Bringing Local Knowledge into Environmental Decision Making : Improving Urban Planning for Communities at Risk

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Abstract:

This article reveals how local knowledge can improve planning for communities facing the most serious environmental and health risks. These communities often draw on their firsthand experience—here called local knowledge—to challenge expert-lay distinctions. Community participation in environmental decisions is putting pressure on planners to find new ways of fusing the expertise of scientists with insights from the local knowledge of communities. Using interviews, primary texts, and ethnographic fieldwork, this article defines local knowledge, reveals how it differs from professional knowledge, and argues that local knowledge can improve planning in at least four ways (1) *epistemology*, adding to the knowledge base of environmental policy; (2) *procedural democracy*, including new and previously silenced voices; (3) *effectiveness*, providing low-cost policy solutions; and (4) *distributive justice*, highlighting inequitable distributions of environmental burdens.

Keywords: *local knowledge; environmental health; community planning*

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Increasingly, concerned lay publics, especially the most disadvantaged populations experiencing the greatest environmental exposure risks and health effects, are demanding a greater role in researching, describing, and prescribing solutions to ameliorate the local hazards they face (Cole and Foster 2001; Di Chiro 1998). These communities are demanding *environmental justice* and are speaking for themselves, often drawing on their firsthand experience—here called *local knowledge*—to address the environmental risks they face (Collin and Collin 1998). The need to take account of local knowledge is putting pressure on environmental and public health planners to find new ways of fusing the expertise of professional practitioners and scientists with the contextual intelligence that only local residents possess (Fischer 2000). As planners increasingly play a mediating role between experts, policy makers, and various publics, they need to learn new ways of taking account of the local knowledge embedded in the communities within which they work. This article highlights the cognitive and normative contributions local knowledge makes to environmental health planning, particularly interventions aimed at improving the most at risk communities.

I highlight the contributions of local knowledge by reviewing the work of residents in the Greenpoint/Williamsburg (G/W) neighborhood of Brooklyn, New York. In this largely immigrant, Latino, and low-income community, residents have organized to research, assess, and offer solutions for the environmental health hazards they face, including asthma, air toxics, and risks from diets of locally caught fish. I suggest that community knowledge provides crucial political and technical insights often overlooked by professionals. The article argues that through both its epistemological and democratic contributions to professional planning, local knowledge should never be ignored by planners seeking to improve the lives of communities experiencing the greatest risks.

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► What Is Local Knowledge?

While this study argues for the professional recognition of local knowledge in research and decision making, I also aim to clarify what I mean by local knowledge. I seek to avoid reifying the categories "professional" and "local" as if they were invariant or monolithic entities (Agarwal 1995; Wynne 1996a). I therefore analyze the tendencies and differences among professional and local ways of knowing. The policy sciences literature characterizes local knowledge as "knowledge that does not owe its origin, testing, degree of verification, truth, status, or currency to distinctive . . . professional techniques, but rather to common sense, casual empiricism, or thoughtful speculation and analysis" (Lindblom and Cohen 1979, 12). Local knowledge can also include information pertaining to local contexts or settings, including knowledge of specific characteristics, circumstances, events, and relationships, as well as important understandings of their meaning. Another definition of local knowledge comes from Geertz (1983), whose seminal anthropological work titled *Local Knowledge* defines it as "practical, collective and strongly rooted in a particular place" that forms an "organized body of thought based on immediacy of experience" (p. 75). Geertz suggests that local knowledge can be described as simply as "to-know-a-city-is-to-know-its-streets" (p. 167).[1]

To further characterize local versus professional ways of knowing, I ask who holds the knowledge? Local knowledge is often held by members of a community that can be both geographically located and contextual to specific identity groups. This means that a "knowledge community" might be a neighborhood and/or a group with a shared culture, symbols, language, religion, norms, or even interests. In contrast, professional knowledge is generally held by members of a profession, discipline, university, government agency, or industrial association. However, this does not imply that *identity* is a fixed concept and predetermined by such things as religion, ethnicity, or neighborhood. As my empirical study will make clear, understanding identity means embracing *intersectionality* and *anti-essentialism*—or the notions that no person has a single, easily stated, unitary identity and that no absolute "truth" exists from any one perspective (Haraway 1991).

A second way to distinguish local from professional knowledge is to ask how evidence is gathered. The differences between professional and local ways of knowing can be characterized by examining the emphases each place on information collection methods, standards of evidence, and analytic techniques. Local knowledge is often acquired through life experience and is mediated through cultural tradition. Practitioners of local knowledge make explicit their reliance on evidence from time-honored traditions, intuition, images, pictures, oral storytelling or narratives, as well as visual demonstrations such as street theater (Van der Ploeg 1993). This knowledge is easily accessible to locals and widely shared. Tacit awareness and understanding, which are the product of historical experience and not merely a hunch, are also emphasized by practitioners of local knowledge (Krimsky 1984). In addition, local knowledge rarely conforms to technical rationality, particularly the need to search for causal models and rely on universal principles and theories for getting to the "truth"—both standard practices in most professions (Habermas 1970). Conversely, professional knowledge is largely gathered through experimental methods and disciplinary tools, such as risk assessment in environmental health problem solving (National Research Council 1996).

