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## ENVIRONMENTAL SOCIOLOGY

RILEY E. DUNLAP

*Oklahoma State University, Stillwater*

BRENT K. MARSHALL

*University of Central Florida, Orlando*

There is little doubt that environmental problems will be one of humanity's major concerns in the twenty-first century, and it is becoming apparent that sociologists can play an important role in shedding light on these problems and the steps that need to be taken to cope with them. While the study of environmental issues is an inherently interdisciplinary project, spanning the natural and social sciences as well as humanities, the crucial role of the social sciences in general and sociology in particular are increasingly recognized (e.g., Brewer and Stern 2005). This stems from growing awareness of the fact that environmental problems are fundamentally social problems: They result from human social behavior, they are viewed as problematic because of their impact on humans (as well as other species), and their solution requires societal effort. It is, therefore, not surprising that sociologists have shown growing interest in environmental issues in recent decades and that environmental sociology has become a recognized field. Yet sustained sociological investigation of environmental problems did not come easily, and is a relatively recent development in the field.

Although there was scattered sociological attention to both urban problems and natural resource issues prior to the 1970s, environmental sociology developed in that decade as sociology's own response to the emergence of

environmental problems on the public agenda. At first, sociologists tended to limit their attention to analyzing societal response to environmental problems, rather than examining the problems themselves. But as sociologists gradually paid more attention to environmental issues, some began to look beyond societal awareness of environmental problems to examine the underlying relationships between modern, industrial societies and the biophysical environments they inhabit. The result was the emergence of environmental sociology as a field of inquiry (Buttel 1987; Dunlap and Catton 1979a).

This chapter provides a necessarily selective overview of this relatively new field (see Benton 2001; Buttel and Gijswijt 2001; Goldman and Schurman 2000; Yearley 2005 for other recent reviews). We briefly discuss how and why environmental sociology represents a major departure from sociology's traditional neglect of environmental phenomena, describe the field's institutionalization, examine the key environmental foci of research in the field, and review both early and more recent research emphases in the field. Early emphases mainly involved analyses of societal awareness of environmental issues, whereas recent emphases continue this line of research but also include considerable work on the causes, impacts, and solutions of environmental problems.

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## ENVIRONMENTAL SOCIOLOGY AND THE DISCIPLINE

In contrast to the larger society, mainstream sociology in the 1970s was almost oblivious to the significance of environmental problems. This blindness stemmed from a long period of neglect of environmental matters, stimulated by the societal context in which sociology developed as well as its unique disciplinary traditions. The Durkheimian emphasis on explaining social phenomena only in terms of other “social facts,” plus an aversion to earlier excesses of biological and geographical “determinisms,” had led sociologists to ignore the biophysical world (Benton 1991; Dunlap and Catton 1979a). To legitimize sociology as a discipline, it was important to move away from explanations of, for example, racial and cultural differences in terms of biological and geographical factors, respectively. Yet in the process of developing distinctively social explanations for societal phenomena, our discipline replaced older determinisms with sociocultural determinism (Carolan 2005a, 2005b). For example, as recently as the late 1970s, sociologists of agriculture argued that it was inappropriate to include factors such as soil type and rainfall in explanations of soil conservation adoption or farm energy use because they were not *social* variables (Dunlap and Martin 1983).

These disciplinary traditions were strengthened by sociology’s emergence during an era of unprecedented growth and prosperity, which made limits to resource abundance and technological progress unimaginable, and increased urbanization, which reduced direct contact with the natural environment. With modern, industrialized societies appearing to be increasingly disembodied from the biophysical world, sociology came to assume that the exceptional features of *Homo sapiens*—language, technology, science, and culture more generally—made these societies “exempt” from the constraints of nature (Catton and Dunlap 1980) and thus reluctant to acknowledge the societal relevance of ecological limits (Dunlap 2002b).

Given sociology’s neglect of the biophysical environment—and tendency to equate “the environment” with the social context of the phenomenon being studied—it is not surprising that efforts to establish environmental sociology as an area of inquiry included a critique of the larger discipline’s blindness to environmental matters. Dunlap and Catton’s (1979a) effort to define and codify the field of environmental sociology was accompanied by an explication and critique of the “human exemptionalism paradigm” (HEP) on which contemporary sociology was premised. While not denying that human beings are obviously an exceptional species, these analysts argued that humans’ special skills and capabilities nonetheless fail to exempt the human species from the constraints of the biophysical environment. Consequently, Catton and Dunlap (1978, 1980) suggested that the HEP should be replaced by a more ecologically sound perspective, a “new ecological paradigm” (NEP), that acknowledges the ecosystem-dependence of human societies.

The call for mainstream sociology’s dominant paradigm to be replaced with a more ecologically sound one proved to be a rather controversial feature of environmental sociology. While the exemptionalist underpinning of mainstream sociology has been increasingly recognized (Dunlap 2002b), the call for adoption of an ecological paradigm has been criticized for allegedly deflecting efforts to apply classical and mainstream theoretical perspectives in environmental sociology (Buttel 1987, 1997). Nonetheless, environmental sociologists are producing rapidly expanding bodies of both empirical literature on the relationships between societal and environmental variables that clearly violates Durkheim’s antireductionism taboo and theoretical literature representing efforts to develop more ecologically sound theories that are not premised on the assumption of human exemptionalism. Both of these trends reflect the declining credibility of exemptionalist thinking within sociology (Dunlap 2002b).

## THE ENVIRONMENTAL FOCI OF THE FIELD

Whether defined narrowly as the study of societal-environmental relations (Dunlap and Catton 1979a, 1979b) or more broadly as covering all sociological work on environmental issues (Buttel 1987), what makes environmental sociology a distinct field is its focus on the biophysical environment. However, the environment is an enormously complex phenomenon, open to various conceptualizations and operationalizations, and this leads to diverse foci in the work of environmental sociologists (Dunlap and Michelson 2002; Redclift and Woodgate 1997). One way of making sense of this diversity draws on ecologists’ insight that the biophysical environment performs many services for human beings (Daily 1997). At the risk of oversimplification, we can sort these numerous services into three general types of functions that the environment or, more accurately, ecosystems serve for human societies (and all living species). Adopting this ecological perspective enables us to highlight the various aspects of the environment that environmental sociologists examine as well as to note some general trends in how these foci have changed over time (Dunlap 1994; Dunlap and Catton 2002).

