Earth, Wind, and Coal: Examining Wind Power Suitability in West Virginia Coal Country

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Data Sources: NREL 2012; WV State GIS Data Clearinghouse 2012
Tufts
uep Urban + Environmental Policy + Planning

Project Description

Coal is king in West Virginia. It keeps the lights on and the community at work, according to local folklore. Yet, even some residents of the state have begun to wonder whether another way might exist, as surface mining – particularly in the form of mountaintop removal – decimates landscapes and endangers quality of life. As demonstrated in the documentary film, *The Last Mountain*, mountaintop removal has proven particularly destructive to ecosystems, water quality, community safety, economic stability, health, and infrastructure.

These factors have made it an especially salient target for both local residents who would like to reclaim their communities and for environmentalists who would like to progress beyond a dependence on fossil fuels and the destructive practices required to extract them above and below the ground. To counter arguments that coal mining must continue in order to retain economic stability in West Virginia, this project explores the potential for siting wind installations and exploiting wind resources in similar communities as those currently connected to coalmines. It compares coalmine locations and communities to wind farm suitability analysis results to highlight potential interactions that could encourage a diminishing reliance on coal.

Methods

I sought to evaluate the extent to which coalmines and locations suitable for utility-scale wind power (possessing a wind power ranking of 3 or higher, according to NREL) might overlap. To provide a basis for this analysis, I began with a map of West Virginia that included layers for the major roads, power lines, surface waters, ecologically sensitive areas, population by census block, wind power, and coalmine points. I projected all the layers in the UTM Zone 17N coordinate system, and rasterized the ecologically sensitive areas – which included state and national forests and parks and wildlife refuges – and the water bodies. I created raster layers of suitable wind, power lines, and roads as well by creating preference grids for each. To narrow my analysis to viable coal mines, I selected out the mines with permits good through at least May 1, 2012.

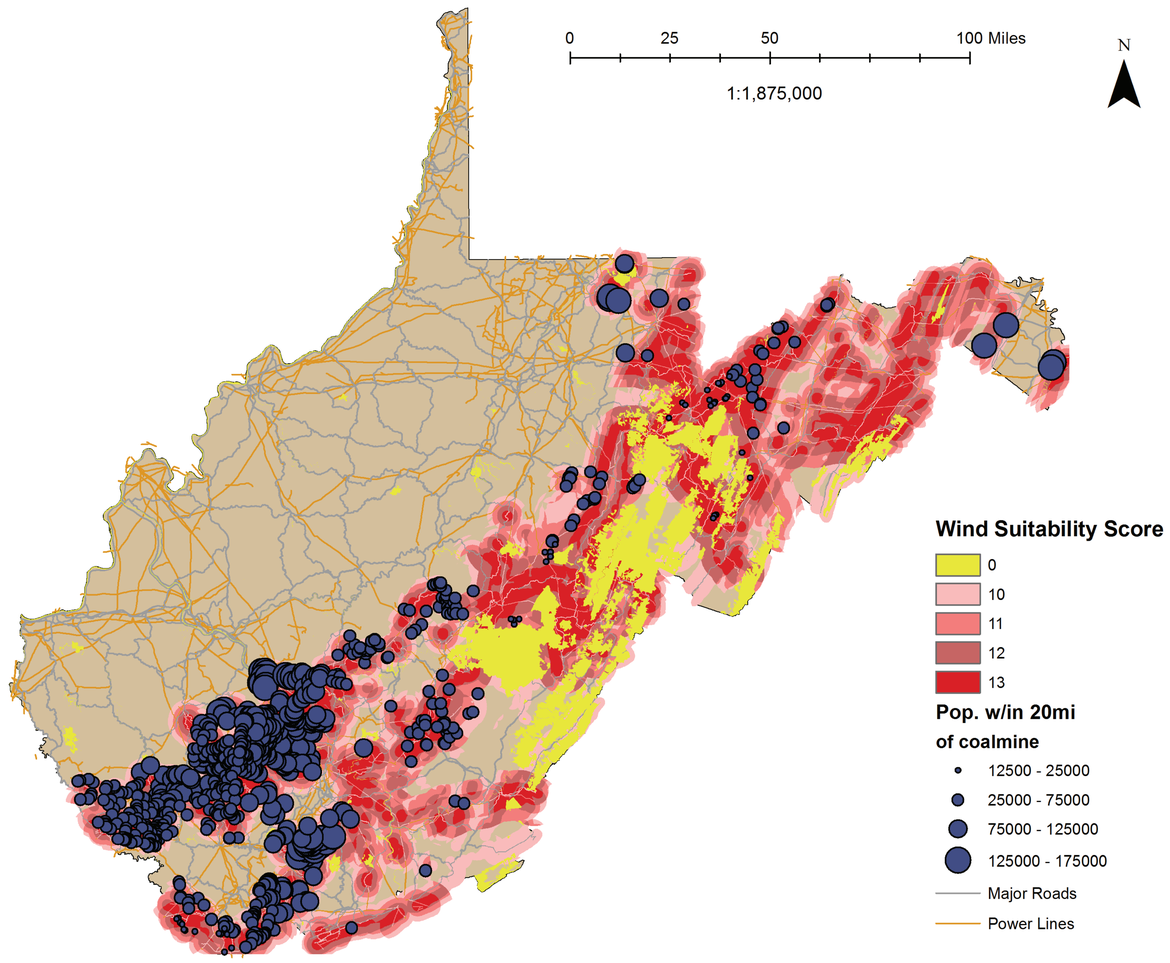
I then devised a wind installation suitability analysis to which I could connect the coalmines to sites that scored a 10 or higher, based on parameters that I set within a specified algorithm. At a minimum, these sites were within 6 kilometers of wind with an NREL power ranking of 3 or higher and 10 kilometers of power lines. The most optimal sites scored a maximum of 13, denoting that they lay within 2 kilometers of suitably powerful wind and between 100 and 5000 meters from both power lines and major roads. Ecologically sensitive areas and water bodies were eliminated from my analysis to ensure that they were not considered for wind development.

