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Citation: Lynch, Michael, Barrett, Kimberly, Stretesky, Paul and Long, Michael (2017) The Neglect of Quantitative Research in Green Criminology and Its Consequences. *Critical Criminology*, 25 (2). pp. 183-198. ISSN 1205-8629

Published by: Springer

URL: <https://doi.org/10.1007/s10612-017-9359-6> <<https://doi.org/10.1007/s10612-017-9359-6>>

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# The Neglect of Quantitative Research in Green Criminology and Its Consequences

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Accepted for publication to Critical Criminology in January 2017

Please cite as follows:

Lynch, M. J., Barrett, K. L., Stretesky, P. B., & Long, M. A. (2017). The Neglect of Quantitative Research in Green Criminology and Its Consequences. *Critical Criminology*, 25(2), 183-198.

## **Abstract**

While interest in green criminology has rapidly expanded over the past twenty-five years, much of this growth has occurred on the periphery of orthodox criminology. This article suggests that green criminology's marginalization is partially a result of its non-quantitative methodology. We hypothesize that non-quantitative tendencies within green criminology distance it from orthodox criminology because orthodox criminology values quantitative methods. Here, we examine how neglecting quantitative research methods may contribute to inattention to green criminology within orthodox criminology, and we consider what can be done to change that situation. We suggest that employing quantitative approaches within green criminology is one way to increase its appeal to mainstream criminology, and that quantitative studies, in conjunction with other research methodologies, can also enhance generalizability of findings, influence policy, and advance theory construction and hypothesis testing.

## Introduction

While green criminology is now more than twenty-five years in the making (Lynch 1990; see also Frank and Lynch 1992), the study of environmental crimes and harms is a neglected research area within the field of criminology. By “neglected,” we mean that there is little reference to green criminological research within the broader discipline of criminology or within what we shall call “orthodox criminology.” By “orthodox criminology,” we mean three things. First, the traditional subject matter that criminologists research, which generally includes studies of street offending and responses thereto. This includes, for example, studies focused on individual offenders, gangs, policing, law, correctional systems and punishment, courts, as well as forms of crime (e.g., murder, rape, robbery). Second, orthodox criminology is largely comprised of traditional criminological theories, which often means excluding a wide range of critically-oriented theories found in critical/radical criminology, feminist criminology, critical race perspectives and green criminology. Third, from these traditional criminological theories, orthodox criminologists derive testable research hypotheses, which they assess empirically using social science research methods, especially quantitative research methods.

To be sure, green criminologists refer to green criminological scholarship, but there are few references to green criminology within orthodox criminology (Lynch et al. 2004; McGurrin et al. 2013; Zilney et al. 2006). This is perhaps part of a larger trend in orthodox criminology to ignore crimes of the powerful [and the fact that the most significant green crimes are committed by the powerful (cf. Agnew 2013)], and the rejection of research that challenges formal legal definitions of “crime” (Lynch and Michalowski 2006; Lynch et al. 2015a; Michalowski 2009; Rothe and Kauzlarich 2016). For example, Lynch, McGurrin, et al. (2004) examined the representation of a host of white-collar crimes in leading criminology journals, textbooks, and Ph.D. programs, including studies on environmental crimes. Among their findings was that the term “toxic waste” failed to appear even

once in any of eight different criminology journals, over a period of 4 years. Lynch, McGurrin, et al. (2004) also found that only 3.6% of articles in criminology journals examined white-collar crime (of any kind). A recent replication of Lynch et al. (2004) study by McGurrin et al. (2013) found that white-collar crime articles constitute about 6.3% of all articles published in fifteen criminology journals from 2001 to 2010. Zilney et al. (2006) examined studies in environmental justice published from 1970 through 2003. The authors found that criminologists published only 2.5% of all environmental justice studies, and only 6% of environmental justice articles were published in criminology journals (Zilney et al. 2006).