To begin with, the environment provides us with the resources necessary for life, most critically, clean air and water, food, and shelter. Ecologists thus view the environment as providing the “sustenance base” for human societies, and we can also think of it as a “supply depot” of natural resources. Many environmental sociologists focus on issues surrounding the extraction, transport, use, and conservation of resources such as fossil fuels, forests, and fisheries. Second, in the process of consuming resources humans, like all species, produce “waste” products; indeed, humans produce a far greater quantity and variety

of waste products than do any other species. The environment must serve as a “sink” or “waste repository” for these wastes, either absorbing or recycling them into useful or at least harmless substances. When the waste products exceed an environment’s ability to absorb them, the result is pollution. A growing number of environmental sociologists examine social processes related to pollution problems, ranging from the generation of pollution to its social impacts. Finally, like all other species, humans must also have a place to live, and the environment provides our home—where we live, work, play, and travel. In the most general sense, the planet Earth provides the home for our species. Thus, the third function of the environment is to provide a “living space” or habitat for human populations and other species. Environmental sociologists have focused on a variety of living space issues, traditionally ranging from housing to urban design but more recently encompassing macrolevel issues such as the impacts of deforestation, desertification, and climate change on human settlements and habitats.

When humans overuse an environment’s ability to fulfill these three functions, “environmental problems” in the form of pollution, resource scarcities, and overcrowding and/or overpopulation are the result. Furthermore, not only must the environment serve all three functions for humans but when a given environment is used for one function its ability to fulfill the other two can be impaired. Impairment of ecosystem functions may yield more complex environmental problems. Functional incompatibilities between the living space and waste-repository functions are apparent, for example, when the use of an area for a waste site makes it unsuitable for living space. Similarly, if hazardous materials escape from a waste repository and contaminate the soil or water, the area can no longer serve as a supply depot for drinking water or for growing agricultural products. Finally, converting farmland or forests into housing subdivisions creates more living space for people, but means that the land can no longer function as a supply depot for food timber or habitat for wildlife.

Analytically separating these three functions provides insight into the evolution of environmental problems as well as the expanding foci of environmental sociology. In the 1960s and early 1970s, when awareness of environmental problems was growing rapidly in the United States, primary attention was given to air and water pollution and the importance of protecting areas of natural beauty and recreational value. Early sociological work focused on these topics (e.g., Catton 1971; Molotch and Follett 1971). The “energy crisis” of 1973–1974 highlighted the dependence of modern industrialized nations on fossil fuels, added credibility to those espousing “limits to growth” (Meadows et al. 1972), and generated sociological interest in the impacts of energy shortages and scarcity more generally (e.g., Catton 1976; Schnaiberg 1975). The living space function came to the fore in the late 1970s when it was discovered that the Love Canal neighborhood in

upstate New York was built on an abandoned chemical waste site that was leaking toxic materials, and this generated sociological attention to local environmental hazards (e.g., Levine 1982). More recently, problems stemming from functional incompatibilities at larger geographical scales, ranging from deforestation and loss of biodiversity to the truly global-level phenomena of ozone depletion and global warming, have attracted attention from sociologists (e.g., Canan and Reichman 2001; Dietz and Rosa 1997; Rudel and Roper 1997).

The above examples of how human activities are affecting the ability of the environment to serve as our supply depot, living space, and waste repository involve focusing on specific aspects of particular environments such as a given river’s ability to absorb wastes without becoming polluted. It is more accurate, however, to note that it is not “the environment” but “ecosystems” and ecological processes that provide these three functions for humans—and for all other living species. Furthermore, it is increasingly recognized that the health of entire ecosystems, including the Earth’s global ecosystem, is being jeopardized as a result of growing human demands being placed on them. Exceeding the capacity of a given ecosystem to fulfill one of the three functions may disrupt not only its ability to fulfill the other two but also its ability to continue to function at all. Whereas historically the notion that human societies face “limits to growth” was based on the assumption that we would run out of food supplies or natural resources such as oil (Meadows et al. 1972), contemporary “ecological limits” refer to the finite ability of the global ecosystem to serve all three functions simultaneously without having its own functioning impaired (see, e.g., Vitousek et al. 1997; Wackernagel et al. 2004).

The late Frederick Buttel noted on a number of occasions (Buttel 2004:333; Buttel and Gijswijt 2001:46) that researchers in the field employ overly simplistic conceptualizations of the environment, often limiting their attention to “ecological withdrawals and additions” or the supply depot and waste repository functions. Despite its simplicity, the three-function model offers major advances. First, as illustrated above, the model clarifies the characteristics and sources of environmental problems, how they change over time, and thus the expanding foci of environmental sociological research. Second, the model acknowledges the function of living space (and spatial phenomena in general), which is essential for examining the flows of resources and pollution across political boundaries in the modern world that are receiving increasing attention from environmental sociologists (Bunker 2005; Mol and Spaargaren 2005). Third, the model is consistent with conceptualizations of the biophysical environment employed in sophisticated measures of “ecological footprints” and “human appropriation of net primary production” that are increasingly used in empirical research by environmental sociologists and environmental scientists (Haberl et al. 2004).

## INSTITUTIONALIZATION OF ENVIRONMENTAL SOCIOLOGY

Sociological interest in the impacts of energy and other resource scarcities accelerated the emergence of environmental sociology as a distinct area of inquiry by heightening awareness that “the environment” was more than just another social problem, and that environmental change can indeed have societal consequences as well as the obvious fact that human activities can affect the environment. Studies of the impacts of energy shortages on society facilitated a transition from the early “sociology of environmental issues”—involving the application of standard sociological perspectives for analyzing societal responses to environmental issues—to a distinctive “environmental sociology” focused explicitly on societal-environmental relations.

