The Production
of Information for
Genred Activity Spaces

Informational Motives and Consequences
of the Environmental Impact Statement

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Genres, although aligning people to joint activity and joint attention, shape the substantive material or information represented within the bounded space of the text. Each genre creates a space that prompts the production of particular kinds of information to populate that space. The National Environmental Policy Act of 1969 that mandated the Environmental Impact Statement (EIS) was invented out of a perceived social need for greater information about the effects of human activity on the environment. The EIS has since spawned a constellation of related genres, has created a large informational market to fulfill the requirements of these genres, and has led to a proliferation of information. The set of relations among genre, information, and activity found in this one sphere of environmental information are suggestive of how information is produced and used in generic forms.

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Recognizable distinctions among kinds of texts help orient language users within what might be seen as a vast and inchoate universe of

linguistic utterances. Genre recognition orients users to the kind of text, of course. Even further, genre orients users to the activity sphere within which the text operates (Russell, 1997a, 1997b); what acts such texts typically carry out and the sequences of texts that they are part of (Bazerman, 1994); what information, affect, and relation are typically realized (Bazerman, 2000a); what audience roles are typically afforded (Bazerman, 1988); what uses can conveniently be made of the text (Bazerman, 1997); and the usual means of interpreting the text (Miller, 1984). The typifications of genre are part of the typifications of social activity and of relations that help people make mutual sense of the life world (Schutz & Luckmann, 1973). In short, genre recognition attunes people in deep and complex ways as to what to make of the utterance and what role it plays within human activity (Bazerman & Russell, 2003).

In this activity-based view, texts, rather than being seen as fixed, formal, independent constructions, are seen as language in use. As language in use, texts mediate human activity, take on its meanings from its roles in the activities, and influence thought as participants make meanings of the texts within activities (Cole, 1996; Scribner & Cole, 1981; Vygotsky, 1986/1984). However, because written texts often come to readers' attention less fully embedded in the immediate situation that they are part of, readers may lack information about the activity being mediated by the text and their roles in that activity. The piece of paper could almost (but not quite) come from anywhere and from anyone and could (almost) travel to anywhere and to anyone—but the genre helps locate the text in some familiar social arrangements and activities, bringing it back down to familiar earth. Thus, genre provides a middle space for approaching production and understanding of text—between the immediate local knowledge of specific conditions of production and reception and an abstract world of symbols existing apart from any use and apart from any organized relation to readers. Texts mediate human activity at a distance and help enlist and align people to larger social institutions and practices, and text genres provide means of recognizing social relations, obligations, and interactions embodied within communications. Because they can create joint attention and alignment, genres are one of the key mechanisms that people have used to create and to maintain larger forms of social organization. But genres also shape the substantive material that is represented within the bounded space of the text—the meanings, information, and knowledge. The information that is produced for and displayed within a particular genre carries with it the

motives and the social relationships implied within that genre (Bazerman, 2001; Bazerman, in press).

The case presented in this article examines how a perceived social need for information motivates the creation of the genre of environmental impact statement (EIS). This genre creates a space that prompts the production of certain kinds of information to populate that space and creates a place for the display of that information. That display has embedded within it certain assumptions about the value and the uses of that information, which are presumed in the activities and the work carried out by each text within the genre. The EIS genre and the kind of work facilitated by it in turn have spawned a constellation of related genres, created a large informational market to fulfill the requirements of the genre and its extended family of related genres, and led to a proliferation of information. That information and the stances and activities implied by the initiating genres have influenced the ways people perceive, monitor, and act with respect to the environment. Although questions remain about the effectiveness of the genre and the information produced for it, those are questions about strengthening the communicative system through changing the genre and the conditions around it, not about doing away with the informational world it has fostered. To make those improvements requires an analysis of the connections among genres, the knowledge produced for and displayed within genres, and the uses intended for and the enacted uses of the knowledge. The set of relations among genre, information, and activity found in this one sphere of environmental information will be suggestive of a general understanding of how information is produced and used in generic forms for all other spheres of activity.

GENRE, CHRONOTOPE, AND INFORMATION

Each text opens up a space for communication and for symbolic action, to be filled by the specifics discussed in the text and the actions instantiated. However, not every text is equally likely to be filled with any piece of information or equally conducive to every form of communicative action. Each genre has a typical set of contents—things it includes with its boundaries, relations among various parts of the contents, transformations of those contents that occur within that bounded space, and work accomplished by those contents, relations, and transformations. Among the many things a genre orients readers

toward is the kind of informational landscape typically available within the text; that is, what kind of objects, actors, and events are presented within what kind of time-space setting. Mikhail Bakhtin (1981) calls this collection of informational elements associated with a genre the genre's chronotope. Bakhtin points out that as readers recognize a text as representing a fiction of the type of Greek romance, they know many things about the story, setting, and plot. The story, for example, will have "descriptions, often very detailed, of specific features of countries, cities, structures of works of art (pictures for example), the habits and customs of the population, various exotic and marvelous animals and other wonders and rarities" (Bakhtin, 1981, p. 88).