While we certainly believe that green criminology can contribute insights to many areas of criminological research, the empirical assessments of the criminology literature suggest that this has not happened to the extent that it might. In this article, we argue that this has occurred because in contrast to orthodox criminological literature, much of the green work uses other methodological approaches to study criminological questions. Rather, our point is that the neglect of quantitative work within green criminology is inconsistent with tendencies within orthodox criminology, and this creates a barrier between green and orthodox criminology that is not easily overcome. Green criminology's under-utilization of quantitative research methods—the preferred method within orthodox criminology—needs to be addressed because of the importance of the issues involved in the study of environmental crime and harm. Green criminology addresses broad forms of ecological destruction and environmental injustice, and includes examining a wide range of victims that, in addition to humans, include non-human species and the ecosystem itself (see, e.g., South and Brisman 2013). For the green criminologist, animal abuse, biodiversity loss, wildlife trafficking, climate change, and so on also raise questions about environmental and ecological justice and potential legal remedies for these situations (White 2007, 2013)—and are important issues ignored in orthodox criminology. While these are crucial topics in the contemporary global context of

ecological collapse in other disciplines (Wackernagel and Rees 2004), the relevance of these topics to the discussion of crime found in orthodox criminology has been overlooked (Lynch et al. 2004; McGurrin et al. 2013; Zilney et al. 2006). Orthodox criminology has been relatively inflexible in its unwillingness to explore harms not proscribed by law and has tended to focus almost exclusively on interpersonal acts of street crime. There is little doubt that green criminology has developed substantially over the past decade. That growing interest, however, seems to be isolated among criminologists claiming green criminology as a research interest, and rarely penetrates orthodox criminological discourse. We are concerned with this situation because we believe that the insights of green criminology not only challenge the orthodox concept of crime, but illustrate the many forms of harm and victimization that ecological destruction generates through the crimes of the powerful. Moreover, it has become increasingly clear from research in other disciplines that ecological destruction is changing the very nature of the world around us, bringing us closer and closer to ecological collapse. This significant problem, ignored in orthodox criminology, is a key concern within green criminology, and research addressing these issues must be expanded to keep criminology relevant in this changing global ecological context (Lynch and Stretesky 2014).

As mentioned above, it is difficult to penetrate the ideological boundaries of orthodox criminology, and numerous criminologists have referred to the class-based nature of this ideological wall which draws attention primarily to the crimes of the poor and powerless (Sutherland 1949; Chambliss 1989, Chambliss 1975; Schwendinger and Schwendinger 1970). To be sure, green criminology also exposes crimes committed by powerful actors and the inefficacy of administrative, civil, criminal and regulatory laws (Frank and Lynch 1992; Lynch et al. 2013), highlights issues of environmental justice (Brisman 2008; Lynch et al. 2015a), and the wide range of victims of different types produced by green crimes (Jarrell et al. 2013; Wyatt 2013). None of these issues receives sufficient attention within orthodox criminology. We assert the tendency for green criminological researchers to use

non-quantitative methods plays a significant role in the marginalization of green criminology within the discipline of criminology. To substantiate this point, we provide a brief overview of the role quantitative research plays within criminology.

## **Quantitative Analysis and Criminology**

Historically, the discipline of criminology has been shaped largely by efforts to study crime and justice scientifically, along with a strong reliance on theory testing and quantitative analysis—a tradition that stretches back to Quetelet (1831). Many disciplines rely upon quantitative studies to generate knowledge, and the history of criminology's efforts to be recognized as a science is reflected in its quantitative orientation. To be sure, quantitative studies, when approached correctly, provide important information about relevant hypotheses, and are useful for assessing whether a theory or hypothesis about a subject or a particular relationship relevant to criminological issues is empirically sustainable and worth retaining and developing. It is not our intention here to engage in a debate about the limitations of quantitative research approaches or their alternatives within criminology (for a discussion, see, e.g., DiChristina 1997, 2000; Worrall 2000), or how using different research methods shapes knowledge within a discipline. Rather, we simply wish to draw attention to the fact that criminological research is overwhelmingly quantitatively oriented, and when that orientation is ignored by any criminological subfield, this can contribute to its marginalization within criminology. This problem/concern has been raised and analyzed previously by feminist criminologists (Westmarland 2001) and radical criminologists alike (Lynch 1987, 2015).