The nascent environmental sociology of the 1970s was quickly institutionalized via the formation of organizations within U.S. national sociological associations. These groups provided an organizational base for the emergence of environmental sociology as a thriving area of specialization, and attracted scholars interested in all aspects of the environment, from built to natural (Dunlap and Catton 1979b, 1983). The late 1970s was a vibrant era of growth for American environmental sociology, but momentum proved difficult to sustain during the 1980s because this decade was a troublesome period for the field and social science more generally. Ironically, however, stimulated by major accidents such as those at Chernobyl in the then USSR and Bhopal in India and growing evidence of global environmental problems, interest in environmental issues from a sociological perspective was taking root internationally. By the late 1980s and early 1990s, environmental sociology was not only reinvigorated in the United States but also was being institutionalized in countries around the world and within the International Sociological Association (ISA) (Dunlap and Catton 1994; Redclift and Woodgate 1997). ISA’s Research Committee on Environment and Society, RC 24, has become an especially important vehicle for facilitating the global spread of environmental sociology (Mol 2006).

## SOCIETAL AWARENESS OF ENVIRONMENTAL PROBLEMS

The emergence of “the environment” on the U.S. national agenda in the late 1960s and early 1970s led sociologists to study factors that contributed to societal awareness of environmental degradation. While there were a few early efforts to analyze the overall processes involved (e.g., Albrecht 1975), most studies focused on specific factors such as environmentalism. The environmental movement played the major role in placing environmental issues on the nation’s agenda, and studies of environmentalism were a primary emphasis of early sociological work not only in

North America but also subsequently in Europe, South America, and Asia. The growth of public awareness and concern stimulated by environmental activists and personal experience with degradation also received a good deal of attention. These two emphases have continued over time, while in recent decades attention to the roles played by the media and especially science in generating societal attention to environmental problems has increased. These strands of research have contributed to a broader concern with understanding how environmental problems are “socially constructed.”

## Environmentalism

In the United States, the modern environmental movement evolved out of the older conservation movement and the social activism of the 1960s, and sociologists helped document this evolution. Early studies focused heavily on the characteristics of people who joined national environmental organizations, finding that organizations such as the Sierra Club drew members who were above average in socioeconomic status, predominately white, and primarily urban. While this pattern led to charges of “elitism,” it was noted that most voluntary and political organizations have similar membership profiles and that environmental activists were hardly economic “elites” (Morrison and Dunlap 1986).

Sociologists also studied the organizational characteristics of large national organizations such as the Sierra Club and Natural Resources Defense Council. Attention was given to their strategies and tactics, especially their efforts to influence national policy making via lobbying and litigation and their successful use of direct mail advertising to recruit a large but only nominally involved membership base (Mitchell 1979). These organizations grew rapidly in the late 1960s and early 1970s and ended up following a typical pattern observed for social movement organizations: As they became larger and more successful in the political arena, they also became more bureaucratic, professionalized, unresponsive to their memberships, willing to compromise, and conservative in their tactics (Mertig, Dunlap, and Morrison 2002).

One result is that by the 1980s, as more people discovered environmental hazards in their communities, a large number of local, grassroots organizations formed independently of the mainstream national organizations (Szasz 1994). The discovery that a disproportionate share of environmental hazards were located in minority and low-income communities led to charges of environmental racism and injustice (Bullard 1990), the development of an “environmental justice frame” (Capek 1993) and the emergence of an “environmental justice” movement that gradually merged grassroots environmentalism centered in both minority and white, blue-collar communities (Pellow and Brulle 2005). Environmental justice organizations have been joined by a vast array of other local environmental groups with a range of foci, including land and wildlife

protection, that display diverse organizational forms and are sometimes linked to national organizations or belong to loose coalitions and networks (Andrews and Edwards 2005).

Besides describing and analyzing the organizational complexity and dynamics of contemporary environmentalism, sociologists have conducted long-term historical analyses of the growth of conservation/environmental organizations, both nationally (McLaughlin and Khawaja 2000) and locally (Andrews and Edwards 2005), and of the increasingly diverse set of environmentally relevant discourses to document the evolution of modern environmentalism out of traditional conservation concerns (Brulle 2000).

Also receiving a good deal of attention has been the emergence of environmental movements and Green parties in Europe (Rootes 2003) and, more recently, in Asia and Latin America (see Redclift and Woodgate 1997:pt. III). Transnational environmental activism is receiving increasing attention, including studies on topics such as how environmentalism in less-developed nations is influenced by international pressures (Barbosa 2000), how relations between transnational environmental organizations are influenced by ties to international governmental organizations such as UN agencies (Caniglia 2001), and the factors that affect transnational environmental organizations' decisions to fund debt-for-nature "swaps" in less-developed nations (Lewis 2000). Some studies suggest that environmentalism is becoming a potent political force within many nations as well as at the international level (Shandra et al. 2004), whereas others are more cautious in their assessment of the potential influence of environmentalism at the global level (Frickel and Davidson 2004).

Within the United States, the increasing mobilization of the conservative movement as an antienvironmental countermovement has begun to receive some attention (Austin 2002), particularly the degree to which conservative think tanks have been successful in influencing U.S. environmental policy making (McCright and Dunlap 2003). The effectiveness of conservatives in opposing American environmentalism was signaled by the recent release of a controversial report by two self-avowed environmentalists titled *The Death of Environmentalism* (Schellenberger and Nordhaus 2004). The authors argue that mainstream environmental organizations focus too narrowly on solutions for specific problems such as global warming while failing to link their goals to widely held values, and thus fail to counter conservatives' success in tying their antienvironmental agenda to traditional American values (see the symposium on the controversy edited by Cohen 2006b).

The inability of environmentalists to halt the weakening of federal environmental regulations by the current administration (Kennedy 2005) has highlighted the ill health, if not moribund state, of environmentalism in a post-9/11 era, and it is unclear if the movement will be able to regain the momentum of earlier decades. Sociologists are actively involved in analyzing the state of environmentalism and

offering prescriptions for its resurgence, including issuing calls for more active support for technological innovations to ameliorate environmental problems by major organizations (Cohen 2006a), for a stronger coalition between labor unions and environmentalists (Gould, Lewis, and Roberts 2004), and for a fundamental restructuring of environmental organizations and their funding (Brulle, forthcoming).