According to Bakhtin (1981), readers also know that "there is a boy and girl of a marriageable age. . . . They are remarkable for their exceptional beauty. They are also exceptionally chaste. They meet each other unexpectedly, usually during some festive holiday " (p. 87). The kind of effect such a story is intended to arouse is also typified. If readers were to be angered or, even worse, left cold rather than charmed by such a story, either they would judge this a poor example of romance or would find in it some other genre—such as a cultural critique in the form of a romance.

Shakespeare, near the opening of *Twelfth Night* (1949), charmingly plays on the expectation of a similar genre, the Renaissance Greenwood romantic comedy. At the opening of act 1, scene 2, on a ship approaching a strange land, Viola, the female lead asks, "What country, friends, is this?" The ships' captain answers, "This is Illyria, lady." Viola replies innocently, "And what should I do in Illyria?"

Of course, the audience immediately knows what she will do in Illyria. They know she will be in a land far from the concerns of daily life, will fall in love, will resist, will be witty, will dress up as a young man, will be caught in complications and sexually delicious ambiguity, and will be married in the end. They know the world they will be entering for the length of the play, exactly what to look out for, and what pleasures will be offered.

Equally, though less charmingly, an Internal Revenue Service tax form (Bazerman, 2000b) orients taxpayers to a land filled with requests for particular information to be reported in particular formats. This information will then be aggregated, subtracted, transformed into categories, defined as new financial entities, and ultimately calculated to define an obligation to be paid. The taxpayer's role involves a historical bureaucratic identity with a Social Security number and a recoverable, continuous history facilitated by

preprinted address labels. That historical bureaucratic identity also draws into the picture past filings and many other intertextually relevant current documents prepared by employers, clients, financial institutions, charitable organizations, and other financial entities. The majority of the entries in the tax form will appear as quantitative amounts in the national currency, and these numbers participate in a drama of relations and calculations that eventuate at the end of the text in that year's obligation. The informational landscape is bounded for the most part by the world of finances and is defined by the just-passed tax year, with some cumulative but limited relations to previous tax years. Love life has little bearing, except as it eventuates in dependents and in standard deductions or hotel bills misreported as business expenses. Of course, the informational landscape evoked by tax forms is a function of the jurisdiction's system of taxation that the taxpayer is held accountable to, as well as to the particular year's iteration of the tax law and procedures. But whatever the landscape is, it provides the scene of local representation, action, and agency. No matter how constrained by forms, conventions, regulations, and sanctions, the tax form becomes the scene of struggle between compliance and each individual's desire to protect personal financial interests. Each taxpayer works hard at creating the most favorable individual representation within the genred site of information aggregation, representation, and calculation that forms a highly consequential relation and obligation to the government.

Tax forms exemplify a particularly salient interaction of information and genre, suggesting how information arises and is used within certain genres that require, activate, and make meaningful and consequential particular information. They also suggest how information is produced to fulfill the needs of genres and the activity systems they realize. These genres regularly create spaces that need to be filled, and the information is produced to fill them. When the tax form annually arrives in the taxpayer's mailbox, the taxpayer knows that there will be consequences if he or she does not fill the blank spaces. The taxpayer must fill it, moreover, with information of the proper form and with proper pedigrees produced in related genres that are part of adjacent activity systems. Many accounting and record-keeping practices are driven by the documentary procedures of the tax system. As well, many other aspects of financial life are planned and executed with an eye toward how consequential they will be and how they will be reported on such tax forms. The genre is a key mechanism by which citizens are put at obligation to produce information of an

appropriate sort. The genre in itself is not enough to produce the information—systems of monitoring, legal action, police enforcement, and incarceration are just part of the coordinated systems needed to make the tax system work. The genre of tax form, nonetheless, crystallizes motives and compulsions to create a local habitation for the information to be lodged and recognized within. The genre and its associated informational space resides in and is animated by social systems and the interactions that have found the genre to be a useful way of doing communicative business.

NEPA AND THE NEED FOR NEW INFORMATION

The United States' National Environmental Policy Act (NEPA) of 1969 and its mandated genre of the EIS provide another site for examining the relations between information and the genres for which it is produced and through which it is made usable for social action. This case will highlight how a mandated genre, however faulty, can crystallize social motives for information and can facilitate the development of extensive and varied knowledge-producing activities that incorporate the motives and the stances of the genre and related genres. This case also raises questions about what makes for an adequate informational system, including both genres and social systems within which meaning, accountability, and consequences of the genred information are realized.

