COMMUNITY RESILIENCE IN REMOTE, RESOURCE-DEPENDENT COMMUNITIES:

A CASE STUDY OF THE U.S. COAL TRANSITION

by

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DEDICATION

I will be forever grateful to have been a member of the Resources and Communities Research Group. You have taught me so much about critical empathy, collegiality, and community. I could not have done it without you.

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TABLE OF CONTENTS

1. INTRODUCTION 1

Coal Transition Dynamics in the US West 3
Conceptual Approach 6
Resource and Economic Geography 6
Resource Geography 6
Economic Geography 7
Community Resilience 9
Transition Theory 11
Research Questions 13
Methods 14
Data Collection and Analysis 16
Policy Analysis and Policy Corridors 17
Qualitative Interview Data Collection and Analysis 18
Dissertation Overview 22
References Cited in Chapter One 23

2. COAL COMMUNITIES IN THE U.S. ENERGY TRANSITION:
A POLICY CORRIDORS ASSESSMENT 30

Contribution of Authors and Co-Authors 30
Manuscript Information 31
Introduction 32
Literature Review: Transitions, Community Resilience, and Policy Corridors 34
Methods 39
Constructing the Policy Corridor 40
Assessing the Policy Corridor 41
Findings and Discussion 42
Policy Corridors Emerging in the U.S. Coal Transition 42
Federal Policy Corridors 42
State Policy Corridors 49
Examining Transition Policies and Programs 'On the Ground' 54
Policies do not address the needs of remote isolated communities 54
Policies do not provide resources to support early or long-term planning 57
Existing transition support is insufficient 58
Conclusion and Policy Implications 59
Acknowledgements 61
References Cited in Chapter Two 62

3. COAL COMMUNITIES IN TRANSITION:
A CASE STUDY OF COLSTRIP, MONTANA 69

Contribution of Authors and Co-Authors....69
Manuscript Information....70
Introduction....71
Transition Challenges for Colstrip....73
Complex Ownership Structure Adds to Uncertainty....77
Closing Units 1 and 2 Highlights the Risks of Future Closures....78
Uncoordinated and Limited Transition Planning Efforts Have Created Challenges....81
Policy Interventions to Support Colstrip....84
State Interventions....84
Federal Interventions....89
Local Environmental Issues and Opportunities....90
Environmental, Health, and Economic Impacts of Air and Water Pollution....92
Economic Potential of Remediation....94
Discussion and Key Insights....96
Conclusion....98
References Cited in Chapter Three....99

4. THE ENERGY TRANSITION AS FISCAL RUPTURE:
PUBLIC SERVICES AND RESILIENCE PATHWAYS IN A COAL COMPANY TOWN....105

Contribution of Authors and Co-Authors....105
Manuscript Information....106
Introduction....107
Community Resilience and Public Services in Resource Peripheries....109
Methods....113
Case Study Context: Colstrip, Montana....115
A "Model" Company Town....118
Electricity Market Deregulation and Colstrip's Incorporation....120
Closure Presents a Fiscal Transition....122
Findings and Discussion....123
Characterizing the Fiscal Transition....123
Uncertainty and Complexity Challenge Service Provision....127
Implications for Community Resilience....131
Conclusion and Policy Implications....133
References Cited in Chapter Four....134

5. PLANNING FOR RISK TO PUBLIC REVENUE AND SERVICES:
OPPORTUNITIES AND CONSIDERATIONS FOR SOCIAL IMPACT ASSESSMENT
IN COAL-DEPENDENT COMMUNITIES IN THE US WEST....144

Contribution of Authors and Co-Authors....144
Manuscript Information....145
Introduction....146

Just Transition, Community Resilience, and Fiscal Collapse
in Western Coal Communities 147
Coal Communities in the US West Confront Fiscal Collapse.....149
Social Impact Assessment: What is it, and why is it useful? 150
SIAs for Closure Management 151
SIAs to Assess Fiscal and Public Service Impacts 153
State Policy Addressing Coal-fired Power Plants and Revenue 154
Siting of Industrial Energy Facilities.....154
Energy Transition Policy.....157
Findings from Policy Review.....159
SIA Considerations and Best Practices 160
Implications for Policy and Practice.....165
References Cited in Chapter Five.....168

6. CONCLUSION.....177

Synthetic Findings.....178
Implications for Policy and Practice.....182
Limitations and Future Directions.....183
A Final Word on Colstrip, Montana.....187
References Cited in Chapter Six.....189

REFERENCES CITED.....199

APPENDICES 225

APPENDIX A: Interview Guide and Questions.....226
APPENDIX B: Letters of Information 230

LIST OF TABLES

Table Page

1. Summary of dissertation research phase and questions, objectives, methods, and activities....15

2. Federal funding to support economic transition in coal communities since 2015....47

3. Recent state legislation related to the coal transition in the U.S. Western States of AZ, CO, MT, NM, WA, WY....52

4. Recent Montana Legislation Addressing Coal Facility Closure....86

5. Fiscal Data Sources....113

6. Tasks of SIA applied to mine closure....151

7. State Policy Addressing Coal-fired Power Plant Siting....156

8. State Energy Transition Policy....158

LIST OF FIGURES

Figure Page

1. Coal Electricity Infrastructure and Major Cities in the U.S. West 4

2. Timeline of U.S. Federal Energy Policy 1970-2020 44

3. Rosebud County Population and Rosebud Mine Coal Production 72

4. Local Taxable Property Values, 2017 74

5. Coal Power Plant Average Monthly Net Electricity Generation 75

6. Colstrip Ownership Shares, 2015-2035 79

7. Montana Coal Board Grants to Rosebud County Governments, 2009-2020 85

8. Federal Economic Development Funds for Rosebud County, 2001-2008 89

9. Nitrogen Oxides and Sulfur Dioxide Power Plant Emissions 92

10. Map of the geological structural basin Powder River Basin (left); map of the town of Colstrip (right). 117

11. Share of City of Colstrip and Rosebud County Revenue from Coal Sources 125

ABSTRACT

The United States is undergoing a significant energy system transition characterized by widespread retirement of coal-fired electricity generation facilities. In the next ten years, nearly 30 percent of the nation's coal power plant fleet will retire. The US West hosts a significant portion of these closures, with twenty-five generating units of coal-fired electricity retiring across six Western states. Retirements pose immediate social, economic, and environmental challenges for the localities and regions that host power plants and associated mines. Affected communities need to both plan for loss of employment and tax revenue and ensure thorough decommissioning and remediation of a major industrial facility. Successfully addressing the social, economic, and environmental legacies at coal facilities presents opportunities for enhancing equity and justice in rural energy communities. However, determining the appropriate policy and planning response to address challenges affecting fossil fuel-dependent communities drives significant debate over the implications of accelerating decarbonization in rural places. Interdependent social, political, economic, historical, and environmental processes influence community experiences of coal decline in the US West. This dissertation explores how such factors enable or constrain the resilience of coal-dependent communities to economic decline, where resilience refers to the capacity of a social system to mobilize its resources and respond to shock. This research is thus informed by and contributes to the multidisciplinary literature on resource geography, community resilience, and energy transitions. It makes the following contributions: (1) it investigates how federal and state policies influence community resilience pathways and decision-making at the local level; (2) it identifies and characterizes processes that constrain resilience or enable rural communities to overcome challenges and foster new trajectories; and (3) it identifies specific policies and strategies to support communities navigating energy transition and socioeconomic uncertainty. To make these contributions, this dissertation engages a mixed-methods approach, combining policy analysis and qualitative data collection to examine the coal transition in the US West at the regional and local scale.

CHAPTER ONE

INTRODUCTION

The United States is undergoing a major energy system transition. In the next ten years, nearly 30 percent or 59 gigawatts (GW) of the nation's coal power plant fleet will retire (U.S. EIA, 2021). The US West hosts a significant portion of these closures, with twenty-five generating units and 9.7 GW of coal-fired electricity retiring across six Western states (U.S. EIA, 2022). Driven by a combination of market and policy factors, closures pose immediate social, economic, and environmental challenges for the localities and regions that host power plants and associated mines. Affected communities need to both plan for loss of employment and tax revenue, and ensure thorough decommissioning and remediation of a major industrial facility (Raimi, 2017). Successfully addressing the social, economic, and environmental legacies at coal facilities presents opportunities for enhancing equity and justice in rural energy communities (Carley and Konisky, 2020). However, determining the appropriate policy and planning response to address challenges affecting fossil fuel-dependent communities eludes contemporary climate policy and drives significant debate over the social and economic implications of accelerating decarbonization in rural places (Davenport et al., 2021; NASEM, 2021).

Academic research has generally considered the socioeconomic impacts of decarbonization through technocratic or justice-oriented lenses (Bazilian et al., 2021). Such Analyses tends to focus on employment as a proxy for broader social, economic, and political factors at the expense of understanding the spatial dimensions of energy transitions and the disruptive effects to individuals and communities. (Pai et al., 2020). Justice-oriented approaches,

conversely, draw attention to the injustices in legacy energy systems and the potential for decarbonization policies to reproduce and exacerbate social and economic inequities (Carley and Konisky, 2020; Sovacool and Dworkin, 2015). Scholars advocating for more just energy transitions call for empirical research that considers the broader socioeconomic dimensions of transition to ensure that policy and program solutions are grounded in experiences and needs of communities that will be most affected (Bazilian et al., 2021; Carley and Konisky, 2020). This dissertation responds to these calls to investigate how policy factors interact with local context to influence community resilience in transitioning coal-dependent communities in the US West.

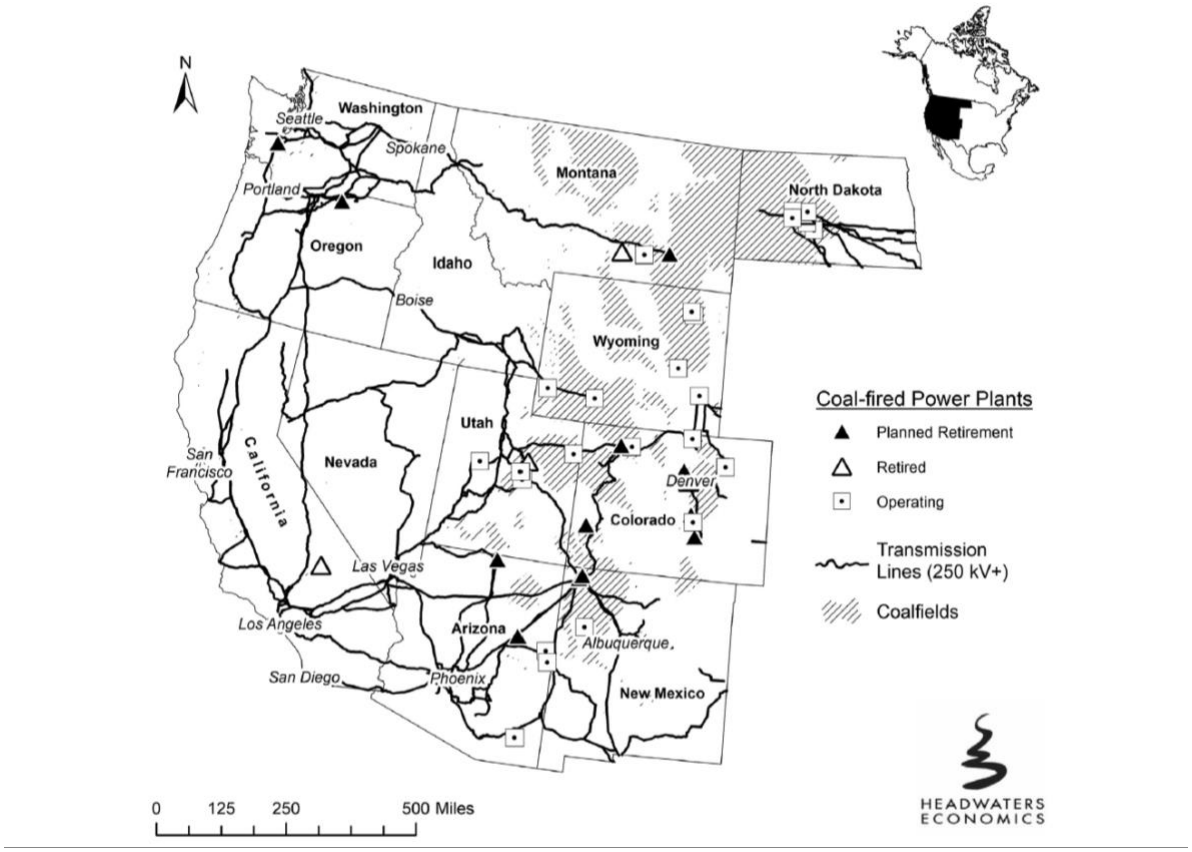
Interdependent social, political, economic, historical, and environmental processes influence community experiences of coal decline in the US West. This dissertation explores how such factors enable or constrain the resilience of coal-dependent communities to economic decline, where resilience refers to the capacity of a social system to mobilize its resources and respond to shock (Berkes and Ross, 2013). This research is thus informed by and contributes to the multidisciplinary literature on resource geography, community resilience, and energy transitions. It makes the following contributions: (1) it investigates how federal and state policies influence community resilience pathways and decision-making at the local level; (2) it identifies and characterizes processes that constrain resilience or enable rural communities to overcome challenges and foster new trajectories; and (3) it identifies specific policies and strategies to support communities navigating energy transition and socioeconomic uncertainty. To make these contributions, this dissertation engages a mixed-methods approach, combining policy analysis and qualitative data collection to examine the coal transition in the US West at the regional and local scale.

Coal Transition Dynamics in the US West

The resource development history of the West's coal expansion and electricity infrastructure strongly influences complex social and economic relationships and processes associated with coal phaseout. In the early 1970s, federal energy policy encouraged development of the West's coal resources, and regional infrastructure planning drove massive buildup of coal-fired electricity infrastructure (US Bureau of Reclamation, 1971). The result was a regional system (Figure 1) where large mine-mouth facilities located in remote, interior regions export electricity long distances over high-voltage transmission lines to meet the needs of urban centers in other states (Ramage and Everette, 2012). This system established the interior West's coal regions as resource peripheries, economically dependent on and vulnerable to changes in demand from urban cores (Wallerstein, 2004; White, 1991). Further, a legacy of deregulation of electricity markets the 1990s is that coal-fired power plant closures now occur amongst a complex set of ownership interests and political jurisdictions (Joskow, 2000). For example, a single generating unit may have multiple owners representing various public and private entities[1], located in different states, with varying incentives that influence decision-making about end-of-life processes (Haggerty et al., 2018).

[1] The types of owners include investor-owned utility companies, independent power producers, cooperatives, and a variety of public owners such as states and municipalities (Haggerty et al., 2017).

Figure 1. Coal Electricity Infrastructure and Major Cities in the US West (Haggerty et al., 2018)



Coal-fired power plant closures are also playing out across a diverse economic geography in which local opportunities to replace employment and revenue vary widely based on access to markets, strength of the local service and knowledge sector economy, and the presence of amenities. Haggerty et al. (2018) applied the "Three Wests" typology – in which counties are metropolitan, connected, or remote as measured by mean driving time to airports – to distinguish among various local contexts for coal retirements (Rasker et al., 2009). For example, compared to their metropolitan and connected counterparts, remote counties have lower wages on average, fewer jobs in high-wage services, and greater income volatility (Haggerty et al., 2018). Further,

economic restructuring and state fiscal policies have intensified dependence on coal revenue and vulnerability to economic shock in remote, isolated communities (Haggerty, 2020).

A notable feature of the coal transition landscape in the US West is its policy framework, or more specifically, lack thereof. There is no single, overarching national policy framework guiding the coal transition, leaving a legislative void filled to varying extents by individual states. The absence of national transition policy has important implications for frontline communities and scholars invested in community resilience dynamics of energy transitions (Graff et al., 2018). When the responsibility for planning for the impacts of closure falls to local and state actors, community leaders confront a procedural and legal milieu in which assigning responsibility to mitigate closure impacts are obscured by a disjointed ownership regime and thus determined on a case-by-case basis (Haggerty et al., 2018). Without a national or regional approach guiding community transitions, local capacity and existing resources may be the ultimate determinant of success in mitigating the impacts of economic shocks. The uncoordinated policy and planning environment raises questions about the ability of coal-dependent communities to successfully transition, especially those in locations made vulnerable by demographic and geographic factors.

This brief overview highlights three key features of the West's coal transition that inform this dissertation's theoretical approach. First, the national energy transition away from coal involves processes of deindustrialization and economic restructuring experienced at multiple scales within the region (Feaster and Cates, 2019; Gallagher and Glasmeier, 2020). Next, the lack of a coherent national policy approach will likely result in uneven community transition outcomes (Haggerty et al., 2018). And, lastly, at the local level, economic transition in coal-

dependent communities must grapple with the ‘unruliness’ of resource dependence and structural realities of distance and capacity which are fundamental dimensions of the rural experience (Markey et al., 2012; Markey and Halseth, 2017; Raimi et al., 2022).

Conceptual Approach

This dissertation engages theories from resource and economic geography, community resilience, and transition theory in its conceptual framework to examine coal community transitions in the US West.

Resource and Economic Geography

This dissertation draws on human geography subfields of resource geography and economic geography to understand the set of social and economic relationships associated with coal extraction and electricity production that have important implications for economic and community development in resource peripheries.

Resource Geography The field of resource geography examines social and environmental implications of natural resource development across global, national, and local scales. A key feature of the resource geography approach is attention to the character, production, and distribution of natural resources; this lens facilitates close examinations of the complex relationships between politics, economics, and environments (Rossiter and Rossiter, 2010). As a result, resource geography studies provide insight to how interactions between national and global political-economic systems affect resource development and produce uneven development within and between societies.

This dissertation focuses on how the coal transition occurs in resource peripheries, which are remote and rural landscapes where resource extraction plays an outsized role in shaping local economies, societies, and environments. Resource peripheries are found across the global economy and were developed to exploit and export resources for consumption in major markets (Hayter and Barnes, 1990; Wallerstein, 2004). Export-dependent resource regions are often highly vulnerable to market fluctuations because resource development moves in and out of production as demand and price rise and fall (Hayter and Patchel, 2015). The vulnerability of these regions to changes in market demand is reinforced by institutional and political forces that may impose longer-term booms and busts. Resource peripheries are frequently characterized by volatile regional economies driven by resource cycle dynamics of resource exhaustion, technological change, and competition (Freudenburg, 1992; Gilmore, 1976). While resource peripheries seek competitive advantages through large-scale and low-cost production, the likelihood of leveraging resource development for economic gains is low. Remoteness from markets, specialized infrastructures, and deep-rooted export-based employment cultures limit economic diversification (Freudenburg, 1992; Hayter and Patchel, 2015). As a result, communities in resource regions struggle to become economically stable despite providing a basis for highly diversified urban economies (Markey et al., 2012; Walker, 2001).

Economic Geography This work also draws on theories from economic geography focused on understanding economic development and change in resource communities and regions. Staples theory and evolutionary economic geography (EEG) are two of the dominant approaches to theorizing transformation and rural restructuring in resource regions (Halseth, 2017). Innis' (1929) framework for staples theory emphasizes the historical relationship between

geography, institutions, and technological development in understanding the causes of uneven development over space and time (Hayter and Barnes, 1990). EEG's concern with explaining the transformation of economic landscapes explicitly recognizes and accounts for the roles of history and path-dependent dynamics and outcomes (Boschma and Martin, 2010). Argent (2017) used Innis' staples theory and EEG to examine how geographic, institutional, and technological changes shape economic shifts over time in the Northern Tablelands region of New South Wales, Australia. As Argent's study demonstrates, EEG approaches provide a broad theoretical platform to explore a particular region's structural features, strengths, and weaknesses and to investigate the causal and contingent factors and processes that drive change over time. EEG scholars have also introduced the concept of path dependence, or how cumulative and self-reinforcing processes eventually lock regions into a particular developmental trajectory (Boschma and Martin, 2010). Once lock-in occurs, a sizeable external shock is required to destabilize or unlock the system and set it on a new pathway.

Both approaches from economic and resource geography emphasize the distinctive, interdependent, and evolutionary dynamics that shape resource communities, and underscore the importance of both historical and geographic perspectives (Hayter, 2017). A historical lens is critical because development is an evolutionary process; decisions, impacts, and past investments create legacies and trajectories that shape and influence possible future pathways. Equally important is attention to geographic context, as the constellations of economic opportunity, resource endowments, policies that frame development processes interact with place-specific cultures and histories (Markey and Halseth, 2017). While the US coal transition is a technical transition in which one energy technology is being replaced for another; resource and economic

geography perspectives enables analysis of the predominant experience of transition in these geographies as deindustrialization and economic restructuring.

Community Resilience

As governments grapple with significant environmental challenges and economic downturns, the notion of community resilience has become increasingly relevant for scholars invested in the social and political determinants and outcomes of resource governance (Kulig and Botey 2016). Community resilience describes the ability of a community to mobilize its resources and respond to challenges in an environment characterized by change, uncertainty, and unpredictability (Magis 2010). According to Berkes and Ross (2013), community resilience is a function of a community's strengths, assets, and resources that contribute to agency and self-organization. Critical features of resilient communities include social capital based on trust and relationships between individuals and organizations within and beyond the community (Besser et al., 2008; Harrison et al., 2016; Reimer, 2002); inclusive and collective governance systems (Kulig et al., 2013; Norris et al., 2008); willingness to learn, self-organize, and problem-solve (Berkes, 2009; Wilson, 2012); and strong institutions and social infrastructure (Flora et al., 1997; Morrison, 2014). These capacities contribute to a community's adaptive capacity or ability to mobilize resources toward a specific goal (Berkes and Ross, 2013).

