

UC Irvine

UC Irvine Previously Published Works

Title

Analytics for local knowledge: exploring a community's experience of risk

Permalink

<https://escholarship.org/uc/item/13t2m3r1>

Journal

Journal of Risk Research, 24(7)

ISSN

1366-9877 1466-4461

Authors

Lejano, Raul P
Stokols, Daniel

Publication Date

2018-10-09

DOI

10.1080/13669877.2018.1476902

Peer reviewed



Analytics for local knowledge: exploring a community's experience of risk

Raul P. Lejano & Daniel Stokols

To cite this article: Raul P. Lejano & Daniel Stokols (2018): Analytics for local knowledge: exploring a community's experience of risk, Journal of Risk Research, DOI: [10.1080/13669877.2018.1476902](https://doi.org/10.1080/13669877.2018.1476902)

To link to this article: <https://doi.org/10.1080/13669877.2018.1476902>



Published online: 09 Oct 2018.





Submit your article to this journal [↗](#)



View Crossmark data [↗](#)



Analytics for local knowledge: exploring a community's experience of risk

Raul P. Lejano^a  and Daniel Stokols^{b,c} 

^aSteinhardt School of Culture, Education, and Human Development, New York University, New York, NY, USA; ^bDepartment of Psychological Science, School of Social Ecology, University of California, Irvine, Irvine, CA, USA; ^cDepartment of Urban Planning and Public Policy, School of Social Ecology, University of California, Irvine, Irvine, CA, USA

ABSTRACT

In privileging expert risk assessments, we may be failing to recognize the authenticity of a community's actual experience of risk. We should remind ourselves that expert measures are always only partial, often surrogate, estimates of such experience and, at times, may fail to capture the actual nature of risk. There is a need for modes of analysis that allow better description of risk as experienced by community. We develop and test the methods for exploring hitherto delegitimized modes of knowing risk. In this exploratory research, narrative-linguistic analysis and cognitive mapping were used to evaluate the experience of residents near a large, municipal landfill. Text was analyzed, in part using speech-act theory. These methods aspire to thick description, as opposed experts' thin description of risk, and add to the analytical tools at our disposal.

ARTICLE HISTORY

Received 15 September 2017
Accepted 11 April 2018

KEYWORDS

Risk analysis; local knowledge; phenomenology; environmental justice; speech-act theory

Introduction

We begin by problematizing the so-called 'knowledge gap' between what are often referred to as expert and lay communities. In this framework, the lay community consists of members of the general public and, at times, more specifically referring to the population subgroup directly dealing with some environmental or other problem. The expert community, on the other hand, refers to the corps of professionals trained in methods for measuring and assessing these phenomena. The gap, sometimes referred to as a knowledge deficit (Frewer et al. 2003; Michael 2012; Irwin 2014), refers to the differences in how the public understands the issue versus how the experts do. The implicit assumption is, conventionally, that the public's understanding is flawed or biased and that only expert assessments are accurate and objective enough to be relied on.

Although we do not contest the value of technical expertise, we, however, open up the discussion to more nuanced understanding of the different ways that risk is assessed. We remind ourselves that expert analyses of risk are, a priori, estimates or approximations of a phenomenon, the totality of which is experienced only by the persons at risk. Contrary to the implicit notion of a knowledge deficit (where public understanding of a situation falls short of the expert assessment), the technical assessment is but an approximation of the real phenomenon, which is what persons at risk actually experience.

Take the example of a community that is beset by air toxics emanating from a nearby, noxious facility. The conventional risk assessment is based on the measured (or estimated) concentrations of a list of several hundred carcinogenic and noncarcinogenic toxic compounds (e.g. the Integrated Risk Information System database¹). As comprehensive as they may be, these lists cover but a small fraction of the thousands of chemicals found in the ambient air around the facility. In addition, these chemicals are designated as toxics on the basis of a limited set of potential health outcomes that does not exhaust all the effects that might be experienced by the community. The expert assessment is but a partial estimate of the total phenomenon that makes up the community's experience of the situation. In a sense, the knowledge gap can be understood to go the other way, where the expert assessment can fall short of the gestalt that is experienced by community. Later in this article, we describe a case study in which this indeed seems to be the case.

Indeed, scholars have questioned the assumptions implicit in the knowledge deficit model and the consequent practices that result. Some have pointed to the valuable knowledge often contributed by community members in bringing richer, contextual knowledge to these issues (Brown 1992; Wynn 1996). Others maintain that experts and the public may employ different modes of understanding a situation, but that these different ways of knowing can complement and enrich each other (Lejano and Ingram 2009).

Much of the risk analysis literature, in fact, acknowledges the importance of people's experiences of risk and encourages participation by community (e.g. Petts et al. 2001; Horlick-Jones et al. 2003). However, there is nonetheless an implicit assumption that, when perceptions of risk by community differ from the expert's, that there is some bias or lack of information on the public's part. We see this implicit assumption in the studies that examine biases and heuristics in public estimates of risk in which the latter are compared with expert estimates of risk and differences defined as bias (e.g. Dake and Wildavsky 1991; Marris et al. 1998). Even when the researchers intuit valid reasons behind the public's different understanding of risk, the latter is forced to take the same form of the expert interpretation of risk, which is usually a unidimensional number – for example, probability of an adverse health outcome or a similar estimate based on a rating scale (e.g. Kasperson et al. 1988; Slovic 2000). Indeed, classic studies comparing lay and expert estimates of risk mainly constrain judgments about risk to these unidimensional measurements (e.g. Slovic et al. 1985; Flynn et al. 1993; Barke and Jenkins-Smith 1993; Gutteling and Kuttschreuter 2002; Savadori et al. 2004; Siegrist and Gutscher 2006).

A person, who experiences the risk situation, may understand the risk in ways different than the expert's and, in fact, not directly comparable to the latter. Hence, the experience of risk will include more aspects of the situation than that observed or measured by the expert. Although there is recognition of this fact, there is a lack of alternative modes of describing risk (in terms faithful to the way the it is experienced) other than in the mode (usually probabilistic) used by the expert.

If people employ different models for representing and understanding risk, then the problem is that risk, as understood by the public, is not entirely encompassed within the expert's (necessarily) limited framework. Hansen et al. (2003) suggest that lay assessments of risk are multidimensional, as opposed to expert assessments, revealing value judgments and other factors. As Slovic (2000) suggests, it may be that the public's 'conceptualization of risk is much richer than that of experts and reflects legitimate concerns that are typically omitted from expert risk assessments'. In this case, the expert community and the public may literally be speaking in different 'languages' (Douglas 2013, 14). If risk is understood by residents, workers, and other publics in modes other than probabilistic, then we do not have a common plane of discourse (e.g. Garvin 2001). Indeed, there are, by now, ample voices suggesting that what really characterizes expert and public knowledge is an issue of rival rationalities (e.g. Margolis 1996; Rowe and Wright 2001; Sjöberg 2011). The problem is that, even when experts acknowledge the validity of public perceptions of risk, they analyze risk in a narrow, technical way and confine public perceptions of risk to these limited forms of expression. If expert risk assessments are "thin"

unidimensional descriptions, then we need analytics for the "thick" description of risk. In this article, we take up the need for alternative analytics for describing risk as experienced by community members.

We discuss our efforts to find new modes of description that can bring out the seemingly multiple ways of cognition and judgment that people employ in situations of risk. Over a period of 6 months, we conducted workshops within a community situated next to a large municipal landfill, and employed new analytic methodologies to evaluate risk, namely, narrative analysis and cognitive mapping. First of all, talk (or narrative) is the plane of representation that seems to most clearly bring out people's richly varied modes of cognition or reasoning about risk. We add to these new methods of employing cognitive maps which bring out spatial modes of cognition which do not seem to be captured well in narratives. This is exploratory work that tests new ideas for risk analysis. What the research is beginning to bring out is a rich manifold of reasoning modalities which depart from the unitary plane of risk in its positivist form. This research responds to recent literature that suggests the need to account for fundamental differences in the mode of risk-related reasoning employed by people (see Sjöberg 2002; Frewer et al. 2003; Bickerstaff 2004). As Moore and Stilgoe (2009) suggest, we need to undo the rigid dichotomies that have separated technical, scientific knowledge and community experience, the latter often pejoratively characterized as lay, anecdotal opinion. At the same time, we emphasize that the alternative risk analytic approaches we develop complement conventional expert risk assessment and do not in any way deny the value of the latter (van Zwanenberg and Millstone 2000).

The main problem being taken up in this article is the inadequacy of technical/expert modes of risk analysis to capture the complex experience and impact of risk on community residents. This brings us to the main question being explored, which is: what alternative modes of analysis (i.e. description of the situation) to better capture community, or local, ways of knowing?