A third question that helps distinguish local from professional knowledge asks what makes evidence credible? For community members, local knowledge is rarely a hunch or spontaneous intuition but rather evidence of one's eyes tested through years if not generations of experiences. Furthermore, local knowledge is rarely instrument dependent. Community activists often draw from their experiences of seeing their own or a neighbor's sick children, combined with observations of industry smokestacks and foul odors, to piece together credible evidence (Tesh 1999). Community knowledge comes in part from actual sights, smells, and tastes, along with the tactile and emotional experiences encountered in everyday life. Yet, community members often make two different claims based on experiential evidence. The first claim represents a type of local knowledge that identifies or poses a problem. This claim is reflected in statements like, "I've seen sick people" and highlights contextual knowledge that allows professionals to focus on things they may have missed. Another claim reflects a type of local knowledge that hypothesizes a relationship between a hazardous exposure and illness. This claim is reflected in statements such as, "I know if dioxin and mercury are going to come out of an incinerator stack, somebody's going to be affected." Too often, professionals assume that local knowledge is only of the second kind, dismiss these claims, and miss the importance of the first type of local knowledge.

A final question that helps distinguish local from professional knowledge asks how the forums where evidence is tested differ. Local knowledge is generally tested in public narratives, community stories, street theater, and other public forums. In contrast, professional knowledge is generally tested through peer review, in the courts or through the media. Admittedly, all these distinctions can fluctuate, particularly when activists organize to try and stake out part of the traditional scientists' terrain—be it in academic journals, the courts, or the media. Community activists concerned with their own health and safety are increasingly wrangling with scientists about issues of

truth and method, exerting pressure on them from the outside and locating themselves on the "inside" of research (Heiman 1997; Irwin 1995; Shepard et al. 2002). These activists challenge not just the use and control of science and expert knowledge but also the content and processes by which knowledge is produced. Fundamentally, community activists claim to speak credibly as experts in their own right, as people who know about things scientific and who can partake of this special and powerful discourse of truth. Brown (1992) has labeled one method of laypeople engaging in environmental health research and decision making "popular epidemiology" and defines it as the process whereby laypeople "gather scientific data and other information and also direct and marshal the knowledge and resources of experts in order to understand the epidemiology of disease" (p. 269). Despite evidence that local knowledge can offer valuable insights for environmental problem solving, professionals continue to treat community members as largely ignorant of the technical and scientific aspects of the hazards they face.

▶ Models of Community Knowledge

While much of the planning literature has recognized the knowledge of communities, particularly in the form of narratives and storytelling (Baum 1997; Forester 1999; Throgmorton 1996), a majority of these studies reveal either what is wrong with expert-lay dialogues or the political, but not technical insights, community members can offer. For example, in a study of the discourse surrounding the locating of a hazardous waste site in the Ironbound community in Newark, New Jersey, Williams and Matheny (1995) reveal how planners used a "managerial" discourse that ignored the "communitarian" views of local residents. Briggs (1996) has noted that communicative planning efforts can often fail because professionals are generally inattentive to the culturally particular and ethnically derived language, speech codes, and scripts used by people of color. In a study of an environmental-planning process discussing the health issues surrounding a toxic waste site, Kaminstein (1996) notes how environmental agency experts alienated community members with confusing scientific language and patronized residents who raised passionate concerns about their safety. Finally, Forester's (1989, 1999) important work on planning, planners, and public deliberation has instructed the entire planning community of the power planners have to either manipulate citizen participation or facilitate deliberative democracy.

What these and other studies reveal is that planning processes, and the planners that organize them, often fail to capture both the technical and political insights community members can offer. Yet, communities from Love Canal, New York, to Woburn, Massachusetts, to St. James Parish, Louisiana, have organized to investigate and address technical issues surrounding the environmental health hazards they face (Brown and Mikkelsen 1990; Cole and Foster 2001; Gibbs 1994). A few planning studies have helped reveal the contributions laypeople make to scientific inquiry and environmental problem solving (Heiman 1997; Tesh 1999). Scott's (1998) study of state-centered planning concludes that projects often fail because professional planners fail to see the importance of the practical, contextual, and local knowledge that makes planning work. Wynne (1996a) notes how sheep farmers in the Cumbria region of England provided information about local variations in soil type to geologists studying the influence of Chernobyl fallout on local flora and fauna. Irwin (1995) also studied the knowledge of farm workers and notes how they organized stories of their experience working with the pesticide 2, 4, 5-T—telling regulators how protective clothing, respirators, and safety guidelines were never followed in practice. This information convinced scientists to reconsider the safety of the chemical and eventually lead to its ban in England. Epstein (1996) reveals how AIDS activists organized their own clinical trials on experimental drugs, reacting to inaction by government scientists in the early years of the AIDS epidemic, and how these "lay experiments" eventually changed the U.S. government's biomedical research protocols and formed the basis of today's disease-suppressing "drug cocktails." In Harlem, community activists with West Harlem Environmental Action (WEACT) organized young people to document and map areas in the neighborhood where they experienced foul odors, irritated throats, shortness of breath, and other symptoms of lung dysfunction (Northridge et al. 1999; Corbin-Mark 2001). The activists used their information to inform a research partnership with Columbia University researchers measuring the effects of diesel exhaust on childhood asthma in the community (Northridge et al. 1999).