The emergence of large-scale production of certain kinds of information about how the environment is at risk and how the state of the environment places humans and animals at risk marks a major moment in both the environmental movement and the history of governmental involvement with natural resources. Although environmentalism has deep and complex roots in American and European philosophy, culture, and political ideology, in the United States, the environmental movement crystallized in only the early 1960s, catalyzed by Rachel Carson's (1962) exposé of the dangers of DDT and other insecticides and herbicides, *Silent Spring*. Carson gathered together the studies of the affects of DDT and other agricultural poisons that had been appearing in scientific and industrial journals and presented this material compellingly for the general public. (For an analysis of the rhetoric of this volume, see Waddell, 2000.) Her public presence brought widespread attention to information detailing the threat to the environment and the headlong rush to use dangerous

chemicals without adequate information about their long-term, cumulative, and environmental effect. A report of the President's Science Advisory Council on the use of pesticides soon followed, taking a much stronger stand on the dangers of pesticide use than it and other government agencies (such as the Department of Agriculture and the Food and Drug Administration) previously had (Wang, 1997). One consequence of the heightened concern for the effects of chemical poisons was a 1972 strengthening of the Federal Insecticide, Fungicide, and Rodenticide Act. This law provided for registration, data submission, and approval of pesticides for particular uses, as well as for the monitoring of production facilities and the seizure and the criminal penalties for illegal distribution and use. The act sets in motion standard genres for the registration of pesticides, the reporting of data, regulatory judgment, and criminal prosecution, in the pattern of other executive regulatory agencies. In this case, the administrator of the act is located within the Environmental Protection Agency (EPA), created by executive order in 1970.

But such focused regulatory legislation seemed to Congress to be only a limited solution not adequate to cover a much wider and more fundamental but poorly understood set of problems. A series of public alarms concerning fallout, soil erosion, loss of wetlands, clear-cutting, and oil spills had created a political climate of uncertainty about the environment. Dramatic events such as the oil spill in Santa Barbara, California, and the Cuyahoga River pollutant fire in Cincinnati, Ohio, mobilized public sentiment in support of the growing environmental movement and gave urgency and credibility to the information gathered and distributed through that citizen-based movement (Bazerman, 2001).

In the late 1960s, congressional committees received testimony from several quarters that both scientists and policy makers lacked adequate knowledge to understand what was happening to the environment and what needed to be done to preserve it. The U.S. House Committee on Science and Astronautics, for example, in June 1967, received a report from the National Academy of Sciences calling for federal engagement in the production of environmental information (National Academy of Sciences, 1967; U.S. House Committee on Science and Astronautics, 1967a). The committee then organized a seminar of leading scientists and science administrators where the same theme was raised (U.S. House Committee on Science and Astronautics, 1967b). The following year, the U.S. House Subcommittee on Science, Research, and Development, in a June 1968 report titled

Managing the Environment," repeatedly comments that current laws are inadequate to protect the environment because there is no provision for the accurate and meaningful pursuit of information and knowledge. The report concludes in italics: "*A well-intentioned but poorly informed society is haphazardly deploying a powerful, accelerating technology in a complex and somewhat fragile environment. The consequences are only vaguely discernible*" (p. 6).

Throughout the sections on findings and recommendations, the report stresses the information needs and the current ignorance, as well as the lack of objectivity within existing information-producing systems, leading to an emotionally charged, ill-informed climate for the development of policy. This characterization of emotionality embodies a governmental response to the oppositional and threat-laden concept of citizen's information developed in advocacy groups (see Bazerman, 2001). Also, the report reiterates the need for integrated approaches to knowledge system–based, ecological, and international approaches to the environment; life-long, holistic, and complex epidemiological views of health and genetic effects; and complex, public decision making for alternative development.

The interdisciplinary, dispersed, and incomplete nature of the relevant knowledge of such integrated thinking suggested to the report writers the multiplicity of executive agencies involved in environmental decision making. They saw the need for an integrative policy body that acted on increased information:

> Perhaps only the Congress has a large enough charter to encompass this management problem…. The best means of getting a long term rational management is to generate an information base and provide a policy for all operational programs which will cause individual decisionmakers to act in harmony with the entire system. (U.S. House Subcommittee on Science, Research, and Development, 1968, p. 29)

Shortly thereafter, a white paper on a national policy on the environment was submitted to the relevant U.S. House and Senate committees, based on a joint House-Senate colloquium. Again, the paper emphasized the themes of the need for knowledge and information, for integrated perspectives, of the lack of facts necessary for making policy, and of the lack of central bodies to aggregate and analyze information. Recommendations included the development of the needed information and increased science and technology with a specific focus on environmental management (Smythe, 1997, p. 11).

