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ABSTRACT

This paper examines the implications of a carbon-constrained future on coal-reliant county governments in the United States. We review modeling projections of coal production under reference and climate policy scenarios and argue that some state and local governments face important revenue risks. Complex systems of revenue and intergovernmental transfers, along with insufficiently-detailed budget data, make it difficult to parse out just how exposed jurisdictions are to the coal industry. A look at three illustrative counties shows that coal-related revenue may fund a third or more of their budgets. When the results of regression analysis of 27 coal-reliant counties are extrapolated outside the sample to the demise of the industry, they suggest these counties could lose on average about 20 percent of their revenue. This does not account for the potential downward spiral of other revenues as the collapse of the dominant industry erodes the tax base. Coal-dependent communities have issued a variety of outstanding bonds that will mature in a time frame in which climate policy is likely. Our review of illustrative bonds indicates that municipalities have not appropriately characterized their coal-related risks. Ratings agencies are only now beginning to document the hazardous exposure of some local governments to the coal industry. Climate policies can be combined with investments in coal-dependent communities to support their financial health. A logical source of funding for such investments would be the revenues from a price on carbon dioxide emissions, a necessary element of any cost-effective strategy for addressing the risks of climate change. We discuss how a small fraction of revenue from a federal carbon price in the United States could fund billions of dollars in annual investments in the economic development of coal-dependent communities and direct assistance to coal industry workers.

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1. Introduction

Some governments across the United States rely heavily on revenues that derive directly or indirectly from fossil fuel production. Those most reliant on coal face a particularly risky fiscal future. Coal production in the United States has already declined significantly over the past decade, and if federal climate policy is implemented, coal production is likely to decline even more precipitously. In that scenario, coal-dependent jurisdictions will experience a steep fall in economic activity, shrinking revenue, falling property values, and a dislocated workforce. Policymakers may be able to head off some of this disproportionate burden with the right mix of offsetting policies, but much research remains to ascertain the most effective approaches.

We begin with a review of the history of US coal production and projections with and without new policies, including evidence on where in the United States climate policy will have the greatest impact on coal production. Then we analyze revenue and budget data for select county governments across the United States to understand their dependence on coal and how their fiscal conditions are likely to deteriorate in a carbon-constrained future. We find that coal-related revenue may fund a third or more of their budgets. Regression analysis of 27 coal-reliant counties outside the same suggests they could lose on average about 20 percent of their revenue with the demise of the industry. To learn from other contexts, we consider previous instances in which geographically concentrated industries have collapsed and explore the extent to which policy responses buffered the impact.[1]

Coal-dependent communities have issued a variety of outstanding bonds, and the risk of collapse of the coal industry threatens their ability to repay them. Our review of illustrative bonds indicates that municipalities have not appropriately characterized their coal-related risks. Ratings reports are only now beginning to document the risks associated with the exposure of some local governments to the coal industry.

Climate policies can be combined with investments in coal-dependent communities to support their financial health. A logical source of funding for such investments would be the revenues from a price on carbon dioxide emissions, a necessary element of any cost-effective strategy for addressing the risks of climate change. We discuss how a small fraction of revenue from a federal carbon price in the United States could fund billions of dollars in annual investments in the economic development of coal-dependent communities and direct assistance to coal industry workers.

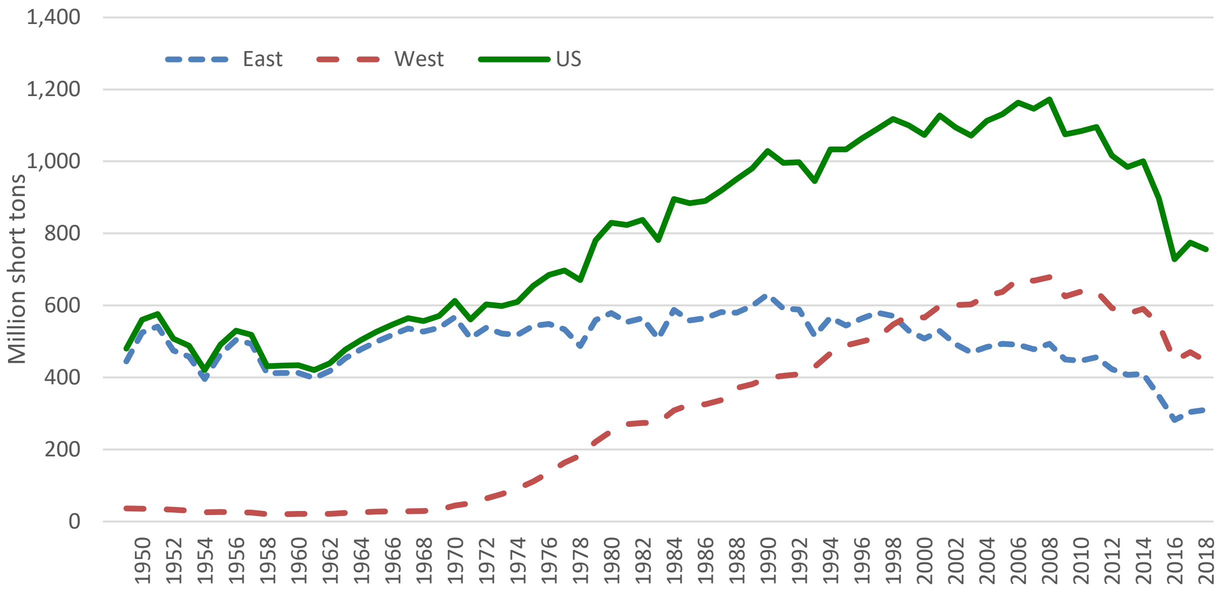
2. Quantifying the fiscal exposure to coal

To understand the coal industry's profound effects on economic conditions in coal-producing jurisdictions, it helps to reflect on how dramatically production has shifted in recent years and how climate policy could hasten the decline of the industry. As shown in Figure 1, US coal consumption nearly tripled between the early 1960s and 2000s, with growth disproportionately in the Powder River Basin in Wyoming and Montana. The abundant resource led to fiscal systems that depended on it, and from a distributional standpoint it made sense to pass the

[1] This paper draws heavily from Morris et al. (2019)

incidence to out-of-state coal buyers. But between 2007 and 2017, the tide turned, and total coal production in the United States declined by 32 percent.

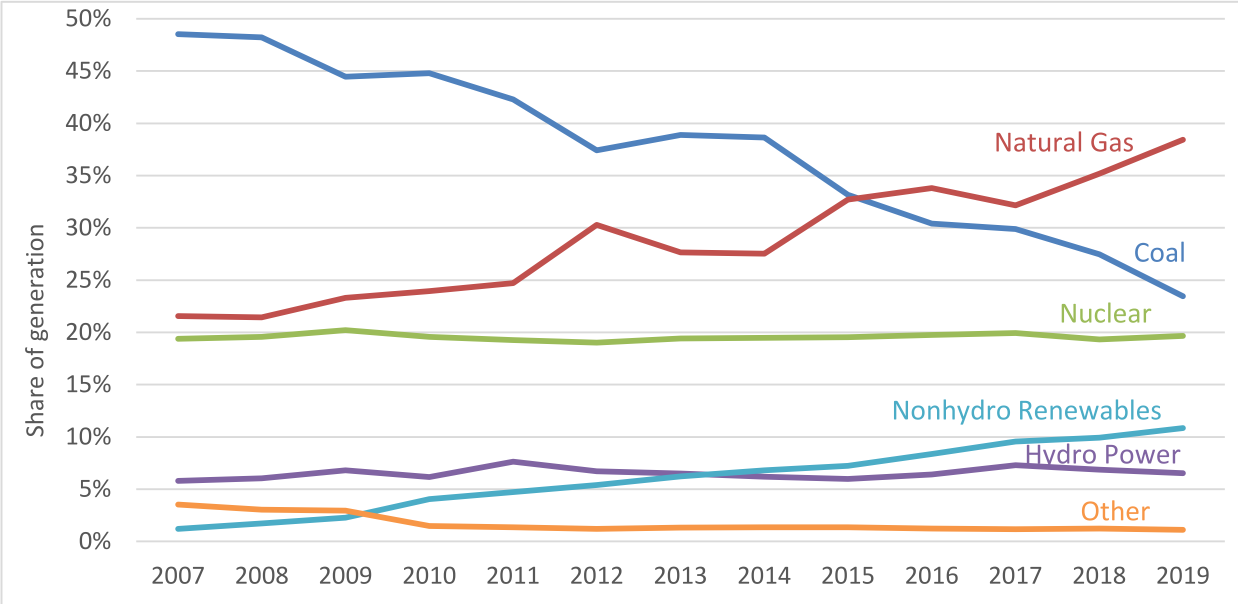
Figure 1. Tons of coal output per year, by U.S. region (1949-2018)



