

Working Group 6: Environmental Justice Research across the LTER Network: long-term and multi-scale understandings of past, present, and future

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Summary

Environmental justice (EJ) and ecological research could benefit substantially from an integrated socio-ecological approach over the long term. To date, however, the two fields of study have occupied separate worlds. The LTER network represents a ready-made infrastructure for a network level analysis of the ecological and social dynamics of environmental inequity (the distribution of environmental amenities and disamenities in relation to social groups) over the long term. Comparative, cross-site research will illuminate how variable human behaviors and outcomes in an EJ context interact with ecological processes, and the implications of those coupled systems for the three grand challenges of biotic structure, biogeochemical cycling, and climate change.

Traditionally, EJ research has focused on the distribution of environmental disamenities – such as toxic sites, polluted air, or hazardous waste facilities – in relation to where social groups, especially minorities and poor persons, live. Within the social sciences, new research analyzes which groups of people benefit from the distribution of environmental amenities, such as parks and greenspaces, or clean air and water. The spatial and statistical analyses of environmental amenities and disamenities in relation to social groups is termed *outcome equity* analysis. Environmental justice research has also

examined the equity of decision-making as it relates to the distribution of amenities and disamenities. *Process equity* is the term used to describe this area of research. Understanding both the patterns and processes of environmental inequity requires a long-term analysis. Single “snapshots” of patterns at one point in time can reveal something about association but tell researchers little about the processes or mechanisms that create those patterns. The LTER network provides a stimulating intellectual milieu for carrying out environmental justice research over the long term, getting us closer to understanding the social and ecological *dynamics* of environmental equity.

Firmly embedded in the “brown” agenda of environmentalism, EJ has operated primarily as a social justice issue. It has been the realm primarily of social science, as well as activists and non-profit organizations. As Pickett described in his presentation, ecologists can put more of the “environment” in environmental justice research by drawing on the concepts of ecological stresses and disturbances. While there is a rich literature on natural hazards and risks in the social sciences, ecologists can contribute their sophisticated understandings of ecosystem structures and functions to better inform natural hazards and environmental justice research. Extensive ecological research on fire, for instance, can improve models of fire hazards. In turn, the consequences of those fires on vegetation succession and soil structure could provide more robust spatial models for estimating susceptibility of future fires, land slides, particulate matter plumes, and so forth. Ecological knowledge on the mechanisms of inundation could likewise translate into better predictive models of food hazards.

While ecological drivers (Q1-Q3) of environmental justice are important and necessary for refining our models, in order to understand the dynamics of human ecosystems, it is also necessary to close the loop, or recognize and analyze the feedback relationships of the socio-ecological system (Q4-Q5). To date, EJ research has directed its attention to the impacts of environmental inequity on human well-being, including health. Little if any scholarship has examined the ecological consequences of environmental inequity. It is at this juncture of ecological and social sciences that very innovative questions can be asked. For instance, do high degrees of environmental inequity correspond with low degrees of ecological health, integrity, resilience, or sustainability? If amenities and disamenities are concentrated rather than dispersed throughout a unit of analysis, what types of ecosystem structures or functions are most affected, and how? Can ecological integrity and environmental equity co-exist? At the same time, EJ research must also improve its understanding of the social consequences and feedbacks of environmental equity or inequity on the system. Feedbacks of an integrated socio-ecological system on environmental justice dynamics is the holy grail, and the LTER is an ideal place to conduct such research.

Currently, only researchers with the BES and CAP are explicitly undertaking research labeled as environmental justice, but many sites have begun or plan to begin research that examines the differential impacts of ecological change and dynamics on human beings. Chris Boone and Morgan Grove at the BES have conducted long term research on outcome and process equity for amenities and disamenities in Baltimore using the TRI database, parks and open spaces, and the BES Telephone Survey. Working with a