Conceptual foundations

The risk analysis model draws from a history of fundamental research in cognition and decision making, most notably the developments in the areas of psychometrics (Fischhoff et al. 1983; Slovic 1987) and prospect theory (Kahneman and Tversky 1979). The most basic model, from which all of these theories draw, is a decision-theoretic one (von Neumann and Morgenstern 1943) in which risk factors in as probabilities within an expected utility model of judgment. This model constructs risk as a unidimensional (probabilistic) measure and equates the (potential or real) impact of an environmental threat in terms of risk as probability. This stands in stark contrast to the way someone subjected to these threats might describe them, which is as real effects that are experienced bodily (as well as emotionally and psychologically). Expressing risk as probability can be seen, for example, when analyzing exposures to carcinogenic air pollutants and describing such in terms of probabilities of developing cancer through the course of the person's lifespan. Alternatively, an even simpler mode of description is often used, when translating these measures into exceeding or not exceeding a certain level of acceptability, as in describing whether a noncarcinogenic toxic substance exceeds a 'reference exposure level'.

Often, estimates of the risk (i.e. probability) of different health outcomes are lumped, usually additively, into a single cumulative risk measure. Alternatively, an even simpler mode of description is often used, when translating these measures into exceeding or not exceeding a certain level of acceptability, as in describing whether a noncarcinogenic toxic substance exceeds a 'reference exposure level'. In a real sense, the complex manifold of effects from an environmental threat can be reduced to a single unidimensional measure. Contrast this to the complex experience of the situation which, as we will see in the case study, is necessarily multidimensional and, often, not quantified.

A problem arises, however, when we consider that risk may not simply be a scalar measure but, rather, a multidimensional phenomenon. To some extent, the psychometric literature has captured the aspects of this – for example, some risks are regarded with varying degrees of familiarity or dread in ways completely apart from probability (Kahneman and Tversky 1979; Covello et al. 2012). Some posit risk as a topological measure – that is, a multidimensional construct wherein the different dimensions (e.g. utility, emotion, and morality) may not be reducible to one common measure (Lejano 2006). If this were to some extent true, then a single (probabilistic) measure of risk may not suffice. A geometric analogy may be useful, at this point. When we posit an object (e.g. risk) reductionistically, it is like viewing a three-dimensional (or n -dimensional) object from one angle. From this perspective, we can imagine the face that we are viewing to be the object, which then appears as a planar figure. The analogy can be extended to any dimension, in the same way as an n -dimensional figure can project as a plane, line, or point onto two-dimensional space or a line or point in one-dimensional space.

If we define risk as probability, then naturally, this precludes nonprobabilistic ways of expressing risk. However, if we conceive of risk as a *phenomenon* – that is, something only fully understood when experienced, then we must admit of differing ways of understanding and representing risk. Perhaps, people understand risk along different dimensions. For the purposes of terminology, we call the multi-dimensional phenomenon that we treat as the object of our research the *experience of risk*. Essentially, the research is about pursuing a deeper understanding of risk as experienced and, hence, takes up suggestions that have already been made in the literature (e.g. Sjöberg 2002, 2011; Slovic et al. 2004). In fact, other researchers who have begun describing risk judgment in terms of localization, that is, the manner by which people understand an abstract concept by referring to their own personal experiences or by referring to elements in their immediate locality (Bickerstaff and Walker 2001; Irwin 2002), are essentially talking about the dimension of *experience*. Furthermore, personal and community understanding of risk is not merely a cognitive phenomenon but an *embodied* one (Brown et al. 2004).

This involves a search for new dimensionalities of understanding risk which motivates us to take a somewhat phenomenological stance. There is a growing store of research in psychology (and, in particular, environmental psychology) on phenomenological approaches to environmental cognition (e.g. Kruger 1979; Gerber and Kwan 1994; Stefanovic 1992; Ohta 2001; Seamon and Mugerauer 2012). Much of this research employs open-ended or semi-structured interviews to uncover subjective frames of understanding, which is the same with this article. Another element of the approach involves, for the moment, bracketing, or setting aside dominant conceptual frameworks, that is, the classic model of risk, and inquiring into additional modes of cognition. In this manner, the research method resembles the phenomenological method of epoché, wherein we try to gain insight into the characteristic of a phenomenon by attending ‘to the things themselves’ (Husserl 1913). This means trying to find approaches that will lend insight into the ways that a risky object or situation makes its presence known in people’s consciousness.

The crux of the matter is translating the categorical difference between community and expert ways of knowing into analytics. Clifford Geertz, referring to the former as local knowledge, depicts it as the difference between ‘experience–near’ and ‘experience–distant’ concepts (Geertz 1974, taking these terms from Kohut). Lyotard (1979) distinguishes two forms of knowing as technical knowledge, which uses the language of the expert, and narrative knowledge characterized by everyday talk, which is the language of community. Although the former requires professionalization and certification within a disciplinary specialization, the latter is inclusive of every member of community. Furthermore, the latter speaks to the kind of knowing particular to those who experience a situation themselves, as opposed to the expert who observes the situation from a distance. Table 1 summarizes the contrast between the two in terms of three modalities: distance versus proximity to the experience, technical versus narrative modes of description, and itemization versus integration of the facets of the experience.

Table 1. Contrasting expert and local knowledge.

Expert knowledge	Local knowledge
Neutral, third-party observation	Direct, first-party experience
Technical measurement	Personal experience
Itemized knowledge	Integrated knowledge

This then brings us to the main question behind the research, which is: what alternative modes of analysis (i.e. description of the situation) to better capture community, or local, ways of knowing?

Taking a cue from Lyotard, we intuit that, perhaps, narrative can be the vehicle for capturing the experience of the affected community. In other words, rather than technical measurement, people describe their experience by telling a story. In other words, we will investigate whether the answer to the above question might be ‘narrative’ (or ‘everyday talk’) as a primary way of describing and analyzing community’s experience of risk. A rich source of descriptive content is the very way that people talk. The study of narrative stems from the realization or claim that narrative is the most basic mode by which people transmit knowledge (Bruner 1986; Polkinghorne 1988; Griffin 1993) and that, it stands to reason, narrative analysis is a powerful way to uncover different knowledge (e.g. Gadamer [1960] 1975; Lyotard 1979; Ricoeur 1991). We do not have to wonder, for the moment, if the way people talk truly represents the way they reason. Some have claimed that talk, itself, and the social conventions around a specific language, is constitutive of knowledge (de Saussure 1915; Wittgenstein 1922), but we do not need to assume this. For the practice of risk communication, differences in talk are important enough as we merely wish to draw a contrast with the classic model of risk communication that often employs a unitary model of talk.

In our analysis of the ways people talk about a risk situation, we consciously seek out different modes of talk that might correspond to different ways of reasoning. Interview transcripts were read and reread to come up with categories inductively (Banister et al. 1994). Each of these categories or types of talk about risk can represent differing dimensions of the total phenomenon of risk cognition. The differing types of statements found in the transcript are defined and discussed in the Context and methods section.

Of course, technical evaluations are, ultimately, expressed using language (as text in a report). But our main contention is that such text will differ from the richer narrative mode of descriptions used by those who experience a risk directly. Technical (or agency) communication will consist of statements that mainly express these objective measures (which, later in this article, we will refer to as valuative statements). In contrast, the narrative descriptions of those who actually experience the risk can consist of a richer set of utterances expressing not just valuation, but emotion, moral judgment, relationship, and others. As the experts do not experience the risk directly, their descriptions are limited to the valuative, objective measures characteristic of the technical way of knowing. A person’s description of her experience of risk is, by definition, subjective, as it expresses personal experience. We will formalize this supposition later on. We will investigate the differences in the types of statements used by the technical agency and community members in describing risk. There will be differences in the terms used, of course (i.e. technical terms vs. everyday language), but our claim is that there will be categorical differences in the kinds of statements made by each party, these different categories pertaining to different and multiple ways of understanding risk.

There are aspects of experience that do not seem to be well captured by analyzing talk, however. For example, the salience of risk may have a spatial component that talk does not reflect. At the same time, we have been influenced by the unique insights into the use of cognitive mapping as a way to bring out people’s understanding of place (e.g. Lynch 1960; Milgram and Jodelet 1976; Appleyard et al. 1964; Orleans 1973). It seemed useful to us to consider whether these same mapping techniques could be used to explore how the experience of risk might

manifest itself as a feature of place. There is ample support from the literature on how place and elements of place enter into cognition in ways other than the simply locational. For example, a transactional model of person–environment interactions suggests that people and groups appreciate (or dread) places according to their degree of fit (or lack thereof) with their needs, goals, and standards (Stokols 1981; Saegert and Winkel 1990). Presumably, the degree of incoherence of a risk-posing landmark (e.g. a landfill) with personal or group identity and objectives should influence their evaluation of it. In this study, we utilized mapping techniques to see whether some of these cognitive patterns show up as distortions or other patterns in the sketches.

The rest of the article discusses the exploratory, empirical research. The main goal of the research is to explore novel, nontraditional modes of analysis that might better capture the community experience (instead of the expert's assessment) of risk. There are three parts to the study.