Source: U.S. Energy Information Administration

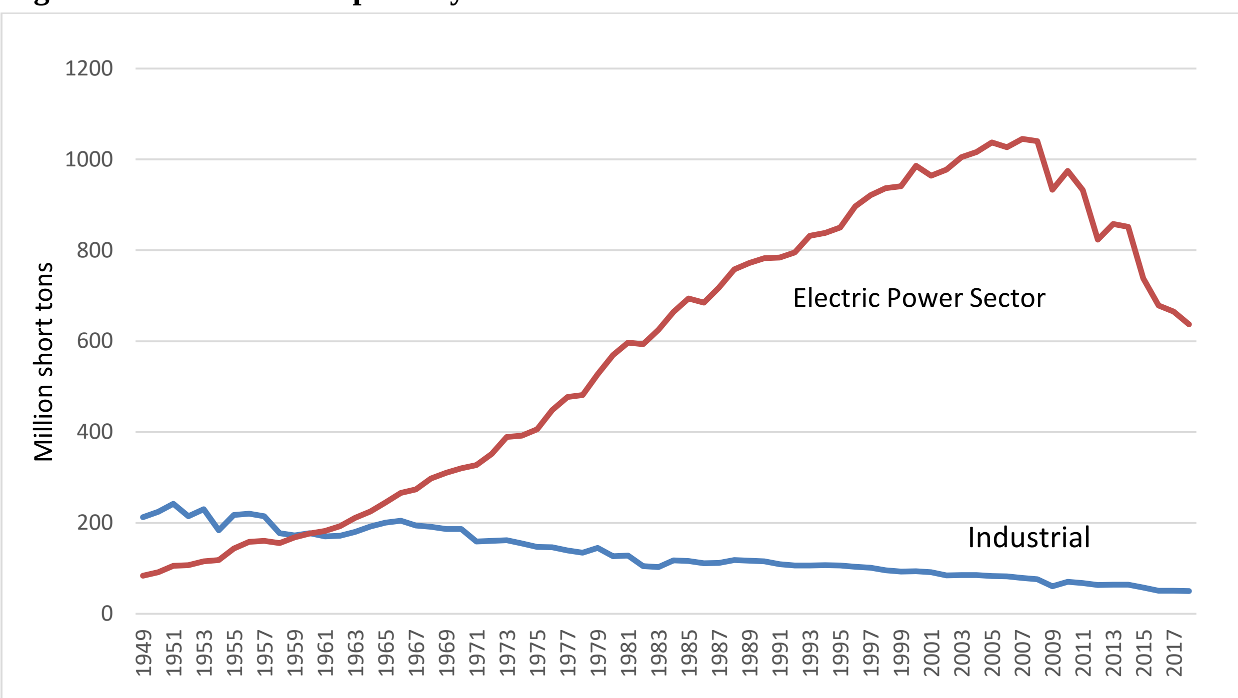
As shown in Figure 2, coal remains the second-largest fuel for electricity generation in the country, trailing only natural gas, and generates over one quarter of all US electricity (EIA 2019a). The United States has not had a federal climate policy, but much like a carbon price would, the declining price of natural gas over the past decade has made coal-fired power plants less competitive relative to natural gas-fired power plants (Cullen and Mansur 2017). This has been the primary driver of the decline in coal use (Conglianese et al. 2020). To a lesser extent, other factors also drove coal's decline, including declining costs of renewable power, slower-than-expected increases in US electricity demand (caused by the Great Recession and improved efficiency), weak exports, and air quality regulations (Houser et al. 2017; Kolstad 2017). Coal-fired power plant retirements peaked in 2015 when the Mercury and Air Toxics Standards (MATS) rule went into effect (EIA 2018), but retirements in 2018 were not far behind. As shown in Figure 3, industrial uses of coal have not offset its decline in the US power sector.

Figure 2. Composition of U.S. Electricity Generation by Energy Source



Source: U.S. Energy Information Administration, Short-Term Energy Outlook, April 2020

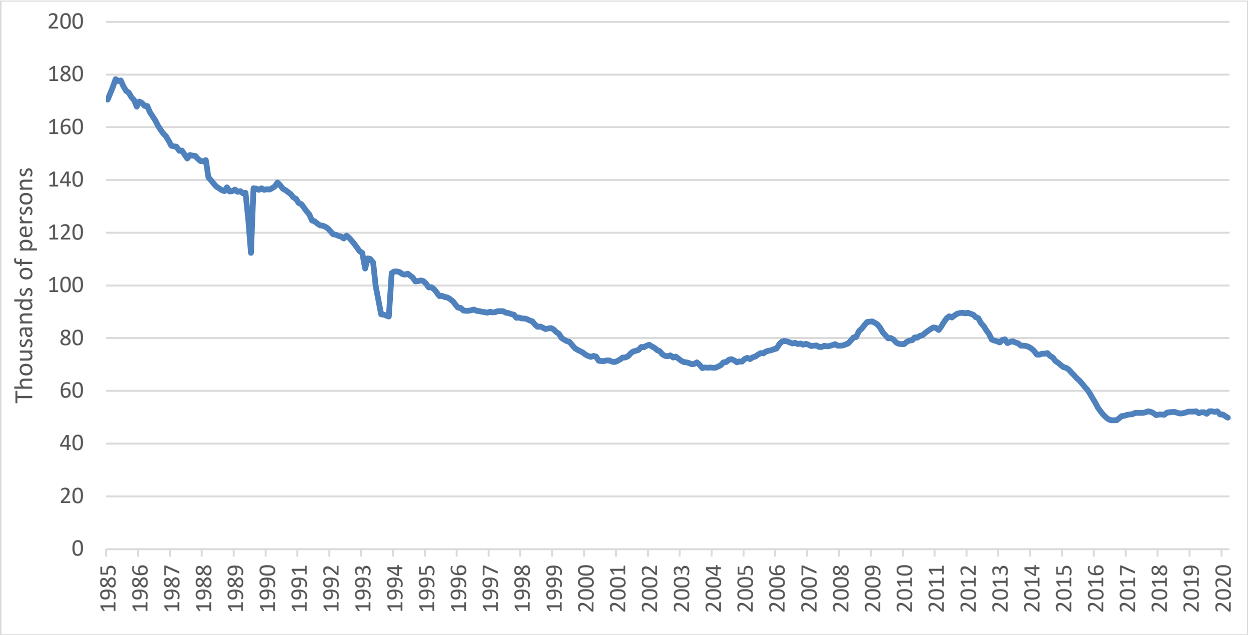
Figure 3. US coal consumption by sector



Source: U.S. Energy Information Administration. Note: Two series have been merged to achieve continuity of data.

Employment declines for coal workers have largely mirrored coal production levels, but mining productivity improvements have amplified the trend. At coal's employment peak in the 1920s, 860,000 Americans worked in the industry. In the second half of the 20th century, improvements in technology began to cut into the coal industry's labor demand, and by 2003, only 70,000 US coal workers remained. Labor productivity in US coal mining (i.e., tons of coal production per hour of work by miners) has not increased since the early 2000s (Kolstad 2017), suggesting the recent decline in employment has been caused primarily by the decline in production levels. As shown in Figure 4 below, as of March 2020, coal mining employed only about 50,000 people.

Figure 4. U.S. Coal Mining Employment



Source: U.S. Bureau of Labor Statistics

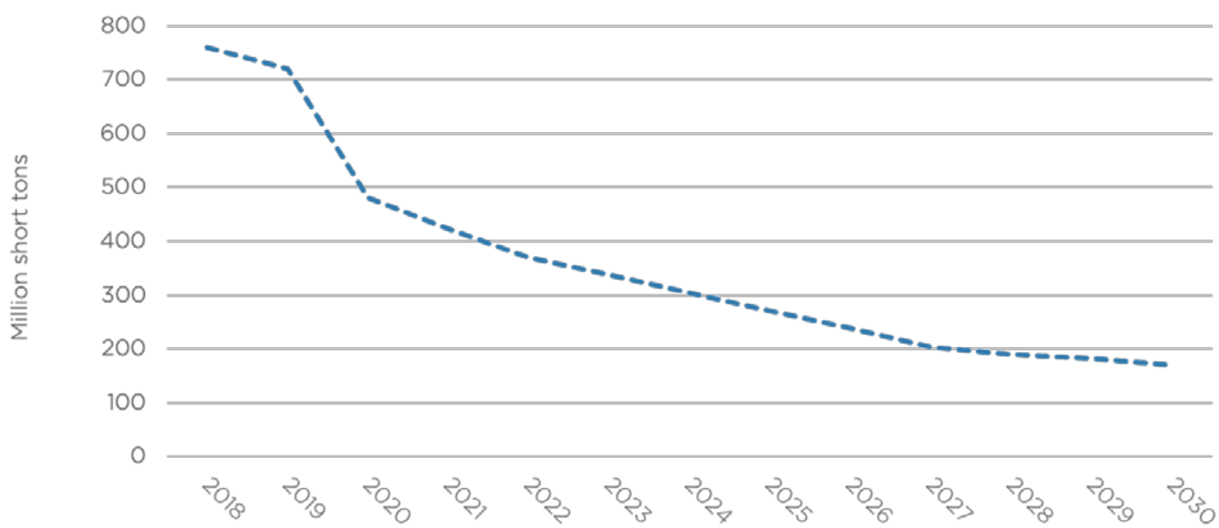
The most concentrated job losses have been in Appalachia. Employment in the coal mining industry declined by over 50 percent in West Virginia, Ohio, and Kentucky between 2011 and 2016. State-level impacts mask even more severe effects at local levels. In Mingo County, West Virginia, coal mining employed over 1,400 people at the end of 2011. By the end of 2016, that number had fallen below 500. Countywide, employment fell from 8,513 to 4,878 over this period (Houser et al. 2017), suggesting important labor market spillovers from mining to the broader economy.

2.1. The Future of US Coal Production

The decline of the US coal industry thus far begs the question of its future. A wide range of future outcomes are possible. Even if natural gas prices do not fall further and no new policies are adopted, projections suggest that coal consumption and production will continue to decline over the next decade, perhaps to 15 to 25 percent below 2018 levels (Larsen et al. 2018; Energy Information Administration 2019c). The long run effects of the coronavirus pandemic and its economic consequences are uncertain, but in the short run, coal demand is down significantly. The US Energy Information Administration (EIA) forecasts that 2020 US coal production will total 537 million short tons (MMst) in 2020, down 22 percent from 2019. Lower production reflects declining demand for coal in the electric power sector, lower demand for US exports, and a number of coal mines that have been idled for extended periods as a result of COVID-19.[2] To the extent that the sinking global economy also reduces steel demand, a decline in the production of metallurgical coal is also in the picture.