### Environmental Awareness and Concern

As environmental problems gained a foothold on the public agenda, both public opinion pollsters and social scientists began conducting surveys to examine levels of public awareness of environmental problems and support for environmental protection efforts. Initial efforts were confined to documenting growing levels of public awareness and concern for the environment among residents of the United States and other wealthy nations and to examining variation in "environmental concern" across differing sectors of society—by levels of education, age, and residence, for example (Albrecht 1975). Syntheses of available findings indicated that age, education, and political ideology were the best predictors, with young adults, the well-educated and political liberals being more concerned about the environment than their counterparts. Urban residents and women were also sometimes found to be more environmentally concerned than were rural residents and men, although these relationships often varied with the measure of environmental concern employed (Jones and Dunlap 1992).

Longitudinal studies have also been conducted, tracking trends in public opinion on environmental issues over extended time periods (Dunlap 2002a). A few studies examined correlates of environmental concern with longitudinal data, finding them to be relatively stable over long periods of time (Jones and Dunlap 1992). However, the lack of a public backlash against what is widely seen as the antienvironmental orientation of the Bush administration (Kennedy 2005), comparable with that which occurred during the first term of the Reagan administration, has led to speculation that concerns over national security in a post-9/11 era may have fundamentally altered Americans' concern with environmental quality (Brechin and Freeman 2004).

A more recent contribution of sociologists has been to extend work on environmental attitudes to the international level. A key finding is that citizen concern for the environment is not limited to wealthy nations as often assumed but rather has diffused throughout most of the world (Dunlap and Mertig 1995; Brechin 1999). These studies challenge the notion that concern for environmental protection is a "postmaterialist" value that emerges only when nations become relatively affluent and citizens' basic needs are reasonably well met.

Although the above studies have provided useful information on the distribution and evolution of environmental

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concern, they often employ single-item indicators or other simple measures and shed little light on the complexity of such concern. Gradually, more attention has been paid to the conceptualization and measurement of environmental concern, and sociologists and other scholars have developed a wide range of measures of this concept (Dunlap and Jones 2002). In particular, the “new ecological paradigm (NEP) scale,” which measures basic beliefs such as the existence of ecological limits and the importance of maintaining a balance of nature, has become the most widely used measure of environmental concern, employed in scores of studies worldwide (see Dunlap et al. 2000 for a revised NEP scale).

Other sociological contributions have been the development of a norm-activation model of environmental concern and behavior, clarification of the attitude-behavior relationship in the environmental domain, and the creation of a comprehensive value-belief-norm theory of environmental attitudes and activism (Stern et al. 1999). The latter has become an influential theoretical framework for helping guide the current emphasis on understanding the value basis of environmental concern (Dietz, Fitzgerald, and Shwom 2005).

In short, sociological studies of environmental concern have documented high levels of public awareness and concern over environmental quality, a crucial aspect of the emergence of environment as a social problem. These studies have shown that, unlike most social problems, environmental problems have had considerable staying power (Dunlap 2002a). It remains to be seen if this long-term trend will be fundamentally altered by 9/11 (Brechin and Freeman 2004).

### Media and Science

It is widely assumed that the media play a vital role in setting the policy agenda, and sociologists among others have examined the role of media coverage in generating societal attention to environmental problems. In general, it has been found that newspaper coverage of environmental issues increased dramatically throughout the late 1960s and reached an early peak at the time of the first Earth Day in 1970, presumably contributing to the concomitant rise in public concern during the same period (Schoenfeld et al. 1979). More recently, Mazur (1998) has shown how changing patterns of media coverage of global environmental problems such as ozone depletion and global warming appear to have influenced the waxing and waning of attention given to such problems by the public and policymakers. Also, Dispensa and Brulle (2003) have documented how U.S. media coverage conveys more scientific uncertainty regarding anthropogenic climate change than does that of other advanced nations—presumably due to the greater influence of the petroleum industry in the United States.

It was common for sociologists to credit Rachel Carson’s *Silent Spring* and other scientific contributions in

accounting for the rapid emergence of societal attention to environmental problems in the 1960s. Mitchell (1979) highlighted the dual emphasis on science and litigation in newer environmental organizations such as the Environmental Defense Fund and the Natural Resources Defense Council. However, a detailed analysis of the significant role played by science in environmental issues has emerged as a major emphasis in environmental sociology only in the past decade or so. Analysts such as Yearley (2005), for example, have emphasized that the environmental movement’s heavy reliance on science is a mixed blessing for several reasons: (1) demands for scientific proof can be used to stall action, particularly by unsympathetic politicians; (2) the probabilistic and tentative nature of scientific evidence falls short of the definitive answers lay people and policymakers seek; and (3) reliance on scientific claims makes environmentalists vulnerable to counterclaims issued by “skeptical scientists” supported by industry. Such insights have led environmental sociologists to focus more broadly on the role of environmental science in generating societal interest in environmental issues, ranging from analyses of how lay persons work to document the deleterious health impacts of local pollution (Brown 1997) to the role of experts in generating consensus on the need to take action to ameliorate the thinning of the ozone layer (Canan and Reichman 2001).

### Social Construction of Environmental Problems and the Constructivist-Realist Debate

Sociologists have long argued that conditions do not become social “problems” unless they are defined as such by claims makers, who are then successful in having their definitions publicized by the media, legitimized by policymakers and thus placed onto the public agenda. Environmental sociologists have applied this “social constructivist” perspective to a wide range of environmental problems and to “environmental quality” more generally, highlighting the crucial roles played by environmental activists, scientists, and policy entrepreneurs (Yearley 1991). Some have synthesized relevant work on environmentalism, environmental science, media attention, and public opinion into detailed models of the social construction of environmental problems and, in the process, helped explain how environmental quality has remained a significant social issue for over three decades (Hannigan 1995).

Constructivist work demonstrates that environmental problems do not simply emerge from changes in objective conditions, scientific evidence is seldom sufficient for establishing conditions as problematic, and the framing of problems (e.g., as local or global) is often consequential (Yearley 2005)—representing a vital sociological contribution. However, in the 1990s some constructivists followed postmodern fads and “deconstructed” not only environmental problems and controversies but also “the environment” (or, more typically, “nature”) itself. Proclamations that “there is no singular ‘nature’ as such,

only a diversity of contested natures” (Macnaghten and Urry 1998:1) were not uncommon (e.g., Greider and Garkovich 1994). This provoked a reaction from environmental sociologists in the “realist camp,” who argued that while one can deconstruct the concept of nature, an obvious human (and culturally bound) construction, this hardly challenges the existence of the global ecosystem and by implication various manifestations of ecosystem change construed as “problems” (Dunlap and Catton 1994). Realist critics further argued that a “strong constructivist” approach that ignores the likely validity of competing environmental claims slips into relativism, undermines environmental science and plays into the hands of its critics, precludes meaningful examination of societal-environmental relations seen as fundamental to environmental sociology, and at least implicitly resurrects the disciplinary tradition of treating the biophysical environment as insignificant (Benton 2001; Dickens 1996; Murphy 2002).