The first examines themes in the verbal accounts of residents about living adjacent to a large municipal landfill and impacts on them of the latter. The main focus of this part is to examine the range of types of statements made by the resident, which correspond to a range of different ways of understanding and describing risk.

In the second part, this same analysis is applied to text from an environmental impact report in which text from residents is compared to that from the agency. The presumption is that expert discourse employs mostly valuative modes of analyzing the risk, whereas community discourse employs a wider range of statements.

In the third part, a novel graphic approach is used to analyze community experience of risk. The main idea is that free-sketched maps of the neighborhood and landfill might reflect residents' feelings or perceptions of the landfill.

These three sections, combined, illustrate how we might conduct risk analysis in novel ways that explore the multidimensionality of risk. Analyzing residents' narratives allows us to both tap into local knowledge and nonmeasured, perhaps incommensurable, dimensions of risk. These aspects of risk are generally not reflected in environmental impact analyses, but they surely are the effects of significance. The second section contrasts residents' discourse with that of agency talk, illustrating the distance between the two, reflecting how technical, agency assessments do not capture dimensions of risk as experienced. Finally, we explore a new source of evidence, cognitive maps, that might capture nonverbalized the aspects of the experience of risk.

Although the use of interviews and discourse analysis is not, in themselves, novel, their deployment in risk analysis is. Classic risk analysis is fundamentally framed within a rational or decision–theoretic framework wherein risks are measured as probabilities of events and expected utilities calculated as the products of these probabilities and costs/benefits (von Neumann and Morgenstern 1943). We explore how to go beyond the rational model and onto a relational one, where the effects are not simply measured by an external observer but also experienced by the local agent who encounters situations (things, other people, etc.) and reflects on their effects on themselves (on relationality, see Lejano and Funderburg 2016; Lejano and Del Bianco 2018).

This article explores analytics that go beyond the classic risk assessment model. In doing so, the authors do not claim that the methods attempted herein are the only or even the most commendable ones to use. Certainly, other nonpositivist methods are possible, which try to capture nonpositivist aspects of risk – for example, photovoice, community mapping, participatory action research, and others (e.g. Gonzalez et al. 2007). The methods used herein were chosen in part because they were the ones most convenient and amenable to community – for example, residents had time to be interviewed one on one but could not engage in an extended participation action research process.

Context and methods

The 2-year study was conducted during the period, 2004–2005, in Val Verde, California, a town with a population of just more than 1500 (U.S. Census, 2000). It is a majority Latino community (51.6% as compared to 44.6% for Los Angeles County) and low to middle income (annual per capita income of \$15,626 vs. \$20,683 for the county). In addition, it is situated right next to the Chiquita Canyon Landfill, one of the largest solid waste sites in Los Angeles County.

In 1998, the California-Integrated Solid Waste Management Board and Los Angeles County approved the expansion of the landfill to its current size of 639 acres, which makes it one of the largest in the state. Around this time, residents began efforts to inquire into possible health (and other) effects of the landfill on the surrounding community. Beginning in the early 2000s, one of the authors started working with residents to investigate these potential impacts. This included a study of cancer and other health risks and a door-to-door survey. For example, cancer risks to Val Verde residents owing to the landfill were estimated to range from 20 to 80 in a million, along with other effects (Lejano and Sassa 2002; Lejano and Stokols, 2010) This can be compared with the Federal guideline of one in a million from any single source. Recently, the county government has begun proceedings to try and expand the landfill again.²

The Val Verde case seemed a particularly good one for our study as it was clear to the authors (as the residents recounted) that the County and other agencies paid little attention to the diverse, negative impacts of the landfill to the residents. As shown in the environmental impact report associated with the 1998 decision to expand the landfill, conventional approaches to assessment did not capture much of the experience of the landfill (including feelings of dread, experiences of nuisance, chronic symptoms like headaches and others). Instead, the environmental impact report focused mainly on criteria pollutant emissions. Furthermore, there was no local monitoring of air quality, underscoring the gap between expert-driven knowledge and local knowledge.

Along with the abovementioned efforts to study potential impacts, the authors also began inquiring into ways to assess the impacts that the conventional methods (risk assessment and health surveys) may not be capturing, leading to the study discussed herein.

This study was conducted with the help of URPAV (Union de Residentes para la Proteccion Ambiental de Val Verde), an environmental justice advocacy group, composed of residents who lobby for better environmental conditions in this town. The researchers held three community workshops over a period of 6 months. The first and third workshops involved cognitive and community mapping exercises. The second workshop was devoted to the collection of the personal narratives from residents. The narratives were collected during face-to-face interviews, consisting of both open-ended and semi-structured batteries of questions, with trained bilingual researchers. Mostly, the participants spoke in both English and Spanish. The interviews were then translated and transcribed. Content analysis was conducted on the interview transcripts, using a hierarchical coding procedure (e.g. Miles and Huberman 1994; Patton 2002).

The participants' pool included male and female Latino residents from a wide age range. The representatives of URPAV invited the members of the community who were not directly affiliated with their organization. By drawing from a pool outside of the organization, our goal was to diminish participant bias. It is important to point out that the focus of the research was not on statistical testing of hypotheses but, in exploratory mode, simply uncovering some indication of different modes of reasoning, and hence, we did not seek a random or representative sample. Our goal was to hear from the residents who had an active desire to talk about their experiences and subsequently find out the ways in which they talk about their experiences of risk.

Interviews and content analysis

The interview protocol was divided into two stages. The first part was comprised of a semi-structured series of general questions designed to capture how the participants understand and

experience risk, in their own words. Interviewers were trained to engage the participant in conversation without influencing his or her responses. The goal of the research design was to yield insights into how the public may experience and understand risk in ways that are different from expert opinion. In addition, the analysis also illuminates the cognitive processes people use to make decisions about risk. The protocol was pilot tested with five university students living in a housing complex that was, at the time, beset by noise and nuisance from a nearby construction site. The interviews were then conducted in Val Verde with eight females and three males, all adult Latinos who had resided in Val Verde for at least 4 years. Capturing language through interviews is an effective way to discover what meanings individuals attach to their experiences (Seidman 1998). The open-ended interview became more focused over time through a funnel design. Interviewers used a worksheet of prompts and directions to refer to during the interview (Table 2). The second half consisted of structured questions that were meant to more explicitly test whether people used specific modes of reasoning (e.g. valuative). The analysis for this article focuses on the unstructured portion of the interview. The interviews generally lasted up to an hour though several exceeded that.

The interviews were taped and transcribed, and Spanish portions were translated. We developed a list of categorical themes according to differing modes of reasoning or talk. The narratives were then analyzed with this categorical framework using NVivo, a content analysis software package. Therefore, to capture the train of thought we counted each passage, generally from one to three sentences, as the unit of analysis. Content analysis of the interview text involved categorizing statements according to different basic types found in the transcript (Table 3). In general, we find three different classes of statements. Using terms from speech-act theory, the first might be called *assertorial* or *constative*, more simply, statements that describe a situation and which can be subjected to tests of truth or falsity (Austin 1975). In the interview text, these consist mainly of statements describing the effects of the landfill and other conditions.

A second general type of statement is *prescriptive* or *evaluative* involving some type of value judgment (Ziembiński 1975) – within this category, we find four subtypes of judgment-type statements. For example, evaluations of risk acceptability in terms of costs, benefits, or allowable probabilities of injury all employ some implicit measure of consequences – we refer to these types of judgments as valuative. Another classic form of judgment employs statements that seem to be couched in the terms of moral principles or norms. Rule-based statements are an example of these, syllogisms being the exemplar of this type of talk (Hare 1964). For example, Bohm's work (2003) on risk evaluation revolves around distinguishing valuative (e.g. consequentialist) from normative (e.g. rule based) type judgments. Another type of judgment might be called similarity based. Ample research has been undertaken to suggest that one way that people make judgments about situations is by comparing themselves to other people and communities (see Festinger 1954; Suls and Wheeler 2000; Buunk and Gibbons 1997; Klein 2002 for social comparison theory applied to health and risk, respectively). So being, we seek out statements that explicitly or implicitly base a judgment on comparison – a set of statements that we categorize under the label of 'similarity'. In the text, we also found a fourth category of judgment in which people formulate moral and other judgments are by assessing a situation

Table 2. Interview protocol.

Opening question

Tell me about your thoughts (anything whatsoever) or experiences living in the housing complex (or Val Verde)

Nonjudgmental prompts, *Say anything that comes to mind, your views of how it's like to live here, things that affect you, anything.* Prompted responses

Followup statements, *You mentioned, it's all right living here ... why do you say so? Can you talk a little bit more of why you would say it's all right? Or You said, there are some problems ... could you discuss them for a while? What do you experience? How do these things affect you?*

More specific questions, *Now, I would like to hear what you feel or think regarding the problems in the community*

vis-a-vis a network of interpersonal relations (e.g. also see Sullivan and Steven 1995). We characterize this type of statement as 'relational' or pertaining to 'care' (the term used in the sense of Gilligan 1982). So being, under the class of prescriptive statements, we find four subtypes: valuative, normative, similarity based, and care based.³ We would expect, then, expert knowledge to mainly employ valuative talk, based on the objectivist measures (e.g. conformance of measured exposures to regulatory standards).

