

How to Go Greene: The Complex Dynamics of the Ongoing Transition in Southwestern Pennsylvania

by

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Abstract

Coal mining is a huge part of the culture and identity in Greene County. Unprompted, when asked about their personal histories and backgrounds, people will mention family and ancestors who were coal miners, as a way of demonstrating their deep ties to the region. Now, the tax structure is such that a lot of public infrastructures are suffering from the loss in value of coal assets.

Those former heights of prosperity are diminishing. The oil and gas industry has not stepped up to replace the loss in tax revenue intake, nor the loss in jobs, nor has the industry provided funds for remediation of the lands it has damaged.

The residents of Greene County are trying to forge a way to bring the community to a place where everyone who considers it home can stay, and build their home for their kids. From economic diversification, to environmental effects of the fossil industry, to workforce issues, to tax base considerations, to long-term education and planning and housing, every issue is at its core about what it means for Greene County to feel like home.

Not everyone agrees on how to move forward. Some believe in a model where a large investment sparks other service industries to move in and build out the economic base. Others believe in a more grassroots, endogenous model, where residents build their own way out. I hear tensions between those who believe in the benefits fracking has brought to some residents through royalties, and those concerned about lack of fresh food and clean water.

Listening to and uplifting the stories of the community members is one way well-resourced institutions can begin to meaningfully engage with and contribute to local partners, through building trust and relationships. Looking to the future, I hope MIT and others can play supportive, collaborative roles, helping to build capacity and to empower communities to chart their own development.

Thesis Supervisor: John E. Fernández
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The most important contributors to this work are my interviewees, my informants, my collaborators, my friends, whom I've come to value and trust, from Greene County, PA. I cannot thank them enough for trusting me to tell their story here, and for each and every person's insights, perspectives, and open hearts.

Further thanks goes to several professors I went to for guidance along the way, including Profs. Larry Susskind, David Hsu, Lily Tsai, Amy Moran Thomas, Graham Jones, and Kathy Araújo. Special gratitude to Profs. Araújo (again), Valerie Karplus, Steve Ansolabehere, and Dustin Tingley for their mentorship while I was working on the Southwestern Pennsylvania case study of the Roosevelt Project, without which I would not have taken this path of research.

My love to my family and friends, keeping me warm and well.

Contents

| | | |
|----------|---|-----------|
| 1 | Introduction | 13 |
| 1.1 | Context | 14 |
| 1.1.1 | Local History | 14 |
| 1.1.2 | National and Global Trends | 21 |
| 1.2 | Structure of Thesis | 25 |
| 2 | Literature Review: Just Energy Transitions | 27 |
| 2.1 | Major Themes | 29 |
| 2.1.1 | Balancing Concerns | 29 |
| 2.1.2 | Forms of Justice | 32 |
| 2.1.3 | Social and Political Dynamics | 35 |
| 2.2 | Conclusions and Future Work | 40 |
| 3 | Methods | 41 |
| 3.1 | Genres of Grounded Theory | 42 |
| 3.2 | Sampling | 44 |
| 3.3 | Autoethnography | 44 |
| 3.3.1 | Online, Remote Ethnography | 45 |
| 3.4 | Narrative Storytelling | 46 |
| 4 | Local Landscape in Greene County | 49 |
| 4.1 | Coal’s Decline | 49 |
| 4.2 | Competing Priorities | 52 |

| | | |
|----------|---|-----------|
| 4.2.1 | Changing Educational Landscape | 55 |
| 4.3 | Community Conversations | 57 |
| 5 | At the Heart: Home | 63 |
| 5.1 | Visions for the Future | 63 |
| 5.2 | Hurdles | 65 |
| 5.2.1 | Legacies of Coal | 65 |
| 5.2.2 | Need for Identity | 67 |
| 5.2.3 | Tax Issues | 69 |
| 5.3 | Pathways for Growth | 70 |
| 5.3.1 | "White Knight" | 70 |
| 5.3.2 | Economic Diversification | 72 |
| 5.4 | Recent Movement and Change | 74 |
| 6 | Learnings, Limits, and Looking Forward | 77 |
| 6.1 | General Lessons | 77 |
| 6.2 | Limits of Study | 78 |
| 6.2.1 | Indigenous History and Justice | 79 |
| 6.2.2 | Gender, Class, and Race | 79 |
| 6.3 | Future Work | 80 |
| A | Tables | 83 |
| | References | 91 |

List of Tables

| | | |
|-----|---|----|
| 2.1 | Coded search terms | 28 |
| A.1 | Search results saved | 83 |
| A.2 | Number of results by search code combinations | 83 |
| A.3 | Number of results employing each method | 84 |
| A.4 | Number of results by publication | 84 |
| A.5 | Summary table of peer-reviewed literature. | 85 |

List of Figures

| | | |
|-----|--|----|
| 1-1 | Sign on Mt. Washington, intended for tourists, describing Coal Hill’s importance as a source of bituminous coal for Pittsburgh, for Pennsylvania, and for the entire US. <i>Photo credit: Heidi Li, MIT, 2021.</i> . . . | 16 |
| 1-2 | Graph of county assessed mineral value over time, showing decline from 2010 value (accounting for inflation). | 19 |
| 1-3 | Graph of assessed real estate value in Greene County, showing that valuation of real estate has not kept up with inflation since 2003. . . . | 20 |
| 1-4 | Graph over time, 2009 to 2019, of the unsubsidized levelized cost of energy for coal, baseload natural gas, photovoltaic solar, and wind energy, showing that coal has been economically outcompeted by the other three since around 2013. | 22 |
| 1-5 | Bar chart of all the number of requests by state for PJM interconnection, split by fuel type. | 23 |

Chapter 1

Introduction

This thesis examines the economic, social, and political processes associated with the ongoing transition away from a coal-based economy in Greene County. Specifically, I ask what residents in the county are prioritizing amidst economic change, and what shared values help form coalitions. I gain an understanding of this landscape using semi-structured interviews conducted by phone and by Zoom and virtual participant observation, from January 2022 through April 2023, during the ongoing pandemic. Through this work, I arrive at the following primary arguments:

1. Sentiment around fossil fuels is mixed. Residents consider the history of fossil fuel extraction (especially coal) in the region as deeply entwined with their own personal histories, as a rule, but differ on how positively or negatively they view that relationship.
2. Many interviewees have a shared sense of values. Common values echoed across community members include strong work ethic, resilience, and support for one another. These values guide their visions for what they want the region to look like in the future.
3. Economic transition is already happening as the value of coal assets decline; the conversation around transition is increasingly prevalent among residents.

I will next provide some background on the historical and present-day context. The end of this chapter lays out the remainder of the thesis.

1.1 Context

The southwest of Pennsylvania is culturally and historically very closely connected to the fossil fuel industry, and especially to coal. With a history of coal mining dating back decades, residents are proud of their legacy of powering the heavy industry and electric sector of the United States.

These close historical ties have resulted in difficulties at present in economic development, with the decline of coal. Per Hodgson (1993), “the future development of an economic system is affected by the path it has traced out in the path.” For rural counties facing the prospect of transition away from economic reliance on the fossil fuel industry, this means that transition is not merely as simple as changing energy sources from coal and natural gas to greener alternatives such as wind and solar. The entangled problem is not only in the tangible product of coal or electricity, but also entwined with employment and tax base issues, as well as a deeply ingrained cultural sense of heritage, tying the region to its historically important employers. For such an energy transition to be both clean and just, without leaving its communities behind, the region must unpack a history that dates back to the 1700s that has created the conditions for the current stage of redevelopment. Only then will we understand the steps the region needs to move forward with a restructured economy.

1.1.1 Local History

The first agricultural people to manage the land that became Green County, Pennsylvania were the Monongahela, from approximately the 11th to 17th centuries (Cumberledge, 2019). Their disappearance is not explained, though it is hypothesized that it was a result of the combination of disease transmission from European settlers and conflicts with the Iroquois Tribes. Some of the earliest white settlers that came to the land began attempts at settlement in the mid 1750s, and set up permanent settlements in the mid 1760s. In the mid-18th century, native tribes including the Delaware, Shawnee, Mingo, and others traveled the area and likely had small settlements.

Around 1760, bituminous coal was first mined across the Monongahela River from

Pittsburgh, on Coal Hill (now called Mt. Washington).¹ Within a century, by 1830, the city of Pittsburgh was consuming over 400 tons of bituminous coal per day for residential and light industrial use (*PA Mining History*, n.d.). Figure 1-1 shows a plaque displayed on Mt. Washington, describing Coal Hill's illustrious history.

As anthracite coal from eastern Pennsylvania “captured the eastern markets” (*PA Mining History*, n.d.), bituminous coal from western Pennsylvania grew with westward expansion of population, rail and train, and the consequent booming of the steel industry. Thus Pennsylvania and the rest of Appalachia established a long and proud history of enabling the industrialization of much of the United States by providing a continuous energy source.

The work of mining coal, before the advent of increased mechanization, was both labor-intensive and incredibly dangerous. In the late nineteenth and early twentieth century, hundreds of thousands of miners worked on extraction and shipping; between 1880 and 1923, more than 70,000 miners died on the job (*Coal Mining and Labor Conflict | Energy History*, n.d.). Pay was low, and the cyclical nature of the market meant that work was irregular. In 1907, one major mine disaster in Pennsylvania killed 239 people.

Eventually, coal miners and their families organized unions, including the United Mine Workers of America, which is still a force in the region today. Violent conflicts, known as the “mine wars,” broke out between workers and employers as the unions struck for better working conditions, pay, and benefits. The largest armed uprising in the United States since the Civil War broke out in 1921 in West Virginia, killing 133 people, mostly miners. Peace was finally found when the federal government passed the National Industrial Recovery Act in 1933, protecting the right to collective bargaining. Though NIRA was declared unconstitutional in 1935, the National Labor Relations Act of 1935 established the National Labor Relations Board and still protects the right to organize into trade unions, collective bargaining, and worker strikes. Having played a major role in building the strength of unions in the Progressive Era, the Appalachian region is justifiably proud of its storied history in this industry.

¹Source: plaque on Mt. Washington, seen on my trip there in summer 2021.



Figure 1-1: Sign on Mt. Washington, intended for tourists, describing Coal Hill's importance as a source of bituminous coal for Pittsburgh, for Pennsylvania, and for the entire US. *Photo credit: Heidi Li, MIT, 2021.*

The present-day implications for tax base structures created with the generation of wealth from coal mining are evident. A 2002 study commissioned by the Bureau of Mining and Reclamation, under the Department of Environmental Protection of Pennsylvania, showed that between 1983 and 2002, longwall coal mining operators accounted for nearly 30% of the countywide tax base in Greene County, and as much as 50% in the northwest part of the county (Kern, Falkenstern, & Stingelin, 2002). However, taxable real estate is naturally depleted as coal is mined out. Taxes generated from mining, though significant, are inherently temporary.

Today, 21 counties in the southwest of Pennsylvania are home to bituminous mining operations, producing over 50 million tons of coal in 2015 (*PA Mining History*, n.d.). This coal is primarily used for electricity generation and metal production.

This is not to say that the regional industry and employment are immovably entrenched in a fossil-based economy. On the contrary, the regional clean energy transition has been ongoing for decades. There is already strong historical precedent in the region for social factors and top-down planning affecting the course of development in the process of economic transition (Ansolabehere et al., 2022). During the 1940s, there was an increasing awareness of the need for economic diversification, and of the health problems associated with air pollution from industrial activity involving coal. This awareness drove developmental plans, that led to the decline of coal extraction in the region since the 1970s and 1980s, as demand for coal and steel began a downward trend. As the steel industry declined, a group of stakeholders from academia, government, economic development groups, and industry came together to form a redevelopment plan known as Strategy 21. Through this planned development, Pittsburgh reinvented itself from a major manufacturing center (earning the city the nickname of “the City of Steel”) to a hub for the healthcare and innovative technology industries.

On the other hand, such reinvention may prove more difficult for rural communities. Employers in coal and natural gas extraction and processing often only require a high school diploma, where employers in other industries may require some amount of postsecondary education while paying lower salaries. Such was the power of coal

unions, to assure workers of hazard pay and pensions; unless other industries unionize in force, such benefits will be difficult to match.

Recent survey work shows that Appalachian residents are willing to back climate policy, as long as it is coupled with transition assistance for workers and community members (such as investments in healthcare, and pensions) (Gazmararian, 2022). Survey respondents also show sensitivity to salaries in the new careers to which they would transition. Taken together, smart policy design can win public support for decarbonization pathways.

Current State of Coal in the County

Given the significant percentage of the county tax base that historically comes from coal mining, as discussed in the section above, we survey the current state of asset valuation.

In examining Greene County, consider two of its school districts: in 2019, 10.55% of the total budget for the Central Greene School District and 64.86% of the budget for West Greene School District came from mineral value tax (White-Nockleby, Wahid, Boone, & Delhees, 2021). As seen in Figure 1-2, this taxable mineral value has been decreasing since 2015, showing no signs of increasing back up to that level. Mineral value tax, in addition to land value tax, still make up a large percentage of the county's tax revenue, but the region faces serious shortfalls for funding. The revenue raised by taxes is used for public works, including education and public spaces.

Shortfalls from declining mineral value also are not being made up with real estate value taxes, as illustrated in Figure 1-3. Mining also causes damage to properties on the surface, which in theory are compensated by restoration, to a value equaling or exceeding the original value. The 2002 DEP study found that very few properties received compensation and reduction in county value (granting temporary or permanent tax relief), and of the 95 properties (out of 401 properties noted as "affected") that received compensation, few were ever returned to their original value (Kern et al., 2002).

