful and Accurate
- Truthful and accurate, free from deceit
- Messages undiluted (information delivered effectively without altering content)

Logical and Rational
- Follows a rational defensible plan, clear to a broad array of stakeholders
- Committed to scientific credibility (sound, dependable, leading edge)
- Processes are consistent, standardized, formalized, flexible, expandable
- Identifies clear decision points (and opportunities for involvement)
- Able to track decisions and policies over time
- Electronic information includes descriptive information (metadata) so can be interpreted by all
- Uses available technologies to improve access to declassified or formerly classified information

Accountable
- Analyses subjected to independent assurances of credibility (i.e., peer review)
- Shows that activities meet goals of policies
- Shows linkages between decisions and implementation; i.e. records milestones (activities), follows cost and schedule changes, provides rationale for changes, etc.
- Provides rationale behind decisions
- Reassures the public
- Responds to stakeholders in timely fashion
- Provides adequate time for stakeholders to be involved

Open/Involve stakeholders
- Allows concerned citizens to see openly into government activities
- Allows citizens to have input into government decisions and rule making
- Undertakes budget preparation, execution, and reporting openly
- Allows stakeholders consistent opportunities to make suggestions during decision process and to appeal decisions
- Provides early notification of opportunities
- Seeks wide ranging early advice on key proposals
- Provides clear and coherent messages
- Describes impact of public/stakeholder input
- Provides user friendly interfaces
- Promotes inter-institutional cooperation and coordination with the Hanford Tri-Party Agreement, internal organizations, and stakeholders

Working closely with stakeholders, we developed a prototype for a geographically based Internet information tool that we call the Decision Mapping System (DMS) (Figure 3). The purpose of the DMS is to allow a better understanding of cleanup activities occurring at Hanford and thus to make it easier for people to participate in Hanford decision processes. The DMS is designed to present cleanup decision information to stakeholders and solicit their comments and feedback.

The DMS has been created specifically for describing decisions in the Hanford "100 Area," but the concepts could be adapted to the entire site, to other weapons production sites managed by the DOE, and to other types of environmental cleanup decisions. The DMS includes six related information structures intended to unpack the spatial, temporal, and socio-cultural dimensions of a decision:

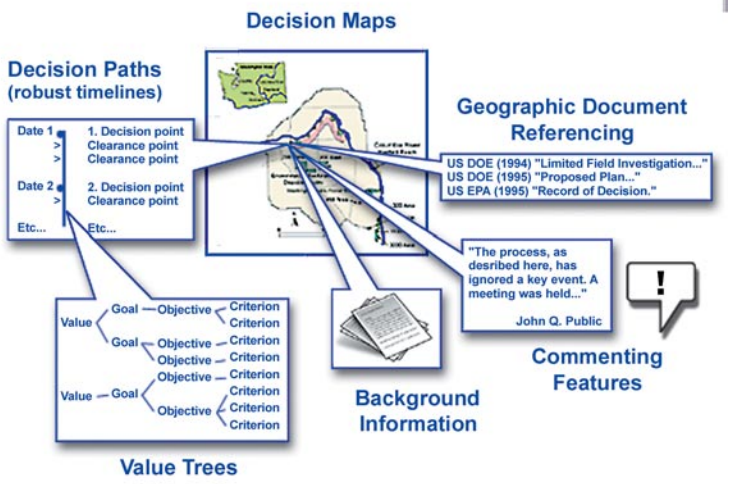

Figure 4

- Decision Maps consist of several interactive Web pages that connect decision information to geographic features on a map (spatial dimension). Decision maps are integrated with background information for geographic areas and decisions.
- Background Information provides contextual information, allowing users to learn more about Hanford history and how the Department of Energy makes decisions (socio-cultural dimension).
- Decision Paths describe decision process information (decision steps) on a timeline (temporal dimension) and provide direct links to online documentation. Each decision has one decision path (Drew et al. 2002).
- The Geographic Library connects decision documents to geographic features on a map (spatial dimension). Geographic libraries can be developed for different spatial scales.
- Value Trees provide rationale for the decision; ideally, broad values and goals as well as specific objectives and criteria are provided for both procedural and outcome aspects of a decision (socio-cultural dimension). A particular value tree could be associated with many decisions, and each decision could be connected to a number of value trees.
- Commenting Features allow users to make remarks about the decision or the DMS (socio-cultural dimension) and view remarks from others.

