THE SHAPE OF APPALACHIA TO COME: COAL IN A TRANSITIONAL ECONOMY

RANDAL A. STROBO, JD, MEM†

> When Robert Kennedy was about to get into his car to drive away, he turned around and came back to my husband. He took him by the hand and he said, "Mr. Caudill, we're going to come back and we're going to do something about all this." And much has been done. But there is an awful lot more to do.
>
> - Ann Caudill[1]

I. INTRODUCTION

The typical reason given by environmentalists to justify ending intrusive surface mining practices in Appalachia is that such practices are devastating to the environment and health of the region. The mining industry's response is usually two-fold. First, they claim that mining practices such as mountain top removal (MTR) do not harm the environment and, instead, improve the property by allowing development on the mountain and enhancing the habitat.[2] Second, even if the environment is being harmed, that harm is a small price to pay for the benefits that the coal industry provides in terms of jobs and energy. Despite these claims, recent developments show that the environmental and health impacts of coal mining—and MTR mining in particular—are more severe than previously thought.[3]

The impacts of coal mining depend on the method of mining and there are numerous ways to mine coal in central Appalachia. The particular method used depends on the geology, terrain, and accessibility of the underlying coal seam. Four of the most commonly used methods are contour mining, auger or highwall mining, area mining, and underground mining. MTR mining can be defined as

---

† This article would not have been completed without the time, assistance, and patience of the following: Emily Strobo, Max Piana, Tom FitzGerald, Hank Graddy, John Morgan, Margaret Palmer, Samir Doshi, Nick Robinson, Louis Kotze, Williemien du Plessis, Anel du Plessis, Justin Maxson, Ken Ward, Evan Hansen, Kristin Tracz, Laura Bozzi, the Yale FES Class of 1980 Fund, and the Coca Cola World Fellows Program.

1. ERIK REECE, LOST MOUNTAIN—A YEAR IN THE VANISHING WILDERNESS 194–95 (2006).

2. NAT'L MINING ASS'N, MOUNTAINTOP MINING FACT BOOK (2009), http://www.nma.org/pdf/fact_sheets/mtm.pdf.

3. These impacts include the increase of metals in the surrounding waterbodies; the filling of headwaters, streams, and wetlands; the fragmentation of forests; the compaction of soils; unstable coal slurry ponds; various indirect impacts on greenhouse gas (GHG) emissions and coal combustion pollutant release; and public health and safety impacts to the surrounding communities. *See* ENV'T PROT. AGENCY, MOUNTAINTOP MINING/VALLEY FILLS IN APPALACHIA: FINAL PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT (2005), http://www.epa.gov/region3/mtntop/pdf/mtmvf_fpeis_summary.pdf.

mining using one or more of these methods (with the exception of underground mining) in mountainous areas.[4] Another important aspect of MTR is the dumping of overburden into the surrounding valleys between mountains. In the now infamous case, *Bragg v. Robertson*,[5] the Court describes the impacts of these "valley fills":

> When valley fills are permitted in intermittent and perennial streams, they destroy those stream segments. The normal flow and gradient of the stream is now buried under millions of cubic yards of excess spoil waste material, an extremely adverse effect. If there are fish, they cannot migrate. If there is any life form that cannot acclimate to life deep in a rubble pile, it is eliminated. No effect on related environmental values is more adverse than obliteration. Under a valley fill, the water quantity of the stream becomes zero. Because there is no stream, there is no water quality.[6]

The environmental impacts are just one of the many challenges the coal mining industry in central Appalachia is facing. Several studies show that coal is becoming more difficult, and therefore more expensive to mine in Appalachia, and the coal industry is in decline because of competition with cleaner energy sources such as renewables and natural gas.[7] In addition, as significant factors in mine permitting, recent legal precedent and regulatory requirements based on current science require the coal industry and federal and state governments to take a hard look at the environmental and community health effects.[8] Moreover, the Appalachian coal mines are being out-competed by the coal mines in the western United States, where coal is more plentiful and can be accessed more readily.[9] In light of these increased environmental, health, legal, and competitive market impacts, the coal industry is losing its prestige as a significant contributor to central Appalachia's regional economy and livelihood. Unfortunately, central Appalachia's economy, up to this point, has failed to diversify, and because of this, the impact of the coal industry has a more significant impact on the Appalachian economy than it would have elsewhere.[10] Furthermore, coal is a finite resource that is unsustainable, and the ecological damage caused by the more intrusive types of coal mining such as MTR is largely irreversible.[11]

In a sense, Appalachia has been preparing for a transition away from coal

---

4. GOV'T ACCOUNTABILITY OFFICE, SURFACE COAL MINING—CHARACTERISTICS OF MINING IN MOUNTAINOUS AREAS OF KENTUCKY AND WEST VIRGINIA REPORT (2009).

5. 72 F. Supp. 2d 642 (S.D. W. Va. 1999).

6. *Id*. at 661–62.

7. RORY MCILMOIL & EVAN HANSEN, THE DECLINE OF CENTRAL APPALACHIAN COAL AND THE NEED FOR ECONOMIC DIVERSIFICATION 10–19 (2010), http://www.downstreamstrategies.com/documents/reports_publication/DownstreamStrategies-DeclineOfCentralAppalachianCoal-FINAL-1-19-10.pdf.

8. *Id*. at 29.

9. *Id*. at 16.

10. A Harvard study estimated that the life cycle impacts of coal and the waste stream generated are costing the U.S. public a third to over a half a trillion dollars annually. *See* HARVARD CTR. FOR HEALTH AND THE GLOBAL ENVIRONMENT, MINING COAL, MOUNTING COSTS: THE LIFE CYCLE CONSEQUENCES OF COAL (2011), *available at* http://chge.med.harvard.edu/sites/default/files/resources/MiningCoalMountingCosts.pdf [hereinafter Mining Coal Mounting Costs].

11. *See* Ohio Valley Envtl. Coal. v. U.S. Army Corps of Eng'rs, 528 F. Supp. 2d 625, 631–32 (S.D. W. Va. 2007).

for decades. Yet coal remains ubiquitous in the region in all aspects of life despite an increased awareness of the threat of decline of the industry in the region. Coal is a way of life, and efforts to find economic alternatives, while promising, still require a collaborative effort among industry members, citizens, governments, and others to ensure a just and successful transition to a regional economy and livelihood that is driven by something other than coal mining.

Many books, articles, and reports have been published over the years that give an excellent portrayal of Appalachian life, especially the environmental and community health impacts of surface mining.[12] This article, while occasionally culling from those materials, will not focus on the past.[13] Beginning with Part II, "The Decline of Coal in Appalachia," the article will describe the drivers of the decline of coal production in central Appalachia. Part III, "The New Science," will describe recently published scientific research and literature regarding central Appalachia and surface mining in particular. Part IV, "Regulatory Compliance," will show how that new science has informed coal mining regulation and policy in the region. Part V, "A Transitioning Economy," will review what is being done to fill the voids left by the impending decline of the coal industry in central Appalachia and highlight the successes and opportunities necessary to transition to a more sustainable regional economic mode.

II. THE DECLINE OF COAL IN APPALACHIA

On January 19, 2010, Downstream Strategies published its report, "*The Decline of Central Appalachian Coal and the Need for Economic Diversification*."[14] This report documents what the coal industry already knew: "[c]oal production in [c]entral Appalachia is on the decline, and this decline will likely continue in the coming decades."[15] However, the report also recognizes the importance of the coal industry to local economic development in the region due to the jobs and taxes that the industry has provided.[16] The report notes that coal-producing counties in Appalachia continue to have some of the highest poverty and unemployment rates in the region, and "due to the dependence on coal for economic development, any changes in coal production will have significant

12. The following books and article are some of the materials that provide an excellent history and overview of MTR in Appalachia: RONALD D. ELLER, UNEVEN GROUND: APPALACHIA SINCE 1945 (2008); REECE, *supra* note 1; HARRY M. CAUDILL, NIGHT COMES TO THE CUMBERLANDS: A BIOGRAPHY OF A DEPRESSED AREA (1963). In addition the "Coal Tattoo" blog written and administered by Ken Ward of the Charleston Gazette is an invaluable online resource for up-to-date information regarding the science, politics, economics, and current happenings of coal mining. *See* COAL TATTOO, http://blogs.wvgazette.com/coaltattoo/.

13. For example, although worthy of examination in light of recent coal mining accidents and disasters, this article also does not focus on coal mine safety and health.

14. MCILMOIL & HANSEN, *supra* note 7.

15. *Id.* at 1.

