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Out of Sight, Out of Mind: Distancing and the Geographic Relationship Between Electricity Consumption and Production in Massachusetts

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Objective. Based on the concept of "distancing" and its implications for ecological feedback and environmental inequality, this article examines the influence of geographic distance from power plants on residential electricity consumption in Massachusetts. *Methods.* Mean geographic distance to all power plants in Massachusetts was calculated to a rasterized surface and aggregated by municipality for 243 cities and towns. Using stepwise regression, annual per household residential electricity consumption by municipality was regressed on mean distance to power plants, median household income, percent minority, median number of rooms, and median age. *Results.* Mean geographic distance to power plants and median number of rooms emerged as statistically significant predictors of per household residential electricity consumption. *Conclusions.* The findings lend support to the concept of "distancing" and its implications for consumption in a domestic context. This analysis offers evidence of scale-independent similarity between global and local phenomena of environmental inequality and resource consumption.

Based on the conceptual framework of "distancing" and its implications for environmental impact, this article examines geographic distance between production and consumption of electricity in Massachusetts and the relationship of this distance to electricity consumption. A growing body of literature has revealed how production and the environmental and social impacts of consumption are increasingly separated from consumers and the places of consumption. The evidence to date indicates that this phenomenon not only exists, but that its perpetuation has important consequences for future environmental impact. Most of this work, however, has focused on the global or international scale. At the subnational scale, a complementary body of research on environmental justice has repeatedly identified the

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unequal distribution of environmental burdens of economic production, but the issue of consumption itself has not been explicitly examined. In this analysis, I show that the conceptual framework of distancing offers a link from the global to the local scale in examining and identifying relationships between consumption and distance, and resource use and environmental inequality.

Distancing is the separation of production from consumption, and it may occur along four dimensions: geography, culture, bargaining power, and agency. Within Thomas Princen's (2002) theoretical framework for a political economy of degradation, distancing is a consequence of the inexorable push by states and firms to minimize the costs of production. One of the cheapest and easiest ways to minimize costs is to externalize them, either by exploiting "frontiers" with lower labor, material, and land costs and weaker environmental and social regulations, or by hiding the real costs of production (e.g., social and environmental costs of pollution). As a result of the quest to externalize costs, a commercial pattern has emerged that has increasingly separated, or distanced, consumers from the consequences of their behavior. Distancing has increased as commodity chains have lengthened, as more and more of the world has been incorporated into the global economy, and as the environmental and social costs of production and consumption have become unacceptable or unaffordable closer to home.

Distancing is also a reflection of consumers' propensities to externalize costs. This distancing is significant because a pattern of externalization and separation enables or encourages narrowly self-interested consumption without regard to the impacts of that consumption. Distancing between production and consumption severs or attenuates ecological feedback from consumption choices. The breaking of ecological feedback inhibits the flow of information from production to consumption choices. As a result, consumers are not only ignorant of the impacts of their choices, but they are insulated from the consequences as well. As distance between consumption and production increases, we can expect a breakdown in the flow of information, creating misperceptions of scarcity and damage, resulting in unrestrained or excessive consumption. No less important, the pursuit of distancing as a method of cost externalization, either by producers or consumers, leads to displacement of environmental problems. Worse, this displacement often appears as a solution to environmental problems when ecological feedback is severed and price is the only information available to consumers.

There is a rich body of literature on the global-scale phenomenon of distancing through a variety of theoretical lenses. Much of this literature is concerned with the lengthening of commodity chains, the incorporation of ever larger proportions of global biophysical resources, and, of course, the creation of global patterns of environmental and social exploitation and inequality (Conca, 2002). What is common to these studies is an explicit attempt to incorporate unequal consumption as a significant and

problematic factor of global environmental degradation and inequality. A direct treatment of distancing can be found in Clapp's (2002) analysis of the phenomenon of "waste distancing"—the process by which waste is separated from consumers—and the negative impacts of this process, especially for poorer countries that accept hazardous wastes in order to generate needed income. Similarly, Frey (2003) critiqued the tendency of transnational corporations to relocate hazardous industries to export processing zones in less developed countries, using *maquiladora* centers in northern Mexico as his focus. He argued that this transfer is essentially an effort to appropriate carrying capacity for more developed countries.

