

**SMELL THE DEATH, HEAR THE CRIES: GREEN
VICTIMIZATION AND RADICAL-GREEN
CRIMINOLOGY IN THE ERA OF GLOBAL
ENVIRONMENTAL COLLAPSE**

Over the past three decades scientific evidence has accumulated concerning the deleterious impacts humans have on local and global ecosystems (Akimoto, 2003; Ballschmiter and Zell, 1980; Nriagu, 1989; Tanabe, 1983). While much has been written about these issues in the scientific literature, the implications of accelerating global ecological decline is not widely explored in the criminological literature. In general, criminologists fail to conceptualize ecological harms as crimes despite the existence of numerous national and international environmental mechanisms of social control that address ecological harm and destruction.

Criminological neglect of green crimes has also meant a neglect of green victimization. Green victimization is extensive and ubiquitous in the contemporary world, and we suggest, makes green victimization more likely than street crime victimization, a point illustrated below. These green victims are under-represented in the criminological literature, leading to under-estimates of the rates of victimization in society. We also call attention to explaining those forms of green victimization employing political economic theory.³ Our analysis of green victimization proposes a radical approach that employs political economic theory (Part I, IV and V). Parts II and III of our discussion provide evidence of the scope of green victimization in several different forms.

– ¹Department of Criminology, University of South Florida, Tampa

– ²Department of Social Sciences and Languages, Lipman Building, Northumbria University, Newcastle upon Tyne, United Kingdom

– ³While forms of green victimization vary widely, we limit our discussion to human victimization, as data on non-human animals does not exist at the present time. We recognize that this emphasis on humans limits our estimate of the scope of green victimization.

BEFORE CONTINUING . . . A FEW OBSERVATIONS

The green victimizations we describe are real, and victims of green crimes experience pain and suffering that should not be overlooked. We encourage readers to humanize the suffering from green victimization— to hear the cries of the victims and smell the noxious odors of a rotting world ecosystem. The cost of green crimes to the species of the world and the ecosystem are extensive. But we acknowledge that there is a cost to criminologists who take up these issues as well. Unfortunately, studying the green victims of capitalism reveals much that is shocking. Perhaps the cries of the poorest and most marginalized peoples in the world who suffer the most from green crimes will keep us awake at night. Yet, it is precisely these groups of victims who have been omitted from the study of green victimization that both deserve and require expanded criminological attention and protection.

PART I: CAPITALISM AND GREEN VICTIMIZATION

Theoretically, we interpret green crimes and victimization in relation to the inherently unequal economic relations generated by the global capitalist system of production) and the inherent contradictions between capitalism and nature suggested by ecological Marxists (Burkett 2008; Burkett and Foster 2008; Clark and York 2005, 2008; Foster 2005, 2002, 2000, 1999). This global view of capitalism suggests that *capitalism must cause ecological destruction as a consequence of its expansionary accumulation tendencies*. This theoretical description of capitalism's ecological destructive tendencies can be employed as a framework for understanding the political economy of green crime and victimization from a radical-green criminological perspective (see parts IV and V).

Many of the major problems of the world are ecological in

origin and result from extensive environmental degradation driven by capitalism's expansion (Foster 1997). This association between capitalism and ecological crisis is widely rejected in orthodox economics, where critiques of anti-capital arguments and their replacement with sustainable development propositions and corporate responsibility doctrines remain widespread (e.g, for the US EPA's position see, "The Green Thumb of Capitalism," Reilly 1990). In traditional economic views, economic growth and environmental degradation are considered essential aspects of human development and enhanced standards of living (Kovel 2007). In contrast to that orthodox view, our theoretical argument suggests that the environmental problems that plague the modern world and threaten ecosystem and species health are a specific consequence of the organization of the contemporary capitalist world system of production (Stretesky, Long and Lynch 2013; Lynch et al. 2013).

Evidence of the extent of ecological damage found in the modern world has been mounting for the past half century. A good deal of this damage and harm is a result of "green crime," with green crime being "an act that may or may not violate existing rules and environmental regulations; has identifiable environmental damage outcomes; and originated in human action" (Lynch and Stretesky 2003, 227).

Below we illustrate the volume and scope of human green victimization compared to street crime victimization. This analysis presents only part of the scope of green victimization as here we exclude non-human and ecosystem victimization of various types (e.g., species extinctions, local ecosystem collapse). Interpreted as harms that impact various species that occur across ecosystem units, the volume of green victimization appears extensive and immeasurable empirically. Nevertheless, to concentrate on human green victimization, we omit, for example, counting extinct

or threatened species resulting from human ecological destruction during the Anthropocene period (Barnosky et al. 2011; Brook et al. 2003, 2006, 2008; Lomolino et al. 2001; Steffen et al. 2011; Stork 2010; Thomas et al. 2004; Thuiller et al. 2004). Moreover, there are no known data for estimating other forms of green victimization that non-human species suffer (e.g., cancer, heart or lung disease rates). Given those limitations, we restrict ourselves to comparing estimates of green victimization to estimates of street crime victimization.

The volume of death associated with green harms is so high, the rate of disease, injury and exposure to green harms so widespread we can smell the death and hear the cries of the human victims of green crimes. Those victims may be forced to move from their homelands due to climate change, or forced to sever themselves from their traditional, ecologically sustainable lifestyles to allow capital to consume the rich ecosystems that once supported them; or they may be those who suffer pain from the diseases pollution creates. Many humans have been displaced and injured by a host of green harms (including mining activities and deforestation; floods caused by human re-engineering of the world) or affected adversely by various human-induced ecological problems (e.g., heat waves and other irregular weather patterns promoted by global warming; by living in areas where exposure to environmental toxins cause diseases). These people—and the nonhuman and ecosystem victims of these green crimes—deserve the attention of criminologists as the victims of the “ordinary” progress of capitalism and its tendency to exploit nature to facilitate production, accumulation and economic growth.

PART II: THE EXTENT OF GREEN VICTIMIZATION: A QUANTITATIVE ASSESSMENT

Evidence of widespread ecological harm is all around us. Orthodox criminology has ignored these harms, and remains

wedded to a dated definition of crime, victimization and justice associated with the criminal law that draws attention only to the problem of street crime. Evidence of the ecological harms around us grows daily and illustrates the ways in which the world ecosystem moves closer and closer to collapse. These forms of green victimization affect the smallest, least conscious and least noticeable species to the most conscious and most visible of species, humans. As the human record of environmental destruction grows, so too does the misery of the species of the world.

