



GREEN CRIMINOLOGY

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Chapter Abstract

The first discussion of green criminology appeared in 1990, when this area of research was proposed as a unique specialty within criminology (Lynch, 1990) and specifically as an extension of radical or Marxist criminology (for discussion see, Lynch & Michalowski, 2006) useful for constructing a political economic and class analysis of crime, law and justice related to environmental destruction. Today, nearly 30 years later, there is impressive diversity in green criminological studies. Here, we draw attention only to the political economic approach to green criminology. When necessary, however, we distinguish the political economic view from other green criminological approaches, referring to PEG-C or political economic green criminology.

I. Introduction: Green Criminology

The first discussion of green criminology appeared in 1990, when this area of research was proposed as a unique specialty within criminology (Lynch, 1990) and specifically as an extension of radical or Marxist criminology (for discussion see, Lynch & Michalowski, 2006) useful for constructing a political economic and class analysis of crime, law and justice related to environmental destruction. Today, nearly 30 years later, there is impressive diversity in green criminological studies. Here, we draw attention only to the political economic approach to green criminology. When necessary, however, we distinguish the political economic view from other green criminological approaches, referring to PEG-C or political economic green criminology. We focus on PEG-C for the following reasons. First, unlike any other form of green criminology, PEG-C has increasingly aligned itself with environmental sociology and ecological Marxism. Second, we believe that the further development of—and best path forward within—green criminology is to facilitate its increased integration with environmental sociology, and to promote increased interest in green criminology among environmental sociologists and to encourage their participation in the study of green crime and injustice. Toward the end of this chapter, we will illustrate some ways this might occur. PEG-C shares its core interests with environmental sociology, namely how humans, societies and nature (in its various forms) intersect and affect one another. That core content also shares an interest in the construction of environmental issues, and includes addressing definitions of environmental harms, how those definitions are constructed and applied, and how definitions affect counting the number, scope, types and costs of environmental crimes. Doing so also defines and acknowledges different victims of green crimes (e.g., humans, nonhuman animals, plants, eco-systems or eco-system elements). Focusing on injustice, PEG-C has also engaged in the study of environmental justice from a political economic perspective. Promoting the greater integration of environmental sociology and PEG-C, in recent years more specific attention has been paid to theoretical

positions that include treadmill of production, metabolic rift, and ecological unequal exchange theory.

We begin the following discussion by briefly situating PEG-C within the discipline of criminology more generally. Next, we define the concept of green crime and its scope. We then focus attention on PEG-C and how it is used to examine issues of ecological withdrawals and additions to examine crime and justice. Finally, we suggest that PEG-C has developed in ways that move it away from criminology and closer to environment sociology.

II. Background: Criminology and Green Criminology

As noted, green criminology developed as a political economic explanation of the causes, injustices associated with, and the social control of green crimes or ecological harms. Below, we define the concept “green crime” in greater detail. Before beginning, however, it is useful to provide some background about the scope and focus of criminology, as well as a few basic concepts central to green criminology.

In broad terms, criminology is defined as the scientific study of crimes and criminals. It overlaps with the study of criminal justice, or the study of criminal justice system processes and outcomes. For purposes of the present discussion, these two areas of research can be collapsed, and referred to as constituting the scope of orthodox criminology. Historically, orthodox criminology has largely encompassed research that employs: (1) positivistic, individual level analysis to identify the causes of crime within individuals (e.g., psychological, biological; see Walsh & Wright, 2015) or as influenced by an individual’s associations (e.g., peer, bonds to parents, community, school; e.g., Hirschi, 1969); (2) legal analysis of documents and the rights and privileges stemming from those legal documents; (3) organizational and processual studies of criminal justice agencies or criminal justice processing outcomes (e.g., how a new rule or policy affects a sentencing practice or outcome; Travis & Edwards, 2015); and (4) the philosophical analysis and studies of theories of justice and punishment (Newman, 2017). Though often lacking sound empirical evidence, orthodox criminology reinforces traditional and sometimes

widespread views of crime and justice, including assumptions that the causes of crime reside within individuals; that more/better punishment reduces criminal behavior; and that expanding the scope of social control reduces crime. While there is a great deal of empirical research examining orthodox oriented questions within criminology, there is little robust evidence (i.e., high empirical explanatory value; non-contradictory; empirically efficient) supporting any of these particular arguments about the causes or control of crime.

One of the most important observations that should be made about orthodox criminology is that it focuses attention on what are called “street crimes” and “street criminals,” and the processes related to street crime (Lynch & Michalowski, 2006; Reiman & Leighton, 2015). Street crimes are also referred to as ordinary crimes, and include the crimes most often reported in the media and addressed by the criminal justice system such as thefts, assaults, robbery, rape and homicide. As radical/Marxist criminologists pointed out in the 1970s (Chambliss, 1975; Quinney, 1974), and before them white collar crime researchers (Sutherland, 1945), street criminals are overwhelmingly poor/lower class individuals who became the subjects of crime control strategies as laws and social control became tools of class control (Reiman and Leighton, 2015). As a result, the formal social control of crime serves a class control function.

One of the first critiques of the class biases evident in criminological research was posed by white-collar crime researchers (for a more general, early critique see, Bonger, 1916). As white collar/corporate crime researchers increasingly pointed out by the mid-twentieth century, street crimes were not the only, nor even the most serious, form of crime that occurred in society (e.g., Sutherland, 1940). Criminologists who criticized orthodox criminology’s focus on street crimes and criminals noted that a wide variety of crimes by corporations and governments cost society more financially and in terms of life and limb. Yet, even while calling attention to the crimes of the powerful, criminologists who were expanding the scope of criminology and critiquing its class biases continued to overlook an important form those crimes took: many were environmental harms.

Even as environmental issues became more important social issues in the 1970s, they were not described in any significant way in the white collar/corporate crime literature. By the mid-1980s, one could periodically find a study on environmental harm or social control by a criminologist, but these studies remained the exception, and even then, the primary focus was on worker health and safety issues (Frank, 1985). This was true despite the fact that in other disciplines environmental issues were receiving rapidly increasing attention, and in some disciplines like sociology, new fields of study had been created to address environmental problems, while in other disciplines like toxicology, environmental studies and ecology, evidence of the extensive nature of ecological destruction was mounting more rapidly than at any other point in history.

By the end of the 1980s, radical/Marxist criminology was essentially replaced by several other alternative criminologies including feminist approaches, critical race theories, left-realism and various post-modern approaches, and all of these alternatives were treated more generally as belonging to what is called critical criminology (Lynch & Michalowski, 2006). This was the context in which green criminology was born. It was not only a reaction to observations of class bias related to the study of crime and its control within the discipline of criminology that Marxists and white collar researchers had identified; it was also a reaction to rapidly expanding evidence of corporate crime and ecological harm in the world; and a reaction to the declining significance of Marxist/class analysis within criminology.

A significant problem is that crime is not necessarily an objective thing, but rather a social construction (Spector & Kitsuse, 2001). Due to space limitations, we cannot adequately address this issue of social construction here, and can only make some rudimentary comments. In the PEG-C view, crime is depicted as being “produced.” That term is employed to indicate that crime results from the intersection of different social forces and factors. The public has perceptions of behaviors they believe ought to be crimes. Politicians select some of those to incorporate into law, but law is also shaped by other powerful interest groups. This is especially

true for environmental law, public health law, and occupational health and safety laws. In addition to creating law, the state decides how to establish a mechanism of enforcement, and the kinds of resources those enforcement mechanisms receive, which affects their ability to enforce laws efficiently (or at all, sometimes). In addition, the idea of crime being produced indicates that we must consider factors that affect social actors who engage in crime. This means considering the factors that motivate and generate opportunities for crime. In abstract terms, if we think of each of these factors as a plane in the space of social relationships, the intersection of all these planes demarcates the space occupied by crime. This may seem like a “messy” way to conceptualize the production of crime, but the production of crime is a messy process.