After the 2008 financial crisis, the concept of resilience gained traction among geographers to study patterns of social and economic change in the context of rural communities and regions affected by processes of economic restructuring and neoliberalism. For example, Hudson (2010) connects resilience concepts to regional development to understand a region as a system with components and feedback that could include both resource use and pollution. Scott

(2013) also examined resilience in economic uncertainty and considered its application in rural studies. Scott focuses on the debate between equilibrium and evolutionary resilience. In his assessment, equilibrium resilience or “bounce back” approaches for resilience are not appropriate for rural studies, as calling for a “return to normal” often ignores the structural processes that created the crises. Instead, he argues for using evolutionary resilience and other evolutionary concepts, such as path dependency, for thinking about community resilience as both a set of capacities and processes that change over time.

Community resilience has both strengths and weaknesses as a conceptual guide for studying rural change. Despite being critiqued for its conceptual "fuzziness," community resilience can be a bridging concept that brings together different disciplines in thinking about factors affecting social, environmental, and economic change in rural geographies (Davidson, 2010). As Hudson (2010) argued, using resilience as a heuristic enables thinking about communities and regions as connected systems. The notion of resilience is particularly salient in contexts characterized by devolved governance, in which the ability to respond to change or shock will depend on the capacity and resources in that place. The concept also provides an alternative policy narrative that focuses on strengthening the resources and capacities that support resilience to economic shock (Scott, 2013).

However, there are a few points of caution to applying community resilience in the context of rural change. The first is concerned with the application of the concept in a neoliberal political-economic context. Hudson (2010) argued that the neoliberal political economy has increased vulnerability and eroded the resilience of rural regions. This is characterized by the emphasis on competition and the withdrawal of public services. Both Hudson (2010) and Scott

(2013) shared concerns that the concept of resilience could be easily co-opted as another factor that puts communities and regions in competition for scarce resources. Second, Scott (2013) warns community resilience could be used in rhetoric promoting individualism, austerity measures, and a sink-or-swim mentality. Therefore, resilience scholars call for empirical research beyond identifying community resilience components (Vaneeckhaute et al., 2017). This dissertation addresses need to examine how a community's resilience pathways evolve over time and how structural and cultural circumstances affect a community's agency and adaptive capacity to respond to disruption of coal decline (Matarrita-Cascante and Trejos, 2013; Vaneeckhaute et al., 2017).

Transition Theory

The field of transition studies builds on EEG concepts to examine the patterns and mechanisms driving large-scale, long-term, and non-linear social change and has been used across a diverse set of contexts, including global sustainable development (Loorbach, 2007), sociotechnical transitions of energy systems (Geels, 2006; Geels and Schot, 2007), and socio-environmental transitions in land use and agriculture (Wilson, 2012). This dissertation uses transition theory as a "theoretical framework that attempts to understand and unravel socioeconomic, political, cultural, and environmental complexities of societal transitions from one state of organizations to another" (Wilson, 2012, p. 53). This framework embraces the complexities of community transitions and seeks to untangle layering factors and processes shaping future trajectories. I apply core concepts from transition theory such as community pathways, path dependency, rupture, and transitional and policy corridors, to examine the factors and overlapping processes of change shaping coal community transitions.

Community pathways represent a sum of cumulative actions at individual and stakeholder group levels, influencing the direction and nature of community development (Wilson, 2014). According to Stark (1991), pathways are a process where memory, knowledge, and experience can be passed from generation to generation or actor to actor. Pathways are directional and bounded by endogenous and exogenous factors that shape a corridor of the possible, beyond which specific actions or options are unthinkable (Wilson, 2014). Pathways fluctuate over time, changing direction at key inflection points called decision nodes– points in time where decisions are made which redirect the trajectory of path development (Cumming et al., 2005; Wilson, 2014). Components that influence path dependency are often shaped by structural, economic, and socio-psychological lock-in effects at the community level. Changes in community pathways can also be characterized by transitional ruptures where the quality of resilience is abruptly changed (Wilson, 2014). While transitional ruptures represent major inflection points in a community's development trajectory, the outcomes are neither inherently negative nor positive but shaped by endogenous capacities and context (Wilson, 2012). How the rupture unfolds will affect the community's ability to implement resilient pathways in the short and long term.

Community pathways are embedded within transition corridors. Transition corridors are based on the assumptions that specific pathways of change over space and time are channeled into metaphorical corridors defined by decision-making boundaries beyond which path development is increasingly unlikely. Transition corridors are the sum of cumulative actions at macro-scalar levels and linked to exogenous socioeconomic, political, or environmental processes that constrain autonomous decision-making at the community level (Cumming et al.,

2006; Smit and Wandel, 2006; Wilson, 2012). Policy is one of the most important processes that defines macro-scalar transition corridors (Dryzek, 2005). By directly influencing and limiting community-level decision-making pathways, state and federal rules and regulations create policy corridors that shape transition direction, size, and speed (Martens and Rotmans, 2005; Wilson, 2013).

Previous research has employed a range of methods to examine the implications of macro-scalar policies on community resilience (Markantoni et al., 2018; Plummer et al., 2018; Ray, 2000; Sisto et al., 2018; Wilson, 2013). From these studies, shared elements can be gleaned and applied to increase understanding of the complex interactions between policy and emerging pathways in coal communities. Characterizing policy history and structural context is critical to understanding the corridors bounding coal communities. Doing so allows for a detailed analysis of alignment or misalignment between policy and community needs and capacities. Further, because there is no coordinated national policy framework addresses coal transition in the US, there is a need to characterize the suite of state- and regional-level policies addressing this issue and assess their impacts on community pathway development.

Research Questions

The interactions between federal, state, and local policy and social processes emerging from the communities themselves remain unknown and the future of the West's remote, isolated coal communities is unclear. Community resilience and transition theory conceptual frameworks allow for a targeted inquiry to disentangle the overlapping processes shaping the community transition landscape to better understand emerging pathways and their potential future implications. This dissertation research investigates factors and processes shaping the West's

coal transition by addressing the following research questions: RQ 1. What are the policy corridors directing or constraining coal communities transition pathways? RQ 2. How does the economic rupture of coal decline affect community resilience pathways in coal-dependent communities? RQ 3. What policy or planning approaches are needed to support rural coal-dependent communities improve resilience to industrial decline?

Methods

The factors shaping community pathways and transition corridors are complex, layered, and difficult to measure, lending this research to a multiphase research design and mixed methods data collection and qualitative analysis. This research was conducted in three phases, with each phase corresponding to a research question (see summary in Table 1 below). The first two phases each employ a core concept from community resilience and transition theory framework to investigate factors and processes shaping coal-dependent community's ability to respond to the shock of coal plant closure. The first phase conducts a comparative policy analysis of state transition policy across six western states to address RQ 1 and characterize the policy corridors that shape community transition pathways. The second phase focuses on RQ 2 and applies the concept of transitional rupture in an in-depth case study of the coal transition in Colstrip, Montana. Drawing fieldwork conducted in the previous two phases, review of impact assessment literature, and analysis of industrial siting and energy transition policy, phase three addresses RQ 3. This dissertation research used a range of data collection methods and activities suited to address the objectives associated with each research phase and research question.

Table 1. Summary of dissertation research phase and questions, objectives, methods, and activities

Research Question	Objectives	Methods and Activities
Phase 1. What are the policy corridors directing or constraining coal communities' transition pathways? *Results in Chapters 2 & 3*	Identify range of policies and programs available to transitioning coal communities in six Western states (AZ, CO, MT, NM, WA, WY) through document and policy analysis Characterize how, collectively, these policies and programs are directing or constraining the transition corridor within which these communities are embedded	Document, content, & policy analysis of state/federal policies addressing coal transition in six states Semi-structured interviews with expert stakeholders (n=25)
Phase 2. How does the economic rupture of coal decline affect community resilience pathways in coal-dependent communities? *Results in Chapter 4*	Assess the fiscal risk of closure to local government revenues in Colstrip and Rosebud County, Montana through fiscal data analysis Characterize how the transition's fiscal dimensions will affect the ability to provide services and maintain infrastructure	Conduct fiscal assessment using property tax data, annual financial reports, coal revenue data to assess share of revenue from coal in total budget Historical narrative and semi-structured interviews with key stakeholders including elected officials, community and economic development professionals, and service providers (n=25)
Phase 3. What policy or planning approaches are needed to support rural coal-dependent communities improve resilience to industrial decline? *Results in Chapter 5*	Review range of policies that address the process of industrial closure in six Western states (AZ, CO, MT, NM, WA, WY) Synthesize best practices and develop recommendations for policymakers and practitioners	Document, content & policy analysis of state policies that address social and fiscal impacts of closure in six states Review literatures on fiscal impact analysis, social impact assessment, and impact assessment for closure

Data Collection and Analysis

My engagement with coal-dependent communities began as a research assistant for Dr. Julia Haggerty on the National Science Foundation EPSCoR Track II project No. OIA-1632810, "Water Agriculture Food Energy Research Nexus." For a study examining the emerging local planning response to coal plant closures in the US West, we reviewed 12 planning documents written by and for local communities with respect to four criteria: how plans address lost tax revenue, identify economic development strategies that address environmental restoration, are appropriate to the local context, and demonstrate an acceptance of change. The quality of the plans was highly variable, ranging from 'addressing all four recommended strategies' to 'problematic or inaccurate.' The uneven quality of these plans raised questions about how such plans are developed, by whom, and what falls through the cracks in this uncoordinated and contradictory transition policy environment. The motivation to dig into the complex policy and community development factors shaping rural community resilience in industrial transitions directly stems from the challenges identified in this study. This project also introduced me to Colstrip, Montana–a remote, coal-dependent community in southeastern Montana which became the focus of Chapters 2 and 3.

In 2020, I was awarded a USDA NIFA Predoctoral Fellowship (Project #2020-67034-31718). This grant provided funding to support several weeks of fieldwork to develop three distinct case studies in rural coal-dependent communities in Montana, Colorado, and Washington. However, the risks and conditions posed by the COVID-19 pandemic required a reorganization of this dissertation and approach to data collection. I shifted my focus from a comparative case study approach to an in-depth case study in Colstrip, Montana. By spring 2020, I had already conducted extensive fieldwork in Colstrip and Rosebud County, Montana,

established research relationships, and there were ample opportunities to adapt and manage interviews to meet health and safety protocols. Despite the change in plans, this shift ultimately resulted in a rich and nuanced analysis of how industrial closures interact with policy and critical community resilience capacities in rural communities.

I used a mixed method approach to operationalize my dissertation's research questions. I collected data via interviews, participant observation, public records, and policy and planning documents between 2017 and 2022. My research activities included policy analysis, qualitative interviews, participant observations at public events and meetings, fiscal data analysis document analyses of community economic development plans, coal board meeting minutes, county and city plans and associated documents, newspaper articles, and socioeconomic data. The data collection and analysis approach used for each research article is covered in more detail in each chapter of this dissertation. However, in this section, I will briefly introduce my approach to policy analysis and qualitative data collection and analysis, as they are the dominant methods used in this dissertation.

Policy Analysis and Policy Corridors Attention to federal and state policy as an enabling or constraining factor to community resilience in rural, coal-dependent communities is a consistent element across my dissertation chapters. This approach understands policy as a set of formal rules and regulations primarily associated with the state, exogenous to communities, which set the parameters for community-level action and decision-making (Wilson and Bryant, 1997).

The policy analysis in phase one began with a desktop analysis of policy documents and other materials relating to transition policy and programs from the federal and state governments

included in this analysis. This analysis was oriented as if responding to a coal plant closure in a hypothetical community in each state. Chapter Two also uses backcasting of US federal energy policy to identify "the known historical shape of decision-making pathways" (Wilson, 2013, p. 301). To characterize the "policy corridor" this analysis sought to gain understanding of how past energy policy influenced the existing transition dynamics and characterize all available policy programs and resources available to a community experiencing transition. After relevant policies were identified, policies were organized by scale and state, and analyzed for type (environmental, economic development, workforce, etc.), intent (people-based or place-based), approach (financial, program, or technical assistance). To identify the directions encouraged by transition policy, this review was supported by qualitative interviews conducted with policy and planning experts that sought to cross-check the transition policy analysis and capture the state and direction of community transition planning as expressed by leaders in the region (Woods and Gardner, 2011).

Qualitative Interview Data Collection and Analysis This study is informed by qualitative data collected through semi-structured interviews. Data collection efforts were conducted between August 2017 and December 2021. My interview data collection activities included multiple interview types, including a series of exploratory interviews (n=15) and a focused set of primary interviews (n=45). I initiated qualitative data collection in 2017 with exploratory interviews (n=15) or unstructured conversations with individuals connected to the study topic. These interviews do not fall under the interview protocol approved by Montana State University's Institutional Review Board (IRB), and interviewees are not cited as research participants, nor are their experiences or perspectives included as data. However, these

interviews were important for developing a preliminary network of research participants and a deeper understanding of study context. Exploratory interviewees included economic development practitioners and topical experts identified through the proposal development this stage of this research and other contacts in rural sociology, resource and economic geography, and impact assessment I gained through networking activities. Discussions focused on the context of the coal transition, key issues related to economic decline in resource-dependent communities, and other ideas about contacts for future sampling. Importantly, several individuals who participated in exploratory interviews agreed to participate as primary interviewees in later data collection efforts. The primary interviews (n=45) were conducted in two distinct data collection phases corresponding to RQ 1 and 2. Interviews were conducted in-person, telephone, or virtually and employ a semi-structured format which follows an interview guide yet allows participants to prioritize and describe in detail the components and concerns that matter most to them and expand on their interests and expertise (Charmaz, 2006). Interview guides comprised a set of questions (Appendix A) which were reviewed and approved by the Montana State University Institutional Review Board (KR070621-EX and KR061919-EX).

Twenty semi-structured expert interviews were conducted in phase one to capture insights about the implications of the policy corridor for transitioning coal communities. Interviews were conducted between August 2019 and January 2020 and ranged from 40 to 70 minutes in length. Expert recruitment began with a reputational process where participants were contacted based on their positions in federal, regional, or state agencies or organizations implementing transition assistance programs; professional researchers specializing in energy, transition, and/or community development policy; or were practitioners from professional

meetings focused on the topic of coal transition (Frank and Hibbard, 2016). Interviewees were tied to organizations that represented national (5), regional (3), and state perspectives including Colorado (6), Montana (3), New Mexico (1), Washington (1), and Wyoming (1). Interviewees were asked to share their experiences with transitioning coal communities, policies and programs, and opportunities and challenges of transitions in the communities they work.

In phase two, I conducted 25 semi-structured interviews with key stakeholders to better understand how the fiscal dimensions of the coal transition will affect local service provision in Colstrip, Montana. Key informant interviews were conducted between August 2021 and December 2021 and ranged between 40 and 75 minutes in length. Interviewee recruitment used a purposeful sampling approach where individuals with expertise, insight, and experience are chosen intentionally because they could speak to key issues affecting transition in Colstrip, Montana (Patton, 1990). Interview participants included city, county, and state government officials (5), community and economic development professionals (4), expert stakeholders (3), and service providers in health care (2), education (3), public safety (3), and municipal water infrastructure (5).

Both sets of interviews were recorded and transcribed verbatim. This research adheres to Montana State University policy which requires all research conducted by faculty, students, and staff that involves human subjects to be approved by the Institutional Review Board (IRB) (Montana State University, n.d.). Participants were provided a Letter of Information (Appendix B) describing the study's goals. All participants were informed that their participation was strictly voluntary (Creswell, 2014). To ensure a participant's privacy, no names were used to transcribe from the audio recording or write up the case study. In addition to interviews, I

conducted participant observations and attended meetings and conferences on topics relevant to my research. These meetings ranged from local to regional, state, and national. A small sample of the meetings I attended include Colstrip Annual Energy Open, Building Resilient Economies in Coal Communities, Economic Development Association Annual Conference, Colstrip Community Impact Advisory Board Meetings, and the Western Region Economic Transition Platform Meeting. Further, this research benefited from regularly participating in national, regional, and international conversations centered on energy transitions with the Center for the New Energy Economy's Energy Transition Academy, Just and Equitable Transition bi-weekly calls, and the Hunter Valley Social Scientists.

Data analysis for this research involved an iterative, grounded theory approach comprised of multiple rounds of qualitative coding. Grounded theory is a data analysis methodology that develops theories and hypothesis through inductive reasoning (Glaser, 1978). Grounded theory approaches involve an iterative process of data collection and analysis and typically involve multiple rounds of coding (Holton, 2007). After an initial phase of data collection, analysis proceeded iteratively with a process of open coding in which textual data is 'opened up' and broken down, segment by segment, and assigned labels to denote relevant phenomenon (Corbin and Holt 2005; Clarke 2007). Findings during this phase informed future sampling and were used to adjust the interview guide. Next, relevant documents and interview transcripts were coded using a conceptual coding strategy which condensed open codes into broader categories (Holton, 2007). For example, the conceptual category of "pressures that affect public service provision" emerged as a core category in the case study of Colstrip, Montana in phase two. Once this category was identified, a round of selective coding was conducted, where data was ready

and re-coded considering this category. Data collection and analysis was determined complete once theoretical saturation had been reached.

Dissertation Overview

This dissertation explores how policy factors interact with local context to influence community resilience pathways in transitioning coal-dependent communities in the US West. Four different manuscripts comprise the body of this dissertation; these include two published peer-reviewed manuscripts (Chapter Two and Chapter Four), a case study report (Chapter Three), and a white paper (Chapter Five). Chapter Two employs the concept of policy corridors, using policy and document analysis and in-depth interviews with policy experts and practitioners to examine how federal and state policies enable or constrain transition planning in rural, coal communities in the US West. Chapter Three is a report co-authored with Resources for the Future and Environmental Defense Fund for a project that examines public policies and programs to promote fairness for workers and communities in transition to a low-greenhouse gas emissions economy. This report provides a case study of the social, economic, and environmental issues that characterize the coal community transition in Colstrip, Montana, as well as the implementation of federal assistance and state intervention efforts to date. Chapter Four applies the concept of transitional rupture to a case study of the fiscal impacts of the coal transition in Colstrip, Montana. This study observes the historical decision nodes leading to present-day economic dependence. It characterizes the resulting fiscal impact of the coal industry decline and the decision-making environment regarding public services and infrastructure. Chapter Five is a white paper for policymakers and practitioners which argues for applying social impact assessment (SIA) as a planning tool for local governments facing transition. It

recommends best practices in leveraging SIA for coal-dependent communities navigating closure. A conclusion offers synthetic findings from the four separate manuscripts and suggests future research directions. A complete reference list follows the conclusion and appendices of interview guides and letters of information complete the dissertation.

References Cited in Chapter One

Adger, W.N., 2000. Social and ecological resilience: Are they related? Prog. Hum. Geogr. 24, 347–364. https://doi.org/10.1191/030913200701540465

Argent, N., 2017. Trap or Opportunity? Natural resource dependence, scale, and the evolution of new economies in the space/time of New South Wales' northern tablelands, in: Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routledge, New York, pp. 18–50. https://doi.org/10.4324/9781315660110

Bazilian, M.D., Carley, S., Konisky, D., Zerriffi, H., Pai, S., Handler, B., 2021. Expanding the scope of just transitions: Towards localized solutions and community-level dynamics. Energy Res. Soc. Sci. 80, 102245. https://doi.org/https://doi.org/10.1016/j.erss.2021.102245

Berkes, F., 2009. Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. J. Environ. Manage. 90, 1692–1702.

Berkes, F., Ross, H., 2013. Community Resilience: Toward an Integrated Approach. Soc. Nat. Resour. 26, 5–20. https://doi.org/10.1080/08941920.2012.736605

Besser, T.L., Recker, N., Agnitsch, K., 2008. The Impact of Economic Shocks on Quality of Life and Social Capital in Small Towns. Rural Sociol. 73, 580–604. https://doi.org/10.1526/003601108786471530

Bickman, L., Rog, D.J., 2009. Applied Research Design. A Practical Approach, in: SAGE Handbook of Applied Social Research Methods. pp. 3–43. https://doi.org/10.4135/9781483348858.n1

Boschma, R., Martin, R., 2010. The handbook of evolutionary economic geography. Edward Elgar, Cheltenham.

Carley, S., Konisky, D.M., 2020. The justice and equity implications of the clean energy transition. Nat. Energy 2020 58 5, 569–577. https://doi.org/10.1038/s41560-020-0641-6

Charmaz, K., 2006. Constructing grounded theory: A practical guide through qualitative analysis. Sage.

Clarke, A. 2007. Grounded theory: Critiques, debates and situational analysis. In The SAGE Handbook of Social Science Methodology. (eds. Outhwaite, W. and Turner, S.P.). London, UK: SAGE Publications Ltd.