In response, defenders of social constructivism replied that they were not denying the reality of environmental problems, as their postmodern rhetoric sometimes suggested, but were simply problematizing environmental claims and knowledge (Burningham and Cooper 1999; Yearley 2002). In eschewing relativism in favor of “mild” or “contextual” constructivism (e.g., Hannigan 1995), most constructivists have moved toward common ground with their realist colleagues. The latter, in turn, have moved toward a “critical realist” perspective that, although firmly grounded on acceptance of a reality independent of human understanding, recognizes that scientific (and other) knowledge is imperfect and evolving (Carolan 2005a, 2005b). The result is that the “realist-constructivist battles” of the 1990s are subsiding, and environmental sociologists continue to make use of constructivist concepts such as framing to shed light on environmental controversies without slipping into relativism (e.g., Capek 1993; Shriver and Kennedy 2005).

## CURRENT RESEARCH EMPHASES

The foregoing work on societal awareness of environmental problems can be technically considered as the sociology of environmental issues, but in recent decades it has become common to find research that clearly involves investigations of societal-environmental interactions or relations (Gramling and Freudenburg 1996). While sometimes involving examinations of perceptions and definitions of environmental conditions held by differing interests, such work is at least implicitly and more often explicitly “realist” in orientation—and clearly ignores the Durkheimian dictum that social facts be explained only by other social facts that hampered early environmental sociology (Dunlap and Martin 1983). Rather than problematizing environmental claims, this work typically investigates how changing environmental conditions (often in interaction with social factors) produce societal impacts or, more

commonly, how social factors affect environmental conditions.<sup>1</sup> Although space constraints prevent us from providing a comprehensive review of such work, we highlight environmental sociologists’ contributions to three particularly important topics: the sources of environmental problems, the impacts of such problems, and the solutions to these problems.

## Sources of Environmental Problems

Given that environmental sociology emerged in response to increased recognition of environmental problems, it is not surprising that a central concern of the field has been to explain the sources of environmental degradation and why such degradation appears endemic to modern industrial societies. Early work often involved analyses and critiques of the rather simplistic views of the causes of environmental degradation that predominated in the popular literature, particularly monocausal explanations highlighting population growth emphasized by Paul Ehrlich or technological development stressed by Barry Commoner. The ecological complex or POET model (highlighting relations among population, technology, social organization and the environment) was used to explicate the competing explanations and point out the limitations of their narrow foci (Dunlap and Catton 1979b, 1983).

The most influential analysis was offered by Schnaiberg (1980), who provided a cogent critique of the emphases on population growth, technological developments, and materialistic consumers as the key sources of environmental degradation. Schnaiberg’s alternative “treadmill of production” model drew on a range of neo-Marxist and other political-economy perspectives to offer a sophisticated alternative that stresses the inherent need of market-based firms to grow, to replace costly labor with advanced technologies, and the inevitable increase in resources used as inputs in expanding production processes. He further clarified how a powerful coalition of capital, state, and labor develops in support of continued growth, making it difficult if not impossible for environmental advocates to halt the resulting “treadmill.”

Because the treadmill presents a compelling analysis of how and why increasing levels of environmental degradation inevitably accompany the expansion of capitalism, it has an inherent “face validity” that makes it appealing to environmental sociologists (Gould, Pellow, and Schnaiberg 2004). Yet despite this appeal, it has proven difficult to test empirically, particularly on a macrolevel, and has been used primarily to analyze localized opposition to treadmill processes (Buttel 2004). It has been used, for example, to explain the lack of success of local recycling programs and environmental campaigns (Gould, Schnaiberg, and Weinberg 1996; Pellow 2002; Weinberg, Pellow, and Schnaiberg 2000), and evoked a rebuttal in the case of recycling (Scheinberg 2003). At this point, the appeal of the treadmill model rests heavily on the fact that the growth of capitalism has been accompanied,

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particularly at the national and global levels, by increasing levels of environmental degradation (York 2004).

Finer-grained analyses of the linkages between economic activity and environmental degradation are needed to examine the validity of the treadmill model's assumption of an inevitable relationship between the two. Two examples of such analyses include Freudenburg's (2005) work suggesting that tiny fractions of the American industrial economy, often single plants within an industry, account for an enormously disproportionate share of pollution, and work by Grant and his colleagues (Grant and Jones 2003; Grant, Jones, and Bergesen 2002) showing that large chemical plants and those that are subsidiaries of other companies account for a disproportionate share of toxic releases. In addition, growing recognition of the importance of consumption in contemporary societies (Carolan 2004; Shove and Warde 2002; Spaargaren 2003; Yearley 2005) raises questions about the treadmill model's dismissal of consumer behavior.

The integration of the treadmill model with another political economy perspective, world systems theory (WST), is needed to advance our understanding of the relationship between economic globalization and environmental degradation. According to Wallerstein (1974), the modern world system emerged in the early 1500s and is comprised of three structural positions: core, semiperiphery, and periphery. While the structure of the system has been stable since its genesis, which nations occupy each of the three positions can change somewhat over time. Core nations tend to specialize in profitable manufacturing, whereas peripheral nations tend to provide raw materials and cheap labor for both core and, increasingly, semiperipheral nations (Burns, Kick, and Davis 2003). Although ignored in the original formulation of the theory, environmental issues have attracted increasing attention from WST researchers (Roberts and Grimes 2002). The late Stephen Bunker, who pioneered the application of WST to environmental questions in his path-breaking work on resource extraction in the Amazon (Bunker 1985), has noted the difficulties as well as benefits of merging the insights of the treadmill model with those of WST (Bunker 2005). While the time is ripe for following Bunker's lead, WST theorists largely ignore the insights offered by the treadmill model (Roberts and Grimes 2002) and treadmill proponents continue to ignore the insights of WST (Gould, Pellow, and Schnaiberg 2004).