It is nearly impossible in studies of green crime to completely depict the above in any specific empirical study. Thus, sometimes green criminologists study the behavior of the state. But, there are only a few studies that address this issue from a political economic perspective (Lynch & Stretesky, 2013; Lynch et al., 2010, 2016b, forthcoming), and this is an area in need of further research.

III. Conceptualizing Green Crimes and Harms

It is necessary to have a point of reference for conceptualizing green crimes. Within orthodox criminology, a crime is a behavior that violates the law, and not just any law, the criminal law. This is a rather restrictive and subjective definition of crime (for an extended discussion, see Lynch et al., 2015b). As a result, this legal definition of crime often excludes legal rules that define significant social harms in administrative or regulatory laws that apply to corporations. It is subjective to the extent that the scope of the criminal law is not objectively defined a priori by law-making rules. That is, in the criminal law, there is no basic definition of a behavior called “crime,” there are only examples of different individual crimes, but no idea of the concept of crime. Moreover, because the criminal law is politically constructed and subjective, it excludes many harmful behaviors that cause as much or more harm than the behaviors that have been included within the criminal law. Green crimes are an example of the kinds of behaviors

that are often excluded from the purview of criminology when the definition of crime is based on an orthodox approach to the study of crime.

Given the limited scope of the definition of crime in orthodox criminology, conceptualizing green crimes requires moving beyond the legal definition of crime. While existing laws may still be useful for defining some behaviors as green crimes, they do not include a broad enough definition of those harms. That is, there are behaviors that cause significant harms that could be treated as green crimes even though they are not labelled as crime by the law. Creating this kind of definition of a green crime, in our view, presents a significant problem. That problem involves constructing a definition that has some objective basis that can be applied consistently in order to avoid the problem of constantly needing to define/redefine the concept of green crime using what we call a “catalog” approach—that is, identifying and adding each new form of green crime as they are “discovered” to a list of green crimes. Here, it is not our intention to review the many different definitions of green crime that have appeared in the literature (see, Lynch et al., 2017a, 2017b, 2017c), but rather to provide an idea of the kinds of definitions of green crime that exist, and more specifically to review how we have attempted to address the problem of multiple (and sometimes contradictory) definitions of green crime through the unification of definitions of environmental harms in environmental sociology, ecological Marxism and physical science literatures.

To begin this discussion, it is necessary to broadly conceptualize the idea of green crime as a harm that damages the environment. At this broad level, three issues are important to consider. First, scientific areas such as toxicology and chemistry can create quite specific definitions of green crimes or harms by referring to chemical toxicity and exposure measurements and studies. Thus, scientifically—which we take as an objective indicator of harm caused by exposure to a pollutant—we can say that certain chemicals (1) either should not be emitted into the environment or a local ecosystem because they will, at any level of exposure, cause ecological harm, or (2) should not be emitted above some concentration level due to the

harm they can generate. At this level of analysis, we have only come to understand a green crime in relation to one of its physical attributes—its toxicity. Scientifically, we can also appreciate that significant research exists that addresses other dimensions of the physical harms associated with green crimes, and that some of these indicators such as planetary boundaries (Rockström et al., 2009; for a criminological discussion see Long et al., 2014) and ecological footprints (Jorgenson & Clark, 2011) can also be used to explore concerns defined in environmental sociology such as metabolic rift (Clark & York, 2005; Clausen & Clark, 2005) and ecological unequal exchange (Jorgenson, 2006, 2016) that help conceptualize the boundaries of green crimes.

Second, as environmental sociology and ecological Marxism suggest, the major forms of environmental harms/crimes that occur in the contemporary era are those associated with capitalist production and consumption, or the organization and practices inherent within capitalism. For example, building on James O'Connor's (1991) "second contradiction" argument, Foster (2002) noted that capitalism must consume nature in order to expand and carry out the functional imperatives of capitalism. In so doing, he also exposed and made evident the physical limits of capitalism ecologically. Elsewhere, Foster (1992) argued that this second contradiction constitutes the "absolute general law of environmental degradation" under capitalism, which is "the amassing of wealth at one pole and the accumulation of conditions of resource-depletion, pollution, species and habitat destruction, urban congestion, over-population, and a deteriorating social life environment . . . at the other" (pp. 78–79). In environmental sociology, this view is expressed in Schnaiberg's treadmill of production approach, which links the mechanisms of expansion associated with post- World War II capitalism (i.e., increased use of fossil fuel and chemical technologies as energy and manufacturing sources) to two forms of ecosystem destruction or disorganization—ecological withdrawals of resources for production (including fuel and chemical energy), and ecological additions or the emission of pollutants from production. As an extension of these observations, we have argued that this contradiction

between nature and capitalism which leads to nature's exploitation and disorganization is also the basis for a political economic definition of green crime (Lynch et al., 2013).

Third, there is extensive empirical evidence and theory consistent with points 1 and 2 above in a variety of disciplines. These arguments support the observation that escalating production and consumption patterns associated with the expansion of capitalism are a driving force behind the structural disorganization and destruction of nature, which can be interpreted as the generation of green crimes and injustice. Examples of relevant research that ties these arguments together include discussions and assessments of: the Anthropocene and the Great Acceleration; climate change; ecological economics; ecological footprint analysis; energy analysis; Gaia theory; general developmental theory of dissipative structures; Jevon's paradox; limits to growth analysis; metabolic/ecological rift; planetary boundary analysis; steady state economics; and ecologically unequal exchange theory and research. While some of these arguments are discussed later in this chapter, underdevelopment of a political-economic approach to green criminology has led to a neglect of how these arguments connect to and expand the scope and explanatory power and utility of green criminology, and a number of these arguments require further elaboration in the literature.

In taking into account the three issues described above, we have proposed the following definition of green crime as consistent with the PEG-C approach. In that view, a green crime is a "human act or behavior that causes or has the potential to cause unnecessary ecological harms that generate scientific evidence of ecological disorganization, or harms that could be avoided if production were organized differently than it is under contemporary capitalism" (Lynch et al., 2017a, 2017b, 2017c: 55; see also Lynch et al., 2013; Stretesky et al., 2013a, 2013b).

In addition to the above, initial conceptualization of the concept of green crime requires an appreciation of the flow of harm produced by those crimes. Conceptualizing this flow of harm also reveals an understanding of the victims of green crimes. The simplest approach here is to divide green crimes into its primary and secondary forms. Primary green crimes are harms that

may or may not violate the law, which cause direct destruction or damage. Direct damage/ destruction may be caused by polluting ecosystems, harming them through destructive resource withdrawal methods or other harmful ecological modifications (e.g., turning a wetland into a housing project). Primary green crimes also include behaviors that directly harm any living nonhuman species through, for example, killing (legal or illegal hunting), poaching and trafficking.

A secondary green crime occurs when species living in an ecosystem are harmed by a primary green crime. For example, when a waterway is polluted, the primary green crime is the pollution of the waterway ecosystem, which can alter the very nature of that ecosystem. The secondary green crimes are the harms the pollution causes to the various species that live in, or use the waterway, and can include harm to connected ecosystems (e.g., primary pollution of a river can cause secondary pollution of an estuary). This distinction also illustrates that most of the ecological harms or green crimes experienced by living species are secondary or indirect. The division between primary and secondary victimization is important to the extent that ecosystems themselves can be conceptualized as living beings/systems. This is not to suggest that living beings in ecosystems are not part of the ecosystem. It is useful, however, to differentiate between primary and secondary victimization since the behavior in question is directed at specific “targets.” This is of particular utility when, for example, animals are victimized through poaching. In such a case, the animal is the primary victim, and the ecosystem may, if poaching reaches a critical level, suffer the secondary victimization. The primary-secondary distinct is also used to indicate a flow in the victimization vector that indicates an increased scope of victimization as the effects of the primary victimization are considered.