16. *Id.* "In 2008, for instance, the coal industry employed 37,000 workers directly and indirectly across the region, accounting for 1% to 40% of the labor force in individual counties . . . [T]he coal severance tax generates hundreds of millions of dollars in state revenues across the region every year, with tens of millions of dollars being distributed to counties and municipalities." *Id.*

impacts on local economies."[17] Despite the growth of coal production nationally, central Appalachian coal production declined twenty percent from 1997 to 2008.[18] Moreover, the annual coal production in central Appalachia is predicted to decline another forty-six percent by 2020 and fifty-eight percent by 2035.[19]

The report outlines three primary reasons for the decline in coal production: (1) increased competition from other coal-producing regions such as the Powder River Basin and sources of energy such as natural gas and renewables;[20] (2) the depletion of the most accessible, lowest-cost coal reserves in Appalachia;[21] and (3) environmental regulations.[22] These substantial declines will cause the region to "face significant losses in employment and tax revenue, and state governments will collect fewer taxes from the coal industry."[23] Therefore, finding solutions and alternatives to the coal economy, such as renewable resources is imperative to the economic success of the region. As the Downstream Strategies report states, "Given the numerous challenges working against any substantial recovery of the region's coal industry, and that production is projected to decline significantly in the coming decades, diversification of [c]entral Appalachian economies is now more critical than ever."[24]

In a similar report, the Mountain Association for Community and Economic Development (MACED), based in Berea, Kentucky, published, "*The Economics of Coal in Kentucky: Current Impacts and Future Prospects*."[25] Like the Downstream

---

17. *Id.*

18. *Id.* The Energy Information Administration (EIA), a department of the U.S. Department of Energy, developed the majority of the data collected for the Downstream Strategies Report. The purpose of the EIA is to collect, analyze, and disseminate independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment. The EIA provides some of the most reliable energy data in the world; however, the interpretation of that data has caused debate.

19. *Id.*

20. *Id.* One of central Appalachian coal's main competitors is the Powder River Basin in the Western United States. New competition with lower cost natural gas sources and renewable energy has also contributed to the coal industry's decline in Appalachia. *Id.* at 13.

21. *Id.* at 8. As coal mine labor productivity decreases in Appalachia, the production costs increase, in turn, increasing the cost of coal. Thus, Central Appalachian coal is more costly to mine, and the most accessible, lowest-cost coal reserves have been mined already, leaving only the least accessible, more costly coal. *Id.* at 23.

22. *Id.* at 3. The Report cites impending cap and trade legislation as a deterrent to future coal production. Cap and trade legislation has since failed. However, the EPA under the Obama Administration has promulgated new GHG emission regulations. Prevention of Specific Deterioration and Title V Greenhouse Gas Tailoring Rule, 75 Fed. Reg. 31514 (June 3, 2010) (to be codified at 40 C.F.R. pt. 71). The EPA has also promulgated new water quality guidance for surface mining. *See* FINAL MEMORANDUM JAMES A. HANLON, DIRECTOR OF WASTEWATER MANAGEMENT FOR ALEXIS STRAUSS, DIRECTOR OF WATER DIVISION EPA REGION 9 (May 10, 2007), *available at* http://water.epa.gov/lawsregs/guidance/wetlands/mining.cfm#memo20100401. The EPA is now more thoroughly reviewing mining permit applications, and, in some cases, revoking those permits. *See* ENVTL. PROT. AGENCY, SPRUCE NO. 1 MINE, http://www.epa.gov/region03/mtntop/spruce1.html (last visited May 29, 2012).

23. MCILMOIL & HANSEN, *supra* note 7, at 3.

24. *Id.* at 4.

25. MOUNTAIN ASS'N FOR CMTY. & ECON. DEV., THE ECONOMICS OF COAL IN KENTUCKY: CURRENT IMPACTS AND FUTURE PROSPECTS (2009), http://www.maced.org/coal/documents/Economics_of_Coal.pdf [hereinafter MACED].

Strategies report, MACED found that coal employment and competiveness in Kentucky has been declining for years. "The competitiveness of Kentucky coal is in decline relative to western U.S. coal due to higher production costs, diminishing recoverable reserves and, for western Kentucky, higher sulfur content . . . . While the future of the coal industry in Kentucky is uncertain, it is clear that significant change is coming."[26] While coal production in 2006 was only slightly lower than in 1979, mining employment fell drastically from 50,000 employees to less than 20,000 over this time.[27] This was mainly due to technological innovations that enabled more coal to be mined with fewer workers, and the proliferation of surface mining—including MTR—replacing underground mining.[28] As of 2006, the mining industry accounted for "over [ten] percent of total employment in eight eastern Kentucky counties, peaking at [twenty-three] percent in Knott County."[29] The combination of extremely high unemployment and heavy economic dependence on the coal industry leaves these Appalachian communities in a vulnerable position.[30] Coal mining represents such a significant part of the economy in these parts of Appalachia that even small changes in coal demand and output have a dramatic impact on resident livelihood.[31]

These reports failed to make the national press until August 2011, when the Associated Press (AP) published a story on the decline of coal in Appalachia.[32] Finding that the coal in Appalachia "is getting harder and [more costly] to dig," the article concluded that "the region . . . is headed for a huge collapse in coal production."[33] The AP article cites the Downstream Strategies report, as well as statistics from the EPA.[34]

Predictably, the AP article and the Downstream Strategies report were criticized by the coal industry. Most of that criticism did not rise above rhetoric. Among the more significant criticisms, however, was an op-ed in the *Herald-Leader*, a newspaper in Lexington, Kentucky, written by Jerry Weisenfluh, Associate Director of Kentucky Geological Survey at the University of Kentucky, in response to the AP article.[35] Although it is far from an academic article, Mr. Weisenfluh nevertheless makes a few poignant observations of the Downstream Strategies Report. Weisenfluh argues that the decline in mine productivity is not only an Appalachian trend, but also a national trend, and that the true reason for the decline in mine productivity in Appalachia is the additional employees needed for complying with new safety and environmental regulations.

---

26. *Id.* at 1.

27. *Id.* at 2.

28. ELLER, *supra* note 12, at 36.

29. MACED, *supra* note 25, at 4.

30. *Id.* at 6.

31. *Id.* (citing ERIC C. THOMPSON ET AL., A STUDY ON THE CURRENT ECONOMIC IMPACTS OF THE APPALACHIAN COAL INDUSTRY AND ITS FUTURE IN THE REGION (2001)).

32. Dylan Loan, *Appalachia Faces Steep Coal Decline*, ASSOCIATED PRESS, Sept. 27, 2011, http://news.yahoo.com/ap-enterprise-appalachia-faces-steep-coal-decline-152623120.html.

33. *Id.*

34. *Id.*

35. Jerry Weisenfluh, *Future Burns Bright for E.Ky. Coal*, LEXINGTON HERALD-LEADER, Nov. 7, 2011, http://www.kentucky.com/2011/11/07/1950038/future-burns-bright-for-eky-coal.html.

Weisenfluh states, "There is no doubt that significant reserve depletion has resulted in mining of thinner seams leading to higher mining and processing costs," but that "there are technological advancements and market conditions that could change the current trend in production."[36] Weisenfluh concludes that the impacts of environmental regulation are having a greater influence on the markets for Central Appalachian coal than depletion of resources and while "[t]his does not suggest that the situation does not need serious attention from policy makers and planners . . . it's premature to write off a sector of the coal market based on such speculative arguments." Yet, despite the recognized decline in coal production, there has been a recognizable increase in coal mining employment.[37]

If nothing else, these reports put the region on notice that the coal industry in Appalachia is on the decline, which may have a substantial impact on the economy and livelihood of the region. No matter how precarious the coal production forecasts are for the region, the coal industry's decline does not have to be detrimental to the region. As the region transitions to a more expansive economy and takes full account of the environmental and health benefits resulting from a declining coal economy, a healthier, more diversified economy and community can emerge.

III. THE NEW SCIENCE

As the largest contiguous strand of forest in the eastern United States, the mixed mesophytic forested mountains of central Appalachia constitute one of the most diverse and delicate temperate ecosystems in the world.[38] The environmental impacts of surface mining and, particularly MTR mining, on that ecosystem are well known. However, the coal industry and politicians continue to question the science that confirms these environmental impacts in much the same way that industry and politicians question the science behind climate change.[39] Residents of central Appalachia have long documented the impacts

---

36. *Id.*

37. *See EPA's Appalachian Energy Permitorium: Job Killer or Job Creator?: Hearing Before the Subcomm. on Regulatory Affairs of the H. Comm. on Gov't & Regulatory Reform,* 112th Cong. 11 (2011) (statement of Joe Lovett, Appalachian Ctr. for the Econ. and Env't), *available at* http://oversight.house.gov/wp-content/uploads/2012/01/7-14-11_Lovett_RegAffairs_EPA_Testimony.pdf.

38. KAREN D. HOLL ET AL., VA. COOP. EXTENSION, RECOVERY OF NATIVE PLANT COMMUNITIES AFTER MINING 1 (2009), http://pubs. ext.vt.edu/460/460-140/460-140_pdf.pdf.