These reports and related hearings eventuated in NEPA, signed January 1, 1970, by President Richard Nixon (Smythe, 1997, p. 12). This act, though having regulatory goals, provided only for the production, reporting, dissemination, and analysis of the information to result in policy recommendations. The regulatory goals were to be achieved by the intermediate mechanism of improving governmental inspection and coordination rather than by direct regulation. Two particular mechanisms (so-called practicable means) were set up to carry out the improvement and coordination—both informational in character and both requiring the preparation and publication of reports. First, the Council on Environmental Quality (CEQ) was established to monitor governmental actions, make policy recommendations, and help the president in the preparation of an annual environmental quality report, which was to be the main vehicle of their findings and recommendations. Second, an EIS was to be prepared by each agency as part of each planned action of the federal government. Each EIS was to contain

1. the environmental impact of the proposed action;
2. any adverse environmental effects that cannot be avoided should the proposal be implemented;
3. alternatives to the proposed action;
4. the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and
5. any irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented (Sec. 102, 42 U.S.C. § 4332C).

In effect, the law mandated that particular kinds of informational documents to be prepared and disseminated, with an eye toward future policy and action. Both the CEQ report and the EIS were only loosely specified. These genres were intended to be inclusionary and open ended, based on interdisciplinary, nonquantifiable information from both social and natural sciences. These documents would require the production and the presentation of extensive information and would make that information available for both reflection and accountability by multiple agencies and audiences. Agencies would be forced to create accounts reflecting on the environmental implications of their actions. The CEQ and the president would review the EISs of agency actions and develop policy. Congress would consider

legislation based on the EISs and on CEQ and presidential reports. The courts would have EISs to rule on in cases involving the environmental effects of government actions. Finally, the public would have greater information with which to put pressure on government agencies and to act politically. Beyond preparation of these documents, however, no further actions were required by NEPA, no specific findings needed to be produced or acted on. The entire set of mechanisms was based on the assumption that if various parties had information on environmental consequences, they would act differently, would formulate environmentally conscious long-term plans and policy, or would hold other entities accountable for their actions in courts, legislatures, community hearings, and voting booths. Whether responsible action would result from the preparation of EISs was a question rarely raised. Many simply assumed that court-mandated "full disclosure" would guarantee fundamental changes in decision-making activity (Anderson, 1973, p. vii).

DIRECT REGULATION OR
REGULATION BY INFORMATION?

How these loosely defined genres worked out in practice is complex and controversial. Indeed, it has been complained that the lack of forced action beyond the preparation of documents has not intervened strongly enough in the motives and the practices of government agencies and that, therefore, it has not produced adequate environmental protection. Although some see the EIS's primary value as a "point of entry for concerned citizens to challenge government actions" (Anderson, 1973, p. v), others, especially environmentalists, argue that full disclosure should be linked to enforcement of substantive standards (LBJ School of Public Affairs, 1974, p. 10; see also Twiss, 1974). Moreover, the information produced by CEQ and EIS mechanisms is easily ignored by presidents. Insofar as the presidency has become an instrument of personal and of political-party agendas, environmental information has only as much consequence as the president wishes to grant it. Under an administrative concept of the presidency, however, such information and reports would be the very mechanism of administration and policy and thus would necessarily be influential (Caldwell, 1998, pp. 42-47). Furthermore, the courts have interpreted the law narrowly, holding government agencies only for due diligence in preparation of EISs and other documents but

not on acting on any of the findings or holding themselves to any level of environmental concern (Caldwell, 1998, pp. 54-55). (For another recent assessment of the court's interpretation of the NEPA-EIS process, see Byrne, 1996.) Carolyn Miller has seen the EIS as created by a congressional mandate insensitive to rhetorical dynamics. It is built on such unstable sands of situation, context, and purpose and is so rife with conflict and contradiction that it has no formal stability as a genre. She sees it as imposing, therefore, no normative rules on meaning hierarchy. Rather, she sees it as a class of discourses (Miller, 1980, pp. 237-246).

These critiques suggest that the EIS has no direct force in any tightly strung, relatively stable system of action, so it is not clear what exactly it does, how it operates, or what its force and meaning is or should be. These critiques are all based on the view that the EIS ought to be a direct regulatory genre rather than just an information-gathering genre. Yet the fundamental notion of the congressional framers of the act and of its chief architect and advocate, Caldwell, is that the informational processes are powerful in and of themselves. Nonetheless, in some other nations—for example, the Netherlands (Petts, 1999)—the EIS system has been modified to include forcing action and accountability.