Based on data related to the production and disposal of toxic and hazardous waste in the world around us, it is fair to say that humans have likely created, redistributed and deposited *trillions of pounds* of toxic waste in various forms into the world's environment *in just the past decade*. For example, in the US, 24.73 billion pounds of toxic waste were *reported* released into the environment in 2012 under the Toxic Release Inventory (TRI) program—and more than 240 billion pounds in the last decade. TRI emissions represent *reported releases* and may underestimate actual releases by as much as 40 percent (Marchi and Hamilton 2006; Bennear 2008). Other nations also emit large quantities of toxic waste: Europe Union, 202.74 billion pounds; China, 28.6 billion pounds; the Russian Federation, 282 billion pounds; Australia, 87.54 billion pounds; Canada, 12 billion pounds; while six other major polluters (Jordan, Kyrgyzstan, Malaysia, Philippines, Serbia and Turkey) released 38 billion pounds of hazardous waste. Including the US, these 11 nations *report* releasing nearly 674 billion pounds of toxic waste annually or 6.7 trillion tons per decade.

Environmental data also indicates that humans have removed hundreds of millions of acres of forest—currently estimated as one-half an acre per second or nearly 16 million acres world-

wide/year according to the Rainforest Action Network—and have filled millions of acres of wetlands (e.g., 110 million acres, or more than one-half of estimated US wetlands, Dahl and Allford, 1997). These data suggest that as a species we have displaced the very soul of the natural world and its ability to reproduce the conditions of life with the unnatural, sterile human environments that have come to define the modern way of life—urban areas. Instead of living within nature, humans have conquered and transformed it and have done so in such an efficient manner that nature has become part of the chain of destruction used to fuel capital accumulation (Foster 2000). This produces a large number of green victims. Humans have created a legacy of ecological destruction, and we illustrate that point below with respect to several major forms of pollution.

AIR POLLUTION VICTIMIZATION

In the US, for example, the air in and around cities has become so polluted that research on air pollution exposure indicates that nearly one-half of the US population—150 million people—is routinely exposed to air quality that violates health and safety standards (www.stateoftheair.org). This form of green victimization alone generates many more victims than street crime.

Humans exposed to air pollution are victimized each day and with each breath they take, with each act being a separate or new victimization.⁴ Among the 150 million Americans exposed to unhealthy air, we conservatively estimate that if exposure lasts one-third (8 hours) of a day, and humans take an average of 8,640

– ⁴Unlike a street crime victimization that may include long term damage and express the existence of a continuous victimization experience (e.g., it takes months for a broken bone to heal), each breath of air pollution constitutes a separate or new act of victimization rather than one continuous act.

polluted breaths in 8 hours (based on average human breaths per minute), this produces 473 trillion air pollution victimizations annually in the US. Each of those incidents represent the potential for violence by producing injury, disease and death. When compared to estimates of violent street crimes in the US from the National Crime Victimization Survey (NCVS; 5.125 million annually), we begin to understand the extraordinary scope of victimization that green harm from air pollution creates. From our estimate there are *92.3 million times as many violent air pollution victimizations than violent street crimes in the US*. Thus, in a *single day* in the US, there are nearly 253,000 times as many violent air pollution incidents as there are violent street crime incidents *in an entire year*. As we digest these figures, they seem almost absurd. But they point out how widespread green victimization from just *one* media—air pollution—has become.

BEYOND AIR POLLUTION

Violent air pollution victimization, while wide-spread, represents only part of the picture of green victimization. There are billions of additional green victimizations associated with water pollution. In the US, researchers estimate 40% of the US population (123 million) is exposed to unsafe levels of water pollution daily (Duhigg, 2009). That daily average yields 44.9 billion annual victimizations, and if we include a small number of repeat exposures per day for each victim (4 uses of water), the annual count reaches 179.6 billion water pollution exposure incidents in the US.. That figure is 35,044 times the number of NCVS acts of street violence that occur in the US in one year.

To these figures, add toxic exposures that occur as a result of living near hazardous waste sites, which include 77 million Americans who live within 4 miles of a known hazardous waste site (Johnson 1999). We exclude many more who live near toxic waste sites that are not officially recognized. Living near a toxic

waste site produces a wide variety of exposure routes to toxic waste since those wastes may be released into the air, move through the ground and affect groundwater, or, as in the case of Garfield, New Jersey (described below), enter residential homes. Living in such an environment may provide constant exposure to toxins, and we know of no research addressing the issue of counting the number of times a person is exposed to toxic pollution by virtue of their proximity to a toxic waste site. To be conservative, we assume that a person living in proximity to a hazardous waste site is exposed to toxic waste 6 times an hour over an eight hour period (one-third of each day), generating an additional 1.39 trillion violent exposure to toxins that occur via proximity to hazardous waste sites. That figure is more than 271,000 times larger than the number of NCVS acts of violence that occur in the US annually.

In sum, taken together, air, water and toxic waste site exposures produce nearly *475 trillion* violent green victimization incidents *annually* in the US alone—93 million times the level of street crime victimization.

INTERNATIONAL DATA

At the international level, the story is no better. Data on all aspects of environmental victimization in other nations cannot be easily accessed, and thus we confine our comments to the most serious outcomes attributable to international green crime for data can be collected—deaths due to pollution.

The World Health Organization (WHO) estimates that globally 2.4 million people die prematurely from exposure to air pollution each year, a figure that is five times the annual number of global homicides (about 485,000). WHO may underestimate these deaths substantially (by perhaps 60%) by excluding deaths from climate change (which results from air pollution), which an

organization called DARA estimates to include 5 million deaths annually. Thus, there may be as many as 8.8 million deaths due to air pollution world-wide, a total that is eighteen times larger than the number of global homicides reported by WHO.

Estimates of air pollution related deaths tell only part of the green victimization story. Water pollution is the primary cause of deaths for children under the age of five globally (United Nations Environmental Programme 2010). In addition, “More people die from unsafe water annually than from all forms of violence, including wars” (World Health Organization, 2002). Taken together, and if the above estimates are accurate and not underestimates, both global air and water pollution deaths are 25-30 times more prevalent than global deaths from homicide.

Important to our argument is the fact that these deaths are omitted from the criminological literature, meaning that the kinds of victimizations that attract criminological attention have been quite limited. Moreover, we wish to point out that these deaths are only some of the forms of green victimization omitted by criminology—there are other ecological human harms that produce diseases around the world which we have omitted here, and as we have acknowledged, these estimates exclude nonhuman and ecosystem victimization.

PART III: GREEN VICTIMS AND NEWS FROM AROUND THE WORLD: SOME QUALITATIVE EXAMPLES

Another way of understanding the scope of green victimization is to examine news reports on green victimization from around the world. This news paints a less abstract view of green victimization because it deals with specific conditions in identifiable, localized areas. While we will not review the specific, individual level manifestations of green victimizations these

stories tell, those stories emphasize how green victimization is experienced by real living people.

