

The Effects of Mountaintop Removal Coal Mining on Mental Health, Well-Being, and Community Health in Central Appalachia

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Abstract

Mountaintop removal coal mining (MTR) is a form of surface mining frequently utilized in Central Appalachia. MTR is exactly what the name suggests; mountaintops are removed to expose coal seams for cheap extraction. The harmful environmental implications of this form of mining are well documented. Research also shows that MTR has detrimental effects on human health and on the functioning of local communities. Although virtually no research has been undertaken on the psychological effects of MTR, reports of people living close to MTR sites along with research on similar environmental problems suggest a high probability of an increased risk of mental health problems for those living near MTR sites. Solastalgia due to drastic environmental changes, eco-anxiety, and stress resulting from the dangerous and noxious aspects of MTR are likely among the most significant contributors to this increased risk of mental health problems. High rates of unemployment and poverty and lower rates of educational attainment persist in Central Appalachia despite significant gains in other areas of Appalachia. These pre-existing socioeconomic problems compound the stressors created by MTR.

Central Appalachia is composed of the coal-producing counties in eastern Kentucky, eastern Tennessee, southwest Virginia, and southern West Virginia (Energy Information Administration, 2009). Coal mining has been the major

industry in much of Central Appalachia for over a century (Eller, 2008). Historically, most of this mining has been accomplished through underground methods; but more recently, coal mining on the earth's surface has become increasingly prevalent (Burns, 2007). Mountaintop removal coal mining (MTR), an extreme form of surface mining, is just what the name suggests; mountaintops are literally removed to expose the coal embedded in the mountain for relatively inexpensive extraction (Shapiro, 2010). In MTR, one of the first steps in accessing the coal is to clear cut the forests that cover the mountains to be mined (Burns, 2007; Reece, 2006). After the trees are removed, explosives are used to loosen the rock and topsoil above a coal seam; coal companies term the material above the coal seam the "overburden" (Palmer et al., 2010). The excess rock and soil is then pushed by enormous earth-moving equipment or dumped by massive trucks into the surrounding valleys, creating huge "valley fills" (Epstein et al., 2011; Reece, 2006). Through this process, the coal seam is exposed and the coal can then be removed quickly, cheaply, and efficiently (Smecker, 2009). This efficiency for coal companies comes at a high price for the ecosystems and communities near MTR sites.

The issue of MTR in Central Appalachia is an environmental justice issue. The long history of reliance on coal in Central Appalachia has set the stage for the contemporary practice of MTR, despite its environmental harmfulness and its negative effects on the health of local communities. The coal industry has long been the major economic engine of the region and has historically been an important source of employment; however, coal mining is a mono-economy in Central Appalachia, significantly limiting the possibilities for economic diversification and development of the region (Burns, 2007; Eller, 2008). Despite the rich deposits of natural resources in the

region and decades of economic success for the coal industry, the people of Central Appalachia are some of the poorest in the United States (Eller, 2008). Many Central Appalachian residents who live near MTR sites strongly support the coal industry and MTR, seeing any negative effects as necessary sacrifices for possible employment opportunities (Woods, 2010). Others living in communities directly affected by MTR oppose the process vehemently (Eller, 2008).

Labor and environmental injustices against those deemed less worthy in society are not uncommon; there are many cases of minority groups in the US bearing an unequal burden of the environmental costs of the nation's "progress" (Bullard, 2005). Although Appalachian people are not typically considered a minority group because of the large percentage of White inhabitants of the region, the same process of "othering" that renders certain groups of people worthy of discrimination in the public mind has often been applied to Appalachians (Scott, 2010). Stereotypes of the "hillbilly" and "red-neck" have helped to camouflage the true nature of the economic situation in the region, creating a façade of personal responsibility for poverty in a region mired in systemic oppression (Fraley, 2007; Scott, 2010). These stereotypes rendering Central Appalachians unworthy of the privileges to which many Americans are entitled have also helped to justify the entrenched poverty of the region and the destruction of the land (Barry, 2001).

