

# Introduction: Progress in Structural Human Ecology

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## Abstract

Structural human ecology is a vibrant area of theoretically grounded research that examines the interplay between structure and agency in human–environment interactions. This special issue consists of papers that highlight recent advances in the tradition. Here, the guest co-editors provide a short background discussion of structural human ecology, and offer brief summaries of the papers included in the collection.

Keywords: structural human ecology, carbon intensity of well-being, sustainability, coupled human and natural systems

## Structural human ecology

Structural human ecology (SHE) is a term that covers the research of a network of scholars who examine the interplay between structure and agency in human–environment interactions.<sup>2</sup> The perspective of SHE is very much grounded in Darwinian thinking (Dietz & Burns, 1992; McLaughlin, 2001, 2012). The structures of the physical, biological and social worlds constrain human action by shaping the responses that will result from a human decision. But human actions also reshape the physical, biological and social worlds. To paraphrase G. Evelyn Hutchinson, SHE examines the cultural evolutionary play enacted in the human ecological theater (Hutchinson, 1965).

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<sup>2</sup> *Structural Human Ecology: New Essays in Risk, Energy, and Sustainability* (2013) Dietz, T., & Jorgenson, A. K. (Eds.) was reviewed by Eric Bond in *Human Ecology Review* Vol 21(2). It can be accessed online from ANU Press at [press.anu.edu.au/titles/human-ecology-review/volume-21-number-2/](http://press.anu.edu.au/titles/human-ecology-review/volume-21-number-2/).

Of course, concern with agency and structure has long been evident in human ecology (Richerson, 1977; Richerson & Boyd, 1997/1998). SHE emerged from two streams of environmental social science research that both embody these concerns. One was the emergence of quantitative macro-comparative work on the anthropogenic drivers of environmental change (Dietz & Rosa, 1994). An early motivation for this work was to offer strategies for, as Gene Rosa often put it, “disciplining theory with data” around long-standing arguments, such as the relative importance of population, affluence and technology as drivers of environmental change (Dietz & Rosa, 1997). This has led to a robust literature examining many forms of anthropogenic environmental stress and many factors that drive it (Jorgenson & Clark, 2012; Rosa & Dietz, 2012). Recently, this line of research has turned to a question central to sustainability, initially raised by Mazur and Rosa (Dietz, Rosa, & York, 2009; Jorgenson, 2014; Jorgenson & Dietz, 2015; Mazur & Rosa, 1974): what is the relationship between human well-being and environmental stress, and in particular is it necessary to produce high levels of environmental stress to achieve high levels of well-being?

Examination of risk and uncertainty is a second stream of scholarship in structural human ecology. The literature on risk and uncertainty is somewhat distinct from the macro-comparative literature but both are pursued by an overlapping group of scholars (Dietz, 2013; Rosa, Renn, & McCright, 2013; York, 2013).<sup>3</sup> While much more work is needed to effectively link these two themes, they do converge around growing efforts to examine the risks associated with global social and environmental change that are the focus of much of the macro-comparative literature (Rosa, Dietz, Moss, Atran, & Moser, 2012), and with efforts by macro-comparative scholars to address policy issues in their work, discussions that inevitably lead to considerations of risk and uncertainty (e.g., Jorgenson, 2012; York, 2012).

This special issue consists of papers that highlight some of the ways in which recent progress has been made in the structural human ecology tradition. The work illustrates the breadth in SHE scholarship, and the diversity in the career stages of the authors underscores the vibrancy of the tradition. It was a pleasure to organize the issue, and we thank the authors and anonymous reviewers for their hard work and excellent contributions.

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3 In *Structural Human Ecology*, an edited volume assessing the contributions of Eugene Rosa to the field, five of eight papers deal with risk (Dietz & Jorgenson, 2013).

## Theoretical perspectives

The papers by Burns and Rudel and by Dietz and York both advance theoretical understanding in structural human ecology. Burns and Rudel offer an innovative integration of a theme from the ecological literature, the adaptive cycle, with a theme from the macro-comparative social science literature, world-systems theory. Adaptive cycle theory in ecology emerged from consideration of ecosystems but has been applied to coupled human and natural systems as well, although mostly at the scale of particular landscapes and the natural resources in them. World-systems theory is framed at the global level, and has long engaged with the idea of Kondratiev cycles (as well as other large-scale cycles and long-term trends, see Chase-Dunn, 1998), waves of change induced in part by new technologies and structures of inequality that unfold over many decades. By juxtaposing these two theories, Burns and Rudel challenge us to think about how ecological changes may interplay with large-scale social changes, offering the dynamics of the Irish Potato Famine as an example. Conceptualizing these changes as cycles emphasizes that responses to large changes often transform the systems responding, eventually leading to yet another round of change.