If policymakers adopt measures to control greenhouse gas emissions, estimates suggest future declines in coal are likely to be much larger and permanent. This is the even more fraught scenario facing coal-reliant local governments. An extensive literature explores the potential effects of different climate policy options in the United States. EIA uses the National Energy Modeling System (NEMS) to project policy outcomes relative to a no-new-policy reference case. In its 2018 Annual Energy Outlook, EIA examined the implications of putting a price on emissions of CO_2 from the power sector only. This "side case" imposes a price of $25 per metric ton of CO_2 in 2020, rising at 5 percent over inflation each year thereafter. Under this side case, EIA projects a rapid decline in total US coal production such that by 2030, total US coal production will be 77 percent below 2016 levels (see Figure 5).

Figure 5. U.S. Coal Production under EIA $25+/ton Scenario

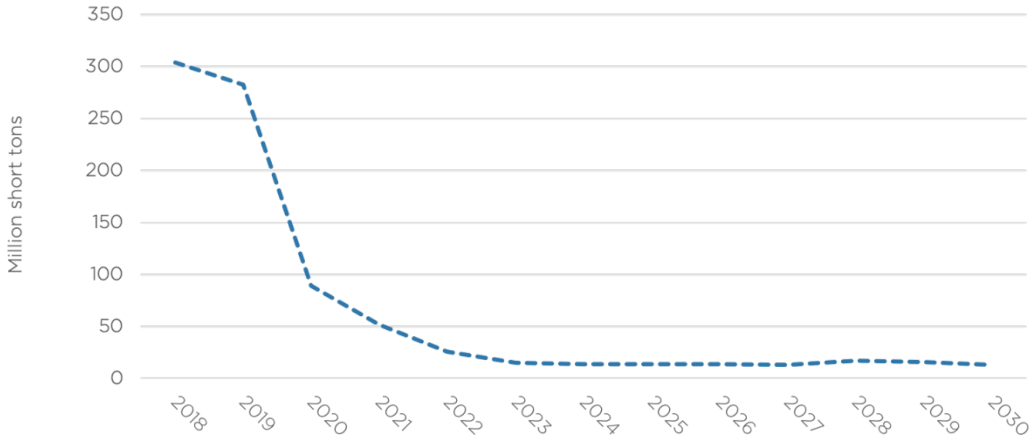


Source: U.S. Energy Information Administration

EIA projects that the sharpest reduction in coal mining would occur in Wyoming's Powder River Basin, currently the source of nearly 40 percent of US coal. In EIA's carbon price side case, Powder River Basin coal production declines by 95 percent between 2016 and 2030. One explanation is that Powder River Basin coal is overwhelmingly subbituminous coal from surface mines that is burned at power plants in the United States. EIA projects that coal produced elsewhere in the western United States would experience a similarly dramatic and rapid decline.

[2] As reported by the EIA Short Term Energy Outlook: https://www.eia.gov/outlooks/steo/report/index.php

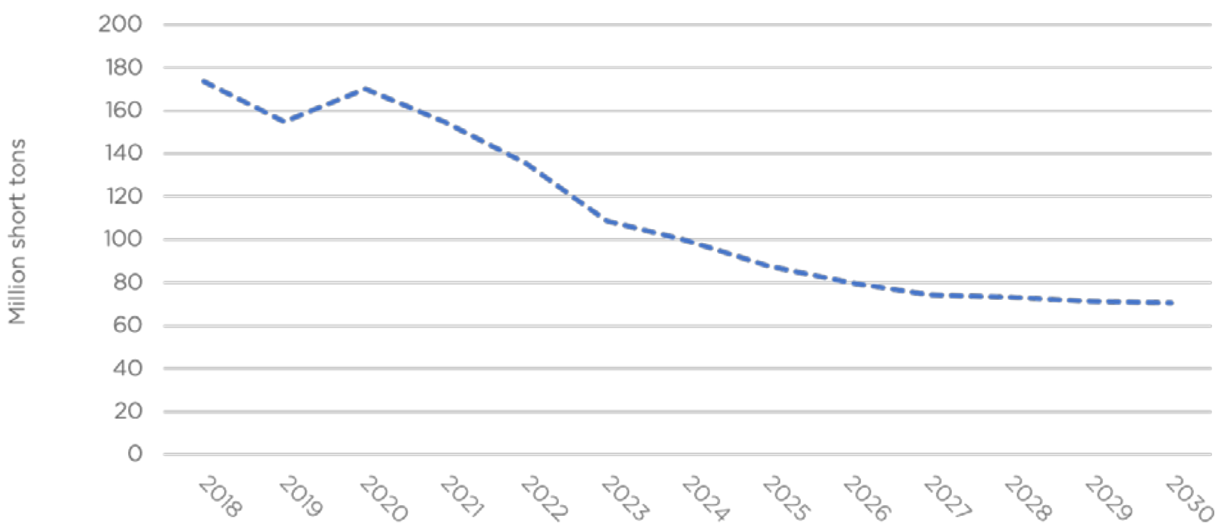
Figure 6. Powder River Basin Coal Production under EIA $25+/ton Scenario



Source: U.S. Energy Information Administration

The EIA projections for the $25/ton carbon price scenario also show a collapse in coal production from the midwestern and southeastern United States, although not quite as rapid as in the western region. As shown in, coal production from northern Appalachia (accounting for 16 percent of current US production and comprised of Pennsylvania, Ohio, Maryland, and northern West Virginia) declines by nearly 80 percent between 2016 and 2030, while production from central and southern Appalachia and the Eastern Interior region (accounting for a quarter of US production and comprised of southern West Virginia, Kentucky, Illinois, Indiana, Mississippi, Alabama, Virginia, and Tennessee) falls by roughly half over that period.

Figure 7. Appalachia Region Coal Production under EIA $25+/ton Scenario

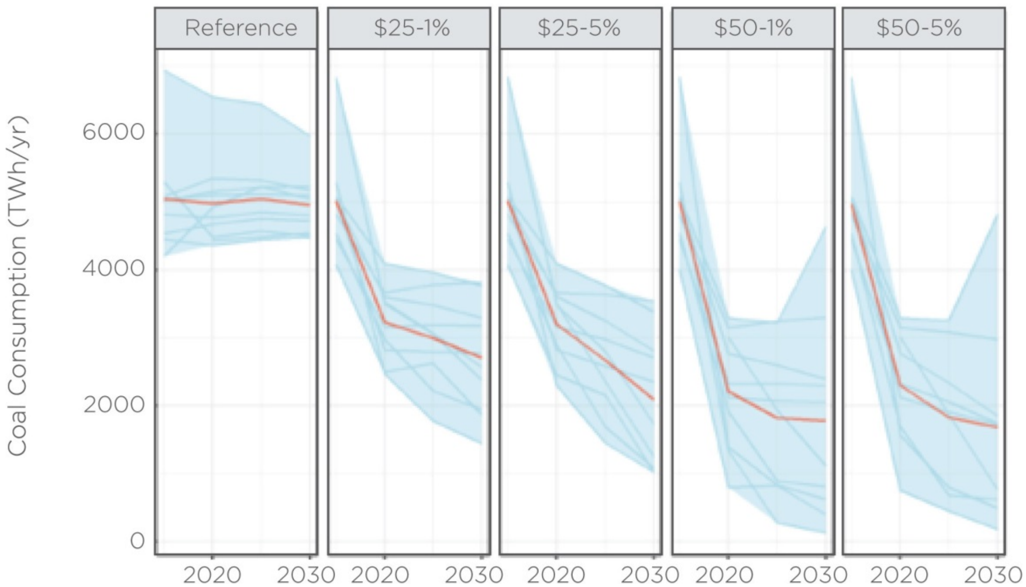


Source: U.S. Energy Information Administration

One should interpret the results from any single energy model with caution given the large uncertainties in future technologies, economic activity, and behavior of consumers and producers. We focus here on projections from the NEMS model because of its prominence and its publicly available and regionally disaggregated results.

Other modeling teams have analyzed policies like the EIA side case. They also project that climate change policy would cause large and rapid declines in the US coal industry, though not necessarily as rapid as projected by EIA. For example, as part the Stanford Energy Model Forum project 32 (EMF 32), 11 modeling teams analyzed the impacts of an economy-wide US CO_2 tax starting at $25 per metric ton in 2020 and increasing at 5 percent over inflation per year (McFarland et al. 2018). Figure 8 displays the results that show that on average, national coal consumption would fall relative to current levels by about 60 percent by 2030 as compared to a decline of nearly 80 percent over a similar time period in EIA's power-sector-only $25 per ton scenario.