One of the earliest and most influential formulations was the concept of the ecological footprint, which identifies the biophysical resources appropriated by a given population or economy (Wackernagel and Rees, 1996). Because many places consume biophysical capacity in a way that is disproportionate to their actual geographic extent, the implication is that these places consume more than their fair share of the planet's resources and contribute disproportionately to global environmental degradation. Ecological footprint analysis highlights the unequal appropriation and consumption of global resources. However, it does not reveal the distributional aspects of disproportionate consumption.

The concept of disproportionality in consumption has been extended by researchers of political ecology and ecological economics attempting to untangle how unequal consumption is perpetuated by international trade, as well as identify the winners and the losers of these unequal exchanges. Andersson and Lindroth (2001) argued that international trade may be enabling wealthy countries to "import" ecological sustainability from poor countries while simultaneously preserving local sustainability, resulting in a blurring of responsibility for the ecological effects of production and consumption. Tucker (2002) has shown how the expansion of U.S. consumer markets for products such as bananas, coffee, and timber since the late 19th century has had a direct and long-lasting ecological impact on tropical parts of the world. More importantly, he makes the case that the rising affluence of industrial societies is directly linked to environmental damage in the tropics. Similarly, Bunker (2003) argues that centuries of extractive and destructive economic activity in the Amazon Basin can be directly linked to changing demands and expansion of wealthier industrialized economies looking not only for cheap resources, but also for ways of displacing environmentally costly production. Analyses such as those by Tucker and Bunker have contributed to the elaboration of theories of unequal ecological exchange. Jorgenson (2006) directly tested the theory of unequal ecological exchange—that more developed countries externalize the costs of their consumption to less developed countries. In an analysis of deforestation between 1990 and 2000, he found that less developed countries with higher levels of exports to more developed countries experienced greater rates of deforestation. Rice (2007) has summarized and elaborated on

the theory of unequal ecological exchange, as well as complementary conceptual frameworks.

The preceding analyses have exposed the exploitive and unequal relationships between consumers and producers. Within the context of international trade, these relationships are implicated in global inequalities of wealth and environmental quality. Unfortunately, such analyses have not yet been extended to the subnational scale. The concern with the unequal distribution of environmental benefits and burdens has, however, found complementary expression in research on environmental justice.

Environmental justice research has centered on the disproportionate distribution and impact of environmental risks and hazards on low-income groups, racial and ethnic minorities, and other marginalized groups or communities. Since at least the early 1980s, scholarly analyses and government investigations have repeatedly shown that marginalized groups and communities play host to socially created environmental burdens with a frequency that is often out of proportion to these groups' representation in the population at large (Bullard, 2005; CQ Researcher, 1998). Recent work has expanded the domain of environmental justice research to encompass questions about the unequal access to and distribution of environmental amenities such as urban green space and wilderness access (Floyd and Johnson, 2002; Heynen, Perkins, and Roy, 2006; Wolch, Wilson, and Fehrenbach, 2005). However, interest in the distribution of environmental burdens has remained central. Curiously, analyses of distributional inequity have continued to focus almost exclusively on the distribution of environmental burdens or costs—points of production—without a complementary empirical consideration of consumption or benefit distribution. Despite this lack of comparative interest in consumption, assumptions and even assertions about the distribution of benefits of consumption in contrast to the burdens of production have been important to arguments about environmental injustice.

Researchers of environmental justice have commonly assumed that the costs of most environmental burdens outweigh the benefits and that those who bear the costs are not the same as those who benefit. These assumptions are in fact central to arguments about the injustice of disproportionate burden. According to Shrader-Frechette (2002:32), "various adverse environmental and technological impacts are visited disproportionately on the poor while the rich receive the bulk of benefits." Similarly, Agyeman, Bullard, and Evans (2002:78) assert: "This unequal distribution of environmental 'bads' is, of course, compounded by the fact that, globally and nationally, the poor are not the major polluters." In a recent analysis of criteria air pollutants and sociodemographics in Phoenix, Grineski, Bolin, and Boone (2007) find that Census block groups with lower neighborhood socioeconomic status, higher proportions of Latino immigrants, and higher proportions of renters are exposed to higher levels of criteria air pollutants. Though it was not a part of their analysis, the authors draw on studies of