These alternative evaluations of NEPA exemplify a conflict between two views of the operations of regulatory activity systems. The first view is that the activity system the documents are part of must mandate required actions and have direct enforcement mechanisms. This view assumes that government already knows what needs to be done and can frame regulation that will achieve known objectives through known, specific mechanisms. The second view is that the information, once created and presented within the activity system, if it is available and usable by relevant parties within the activity system, will have profound effects on the system. The information will create meanings that will influence the participants in the system such that they will act differently and modify the system in accordance with the information. This second view is consistent with a belief that government does not know enough to identify and to compel necessary action until it is more informed. The second view also is consonant with a belief that change occurs best when participants come to understand issues and are convinced of the need for change and action, whereas the first view relies more on legislative compulsion of recalcitrant actors to follow an externally imposed regime. Finally, the second perspective would direct government and

concerned citizens toward an understanding of informed environmental policy as an emergent and continuing process still very much present rather than as a resolved regulatory issue. Such continuing concern is exemplified in such documents as the 1996 study by the National Forum on Science and Technology Goals published by the National Research Council, *Linking Science and Technology to Society's Environmental Goals* and in the two lengthy volumes of the 1999 *Handbook of Environmental Impact Assessment* (Petts, 1999). At the same time, as this latter handbook documents methods, it examines fundamental questions of how environmental assessment can act as a policy tool and what the experience of 30 years reveals about focusing and improving environmental assessment as a policy tool regionally, nationally, and locally.

TOWARD THE INFORMATIONAL CONSEQUENCES OF THE EIS AND RELATED GENRES

To understand the power of the genres to create information that will amend behavior and policy requires a detailed investigation of the informational processes, the information genres, and the specifics of information that have emerged. As well, it requires an examination of the detailed mechanisms, social groups, and other entities that have emerged to produce and act on the information; that is, to suggest how the genre itself may have changed the social landscape of knowledge production and use. Furthermore, it calls for a study of the specific behaviors of the preexisting government entities in the light of information, the response of other actors, and the concrete actions and policies that have occurred in the wake of information.

A comprehensive view of what environmental information has come to mean and be goes beyond the scope of this study. This article, however, can present a few fragments suggesting that environmental information has proliferated since the passage of NEPA. These developments cannot be said to be directly caused by the genre. The genre and its many variations, nonetheless, have crystallized a stance toward information, provided a mechanism by which to identify the need for information, and provided a place for that information to be presented within a decision-making environment. The genre has provided a mechanism that has helped advance and proliferate a large market in information to monitor the environment and human actions affecting the environment. Most who now view the

environment view it differently—through the perspective of threat, mitigation, and protection, which were the motives built into this information-producing genre.

In the first 10 years of the law alone, more than 9,000 EISs were filed and more than 500 court cases eventuated. Currently, around 500 federal EISs are filed per year, averaging 204 pages, such that there are on the order of 20,000 federal EISs now available. In the government documents section of the University of California, Santa Barbara, library, several aisles of shelves are devoted to EIS and related documents. It is difficult to say whether the decreased number since the early years reflects a backing away from the intent of the law through an avoidance of the process, a more efficient recognition of those cases needing assessment, an exhaustion of the grandfathered issues, a regularization of the process, or some other cause. A 1997 CEQ study, *The National Environmental Policy Act: A Study of Its Effectiveness After Twenty-Five Years*, suggests that the NEPA processes are often initiated too late into projects to have sufficient effect and that citizen input is often not adequate (CEQ, 1997a, pp. 7-8); it also points to the wider use of less rigorous documentation of environmental assessments and of findings of no significant impact (FONSI) and of mitigated FONSIs as efficient but perhaps questionable ways of avoiding full EIS reviews (CEQ, 1997a, pp. 19-20). Other criticisms have been raised about the use of habitat conservation plans and other strategies that fold several sites or actions into a single EIS.

Whereas Miller (1980) gave a philosophical analysis of the rhetorical problems and contradictions faced by EISs, Ginger (2000) has examined how specific, situated, argumentative concerns gave shape to the structuring of information in EISs concerning wilderness-study areas. In these cases concerning a new Bureau of Land Management program, the shift of focus toward study areas and away from program establishment influenced the information included. Both studies indicate, as to be expected, that EISs are highly rhetorical documents and that the information landscape presented is shaped by the goals and the needs of the agencies preparing the documents.