Corbin, J. and N. L. Holt. 2005. Grounded theory. In Research Methods in the Social Sciences. (eds. Somekh, B. and Lewin, C.). London, UK: SAGE Publications Ltd.

Creswell, J.W., 2014. Research design: qualitative, quantitative, and mixed methods approach.

Cumming, G., Barnes, G., Perz, S., Schmink, M., Sieving, K., Southworth, J., Binford, M., Holt, R., Stickler, C., Holt, T., 2005. An Exploratory Framework for the Empirical Measurement of Resilience. Ecosystems 8, 975–987.

Cumming, G.S., Cumming, D.H.M., Redman, C.L., 2006. Scale mismatches in social-ecological systems: Causes, consequences, and solutions. Ecol. Soc. 11. https://doi.org/10.5751/ES-01569-110114

Davenport, C., Friedman, L., Tankersley, J., 2021. Biden's Bet on a Climate Transition Carries Big Risks. New York Times.

Davidson, D.J., 2010. The Applicability of the Concept of Resilience to Social Systems: Some Sources of Optimism and Nagging Doubts. Soc. Nat. Resour. 23, 1135–1149.

Dryzek, J., 2005. The politics of the Earth: Environmental discourses (2nd ed.). Oxford: Oxford University Press. Hum. Ecol. Rev. 5, 65. https://doi.org/10.1177/107049659800700312

Feaster, S., Cates, K., 2019. Powder River Basin Coal Industry Is in Long-Term Decline Fast-Changing Markets Indicate Deeper Downturns to Come in Montana and Wyoming.

Freudenburg, W.R., 1992. Addictive Economies: Extractive Industries and Vulnerable Localities in a Changing World Economy. Rural Sociol. 57, 305–332. https://doi.org/10.1111/j.1549-0831.1992.tb00467.x

Gallagher, D., Glasmeier, A., 2020. Just Institutions for Deep Decarbonization? Essential Lessons from 20th Century Regional Economic and Industrial Transitions in the U.S., The Roosevelt Project Special Series. Boston.

Geels, F.W., 2006. Technological Transitions and System Innovations, A Co-Evolutionary and Socio-Technical Analysis, Edward Elgar Publishing Limited. https://doi.org/10.1016/j.techfore.2006.05.008

Geels, F.W., Schot, J., 2007. Typology of sociotechnical transition pathways. Res. Policy 36, 399–417. https://doi.org/10.1016/J.RESPOL.2007.01.003

Gilmore, J.S., 1976. Boom towns may hinder energy resource development. Science 191.

Glaser, B. G. 1978. Theoretical Sensitivity. Mill Valley, CA: Sociology Press.

Graff, M., Carley, S., Konisky, D.M., 2018. Stakeholder perceptions of the United States energy transition: Local-level dynamics and community responses to national politics and policy. Energy Res. Soc. Sci. https://doi.org/10.1016/j.erss.2018.05.017

Haggerty, J.H., Bills Walsh, K., Rose, J., 2017. The Status of Key Policies and Decision Processes.

Haggerty, J.H., Haggerty, M., Roemer, K.F., Rose, J., 2018. Planning for the local impacts of coal facility closure: Emerging strategies in the U.S. West. Resour. Policy. https://doi.org/10.1016/j.resourpol.2018.01.010

Haggerty, M., 2020. Fiscal Policy is Failing Rural America. Bozeman, Montana.

Halseth, G., 2017. Political Economy Perspectives on the Transformation of Resource Towns and Peripheries. Routledge, New York.

Harrison, J.L., Montgomery, C.A., Bliss, J.C., 2016. Beyond the monolith: the role of bonding, bridging, and linking social capital in the cycle of adaptive capacity. Soc. Nat. Resour. 29, 525–539.

Haynes, K.E., Xie, Q., Ding, L., 2004. Political geography, public policy, and the rise of policy analysis, in: Bailly, A., Gibson, L.J. (Eds.), Applied Geography A World Perspective, GeoJournal Library, 77. Springer Netherlands, Dordrecht, pp. 69–93.

Hayter, R., 2017. Geography and History Matter, in: Halseth, G. (Ed.), Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routledge, New York.

Hayter, R., Barnes, T., 1990. Innis' Staple Theory, Exports, and Recession: British Columbia, 1981-86. Econ. Geogr. 66, 156. https://doi.org/10.2307/143744

Hayter, R., Patchel, J., 2015. Resource Geography, in: J.D. Wright (Ed.), International Encyclopedia of the Social & Behavioral Sciences. Elsevier Science & Technology, Oxford.

Holling, C.S., 1996. Engineering Resilience versus Ecological Resilience, in: Engineering Within Ecological Constraints. pp. 31–44. https://doi.org/10.17226/4919

Holling, C.S., 1973. Resilience and Stability of Ecological Systems. Annu. Rev. Ecol. Syst. 4, 1–23. https://doi.org/10.1146/annurev.es.04.110173.000245

Holton, J. A. 2007. The coding process and its challenges. In The SAGE Handbook of Grounded Theory. (eds. Bryant, A. and Charmaz, K.). London, UK: SAGE Publications Ltd.

Hudson, R., 2010. Resilient regions in an uncertain world: wishful thinking or a practical reality? Cambridge J. Reg. Econ. Soc. 3, 11–25.

Innis, H.A., 1929. The Teaching of Economic History in Canada. Contrib. to Can. Econ. 2, 52. https://doi.org/10.2307/136518

Joskow, P.L., 2000. Deregulation and Regulatory Reform in the U.S. Electric Power Sector by DEREGULATION AND REGULATORY REFORM IN THE U.S. ELECTRIC POWER SECTOR. MIT Center for Energy and Environmental Policy Research.

Kulig, J.C., Edge, D.S., Townshend, I., Lightfoot, N., Reimer, W., 2013. Community resiliency: Emerging theoretical insights. J. Community Psychol. 41, 758–775. https://doi.org/10.1002/jcop.21569

Kulig, J., Botey, A., 2016. Facing a wildfire: What did we learn about individual and community resilience? Nat. Hazards 82, 1919–1929.

Loorbach, D., 2007. Transition management: new mode of governance for sustainable development.

Magis, K., 2010. Community Resilience: An Indicator of Social Sustainability. Soc. Nat. Resour. 23, 401–416. https://doi.org/10.1080/08941920903305674

Markantoni, M., Steiner, A., Meador, J.E., Farmer, J., 2018. Do community empowerment and enabling state policies work in practice? Insights from a community development intervention in rural Scotland. Geoforum 97, 142–154. https://doi.org/10.1016/J.GEOFORUM.2018.10.022

Markey, S., Halseth, G., 2017. Rural Restructuring: Conclusion, in: Halseth, G. (Ed.), Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routeledge.

Markey, S., Halseth, G., Manson, D., 2012. Investing in place: Economic renewal in northern British Columbia. UBC Press.

Martens, P., Rotmans, J., 2005. Transitions in a globalising world. Futures 37, 1133–1144. https://doi.org/10.1016/j.futures.2005.02.010

Matarrita-Cascante, D., Trejos, B., 2013. Community resilience in resource-dependent communities: a comparative case study. Environ. Plan. A 45, 1387–1402. https://doi.org/10.1068/a45361

Montana State University, n.d. Institutional Review Board - Office of Research Compliance | Montana State University [WWW Document]. 2019. URL http://www.montana.edu/orc/irb/index.html (accessed 2.16.19).

National Academies of Sciences Engineering and Medicine (NASEM), 2021. Accelerating Decarbonization of the U.S. Energy System. Washington, D.C.

Norris, F.H., Stevens, S.P., Pfefferbaum, B., Wyche, K.F., Pfefferbaum, R.L., 2008. Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. Am. J. Community Psychol. 41, 127–150.

Pai, S., Zerriffi, H., Jewell, J., Pathak, J., 2020. Solar has greater techno-economic resource suitability than wind for replacing coal mining jobs. Environ. Res. Lett. 15, 034065. https://doi.org/10.1088/1748-9326/ab6c6d

Patton, M., 1990. Qualitative Evaluation and Research Methods. Qual. Eval. Res. Methods 169–186. https://doi.org/10.1002/nur.4770140111

Plummer, P., Tonts, M., Argent, N., 2018. Sustainable rural economies, evolutionary dynamics and regional policy. Appl. Geogr. 90, 308–320. https://doi.org/10.1016/J.APGEOG.2017.01.005

Raimi, D., 2017. Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

Raimi, D., Carley, S., Konisky, D., 2022. Mapping county-level vulnerability to the energy transition in US fossil fuel communities. Sci. Rep. 12, 15748. https://doi.org/10.1038/s41598-022-19927-6

Ramage, J., Everette, B., 2012. Coal, in: Everett, B., Boyle, G., Peake, S., Ramage, J. (Eds.), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford, pp. 141–178.

Rasker, R., Gude, P.H., Gude, J.A., van den Noort, J., 2009. The economic importance of air travel in high-amenity rural areas. J. Rural Stud. 25, 343–353. https://doi.org/10.1016/j.jrurstud.2009.03.004

Ray, C., 2000. Editorial. The eu leader Programme: Rural Development Laboratory. Sociol. Ruralis 40, 163–171.

Reimer, B., 2002. Understanding and measuring social capital and social cohesion. New Rural Econ. 23.

Rossiter, D.A., Rossiter, 2010. Resource Geography, in: Encyclopedia of Geography. Sage Publications, Thousand Oaks.

Salt, D., Walker, B., Reid, W., 2006. Resilience Thinking. Island Press.

Scott, M., 2013. Resilience: A Conceptual Lens for Rural Studies? Geogr. Compass 7, 597–610.

Sisto, R., Lopolito, A., van Vliet, M., 2018. Stakeholder participation in planning rural development strategies: Using backcasting to support Local Action Groups in complying with CLLD requirements. Land use policy 70, 442–450. https://doi.org/10.1016/J.LANDUSEPOL.2017.11.022

Smit, B., Wandel, J., 2006. Adaptation, adaptive capacity and vulnerability. Glob. Environ. Chang. 16, 282–292. https://doi.org/10.1016/J.GLOENVCHA.2006.03.008

Sovacool, B.K., Dworkin, M.H., 2015. Energy justice: Conceptual insights and practical applications. Appl. Energy 142, 435–444. https://doi.org/https://doi.org/10.1016/j.apenergy.2015.01.002

Stark, D., 1991. Path Dependence and Privatization Strategies in East Central Europe. East Eur. Polit. Soc. Cult. 6, 17–54. https://doi.org/10.1177/0888325492006001003

U.S. Bureau of Reclamation, 1971. North Central Power Study: Report of Phase I.

U.S. EIA, 2022. Table 6.6 Planned U.S. Electric Generating Unit Retirements [WWW Document]. Electr. Power Mon.

U.S. EIA, 2021. Of the operating U.S. coal-fired power plants, 28% plant to retire by 2035 [WWW Document]. URL https://www.eia.gov/todayinenergy/detail.php?id=50658

Vaneeckhaute, L.E., Vanwing, T., Jacquet, W., Abelshausen, B., Meurs, P., 2017. Community resilience 2.0: Toward a comprehensive conception of community-level resilience. Community Dev. 48, 735–751.

Walker, R.A., 2001. California's Golden Road to Riches: Natural Resources and Regional Capitalism, 1848 – 1940. Ann. Assoc. Am. Geogr. 91, 167–199. https://doi.org/10.1111/0004-5608.00238

Wallerstein, I.M., 2004. World-systems analysis: An introduction. Duke University Press.

Werner, E., Smith, R., 1982. Vulnerable but invincible: A longitudinal study of resilient children and youth. McGraw Hill, New York.

White, R., 1991. "It's Your Misfortune and None of My Own": A New History of the American West. University of Oklahoma Press, Norman.

Wilson, G.A., 2014. Community resilience: Path dependency, lock-in effects and transitional ruptures. J. Environ. Plan. Manag. 57, 1–26. https://doi.org/10.1080/09640568.2012.741519

Wilson, Geoff A, 2013. Community Resilience, Transitional Corridors and Macro-Scalar Lock-in Effects. https://doi.org/10.1002/eet.1620

Wilson, Geoff A., 2013. Community resilience, policy corridors and the policy challenge. Land use policy 31, 298–310. https://doi.org/10.1016/j.landusepol.2012.07.011

Wilson, G.A., 2012. Community resilience and environmental transitions, Community Resilience and Environmental Transitions. https://doi.org/10.4324/9780203144916

Wilson, G.A., Bryant, R.., 1997. Environmental Management: New Directions for the 21st Century. UCL Press, London.

Woods, M., Gardner, G., 2011. Applied policy research and critical human geography: Some reflections on swimming in murky waters. Dialogues Hum. Geogr. 1, 198–214.

CHAPTER TWO

COAL COMMUNITIES AND THE U.S. ENERGY TRANSITION: A POLICY CORRIDOR ASSESSMENT

Contribution of Authors and Co-Authors

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Contributions: Conceived and designed the analysis; Collected the data; Contributed data or analysis tools; Performed the analysis; Wrote the paper.

Co-Author: Julia H. Haggerty

Contributions: Supervised the project, offering feedback on the research's development and findings. She also edited the manuscript.

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Introduction

The United States is undergoing a major energy system transition characterized by widespread retirement of its aging coal-fired power plants, reduced use of operating coal plants, and decline in thermal coal exports. The coal transition is driven by market forces such as increased competition from natural gas and renewable sources, as well as an overall stagnant demand for electricity (EIA, 2019). In early 2020, the effects of the COVID-19 global pandemic compounded declines in coal electricity generation and production and led to speculation of accelerated closure timelines of U.S. coal facilities (EIA, 2020a). For coal-dependent communities, states, and regions, the energy transition brings a set of social and economic, and environmental impacts that vary greatly by geography (Carley et al., 2018a, 2018b). In the American West, remote and rural communities are particularly vulnerable to the social and economic impacts of the coal transition (Haggerty et al., 2018).

Federal and state policies shape the direction and pace of transitions and have long-term implications for community resilience (Markantoni et al., 2018; Martens and Rotmans, 2005; Ray, 2000; Wilson, 2013). To meet global climate objectives, several developed economies have implemented coal phase-out initiatives (Sartor, 2018). In contrast, the United States does not have a national set of policies designed to facilitate the energy transition (Graff et al., 2018). Rather, policymaking in the U.S. is highly decentralized with individual states introducing their own sets of policies on energy production, consumption, as well as mitigating the socio-economic implications of transition. Thus, the current policy landscape addressing the community-level impacts of the coal transition is complex and disjointed, presenting a need for a

critical assessment of existing policies and how they align (or misalign) with the needs of impacted communities.

This paper responds to the call for increased understanding of interactions between macro-scalar policy and community experiences with transitions (Markantoni et al., 2018; Sisto et al., 2018; Wilson, 2013) by reviewing federal and state policies that address the socio-economic impacts of the coal transition in rural communities in the western United States. The dynamics of the coal transition in the U.S. West are strongly influenced by and specific to the physical and political geographies of the region's energy system (Haggerty et al., 2018). This paper uses Geoff Wilson's concept of policy corridors to examine how exogenous forces, such as policy, influence options for isolated communities as they navigate the multifaceted coal transition provides an opportunity to increase insight and understanding of how macro-scalar policies shape the direction and pace of complex community transitions in resource regions (Wilson, 2012; 2013). Through a review of national and state policies, supported by in-depth interviews with policy experts and practitioners, this research characterizes and compares the emerging policy corridors between U.S. states and examines how they may enable or constrain resilient community pathways. This study focuses on three sets of policies: U.S. federal energy policy, state-level transition policies, and federal transition assistance programs, and their implications for the policy corridors emerging in states in the U.S. West.

This paper begins by situating coal community transitions within the community resilience and transition theoretical framework, and the broader geographic scholarship examining socio-economic transitions in resource peripheries. The next section describes our study region, methods, and analytical approach. Then we describe the findings from the multi-

scalar policy review and expert interviews. The conclusion discusses recommendations for policy and future research.

Literature Review: Transitions, Community Resilience, and Policy Corridors

Between 2010 and 2019, U.S. power companies have retired or announced the retirement of more than 546 coal-fired power units, totaling about 102 GW of generating capacity, with another 17 GW of capacity planned for retirement by 2025 (EIA, 2019). Socio-economic vulnerability to declining coal power and mining sectors varies across the United States but in the American West vulnerability is associated with remote, isolated geographies (Haggerty et al., 2018). The dynamics of the West's coal transitions are strongly influenced by the physical and political geographies of the region's energy system. The region's energy infrastructure is typical of the coal-by-wire model, where large mine-mouth facilities located in remote interior regions export electricity long distances over high-voltage transmission lines to meet the needs of urban centers in other states (Ramage and Everett, 2012). For the last 50 years, the West's coal resource and electricity-producing regions have operated as resource peripheries. Resource peripheries are vulnerable to the changing prices and demands of urban cores and gain competitive advantages through large scale and low-cost production (Freudenburg, 1992; Hayter and Barnes, 1990; Wallerstein, 2004).

The West's rural, isolated communities are significantly more vulnerable to revenue and employment loss following a coal plant or mine closure than their metropolitan counterparts. Currently, the planning processes for local impacts of the coal transition vary substantially (Haggerty et al., 2018). For many years, coal production and electricity generation have

generated taxes, royalties, and fees to states and communities where they are located, providing stable and substantial revenue (Godby et al., 2015). In the West's coal producing regions, state and local government funding has evolved to depend heavily on the coal industry (Haggerty, 2019). As a result, energy transitions at the national level encompass a social, economic, and fiscal transition that put local livelihoods, identities, and public services at risk.

Resource-dependent communities are shaped by historical and interconnected global-local dynamics that are constantly evolving (Halseth, 2017). Scholars employ a range of concepts and theoretical frameworks to investigate the multifaceted processes shaping transitions in resource regions, including historical approaches (Ryser et al., 2019), political economy perspectives (Connelly and Nel, 2017), and evolutionary economic geography (Argent, 2017). Specific to energy system transitions, scholars tend to focus most heavily on the technical, economic, and political factors shaping the adoption of new energy technologies at macro-scales (Markard et al., 2012; Smil, 2010; Stokes and Breetz, 2018). Recent energy transition research engages in geographically sensitive questions in resource peripheries (Murphy and Smith, 2013), spatial assessments of vulnerability to impacts of 'low-carbon' energy transitions (Carley et al., 2018a; Harrahill and Douglas, 2019; Snyder, 2018), and community-level effects of energy transitions (Carley et al., 2018b; Graff et al., 2018; Haggerty et al., 2018). Building on these threads of scholarship, this study focuses on how policy and other external forces influence the options for isolated communities as they navigate the transition initiated by coal-plant and mine closures. This study applies concepts from Wilson's (2012) community resilience and transition theory framework to understand the circumstances shaping community transitions.

The concept of community resilience resonates in an age of widespread economic and environmental uncertainty and political-economic contexts characterized by devolved governance. A community's resilience is often understood as the capacity of its social system to mobilize its resources and work together in response to a shock (Berkes and Ross, 2013). Key features of community resilience include strong social capital with cross-scale linkages between stakeholders and organizations (Besser and Miller, 2013; Harrison et al., 2016), the ability of the community to learn, self-organize, and problem solve (Berkes and Ross, 2013), inclusive and collective governance systems (Kulig et al., 2013; Norris et al., 2008), and strong institutions that are willing to partner and experiment (Anderies et al., 2004). These factors and processes of agency and self-organizing shape a community's adaptive capacity – the capacity of actors in a system to influence community resilience (Berkes and Ross, 2013; Folke et al., 2005). To understand how community resilience and vulnerability change over time, this research links community resilience with complementary concepts from transition theory.

Transition theory examines the patterns and mechanisms driving large-scale, long-term, and non-linear social change. Transition theory seeks to "unravel socioeconomic, political, cultural, and environmental complexities of societal transitions from one state of organizations to another" (Wilson, 2012: 53), and has been applied in diverse contexts such as global sustainable development (Loorbach, 2007), policy change (Loorbach and Rotmans, 2010), socio-technical transitions of energy systems (Geels, 2006; Geels and Schot, 2007; Martens and Rotmans, 2005), and socio-environmental transitions in land use and agriculture (Wilson, 2012). Empirical research in transition studies often focuses on the technical aspects of changes in energy, agriculture, or sustainable development (Geels and Schot, 2007; Martens and Rotmans, 2005;

Wilson, 2010). However, scholarship focusing on the social aspects of transitions remains largely theoretical (Wilson, 2015, 2013, 2012).

As a means to embrace the complexities of community transitions and to untangle interwoven factors and processes shaping future trajectories, this study applies concepts from transition theory to investigate coal community transitions including community pathways, transition corridors, transitional ruptures, and policy corridors. The community pathways concept focuses on the cumulative actions at individual and stakeholder group levels and how they change over time. Transition corridors assume that community pathways of change are channeled into specific corridors defined by decision-making boundaries beyond which decisions are increasingly unlikely. This concept describes the exogenous factors such as macro-level socio-economic, political, and environmental processes, upon which communities have little influence but severely constrain decision-making and action at the community level (Wilson, 2012). While community pathways are usually characterized by slow and gradual change over time, the concept of transitional ruptures, usually associated with sudden changes at the macro-level such as a sudden shift in markets or policy change, suggests that community resilience can change rapidly from one moment to another (Wilson, 2014). According to transition theory, community-level responses to macro-scalar ruptures usually occur within clearly specified corridors of decision-making that define the majority of possible decision-making pathways. After a transitional rupture, multiple community pathways may emerge. After an initial decline in resilience, communities can implement more resilient pathways in the long-term (Wilson, 2012). However, ruptures can also lead to a long-term decline in resilience - where the relative loss of economic, social, and environmental capital results in a lower adaptive capacity. Wilson

and others argue that policy acts as one of the most important factors shaping transition corridors and community response to rupture (Dryzek, 2005; Jordan, 2005; Wilson, 2013).