County assessed mineral value, 2010-2019

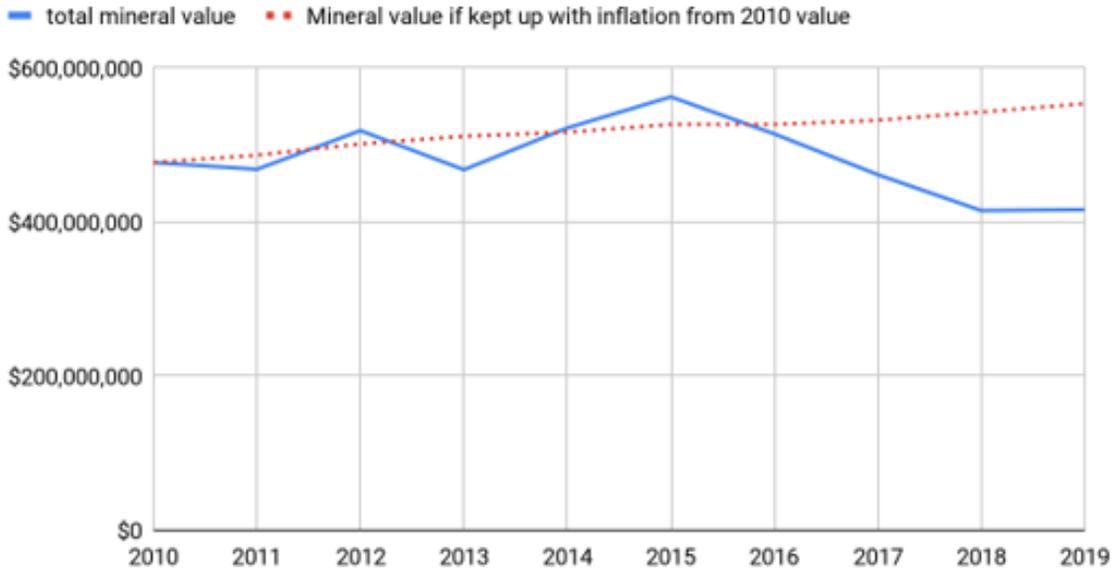


Figure 1-2: Graph of county assessed mineral value over time, showing decline from 2010 value (accounting for inflation).

"Frackalachia"

The oil and gas industries have profited tremendously from their work in the tri-state region of Ohio, Pennsylvania, and West Virginia, but the communities that live where they operate have not received commensurate benefits – nor anything near what the companies promised when they moved in. An Ohio River Valley Institute report from 2021 details the economic boom of the natural gas industry in Appalachia from 2008 to 2019, and the lack of corresponding growth in jobs, income, or population to the region (O’Leary, 2021).

Natural gas production in the region in the 22 counties of the region created a regional increase in economic output by 60%; jobs in those 22 counties grew by only 1.6%, compared to a national growth of 9.9%. Even as the counties’ contribution to the national economy grew by 35%, their share of the nation’s personal income fell by 6.3%.

The report demonstrates that in economic terms, the natural gas industry is not a

Assessed Greene County Real Estate Value, 2003-2018, as compared to inflation

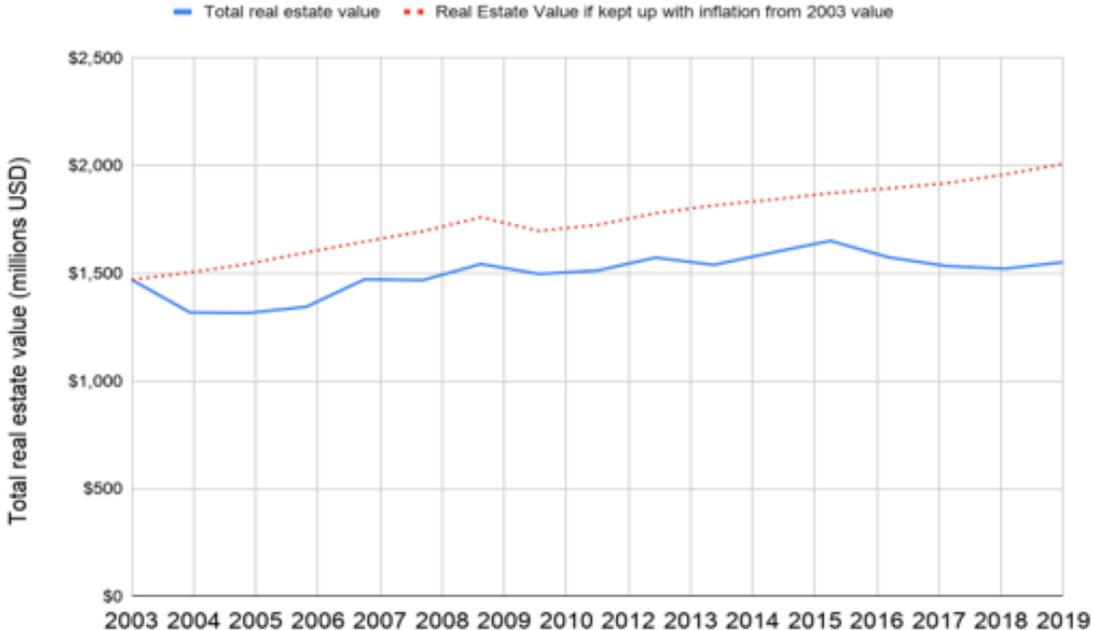


Figure 1-3: Graph of assessed real estate value in Greene County, showing that valuation of real estate has not kept up with inflation since 2003.

suitable replacement for the coal industry in terms of employment that brings wealth and stability to communities. Other sources of regional investment must be explored for long-term growth.

1.1.2 National and Global Trends

Critics of renewable technologies have long decried the so-called political “war on coal” (*Obama’s War on Coal*, 2012), which is a phrase used by coal industry supporters to explain coal’s decline in market share, claiming that ruinously expensive new technologies are being subsidized at the cost of coal communities’ welfare and the public interest of a reliable source of energy. It is important to note here that it is not environmental extremism that is causing the decline of coal, but rather a host of technological and economic factors decreasing coal’s competitive standing (Kirk, 2019).

A 2016 study from Case Western Reserve University demonstrates that the decline in the use of coal in the United States since 2008 is not a result of any policy put forth by the Obama administration or the EPA under it, but rather due to coal being outcompeted by cheap natural gas from shale drilling (Culver & Hong, 2016). The study finds that coal’s market share shows decline even before EPA rules are either finalized or implemented, and that the price for natural gas easily outcompeted the breakeven point for Appalachian coal during 88% of the months between January 2012 and January 2016. Furthermore, gas is cheap to drill and plentiful in the United States, especially in the Appalachian region, so it has not been expected in recent history that the price of natural gas would increase significantly (though naturally reconsiderations of the energy supply chain must be made in the light of Russia’s invasion of Ukraine).

Indeed, as of about 2013, coal has been economically outcompeted not only by shale gas, but also by wind and solar technologies, as shown in Figure 1-4.

PJM, the regional transmission organization for several states including Pennsylvania, has over 2000 renewable generation and battery storage projects waiting in its interconnection queue, totaling nearly 300 GW of generating capacity, including

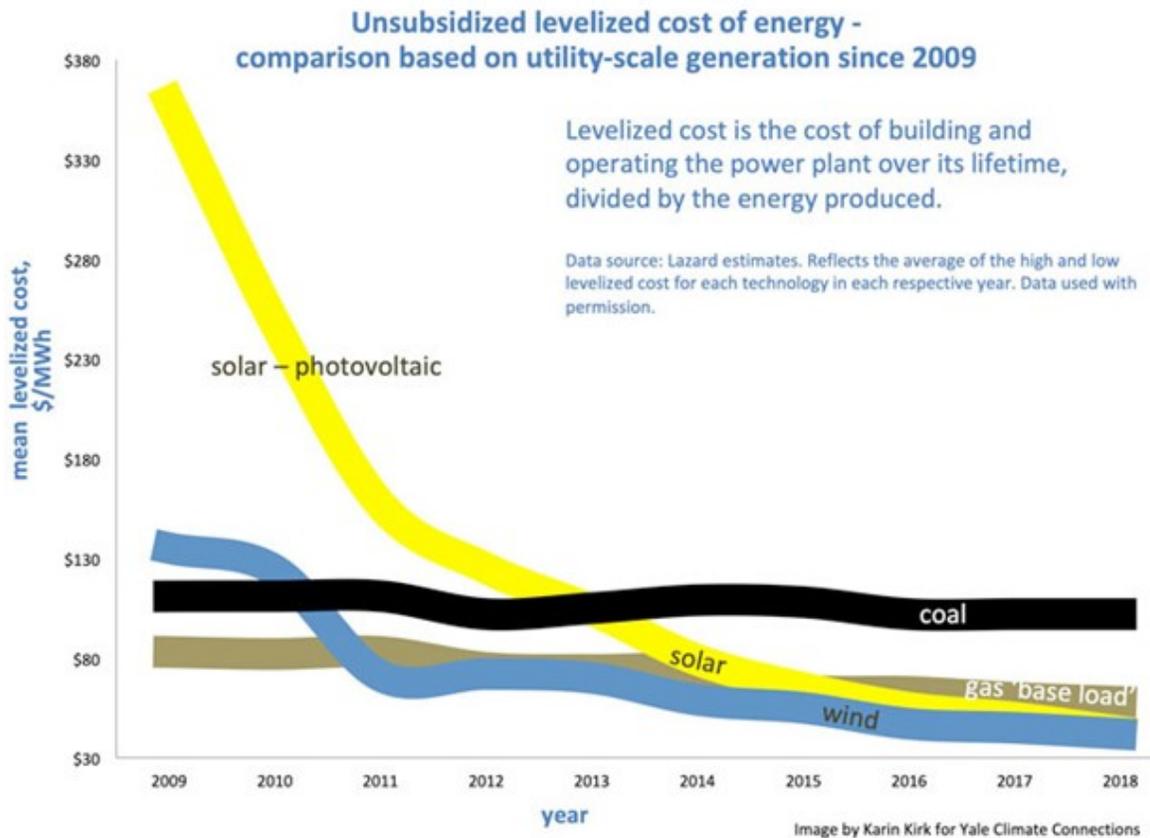


Figure 1-4: Graph over time, 2009 to 2019, of the unsubsidized levelized cost of energy for coal, baseload natural gas, photovoltaic solar, and wind energy, showing that coal has been economically outcompeted by the other three since around 2013.

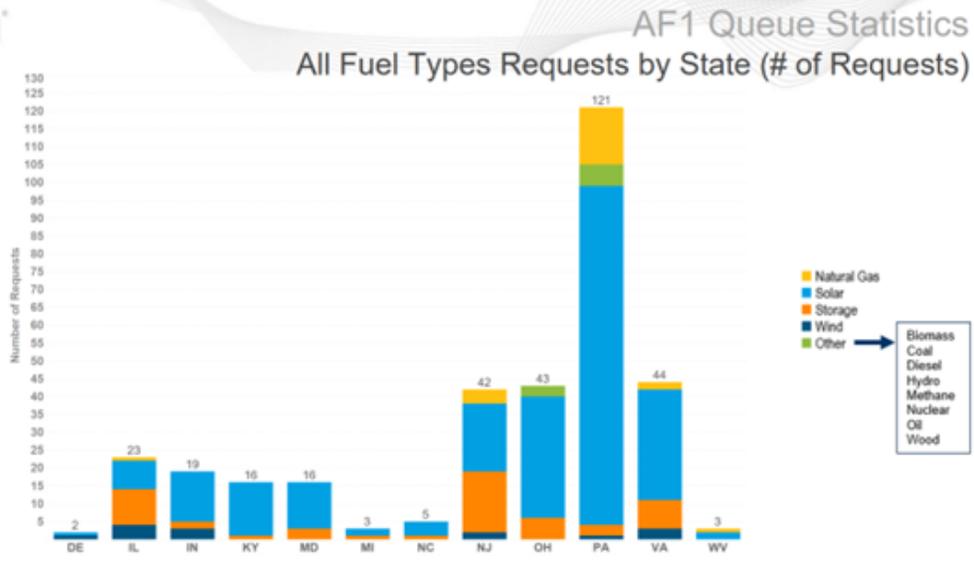


Figure 1-5: Bar chart of all the number of requests by state for PJM interconnection, split by fuel type.

over 13 GW of solar in Pennsylvania alone (Dennis & Burnham, n.d.). In general in the interconnection queue, most proposed projects are small-scale solar, some are natural gas, and vanishingly few are coal. New proposals from 2019 are shown in the bar graph in Figure 1-5 below (Caven, 2019). These projects are market-driven and proposed by the private sector; the winds of change in our region blow green.

Environmental and Health Issues

An additional factor shifting global trends away from fossil-based economies is the range of environmental and health issues associated with coal mining and traditional steel production. Per CDC findings (CDC, 2011), direct exposure to coal mine dust causes a range of lung diseases, most notably coal workers’ pneumoconiosis, which is also called “black lung disease” (*Coal Worker’s Pneumoconiosis (Black Lung Disease)*, n.d.). No known treatment can reverse the damage caused by coal dust. A more indirect health effect comes from the air pollution produced by coal-fired power plants (*Coal and Air Pollution*, 2017). Pollutants emitted include mercury (a notable inclusion, as coal plants are responsible for 42% of mercury emissions in the US), sulfur dioxide, nitrogen oxides, and various particulate matter known as soot. Together,

health effects include damage to the nervous, digestive, immune, respiratory, and cardiovascular systems, as well as child development effects.

Climate Change

At a national and global scale, one of the biggest motivators for increasing the energy efficiency of, and eventually moving away from, fossil-based industries is the persistent specter of climate change. Carbon dioxide produced by coal-fired power plants is well-studied as a pollutant and a greenhouse gas. Natural gas (which is mostly methane gas) has long been considered a cleaner alternative to coal, but recent studies have called this assumption into question (*Natural Gas Is a Much ‘Dirtier’ Energy Source, Carbon-Wise, than We Thought*, 2020). One point where historical models may be faulty is the amount of leakage of methane into the atmosphere in the production process: little to no leakage would make natural gas seem cleaner, as methane burns more cleanly and lasts for much less time in the atmosphere, but leakage rates may be as high as 2% in the United States, and even higher for specific “super emitters” in drilling regions.

The need for climate change mitigation is urgent, as examined in the most recent IPCC report (*Climate Change 2022: Impacts, Adaptation, and Vulnerability*, 2022). Over the last several decades, countries have been making commitments to reduce emissions, though often in legally non-binding ways (*Global Climate Agreements: Successes and Failures*, 2020). Agreements reached in Kyoto, Montreal, and Paris have been landmark statements of collaboration and public interest priorities for the global community.

Even state level governments are making commitments to slow global warming. Pennsylvania’s Climate Action Plan of 2021 identifies 18 strategies in generation, agriculture, buildings, fuel supply, and transportation, for meeting goals of 26% reduction of greenhouse gas emissions from 2005 levels by 2025, and 80% reduction by 2050 (*PA Climate Action Plan*, 2021). In 2004, Pennsylvania passed the Alternative Energy Portfolio Standards Act, requiring electricity distribution companies and generation supplies to gradually increase their share of total retail sales of electricity in the state,

reaching 18% by May 2021 and plateauing there (*Alternative Energy Portfolio Standards Act of 2004: Compliance for Reporting Year 2021*, 2022). All distributors and all generators but five managed to meet the requirements in 2021.