An example of the current form of the EIS as practiced by the U.S. federal government as originally mandated by NEPA is the draft EIS prepared by the National Park Service concerning future use of the Cane River Creole National Historical Park in Natchitoches Parish, Louisiana (National Park Service, 2000), supplemented by a few amendments in the final EIS (National Park Service, 2001). The draft EIS, consisting of an almost 300-page book, including front matter

and appendices, considers many areas and domains of affected environment. The final version consists only of about 15 pages to be substituted in the draft, with paragraph length or shorter changes concerning mostly matters of historical detail or added citations. There is no change that substantively affects the assessment of environmental impacts.

The draft is prefaced by a 5-page summary and begins substantively with a description of the park and heritage area, along with a rationale and a set of goals for the plan. Five alternative plans are then described, starting with the preferred alternative. This brings readers more than 100 pages into the document. The next 60 pages are devoted to a description of the environment in the region. The environment is broadly and interdisciplinarily construed to include all aspects of human and nonhuman life as well as inanimate nature. The historical and cultural background of the two plantation sites in the park are examined first, along with an examination of the archeological, cultural, and ethnographic resources available, as well as the actual collections and buildings on-site. Also described are visitor use, recreational resources, and socioeconomic environment. Only about 10 of the 60 pages that are devoted to a description of the environment focus on those items more typically thought of as environmental: air quality, geology and soils, floodplains and wetlands, water resources, water quality, wildlife, threatened species, farmland, and hazardous materials on or near sites and dams in the region. Three further pages are devoted to land use and trends. Finally described are regional planning items, such as land use, roads, bridges, and transportation.

Another 80 pages are then devoted to the effects of each of the five alternative plans on all the aspects of environment previously described, along with a statement of impacts common to all. Again, only about 10 pages are devoted to a discussion of effects on natural resources and an additional five on land use. Although the topics covered seem comprehensive, the descriptions of the resources and effects are summative and not very technical, aimed more to a general public understanding than to warranting the conclusions through technical analysis and extensive data, although a number of data charts are presented. Overall, it seems that public accessibility and straightforward policy consequences are advanced in a plain-language mode. The depth of the underlying analysis and data gathering, however, remains obscure. Further, there is no zero-change alternative examined, so there is no true zero baseline against which to

examine environmental consequences. The law and regulations apparently do not mandate any baseline or control situation for comparison. There appears to be no experimentation or scientific peer review. The inspection of the document depends entirely on monitoring from motivated citizens, which requires the continuation of an activist, information-engaged citizen movement of the sort that existed prior to NEPA, that created the conditions for NEPA, and the impulse of which was coopted into NEPA.

EIS AND THE GROWTH OF THE MARKET IN ENVIRONMENTAL IMPACT ASSESSMENT

Despite the apparent limitations of the EIS as practiced according to NEPA, the format has been picked up and adapted widely, suggesting the value of the rhetorical impulse embodied within it, though perhaps with major modifications of particulars. Environmental impact assessment is now accepted internationally as a widely useful decision tool, with versions adopted in at least 25 states and 80 countries (CEQ, 1997b, section II: 10). Environmental impact assessment also appears in international treaties such as the United Nations–sponsored conventions on biological diversity and the framework convention on global change (section I: 27), as well as the Convention on Environmental Impact Assessment in a Transboundary Context, approved by the European Community and at least 22 other countries (section II: 85). Environmental impact assessment documents are also prepared as part of economic planning by the major multilateral financial institutions, such as the World Bank, the European Ban for Reconstruction and Development, the Inter-American Development Bank, the Asian Development Bank, and the African Development Bank. (section I: 198-120). In various jurisdictions, they need be prepared not only for government-sponsored projects but also for private and corporate projects requiring zoning or other government approval.

NEPA, along with affiliated legislation and executive orders, has created a massive bureaucratic system with a 31-year history of activities. NEPA was only one of many congressional acts passed in recent decades, but it is the most comprehensive and general. Almost all of the acts, however, have their informational component. Almost all, also, are administered, at least in part, through the EPA. In fiscal year 2000, the EPA had a budget of 7.5 billion dollars and a workforce of

more than 18,000. The EPA Web site contains extensive databases on multiple areas of environmental concern, including air, chemicals, facility information, grants and funding, hazardous waste, risk management plans, superfund, toxic releases, water permits, drinking water, drinking water contaminant occurrence, and drinking water microbial and disinfection-byproduct information (see http://www.epa.gov/pesticides/fifra.htm#contents). It also serves as a clearinghouse for information created by universities and other public entities.