Aside from assertorial and prescriptive statements, we find a third general category of statements that fall under the theme of the *performative* (or illocutionary – see Austin 1975) – that is, statements that posit an action that the speaker intends to take or be taken. Within this category are several subcategories of statements.

We began with the three basic types of statements (i.e. assertorial, prescriptive/evaluative, and performative), and allowed subcategories within each of these to emerge during the study through a process of grounded research (Glaser and Strauss 1967). Table 3 lists the categories and subcategories of statements that were coded and illustrative examples of each kind of statement.

Intercoder reliability is an essential part of content analysis. For this project, steps were taken to validate the coding scheme and establish intercoder reliability (Neuendorf 2001). During an initial training session, coders worked together to establish agreement on the coding scheme, which went through a number of revisions. Subsequently, two independent coding tests were conducted to determine the reliability of each variable. Comparing the primary coder with another researchers' codings, the correlation coefficient between the two sets of codings was 0.81.

Comparison of agency's and residents' talk found in formal correspondence

This brings us to an important supposition: that the content of technical (or agency) communication reflects a different way of knowing that departs from community's. Specifically, while technical modes of analysis involve primarily valuative claims, community or local knowledge involves a richer, and wider, spectrum of claims. We formalize this statement below.

Supposition 1: While technical (or agency) modes of describing risk are primarily valuative, community or local descriptions of risk display a richer, more widely varying, spectrum of statements.

We would expect that agency communication would mainly reflect the technical (or expert) way of knowing, which takes the form of primarily valuative statements. In contrast, those who experience the risk can describe more aspects of the situation, including the affective, moral, and other aspects.

The textual analysis of the interviews will allow us to confirm whether residents do employ a rich combination of differing modes of talk. It also allows us to establish the specific ways, keywords, and expressions used, as well as constructing the basic categorical scheme used for content analysis. Furthermore, we can compare the patterns of talk exhibited by residents from that characterizing agency officials, which is tied to our research objective of uncovering how differently residents and officials talked about risk. To do this, we employed the content analytic procedure on the Final Environmental Impact Report (FEIR) for the Chiquita Landfill expansion (Los Angeles County 1996). The FEIR is a convenient research artifact to use as the bulk of the report consists of letters from stakeholders and official response letters from the agency (in this case, the Los Angeles County). It is essentially a virtual, written conversation consisting of statements and counterstatements, where turn-taking is perfectly enforced. For this exercise, we analyzed patterns in the letters from the residents and neighborhood groups with the responding letters from the agency – six letters each. We will compare the two patterns of talk using a frequency histogram of types of statements found in the letters.

Table 3. Thematic categories of statements for content analysis.

I.	Assertorial statements: Expression of effect
	I.1 Lifestyle <i>Example: The landfill disrupts our daily routine</i>
	I.2 Health <i>Example: My child started suffering from asthma</i>
	I.3 Social (stigma, etc.) <i>Example: We feel like other communities think we are lower than they are</i>
	I.4 Psychological (stress, etc.) <i>Example: I am going crazy with the constant noise</i>
II.	Prescriptive statements: Expression of judgment
	II.1 Valuation <i>Example: It is easier to move one landfill, than all 500 families</i>
	II.2 Rule based <i>example: It is wrong to have a landfill so close to a town</i>
	II.3 Similarity <i>Example: Other communities do not need to deal with the things we get</i>
	II.4 Nurturing/care <i>Example: We have too many kids here, I want them to have better</i>
III.	Performative statements: expression of desired action/response
	III.1 Response by individual <i>Example: I would like to find a way to challenge the EIR (environmental ... impact report) again</i>
	III.2 Response by others (e.g. authorities) <i>Example: The county should just shut down this operation</i>

Spatial analysis: cognitive mapping

In exploring the use of free-sketched maps, the main motivation goes back to the need for analytics for describing different aspects of risk. That is, it is possible that some aspect of experiencing risk is captured by a drawing in a way that narrative does not. In the case study, the mapping exercise seems to express how the landfill looms ever present in the resident's psyche, perhaps causing a constant angst, in a way not expressed in any of the interviews.

The same eleven Val Verde interviewees were also asked to sketch maps of their neighborhood during another session. Each person was provided an 11"×17" (28 cm × 43 cm) sheet and asked to spend about half an hour on the exercise. No other prompts or cues were given. After each resident had finished their sketch, they were then asked to annotate some of the landmarks that they portrayed on their maps and provide a subjective rating on a scale of -7 to +7 to represent some indication of the degree of positive or negative affect of the particular landmark. The mapping exercise lasted for about 40 min, and the rating and annotation about half an hour. The researchers then collected the maps and noted which landmarks were found on each map. They listed all the landmarks that were found on any of the maps and prepared an aggregate list. They then returned to the participants at a later date and asked them to fill in landmarks that they did not include in their maps the first time. The protocol is probably closest to that employed by Orleans (1973) in the sense that respondents were asked to simply free sketch their neighborhoods with a minimum of instructions, and spatial distortions relative to actual mapped distances subsequently analyzed. The cognitive mapping protocol was pilot tested with residents at a university housing complex, which allowed researchers to fine tune the protocol prior to employment in Val Verde. This allows us to explore the following supposition.

Supposition 2: The experience of risk may find expression in the way these persons portray the place in which they reside (sketches being a mode of portraying place).

There are many different ways to interpret the cognitive maps, none of them definitive. We illustrate one way in an exploratory mode, without making any claims about certainty of our interpretation. In looking for distortions in the sketches, we are guided by some of the literature that also associated spatial distortions in the drawings with psychological and

social phenomena. For example, Orleans (1973) associated the relative size of the map's spatial extent with the degree of socialization of the drawer, and Milgram and Jodelet (1976) interpret distortions with the person's particular experience of the place. Admittedly, in each study as in ours, these interpretations are always only speculative. Our interpretation of spatial distortions in the map is not meant to be a rigorous analysis (for which we would have attempted a large-*n* study) but an exploratory one to investigate how such maps might be analyzed.

Results

Content analysis: interviews

Content analysis of the interview transcripts allowed the construction of narrative 'profiles' that we will use as a descriptive of the multimodal ways that residents in Val Verde reason and form judgments about the landfill. In Figure 1, we show the aggregated frequencies of passages as coded and classified into the different categorical types. The bars represent the average frequencies per categorical type of statement. It should be noted that the somewhat uniform pattern of responses across interviewees is observed, as seen in the small standard deviations.

As shown in Figure 1, residents' talk spans a broad range of distinctly different types of statements. We note that the classic, valuative mode of reasoning is not the most prevalent type that shows up in these narratives. The most dominant mode of talk employed by the residents tends to be the rule based, which is defined as the statement of a moral or other principle that holds out of considerations of right and wrong. This is illustrated by the following statements (which were taken from the transcripts):

... Because I think it is wrong that is located here. It is an error, to begin with, that the landfill is too close from the community... I believe that, if everything would be working normally and correctly with all the monitors and everything, it would be acceptable...

and note the use of the classic rule-based statement in the form of the syllogism (i.e. the if-then statement) in this passage.

Next in frequency are the statements that pertain to a mode that can be characterized as one of nurturing or care. These statements deal not with judgments regarding the object in question (i.e. the landfill) as considered in isolation, but only with reference to a pattern of relationships between residents, residents and agencies, the landfill operator, and society at large. It is a mode of reasoning that we have characterized as care, which pertains to the effect of a situation on relationships. The following are some statements that characterize this mode of talk:

Here there are families, there are children; and the children especially by being young have fewer defenses to try... how would I say it... Yes, to defend their system from illnesses...

Finally, we note the presence, albeit subdued, of statements that seem to be consistent with an evaluative mode of reasoning (i.e. that representation of risk that comports with the classic model of risk analysis). We find it in statements such as the following:

I say, it is easier to move a landfill than all 500 to 700 homes, families.

As shown in Figure 1, the residents' talk displays a wide range of statement types, which supports half of what we claim in *Supposition 1*. Such talk, in fact, employs valuative statements to a lesser degree than other types of judgment (moral/normative, relational, and comparative). Assertorial statements are also found, but it should be noted that such statements do not confine themselves to conventional technical outcomes associated with health but others as well (e.g. social impacts).