As another sign of the direction Pennsylvania state government wants to take for its energy use, in October 2019, Governor Wolf released an executive order that declared Pennsylvania would join the Regional Greenhouse Gas Initiative (RGGI), an alliance of 11 New England and Mid-Atlantic states (not including Pennsylvania) that began in 2009 to reduce emissions from the power sector while maintaining economic growth (Riccardi, 2019). As of April 2022, the Wolf administration has finalized this regulation, making Pennsylvania an official member.

At a national and global scale, it is clear that the globalized economy is shifting away from reliance on fossil fuels. Only time will tell how quickly this shift occurs in the United States and in Appalachia.

Urban vs. Rural Divide

The conversation around transition plays out very differently in Pittsburgh, as compared with more rural regions. Ansolabehere et al. (2022) show that regional alignment and vision can come together with capacity and resources, which more urban areas are more likely to have. Pittsburgh has well-resourced academic institutions, a high concentration of industry working on cutting edge technology, many philanthropies, and a government with a community-engaged Comprehensive Plan.

What kinds of capacities need to be built for any less-resourced community to work on comprehensive development?

1.2 Structure of Thesis

In chapter 2, I provide an overview of the state of peer-reviewed literature surrounding just transitions, with a focus on communities historically economically dependent on coal.

In chapter 3, I explain the methods I used in this work, including my own positionality as an external researcher conducting virtual research.

I discuss my findings in chapters 4 and 5. In chapter 4, I illustrate the issues that Greene County residents worry about, and the local social and political dynamics that arise from negotiating solutions to these issues. In chapter 5, I pull on the common theme of "home" to connect the issues described in chapter 4.

In chapter 6, I lay out the limits of this study, and suggest possible future work that research institutions can conduct in collaboration with community partners.

Chapter 2

Literature Review: Just Energy Transitions

I am conducting this literature review to form an understanding of the landscape of peer-reviewed literature surrounding the issues that arise as part of a just energy transition in Southwestern Pennsylvania, a rural, traditionally coal- and fossil-fuel-reliant region of the United States. The research has political implications for the future of the entire nation. "Coal," as a mineral asset and a shorthand way to refer to the industrial system built around it, is an important symbol for a varied set of values held by community members. In the United States, coal *miners* are also an important symbol in politics, even though their economic activities form a small fraction of the nation's overall and energy economy. Understanding how the communities built around coal are reacting to economic and future social changes will provide a deeper insight into how our deeply politically polarized nation can find common ground for economic development and community organization.

In September of 2022 I searched Web of Science for ease of replicability, for peer reviewed literature including the following search terms in any field:

Table 2.1: Coded search terms

| Search code | Search term |
|-------------|---|
| A | Just Energy Transitions OR Energy Transitions OR Just Transitions OR Climate Transitions or Transition Towns |
| B | Climate Justice or Environmental Justice or Spatial Justice or Climate Equity or Environmental Equity or Spatial Equity |
| C | Economic Diversification |
| D | Appalachia OR Pennsylvania OR Coal Community OR Fossil Fuel Community OR Coal Identity |

Terms were connected by the Boolean operator AND in the search string, with the results in Web of Science limited to Highly Cited and sorted by Most Relevant (see Table A.1).

Each saved citation in Zotero was tagged with the search strings that led to it being saved.

In total, after removing duplicates, this resulted in 44 articles. 13 were removed by manual sorting, for papers regarding topics outside of the scope of my study. These topics include demand-side initiatives, environmental justice implications of low-carbon energy technology manufacturing and siting, climate urbanism, global social movements, impacts of Covid-19, carbon pricing and tax structures, effects of the shale gas boom, smart cities, and agroforestry.

After sorting and filtering, Table A.2 shows the number of results by search code combination.

2 more papers were added by snowballing from this corpus.

The resulting body of 33 articles was read in full, then tagged with the methods employed (see Table A.3).

These articles were found in the publications listed in Table A.4.

2.1 Major Themes

Wang and Lo (2021) provide a review of the perspectives surrounding the concept of a just transition, summarizing the current debates in the literature. They identify five themes: "(1) just transition as a labor-oriented concept, (2) just transition as an integrated framework for justice, (3) just transition as a theory of socio-technical transition, (4) just transition as a governance strategy, and (5) just transition as public perception." The review also sets forth a research agenda, listing four potential future avenues: more empirical studies, relating the different concepts of just transition, including a broader geographic range, and more focus on power dynamics.

Overall, three major themes emerge from this corpus: the balance between economic, environmental, and social concerns, forms of justice, and the social and political dynamics in transition processes.

2.1.1 Balancing Concerns

The first theme that emerges is that policymakers are often trying to balance social, economic/industrial, and environmental concerns when planning their region's development. Another balance they try to account for is between remediating existing injustices and avoiding generating new ones as they pick technologies and industries to develop.

Six articles address how decarbonization processes might continue to perpetuate existing injustices, and even bring up new forms that have yet to be characterized.

McCauley et al. (2019) describe, in their introduction to a special issue of *Applied Energy*, a series of studies examining energy justice that spans timescales, geographic scales, regions, and a diversity of theoretical approaches and methodologies. They recognize that old injustices in the incumbent energy system must continue to be recognized and solved, but also begin to reckon with a need to understand new, emerging injustices which may not yet be apparent to policymakers or researchers.

Sovacool (2021) provides a review of 20 years of political ecology literature that shows that every studied form of climate mitigation efforts is linked to exclusion, con-

centration of assets, and harm to communities. Harm incurred has included societal violence, environmental extinction events, and further dispossession of the most vulnerable populations. The author therefore advocates for a multiscalar, whole-systems approach, and further recommends that researchers in political ecology, political economy, and energy justice should provide more actionable recommendations for policy, rather than only identifying problems or theorizing in inaccessible ways.

Carley and Konisky (2020) review potential harms of the energy transition for the most vulnerable communities undergoing transition. They emphasize "a consideration of the inclusivity and distributional aspects of the transition," which we can understand as procedural, recognition, and distributional justice (to be discussed later in section 2.1.2). A few highlighted harms include declines in jobs, pension funds, and tax revenue bases that come from the coal industry; the latter affects not just coal workers but also their surrounding communities. Aside from financial losses, there is also a sense that the decline of coal "compromises the culture and sense of both place and identity" of these communities. The authors also identify several types of efforts to build adaptive capacity, ranging from workforce transition programs to technology access programs to collective action initiatives; the latter should educate communities and engage them in the decision-making process. The authors note that a just transition does not dictate specific policies, but rather should involve all stakeholders in region-specific ways.

Bang, Rosendahl, and Boehringer (2022) state explicitly: "Policymakers must balance the objective of a fast decarbonization process against two other important concerns: cost-effectiveness and a just transition." They find that political-economic institutions such as industry incumbents and political organizations influence how this balance is achieved. In some historical transitions, justice concerns were not important to public policy at all, a finding which may not hold for future transitions as more jobs are at stake. In other transitions, just transition concerns were given more attention when they aligned with incumbent concerns and with a need for broad stakeholder support for policy change.

Arora and Schroeder (2022) break down a transition process in the Ruhr region

of Germany into two phases, as it moved from a coal-based economy to a knowledge-based economy with strong service and educational sectors. Their results show that this transition could have seen improvements in speed, efficacy, and justice metrics with greater attention to coalition-building and full and equitable participation of marginalized groups.

Newell and Mulvaney (2013) discuss the politics of decarbonization strategies, using a lens of the political economy of global energy. They find that social costs must be considered as part of a just energy transition, and that energy justice must answer the question of who will bear the costs of social externalities resulting from energy processes. They also find that the interests of those holding the most power often do not align with the needs of those with the least. If social and environmental consequences are not taken into account in transition planning, decarbonization pathways risk reinforcing existing structures of "exploitation and dispossession that characterise the current global political economy".

One article describes best practices for policymakers and creates a typology of transitional assistance policies. Green and Gambhir (2020) provide a comprehensive review of transitional assistance policies to facilitate a just, equitable, and smooth low-carbon transition. The authors classify four types of transitional assistance policy: compensation; exemption; structural adjustment assistance; and comprehensive adaptive support. The authors emphasize that though the fourth type is the likeliest to produce just and equitable outcomes, it relies on larger state capacity, including an ability to design and manage the policy well.

In general, there is agreement in the literature that policies to aid transitions must equitably account for social and environmental impacts as well as financial losses. There is also a balance of movement away from old injustices, and avoidance of creating new injustices (or simply moving injustice elsewhere, in considering who will bear the burdens of energy transitions). Scholars also raise concerns about whether incumbents in power will be able and willing to oversee transitions that may overturn current power structures.

2.1.2 Forms of Justice

Another emergent theme of this corpus is that justice in transition does not have to be framed as a balancing act, or a zero-sum process. 16 articles discuss forms of justice and how they may be applied to transitions.

Jasanoff (2018) discusses "persistent mismatches" between problems, policy framings, and solutions. She notes three points for further study: interrogating "progress" as it relates to the relationship between prosperity, development, and sustainability; a need for differentiated solutions in different contexts; and principles for an energy transition with "due attention" to enacting justice. Scholars studying just energy transitions formulate a number of responses to this challenge of unpacking which models of justice are most applicable, and how they might best be used.

Jenkins, McCauley, Heffron, Stephan, and Rehner (2016) provide a conceptual review of justice principles as they apply to energy policy, and a research agenda for advancement of the field of energy justice. The range of conceptual frameworks that has emerged includes energy security, fuel poverty, and energy justice. Sovacool, in 2014, identified a need to move the field of energy scholarship more toward "human-centred, social science explorations of energy developments." The authors include distribution, recognition, and remediation as the steps of tackling injustice. Jenkins (2018) build off a framework that focuses on distributional and procedural justice tenets, adding in a recognition-based approach in line with McCauley, and show that "it is within the overarching process of sociotechnical change that issues of energy justice emerge."

In line with Jenkins et al., most authors in this review classify justice into three categories, and some add a fourth. Most commonly seen are distributional, procedural, and recognition justice. Heffron and McCauley (2018) add restorative justice in their JUST framework, which Pai, Harrison, and Zerriffi (2020) use as a classification system. Bulkeley, Edwards, and Fuller (2014) add rights as their fourth, and amend "recognition" to become "responsibilities and recognition."

Heffron and McCauley (2018) build the JUST framework from a combination of

legal geography and the literature in climate, energy, and environmental justice ("the CEE justice literature") based on a need for clarity on "(1) what justice is needed and/or expected; and (2) how this will be enforced and/or applied." Different types of justice come to the fore at different points in a transition, and understanding the context in terms of location and timing are necessary to build differentiated solutions. The JUST framework examines five forms of justice: distributional, procedural, restorative, recognition, and cosmopolitanism. McCauley et al. (2019) recognize the same five, naming the "central tenets of justice – distributional, [recognition], procedural to which have been added cosmopolitan and restorative justice" as the "dominant forms of justice mentioned in the literature".

McCauley and Heffron (2018) define the just transition as "a fair and equitable process of moving towards a post-carbon society." They claim the framework must move beyond its simplistic "jobs-based solution" focus, towards a composite of distributive, procedural, and restorative justice; this piece does not include recognition-based justice.

Goddard and Farrelly (2018) connect the just transition approach with the concept of transition management, as a means of both accelerating the transition process and mitigating negative impacts on communities. This combined framework seeks to address prior criticism of transitions management as excessively apolitical, bringing to the fore an awareness of distributional, procedural, and recognition justice in the transition process.

Pai et al. (2020) identify 17 factors that are key to fossil fuel transitions through a study of transitions literature, focusing on fossil fuel jobs. They further classify this list using Heffron and McCauley's (2018) JUST framework into the types of justice they further (distributional, procedural, recognition, and restorative justice), and their spatial and time scales.

Two articles present location-specific case studies.

Arora and Schroeder (2022) look for evidence of distributional, procedural, and recognition justice across several decades in one transition case study of the Ruhr region in Germany. Taking each form of justice as a lens gives rise to new understanding

of what types of justice garnered more focus at different points of the transition period, and what forms of justice were overlooked.

Agbaitoro and Oyibo (2022) examine the balance of energy access and sustainability in Sub-Saharan Africa, a region that needs to address a growing demand for affordable modern energy in conjunction with social justice and human rights. The authors recognize distributive, procedural, recognition, restorative and cosmopolitan justice, and focus on distributive and procedural justices.

Three articles reframe the discussion of energy justice around energy injustice and inequity.

Finley-Brook and Holloman (2016) examine inequities arising from five paths of clean technology development. They evaluate justice over the life cycle of a technology, allowing for a consideration of a combination of energy concerns, linkages between production and consumption, and a sociotechnical ecosystem of human and non-human agents. Their work accepts the framework that achieving energy justice requires distributive, procedural, and recognition justice, and finds that distributive justice receives the most attention while recognition justice receives the least.

Healy and Barry (2017) extend energy justice to cover the entire energy lifecycle of technologies, focusing on recognition and distributional justices. In reframing the conversation around just transitions with a focus on energy injustice, unsustainability, and a lack of democracy, the authors "[make] the approach to energy transition a much more radical, systemic and politically oppositional project."

Sovacool, Hook, Martiskainen, and Baker (2019) categorize injustices into three spatial scales, moving from micro (family, community) to meso (national) to macro (global). The authors identify concerns that spatially, some low-carbon transitions are causing energy injustices to be "outsourced" to other, potentially more vulnerable regions. Temporally, energy technology decisions may be pushing lock-in and environmental hazards off to future generation (e.g., managing coal tailings from mining, and other forms of waste disposal and recycling).

One article shifts the focus from consumption to extraction. Muttitt and Kartha (2020) primarily address questions of distributional justice. They note that main-

stream climate equity discussions have focused on "territorial emissions and consumption of fossil fuels," and contribute to a growing literature on curbing fossil fuel extraction as a means of working on climate justice. The authors derive a set of principles through examining three equity approaches (economic efficiency, meeting development needs, and effort-sharing), concluding that global extraction should be phased down in line with environmental justice concerns, with due attention to both a just transition for workers and communities and to ensuring transition costs are shared fairly (i.e., borne more heavily by wealthier countries). In forming these guiding principles, the authors do not propose a justice framework, but instead target their recommendations toward stakeholder actions.