After scoring each coalmine with its wind suitability, 841 coalmines remained out of original 9213 that were both still "viable," according to my definition, and proximate to sites that achieved a wind suitability score of 10 or greater. I linked census block data from the 2010 Census to each of these remaining coalmines to obtain a population count within 20 miles of each mine. The resulting graduated blue circles on the large map demonstrate the large clusters of population in communities that are both highly proximate to – and likely highly dependent on – one or more coalmines and within an optimal location for utility-scale wind power installations.

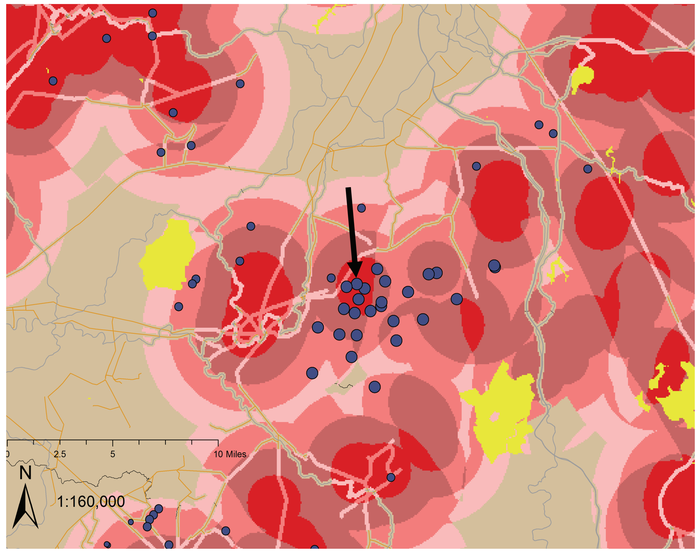
Results

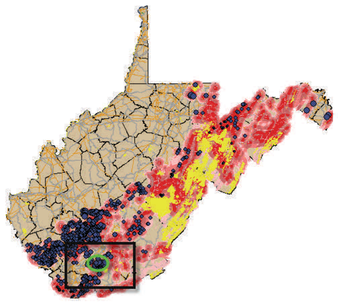
According to my analysis, 310 coalmines attain the maximum wind suitability score of 13. These correlate with approximately 160 census blocks that represent more than 100,000 people each, minus any double counting for those within 20 miles of more than 1 coalmine. Though a more rigorous analysis would yield more exacting conclusions, the large number of population blocks within easy commuting distance of coalmine sites with suitable wind power potential demonstrates a possible positive interaction. Wind power could provide a plausible salve for communities damaged by conventional fuel extraction.

A large number of people linked to coal directly or indirectly because of where they live also reside nearby to potentially suitable utility-scale wind sites. Clearly, other factors complicate a community's capacity to shift industries, including politics, economic disparities, and culture. Based on these findings, however, I recommend that additional study of these interactions be performed. In particular, an assessment of jobs associated with coal and those that could result from wind development within the most suitable zones could provide greater validation for a shift in industry and perspective.



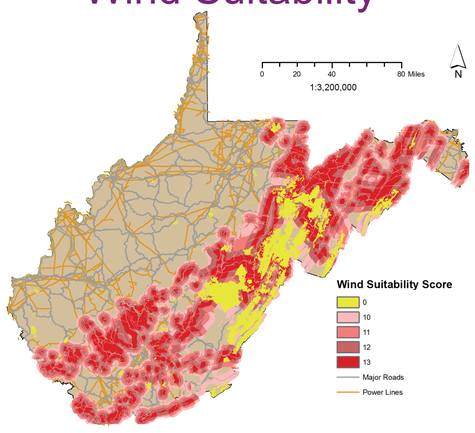
Close-up: Tommy Crk Highwall Mine No. 2, Raleigh County, West Virginia





Raleigh County, West Virginia
Mine Operator: Pocahontas Coal Company
Facility: Tommy Crk Highwall Mine No. 2
Mine Type: Surface Mine
Status: Active, Permit Expires Dec 2016
Wind Suitability Score: 13
Population Within 20-mile Radius: 133,116

Wind Suitability



Coalmines