What these studies reveal is that community members can contribute both political and technical insights to environmental problem solving. However, the dominant models of community knowledge still view the public as having either a deficit of technical understanding or as merely complementing the work of experts. In the deficit model, professionals claim that the public needs to be educated in the ways and knowledge of professional experts to meaningfully participate in environmental decisions (Yearley 2000). This view was perhaps most clearly articulated by Supreme Court Justice Stephen Breyer (1993) when he called for a federal "superagency" consisting only of scientists and other experts, insulated from politics and public input, to make neutral, risk-based decisions. While most planners committed to

democracy and even the U.S. Environmental Protection Agency (EPA) rejected the deficit model (Lash 1994; National Research Council 1996), professionals often prefer a "complementary" model of public participation. In the complementary model, the public is asked to offer values, raise questions of fairness, and provide "political" insights, but scientific experts retain autonomy over technical issues (Douglas and Wildavsky 1982; Slovic 1991). The complementary view prevails in most studies of communicative planning since these analysts generally fail to adequately problematize and deconstruct the discourse of technical experts (Healey 1999; Ozawa and Susskind 1985). This article argues for a third model, called "co-production," where all publics are understood as potential contributors to all aspects of environmental-planning decisions because hard distinctions between expert and lay, scientific and political order, and facts and values are rejected (Susskind and Elliot 1983; Jasanoff and Wynne 1998).

In the co-production model, science is understood as dependent on the natural world, as well as historical events, social practices, material resources, and institutions that contribute to the construction, dissemination, and use of scientific knowledge (Habermas 1970; Jasanoff and Wynne 1998). Political decision making in the co-production framework does not take scientific knowledge as a given but seeks to reveal and deconstruct how science is conducted, communicated, and used (Latour 1979). The co-production model also problematizes knowledge and notions of expertise from the outset, challenging traditional distinctions between expert and lay ways of knowing (Wynne 1996a; Yearley 2000). I now turn to the work of activists in Brooklyn to further clarify the practice of co-production and to reveal how local knowledge improves environmental planning.

► Local Knowledge and Community Air Toxic Exposures

The G/W neighborhood was selected by the EPA for the first community-based cumulative exposure project to respond to the lack of local health studies, the disproportionate number of polluting facilities in the neighborhood, and to address concerns raised by neighborhood-based environmental groups (Hanhardt 2000; Talcott 1999). With approximately 160,000 residents living in a less than five square mile area, the G/W community is a dense urban neighborhood where industry abuts housing. The residents are some of the poorest in all of New York City, with 35.7% of the population living below the poverty line and less than half of the adults older than twenty-four years of age having a high school diploma or higher level of education (U.S. Bureau of the Census 2000). The ethnically diverse neighborhood is approximately 42% Latino (mostly Puerto Rican and Dominican), 24% Hasidic Jew, 13% African American, and 10% Polish and Slavic immigrant (U.S. Bureau of the Census 2000). The neighborhood is also one of the city's most polluted; it has the largest amount of land devoted to industrial uses among New York City's fifty-nine community districts, the largest concentration of Toxic Release Inventory (TRI) reporting industries in New York City, a sewage treatment plant, more than thirty solid waste transfer stations, a radioactive waste storage facility, thirty facilities that store extremely hazardous wastes, and seventeen petroleum and natural gas storage facilities (New York City Department of Environmental Protection [DEP] 1997; Perris and Chait 1998; Steinsapir, Schwarz, and Lalor 1992).

The EPA exposure assessment was aimed at better understanding and addressing some of these hazardous exposures in the neighborhood. One aspect of the EPA project attempted to estimate resident's exposure to air toxics. The study modeled the local dispersion of 148 hazardous air pollutants using a dispersion model titled Assessment System for Population Exposure Nationwide (ASPEN) (EPA 1999). The EPA had originally planned to run the dispersion model and present the results to the community (Talcott 1999). However, at the urging of some city environmental officials who had worked with activists in the G/W neighborhood, the EPA agreed to present its research methods to local activists (Hanhardt 2000).

During one community meeting, the EPA heard from the Watchperson Project, a neighborhood organization that monitors local environmental and health hazards, that the air dispersion model was going to miss hundreds of polluters that did not show up in any state or federal air-quality database. The EPA had based its air pollution model on data from New York State air monitors and TRI sites in the neighborhood (EPA 1999). The community group noted that there was only one state air monitor in the entire neighborhood and that there were hundreds of small local polluters that did not appear in the TRI. Activists also argued that since the ASPEN model would aggregate air pollution by census tract, it would likely "wash out" these small-source polluters and the block-to-block pollution differences that characterized their industrialized neighborhood (Swanston 2000).

In making its case to the EPA, the Watchperson Project developed maps of the neighborhood showing the locations of the small polluters on each land parcel in the community. The community organization obtained pollution permit data from the DEP and plotted these sources using a geographic information system (Swanston 2000). The DEP database included the small-source air polluters that the city permitted but the EPA did not regulate, such as boilers in apartment buildings, auto paint shops, and printing facilities. The Watchperson Project

mapped these small sources because they were concerned that by relying on the TRI and aggregating exposures by census tract, the EPA model was not going to accurately characterize community air pollution exposures. According to Robert Lewis, director of the Watchperson Project's geographic information system,

> To capture data only by census tract or block group averaged-out significant localized emissions. A data-set that aggregated by census-tract or even block would miss important distinctions between city blocks and even within one block. Our map was the only one to show just how many small-sources there are in the neighborhood and how the state and federal monitoring misses all these sources.

The community group mapped 15,167 distinct land parcels in the community and produced maps comparing the facilities the EPA was modeling with the facilities in the DEP database that the exposure assessment was not going to include. The group found more than one thousand potentially toxic air polluters that the EPA was going to miss (Swanston 2000).