One article contrasts energy justice with environmental and climate justice. Jenkins (2018) outlines the history, strengths, and weaknesses of the concepts of environmental and climate justice, and argues that "energy justice" contributes a more focused means of tackling injustice. The author posits that energy justice has a greater potential for impacting policymaking because it is more targeted in its focus on topics and systems, it does not have roots in anti-establishment movements (unlike environmental and climate justice), and it is backed by methodologies from across several disciplines.

Overall, this corpus suggests that just transition studies have begun to follow some of Wang and Lo's (2021) suggested research agenda, in relating differing conceptions of "just transition" to each other, namely conceptions of the just transition as a framework for justice, as a theory of sociotechnical transition, and as a governance strategy. While scholars disagree on the component parts of the justice framework, there is widespread agreement that distributive and procedural justice are key for an inclusive and equitable transition, and that more attention must be given to recognition justice, potentially through reframing the conversation around existing injustices.

2.1.3 Social and Political Dynamics

Twelve articles address social and political dynamics of power in just transitions.

Six articles discuss the necessity and process of building coalitions.

Cha and Pastor (2022) find a lack of a shared basis of what a just transition entails. Even within the same interest group there may be differing visions of a just transition. Some imagine a movement toward a clean energy economy, while others envision the just transition as a means of transforming society at large to be more just. The authors find that for building power and coalitions, some difference in conceptualization can be overcome; broader policies that encompass energy, economic, environmental, and social efforts can lead to a broader base of support. These support efforts are deeply localized, so they must be led by impacted stakeholders, not by outside entities, though federal action is also needed.

Roddis, Carver, Dallimer, Norman, and Ziv (2018) analyze the relationship between community acceptance and planning outcomes for onshore wind development, finding that community acceptance is statistically significant in affecting planning outcomes. Particularly salient are "material arguments," especially aesthetic variables. Policymakers therefore need to take public acceptance into account when planning for energy policy. The authors also raise the question of whether these criteria should be considered at all, on balance with issues of climate mitigation or energy security concerns. Still, the work shows that a lack of community buy-in may pose a great stumbling block to policy implementation.

Shelton and Eakin (2022) provide a review of the current understanding of justice advocacy and its impacts. The work identifies motivations, identities, tactics, and targets of advocates. Per the authors, "the six most common types of motivations were: procedural injustices, environmental degradation, energy ownership or control, recognition injustices, changed livelihood opportunities or economic conditions, and opposition to proximate energy infrastructure." While Jenkins et al. (2016) find that the energy justice movement is "mute" in comparison to the activist environmental and climate justice movements, Shelton and Eakin find that the energy justice movement is "active and vocal." It encompasses a wide array of actors, with the most frequent collaborations occurring between residents, local government, unions and labor groups, and environmental or environmental justice groups. The authors find that overall, strong local support, institutional structures that support justice con-

cerns, and the support of organized labor are all important factors in justice success stories.

Walk et al. (2021) demonstrate that participation in the just transition has not been historically equitable on a gender basis, especially in terms of agency. Women had to organize themselves into grassroots movements because they were not part of labor unions. The authors also call for increased focus on the under-researched impact of coal phase-out transitions on women's lives.

Following their work in 2021, Braunger and Walk (2022) use and add to Avelino's 2017 Power in Transitions (POINT) framework to show how men and women are affected differently by coal transitions in the UK and in the US. The authors illustrate that division of labor is far from equal, as women are generally still expected to take on most of the domestic labor of a household, as well as to pick up lesser-paying and more insecure jobs as the coal sector (with its majority-male workforce) declines. In all cases studied, women found it harder to participate in transition processes due to limited access to resources such as political institutions, media attention, and credit for doing community organization and groundwork.

Evans and Phelan (2016) describe a harmful narrative that pits job growth against environmental protection, which is hindering coalition-building between environmental justice goals and labor movement goals. The authors describe local level collaboration as "currently limited and conflicted," but see opportunity for synergy in health concerns and changing power relationships. Both social movements provide "disruptive counter-hegemonic discourses" to the established fossil fuel industry in the Hunter Valley of Australia, and a stronger alliance could build a collaboration that will bring a faster and more widely transformative transition away from coal.

Four articles deepen our understanding of how extractive industries are part of regional and individual identities.

Della Bosca and Gillespie (2018) note that transition policies must address "not only the threats associated with coal's continuation, but also those associated with its cessation." The lived experience of "generational coal mining communities" must be acknowledged in order for policies to effectively reach a wider audience.

This deep relationship between coal mining and generational identity is echoed by others in the literature. Greenberg (2022), MacNeil and Beauman (2022), and Cha (2020) all find that residents in generational coal mining communities are attached to their identities as tied to a history of coal mining, even if they acknowledge the harmful health and environmental effects the extraction industry has created. MacNeil and Beauman further unpack the anxieties residents feel about transitions. Namely: there is distrust of a transition driven by outsiders; there is no consistent understanding of what a just transition would entail; they feel their skill and culture built around coal is not being respected; residents feel that transition advocates may be exaggerating coal's decline; and even those that support just transition strategies in theory think that implementation will not be well-executed in practice.

Cha (2020) examines the Wyoming Powder River Basin's perspectives on coal mining and the coal industry after sudden mine closures, and finds that even strongly negative social and economic outcomes did not increase acceptance of just transition principles. The author finds that the energy transition will therefore probably always remain contested, as residents of this coal mining community are still in favor of pro-coal policies and view their history with the coal industry as part of their identity. The author concludes that while government may be viewed as a source of the problems (e.g., residents blaming President Obama for loss of coal jobs), government intervention may also pose the only solution. Some options include seeding industries to diversify local economies, providing safety nets for workers and families losing sources of income, and providing tax revenue replacement options for communities and towns as coal continues to decline.

Regional identities still have complications that arise from personal histories and experiences; even personal identities may hold several values in conflict. Greenberg (2022) identifies conflicting stances toward coal in southern West Virginia, illuminating nuances in a region "often portrayed as overwhelmingly in favor of extractive industries." Even residents with mistrust that the coal industry will ever remediate environmental and health impacts caused are often still attached to coal as an issue of legacy and family history. Understanding that residents hold diverse opinions al-

lows for increased community-led discussion, collaboration, and activism, which might mobilize more people to support just policies.

Two articles shift the discussion of justice toward a broader, more transformational social movement.

Brown and Spiegel (2019) argue that much of the current energy transition debate focuses too heavily on a purely economic and growth-oriented development mindset, and that this narrative has already begun to "replicate and compound patterns of exclusion and inequality." The authors find the "normative" framing of justice in distributive, recognition, and participation justice terms limiting, and push for a more radical, transformative movement affecting wider social relations.

Sovacool and Brisbois (2019) lay out the landscape of many conceptions of power in transition, defining power as "a continuous relational interplay between co-created structures and agency." These relations of power range across "multiple sites of visible and invisible struggle, in all shapes and sizes, from the intimate to the infrastructural, and across micro and macro scales." In the context of energy transitions, the authors describe elite power as able to effect efficient and just transitions, but there is great incentive for incumbents to maintain their power, and consequently less willingness for powerful actors to enact transformational change. As power structures must be continually reinforced at many scales and sites, opportunity is present for existing forms of hegemony and domination to be understood, resisted, and transformed through large societal transitions.

This collection of work suggests that discussions of justice are happening everywhere, at many scales, and between a diverse array of actors. Scholarship on activism, government intervention, incumbent industrial lock-in, community resistance, and many other aspects of transition processes is beginning to uncover the local nuances requiring transition policies to be tailored to region-specific needs. Overarching concerns about inequities resulting from low-carbon transitions are prevalent, and more research should be conducted to create locally effective energy and economic transitions, and to effect equitable social transformation.

2.2 Conclusions and Future Work

Based on this body of work, summarized in Table A.5, I conclude that scholarship on climate, energy, and environmental justice in the context of energy transitions is beginning to unpack the nuances policies need to consider in local contexts, to most effectively and fairly decarbonize. If we are to move past current systemic exploitative and dispossessive structures, we must understand how current power dynamics are negotiated and how concerns are balanced by powerful actors. If incumbents find themselves slow or unwilling to enact sweeping changes in how justice is meted out, grassroots community organizations have proven themselves vocal and active in advocating for their own futures, but top-level action will be needed for the most effective and most transformative changes.

Future work needs to be done on how these changes are to be enacted in very specific contexts. Policies are hard to generalize because local contexts in terms of support for transitions and history of fossil fuel ties are so varied. I would suggest continued case studies exploring regional reasons for resistance to transition, as well as work on how economic diversification, a commonly suggested solution for supplementing tax revenue loss, can be effectively implemented. My work in southwestern Pennsylvania, a region with a long history in extractive industries, will contribute to the scholarship on what forms of justice come to the fore during transition processes, will explore personal and regional identities and values shaped by local history, and deepen the academic understanding of the social and political dynamics that underlay generational coal mining communities' visions for their own futures.

Chapter 3

Methods

This work is an exploratory project, designed to understand a political, cultural, social, and economic landscape that is shifting as a direct result of the energy transition. In this research I take a grounded theory approach to exploring the political process happening in Greene County. Grounded theory (GT) is best suited to allow theory to emerge from data, as I interrogate a process and environment that is not well-understood. My research does not test an existing hypothesis, but rather aims to use inductive research to allow patterns to emerge.

In early 2021, I started my research with only a broad understanding of the interstate, regional economic situation – coal in decline, population slowly decreasing, wealth in the region concentrated in cities like Pittsburgh that pivoted toward high-tech industries like biomed or advanced robotics – and a desire to understand how this rural county was thinking about economic transitions and their future.

My earliest meetings were with the Economic Diversification Steering Committee, convened by the Just Transition Fund, which is a national nonprofit that leverages public and private resources to accelerate a just economic transition, through place-based economic development strategies. The Committee had been meeting since sometime in 2020, born out of early conversations about moving the county away from the deep dependence on coal we’ve been hearing about.

Soon after I started sitting in on meetings, JTF stepped away from its convening role in these conversations, and instead I reached out to many of these mentioned

members of the committee, who directed me to talk to still more people, all working on various aspects of county health, and engagement, and growth.

To begin with, I wanted to pose a specific hypothetical investment scenario to interviewees, to see if residents as a whole might be more interested in manufacturing jobs, or reskilling programs, or something else. My initial research question: *What industries are part of the pathways of economic development that residents want to see?*

Early informational meetings directed me away from this line of thinking.

Instead of discussing favored industries for hypothetical investment or skillsets that are or aren't transferable, I found myself talking about family. Veronica unpacked for me the nuances within Greene County, and how and why her family moved from west to east. John¹ told me about what his cousin has been telling his kid, about what a good job might look like in the future.

I found myself talking about home. MaChal looked for jobs that would allow her to move back closer to home, to come back and support the community she grew up in, and to grow her family there. Mike came back home, after about 30 years in the military, so his kids can graduate from the same high school he went to, so he can live a mile and a half from his dad's place. Tonya reminisced about a time when Greene County was more populated, when more young people stayed. Multiple conversations brought up damage to rivers from coal, to forests and hills from drilling activities.

This conversations shifted my research question. The inductively-derived form: *What are the most important values to preserve, in a changing social and economic landscape?*

3.1 Genres of Grounded Theory

As described by Chun Tie, Birks, and Francis (2019), GT has three major distinct methodological genres: *traditional*, *evolved*, and *constructivist*, all of which are variants on the original work of Glaser and Strauss, which explained how theory could be

¹Anonymized.

generated from data inductively. Glaser's traditional GT generates theory that explains observed behavior; Strauss, Corbin, and Clarke's evolved GT is based on symbolic interactionism, which describes how people assign symbolic meanings to objects, behaviors, and events; Charmaz's (2017) constructivist GT encourages "methodological self-consciousness," a form of reflexivity that encourages continuous questioning of the inquiry process, comprising data, actions, and analysis.

I'm not splitting hairs over these categorizations, but taking them as guidelines, I focus on the methodological distinctions, in line with Birks and Mills (2015). I'm interested in what Birks and Mills name as the fourth and fifth moments of qualitative inquiry (following Denzin and Lincoln), namely:

- Crisis of representation: Author places themselves in the text, examines their relationship to participants, and grounds analysis and text in the data. Ethnographies are not (and have never been) neutral nor objective descriptions, but are rather the result of a social system of interactions and power dynamics, and academic traditions of interpretation of social life.
- Postmodernism: Crises of legitimation (i.e., the merit of the qualitative research outcomes) and praxis (i.e., the ability of the textual analysis to effect change in society) are added to the crisis of representation. The researcher appears not only in the research output, but also in how the research is received in the world.

I believe that my GT research, as it brings emerging themes and additional questions from the data, situates me within a constructivist frame. As I examine the meanings brought by my correspondents to objects, processes, and events in their world, I am also examining the meanings I am bringing, as well as the effects my work has, or has the potential to have. I believe this will deepen the relationship between me, representing my research group, and Greene County, building trust and facilitating future collaboration.

3.2 Sampling

As described by Hennink and Kaiser (2022), saturation is the most common guiding principle for ascertaining completeness of purposive sampling. The concept of theoretical saturation was first described by Glaser and Strauss (2017), referring to the point where gathering more data does not reveal any deeper insights. This point is reached by an iterative process of sampling, during which data gathering informs further sampling.

Hennink and Kaiser (2022) find an average of 12-13 interviews to reach saturation, with more heterogeneous groups requiring more interviews. I have confidence that my purposive sampling across government, nonprofits, industry, and community, totalling 14 interviewees for over 40 hours of interviews (and an additional 10 hours of participant observation of County Commissioners Meetings and Planning Commission Meetings), have reached an adequate level of saturation for my purposes of understanding the political processes that currently drive decisionmaking in Greene County.

3.3 Autoethnography

As Ellis (2004) says: "autoethnography overlaps art and science; it is part *auto* or self and part *ethno* or culture. ... [It is] something different from both of them, greater than its parts."

As described by Adams, Ellis, and Jones (2017), autoethnography is at the intersection of writing about the self, calling on memories and personal experience, and writing about a culture and cultural experience, which the researcher has observed and participated in. Taken together, autoethnographers focus on personal experience to counter dominant and stereotyping narratives, avoiding generalizations that mask important cultural nuances and articulating insider knowledge. Through long and repeated conversations with residents of Greene County, and reflection on content and tone of conversations, I begin to connect "the personal to the cultural" (Bochner

& Ellis, 2016).