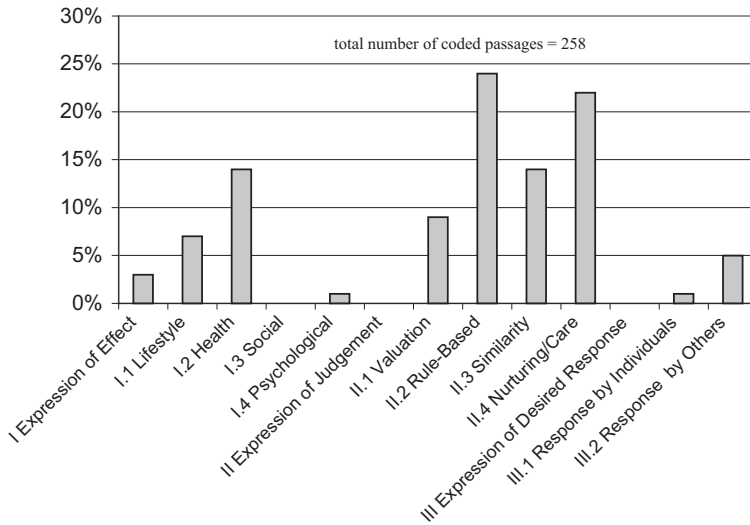


Figure 1. Frequency of statement categories in residents' talk ($n = 112$). Note: For labels on the horizontal axis, refer to categories listed in Table 2.

Content analysis: comparison of agency and residents' talk

We then inquired into whether or not these resident-derived profiles of talk differed from that employed by agencies by comparing correspondence contained in the FEIR for the landfill (Los Angeles County 1996). We did find distinct differences, and this has important consequences for risk communication. Figure 2 contrasts narrative profiles found in six letters from the the Val Verde residents and the six response letters from the County Planning agency. For example, one clear distinction is the higher frequency of normative and other statements and lower frequency of valuative statements in the resident letters than in the agency's. As suspected, agency communication features predominantly valuative statements, whereas community discourse employs a fuller range of statement types. This corresponds to the differences we discussed between technical and local modes of knowing. Figure 2 lends support to *Supposition 1*.

In terms of communication between agency and community, Figure 2 shows a dilemma portrayed in graphic terms. Talk is literally occurring along different planes of discourse and hence, transmission of information from one part to the other, and back, should not be expected to occur effectively. Responses from an agency that are mainly valuative would 'speak to' those concerns that occur in the same plane of the evaluative, but would not address the other modes of concern.

We can only speculate on reasons for these differences. First, we might assume that many of the agency personnel are technical experts whose training is steeped in scientific-technical disciplines, with their strong positivist foundations. This may prime these agency experts to emphasize valuative judgments as opposed to normative ones (inasmuch as science is often typologized as a value-free discipline). Their expert training may also cause a narrower spread in the modes of analysis they employ. On the other hand, although the agency is primarily describing a technical analysis, the resident may be describing a much richer phenomenon, which is the experience of risk, for which different modes of talk may be necessary.

The assertorial statements found in the residents' text feature mainly those about health (matching the agency's), which differs from that found in the resident interviews, where people talked about other types of effects (such as social stigma). It is possible that the forum for these communications, which is formal letters responding to the DEIR, constrained the conversation to some extent.

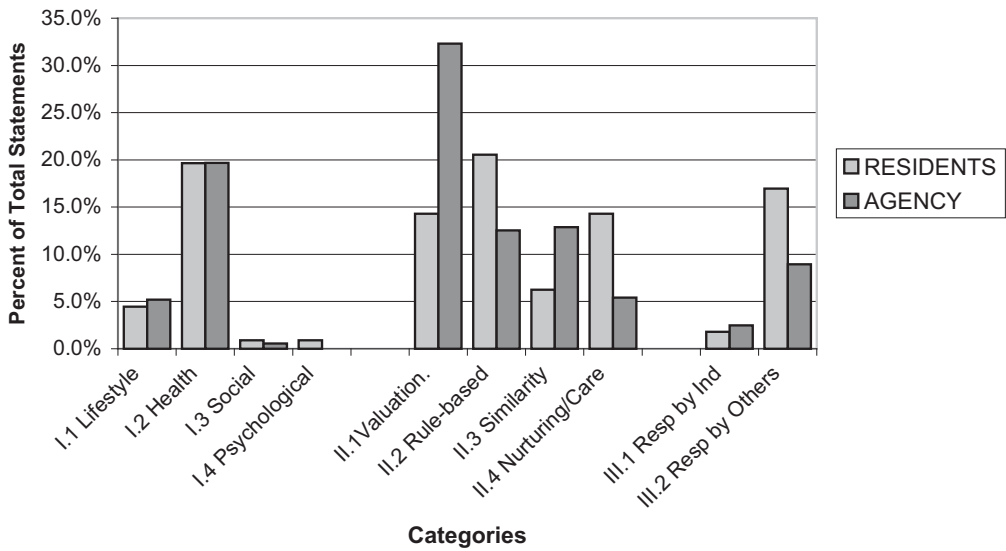


Figure 2. Comparison of resident and agency correspondence (final EIR) ($n = 112$ for residents; $n = 2694$ for agency). Note: For labels on the horizontal axis, refer to categories listed in Table 2.

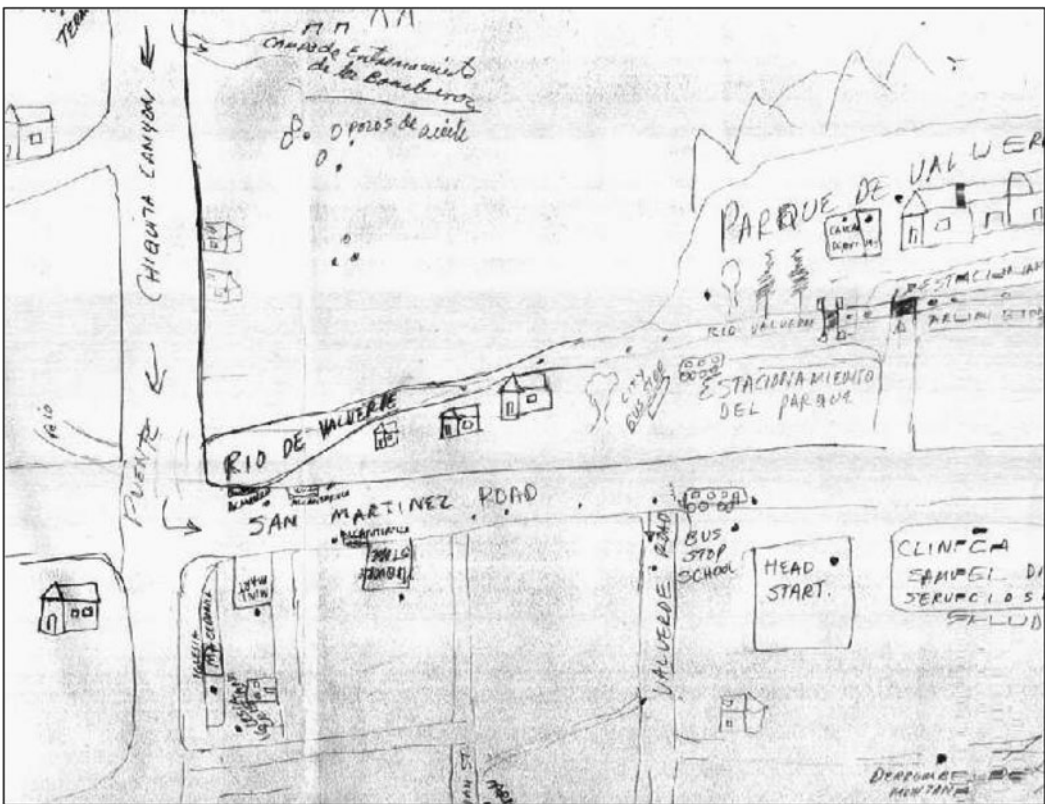


Figure 3. Resident's cognitive map (Val Verde, California).

Spatial analysis: cognitive mapping

The sketches provide us yet other insights into, and descriptions, of the experience of risk. For illustration, one of the residents' maps is shown in [Figure 3](#). We assume that part of the experience of the resident manifests itself in their understanding of place (Gustafson 2001; Tuan 1977). How do we go about finding meaningful information from sketches such as shown in [Figure 3](#)? As research artifacts go, the cognitive maps are information rich. However, they present the challenge of discerning patterns attributable to the phenomenon being studied versus those that arise from artifactual sources such as individual differences in drawing ability.

The first element that we sought to find in these sketches lies in the salience with which different features of a place appeared in the maps and, one might assume, in the consciousness of the mapmaker (e.g. Milgram and Jodelet 1976). Here, salience or prominence of a feature may be expected to manifest in frequency of appearance in the residents' sketches or through some type of emphasis within each map. For example, the size of a feature may be enlarged in keeping with the prominence of the feature. In our procedure, we ask the participant to provide ratings of the degree of negative or positive importance the landmark has for him/her, which we take as a measure of salience. In these sketches, distortions in size of each feature did not seem to be a meaningful thing to measure as some people drew rather iconic features (e.g. a comic-book type house), and one can expect drawing style to unduly affect the size of the feature. However, we did find possibly significant patterns in the distances represented in the sketches. The following are some patterns culled from the nine resident sketches. In these characterizations, we use statistical correlations not for hypothesis testing but rather to serve a descriptive purpose in an exploratory exercise. In other words, we employ regression equations as a qualitative mode of description. The fact that some of the coefficients in the equations came out significant is not a major point of this exercise – though, it is a rather encouraging sign.