The Watchperson Project's maps were compelling to EPA scientists, but according to one, the agency struggled with how to treat the local data in the dispersion model:

> We struggled for a long time considering the community group's data set. We tweaked the model some but we just couldn't aggregate all those sources at a block-by-block level without loosing accuracy in the dispersion model. What we did do, however, was take the area sources we could get enough data for, plot them, and model them as point sources.[2]

Thus, the community-gathered information forced the EPA to rethink how its dispersion model might more closely reflect actual community exposures.

Another set of data collected by the Watchperson Project also influenced the EPA model. A project run by the community group used volunteer high school students to canvass the neighborhood in teams to follow up on community complaints of air, noise, and odor pollution registered by residents with the city DEP. This survey discovered that a large number of complaints were coming from residents living in buildings with dry-cleaning establishments on the ground floor. The Watchperson Project organized the students to document the location of all the dry-cleaning establishments and the specific type of buildings where they were located. The survey found fifty-four dry cleaners in the neighborhood, with twenty-three of the fifty-four performing dry-cleaning in residential buildings (EPA 1999). Combining census data with the neighborhood survey, the group also found that as many as 183 apartments and approximately 550 persons in G/W were living above the dry-cleaning establishments (Swanston 2000).

The Watchperson Project's dry-cleaning survey raised a particular concern to the EPA since previous studies had found concentrations of perchloroethylene ("perc"), a known carcinogen, inside apartments (at up to three floors above a dry cleaner in the same building) averaging 150 parts per million and some measurements exceeding 1,000 parts per million (Wallace et al. 1995; New York State Department of Health [NYS DOH] 1993).[3] Yet, the EPA model estimated that the expected *outdoor* concentration of perc in G/W was less than 2 parts per billion, with a maximum-modeled census tract outdoor concentration of 39 parts per billion (EPA 1999). According to Fred Talcott of the EPA,

> The average concentrations found in apartments above dry cleaning establishments was on the order of 1000 times higher than the outdoor concentration of "perc" as predicted by the ASPEN model in G/W. That to me is an illustration of a micro-level problem that would be completely obscured if you only looked at daily walking around concentration. Without the community group data set, we would have missed this. (Talcott 1999)

The EPA considered performing a separate assessment for this subpopulation but eventually decided to document only the findings in the cumulative exposure project report (EPA 1999, chap. 6). Nonetheless, the fact that the EPA considered the dry-cleaning establishment data generated by the community represented a significant change from the traditional expert-driven assessment process. According to Samara Swanston (2000), director of the Watchperson Project, "The dry cleaners were something you couldn't know from any database. You'd have to walk around the neighborhood to know that they are located in residential buildings. That's what we did in our survey and they listened to us." The EPA modeling team acknowledged that lived experience is an important factor in understanding exposures and acquiesced to "local experts" for this knowledge. Community knowledge forced the EPA to rethink their initial assumptions and set the stage for local knowledge to frame other aspects of the community exposure assessment.

▶ Tapping the Local Knowledge of Subsistence Anglers

During the same series of community meetings about the air toxics model, the EPA heard concerns from residents about the agency's planned methodology for assessing dietary exposures. Residents learned that the EPA intended to estimate hazardous dietary exposures using a series of default "urban diet" assumptions. This raised immediate objections since it was obvious to most locals that the community's different ethnic

groups all ate different diets. According to one resident, Loyda Gisela Guzman, "*Mira* [look], you can't tell me Hasidic Jews, Puerto Ricans, Poles, Italians and Guyanese immigrants all living here are eating the same thing. We might all be 'urban' but we ain't eating typical diets." Residents were particularly concerned that the EPA assessment lacked any specific information about the potential hazards from diets consisting of locally caught fish. Residents noted that due to poverty and cultural tradition, many locals were living off a subsistence diet of East River fish (Swanston 2000). This was the first time the agency had heard of this potential health hazard, and neither the EPA nor the community had any detailed data about subsistence fishing beyond anecdotal evidence (Swanston 2000).

The Watchperson Project emphasized to the EPA that not only were the hazards from subsistence fishing a significant dietary exposure but also that since many of the anglers were immigrants and non-English speakers, they would likely be reluctant to speak with outside researchers about their practices (Swanston 2000). The community group recommended that angler exposure data be included in the EPA study and that a data collection effort be conducted by local people since they would be the only ones trusted by the anglers to share honest information about local fish diets (Swanston 2000). After bringing the EPA researchers on a tour of popular fishing piers in the community, the agency agreed that this was a potentially serious hazard and decided to help the Watchperson Project collect information about the practices of local anglers. According to Talcott of the EPA,

> After we learned from residents that they were eating fish from the East River, we had no choice but to let the community groups gather the data. For a number of reasons, including language, cultural barriers, and potential trust issues, we felt the local people could best gather this data. This was one situation where residents raised an issue we hadn't considered, defined the extent of the problem, and provided the data for analysis. (Talcott 1999)

Working with the EPA, the Watchperson Project developed a protocol to interview anglers to identify approximately how many people were eating fish out of the river, the amounts and frequency of fish consumption, and the types of fish that anglers and their families were eating (EPA 1999). The community group spent three months interviewing anglers at the India Street and the North Seventh Street/Kent Street Piers along the East River. Community members volunteering with the Watchperson Project visited the piers twice a day for two weeks during August and September and observed and interviewed more than two hundred anglers. Each angler was asked about his or her age, race, country of origin, and the number and age of people in their family. The species of fish and the number they regularly caught was also asked. Since the interviewing was conducted during the summer, each interview included questions about seasonal variability and frequency of catches in different seasons. Finally, each angler was asked about his fish consumption patterns and those of his family, including the species, quantities, and preparation techniques of the fish they ate (EPA 1999).