In line with Anderson (2006), this work, which may be described as analytic autoethnography, presents me as a visible member of the setting, and develops the theoretical understanding of social phenomena present in the region.

3.3.1 Online, Remote Ethnography

I want to make a special note about conducting this process of interview and observation remotely. I'll be clear: this research process did not replicate the feeling of going in-person to Greene County. My reach was limited to those who had the interest and bandwidth (with regards to time, energy, and internet connection) to have conversations with me, often repeatedly and at length. Most video calls were made to offices, either in someone's home or at their place of work, but I generally did not see one person in more than one place.

Participant observation began at one extreme, with the County Commissioners' meetings, which are livestreamed on Facebook, which did not give me a great deal of information about identities or numbers of attendees who were not the Commissioners themselves, and made me feel invisible; my experience of these meetings would not have changed if I'd watched their recordings later.

Participant observation only got weirder, as the Greene County Planning Committee was kind enough to find a way to video call me into their monthly meetings: from my vantage point in the corner of the room, I could tell that there were about ten people in each meeting, mostly sitting around a table facing one another, and couldn't make out many faces even if their voices were clear, but I *could* tell that on three large screens on three sides of the room, *my* face loomed, enormous.

However, I also want to be clear about *this*: I was never going to integrate into the county or feel like a local. My name and face are quite typically Asian, and I don't believe anyone ever forgot they were speaking to someone from MIT. Greene County's population is overwhelmingly white, and overwhelmingly comprised of people whose families have lived there for generations, generally tied to coal and extraction industries.

Liu and Burnett (2022) describe the differences experienced by "cultural insiders and outsiders" in conducting research. Insiders have a deeper understanding of cultural norms, and may more easily form relationships with and gain trust from participants. Outsiders, on the other hand, do not face the difficulty of separating out personal experiences, and may not come in with the same pre-formed biases.

I could not be more of an outsider, but I'm also not sure I could have become any more of an insider. Knowing that, and knowing the external constraints on my ability to travel and visit the county in person, I hope I've done justice to the community that worked with me on this through our video and phone calls.

3.4 Narrative Storytelling

In this work, I tell stories and give details of those I worked with in Greene County to give nuance and detail to their community as I describe it. I hope that by doing so, the narratives of the participants, their relationships, their work plans, and their visions are made more clear and tangible to readers. It's important to me that nuances are made in these narratives, that refuse to consider any community a monolith, that respect individuals and their backgrounds and hopes. I hope that I'm helping them tell their *own* stories to a wider audience, and that these stories form connections that build a foundation of trust that can help bridge the gap between removed academic research and lived experience.

As Lubet (2019) notes, it is important to maintain integrity in accuracy of stories and events used to anchor ethnographic work. While eyewitness reports are invaluable for recreating cultures and emotional realities, extensive research has shown that they are not always completely factually accurate. In this work, I have strived to ensure that only true events are represented, and not to tell any stories that are only true in a "bigger sense."

This research places the stories I have been told at the center, as part of honoring the relationship I have built with my interviewees, in line with J.Lewis and Hildebrandt (2019). My main ethical consideration here is to represent their lived

experiences as truthfully as I can, to avoid generalizations that might be harmful and fully illuminate nuances, and to acknowledge where I as a researcher am situated in this story.

This work is in line with Götsch and Palmberger (2022) and the authors' belief that narratives "help tellers convey what they think is important about certain circumstances or what they think listeners want (or are allowed) to hear." I hope the narrative I form from hearing a whole collection of stories can help link "past and present experiences, as well as aspirations for the future" for county residents.

Chapter 4

Local Landscape in Greene County

4.1 Coal's Decline

Greene County is a generational coal mining community, historically deeply reliant on the fossil fuel extraction industry. As the value of underground taxable coal assets declines (White-Nockleby et al., 2021), the county finds itself searching for a new path forward, to solve the twin primary issues of the future of the source of taxes and the future of work in the region, and their corollary issues including an inability to fund schools and infrastructure projects adequately. In the meantime, tax rates are high to make up for the shortfall, significantly higher than surrounding counties with better amenities, dissuading developers and potential industry entrants from choosing Greene County.

Today, as described in section 1.1.2, there is a global trend away from coal, and fossil fuels in general. This has led to a gradual loss of tax base that endangers some of the core functions of the county. The Greene County government relies on taxes to keep public works like public schools, hospitals, and roads functioning, as described in section 1.1.1. The continued depreciation of coal as it is out-competed by natural gas and, increasingly, renewable energy sources, means that Greene County must look to supplement its tax base through other means to continue its basic functions, such as paying schoolteachers and carrying infrastructure projects forward. This struggle is the backdrop of every conversation I had with decisionmakers of the county.

Taxes in Greene County are much higher than that of those of surrounding counties. Property taxes are about 1.4 times as high in Greene as compared to Washington County (*Pennsylvania Property Taxes By County - 2023*, n.d.); gasoline tax is 1.64 times higher, and undyed diesel tax is 2.11 times higher in Pennsylvania than in West Virginia (*Gas Tax by State 2022 - Current State Diesel & Motor Fuel Tax Rates*, 2022). For industrial developers, this means that from an economic standpoint, any potential investment into a new building, warehouse, trucking company, or other structure makes significantly more sense in Washington County, PA, to the north, or farther south or west in West Virginia. This only exacerbates the issue addressed previously, that Greene County is short on taxable assets.

This is the region that powered the Industrial Revolution in the United States, and enabled large-scale steel projects such as the construction of the Transcontinental Railroad. Generations of men have worked in coal, steel, and now natural gas, and these families have owned land in the county for decades. As the value of coal decreases, these same families are being priced out of houses they *already own*, due to the high tax rate. The effects of the changing global and national economic landscape are undeniable, whomever one might blame as the root cause.

Also undeniable are the effects on the land caused by the extraction industries. In several interviews, the word "scarred" was used to describe how the land looks, with slurry pits, acid mine drainage, post-mining operations, and brownfields all over the county. Oil and gas drilling has flattened hilltops, and transportation networks for coal, oil, and gas have further left tracks through hill and stream. Greene County residents love their land, and love the outdoors; this is a serious consequence for them to live with.

In a way, this situation sidesteps the first balancing problem discussed in section 2.1.1, where policymakers are forced to choose between economic development and environmental preservation. Greene County has the opportunity to work on development plans that provide community benefit in every sense, as it seeks to identify what those options are. The second concern, balancing remediation of existing injustices and avoidance of future injustices, is ameliorated by incorporating a wide range

of stakeholders in every discussion. This mode of operation is actually the default when the community needs to pull together all of its assets.

I wanted to hear from conservation groups about their perspective on regional sentiment around industrial development, so in February 2023, I talked to Ken Yonek, President of the Harry Enstrom chapter of the Izzak Walton League (a volunteer group mostly focused on conservation of nature). Ken is a retired chemist, turned gardener. We spend several minutes just talking about the work he does as a Master Gardener, the Phipps Botanical Gardens in Pittsburgh, and seasonal displays. He's on camera dressed casually, in his home office in Washington County (immediately neighboring Greene, to the north), a little curious about why MIT might be interested in a little county in Southwest Pennsylvania but mostly offering his time to my work and to my questions.

He describes the entire past and present of Greene County as "based on the exploitation of natural resources."

I make a sort of quizzical noise.

"Not a lot has changed, from where I sit," he continues. "From the official political emphasis, it's all the same thing: it used to be coal, and now it's natural gas. The coal industry built communities, and longwall mining destroyed them. Natural gas doesn't build communities either. It's transient worksites, and often transient workers." He tells me that wells only produce for some number of years, then fade away. Ken doesn't think much of the idea of investing in a plastics plant either, as we're "coming down to the end of single-use plastics – or what should be the end of it, anyway."

I ask him how he thinks the community might think of all this.

He notes that the mentality of relying on the fossil fuel industry is especially entrenched in older residents. "They'll still come to volunteer at conservation events, but in an unguarded moment, they'll mention the war on coal, the war on gas, and 'next they're coming for our guns,'" he says somewhat bleakly. "This political system corrupts everything, benefiting nobody, giving value to nobody."

Really, he concludes, if you're thinking about the future of the county, "depends on who you talk to."

In sum, sentiment around coal is mixed. Between residents, there is variation in how they see the legacy of coal as one of harm, or one of development and growth, or simply tied to family history. These positions are not mutually exclusive, either. Tonya Yoders and Jonathan Johnson both tell me that generations of blue collar work gave the community a shared sense of work ethic and resilience, which speaks to deeper community values. I believe these shared values are what will bring the community together, across changing identities and transition-related anxieties as discussed by Greenberg (2022), MacNeil and Beaman (2022), and Cha (2020).

4.2 Competing Priorities

One group I met with several times, through different members, was the Center for Coalfield Justice, which has a stated mission of improving regulatory policies around fossil fuel industrial behavior, engaging with surrounding communities, and protecting the health of residents and the environment. Members come to them with issues, then-Executive Director Veronica Coptis told me in March 2022, and CCJ helps them find pathways to make change, be that through agencies and funding, or law changes, or public pressure leading to corporate accountability. According to Nick Hood, when I spoke with him in February 2023, most of CCJ's community events are aimed at education and engagement to get people thinking about system-level problems and understanding who has the power to fix problems. One upcoming event they're planning is the 17th annual DRYerson Festival, hosted at Ryerson Station State Park, to bring the community together around the park's Duke Lake, which was compromised and damaged by coal mining in 2005 (Nelson, 2022).

Tonya Yoders, the young new community organizer for Greene County, tells me how CCJ members like herself campaign and organize door-to-door, communicating with the community through Facebook, emails, a lot of phone calls, and connections through personal relationships. I've called to ask her what she does in the new role. She joins the Zoom call in a floral outfit, long blonde hair and sweet smile.

"What's the actual work now? What does community organizing look like?" I

ask.

"Mostly rapid response type situations and issues," Tonya says. In her time at CCJ, which she only joined in the last couple years, she's worked with townships thinking about zoning issues with regards to protections against oil and gas work, issues with the siting of a compressor station, and a fracking incident "which actually affected my parents."

"I'm so sorry to hear that."

"Thanks," she says seriously. "We've been looking for clean water and answers for them."

I think back to my first conversation with Veronica. "The game here," she told me, is that "everyone is only thinking about immediate problems, and not system-level." Her thinking is in line with Brown and Spiegel (2019): CCJ is interested in transformation of an entire system. Everyone needs energy, so access should be controlled by a public entity that the community has control over. Everyone needs water, and there's going to be a fight over privatization of water in the coming years. If the system providing broadband internet access isn't profit-based, problems will actually get fixed. Getting people who care about their own community is the first step in making real tangible change.

I hear from both Tonya and Veronica a strong sense of justice, that the community has received neither distributional nor procedural justice as described in section 2.1.2. There is hope yet for restorative justice to be enacted through just transition management, remediation for the land, and healthcare, depending on the policies and funding that come through.

The political process for policies in Greene County is both initiated and concluded by these county-level decisionmakers. Intermediate stages are for "dealing with" concerns brought up by other, non-decisionmaker members of the community. One of the biggest sticking points in getting things done is apathy – you can't work with people who won't work. John Smith¹, who works in the Department of Planning & Community Development, sighs a little over the phone as he tells me about agenda

¹Anonymized.

items that make it to them, and how they are often issues that should be addressed by townships and their supervisors, but townships will tell residents to bring those complaints to the county-level planning commission anyway.

"And why do townships do that?" I prod.

"I have opinions on why they do that," John says.

"I would love to hear these opinions," I tell him earnestly.

He groans, teasing. "Oh I knew you would, I knew you would!" he laughs.

Though we'd spoken for a few hours cumulatively at this point, I'd only seen John once, in side-profile over a hazy video call into a large meeting room for the monthly Planning Commission meetings, which are open to the public. Still, I could picture him leaning forward and gesturing with his hands as he told me about some township supervisors uninterested in performing many of their supervisory duties, largely ignoring long-term planning decisions, foisting zoning decisions on county committees that don't have jurisdiction over zoning to begin with, and generally not bothering to do a good job on planning because they're all going to retire within the next ten years anyway. This negligence forces county committees such as the Planning Commission to spend time on activities considered "economic development" rather than "planning" proper.

"Is there a separate group focused on economic development?" I ask, with some concern.

John explains they are "so stretched that we end up piggybacking and overlapping" on each other's work. They "just chip in and help each other when needed." There is a constantly negotiated insider process through which sometimes planning dictates economic development, and sometimes vice versa.

"How has that played out?"

John laughs aloud. "Depends on who you talk to!"

Depends on who you talk to. The phrase, echoed across many conversations with many people, seems to neatly capture much of the political process happening in Greene County.

4.2.1 Changing Educational Landscape

The fossil fuel industry is currently still a major employer, and a source of many employment opportunities for new high school graduates.

In February 2023, MaChal Forbes greets me with a warm smile, and tells me about how she grew up in Greene County, and came back after college and a first job to "work closer to home... to come back and support my community, that I grew up in, where I'm now growing my family." I've called her to ask about her work, where she runs a local branch of the national nonprofit United Way, which both supports other nonprofits and provides direct aid to individuals. The organization's priority individuals are children, from birth through high school, and into their first years of college if they need it.

I ask how she sees the community thinking about the future of coal and other fossil fuel jobs, since she's so involved in education.

"While coal is –" she searches for a word – "not as prevalent as it once was, there's still a huge need for it," she says, after a moment. "We know it's declining, so it will be really interesting to see what comes in to take its place."

Right now, she tells me, the oil and natural gas industry provides a lot of opportunities in the form of scholarships, camps, and internships for high school graduates, and offers decent wages.

"As we look out a little further," she says, slowly, "the nonprofit sector as a whole is worried about what's next. As a whole, we're trying to figure out what's next, once that piece goes," at a regional level, not just within Greene County.

Education for the children in the region is inherently tied to the county's future, so I next ask around for what people working with the school districts are seeing in terms of where the next generation's interests lie. After a few information sessions County Commissioner Mike Belding participated in from March to April 2023, some attended by school superintendents, where he gave presentations on the state of the county's tax base, we chatted about what he is seeing in the educational system, and how that aligns with where the county is heading.

"What are students interested in now, do you have a sense?"

"It's a really diverse range, based on what information is available. Twenty to twenty-five years ago, we only knew what we saw," Mike reflects. Today, with internet access and communities online, kids are exposed to a much wider range of potential occupations, and are much better informed about educational and training opportunities. Mike just wants to figure out how young people can start pursuing those opportunities while staying home, in Greene County.