The DMS is intended to provide a transparent alternative to the current "public record" that documents decision information. A robust public record is important for the Hanford context because some radioactive contaminants may persist in the environment for tens of thousands of years and because the volume of relevant information is so vast. We believe that GIS and Internet technology could be powerful tools to better manage both documents and data important for the public record, but they are currently underutilized at Hanford. Geographic Information Systems have long been used as a tool to integrate data but we now propose that, when combined with other information structures (such as those in the DMS), GIS can be used to integrate information. This integration can allow participants to synthesize knowledge in new ways and more easily than in the past. Similarly, Internet publication will foster greater physical accessibility to information – mainly because of the number of cross-links that are envisioned for the system. Where possible, we have simply linked to existing information, but have also organized it in several ways – spatially, temporally, and conceptually. We hope that this multi-pronged approach will make the decision information easier to understand (i.e., so that it is more conceptually accessible). Internet publication should also allow a broader audience to access the information, but we recognize that Internet publication is not a panacea and it cannot replace the "grounded social relations" (Niles and Hanson 2001) essential to any decision process.

An important contribution of this research is to study how people want complex environmental decision information to be structured so that they have both physical and conceptual access to it. Our research design has been strongly influenced by a conceptual framework called Enhanced Adaptive Structuration Theory-2 (EAST-2) (Jankowski and Nyerges 2001), which provides a broad outline for exploring how geographic and other information technology is used in a group decision-making process (see also Nyerges et al. 2002). The research design includes an Internet survey that evaluates the ability of the DMS to provide information transparently. Concepts identified in the transparency literature review form the basis for the survey questions, resulting in an innovative protocol to evaluate the transparency of decisions (Drew 2002).

Conclusions

The issues introduced in this article are only a beginning. While the DMS is perhaps better characterized as "public records" GIS (Weiner et al. 2001) than PPGIS per se, we are excited by working hands-on with stakeholders to address the problem of organizing complex spatial information for broad consumption. Ideally, we will be able to continue with a planned "build out" of the DMS into a robust database driven PPGIS. (Currently, the only images and graphics available in the system are static image maps – there is no capability in the system to generate images, charts, or tables on demand.) Nevertheless, I believe that the deeper understanding about the meaning of transparency we expect to bring will be highly applicable to PPGIS research agenda. With this in mind, I'd like to make three summary points:

First, the participatory design model has been a key to our success. Hanford has been designated as a national repository for nuclear waste, giving it high priority as a local, regional, and national issue. The DMS was developed using a participatory

approach that incorporated several active local and regional Hanford stakeholders – including representatives from the U.S. Department of Energy, Washington Ecology, the U.S. Environmental Protection Agency, several activist groups, and university researchers. National, regional, and local stakeholders will also be involved in the evaluation of the Decision Mapping System. Preliminary reactions to the DMS have been overwhelmingly positive (Drew 2001). I believe that this response directly reflects the participatory approach used to develop the system.

Second, physical access is only a first step. Access is a major component of our working definition of transparency because it is a major concern of Hanford stakeholders. The participants of the Hanford Openness Workshops, for example, looked closely at the notion of "access" and concluded that physical access to documentation is only a first step. Tools to comprehend technical information contained in the documents, tools to see how documents and decisions fit together, tools that allow stakeholders to provide feedback on the documents and decisions, and tools that allow stakeholders to see how their contributions have influenced decisions are needed. These concerns have been a driving force behind the DMS and transparency research – particularly in regard to the system features that foster commenting and information integration. However, much more work is needed to make these goals attainable.

Third, place matters. The Hanford setting is extraordinarily complex and our findings will certainly be colored by this context. Some argue that Hanford is an excellent testing area because it often represents the worst problems – if you can make something work there, you can make it work anywhere. Others suggest that the Hanford context is so complex that results are simply not transferable elsewhere. Either way, our findings will only provide a partial "truth" which must be evaluated in other contexts.

These three lessons suggest that a dialogue about what transparency means, how it should be measured in different contexts, and its relative importance compared to other needs (e.g., equity or efficiency) should be a core component of any research agenda involving "communities" or the "public."

About the Author

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Acknowledgements

This research is supported by the Consortium for Risk Evaluation with Stakeholder Participation (CRESP) through a grant with the U.S. Department of Energy (Award No. DE-FG26-00NT40938). Any opinions, findings, conclusions, or recommendations expressed herein do not necessarily reflect the views of the Department of Energy. I thank the many Hanford stakeholders who donated time and energy to the project and to Tim Nyerges and the anonymous reviewers for comments on earlier drafts of this article.

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