A serious concern in the modern world is cancer, which has been escalating among human populations. Two major apologies for rising rates of cancer are offered by researchers and often reported in the news. First, some researchers suggest that the rise in cancer is the result of enhanced medical screening. Second, some researchers suggest that rising cancer is the result of longer life spans that allow cancers to develop more widely in the human population (Yancik 2005; on methodological issues see, Mdzinarishvili, Gleason and Sherman 2010). News stories often focus on the recent stabilization of cancer rates in economically advanced nations but ignore continued increases in cancer rates in less developed, industrializing nations. Considered together, these apologies ignore contradictory evidence such as increased rates of cancer among children especially in developing countries (Jemal et al. 2010). The rise in childhood cancer is important to consider because it is not the result of population ageing effects. These apologies also ignore the fact that cancers are rising among populations underserved by the medical profession (e.g., those in underdeveloped nations, McCormack and Schuz 2011), and for poor populations within developed nations (e.g., in the US among American Indians; Espey et al. 2007).

The escalation of cancer rates bears a relationship to environmental pollution. That relationship has become increasingly obvious and is now quite extensive (Ramis et al. 2011; Lewtas 2007; Liu et al. 2008). In some locations, evidence of the association between cancer and environmental pollution is evident following environmental disasters that involve the release of large quantities of environmental pollutants or radiation in a short period of time (Landi et al. 1998; Baccarelli et al. 2005; Nilsson et al. 2000). Pollution has become so ubiquitous that it is

found in areas not inhabited by humans (e.g., the Arctic and Antarctic; Camarero et al. 2009). Indeed, in some locations the extent of environmental pollution (with the level above background being identified as the anthropogenic enrichment factor; see, Hardy 1982) is considered so ubiquitous that it makes it difficult to determine whether a chemical accident has any effect on already high levels of exposure to cancer causing pollutants. Such is the case in Japan with respect to the Fukushima nuclear reactor accident that occurred as a result of a March 2011 earthquake and tsunami.

Fukushima. Japanese scientists have questioned whether it will be possible to detect the effects of the Fukushima reactor accident on local populations given the already high levels of industrial pollution found in that area (Ritter and Yamaguchi 2011). As scientists point out, cancer has already become the leading cause of death for people in industrialized nations, and exposure to hazardous and toxic waste now seems unavoidable for those populations. Scientists have, for example, estimated that 40% of people in industrialized nations will be diagnosed with cancer during their lifetime. Determining whether an environmental accident causes a spike in cancer related deaths is difficult since cancers take years to form and in urban locations where there are already industrial facilities, there are high background levels of cancer causing pollutants. Clearly, the link between environmental pollution, environmental accidents and cancer is a serious concern, one that should be drawing much more attention from criminologists as they investigate not only green victimization but the very definition of behaviors that ought to count as green crimes. In some locations, such as the US, there are additional, confounding issues that require attention, such as the relationship between race, class and cancer incidents or the environmental justice dimensions of cancer (Morello-Frosch et al. 2002).

Garfield, New Jersey. On the other side of the world from Fukushima sits the small town of Garfield, New Jersey, US (population 31,199). This small town has a big green victimization problem—it is widely polluted with hexavalent chromium from a 3 million ton spill that occurred in the early 1980s. The U.S. Center for Disease Control and the US National Institute of Occupational Health and Safety consider hexavalent chromium a potential carcinogen (Holmes, Wise and Wise 2008). Hexavalent chromium is well known to the public, though perhaps not immediately, because it is the same chemical that caused the contamination of drinking water in Hinkley, California which was the subject of the movie, *Erin Brockovitch*.

In Garfield, the US Environmental Protection Agency has identified 600 homes where 10% of the population lives as being sited directly over an underground plume of hexavalent chromium. As a consequence of the spill and failed efforts to contain it, this area is now listed as a Superfund Site. Superfund Sites are areas that are so polluted that they pose an immediate threat to local residents. In Garfield, that threat includes hexavalent chromium seeping into residential basements. The clean-up effort in Garfield has moved quite slowly because the small company responsible for the spill went bankrupt in 2009. Because the company is bankrupt, the EPA cannot recover cleanup and remediation costs or offer to buy residents' homes due to a lack of funds. In addition, since the spill is now nearly three decades old, the notion that the EPA could move quickly to solve this problem has long past. A major concern, for example, is that hexavalent chromium pollution in the basements of those homes has ample opportunity to seep into the upstairs living quarters, limiting the utility of the EPA's advice that people stay out of their basements. As long as the plume remains in place—and there is no reason to think that after 30 years it's going anywhere anytime soon—these residents remain trapped in their

toxic abodes, victims of a green crime.

Garfield is not alone among the small towns in America thought to be safe havens to which residents move to insulate themselves from the harsh realities of modern life. Here we present a short list of some small cities and towns with big problems—each is polluted by one or more Superfund sites: Coraopolis, Pennsylvania (population 5,677), Middlesborough, Massachusetts (21,117), Butte, Montana (14,200), Hinkley, California (1,910), Libby, Montana (2,880), Anniston, Alabama (24,276), Mossville, Louisiana (56,694), Silverton, Colorado (531), Woburn, Massachusetts (38,120), Ashland, Massachusetts (16,593), Fridley, Minnesota (27,208), Louisville, Mississippi (7,006), Old Bridge Township, New Jersey (60,456), Gloucester Township, New Jersey (38,100), Troutdale, Oregon (15,982), Sheridan, Oregon (6,026) and Richland Township, Pennsylvania (11,100). These are not all of the affected small towns and cities, but represent those with the *highest hazard scores* listed in the EPA's National Priorities List. The nearly 418,000 people living in these small towns and cities face daily exposure to toxic waste which threatens their health and lives in ways that crime does not and makes them daily victims of green crime.

There are other towns and cities all over the world where toxic pollution has changed the population's way of life. In the US, for example, at least five geographically diverse cities that have been abandoned or closed by the EPA due to the extensive level of industrial pollution found there: Centralia, Pennsylvania; Gillman, Colorado; Times Beach, Missouri; Picher, Oklahoma and Love Canal in Niagara Falls, New York.

Yangtze River Basin, China. Back on the other side of the world in China, there is bad news for “hundreds of millions” of Chinese citizens who live near the Yangtze River (or in Chinese, the Chang Jiang River). The Yangtze is the longest river in China

and the third longest river in the world. Approximately one third of China's population (450 million) live in the Yangtze River basin (Hollert 2013), making it the most important river basin in China. Culturally, the Yangtze River is an important geographic site and ecosystem which divides China into the North and the South. The Yangtze is also home to the world's largest hydroelectric dam.