Figure 8. US coal consumption under four carbon tax trajectories from EMF 32 (2015-2030)

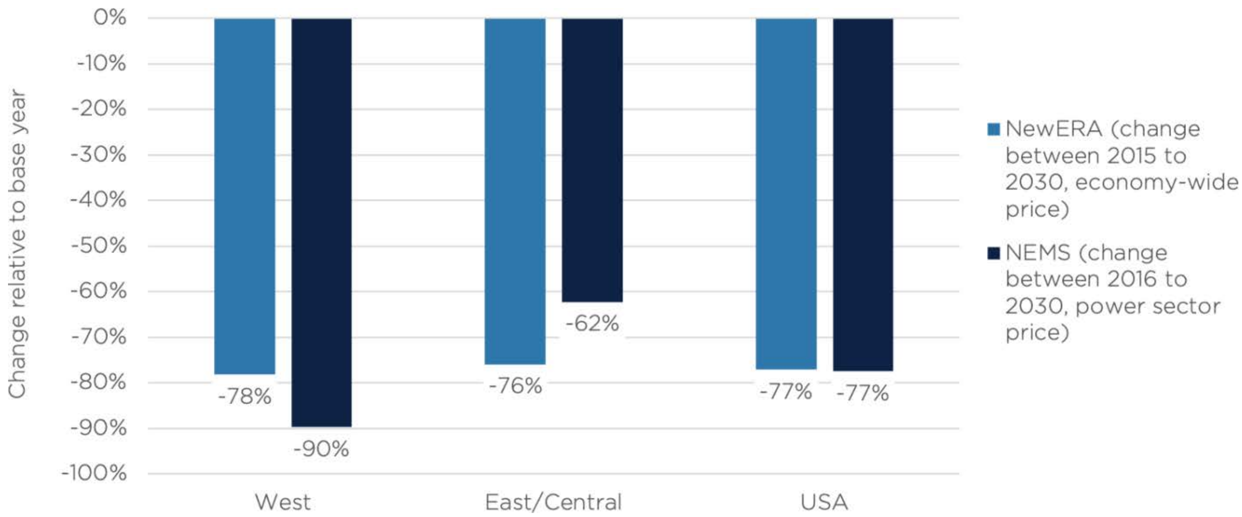


Notes: Blue bands represent the range of model results. Darker blue lines show the individual model results, and the red lines show the average value. The column titles report the initial carbon tax rates per metric ton of CO_2 (e.g. $25) in 2020 and the rate of real increase in the tax each year thereafter (e.g. 1%).

Few of the EMF 32 modelers estimated the policy's effects on US coal production by region. One exception is the NewERA model, from NERA Economic Consulting.[3] NERA's results are similar on a nationwide basis to those of EIA (see Figure 9), although the authors find the decline is more equally distributed across the east and west regions of the country.

[3] Details about the model can be found here: https://www.nera.com/practice-areas/energy/newera-model.html#tab-1.

Figure 9. Change in Coal Production, $25+ CO_2 Price Scenarios



Source: NEMS data are from EIA's side case from its Annual Energy Outlook 2018. NewERA data are from authors of the EMF 32 exercise.

Some may hope that with appropriate research and development, coal could be saved by deploying carbon capture and storage (CCS) technologies, which strip CO_2 from waste gases and sequester them permanently underground. At one point, this may have been plausible. In the late 2000s when Congress last seriously debated comprehensive climate change policy, the American Clean Energy and Security Act[4] included numerous provisions intended to preserve coal use with CCS technologies. However, the decline since then in coal's economics relative to natural gas and renewables suggests CCS cannot save the coal industry.

Modeling bears this out. By the time the carbon price is high enough to warrant CCS, coal is already largely displaced, and CCS comes in with natural gas. Only one of the eleven models participating in EMF 32 showed any significant deployment of coal-fired electricity with carbon capture and storage between 2020 and 2040, even in the highest carbon tax scenario (Environment and Climate Change Canada's multi-sector, multi-region Computable General Equilibrium model (EC-MSMR)) (McFarland et al. 2018). Another recent study of a federal US carbon tax that rises to $115 per metric ton by 2030 shows that such a policy could result in significant deployments of natural gas with CCS (about 15 percent of US generation by 2030) but no significant deployment of coal with CCS (Kaufman et al. 2019, 17).

To be sure, strong national climate policy in the United States is not certain. Experts have long recommended strong policy action to reduce emissions, and for years, policy makers have largely ignored their advice. Nevertheless, with growing support by the public and policy makers, meaningful climate policy in the United States may be on the horizon, and those dependent on coal have new risks to manage.

2.2. Revenue from Coal Production

[4] American Clean Energy and Security Act of 2009, H.R. 2454, 111th Congress (2009-2010).

How might the projected declines in coal production translate into revenue declines for state and local governments? Ideally, we would project coal production in both no-policy and climate policy scenarios, estimate the respective revenue streams that coal generates, and compare the two outcomes. This is harder than it sounds.

For one thing, the way state and local governments collect and spend coal revenue varies widely, and the types of revenue instruments, tax rates, and intergovernmental transfers differ across states and substate governments (Headwater Economics 2017). For example, in some places and for some taxes, coal revenue goes directly to county governments and local school districts. In other cases, it flows to counties or school systems via coal-funded state trust funds, and some states use coal revenue to pay directly for public services that would otherwise fall to counties, such as construction and maintenance of county roads. This means that the translation between coal production and fiscal flows to local governments is complicated.

Even tracking revenues just from sources directly tied to coal is challenging.[5] Typically, state mineral severance taxes are a percentage of gross or net value at the point of production, but some states apply it to the volume of production.[6] Severance tax rates and bases vary widely across and within states, by type of mineral or well or by volume of production.[7] Severance taxes can apply to production on both private and public land. Owing to variations in both production quantities and commodity prices, revenue from severance taxes can be volatile. It can also amplify the fiscal effects of a downturn in the coal industry. For example, in West Virginia, severance taxes raised $483 million in 2011, or 12 percent of general revenue. In 2016, severance taxes fell to $262 million, or 6 percent of general revenue.

States also receive royalties, lease bonuses, and rents from mineral production on state lands, and the federal government gives states a cut of the royalties from production on federal lands in their jurisdictions. Royalties are a payment for extracted resources, determined by a percentage of the resources' production value.[8] A lease bonus is a payment to the landowner upon the signing of the mineral lease. Royalty rates to state governments are typically set in law, but lease auctions often determine the bonus payments. Lessees may also be subject to annual administrative fees and rent payments, which are usually a small share of their overall payments to the state. Royalty receipts vary significantly, owing in part to variation in the patterns of land ownership across states, even ones that are major fossil energy producers. For example, over 61 percent of the land in Alaska is administered by federal government agencies, whereas the federal government administers less than 2 percent of Texas land (Vincent, Hanson, and Argueta 2017). As documented by Fitzgerald (2014), western states have retained relatively more state-owned land and are more likely to have active leasing programs.

[5] An analysis of state and local revenue sources and uses from oil and gas production appears in Newell and Raimi (2018).
[6] A compendium of state severance tax policies for natural gas appears here: http://www.ncsl.org/research/energy/taxing-natural-gas-production.aspx. Weber, Wang, and Chomas (2016) also has an appendix that documents state severance tax policies.
[7] The variation of severance tax policies by state appears here: http://www.ncsl.org/research/energy/oil-and-gas-severance-taxes.aspx#severance.
[8] "Natural Resources Revenue Data," US Department of Interior, accessed June 2019, https://revenuedata.doi.gov/.

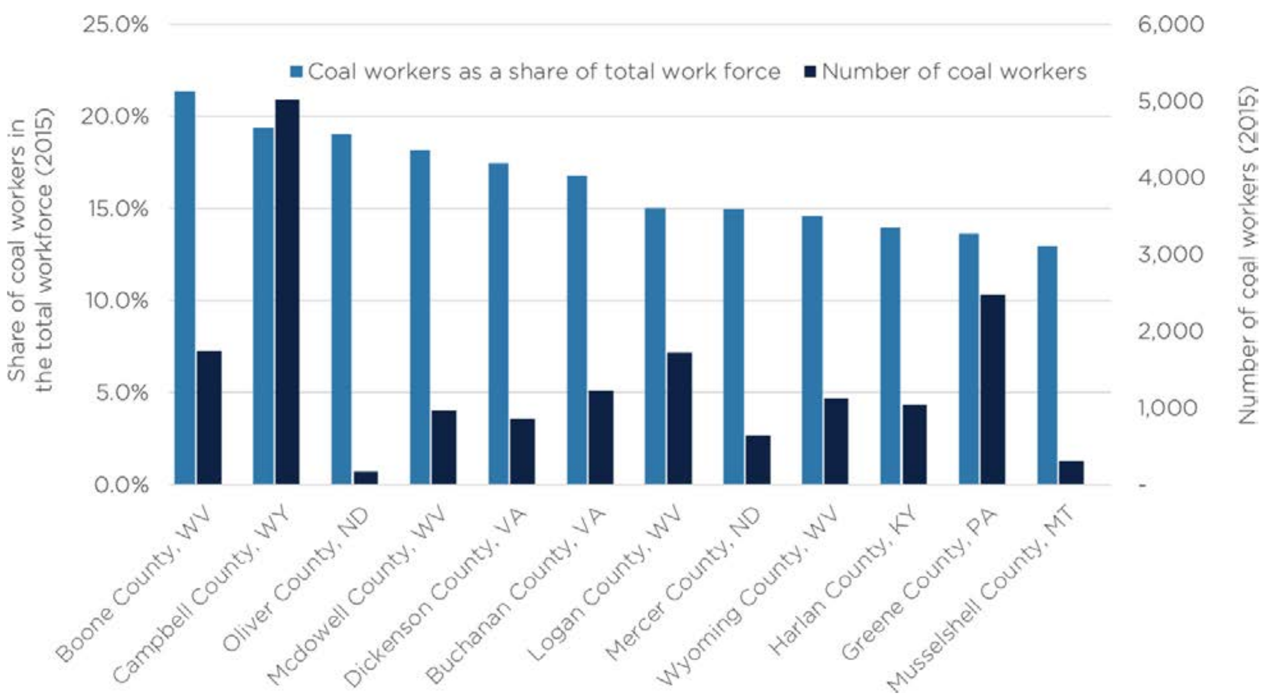
The typical federal royalty rate is 12.5 percent of the gross value of production (US Government Accountability Office 2017). According to Tax Foundation calculations, state governments receive about 17.5 percent of the royalties the federal government collects (Malm 2013).