► Angler Survey Findings

The community-gathered information was divided by age and ethnicity, and separate categories were created for whites, Poles, African Americans, and Latinos. The Watchperson Project found that almost all the anglers were Latino males between the ages of sixteen and sixty years. The family size of each angler ranged from three to ten persons, and all anglers interviewed noted that at least one family member was younger than the age of nineteen (EPA 1999). The Watchperson Project survey determined that local anglers were catching between 40 and 75 fish per week, averaging 57 fish per week, and that each family member of an angler was eating approximately 9.5 fish per week (EPA 1999).

All the anglers interviewed listed the same four species as the most frequently consumed fish: blue crab, American eel, blue fish, and striped bass. Most anglers reported that they ate whatever they caught. The EPA analysts performed toxicological tests on fish from the same river and compared these data with fish contaminant estimations in the East River from the New York State Department of Environmental Conservation (EPA 1999). From these data, the EPA determined that the contaminants of concern in the locally caught fish included cadmium, mercury, chlordane, DDT, dieldrin, dioxins, PCBs, arsenic, and lead (EPA 1999).

Using the community survey data, EPA generated a consumption rate for G/W residents in grams per day, which was found to be consistent with EPA data from other communities relying on subsistence fishing (EPA 1993). Resident exposures were then calculated based on fish tissue contaminant concentrations found in actual samples and the consumption rates. Eventually, the EPA calculated a lifetime cancer risk for adult subsistence anglers in G/W and found that the risk exceeded one in ten thousand (1×10^{-4}) for every exposure scenario (EPA 1999). Compared with the EPA's acceptable cancer risk of one in a million (1×10^{-6}), the risks to subsistence anglers in G/W were significant but would have been missed without the community-generated information.

▶ Local Knowledge to Address Asthma

A third example of how the knowledge only community residents hold can improve environmental decision making comes from another community organization in G/W called El Puente. A community learning and development institution located in Williamsburg's Southside, El Puente has conducted a series of community health surveys focusing primarily on asthma (Ledogar et al. 2000). Designed, administered, and interpreted largely by community residents, the surveys have enabled El Puente to learn about neighborhood health, the challenges residents face in maintaining their health, and structuring interventions that resonate with and make sense in people's daily lives (Ledogar, Acosta, and Penchaszadeh 1999). Since 1995, El Puente, with the assistance of the nonprofit group Community Information and Epidemiological Technologies, has performed six community health surveys.

El Puente and Community Information and Epidemiological Technologies adopted a research methodology called Sentinel Community Surveys or Service Delivery Surveys (Ledogar and Anderson 1993). In these methods, a mix of quantitative and qualitative data is gathered by existing community organizations that are trained to conduct questionnaires, perform face-to-face interviews, and facilitate public discussions of survey design and results—all with the intention of collective action. The research philosophy is rooted in the Latin American tradition of Participatory Action Research, which emphasizes that research ought to be understood as a process of education and pedagogy as a practice of social transformation (Freire 1974; Fals Borda and Rahman 1991). The key components of El Puente's research approach include (1) community ownership of both the information and the research process, (2) the premise that research will lead to action for the benefit of the community, and (3) the weaving of research into a process of community reflection and learning (Ledogar, Acosta, and Penchaszadeh 1999).

After its first survey effort, which was limited to high school students, El Puente employed a dedicated survey staff of ten Latinas from the neighborhood to obtain more detailed information and to develop a sustained action-research effort (Ledogar, Acosta, and Penchaszadeh 1999). These women, all Puerto Ricans and Dominicans, comprised El Puente's Community Health Educators (CHE) team. The CHE women acted as community health workers, lay health educators, advocates, and advisors who learn from and help educate individuals and groups toward increased well-being (Love, Gardner, and Legion 1997; Ramirez-Valles 1998). The workers act as bridge builders between residents, cultural and folk practices, and professional providers of clinical health care (Love, Gardner, and Legion 1997). This can be accomplished when the women workers offer basic disease education, screening, and detection techniques; translate the cultural and folk practices for unknowing health care providers; and seek out professional health care for those who desire it (Ramirez-Valles 1998).

▶ Focus Groups and Local Knowledge

After a series of surveys, El Puente established a peer-reviewed asthma rate for the first time in Williamsburg's Latino community. Published in the *American Journal of Public Health*, El Puente calculated an 8.5 percent active asthma rate generally and a 12.4 percent active asthma rate for children, more than twice the national rate of 5.4 percent (Ledogar et al. 2000). Other survey findings revealed that residents who had been living the longest in the neighborhood had the highest prevalence of asthma, more than half the respondents did not have health insurance, many new immigrants avoided professional health care, and residents who came straight from Latin America or the Caribbean had half the risk of having been diagnosed with asthma than those who came from other areas within the United States (Ledogar et al. 1999). El Puente used focus-group discussions to reveal some of the reasons behind many of these survey findings. For example, one survey found that women older than forty-five years of age had a high prevalence of asthma, similar to that found in children. This was surprising since children, not older women, are generally suspected as being the most vulnerable to developing asthma. During focus-group discussions, many women noted that their only choices for work included hair and nail salons, laundries, dry cleaners, or textile factories—all occupational environments that could contribute to respiratory disease (Igelsias-Garden 2001). Without the focus-group discussion, it is unlikely that the potential relationship between women's employment and asthma would have been uncovered.