Wilson's (2013) concept of policy corridors describes the policies exogenous to communities that set the parameters for community action – policies here are understood as the set of formal rules and regulations largely associated with the state (Martens and Rotmans, 2005; Wilson and Bryant, 1997). These policies affect every community within a nation-state either directly, by guiding human action at the community level, or indirectly, by affecting actions of stakeholders and actors at regional or national levels which, in turn, influences local decision-making (Dryzek, 2005; Winter, 1990). The role of policy and other institutional interventions is particularly important in defining, shaping and, at times, distorting, the direction and pace of transitional corridors (Wilson, 2012). Corridors do not emerge in a vacuum but are shaped by previous policies, government and societal ideologies. Wilson (2013) argues that policy is a particularly potent mechanism for raising resilience, especially as policy corridors can influence and shape community transitional pathways. Communities may be more or less prepared to address loss of resilience because adaptive capacity varies based on the severity of propelling forces and the strength of communities' existing assets. As noted earlier, community resilience can often be harnessed through endogenous forces emanating from the community itself (Pretty, 1995). However, there are substantial limits as to how the local level can shape and influence resilience trajectories. This suggests that policies outside of the community may be crucial to helping raise resilience (Wilson, 2007).

Accelerated closures of aging coal plants, increased market competition with natural gas and renewables, and uncertainty regarding future climate change regulation are driving a macro-

scalar transitional rupture that will have acute impacts on coal-reliant communities, especially those in remote, isolated communities reliant on employment and revenue. According to transition theory, it is possible for a community facing a rupture to emerge with more resilient post-rupture pathways in the long-term, despite experiencing an initial decline in resilience. In reality, transitional ruptures often lead to loss of economic, social, and environmental capital resulting in long-term decline. Such ruptures are often linked to exogenous forces outside of the community such as environmental disasters such as tsunamis (Rigg et al., 2005), earthquakes (Imperial and Vanclay, 2016), or wildfires (Kulig and Botey, 2016). Community-level responses to ruptures are shaped by transition corridors, and the role of policy is particularly important in defining and shaping the direction and pace of transitional corridors (Wilson, 2012). Therefore, it is essential to examine how the complex and disjointed policy landscape in which the coal transition is taking place enables or constrains resilient community pathways.

Methods

This study uses a mixed methods approach to investigate community transitions, by incorporating policy and document analysis with semi-structured expert interviews to ask the following questions: How has U.S. energy policy changed over time to shape dynamics of coal community transitions? What policies and programs exist at the federal and state level to address socio-economic impacts of the coal transition? How do state approaches vary and what are the implications for the transition corridor? Finally, how are these policies and programs aligned with the needs of transitioning resource-dependent communities in remote regions?

Constructing the Corridor

To establish the existing policy corridor(s) this study examines three sets of national and state-level policies that affect the coal transition including U.S. energy policy, state legislation addressing the decline of the coal industry, and transition assistance programs. Data collected to inform the policy review include legislative and policy documents, law and policy reviews, Congressional Research Service reports, government documents, and news articles. These materials seek to provide: 1) an understanding of the evolution of U.S. energy policy, particularly as it relates to coal resource and electricity infrastructure development, beginning with the enactment of the first comprehensive federal energy legislation in 1975; 2) a characterization of the range of legislation addressing coal industry decline in six western states[2]; 3) an evaluation of the existing transition assistance programs available to address economic and labor dislocations caused by the effects of the decline in the coal industry.

Twenty semi-structured interviews with transition policy experts, economic development practitioners, and community planners were conducted to capture expert insights about the implications of the policy corridor for transitioning coal communities. Expert interviews provide specialist professional and technical knowledge, knowledge of organizational procedures and processes, and interpretive and background knowledge of their particular field (Littig, 2011).

Recruitment for expert interviews began with a reputational process where participants were contacted based on their positions in federal, regional, or state agencies or organizations

[2] States included in policy analysis are in the U.S. West and have passed legislation addressing aspects of coal industry decline, and include Arizona, Colorado, Montana, New Mexico, Washington, and Wyoming.

implementing transition assistance programs; professional researchers specializing in energy, transition, and/or community development policy; representatives from labor and administrators of workforce service programs; or were practitioners from professional meetings focused on the topic of coal transition (Frank and Hibbard, 2016). Using a snowball sampling approach to identify a network of experts, participant recruitment continued based on recommendations of interviewees until saturation was met (Bickman and Rog, 2009). Interviewees were asked to share their experiences with transitioning coal communities, policies and programs, and opportunities and challenges of transitions in the communities they work. The open ended, semi-structured format follows a general protocol yet allows participants to prioritize and describe in detail the components and concerns that matter most to them and expand on their interest and expertise (Charmaz, 2006). Interviews were conducted between August 2019 and January 2020 and were recorded, transcribed, and ranged from 40 to 70 minutes in length. Transcripts were coded using an iterative and systematic process of analysis using both *a priori* codes informed by the conceptual framework and inductive coding (Miles and Huberman, 1994).

Assessing the Policy Corridor

This analysis characterizes how policy corridors direct or constrain the community transition corridor(s) and is organized as follows: First, because this analysis is positioned to examine the *exogenous* factors, specifically policy, shaping transition in each state. The purpose is to gain a comprehensive understanding of all available transition policy programs and resources available to a community experiencing transitions. Applying Wilson's (2013) logic, the coal transition corridors are linked to previous energy policies and historical events that have important repercussions for local community resilience and vulnerability. Therefore, this paper

examines how past U.S. energy policy and processes of making policy influence the existing conditions and dynamics of coal community transitions. Another key aspect of the policy corridor heuristic is the idea that state-led policies and interventions play an important role in shaping the *pace* and *direction* of community transitions (Wilson, 2013, 2012). Thus, this analysis asks how state policy shapes the direction and the pace of the coal transition. Finally, effective rural and regional development interventions should be aligned with the needs of particular communities and appropriate to the economic geography (Haggerty et al., 2018; Ray, 2000; Whitener, 2005). For remote, isolated coal communities, research has stressed the importance of proactive planning before the decline, support in mitigating fiscal impacts, and long-term financial and technical assistance in supporting capacity and ability to self-organize and exercise agency (Bainton and Holcombe, 2018; Berkes and Ross, 2013; Everingham et al., 2013; Haggerty et al., 2018).

Findings and Discussion

Policy Corridors Emerging in the U.S. Coal Transition

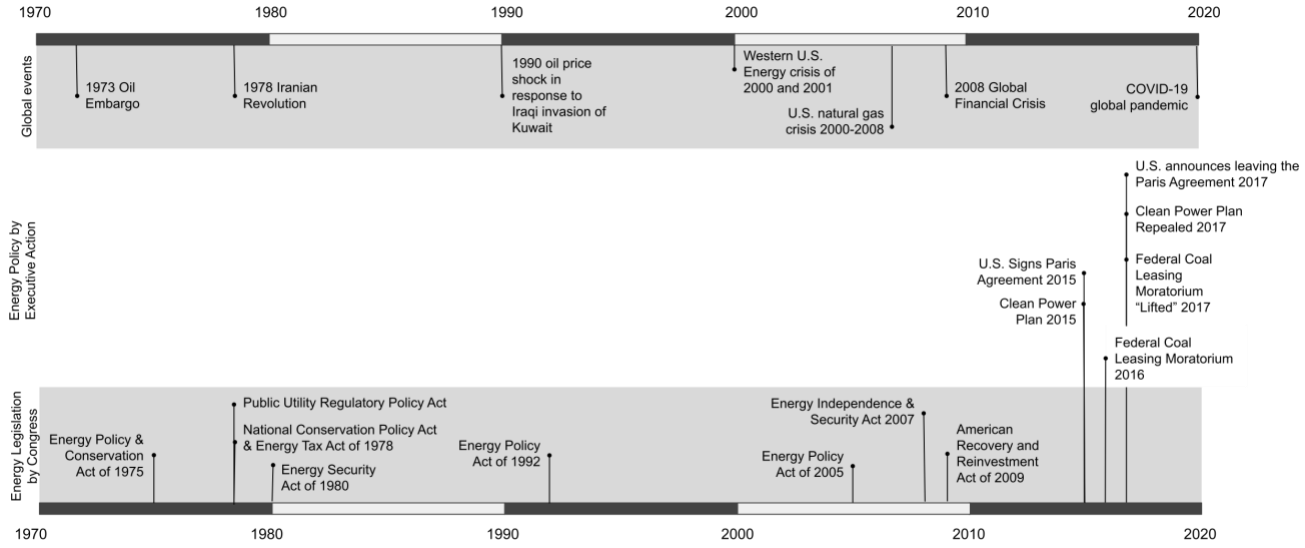
Federal Policy Corridors Federal efforts to develop the West's coal resources in the 1970s and 1980s were driven by national concerns about fuel scarcity and energy independence and the Clean Air Act's restrictions on sulfur dioxide emissions (Robertson, 1979). Congress passed the United States' first comprehensive and systematic federal energy policy with the Energy Policy and Conservation Act of 1975 (EPCA). By guaranteeing loans for coal mine development, the EPCA encouraged the rapid development of centralized, coal-based electricity infrastructure consisting of new strip mines, railroads, mine-mouth power plants, and transmission lines, exporting electricity from the remote, isolated communities to urban centers

in other states (n.a.,1976). The geographic market for Western coal exports was expanded with rail freight deregulation initiated by the Staggers Rail Act of 1980. Substantial declines in the mine-mouth price of coal, railroad freight rates, and rail transportation costs led to increased utilization of Powder River Basin coal in power plants across the United States (Gerking and Hamilton, 2008). Early federal policy established the West's coal electricity generation and producing regions as a resource periphery in relation to outside markets (Wallerstein, 2004).

In 1992, the Energy Policy Act removed barriers to private market competition within the wholesale generation of electricity – opening the door for states to deregulate their electricity markets (Joskow, 2000). Several western states deregulated their electricity markets, shifting ownership and regulatory responsibility from the states to market and private actors. While some 're-regulation' has occurred, the legacy of deregulation is evident in the complex ownership regimes of individual plants – in which the ownership portfolio varies in individual generating units as well as across plant assets (Haggerty et al., 2018). For example, Montana's Colstrip Generation Station consists of four generating units owned by six individual entities of varying types including independent power producers and investor-owned utilities (Haggerty et al., 2017). Different types of owners are guided by different incentives affecting decision-making about end-of-life processes. This set of facility stakeholders spans several states, including those that have recently enacted laws to end the use of coal power (Oregon and Washington). Over the years, individual owners have set and reset their exit timelines for earlier dates (Lutey, 2019a). In 2019, Talen Energy announced the early closure of Units 1 and 2, previously scheduled in 2022, a decision that surprised Colstrip city officials (Lutey, 2019b). Past energy policy enables

complex ownership regimes that exacerbate uncertainty and undermines the ability to plan for closures.

Figure 2. Timeline of U.S. Federal Energy Policy 1970-2020.



Since 2015, enactment of U.S. Federal energy policy has shifted from legislative to executive action. Generally, energy policy has been legislated in large, complex bills, occurring every five to ten years and often driven by global energy or financial crises (see timeline in Figure 2). The Energy Policy Act of 2005 is the most recent comprehensive general legislation, with provisions and authorizations in almost all areas of energy policy (Morehouse, 2020; Yacobucci, 2016). More recent bills have had major energy provisions such as the Energy Independence and Security Act of 2007 and the American Recovery and Reinvestment Act and includes the proposed American Energy Innovation Act of 2020 in the current session of the 116th congress (Morehouse, 2020; Yacobucci, 2016). However, the process has become increasingly politicized with a marked uptick in executive actions. In the last ten years, energy policy has been enacted through executive action, and examples include the Obama

Administration's Climate Action Plan, Clean Power Plan (CPP), signing of the Paris Agreement, and Federal Coal Leasing Moratorium. In 2017, the Trump Administration lifted the Federal Coal Leasing Moratorium, repealed the CPP, and announced the U.S.' exit from the 2015 Paris Agreement.

The absence of a coordinated policy designed to facilitate the energy transition has important implications for the frontline communities (Graff et al., 2018). Key challenges facing coal communities include significant labor disruptions, loss of tax revenue to support public services, and limited opportunities to replace economic base activity (Cates and Eaton, 2019; Godby et al., 2015). The unstable and rapidly changing policies at the national level send conflicting messages, exacerbating uncertainty about the future pace and direction of the transition, when and how the rupture will occur, and how it will affect specific communities (Graff et al., 2018; Mendelevitch et al., 2019). The lack of a guiding framework puts the onus of transition planning on communities with strong economic and cultural ties to extractive industries, which may limit the scope of strategies engaged to mitigate impacts (Freudenburg, 1992; Hudson, 2005). A federal economic development practitioner noted that communities are hesitant to plan for fear of "turning [their] back on a powerful industry that has supported [them] for so long." At the same time, executing transition strategies requires that communities assess impacts, advocate for mitigation, and negotiate with individual facility owners dispersed across a broad geography (Haggerty et al., 2018). These efforts often come at the expense of comprehensive planning at the local level.

According to energy transition theorists, successful policies that drive transitions are persistent and continuous (Grubler, 2012; Grubler and Wilson, 2014). Erratic stop-and-go policy

initiatives are ill-suited for triggering long-term energy transitions, nor do they engender successful policy initiatives that address community transitions (Grubler, 2012). In 2015, the Obama Administration introduced a set of Transition Assistance Programs (TAPs) for distressed coal communities, known as the Partnerships and Opportunity Workforce and Economic Revitalization (POWER) Initiative (Table 2). The POWER Initiative was a multi-agency federal program operating primarily through the Department of Labor and the Department of Commerce's Economic Development Administration (EDA). In FY2016, $55 million was appropriated in grant funding and technical assistance to address economic and labor dislocations in communities negatively impacted by changes in the coal industry and power sector (The White House, 2015). In the current administration, elements of the POWER Initiative still operate as a funded program of the Appalachian Regional Commission (Appalachian Regional Commission, 2020). Early POWER programs through the EDA continue today and have been rebranded as Assistance to Coal Communities (ACC). In FY2019, $30M was designated for the ACC, representing the fifth consecutive year for the program. It is no longer associated with the POWER Initiative and is identified as a separate program drawing on Economic Adjustment Assistance (EAA) funding. Funding for the ACC programs is appropriated on an annual basis and future funding is precarious, evidenced by the Trump Administration's efforts to terminate the EDA and its programs (Cecire, 2019).

Table 2. Federal funding to support economic transition in coal communities since 2015

Program	Overview	Fiscal Year	Funding Appropriated
Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative	Introduced in 2015, a multi-agency federal effort to provide grant funding and technical assistance to address economic and labor dislocations caused by the effects of the energy transition. Participating agencies include Department of Commerce, Department of Labor, Appalachian Regional Commission (ARC)	FY 2015	$28-38 million
POWER + Plan	Intended to develop grant programs across multiple agencies to facilitate energy transition and ameliorate the negative effects of that transition. The FY2016 President's Budget requested $56M in POWER+ grant funds, an additional $97M in USDA rural development in grants and loans aligned to POWER+ Priorities, $1B for AML reclamation, and $2B for CCS technology investments. With exception of certain parts of the POWER Initiative and funding for AML, broad elements of the POWER+ Plan were not enacted by Congress.	FY2016	$56 million (Proposed, never enacted in legislation)
POWER Initiative - Appalachian Regional Commission	The ARC is the only organization that continues to receive regular appropriated funding for energy transition activities under the POWER Initiative. The ARC's POWER Initiative program prioritize federal resources and activities in coal communities that produce multiple economic development outcomes, are identified under state, local, or regional economic development plans; and have	FY2016-2019	$50 million

	been collaboratively designed by state, local, or regional stakeholders.		
Assistance to Coal Communities (ACC)	A grant-making element launched as part of the EDA's role in the POWER Initiative. The EDA continues to receive appropriations for the ACC program. The ACC is no longer associated with the POWER Initiative, instead is a separate program drawing on Economic Adjustment Assistance (EAA) funds.	FY2015	$10 million
		FY2016	$15 million
		FY2017-2019	$30 million

The existing federal approach to the coal transition does not provide the certainty and adequate support needed in transitioning communities. In an interview, a federal economic development practitioner said s/he saw a decline in individual participation in retraining and workforce assistance programs and attributed the decline to mixed signals from the administration.

> They were seeing … a decline in participation in [workforce retraining] programs after hearing the rhetoric on the campaign trail about the industries coming back. 'You'll be back in the mines, just wait, wait, wait…' You saw this drop off in folks that were willing to look into other possibilities.

Inconsistent messages dampen individuals and local communities' willingness to prepare for a post-coal future (Freudenburg, 1992). With tax revenue replacement looming as the greatest challenge facing coal-reliant communities, policy experts call for an approach that transcends politics and directs significant fiscal reinvestment to impacted regions. In an interview, a national energy policy analyst emphasized the importance of garnering bipartisan political support for federal policies that reinvest in impacted communities and regions: "It's important to emphasize that the communities affected by this are diverse geographically, ethnically, and they are all

deserving of reinvestment for what they've done for the country over [for] generations." Several experts recommended intervention that goes beyond existing grant programs and advocated for programs similar to the Department of Defense Office of Economic Adjustment program used to mitigate local impacts of military base closures. An example of such an approach is outlined in the recently proposed federal bill, Providing Recovery Opportunities & Mitigating Industry's Shifting Economics (PROMISE) Act (H.R.4318), which would provide direct payments to tribal and local governments in Northern Arizona to compensate for revenue losses due to closure at a decreasing rate over the course of seven years. Despite its piecemeal approach targeting a single geography, this bill has been recommended as a template for broader bipartisan legislation supporting federal reinvestment in coalfield communities nationally (Cates and Skrelunas, 2019).

State Policy Corridors Without a comprehensive national policy framework to address the implications of the coal transition, several Western states have enacted their own legislation to address the impacts of coal industry decline. This review of state policies shows multiple policy corridors and a range of interventions to address social and economic aspects of the coal transition.

In 2011, Washington was the first western state to enact legislation that established closure timelines for both coal-burning units of the state's sole coal power plant. Often pointed to as a model for securing a $55 million transition fund, Washington S.B. 5769-11 set the longest timelines for closure with Unit 1 scheduled for closure in 2020 and Unit 2 in 2025. In 2019, New Mexico passed the Energy Transition Act (ETA). This bill places air emission caps of 1,100 lbs. of carbon dioxide per megawatt hour electricity by 2023, effectively prohibiting coal burning after 2023 (Iglesias, 2019).The ETA also authorizes qualifying facilities to apply for energy

transition bonds, a financial mechanism that allows utilities retiring coal facilities early to recover up to $375 million in costs of stranded assets, as well as $30 million in reclamation costs and $40 million in economic impact support, generated through ratepayer-backed securitization (NM SB489 2019). Both the Washington and New Mexico bills provide examples of state legislation that seeks to manage the pace of coal transition while generating revenue to mitigate impacts of closure.

A main concern of nearly every interviewee was the absence of structures to stabilize and replace revenue losses incurred with the closure of local coal plants and mines. Participants expressed fear of the looming "fiscal death spiral" and "domino effect" caused by the loss of tax base. Previous research emphasized the importance of a transition revenue and investment strategy (Haggerty et al., 2018; Haggerty, 2019). The review of state legislation offered only a few examples of transition funds. Washington's S.B. 5769-11 and subsequent Memorandum of Agreement between merchant power producer TransAlta and the State of Washington outlined the most comprehensive process for establishing a transition fund that would eventually accrue up to $55 million for workforce retraining, community and economic development, and renewable energy development. New Mexico's recent legislation allocates $30 million for reclamation and $40 million for three transition funds – including a fund specifically for impacted tribal communities. Outside of state legislation, there are several mechanisms for securing transition and reinvestment funds (Cates et al., 2020). Through rate case settlement agreements, two of Colstrip's six owners set aside funds available to the community to address transition – Puget Sound Energy ($10 million) and Avista Corporation ($3 million). These policies present a range of transition funds that vary in the ways they are linked to long-term

transition strategies, governance processes, who can benefit from these resources, and the extent to which the states assisted with securing these funds.

State policies demonstrate divergent strategies for mitigating the impacts of coal industry declines. Some states are enacting policies that encourage the energy transition away from coal towards renewable sources of electricity, while others are enacting policies that seek to resist or prevent the coal transition by bolstering the coal industry. Examples of the former include recent legislation in Colorado aiming to reduce greenhouse gas emissions, provide securitization, and provide support for transition planning. Similar elements are also found in New Mexico's Energy Transition Act. Meanwhile, other states like Montana and Wyoming, are working to stave off the decline of the coal industry. In 2017, Montana enacted legislation that allows the State Board of Investments to make loans to an owner of a coal-fired generating unit in Montana from the MT Permanent Coal Tax Trust fund for operation and maintenance of a coal-fired generating unit. In 2019, the state of Wyoming passed the "New Opportunities for WY Coal-fired Generation" bill, directing utilities to attempt to find new buyers for coal plants before retiring them and proposing replacement generation. Despite these efforts, coal facility closures continue to be announced as coal production declines in the Powder River Basin (Bleizeffer, 2019; Erickson, 2020; Frosch, 2019).