Given the large population in the Yangtze River basin and its central economic and food supply role (Hollert 2013), there is concern with the impact of industrial pollution on the region. It now ranks as among the ten rivers in the world most threatened by industrialization (Wang et al. 2012). The Yangtze River Resource Protection Bureau stated that nearly *34 billion pounds* of toxic waste are pumped into the Yangtze *annually* by more than 400,000 manufacturing facilities (Wen and Zitan 2011). The Chinese citizens who live in this area form a significant population of green crime victims (Cheng 2003). Many residents who live near the Yangtze River are victimized every day and every time they use water from the river because they are heavily exposed to industrial pollutants. And that pollution, being vast and dispersed throughout the long flow of the Yangtze, is likely to impact residents for hundreds of years (Yi, Yang and Zhang 2011; Wang et al. 2011; Hu et al. 2013). As Cheng (2003, 192) noted in his review of heavy metal pollution in China, some diseases resulting from pollution "were observed with long-term and non-reversible effects." Yangtze River basin residents have long been subject to high levels of industrial pollution, but have yet to be the subjects of criminological research on green victimization. Their plight as green victims goes unnoticed despite the tremendous size of this population.

New Delhi, India. In near New Delhi, 16 million people are routinely exposed to highly concentrations of air pollution. New Delhi now ranks as the most polluted city in the world with

respect to air quality, surpassing the air pollution level in Beijing, China (Upton 2013).

Beijing, China. While New Delhi has surpassed the average poor air quality in Beijing, Beijing's residents are not much safer. Indeed, Air Quality Index (AQI) readings in Beijing can top 300 on a scale where 300 indicates serious health concerns (and has been as high as 755, Wong, 2013). For Beijing's nearly 20 million residents, this remains bad news, and provides further evidence of the extraordinary reach of green harms.

SUMMING UP THE GREEN VICTIMIZATION EVIDENCE

Using quantitative and qualitative data, the preceding sections illustrate the scope of green victimization at many levels (globally and locally) of analysis. In the US we calculated that green victimization is 93 million times more likely than a street crime victimization, and that even residents of numerous small towns in the US are not protected from green victimization. At the global level we conclude that there are more deaths caused by air pollution than global homicides. And we also noted that in places like the Yangtze River Basin, New Delhi and Beijing there are nearly 500 million green crime victims.

This partial description of the scope of green victimization provides evidence that further attention ought to be directed to the victims of green crime. Those victims include victims we acknowledge we have omitted—nonhumans species and ecosystems—which makes this concern with green victims more salient.

These facts and figures tell us a story about the extent of green victimization. That story is, we think, quite obvious. However, we recognize that these facts and figures *could* be *interpreted* in various ways. Some might suggest, for example, that the harms reviewed above are the price humans pay for living modern

lifestyles, and some might suggest that humans could choose to protect themselves from being green victims. Our point is that we have long ago crossed the threshold where individuals can make the kinds of choices that protect them from being green victims given the ubiquitous nature of pollution. To be sure, green victimization is the price people pay for their modern way of life; that doesn't mean they willingly accept nor welcome their victimization.

In our view, the global problem of green victimization is an example of how the fundamental organizational structures of the global economy drive green victimization. For example, most scientific studies reviewing the extensive nature of pollution in the developing world begin with statements noting this outcome is due to industrial pollution. Cheung and Wang (2001), for instance, note:

The Yangtze Delta of China is one of the most anthropogenically active regions in Asia, experiencing rapid industrial and infrastructure development in the past decade. (4947)

Thus, in the sections that follow we describe a political economic explanation of the connection between green victimization and the organization of the capitalist world economy, and in particular focus attention on the role the treadmill of production plays in that process.

PART IV: TOWARD A RADICAL-GREEN CRIMINOLOGICAL VIEW OF VICTIMIZATION

Broadly speaking, green criminology examines environmental crimes, harms, victimization, laws and social control. The goal of green criminology is to address these important issues in ways that open a space in the criminological literature so that scholars can examine the expansive scope of green harms in the modern era.

During the past two decades as the green criminological literature has expanded, it has been amenable to a variety of perspectives and approaches. The initial call for a green criminology framed that view as an extension of radical criminology which drew on political economic and class-based analysis (Lynch 1990). Since then, the perspectives employed to address green criminological issues have expanded to nonspeciesist theory (Beirne 1999; Geertrui 1999), environmental justice issues and theory (Stretesky and Lynch, 1999a, 1999b, 2002; Lynch, Stretesky and Burns, 2004a, 2004b), conservation criminology (Gibbs et al., 2010), eco-global criminology (White 2011), and to a wide range of harms (South 1998). Much of the green criminological literature is issue oriented, and green criminologists have noted the lack of a unifying theory of green criminology (White 2011). This lack of a theoretical approach to green criminology has advantages and disadvantages. As far as advantages, the lack of a unifying theory has allowed the development of an open dialogue regarding green crime and justice to occur in an academic environment free from the kinds of ideological divisiveness that characterizes other areas of criminology. This has led to the development of a literature that is more focused on investigating the scope of green crime and injustice than with explaining the causes of green crime and injustice. Perhaps this has occurred because green harms are so serious that explaining those behaviors seems less important than exploring their scope, or perhaps because their causes appear so obvious. Nevertheless, these “obvious” causes of green victimization have rarely been discussed in the green criminological literature.

In our view, the problem of green victimization is one of economics and more specifically the political economy of global capitalism as it plays out at the national and local levels (Stretesky, Long and Lynch 2013; Lynch et al. 2013). At both the world

systems and national political economic levels the quest for profit and the obsession with accumulation and “improved” economic standards of living, expanded inequality in the distribution of ownership and wealth, class relations, and the treadmill of production (ToP) all play significant roles in promoting green crime, victimization and injustice. Theoretically, we argue that this leaves the explanation of green victimization a rather clear choice—a political economic explanation which forms the foundation of what we call radical-green criminology.