spatial mismatch between jobs and inner-city residents to conclude that the air pollution suffered by these populations is generated by "suburban commuters to the CBD [Central Business District]" who likely benefit from the employment opportunities. Less fortunate residents of the CBD are excluded from the economic benefits of city growth yet suffer all its costs. Bullard (1992) has made a similar argument, asserting that industrial facilities are more likely to pollute minority neighborhoods than to offer jobs to the residents of these neighborhoods. Downey (2005) tests Bullard's argument by examining whether manufacturing facility employment or pollution is a stronger predictor of neighborhood racial composition. His results indicate that average employment in areas around these facilities is significantly and negatively associated with black population proportion, while average exposure is not significantly associated. Though the nonsignificant association between percent black and average pollutant exposure contradicts findings by other researchers, Downey concludes that "in showing that in the Detroit metropolitan area, [percent black] is negatively associated with average employment, but insignificantly associated with average exposure, these analyses provide tentative support for the argument that for blacks the burdens of industrial production outweigh its benefits." Other analysts have made claims about the imputed relationship between benefits of consumption and burdens of production in cases of environmental injustice, but as Downey observes, few have actually undertaken analyses to critically examine this relationship specifically (Touché, 2002). Despite being largely unexamined, however, questions and assumptions about the relationship between the benefits and burdens of social production (e.g., manufacturing facilities, transportation, utilities, waste treatment and storage) remain central to arguments of environmental justice research (Pellow, Weinberg, and Schnaiberg, 2001). The relative lack of empirical support for this important assumption about the relationship between production and consumption in environmental justice research begs closer scrutiny. The conceptual frameworks offered by distancing and unequal ecological exchange at the global scale offer a promising approach.

Burdens of Electricity Generation

One place to begin a subnational analysis of the relationship between production and consumption is with electricity. The unequal distribution and localized costs of electricity generation have been a recurring concern of environmental justice activists and researchers (Bullard, 1993; Creech and Brown, 2000; Touché, 2002). Studies show that low-income and minority communities have been unfairly targeted for the siting of such facilities and that these communities are overrepresented—as a proportion of the population—in close proximity to such facilities (Keating and Davis, 2002; Keating, 2004). Power plants, especially dirtier, coal-fired facilities, are

major contributors to both local and regional air pollution. The issue of air pollution is of particular importance because minorities are heavily represented in areas that consistently fail federal air quality standards and because minorities are particularly vulnerable to health impacts of poor ambient air quality (Payne-Sturges and Gee, 2006; O'Neill et al., 2003). Asthma, which has been unambiguously linked to environmental triggers, is a serious problem for African Americans and Latinos, especially children (Brown et al., 2003; Pew Environmental Health Commission, 2000). Other adverse impacts of power plants include emissions of mercury and other toxins that travel through air, water, and even the food chain. Because of higher than average reliance on fishing for consumption and low awareness of potential threats, African Americans, Asians, and Latinos have higher than average exposure to mercury-contaminated fish. Taken together, these studies repeatedly show that marginalized communities bear a heavy and conspicuous burden for electricity generation.

The issue of power generation and environmental equity is of particular concern in Massachusetts. Growing demand for electricity in Massachusetts and limited supply has meant increased pressure for expanded generation, through the construction of new generation facilities, increased output from existing facilities, and the extension of operating licenses for older and dirtier facilities (New England Council, 2001). Although natural gas has been the fastest growing fuel for electricity generation in Massachusetts, coal-fired power plants still account for nearly one-quarter of energy generation within the state. In addition, Massachusetts is a leading source of electricity generated from landfill gas and municipal solid waste (U.S. Energy Information Administration, 2007a). In the most comprehensive analysis to date of cumulative environmental burdens in Massachusetts communities, Faber and Krieg (2005) show that electricity generation facilities, especially coal-fired power plants, constitute an important component of the overall toxic burden for minority and low-income communities.