The environmental sciences have greatly expanded in activity to document and understand environmental phenomena. According to the Institute for Scientific Information's Web of Science, 3,481 science or social science articles with *environment* or *environmental* listed as a keyword were published between 1960 and 1969; of these, 2,452 were published in the latter half of the decade, after the release of Carson's (1962) *Silent Spring* (Institute for Scientific Information, 2002). In the 1970s, the number of environmental articles tripled to 11,783. In the 1980s, nearly 18,000 environmentally oriented science or social science articles were published in the English language, and in the 1990s, that number grew to a staggering 117,082. The increased environmental presence in the literature was not restricted to policy issues or the so-called soft sciences. According to Hoffman (1997, p. 114), the number of environmental articles published annually in *Chemical Week* alone increased from 5 in 1965 to nearly 30 in 1973; by 1994, that number reached 55. Likewise, industrial environmental expenditures in America have steadily increased since the early 1970s, from $5 billion in 1973 to $25 billion in 1992 (Hoffman, 1997, p. 25; see Palmer, Oates, & Portney, 1995, for less conservative estimates).

For the most part, the scientists and engineers carrying out this work have been trained in and remain affiliated with traditional disciplines, such as geography, biology, chemistry, and mechanical engineering, even though they focus on environmental problems. Within those fields, however, identifiable specializations have formed. In landscape architecture, some scholars now list environmental issues among their research interests, and symposia, such as the 1998 "Environmentalism in Landscape Architecture" sponsored by Studies in Landscape Architecture at Dumbarton Oaks, provide communicative spaces (see http://csf.colorado.edu/ecofem/feb97/0032.html). The situation is similar in geography: Some geographers, especially physical geographers, list environmental concerns among their research interests, and newly developed centers of research, such as the Lovell

Center for Environmental Geography and Hazards Research at Southwest Texas State University, provide important sites of interaction for environmentally oriented geographers. But such research centers do not provide geographers with their primary affiliation, nor do they offer specialty-specific employment or publication avenues. Plenary papers from the Lovell Center's Conference on Environmental Geography, for example, were published in the mainstream journal *Physical Geography* (see http://www.geo.swt.edu/lovell/purpose.html).

Additionally, several new aggregative specialties have arisen to deal with the large and complex amounts of environmental information and the ways they interact with other forms of large, aggregated knowledge. In 1975, an international panel of editors led by S. E. Jorgensen launched *Ecological Modelling*, an interdisciplinary journal dedicated to the "use of mathematical models and systems analysis for the description of ecosystems and for the control of environmental pollution and resources development" (Jorgensen, 1975, p. 1). For the first time, mathematicians, systems analysts, and computer scientists grappling with environmental problems had a unifying rubric from which to follow or contribute to this rapidly growing area of activity. Likewise, by the 1990s epidemiologists and public health professionals with a special interest in environmental factors had their own International Society for Environmental Epidemiology as well as two journals, the *Journal of Exposure Analysis and Environmental Epidemiology* and the *Journal of Environmental Epidemiology and Toxicology*. Other aggregative specialties include environmental statistics, with the journal *Environmental and Ecological Statistics* first appearing in 1994 and the *Journal of Agricultural, Biological, and Environmental Statistics* first appearing in 1996 (see also Cothern & Ross, 1994), and environmental information systems, with the first meeting of the International Symposium on Environmental Software Systems in 1995 and several major programs arising around then (see also Günther, 1998). These, nonetheless, are considered part of the disciplines, and people trained in these specialties are hirable within university departments in the traditional disciplines, even if their publications are in environmentally focused journals (Arturo Keller, personal communication, June 3, 2001). A striking example of this is ecology, which as a field dates back to the mid–19th century when Haeckel introduced the term to cover the study of the interactions between species and their environments (Dajoz, 1977). However, it remained a rather esoteric, somewhat mathematical study with little direct application until the

rise of the environmental movement, which used systemic ecological thinking (Hoffman, 1997).

In at least two cases, however, environmental subfields have taken on distinctive characteristics that have, in essence, created new domains of knowledge. Environmental economics emerged into its own in the late 1970s with the founding of a journal and a society and now is so distinctive from mainline economics that anyone who publishes only in environmental journals is no longer considered a mainline economist employable in an economics department (Arturo Keller, personal communication, June 3, 2001). In the case of toxicology, turning to environmental issues has meant major transformations in theoretical orientation, research methods, and research focus. Modern toxicology as a field dates back to Matthieu Joseph Bonaventura Orfila (1787-1853), the attending physician to Louis XVIII of France, but its focus was traditionally on the effects of particular agents on individual organisms. However, the rise of the environmental movement and the particular impact of toxic agents on entire populations and the ecology gave rise to the new field of ecotoxicology. The name was coined in 1969 by Truhaut, but the style of work goes back at least a decade and was popularized in *Silent Spring* (Carson, 1962). This field was concerned with large, aggregate data about population dynamics in contrast to the individual approach of the older disciplines. The field began to flourish in the 1970s after NEPA with the founding in 1973 of *Archives of Environmental Contamination and Toxicology* and the highly technical and mathematical journal *Ecotoxicology and Environmental Safety* in 1977. Collections on particular topics soon followed like Boggess and Wixson's (1979) *Lead in the Environment*; Nriagu's (1979) *Copper in the Environment*; and Nriagu's (1980) *Cadmium in the Environment*. A decade after, summative textbooks for graduate training such as Newman and McIntosh's (1992) *Metal Ecotoxicology: Concepts and Applications* and Boudou and Ribeyre's (1990) *Aquatic Ecotoxicology: Fundamental Concepts and Methodologies* appear. The authors of the latter remark, "Ecotoxicology is one of the essential disciplines which provide the scientific basis for environmental protection policy." The preface of the book laments the inadequacy of traditional toxicological methods in dealing with sublethal effects of harmful substances on complex environments and offers this book as a step in the new direction (Bazerman & De los Santos, in press).