39. As recent as November 18, 2011, Senator Rand Paul (R-KY) stated in a hearing regarding the merger of the Office of Surface Mining Reclamation and Enforcement and the Bureau of Land Management, "And you hear this ridiculous notion from people saying we've destroyed 2,000 miles of stream . . . . People think that, 'oh, they're polluting the Ohio River and we've disrupted the Ohio River or some major creeks.' We're not talking about that at all." Erica Peterson, *Paul Questions OSM Director on Stream Protection Rule*, WFPL NEWS, Nov. 17, 2011, http://www.wfpl.org/2011/11/17/paul-questions-osm-director-on-stream-protection-rule. Climate-conscious Kentuckians are also faced with Kentucky Representative Tim Gooch (D-Providence) who serves as their Chair of the House Natural Resources and Environment Committee. Representative Gooch makes his climate change skepticism well known, as he has appeared on national television to voice his opinion. ABC NEWS (ABC television broadcast Nov. 18, 2007), a*vailable at* http://abcnews.go.com/GMA/video?id=3882713.

that surface mining, valley fills, and slurry ponds have had on the environment in which they live.[40] Sam Evans, in his award winning article, *Voices from the Desecrated Places: A Journey to End Mountaintop Removal Mining*, eloquently summarizes those impacts:

> Still, the impact of MTR mines on the natural environment is outpaced by its impact on the people who live nearby. Every afternoon in Rock Creek, West Virginia, at about 3:00, the valley shakes and rumbles as if from a thunderstorm, and each peal threatens the communities in the mountains' shadows. Every hollow in these mountains has a history and a community with deep roots of place, but they are being systematically erased. Communities disintegrate when Big Coal is their neighbor: the noise, dust, vibrations, and "fly rock" from blasting make them uninhabitable, and make the land worthless. The coal companies buy out the residents, the community dies, and no one is left to complain. Blasting is not the only threat. Incessant coal truck traffic makes living near the mines almost intolerable. Additional runoff from denuded mountains and silt-filled river channels increases the damage caused by flooding, though it is difficult to place a price tag on the costs. Valley fills occasionally give way, creating massive mudslides. Another threat is that coal is washed of impurities before being sold, producing a "sludge" containing high levels of carcinogens and heavy metals. Although there is a practical (and only slightly more expensive) way to turn the sludge into solid waste, regulations allow it to be stored in ponds at the heads of valleys or injected into old underground mines. Those living below the sludge dams—of which there are approximately 650 in the coalfields—know that they are unstable. Residents in Mingo and Wyoming Counties in West Virginia, are literally afraid for their lives, displaying an "overriding concern" about the dangers of sludge. Their fears are not unfounded: the dams leak and accidental spills are common. For those living below the sludge ponds, it is hard to forget the 1972 Buffalo Creek disaster that killed 125 people. Although sludge spills can be ecologically catastrophic, even large spills receive little media attention. Compared to the media blitz following the recent coal fly ash spill in Kingston, Tennessee, it is easy to get the impression that nobody cares what happens in the coalfields.
>
> Sludge is a byproduct of coal processing regardless of whether the coal was mined underground or by MTR, but MTR multiplies the risks associated with sludge. For example, one leaking dam sits a quarter-mile above Marsh Fork Elementary School, and holds back 2.8 billion gallons of sludge. Blasting recently began on the same ridge to keep this sludge from burying the valley below, and it has so far been successful.
>
> Although catastrophic dam failures are not common, blasting from MTR can also cause fractures that allow sludge in ponds or injection wells to seep into the groundwater. Most residents in the coalfields, such as Adam and his family, are dependent on wells for their water. The obvious effects on the water—rotten egg smells and dark stains—are not merely inconveniences; they are health hazards. The day I met Mat Louis-Rosenberg of Coal River Mountain Watch, he had been in nearby Prenter Hollow, delivering drinking water by truck to residents who can no longer drink from their taps. In Prenter, over two billion gallons of slurry have been injected into abandoned underground mines, and some of it has

40. *See* Sam Evans, *Voices from the Desecrated Places: A Journey to End Mountaintop Removal Mining*, 34 HARV. ENVTL. L. REV. 521 (2010).

> migrated into residents' wells. A recent health survey revealed that ninety-eight percent of adults in that community have gallbladder disease or kidney problems. Children's teeth are dissolving from the acid in the water, too: a five-year old girl who lives in Prenter already has a full set of dentures. Not surprisingly, cancer rates are also disproportionately high: on one 500-yard stretch of road, there have been six new cases of brain cancer. Prenter Hollow may be unusually well-documented, but it is not unusual: there are untold numbers of injection wells that may be contaminating drinking water supplies in other communities.
>
> Even breathing the air near MTR mines carries a significant health risk. Coal dust and silica from the blasts and the processing facilities fall on the towns near active mine sites every day. At Marsh Fork Elementary, the same dust that causes black lung settles on the playgrounds of elementary schools; the tattered American flag above the playground at Marsh Fork Elementary is stained coal-gray. In 2004, a firsthand account of that school's "sign-out" book found that "15 to 20 students [at Marsh Fork] went home sick every day because of asthma problems, severe headaches, blisters in their mouths, constant runny noses, and nausea." Whether residents are exposed to coal contaminants by water, air, or a combination of both, it is beyond dispute that residents of areas where MTR is prevalent have much poorer health than those living in areas where it is not.[41]

The coal industry and the government agencies that regulate it were reluctant to hold mining operations accountable for these environmental and community health impacts until recently. Then, on January 8, 2010, Dr. Margaret Palmer, along with eleven of her colleagues, published the peer-reviewed article, "*Mountaintop Mining Consequences*,"[42] which is perhaps the most important scientific article published regarding the environmental impacts of mining in Appalachia to date. Dr. Palmer *et al*. state:

> Despite much debate in the United States, surprisingly little attention has been given to the growing scientific evidence of the negative impacts of [mountain top mining with valley fills]. Our analyses of current peer-reviewed studies and of new water-quality data from WV [sic] streams revealed serious environmental impacts that mitigation practices cannot successfully address. Published studies also show a high potential for human health impacts.[43]

The article finds that "extensive tracts of deciduous forests destroyed by MTM/VF [mountain top mining/valley fills] support some of the highest biodiversity in North America, including several endangered species," and that the "[b]urial of headwater streams by valley fills causes [a] permanent loss of [the] ecosystems that play [a] critical [role] in ecological processes such as nutrient cycling and production of organic matter for downstream food webs; these small Appalachian streams also support abundant aquatic organisms."[44] Dr. Palmer focuses on conductivity[45] and the role that it can play in the

---

41. *Id.* at 525–28 (citations omitted).

42. M.A. Palmer et al., *Mountaintop Mining Consequences*, 327 SCIENCE 148 (2010).

43. *Id.* at 148 (citations omitted).

44. *Id.* (citations omitted).

45. Conductivity is a measure of the ability of water to pass an electrical current. Conductivity is measured in μhos or siemens. Studies have found that waterbodies with conductivity measurements outside the range of 150 and 500 μhos/cm are not suitable for certain species of fish or

measurement of impacts that valley fills have on the quality of streams. "Conductivity, and concentrations of SO_4 [sulfate] and other pollutants associated with mine runoff, can directly cause environmental degradation, including disruption of water and ion balance in aquatic biota."[46] The article also recognizes the impact of MTR on selenium concentrations on streams, which has been the focus of numerous lawsuits against mining operations and the permitting of those operations.[47] Elevated selenium concentrations in Appalachian streams were found to cause mutations in fish and birds, leading to reproductive failure.[48] Beyond ecological damage, the article also cites to the impact of elevated stream concentrations on human health. "Adult hospitalizations for chronic pulmonary disorders and hypertension are elevated as a function of county-level coal production, as are rates of mortality; lung cancer; and chronic heart, lung, and kidney disease."[49] The article recognizes stream restoration as an invalid form of mitigation and that "[s]enior officials of the U.S. Army Corps of Engineers (ACOE) have testified that they do not know of a successful stream creation project in conjunction with [mountain top mining with valley fills]."[50]

Most importantly, the article concludes:

> Mining permits are being issued despite the preponderance of scientific evidence that impacts are pervasive and irreversible and that mitigation cannot compensate for losses. Considering environmental impacts of MTM/VF, in combination with evidence that the health of people living in surface-mining regions of the central Appalachians is compromised by mining activities, we conclude that MTM/VF permits should not be granted unless new methods can be subjected to rigorous peer review and shown to remedy these problems.[51]

The health impacts of MTR mining have also been well documented by a series of articles published by Dr. Michael Hendryx of West Virginia University and his colleagues. In his most recently published peer-reviewed article,[52] Dr. Hendryx *et al*. found that self-reported cancer rates were significantly higher in

---

macroinvertebrates. ENV'T PROT. AGENCY, WATER: MONITORING AND ASSESSMENT, 5.9 CONDUCTIVITY, http://water.epa.gov/type/rsl/monitoring/vms59.cfm (last visited Apr. 18, 2012).

46. *Id.* (citations omitted); *see also* Emily S. Bernhardt & Margaret A. Palmer, *The Environmental Costs of Mountaintop Mining Valley Fill Operations For Aquatic Ecosystems of the Central Appalachians*, 1223 ANNALS N.Y. ACAD. SCI. 39 (2011). All research to date indicates that conductivity is a robust measure of the cumulative or additive impacts of the elevated concentrations of multiple chemical stressors from mine sites that lead to biological impairment of streams. Each constituent pollutant increases conductivity and they may have additive or multiplicative ecological impacts. To date, mitigation practices and restoration efforts have not been effective in ameliorating water pollution from MTVF sites. Furthermore, efforts to reclaim vegetation and restore the full diversity of plant species in mined watersheds have not proved successful to date.

47. *See, e.g.*, United States v. Arch Coal, Inc., 2011 U.S. Dist. LEXIS 128810 (S.D. W. Va. Nov. 7, 2011); Ohio Valley Envtl. Coalition, Inc. v. Patriot Coal Corp., 2011 U.S. Dist. LEXIS 141190 (S.D. W. Va. Dec. 7, 2011).

48. Palmer, *supra* note 42, at 148.

49. *Id.*

50. *Id.* (citations omitted).

51. *Id.* at 149.