Table 3. Recent state legislation related to the coal transition in U.S. Western States of AZ, CO, MT, NM, WA, WY

State	Policy	Date Enacted*	Purpose
AZ	E.O. on Climate Change Action	2006	Adopt the goal of reducing AZ GHG emissions to 2000 level by 2020.
	Providing Recovery** Opportunities & Mitigating Industry's Shifting Economics (PROMISE Act)	2020* Introduced	Direct federal government to reinvest in Hopi and Navajo communities impacted by impending closure of NGS and Kayenta Mine.
CO	Clean Air Clean Jobs Act	2010	Requires CO coal-fired power plants to reduce emissions by 80%.
	Sunset Public Utilities Commission	2019	Reauthorizes the CPUC; adds a 'social cost of carbon at $46/ton', & the Colorado Energy Impact Bond Act that enables utilities to use securitization bonds for early power plant retirements
	Climate Action Plan to Reduce Pollution	2019	Aims to reduce GHG emissions by 50% by 2030, and 90% by 2050
	Just Transition from coal-based electrical energy economy	2019	Creates Just Transition Office and director to create a state Just Transition Plan
MT	Coal-fired Generating Unit Mitigated Retirement Act	2017* Failed	Require facility operators to enter a formal transition agreement with state officials to outline retirement dates, decommissioning
	Provide for loans to an owner of a coal-fired generating unit	2017	Allows board of investments to make loans to an owner of a coal-fired generating unit in MT from the MT Permanent Coal Tax Trust Fund for operation and maintenance of a coal-fired generating unit
	Appropriate money to assist/intervene/plan for closure of coal-fired generation	2017	Appropriates money to the Department of Justice to assist in out-of-state energy proceedings.

	Allow counties to establish a coal trust fund	2019	Allows for the establishment of a coal mine trust reserve fund for county governments
NM	Energy Transition Act	2019	Mandates NM electricity providers get 80% of their electricity from renewable sources by 2040, & 100% from carbon-free sources by 2045. Allows for 'energy transition bonds' to cover costs associated with abandonment. Does not force closure but mandates creation of standards that drastically limit CO2 emissions from coal plants. Allocates $30 million for reclamation, $40 million for three transition funds.
WA	Reducing statewide greenhouse gas emissions	2007	Enacted targets for reducing emissions to 1990 levels by 2020, 25% below 1990 levels by 2035, & 50% below 1990 levels by 2050.
	Relating to coal-fired electric generation facilities	2011	Aims to reduce GHG emissions from coal plants by specifying compliance with emission standards, require the plant to provide financial assurances and enter into MOA with WA governor that includes provisions for the owner to provide financial assistance to impacted community for a total of $55 Million.
	Concerning coal transition power	2013	Requires utilities to pursue all available energy that is consistent with its PNW electric power and conservation regional plan, with the exception of 'coal transition power'.
WY	New opportunities for WY coal fired generation	2019	Direct utilities to attempt to find new buyers for coal plants before retiring them and proposing replacement generation

*Policy enacted unless otherwise noted
**Policy is proposed at the federal level but is designed for a specific region in AZ

The policies outlined in Table 3 highlight the range of state approaches to shape the pace and direction of coal industry decline. While no two states are the same, two distinct and diverging types of policy corridors emerge. The first type of corridor accelerates the energy

transition away from coal-based electricity and seeks to clarify the pace of transition by setting closure dates or incentives to expedite coal plant retirements. The second type of corridor works to slow the energy system transition by bolstering the coal industry and aims to postpone coal plant retirements. For communities negotiating these policy corridors, the state approach to managing the coal transition has important implications for the socio-economic transition experienced at the local level. First, the policy corridors that accelerate the pace of transition provide certainty and a timeline that informs local transition strategies. For example, a policy expert familiar with the negotiations of the 2011 Washington coal transition bill emphasized the importance of the extended timeline for preparing for workforce and labor impacts. According to the interviewee, an earlier version of the bill setting the closure date for 2015 was opposed by labor stakeholders. More support was garnered by 2020 and 2025 closure dates which provided "more time to plan and to think about the redirection of their workforce." Longer timelines allow communities to engage in strategic approaches to addressing differentiated impacts of labor changes. Second, despite state efforts to postpone coal decline as long as possible, communities are more exposed to unexpected closures and layoffs. Without access to a planned approach allowing for mitigating the impacts of revenue loss, local municipalities are driving towards a fiscal crisis.

Examining Transition Policies and Programs 'On the Ground'

Policies do not address the needs of remote isolated communities

Discussions with interview participants highlight critical gaps between policy and the needs of remote, isolated coal-reliant communities. Several experts and practitioners identified a central challenge to supporting community transitions is the lack of obvious development options able to replace the

coal-based tax revenue, economic base activity, and employment. An economic development practitioner who works for a regional development district describes how this reality affects community stakeholders' willingness to discuss aspects of transition.

> They [would] sit in a room and start talking about transitioning economies, that there's not a direct replacement for that… I think that the backfill of revenue support to communities is the piece that we have not figured out well on any level. If we could figure that out, communities would be much more willing to transition.

The absence of structures to address revenue loss was a concern mentioned by nearly every interviewee. In addition, interviewees expressed fear of the loss of critical services and institutions. This challenge presents an important gap between existing programs and what is needed in impacted communities.

Most funding for economic transition assistance comes through the Department of Commerce's Economic Development Administration (EDA). The EDA provides planning, public works, and technical assistance grants that support job creation and economic development through public infrastructure. Traditional economic development approaches such as the EDA are well-intentioned but are often ill-suited for small, isolated communities. According to a community planner, EDA resources fall short in rural, remote geographies because vulnerable communities lack the ability to link the general planning resources to recommended strategies.

EDA funding does not "promote any strategies that I can tell. I mean, you can do a study, but you have to know what your strategy is to get what you want out of your study. Not to be cynical but you got to tell the people that are doing [the feasibility] study exactly what you're looking for."

From the perspective of experts on the ground, communities tend to lack a clear vision of what a post-coal economy looks like, and therefore, it is a challenge to leverage federal resources. The community planner also identified a concern is that infrastructure investments may push municipalities into further debt.

> Communities that have lost their tax base and now are losing some of their industrial tax base, and now are losing workers who were the customers for the water or the sewer or the new road or whatever it is... There's nobody left to pay for it. So, the community is hit once again [and] now you can't even borrow money.

Currently, there are no federal strategies, from the EDA or otherwise, that directly address the fiscal challenges facing impacted communities.

Practitioners identified a need for facilitated discussions about social and economic impacts of closure and what that might mean for the community's future. A policy expert involved with the transition negotiations in Centralia, Washington emphasized the importance of an honest assessment of the impacts and timeline of closure. "The reality has to be brought into the room. Okay, this plant is going to close early. Let's figure out how to make that work for the community, for the workers, for the environment, and the owners." These comments align with literature and practice regarding "shrinking cities" which recommend strategies that work to manage or control decline (Hollander and Németh, 2011; Rhodes and Russo, 2013). A community planner spoke of strategies that "[help] downsize or right size the community to whatever it can support without the tax base it once had… We need to find a way to help them think about the future, even if that future is things like well, we're going to have to consolidate our schools."

Several participants underscored the importance of these strategies. However, as practitioners often come from outside of the community, they felt that these conversations needed to be initiated from within the community. This a defining challenge to community transition planning: to be resilient requires cross-scale linkages between stakeholders and organizations and strong institutions that are willing to partner and experiment (Anderies et al., 2004; Besser and Miller, 2013). However, practitioners with relevant expertise and access to resources do not feel they have the license to begin or lead these conversations. So, as one federal economic development specialist described, "solutions [will] need to come from within the community."

Policies do not provide resources to support early or long-term planning Previous studies examining economic transitions in resource-dependent counties emphasize the importance of economic diversification and planning before the decline occurs (Rasker, 2017). In addition to proactive planning, transition strategies need to mitigate the immediate impacts and provide support for a long-term, economic transition (Haggerty et al., 2018). Interviews demonstrate that timelines of federal Transition Assistance Programs are incongruent with the needs of impacted communities. Federal and state resources for communities are not available until formal announcements of closure or demonstrated layoffs. For example, in 2017 the Montana Department of Labor and Industry was awarded a $2 million POWER grant to support retraining of displaced coal workers. However, this funding nearly expired because operator Talen Energy had not announced any layoffs (Lutey, 2019c). Similarly, an economic development practitioner highlighted the challenge of finding resources to support proactive planning in coal-impacted communities in their economic development district.

> We have [a] communities that was one of the most impacted by the closure of the coal mines, but they didn't qualify for opportunities now, because their wages had not decreased during the time in which they were doing the consideration… That's one of the challenges… They're not always qualified to start the planning process.

POWER and ACC program criteria limit proactive planning efforts. Instead, these resources operate as "emergency assistance" and practitioners are concerned that by the time communities are able to access these critical resources, it may be too late to alter resilience pathways.

In the U.S., existing transition assistance policies tend to focus on the immediate impacts of closure. Economic and community development practitioners emphasized that projects linked to long-term solutions take time, and it is important to understand "that you're not going to come in with a three-year grant and save the community." As many of these grants operate on short-term funding cycles, practitioners are asking for support that can be linked to long-term economic development goals.

Existing transition support is insufficient Policy experts are calling for larger investments and greater external support for impacted communities and workers than the existing programs, like the ACC, provide. A tax policy expert with a national public policy research firm assessed that federal intervention is key:

> Federal resources are going to be critical because it's hard to ask a state that's going through a fiscal crisis to solve its own problems. Then, there's the communities themselves… when you're in this fiscal death spiral, how are you supposed to redevelop your community into a place that has a sustainable economic base?

Experts argue that impacted communities and regions may need long-term reinvestment "orders of magnitude higher than [existing] grants or loans… it will be on the order of billions per year for 10 years. I wouldn't do it forever. I mean it's a transition… but I do think 10 years

might be about the right length." Policies that support major reinvestment in impacted communities and regions may be key. Interview participants emphasized the importance of these place-based investments.

> Now, why if your family is from Gillette, Wyoming and has been for years, you know for generations, should you be expected to go live in the suburbs of Denver and find a job? Along the same lines, we look at coal communities as places that have contributed to the economic growth of the U.S. for generations, and we feel like it's a cause for a just transition for a job well done.

Interviews with key informants highlight the need for federal transition assistance of a much greater scale that is tailored to the specific needs of these coal impacted communities and regions.

Conclusion and Policy Implications

As the pace of the energy transition accelerates, it is important to consider how federal and state policy have shaped the existing transition landscape and how to provide meaningful opportunities and tangible resources that support communities navigating the social and economic impacts of transition. This paper has explored how the concept of policy corridors can be used to study the relationships between federal and state policies and community resilience pathways in the context of the U.S. coal transition. The analysis suggests that community resilience and transition theory provide a useful framework for examining how exogenous factors, specifically macro-scalar policies, shape transition planning at the community level.

Findings indicate that past energy policies have created the core-periphery dynamic and complicated ownership regime that thwarts transition efforts in remote coal communities. The absence of a coordinated national energy policy exacerbates uncertainty for coal communities

and leaves it to states to establish their own legislation, resulting in a range of strategies and levels of support. Two distinct policy corridors emerge among states reviewed in this paper. The first corridor accelerates the energy transition and seeks to clarify the pace of transition by negotiating closure dates or incentives to expedite coal plant retirements. The second corridor works to slow transition by bolstering the coal industry and aims to postpone coal plant retirements. While it is too soon to know how community pathways will be shaped by these policy corridors, both the literature and expert interviews agree that strategies that provide more certainty around closure dates, provide time and resources for early planning, and secure transition funds better equip communities to navigate transitional ruptures.

Findings from the policy analysis and interviews with experts and practitioners highlight several opportunities to improve policy to address the coal transition. At the federal level, there is a need for comprehensive legislation that coordinates the energy transition by establishing clear timelines and strategies for transition; mandates a comprehensive assessment of impacts of closure; and identifies strategies to mitigate social, economic, and environmental impacts of closure. In coordination with energy transition policy, federal assistance programs for coal communities need to be significantly expanded in terms of scope and scale. Policy experts are calling for long-term, predictable funding for assistance programs and significant reinvestment in impacted communities and regions. More flexibility is needed in how grant programs can be used to better meet the needs of vulnerable communities. One example of how criteria of programs can be adjusted is to enable access to federal resources before closures are officially announced.

Interviews with practitioners highlighted limited capacity and weak ties to state and federal actors key as challenges to strategic and meaningful transition planning. One solution to address these challenges is to facilitate and support coordinated regional planning that integrates energy system and economic development approaches. Building long-term capacity and 'thick' institutional relationships through rural regional planning supports community and regional resilience (Healey, 1998; Morrison, 2014). Experts interviewed point to the Appalachian Regional Commission as a potential model to create cross-scalar networks and leverage existing resources needed to bring planning expertise and geographically sensitive approaches to community transitions. Finally, to address the problem of stabilizing and replacing revenue losses states need to remove barriers to saving revenue and expand the range of financial tools that enable communities to unwind fiscal dependence on coal revenue (Haggerty et al., 2018).

Further research should continue to examine the factors shaping community and regional path creation. Empirical assessments are needed to understand, recognize, and strengthen the endogenous capacities and social processes that communities enact to overcome challenges and navigate change. In a moment of increasing environmental and economic uncertainty, scholars, policymakers, and practitioners need to broaden our theoretical and practical toolset to grasp the emerging opportunities and transcend the rising challenges in resource regions.

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References Cited in Chapter Two

Anderies, J.M., Janssen, M.A., Ostrom, E., 2004. A framework to analyze the robustness of social-ecological systems from an institutional perspective. Ecol. Soc. 9, 18. http://www.ecologyandsociety.org/vol9/iss1/art18.

Appalachian Regional Commission, 2020. Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative - Appalachian Regional Commission. https://www.arc.gov/funding/power.asp (accessed 19 March 2020).

Argent, N., 2017. Trap or opportunity? Natural resource dependence, scale, and the evolution of new economies in the space/time of New South Wales' Northern Tablelands, in: Halseth, G. (Ed.), Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routledge, New York, pp. 39-67.

Bainton, N., Holcombe, S., 2018. A critical review of the social aspects of mine closure. Resour. Policy. 59, 468-478. https://doi.org/10.1016/j.resourpol.2018.08.020

Berkes, F., Ross, H., 2013. Community resilience: Toward an integrated approach. Soc. Nat. Resour. 26, 5-20. https://doi.org/10.1080/08941920.2012.736605

Besser, T.L., Miller, N.J., 2013. Social capital, local businesses, and amenities in U.S. rural prairie communities. J. Rural Stud. 32, 186-195. https://doi.org/10.1016/j.jrurstud.2013.06.004

Bickman, L., Rog, D.J., 2009. Applied research design: A practical approach, in Bickman, L., Rog, D.J. (Eds.), The SAGE Handbook of Applied Social Research Methods. SAGE Publications, Thousand Oaks, pp. 3-43.

Bleizeffer, D., 2019. Can Wyoming law delay coal plant closures? https://www.wyofile.com/can-wyoming-law-delay-coal-plant-closures/

Carley, S., Evans, T.P., Graff, M., Konisky, D.M., 2018a. A framework for evaluating geographic disparities in energy transition vulnerability. Nat. Energy 3, 621–627. https://doi.org/10.1038/s41560-018-0142-z

Carley, S., Evans, T.P., Konisky, D.M., 2018b. Adaptation, culture, and the energy transition in American coal country. Energy Res. Soc. Sci. 37, 133-139. https://doi.org/10.1016/j.erss.2017.10.007

Cates, K., Eaton, P., 2019. As coal economy collapses, imminent public budget crisis confronts Hopi-Navajo Tribes. https://ieefa.org/wp-content/uploads/2019/05/Imminent-Public-Budget-Crisis-Confronts-Hopi-Navajo-Tribes-With-Coal-Economy-Collapse_May-2019.pdf

Cates, K., Ormund, A., Feaster, S., Roemer, K., 2020. The case (and the mechanisms) for utility-company reinvestment in Arizona's coalfield communities. https://ieefa.org/wp-content/uploads/2020/03/The-Case-for-Utility-Company-Reinvestment_AZ-Coalfield-Communities_March-2020.pdf

Cates, K., Skrelunas, T., 2019. Bill to spark federal post-coal reinvestment in Arizona tribal communities is a good beginning. http://ieefa.org/wp-content/uploads/2019/09/PROMISE-Act-Bill-Is-a-Good-Beginning_September-2019.pdf

Cecire, M.H., 2019. The POWER Initiative: Energy transition as economic development. https://fas.org/sgp/crs/misc/R46015.pdf

Charmaz, K, 2006. Constructing grounded theory: A practical guide through qualitative analysis. Sage Publications, Thousand Oaks.

Connelly, S., Nel, E., 2017. Global-Local links and evidence from the West Coast and Southland regions, in: Halseth, G. (Ed.), Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routledge, New York, pp. 98-123.

Dryzek, J., 2005. The Politics of the Earth: Environmental Discourses, second ed. Oxford University Press, Oxford.

EIA, 2020a. Short-Term Energy Outlook [WWW Document]. URL https://www.eia.gov/outlooks/steo/ (accessed 5.5.20).

EIA, 2020b. More U.S. coal-fired power plants are decommissioning as retirements continue [WWW Document]. Today in Energy. URL https://www.eia.gov/todayinenergy/detail.php?id=40212 (accessed 3.2.20).

EIA, 2019. More U.S. coal-fired power plants are decommissioning as retirements continue [WWW Document]. Today in Energy. URL https://www.eia.gov/todayinenergy/detail.php?id=40212 (accessed 5.11.20).

Erickson, C., 2020. Peabody Energy reduces workforce at three Powder River Basin mines | Energy Journal | trib.com. Casper Star Trib.

Everingham, J.A., Pattenden, C., Klimenko, V., Parmenter, J., 2013. Regulation of resource-based development: Governance challenges and responses in mining regions of Australia. Environ. Plan. C Gov. Policy. https://doi.org/10.1068/c10184

Folke, C., Hahn, T., Olsson, P., Norberg, J., 2005. ADAPTIVE GOVERNANCE OF SOCIAL-ECOLOGICAL SYSTEMS. Annu. Rev. Environ. Resour. 30, 441–473. https://doi.org/10.1146/annurev.energy.30.050504.144511

Frank, K.I., Hibbard, M., 2016. Production, consumption, and protection: perspectives from North America on the multifunctional transition in rural planning. Int. Plan. Stud. 21, 245–260. https://doi.org/10.1080/13563475.2016.1188685

Freudenburg, W.R., 1992. Addictive Economies: Extractive Industries and Vulnerable Localities in a Changing World Economy. Rural Sociol. 57, 305–332. https://doi.org/10.1111/j.1549-0831.1992.tb00467.x

Frosch, D., 2019. Coal-Mine Closures Shake Wyoming . Wall Str. J.

Geels, F.W., 2006. Technological Transitions and System Innovations, A Co-Evolutionary and Socio-Technical Analysis, Edward Elgar Publishing Limited. https://doi.org/10.1016/j.techfore.2006.05.008

Geels, F.W., Schot, J., 2007. Typology of sociotechnical transition pathways. Res. Policy 36, 399–417. https://doi.org/10.1016/J.RESPOL.2007.01.003

Gerking, S., Hamilton, S.F., 2008. What explains the increased utilization of powder river basin coal in electric power generation? Am. J. Agric. Econ. 90, 933–950. https://doi.org/10.1111/j.1467-8276.2008.01147.x

Godby, R., Coupal, R., Taylor, D., Considine, T., 2015. Potential Impacts on Wyoming Coal Production of EPA's Greenhouse Gas Proposals. Electr. J. 28, 68–79.

Graff, M., Carley, S., Konisky, D.M., 2018. Stakeholder perceptions of the United States energy transition: Local-level dynamics and community responses to national politics and policy. Energy Res. Soc. Sci. https://doi.org/10.1016/j.erss.2018.05.017

Grubler, A., 2012. Energy transitions research: Insights and cautionary tales. Energy Policy. https://doi.org/10.1016/j.enpol.2012.02.070

Grubler, A., Wilson, C., 2014. Energy technology innovation. Cambridge University Press.

Haggerty, J., Bills Walsh, K., Rose, J., 2017. The Status of Key Policies and Decision Processes.

Haggerty, J.H., Haggerty, M.N., Roemer, K., Rose, J., 2018. Planning for the local impacts of coal facility closure: Emerging strategies in the U.S. West. Resour. Policy. https://doi.org/10.1016/j.resourpol.2018.01.010

Haggerty, M.N., 2019. Replacing Coal Revenue and Investing in Economic Transition: Solutions for Coal-Dependent Communities. Bozeman.

Halseth, G., 2017. Transformation of Resource Towns and Peripheries: Political economy perspectives. Routledge, Abingdon.