Dietz and York pursue the growing attention to non-human animals in human ecology. They suggest that animals do not easily fit into traditional categories of manufactured, natural, human and social resources. In particular, animals used in the production of goods and services can act with agency that disrupts the management of the production processes. That in turn has led to ongoing historical efforts to rationalize and control the way animals act in production to increase the economic efficiency of the process. Examining the role of animals in parallel with the role of human workers offers insights into the political dynamics and ethics of production.

These two papers, while addressing different bodies of theory and focusing on different phenomena, do reflect a common theme in structural human ecology: a strong emphasis on developing theory that integrates across fields of inquiry. To date most structural human ecologists are grounded in sociology. But they are sociologists who make a point of embracing other disciplines. They focus on work that is informed by, while concurrently informing, the full body of scholarship on human–environment interactions.

## Driving the human ecological footprint

Perhaps the most robust area in structural human ecology is the large body of research that articulates the ways in which various human drivers produce stress on the biophysical environment. Clearly the size of human populations

and their level of affluence are major drivers of environmental stress—they constitute the scale of human activity. But the effects of scale can be moderated by both the content of what is consumed and the technique, or technology, that is used in production, including disposal of waste. In turn, the composition of consumption and the techniques of production are influenced by a variety of structural factors, including culture and institutional arrangements that allow manifestation of power by some and suppress the exercise of power by others. Thus the set of factors that influence anthropogenic environmental stress is very diverse and is the subject of a rapidly growing literature. Papers by Longo and York, by Marquart-Pyatt, and by Jorgenson, Schor, Huang and Fitzgerald offer important new insights into the drivers of anthropogenic environmental stress.

Longo and York note that there have long been hopes that new information technologies will “dematerialize” economies, leading to reduced environmental stress. They examine the empirical evidence that the growth in traditional landline phones, cell phones and internet use changes energy consumption and production, electricity consumption and production, and the number of cars. Unfortunately, the hope that electronic communication will displace energy use is not warranted. Cell phone use has no observable effect on the prevalence of cars, the production or consumption of energy in general, and electricity in particular. In contrast, an increase in landline phones is associated with an increase in both overall energy production and consumption, and with increased electricity consumption and production. And increased internet use is associated with an increase in car ownership. Overall, the growing use of electronic communications does not reduce stress on the environment and may be part of a process by which it is exacerbated.

Marquart-Pyatt provides an analysis that combines a central theme in structural human ecology—the analysis of the ecological footprint of nations—with an emerging methodological approach—the analysis of a regional subset of nations. The ecological footprint is a widely accepted integrative measure of stress on the environment, and was the subject of some of the earliest work in structural human ecology (Jorgenson, 2003; York, Rosa, & Dietz, 2003). The overall footprint and its components (land area devoted to crops, to grazing, to the built environment and CO<sub>2</sub> emissions) continue to be a major theme in structural human ecology. But while initial studies typically considered the full set of nations for which data were available, more recent analysis, being attentive to structural variations across nations, have examined drivers within regional subsets. Here Marquart-Pyatt offers an examination of the drivers of the ecological footprint and its components in a critical region: West Africa. Looking at longitudinal data for five nations (Burkina Faso, Ghana, Mali, Niger, and Nigeria), she gives us a better understanding of the factors driving environmental stress within a critical context over a 45-year time span. A particularly important finding of her

analyses is that, with the exception of CO<sub>2</sub> emissions, affluence (gross domestic product per capita) does not drive environmental stress among the regions within West Africa, while population size and various aspects of population distribution do.

Jorgenson et al. examine the effects of income inequality on residential CO<sub>2</sub> emissions. While concern with inequality with regard to who suffers from environmental risks is long-standing (Burch, 1976; Hare, 1970), relatively little work has been done on how income inequality may influence stress placed on the environment. Jorgenson et al.'s paper is also part of a new methodological move in structural human ecology to complement analyses that compare nation-states with those working at the sub-national level, in this case U.S. states. They choose a measure of inequality that is sensitive to the concentration of income among the most affluent and find that income inequality does exacerbate CO<sub>2</sub> emissions, another problematic impact added to the growing set of concerns being raised about income inequality (e.g., Pickett & Wilkinson, 2015). Their study also encourages us to remember that structural analyses must consider how resources and power are distributed within a society, as well as between societies, the latter of which is commonly addressed in SHE scholarship at more macro levels.

## Human well-being

While the majority of studies in structural human ecology examine the drivers of stress on the environment, one of its pioneering contributions—made by Mazur and Rosa—examined the relationship between environmental stress and human well-being (Mazur & Rosa, 1974). This theme is being revitalized in a number of recent studies examining the question of whether or not increases in well-being can be achieved without attendant increases in environmental stress. Papers by Givens and by Sommer, Shandra, Restivo and Coburn contribute to this line of analysis on human well-being and the environment.