Significant attention has been directed to defining green crime and its scope, and as noted above, it is not our intention to review each of these definitions here. It is worthwhile to note that these definitions have different strengths and weaknesses, which can include the breadth of their scope. Ignoring those specific criticisms, one positive outcome of efforts to

construct a definition of green crime is that green criminologists have expanded the scope of criminology as a discipline, moving it well beyond the traditional legal definition of crime and the study of street crime and criminals, and expanding the kinds of victims criminology examines. Drawing on the legal definition of crime, orthodox criminology typically only allows room for discussions of humans who suffered victimizations defined by the criminal law. Green criminology expanded the discussion of victimization by moving beyond the criminal law, which then also allowed considering nonhuman victims—ecosystems and nonhuman living beings—as worthy of discussion. In part, green criminologists revealed nonhuman victims by defining green crime in relation to different foundational concepts. For instance, some green criminologists referred to various eco-philosophical positions (e.g., speciesism; biocentrism; ecocentrism) to draw attention to nonhuman animal rights and interpreting harms against nonhuman entities as crimes, including crimes against wildlife, domestic/companion animals, ecosystems/nature and ecosystem components. Other definitions of green crime emerged by considering the form of victimization acquired (e.g., through pollution; deforestation), or as part of a broader victimization process (e.g., anthropogenic extinction; climate change).

Some types of green crime or green victimization are the subject of specific forms of green criminology. For example, one strand labeled “nonspeciesist criminology” by Beirne (1999) in his foundational work on this subject, focuses attention on the victimization of nonhuman animals and includes discussions of poaching and wildlife trafficking (e.g., Beirne, 1995, 1996, 1997; Cazaux, 1999; Sollund, 2011). Studies related to eco-crime and ecocide have drawn attention to transnational green crimes (South, 2013), bio-piracy, bio-prospecting (South, 2007), corporate colonization of nature, bio-exploitation and genetically modified foods (South, 2007; Walters, 2004, 2005), deforestation and illegal logging (Bisschop, 2012; Green et al., 2007; van Solinge, 2010, 2014), the exploitation of water resources (Johnson et al., 2016) and laws for the prevention of ecocide (Higgins et al., 2013). Green-cultural criminology examines the social construction of green harms, particularly the media’s construction of environmental harms, and

the political dynamics of constructing environmental harms (Brisman & South, 2014). In addition, there are two strands of conservation criminology—the Rutger’s Model and the Michigan State Model. The Rutger’s Model draws specifically on Ronald Clarke’s (1980) theory of situational crime prevention. The scope of these studies is not defined by the type of victimization (although to date, all of these studies address wildlife crime/victimization), but rather by the ability to study the effectiveness of policies designed to control ecological victimization or factors that promote ecological victimization. For example, Clarke’s approach suggests that items/commodities that are concealable, removable, available, valuable, enjoyable and disposable (CRAVED) increase the opportunity for crime. As a result, controlling crimes—including green or conservation crimes—requires implementing policies that impinge upon these factors and limit their CRAVED attributes. Numerous studies have examined these issues, providing varying support for the Rutger’s conservation approach (Clarke & Rolf, 2013; Kurland & Pires, 2017; Lemieux & Clarke, 2009; Petrossian & Clarke, 2014; Petrossian et al., 2015a, 2015b, 2018; Pires & Clarke, 2011, 2012). The Michigan Model is a multidisciplinary approach for studying green crimes and their prevention that draws on risk assessment and decision-making science literature (Gibbs et al., 2010). A number of these studies focus on conservation management, human-wildlife conflicts, and perceptions of wildlife/ecological issues (Gore et al., 2007, 2008, 2016).

The political economic approach to green criminology (PEG-C) is different than each of the views described briefly above, and that difference begins with the initial conceptualization of green crime and injustice within the political economic context of global capitalism (Lynch, 1990). Other forms of green criminology employ differing philosophical, legal or harms-based definitions, and none of those definitions are tied to a specific theoretical approach that avoids engaging in ahistorical, grand theory (Mills, 1959). In PEG-C, however, the definition of green crime (and hence green injustice) is derived by considering core theoretical arguments in environmental sociology and ecological Marxism (for elaboration see Lynch et al., 2013). That

approach states that behaviors that cause ecological disorganization are, from a political economic understanding of the “perspective” of nature, green crimes. As noted above, this argument represents an integration of ecological Marxism and treadmill of production theory. It recognizes that the way in which humans have organized production and consumption under capitalism leads to harming and exploiting nature (as well as humans) through destructive ecological withdrawal methods and ecological addition practices in order to increase production efficiency and profit-making. Green crime and injustice, in other words, can be seen as a result of the contradiction between nature and capitalism (Foster, 1992)—meaning that capitalism, due to the way it is organized, promotes green crimes. The PEG-C definition is derived from a structural model, and its utility is related to understanding that: (1) capitalism must cause green crimes (and injustice); (2) that the structure of capitalism will cause green crimes to be structured in terms of (A) types/forms, and that (B) the types/forms will have a distribution across the local and global geography of capitalism; and (3) that the location of nations within global capitalism will affect the types of green crimes and forms of injustice within and between nations, and the forms and extent of law and social control applied to regulating green crimes.

Above, we have described some of the basic issues that need to be addressed when considering the definition of green crime as a concept. Rather than review all the possible definitions, we have focused primarily on conceptual issues relevant to PEG-C. As we noted, PEG-C is the variety of green criminology most closely associated with environmental sociology in general, and with ecological Marxism in particular. In fact, given developments in PEG-C research over the past few years, it may now have a closer affinity to environmental sociology than to criminology. From an environmental sociological perspective, interesting features of PEG-C include: illustrating societal-environment interactions with respect to crimes committed against and through the environment that harm various species, an issue environmental sociology has not widely addressed; the study of environmental justice in its political economic context; examinations of the political or social construction of environmental laws and

regulations and their applications; and theoretical and empirical research linking treadmill of production, metabolic rift and ecologically unequal exchange perspectives to green crimes. We take up these issues in the sections that follow, beginning with a brief history of PEG-C.

IV. Political Economy and Green Criminology: A Brief History

As noted, the first discussion of green criminology appeared in 1990 in a paper proposing this research area as an extension of radical/Marxist criminology (Lynch, 1990). That proposal framed green criminology as including the study of environmental harms, (in)justice, and environmental law and regulation in their “economic, political and social class contexts” (Lynch, 1990: 3), and required exploring how the structure of capitalism affects environmental harms/crimes, justice and law. Doing so examines the way that powerful groups shape the law to regulate the “environment to preserve the basis of their power” (Lynch, 1990: 3). Lynch noted that within the political economic context of capitalism, environmental destruction would be “protected” and legitimized by corporate ideology, government consumption patterns, and lax environmental regulation. Primarily, the crimes PEG-C would examine would be those that were sometimes (but rarely) addressed in the corporate crime literature. Examining these issues would also require drawing attention to how green harms/crimes produced an array of victims associated with environmental destruction and predation, including (in addition to humans), plants and other living victims (even insects!), and ecosystems as victims. He acknowledged the global nature of these concerns, pointing toward examining how these problems played out in the political economic context across core and peripheral nations in an effort to reveal “the pervasive political and economic powers that negatively affect all life on this planet each and every day” (p. 12). Referring to the development of green politics in European nations, Lynch (p. 3) also argued that green criminology should connect “action/activism to political economic theory that views environmental destruction as an outcome of the structure of modern, industrialized capitalist production and consumption patterns. . . .”

Though not yet connected to environmental sociology, these preliminary PEG-C themes reflected a wide range of issues and conceptual and theoretical concerns expressed within environmental sociology. This included attention to: how human-environment relationships relate to praxis, structure and agency; the social and political construction of environmental harms; the study of environmental injustice; global environmental harms, laws and regulations; the intersection of humans and the environment in relation to social movements; and the relationship between neoliberalism and environmental regulation (Woodgate, 2010).