The rapid growth of work on environmental issues by WST proponents in the past decade has included both long-term historical analyses of environmental degradation (Chew 2001) and the role of ecological factors in capitalist development (Moore 2003), and a spate of cross-national empirical studies investigating the relationship between countries' positions in the world system and, for example, national levels of deforestation (Burns et al. 2003), CO<sub>2</sub> emissions (Roberts and Grimes 1997), and ecological footprints (Jorgenson 2003). These large-scale, cross-national studies—typically finding that core nations contribute disproportionately to global levels of environmental degradation—complement more narrowly focused analyses

of the export of both hazardous wastes (Frey 2001) and polluting industries (Frey 2003) from core to peripheral nations, as well as the export of natural resources from the peripheral to core nations (Bunker 1985; 2005).<sup>2</sup> Finally, Barbosa's work (2000) sheds light on how the world system not only encourages the exploitation of the Brazilian Amazon but also weakens efforts to protect it.

Adherents of WST have offered vital insights into the sources of environmental degradation. However, they must do more than demonstrate that world system position has a significant effect in regression equations predicting various forms of environmental degradation. Studies that examine patterns of environmental degradation *within* differing sectors of the world system (Burns et al. 2003) offer an advance, but more work on less-developed nations that clarify how involvement in the world capitalist system stimulates treadmill processes (e.g., privatization of natural resources) is needed—including attention to the role of international institutions such as the World Bank in expanding global capitalism, even under the guise of sustainable development (Goldman 2005).

Ironically, given the dismissal by Schnaiberg and many other sociologists of the perspectives of Ehrlich and Commoner, a recent alternative to the treadmill and WST models draws explicitly from the "IPAT equation" (holding that environmental impact is a function of population, technology, and affluence) that evolved from debates between the two ecologists. IPAT is isomorphic with the POET model developed by sociological human ecologists and used by early environmental sociologists (Dunlap 1994; Dunlap, Lutzenhiser, and Rosa 1994). Thus, the derivative "STIRPAT" (or "stochastic impacts by regression on population, affluence, and technology") model developed by Dietz and Rosa (1994) is rooted in what Buttel (1987) termed the "new human ecology" perspective in environmental sociology (see Benton 2001 for an updated overview of work representing this perspective).

The STIRPAT model provides a statistically rigorous technique for empirically examining the relative contributions of potential sources of environmental degradation, including the economic variables central to political economy models, and thus offers an improvement over IPAT (York, Rosa, and Dietz 2003b). An early STIRPAT analysis of national-level CO<sub>2</sub> emissions found that population and affluence explained cross-national variation extremely well (Dietz and Rosa 1997), giving some credibility to the neo-Malthusian perspective (e.g., Catton 1980, 1987) that has generally been disregarded in the field. A recent and more sophisticated STIRPAT analysis of cross-national variation in ecological footprints (a comprehensive measure of ecological load encompassing the three functions of the environment noted earlier) again found population (size and age distribution) to be the most important contributor to national-level footprints, although environmental conditions such as land mass and latitude (reflecting climate variation) and economic variables such as affluence also have an effect (York, Rosa, and Dietz 2003a).



While the STIRPAT model helps provide great insight into the sources of environmental degradation, it will likely be subjected to criticism (in part because its emphasis on the importance of population may prove unpalatable to some environmental sociologists) and refinement. The “human ecology” perspective on which it builds is a broad orienting framework—calling attention to the ecological embeddedness of human societies—rather than a coherent theoretical perspective (Dietz and Rosa 1994),<sup>3</sup> and the degree to which “ecological theory” can be directly applied to *Homo sapiens* remains a problematic and contentious issue (e.g., Freese 1997). While a strength of the STIRPAT model is that it can incorporate an endless range of variables, including those suggested by alternative theoretical perspectives, the selection of predictor variables beyond indicators of population and affluence thus far appears to be rather ad hoc (compare, e.g., Dietz and Rosa 1997 with York et al. 2003a, 2003b). This is important because we can expect to see varying conclusions drawn from studies that incorporate differing variables into the model, as suggested by Shandra et al. (2004). Future work with STIRPAT might benefit from the concepts of “societal metabolism” and “colonization of nature” employed by Fischer-Kowalski and colleagues (arguably the leading exponents of a human ecological perspective in Europe), as well as from the examples of in-depth longitudinal studies of the environmental impacts of specific nations guided by those concepts (e.g., Fischer-Kowalski and Amann 2001; Fischer-Kowalski and Haberl 1997; Haberl and Krausmann 2001).

The recent rapid development of theoretically and empirically sophisticated analyses of the sources of environmental degradation, particularly quantitative, cross-national studies, means that knowledge is evolving rapidly. It is not surprising that studies differ in findings and conclusions when they use differing samples of nations as well as varying indicators of an array of predictor variables, to say nothing of focusing on differing forms of environmental degradation. Also, there is a fundamental difference in logic between, for example, Jorgenson’s (2003) effort to demonstrate that world system position is the key factor influencing nations’ ecological footprints and York et al.’s (2003a) effort to explain variation in national footprints as fully as possible by employing a wide range of variables. We can expect considerable debate as well as eventual progress, especially if proponents of differing theoretical perspectives begin to focus on the same topics, in developing improved understanding of the sources of environmental degradation. Clearly, the field has come a long way since the early efforts to clarify debates over the key sources of such degradation (Dunlap and Catton 1979b, 1983; Schnaiberg 1980).

### Impacts of Environmental Problems

As noted earlier, environmental sociology was just emerging at the time of the 1973–1974 energy crisis, so it

is not surprising that identifying real as well as potential social impacts of energy and other natural resources was emphasized in this early period. While diverse impacts—from regional migration to consumer lifestyles—were investigated, heavy emphasis was placed on investigating the “equity” impacts of both energy shortages and the policies designed to ameliorate them (Rosa, Machlis, and Keating 1988). A general finding was that both the problems and policies often had regressive impacts, with the lower socioeconomic strata bearing a disproportionate cost due to rising energy costs (Schnaiberg 1975).