Givens provides a detailed examination of how urbanization and efforts to provide improved water services in urban areas are related to the carbon intensity of well-being (CIWB; CO<sub>2</sub> emissions per capita divided by average life expectancy at birth). She finds that both urbanization per se and provision of improved water services (potable water and sanitation) increase CIWB, and that these effects are stronger in developing nations than in developed nations. As with the findings of Longo and York, Givens' results counter a long-standing hope that urban areas might be able to provide well-being efficiently with

modest environmental impact. Not only does urbanization increase CIWB, but provision of critical water services further exacerbates emissions per unit of human well-being.

Sommer et al. conduct an analysis, which, like that of Marquart-Pyatt, focuses on Africa. They examine two related key indicators of human well-being: maternal and neo-natal mortality for a sample of nations located throughout the continent. Their work is motivated in part by a sociological literature investigating how institutional arrangements have affected human well-being. They consider the requirements for “structural adjustments” imposed by the International Monetary Fund on a number of developing nations. These “adjustments” required moves towards neoliberal economic policy in exchange for restructuring crippling debt on international loans. Sommer et al. find that access to improved water and sanitation decreases mortality. But structural adjustment policies still have an adverse effect on human well-being, even when improved water and sanitation are accounted for in the analysis.

## Emerging directions in structural human ecology

Each of the papers in this special issue makes specific contributions to theory and our empirical understanding of human ecology. In the aggregate, they also point to several emerging directions of inquiry in structural human ecology. First, efforts are underway to connect SHE with a number of other lines of theory. These include links to theories of ecosystem and world-systems dynamics, to the growing body of work in animal studies, to growing concerns with the effects of inequality, and to work on the human well-being impacts of economic growth and development policies, such as broad neo-liberal structural adjustments and ongoing efforts to improve access to potable water and sanitation.

Second, a number of papers in this issue counter commonly held conceptions about factors that enhance sustainability. Both increased use of telecommunications and increased urbanization seem to make things worse, despite hopes that the opposite might be true. However, we also have evidence that, at least in some West African nations, economic growth over the last 45 years has not tended to increase stress on the environment—at least in the context of the ecological footprints of nations—although population growth has. These findings demonstrate a particular value of structural human ecology: disciplining theory with data and thus identifying what social changes may enhance sustainability and which, at least to the present, have not.

Third, several papers are especially attentive to context by examining a subset of all nations to elucidate processes that may be at work in some places but not others. In addition, Jorgenson et al. is one of the first papers in SHE to use subnational units of analysis. Structural human ecology embraces units of analysis from the individual to the globe, noting that each level of analysis has its strengths and limits and thus all are needed to provide a robust understanding of how structure affects ecological and evolutionary processes. Examinations of subsets of nations and subnational units are important contributions to better understanding the relevance of context.

Reading across these papers it is clear that structural human ecology is flourishing. New theoretical arguments are emerging. Empirical analyses are becoming more sophisticated and nuanced. Researchers are examining both broad theoretical questions and issues of immediate policy relevance. Thus SHE seems to reflect the core themes of human ecology: to span disciplines while doing work that contributes to fundamental understanding and that also addresses important practical problems.

## Coda

The papers in this special issue are intended as a gesture of respect for the work of the late Eugene A. Rosa. Gene was a long-time and enthusiastic member of the Society for Human Ecology. He was at the hub of the network of what has come to be called structural human ecology, making foundational contributions to both macro-comparative analyses (Dietz & Rosa, 1994; Mazur & Rosa, 1974; York et al., 2003) and to structural perspectives on risk (Rosa et al., 2013). His influence was felt not only through his written work but also through his extensive collaborations; nearly half the authors of the papers in this issue co-authored with Gene. Gene would have enjoyed the session from which these papers emerged, and would have insightful and supportive comments on them. We thank him for his immense intellectual and personal contributions to the field.

## Acknowledgments

We thank Rachel Kelly for her superb copyediting of the papers in this special issue and HER editor Rob Dyball for authorizing and guiding this special issue. Dietz's contributions were supported in part by Michigan AgBio Research.