Finally, in some cases states set local tax rates and bases, collect taxes, and/or distribute the revenues. So even when the volume of dollars flowing is clear, who controls the spigots may not be. Given the wide variation in the channels of fiscal exposure of substate governments to coal, we focus on the finances of a few illustrative jurisdictions and learn what we can through their particulars. We chose three illustrative counties in three different states: Campbell County in Wyoming, Boone County in West Virginia, and Mercer County in North Dakota.

2.3. **Finances of Illustrative Coal-Reliant Counties**

The US Department of Agriculture's (USDA) Economic Research Service defines a county as "mining dependent" if 8 percent or more of its employment is engaged in the mining industry (US Department of Agriculture 2019). Applying that threshold to 2015 employment data (the most recent year available), 27 counties across 10 states in the United States are coal-mining dependent. Figure 10 shows the top 12 counties, each with more than 13 percent of their 2015 labor force tied to coal mining.

Figure 10. Top Twelve U.S. Counties by Coal Employment Share



Source: U.S. Bureau of Labor Statistics

Figure 10 shows that Boone County, West Virginia, and Campbell County, Wyoming, have the highest labor shares in coal mining. To choose a third county in another state, we skip over tiny Oliver County, North Dakota (population 1,898) to its larger neighbor, Mercer County (population 8,267).[9] These are three of the most coal-mining dependent counties in the United States, so they represent the most coal-exposed economies. Further research is necessary to consider the fiscal implications of climate policy in coal-reliant counties that are also dependent on natural gas and oil production. Our focus is strictly on coal because modeling suggests that coal would be the fossil fuel most rapidly and dramatically wrung out of the economy under climate policies, but we do not intend to suggest that dependence on the other fuels is unimportant, particularly over the longer run.

While we primarily discuss revenues to the county governments themselves, each county also contains a collection of municipalities, school systems, and special districts, such as for libraries and fire departments. Each of these has its own exposure to the coal industry via state funds, property tax revenues, and the like.

Boone County, West Virginia

Boone County (population 22,000) lies in southern West Virginia and forms part of the Central Appalachian coal basin. Along with other southern West Virginia counties, it has long been a center of coal extraction (US Department of the Interior 2019). The county revenue directly from coal is primarily from property and severance taxes. Because coal production has already fallen dramatically in Boone County, its challenges illustrate the trouble that may face other coal-reliant jurisdictions. Property taxes fund both county governments and school systems in West Virginia. Proceeds from coal severance taxes flow to local governments primarily via transfers from the state; percentage points of the 5 percent severance tax goes to the state government.[10] The state distributes 75 percent of the remaining 0.35 percentage points to coal-producing counties and 25 percent to other counties and municipalities.[11]

Coal-producing counties in West Virginia can recapture some of the state's share when they face budget shortfalls, a policy known as a reallocation tax. This revenue funds the county commission, jails, community programs, public transit, the health department, and trash collection activities. The most recent data that distinguish coal-related revenue from other revenue are from 2015. The numbers suggest that about a third of Boone County's revenues directly depended on coal in the form of property taxes on coal mines and severance taxes. In 2015, 21 percent of Boone County's labor force and 17 percent of its total personal income were tied to coal.[12] Coal property (including both the mineral deposit and industrial equipment) amounted to 57 percent of Boone County's total property valuation.[13] Property taxes on all

[9] Population estimate as of July 1, 2018. Demographics of Mercer County appear here: https://www.census.gov/quickfacts/fact/table/mercercountynorthdakota,US/PST045218.
[10] As described by the West Virginia State Tax Department, p. 1: https://tax.wv.gov/Documents/Reports/SeveranceTaxes.TaxData.FiscalYears.2015-2018.pdf.
[11] State of the Treasury (2015), p. 11.
[12] Data for 2015 from the US Census Bureau, US Bureau of Labor Statistics, and US Bureau of Economic Employment.
[13] The total assessed valuation for Boone County for 2015 is $1.5 billion as per Levy Rates for the County and Cities in Boone County 2015, p. 2. The total valuation for coal industrial and mineral property is $840 million, as calculated from Kent (2016), pp. 13–14. This implies that coal forms about 57 percent of total Boone County valuation. This is in line with the findings of O'Leary (2011), p. 6, that coal forms about 60 percent of the total property tax revenue for Boone County.

property generated about half of Boone County's general fund budget,[14] which means that property taxes just on coal brought in around 30 percent of the county's general fund. Property taxes on coal also funded about $14.2 million of the $60.3 million school budget (24 percent).[15]

In total, coal-related property taxes generated approximately $21 million for Boone County's schools, the county government, and specific services.[16] In addition, Boone County received over $1.6 million from severance taxes and an additional $800,000 from the reallocation tax.[17] In 2012, 31 mines in the county produced 16.4 million short tons of coal. Just five years later in 2017, only 11 mines remained, producing only 5.0 million short tons, a 70 percent decline.[18] This resulted in a 50 percent decline in property tax revenue for the county government and a 38 percent decline in its total revenue.[19] Coal prices were fairly flat over the period, so the relationship is mostly a function of the volumes of coal produced.

Revenue declines have driven painful spending cuts. In 2015, Boone County closed three of its ten elementary schools (Jenkins 2015). Bankruptcies of coal companies left the county with $8 million in uncollected property tax revenue in 2015 (Kent 2016), and West Virginia passed an emergency bill for school funding in 2016 to provide for a $9 million shortfall due to one such bankruptcy (*WSAZ News* 2016). To make up for these shortfalls, Boone County cut back services such as its solid waste program. To attract more investment and employment by coal companies, West Virginia passed two bills in 2019 giving tax breaks to the coal industry. House Bill 3142 reduces for two years the severance tax rate from 5 to 3 percent on coal that is used in power plants.[20] House Bill 3144 creates a 35 percent investment tax credit that would offset up to 80 percent of a coal company's severance tax liability.[21]

Campbell County, Wyoming

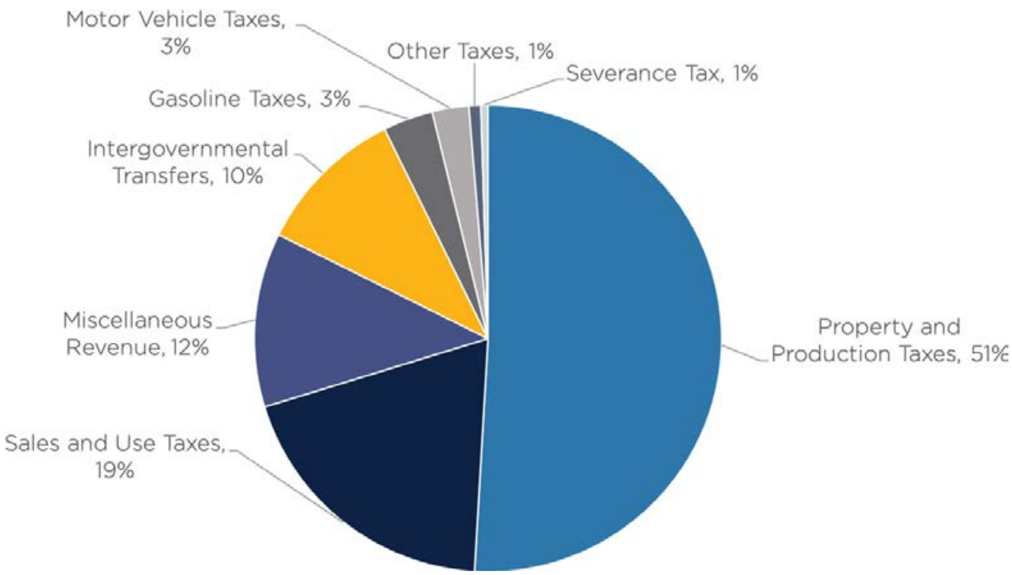
Campbell County (population 46,170) lies in northeast Wyoming in the Powder River Basin.[22] It is home to the largest coal mine in the world, and mining is its largest sector, employing about 20 percent of the county's labor force (Campbell County Board of County Commissioners 2017). In Wyoming, coal generates government revenues through four main instruments: property taxes, federal mineral royalties, coal lease bonuses, and severance taxes. The generation and flow of

[14] Calculated by authors from West Virginia State Auditor (2016). Property taxes generate about $6.3 million of the county's $12.5 million budget.
[15] We calculated this by applying the schools total levy rate for class 3 and 4 property (1.69 percent) from Boone County Government (2015), p. 1, to the assessed valuation of coal as described in footnote 12 above.
[16] We calculated this by applying the total levy rate for class 3 and 4 property (2.53 percent) from Boone County Government (2015), p. 1, to the assessed valuation of coal as described in footnote 12 above.
[17] We calculated annual revenues by combining amounts derived from quarterly severance and reallocation tax distribution documents published by the West Virginia State Treasurer: https://www.wvtreasury.com/Banking-Services/Revenue-Distributions/CoalSeverance-Tax/Coal-Severance-Tax-Archive.
[18] Data from the 2018 and 2012 Annual Coal Report published by the EIA.
[19] Kent (2016) found that revenues from coal severance tax to West Virginia counties declined from a total of $30.5 million in 2011 to $16.1 million in 2015. Boone County severance tax revenue declined from $5 million in 2011 to $1.6 million in 2015.
[20] Relating to reducing the severance tax on thermal or steam coal. House Bill 3142. Regular Session (2019).
[21] North Central Appalachian Coal Severance Tax Rebate Act. House Bill 3144. Regular Session (2019).
[22] Population estimate as of July 1, 2018. Demographics of Campbell County appear here: https://www.census.gov/quickfacts/campbellcountywyoming.

these revenues to local governments is complex.[23] Some coal-related revenue goes directly to local governments. Coal-related revenues to the state travel via various trust funds to a myriad of substate jurisdictions. Some are targeted to specific local expenditure categories, and some amounts are contingent on whether a certain revenue threshold is exceeded. If one wanted to design a fiscal system to obscure local governments' full dependence on coal production, it would be hard to improve on the current approach in Wyoming.