The analysis suggests the following spatial patterns. In doing this, we simply state some possible interpretations (while suggesting alternative interpretations below). The purpose of this research is to see how new methodologies can be used to generate new hypotheses that can be further tested in subsequent studies.

*Supposition 2. The experience of risk may be reflected in portrayals of the place (e.g. distortions in maps of the place).*⁴

By spatial distortion, we simply mean the ratio of the sketched distance to the actual (streetmap) distance. Statistics are described in Endnote 1. In general, we find some consistent patterns in the sketches that more salient objects seem to be more accurately positioned.

Supposition 2 can be expressed in an alternative way, as shown below.

*Supposition 2'. It is possible that objects are judged closer (with respect to one's home), the closer these objects are to the landfill.*⁵

Salience again appears as proximity (see Endnote 2 on the statistical relationship). A literal way of describing this is as if more landmarks that are more prominent in the consciousness of an individual loom larger in their cognitive map of a place – that is, appear closer than they really are. However, the above relationship says something in addition, and that is the idea that prominence is conferred on the landmark by its proximity to the landfill. One interpretation of this is that salience of the dominant feature of the place, the landfill, somehow transfers to objects around it. We can depict the above relationships graphically, by plotting their combined effects on a contour map (where topographical height represents the amount of distortion, or r , in the above equations). This is shown in [Figure 4](#).

[Figure 4](#) is suggestive of one possible way that risk, as perceived and experienced, may manifest itself in these cognitive maps, and that is through something akin to a gravity effect. That is, prominent places (and, we posit, possibly risky places) imbue the space around them with a distortionary effect that decays as spatial distance from them decreases. This effect is something

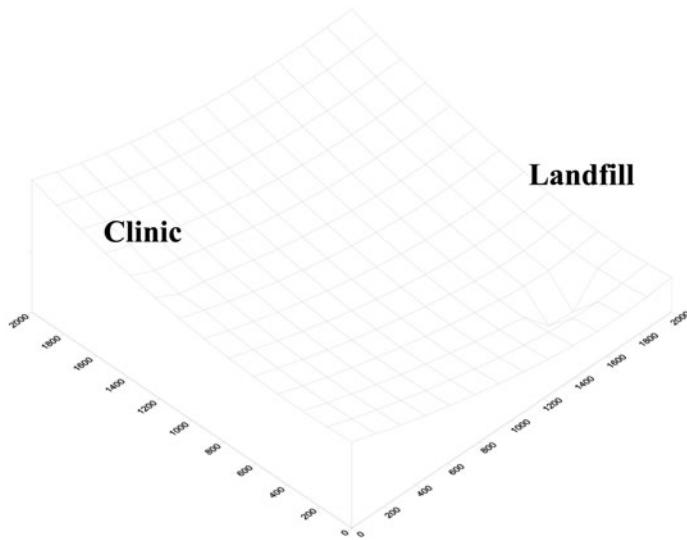


Figure 4. Distortion map (Val Verde, California).

over and above the distortion created by the prominent landmark itself, which is also portrayed in the figure.

Again, we are merely making some initial observations, not claims about what effects are really occurring. One alternative explanation may be that the underestimation of the distance of the landfill from the homes is simply owing to drawing style (e.g. people may crowd most items near the middle of the page, or perhaps run out of space to accurately place distant objects). It is possible, in addition, that items near the landfill are subjected to some of this ‘crowding’ also. Other alternative interpretations may be possible.

It is too early in the research to conclude whether these distortions are artifacts of experienced risk, but we can at least suggest possible connections with risk even at this point. One possible implication of these spatial patterns of cognition is that experienced risk (or, more generally, feature salience) may not only be associated with the object of risk (or salience) but that these cognitive impressions also become a feature of place. We can see this in the way that distortions seem to emanate from the features in question. As such, these cognitive effects may not only attach to the objects themselves but be entrained in the landscape itself. In the cognitive mapping literature, this is seen in the way that particularly salient features become cognitive reference points (Tversky 1993).

Discussion

In this article, we employed narrative analysis and cognitive mapping to find new descriptive tools with which to represent the aspects of risk, as experienced. The results of the content and map analyses, when taken together, are suggestive of experienced risk as a manifold of fields of judgment that may or may not be integrable into a single analytical framework. For now, it appears that we can describe various modes by which people understand a complex situation involving risk. It remains for future research to inquire into the manner by which people use these different modes – whether they are coherent parts of a single reasoning process, whether they operate independently of each other, or other possibilities. It is also evident that there are other dimensions of judgment under risk that are not even captured in this analysis. For example, if we are willing to forego any assumed separation between cognitive and natural spheres, then we might also consider the way by which persons resolve these situations through

identifying proper courses of action. For now, we simply suggest that if the question is whether or not a town such as Val Verde can accommodate the landfill, the space of which we speak also encompasses the normative, aesthetic, valuative, relational, and other 'spaces'. Similarly, deliberations and decisions about risk management or avoidance strategies should also be recognized as necessarily occurring in all of these fields.

The findings presented above suggest that there are diverse reasoning processes at work in individual judgment (not to mention group judgment). [Table 1](#) is instructive in this regard and suggests how many modes of reasoning are associated with local, not expert, understandings of risk. The question of how best to integrate the diverse processes at both individual and collective levels remains an important question for future research. For instance, we might inquire as to whether there exists a metaprocess of reasoning about these reasoning processes, and so on. The major purpose of this study, however, is to identify new modes of description for portraying the experience of risk. These modes of description are, for now, best left in their primitive state, without attempting to parameterize them. As an analogy, this might be likened to distinguishing two different colors – the attempt to reduce the comparison to some numerical scale is either not possible or, in the case of describing each of them in terms of wavelength, holds no meaning vis-a-vis our human experience. Meaning is interpretive (Gadamer [1960] 1975; Ricoeur 1991), and interpretation can occur along several different dimensions. Understanding seems to be describable as a sort of coherence, which is not the same as integration but, rather, more about the ability to make sense and form judgments about complex situations.

The findings from this exploratory investigation have implications for the practice of risk communication. Providing better technical information is something that the experts can do, but dictating the mode of sense making employed by the individual is something they cannot. There is no justification for saying that one person's manner of reasoning is better or worse than any others'. Ultimately, risk communication may require multimodal descriptions of risk (e.g. encompassing valuative, normative, and other dimensions).

We can also question whether we have observed qualitatively different modes of reasoning, or whether we have just one comprehensive logic which, when examined, seems to shift in the degree to which different descriptive categories correspond to it. We have found a number of explicit categories – explicit as these modes of reasoning are spoken and acknowledged. Understanding bridges the explicit and inexplicit, however. In this research, we have shown how some inexplicit dimensions of risk experience can be captured through the use of cognitive mapping. Future research will provide more clues as to how all these dimensions are integrated into personal and community experience. Looking ahead, the hope is that these analytics will be part of institutional reforms that improve upon the "superficial rhetoric of inclusion" (Ferilli et al., 2016, pg. 95).

On a practical note, there is the never-ending challenge to try and make unconventional, qualitative information (which is how local knowledge is most often portrayed) useful for policy purposes. There is, at present, a legal battle over whether the County can expand the landfill yet again (see Stokols 2018). The authors note that, thus far, the agencies and their consultants have not used (and, in fact, are dismissive of) the kind of knowledge offered by community residents, who can speak to the experience of risk first-hand. The question of making local knowledge more salient to policymakers remains unsettled and remains ripe for future investigation.