Another survey finding revealed that many residents relied on herbal and other culturally derived home remedies to treat asthma, often in place of physician-prescribed medication (Ledogar et al. 1999). When the group discussions turned to why this might be happening, most residents told of being shunned and ridiculed by their health care provider when they tried to explain their cultural or spiritual practices (Penchaszadeh 2001). Residents also stated that they had a hard time trusting a physician who did not understand, appreciate, or take seriously their home remedies as both spiritual and traditional practices (Iglesias-Garden 2001).[4] Focus-group discussions also helped reveal why Dominicans were almost twice as likely as Puerto Ricans to replace physician-prescribed medication with home remedies. Dominicans noted that the home remedies helped them "connect with others who could

help them integrate into American culture," suggesting to El Puente that the home remedies helped keep new immigrants connected with their social networks (Ledogar et al. 2000).

► Local Knowledge for Action

Armed with local knowledge from surveys and focus-group discussions, El Puente began taking action. The CHE team enrolled hundreds of families in a free New York State health insurance program and in the group's asthma management program (Iglesias-Garden 2001). The CHE also developed a "cultural competency program" to train local health care providers in Latino folk medicinal practices. The work of El Puente also appears to be influencing the professional environmental health community. The group's research has twice been published in the *American Journal of Public Health* (Ledogar, Acosta, and Penchaszadeh, 1999; Ledogar, 2000), and the National Institute of Environmental Health Sciences funded El Puente to continue its research and act as the principal investigator for a four-year asthma study (National Institute of Environmental Health Sciences 2000). Most important, El Puente's work appears to be paying off; not only have they educated and enrolled hundreds of community members in their asthma mastery program, but asthma hospitalizations in the Community District have decreased from 1,166 in 1997 to 484 in 1999 (NYS DOH 1999).

► The Cognitive and Normative Contributions of Local Knowledge

The work of activists in G/W reveals some of the ways local knowledge can improve environmental planning and how coproduction works in practice. Yet, studies of local knowledge and community-based practices, particularly in environmental politics, are often challenged for romanticizing local culture and practice and overlooking the structural and global dimensions of problem solving. Local knowledge might be understood by these critics as parochial and condemned to "the neighborhood," and this, they say, ignores national and global politics. Skeptics might accuse me of being too sympathetic to "identity groups" and in the process reifying social divisions among groups. This critique claims that by valorizing identity groups as important sources of knowledge and political claims, I am perpetuating divisions among social groups that are often creations of the state. A similar critique might label my work "populism" since I challenge elitist assumptions that ordinary people cannot think or act as rationally as experts. Finally, my research into local knowledge might be challenged for exonerating the state's responsibility to protect those least well off and shifting the burden of information gathering to local people. This same critique might suggest that by emphasizing local knowledge, I am ignoring the social, political, and economic structures and institutions that helped create the environmental burdens currently facing the poor and people of color. In the next section, I attempt to respond to these challenges by emphasizing both the cognitive and normative contribution local knowledge makes to environmental policy.

Local knowledge contributed to community planning in G/W in at least four different ways: (1) *epistemology*—local knowledge made a cognitive contribution by rectifying the tendency toward reductionism in professional vision and policy; (2) *procedural democracy*—local knowledge contributed additional and previously excluded voices, which can promote wider acceptance of decisions by fostering a "hybridizing" of professional discourse with local experience; (3) *effectiveness*—local knowledge identified low-cost and efficient policy analysis and implementation options; and (4) *distributive justice*—local knowledge raised previously unacknowledged distributive justice concerns facing disadvantaged communities. The epistemology category can be aggregated into four additional contributions to environmental decision making:

1. *Aggregation*—that is, professional decision-making tools always aggregate, and this misses local particularity.
2. *Heterogeneity*—local knowledge can highlight how professional assessment models pay inadequate heed to the interindividual or intergroup variability of the population on which the model is being imposed.
3. *Lifestyle*—professional models always try to say something about the relevant causal factors, and in so doing, they necessarily bound some things out as not relevant. From the community perspective, this category says "your professional model of how I'm going to react (my body or my community) to this exposure is flawed because you are not taking a holistic enough look at how I move through the world."
4. *Tacit knowledge*—local knowledge reveals the unspoken information that does not easily lend itself to the reductionist model making that is characteristic of professional science.

► Epistemology

The episodes presented here make clear that community knowledge makes a contribution to the overall knowledge base used for environmental policy making (Krimsky 1984). Part of the knowledge base for environmental decisions comes from professional science, or information emerging from a profession or discipline that undergoes a series of professional legitimacy "tests" (i.e., case-controlled experiments, statistical analyses, peer review, etc.) (Habermas 1970). Yet, Brooklyn activists

highlighted that critical environmental health insights also come from time-tested experiences, community maps, and narratives. The G/W activists contributed to epistemology by engaging with and seeking to extend science. When these activists challenged the "normal" ground rules about how science was conducted by, for example, altering the dietary risk assessment, they contributed to what Funtowicz and Ravetz (1993, 1999) have called "post-normal science."[5] In other words, when given an opportunity to engage with science and scientists, community members often seek "to re-value forms of knowledge that professional science has excluded, rather than to devalue scientific knowledge itself" (Cozzens and Woodhouse 1995, 538). The Brooklyn activists demonstrated that a lack of data should not lead to professional assumptions of an absence of hazard. Too often, specific disease and environmental exposure information do not exist at the local level, especially in communities of the poor and people of color (Shepard et al. 2002). This ignorance leads researchers and agency decision makers to assign zero risk where little or nothing is known. These episodes have shown that local knowledge is crucial for filling the gaps in health department and environmental regulatory agency informational databases. At least four additional subcategories help clarify the epistemological contribution local knowledge makes to environmental planning.