sociologist, economist, historian, and environmental lawyer, Boone is also the lead PI for a project recently funded through NSF's HSD program to execute both outcome and process based analyses of long term environmental amenities and disamenities in Baltimore from 1880 to 2000. Bob Bolin at CAP has researched outcome equity patterns in the Phoenix metro area, including historical analyses of environmental justice dynamics. He has also worked on the environmental justice patterns of transportation networks, and underscores the importance of understanding the inequities from mobile sources. Bob Bolin and Boone have also begun a cross-site analysis (BES and CAP) of environmental inequity, using TRI data. Sharon Harlan (CAP) has analyzed the differential impacts of the urban heat island in the Phoenix area, demonstrating that it is linked strongly to social characteristics and vegetation patterns. Harlan describes the urban heat island as a press disturbance, or constant danger of heat, that is exacerbated (pulse) by heat waves that heighten risks. Kelli Larson (CAP) emphasized the need to move beyond mapping vulnerability and risk to understanding people's perceptions of risk and vulnerability, as those perceptions influence individual and group responses. Laura Ogden (FCE) noted that climate change and concomitant changes in hurricane frequency and magnitude, and sea level rise, will have differential impacts on residents in Miami. She also noted potential inequities in decision-making regarding restoration of the everglades and that the outcomes will have differential impacts on migrant workers. A better understanding of land use change dynamics, such as the role of gentrification, on the socio-ecological system, she notes, is also required.

Students from Bonanza Creek (BNZ) remarked on the differential impacts of climate change on subsistence food security. They also commented on changing attitudes of fire, from one of disamenity to necessary ecological process. Yet at the same time, smoke from fires decreases tourism, threatens property, and worsens air quality, problems that are particularly acute in Fairbanks. Bonnie Keller (Cedar Creek) noted that in PIE, individuals and groups have varying abilities to respond to sea level rise. Tom Baerwald (NSF) stressed the need to improve descriptive analyses of environmental justice patterns and processes, and to use the LTER to move beyond anecdotes (single site analyses) to multiple, synthetic and theoretically-based analyses. Chuck Redman (CAP) commented that mitigation of environmental injustices should not foreclose on opportunities in the future. Any interventions should maintain choice and alternatives for future generations, in the interest of sustainability. Sharon Harlan (CAP) emphasized the need for long term social data sets (such as the Phoenix Arizona Social Survey and the BES Telephone Survey) and coordination of those data sets for cross-site research. Ken Sylvester (KBS) also emphasized the need for standardized protocols to ensure replicability of analyses. David Blankman (Israel LTER) indicated that the informatics community in the LTER can be a helpful resource in cross-site research.

Next Steps

Participants agreed that EJ research across the LTER network is worthy, important, and manageable. Because the sites have different physical and social characteristics, operate at different spatial and temporal scales, and have access to different data sets, the group agreed that an intermediate step would be required to develop a coherent and clear plan

for a research proposal. While the NCEAS working group model was commended, the consensus is that *a follow-up workshop funded from the LTER network* would be necessary to develop a strategy for preparing materials for submission to NCEAS and formulating cross-site projects that could respond to the results of the LTER Planning Grant effort. Twelve persons at the workshop indicated they would be willing to attend the follow-up meeting. We have heard from two others not present at the workshop that would be willing to attend. Morgan Grove (BES) suggested a wiki to organize EJ research across the network. Ken Sylvester (KBS) suggested the need to influence bigger instruments, such as the US Census or American Community Survey, in their data collection to match data needs for cross-site EJ research. Improved metadata generation as well as semantic searching and smart cyber-infrastructure were also discussed as necessary mechanisms for cross-site research.

Links to Planning Grant

A network level analysis of environmental justice dynamics, one that is socio-ecological in approach, addresses the three grand challenges outlined in the planning grant. Human behavior and action influence biotic structure, biogeochemical cycling, and climate change, which in turn impact human outcomes and behavior. But what is clear is that these environmental drivers do not affect all people equally, nor do social systems respond equally to environmental change, regardless of who is affected. One need look no further than the Chicago heat wave of 1995 or Hurricane Katrina for stark examples of such dynamics. The key is to move from anecdote to generalized understanding. While the proposed research will incorporate results from all questions of the planning grant, it is particularly salient to questions 4 and 5, which address the feedback relationships between human and ecological dynamics.