By “political economic” and “radical” we mean theory that draws on approaches that make the connection between unequal ownership, accumulation and economic expansion, class inequality and the exploitation of nature. There is little doubt that humans exploit nature for survival. In the modern world, driven by the internal goals of capitalism—accumulation, consumption, and continual economic expansion and the elevation of living standards—natural resources are no longer used simply to survive, but rather to elevate consumption as a positive social value. In doing so, the global capitalist ToP causes accelerating rates of natural resource depletion and severe ecological inequities between and within nations. Under the direction of capitalism’s constant expansionary tendencies, humans are no longer satisfied with sufficient means of survival, but rather seek to elevate consumption to new heights. In doing so, however capitalism has stripped nature of its ability to reproduce itself and the conditions for life, preferring instead to support the escalation of high standards of living beyond nature’s reproductive capacity (Foster 1999; Burkett 2008). Moreover, the unequal forms of ownership and property distribution promoted by capitalism ensures that access to elevated standards of living are also unequally distributed within and across nations. Thus, for example, some of the poorest peoples in the world live near and amongst natural resources that are extracted in harmful and even

illegal ways by the machinery of the capitalist ToP (Stretesky, Long and Lynch 2013). The extracted materials are used to provide for the consumption “needs” of the developed world including luxury housing, gourmet foods, designer clothing and bottled water. At the same time, the people of the under-developed world suffer from hunger and lack clean water, clothing or appropriate housing while being exposed to the detrimental and often toxic practices employed to harvest and relocate natural resources through the global extension of the ToP (Stretesky, Long and Lynch 2013). In our view, explaining these forms of inequality and simultaneously the exploitation and destruction of nature and how these consequences merge to form green victimization requires the use of a radical or political economic approach. It is to this view that we now turn our attention.

PART V: ELEMENTS OF A RADICAL-GREEN CRIMINOLOGY.

It is widely recognized that the basis of capitalism is accumulation expressed in the accumulation of capital itself, in stored labor and the commodification and transformation of labor into goods and services. In radical economics, the core of this accumulation process revolves around the unequal ownership of the means of production and capital, the exploitation of labor and the production of surplus value (Marx 1978). The long run success of capitalism depends on its ability to produce and instill a belief in the core values of capitalism, especially the ideas that accumulation enhances the standard of living, that through hard work anyone can succeed and obtain “the good life,” and that individuals and society can enhance their standard of living through mass consumption. In short, capitalism’s quest for profit, accumulation, surplus value, economic growth and consumption drive this system to expand.

In order to grow, capitalism must not only stimulate the demand for and produce commodities, but must seek out raw

materials and inexpensive labor to promote capital accumulation. The search for inexpensive raw materials and labor continually shifts the balance of the world marketplace of capitalism. This shifting pattern of global resource extraction, consumption, accumulation and exploitation of labor is stabilized through unequal relationships between the core capitalist nations (those with elevated standards of living, commodity consumption and ownership of capital and production) and peripheral nations where the costs of labor are low and raw materials plentiful.

In the long run, the various sectors of the political economic system—capital, labor and the state—each buy into the expansionary goals of capitalism, and promote those goals, especially with respect to raw materials or ecological resource extraction (Stretesky, Long and Lynch 2013). Each productive sector promotes the exploitation of natural resources to further its interests in economic expansion, creating an economic ToP that increasingly devours raw materials, contributing to environmental destruction and disorganization (Schnailberg, Pellow and Weinberg 2002). Taken together these various forces—accumulation and expansionary drives that define the goals of capitalism; the contingent powers of the state derived from its connection to capital; and the tendency for the working class to define its goals as synonymous with those of capitalist expansion—intersect to promote long term environmental degradation (Schnaiberg 1980). In short, the expansion of capitalism drives the plunder of the environment.

At the same time that capitalism promotes environmental degradation through continually expanding resource extraction (O'Connor 1998), it also promotes environmental degradation through the production of pollution. As Schnailberg (1980) notes, ecological degradation or disorganization has been accelerated by the expansion of the ToP since World War II. The post WW-II ToP

is characterized by its heavy reliance on fossil fuel and chemical energy. That increased reliance on fossil fuel and chemical labor leads to a reduction in labor costs as fossil fuel and chemical energy continually replaces human labor through technological innovation, a complex problem related to the fundamental nature of the organization of capitalism and its relationship to nature (Burkett 2008; Boyce 2002; Foster 2000).

As the capitalist ToP expands its global reach, it also accelerates ecological disorganization. First, by degrading ecological conditions through the damage caused by the withdrawal of ecological resources (Schnaiberg 1980); second by expanding the production of pollution through ecological additions (Schnaiberg 1980); and third, by promoting forms of ecological damage related to the increased production of entropy (Foster 1999).

In a political economic view, environmental degradation is a consequence of the inner logic of capital accumulation and the effort to minimize costs. One way to constrain the costs of production is to socialize the cost of pollution (O'Connor 1998) through, for instance, favoring free market principles of an unregulated market as far as possible, and avoiding the proliferation of laws and regulations related to polluting and maintaining the public's health. Thus, in the name of the economic "common good," firms are allowed to release pollution into the air, water and soil. Because economic necessity is nearly always a factor in setting emissions caps, polluting the commons keep the costs of controlling pollution for corporations to a minimum, and favors profit over human and ecological health.

In theory, the creation of pollution regulations is undertaken to protect public and environmental health. Law making, however, is a complex process (Chambliss and Seidman 1982) and various groups, each with their own objectives influence environmental

regulations (Schnaiberg 1980). And while each group has interests to stake, these interests do not meet one another on an equal playing field devoid of the influence of capital.

The various mechanisms of this world and local capitalist market economy influence the scope of environmental pollution. This trade-off between capitalism and the environment has a long history, extending from the colonization of foreign lands that facilitated resource exploitation from the 15th century onward, to the conquering of the wilderness within the geographic boundaries of individual capitalist nations.

Understanding the effect of capitalism on the ecological system and explaining green victimization requires conceptualizing the relationship between capitalism and nature from the perspective of political economic theory (Lynch et al. 2013). In that view, nature is nothing more than a warehouse of raw materials exploited in capital's pursuit of profit (Burkett 2008; Foster 2000). Without the raw material inputs of nature, there can be no production. As Foster (1999, 2000) and Burkett (2008) argue, there is an inherent contradiction between the expansionary tendencies of capitalism and the conservationist tendencies of nature. That contradiction leads capitalism to continually destroy nature, exposing how the health of capitalism promotes the destruction of nature and poor ecological health.

Capital does not keep track of ecological destruction, and continues to consume nature as rapidly as possible to facilitate capital accumulation without concern for the long-run consequences of such activities for ecological sustainability (Foster 2000). Capital can only survive by consuming nature, and the more of nature it consumes, the more it can grow. In this political economic view we can say that throughout capital's life course it must continually commit green crimes against nature in the form of excessive raw material extraction/consumption, the

over-production of commodities beyond nature's reproductive abilities, and with respect to polluting nature. All of these activities limit nature's ability to reproduce itself and to remain viable and sustainable, and become part of the cycle of green victimization.