In addition to being a local environmental justice concern, the electricity system in Massachusetts is suitable for an exploratory analysis of the spatial relationship between production and consumption. The electricity system in Massachusetts is technically an open system, part of the greater New England network. Massachusetts both generates and exports electricity into the larger network. However, the electricity system of Massachusetts also exhibits qualities of a closed, or at least geographically constrained, system. By virtue of its volatility and lack of cost-effective energy storage technologies, electricity must be consumed when generated, and it cannot be easily transported long distances, except by fixed transmission lines. Although electricity generated within the boundaries of the state may theoretically flow anywhere within the network (and thus out of state), basic engineering estimates predict that electricity produced at any given point is more likely to flow to a near point of consumption than to a distant point, so that local electricity production is more likely to be consumed locally than distantly (Minerals

Management Service, 2008). In addition, Massachusetts is the largest consumer of electricity in New England and has been importing electricity from neighboring states for decades (U.S. Energy Information Administration, 2005, 2007b). Thus, we can assume that the majority of electricity produced in Massachusetts is consumed within the state. This relatively short distribution chain presents an excellent opportunity for investigating the spatial relationship between places of electricity production and the corresponding places of consumption.

Data and Methods

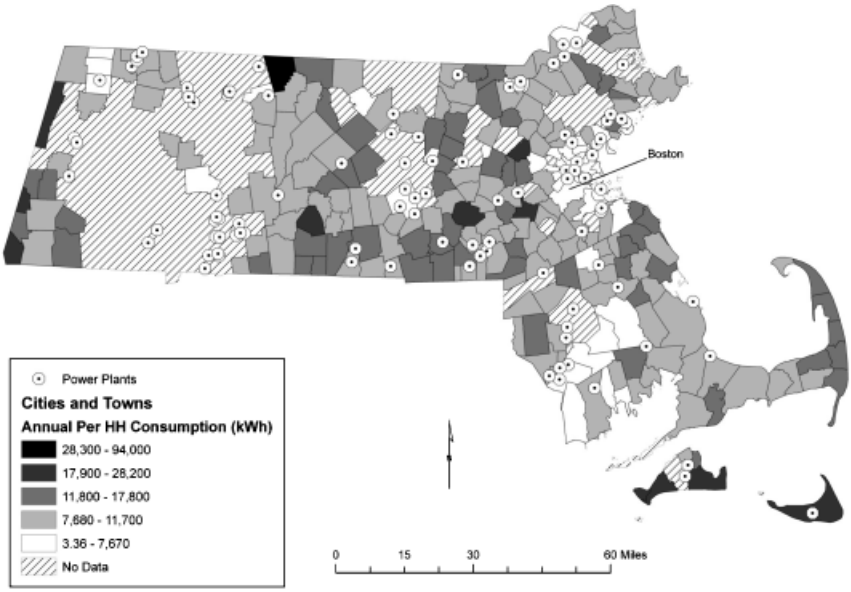
To explore the potential influence of distance on electricity consumption and production, this analysis examined the independent effect of mean geographic distance from certain types of power plants on residential electricity consumption. Mean geographic distance to power plants was determined by geocoding power plants in Massachusetts and creating a rasterized surface of distance from power plants. This rasterized surface of distance was then aggregated by municipality to match electricity consumption data. Using stepwise linear regression, mean distance to power plants, along with more common predictors of electricity consumption, were treated as independent variables, while annual per household residential electricity consumption was treated as the dependent variable.

The data for this analysis include total annual residential electricity consumption for 243 of the 351 cities and towns in Massachusetts for 2005, representing approximately 83 percent of all households in the state. Western Massachusetts Electric Company refused to make available electricity consumption data for the remaining municipalities. Annual residential electricity consumption data by municipality were provided by the two largest electric utility retailers in Massachusetts, NSTAR and National Grid. NSTAR transmits and delivers electricity to 1.1 million customers in 81 communities. National Grid serves electricity to approximately 1.2 million customers in 168 communities in Massachusetts. Residential electricity consumption was normalized to annual per household residential electricity consumption by municipality in order to make differences between municipalities comparable. According to an increasing number of analysts, per household consumption is a more coherent measure of electricity consumption than per capita consumption (Curran and Sherbinin, 2004; Lutzenhiser, 1997; Lutzenhiser and Hackett, 1993, O'Neill and Chen, 2002). These electricity consumption values were joined to Cartographic Boundary Files of 2000 Census County Subdivisions for analysis within ArcGIS 9.2 (Figure 1).