The composition of 2018 revenues to the Campbell County government appears in Figure 11.[24] The property tax generates more than half of the county's tax revenue. It includes the county tax on assessed property values and an ad valorem tax on the value of minerals extracted in the county, including coal, natural gas, and oil. The next-largest revenue sources are the sales and use tax and intergovernmental transfers.

Figure 11. Campbell County Revenue Sources, Fiscal Year 2018



Source: Campbell County Audit, FY Ending June 2018

The coal-specific share of the wedges in Figure 11 are difficult to parse out, but they include the coal share of the property and production tax, the coal-related share of sales and use tax proceeds, and some of the transfers from the state and federal governments. According to the county's 2018 audit statement, mineral production taxes comprise about 81 percent of the property and production tax, but how much was from coal is not specified.[25]

A 2017 special report by the Campbell County Board of Commissioners sheds some light on this. Of the $5.3 billion in total county assessed property valuation (which includes the value of minerals produced) in the 2016–17 fiscal year, 89 percent was oil and gas production and coal

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[23] Flowcharts of various revenue streams appear in the Wyoming Legislative Service Office's *2019 Budget Fiscal Data Book.*
[24] *Campbell County Financial and Compliance Report* ending June 30, 2018, p. 25.
[25] *Campbell County Financial and Compliance Report* ending June 30, 2018, p. 51.

mining and their associated production and transportation facilities.[26] More narrowly, 79 percent was from mineral production, and coal was 75 percent of that, meaning in that year, about 59 percent of the county's overall property and production valuation was directly associated with coal mining.[27] In that same year, 29 percent of the county's total sales and use tax revenue came from mining, but the share from coal per se is not reported. Likewise, it is unclear what shares of intergovernmental transfers flow from state coal-related revenues.

Coal revenues are falling. In 2018, including revenues to the county government, the school system, and other special districts within the county, the property and production tax in Campbell County raised over $266 million. This was a sharp decline from 2016, when those collections were over $317 million.[28]

County officials recognize the challenge of a declining coal-related tax base. The county's fiscal year 2017–18 report addresses the issue directly: Assessed valuation for the 2015–2016 fiscal year (derived from 2014 calendar year production and property) was $6.2 billion. The assessed valuation for the 2016–2017 fiscal year declined to $5.3 billion and then to $4.2 billion for the 2017–2018 fiscal year. Proactive decisions by this board, and previous boards, helped to make this transition as painless as possible because of substantial investments in savings and reserves, a relatively new age of facilities and plants, and an early retirement incentive that lowered employment expenses. It is important for Campbell County to effectively plan for a future with significantly less coal production and the ad valorem taxes that it pays.[29]

To prepare for a future with lower coal production, the county established reserve and maintenance funds for capital replacement, vehicle fleet management, buildings, and recreation facilities. Nonetheless, concerns are rising that coal production in Wyoming is declining faster than the area can absorb (Richards 2019). Wind power development in the Midwest is dampening demand for coal in key markets, and natural gas prices remain low. Layoffs at Powder River Basin coal mines follow the pandemic-driven declines in power demand.

Like Boone County, Campbell County has experienced the costs of coal-related bankruptcies, and more could be on the horizon. The 2015 bankruptcy of coal producer Alpha Natural Resources left Campbell County with over $20 million in unpaid taxes. Campbell County litigated and collected most of the money, but its legal expenses were significant. Subsequently, local leaders have called for changes in laws and tax collection structures in Wyoming to place the interests of taxing entities above investors and creditors (McKim 2018; Campbell County 2018).

Mercer County, North Dakota

Mercer County is in central North Dakota. Along with its neighbors, McLean County and Oliver County, Mercer County is home to the largest mines in North Dakota. These counties primarily

[26] Campbell County Board of County Commissioners, *A Campbell County Profile: Socioeconomics (2017)*, p.10.
[27] Ibid., p. 37.
[28] Wyoming Department of Revenue *2018 Annual Report*, pp. 23, 17.
[29] Campbell County FY 2017–18 *Annual Report*, pp. 3–4.

produce lignite coal, nearly 80 percent of which is used to generate electricity. In 2015, the mining sector employed about 15 percent of Mercer County's labor force.[30]

Compared to Wyoming and West Virginia, the North Dakota government is less dependent on the coal industry.[31] However, coal-producing counties like Mercer are highly dependent on coal and would face major shortfalls if the industry collapses. Three main county revenue streams derive from coal-related revenue at the state level that the state then transfers to counties and other substate jurisdictions. The most important is the coal severance tax. The state deposits 30 percent of the revenue from the severance tax into a permanent trust fund that distributes construction loans to school districts, cities, and counties impacted by coal development.[32] The remaining 70 percent is distributed to counties. The state also imposes a coal conversion tax on operators of facilities that produce electricity from coal or convert coal to gaseous fuels or other products.[33] Third, North Dakota distributes half of its share of federal mineral royalties to counties in proportion of their mineral production and the other half to school districts.[34]

The North Dakota state government provides documentation of its payments to substate jurisdictions, so we can quantify the flows to Mercer County. According to the North Dakota state tax website, in 2018, Mercer County government received $1.3 million in coal severance tax distributions, $0.84 million in coal conversion taxes, and $0.37 million in mineral royalty distributions.[35] We do not know how much of the mineral royalty distribution is related specifically to coal.

The most recent Mercer County audit report is from 2016, so we can put the coal revenue in context for that year. According to the audit statement for the year ending December 31, 2016, the Mercer County general fund received $1.71 million from coal severance taxes, $1.25 million from coal conversion taxes, and $0.76 million from mineral royalty revenue.[36] Overall county general revenues were $7.5 million, making the three sources about half of all county revenues. The exposure is compounded because school districts and other special districts within Mercer County also receive coal-dependent revenue.

3. Analysis of revenue's relationship with coal production

The three counties illustrate the variety of coal-related fiscal flows in specific areas. Next we endeavor to generalize the relationship between county-level revenue and coal production across a broader set of coal-intensive counties. We first calculate county-level revenue from the US Census Bureau's Annual Survey of State and Local Government Finances for the years 2012 through 2017. Revenue includes taxes, intergovernmental transfers, utility and alcohol tax revenue, and social insurance revenue. In some regressions, labeled "county government revenue," we include only revenue that goes directly to the county government. In others, labeled "total revenue," we also include revenue to special (e.g. sewer) and school districts in the county.

[30] Data from US Bureau of Labor Statistics and US Mine Safety and Health Administration.
[31] North Dakota Tax Commissioner. *State and Local Taxes: An Overview and Comparative Guide*, p. 3.
[32] Ibid., p. 16.
[33] The land on which the plant is located is still subject to property tax.
[34] North Dakota Tax Commissioner, op. cit., p. 16.
[35] North Dakota State Treasurer. Website. North Dakota State Government. Accessed 2019. http://www.nd.gov/treasurer/revenue-distribution/.
[36] Mercer County audit 2016.

We exclude revenue to townships in all cases. We adjust all revenue figures to 2018 dollars using the Consumer Price Index for Urban Consumers.

We aggregate EIA's mine-level coal production data, which include both surface and underground coal mines, to compute county-level coal production for each year from 2012 to 2017. We lag the coal production variable by one year to reflect the typical delay between coal production levels and the subsequent revenue collections. We include in our regression state-level fixed effects to control for the different revenue structures across states and other time-invariant state characteristics. We also include year effects to account for broad trends in coal markets and the macroeconomy.

We include all 27 counties that had (as of 2015) at least 8 percent of their labor force in coal mining, mirroring the definition of a mining-dependent jurisdiction used by the USDA. The summary statistics appear in Table 1.

Table 1. Summary statistics for 27 coal-reliant counties

All 27 Coal-Intensive Counties 2012-2017	Mean	Standard Deviation	Minimum	Maximum
All revenue (2018 $1,000)	95,225	117,124	7,071	524,884
County revenue (2018 $1,000)	30,232	33,230	1,840	147,035
Coal production in short tons, lagged one year (1,000)	22,895	67,457	654	389,022
Share of coal employment in labor force	.133	.038	.084	.214

Mean total revenue is roughly triple mean county revenue, demonstrating that revenue to school and special districts is a large share of overall local fiscal flows.

The regression equation is:

$$Revenue_{it} = c + \beta(coal\ production)_{it-1} + S_i + Y_t + \varepsilon_{it}$$

$Revenue_{it}$ is the total real revenue to county i in year t. The variables S_i are the state indicators for each county. The Y_t are the year indicators, and the variables ϵ_{it} are the error terms that reflect random variation in revenue. The estimated coefficient β is the relationship between lagged coal production and revenue to the county. We specify the relationship as linear rather than log because many of the revenue sources tied to coal, such as severance taxes and royalties, are linear functions of production levels. Of course, by the time the revenue gets to counties the relationship is not that simple, but in principle linear should be a better fit than log.

The results from the regressions appear in Table 2. The two columns show the results for all 27 counties. Column 1 includes the expansive measure of revenue (for example including school district revenue), and column 2 includes only revenue that goes directly to the county government.