Acknowledgements

The authors thank Elvia Vega and Jose Vega, Jr. of URPAVV for their insight and assistance in conducting the research, as well as several anonymous reviewers for their substantive reviews.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes

1. https://cfpub.epa.gov/ncea/iris_drafts/simple_list.cfm
2. Court proceedings are ongoing, as of this writing, as the proposed expansion is being challenged by the community. Some of the community's grievance stems from its claims that the County government has ignored, even dismissed, the significant adverse impacts experienced by residents owing to the landfill and did not attempt to monitor local environmental quality. Another issue is the fact that the County reneged on a prior agreement to close the landfill by 2019. It seems to be a striking example of social (and environmental) injustice. For a comprehensive review of the landfill situation, see Stokols (2018).
3. It is perhaps no coincidence that these four types of judgments closely reflect the forms used in the literature on ethics as we utilized a similar method of textual analysis as some of these researchers (notably Kohlberg and Gilligan). The first three types of judgments in our classification correspond to the three levels of judgment found by Kohlberg (1981) in his original analysis of interview texts Kohlberg, L. (1981) *Essays on moral development, Vol. II, The psychology of moral development: The nature and validity of moral stages*. San Francisco: Harper & Rowe." . Within a Piagetian framework, Kohlberg theorized that, as a person attained maturity in moral and intellectual capacity, she/he would increasingly be able to formulate moral principles in terms of universalistic rules, and the three levels of judgment reflect this evolution. Using similar modes of textual analysis (as Kohlberg and we have used), Gilligan proceeded to demonstrate a fourth mode of moral reasoning that was not rule-based but, rather, corresponded to an ethic of care wherein the focus is on being responsible for specific individuals' specific needs (Gilligan 1982).
4. Note that we did not employ other indices of distortion as these did not seem as applicable to this dataset – for example, the index used by Waterman and Gordon (1984), which sums the total distance deviations over all features, is not useful for our maps which did not all show the same set of landmarks. In the following discussion, we refer to several variables, which are defined as follows: d the distortion or ratio of mapped distance (from home to landmark) to actual distance S the salience of a landmark (which is the absolute value of its rating) L the distance (on the actual map) from the landmark to the landfillThe following statistical relationship simply suggests that residents systematically judge salient objects (whether salience pertains to a very positive place or very negative) to be closer than they really are. We note the significant t -statistic on the salience coefficient but remind the reader that statistical significance is not the point of this qualitative exercise. $\log_n(d) = 0.1474 - 0.1891St$ ratios: (0.71) (2.11)This can also be expressed as an exponential relation: $d = 1.159 e^{-0.1891(S)}$
5. The pattern is illustrated in the following statistical relationship (t -statistics are all significant to >95% confidence): $\log_n(d) = -0.6189 + 0.005729Lt$ ratios: (3.27) (3.93)This can also be expressed as an exponential relation: $d = 0.539 e^{+0.00573(L)}$

ORCID

Raul P. Lejano  <http://orcid.org/0000-0001-6949-7252>

Daniel Stokols  <http://orcid.org/0000-0002-3008-3009>

References

- Appleyard, D., K. Lynch, and R. Myer. 1964. *The View from the Road*. Cambridge, MA: MIT Press.
- Austin, J. L. 1975. *How to do Things With Words*. Cambridge, MA: Harvard University Press.
- Banister, P., E. Burman, I. Parker, M. Taylor, and C. Tindall. 1994. *Qualitative Methods in Psychology: A Research Guide*. Buckingham: Open University Press.
- Barke, R. P., and H. C. Jenkins-Smith. 1993. "Politics and Scientific Expertise: Scientists, Risk Perception, and Nuclear Waste Policy." *Risk Analysis* 13 (4): 425–439.
- Bickerstaff, K. 2004. "Risk Perception Research: Socio-Cultural Perspectives on the Public Experience of Air Pollution." *Environment International* 30: 827–840.
- Bickerstaff, K., and G. Walker. 2001. "Public Understandings of Air Pollution: The 'Localisation' of Environmental Risk." *Global Environmental Change* 11: 133–145.

- Bohm, G. 2003. "Emotional Reactions to Environmental Risks: Consequentialist Versus Ethical Evaluation." *Journal of Environmental Psychology* 23: 199–212.
- Brown, P.. 1992. "Popular Epidemiology and Toxic Waste Contamination: Lay and Professional Ways of Knowing." *Journal of Health and Social Behavior* 267–281.
- Brown, P., S. Zavestoski, S. McCormick, B. Mayer, R. Morello-Frosch, and R. Gasior Altman. 2004. "Embodied Health Movements: New Approaches to Social Movements in Health." *Sociology of Health & Illness* 26 (1): 50–80.
- Bruner, J. 1986. *Actual Minds, Possible Worlds*. Cambridge, MA: Harvard University Press.
- Buunk, B. P., and F. X. Gibbons. 1997. *Health, Coping, and Well-Being: Perspectives from Social Comparison Theory*. Hillsdale, NJ: Lawrence Erlbaum.
- Covello, V. T., D. B. McCallum, and M. T. Pavlova. eds. 2012. *Effective Risk Communication: The Role and Responsibility of Government and Nongovernment Organizations*. Vol. 4. New York: Springer Science & Business Media.
- Dake, K., and A. Wildavsky. 1991. "Individual Differences in Risk Perception and Risk-Taking Preferences." In *The Analysis, Communication, and Perception of Risk*. 15–24. Boston, MA: Springer.
- de Saussure, F. 1915. *Course in General Linguistics* (W. Baskin, Trans.) [compiled by C. Bally & A. Sechehaye, Eds.]. Glasgow, UK: Fontana/Collins.
- Douglas, M. 2013. *Collected Works, Vol. XII. Risk and blame*. New York, NY: Routledge.
- Ferilli, G, Sacco, P. L., and Blessi, G. T. 2016. "Beyond the Rhetoric of Participation: New Challenges and Prospects for Inclusive Urban Regeneration." *City, Culture and Society* 7 (2): 95–100.
- Festinger, L. 1954. "A Theory of Social Comparison Processes." *Human Relations* 7: 117–140.
- Fischhoff, B., S., Lichtenstein, and P. Slovic. 1983. "The public" vs. "the experts": Perceived vs. Actual Disagreements about Risks of Nuclear Power." In *Analysis of Actual Versus Perceived Risks*, edited by V. T. Covello, W. G. Flamm, J. V. Rodricks, and R.G. Tardiff. New York: Plenum Press.
- Flynn, J., P. Slovic, & C. K. Mertz. 1993. "Decidedly Different: Expert and Public Views of Risks from a Radioactive Waste Repository." *Risk Analysis* 13(6): 643–648.
- Frewer, L., S. Hunt, M. Brennan, S. Kuznesof, M. Ness, and C. Ritson. 2003. "The Views of Scientific Experts on How The Public Conceptualize Uncertainty." *Journal of Risk Research* 6 (1): 75–85.
- Gadamer, H.-G. [1960] 1975. *Truth and Method*. Translated by G. Barden. New York: Continuum.
- Gerber, R., and T. Kwan. 1994. "A Phenomenological Approach to the Study of Pre-Adolescents' Use of Maps in a Wayfinding Exercise in A Suburban Environment." *Journal of Environmental Psychology* 14: 265–280.
- Geertz, C. 1974. "'From the Native's Point of View": On the Nature of Anthropological Understanding." *Bulletin of the American Academy of Arts and Sciences* 28(1): 26–45.
- Gilligan, C. 1982. *In a Different Voice: Psychological Theory and Women's Development*. Cambridge, MA: Harvard University Press.
- Glaser, B. G., and A. Strauss. 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Chicago, IL: Aldine Publishing Company.
- González, E. R., R. P. Lejano, G. Vidales, R. F. Conner, Y. Kidokoro, B. Fazeli, and R. Cabrales. 2007. "Participatory Action Research for Environmental Health: Encountering Freire in the Urban Barrio." *Journal of Urban Affairs* 29 (1): 77–100.
- Griffin, R. J., S. Dunwoody, F. Zabala, and M. Kamerick. 1994. "Public Reliance on Risk Communication Channels in the Wake of the Cryptosporidium Outbreak." Paper presented at the Society for Risk Analysis Annual Meeting, Baltimore, MD, December 1994.
- Gustafson, P. 2001. "Meaning of Place: Everyday Experience and Theoretical Conceptualizations." *Journal of Environmental Psychology* 21: 5–16.
- Gutteling, J. M., and Kuttuschreuter, M. 2002. "The Role of Expertise in Risk Communication: Laypeople's and Expert's Perception of the Millennium Bug Risk in The Netherlands." *Journal of Risk Research* 5 (1): 35–47.
- Hansen, J., L. Holm, L. Frewer, P. Robinson, and P. Sandøe. 2003. "Beyond the Knowledge Deficit: Recent Research into Lay and Expert Attitudes to Food Risks." *Appetite* 41 (2): 111–121.
- Hare, R.M. 1964. *The Language of Morals*. New York: Oxford University.
- Horlick-Jones, T., Sime, J., and Pidgeon, N. 2003. "The Social Dynamics of Environmental Risk Perception: Implications for Risk Communication Research and Practice." In *The Social Amplification of Risk*, edited by N. Pidgeon, R. Kasperson, and P. Slovic, 262–285. Cambridge: Cambridge University Press.
- Husserl, E. 1913. *Ideas: General Introduction to Pure Phenomenology*, Translated by Boyce Gibson. New York: MacMillan.
- Irwin, A. 2002. *Citizen Science: A Study of People, Expertise and Sustainable Development*. New York: Routledge.
- Irwin, A. 2014. "Risk, Science and Public Communication: Third-Order Thinking About Scientific Culture." In *Routledge Handbook of Public Communication of Science and Technology*, edited by M. Bucchi and B. Trench, 160–172. Cambridge: Cambridge University Press.
- Kahneman, D., and A. Tversky. 1979. "Prospect Theory: an Analysis of Decision Under Risk." *Econometrica* 47: 263–291.
- Kasperson, R. E., O. Renn, P. Slovic, H. S. Brown, J. Emel, R. Goble, J. X. Kasperson, and S. Ratick. 1988. "The Social Amplification of Risk: A Conceptual Framework." *Risk Analysis* 8 (2): 177–187.