Electricity generation data were derived from the U.S. Energy Information Administration's 2005 EIA-860 Annual Electric Generator Report (available at http://www.eia.doe.gov/cneaf/electricity/page/eia860.html).

FIGURE 1

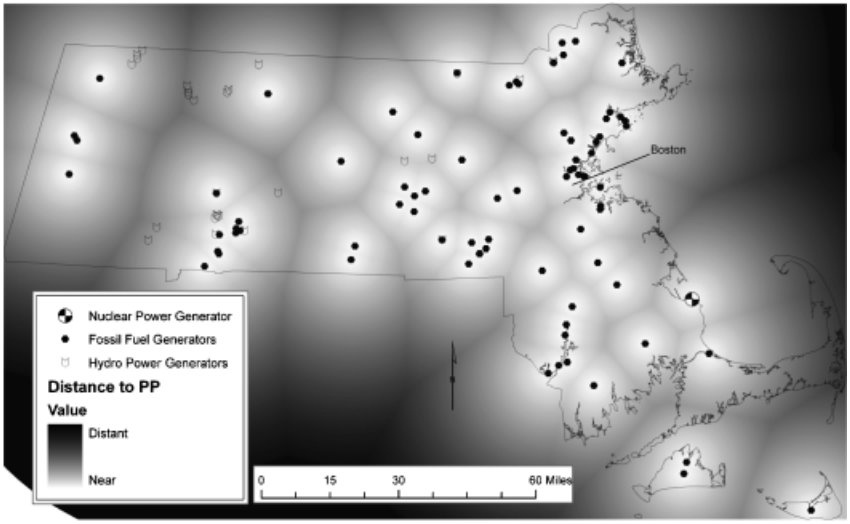
Massachusetts Annual per Household Residential Electricity Consumption 2005



The EIA-860 contains information on all electric generating plants that have or will have a nameplate rating of 1 megawatt or more and are operating or plan to be operating within five years of the year they are reported. Data reported in the EIA-860 include ownership, generator capacity, fuel capability, operational status, on-line date and actual or planned retirement date, regulatory status, energy sources, primary fuel, maximum rated output of generators, net summer capacity, net winter capacity, in-service date, NAICS designation, and fuel-switching capability. The EIA-860 identifies both power plants and individual generation units at each power plant, including both commercial and private generators. Because of recent heightened concerns over security, neither the EIA nor the regional New England Independent System Operator provides public access to precise location information of generators or power plants beyond the zipcode of plant facilities. However, precise location information for these facilities is available through publicly accessible online environmental databases maintained by the U.S. Environmental Protection Agency (EPA). A search through EPA's online Envirofacts database yielded street address, latitude and longitude coordinates, and site-specific information about most of the generating facilities (available at http://www.epa.gov/enviro/). As a result, 118 of the 125 plants listed in the 2005 EIA-860 for Massachusetts were successfully geocoded and plotted. These 118 generating facilities account for more than 99 percent of EIA's listed nameplate capacity for all power

FIGURE 2

Raster Map of Distance to Nearest Power Plant



generated within Massachusetts. For the purposes of this analysis, however, only fossil fuel and nuclear-powered facilities were examined.

To evaluate distance from power plants, I created a raster map of distance to power plants. A raster map is an array or grid of equal-sized cells populated by some value. In this case, the generated raster consisted of an array of 100 meter^2 (10 meters $\times$ 10 meters) cells covering the entire State of Massachusetts. Based on straight-line distance, each cell was populated with a value equal to the distance from the center of that cell to the nearest geocoded power plant. I then aggregated the cells by calculating the mean of all cell values falling within each municipality (Figure 2). This provided a new municipal-level variable: the average minimum distance in a municipality, or the distance from the average municipal cell to its nearest power plant.