Quantitative research is characteristic of the social sciences more generally. In their study of the content of articles published in major sociology journals from 1935 through 2005, Hunter and Leahey (2008) found that about two-thirds of the 1274 articles published employed quantitative data and methods. Studies of the content of articles published within criminology journals show even greater reliance on quantitative methods (Kleck et al. 2006; Tewksbury et al. 2005, 2010). In his

study, Buckler (2008) found that across upper and lower tier criminology journals, there was a preference for the use of quantitative methods and analysis. Buckler reported that 90.7% of the 948 studies published in those journals from 2003 through 2007 used quantitative data and analyses. In contrast, we estimate that less than 10 percent of green criminological studies—which includes those researchers identify as doing “conservation criminology”—employ quantitative data and methods. That observation is important to the extent that it illustrates a large difference between the content of the green criminological and orthodox criminological literatures that, we suggest, impedes the integration of green criminological research into the larger criminological literature.

Orthodox criminologists tend to create research questions that emphasize quantitative approaches. This quantitative approach in orthodox criminology exists despite any “best” approach to generate knowledge. As a result, the vast bulk of criminological research is quantitative. It is within this marketplace of science that quantitative research is valued and non-quantitative research is devalued. Thus, non-quantitative work continues to be under-represented in the criminological literature.

### **The Relevance of Quantitative Green Research**

Above, we illustrated that criminological research is overwhelmingly quantitatively oriented. Because criminology research on environmental crimes and harms often do not employ quantitative methods, we contend that this limits the appearance of green criminological studies in mainstream criminological literature—or even the citation to research by green criminologists in orthodox criminological books and journal articles.

We imagine that many green criminologists might shrug at this observation, and perhaps do not care much that this is the case. In our view, however, this is an issue of vital importance. If green criminology has difficulty permeating mainstream criminological literature, there is little hope that green criminologists will influence the content of that literature. In our view, that is an important limitation of green criminological research. Of what value is green criminological research if its reach



within its own discipline is limited? How can unread research impact the issues that serve as its subject(s)/topics of study? If green criminology produces only what can be described as an “inbred” literature, where lies the benefit of preaching to the choir? Below, we review our concerns as they pertain to the following issues: (1) influence and appeal; (2) generalizability; (3) policy; and (4) theory and hypothesis testing.

## **Influence and Appeal**

It is difficult to make in-roads into quantitatively oriented literature without research that employs quantitative methods. Despite the value and importance of the articles, chapters and books that have been written on/in green criminology, refraining from using quantitative methods limits the integration of green criminology into the broader field of criminology.

Unlike other sub-fields within criminology, green criminologists do not take any specific position on the use of one methodological approach (e.g., qualitative or quantitative), and do not argue that one method is necessarily more appropriate to green criminological research. This is not true for other criminological sub-fields. For example, there has been a tendency among radical/critical criminologies, for example, to sometimes reject quantitative analysis as part of their challenge to orthodox criminology and as part of efforts to distance these alternative criminologies from their orthodox origins (see, e.g., Lynch 1987, 2015). As an example, in cultural criminology there has been a purposeful critique of quantitative analysis that outwardly rejects its use (Ferrell et al. 2004; Young 2011). In contrast, in our view, the neglect of quantitative research within green criminology has been largely “accidental”—it is the result of the ways in which green criminologists have approached the examination of environmental crimes, and is not a deliberate attempt to rebuff orthodox criminology’s preference for quantitative analysis or scientific methods. In this sense, then, we can say that as a field of study, green criminology does not inherently eschew quantitative analysis.