He remembers when students were told that it didn't matter what they studied in college, and they would be employed as long as they had a college degree. "Now everybody just has debt."

There are some paths Mike sees as more viable than others. Agriculture is still a big industry in the county, but it's difficult to break into for those who don't come from families with farms because all the land is already owned. Kids still go to school and vocational training for agriculture, but they are almost entirely children of farmowners. Increased computerization and more advanced farming equipment are decreasing employment in agriculture – Mike refers to it as a "reduction market" these days. Profit and efficiency might increase, but not employment.

Nursing, on the other hand, has a full pipeline from education through employment, as healthcare is one of the big employers in the region. Mike wants to open this possibility for any type of career a child might be interested in: "We want to train kids to be assets to the county, to work in industries the county needs, so they can stay home," as he puts it.

The local superintendents are fully on board. Carmichaels Area School District Superintendent Fred Morecraft is proposing a system where students from eighth to twelfth grade start getting exposure to careers of interest. Instead of treating every child the same way in a generalized education, an alternative proposal has children taking accelerated classes or experiential learning programs in areas of interest, to meet students where they are and keep them engaged. Mike and the superintendents he works with are determined to build an environment within the county where a child can begin to experiment with any occupation they see online, and eventually

find employment in that field near home.

4.3 Community Conversations

Mike Belding is a local, at his core. After growing up and leaving Greene County, PA as part of the US military for thirty years, he has returned to the place he still considers home. He now lives a mere mile and a half from his father's place, where he grew up. Tax rates in Greene County are about double those of neighboring counties, but for Mike, a dedicated family man, it's an easy price to pay given the alternative of "being farther away from my dad's place, or not having my kids graduate from the same high school I went to."

Mike is also a politician, chair of the county commissioners. When Mike's little Zoom window popped up beside mine when we spoke in mid-October 2022, he looked as he always does, wearing a three-piece suit, tie, and a neutral if world-weary expression. As always, he was sitting in his office, American flag in the corner behind him. Unlike our prior meetings, we exchanged few pleasantries – I had barely got in a word edgewise about the unseasonably warm weather before he dove straight into the contents of the reports on the state of the county that he'd sent as email attachments the week before. It felt much like the calls of the now-disbanded Economic Diversification Steering Committee on which I'd first met him, when he would take charge of agenda items such as sewage and broadband infrastructure developments and provide top-down perspectives on project forecasts.

I ask Mike what other groups in the area he might consider allies in the work for economic development in the area. I mention that I've already spoken with Veronica, who was until March 2023 the Executive Director of the nonprofit Center for Coalfield Justice.

"What about CCJ, are they also allies in your work?" I ask, remembering projects they'd mentioned regarding workforce development initiatives.

Mike takes an unexpected and uncharacteristic pause.

"CCJ is... they're not a threat," he says finally. "They're not a threat or anything

like that." He goes on to explain that their aims used to be "divergent," but are now closer than they've ever been. "Veronica's very smart," he says.

It was fascinating to see him describe CCJ's interest in alternative economic development initiatives (alternates to the fossil fuel industry, that is) as a means of offsetting the "dirty" coal industry, complete with finger scare quotes around the word "dirty." To me his tone felt dismissive of the idea that the industry should be described that way, which is not so surprising: county commissioners seem to place the greatest importance on balancing the county budget and attracting business opportunities, regardless of whence they come. Still, this, from a man who had described to me not twenty minutes prior that the natural beauty of Greene County was physically "scarred" from the presence of fossil fuels!

Between decisionmakers, alignment is found through their specific projects of interest. Take Mike and Veronica, who may not see eye-to-eye on *why* diversifying the economy away from reliance on fossil fuels is important, but at least both believe it *is* important. A foundation of trust that others are making good-faith efforts and care about the county is also core to these relationships – "smart" comes up a lot with Mike as a descriptor of others who are aware of all the same base issues.

People in Greene County become political beings by doing the work. On one hand, this is true by definition: those who participate in the political process are those who care enough to either volunteer their time on committees, or who take on policy-making roles as occupations, running for office and spending enough time on community engagement to be reelected. On the other, becoming a political being is complicated by personal and work relationships. One is given more or less political influence through one's own social embeddedness, whether that involves being a career bureaucrat, one's individual charisma, one's neighborly and familial connections with the rest of the community, and a host of other social ties. The importance of social capital neither begins nor ends when individuals formally enter the political process. As an example, the volunteer members of the Planning Commission are appointed directly by the county commissioners, so each has been chosen by one of three commissioners to help advance their vision. Becoming a political being, therefore, is

tied to others somehow already perceiving you as being part of the political process.

The clearest example of someone in this kind of role is Julie Gatrell. When Julie and I speak in August 2022, I ask her how she got involved with volunteering her time to chair the Planning Commission for the county, and how she got to be the person everyone else was telling me to talk to for a good view on community development.

She laughs, long and bright. "We weren't moving forward!"

"In what sense?" I ask.

"You know, people still had their blinders on about coal," she explains. She saw stagnation, rather than entrepreneurship, and that most around her were "never changing the way we look at things, or . . . trying to bring additional or other resources here, other businesses."

"Is this still the case today?"

"Absolutely. Listen, people will complain, but that doesn't necessarily mean they'll get up and do anything. I'm just not one of those people who can sit back and say 'you know, this is a problem, but I'm going to ignore it,' you know what I mean?"

When she introduces herself, she is firstly a business owner, an accountant. In this role, she interacts with basically everyone else in the county with a business when they need their taxes done, so she has regular and detailed updates on development efforts going on. She is the Chairman of the Greene County Planning Commission Board, so she holds administrative power during the monthly Planning Commission meetings: calling the meeting to order ("all right, we ready?"), wrapping up agenda items ("any further discussion or questions?"), that kind of thing.

She also wields unmistakable soft power. In the November 2022 meeting of the Planning Commission, Planning Director Jeremy Kelly gave updates on "old business" including public participation in the Southwest Pennsylvania Commission, based in Pittsburgh.

"I was the public," Julie notes dryly as an aside. The room huffs out laughter in response.

Jeremy explains for the benefit of the group that the SPC is a metropolitan

planning organization; Greene County must be part of this MPO to get access to transportation funding. ("I get it, it's fine," Jeremy sighs.) The SPC acts as the recommendation body for public participation panels, which are supposed to be demographically representative of the region, but the actual people who know the most about the relevant issues aren't necessarily representative.

"They were very proud of what they've done in Allegheny," Julie says with some scorn. "and they said 'what have you done here?' I basically said *BS!*" Heads nod vigorously around the room.

Julie is both well-connected and incredibly proactive about participation in public affairs. This visibility creates soft power, positioning her as a go-to person for others on the committee to ask about affairs external to the county, which in turn gives her power in external communications as a representative for the voices within the county.

Doing the work is very self-motivated, and this proactivity is rewarded. Johnathan Johnson leads the vision for The Way Community Center of Greene County, a new community organization with a big mission: to value each person, to equip each person with opportunities to gain education and connections where they need it, and to create a self-sustaining culture and ecosystem of growth.

He was also an early part of forming the Economic Diversification Steering Committee, so I ask him about what drew him to that work.

"I'm just naturally – I pay attention to things, and try to find solutions to problems," he says. He was originally asked to join by Mike Belding. He lists off for me a number of "good things in the community that go underutilized, under-noticed," happening within families, organizations, community, county, and church.

The Way came out of the First Baptist Church of Waynesburg, which bought up the land of a former grocery store adjacent to the property in 2019. The Way Community Center was formed as a public charity, separate from the church. Six out of its eleven board members are members of FBC, while the other five are members of other congregations or other community members. This was a conscious decision to make the community center feel as inclusive as possible to all residents of the county.

Jonathan tells me this has gone quite well, and that he's pleased with the response from the community.

Jonathan is a clinical social worker, and has a deep awareness of the barriers to social and economic change. Generational employment by one industry has made it hard for "men of our community to move to different ways of life, and employment. Often your identity is wrapped up in that."

Through The Way, he's trying to change that. The community center is intended to be a "beacon, or something, to show that transformation is possible" in a very tangible way to residents.

It has also been acting as a hub for social connections between organizations. Jonathan is "very conscious that resources in this community kind of have an end [date or goal], and then that program's over." The Way has been helping to align nonprofits that traditionally have been siloed in their efforts, trying to hold onto their "piece of the pie" of the grants that come down through philanthropies or the state. "We wanna be able to work with anybody," he says, which means local organizations need to reconceptualize how to create synergy between their efforts.

It also means that Jonathan will work with any type of funder. He tells me that one of the biggest sources of donations has been the oil and gas industry.

"They've made money in this community, and want to leverage that as an opportunity for us," he says. The Way has already raised \$2.4 million from private individuals, and is now seeking funding to pay for the kitchen and community room. "I would be hard-pressed to identify, I don't know, ten businesses that would have the capital we're looking for to support [these projects], outside of oil and gas."

Jonathan has mentioned that the culture of the local nonprofits has become more positive and collaborative, and I ask what else he's seen changing in recent years. He says the social milieu has changed, that there's a sense of optimism that within five years, The Way might have tremendous impact.

Projects are also moving along better because the leadership has changed. The previous set of county commissioners had been more interested in maintaining the status quo.

I ask what he means by that.

"You're gonna put me on the spot here," he huffs out a laugh.

"Only a little bit!" I say cheerfully.

"They're politicians, right," he explains. "*I'm here to serve for my own purposes, I have a list of people I'm indebted to, and everything I do is with them in mind.* It keeps this status quo." Part of the reason that situation persisted was that counties were receiving "perpetual money" from coal, oil, and gas. A stable source of funds meant that governance and leadership didn't have to make any changes or plans. With the "new economic reality" of coal in decline, things needed to change that previously people in power could ignore.

Political beings are also constantly negotiating their modes of being, positioning themselves in relation to one another with regards to how conservative, proactive, visionary, practical, and passionate they are. John's thoughts on some township supervisors' dereliction of duty, Mike's thoughts on Veronica's and CCJ's work and aims, all show that political beings do not build alliances solely on conceptual, issue-based ideals, but that these relations are mediated by other layers, together forming the situated nature of their relationships.

Mike's use of scare quotes around the word "dirty" to describe how CCJ thinks of coal, and John's thoughts on what I would find interesting as topics to learn more about, told me that in some way, I was also being positioned as a participant in the political process. I don't know yet what my participation means to Greene County residents, and what position and entailed responsibility each thinks I should fulfill, but I think that's part of the ongoing negotiation. We are all in this way political beings, yes, but we are also political doings.

Chapter 5

At the Heart: Home

The thing Greene County wants most, cares about most, is that their home can still feel like home, for everyone who calls it home. Everything else, every other concern, every project, is in service of this desire. Every conversation I had was, ultimately, about conceptions of home. Every topic brought up – economic diversification, environmental effects of the fossil industry, workforce issues, tax base considerations, long-term education and planning and housing, activism and community engagement – circled back to what it means for Greene County to feel like home.

5.1 Visions for the Future

In April 2023, Tonya tells me about when she looked for jobs in the years after high school that would allow her to stay where she grew up, because she "didn't want to have to leave."

She reminisces about a time when Greene County was more populated, when more young people stayed.

"All my friends from high school have left," she says, explaining that today, whole towns and villages are "totally gone."

I ask if she has a vision for her county.

"I know what it looked like when I was a kid, and I know it had issues then," she says. But there are positives to what she remembers, too: she wants to see "families

building homes here, schools thriving, small businesses being able to thrive" again.

"People think the only reason they've been able to thrive in the past was industry, but it's people's resilience... their hard work and effort," she adds. "I wish that more industries that are not fossil fuel would come in."

Non-fossil investment into Greene County, then, is one pathway for stabilizing community wealth and ensuring growth. As an alternative, Nick Hood of CCJ is interested in reconnecting with the community's roots. When I called him in February 2023, we'd talked a couple times, mostly in mid 2022. This time, several months later, he looks as he always does, sweater and beanie in the same home office, though a little more worn down. It's not surprising, as he's just had a newborn since we spoke last. I ask about what he thinks of the future of the county, and maybe what he hopes for.

"Aside from coal, what's the biggest employer here?" I ask.

"Construction, maybe oil and gas?" he guesses. He explains that these are mostly temporary construction jobs, and many are given to workers imported from outside the county. Thinking further, he continues: "And when we talk to folks – we canvassed a couple years ago, around the commissioners' race, it was right around when they were running last time, four years ago – for the most part, most people said that if you weren't working in coal or oil or gas, the next best job is working at the state penitentiary, ten to fifteen bucks an hour."

"Doesn't sound like that's the kind of direction you'd like development to go. What's the dream for you, then, or for CCJ, for the future of employment here?"

Nick's face is grim as he describes for me county land "that's been scarred due to mining." He hopes for a program that would allow residents to engage in manual labor to repair and fix its state, "to get to a point where it's usable and beneficial to the county. People should work on their own land, you know? Become more self-sustaining again."

I find myself surprised. This is a new answer to me. "Your dream, then, is a way forward in being more in touch with the land?" Increased employment in agriculture is a difficult path, as the field digitizes and automates.

Nick nods. He notes the new influx of federal funding directed toward mine reclamation and other remediation efforts, and that this kind of hands-on work would suit residents. "They don't trust the government to fix things, and they don't want to live in the city. Is a new plant going to solve our issues, or a tech company coming in? I don't think so," he concludes.

Either moving toward another industry or reinvigorating agriculture and land use would require planning and community buy-in, just as offshore wind development does (Roddis et al., 2018). Both pathways of development involve extensive coalition-building; neither pits job growth against environmental protection, which can allow for more widely transformative economic change (Evans & Phelan, 2016).

5.2 Hurdles

5.2.1 Legacies of Coal

In Greene County, there is no question of *whether* coal is part of one's identity: coal is part of everyone's personal history and forms a core means of relating to one's community and physical environment. A more relevant question might be how each person conceives of their relation to "coal," or even what each person means when they mention "coal." How coal is defined and abstracted out is related to how and why people get involved in community organization, whether through formal or informal means.

County Commissioner Mike brought up a regional saying: "as coal goes, there goes the county." Understandably for someone in his bureaucratic position, the word "coal" appears to be a stand-in for the industries, the actual belowground taxable assets, and for the taxes brought in by economic activity related to the coal industry. Coal is per se value-neutral, a positive or negative force only as far as it changes the county's tax base. This is not unusual, for him: all industries, all types of jobs are morally interchangeable to him, so long as they bring monetary value. He takes seriously his bureaucratic position, and positions budget-balancing as one of his

primary motivators. Mike is one of the only people to use "coal" and actually mean the tangible material.