Harrahill, K., Douglas, O., 2019. Framework development for 'just transition' in coal producing jurisdictions. Energy Policy. https://doi.org/10.1016/j.enpol.2019.110990

Harrison, J.L., Montgomery, C.A., Bliss, J.C., 2016. Beyond the monolith: the role of bonding, bridging, and linking social capital in the cycle of adaptive capacity. Soc. Nat. Resour. 29, 525–539.

Hayes, L.R., 1980. Energy, economic growth, and regionalism in the West. University of New Mexico Press, Albuquerque.

Hayter, R., Barnes, T., 1990. Innis' Staple Theory, Exports, and Recession: British Columbia, 1981-86. Econ. Geogr. 66, 156. https://doi.org/10.2307/143744

Healey, P., 1998. Building Institutional Capacity through Collaborative Approaches to Urban Planning. Environ. Plan. A Econ. Sp. 30, 1531–1546. https://doi.org/10.1068/a301531

Hollander, J.B., Németh, J., 2011. The bounds of smart decline: A foundational theory for planning shrinking cities. Hous. Policy Debate 21, 349–367. https://doi.org/10.1080/10511482.2011.585164

Hudson, R., 2005. Rethinking Change in Old Industrial Regions: Reflecting on the Experiences of Northeast England. Environ. Plan. A Econ. Sp. 37, 581–596. https://doi.org/10.1068/a36274

Iglesias, D., 2019. Fiscal Impact Report.

Imperiale, A.J., Vanclay, F., 2016. Experiencing local community resilience in action: Learning from post-disaster communities. Journal of Rural Studies, 47, pp. 204-219. http://dx.doi.org/10.1016/j.jrurstud.2016.08.002

Jordan, A., 2005. Environmental Policy in the European Union. Earthscan, London.

Joskow, P.L., 2000. Deregulation and Regulatory Reform in the U.S. Electric Power Sector by DEREGULATION AND REGULATORY REFORM IN THE U.S. ELECTRIC POWER SECTOR. MIT Center for Energy and Environmental Policy Research.

Kulig, J.C., Edge, D.S., Townshend, I., Lightfoot, N., Reimer, W., 2013. Community resiliency: Emerging theoretical insights. J. Community Psychol. 41, 758–775. https://doi.org/10.1002/jcop.21569

Kulig, J.C., Botey, A.P., 2016. Facing a wildfire: What did we learn about individual and community resilience? Nat. Hazards. 82, 1919-1929 https://doi.org/10.1007/s11069-016-2277-1

Littig, B., 2011. Interviews, expert, in: Badie, B., Berg-Schlosser, D., Morlino, L. (Eds.), International encyclopedia of political science. Sage Publications, Thousand Oaks.

Loorbach, D., 2007. Transition management: new mode of governance for sustainable development.

Loorbach, D., Rotmans, J., 2010. The practice of transition management: Examples and lessons from four distinct cases. Futures 42, 237–246. https://doi.org/10.1016/j.futures.2009.11.009

Lutey, T., 2019a. Washington state lawmakers eyeing earlier closure of Colstrip. Billings Gaz.

Lutey, T., 2019b. Colstrip Units 1 and 2 will close in 2019 | State & Regional | billingsgazette.com. Billings Gaz.

Lutey, T., 2019c. $2M grant for Colstrip coal worker retraining sits unused after two years | State & Regional | helenair.com. Indep. Rec.

Markantoni, M., Steiner, A., Meador, J.E., Farmer, J., 2018. Do community empowerment and enabling state policies work in practice? Insights from a community development intervention in rural Scotland. Geoforum 97, 142–154. https://doi.org/10.1016/J.GEOFORUM.2018.10.022

Markard, J., Raven, R., Truffer, B., 2012. Sustainability transitions: An emerging field of research and its prospects. Res. Policy. https://doi.org/10.1016/j.respol.2012.02.013

Martens, P., Rotmans, J., 2005. Transitions in a globalising world. Futures 37, 1133–1144. https://doi.org/10.1016/J.FUTURES.2005.02.010

Mendelevitch, R., Hauenstein, C., Holz, F., 2019. Climate Policy The death spiral of coal in the U.S.: will changes in U.S. Policy turn the tide? The death spiral of coal in the U.S.: will changes in U.S. Policy turn the tide? Technology. https://doi.org/10.1080/14693062.2019.1641462

Miles, M.., Huberman, M.B., 1994. Qualitative data analysis: An expanded sourcebook (2nd ed.). Qual. data Anal. An Expand. Sourceb. (2nd ed.). 20, 159–160. https://doi.org/10.1016/S1098-2140(99)80125-8

Morehouse, C., 2020. “Beyond frustating” Senate dispute stalls bipartisan energy legislation | Utility Dive. Util. Dive.

Morrison, T.H., 2014. Developing a regional governance index: The institutional potential ofrural regions. J. Rural Stud. 35, 101–111. https://doi.org/10.1016/j.jrurstud.2014.04.004

Murphy, J., Smith, A., 2013. Understanding Transition—Periphery Dynamics: Renewable Energy in the Highlands and Islands of Scotland. Environ. Plan. A Econ. Sp. 45, 691–709. https://doi.org/10.1068/a45190

Norris, F.H., Stevens, S.P., Pfefferbaum, B., Wyche, K.F., Pfefferbaum, R.L., 2008. Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. Am. J. Community Psychol. 41, 127–150.

Pretty, J.N., 1995. Regenerating Agriculture: Policies and Practice for Sustainability and Self-Reliance. Earthscan, London.

Ramage J., Everette, B., 2012. Coal, in: Energy Systems and Sustainability: Power for a Sustainable Future, in: Everett, B., Boyle, G., Peake, S., Ramage, J. (Eds.) 2nd edition. Oxford University Press, Oxford, pp. 141-178.

Rasker, R., 2017. The Transition from Western Timber Dependence: Lessons for Counties The Transition from Western Timber Dependence: Lessons for Counties .

Ray, C., 2000. Editorial. The eu leader Programme: Rural Development Laboratory. Sociol. Ruralis 40, 163–171.

Rhodes, J., Russo, J., 2013. Shrinking smart?: Urban redevelopment and shrinkage in Youngstown, Ohio. Urban Geogr. 34, 305–326. https://doi.org/10.1080/02723638.2013.778672

Rigg, J., Law, L., Tan-Mullins, M., Grundy-Warr, C., 2005. The Indian Ocean tscunami: socio-economic impacts in Thailand. The Geographic Journal. 171, 4. Pp. 374-379. https://doi.org/10.1111/j.1475-4959.2005.00175_3.x

Robertson, D., 1979. Power Plant and Industrial Fuel Use of 1978: Fuel Replacement. Harvard Environ. Law Rev. 3, 214–235.

Ryser, L., Halseth, G., Markey, S., Gunton, C., Argent, N., 2019. Path dependency or investing in place: Understanding the changing conditions for rural resource regions. Extr. Ind. Soc. 6, 29–40. https://doi.org/10.1016/J.EXIS.2018.10.009

Sartor, O., 2018. Implementing coal transitions: Insights from case studies of major coal-consuming economies.

Sisto, R., Lopolito, A., van Vliet, M., 2018. Stakeholder participation in planning rural development strategies: Using backcasting to support Local Action Groups in complying with CLLD requirements. Land use policy 70, 442–450. https://doi.org/10.1016/J.LANDUSEPOL.2017.11.022

Smil, V., 2010. Energy Transitions: History, Requirements. Prospects 1.

Snyder, B.F., 2018. Vulnerability to decarbonization in hydrocarbon-intensive counties in the United States: A just transition to avoid post-industrial decay. Energy Res. Soc. Sci. 42, 34–43.

Stokes, L.C., Breetz, H.L., 2018. Politics in the US energy transition: Case studies of solar, wind, biofuels and electric vehicles policy. Energy Policy 113, 76–86.

The Energy Policy and Conservation Act (P.L. 94-163, 42 U.S.C. 6201), 1976. . William Mary Environ. Law Policy Rev. 1.

The White House, 2015. FACT SHEET: The Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative | whitehouse.gov [WWW Document]. URL https://obamawhitehouse.archives.gov/the-press-office/2015/03/27/fact-sheet-partnerships-opportunity-and-workforce-and-economic-revitaliz (accessed 3.18.20).

Wallerstein, I.M., 2004. World-systems analysis: An introduction. Duke University Press.

Whitener, L., 2005. Policy Options for a Changing Rural America.

Wilson, G.A., 2015. Community Resilience and Social Memory. Environ. values. 24, 227–257.

Wilson, G.A., 2014. Community resilience: path dependency, lock-in effects and transitional ruptures. J. Environ. Plan. Manag. 57, 1–26. https://doi.org/10.1080/09640568.2012.741519

Wilson, G.A., 2013. Community resilience, policy corridors and the policy challenge. Land use policy 31, 298–310. https://doi.org/10.1016/j.landusepol.2012.07.011

Wilson, G.A., 2012. Community resilience and environmental transitions, Community Resilience and Environmental Transitions. https://doi.org/10.4324/9780203144916

Wilson, G.A., 2010. Multifunctional ‘quality’ and rural community resilience. Trans. Inst. Br. Geogr. 35, 364–381.

Wilson, G.A., 2007. Multifunctional agriculture: a transition theory perspective. Cambridge, MA : CABI, Cambridge, MA.

Wilson, G.A., Bryant, R., 1997. Environmental Management: New Directions for the 21st Century. UCL Press, London.

Winter, S., 1990. Integrating implementation research, in: Palumbo, D.J., Calista, D. (Eds.), Implementation and the Policy Process: Opening Up the Black Box. Greenwood Press, Westport, pp. 19–38.

Yacobucci, B.D., 2016. Energy Policy: 114th Congress Issues.

CHAPTER THREE

COAL COMMUNITIES IN TRANSITION: A CASE STUDY OF COLSTRIP, MONTANA

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Resources for the Future

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https://media.rff.org/documents/RFF_Report_21-01_Colstrip_Case_Study.pdf

Introduction

Colstrip (pop. ~2,440) is a rural community in Rosebud County in the High Plains of southeastern Montana, more than 100 miles east of the nearest large city (Billings, pop. ~110,000). It sits roughly 20 miles north of two Native American reservations, the Northern Cheyenne and the Crow reservations, and at the northern end of the Powder River Basin, the single largest source of coal in the United States and one of the largest deposits of coal in the world.

As its name implies, Colstrip was born from coal.[3] Established in the early 1920s by the Northern Pacific Railway Company to provide fuel for locomotives (City of Colstrip 2020a), the townsite was sold in 1959 to the Montana Power Company (MPC) as diesel replaced coal as the fuel of choice for locomotives. For nearly a decade, coal production was idled, but it resumed with the construction of the Colstrip Steam Electric Station in the late 1960s.

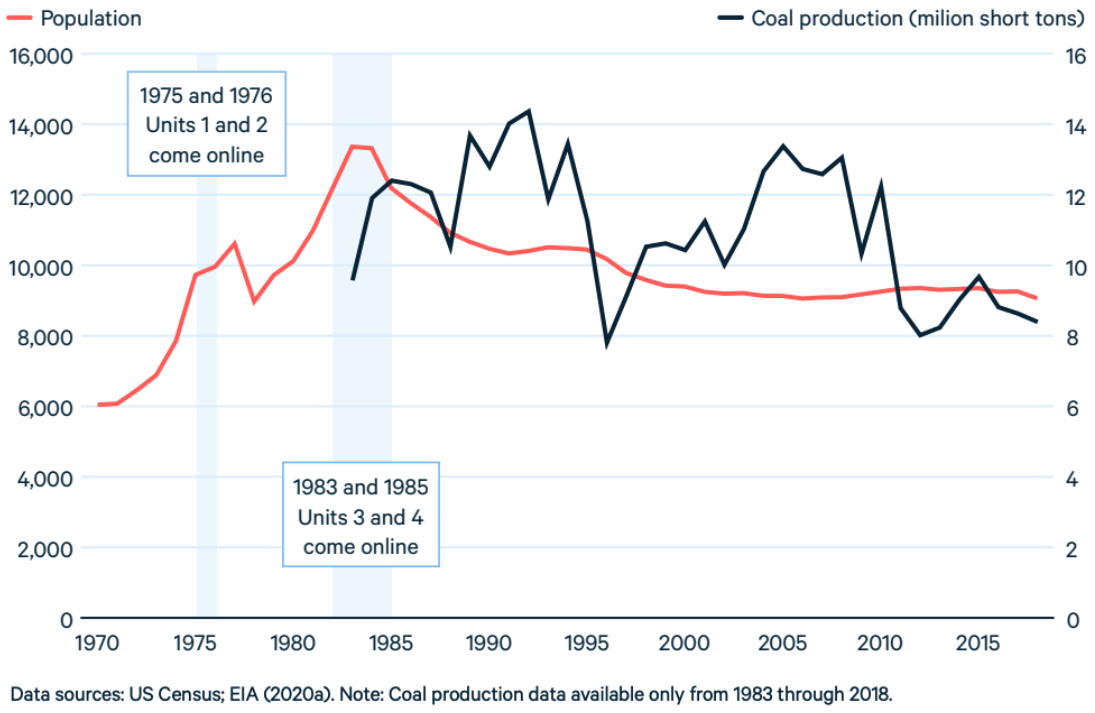
In the 1970s, a variety of factors, including federal Clean Air Act regulations on sulfur dioxide emissions and concerns about energy security, drove a rapid and extensive development of low-sulfur coal resources in the Interior West, which displaced higher- sulfur coal from Appalachia and the Midwest (Robertson 1979; Gerking and Hamilton 2008). Colstrip was one of the dozens of locations identified for construction of mine- mouth generating plants and high-voltage long-distance transmission lines (US Bureau of Reclamation 1971). In 1975 and 1976, Colstrip Station's Units 1 and 2 began operating with a combined capacity of 614 MW. Units 3

[3] It is unclear why the town is named "Colstrip" rather than "Coalstrip," though the word "coal" is derived from the Middle English word "col."

and 4 came online in 1983 and 1985, with 1,480 MW of generating capacity. With a total capacity of 2,094 MW, Colstrip Station became the second-largest coal-fired power plant in the western United States and the largest in Montana.

During construction, Rosebud County's population more than doubled, rising from roughly 6,000 in 1970 to more than 13,000 in the mid-1980s. Following the completion of Units 3 and 4, population abruptly dropped by several thousand, settling just below 10,000 residents in the 2000s. Coal production from the Rosebud mine, which provides all the plant's fuel, has varied since the 1980s, but in recent years, output has hovered near its lowest levels in decades (Figure 3).

Figure 3. Rosebud County Population and Rosebud Mine Coal Production



Data sources: US Census; EIA (2020a). Note: Coal production data available only from 1983 through 2018.

In recent years, as coal-fired power has come under increasing pressure from low-cost competitors, including natural gas, wind, and solar, Colstrip Station has become less competitive, leading to a reduction in power production and associated coal mining.

In 2010, Colstrip Station generated more than 16,000 gigawatt-hours (GWh) of net electricity, its highest level, but annual production declined to roughly 13,000 GWh from 2016 to 2019 (EIA 2020b). At the Rosebud mine, employment hovered near 400 workers from 2005 through 2016 but dipped to a low of 320 in late 2017 (MSHA 2020).2 Colstrip represents an outsized share of the coal industry in Montana. As of 2017, the power plant employed nearly 80 percent of Montana's coal power plant workforce, while the Rosebud mine employed more than 35 percent of the state's coal miners (Nowakowski 2018).

This year, following a legal settlement related to the installation of emissions control technologies under the Clean Air Act, Units 1 and 2 shut down, reducing the plant's capacity by 29 percent. The future of the plant's remaining two units is highly uncertain, as we discuss in the sections ahead.

Transition Challenges for Colstrip

For rural and remote coal-reliant communities like Colstrip, a shift away from fossil energy implies major social and economic transitions. Rural communities often have limited capacity, networks, and resources to navigate shocks such as the closure of a major employer. When these shocks occur, communities may experience a structural shift in employment and economic opportunity. The isolation and distance from population centers limits opportunities to participate in the knowledge and service- based sectors, which are increasingly concentrated in urban locations (Rasker et al. 2009). In addition, the loss of local tax revenue can affect

government's ability to provide services and maintain relatively low tax rates for residents (Haggerty et al. 2018).

The town of Colstrip and Rosebud County are heavily reliant on coal for employment, economic activity, and public revenues. In 2017, the taxable value of all property across Rosebud County was roughly $95 million, $76 million of which was accounted for by the power plant, coal mine, and associated property. Units 1 and 2 represented $22 million of this taxable value, meaning that the closure of these units erased roughly 24 percent of the county's property tax base (importantly, subsequent increases in the local property tax rate may mean that county revenues would not experience such a sharp drop). As shown in Figure 4, power plant property makes up an even larger share of the local tax base for Colstrip schools (Wagner 2018). However, state tax laws known as "equalization" mean that revenues raised from property taxes in other counties would help offset revenue shortfalls in Colstrip, limiting local losses (Montana Office of Public Instruction 2020).

Local governments will experience other major changes in revenue due to the closure of Units 1 and 2. Lower coal production driven by the closures will reduce the federal and state royalties and taxes that have flowed to Rosebud County for years. The state estimates that these will include annual losses of roughly $460,000 in federal mineral royalties and $900,000 in state coal taxes, though the ultimate level of losses will depend on coal prices, which form the base of the tax (Wagner 2018). For context, total revenue from all sources for Rosebud County in 2018

was $12.6 million (Montana Legislature 2020). However, these losses could be partly offset by an increase in payments in lieu of taxes (PILTs), which could rise by roughly $750,000.[4]

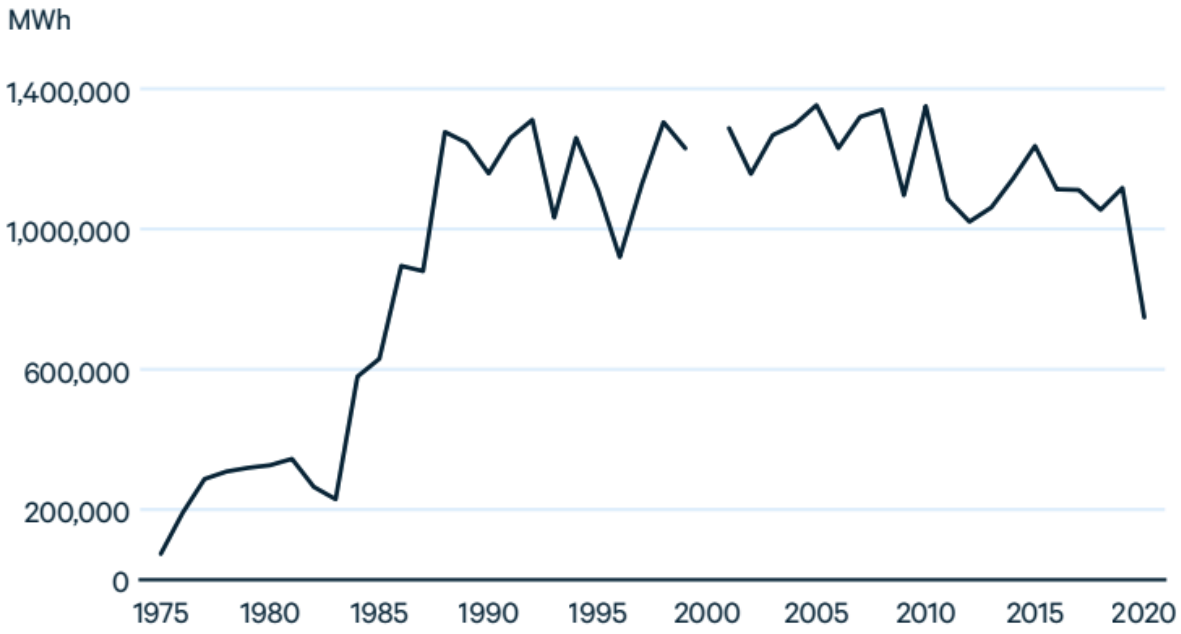
Figure 4. Local Taxable Property Values, 2017

Data source: Wagner (2018).

The closure of Units 1 and 2 has dramatically affected Colstrip's electricity output. As shown in Figure 5, monthly power generation fell by 33 percent in the first half of 2020, reaching its lowest level since 1985.

[4] A recent analysis prepared for Montana's Financial Modernization and Risk Analysis study estimates that the county's annual PILT payment could increase by more than $750,000 (Haggerty 2020).

Figure 5. Colstrip Power Plant Average Monthly Net Electricity Generation



Data source: EIA (2020b). Notes: No data available for year 2000. 2020 data are preliminary, January through May only.

Another potential challenge relates to water infrastructure. The town's fresh water comes from the Yellowstone River and is transported via a 30-mile pipeline constructed by Montana Power in 1974. Ownership of the water rights has changed over the years, but today, the water rights and infrastructure are shared by the City of Colstrip and the power plant's six owners (City of Colstrip 2020b). If the plant's remaining two units are retired, the ownership, operation, and maintenance of this infrastructure would be a key concern, leading community leaders to seek a long- term agreement that would expand the water rights to the city (Colstrip City Council Chambers 2018). However, such an arrangement would not necessarily address who pays for the maintenance and operations of the infrastructure, an issue that has arisen in other natural resource–dependent communities (e.g., Raimi and Newell 2016; Smith et al. 2019).