While green criminology's under-utilization of quantitative research methods seems more a matter of preference than prejudice, this reality can create the impression that green criminology cannot be explored using quantitative methods. For example, as Higgins (2011, p. 48) writes: To date...theories directed at environmental crime...seem to take a macro level of analysis and originate from a critical criminological (or conflict) theoretical tone. This creates difficulty in testing concepts associated with these kinds of environmental crime theories. Thus, one would have to wonder if the theories provide any real advancement in the understanding of environmental crime beyond a philosophical debate [emphasis ours]. This is not to say that theories that have been empirically tested do not offer a substantial amount of information. For instance, green criminology seems to provide a great deal of information on all parts of environmental crime. The central components of green criminology, however, seem to be a reformulation of the current macro-level theories that have existed in criminology for some time. Furthermore, not all the parts of green criminology may be testable, suggesting that some reformulation is necessary.

This excerpt illustrates at least two issues of concern. The first is that theories grounded in conflict or critical paradigms and which require macro-level measurement (units of analysis) cannot, at the same time, generate testable hypotheses. This sentiment can also be found in more general criticisms of conflict and radical criminologies. For example:

- “Critics still complain that [conflict] theory does not define its major concepts well, which poses difficulty for testing” (Kubrin et al. 2009, p. 244);
- “Marxist theory has been criticized for stating tautological propositions and dogmatic ideology rather than providing a testable theory of law making and enforcement” (Akers and Sellers 2009, p. 240);
- “Conflict theory has several analytic issues that make empirical testing of this perspective quite difficult. As a result, some believe that the literature is characterized by too many ideas

and not enough systematic research and that most empirical studies are illustrative of, but do not actually test, the theory (Liska and Messner 1999: 2008). These have been longstanding criticisms.” (Kubrin et al. 2009, p. 239).

What this line of thinking does not explain is how or why concepts from macro-level critical theories are any more difficult to test than, for example, abstract psychological concepts generated from micro-level theories grounded in classical or positivist paradigms. It appears this sentiment has garnered a widespread acceptance within mainstream criminology, however. To be sure, a lack of quantitative studies within green criminology can hinder its theoretical development. The assumption, however, that concepts discussed by green criminologists cannot be empirically tested—rather than an observation that suggests that they tend not to be quantitatively assessed—is exactly the type of problem that arises from a paucity of quantitative assessments. More quantitative work within green criminology could address this misconception.

That the above criticisms of conflict and radical criminologies also appear to use the paucity of empirical tests of critical theories examining environmental issues to justify a disregard of such theories illustrates a second issue arising from a lack of quantitative work in green criminology. Admittedly, theories that lack parsimony need reformulation to lend themselves to empirical assessment (Lynch et al. 2013). And we would agree with the importance of empirical studies to advance a body of knowledge past philosophical debate. But we dispute the notion that critical theories regarding environmental issues cannot move understandings of environmental issues past philosophical debate. This suggests that criminologists in general are quite unaware of the large body of scientific literature on environmental issues in other disciplines that employ quantitative methods. Accordingly, we conclude that the lack of quantitative studies within green criminology is facilitating a myth that theories grounded in critical or conflict orientations cannot explain environmental issues because they cannot be tested. Here, we will not review the large number of relevant quantitative

studies generated by ecological Marxists, such as Andrew K. Jorgenson, whom we estimate has produced more than 65 such studies between 2003 and 2016 alone, or the thousands of scientific studies that incorporate quantitative analyses of environmental issues. Instead, we maintain that the type of arguments highlighted above appear to be used within orthodox criminology to justify a distancing from ideas promulgated in green criminology. In this sense, the lack of quantitative studies within green criminology seems to (inadvertently) isolate green criminology from orthodox criminology. But this is a two-way street: mainstream criminologists contribute to that distancing by ignoring the green criminological literature and its uses, and creating a caricature of green criminology as untestable.

Given the absence of any definitive statements about quantitative methods within the green criminological literature, we suggest that the perception that green criminology harbors an anti-empirical or anti-quantitative orientation is indeed more of a perception than a reality. At the same time, however, we believe that the perception of an anti-quantitative stance within green criminology is perhaps not unwarranted given the dearth of quantitative green criminological studies, and this has important implications for the majority of orthodox criminologists. For example, orthodox criminologists have a tendency to overlook green criminology's relevance and importance to the study of crime and justice more generally. This facilitates the orthodox criminologists' tendency to ignore that literature perhaps even when it is quantitatively oriented and relevant to larger discussions of crime and justice. In addition, orthodox criminologists are rather unlikely to attempt to contribute to the green criminological literature because they perceive an anti-quantitative bias among green criminologists. Again, this reduces the likelihood that orthodox criminologists will refer to green criminological research and increases the prospects for green criminological research to remain un-integrated or outright ignored. Equally important, orthodox criminologists are unlikely to attempt to undertake quantitative studies related to green criminological issues because they might