Mountaintop removal coal mining takes more than an environmental or physical toll on those who live in its wake. There are also psychological implications to environmental problems. In the following pages, some of the environmental, health, community, and psychological effects of MTR are explored. Although virtually no research has been done on the psychological implications of MTR in Central Appalachia, enough information exists to suggest an increased risk of mental health problems for those living near MTR sites.

The Effects of MTR in Central Appalachia

Mountaintop removal coal mining is a form of surface mining that is beset by controversy in the Central Appalachian region. Proponents of the process tend to emphasize economic benefits of MTR. High rates of unemployment and poverty have long been a problem in Central Appalachia, and coal mining of any type provides much-needed employment opportunities (Appalachian Regional Commission, 2009). In addition, both underground and surface coal mining positions offer wages and benefits far better than those of most other employment options (West Virginia Coal Association, 2010). Superior miner safety in surface mines is another benefit cited by supporters of MTR. Supporters also argue that surface mining can be undertaken without significant damage to local ecosystems and that

reclaimed MTR sites provide flat land for projects such as golf courses, industrial parks, and prisons that will enhance economic development (Kentucky Coal Association, 2008; West Virginia Coal Association, 2010).

On the other hand, opponents of MTR argue that it does little to improve the economic situation in Central Appalachia. Indeed, there is a correlation between high poverty rates and high rates of MTR in Central Appalachian counties (Epstein et al., 2011; Reece, 2006). In addition, MTR mining requires far fewer workers than underground mining because of the high degree of mechanization involved (Burns, 2007; Kentucky Coal Association, 2008; West Virginia Coal Association, 2010). Further, mounting scientific evidence is revealing devastating effects of MTR on environmental and human health.

Environmental effects

The environmental and health impacts of MTR are beginning to be understood. To date, over 500 mountaintops in Central Appalachia have been destroyed by MTR (Epstein et al., 2011; Harkinson, 2011). According to U.S. Environmental Protection Agency (EPA) estimates, by 2012, MTR projects in Appalachia will have seriously damaged an area as large as the state of Delaware (Lovett, 2011; McQuaid, 2009). Research has uncovered clear evidence of harmful implications of MTR, such as water pollution, flooding, and forest loss (Palmer et al., 2010; Pond et al., 2008; Wickham et al., 2007).

One of the MTR activities with the greatest environmental impact is the creation of valley fills. Valley fills frequently bury headwater streams, creating significant disruption of the ecosystems of the buried streams and of the streams and rivers that are fed by these headwater streams (Palmer et al., 2010; Pond et al., 2008). Valley fills can contain more than 300 million tons of mining debris and extend downstream as far as 6 miles from the original mining site (Spadaro, 2009). According to the EPA, 1,200 miles of headwater streams in Central Appalachia were directly impacted by MTR between 1992 and 2002; since 2002, many more miles of streams have been impacted (McQuaid, 2009; Shnayer-son, 2008; U.S. Environmental Protection Agency, 2005). The biodiversity of Appalachian headwater streams is very rich, second only to the tropics (Epstein et al., 2011; Morse et al., 1993). Notably, a recent study found evidence of continued water quality degradation from surface mines that had ceased operation nearly two decades ago (Lindberg et al., 2011). Clear-cutting also has devastating effects. Like the streams of Central Appalachia, its forests are some of the most biodiverse in the world. Over a million acres of these forests have been destroyed or severely damaged by MTR (Hufford, 2009; McQuaid, 2009; Palmer et al., 2010). The loss

of these forests has significant negative effects on wildlife and plant species (Reece, 2006).

In addition, there is a clear risk of flooding following mountaintop removal and valley fill operations (Phillips, 2004). The destruction of the trees and topsoil on ridges increases the potential for flooding by eliminating groundcover and increasing run off (Negley & Eshleman, 2005). Valley fills contribute to the risk for flash floods by burying headwater streams that would typically contain some of the rainwater.

The blasting done during MTR also creates problems. It shakes people's homes, cracking foundations and walls, knocking items off shelves, and separating walls from floors (Burns, 2007; Stockman, 2004). Further, blasting contributes to the destruction of wells and the pollution of water through the cracking of aquifers (Blakeney & Marshall, 2009). The explosives used to remove the "overburden" are a mix of ammonium nitrate and diesel fuel, the same mixture that Timothy McVeigh used in the Oklahoma City bombing (Reece, 2009). However, these blasts are 10 times stronger than the Oklahoma City blast and occur thousands of times a day across Central Appalachia (Reece, 2009).