Demographic and housing data were derived from 2000 U.S. Census Summary File 2 and 3 tables, including median household income, mean household size, median number of rooms, median age, and percent nonwhite. All data were aggregated by municipality. Literature on household electricity consumption has historically focused on similar demographic and housing characteristics (Curran and Sherbinin, 2004; Lutzenhiser, 1997; Lutzenhiser and Hackett, 1993, O'Neill and Chen, 2002). Higher household energy consumption is generally positively associated with higher median household income, residence size (indicated by median number of rooms), higher median age of household members, larger households, and higher proportion of non-Hispanic white populations.

Stepwise linear regression was conducted for all 243 municipalities for which residential electricity consumption data existed to determine the independent influences of median household income, mean household size, median number of rooms, median age, percent nonwhite, and mean distance from power plants. Descriptive statistics, including correlation matrices, were generated in order to investigate intervariable relationships.

Results

The stepwise linear regression revealed the most parsimonious model for per household residential electricity consumption by eliminating independent variables that were highly correlated with one another. All the independent variables were significantly correlated with the dependent variable according to the Pearson correlation coefficient matrix. As we can see in Table 1, many of the independent variables are also significantly correlated with each other. In stepwise regression, only two independent predictors were retained to produce a best-fitting model: median number of rooms and mean distance to power plants. Model 2, which included both independent variables, exhibited an adjusted R^2 of 0.203 and was significant at better than $p<0.01$ (Table 2). The best-fitting model thus explains approximately 20 percent of the variance in per household residential electricity consumption.

According to Model 2, mean distance to power plants is an independent and significant predictor of per household residential electricity consumption, when coupled with median number of rooms. Median number of rooms, which is a proxy for residence size, has the strongest correlation with electricity consumption, and is also significantly correlated with all other independent variables except for mean distance to power plants. In the stepwise regression, the inclusion of median number of rooms greatly reduces the partial correlations of the remaining independent variables with which median number of rooms is significantly correlated, an indication that the latter captures much of the explanatory power of the other variables. This is especially the case for percent nonwhite, average household size, and median household income. Mean distance to power plants, which is the only independent variable not significantly correlated with median number of rooms, emerges as the only remaining independent variable with significant explanatory power for electricity consumption.

The resulting regression equation indicates that mean distance to power plants has an expected positive effect on per household residential electricity consumption. According to the unstandardized beta coefficient, for every added kilometer of distance from a power plant, annual per household residential electricity consumption is predicted to increase by approximately 161 kWh. By contrast, every added room in a residence adds over 2,000 kWh of predicted consumption. Although median number of rooms

TABLE 1

Pearson Correlations

	Per HH Consumption	Median Age	Percent Nonwhite	Mean Distance to PP (m)	Median HH Income	Median No. Rooms	Avg HH Size
Per HH consumption	1.0						
Median age	0.281 ***	1.0					
Percent nonwhite	−0.278 ***	−0.427 ***	1.0				
Mean distance to PP (m)	0.253 ***	0.635 ***	−0.290 ***	1.0			
Median HH income	0.251 ***	–0.007	−0.202 **	−0.171 **	1.0		
Median no. rooms	0.364 ***	0.152 **	−0.394 ***	−0.069	0.864 ***	1.0	
Avg HH size	0.120 *	−0.456 ***	−0.106 *	−0.353 ***	0.597 ***	0.639 ***	1.0

*$p<0.05$; **$p<0.01$; ***$p<0.000$.

is a stronger predictor than mean distance to power plants, standardized beta coefficients indicate that the former actually has only one-third greater impact than the latter.

Discussion and Conclusion

This analysis lends support to the hypothesis that distance between places of consumption and places of production is significantly related to consumption, and thus environmental impact. The geographic separation of

TABLE 2

Regression Results

		Unstandardized Coefficients		Standardized Coefficients	F*	Adj. R^2
Model		B	Std. Error	Beta		
1	Median no. rooms	2,099.766	346.339	**0.364**	36.757	0.130
2	Median no. rooms	2,210.750	331.997	**0.383**	31.858	0.203
	Mean distance to PP (meters)	0.161	0.033	**0.279**		

*All F scores are significant at $p<0.000$.