Planning & Community Development member John says the county was "spoiled" with coal companies with regards to the tax structure, in comparison to natural gas companies, which negotiated contracts much more favorable to industry (i.e. not needing to pay taxes on the resource, the way coal companies did). "Coal" represents the companies as a form of taxpayer, as a form of stakeholder, perhaps as a respected opponent (as they have opposing goals – as a rule, companies want to pay less in taxes, counties want companies to pay more). John wants to engage in "long-range planning" of systems like transport, and water, and amenities offered by townships, but cannot work on these plans without long-term surety of the county's source of taxation revenue.

Small business owner Julie began her community organizing efforts when she came to the conclusion that "we weren't moving forward" because "people still had their blinders on about coal!" Here "coal" means the jobs, and is the strongest example of the eggs-in-one-basket, boom-bust cycle problem the county has repeatedly faced with different industries. This association of coal with the direct employment effects on people drives Julie's form of organization, which is encouraging people to start small businesses to diversify incomes and decrease reliance on any one big employer, a system which has historically failed the county.

When asked about county residents' general attitudes toward coal, nonprofit advocate Veronica uses the phrases "loyalty to coal" and "heritage" – then brings up capitalism at the root of the problems, and the need for "local" bottom-up control of systems like water that should be public goods. Further in our conversation, she says "the care economy is our future... coal [represents?] white men who got severance." This is in line with Walk et al. (2021) and Braunger and Walk (2022), who illustrate the differing ways men and women experience coal phase-out transitions, and with Brown and Spiegel (2019), who argue for a more radical conceptualization of transition that affects wider social relations. So for Veronica, coal is emblematic of a much wider-ranging problem. It is not only a dirty industry, polluting homes, ruining

farms, and hurting health, but also the most tangible and illustrative example of the harms of capitalism and sexism at large, socially damaging to the point of devaluing other types of labor. Coal, for Veronica, is a system.

In a later conversation with Mike, after I brought up CCJ as an ally in the work, he used finger quotes around "dirty" when describing coal. So he also acknowledges how others are conceiving of coal, while clearly placing primacy on the benefits any industry brings. That's not very surprising; in each of our conversations, he circles himself back to the economy as the focus of his attention.

The number of jobs and taxes brought in by the coal industry are undeniably waning. This shift brings actors into alignment even though their conceptions of coal diverge – Mike and Veronica used to be at odds, because the county relied so heavily on coal taxes and CCJ wanted to change that, but as tax revenue is going down anyway, both agree that the county needs to push toward diversification.

5.2.2 Need for Identity

Diversification necessarily means that not all residents in the county will work for one company, and probably not for one industry.

In that same February 2023 conversation with Nick, he mentions he knows one of the school district's superintendents. I ask if he has a sense for the conversation around what kids want to do, and want to get trained for, in the changing economy.

"I don't think they're quite there," he says. In his view, vocational and technical training "is what we need to elevate more. Culturally and socially ... more hands-on work is probably going to be more accepted, digestible, rather than something more technology-focused."

As mentioned in section 4.2.1, Mike Belding explained that agriculture is still the biggest industry in the county, but it's shrinking in employment numbers with increased automation and computerization. Some children of farmowners still go to West Greene, the high school with the strongest focus on agriculture, but it's not an industry that can employ all of the young population.

Ken Yonek, conservator and gardener, acknowledges that other counties in south-

west Pennsylvania are probably in better financial shape because they serve as bedroom communities for Pittsburgh.

In Washington County, "coal became insignificant [as an industry] long ago," he says. "Every house was undermined by coal, up until the 1980s, and then the mine flooded." Lower real estate taxes than Allegheny, home of Pittsburgh, then brought in educated professionals, and offices and tech parks, since Washington is still geographically "close enough to the meds and the eds."

And what of the future of Greene County?

Well, he considers, at one time, Greene County was a large producer of sheep. "It's a hilly county, not conducive to large-scale ag[riculture] or cattle, but good for small livestock. Then even that disappeared, with the consolidation of the meatpacking industry." Large-scale stock growing moved to the cheaper, non-union, American Midwest.

I mention what I've heard about plans for increased tourism for outdoor recreation.

"They don't have the capability to develop that yet," Ken says. From the impacts of coal, "the streams and rivers used to be sewers, when I grew up. That impairment lasts a long time." He estimates over 5,000 miles of streams in Pennsylvania have been impacted by abandoned mine drainage, which could take many decades to clear back up. Here in the middle of the Monongahela Valley, "they're still looking for a way out. There's no obvious way forward, not even a way to take out the trash."

In sum, "they're still looking for identity," he muses. Regarding their future, "I don't know, and I don't think they know."

Jonathan Johnson comes from a different perspective. Prompted only with the context that I'm interested in hearing about the region's priorities in the ongoing economic transition, he dives straight in.

"The sacrifices that those [blue collar, coal mining] men have made over generations to support their families," he says, "that's the identity ... of our county. ... This is what's so sad: if a coal miner is advocating for their child to step out of that role, and do something more, then typically they take that education, and leave the county." Nobody has really experienced living in Greene County with a higher

education degree.

Jonathan himself wasn't born and raised here, but his dad was, and his grandparents lived here. "At this point people don't even remember I wasn't born and raised here," he laughs. "I kinda have a different perspective," gained from living in different places around the country as he grew up. He only spent two years of his childhood in Greene County, kindergarten and first grade, but he's come back to raise his family here.

I ask what brought him back. Nostalgia, fond childhood memories?

"I always had a desire to help breathe into this community a sense of value – they have more to offer than even they realize," he smiles. "People are kind, and protect their own here." He felt a sense of community, and "felt like people cared here."

He tells me the history of the county means "there's a lot of great values that come from where we've been." There is a strong sense of work ethic, of responsibility for taking care of and providing for one's family. This is echoed in the literature on generational coal mining communities, supported by Della Bosca and Gillespie (2018), who describe the sense of community as a "cultural asset."

Caring about the people in one's community doesn't necessarily create a shared sense of identity, but it's a good start.

5.2.3 Tax Issues

I had several conversations with County Commissioner Mike Belding over the course of several months. One thing we talked a lot about is the idea of home, and passion for the community. Mike is interested in finding a large investor for the region, because the tax base deficit is too large to be made up by smaller projects such as new housing development or small businesses. Any large investment by a corporation would require a for-profit business to choose to invest in the future of Greene County; the purely financial calculation for a regional investment would come out to favor surrounding counties, due to Greene County's unfavorable tax rates.

"Why would someone pay more to get less, you know what I mean?" Mike muses aloud.

5.3 Pathways for Growth

5.3.1 "White Knight"

It's a rhetorical question, to which he's already prepared an answer. He's had this answer ready since we first spoke, in October 2022.

He calls his personal solution the White Knight Theory.

"It's gotta be national or global in scale, and it could be anything. Firestone, or parts manufacturing for Caterpillar, not necessarily Amazon. A 50 million dollar manufacturing plant, or a 40 million dollar assembly plant, or a truck transfer station."

"What would be the draw for them, of Greene County?"

This is our first one-on-one conversation, so I don't know Mike very well yet, which is why I'm surprised at the emotion that comes through next. I learn through future conversations that Mike holds pragmatic concerns and emotional arguments together.

Passion, he says. An investment that might be small for a large company could have a huge local impact.

There are caveats. "It has to be taxable," he adds. Taxes come from assets on the land and under the ground, so "the only thing we can do is build. Facilities, buildings, whatever it is." Mike is sure there will be a workforce for anything that needs infrastructure. "We're used to blue collar, dirty hands," if the investment came from Caterpillar, for example.

"What kinds of white knights would you trust?" I'm gesturing at a long history of industries moving in, and moving back out.

He has a couple ideas. They should be resilient; he'd need to look at the company's track record. They should be in a growing field, "like solar," over the next several decades. "In 1890 when they took the first coal car of coal out of here, we knew it was not coming back. It's a nonrenewable resource, it was just going to get depleted." Industries coming in need to be "sustainable over time, for the future, and resilient to change."

Another white knight could be the federal government, setting up a base in the

county for "any of the three-letter agencies – DEA, FBI, you name it." Employees moving in would demand a higher quality of education for their children, forcing greater investment into the local school system, and service industries would move in to provide amenities and entertainment. While the federal building wouldn't pay taxes, everything that moved in around it would.

I ask his thoughts on what the plan is in the interim, while hoping for a large investment.

The little contributions to the tax base – a new housing development of thirty homes, a new Applebees – are "just a drop in the bucket" of the scale of the issue. "The numbers just aren't there. ... We will never get there if we're simply building houses."

Near the end of this conversation, he offers me insight gained from years of experience.

"You know, one of the interesting things over time, is that there's been a lot of analysis of this problem, including the personal analysis that I've done. ... But none of them have come up with the solution that perhaps I've proposed, like the White Knight Theory, you know, that says *we need a ten mill– a huge investment in Greene County, and let's go look for them.* ... You know, it's hard. I mean, *you want me to pay - I'm going to invest 50 million dollars, and you want me to pay twice the amount of taxes?* So they're not on the passion part yet. They're still on the economic analysis part, so it doesn't make sense, right, so we need to get them over on the passion side."

Mike's solution requires someone to make a financial decision based on more than economics, to make a commitment, to build something bigger. Crucially, this solution involves someone *external* to Greene County coming in and making this place their home. History in this region hasn't shown that industries value the community here as much as generational residents and their families do – it might be up to Mike to make a personal plea to change that.

Regional reports generally favor a multi-industry, diversified approach to economic development instead (*Inflection Point 2017-2018: Supply, Demand and the Future*

of *Work in the Pittsburgh Region*, 2017; Ansolabehere et al., 2022). On the other hand, these reports include better-resourced areas including Pittsburgh, so localized solutions in Greene County may not have as many options.

5.3.2 Economic Diversification

Still, as a longer-term solution, economic diversification seemed to come up a lot. That would require the county residents to move away from the long-held history of mostly sticking to "hands-on" work, as well as a serious amount of infrastructure development. Since last-mile broadband is being pushed to the most rural, most remote parts of the county, some residents imagine that remote work might be more prevalent in the future.

Asked broadly about the future of work in the area, MaChal mentions she's heard that remote work with increased broadband access might be one direction of development, but ultimately doesn't have a clear vision. Maybe manufacturing, with a pipeline including education in high schools and vocational training? "I hate to say it, but it's kind of a guess. I've heard so many possibilities."

"Tell me, what possibilities have you heard?"

There's speculation that people living farther south, where it's getting hotter and drier as the climate changes, may want to move up north. There's a sense that businesses may want to come out to rural Pennsylvania, or to the Midwest, for cheaper land. MaChal hasn't heard specifics; "timelines on those are so general."

Reconsidering: "I've heard people talk about, you know, if we could find a couple of companies that have hands-on work," she says. Manufacturing might come in, and then there might be a possibility to connect with schools to start training and vocational study, and eventually placement in the area.

For Julie, a scenario that's even better than people being able to find jobs at companies that move into Greene County is one where residents make it a collective effort.

"It's not really about big industry, we just need to diversify," she explains. She imagines businesses with ten to twenty employees, and many of these businesses,

rather than one company offering a thousand jobs.

Her words are echoed in my conversation with Jonathan Johnson, who talked about the community center as a physical representation of transformation. Julie too believes in smaller projects acting as points of inspiration: "you can't change everything at once, you gotta implement small changes. ... When you show people things can be done, that gives people hope, the drive, to say *yes, we can change this or change that*. ... I think if you do more of a grassroots effort, I think you'll see more progress long-term."

These smaller projects have to come from somewhere, and she's eager to see residents build up their own small businesses. As she says, "if you're not fighting for your community, then you might as well just move out."

I mention the idea that another large industry or company could come in, to provide a whole bunch of jobs at once. She nearly scoffs at the idea.

"*We just need big industry, we just need Amazon*. First of all, no we don't. Two, how are you going to bring Amazon here, really? They don't think! I was like *no, no, that would not be the answer*. ... Another guy talked about putting a landfill in our county, *those are really profitable* – I'm like, *wow*."

She notes that in the current economy, cities and states are enticing industrial investment with tax breaks. Then, "companies take the tax incentives and move out. That is not the answer. We've seen it time and time again, and there is no guarantee with that. They always end up being unsustainable. It's a five, ten year process, and they're gone."

In the last ten years, "Gas and oil did the same thing." For a time, "they moved in, drilled drilled drilled like crazy then moved out." While extraction was booming, service industries came in around it, but "all these people, well they're all gone." None of that is a long-term solution for Julie. "People are invested in their own community. There's not somebody jumping in, and taking what they can, and going away."

5.4 Recent Movement and Change

Near the end of my February 2023 conversation with Nick, I ask about where CCJ finds allies, looking toward a future away from fossil fuels. "Could that be the government, or others?"

"Yes and no," Nick returns after some thought. "I don't think anyone is talking about moving away from coal, realistically, or oil and gas." With grim humor, he says that these are the only assets the county really has, and elected officials won't say anything against them – "and I wouldn't expect them to, or they wouldn't have a job." Local government might work "on the back end of things" on projects such as mine reclamation, but won't openly shift away from fossil fuels.

I'm delighted to have good news to share. "You know, I was in the meeting of the Greene County Planning Committee when Jeremy Kelly walked everyone through the declining value of mineral assets in the county and what it means for housing planning purposes, and no one seemed that surprised. Also, I hear Mike Belding is talking with school superintendents about the report, and what it means for training and education in the future."

I love surprising people with good news. It takes a minute to land, but Nick eventually tells me that despite "maybe some skepticism or cynicism that I have, deep down," and despite the fact that it's hard to move the county away from its cultural and social roots, "Mike is the best harbinger for these conversations to happen." Nick guesses that having data to show on the measurable decline of tax revenue from coal makes people "realize something [needs] to be done," rather than maintaining faith that coal and the fossil fuel industry at large can remain the largest employer and tax revenue source.

It's a glimmer of hope, after our mostly pessimistic discussion about the county's potential future. Very similar threads come up in my conversation about three weeks later with Jonathan. Politicians used to be able to serve the status quo, but as the perpetual money from fossil industries wanes in the "new economic reality, that's not gonna work. We can't go back to the same thing." The county's budget may

completely run out in the next couple years (White-Nockleby et al., 2021), and policy must adapt to meet urgent needs.