well believe that the audience for such studies is not only limited, but ideologically pre-disposed to reject that type of research. As noted above, criminology journals either demonstrate a preference for publishing studies using quantitative methodologies or criminologists tend to prefer those methods more generally (Buckler 2008; Kleck et al. 2006; Tewksbury et al. 2005, 2010).

To be sure, while descriptive articles are useful strategies for understanding crime, law and justice, an over-reliance on those approaches to any subject—not just environmental crime and harm—generates a loosely connected “descriptive” literature. This is a problem that perhaps characterizes the present state of green criminological literature. As we explain below, this loosely-connected literature remains as such because the refusal to adopt quantitative analysis can hamper efforts to develop and test hypotheses and theories that provide a framework to which individual researchers may link their studies and arguments. Indeed, the development of hypotheses and theories are often the glue of a discipline or sub-discipline—and, as Bhaskar (1998) argues, those hypotheses and theories act as useful scripts for interpretive purposes, helping to form the basis of scientific enterprises. In this view, quantitative analysis plays a role in developing a field of research in theoretical ways as well.

In the sections that follow, we review a few important issues of concern that tend to be perceived as problematic from the perspective of orthodox criminologists. These concerns are attached to how orthodox criminologists interpret the utility of research. The material that follows does not suggest that any specific green criminological study ignores these concerns, but that green criminologists must be aware that these are the kinds of issues that an orthodox criminologists expects that a study should address. In reviewing these issues, we focus attention on how, in its current state, green criminology might overlook addressing key concerns that influence how orthodox criminologists perceive studies where these issues are not addressed.

## **Generalizability**

In considering the relevance of quantitative research, green criminologists must also address issues related to the generalizability of qualitative research especially from case studies (Schofield 2002). Case studies, for example, are not chosen on the basis of random sampling (i.e., they contain selection bias), but are specifically selected to illustrate a particular type of problem—or the emergence of a particular problem in a particular place—thereby limiting their broader applicability and utility (see, Schofield 2002, for discussion). Moreover, generalizability from case studies is limited by case availability or sample size (Schofield 2002). In a case study—regardless of how much other information is used, such as the number of interviewees within the case study—the N for the study is 1. That is, the N is 1 because the case study is a study of one event or process. Moreover, if the case study is about, for example, perceptions of environmental crime A in a specific location X, and it has used 1000 interviews as the qualitative data for assessment, and the interviews were selected based on random sampling, the outcome of the analysis is only generalizable to the rest of the population in location X, and not to people/population in other places.

Because the N in such approaches is 1, there is no assurance that any of the information gleaned from a case study can be generalized to any other case (e.g., another location), and unless the same issue has been examined in other places, and a connection across places can be established from extant literature, the extent to which the results of the case study can be generalized is an unknown. (Thus, for example, one cannot generalize a case study of interview of illegal wildlife traffickers in Laos to other countries even if one conducted 5000 interviews. The case study is still about Laos and not about anywhere else. The information gathered, therefore, is not generalizable.) In contrast, quantitative studies can include dozens, hundreds or thousands of cases (and perhaps more) across time and place, and because of that can be generalized to other locations when the sampling procedure is adequate. To generalize from case studies, the same observations must be made repeatedly in other places, and common characteristics from those studies must latter be

extracted empirically to produce generalizable knowledge. Understood in this light, the preference for case study approaches adds an additional layer of research that must be repeated hundreds of times before empirical methods can be applied to case study data to generate generalizable knowledge. Appropriate empirical methods, in other words, not only produce generalizable results when proper research methods frame the study, but provide a useful shortcut for the production of generalizable knowledge. In the long run, case study research should produce the same kind of generalizable knowledge that empirically based research produces, but when case studies are relied upon to do so, this is a rather slow process (Schofield 2002).