Expanding on these themes, Frank and Lynch (1992: 79–96) noted the need for criminologists to expand attention to “green victims” of corporate harms. Here the argument suggested that corporations committed a wide range of acts that produced environmentally-related violence normally excluded from criminology because within orthodox criminology (as a result of its tendency to draw on modernization-related arguments), those behavior are typically viewed as the acceptable costs of production. In contrast, Frank and Lynch framed these violent green victimizations as occurring within the political economic organization of capitalism, which attempts to legitimize such harms as normal within the profit orientation of capitalism, and as excusable behaviors associated with “legitimate businesses enterprise.” These forms of violent harm and victimization, overlooked by criminologists, they argued, needed to be reconceptualized in relationship to the forces that produce and legitimize these acts within the political economic structure of capitalism (pp. 110–113).

Despite these arguments, little interest was directed toward these issues within criminology. Increased interest in green criminology began to emerge following publication of a special issue on green criminology (1998, volume 2, number 2) of the journal, *Theoretical Criminology*, edited by Piers Beirne and Nigel South. During the mid-1990s, Beirne (1994, 1995, 1996, 1997) had published several articles examining harms against animals from a criminological perspective. In 1999, he published a landmark work on criminological examinations of harms against nonhuman animals, “For a nonspeciesist criminology,” which significantly affected the

development of green criminology and drew increased attention to nonhuman animal crimes/harms. This was not, in the view of most, a political economic analysis. Beirne, however, included relevant materials on political economy in overlooked footnotes to this manuscript. Those footnotes (# 2, # 10, # 11) explored the historical “exploitative” connection between humans and animals through commercial production, including the replacement of human with animal labor. He also refers to the development of anti-animal cruelty statutes in the nineteenth century as an effort to extend social control over the working class within the political economic relations of capitalism, and especially within the context of capitalism’s property interests in animals.

Reflecting this general lack of interest in PEG-C, some PEG-C researchers attempted to stimulate interest in green criminology by drawing attention to a more traditional criminological problem: namely, problems of injustice connected to racial bias. This produced a number of short theoretical and empirical studies of environmental (in)justice, which referred to the association between political economy and environmental justice (Stretesky & Hogan, 1998; Stretesky & Lynch, 1998, 1999). This research connected the problem of race and unequal exposure to the environmental justice literature in particular rather than the environmental sociology literature more generally.

Much of the effort required to establish green criminology involved making space for that view within the criminological literature and establishing that the scope of and harms associated with green crimes required attention. As a result of addressing those issues, more exacting assessments of the intersection between environmental sociology and PEG-C were overlooked. A more complete articulation between PEG-C and environmental sociology only began to emerge more recently (e.g., Long et al., 2012; Stretesky & Lynch, 2009a). In these works, the connection between PEG-C and environmental sociology were drawn much more clearly and definitively, particularly in Stretesky et al.’s (2013a) book, *The Treadmill of Crime:*

Political Economy and Green Criminology, and several related publications (Lynch, 2016b; Lynch et al., 2013, 2016b; Stretesky et al., 2013b). We examine those arguments below.

V. Green Criminology and the Treadmill of Production

Despite being grounded in political economic theory, most green criminology does not draw directly on that approach. Moreover, most green criminological publications involve discussions of the kinds of behaviors that ought to be included as examples of green crimes, as well as numerous case studies of green crimes. As a result, there has been little development of a theory of green crime or green criminology, and the lack of welldeveloped green criminological theories has long plagued this area of research.

To address these concerns and reconnect green criminology to its political economic origins, we wrote a series of theoretical and empirical manuscripts connecting green criminology to treadmill of production (ToP) arguments, and to related arguments in environmental sociology and ecological Marxism (Long et al., 2012; Lynch et al., 2013, 2016a, 2016b; Stretesky et al., 2013a, 2013b). Those arguments rest on the observation that nature and capitalism are in contradiction with one another. As a result, continued economic expansion results in continued ecological disorganization through increasing ecological additions and withdrawals, which shift across nations and economic sectors throughout the history of capitalism. These observations have relevance to several important sociological approaches beyond the ToP, such as the second contradiction and absolute general law of environmental degradation under capitalism arguments; metabolic/ecological rift approaches; and the ecologically unequal exchange perspective (EUE). For us as criminologists, these views are important to the extent that they can be related to the volume of green offending and the scope and application of environmental law and social control mechanisms. In PEG-C it is not only important to show how the political economy of capitalism gives rise to green crimes (i.e., how part of the contradiction between capitalism and nature plays out or becomes evident as green crimes), but also how the structure of capitalism shapes environmental laws and forms of social control. From a political economic

view critical of capitalism, environmental law and social control are not constraints on capitalism—rather, it legitimizes and facilitates ecological disorganization and destruction, and hence other outcomes that promote the expansion of capitalism such as metabolic rift and EUE. We explore these arguments in greater detail below. It should be noted that in the following, we refer largely to our own work since we have been the primary source of these arguments.

The first effort to link ToP and PEG-C perspectives involved a study of whether coal companies charged with environmental violations attempted to employ their economic power to mitigate the impact of the violations (Long et al., 2012). Drawing on Schnaiberg's (1980) ToP theory, which lays out arguments concerning how different treadmill actors behave, and Marxist theories of the state, it was hypothesized that coal companies charged with environmental violations would attempt to influence the outcome of environmental investigation by employing their economic assets to make political donations before environmental investigations were completed. Controlling for lobbying, production volume, and company size, we found clear evidence of increased political donations following environmental charges. For environmental sociologists, the ToP is a familiar theory which describes how post World War II capitalism escalated production and consumption by increasing the use of fossil fuel and chemical based production techniques. These methods sped up the treadmill of production and required accelerated raw material inputs into the system of production. Extraction of those raw materials (called ecological withdrawals) was also expanded through the use of new industrial technologies. Intensified extraction and production also increased emissions/pollution (ecological additions), and taken together, the expanded pace of the ToP promoted the growth of ecological disorganization, while also intensifying social inequalities.

Addressing the relevance of observations related to ToP theory, PEG-C criminologists have undertaken several empirical studies related to ecological additions, ecological withdrawals and the social control of environmental crimes. These PEG-C studies are reviewed in the

sections that follow, however the review that follows should not be considered a review of the broader green criminological literature (e.g., outside the scope of PEG-C arguments).

VI. Ecological Withdrawals and PEG-C Explanations and Research

Drawing on Durkheim's (Durkheim, 1983) theory of social order and change, various criminological theories suggest a link between social disorder/disruption—or what is typically called social disorganization—and crime. Connecting this issue to resource extraction, Freudenburg (1984) argued that the rapid development of oil boomtowns created forms of social disorganization that increased rates of crime. PEG-C researchers suggested that these traditional criminological assumptions about social disorganization might also be related to ecological disorganization, and that areas adversely affected by social disorganization may also be experiencing ecological disorganization (Stretesky et al., 2013a). In this view, some forms of ecological disorganization may be promoted by efforts to accelerate ecological withdrawals to promote expansion of the ToP, and may in turn contribute to or co-occur in geographic locations suffering from social disorganization (Lynch, 2016a; Lynch & Boggess, 2015). Testing this argument, Stretesky et al. (2018) found an association between the location and volume of oil and natural gas extraction wells in the UK (2004–2015) and levels of property and violent crime.

Within criminology as in sociology and in the ecological literature, numerous studies link the process of modernization and development to both positive and negative outcomes. In the traditional modernization approach within criminology linked to Durkheim, modernization is believed to add complexity to society, and sever small group relationships and social ties, contributing to increased crime. This argument has also been translated into a resource curse hypothesis which suggests that nations with excessive dependence on natural resource extraction economies (e.g., as in the oil boomtown example above) experience rapid social change, normative disruptions, diminished social ties and increased social disorganization, leading to increases in crime. Though criminological studies posit a possible resource curse-crime effect,

the existence and distribution of the resource curse itself has not been explained nor adequately assessed by criminologists.