Health effects

Pollution generated by coal mining (both MTR and underground mining) creates serious health problems for those who live in the coal fields (Hendryx & Ahern, 2008; Hitt & Hendryx, 2010). Health effects of this pollution include increased rates of hospitalization, pulmonary disease, hypertension, kidney disease, heart disease, and cancer (Hendryx & Ahern, 2008; Hendryx & Zullig, 2009; Hendryx et al., 2007, 2010). In the long term, drinking water polluted by coal mining processes can produce bone damage; cancers of the digestive tract; and liver, spleen, and kidney failure (O'Bryant et al., 2011). In West Virginia, women residing in coal mining counties are 16% more likely to give birth to low birth weight infants than are other West Virginian women (Ahern et al., 2010). Further, poor birth outcomes are elevated in MTR regions in comparison to areas with other types of coal mining (Epstein et al., 2011). Recent research has also uncovered an association between residence in MTR communities and an increased risk of birth defects (Ahern et al., 2011).

Children in MTR regions of Central Appalachia suffer from the negative health effects of coal dust, including asthma, severe headaches, mouth blisters, and frequent runny noses (Reece, 2006). Those exposed to water contaminated by various MTR processes experience high rates of nausea, vomiting, and shortness of breath (Baller & Pantilat, 2007; Blakeney & Marshall, 2009). Residents report skin problems and other ailments as a result of using water polluted by mining, even for bathing (Blankenship, 2006; Reece, 2006).

Mental health implications of MTR

Emerging evidence suggests that MTR may have significant negative psychological effects upon those living in its shadow. The Appalachian Regional Commission found higher rates of substance abuse and mental health problems in coal mining regions in general than in the rest of Appalachia (Zhang et al., 2008). Zullig and Hendryx (2011) examined the health-related quality of life for residents of MTR counties, counties with other forms of coal mining, and counties with no mining in Central Appalachia. Residents of MTR counties reported the most days of poor physical health, the poorest mental health, and most activity limitation (Zullig & Hendryx, 2011). In addition, reports from those living near MTR suggest that mental health problems such as traumatic stress symptoms, anxiety, insomnia, drug abuse, and depression may be widespread in these regions (Epstein et al., 2011; Reece, 2009; Stockman, 2004).

Solastalgia

Some residents leave MTR communities after the operation begins near their homes. Others remain in communities that are forever changed. Their very landscape is altered, and they no longer know what to expect from their environment (Albrecht, 2010a). They may no longer have access to clean water, they experience unusual patterns of flooding, the types of wildlife that the ecosystem can support have changed, and they may not be able to participate in the recreational activities that the ecosystem once afforded them. In short, their sense of place has been undermined; even though they have not left home, home has become unfamiliar (Albrecht, 2010b). Central Appalachians living in communities transformed by MTR may experience feelings of homesickness without ever leaving home (Albrecht, 2006). *Solastalgia* is a term coined to describe this place-based distress engendered by unwelcome environmental change (Albrecht, 2010a; Albrecht et al., 2007). Solastalgia is a psychoterratic mental health issue; that is, it is an earth-related mental health problem stemming from negatively perceived and felt environmental change (Albrecht, 2011). Solastalgia is especially distressing for those who directly witness the destruction of their home environment and who feel intimately connected to the place in which they are rooted (Albrecht, 2005). Like others in largely rural cultures, Appalachians tend to have a keen sense of connection to the land. Many Appalachians have a sense of historical and spiritual place attachment that connects them to family land, to ancestors who have lived on the land before them, and to their children who they hope will live on the land after them (Howell, 2002). While this place attachment typically serves as a grounding source of strength, it makes the destruction of the land a far more painful blow.

Research on other forms of environmental problems, such as pollution from toxic waste dumps, soil pollution, industrial activity, and technological accidents reveals mental health effects on people living in close proximity to the problems (Baum & Fleming, 1993; Downey & Van Willigen, 2005; Vandermoere, 2008). In addition, studies of natural disasters and forced relocation have documented feelings of grief, loss, and mourning (Rogan et al., 2005).