Table 2. Panel regressions of government revenue on lagged coal production
(t statistics in parentheses)

	(1) Total revenue, All 27 coal-dependent counties	(2) County govt revenue, All 27 coal-dependent counties
County-level coal production, lagged by one year	0.812**	0.351**
	(2.96)	(2.97)
Constant	65,634,720***	8,476,680
	(3.53)	(1.06)
Observations	140	140
R^2	0.941	0.864

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

In both regressions, the estimated coefficient on coal production is positive and significantly different from zero. [37] The magnitude of the coefficient is more than double for total revenue as it is for the more limited county revenue. This suggests that coal features significantly in the revenue streams for schools and other special districts.

The regression coefficient of 0.812 on the coal production variable indicates that a decrease in coal production of 1,000 short tons will decrease expected total revenue by $812. In 2018, the national average sale price for coal was $36 per short ton.[38] At that price, a decrease of 1,000 short tons is a decrease of $36,000 in coal sales, holding everything else constant. The average decrease in coal production for the mining-intensive counties from 2012 to 2017 was 3.5 million short tons per county. Applying the estimated coefficient, this would have produced an average decrease in total revenue of $2.8 million per county from 2012 to 2017. Given that mean total revenue is over $95 million, this is not that worrisome. On the other hand, this relationship (if it holds outside the sample) would imply that if all coal production were eliminated in a county with mean coal production of about 22.9 million short tons, as shown in Table 1, expected total revenue would decrease by about $18.6 million, or about 20 percent of mean total revenue.

In the context of the total collapse of the industry locally, one might expect non-linear revenue declines as a downward spiral in non-coal revenues (such a property and sales taxes) and economic conditions develops. As explored in the next section, experiences from other contexts illustrate how the rapid demise of a dominant industry can create negatively reinforcing deterioration in local fiscal conditions, including tax capacity, credit worthiness, and public service provision.

[37] We also perform the analysis with data from only the top 20 most coal mining dependent counties, which all have more than 10 percent of the labor force in coal mining. For the regressions on total revenue, we find that the estimated coefficient on coal production is statistically significant and a little larger for the full set of 27 counties (0.74) than it is for the top 20 most coal-intensive counties (0.54). For county revenue, the estimated coefficients are nearly the same.

[38] https://www.eia.gov/energyexplained/coal/prices-and-outlook.php

4. Experience from other contexts

The previous section illustrated how certain counties in the United States are directly dependent on the coal industry for revenue. Indirect dependencies are important as well but are more difficult to quantify. But we do know from experience, when a major industrial employer collapses, service sector economic activity could also collapse, leading to lower revenues from sales taxes and amplifying the fiscal stress. In addition, as residents migrate out of the area in search of jobs, they may leave behind unsaleable vacant homes, further depressing property values and tax revenue. The social safety net in the United States has arguably shown its weaknesses in such circumstances, and in the next section we consider the policy implications of the risks for coal country.

Instructive examples of these downward spirals abound through history, both in the United States and abroad. In many cases the collapse begins in a resource industry, such as silver, whaling, fisheries, old growth forestry, and kelp. Often, exacerbating factors include technological change and shifts in comparative advantage across different locations. For example, coal-producing areas of the United Kingdom, steel towns in Pennsylvania, and Detroit, with an economy dominated by the automobile industry, all endured the decline of their major industry, and they all experienced a collapse in fiscal conditions, resulting in prolonged periods of attempts at revitalization and dependence on external financial support. While each decline arose from different factors in very different geographies, the fiscal impacts have strong parallels.

A search for successful precedents for the kind of economic transition that will be necessary in coalfield areas comes up wanting. Although policymakers have targeted federal assistance to a number of abrupt economic transitions, the most successful examples are quite different than the challenges facing coal country. For example, the Servicemen's Readjustment Act of 1944,[39] a.k.a. the GI Bill, offered an extraordinary opportunity for soldiers returning from World War II to get an education, buy a home, start a business, and build a new future. The program was a major political and economic success and arguably set the course for strong post-war economic growth. However, the opportunities available to healthy twenty-somethings who can move anywhere to work or study are not the same as those facing small rural towns and older families that have had the whole economic rug pulled out from under them.

One might look the federal Trade Adjustment Assistance (TAA) Program, which provides assistance for those negatively affected by freer trade. The results of TAA assistance are mixed. Some data suggest that program participants who leave the labor force for extended training (particularly older workers) can lose ground relative to otherwise similar non-participants. This research suggests that job training programs must be carefully designed and delivered to ensure they truly benefit their participants.

Another possible model arises in the way the U.S. Department of Defense (DoD) assists local economic transitions when it closes military bases, makes major adjustments in workforce levels, or ends large defense contracts. In most instances, communities have the advantage of advance notice of the major DoD changes and can plan ahead to minimize the economic dislocation. Also, unlike with most abandoned mines, in many cases the DoD leaves behind buildings,

[39] Servicemen's Readjustment Act of 1944, 38 U.S.C. § 3701.

airports, and other infrastructure that communities can convert to commercial purposes. Nonetheless, technical and financial support for local economic diversification planning appears to be a useful coordinating role for the federal program.

5. Municipal Bonds

Local governments are not the only ones with risks tied to coal. To the extent that they have issued bonds or taken on other debt, those creditors could share in their jeopardy. Municipal bond market participants have only begun to acknowledge the unique risks facing jurisdictions that rely on coal production. In part this may be because municipal bonds are generally considered safe assets. According to analysis by the ratings agency Moody's, recent default rates in this market were approximately 0.18 percent, a rate that is significantly lower than that of corporate bonds (Muni Facts 2019).

Governments that issue bonds are legally required to disclose risks that could affect their ability to pay back investors, both when the bonds are issued and throughout their lifetimes. In primary offerings, the bond issuers must produce an "official statement," a document informing investors about the issuer and the project. Bonds from coal-reliant jurisdictions make up a small share of overall subfederal US debt. In 2018, the issuances for top coal-producing state governments comprised only about 10 percent of the national total of $388 billion. The share of bonds issued by regions in coal-dependent communities within these states is even smaller. Table 3 lists some of the active bonds issued in two of the three coal-dependent counties discussed in section 2.3.[40] The Boone County government had no active issuances.[41]

[40] As found on the EMMA website operated by MSRB, as of April 2020.
[41] West Virginia has issued infrastructure general obligation bonds secured in part by severance tax collections. Entities, such as towns within Boone County, have issued bonds; they tend to be much smaller than the bonds in table 1. A compendium appears here: http://mbc.wv.gov/AnnualReports/AnnualReport2018.pdf.

Table 3. Bond issues in select coal-reliant counties

No	CUSIP Number	Issuer	Type of Bond	Maturity Date	Purpose	Principal Amount ($000)	Ratings (Moody's)
1	13433Q AA0- AQ5	Campbell County, WY	Hospital Revenue Bonds	2012–2034	Campbell County Memorial Hospital	$ 47,395	
2	134331DH7	Campbell County, WY	Industrial Development Revenue Bonds	11/1/2037	Solid waste disposal facility for waste coal	$445,480	
3	134333AD5	Campbell County, WY	Pollution Control Revenue Bond	10/1/2024	Pollution control facilities	$ 12,200	Baa2
4	134340AA6	Campbell County, WY	Solid Waste Facilities Revenue Bonds	7/15/2039	Solid waste disposal facilities	$150,000	Baa1
5	587849 AA8- AG5	Mercer County, ND	General Obligation Bonds	2017–2036	County courthouse and jail expansion	$3,500	Baa2
6	587850D N5/ DP0	Mercer County, ND	Pollution Control Revenue Bond	2028/2038	Refund of outstanding principal	$100,000	Aaa
7	587850DM 7	Mercer County, ND	Pollution Control Revenue Bond	9/1/2022	Refund of outstanding principal	$20,790	A2

Source: Electronic Municipal Market Access (EMMA), MSRB https://emma.msrb.org/

Most bonds fund construction of facilities such as hospitals and solid waste disposal facilities, for which repayment would ostensibly come from the income and fees associated with the facility. Principal amounts range from $3.5 million to $445 million. The bond terms range over 20 to 30 years, maturing between 2022 and 2039. In the climate policy projection in Figure 5. U.S. Coal Production under EIA $25+/ton Scenario, US coal production in 2030 falls by about 77 percent below 2016 levels. Thus, much of the bond interest payments and the principal payment could be due during a period of precipitous decline in the coal industry.

The official statements for the bonds in Table 3 document their amounts, maturity provisions, trustees, underwriters, and other details. The statements vary widely in their discussion of bondholders' risks. There is no standard format for the statements, and it takes careful reading to dig out any important details disclosing material risks. Some statements allude vaguely to exposure to government policy and economic conditions, while others make no mention of risks of any kind. Only two describe the potential for policies that regulate CO_2 to have "a significant impact" on the relevant facilities. None discuss the important connections between climate policy, coal production, and the economic and fiscal conditions of local communities.

For example, the statement for the first bond in the table, which funds a hospital construction project, highlights bondholders' risks such as changes in Medicare and Medicaid policies. With regard to other risks, it reads as follows:

> Future economic and other conditions, including demand for healthcare services, the ability of the District to provide the services required by residents, public confidence in the District, economic developments in the service area, competition, rates, costs, third-party reimbursement and governmental regulations may adversely affect revenues and, consequently, payment of principal of and interest on the Series 2009 Bonds.

So it notes the relevance of "economic developments in the service area" but does not explain what that might mean. The statement lacks any recognition of the prospects or local impacts of greenhouse gas regulation, which in 2009 was a lively debate in Congress. Indeed, an appendix describes the local coal-based economy in positive terms:

> Campbell County, known as the energy capital of the nation, is located in the heart of the resource rich Powder River Basin. Over 30% of the nation's coal is produced in area surface mines. Over 25% of Campbell County jobs are mineral-based, directly attributed to coal mining, oil and gas extractions, and supporting operations.