## References

- Burch, W. R. (1976). The Peregrine Falcon and the Urban Poor. In P. J. Richerson & J. I. McEvoy (Eds.), *Human ecology: an environmental approach* (pp. 308–316). North Scituate, MA: Duxbury.
- Chase-Dunn, C. (1998). *Global Formation: Structures of the World-Economy*. Lanham, MD: Rowman & Littlefield Publishers.
- Dietz, T. (2013). Epistemology, Ontology, and the Practice of Structural Human Ecology. In T. Dietz & A. K. Jorgenson (Eds.), *Structural Human Ecology: Essays in Risk, Energy, and Sustainability* (pp. 31–52). Pullman, WA: Washington State University Press.
- Dietz, T., & Burns, T. R. (1992). Human Agency and the Evolutionary Dynamics of Culture. *Acta Sociologica*, 35, 187–200.
- Dietz, T., & Jorgenson, A. K. (Eds.). (2013). *Structural Human Ecology: New Essays in Risk, Energy, and Sustainability*. Pullman, WA: Washington State University Press.
- Dietz, T., & Rosa, E. A. (1994). Rethinking the Environmental Impacts of Population, Affluence and Technology. *Human Ecology Review*, 1, 277–300.
- Dietz, T., & Rosa, E. A. (1997). Effects of Population and Affluence on CO<sub>2</sub> Emissions. *Proceedings of the National Academy of Sciences, USA*, 94, 175–179.
- Dietz, T., Rosa, E. A., & York, R. (2009). Environmentally Efficient Well-Being: Rethinking Sustainability as the Relationship between Human Well-being and Environmental Impacts. *Human Ecology Review*, 16(1), 113–122.
- Hare, N. (1970). Black Ecology. *The Black Scholar*, 1(6), 2–8.
- Hutchinson, G. E. (1965). *The Ecological Theater and the Evolutionary Play*. New Haven, CT: Yale University Press.
- Jorgenson, A. K. (2003). Consumption and Environmental Degradation: A Cross-National Analysis of the Ecological Footprint. *Social Problems*, 50, 374–394.
- Jorgenson, A. K. (2012). Energy: Analyzing Fossil Fuel Displacement. *Nature Climate Change*, 2, 398–399.
- Jorgenson, A. K. (2014). Economic Development and the Carbon Intensity of Human Well-Being. *Nature Climate Change*, 4, 186–189.
- Jorgenson, A. K., & Clark, B. (2012). Are the Economy and the Environment Decoupling? A Comparative-International Study, 1960–2005. *American Journal of Sociology*, 118, 1–44.



- Jorgenson, A. K., & Dietz, T. (2015). Economic Growth Does Not Reduce the Ecological Intensity of Human Well-Being. *Sustainability Science*, 10, 149–156.
- Mazur, A., & Rosa, E. (1974). Energy and Life-Style: Massive Energy Consumption May Not Be Necessary to Maintain Current Living Standards in America. *Science*, 186, 607–610.
- McLaughlin, P. (2001). Towards an Ecology of Social Action: Merging the Ecological and Constructivist Traditions. *Human Ecology Review*, 8(2), 12–28.
- McLaughlin, P. (2012). The Second Darwinian Revolution: Steps Toward a New Evolutionary Environmental Sociology. *Nature and Culture*, 7(3), 231–258.
- Pickett, K. E., & Wilkinson, R. G. (2015). Income inequality and health: A causal review. *Social Science & Medicine*, 128, 316–326.
- Richerson, P. J. (1977). Ecology and Human Ecology: A Comparison of Theories in the Biological and Social Sciences. *American Ethnologist*, 4, 1–26.
- Richerson, P. J., & Boyd, R. (1997/1998). Homage to Malthus, Ricardo and Boserup: Toward a General Theory of Population, Economic Growth, Environmental Deterioration, Wealth and Poverty. *Human Ecology Review*, 4, 85–90.
- Rosa, E. A., & Dietz, T. (2012). Human drivers of national greenhouse-gas emissions. *Nature Climate Change*, 2(8), 581–586. DOI:10.1038/nclimate1506.
- Rosa, E. A., Dietz, T., Moss, R. H., Atran, S., & Moser, S. (2012). Risk and Sustainability: A Look at Two Global Threats. *Solutions*, 3(2), 59–65.
- Rosa, E. A., Renn, O., & McCright, A. M. (2013). *The Risk Society Revisited: Social Theory and Governance*. Philadelphia, PA: Temple University Press.
- York, R. (2012). Do Alternative Energy Sources Displace Fossil Fuels? *Nature Climate Change*, 2, 441–443.
- York, R. (2013). Metatheoretical Foundations of Post-Normal Prediction. In T. Dietz & A. K. Jorgenson (Eds.), *Structural Human Ecology: New Essays in Risk, Energy and Sustainability* (pp. 19–29). Pullman, WA: Washington State University Press.
- York, R., Rosa, E. A., & Dietz, T. (2003). Footprints on the Earth: The Environmental Consequences of Modernity. *American Sociological Review*, 68(2), 279–300.

This text is taken from *Human Ecology Review*,  
*Volume 22, Number 1, 2015*, published 2015 by ANU Press,  
The Australian National University, Canberra, Australia.