Drawing on ToP theory, PEG-C researchers argued that the distribution and structure of the global ToP influences the physical geography of resource extraction (i.e., ecological withdrawals) across nations, which in turn influences factors (e.g., including social disorganization) that affect crime, and that these effects operate independently of more traditional criminological modernization arguments. Stretesky et al. (2017a) employed multilevel growth models to assess the relationship between ecological withdrawals measured as natural resource rents and homicide rates across 173 nations for the year 2000 through 2012. Multilevel growth models indicated that resource rents were related to homicide rates within but not across nations. In other words, as nations become more economically dependent upon natural resource extraction their homicide rates tend to increase. Drawing on several arguments in environmental sociology, Jorgenson (2009) proposed that the adverse impacts of certain indicators of economic development on ecological disorganization might be evident in less developed nations. In particular, Jorgenson noted that there is a widespread assumption that foreign direct investments (FDIs) often have positive benefits for nations receiving those payments, but that in the environmental sociology literature numerous studies indicate the existence of widespread adverse ecological disorganization impacts on FDI receiving nations. Consistent with ToP arguments, he found that within less developed nations, increased FDI was related to increased water pollution levels over time, and that in these nations there was also increased evidence of child and infant mortality over time. Extending that argument to ecological withdrawals, Long et al. (2017) assessed the effects of FDI on rates of ecological withdrawals across a sample of 125 less developed nations (for the years 2005–2013). Based on the results, they argued that the structure of global resource withdrawal investment impacts ecological disorganization in less developed countries.

Ecological withdrawals occur in many forms. One of those forms relevant to green criminology is the poaching and trafficking of wildlife species. Outside of PEG-C, criminologists do not conceive of wildlife poaching/trafficking as crimes that relate to the global ToP's influence on ecological withdrawals. Thus, there is little discussion of how political economic theory helps in the conceptualization and testing of assumptions that relate to the intersection of the global ToP and the global trade/trafficking in wildlife. Most green criminological studies of wildlife trade and crime are qualitative and employ case study techniques.

Stretesky et al. (2013a) offered initial discussions of how the ToP affects not only wildlife crimes but crimes against other nonhuman animals (e.g., farm animals). Specifically, they argued that not all animal harms were the proper subject of a PEG-C, and that PEG-C animal harm research should focus on animal harms related to the political economic structure of society. For example, within criminology, some study the psychological attributes of individuals who harm animals, and others argue that harming animals is a pathway to harming humans. Ignoring the utility of such arguments, our point is that these kinds of animal harms exist outside the scope of political economic analysis, and that the goal of a political economic analysis of crimes/harms against animals is to illustrate how the political economic organization of society promotes crimes against animals and routinely overlooks those crimes when and because animals are being employed and exploited for economic purposes (e.g., in farming/food production; pet trade; the animal experimentation treadmill/complex). Moreover, in a political economic view, one should expect that animals that destroy economic value are likely to be killed/destroyed by the state even when those animals are protected by law (Lynch, 2019). In other words, when applying a PEG-C model to animal harms, one must take care to explore contradictions between the content of law (i.e., law as ideology or as a legitimation mechanism), and how the organizational structure of capitalism affects the enforcement of law. In this case, for instance, laws that protect animals from harm may exist, but enforcement of those laws may be overlooked if enforcement undermines the structural goals of capitalism (i.e., profit-making/accumulation).

PEG-C scholars have also made arguments about the link between wildlife trade/wildlife destruction and anthropogenic development (Lynch et al., 2015a) that are consistent with world systems theory (McKinney et al., 2010; Shandra et al., 2009b). The PEG-C argument has not, however, been widely tested with respect to examining the intersection between political economic forces that impact ecological withdrawals and wildlife crime/trafficking patterns. Stretesky et al.'s (2018) analysis of the global Saker falcon trade addressed the effects of three theories that potentially explain threats to wildlife species due to economic forces: ecological modernization, unequal ecological exchange and treadmill of production theory. While each argument has been employed to examine how economic development impacts ecological conservation, they have not been applied to wildlife trade.

The ecological modernization approach, which is also expressed in the Environmental Kuznets Curve literature, suggests that as societies progress economically and accumulate excess resources, public opinion concerning environmental preservation pressures politicians to enact environmental protection measures, leading to declining ecological destruction and expanding economic progress over time. Here, the argument is that the environment and economy are decoupling, so that additional development does not continue to generate additional environmental degradation. Moreover, it is suggested that technological advances contribute to decoupling (for a more extensive green criminological critique see Lynch, 2016c). In this view, there should be an inverted “U”-shaped relationship between economic development and ecological disorganization over time, meaning that as countries modernize, the falcon trade would decline over time. The protecting factor in this case could, for example, be the setting aside of forested area for the protection of wildlife species.

In contrast, ToP theory suggests that the expansion of the capitalist ToP requires additional ecological resource consumption, so that capitalism and ecological disorganization expand simultaneously, the number of Saker falcons traded would increase. In addition, ecologically unequal exchange (EUE) theory posits that the structure of the global economy

organizes a system of unequal exchange relationships between developed and less developed nations that facilitates the flow of ecological resources away from the latter. This ecological trade flow could include the trade in wildlife.

We tested the utility of these explanations on the global Saker falcon trade across 24 countries (for the years 1971–2015) using fixed-effects regression models. The results supported the ToP and EUE hypotheses, and rejected the modernization/ Kuznets arguments. In short, it appears that modernization does not slow wildlife trade; rather, as ToP and EUE theories suggest, wildlife trade (a measure of ecological withdrawal/green crimes) increases over time. This outcome can help explain why it is difficult to prevent legal or illegal wildlife trafficking in a global capitalist economy. As illustrated below, one of the more important outcomes of empirical PEG-C research is the observation that the creation and application of environmental regulations is insufficient to slow the continued expansion and forms of ecological disorganization caused by the ToP.

VII. Ecological Additions and PEG-C Explanations and Research

As noted earlier, ToP arguments posit that the expansion of capitalism following WW II has been facilitated by an increase in ecological withdrawals and ecological additions. PEG-C posits that ecological withdrawals and ecological additions are forms of green crime. In the previous section, we reviewed PEG-C studies that have examined withdrawals, and here turn to the larger PEG-C literature on ecological additions.

One of the difficulties in assessing PEG-C arguments within the context of global theories derived from ToP and EUE arguments relates to the paucity of and poor quality of data on environmental/ green crimes and their control across nations. Drawing on world systems theory and EUE explanations, one would posit that the changing nature of global capitalism over time would impact the location of crimes of ecological addition. Moreover, because much of the ecological addition data examines pollution emissions, and trend data on pollution emissions are not typically found for many nations and are especially difficult to locate for less developed

nations, PEG-C hypotheses about ecological additions are often tested with data from a handful of countries, and primarily from the US where these data are more easily accessed and exist over longer periods of time.

From a criminological perspective, a key issue concerning crime is whether the forms of formal social control devised to constrain crime work. By “work” criminologists typically mean that a crime control strategy reduces crimes, and the crime reduction effects of a crime control strategy are often summarized in relation to the theory of deterrence. Deterrence theory is dependent on making individual level assumptions about behavior. In that view, people are rational, and are deterred from crime when the costs of crime outweigh its rewards. A person offends, therefore, when the rewards of crime outweigh its costs. Here, it is not our intention to review all the intricacies of the deterrence argument, but simply to note its general structure and that there is actually little empirical evidence that deterrence works well with respect to deterring street (Paternoster, 2010) or corporate crime (Schell-Busey et al., 2016). We mention this empirical outcome because despite what empirical studies indicate about the limitations of punishment as a deterrent, the public, and most law-makers and law enforcement agencies believe that deterrence works. Moreover, the US EPA often boasts that deterrence is one of the primary mechanisms that makes US environmental law successful.

Consistent with both observations from ToP theory and the results from studies of the deterrent effect of criminal punishments, one would not expect environmental punishment to effectively deter corporations from engaging in green crimes linked to ecological additions. Those who have drawn on ToP theory, such as York (2004), have noted that despite the ideological claims made about environmental law and environmental law enforcement, those factors should promote conditions for the continued expansion of the ToP and profit-making. While this observation has been offered in ToP research (see also Schnaiberg, 1980), it has not been empirically assessed in the environmental sociological literature. Such empirical tests, however, have been undertaken within PEG-C research.