Complex Ownership Structure Adds to Uncertainty

The complexity of Colstrip Station's ownership portfolio has created additional challenges for the community as it navigates closures and uncertainty. Because the plant's six owners face varying regulatory, economic, and social conditions, they each have different incentives that affect their decision-making. The varying approaches taken by plant owners have exacerbated the uncertainty over when and whether Units 3 and 4 will close, making it difficult for local stakeholders to plan for a potential transition (Haggerty et al. 2018).

To understand this dynamic, it is useful to review the history of the plant's ownership. In 1972, the Montana Power Company partnered with utilities in Washington and Oregon to develop Colstrip's mines and generating facilities (Haggerty et al. 2017). Along with MPC, Seattle-based Puget Sound Electric (PSE) was an original partner in Units 1 and 2. The construction and ownership agreement for Units 3 and 4 involved six entities with varying levels of investment: MPC, PSE, Washington Water and Power, Portland General Electric (PGE), Pacific Power and Light, and Basin Electric (Coal Transportation Agreement 1981). Over time, companies have invested and divested from Colstrip, and some have changed names.

In 1997, Montana deregulated its electricity sector (Martin and Everts 2002), which enabled MPC to sell its generating assets to Pennsylvania Power and Light (PPL) and divest its ownership of the town. Until that point, Colstrip was a true "company town." It was officially incorporated in 1998, technically becoming the state's newest town despite its decades of

history[5] (City of Colstrip 2020a). In 2015, Talen Energy, an independent power producer operating plants in multiple US power markets, acquired PPL's assets, including Colstrip Station (Brown 2015), and is the plant's operator.

When Units 1 and 2 were retired, six entities retained ownership shares in Colstrip's remaining units: Talen, PSE, PGE, Avista Corporation, PacifiCorp, and NorthWestern Energy (NWE). Each of these companies, except for Talen, is an investor- owned utility.

Colstrip Station obtains all its fuel from the Rosebud mine, previously owned by Westmoreland Mining Company, which filed for bankruptcy in 2018. In 2019, the company emerged as Westmoreland Mining, LLC, which was created by Westmoreland Mining Company's first lien creditors (Lutey 2019). A coal supply agreement has been in effect between Colstrip Units 3 and 4 owners and Westmoreland Mining Company since 1998 and was recently renewed through 2025 (Westmoreland Mining, LLC 2019), creating at least one point of certainty for the community.

Closing Units 1 and 2 Highlights the Risks of Future Closures

The closure of Units 1 and 2 was driven by a mix of ad hoc legal efforts and market factors. In March 2013, the Sierra Club and the Montana Environmental Information Center sued the plant's owners,[6] alleging that they had violated the Clean Air Act by undertaking major repairs without obtaining permits that would have required installation of additional pollution

[5] For company towns such as Colstrip, divestiture of ownership and services could exacer- bate challenges of resource dependency (Commander 2018). Though an important aspect of Colstrip's situation, the impact of MPC's divestment is not the focus of this report.
[6] Sierra Club and MEIC v. PPL Montana LLC, et al. (2013).

controls. In July 2016, the parties entered an administrative order on consent (AOC) requiring Units 1 and 2 to cease operations by July 1, 2022 (Montana DEQ 2012). In June 2019, Talen announced that Units 1 and 2 would be permanently retired two years early because of financial challenges, citing an inability to renegotiate fuel costs with the Rosebud mine operators (Talen Energy 2019).

The future of Units 3 and 4 is unclear and, as noted above, complicated by the owners' different decisions over when to exit the plant. One key driver of these varying timelines is differing regulatory and policy environments for plant owners based in Oregon and Washington, states that are seeking to phase out coal-fired power.

In March 2020, the Washington Utility and Transportation Commission (WUTC) approved the acceleration of depreciation of Avista Corporation's ownership share of Colstrip Units 3 and 4 through December 31, 2025.[7] WUTC has also approved PacifiCorp's accelerated timeline for exiting ownership of Units 3 and 4, from 2046 to 2027 (PacifiCorp 2019). To meet the requirements of Oregon's SB 1547, PGE will fully depreciate Units 3 and 4 by the end of 2030 and remove them from its portfolio by the end of 2034 (PGE 2019). PSE will need to exit ownership of Units 3 and 4 to comply with Washington State's Clean Energy Transformation Act, which requires all electric utilities in the state to eliminate coal-fired electricity by 2025.[8]

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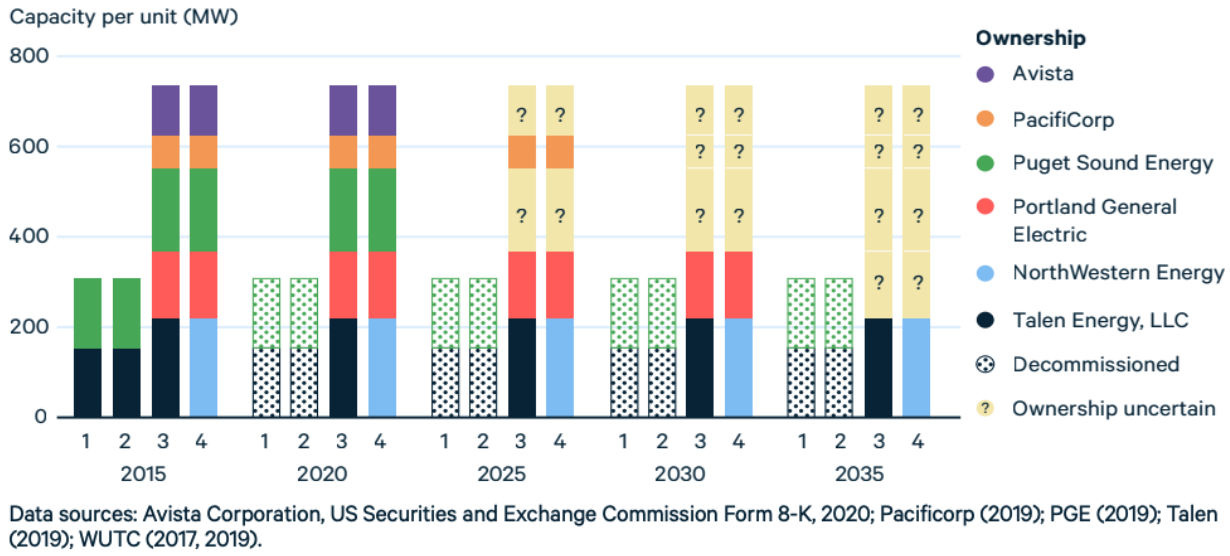
[7] Avista Corporation, US Securities and Exchange Commission Form 8-K, 2020.
[8] An Act Relating to Supporting Washington's Clean Energy Economy and Transitioning to a Clean, Affordable, and Reliable Energy Future, SB 5116, State of Washington Legislature (2019).

Figure 6 illustrates the complex, shifting, and uncertain nature of Colstrip's ownership structure. The stippled areas represent the closure of Units 1 and 2, and the gray areas with question marks indicate the ownership shares that are expected to be divested by various companies in the years ahead.

Figure 6. Colstrip Ownership Shares, 2015-2035



Data sources: Avista Corporation, US Securities and Exchange Commission Form 8-K, 2020; Pacificorp (2019); PGE (2019); Talen (2019); WUTC (2017, 2019).

It is possible that buyers will emerge to take on the shares vacated by these exits. However, the long-term uncertainty surrounding coal-fired power in the United States, along with the specific challenges facing Colstrip, dim this prospect.

In 2019, NWE filed an application with the Montana Public Service Commission for preapproval to acquire PSE's 25 percent interest in Colstrip Unit 4 for $1 (Larson 2019). Talen, which had first right of refusal to purchase assets divested by PSE, sought to purchase half of PSE's 25 percent share of Unit 4. The sale to NWE and Talen, where each firm would pay $0.50, needed approval from both the Montana Public Service Commission and WUTC. Arguing that

the sale would not be in the best interest of the public, WUTC staff recommended that PSE's request to sell Unit 4 be denied, followed by PSE's cancellation of the sale in late October 2020 (WUTC 2020b).

This situation highlights the central challenge faced by the community: planning for the future becomes all but impossible when there is deep uncertainty over not only whether the plant is retiring, but when.

Uncoordinated and Limited Transition Planning Efforts Have Created Challenges

No federal or Montana state law mandates advanced planning for the social and economic impacts of power plant or mine closure (though there are requirements for environmental remediation planning). New policies, such as those beginning to be implemented in Colorado[9] and New Mexico,[10] include funds to support local transition activities, such as planning, workforce development, and reporting requirements for plant owners. In the absence of centralized transition planning in Colstrip, a variety of actors—including community stakeholders and some plant owners—are taking measures to support the community in navigating the transition.

After the closure of Units 1 and 2 was announced in 2016, three distinct proposals emerged to address Colstrip's future. These efforts covered a wide range of approaches, reflecting the differing priorities of local and regional stakeholders, from a traditional

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[9] Just Transition from Coal-Based Electrical Energy Economy, HB19-1314, Colorado General Assembly (2019).
[10] Energy Transition Act, SB 489, New Mexico Legislature (2019).

comprehensive economic development strategy process aimed at economic diversification (SEMDC 2017), to a plan for local stakeholders to press for new federal efforts to maintain the viability of coal-fired power and mining nationwide (Taimerica Management et al. 2017), to a plan focused on job creation driven by cleaning up a legacy of local groundwater pollution (Northern Plains Resource Council 2019).

In parallel—though not in coordination—with those planning efforts, some plant owners have established funds to support transition efforts as part of their negotiations to exit ownership of Colstrip Station. The first of these efforts emerged in 2017 during rate case negotiations between WUTC and PSE.[11] The resulting settlement required PSE to contribute $10 million for community transition planning and prompted the creation of the Colstrip Community Impact Advisory Group (CCIAG), which was convened "to develop a community transition plan to address future closures at the Colstrip Generation Plant" and included state and local officials, community leaders, and labor and economic development organizations (Montana Governor's Office 2017).

The approved CCIAG draft plan provides for the establishment of a seven-member board tasked with distributing the community impact funds provided by PSE to projects that support workers and enhance local economic development. The CCIAG plan includes two funds: $7.5 million for issuing grants and short-term loans supporting worker assistance, economic

[11] WUTC v. PSE, UE-170033 and UG-170034, before the Washington Utilities and Transportation Commission (2017)

diversification, and tax base replacement; and a $2.5 million endowment, the proceeds from which would be used for future grants and loans (CCIAG 2018).

A second effort, the result of a partial settlement between Avista Corporation and WUTC, requires the company to contribute $3 million to a Colstrip Community Transition Fund, to be shared among the town, Rosebud County, and the Northern Cheyenne Tribe (WUTC 2018). As of this writing, it is not yet clear how this fund will be administered and distributed.

Looking forward, additional planning and funding will likely be needed to support any effective transition initiative. For example, one effort in Washington State (the Centralia Coal Transition Fund) offers $55 million to support local transition efforts (State of Washington 2011); in New Mexico, $50 million has been set aside to support environmental remediation, severance pay, and job training in and around one community where a large coal-fired plant is slated to close.[12]

In addition to securing transition funds, the City of Colstrip will need to address the impacts of potential revenue losses outlined above. The concept of "rightsizing," or aligning public resources with changing population levels, is one strategy to maintain fiscal health in cities experiencing decline (Hummel 2015). For rightsizing to be effectively implemented, residents, local leaders, and planners would need to agree to the difficult proposition that the city will shrink (Ehrenfeucht and Nelson 2011). Though the CCIAG plan identified the impacts of

[12] Energy Transition Act, SB 489, New Mexico Legislature (2019).

plant closure, right-sizing strategies, such as participatory budgeting, have yet to play a prominent role in public discussions in Colstrip (CCIAG 2018; Just Transition Fund 2020).

One option that could, in theory, enable the continued operation of the Colstrip plant in a carbon-constrained future would be the addition of carbon capture, use, and storage (CCUS) technology. However, a study commissioned by the US Department of Energy and completed in 2018 (but only made public in 2020) found that deploying CCUS would require roughly $1.3 billion of upfront investment and more than $100 million in annual operating costs (Leonardo Technologies, Inc. 2018). Despite the availability of federal tax credits for CCUS deployment, these high costs led the study authors to conclude that undertaking such a project may not be financially viable.

Policy Interventions to Support Colstrip

For several decades, state and federal funds have been directed toward Colstrip and the surrounding region to support economic development planning, infrastructure, and other key services. In addition, several pieces of legislation have been proposed and enacted that have considerable bearing on the future of the plant, mine, city, and region. This section provides an overview of some of these interventions, including state and federal efforts, over roughly the last 10 years.

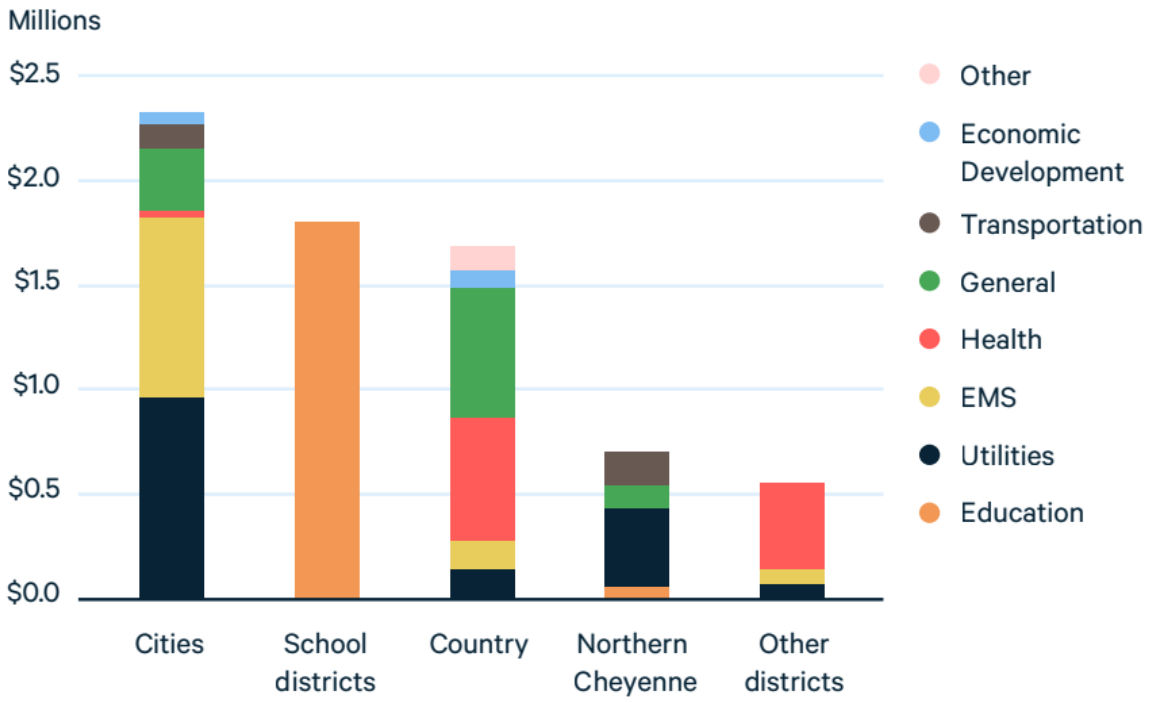
State Interventions

Montana has taken a variety of initiatives to support the Colstrip region. Some of the clearest efforts have come from the Montana Coal Board, which was established in 1975 to allocate funds raised from the state's severance tax on coal production. The board is tasked with

supporting “local governmental units that have been required to expand the provision of public services as a consequence of large-scale development of coal mines and coal-using energy complexes or as a consequence of a major decline in coal mining.” (Montana Code Annotated 2019). The seven-member board meets quarterly to consider applications and award grants for infrastructure planning, health care, and other local services.

In the past decade, the board has awarded more than $7 million to governmental entities in Rosebud County: the cities of Colstrip and Forsyth, local school districts, Rosebud County, the Northern Cheyenne Tribe, and other taxing units such as fire districts (Montana Department of Commerce 2020). Grants to cities have primarily supported utilities and emergency services (including law enforcement), followed by grants to school districts. Grants to Rosebud County have primarily supported health programming and general expenses such as building construction. Across all grants, just $130,000 (1.9 percent) was awarded to projects with an explicit economic development focus (Figure 7).

Figure 7. Montana Coal Board Grants to Rosebud County Governments, 2009-2020



Data source: Montana Department of Commerce (2020). Notes: Data through March 2020. EMS includes fire and law enforcement.

Along with funding direct support from the coal board, the state has considered and enacted numerous pieces of legislation with significant bearing on Colstrip's future. These bills have focused on aspects of the state's coal transition: addressing or managing remediation and timing of power plant closure, linking that process to social and economic transition efforts, and preventing an early closure. Table 4 identifies these bills, notes whether they have been enacted, and provides a brief description. The discussion that follows provides additional detail.

To ensure public and environmental health for long-term rural economic development (BenDor et al. 2015; Haggerty et al. 2018; Hibbard and Lurie 2013), and in light of the many uncertainties surrounding the future of Colstrip, state legislators have enacted several bills

focused on the decommissioning, remediation, and environmental reclamation of coal mines and power plants. For example, the 2017 Coal-Fired Generating Unit Remediation Act (SB 339) required Colstrip's operators to submit an environmental remediation plan and outline the standards and extent of the cleanup they planned to pursue. In 2019, SB 264 amended the act to include labor standards, including prevailing wage standards, for workers carrying out these activities.

Table 4. Recent Montana Legislation Addressing Coal Facility Closure

Bill No.	Year	Status	Description
SB 339	2017	Enacted	Establish Coal-Fired Generating Unit Remediation Act
HB 22	2017	Enacted	Appropriate money to assist, intervene, plan for closure of coal-fired generation
HB 585	2017	Enacted	Provide loans to owner of coal-fired generating units
SB 338	2017	Not enacted	Propose Coal-Fired Generating Unit Mitigated Retirement Act
SB 191	2019	Enacted	Allow counties to establish coal trust fund
SB 201	2019	Enacted	Revise requirements to hold mining permit
SB 264	2019	Enacted	Revise laws related to coal-fired generation remediation activities
HB 292	2019	Enacted	Increase funding to coal board
HB 467	2019	Enacted	Authorize securitization for energy infrastructure
SB 33	2019	Not enacted	Allow NWE to purchase additional 150 MW share of Unit 4 of Colstrip Station for $1
SB 331	2019	Not enacted	Revise electric utility cost recovery for certain coal-fired generating units and transmission

Proposed and enacted legislation has also addressed the need for long-term planning in Colstrip, consistent with recent research emphasizing the importance of providing more certainty

about closure dates to facilitate transition planning (Roemer and Haggerty, forthcoming). However, as discussed in Section 1, considerable uncertainty remains about the timing and owner obligations of closing the plant. In 2017, HB 22 enabled state officials to represent Montana's interests in the settlement negotiations between PSE and WUTC, focused on decisions about decommissioning, remediation, and power replacement. That same year, SB 338—which was not enacted—would have required plant owners to file a retirement plan, allow for the development of a transition agreement, and create a retirement planning and grant program and account. In 2019, HB 467 authorized securitization for energy infrastructure, allowing electric utilities to raise revenue through bonds, lowering the costs of retiring or replacing assets. This approach, which has garnered interest in numerous states (Bodnar et al. 2020), could provide substantial revenue to support transition efforts in and around Colstrip.

Other legislation has focused on the economic impacts for affected communities. In 2019, HB 292 increased the share of the state's coal severance tax that is allocated to the coal board. In 2019, SB 191 allowed Rosebud and Big Horn counties to establish a coal trust fund, addressing a common challenge for resource-dependent counties, which often have limited fiscal autonomy and capacity to collect, save, and distribute natural resource revenues (Newell and Raimi 2018; Haggerty 2019).

Finally, in contrast to efforts aimed at managing the closure of Colstrip, some recent legislation has sought to prevent or limit the decline of coal in Montana. In 2017, HB 585 allowed the state's Coal Severance Tax Trust Fund, which was originally designed to support infrastructure and economic development needs, to potentially provide loans to facilitate the continued operation of coal-fired power generation in Montana. In 2019, the "Save Colstrip" bill

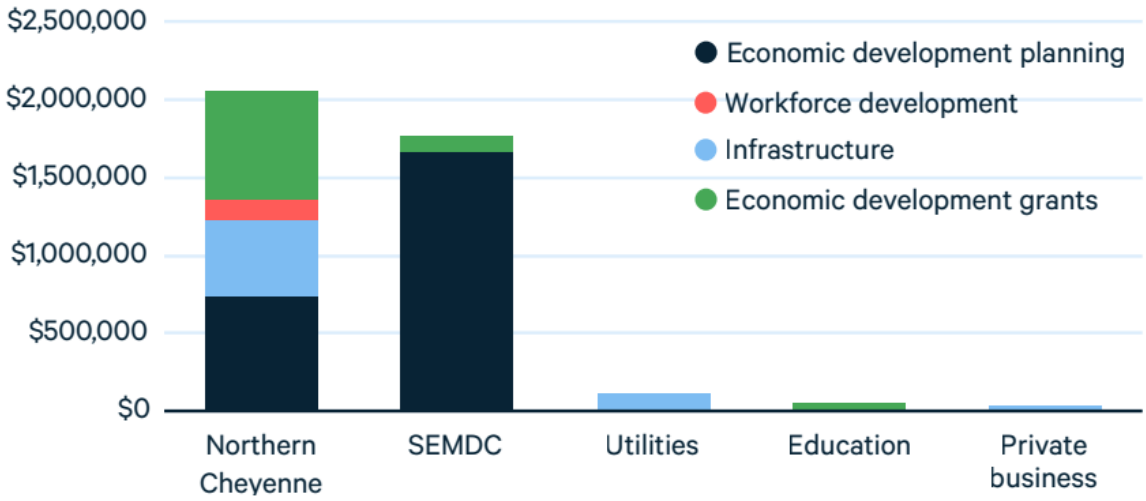
(SB 33) would have allowed NWE to purchase an additional 150- MW share of Unit 4 of Colstrip Station for $1 (Cates-Carney 2019). The proposal, which was not enacted, would have given NWE more control over the retirement date of Unit 4, which it has expressed interest in operating through 2045 (NWE 2019).