Equity has been a persistent concern in environmental sociology, and researchers gradually shifted their attention to the distribution of exposure to environmental hazards (ranging from air and water pollution to hazardous wastes). Numerous studies have generally found that both lower socioeconomic strata and minority populations are disproportionately exposed to environmental hazards (Brulle and Pellow 2006), and clarifying the relative importance of income and race-ethnicity has begun to receive attention (Szasz and Meuser 2000). While these findings have played a key role in generating attention to “environmental racism” and stimulating efforts to achieve “environmental justice” (Pellow and Brulle 2005), there are many methodological challenges to be overcome if researchers are to provide stronger documentation of environmental injustice (Saha and Mohai 2005; Bevc, Marshall, and Picou 2006).

At a broader level, international equity is attracting the attention of environmental sociologists such as WST researchers investigating the export of hazardous wastes and polluting industries from wealthy to poor nations, the exploitation of Third World resources by multinational corporations, and the disproportionate contribution of wealthy nations to many global-level problems—while the consequent hurdles these phenomena pose for international cooperation has also received attention (Redclift and Sage 1998). Mounting evidence of the disproportionate impact of environmental problems on peripheral nations and the lower strata within most nations calls into question Beck’s (1992) “Risk Society” thesis that modern environmental risks transcend class boundaries (Marshall 1999).

Sociologists have not limited themselves to investigating the distributional impacts of environmental problems, and studies of communities exposed to technological or human-made hazards offer particularly rich portrayals of the diverse impacts caused by environmental and technological hazards. Whereas natural disasters—such as floods, hurricanes, and earthquakes—have been found to produce a therapeutic response in which communities unite in efforts to help victims, repair damage, and reestablish life as it was before the disaster struck, technologically induced disasters (particularly toxic releases) have a corrosive effect on community life (Freudenburg 1997; Kroll-Smith, Couch, and Levine 2002). Although a putative hazard may appear obvious to some residents, the ambiguities involved in detecting and assessing such hazards often generate a pattern of intense conflict among different

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community groups (Shriver and Kennedy 2005). In many cases, such conflicts have resulted in a long-term erosion of community life as well as exacerbation of the victims' personal traumas stemming from their exposure to the hazards (Kroll-Smith et al. 2002).

Even when there is general agreement among residents concerning the impact of a disaster, there can be long-term socioeconomic damage to the community and psychological stress to its residents, as illustrated by longitudinal work on the impact of the 1989 Exxon Valdez oil spill in Alaska (Picou et al. 2004). In the aftermath of such disasters, three factors tend to impede recovery and contribute to long-term psychological stress and community damage: (1) perceptions of governmental failure; (2) uncertainty regarding the mental and physical health of victims; and (3) protracted litigation (Marshall, Picou, and Schlichtmann 2004). For the plaintiffs of Cordova, Alaska, the litigation process following the Exxon Valdez Oil Spill served as the strongest source of psychological stress and community damage (Picou et al. 2004).

It has been argued recently that the social-psychological distinction between natural and technological disasters is losing its empirical import, especially with the recent emergence of a third type of disaster—terrorism (Marshall, Picou, and Gill 2003; Webb 2002). Indeed, the blurring of the distinction is suggested by anecdotal evidence indicating that Hurricane Katrina is perceived as a natural disaster (storm surge damage along the Gulf Coast), technological disaster (breached levee system causing flooding in New Orleans), and a case of environmental injustice (low-income people disproportionately trapped by rising flood waters in New Orleans). Such ambiguities indicate the need for fresh perspectives in sociological work on hazards and disasters. More generally, the rising incidences of human exposure to environmental hazards and technological disasters, particularly as less-developed (semi-peripheral and peripheral) nations experience more industrial growth and/or resource exploitation, suggests that environmental sociologists will pay increasing attention to the impacts (as well as the sources) of environmental degradation.

### Solutions to Environmental Problems

Environmental sociologists have typically focused more attention on the causes and impacts of environmental problems than on their solutions, although the situation has changed in the past decade. Akin to their analyses of causes, early work by environmental sociologists often involved explications and critiques of predominant approaches to solving environmental problems. Heberlein (1974) noted the predilection of the United States for solving environmental problems via a "technological fix," and then analyzed the relative strengths and weaknesses of voluntary and regulatory approaches. Other sociologists (e.g., Dunlap et al. 1994) subsequently identified three broad types of "social fixes" implicit in policy approaches: (1) the cognitive (or knowledge) fix relying on information

and persuasion to stimulate behavioral change; (2) a structural fix employing laws and regulations to mandate behavioral change; and (3) a behavioral fix using incentives and disincentives to encourage behavioral change.

In the 1970s and 1980s environmental sociologists, along with other behavioral scientists, conducted a variety of studies evaluating the efficacy of these differing strategies, particularly for energy conservation (Rosa et al. 1988). Sociological analyses emphasized the degree to which energy (and other resource) consumption is affected by factors such as building construction and transportation systems, and thus the limitations of educational and information programs for achieving conservation (Lutzenhiser 1993; Shove and Warde 2002). Nonetheless, the changing regulatory climate of recent decades has generated renewed interest in voluntaristic approaches to environmental policy, and Tom Dietz and Paul Stern have recently led a comprehensive examination of environmental policy approaches via the U.S. National Academy of Sciences and the resulting volume (Dietz and Stern 2002) provides an excellent update of relevant work by environmental sociologists and other social scientists.

By the 1990s sociological interest in environmental policy took a quantum leap forward as environmental sociologists in Northern Europe began to analyze what appeared to be significant environmental amelioration within their nations. Originally building on models of industrial ecology, which suggest that the modernization of industry can permit expanding production with decreasing levels of material input and pollution output, proponents of "ecological modernization" gradually moved beyond technologically driven explanations of environmental progress. New forms of collaboration between government, industry, and civil society were seen as institutionalizing an "ecological rationality" that not only tempers the excesses of traditional economic decision making but also stimulates the development of a "green capitalism" that purportedly marries the pursuit of environmental protection with the power of the market (e.g., Mol and Sonnenfeld 2000; Mol and Spaargaren 2000). In part because its acceptance of the presumed inevitability of capitalist expansion makes it compatible with currently hegemonic neoliberal economic ideology, ecological modernization theory (EMT) has become a leading perspective within environmental sociology—particularly in Europe.