The statement also lists mining and energy companies as the top ten taxpayers in the county.

Let us consider the other bonds in the table. The second bond finances costs related to a facility that handles waste coal. The third bond finances costs of pollution control facilities at a power plant. Neither of the official statements discusses bondholders' risks.

The fourth bond funds solid waste disposal and sewage treatment facilities at Dry Fork Station, a coal-fired power plant. The risk factors the issuance discloses are reasonably comprehensive and, although not quantitative, characterize the broad array of environment-related factors that could affect the net revenue from the power plant. The documented risks include the large amount of long-term debt the power company is incurring, along with potential delays or termination of the project owing to opposition from environmental groups and/or regulatory measures. The statement also notes that the company may rely on technology that becomes less competitive, and it describes how laws and regulations related to climate change may "adversely affect our operations and future financial performance." It even mentions the cap-and-trade legislation passed by the House of Representatives in June 2009 and potential environmental regulation in states that purchase power from the project. However, the document does not address risks to the economy of the surrounding community. If the coal economy collapses and demand for power declines along with it, we have no information about what that would mean for bondholders' risks.

The fifth bond in the table, a general obligation bond issued by Mercer County, North Dakota, includes just one sentence describing risks (p. 80): "Mercer County is exposed to various risks of loss relating to torts; theft of, damage to, and destruction of assets; errors and omissions; injuries to employees; and natural disasters." It lists the major employers, which include energy and mining companies, and the Revenue Obligations page notes that "[d]ebt is supported by coal severance and conversion tax receipts." Most of the ledgers reporting tax receipts do not break down tax revenues related to coal and other sources, but one that does (p. 16 of an attached audited financial statement for 2013) shows that of about $7 million in general revenues for Mercer County, about $3.3 million came from the coal severance and conversion taxes. This extreme dependence on coal production seems an obvious material risk, yet the statement includes no discussion of it.

The statement for the sixth bond, another pollution control issuance for energy operations, reads much like the fourth bond, including a discussion of climate and water quality regulations. It also highlights risks associated with natural gas prices and Federal Energy Regulatory Commission policy. However, like the fourth bond, the document does not address risks associated with the economy of the surrounding community.

The seventh bond lists factors affecting the business operations of the company:

> Future Economic Conditions. The Company's operations and financial performance may be adversely affected by a number of factors including, but not limited to, the Company's ongoing involvement in diversification efforts, the timing and scope of deregulation and open competition, growth of electric revenues, impact of the investment performance of the utility's pension plan, changes in the economy, governmental and regulatory action, weather conditions, fuel and purchased power costs, environmental issues, resin prices, and other factors discussed from time to time in reports the corporation files with the Securities and Exchange Commission.

It is interesting that resin prices rise to the significance of specific mention, whereas the potentially calamitous effects of climate policy on coal production do not.

In principle, investors can turn to ratings agencies for guidance. Ratings agencies have assessed most of the bonds in table 3, ranging from Baa to Aaa, with most bonds falling somewhere in between. In some instances, ratings reports are not much better than official statements in describing the risks, and sometimes they are worse. For example, Fitch gave the seventh bond in the table an A+ rating in 2015, highlighting only the upside potential of energy development and indicating no risk associated with climate or other environmental policies.

That said, some ratings are shifting and ratings agencies are paying new attention to coal-dependent regions. Two of the seven bonds in the table received systematic downgrades from ratings agencies, with exposure to coal cited as a factor in the ratings agencies' reviews. None have received an upgrade. For example, in 2018 Moody's downgraded the fifth bond in table 3 to Baa1 "based on the county's narrowed financial position following consecutive years of declines in liquidity driven by negative expenditure variances. The rating also reflects the county's moderate tax base with consecutive years of tax base growth, but with some concentration in coal mining and power generation, strong demographics, low fixed costs and debt burden with moderate pension burden." Still, even Moody's downgraded rating places the security as "investment grade" with only "moderate credit risks."[42]

According to a 2019 report from S&P Global Ratings, "For nearly a decade, U.S. coal production has been on the decline. Global efforts to stem emissions of carbon dioxide from fossil fuels and the availability of cheap alternative renewable energy sources will limit future growth of coal production. In S&P Global Ratings' opinion, reliance on coal-related revenue and economic activity, absent diversification, may result in long-term credit deterioration for some U.S. government entities…Severance tax volatility, eroding property tax assessments, and economic decline are the major credit factors affecting coal-reliant regions (2019)."

6. Conclusions and implications for policy

Coal industry jobs in the United States have declined for decades due to labor-saving automation. In recent years, coal demand and production have begun to fall as well, owing primarily to lower cost alternatives. Economic modeling shows this decline will dramatically steepen under a price on carbon or regulatory program. While obstacles remain, momentum for federal climate change policy is growing in the United States and threatening the fiscal future of coal-reliant areas.

Several policy implications arise. First, diversifying a rural economy that is deeply integrated with a particular industry is a difficult task, but it is central to long run sustainability – as is a more diverse revenue base. Attracting new non-fossil business investment may bring new residents and demands on public services. Unless the tax system includes non-mineral revenue instruments like property and sales taxes, an inflow of residents can be a net negative on district budgets. Some jurisdictions may be able to attract new businesses by offering favorable business environments and by investing in local infrastructure that makes the area a more desirable place to live. The town of Greenville, South Carolina, is one example. Once the "textile center of the world," a combination of incentives and attractive amenities helped Greenville transform into a popular destination for new businesses.[43]

Second, economic revitalization will require large investments and thus significant external support for already-struggling coal-dependent communities and workers. A federal carbon tax could provide tens to hundreds of billions of dollars per year in new federal government revenues, a small fraction of which could be devoted to coal communities and workers. For example, the U.S. Congressional Budget Office estimates that a greenhouse gas tax starting at $25 per ton of CO_2 equivalent, rising at 2 percent over inflation each year could raise over $1 trillion over 10 years.[44] Polling suggests that American households would be willing to spend carbon tax revenues on assisting displaced workers in the coal industry by enough to

[42] The Moody's rating scale and definitions can be found at: https://www.moodys.com/sites/products/productattachments/ap075378_1_1408_ki.pdf

[43] Torres and Saraiva 2018

[44] Detailed revenue estimates can be found here: https://www.cbo.gov/budget-options/2018/54821

compensate each miner nearly $146,000 (Kotchen et al. 2017). External support does not necessarily need to be funded with carbon pricing. For example, in 2019 some Democratic presidential candidates pledged generous support for displaced fossil fuel workers, including wage supplements, healthcare, housing, relocation assistance, and job training.

The question arises how and how much money should be spent to best ameliorate the burdens in coal country. Relatively straightforward options include temporarily backfilling lost state and local coal-related revenue, supplementing miners' pension and health benefits, replenishing funds for black lung disease benefits, and paying to reclaim areas mined by bankrupt companies. Other options, such as workforce and community development and water quality remediation, may be important to a successful transition but the optimal approaches may vary widely across different locations. Health needs also vary locally. As discussed in Metcalf and Wang (2019), some coal-reliant areas are pummeled by opioid addiction. To the extent feasible, it could make sense to bolster health benefits and economic development with additional substance abuse assistance.

Further research is needed to elaborate these and other approaches as well as to estimate appropriate funding levels. A brief review suggests spending in some categories would range in the tens of billions of dollars cumulatively over the coming decades -- still quite small relative to potential carbon pricing revenue. For example, the Black Lung Benefits Act[45] provides monthly payments and medical benefits to coal miners disabled by lung disease from their job. Currently under-financed by an excise tax on coal, the Black Lung Liability Trust Fund's cumulative outstanding shortfall could exceed $15 billion by 2050.[46]

Mine reclamation is another potential line item that could also create local jobs. By law, mine operators must restore the land (federal or private) to a condition no worse than that supporting the uses the land could support before mining. However, some firms have not appropriately planned for their cleanup liabilities, both because they have insufficiently bonded and because some states have allowed them to "self-bond," that is to underwrite the reclamation guarantees with the assets of the firm rather than through third-party contracts. According to the US Department of the Interior, total unfunded costs for reclamation of about $10.7 billion could fall to states and tribes (Congressional Research Service 2020). This number could grow substantially with more coal mining bankruptcies.

Environmental and cost effectiveness arguments also support prompt and thorough reclamation. Ongoing drainage from coal mines can contaminate drinking water and soil, causing long-term health damages, disrupting aquatic organisms, and corroding infrastructure. If residents cannot even drink their local water, attracting new investment could be nearly impossible. About 28 percent of coal-rich Central Appalachian water streams are impaired by mine drainage.[47] In West Virginia, the cost of correcting acidic mine drainage-related problems with currently available

[45] Black Lung Benefits Act of 1972, 30 U.S.C. §901.
[46] U.S. Government Accountability Office 2018
[47] According to the West Virginia Department of Water: http://www.appalmad.org/wp-content/uploads/2010/11/IR_Report_Only_EPA.pdf.

technology is estimated at $5 to $15 billion.[48] Rapidly addressing water quality can minimize damages and lower overall cleanup costs (Kefeni et al. 2017).

Some may argue that if states have to absorb under-funded cleanup costs, it is the natural consequence of allowing industries to capture their regulators and federal taxpayers should not bail them out. However, lifting the reclamation burden from coal states (perhaps with the proviso of no further self-bonding) and otherwise ameliorating the disproportionate burdens of climate policy on coal-reliant areas may be critical elements of a deal that enables the adoption of federal climate policy.

[48]As estimated by the U.S. Geological Survey: https://www.usgs.gov/special-topic/water-science-school/science/mining-and-water-quality?qt-science_center_objects=0#qt-science_center_objects

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