- Klein, W. 2002. "Social Comparison and Risk Judgment, Recent Work and New Directions." *Risk Decision and Policy* 7: 145–152.
- Kohlberg, L. 1981. *Essays on Moral Development, Vol. II, The Psychology of Moral Development: The Nature and Validity of Moral Stages*. San Francisco, CA: Harper & Rowe.
- Kruger, D. 1979. *An Introduction to Phenomenological Psychology*. Pittsburgh, PA: Duquesne University Press.
- Lejano, R. P. 2006. *Frameworks for Policy Analysis: Merging Text and Context*. New York: Routledge.
- Lejano, R. P., and C. Del Bianco. 2018. "The Logic of Informality: PATTERN and Process in a São Paulo Favela." *Geoforum* 91: 195–205.
- Lejano, R. P., and C. Sassa. 2002. *Air Quality Assessment of the Chiquita Landfill, Technical Report*. Cambridge, MA: MIT Environmental Policy Group.
- Lejano, R., and D. Stokols. 2010. "Understanding Minority Residents' Perceptions of Neighborhood Risks and Environmental Justice: New Modalities, Findings, and Policy Implications." *Journal of Architectural and Planning Research* 27 (2): 107–123.
- Lejano, R. P., and R. Funderburg. 2016. "Geographies of Risk, the Regulatory State, and the Ethic of Care." *Annals of the American Association of Geographers* 106 (5): 1097–1113.
- Lejano, R. P., and H. Ingram. 2009. "Collaborative Networks and New Ways of Knowing." *Environmental Science & Policy* 12 (6): 653–662.
- Los Angeles County. 1996. Final Environmental Impact Report for the Chiquita Landfill Expansion, Department of Regional Planning, Los Angeles
- Lynch, K. 1960. *Image of the City*. Cambridge, MA: MIT Press.
- Liotard, J.-F. 1979. *The Postmodern Condition: A Report on Knowledge*. Minneapolis, MN: University of Minnesota.
- Margolis, H. 1996. *Dealing with Risk: Why the Public and the Experts Disagree on Environmental Issues*. Chicago, IL: University of Chicago Press.
- Marris, C., I. H. Langford, and T. O'Riordan. 1998. "A Quantitative Test of the Cultural Theory of Risk Perceptions: Comparison with the Psychometric Paradigm." *Risk Analysis* 18 (5): 635–647.
- Michael, M. 2012. "What are We Busy Doing? Engaging the Idiot." *Science, Technology & Human Values* 37 (5): 528–554.
- Miles, M. B., and A. M. Huberman. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*. London: Sage.
- Milgram, S., and Jodelet, D. 1976. "Psychological Maps of Paris." In *Environmental Psychology, People and Their Physical Settings*, edited by H. Proshansky, et al. 2nd ed. New York: Holt, Rinehart & Winston.
- Moore, A., and J. Stilgoe. 2009. "Experts and Anecdotes the Role of 'Anecdotal Evidence' in Public Scientific Controversies." *Science, Technology & Human Values* 34 (5): 654–677.
- Neuendorf, K. A. 2001. *The Content Analysis Guidebook*. Thousand Oaks, CA: Sage.
- Ohta, H. 2001. "A Phenomenological Approach to Natural Landscape Cognition." *Journal of Environmental Psychology* 21: 387–403.
- Orleans, P. 1973. "Differential Cognition of Urban Residents, Effects of Social Scale on Mapping." In *Image and Environment, Cognitive Mapping and Spatial Behavior*, edited by R. M. Downs and D. Stea, 115–130. Chicago, IL: Aldine Publishing Company.
- Patton, M. Q. 2002. *Qualitative Research and Evaluation Methods*. Thousand Oaks, CA: Sage.
- Petts, J., T. Horlick-Jones, G. Murdock, D. Hargreaves, S. McLachlan, and R. Lofstedt. 2001. *Social Amplification of Risk: The Media and the Public*. Sudbury: HSE Books.
- Polkinghorne, D. E. 1988. *Narrative Knowing and the Human Sciences*. Albany, NY: SUNY Press.
- Ricoeur, P. 1991. *From Text to Action—Essays in Hermeneutics II*. London: The Athlone Press.
- Rowe, G. and G. Wright. 2001. "Differences in Expert and Lay Judgments of Risk: Myth or Reality." *Risk Analysis* 21 (2): 341–356.
- Saegert, S. and G. Winkel. 1990. "Environmental Psychology." *Annual Review of Psychology* 41: 441–477.
- Savadori, L., S. Savio, E. Nicotra, R. Rumiat, M. Finucane, and P. Slovic. 2004. "Expert and Public Perception of Risk from Biotechnology." *Risk Analysis* 24(5): 1289–1299.
- Seamon, D., and R. Mugerauer, eds. 2012. *Dwelling, Place and Environment: Towards a Phenomenology of Person and World*. Dordrecht: Martinus Nijhoff Publishers.
- Seidman, I. 1998. *Interviewing as Qualitative Research: A Guide for Researchers in Education and the Social Sciences*. 2nd ed. New York: Teachers College Press.
- Siegrist, M., and H. Gutscher. 2006. "Flooding Risks: A Comparison of Lay People's Perceptions and Expert's Assessments in Switzerland." *Risk Analysis* 26 (4): 971–979.
- Sjöberg, L. 2000. "Limits of Knowledge and the Limited Importance of Trust." *Risk Analysis* 21 (1): 189–198.
- Sjöberg, L. 2002. "The Alleged Simple Structure of Experts' Risk Perception: An Urban Legend in Risk research." *Science, Technology, & Human Values* 27 (4): 443–459.
- Sjöberg, L. 2011. "Risk Communication Between Experts and the Public: Perceptions and Intentions." *Revista Organicom* 4(6): 69–85.
- Slovic, P. 1987. "Perception of Risk." *Science* 236: 280–285.
- Slovic, P. 2000. *The Perception of Risk*. London: Earthscan.

- Slovic, P., B. Fischhoff, and S. Lichtenstein. 1985. "Characterizing Perceived Risk." In *Perilous Progress: Managing the Hazards of Technology*, edited by R. W. Kates, C. Hohenemser, and J. X. Kasperson, 91–125. Boulder, CO: Westview Press.
- Slovic, P., M. Finucane, E. Peters, and D. MacGregor. 2004. "Risk as Analysis and Risk as Feelings: Some Thoughts About Affect, Reason, Risk, and Rationality." *Risk Analysis* 24 (2): 311–322.
- Stefanovic, I. L. 1992. "What is Phenomenology?" *Brock Review* 3 (1): 58–77.
- Stokols, D. 1981. "Group x Place Transactions: Some Neglected Issues in Psychological Research on Settings." In *Toward a Psychology of Situations: An Interactional Perspective*, edited by D. Magnusson, 375–393. Hillsdale, NJ: Lawrence Erlbaum Associates.
- Stokols, D. 2018. *Social Ecology in the Digital Age: Solving Complex Problems in a Globalized World*. London: Academic Press.
- Sullivan, P., and G. Steven. 1995. "A Relational Approach to Moral Decision-Making: The Majority Opinion in Planned Parenthood v. Casey." *The Quarterly Journal of Speech* 81 (2): 167–190.
- Suls, J., and L. Wheeler. 2000. *Handbook of Social Comparison: Theory and Research*. New York: Kluwer Academic/Plenum Publishers.
- Tuan, Y.-F. 1977. *Space and Place, the Perspective of Experience*. Minneapolis: University of Minnesota.
- Tversky, B. 1993. "Cognitive Maps, Cognitive Collages, and Spatial Mental Models." In *Spatial Information Theory: A Theoretical Basis for GIS*, edited by A. Frank, and L. Campari. Proceedings COSIT '93, Lecture Notes in Computer Science, 716, 14–24. Berlin: Springer.
- Van Zwanenberg, P., and E. Millstone. 2000. "Beyond Skeptical Relativism: Evaluating the Social Constructions of Expert Risk Assessments." *Science, Technology & Human Values* 25 (3): 259–282.
- von Neumann, J., and O. Morgenstern. 1943. *A Theory of Games and Economic Behavior*. Princeton, NJ: Princeton University Press.
- Waterman, S. and D. Gordon. 1984. "A Quantitative-Comparative Approach to Analysis of Distortion in Mental Maps." *Professional Geographer* 36: 326–337.
- Wittgenstein, L. 1922. *Tractatus Logico-Philosophicus*. English translation by Ramsey, F. P. and C. K. Ogden, New York: Kegan Paul.
- Wynne, B. 1996. "May the Sheep Safely Graze? A Reflexive View of the Expert-Lay Knowledge Divide." In *Risk, Environment and Modernity: Towards a New Ecology*, edited by S. Lash, B. Szerszynski, and B. Wynne, pp. 44–83. London: SAGE.
- Ziemiński, Z. 1976. "Evaluative Utterances and Norms." In *Practical Logic*, 122–145. Dordrecht: Springer.