52. Michael Hendryx et al., *Self-Reported Cancer Rates in Two Rural Areas of West Virginia With and Without Mountaintop Coal Mining*, 37 J. CMTY. HEALTH 320, 325–26 (2012).

the areas around mountain top mining versus non-mining areas after controlling for respondent age, sex, smoking, occupational history, and family cancer history. The article concludes that if the rates found by the study represent the entire central Appalachian region, an additional 60,000 people in that area will have cancer than would a population of the same size in a non-mining area.[53]

This recent research confirmed what the residents of central Appalachia have known since their community began receiving the brunt of the MTR impacts in the 1990s.[54] MTR mining has detrimental impacts on the human health and environment of central Appalachia, and the coal industry and regulating entities have failed to protect them.

Since the publication of these articles, and also because of their continued research, both Dr. Palmer and Dr. Hendryx have been in high public and media demand as the coal industry has sought to discredit their conclusions, but the communities impacted by mining have rallied behind them.[55] As these articles add to the growing body of scientific evidence against the practices of MTR and valley fills, the Courts have required the regulating agencies to scrutinize the impacts of the current regulations on the environment and community in central Appalachia. This new impetus to regulate coal mining in Appalachia will have the greatest impact on surface mining, which may further decrease the economic output of an already suffering economy.[56]

IV. REGULATORY COMPLIANCE

A significant factor in the decline of coal production in Appalachia is the myriad of lawsuits against the mining corporations and regulatory agencies. Knowing the implications of these legal efforts to hold mining companies accountable for the impacts they have on both the environment and the community is important to understanding the efforts to create and maintain a more sustainable region—economically, environmentally, and otherwise. Without the efforts of citizens to hold coal companies accountable through the legal system, the mining corporations will retain their stranglehold on the region and impede the diversification and sustainability of the regional economy. Additionally, the industry will continue to add to the over 2,000 miles of streams already buried in valley fills[57] and over 500,000 hectares of mountains and forests

53. *Id.*

54. A recent paper published by a Yale University professor also concludes, "the possibility that mining contributes to the development of the social environments and cultural practices that adversely impact health . . . seems most likely in those specific areas where mining is the principal industry." J. Borak et al., *Mortality Disparities in Appalachia: Reassessment of Major Risk Factors*, 52 J. OCCUPATIONAL & ENVTL. MED. 146 (2012).

55. Among her many media appearances, Dr. Palmer notably appeared on the Comedy Central show, *The Colbert Report*, after the publication of her 2010 article. *See The Colbert Report* (Comedy Central television broadcast on Jan. 18, 2010), *available at* http://www.colbertnation.com/the-colbert-report-videos/261997/january-18-2010/coal-comfort—-margaret-palmer.

56. *See* MACED, *supra* note 25.

57. Memorandum from Peter S. Silva, Assistant Admin. for Water & Cynthia Giles, Assistant Admin. for Enforcement & Compliance Assurance, Env't Prot. Agency, to Shawn Garvin, Reg'l Admin., Env't Prot. Agency Region 3, *et al.* 2 (Apr. 1, 2010), http://water.epa.gov/lawsregs/guidance/wetlands/upload/2010_04_01_wetlands_guidance_appal

destroyed by mining.[58]

Citizens have consistently pressured the coal industry and regulating entities over the past twenty years. With the backing of the scientific community and a continued industry apathy regarding the impacts of their actions, citizens, environmental groups, and community organizations have brought successful lawsuits against mining companies. As a result, the regulating agencies and the courts are taking into account the impact of these mining practices on the community and ecology of Appalachia.

The legal struggle against surface mining originated in the fight to void broad form deeds in Appalachia.[59] This struggle began almost a half century ago and laid the groundwork for modern day legal challenges to mining practices.[60]

Broad form deeds were instruments that transferred subsurface mineral property rights of a grantor to a grantee. In most cases in Appalachia, the grantor was often a poor, illiterate landowner and the grantee was a representative of a large land-holding corporation.[61] Broad form deeds left only a nominal title to the surface and total responsibility for property taxes with the landowner.[62] Most tragically, and unbeknownst to the landowner,[63] courts held that those deeds also conveyed the rights to excavate and remove all subsurface minerals and permitted the subsurface owner to use the surface as necessary for either the removal or storage of those minerals.[64] This included surface (or strip) mining, and the destruction of the property of those who signed away the rights to their minerals.[65] However, most of these deeds were signed in the late 1800s and early 1900s, when the predominant method of mining was underground mining.[66] The technology required for efficient strip mining was not developed until the mid-1900s, and only then did this more destructive mining practice start to dominate.[67] Thus, most owners who deeded their mineral rights to coal prospectors did so without knowing that the minerals beneath their property could be surface mined, and that everything above the coal seam and above ground would be destroyed. This lack of knowledge meant few owners were compensated appropriately for that destruction.

After decades of litigation, state constitutional amendments, and lobbying,

---

achian_mtntop_mining_detailed.pdf [hereinafter Silva & Giles Memorandum].

58. J. A. Rodrigue & J. A. Burger, *Forest Soil Productivity of Mined Land in the Midwestern and Eastern Coalfield Regions*, 68 SOIL SCI. SOC'Y AM. J. 833, 833 (2004).

59. *See* Dean Hill Rivkin, *Lawyering, Power, and Reform: the Legal Campaign to Abolish the Broad Form Mineral Deed*, 66 TENN. L. REV. 467, 482 (1999).

60. *Id.*

61. *See* CAUDILL, *supra* note 12, at 73–74.

62. Bryan C. Banks, *High Above the Environmental Decimation and Economic Domination of Eastern Kentucky, King Coal Remains Firmly Seated on Its Gilded Throne*, 13 BUFF. ENVTL. L.J. 125, 133 (2006). Thus, while the corporations reaped the profits from the subsurface minerals, the landowners were still left with the property tax bill, even if their property was destroyed to get to those minerals. As the owners of the mineral rights were likely large out-of-state corporations, those profits were also never reinvested into the regional economy. *See* ELLER, *supra* note 12, at 224–25.

63. *See* CAUDILL, *supra* note 12, at 306.

64. *Id.*

65. *Id.*

66. Rivkin, *supra* note 59, at 479.

67. *Id.*

broad form deeds were eventually abolished throughout Appalachia, with some states taking much longer than others.[68] Even more important was the emergence of the community organizing, legal efficacy, and recognition of the community destruction caused by surface mining.[69] The struggle to outlaw the broad form deed emphasized the need to reign in the influence of the coal industry in central Appalachia and laid the groundwork for future challenges to the coal industry's questionable practices.

In 1998, almost a decade after Kentucky outlawed the broad form deed, the West Virginia Highlands Conservancy and ten coalfield residents filed suit over the Clean Water Act (CWA) § 404 permit for the Spruce No. 1 mine in Logan County, West Virginia, which allowed the Mingo Logan Coal Company to construct valley fills for the Spruce No. 1's overburden. The Spruce No. 1 Mine is one of the largest surface mining operations ever authorized in Appalachia.[70] In this case, *Bragg v. Robertson*, the District Court for the Southern District of West Virginia held that valley fills are illegal under the CWA.[71] The Southern District of West Virginia held the same in *Kentuckians for the Commonwealth, Inc. v. Rivenburgh*.[72] However, the Fourth Circuit Court of Appeals overturned both district court rulings.[73]

Despite being overturned, these District Court holdings resonated throughout the court system and regulatory agencies, and, after a transition from the coal-friendly Bush Administration to the less friendly Obama Administration, the EPA began to reconsider § 404 permits for valley fills. In September of 2009, the EPA announced that it would revisit seventy-nine § 404 permits[74] under its new coordination procedures between the EPA, the ACOE and the Department of Interior.[75] Based on that review, the EPA proposed to revoke one permit,[76] the same one originally challenged by West Virginia

---

68. *Id.* at 495. Kentucky took the longest to abolish the broad form deed. In doing so, the Kentucky Supreme Court agreed that the parties to the broad form deeds could not have intended the destruction of the surface. "The obliteration of the surface would never have been anticipated by the grantor of the mineral estate." Akers v. Baldwin, 736 S.W.2d 294, 307 (Ky. 1987).

69. Rivkin, *supra* note 59, at 496.

70. *Mid-Atlantic Mountaintop Mining: Spruce No. 1 Mine*, ENVTL. PROT. AGENCY, http://www.epa.gov/region3/mtntop/spruce1.html (last updated Sept. 1, 2011).

71. Bragg v. Robertson, 72 F. Supp. 2d 642 (S.D. W. Va. 1999) (*rev'd sub nom* Bragg v. W. Va. Coal Ass'n, 248 F.3d 275 (4th Cir. 2001)).

72. Kentuckians for the Commonwealth, Inc. v. Rivenburgh (KFTC I), 204 F. Supp. 2d 927, 946 (S.D. W. Va. 2002) (*vacated*, 317 F.3d 425 (4th Cir. 2003)).

73. *See* Bragg v. W. Va. Coal Ass'n, 248 F.3d 275 (4th Cir. 2001) (deciding not on the merits, but holding that the state, in certain circumstances, could not be sued in federal court); *see also* Kentuckians for the Commonwealth, Inc. v. Rivenburgh, 317 F.3d 425 (4th Cir. 2003).

74. *Question and Answer Sheet*, ENVTL. PROT. AGENCY (Sept. 30, 2009), http://www.epa.gov/owow/wetlands/pdf/ECP_Q&A_09-30-09_final.pdf.