Stress

People who are experiencing the psychoterratic distress of solastalgia may be further stressed by worries about the impact of mining on their health (Connor et al., 2004; Higginbotham et al., 2007; Moffatt & Pless-Mulloli, 2003). MTR blasting engenders stress for residents who must deal with the startling noise of blasting and who worry about damage to their homes and wells (Epstein, et al., 2011; Stockman, 2004). In addition, survivors of flooding from MTR activity remain concerned about future flooding (Gunnore, 2009). These stressors produced by MTR can best be conceptualized as ambient stressors (Boardman et al., 2008), which are defined as chronic, pervasive, intractable, and aversive conditions of the environment to which people must adapt (Boardman et al., 2008; Campbell, 1983; Cohen et al., 1986; Topf, 2000). In addition to these ambient stressors, the existential stress of environmental change may also be a problem in communities near MTR sites. Eco-anxiety can be thought of as the feelings of powerlessness and uncertainty about the future associated with environmental problems (Albrecht, 2011). This stress or anxiety can sometimes lead to eco-paralysis, a condition which is characterized by a sense of apathy, disengagement, anger, or denial regarding ecological problems (Albrecht, 2011).

Chronic stress like that described above has many well-known negative physical and psychological implications such as immune suppression, high blood pressure, digestive problems, slowed tissue repair and regeneration, infertility, inhibition of growth in children, fatigue, and the increased risk of anxiety and depression (Beck, 2007; Carlson, 2010; Sapolsky, 1998). Prolonged exposure to stress hormones both prenatally and throughout the life span can lead to memory and learning problems as well (Carlson, 2010; Lupien et al., 2009).

Stress and socioeconomic status (SES). Socioeconomic status influences both a person's likelihood of being exposed to environmental problems and the probability of successfully coping (Boardman et al., 2008). MTR sites are located in Central Appalachia because of the large deposits of coal there. However, MTR mining is also made possible by the socioeconomic position of the people in the region; people with fewer economic and educational resources

often do not have the political voice to oppose harmful industrial practice or may be so desperate for employment that they do not speak out (Bullard, 2005; Scott, 2007). Research has consistently shown that those of lower socioeconomic and minority statuses have the poorest health outcomes (Baum et al., 1999; Pearlin et al., 2005; Taylor, Repetti, & Seeman, 1997). Because differences in people's health correspond to inequalities in SES, one can think of health itself as stratified (Pearlin et al., 2005). Some of these disparities are likely the result of the toxic conditions to which disadvantaged groups are exposed (Bullard, 2005). Other reasons cited for these inequalities include lifestyle differences (e.g., increased rates of smoking in low-income groups) and unequal access to healthcare (Pearlin et al., 2005).

Although these explanations of health disparities are reasonable, differential exposure to stressors in general offers a more complete explanation for disparities (Baum et al., 1999). Those belonging to disadvantaged economic and racial minority groups are likely to be exposed to a stress load much greater than those with more advantages and coping resources. Disadvantaged groups often experience stressors that are chronic, repeated, and severe (Baum et al., 1999; Pearlin et al., 2005). In Central Appalachia, MTR heaps another severe stressor on residents who are already dealing with poverty and unemployment, low education attainment, less access to quality medical care, and poorer health. Problems stemming from the lack of financial resources are compounded by community problems in low SES areas; limited access to transportation, resources, work options, and recreational opportunities take a toll on coping ability (Taylor et al., 1997).

Mountaintop removal coal mining also undermines one of the most important coping resources available to community members: close-knit social support networks. As outlined above, community divisions surrounding the issue and out-migration are often a result of MTR (Bell, 2009; Wakefield & Elliott, 2000). Social support is among the most important resources for coping with chronic stress, making loss of this support especially problematic (Baum & Fleming, 1993; Boardman, 2004).