## **Policy**

Generalizable research outcomes can be used to shape and influence policy. Case studies, when not generalizable, have restrictive policy implications, unless they employ pre-post- evaluation methods—a criterion that is difficult to meet when using case study approaches (Ritchie and Spencer 2002). Historically, orthodox criminology has long used policy relevant quantitative methods, and again, prefers that approach. While qualitative case study approaches can offer some general but often subjective observations about the effect of an enacted policy, it is not able to make those claims with any kind of surety—that is, with respect to estimating statistical outcome probabilities. These kinds of statistical measures (i.e., probability) are important in policy terms because they indicate the likelihood that a policy will have the desired effect. In short, the neglect of empirical quantitative analysis limits the policy applications of green criminology, reducing its potential influence on ecological policies useful for controlling the deleterious ecological impacts caused by humans. Indeed, one could argue that logically, no one should make policy based on one or a few qualitative case studies because it is unknown whether those case studies represent the universe of cases. It should be noted that this criticism could also be true of quantitative case studies that lack appropriate research design and controls.

## Theory and Hypothesis Testing

Empirical research plays an important role in theory development and hypothesis testing. Hypothesis testing is an important dimension of establishing whether an explanation of an outcome/event is useful and should be employed as the basis for course, is not to imply that all quantitative knowledge is useful simply because it is generated empirically. What this does mean, however, is that empirical knowledge can help us decide which theories are useful, providing that the quantitative assessments and their interpretations are adequate.

Any explanation that attempts to describe a phenomenon is “useful” in three ways (Bhaskar 1998). First, the explanation must be logically valid and sufficiently well designed to exclude alternative explanations. This type of assessment may be made both with reference to empirical data and logical analysis. Second, it can be applied to other cases—that is to cases other than the one from which the explanation was derived. To meet this condition, the evidence from an analysis must be generalizable. Third, an explanation is useful to the extent that its repeated application to a number of other cases produces similar results. If the above conditions hold, then we can say that the explanation acquires the status of a theory and applies to all or to a significant majority of cases and to new emerging cases as well. Here, we take the view that a theory is not simply any form of explanation of an event/outcome, but is a description of a relationship that generates hypotheses about a phenomena or event, and that the hypothesis can be tested and generalized, indicating that the explanation can be generalized and then recognized as a theory—assuming that the majority of its tenants cannot be rejected (for a more capacious conception of theory, see, e.g., Brisman 2014).

Within the green criminological literature itself, one can also see how the under-utilization of quantitative methods impacts the theoretical development of green criminology. It has been widely noted and accepted in the literature that green criminology does not possess or offer its own theory or theories upon which it bases its analyses (Brisman 2014). While Brisman’s description is accurate,



there is a need to understand how that situation is affected by the link between theory development and quantitative research strategies. As Brisman acknowledges, some existing criminological theories developed to explain crimes other than ecological harms have been employed to understand the emergence of environmental/ecological justice. For example, in various studies, Clarke and his associates have tested Concealable, Removable, Available, Valuable, Enjoyable, Disposable (CRAVED) models (Clarke and Rolf 2013; Lemieux and Clarke 2009; Petrossian and Clarke 2014; Pires and Clarke 2011, 2012). In addition, Stretesky, Lynch and Long have tested various political economic, treadmill of production and environmental justice theories that have arisen in other fields' study of environmental harms (Long et al. 2012; Lynch and Stretesky 2013; Lynch et al. 2004a, b; Stretesky 2003, 2006; Stretesky and Hogan 1998; Stretesky et al. 2011, 2013; Stretesky and Lynch 1999, 2001, 2002, 2004, 2009a, b, 2011a, b). These quantitative studies indicate that each of these theoretical explanations has important applications in the study of green criminological issues and that each has substantial support. In this case, these empirical studies indicate that tested hypotheses can be generalized, and hence can be employed to generate theoretical explanations of green crime and justice. As noted earlier, however, green criminology's neglect of quantitative methods limits generalizable knowledge suitable for theory construction or the specification of testable hypotheses. Thus, there is a tendency for existing "explanations" of green crime derived from works that may or may not prove, in the long run, to be generalizable.