75. *Surface Coal Mining Activities Enhanced Coordination Procedures*, ENVTL. PROT. AGENCY, http://water.epa.gov/lawsregs/guidance/wetlands/mining-screening.cfm (last updated Mar. 22, 2012).

76. Proposed Determination to Withdraw Specification of Spruce No. 1 Surface Mine, 75 Fed. Reg. 16,788, 16,805 (proposed Apr. 2, 2010); *see also Mid-Atlantic Mountaintop Mining: Spruce No. 1 Mine*, *supra* note 70 ("EPA has reason to believe that the Spruce No. 1 Mine, as currently authorized, will result in unacceptable adverse effects to fish and wildlife resources. EPA's action prevents construction of valley fills in Pigeonroost Branch and Oldhouse Branch").

Highlands Conservancy in 1998: the Spruce No. 1 mine permit.

Shortly after it revoked the Spruce No. 1 permit, the EPA issued a new interim guidance memorandum that utilizes numeric triggers for conductivity levels downstream from valley fills,[77] and the standards outlined in the memorandum are almost directly informed by the research of Dr. Palmer.[78] The new guidance has since been finalized.[79] Furthermore, members of Congress in both houses have proposed bills that would undo the Bush-era valley fill rule, restore the original meaning of the CWA, and redefine "fill material" to not include mining "waste" under the CWA.[80] While the guidance "merely rearticulates the authority that EPA already had to object to state agency decisions or veto Corps' decisions,"[81] and does little to change the legal landscape, the guidance does accomplish two things: (1) the guidance will reduce the costs of enforcing water quality standards and increase the cost of valley fills, and (2) as the costs are internalized by coal companies, they will shift toward other methods of mining.[82]

As organizations such as Appalachian Mountain Advocates, Kentuckians for the Commonwealth (KFTC), and the West Virginia Highlands Conservancy continue to apply legal pressure—backed by sound science, law, and unambiguous regulation—to the regulatory agencies and mining companies, coal companies are turning to less intrusive mining practices.[83] Already, both coal production and valley fill permit approvals have decreased in the region.

Yet, as coal production is decreasing, coal mine employment has increased since 2007.[84] This is attributed to the increase in underground coal mining production, which requires substantially more coal miners to mine the same amount of coal as compared to a surface mine with similar coal production.[85] This is significant for the future of the coal industry in central Appalachia's economy especially where there continues to be a growing demand for coal

---

77. Silvia & Giles Memorandum, *supra* note 57, at 2.

78. *See* MINING COAL MOUNTING COSTS, *supra* note 10.

79. *See EPA Issues Final Guidance to Protect Water Quality in Appalachian Communities from Impacts of Mountaintop Mining / Agency to Provide Flexibility While Protecting Environment and Public Health*, NEWS RELEASES FROM HEADQUARTERS, ENVTL. PROT. AGENCY (July 21, 2011), *available at* http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceeac8525735900400c27/1dabfc17944974d4852578d400561a13!OpenDocument ("The guidance, which replaces the interim-final guidance issued by EPA on April 1, 2010, is based on the best-available science and incorporates input and feedback from over 60,000 comments received from the public and key stakeholders.").

80. *See* H.R. 1310, 111th Cong. (2009); S.R. 696, 111th Cong. (2009).

81. *See* Evans, *supra* note 40, at 574.

82. *Id.*

83. Citizens and organizations have recently found success with challenges to coal mines' CWA § 402 National Pollution Discharge Elimination System (NPDES) permits, where the discharges from the mine sites were found to have illegal levels of selenium and other pollutants. *See* Consent Decree, *OVERC et al. v. Coal Mac et al.*, Civil Action No. 3:10-cv-833 (S.D. W. Va. Sept. 29, 2011), http://wvgazette.com/static/coal%20tattoo/ archseleniumsettle.pdf. Elevated levels of selenium can cause mutations in fish and birds and severely impair a watershed. *See* Palmer, *supra* note 42.

84. *Hearing before the H. Comm. on Gov't and Regulatory Reform and S. Comm. on Regulatory Affairs* (July 14, 2011) (statement of Joe Lovett, Exec. Dir. of the Appalachian Ctr. for the Econ. and Env't), http://oversight.house.gov/images/stories/Testimony/7-1411_Lovett_RegAffairs_EPA_Testimony.pdf.

85. ELLER, *supra* note 12, at 20, 210, 224.

nationally and globally. As long as coal continues to be produced and profitable and the coal industry continues to provide jobs, despite declining production, the coal industry will likely have a place in the Appalachian economy for the foreseeable future. Still, coal production is declining, and central Appalachia must be prepared to fill the void that the coal industry will inevitably leave when the coal has run dry.

V. A TRANSITIONING ECONOMY

The boom and bust economy of Appalachia, illustrated first by logging and then by coal, provides a backdrop to the development of Appalachia over the past century. During the years since the "war on poverty" in the region[86] and the creation of a host of special programs and congressional acts for Appalachian development,[87] some communities prospered, while others declined.[88] Despite over fifty years of efforts to improve the socioeconomic performance of Appalachia, the region still trailed the rest of the country in income, health, education, and job security.[89] While the region is now more diverse than ever with modern roads, regional and national chain stores and restaurants, better schools, better healthcare facilities, and public infrastructure, the old problems of an inadequate tax base, a low-wage economy, environmental abuse, civic fraud, political corruption, absentee ownership, and corporate irresponsibility continues to hold the region back.[90] "As the rest of the nation invested in expanding higher education, improving environmental quality, and encouraging creativity for a higher-tech and more service based world, the core communities of Appalachia remained tied to the old, extractive economy."[91]

Now, for the reasons set forth above, coal production is declining and is predicted to do so for the foreseeable future. As coal production declines so too will the coal companies' influence, further limiting the already limited options Appalachian communities have to earn a livelihood. "In a region desperate for better housing, health care, education, and cultural amenities, community-based solutions for development were often bypassed in favor of externally controlled businesses and institutions that were more interested in growth than development."[92] The fact remains that Appalachia is still poor, and traditional

86. The War on Poverty was the unofficial name of the Johnson Administration's anti-poverty legislation officially known as the Economic Opportunity Act (EOA). The EOA authorized the creation of the community action agencies (CAA), which were intended to serve as vehicles to quickly channel federal funds to local neighborhoods throughout the nation; Volunteers in Service to America (VISTA), patterned after the Peace Corps, assisted in organizing antipoverty projects and to provide direct training services; the Office for Economic Opportunity, administered grants and directed the War on Poverty effort. *Id.* at 93–95. The War on Poverty ultimately failed, as the Nixon administration shifted from fighting the causes of poverty, to managing a growing welfare system. *Id.* at 155. The EOA programs were either gutted or transferred to other departments, leading to a decline in grants and poverty workers in central Appalachia. *Id.* at 156.

87. *Id.*; *see also* the Appalachian Regional Commission (ARC), Council of Southern Mountains (CSM), and Appalachian Volunteers (AV), among others. *Id.* at 2, 46, 114.

88. ELLER, *supra* note 12, at 156.

89. *Id.* at 221.

90. *Id.*

91. *Id.* at 223.

92. *Id.* at 236.

market-based solutions to its problems never have and never will suffice.[93]

Fortunately, a paradigm shift in Appalachia is emerging, led by progressive citizens, researchers, entrepreneurs, and organizations who have realized that Appalachia's economy must be more diverse and sustainable for Appalachia to make the drastic improvements it needs and deserves. Development, not growth, must be a priority, and while coal will still play a role in the region's economy, it should not remain the behemoth it has historically been. Moreover, while coal production in central Appalachia is declining, the void left by that industry must be filled and expanded, allowing for an influx of more sustainable economies and jobs.

Toward that end, MACED and KFTC have jointly established a groundbreaking program titled "Appalachian Transition Initiative."[94] The Initiative is devoted to "ideas for a more just, sustainable[,] and prosperous future in Central Appalachia" that focuses on the transition of Appalachia's economy, workforce, and communities.[95] The Appalachian Transition Initiative developed a website that is a clearinghouse for ideas, research, opportunities, and success stories, and it also links to other organizations working to improve Appalachia's economy. Efforts like this demonstrate that opportunities for diversification exist, and people just need help finding and cultivating them. As the Appalachian Transition Initiative indicates, those opportunities include the arts, education and workforce development, entrepreneurship, environmental restoration, health and community-based services, housing, infrastructure, philanthropy, renewable energy and energy efficiency, sustainable agriculture, sustainable forestry, and telecommunications.[96] All of these economic domains are important to a diverse economy, but this article will focus on the "green" domains of renewable energy and sustainable forestry.

A. Energy Efficiency and Renewable Energy

Although Appalachia constitutes only 7.95% of the total U.S. population, Appalachia produces 35% of the nation's coal, employs two-thirds of the nation's coal miners, and generates approximately 15% of the nation's total electricity.[97] In 2006, Appalachia produced a per capita energy intensity[98] that surpassed the national average, reflecting the historically cheap price of energy in the region.[99] Appalachia uses more energy on residential and commercial uses, reflecting both its high reliance on electricity for heating and cooling, as well as its relatively

93. *Id.*

94. *See* APPALACHIAN TRANSITION, http://appalachiantransition.net/ (last visited Mar. 30, 2012).