CONCLUSION

In *Natural Causes: Essays in Ecological Marxism*, James O'Connor (1998) pointed out a rather ironic fact when he wrote "just at the moment when world economy simulates the model... Marx developed in *Capital*, Marxism is dismissed as fatally flawed, a failed enterprise..." (1). Much continues to be written about environmental issues from a radical or Marxist perspective (Jones 2011; Tanuro 2010; Mann 2009). At the same time that radical/Marxist approaches to environmental issues have been increasingly explored, these views have lost their momentum within criminology. Given the emergence of radical/Marxist views with respect to environmental issues in other disciplines, it seems relevant to investigate this approach further.

Radical criminologists must play an increased role in exploring a political economic explanation of green crime and victimization. As we have illustrated, green harms abound. Yet, at the same time, criminologists have tended to ignore these harms. Critical criminologists can decide that green harms are not worthy of discussion, in which case they leave that field of research open to the interpretation of more orthodox criminological research. There are already signs that orthodox criminologists are moving into this area of research (Agnew 2011; 2013). While we welcome increased attention to environment issues and appreciate these works as marking a break from the longstanding tradition of class-biased criminology, we remain concerned that critical criminology will fail to make itself heard on the most important issue facing the world today.

For those already doing green criminology, there is a need to move beyond descriptions of green crimes and their victims, and to explore how these crimes and forms of victimization can be explained. We have provided one example above. In addition, there is also a need for green criminology to expand the ways in which it uses empirical data to examine green crimes and green victimization. While qualitative analysis tells part of the story of green crime, it cannot by itself tell the whole story. Because empirical analysis ties many observations together, it provides a more efficient way to present large quantities of observations about green crime and victimization and appeals to those who require a different form of data to be convinced of the extent of the problem around us.

REFERENCES

- Agnew, Robert. 2011. "Dire Forecast: A Theoretical Model of the Impact of Climate Change on Crime." *Theoretical Criminology* 15(2): 115-139.
- Agnew, Robert. 2013. "It's the End of the World as We Know It: The Advance of Climate Change from a Criminological Perspective." In R. White's (ed), *Climate Change from a Criminological Perspective*. New York: Springer.
- Akimoto, Hajime. 2003. "Global air quality and pollution." *Science* 302(5651): 1716-1719.
- Baccarelli A., A.C. Pesatori, D. Consonni, P. Mocarelli, D.G. Patterson Jr., N.E. Caporaso, P.A. Bertazzi and M.T. Landi. 2005. "Health status and plasma dioxin levels in chloracne cases 20 years after the Seveso, Italy accident." *British Journal of Dermatology* 152:459-465.
- Ballschmiter, K., and M. Zell. 1980. "Baseline Studies of the Global Pollution I. Occurrence of organohalogens in pristine European and Antarctic aquatic environments." *International Journal of Environmental Analytical Chemistry* 8,(1): 15-35.
- Barnosky, Anthony D., Nicholas Matzke, Susumu Tomiya, Guinevere O.U. Wogan, Brian Swartz, Tiago B. Quental, Charles Marshall, Jenny McGuire, Emily L. Lindsey, Katlin C.

- Mcguire, Ben Mersey and Elizabeth S. Ferrer. 2011. "Has the Earth's sixth mass extinction already arrived?" *Nature* 471(7336): 51-57.
- Beirne, Piers. 1999. "For a Nonspeciestist Criminology: Animal Abuse as an Object of Study." *Criminology* 37: 117-147.
- Bennear, Lori S. 2008. "What Do We Really Know: The Effect Of Reporting Thresholds On Inference Using Environmental Right-To-Know Data." *Regulation and Governance* 2(3): 293-315.
- Boyce, James K. 1994. "Inequality as a Cause of Environmental Degradation." *Ecological Economics* 11(3): 169-178.
- Boyce, James K. 2002. *The Political Economy of the Environment*. Cheltenham, UK: Edward Elgar.
- Brook, Barry W., Corey J.A. Bradshaw, Lian Pin Koh, and Navjot S. Sodhi. 2006. "Momentum Drives the Crash: Mass Extinction in the Tropics." *Biotropica* 38(3):302-305.
- Brook, Barry W., Navjot S. Sodhi, and Corey J. A. Bradshaw. 2008. "Synergies among extinction drivers under global change." *Trends in Ecology & Evolution* 23(8): 453-460.
- Brook, Barry W., Navjot S. Sodhi, and Peter KL Ng. 2003. "Catastrophic extinctions follow deforestation in Singapore." *Nature* 424 (6947): 420-426.
- Burkett, Paul. 2008. *Marxism and ecological economics: Toward a red and green political economy*. Chicago: Haymarket Books.
- Burkett, Paul, and John Bellamy Foster. 2006. "Metabolism, energy, and entropy in Marx's critique of political economy: Beyond the Podolinsky myth." *Theory and Society* 35(1): 109-156.
- Camarero, L., I. Botev, G. Muri, R. Psenner, N. Rose and E. Stuchlik. 2009. "Trace elements in alpine and arctic lake sediments as a record of diffuse atmospheric contamination across Europe." *Freshwater Biology* 54(12): 2518-2532.
- Chambliss, William J. and Robert Seidman. 1982. *Law, Order and Power*. Reading, MA: Addison-Wesley.
- Chen, Shuiping 2003. "Heavy metal pollution in China: Origin, pattern and control." *Environmental Science and Pollution Research*, 10(3):192-198.
- Clark, Brett, and Richard York. 2008. "Rifts and shifts: getting to

the root of environmental crises." *Monthly Review* 60(6): 13-24.

Clark, Brett, and Richard York. 2005. "Carbon metabolism: Global capitalism, climate change, and the biospheric rift." *Theory and Society* 34(4): 391-428.

Dahl, Thomas E., and Gregory J. Allford. 1997. "History of Wetlands in the Coterminous United States." United States Geological Survey Water Supply Paper # 2425. United States Geological Survey: Reston, VA.

De Marchi, Scott and James T. Hamilton. 2006. Assessing the accuracy of self-reported data: An evaluation of the toxic release inventory. *Journal of Risk Uncertainty* 32: 57-76.

Duhigg, Charles. 2009. "Clean Water Law are Neglected at a Cost in Suffering." *New York Times* September 12. Retrieved June 1, 2014.

http://www.nytimes.com/2009/09/13/us/13water.html?page_wanted=all

Environmental Protection Agency. 2009. *Air Quality Index: A Guide to Air Quality and Your Health*. EPA-456/F-09-002. U.S. Environmental Protection Agency Office of Air Quality Planning and Standards Outreach and Information Division Research Triangle Park, NC.