Having the public sector conversation about a future that moves away from coal, oil, and gas is a sea change, and county residents are increasingly ready to address it.

Chapter 6

Learnings, Limits, and Looking

Forward

6.1 General Lessons

MIT's voice is considered reputable (see Jeremy Kelly and Kyle Lamb from *Planning: the board members really enjoyed seeing someone from a prestigious college have interest in a small county.*). We can leverage this public perception for wider impact. The socialization of the ESI whitepaper by county officials into the wider Greene County community shows that having a well-respected external body look at a story can elevate it, and make it undeniable.

That's one role an external research body can play: lending credence and weight to a story when it's told to a larger audience. I came in an outsider, and learned to listen. I hear, and listen, and right now, I can help lift and amplify the stories I've been trusted with. I believe this is the beginning of the role prestigious research institutions can play in these contexts, where we engage with communities and forge long-term partnerships.

Community building, writ large, is about finding commonalities and working toward a shared vision. Research institutions can work on building community with partners across the world. This process must include careful listening and trust-building. I think coming into each conversation with the intention of listening, learn-

ing, and centering their concerns was hugely important in building up my collaborators' trust in me. Without this process, research becomes yet another extractive industry.

I know that after my graduation, MIT's Environmental Solutions Initiative plans to continue collaboration with Greene County. That work will build upon the trust and relationships we've already built, and will continue to center community values and priorities in future research projects. This holds true for any field of research, from economic modeling for investment-scenario analysis to water sensor technology deployment. I'm really excited for what we can learn together, and what we can build together.

6.2 Limits of Study

I've never been to Greene County. The closest I've come are Allegheny, where Pittsburgh is, and Westmoreland and Beaver Counties, all within a county or so of Greene. I started this research in 2021, amidst an ongoing pandemic, and due to health and safety, and financial, and logistical constraints during this period, I made a lot of phone calls, and scheduled a lot of Zoom meetings. To my 14 interviewees, who carved a combined 40+ hours of interviews out of their days to welcome me into their lives the best they could, and to tell me their stories, there's no way to fully express how grateful I am. But visiting a place can pass embedded, tacit knowledge that is hard to access otherwise, and hard to know that I'm missing at all.

I interviewed until I felt I had reached saturation, as described in section 3.2. Since I had one group I started with – the Economic Diversification Steering Committee – this study runs the risk of missing segments of the population that were not included in this original discussion. It didn't even include everyone on the Committee, as some people didn't respond to email outreach. Key missing stakeholders are representatives of industry and members of the school systems. Further research in this area should definitely include conversations with them to gain an understanding of how these systems are planning adaptation to the changing economic environment.

Future work should also expand the geographic scope. Greene County's concerns about a decreasing tax base, workforce, education, and maintaining identity in changing economic conditions are not unique. While the specifics change, these underlying concerns remain. Future work could begin to understand how issues in this county compare to those in the rest of Appalachia, other generational coal mining communities, and other towns historically dependent on one industry (such as manufacturing).

Apart from widening my sample, I would also have liked to deepen it. Only near the end of my research did I begin to grasp the sense of identity, separate from the region's industrial history. Oral histories, with more time, might open new insight into what values are most deeply held, and how they can be brought forward into whatever future Greene County dreams.

A few topics lay outside the scope of this work.

6.2.1 Indigenous History and Justice

No indigenous tribes have lived in the land called Greene County for hundreds of years, as explained in section 1.1.1, but the county still has a history it needs to contend with. The county's website (*History*, n.d.) claims that settlement began as forts "built to protect the isolated homes in the area from attacks," without mentioning the violence of invasion and colonialism that preceded the conflicts. The resistance to colonialism is described as "the Indian hostility ... problem." Further work should be done to unpack this history and understand what justice would mean for these forcibly displaced peoples.

6.2.2 Gender, Class, and Race

In this work I primarily focus on the lenses of workforce and environment, because these are the issues most often at the forefront of my conversations with my interlocutors. It does not mean that other social dynamics are not at play. Race and class form less of a focus due to how homogenous Greene County's population is, but the US Census still shows a presence of 4% Black and 1.6% Hispanic population (*U.S.*

Census Bureau QuickFacts: Greene County, Pennsylvania, n.d.). Further research could explore how very small minority groups experience the same or overlapping concerns. Gender is briefly touched on in my interview with Veronica, in the context of social valuation of predominantly-female care and service labor compared to predominantly-male blue collar labor, but otherwise does not make up one of the topics of conversation. More work can be done on how different genders hold power differently in this region.

6.3 Future Work

On April 25, 2023, I gave a talk at MIT, summarizing what I was hearing from my interviewees and pulling out a few threads: love for family and heritage, roots to home. I organized a panel at the same event, and we were lucky enough to have Mike Belding, Veronica Coptis, and Tonya Yoders join us in Cambridge as speakers, at an event we titled Legacies of Coal: In Search of a Just Transition. I'm told the talk was well-received by both my speakers and my audience, that it provided a fair depiction of the conversations we've been having and the residents' conception of home.

This talk was part of an intentional process of deepening the ongoing relationship between ESI's Climate Justice Program and Greene County, to create a long-term partnership that serves the region's needs. I hope there is value in demonstrating that MIT is committed to this partnership by bringing speakers out, but we will also need to send more researchers to Greene County to demonstrate complete collaboration and partnership.

While the talk might have been educational for the MIT audience, there's an open question of what this research does for the county. Is it enough to uplift a message, to have people at an elite institution gain awareness of an issue? Further research in this area might be able to use this work as grounding, to begin to understand cultural nuances. We are still working on understanding what a useful product for the community could look like. Figuring out the most helpful form of results is a necessary part of making sure research is useful.

Naturally, this answer differs depending on the intended recipients. ESI's first whitepaper (White-Nockleby et al., 2021) was useful in spreading awareness of the magnitude of the problem in tax base; gathered data and resultant graphs have made their way into many presentations given within the county, and are helping spark conversations about future planning. My MIT audience walked away from the event with a better understanding of the nuances within Greene County, and some have reached out to me since to discuss resonance in concerns faced by other places undergoing transition. What did my Greene County speakers walk away with?

I hope the first thing they can bring away with them is trust in MIT's work. The speakers all noted that research and journalism can be extractive, that outsiders can come in to find stories that support a larger narrative, then leave without ever looking back. ESI is interested in building long-lasting relationships with communities we partner with, and long-lasting commitment to the projects we can collaborate on.

Designing and working on projects is probably a good next step. There is a sense that awareness is spreading within Greene County about economic, environmental, and health problems that are all tied together, but that action is hard to motivate. Part of the issue is that systemic problems require systemic change, which doesn't always present clear and immediate action. Residents are aware that their taxes are high, their water isn't always drinkable, and their families may have health concerns. Future collaboration with the county can help design projects that give residents a sense of autonomy and empowerment, to understand the underlying systems that cause immediate problems in their lives.

As one example, MIT and other research entities can help by providing sensors and robots for air and water quality monitoring. Better, they can work with local school districts to educate children about these technologies at the same time. Focusing in on education can bring awareness around local environmental issues, as well as larger climate issues.

For another example, economists and modelers might begin to chart out scenario analyses, depending on what policy action is taken in the immediate future, as concerns public infrastructure and funding, population change, and workforce. On the

current path, what happens when the county simply runs out of funds? With some new investment and a restructuring of the school districts, how might the county stave off a collapse in funding for public schools? With a large investment in infrastructure and training programs, what kind of home can the county imagine for itself?

I hope this is the future work. I hope it is collaborative, and imaginative and creative, and that it can really help build a future.

Appendix A

Tables

Table A.1: Search results saved

| Code | Results saved |
|-------------|----------------------|
| AB | top 20 saved |
| ABC | 7 results |
| ABD | top 20 saved |
| ABCD | 3 results |

Table A.2: Number of results by search code combinations

| Search code combinations | # results tagged with these codes |
|---------------------------------|--|
| AB (including ABC, ABD, ABCD) | 31 |
| ABC (including ABCD) | 3 |
| ABD (including ABCD) | 18 |
| ABCD | 2 |

Table A.3: Number of results employing each method

| Method | # results tagged with this method |
|---------------------|--|
| Literature review | 20 |
| Interviews | 4 |
| Case study | 11 |
| Survey | 1 |
| Focus group | 1 |
| Regression analysis | 1 |

Table A.4: Number of results by publication

| Publication | # results published here |
|---|---------------------------------|
| Applied Energy | 3 |
| Climate Policy | 3 |
| Energies | 1 |
| Energy Policy | 5 |
| Energy Research & Social Science | 9 |
| Energy Sustainability and Society | 1 |
| Environmental Innovation and Social Transitions | 1 |
| Environmental Justice | 1 |
| Environmental Research Letters | 1 |
| Geoforum | 1 |
| Geographical Journal | 1 |
| Global Environmental Change-Human and Policy Dimensions | 2 |
| Global Environmental Politics | 1 |
| International Journal of Environmental Research and Public Health | 1 |
| Journal of World Energy Law & Business | 1 |
| Nature Energy | 1 |

Table A.5: Summary table of peer-reviewed literature.

| Year | Author | Title | Major Themes |
|-------------|--|--|---------------------|
| 2022 | Agbaitoro, Godswill A.; Oyibo, Kester, I | Realizing the United Nations Sustainable Development Goals 7 and 13 in sub-Saharan Africa by 2030: synergizing energy and climate justice perspectives | AB |
| 2022 | Arora, Anmol; Schroeder, Heike | How to avoid unjust energy transitions: insights from the Ruhr region | ABC |
| 2022 | Bang, Guri; Rosendahl, Knut Einar; Boehringer, Christoph | Balancing cost and justice concerns in the energy transition: comparing coal phase-out policies in Germany and the UK | A |
| 2022 | Braunger, Isabell; Walk, Paula | Power in transitions: Gendered power asymmetries in the United Kingdom and the United States coal transitions | C |
| 2019 | Brown, Benjamin; Spiegel, Samuel J. | Coal, Climate Justice, and the Cultural Politics of Energy Transition | C |
| 2014 | Bulkeley, Harriet; Edwards, Gareth A. S.; Fuller, Sara | Contesting climate justice in the city: Examining politics and practice in urban climate change experiments | B |
| 2020 | Carley, Sanya; Konisky, David M. | The justice and equity implications of the clean energy transition | A |

| | | | |
|------|---|---|----|
| 2020 | Cha, J. Mijin | A just transition for whom? Politics, contestation, and social identity in the disruption of coal in the Powder River Basin | C |
| 2022 | Cha, J. Mijin; Pastor, Manuel | Just transition: Framing, organizing, and power-building for decarbonization | AC |
| 2018 | Della Bosca, Hannah; Gillespie, Josephine | The coal story: Generational coal mining communities and strategies of energy transition in Australia | C |
| 2016 | Evans, Geoff; Pheelan, Liam | Transition to a post-carbon society: Linking environmental justice and just transition discourses | C |
| 2016 | Finley-Brook, Mary; Holloman, Erica L. | Empowering Energy Justice | B |
| 2018 | Goddard, George; Farrelly, Megan A. | Just transition management: Balancing just outcomes with just processes in Australian renewable energy transitions | B |
| 2020 | Green, Fergus; Gambhir, Ajay | Transitional assistance policies for just, equitable and smooth low-carbon transitions: who, what and how? | A |
| 2022 | Greenberg, Pierce | Sites of Ambivalence? Conflicting Attitudes Toward Coal in Southern West Virginia | AC |
| 2017 | Healy, Noel; Barry, John | Politicizing energy justice and energy system transitions: Fossil fuel divestment and a "just transition" | B |

| | | | |
|------|--|---|----|
| 2018 | Heffron, Raphael J.; McCauley, Darren | What is the 'Just Transition'? | B |
| 2018 | Jasanoff, Sheila | Just transitions: A humble approach to global energy futures | B |
| 2018 | Jenkins, Kirsten | Setting energy justice apart from the crowd: Lessons from environmental and climate justice | B |
| 2016 | Jenkins, Kirsten; McCauley, Darren; Heffron, Raphael; Stephan, Hannes; Rehner, Robert | Energy justice: A conceptual review | B |
| 2018 | Jenkins, Kirsten; Sovacool, Benjamin K.; McCauley, Darren | Humanizing sociotechnical transitions through energy justice: An ethical framework for global transformative change | B |
| 2022 | MacNeil, Robert; Beauman, Madeleine | Understanding resistance to just transition ideas in Australian coal communities | C |
| 2018 | McCauley, Darren; Heffron, Raphael | Just transition: Integrating climate, energy and environmental justice | B |
| 2019 | McCauley, Darren; Ramasar, Vasna; Heffron, Raphael J.; Sovacool, Benjamin K.; Mebratu, Desta; Mundaca, Luis | Energy justice in the transition to low carbon energy systems: Exploring key themes in interdisciplinary research | AB |

| | | | |
|------|--|--|----|
| 2020 | Muttitt, Greg; Karthan, Sivan | Equity, climate justice and fossil fuel extraction: principles for a managed phase out | B |
| 2013 | Newell, Peter; Mulvaney, Dustin | The political economy of the “just transition” | AB |
| 2018 | Roddis, Philippa; Carver, Stephen; Dallimer, Martin; Norman, Paul; Ziv, Guy | The role of community acceptance in planning outcomes for onshore wind and solar farms: An energy justice analysis | C |
| 2022 | Shelton, Rebecca E.; Eakin, Hallie | Who’s fighting for justice?: advocacy in energy justice and just transition scholarship | C |
| 2021 | Sovacool, Benjamin K. | Who are the victims of low-carbon transitions? Towards a political ecology of climate change mitigation | A |
| 2019 | Sovacool, Benjamin K.; Brisbois, Marie-Claire | Elite power in low-carbon transitions: A critical and interdisciplinary review | C |
| 2019 | Sovacool, Benjamin K.; Hook, Andrew; Martiskainen, Mari; Baker, Lucy | The whole systems energy injustice of four European low-carbon transitions | B |

| | | | |
|------|--|--|-------|
| 2021 | Walk, Paula; Braunger, Isabell; Semb, Josephine; Brodthmann, Carolin; Oei, Pao-Yu; Kemfert, Claudia | Strengthening Gender Justice in a Just Transition: A Research Agenda Based on a Systematic Map of Gender in Coal Transitions | C |
| 2021 | Wang, Xinxin; Lo, Kevin | Just transition: A conceptual review | Other |

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