Aggregation

By definition, professional decision-making tools always aggregate, and this tends to miss local particularity (Winner 1986). Local knowledge can point out where an insupportable degree of aggregation is taking place. For instance, in the air toxics episode, community members pointed out to the EPA that its dispersion model missed many small emission sources and dangerous perc emissions from dry cleaners located in residential buildings. In the angler episode, residents highlighted how the EPA assumption of an "urban default diet" was also a grossly inaccurate aggregation of local diets. Thus, local knowledge can highlight an epistemological flaw when professional models of data aggregation wash out particularities within the community (Habermas 1970).

Heterogeneity

Local knowledge can also reveal that professionals are paying inadequate heed to the heterogeneity of a population that expert models are often studying. Interindividual or intergroup variability was revealed by local knowledge when, for instance, El Puente's CHE helped highlight culturally specific information about asthma. The El Puente surveys also found that asthma rates differed significantly for Puerto Ricans and Dominicans despite the fact that they often lived side by side (Ledogar et al. 2000). Population differences that local knowledge exposes are critically important for understanding interindividual and intergroup susceptibility to certain hazardous exposures, especially for people of color and low-income communities who currently experience disproportionate disease and hazardous exposures burdens (Institute of Medicine 1999). These groups tend to be more susceptible and vulnerable to hazardous exposures and illness by virtue of their social environment (Krieger 2000; Northridge and Shepard 1997). Yet, the heterogeneity of a population is commonly ignored by professional models, particularly risk assessments, because the default assumption is that everyone is equally and similarly susceptible (Kuehn 1996; Jasanoff 1999).

Lifestyles

Local knowledge can also highlight the importance of lifestyles for understanding the relevant causal factors that professional models should and should not consider. In other words, local knowledge can help capture the information that is often ruled out by professionals as "a way of living." For example, diets consisting of locally caught fish were not something the EPA considered, and it was not until the Watchperson Project took agency representatives on a tour of the neighborhood that the scientists treated fishing as more than a lifestyle issue.[6] The importance of lifestyle factors was also made evident during El Puente's focus-group discussion highlighting the extent of home-remedy use and why folk medicines were substituted for physician-prescribed medications. When challenging professional models for ignoring their lifestyles, G/W activists were not merely saying, "You have to give weight to me and my experience" as a narrative voice, but rather, "Your professional model of how I'm going to react (my body or my community) to this exposure is flawed because you are not taking a holistic enough look at how I move through the world." In other words, residents failed to "see themselves" in the science, and the professional study failed to take on board the very public whose health it was trying to assess. The assumption that local lifestyles have nothing to offer science is an all-too-common occurrence when professionals assess community environmental health issues (Brown 1992; Israel et al. 1998).

Community knowledge helps uncover inadequacies in professional models when these models bound-out of their cognitive domain things that really do affect health and illness.

Tacit Knowledge

A fourth epistemological contribution local knowledge makes to environmental planning is that it can uncover previously inaccessible and highly contextual information. Tacit knowledge is important because without it professionals can rarely truthfully discover information that does not easily lend itself to the reductionist model-making characteristic of professional science. The most obvious example of this occurs when professionals are doing research on the mafia; they cannot get truthful information unless they become part of the community, and some information is so tacit that only members of the community can gather it. The information provided by the subsistence anglers—most of whom were immigrants, non-English speakers, and fearful of talking with outsiders—was an example of the kind of tacit information that only local people could accurately gather. When community members surveyed the anglers, with whom they shared a common language, cultural heritage, socioeconomic background, and immigration status, many of the angler's fears and disincentives to participate were allayed.

► Procedural Democracy

Beyond its cognitive contributions, local knowledge can also make normative contributions to environmental planning. One such contribution is toward enhanced procedural democracy, which occurs when previously excluded and marginalized voices are included in the technical research and decision-making process, especially in a world where expertise tends to exclude people (Fischer 2000; Sclove 1995). Including local knowledge with professional science can foster a "hybridizing" of professional discourse with local experience and ultimately promote wider democratic legitimacy for professional decisions (Jasanoff and Wynne 1998). In the El Puente example, Latinas with no formal education and folk healers were two groups historically ignored by public health professionals that made significant contributions. Similarly, in the air pollution episode, community residents participated in risk modeling, a process that is generally the domain of only a select group of experts (Jasanoff 1999; Winner 1986). When local people meaningfully participate in science, not only is the circle of participation expanded, but they can "create value" by identifying additional decision-making considerations and can fundamentally alter the existing rules of the "scientific field."[7] By explicitly recognizing community expertise, local environmental decision making can provide the opportunity for communities to speak back to the often hegemonic power of scientific expertise and ensure that problems are defined, analyzed, and addressed in ways that make sense to local people (Habermas 1970; Tesh 1999). Issues of research transparency, trust, ownership, and self-determination continue to concern community groups, especially the poor and people of color who have either been ignored by researchers or, when asked to participate as subjects, are often abandoned in the end by researchers intent on analyzing results only for their own advancement and not for community improvement (Shepard et al. 2002). The practice of joint fact-finding, commonly used in consensus building and collaborative planning, is one way planners might address community concerns. In joint fact-finding, community residents, agency representatives, and other interested "stakeholders" work together to gather and analyze information, making assumptions and judgments explicit along the way, and collaboratively decide how information should be used in decision making (Ozawa 1990). While no panacea, local knowledge helps democratize the environmental assessment and decision-making process.