Espey, David K., Xiao-Cheng Wu, Judith Swain, Charles Wiggins, Melissa Jim, Elizabeth Ward, Phyllis A. Wingo, Holly L. Howe, Lynn A.G. Reis, Barry A. Miller, Ahmendin Jemal, Farque Ahmed, Nathaniel Cobb, Judith S. Kaur and Brenda K. Edwards. 2007. "Annual Report to the Nation on the Status of Cancer, 1975-2004, Featuring Cancer in American Indians and Native Alaskans." *Cancer* 110(10): 2119-2152.

Foster, John Bellamy. 2005. "The treadmill of accumulation: Schnaiberg's environment and Marxian political economy." *Organization & Environment* 18(1): 7-18.

Foster, John Bellamy. 2002. "Capitalism and ecology: the nature of the contradiction." *Monthly Review* 54(4): 6-16.

Foster, John Bellamy. 2000. *Marx's Ecology: Materialism and Nature*. NY: Monthly Review Press.

Foster, John Bellamy. 1999. "Marx's theory of metabolic rift: Classical foundations for environmental sociology." *American*

Journal of Sociology 105(2): 366-405.

- Foster, John Bellamy. 1997. "The Age of Planetary Crisis: The Unsustainable Development of Capitalism." *Review of Radical Political Economics* 29(4): 113-142.
- Geertrui, Cazaux. 1999. "Beauty and the Beast: Animal Abuse for a Nonspeciesist Criminological Perspective." *Crime, Law and Social Change* 31: 105-126.
- Gibbs, Carole, Meredith Gore, Edmund McGarrell and Louie Rivers III. 2010. "Introducing Conservation Criminology: Towards Interdisciplinary Scholarship on Environmental Crimes and Risks." *British Journal of Criminology* 50:124-144.
- Hardy, J.T. 1982. "The Sea Surface Microlayer: Biology, Chemistry and Anthropogenic Enrichment." *Progress in Oceanography* 11(4): 307-328.
- Hollert, Henner. 2013. "Processes and environmental quality in the Yangtze River." *Environmental Science and Pollution Research* 20: 6904-6906.
- Holmes, A. L., S. S. Wise and J. P. Wise. 2008. "Carcinogenicity of hexavalent chromium." *Indian Journal of Medical Research* 128: 353-372.
- Hu, Xinxin, Wei Shi, Fengxian Zhang, Fu Cao, Guanjiu Hu, Yingqun Hao, Si Wei, Xinru Wang, and Hongxia Yu. 2013. "In vitro assessment of thyroid hormone disrupting activities in drinking water sources along the Yangtze River." *Environmental Pollution* 173: 210-215.
- Jemal, Ahmendis, Melissa M. Center, Carol DeDantis and Elizabeth M. Ward. 2010. "Global Patterns of Cancer Incidence and Mortality Rates and Trends." *Cancer Epidemiology: Biomarkers & Prevention* 19(8): 1893-1907.
- Jones, Andrew W. 2011. "Solving the Ecological Problems of Capitalism: Capitalist and Socialist Possibilities." *Organization and Environment* 24(1): 54-73.
- Johnson, Barry L., 1999. "A Review of the Effects of Hazardous Waste on Reproductive Health." *American Journal of Obstetrics and Gynecology* 180: S12-S16.
- Kovel, Joel. 2007. *The Enemy of Nature: The End of Capitalism of the End of the World?* New York: Zed Books.

- Landi M.T., D. Consonni, D.G. Patterson Jr., L. L. Needham, G. Lucier, P. Brambilla, M.A. Cazzaniga, P. Mocarelli, A.C. Pesatori, P.A. Bertazzi and N.E. Caporaso. 1998. "2,3,7,8-Tetrachlorodibenzo-p-dioxin plasma levels in Seveso 20 years after the accident." *Environmental Health Perspectives* 106:273–277.
- Lewtas, Jollen. 2007. "Air Pollution Combustion Emissions: Characterization of Causative Agents and Mechanisms Associated with Cancer, Reproductive and Cardiovascular Effects." *Mutation Research/reviews in Mutation Research* 636(1-3): 95-133.
- Liu, Chia-Chia, Chih-Cheng Chen, Trong-Neng Wu and Chung-Yu Yang. 2008. "Association of Brain Cancer with Residential Exposure to Air Pollution in Taiwan." *Journal of Toxicology and Environmental Health, Part A* 71(5): 310-314.
- Lomolino, Mark V., Rob Channell, David R. Perault, and Gregory A. Smith. 2001. "Downsizing nature: anthropogenic dwarfing of species and ecosystems." Pp. 223-243 in J. Lockwood and M. McKinney's (eds), *Biotic homogenization*. NY: Springer.
- Lynch, Michael J. 1990. "The Greening of Criminology: A Perspective on the 1990s." *Critical Criminologist* 2:3-4,11-12.
- Lynch, Michael J., Michael A. Long, Kimberly L. Barrett and Paul B. Stretesky. 2013. "Is it a Crime to Produce Ecological Disorganization? Why Green Criminology and Political Economy Matter in the Analysis of Global Ecological Harms." *British Journal of Criminology* 55(3): 997-1016.
- Lynch, Michael J., & Paul B. Stretesky. 2003. "The Meaning of Green: Contrasting Criminological Perspectives," *Theoretical Criminology* 7(2): 217–238.
- Lynch, Michael J., Paul B. Stretesky and Ronald G. Burns. 2004a. "Determinants of Environmental Law Violation Fines Against Oil Refineries: Race, Ethnicity, Income and Aggregation Effects." *Society and Natural Resources* 17(4): 333-347.
- Lynch, Michael J., Paul B. Stretesky and Ronald G. Burns. 2004b. "Slippery Business: Race, Class and Legal Determinants of Penalties Against Petroleum Refineries." *Journal of Black Studies* 34(3): 421-440.
- Mann, Geoff. 2009. "Should Political Ecology be Marxist? A Case