95. *Id.*

96. *Id.*

97. Marilyn Brown. et al., *Energy Efficiency in Appalachia: How Much More is Available, At What Cost, and By When?* APPALACHIAN REGIONAL COMMISSION, May 2009, at 4, http://www.arc.gov/assets/research_reports/EnergyEfficiencyinAppalachia.pdf.

98. Per capita energy intensity is the amount of energy used per person. *See Energy Intensity Indicators in the U.S.*, U.S. DEP'T OF ENERGY (2008), *available at* http://www1.eere.energy.gov/ba/pba/intensityindicators/efficiency_intensity.html.

99. Brown, *supra* note 97, at xi.

inefficient buildings and homes.[100] Energy inefficiencies do not only involve coal, as 68% of the energy-efficiency potential[101] in Appalachia resides in the electricity system, 17% in gasoline consumption by vehicles, and 12% in natural gas savings potential in the commercial, residential, and industrial sectors.[102] The region's energy consumption is expected to grow 28% over 2006 levels by 2030; the national growth rate is forecasted to be 19%.[103] Moreover, a model that doubled the electricity prices in Appalachia was estimated to only produce a 15 to 17% reduction in electricity consumption.[104] These inefficiencies suggest that strong policy interventions will be needed to transition Appalachia to a more energy efficient and sustainable economy.[105] An analysis by the ARC found that a net of 60,000 new jobs in creating energy efficiency could be created in fifteen years with the appropriate investment.[106] These policies will not only create jobs, they will create significant energy costs savings.[107] Annual consumer energy savings could rise to more than $27 billion by 2030.[108] Thus, there is great potential for Appalachia to diversify its economy, create a more sustainable economy, improve its environmental conditions, and improve the health of its citizens by investing in and developing energy efficient policies.

Like Appalachia's historic non-renewable resource reserves, the region also has strong renewable resource potential including wind, solar, small and low impact hydro, geothermal, biomass, and biofuels.[109] While each of these renewable resources has the capacity to significantly impact the region, wind and hydro sources have the strongest potential,[110] with wind appearing to be the

---

100. *Id.* at 7.

101. Energy efficiency potential provides a transparent method for assessing potential and socially desirable (as defined by cost-effectiveness) energy savings from technology and efficiency adoption under a specific set of conditions and relative to a projected baseline. *See* Mithra Moezzi, *Behavioral Assumptions in Energy Efficiency Potential Studies*, CAL. INST. FOR ENERGY AND ENV'T 12 (2009).

102. Brown, *supra* note 97, at xvi.

103. *Id.*

104. CTR. FOR BUS. AND ECON. RESEARCH (CBER), ENERGY EFFICIENCY AND RENEWABLE ENERGY IN APPALACHIA: POLICY AND POTENTIAL (2006), http://www.arc.gov/ assets/research_reports/ arc_renewable_energy_full.pdf.

105. *See, e.g.*, *id.* (showing that such policy interventions work); MARILYN A. BROWN ET AL., INTERLAB. WORKING GRP. ON ENERGY-EFFICIENT & CLEAN-ENERGY TECHS., SCENARIOS FOR A CLEAN ENERGY FUTURE ES.1 (2000) ("[Clean energy] policies could produce direct benefits, including energy savings, that exceed their direct costs (e.g., technology and policy investments). Indirect macroeconomic costs are in the same range as these net direct benefits. The CEF scenarios could produce important transition impacts and dislocations such as reduced coal and railroad employment; but at the same time, jobs in wind, biomass, energy efficiency, and other "green" industries could grow significantly.").

106. *See* Brown, *supra* note 97, at 114.

107. *Id. at* 2–3. Some of the governmental policies that could be employed include net metering, public benefit funds, tax incentives, grant opportunities, loan opportunities, clean energy procurement programs, rebate programs, and most importantly Renewable Energy Portfolio Standards (REPSs). In the case of REPSs, only New York, Maryland, and Pennsylvania have REPSs in the ARC region. Obviously, no states in central Appalachia have adopted such standards. CBER, *supra* note 104, at 11–24.

108. Brown, *supra* note 97, at xvi.

109. CBER, *supra* note 104, at 26–29.

110. About 5,744 total average megawatts (MWa) of electricity are estimated to be available from

greatest potential source of renewable power in Appalachia.[111] Furthermore, the adoption of a renewable energy portfolio standard (REPS) and similar policies in Kentucky would save Kentuckians an average of eight to ten percent on electricity bills, would net over 28,000 new jobs over any jobs lost in fossil fuels, and add $1.5 billion to gross state product if fully implemented by 2022.[112]

The now famous Coal River Mountain controversy[113] is emblematic of the region's difficulty in transitioning to renewable energy, and it provides an excellent comparison between the old extractive resource energy solution and the more progressive wind renewable solution. Coal River Mountain is located in Raleigh County, West Virginia and is slated to be mined by highwall and MTR mining.[114] In light of the usual protests by locals and environmentalists to save Coal River Mountain from its impending destruction, the citizens have discovered a new point of persuasion: the Coal River Mountain is ideally situated to produce wind energy. However, the mining companies currently own the mineral rights to these mountains and have already begun to extract the coal.[115] This is especially problematic for the citizens challenging this potential mining site because surface mining will render the mountains incapable of producing profitable wind energy.

In 2006, about 30% of all West Virginia coal was mined using MTR methods,[116] compared to 7% nationally.[117] Surface mining and valley fills are ubiquitous in and around Coal River Mountain where 11,006 acres of existing valley fills are within the Coal River watershed.[118] The valley fills proposed on Coal River Mountain would bury an additional 901 acres or about 1.4 square miles.[119] These valley fills have already contributed to burying over 571,540 feet (108 miles) of streams,[120] and the Coal River MTR project will bury an additional nine miles of them.[121]

As an alternative to MTR, a group of citizens spearheaded by the Coal River Mountain Watch hired a consulting firm to determine the viability of a wind farm on Coal River Mountain. The firm produced a report entitled "The Long

---

small and low impact hydro in the ARC states. *Id.* at 8.

111. *Id.* at 3.

112. RICK HORNBY ET AL., POTENTIAL IMPACTS OF A RENEWABLE AND ENERGY EFFICIENCY PORTFOLIO STANDARD IN KENTUCKY 6–7 (2012), *available at* http://www.maced.org/files/Potential_Impacts_of_REPS_in_KY.

113. *See Save Coal River Mountain!*, COAL RIVER MOUNTAIN WATCH, http://www.crmw.net/crmw/savecoalrivermountain (last visited Nov. 15, 2011).

114. *See id.* (Follow the "Current Status of the Mountain" hyperlink).

115. Deborah Feyerick, *The Battle Over Coal River Mountain*, CNN, Oct. 7, 2008, http://www.cnn.com/2008/US/10/07/coal.river/.

116. EVAN HANSEN ET AL., THE LONG-TERM ECONOMIC BENEFITS OF WIND VERSUS MOUNTAINTOP REMOVAL COAL ON COAL RIVER MOUNTAIN, WEST VIRGINIA 3 (2008), http://www.downstreamstrategies.com/documents/reports_publication/Wind_vs_mountaintop_removal_coal_Coal_River_Mtn_Dec2008.pdf.

117. James Hansen, *A Plea to President Obama: End Mountaintop Coal Mining*, YALE ENV'T. 360 (June 22, 2009), *available at* http://www.e360.yale.edu/content/feature.msp?id=2168.

118. HANSEN, *supra* note 116, at 4.

119. *Id.*

120. *Id.*

121. *Id.*

Term Economic Benefits of Wind Versus Mountaintop Removal Coal on Coal River Mountain, West Virginia,"[122] which outlined three different scenarios: a MTR scenario, a conservative wind scenario, and a local industry wind scenario.[123] The conservative wind and local wind industry scenarios proposed 164 wind turbines on Coal River Mountain.[124] The MTR scenario included development of a local wind industry in addition to the construction of wind turbines on Coal River Mountain to further enhance the local economy.[125] All three scenarios include the potential for underground coal mining, albeit not MTR.[126]

For each scenario, the local economic benefits were quantified based on the projected increases in jobs, earnings, and economic output. The costs due to excess deaths and illnesses from coal production and local environmental problems are also quantified.[127] For MTR, the cumulative external costs from coal production exceed the cumulative earnings in every year, while both wind scenarios show cumulative earnings that exceed cumulative externalities in every year. The wind scenarios also provide significantly more jobs than would an MTR project. The study also found that Raleigh County would receive an additional $36,000 per year in coal severance taxes by MTR mining on Coal River Mountain.[128] The wind farm scenarios estimate that an additional $1.74 million in local property taxes will be generated each year.[129]

The study also found that eighteen percent of the forty-seven million tons estimated to be surface-minable through MTR on Coal River Mountain could be mined through underground mining if the proposed wind farms are constructed.[130] This decrease in minable coal is due to decreased access to marginal coal seams and because the contour and area mining methods

---

122. *Id.*

123. *Id.* at vi.

124. *Id.* at 14.

125. *Id.* at 17.