Stretesky et al. (2013b) conducted the first direct test of this proposition. Within deterrence theory, it can be assumed that large penalties carry a greater deterrent effect than smaller penalties, and that a deterrent effect would be most likely when penalties were quite high. To incorporate those strict assumptions of deterrence theory into an empirical test of the effect of environmental penalties on re-offending, Stretesky, Long and Lynch drew a sample of the 25 corporations that had received the largest environmental crime fines from the US EPA in 2006, and obtained emissions data for those corporations prior to and following the application of that penalty. Using fixed effects regression models, they examined the effect of the penalty on the pollution-emission behavior of those corporations. The results indicated that large penalties had little impact on the emission behavior of these corporations. They concluded that environmental penalties had little effect on slowing the treadmill of production and the forms of green crimes corporations commit through behaviors that expand ecological additions. Additional studies by PEG-C criminologists have also produced results that suggest that environmental penalties failed to deter corporations from engaging in behaviors that contribute to green crimes through ecological additions. For example Stretesky et al. (2017a, 2017b) examined the effect of modernization, criminal prosecution/social control indicators, and measures of the growth of the US treadmill of production to predict toxic emissions by US corporations from 1988 through 2014. The strongest predictor of emission was growth in gross domestic product, while neither modernization nor criminal prosecution/social control indicators were related to the toxic emission trend. The effect of monetary penalties/deterrence on firms' compliance with environmental regulations in Michigan were assessed by Barrett et al. (2018). They found that over time, fines had a small effect on noncompliance in the short term. In the longterm, however, fines not only failed to deter corporate behavior by increasing compliance, they actually increased noncompliance. This led the authors to posit that not only do fines fail to slow the trend in emissions promoted by growth of the ToP, but that continued economic growth

associated with ToP expansion actually undermines any deterrent effects that might be associated with fining corporations for green crimes related to toxic emissions.

As indicated, the studies reviewed above by PEG-C researchers indicate that punishments do not change the behavior of treadmill actors or the ToP, and that despite the application of punishment, corporations continue to engage in green crime through ecological additions/toxic emissions. Some argue that the lack of corporate deterrence should not be unexpected given that the application of a punishment to a corporation for violating an environmental regulation is a rare event. Despite negative findings and the limited use of environmental punishments against corporations, one can still find research that suggests that though rare, such punishments have large effects on the corporations to which they are applied, and to other corporations through signaling, or the message sent to corporations about environmental offending through punishment. The idea that rare punishments still deter corporations is known as Harrington's Paradox (Harrington, 1988). Harrington's Paradox is an argument in ecological economics that contradicts the rational economic model of behavior made famous by Gary Becker. Harrington's Paradox argues that despite infrequent and unpredictable monitoring of environmental laws, a low likelihood of environmental offense detection, a low likelihood of an applied punishment, and low expected fine amounts, corporations will nevertheless be deterred by environmental law and punishment. As noted above, this argument is inconsistent with the expectations of deterrence theory and ToP theory and at odds with the empirical evidence. From a green criminological perspective, part of the issue here involves evidence related to the actual frequency of environmental punishments. Lynch et al. (2016a, 2016b) argued that the rate of environmental punishment is so low that it would be impossible for those outcomes to deter offenders. In an effort to make sense of this argument, Lynch et al. calculated the probabilities for punishment for 19 different federal environmental statutes in the US from 1983 through 2013. Among the 19 statutes examined, five were never enforced, and 11 other statutes were enforced on average of less than once per year.

Thus, among 16 of the 19 statutes, the probability of punishment was close to zero. For the remaining laws, the likelihood of being caught was approximately eight in one million. These outcomes also require some context to more fully interpret. For example, not only is the rate of detection for environmental crimes very low, the likelihood of being incarcerated, and if incarcerated, sent to prison, are so unlikely that they are difficult to quantify (Lynch, 2017). Among individuals sentenced for violating a federal environmental crime statute in the US between 2001–2013 (N = 428), the mean sentence to incarceration was 8.7 months, which should be compared to the mean sentence for street crime violations of 59 months (Lynch, 2017). This mean difference also tells us something about the incarceration context: since jail sentences are less than 1 year, and prison sentences are greater than 1 year, we can see from these mean comparisons that environmental and street crime offenders are sent to different kinds of places when they are incarcerated. For this 13 year period, about 33 individuals were sent to jail or prison annually for violating a federal environmental law, while on average about 38,000 people were sent to prison (this estimate does not include jail sentences) for violating federal street crime laws. These differences—which were well summarized by Jeffrey Reiman in his 1979 book, *The Rich get Richer and the Poor get Prison*—we would argue, have a great deal to do with how law is written and enforced to promote and protect the interest of ToP actors. For instance, of the 120,000 police/investigators employed by the federal government, only 200 work for the US EPA. It has also been illustrated that even at the state level, violations of environmental laws are rarely enforced, the enforced laws tend to involve minor violations, and green offenders received less punishment compared to matched samples of non-green offenders (Cochran et al., 2018; Crow et al., 2013).

The US EPA also employs other compliance strategies in an effort to promote corporate compliance with environmental regulations and to deter corporations from engaging in green crimes through toxic emissions. In 1986, the US EPA created the self-audit program, which was an effort to promote environmental compliance among corporations by allowing them to

self-report environmental violations in return for reduced penalties. The US EPA believed that this approach would increase compliance with environmental regulations while decreasing toxic emissions. The effectiveness of the US EPA's self-audit programs has been tested by PEG-C criminologists on several occasions, producing little evidence that this type of policy works (Stretesky, 2006; Stretesky & Lynch, 2009b, 2011b; Stretesky et al., 2017a, 2017b). Still, regulators and corporations often promote self-regulation and enforcement policies as effective mechanisms for constraining corporate environmental violations. Even if these programs succeed in a limited number of cases and to a limited extent, we would suggest that the preference for these strategies is based upon their failure to cause larger scale, structural changes that alter the direction of the ToP in ways that limit ecological destruction and profit making.

If the conclusion we propose above is correct, then the green crime associated with toxic emissions should be more highly influenced by economic trends than by law enforcement behavior. The studies reviewed above provide some indication that this conclusion contains significant merit. However, more appropriate tests of these arguments with respect to their effects on toxic emissions could be undertaken under circumstances where there is a significantly large interruption in the growth of the treadmill of production. Those circumstances were present during the Great Recession. Using US EPA toxic emissions data from before, during and after the Great Recession (2005–2014), Long et al. (2018) were able to demonstrate that the recession had, as one would predict from the perspective of ToP theory, an independent negative effect on toxic releases in the US, and that the recession effect existed controlling for measures of economic development and manufacturing industry productivity.

While green criminologists in general often use water pollution as an example of a serious green crime, references to water pollution crimes in the green criminological literature have largely been anecdotal and have employed cases study examples. In an effort to indicate the widespread nature of water pollution crimes and how those crimes contribute to ecological disorganization, Lynch et al. (2017c) employed US EPA Discharge Monitoring Report data to

describe volume and types of pollutants emitted by Publically Owned Treatment Works (POTW) in the US. US POTWs emit billions of pounds of water pollutants annually into US waterways, and in doing so facilitate ecological disorganization and hide various pollution emissions (including those from corporations) in a legitimized emission form. By facilitating this form of pollution and failing to adequately protect US waterways from a variety of pollutants, we argued that the state uses POTWs to engage in a form of state-green crime which is facilitated by the organization of the treadmill of production and the its intersection with the treadmill of environmental law and regulation (Lynch et al. 2021, forthcoming; Stretesky et al., 2013a).