### **Objective Versus Subjective Explanation**

In the previous section, we noted that quantitative data can, under specific conditions, produce testable hypotheses, and that likewise, under appropriate methodological conditions, those hypotheses can be tested and potentially used for theory construction (Eisenhardt 2002). This approach constitutes a "normal" scientific model in which observations generate hypotheses that are tested and then used to assess whether the observations are appropriate and potentially generalizable

into a relevant theoretical explanation that apply across a mass of cases. The goal of this commonly-accepted scientific approach is to produce valid and reliable observations that can be used to explain and predict outcomes in an efficient manner so that they can be understood and controlled.

Scientifically, we can think of this approach as producing objective explanations that contribute to a base of knowledge because the extracted knowledge can be tested repeatedly in the same way, thereby producing the same outcome.

Part of the dynamic of this scientific approach relies on its ability to produce numerous tests of a hypothesis to and assess the likelihood that the aggregation of these tests is efficient and similar in their predictive content. For this to occur, the assessment must be “objective,” meaning that it employs agreed upon procedures that are repeatable, regardless of who performs the assessment. Moreover, the end result of these tests is an aggregation of the results into generalizable observations produced by numerous observations of relevant data. When these procedures are followed, there is reason to believe (a high probability) that the outcome is objective and is not a consequence of the way in which the data is collected, assessed and interpreted—in other words, that it is not simply a methodological artifact of the analytic procedure. The orthodox criminologist is concerned that these kinds of outcomes may not be achieved simply through the use of one methodological approach, or, absence of any methodological approach.

Quantitative data, by its nature, is designed to help facilitate objective assessment outcomes. To be sure, quantitative data can be manipulated, and performed inadequately, or inappropriately interpreted, subverting the effort to produce an objective outcome, and, we would suggest, that this is a problem found in many tests of criminological theories that explain crime. With respect to attempting to produce objective outcomes, orthodox criminologists prefer quantitative data over qualitative data, which unfortunately generates suspicion of qualitative research especially when qualitative researchers do not appropriately provide information assuring

that the methods employed produce useable outcomes. For example, we have noted that the case study is often limited to one case, meaning that it does not meet the minimum requirements for extracting objective, generalizable knowledge that meet with the expectations of mathematical probability modeling. This has important consequences for green criminologists who undertake qualitative studies because they need to assure their audience that the assessment does not reflect subjective assessment criteria, and must ensure that assessment criteria have been openly delineated (Schofield 2002). In the criminological literature, this point has been addressed, for example, with respect to the development of explanations of state-corporate crime derived from qualitative assessments (Lynch et al. 2013). In this case, it has been argued that each new qualitative assessment may uncover some new factor(s) that appear relevant to explaining state crime. Following such a method, however, produces a rapidly expanding “theory” of state-corporate crime that employs invalid inclusionary criteria, resulting in non-parsimonious explanations in which every variable that has been proposed becomes part of a rather unwieldy theoretical model that cannot be adequately assessed (Lynch et al. 2013). Such an approach yields too many variables beyond those necessary for an adequate explanation (Lynch et al. 2013).

In constructing such unwieldy models, interpretations of which variable should be included or which variables “count more” than others is an important concern. Absent some pre-specified conditions, the choice of what to include and exclude is left to the researcher’s preferences (Lynch et al. 2013). Under these conditions, it is highly likely that different researchers can produce dramatically different explanations of the outcome when faced with the same qualitative data. The same is not true for quantitative analysis as the test conditions are pre-specified and the same across studies. That is to say, a regression analysis of data set A produces result X each time the model is run when the models and data are the same. The same is not necessarily true for qualitative data analysis, and indeed, in recognition of this possibility, a good qualitative study should have several

coders/interpreters so that outcome reliability can be assessed (Maxwell 2002; Schofield 2002). Currently, qualitative data assessments found in the green criminological literature have not often used intercoder reliability to determine if multiple individuals extract the same outcome/conclusions/facts from qualitative data. Because such procedures have not been employed, this leaves open the possibility that existing qualitative green criminological studies reflect subjective interpretation biases. This is an issue green criminologists should address before they can expect the results of qualitative studies to be more widely accepted as relevant, generalizable, objective observations by a broader criminological audience. In this case, the burden is on green criminologists to employ more valid qualitative research assessment methods. This is an important issue green criminologists should not continue to overlook.