126. *Id.* at 18. Although the externalized economic and environmental costs of MTR are substantial, the Report failed to adequately consider the external environmental and economic costs of wind farms. Although the Report mentions increased avian and bat mortality rates, and land clearing for the wind turbines, it fails to take other major factors into consideration. For example, the Report fails to take into consideration externalized environmental costs in the production phase of the wind turbines—including obtaining the raw materials through the completion of the wind turbines, the transport of wind turbine components and erection of the wind turbines, the operation and maintenance throughout the twenty-year design lifetime of wind turbines, the replacement of decommissioned wind turbines, the disposal of wind turbines, and the visual light and sonic pollution associated with wind turbines. However, at least one manufacturer has claimed that up to 80% of a decommissioned wind turbine is recyclable. VESTAS WIND SYSTEMS A/S., AN ENVIRONMENTALLY FRIENDLY INVESTMENT: LIFECYCLE ASSESSMENT OF A V90-3.0 MW ONSHORE WIND TURBINE 12 (2009). A complete life cycle assessment of the proposed wind farm project was never conducted.

127. More indirect externalities such as global environmental costs, forestry, tourism, property values, and gathering, hunting, and heritage were not analyzed or included in the Long Term Economic Benefits of Wind Versus Mountaintop Removal Coal on Coal River Mountain, West Virginia Report.

128. HANSEN ET AL., *supra* note 116, at 21.

129. *Id.* at 45.

130. *Id.* at 18.

associated with MTR recover a larger percentage of the coal compared to room and pillar underground mining.[131] MTR mining would not be compatible with a wind farm on Coal River Mountain, as the mountain's elevation would be excavated too low to harness the necessary wind speeds.[132]

In light of the local economic and environmental benefits of the development of wind farms described above, the major impediments to the construction of the proposed wind farms are the landowners and the mining companies that are leasing the Coal River Mountain property. Large landholding companies own the bulk of the land and mineral extraction rights on Coal River Mountain.[133] Landowners are paid based on royalties from the coal that is sold. For wind power generation, the report estimated landowner revenue to be $10,997 per turbine based on a 3.5% gross revenue share from electricity generated by the wind turbines.[134] However, the MTR scenario would generate a net present value of $63 million in landholder revenues for MTR versus $19 million for wind.[135] The increased profits are substantial, and the landholding companies have a $40 million incentive to invest in MTR instead of wind farms.

Thus, even where the development of a viable wind farm would be highly profitable and beneficial to the government, local community, and individual citizens, there are still insufficient incentives to develop a wind farm as long as there is minable coal beneath the surface. Only the few politically strong landowners and leaseholders will earn higher profits through MTR of the coal. Thus, the Coal River Mountain Wind Project would not likely happen without significant government and public support.

Despite these hurdles, there are still several steps the state government can take to prevent surface mining on Coal River Mountain. For one, the government could rescind the mining permits[136] or declare the Coal River Mountain unsuitable for mining.[137] Realizing that a wind farm will benefit government over an extended period of time, the government could appropriate public funds to compensate the holders of private property rights on Coal River Mountain to prevent the landholders from using MTR to mine the land. The state government can also provide greater incentives for the development of renewable energy.

Even if the wind farm project was approved and Coal River Mountain was not destroyed, these proposals still include underground mining in their scenarios. While underground mining is certainly less destructive and provides more jobs than surface mining, it is also a lingering reminder of the difficulty of certain areas in the United States to transition to renewable resources.

---

131. *Id.*

132. *Id.* at 11.

133. *Id.* at 41.

134. *Id.* at 23.

135. *Id.* at 42.

136. As the EPA did for Spruce Mine No. 1. *See Mid-Atlantic Mountaintop Mining: Spruce No. 1 Mine*, *supra* note 70.

137. *See Re: Decision On Pine Mountain Petition*, KY. RES. COUNCIL (May 16, 2001), *available at* http://www.kyrc.org/webnewspro/99004443941597.shtml (declaring, in 2001, 2,364 acres of land within the area north of the Pine Mountain Settlement School as unsuitable for all types of surface coal mining operations because of the historical and cultural significance of the land); *see also* KY. REV. STAT. § 350.610 (2010).

The inherent political difficulties behind constructing a wind farm on Coal River Mountain instead of losing the mountain to a vast surface mine are inconceivable in other parts of the world. For example the success of renewable energy in Germany has been lauded across the globe.[138] This success has been attributed to many policies, the most significant of which has been Germany's early and consistent commitment to a comprehensive series of promotions for renewable energy in the early 1990s, which has since been augmented with additional legislation and policy actions to increase renewable energy use.[139] Germany's transition to renewable energy is even more impressive because Germany is Europe's largest producer of coal.[140]

Germany has embraced energy independence, committed to the lowering of global temperatures, heavily invested in and subsidized renewable energy, and has established a burgeoning, highly profitable energy industry, through the implementation of consistent energy policies over the past forty years. In comparison, the United States' commitment to renewable energy has been capricious at best.[141] Given the success of the renewable energy policies in Germany, the Coal River Mountain Wind Project could flourish if West Virginia and the United States adopted similar policies, and the development of the wind farm, rather than MTR coal mining, would most likely prevail.

The story of Coal River Mountain demonstrates the need for progressive government policies that support renewable energy. State and federal governments need to provide the proper incentives to keep the current landowners complacent and their companies profitable, while contemporaneously providing the incentives for a transition to renewable energy sources. The region needs to set policies and implement goals and targets for the promotion and development of renewable energy, including paying renewable energy producers the actual costs of energy production rather than the avoided costs.[142] The Coal Mountain River Wind Project may not be a successful project

---

138. PAUL RUNCI, RENEWABLE ENERGY POLICY IN GERMANY: AN OVERVIEW AND ASSESSMENT, JOINT GLOBAL CHANGE RESEARCH INSTITUTE (2005), *available at* http://www.globalchange.umd.edu/energytrends/germany.

139. *Id.*

140. U.S. ENERGY INFO. ADMIN., *Asia Leads Growth in Global Coal Production Since 1980*, (Dec. 7, 2011), *available at* http://www.eia.gov/todayinenergy/detail.cfm?id=4210.

141. In 1991 the Federal Electricity Feed Law was adopted in Germany. This law required public utilities to purchase renewably-generated power from wind, solar, hydro, biomass, and landfill gas sources on a yearly fixed rate basis, based on utilities' average revenue per kWh. The law also provided that investment in wind power installations are to be subsidized by the Deutsche Ausgleichsbank, a state-owned development bank that offered low-interest, government guaranteed loans for new wind power development. *See* RUNCI, *supra* note 138. Compare this legislation to the Public Utility Regulatory Policies Act (PURPA) in the United States, where the United States government required electric utilities to buy power from renewable energy producers at the "avoided cost" rate. The "avoided cost" rate is the cost the electric utility would incur were it to generate or purchase from another source. Public Utility Regulatory Policies Act, 16 U.S.C. §§ 2601–45 (1978). As a result, instead of paying the renewable energy producers the actual cost of renewable energy production as in Germany, the United States requires that the energy producers be paid the cost as if the energy was produced by conventional methods. Thus, renewable energy producers cannot compete in the United States with conventional energy producers.

142. MOUNTAIN ASS'N. FOR CMTY. ECON. DEV., THE FORESTS AND WOOD PRODUCTS SECTOR IN APPALACHIAN KENTUCKY: WHAT WE HEARD AND WHAT WE LEARNED, (2009), http://www.maced.

today, but if the region follows Germany's example and embraces renewable policies, the same may not be true in the years to come. By exploiting the Region's substantial energy-efficient and renewable resources, Appalachia can cut the energy bills of its households, businesses, and industries, create green jobs, and grow its economy.[143]

B. Sustainable Forestry

Appalachia has large forested areas that are home to diverse and valuable species,[144] but years of poor logging practices, including high grading,[145] have significantly diminished the quality of Appalachian forests. However, there has been a net growth in forests in Appalachia, with more growth in non-coal counties than coal counties because of the impacts of surface mining.[146] There is little active management or awareness of forest management practices in the region, and because the majority of forested land is owned by private landowners—in many cases absentee landowners associated with coal mining—there is little incentive for landowners to manage their land.[147] Moreover, incentives and new institutional models, such as land aggregation,[148] are needed to encourage sustainable and productive management of central Appalachian forests. There is also a need to develop markets for goods produced by the Appalachian forests and to implement better regional and state economic development policies in both the public and private sectors.[149]

There is also a unique forestry opportunity emerging in Appalachia because

---

org/files/Forests_and_Wood_Products_Report.pdf.

143. *See* Brown, *supra* note 97, at xviii.

144. *See The Forests and Wood Products Sector in Appalachian Kentucky*, *supra* note 142.

145. *See* Paul Cantanzaro & Anthony D'Amato, *High Grade Harvesting: Understand the Impacts; Know Your Options*, University of Massachusetts Extension, *available at* http://extension.unh.edu/resources/files/Resource000210_Rep228.pdf (last visited May 29, 2012). High grading is a harvest that removes the trees of commercial value, leaving small trees, as well as large ones of poor quality and of low-value species. This harvesting practice is frowned upon in the forestry community because it substantially diminishes the overall health of a forest.

146. *See The Forests and Wood Products Sector in Appalachian Kentucky*, *supra* note 142, at 3.