Bold betas are significant at $p<0.000$.

production and consumption appears to be important not only in identifying the existence of environmental inequities, but also in revealing a relationship between consumption and production that is predictive of both environmental degradation and inequity. This analysis has shown that the phenomenon of distancing, which has been repeatedly documented at global or international scales, is also identifiable at the local and domestic scale, and within the context of a developed state. The scale independence of this phenomenon offers a potential bridge between domestic research on the issue of environmental justice and international analyses of distancing, environmental inequality, and unequal ecological exchange.

The spatial relationship between electricity production and residential electricity consumption in Massachusetts is consistent with theories of distancing and unequal ecological exchange. As predicted, consumption of electricity increases with distance from points of production, creating a gradient of geographic separation between consumption and production; the more electricity a household consumes, the further it is from power plants and thus the environmental impacts of its consumption. These results validate the suspicions of environmental justice researchers that the unequal distribution of environmental burdens is paralleled by unequal distribution of the benefits of consumption. However, unlike much environmental justice research, distance itself appears as a significant variable whose influence is independent of conventional demographic predictors, especially those relating to socioeconomic status (i.e., income, race). Princen's conceptual framework for a political economy of environmental degradation holds that it is the attenuation or severing of ecological feedback, which increased distance provides, that enables or encourages environmentally destructive consumption and environmental inequality. Although this analysis confirms the role of distance as an independently significant variable for predicting consumption, it offers neither validation nor refutation of ecological feedback as an explanation for the positive correlation between distance and consumption. The latter is something that begs further investigation. However, this analysis makes clear that distance and consumption matter in understanding and addressing environmental degradation and inequality.

The environmental and social justice implications of distancing are significant. At the global or international scale, a growing body of research reveals how the environmental impacts of production and consumption are displaced onto distant places and usually marginalized peoples. Although conspicuous consumption continues unabated in wealthier developed countries, environmentally burdensome forms of production, resource extraction, and waste disposal have shifted to poorer, less developed countries. Increasing distance between consumption and production on a global scale has been accompanied by an increasing separation of the benefits of consumption from its costs. At the subnational scale, a complementary body of literature on environmental injustice has repeatedly identified systemic inequities in the distribution of environmental burdens, principally in terms of

the distribution of undesirable facilities of production. However, an explicit examination of the role of consumption in relation to these environmental inequalities has been curiously absent from environmental justice research.

Energy systems offer a promising opportunity for initiating research on the relationship between production and consumption and environmental inequalities. Indeed, the analysis presented here takes a very restricted perspective of the chain of energy production and consumption. If we expand our perspective on the production side to include the lifecycle of the primary fuels of electricity generation, we will be drawn to those localities and communities from which coal, oil, natural gas, and uranium are extracted, as well as the places where these fuels are processed, where they are stored, and where their waste residues are eventually deposited. Within the United States, many of the places that play host to the various stages of this process of energy production are also home to marginalized communities (Brugge, 2002; Lerner, 2005; Urban, 2004). Within Massachusetts, the larger context of energy and environmental equity has been highlighted by recent controversies over proposals for the siting of new liquefied natural gas (LNG) terminals (important for both home heating and electricity generation) and, surprisingly enough, proposals for renewable energy facilities such as wind turbine generators off the coast of Cape Cod (New England Council, 2005). The latter case presents an interesting twist as protracted opposition has been spearheaded by some of the most affluent and politically powerful communities in the state, if not the nation (Kempton et al., 2005; Williams and Whitcomb, 2007). The latter might be interpreted as a struggle by high energy consumers to retain distance between themselves and electricity production.

It seems something of an irony that analyses of the connections between consumption and the displacement of costs onto other places has been performed most thoroughly at the global level, while local understanding is relatively unexamined. If the process of distancing translates across scales, it may offer a fruitful model for understanding or at least investigating the relationships among consumption, inequality, and environmental degradation at both the global and local scales. In the U.S. context, this approach would draw attention to the role of consumption, rather than just production, in environmental injustices, and to the behavior and role of consumers (especially privileged consumers), rather than simply the experiences and plight of the less privileged. The study of electricity generation and consumption offers an accessible opportunity for investigating the phenomenon of distancing at the subnational scale and within the context of developed states.

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