## **The Role of Critique**

One of the current problems faced by green criminology is that it has largely developed in an intellectual vacuum. By “intellectual vacuum,” we mean that green criminology has developed in an insulated state, largely free from external criticism, especially from orthodox criminologists. This is not surprising because green criminology has not entered the orthodox criminological literature to the extent necessary to stimulate such a critique. Indeed, with the exceptions of Halsey’s (2004), Davies’ (2014) and Jewkes and Moran’s (2015) articles, there have been limited efforts to critique green criminology—a phenomenon likely attributable to the limited contact most criminologists have with the green criminological literature. This has something to do with the lack of quantitative studies in this area and the orthodox criminological assumption is that this lack of quantitative study means green criminology has little to offer to the field in terms of understanding crime, law or justice, and hence, there is little to criticize. Most certainly, that assumption is both unstated and unfair because, as we have noted earlier, green criminology has much to offer on a number of issues explored within criminology. Indeed, orthodox criminologists would find much to critique in the

green criminological literature if they read it, especially with respect to the definition of “crime” and the range of victims and victimization (see, e.g., Lynch et al. 2015a). Here, we bring up the issue of critique as one of the potential roles filled by quantitative assessments. When, for example, an explanation or set of hypotheses about some relationship is suggested, an essential form of critique can be posed by a quantitative assessment of those hypotheses. To be sure, quantitative assessment may not always result in critique if, for instance, the hypotheses are not rejected. Absent quantitative analysis, however, it is difficult to assess the utility of any given hypothesis or observation. Without some sort of valid assessment of hypotheses, all that can be asserted is a belief that the hypotheses are true and relevant, which is hardly the state of explanation that green criminologists should be striving to create.

## **Conclusion**

At this moment in the historical development of green criminology, it is necessary to consider and address the importance of quantitative studies with respect to broadening the appeal and scope of green criminology. Quantitative studies can add layers of information to what is known and produce information that is otherwise missing when those studies are neglected. That is to say, a mature and well-developed green criminology requires the development of an empirical literature enriched by a host of research methodologies- including quantitative methods. To be sure, criminology has a long history of emphasizing quantitative analysis, and the failure of green criminology to address similar issues in empirically relevant ways creates a barrier between green criminology and orthodox criminology that is difficult to overcome. It is not only the orthodox criminologists that create this barrier to green criminology, but the green criminologists who also create this impediment to the inclusion of green criminology in more diverse ways within the field of criminology.

Things, of course, do not need to be this way. There is in the world around us an extraordinary wealth of empirical data that can be employed to address theoretically relevant questions that can lead to both the enhancement of the green criminological literature and its recognition by orthodox criminologists (e.g., Burns and Lynch 2004). The green criminologist, however, cannot sit idly by in the hopes that orthodox criminologists will see the wisdom of the insights generated by green criminologists, and will subsequently begin to develop an empirically oriented green criminological literature. The impetus for such a movement must, in contrast, come from within green criminology. To be sure, there is no guarantee that an effort to generate a quantitative green criminological literature will necessarily enhance the integration of green criminology into the orthodox criminological literature. Indeed, this approach has been suggested in radical criminology (Lynch 1988) with little effect, despite the strength of empirical findings related to radical criminological theories and hypotheses (Lynch et al. 2006). Then again, one can say that radical but especially critical criminology never developed much of a quantitative literature. Whether or not expanded use of quantitative methods increases the acceptance of green criminology, such studies will enhance the strength of green criminology and insulate it from criticism that its assumptions cannot be quantified or tested empirically.

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