Environmental sociologists have undertaken numerous empirical studies of the adverse effects and economic predictors of CO₂ pollution across nations (e.g. Jorgenson, 2012; Jorgenson & Clark, 2011). Those studies have generally been limited to direct CO₂ emissions, and show that the US plays the most significant role in generating CO₂ pollution. In 2009, Stretesky and Lynch performed the first study examining the indirect effect of international trade/consumption on CO₂ pollution across nations. Using international trade data linked to carbon emissions, results indicated an enhanced US effect on CO₂ emissions that was significantly higher than prior studies indicated, which only examined direct CO₂ pollution. This occurs because the US trade deficit, which measures the balance of imports and exports, increases US pressure on production and CO₂ pollution generation in other nations.

VIII. Environmental Justice and PEG-C Explanations and Research

A significant concern within PEG-C involves questions related to environmental justice, such as the distribution of environmental hazards or the enforcement of law and the imposition of penalties against environmental offenders as these outcomes are affected by the demographic characteristics of communities. To be sure, this is not a unique area of research interest, and the study of environmental justice spans across various sub-areas within sociology and political science. Within criminology, there has been some interest in the equal application of the law, which historically only became evident in the 1960s during the Civil Rights Movement in the US.

One would imagine that the portion of criminology (criminal justice) that examines the effectiveness and fairness of criminal justice processes would have initiated concern with equity in law long before the 1960s. It was not, however, until the 1960s in the US that significant changes occurred in the racial composition of the population drawn into the criminal justice process. While the criminal justice system has long focused attention on enforcing laws in lower class areas, in most places in the US, the criminal justice process did not become a significant force in the maintenance of race relations until the 1960s. Despite an increase in the number of studies that addressed the existence of racial biases in criminal justice processes from the 1970s onward, criminologists have shown little interest in examining racial biases in the making and application of law more generally.

Early environmental justice research within criminology focused on the location of hazardous waste sites, including Superfund sites, which are the most serious of the known hazardous waste sites, and due to their seriousness, are slated for clean-up/remediation by the US EPA. Stretesky and Hogan (1998) undertook the first green criminological examination of Superfund sites by using data from the state of Florida. Unlike prior studies that had used larger aggregation levels and focused on relationships at one point in time, Stretesky and Hogan employed census tract data and compared outcomes across time (for the years 1970, 1980, 1990). They found evidence that Superfund sites were more proximate to African American and Hispanic communities in Florida, and that this relationship intensified over time.

In the first test on this issue, Stretesky and Lynch (1999) examined whether community class, racial and ethnic composition were related to patterns of accidental chemical releases in Hillsborough County, Florida. Legally, federal law defines an accidental chemical release as an unintended, unplanned or sudden release of a chemical from a manufacturing facility, during a chemical transfer (e.g., shipment via tankers cars), or from a treatment, storage and disposal facility (TSDFs). The term “accidental” provides the impression that these releases are not patterned, and one might assume that they would be randomly distributed. Given that

manufacturing industries, TSDFs and chemical transport routes are fixed, the geographic distribution of ACRs may illustrate a spatial pattern, and that spatial pattern may have a discernible structure related to the attributes of the communities in which they occur.

Controlling for the location of manufacturing facilities and transportation routes, Stretesky and Lynch found evidence that ACRs occurred most often in communities with elevated percentages of African Americans, Hispanics and low-income groups. Additional research indicates this pattern exists for other locations and time periods, and has an association with chronic health risks (Derezinski et al., 2003). The environmental justice literature also suggests that community racial, ethnic and class characteristics can impact the quality of environmental enforcement communities receive, and affect the punishment of environmental offenders. Green criminologists have directed some attention to empirical studies examining these kinds of propositions. Lynch et al. (2004a, 2004b) performed two studies assessing the relationship between community characteristics and punishments for environmental violations. In the first study (Lynch et al., 2004a) they found that corporations that violated the federal Clean Air, Clean Water, and Resource Conservation Recovery Acts received reduced fine amounts when they violated those laws in Hispanic communities and lower income communities defined by zip code, and controlling for seriousness of offense, prior record and corporate characteristics. In the second study (Lynch et al., 2004b), which involved violations against petroleum refineries for the same violation types, they found racial and income differences in penalties applied to violators. Controlling for relevant factors, violations that occurred in African American communities were only 31.8% as large as penalties assigned to violations that occurred in White communities. There was a smaller income effect—penalties against violators in low income communities received only 78% of the fine levied against violators who committed their offenses in high income communities. For green criminologists, these findings are considered somewhat surprising since there is evidence that environmental violations occur more often around and in communities with elevated rates of poverty (Stretesky & Lynch, 2011a). In short, the

combination of these findings indicates that while corporations are more likely to violate environmental laws near low income communities, those kinds of violations tend to receive less punishment, indicating that low income communities receive less formal/legal protection than other communities from environmental violations (see also Greife et al., 2017). From a political economic/ ToP perspective, these results are not surprising, and illustrate how unequal enforcement of the law perhaps encourages environmental violators to target low income and minority communities.

The first broad-scale empirical studies of the relationship between environmental justice and school segregation and characteristics began to appear in the early 2000s (Pastor et al. 2002), and included an examination of this topic by green criminologists (Stretesky & Lynch, 2002). Stretesky and Lynch's analysis employed data for the years 1987–1999 to examine the relationship between school characteristics and proximity to hazardous waste sites in Hillsborough County, Florida. Employing a political economy of race approach in which racial and class structures intersect to produce a geography of race-class linked communities with varying probabilities of exposure and access to goods and harms as background for this analysis, and analyzing proximity with respect to the type of hazards, number of hazards and distances to hazards, they found: (1) that at the cross-sectional level, schools with a higher percent of African Americans were closer to environmental hazards; (2) controlling for community factors that might influence the location of environmental hazards, the more African American-segregated a school was, the closer it was to a toxic waste site; (3) that over time, schools located closer to environmental hazards saw the percentage of African American and Hispanic students increase; and (4) that the percentage of African American and Hispanic free lunch eligible students increased in schools proximate to environmental hazards, indicating a class-race interaction.

As noted, in general, criminologists have done little to examine environmental justice concerns, and have done little to explore how environmental justice and law enforcement equity concerns overlap. Illustrating that point, Lynch and Stretesky (2013) examined the distribution of

US EPA sponsored community water monitoring programs. Within criminology, significant attention has been directed to community policing as a mechanism for enhancing bonds between the police and the community in order to improve public perceptions of the police and policecommunity cooperation as ways to reduce crime. The US EPA employs community water monitoring programs (CWMP) for somewhat similar reasons, but primarily to augment their ability to monitor waterway pollution in local communities. The US EPA has established a program for training CWMP participants and promoting the formation of CWMPs throughout the US. CWMPs are important sources of information about local water pollution for the US EPA, and can be used to initiate further investigations of water pollution problems and violations.

Lynch and Stretesky's (2013) study was designed to determine whether the distribution of CWMP was related to community characteristics. The study included information on the 1308 CWMPs in the US in 2009, and examined cross-state correlations, difference tests, and multivariate models. The results suggest the existence of environmental injustice in the formation of CWMP (i.e., more likely in White and high-income communities), and perhaps that US EPA programs that encourage CWMP formation unequally target and promote the programs.

IX. PEG-C, Environmental Sociology and Moving Beyond the Treadmill

Above, we have examined the origin of green criminology and its concepts, and focused attention primarily on political economic green criminology. As noted, PEG-C and green criminology are both overlooked within the discipline of criminology. PEG-C is avoided due to its political economic orientation, and we have suggested elsewhere that other forms of green criminology tend to be overlooked because criminology is a quantitatively oriented discipline while much of the green criminological literature is qualitative (Lynch et al., 2017a). To address these issues, we have personally been engaged in numerous studies that have laid the foundation for green criminology, tested our arguments, and developed a perspective that has, in recent years, drawn our approach much closer to environmental sociology than was previously the case.

Indeed, we would argue that the theoretical and empirical studies we have undertaken over the past several years has moved us away from criminology—even green criminology—and more fully into the field of environmental sociology.