147. *Id.*

148. In 2008, MACED launched The Forest Opportunities Initiative, the first organized program in Central Appalachia designed to pay private landowners for the ecosystem services of their property. Forest landowners who manage their woodlands sustainably receive annual payments for the value of the carbon their forest removes from the atmosphere. To participate in the program, the land must be certified by the Forest Stewardship Council. As of 2010, 16,000 acres have been enrolled in the program. Anthony Flaccavento, *The Transition of Appalachia and the Transformation of Prosperity in the United States*, APPALACHIAN TRANSITION INITIATIVE (Jan. 2010), http://appalachian transition.net/sites/ati/files/essays/CAPP%20Flaccavento%20Essay%20-%20 Final.pdf.

149. *The Forests and Wood Products Sector in Appalachian Kentucky*, *supra* note 142, at 8. Suggestions include: increasing the budget of the Kentucky Division of Forestry to hire more foresters to provide assistance to landowners with stewardship plans; making a substantial investment in a cost-share program for landowners to develop and implement management plans; revisiting the model of the wood products competitiveness corporation to provide enhanced support to the wood products industry in a new fashion; reinstating the wood products market specialist in Kentucky's Department of Agriculture; and promoting the expansion of Kentucky's Certified Master Logger program, including the involvement of non-mechanized loggers. *Id.*

of the presence of vast areas of abandoned mines and surface mines.[150] In Appalachia, there are up to one million acres of mined land that can be reforested.[151] These lands can be utilized to provide jobs to restore native hardwood forests that will sequester carbon, improve water quality, and improve the habitats and environmental quality of the region.[152]

In an effort to reestablish these forests, researchers are currently experimenting with different site restoration methods that allow for native species to once again establish and regenerate. The Appalachia Regional Reforestation Initiative (ARRI) is a cooperative effort led by the Appalachian States, the U.S. Office of Surface Mining, the coal industry, academics, and researchers to encourage restoration of high quality forests on reclaimed coalmines in the eastern United States. ARRI has developed a reforestation method for both former and future reclaimed mountain sites that includes using native species to restore these forests to their pre-coal extraction composition. ARRI claims these methods will achieve cost-effective regulatory compliance for coal operators while creating productive forests that generate value for their owners and provide watershed protection, wildlife habitat, and other environmental services.[153]

Surface coal mining impacts the entire soil profile by changing the physical, chemical, biological, and hydrological properties of the soil that is removed and replaced.[154] The depth of the displaced soil can stretch to several hundred meters below ground.[155] Such mining operations can also cause landslides and sedimentation, the vast deposits of sediment that often bury stream corridors and impact aquatic ecosystems.[156] The mixing of overburden with soil is known as "spoil" and often includes the oxidation of iron sulfide in water, which results in acid mine drainage.[157] Coal companies have historically made little effort to control the composition of the spoil.[158]

---

150. The maintenance, development, and use of abandoned mine properties remains a contentious issue in central Appalachia. The Surface Mining Control and Reclamation Act of 1977 allows coal companies to avoid the requirement to restore the mined land to its approximate original contour if the reclaimed land could be put to a "higher and better use." Higher and best use includes providing flat land for developments such as box stores, prisons, subdivisions, and golf courses. However, most promised developments never materialized, and those that did were plagued with unstable and shifting land. As a result, "communities were left with miles of deserted, treeless plateaus, positioned water tables, and a permanently altered landscape." ELLER, *supra* note 12, at 227.

151. APPALACHIAN REG'L. REFORESTATION INITIATIVE, GREEN FOREST WORKS FOR APPALACHIA 4 (2009), *available at* http://arri.osmre.gov/Partnerships/green_forest_works/gfw.shtm [hereinafter ARRI].

152. *Id.*

153. JIM BURGER ET AL., FOREST RECLAMATION ADVISORY NO. 2: THE FORESTRY RECLAMATION APPROACH 1 (2005), http://arri.osmre.gov/PDFs/Pubs/FRA_No.2.7-18-07.Revised.pdf.

154. Samir K. Doshi & John H. Todd, *Soil as a Pillar for a New Appalachian Economy*, APPALACHIAN TRANSITION INITIATIVE (2010), *available at* http://appalachiantransition.net/sites/ati/files/essays/Doshi%20and%20Todd%20Essay%20Final.pdf.

155. *Id.*

156. *Id.*

157. W. Lee Daniels et al., *Mine Soil Morphology and Properties in Pre- and Post-SMCRA Coal Mined Landscapes in Southwest Virginia*, Proceedings, 21st National Conference of American Society of Mining and Reclamation, 421, Apr. 18–22, 2004.

158. *Id.* at 422.

The grading of the spoil at mine sites results in compaction, which leads to decreased porosity, aggregate formation, water retention, microbial habitat, and nutrient cycling.[159] Soil compaction is the primary impediment to the survival and growth of trees on reclaimed coal mine sites.[160] Most mine operators and regulators have instituted post-mining land uses, such as turning them into grasslands, which are easier, cheaper, and quicker to achieve than forests.[161] Instead of preparing sites for reforestation, the ground is typically hydroseeded with mixes of invasive grasses and legumes as inexpensive options for basic erosion control with no concern for forest restoration.[162] The resulting "moonscapes" and invasive grasslands have become ubiquitous across central Appalachia.

ARRI and others are currently experimenting with different site restoration methods that allow for native species to once again establish and regenerate to produce viable commercial forests in Appalachia on surface mine sites.[163] Not only does reforestation of mining sites help restore the ecosystem, hydrology, soils, and economy of Appalachia, reforestation can also provide local communities with opportunities for employment, education, and research.[164] Furthermore, forest restoration can lead to the development of certified green wood products, ecotourism, biodiversity enhancement, woody biofuels, and other opportunities.[165] ARRI's Green Forest Works for Appalachia program estimates that it will create permanent employment for approximately 2,000 local residents in Appalachia over the next five years to plant more than 125 million trees on over 175,000 acres.[166]

These abandoned mine sites can also be utilized for other purposes to further diversify the region. Reclaimed mine sites in Appalachia could be developed for renewable energy production,[167] industrial ecology, and sustainable agriculture, and other remediation projects.[168] In addition, there remains a constant need to monitor the environment of current and abandoned mine sites and to develop those sites for ecological or economic purposes, or

---

159. *See* Patrick N. Angel et al., *Surface Mine Reforestation Research: Evaluation of Tree Response to Low Compaction Reclamation Techniques*, Proceedings, 7th International Conference on Acid Rock Drainage, 45–58, Mar. 26–30, 2006.

160. *Id.* at 46.

161. PATRICK ANGEL ET AL., FOREST RECLAMATION ADVISORY NO. 1: THE APPALACHIAN REGIONAL REFORESTATION INITIATIVE (Dec. 2005), *available at* http://arri.osmre.gov/PDFs/Pubs/FRA_No.1.7-18-07.Revised.pdf.

162. Sarah L. Hall et al., *Topsoil Seed Bank of an Oak-Hickory Forest in Eastern Kentucky as a Restoration Tool on Surface Mines*, 18 RESTORATION ECOLOGY No. 6, 834, 834–35 (2010).

163. *See* Flaccavento, *supra* note 148.

164. *Id.*

165. ARRI, *supra* note 151, at 11.

166. *Id.*

167. Several native grasses have been researched for their aboveground vegetation development and biofuel feedstock productivity. The most researched grasses for biofuel potential that are native in Appalachia and can tolerate degraded soils include switchgrass, Atlantic coastal panicgrass, and big bluestem. *See* Doshi, *supra* note 154.

168. Evan Hansen & Anne Hereford, *Creating Green Jobs and Economic Diversification in Central Appalachia by Reclaiming Polluting Coal Mines*, DOWNSTREAM STRATEGIES (Feb. 12, 2010), *available at* http://appalachiantransition.net/sites/ati/files/essays/Hansen%20Essay%20FINAL.pdf.

both.[169] Land will never be the same as it was before being mined, but identifying alternative economic uses that enhance the land's ecological integrity to near its pre-mining level offers hope for sites historically ignored by those that have mined and regulated it.

VI. CONCLUSION

Coal production in Appalachia is on the decline and is slated to continue to decline for the foreseeable future. However, this decline does not signify the end of coal for the region. A transitional Appalachian economy will include coal production at some level. Mining companies should incorporate more sustainable mining practices that cause less damage to the environment[170] and employ more miners. Yet, for Appalachia to improve its economy, it must diversify and continue to cultivate policies that incorporate sustainable industries and livelihoods including energy efficiency, renewable energy, and sustainable forestry and agricultural practices. Much has been done to lay the groundwork for a just and sustainable economic transition in Appalachia, but there remains a lot more to do.

169. Evan Hansen et al., *The Benefits of Acid Mine Drainage Remediation on the North Branch Potomac River*, DOWNSTREAM STRATEGIES (Dec. 1, 2010), *available at* www.downstreamstrategies.com/projects.html.

170. For example, a redesign of Spruce Mine No. 1 by engineers at Morgan Worldwide at the request of the EPA was able to reduce the amount of streams temporarily or permanently buried from 8.3 miles to about 3.4 miles at a raised production cost of only 1% of the per ton sales price of the mined coal. *See* Ken Ward, Jr., *Spruce Mine Veto: Engineering Study Shows Arch Coal Could Have Greatly Reduced Impacts at Little Cost*, COAL TATTOO (Jan. 18, 2011), http://blogs.wvgazette.com/coaltattoo/2011/01/18/spruce-mine-veto-engineering-study-shows-arch-coal-could-have-greatly-reduced-impacts-at-little-cost/#more-11924.