► Effectiveness

Community insights can also make environmental decisions more efficient and effective. Local knowledge can help identify low-cost policy options and implementation strategies that more closely align with "street-level" realities. Low-cost policy options might include community residents' performing education, information dissemination, or even a community survey. By including local knowledge in professional science, community members are more likely to see themselves in science thus finding it more acceptable, potentially saving time and money in policy making (Wynne 1996b). Implementation of policy options is also likely to be more effective when local knowledge highlights existing practices embedded in the community that might affect an intervention, such as the cultural medicinal practices of Latinos discussed in the El Puente example (Majone 1989; Scott 1998).

► Distributive Justice

Finally, local knowledge can improve environmental decisions by highlighting the distributive justice concerns of

community residents. By revealing the hundreds of polluters the EPA air toxics model was missing, residents highlighted the disproportionate environmental burden they experienced every day. When community members asked whether the EPA assessment of local diets accurately captured the potentially hazardous diets of anglers, a particular subpopulation in the community, they were asking who was at risk, not merely whether a particular probability or level of risk was acceptable. Similarly, when El Puente documented the high asthma rate for local Latinos and the challenges these same Latinos face accessing health care, they were demanding to have the same distribution of goods and opportunities as any other community. When community residents raise distributive outcome issues in environmental planning, they are demanding a lowering of risks (not for a shifting or equalizing of existing risks) and for fairly distributed environmental and health benefits (Gelobter 1994). Ultimately, to lower risks for everyone, advocates of local knowledge almost always prefer preventative and precautionary action since communities at risk cannot wait for the "definitive proof" to guide interventions (Cole 1999; Gibbs 1994).

▶ Local Knowledge for Environmental Justice

While policy analysts often document how science transforms society (Ezrahi 1990), it is less often appreciated that society, in speaking back, can transform science and accompanying decision making. The implication is a shift from science "speaking truth" to society to the more democratic notion of "making sense together" (Sclove 1995). The three episodes in G/W revealed that local knowledge can both extend the knowledge base used for environmental decisions and promote democracy by doing such things as identifying gaps in expert assumptions, improving professional understanding of local practices, and highlighting culturally based health-promoting practices. The episodes also point out that community residents can be "citizen scientists," working with conventional scientists, not in place of them. The activists in G/W brought to light how the co-production model works in practice and debunked the notions that the public always has a deficit of knowledge or merely complements what experts already know. Certainly, the knowledge of community residents is no panacea for improving environmental decision making. More work is needed to understand both the benefits and limits of how the contextual knowledge of local people can improve environmental decisions. However, one thing is clear: for epistemological and democratic reasons, local knowledge should never be ignored by professional planners interested in improving the scientific basis and fairness of community-based environmental decisions.

▶ Notes

1. The international development literature (Agarwal 1995; Chambers 1997) often defines local or indigenous knowledge as
   a. information linked to a specific place, culture, or identity group;
   b. dynamic and evolving knowledge;
   c. know-how belonging to groups of people who are intimate with the natural and human system within which they live; and
   d. knowledge that has some qualities that distinguish it from "formal (i.e., modern) scientific" knowledge.

2. U.S. Environmental Protection Agency (EPA) scientist interviewed on 24 April 2000, on the condition of anonymity.

3. The EPA cancer benchmark level for perchloroethylene is 1.7 parts per billion.

4. The use of herbs and home remedies is widespread in Latino cultures, especially for those following the spiritual practices of Santeria and Espiritismo, popular among Caribbean Latinos from Puerto Rico, the Dominican Republic, and Cuba (Zayas and Ozuah 1996).

5. The term *post-normal* provides a contrast to two sorts of "normality." One is the picture of research science as normally consisting of puzzle solving within the framework of an unquestioned and unquestionable "paradigm," in the theory of Kuhn (1962). Another is the assumption that the policy environment is normal in that routine puzzle solving by experts provides an adequate knowledge base for policy decisions. The idea of post-normal science is to bring "facts" and "values" into a unified conception of problem solving where a plurality of legitimate perspectives are recognized as capable of contributing to addressing any given problem (Funtowicz and Ravetz 1999).

6. Community-led tours, often called "toxic tours," can be thought of as important "rituals of learning." Forester (1999) notes that these rituals are performances that enable learning by both locals and outsiders:

> We can think of participatory rituals as encounters that enable participants to develop more familiar relationships or to learn more about one another before solving the problems they face—for example, the informal drink before negotiations; the meals during focused workshops; . . . Participatory rituals are encounters in which "meeting those people" comes first, even if it serves the secondary objective of "solving our problem." On such occasions we discover that we learn about our problems through, and as we learn about, other participants too. (Forester 1999, 131-32)

7. To "create value" means to expand the possible questions to ask, evidence to consider, and options for action (see Susskind and Cruikshank 1987). For an understanding of "field," I draw from Bourdieu and Wacquant (1992), who describe fields as specific, relatively autonomous domains of social action, social production, and reproduction, which reflect and constrain the interests, positions, strategies, and investments of the actors within them. While this idea is helpful to understand how laypeople attempt to locate themselves within science, it may be too narrow because Bourdieu

portrays scientific practice as something carried out in laboratories, universities, and peer-reviewed journals, not in foundations, defense departments, biotech companies, or community-based social movements.

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