That is, hopefully, a good thing as we believe environmental sociologists can make significant contributions to the further development and application of green criminological research. In the remainder of this section, we provide some discussion of how we believe environmental sociologists and sociology can contribute to the further development of green criminology.

Exploitation. PEG-C criminology has not elaborated on one of the key observations in environmental sociology—namely that the inherent contradiction between nature and capitalism, which describes capitalism’s persistent consumption and exploitation of nature as a necessity for the expansion of capitalism. Building on observations made by Marx, Foster (1997, 1999, 2002) draws attention to the fact that the process/expansion of capitalism requires the dual exploitation of nature and labor. This observation also draws attention to the ways in which these forms of exploitation are promoted by unequal ownership of and access to nature/natural resources, unequal ownership of the means of production, and methods of organizing and exploiting human labor for the extraction and modification of raw materials. These processes are important parts of the world capitalist ToP, and take advantage of international exploitation of the global labor, wage and raw material markets (Jorgenson & Burns, 2007; Kick & McKinney, 2014). The structure of this global system of labor-nature exploitation is linked to the global hierarchy of nations and the locations of nations in a core-periphery/developed- underdeveloped framework useful for understanding the flow of natural resources, which can be described relative to their effects on ecological withdrawals, production/ecological additions and consumption across nations. Here, PEG-C can help green criminologists expand their conceptualization of the definition of green crime, and better explain how ecological disorganization produces green crimes (Lynch et al., 2013). Expanding the understanding of

green crime in this way, we suggest, would allow for reinterpretations of behaviors that constitute green crimes in ways that hopefully open up further empirical studies as illustrated by environmental sociologists (Clausen & Clark, 2005; Jorgenson, 2012; Jorgenson & Clark, 2011; Shandra et al., 2009a, 2009b, 2009c). Addressing this link also requires expanding discussions of metabolic rift and ecological unequal exchange.

Metabolic/Ecological Rift. The theory of metabolic/ecological rift, particularly as developed by Foster (1999) and Clark and York (Clark & Foster, 2009; Clark & York, 2005; Foster et al., 2011), well known in environmental sociology, has rarely been brought into discussions of green crimes and justice. References to metabolic rift arguments only appear in PEG-C, and there its use has been limited and awaits further exploration. One might imagine that Foster's (1999: 379) argument that metabolic rift involves the "robbery" of metabolic materials from nature through the process of ecological withdrawals might attract greater attention and promote new ways of conceptualizing and studying green crimes and injustice. Since the concept of metabolic rift is about the production of raw materials through the labor supplied by nature, the transfer (exploitation) of nature's labors, and the ecological disorganization of nature through ecological withdrawals (in particular, those related to acts such as deforestation, oil, natural gas and coal extraction), this theory opens up a vast array of areas for study with respect to the field of green criminology. In environmental sociology, there is a tendency—which is quite consistent with Marx's analysis—to describe processes related to metabolic rift as forms of exploitation, and we are not suggesting that this kind of description is inappropriate. However, as Foster suggests, and consistent with PEG-C, it is also useful to describe the processes that generate the metabolic as forms of crime and as injustice—that is, as crimes where the victim is nature. Developing that view further could, for instance, promote richer interpretations of agricultural/biotech/food crimes that have been brought into the green criminological literature by Walters (2004, 2005, 2007). Following metabolic rift analysis and various studies in environmental sociology and in the natural sciences, studies of over-

exploitation of the soil in less developed nations, fertilizer/pesticide use/production/pollution, the fertilizer/pesticide industry and soil science itself, mass food production, the global nitrogen/phosphorus cycle, and other examples of the exploitation of nature and the redistribution of ecological withdrawals of metabolic materials can be framed as PEG-C issues of concern. These studies should also explore how adverse consequences associated with metabolic rift produce related harms that constitute green crimes including encroaching on planetary boundaries, effects on plant and species diversity, and human health. Moreover, as Foster and Holleman (Foster & Holleman, 2014, see also, Foster et al. 2011) have suggested, concepts in the theory of metabolic rift can be tied to theories of physics and energy analysis and theory, creating the possibility for describing the production of entropy as a form of green crime affecting the stability of nature. These various arguments require better integration with the kinds of ToP approaches that have been employed to date within PEG-C.

Ecologically Unequal Exchange. Within sociology, numerous kinds of analysis and traditions that are ignored within criminology have played a role in shaping environmental sociology. For example, discussions of ecological imperialism, dependency/development theories, under-development theory, unequal economic exchange, world-systems theory, and of course, Marx's theory of capitalism and the labor theory of value—among other theories—have been incorporated into various theories and studies in environmental sociology (Foster & Holleman, 2014). While any of these ideas can be elaborated and connected to PEG-C, here we draw attention to ecologically unequal exchange (Jorgenson, 2006). One reason for drawing attention to EUE has to do with its ability to address some of the founding global issues defined as central to green criminology (Lynch, 1990). Another is that EUE theory also contains a discussion of an empirical measure of the relationships between nations that might become useful for testing hypotheses about green crime/justice generated by PEG-C. For instance, as Jorgenson argues, economic relationships between nations establish trade dependency, with some nations benefitting from and some nations being exploited by those relationships. As he

has illustrated (Jorgenson, 2003, 2004, 2005), these trade relationships contribute to the pattern of ecological consumption and waste production across nations, including the externalization of pollution and ecological disorganization/destruction by developed nations. This process of externalization of resource extraction, ecological destruction, production and waste generation makes it appear as if less developed nations are driving the ecological crisis when, in fact, the problem remains the economic trade and consumption systems organized to promote the continued consumption behaviors of developed nations. In addition, he argues that this process is facilitated by constant expansionary tendencies of the global ToP, which allows developed nations to employ EUE to externalize ecological disorganization, increase domestic ecological protection, and reduce domestic ecological disorganization over time (Jorgenson, 2006: 688–690). Aspects of this argument have been tested by green criminologists employing carbon emissions and trade data with the US (Stretesky & Lynch, 2009a).

From the above, EUE allows conceptualization of the flow of ecological exchanges in relation to ToP and metabolic rift analysis, and would contribute to a broader PEG-C understanding of the global nature of green crime and injustice. This is, we would argue, an important observation to the extent that green criminology originated from political economic observations about green crime in a global context. While some forms of green criminology claim to draw attention to the global nature of this problem, they— unlike a political economic approach—lack a theory of world relations to frame the explanation of green crime/injustice.

International Issues: Human Rights, Environmental Justice and Indigenous Peoples. Green criminology is a small field, and within green criminology, few researchers attend to political economic explanations. This leaves much ground uncovered with respect to the PEG-C approach, and the opportunity for numerous research projects. For example, there are no PEG-C studies related to international environmental law, or on most environmental rights/ human rights issues that intersect with the environment, or on international environmental justice concerns. The exceptions here included studies that have examined:

political economic critiques of situational crime prevention theories applied through, for instance, United Nations' environmental policies and programs (Lynch et al., 2018a); and the killings of Indigenous/ Native environmental activists (Crook & Short, 2014; Crook et al., 2018; Lynch et al., 2018b).

X. Conclusion

This chapter provided a brief overview and history of green criminology, now almost 30 years old, and in particular its political economic origins and more recently efforts to connect green criminology to treadmill of production theory and ecological Marxism. This historical path illustrates how PEG-C has increasingly turned toward environmental sociology. Through this integration between key green criminological and environmental sociological concepts and perspectives, we believe green criminology is now on stronger theoretical and empirical footing. Similarly, it is our belief that environmental sociology can benefit and grow through a closer relationship with green criminology. In this spirit, we suggested a few of the many possible areas where environmental sociologists could help in the development of PEG-C including, exploitation, metabolic/ecological rift and ecological unequal exchange. In the end, both PEG-C and much of environmental sociology study the effects of capitalism on the environment, and we hope these two areas can continue to learn from one another and become better integrated. There is a great deal of research that remains to be done, and we in particular welcome environmental sociologists to the PEG-C project.

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