- for Gramsci's Historical Materialism." *Geoforum* 40(3): 335-344.
- Marx, Karl. 1978[1867]. *Capital, Volume I*. NY: International Publishers.
- McCormack, Valerie A. and Joachim Shuz. 2011. "Africa's Growing Cancer Burden: Environmental and Occupational Contributions." *Cancer Epidemiology* 36, 1:1-7.
- Mdzinarishvili, Tengiz, Michael X. Gleason and Simon Sherman. 2010. "Estimation of Hazard Functions in the Log-Linear Age-Period-Cohort Model: Application to Lung Cancer Risk Associated with Geographical Area." *Cancer Informatics* 9:67-78.
- Morello-Frosch, Rachel, Manuel Pastor, Carlos Porras and James Sadd. 2002. "Environmental Justice and Regional Inequality in Southern California: Implications for Future Research." *Environmental Health Perspectives* 110(S2): 149-154.
- Nilsson B., E. Gustavasson-Kadaka, B.A. Bengtsson and B. Jonsson. 2000. "Pituitary adenomas in Sweden between 1958 and 1991: incidence, survival, and mortality." *Journal of Clinical Endocrinology and Metabolism* 85:1420-1425.
- Nriagu, Jerome O. 1989. "A global assessment of natural sources of atmospheric trace metals." *Nature* 338(6210): 47-49.
- O'Connor, James F. 1998. *Natural Capitalism*. NY: Guilford.
- Ramis, R., P. Diggle, E. Boldo, J. Garcia-Perez, P. Fernandez and G. Lopez-Abente. 2011. "Industrial Pollution and Cancer in Spain: A Simple Industrialization Index." *Journal of Epidemiology and Community Health* 65: A291-A301.
- Reilly, William R. 1990. *The Green Thumb of Capitalism*. 21-Z-1001. Washington, DC: US EPA. <http://goo.gl/EDp740>. Accessed December 29, 2013.
- Ritter, Malcolm and Mari Yamaguchi. 2011. "Future cancers from Fukushima disaster may be hidden." Accessed June 1, 2014. www.msnbc.msn.com/id/45376302/ns.health-cancer
- Schnaiberg, Allan. 1980. *The Environment: From Surplus to Scarcity*. New York, NY: Oxford University Press.
- Schnaiberg, Allan, David N. Pellow and Adam Weinberg. 2002. "The Treadmill of Production and the Environmental State." Pp

15-32 in A.P.J. Mol and F. H. Buttel (eds.) *The Environmental State Under Pressure*. Bingley, UK: Emerald Group Publishing Limited.

- South, Nigel. 1998. "A Green Field for Criminology? A Proposal for a Perspective." *Theoretical Criminology* 2(2):211-223.
- Steffen, Will, Jacques Grinevald, Paul Crutzen, and John McNeill. 2011. "The Anthropocene: conceptual and historical perspectives." *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 369 (1938): 842-867.
- Stork, Nigel E. 2010. Re-assessing current extinction rates. *Biodiversity and Conservation* 19 (2): 357-371.
- Stretesky, Paul B., Michael A. Long and Michael J. Lynch. 2013. *The treadmill of crime: Political economy and green criminology*. New York: Routledge.
- Stretesky, Paul B., and Michael J. Lynch. 2002. "Environmental Hazards and School Segregation in Hillsborough County, 1987-1999." *The Sociological Quarterly* 43(4): 553-573.
- Stretesky, Paul B., and Michael J. Lynch. 1999a. "Corporate Environmental Violence and Racism." *Crime, Law and Social Change* 30(2): 163-184.
- Stretesky, Paul B., and Michael J. Lynch. 1999b. "Environmental Justice and the Prediction of Distance to Accidental Chemical Releases in Hillsborough County, Florida." *Social Science Quarterly* 80(4): 830-846.
- Tanabe, Shinsuke, Toru Mori, Ryo Tatsukawa, and Nobuyuki Miyazaki. 1983. Global pollution of marine mammals by PCBs, DDTs and HCHs (BHCs). *Chemosphere* 12(9): 1269-1275.
- Tanuro, Daniel. 2010. "Marxism, Energy and Ecology: The Moment of Truth." *Capitalism Nature Socialism* 21(4): 89-103.
- Thomas, Chris D., Alison Cameron, Rhys E. Green, Michel Bakkenes, Linda J. Beaumont, Yvonne C. Collingham, Barend F. N. Erasmus, Marinez Ferreira de Siqueira, Alan Grainger, Lee Hannah, Lesley Hughes, Brian Huntley, Albert S. van Jaarsveld, Guy F. Midgley, Lera Miles, Miguel A.Ortega-Huerta, A. Townsend Peterson, Oliver L. Phillips and Stephen E. Williams. 2004. "Extinction Risks from climate change." *Nature* 427: 145-148.

- Thuiller, W., M.B. Araújo, R. G. Pearson, R. J. Whittaker, L. Brotons, and S. Lavorel. 2004. "Biodiversity conservation: Uncertainty in predictions of extinction risk." *Nature* 430, 6995: doi:10.1038/nature02719
- United Nations Environmental Programme. 2010. *Water Quality Facts and Statistics*.
http://www.unwater.org/wwd10/downloads/WWD2010_Facts_web.pdf. Accessed December 15, 2013.
- Upton, John. 2013. "Where is the worst air in the world?" *The Slate*. Accessed June 1, 2014.
http://www.slate.com/articles/health_and_science/medical_examiner/2013/03/worst_air_pollution_in_the_world_beijing_delhi_ahwaz_and_ulaanbaatar.html.
- Wang Ying, Xue. Li, Baohua H. Li, Zhenyao Y. Shen, Chenghong H. Feng, and Yaxin Chen. 2012a. "Characterization, sources, and potential risk assessment of PAHs in surface sediments from nearshore and farther shore zones of the Yangtze estuary, China." *Environmental Science and Pollution Research* 19:4148–4158.
- Wang, Ying, Zhifeng Yang, Zhenyao Shen, Zhenwu Tang, Junfeng Niu, and Fan Gao. 2011. "Assessment of heavy metals in sediments from a typical catchment of the Yangtze River, China." *Environmental Monitoring and Assessment* 172 (1-4): 407-417.
- Wen, Tang and Gao Zitan. 2011. "Yangtze River pollution imperils hundreds of millions." *The Epoch Times* (English edition). Accessed June 1, 2014.
<http://www.theepochtimes.com/n2/china-news/yangtze-river-pollution-imperils-hundreds-of-millions-144822.html>
- Wong, Edward. 2013. "On a scale of 0 to 500, Beijing's air quality tops 'crazy bad' at 755." *The New York Times*. Accessed June 1, 2014.
<http://www.nytimes.com/2013/01/13/science/earth/beijing-air-pollution-off-the-charts.html>
- White, Rob. 2011. *Transnational Environmental Crime: Toward an Eco-global Criminology*. Oxford, UK: Taylor & Francis.
- World Health Organization (WHO). 2002. *World Health Report, 2002: Reducing Risks, Promoting Healthy Life*.

http://www.who.int/whr/2002/en/whr02_en.pdf. Retrieved December 15, 2013.

Yancik, Rosemary. 2005. "Population Aging and Cancer: A Cross-National Concern." *Cancer Journal* 11(6): 437-441.

Yi, Yujun, Zhifeng Yang, and Shanghong Zhang. 2011. "Ecological risk assessment of heavy metals in sediment and human health risk assessment of heavy metals in fishes in the middle and lower reaches of the Yangtze River basin." *Environmental Pollution* 159(10): 2575-2585.