Post-traumatic stress disorder (PTSD). Anecdotal reports compare symptoms resulting from the problems associated with MTR such as flooding and blasting to the symptoms of PTSD. It may be the case that, for some, stressors associated with MTR are acute and severe enough to precipitate this disorder. One West Virginia resident stated that the effects of MTR on community members were similar to the "shell shock" he witnessed during his time as a soldier in Vietnam (Biggers, 2011). Numerous residents subjected to flooding report living in fear of another flood each time it rains (Gunnore, 2009;

Hufford, 2009). Others report that their children experience fear, anxiety, and nightmares as they struggle with the possibility of another flood or of a shortened life span for them or their family members (Blankenship, 2006). Residents report sleep difficulties because of constant worry about MTR effects (Stockman, 2004). Some report fear for their physical safety during blasting, fear that causes them to experience increased heart rate and stomach upset at the sound of each blast (Stockman, 2004).

Mountaintop removal coal mining has the potential to seriously affect the mental health of those who live near it. From solastalgia to PTSD, the desolating change produced by MTR may have serious implications for mental health and wellness in Central Appalachia. The strong place connection that is a cultural norm in the region is likely to amplify the psychoterratic effects of MTR. Threats of MTR to mental health are further intensified by the high rates of poverty and unemployment in the region and by the negative effects of MTR on community functioning and social support networks.

Community effects

Mountaintop removal coal mining has negative effects on community life and culture in Central Appalachia. As stated above, it creates divisions in mountain communities between those who oppose the practice and those who support it. But the effects on community life and culture go far beyond these divisions alone. Residents of MTR communities lose access to de facto common land where they once hunted, fished, picked berries, dug ramps (wild leeks), and searched for ginseng and other medicinal herbs and edible plants (Burns, 2007; Hufford, 2002). The pollution of streams and rivers that once provided swimming and fishing opportunities is another painful blow for a people who spend much of their recreational time in nature (Blakeney & Marshall, 2009).

Mountaintop removal coal mining also affects family cemeteries. Although there are laws protecting family cemeteries, these burying grounds have at times been destroyed in MTR areas, simply pushed into the valley fills with the rest of the “overburden” (House, 2011). At other times, the remains of family members have been disinterred and moved off of mine property to other locations (Burns, 2007; Young, 2008). Cemeteries that are left behind are subject to damage from blasting and are difficult to access because of the mining surrounding them (Gibson, 2006; Reece, 2009).

Further, the conflict between those who support the coal companies because of the jobs generated by MTR and those who oppose them because of the negative effects of MTR often creates insurmountable rifts in once tight-knit communities (Burns, 2007; Smecker, 2009). Many residents fear speaking out against coal

companies when these companies serve as the sole employer in the region that pays a decent “breadwinner’s” wage, no matter how few of those jobs are actually available to community members (Scott, 2007). Those vocal in their opposition to MTR have been subjected to threats and violence at times by neighbors and coal mine employees who support the practice (Gibson, 2006; Gunnoe, 2009).

Communities are also disrupted when families are displaced and small towns or hollows emptied of their residents because of MTR activities (Bonds, 2009; Hufford, 2009; Janofsky, 1998). Coal companies often aggressively pressure homeowners living near proposed MTR sites to sell their land to the companies (Barry, 2001; Connor et al., 2004). In addition, when company representatives offer to buy property, they often ask the seller to sign a document stating that he or she will not speak out against company activities or move back into the area (Barry, 2011; Ward, 1998). For those who withstand the pressure to leave, entrapment is a problem. Property values fall, and as others leave the area, people are unable to later sell their property at high enough prices to enable them to relocate (Fraser et al., 2005; Hufford, 2009). This displacement seems especially egregious when one considers the importance attached to place in Appalachian culture (Howell, 2002; Hufford, 2009).

Conclusion

Although little to no research has been done on the mental health effects of MTR, research on similar environmental problems and reports from residents of MTR communities suggests that significant mental health problems including solastalgia, stress, eco-anxiety, eco-paralysis, and PTSD are likely for those living in close proximity to MTR. In addition, the well-being of communities near MTR operations is seriously endangered. In an area already plagued by socioeconomic inequalities, research on the extent of mental health and community problems is urgently needed to complement growing bodies of research on the health and environmental costs of MTR. Attention should be given to the prevention and amelioration of the psychological costs of MTR for people in Central Appalachia. The well-being of Central Appalachians is not a justifiable sacrifice for cheap energy and high corporate profits.

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