Not only do proponents of EMT view the relationship between capitalism and environmental quality quite differently than do adherents of political economy perspectives but also their efforts to theorize processes of environmental improvement have led to a major revision in environmental sociology's traditional preoccupation with explaining environmental degradation (Buttel 2003). It is therefore not surprising that major debates have ensued over the validity of ecological modernization theory. American scholars from various theoretical perspectives have issued critiques, particularly dealing with the methodological inadequacies and resulting limitations of empirical research purportedly

documenting cases of ecological modernization. These include EMT's emphasis on institutional change rather than actual environmental improvements; its focus on atypical plants, corporations, and industries selected to illustrate environmental improvements; its lack of generalizability beyond a small number of European nations; and its failure to recognize that environmental improvements in these nations result from increased use of poorer nations as supply depots and waste repositories (Bunker 1996; Goldman 2002; Schnaiberg, Pellow, and Weinberg 2002; York 2004; York and Rosa 2003).

Although it initially appeared that such critiques would foster serious debate over the validity of EMT and especially its applicability outside of Northern Europe (Mol and Spaargaren 2002), most recently the leading proponents of EMT have retreated into a postmodernish stance emphasizing "the limitations of empirical studies in closing theoretical debates" (Mol and Spaargaren 2005:94). However, given the recent growth of cross-national empirical studies in environmental sociology, surely the best way to resolve theoretical debates and establish the generalizability of theoretical claims is for the contestants to reach agreement concerning key variables, appropriate measures, and reasonable samples and then to empirically test theoretically derived hypotheses—as suggested by Fisher and Freudenburg (2001). Thus far it has fallen primarily to American scholars to provide empirical, cross-national tests of EMT, and preliminary results are at best mixed. Fisher and Freudenburg's (2004) claim of some support for expectations partially derived from EMT has generated an exchange over the adequacy of their methodological analysis (Fisher and Freudenburg 2006; York and Rosa 2006). Likewise, investigations of the existence of an environmental Kuznets curve (an inverted U-shaped relationship between affluence and environmental degradation, indicating that degradation increases as nations develop economically but then declines once a reasonable level of affluence is reached), a central expectation from EMT, has generated conflicting evidence (Burns et al. 2003; Ehrhardt-Martinez, Crenshaw, and Jenkins 2002; Fisher-Kowalski and Amann 2001; Roberts and Grimes 1997; Rudel 1998; York et al. 2003a, 2003b).

Despite the dubious evidence for ecological modernization, we believe it deserves continued testing, particularly in the United States. While contemporary U.S. environmental policy, which might be construed as ecological *demodernization*, represents a major anomaly for EMT, the theory may offer insights into why and how some local governments and a few corporations in the United States appear to be taking steps in accordance with EMT expectations despite a federal government that is widely seen as antienvironmental (Kennedy 2005). More generally, EMT has become just one strand of a larger recent effort within environmental sociology to contribute to an understanding of processes of "environmental reform" (Buttel 2003) and "environmental governance" (Davidson and Fricke 2004), topics once ceded to political science and economics.

Perhaps the most significant sociological contribution in this vein outside of EMT has been research conducted by proponents of the world civil society (WCS) perspective, research employing sophisticated quantitative techniques such as event history analysis to demonstrate the global spread of norms concerning appropriate governmental responsibilities—including environmental protection. Emphasizing the role of intergovernmental organizations, transnational nongovernmental organizations, international treaties, and other vehicles of diffusion, WCS researchers have documented the global spread of governmental laws and agencies designed to protect environmental quality or "environmental regimes" (e.g., Meyer et al. 1997; Frank, Hironaka, and Schofer 2000).

In response to criticism that WCS research documents institutional and policy changes but not changes in environmental conditions (Buttel 2000), a recent study reports that institutionalization of a global environmental regime is related to declining rates of CO<sub>2</sub> and chlorofluorocarbon (CFC) emissions (Schofer and Hironaka 2005). However, while there has been an absolute decrease in global CFC emissions, reflecting the fact that there were economically attractive technological alternatives to CFCs, the study finds only a slowing in the *rate of growth* of CO<sub>2</sub> emissions. Given that data on global ecological footprints suggest the need for declines in overall levels of environmental degradation (Wackernagel et al. 2004), a mere slowing in the rate of increase of degradation may be inadequate for avoiding the possibility of "overshoot" raised by Catton (1980) a quarter century ago. Thus, it is unclear whether the global diffusion of an environmental regime touted by WCS proponents, a process compatible with EMT's claim of a global trend toward ecological modernization (Mol 2001), will prove adequate for halting continued degradation (Goldman 2002). This is particularly the case now that the United States, once a pioneer in terms of environmental protection, has arguably become the major obstacle to the effective implementation of a global environmental regime (Kennedy 2005), at the very time rapid industrialization of nations such as China and India makes the need for such a regime more crucial than ever.

## CONCLUDING COMMENTS

As the foregoing overview of major emphases and trends suggests, environmental sociology has not only become well established internationally, but is experiencing a period of intellectual growth and ferment. The realism-constructivism debates have subsided, and the realist underpinnings of the field are once again firmly in place (even as social-constructivist analyses continue to provide vital insights), but new debates have opened up—particularly over two key foci of the field. Understanding the sources of environmental degradation is the subject of more research than ever, and increasingly sophisticated empirical analyses are shedding light on the relative

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adequacy of various perspectives, especially those derived from political economy and human ecology, to explain the primary driving forces of such degradation. At the same time, the internationalization of environmental sociology has opened a debate over the inevitability of environmental degradation, with proponents of EMT (complemented by WCS studies) arguing that significant progress can be made by modernizing industrial societies and that the field should give more attention to processes of environmental improvement and reform.

While we can expect spirited theoretical debates among the proponents of the various perspectives, our hope is that efforts will be made to design rigorous empirical studies

that will help resolve apparent and often real inconsistencies and contradictions. The effort of Roberts, Parks, and Vasquez (2004) to reconcile divergent conclusions produced by a WST analysis (Roberts 1996) and a WCS analysis (Frank 1999) of the key factors influencing nations to ratify international environmental treaties via a more comprehensive explanatory model is a good example. If environmental sociology is to make valuable contributions to efforts to deal with the enormous problems of environmental degradation facing humankind in the twenty-first century, the field must develop a solid base of theoretically informed but empirically verified knowledge.