One indicator of the growth of knowledge professions in the wake of NEPA and related legislation is the emergence of graduate

programs in environmental studies and sciences. *The Guide to Graduate Environmental Programs* (Student Conservation Association, 1970) indicates that although programs in zoology, botany, and forestry that now do environmentally related work have long-standing histories, some going back almost a century, all those programs designated by some direct environmental term were founded from 1968 onward. Examples include Ball State University's Department of Natural Resources and Environmental Management, founded in 1970 (p. 59); Baylor's Department of Environmental Studies, founded in 1969, and the Program in Environmental Economics, founded in 1978 (p. 67). Within the University of California (UC), UC Berkeley's Program in Environmental Law began in 1990 (p. 291); UC Davis' graduate group in ecology started in 1968 (p. 292); UCLA's Environmental Health Science Program began in 1989 (p. 294), its Geography Program in 1971 (p. 297), and its Environmental Science and Engineering Program in 1973 (p. 299); UC Santa Barbara's Bren School of Environmental Science and Management began in 1996 (p. 301) with an earlier undergraduate Environmental Studies Program in 1969; and UC Santa Cruz's Environmental Studies Board formed for undergraduates in 1970 and for graduates in 1994 (p. 303).

CONCLUSIONS

The EIS was the first mechanism for creating broad-focus, government- and large institution–sponsored interdisciplinary knowledge for public policy and planning. It arose in response to public informational movements and within a political climate calling for openness of governmental proceedings and information—the same climate that produced the Freedom of Information act, first passed in 1966 and amended in 1974, 1976, 1986, and 1996. Thus, not only was information made available for public planning, it was made open for public inspection, accountability, and political action and decision. Thus, it presents a very different informational regime than existed in the period immediately following World War II and was part of the reaction against government control of information during that earlier period.

The EIS clearly was only the first of a much larger class of environmental assessment and planning documents, which provided space and need for many forms of information about the environment and

which supported the development of many scientific and social-scientific specialties. Many questions remain about

1. how this knowledge enters into voluntary and compulsory decision making at all levels of state, national, and international government and institution planning and decision making;
2. who has the means and access to produce, make visible, and make imperative what kinds of information bearing whose interests;
3. what the underlying assumptions and enthymemes of these forms of information are and how they enter into the systems of activity that bear on the environment; and
4. whether adequate information is produced by the genre to make wise policy choices and to persuade all parties that need to be brought into the decision-making and decision compliance process.

Every one of these questions raises readily visible problems and raises causes for cynicism. But having recognized that the environment is endlessly complex, particularly as it interacts with human life, there seems to be no other choice except to produce and to ponder the forms of information that concerned researchers can create. Language—symbolic representation—has been associated deeply for millennia with reflection for purposes of action. Creating genres for the production, contemplation, and decision making of information is an essential part of the reflective monitoring of collective behavior and its impact on the world.

More generally, this case furthers the argument that information is properly understood within the social systems, social activities, and textual forms within which it is produced, represented, and used. Although information created in one system of activity may be imported to another, that importation raises issues of translation and recontextualization. Information does not immediately transcend the social conditions of its making but rather carries its communicative and activity genealogy with it. This case further suggests that information is available only as it is made, and if people feel in need of information they need also foster the communicative systems in which the information will emerge and be made available for use. Any contradictions, difficulties, or trade-offs that go into creating those informational genres will likely have long-lasting consequences in the character of information produced and its usefulness for the purposes that motivated its production. These are useful cautions for an age that puts so much stock in the production of information, sees in the potential universal availability of information a

resource of universal application, and accepts the general authority of information. Producing, disseminating, and using information is not as easy as it might appear. Rather than removing deliberations from the realm of values, interests, and social dynamics, information draws discussions into ever more sophisticated and abstracted scenes and systems of rhetorical deliberation and action.

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