Federal Interventions

Along with those significant efforts at the state level, the federal government has provided consistent, if modest (roughly $4 million total from 2001 to 2018), support for regional economic development (Figure 8). The US Economic Development Administration has awarded annual grants to local and tribal entities for the continuation of their comprehensive economic development strategies as well several small grants for infrastructure projects. The USDA Rural Business-Cooperative Service has also been involved in the region, primarily through Rural Business Development Grants and the Rural Energy for America Program.

These funds have flowed primarily to the Northern Cheyenne Tribe and the Southeastern Montana Development Corporation, the regional economic development planning organization. The majority of the funding ($2.4 million) has supported economic development planning, economic development grants to businesses and other local entities ($850,000), and infrastructure development ($640,000).

Figure 8. Federal Economic Development Funds for Rosebud County, 2001-2018



Data source: USASpending (2020). Note: SEMDC = Southeastern Montana Development Corporation.

In addition to these grants, the federal government has provided funds to Colstrip and other Montana coal communities through the Partnerships and Opportunity Workforce and Economic Revitalization (POWER) Initiative. In 2017, the state Department of Labor and Industry was awarded $2 million, which has been distributed across worker retraining programs operated by local unions and higher educational institutions (Montana Department of Labor and Industry 2020). However, deploying these programs has been slowed by restrictions on eligibility, particularly the requirement that workers must be unemployed to enroll in a retraining program.

Local Environmental Issues and Opportunities

Like all coal-fired power plants, Colstrip generates significant quantities of waste products, particularly coal combustion residuals (CCRs), often referred to as “coal ash.” CCRs

are typically stored in “dry” landfill-type structures or “wet” ponds, which, if not constructed and managed properly, can contaminate local water resources.

Colstrip’s network of CCR impoundments, which in the past mostly consisted of ponds, exceeds 800 surface acres (Northern Plains Resource Council 2019), and numerous legal proceedings have documented an extensive legacy of groundwater contamination. Although small amounts of contamination were anticipated by the Montana Department of Environmental Quality (DEQ) when the ponds were permitted in the 1970s, the extent of groundwater pollution has substantially exceeded those expectations, and previous efforts to prevent the spread of contaminated water have failed (Montana DEQ 2020). In 2008, Colstrip’s owners settled a lawsuit brought by 57 individuals over water contamination associated with ash ponds, paying out $25 million to the plaintiffs (Halstead-Acharya 2008). In 2012, the owners entered an AOC with DEQ that requires the remediation of this pollution (Montana DEQ 2012).

The remediation process has required extensive study of local hydrogeology and produced reports documenting the spread of the pollution, finding that the plume has spread under parts of Colstrip and numerous nearby creeks (Montana DEQ 2020). For example, a 2019 report carried out as part of the AOC found that the levels of boron, cobalt, lithium, and molybdenum at nearby monitoring locations were substantially higher than background levels (Hydrometrics, Inc. 2020).

The AOC requires that Colstrip’s owners take numerous actions to reduce future leakage, monitor groundwater conditions, and address contamination where it is detected. This includes the addition of new synthetic liners to CCR impoundments and the installation of evaporation systems to reduce water volumes at ash ponds,

limiting the risk of future leakage. In addition, the owners are required to install capture systems and pumping equipment at sites where the plume is detected. As of early October 2020, the Montana DEQ has provided conditional approval to multiple aspects of the cleanup plan, and public comments are being collected (Montana DEQ 2020).

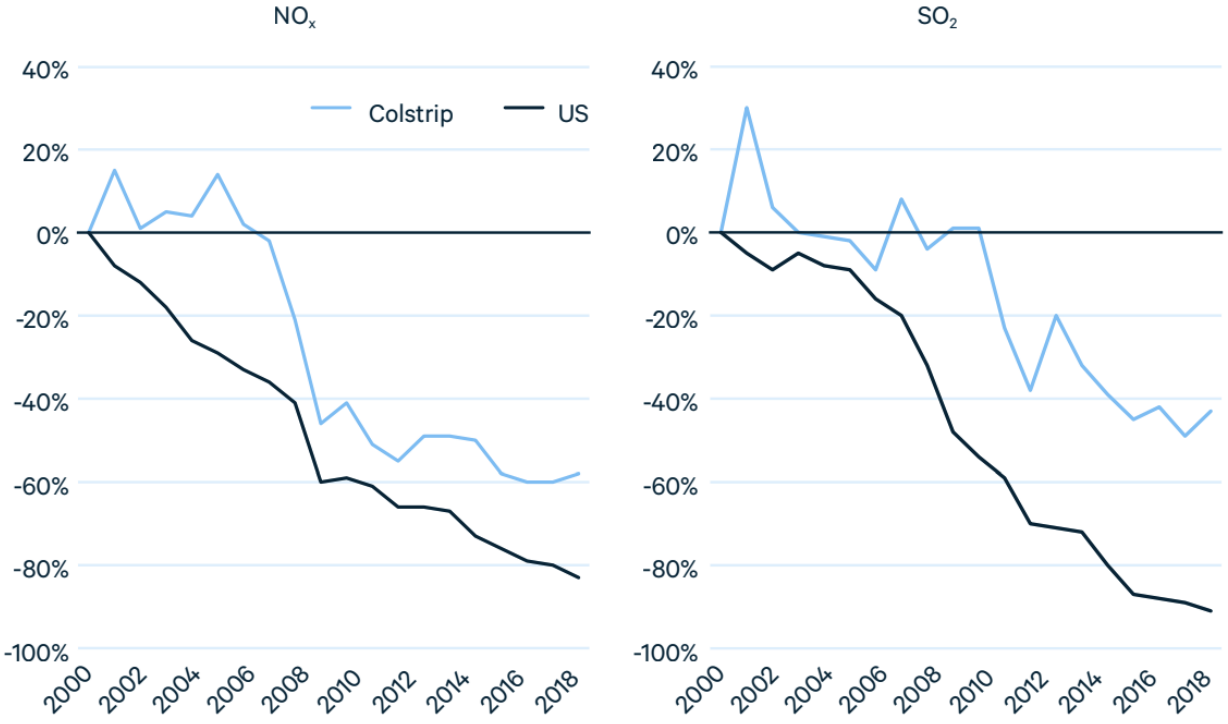
Environmental, Health, and Economic Impacts of Air and Water Pollution

Groundwater contamination in Colstrip not only affects local ecosystems through its connection with streams, but it also poses a potential risk to the health of Colstrip's residents and economy. As noted above, some of the plume extends beneath homes in Colstrip, and failure to halt further spread could contaminate groundwater under additional homes (though, as noted above, Colstrip's municipal water is supplied via a pipeline from the Yellowstone River).

In addition to risks associated with water, air emissions from coal-fired power plants contribute to respiratory and cardiovascular illness, causing large morbidity and mortality impacts around the world (Rauner et al. 2020). In the United States, modern coal-fired power plants include equipment to reduce these pollutants considerably, but they do not eliminate all emissions of concern, including nitrogen oxides (NOx), a precursor to ozone formation and fine particulate matter (PM), and sulfur dioxide (SO2), also a PM precursor (e.g., Henneman et al. 2019).

In Colstrip, pollution controls and reduced output have contributed to declines in these pollutants since 2000. However, SO2 and NOx emissions from the Colstrip plant have lagged reductions seen nationwide (Figure 9).

Figure 9. Nitrogen Oxides and Sulfur Dioxide Power Plant Emissions



Data source: EPA (2020a).

Additional data from the Environmental Protection Agency's Toxic Release Inventory database indicates that emissions of other chemicals of concern have declined considerably over roughly the past decade. In particular, air emissions of chromium and chromium compounds, which can increase risk of cancer and other diseases and have been the largest contributor to health risks from Colstrip's air emissions,[13] declined by more than 75 percent from 2007 to 2018 (EPA 2020b).

[13] Chromium and chromium compound emissions accounted for more than 97 percent in 2007 and 84 percent in 2018 of air emissions' health risk, as measured by their Risk-Screening Environmental Indicator scores (EPA 2020b).

Unfortunately, we are not aware of any studies that have examined the specific effects of water contamination or air emissions on the health of Colstrip residents. But in general terms, health risks—whether from water pollution, air pollution, or other sources—are often reflected in economic outcomes such as property values. A substantial body of research demonstrates that polluted sites considerably reduce the value of nearby property (Gamper-Rabindran and Timmins 2013; Guignet et al. 2016; Haninger et al. 2017; e.g., Zabel and Guignet 2012). And studies that demonstrate reduced property values because of pollution may underestimate the true health risks for residents, particularly if people do not have full information about the extent of local pollution (Hausman and Stolper 2020).

To the extent that air and water pollution harms the health or quality of life for Colstrip residents, some of these effects are likely reflected in lower property values. Of course, the closure of the power plant—without a new source of local employment and prosperity—would severely damage the local economy and reduce property values. These effects could be far more consequential than any reductions caused by pollution.

In sum, reduced air pollution from the Colstrip station has likely reduced public health risks, but the continuation of some of these air emissions coupled with the legacy of groundwater contamination poses ongoing concern for the local environment and local public health.

Economic Potential of Remediation

Access to a healthy environment, including clean water, is a prerequisite for long-term economic growth. Recognizing this reality, state legislators, plant owners, and other stakeholders have examined options for addressing the groundwater contamination in Colstrip. In addition to the long-term necessity of managing this legacy, cleaning up groundwater in Colstrip in the near

to medium term will require considerable resources, offering potential economic benefits for community members.[14]

In the short to medium term, plant decommissioning and environmental remediation efforts would offer business and employment opportunities. In the medium to long term, benefits would include reducing community health risks and enhancing property values, along with continuing (though more modest) employment opportunities associated with site cleanup and monitoring. One recent report (Northern Plains Resource Council 2019) assesses two options for pond closure and groundwater remediation, estimating that Talen's plan would cost roughly $400 million through 2069, while a "Doing It Right" plan would cost $925 million over the same period.14 Intuitively, the authors estimate that a higher level of investment would lead to more local jobs and higher incomes throughout the duration of cleanup and monitoring, which would likely provide ancillary benefits to the community as a whole.

One key question is whether employment opportunities generated from remediation activities would support workers displaced from jobs at Colstrip Station or the Rosebud mine. Although some activities (e.g., earth moving, project management) would be well matched to the skill sets of some plant and mine workers, other jobs (e.g., groundwater modeling and monitoring) are not a clear match. It is unclear whether and to what extent state policymakers would be able to ensure that remediation jobs benefited the local workforce and community.

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[14] For explorations of a "restoration economy" or a "new natural resource economy," where environmental remediation boosts economic activity nationwide, see BenDor et al. (2015) and Hibbard and Lurie (2013), respectively.

Discussion and Key Insights

For isolated rural communities such as Colstrip, the decline of coal poses enormous challenges and raises questions about the future viability of the community. The town, which was purpose-built for producing coal, is overwhelmingly reliant on its mining, processing, and use. At the same time, the waste products generated from burning that coal have created significant environmental degradation that poses another long-term challenge to Colstrip's public health and economy.

Colstrip is not a unique case. Other cities and towns, particularly isolated communities in the West such as Craig, Colorado, and Mercer, North Dakota, face similar challenges from the closure of coal-fired power plants and mines. Additional cities and towns, less isolated but still heavily reliant on coal, oil, or natural gas to sustain local economies, may face similar—albeit less acute—challenges in the years and decades ahead.

To help support communities in transition, we offer several key insights from the Colstrip experience for policymakers, community leaders, and other stakeholders:

- Deep uncertainty makes planning difficult, if not impossible, for communities in transition. For Colstrip, this uncertainty stems from complex ownership structures and competing priorities for policymakers in Montana and nearby states. In the absence of certainty, some state and local efforts have focused on maintaining the status quo rather than proactive planning, ultimately hindering the ability to facilitate a successful transition.

- Future climate policy can support planning efforts in communities like Colstrip by aiming to provide some indication about the timeline of emissions reductions, thereby informing decisions about the timing of plant or mine closures. In addition, state and federal policymakers could support local planning efforts directly, by providing funds and technical assistance that takes advantage of existing economic development resources.
- This case demonstrates that funding for transition planning often emerges from ad hoc, uncoordinated processes playing out in boardrooms and state utility proceedings and among local stakeholders. Planning efforts would be enhanced if communities, regulators, plant operators, and others coordinated their activities and funding decisions with clearly defined goals, similar to the approach recently established in Colorado and New Mexico.
- In the absence of certainty and coordination, much of the responsibility for transition planning, including the need to find funding to support these efforts, falls on the local community. However, not all communities have the capacity or inclination to take a proactive planning approach, reducing the likelihood of developing and implementing a successful transition strategy. Policies that build local capacity, such as technical assistance or grants to support planning processes, could increase communities' ability to plan proactively.
- Isolated communities in transition may face a declining population and shrinking tax base in the years ahead. If so, local stakeholders need to consider how to right-size government services and develop new, if more modest, drivers of local employment and prosperity.

- Environmental remediation activities, including cleaning up polluted groundwater and reclaiming mines, have the potential to provide short- and medium-term employment opportunities. However, absent more detailed information on the benefits associated with different levels of remediation, it is unclear what the "right" level of investment should be to carry out these activities. Additional research to better characterize the environmental, health, and other benefits of remediation would help inform these decisions.

Conclusion

Socioeconomic vulnerability to the decline of the coal industry varies widely, but in the US West, it is associated with rural communities in remote, isolated geographies. For communities like Colstrip, Montana, the decline of the coal industry poses acute economic impacts, including structural changes in employment and significant declines in revenue that threaten the viability of the town's critical institutions, services, and infrastructure. In Colstrip, transition planning efforts led by local stakeholders have been hamstrung by uncertainty about whether and when the plant will close, which is exacerbated by the plant's complex ownership structure.

Although the state of Montana has a clear set of policies addressing planning for coal plant decommissioning and environmental remediation, it has not provided substantial resources or a framework that facilitates planning for the social and economic impacts of closure. This is in stark contrast to recent state policies enacted in Colorado and New Mexico. Federal grantmaking has provided some support for economic development planning and workforce retraining in the

region, but these efforts have been modest, and some grants have come with restrictions that limit their effectiveness in supporting worker retraining.

By characterizing the transition process under way in Colstrip, this case study highlights the challenges facing communities whose economies depend on coal. It illustrates the need for a planning framework that can enable workers, communities, governments, and businesses to coordinate their efforts in planning for the future and identifies some of the roadblocks to that coordination.

Policy interventions aimed at mitigating the social and economic impacts of an energy transition—whether away from coal or any other energy source—can support workers and communities by providing additional certainty over funding and timelines. In addition, policy efforts can support workers and communities by coordinating regional resources to plan for transitions that are region- and context-specific, including the potential for linking environmental remediation activities with local economic development and employment opportunities.

References Cited in Chapter Three

BenDor, T., T. W. Lester, A. Livengood, A. Davis, and L. Yonavjak. 2015. Estimating the Size and Impact of the Ecological Restoration Economy. PLOS ONE 10(6):e0128339

Bodnar, P., M. Gray, T. Grbusic, S. Herz, A. Lonsdale, et al. 2020. How to Retire Early: Makin Accelerated Coal Phaseout Feasible and Just. Basalt, CO: Rocky Mountain Institute.

Brown, M. 2015. Colstrip Gets New Operator as PPL Spins Off Montana Assets. Billings Gazette, June 1.

Cates-Carney, C. 2019. House Committee Hears Controversial “Save Colstrip” Bill. Montana Public Radio, April 8.

City of Colstrip. 2020a. About Colstrip. https://cityofcolstrip.com.

City of Colstrip. 2020b. Water Treatment. www.cityofcolstrip.com.

Coal Transportation Agreement between the Montana Power Company and Puget Sound Power & Light. 1981. Accessed via US Securities and Exchange Commission website via: https://www.sec.gov/Archives/edgar/data/106455/000103570407000530/d48339ex-v10w2.htm.

Colstrip City Council Chambers. 2018. CCIAG Meeting Minutes, April 16.

Colstrip Community Impact Advisory Group (CCIAG). 2018. CCIAG Plan. http://cciag.mt.gov/Portals/190/Documents/2018%20Final%20CCIAG%20Plan.pdf?ver=2019-01-11-112905-077

Commander, S. 2018. One-Company Towns: Scale and Consequences. IZA World of Labor,

https://wol.iza.org/articles/one-company-towns-scale-and-consequences.

Ehrenfeucht, R., and M. Nelson. 2011. Planning, Population Loss and Equity in New Orleans after Hurricane Katrina. Planning Practice & Research 26(2): 129–46.

Energy Information Agency (EIA). 2020a. Detailed data from the EIA-7A and the US Mine Safety and Health Administration. US Department of Energy, Washington, DC

Energy Information Agency (EIA). 2020b. Form EIA-923 detailed data with previous form data (EIA-906/920). US De- partment of Energy, Washington, DC.

Environmental Protection Agency (EPA). 2020a. Power Plant Data Viewer. Washington, DC.

Environmental Protection Agency (EPA). 2020b. Toxics Release Inventory Database. Washington, DC.

Gamper-Rabindran, S., and C. Timmins. 2013. Does Cleanup of Hazardous Waste Sites Raise Housing Values? Evidence of Spatially Localized Benefits. Journal of Environmental Economics and Management 65(3): 345–60.

Gerking, S., and S. F. Hamilton. 2008. What Explains the Increased Utilization of Powder River Basin Coal in Electric Power Generation? American Journal of Agricultural Economics 90(4): 933–50.

Guignet, D., P. J. Walsh, and R. Northcutt. 2016. Impacts of Ground Water Contamination on Property Values: Agricultural Run-off and Private Wells. Agricultural and Resource Economics Review 45(2): 293–318.

Haggerty, J. H., M. N. Haggerty, K. Roemer, and J. Rose. 2018. Planning for the Local Impacts of Coal Facility Closure: Emerging Strategies in the U.S. West. Resources Policy 57: 69–80

Haggerty, J. H., K. B. Walsh, M. Haggerty, and J. Rose. 2017. Colstrip: The Status of Key Policies and Decision Processes. Montana State University, Bozeman.

Haggerty, M. 2019. Replacing Coal Revenue and Investing in Economic Transition: Solutions for Coal-Dependent Communities. Headwaters Economics, https://headwaterseconomics.org/energy/coal/solutions-for-coal-communities/.

Haggerty, M. 2020. Financial Modernization and Risk Analysis Study (MARA). Report prepared for Montana Legislative Fiscal Division, Helena.

Halstead-Acharya, L. 2008. Colstrip Companies Paying $25M in Water Lawsuit. Billings Gazette, May 2.

Haninger, K., L. Ma, and C. Timmins. 2017. The Value of Brownfield Remediation. Journal of the Association of Environmental and Resource Economists 4(1): 197–241

Hausman, C., and S. Stolper. 2020. Inequality, Information Failures, and Air Pollution. Working Paper Series 26682, National Bureau of Economic Research, Cambridge, MA.

Henneman, L. R. F., C. Choirat, and C. M. Zigler. 2019. Accountability Assessment of Health Improvements in the United States Associated with Reduced Coal Emissions between 2005 and 2012. Epidemiology 30(4): 477–85.

Hibbard, M., and S. Lurie. 2013. The New Natural Resource Economy: Environment and Economy in Transitional Rural Communities. Society and Natural Resources 26(7): 827–44.

Hummel, D. 2015. Right-Sizing Cities: A Look at Five Cities. Public Budgeting and Finance 35(2): 1–18.

Hydrometrics, Inc. 2020. 2019 Annual Groundwater Monitoring and Corrective Action Report: Talen Energy, LLC Colstrip Steam Electric Station. Prepared for Talen Montana, LLC, Per 40 CFR Section 257.90(e), Billings, MT.

Just Transition Fund. Planning for the Long-Term: How to Replace Lost Revenue. https://www.justtransitionfund.org/overview.

Larson. 2019. Ownership Shakeup at Colstrip Coal Power Plant. POWER, December 12. Leonardo Technologies, Inc. 2018. Colstrip Power Plant Study. Contract No. GS-23F-0231R,

Order No. DE-FE0022594; DE-BP0005235. Prepared for Office of Fossil Energy, US Department of Energy.

Lutey T. 2019. Rosebud Mine, Post Bankruptcy, Is Stable until Year's End. Billings Gazette, March 21.

Martin, J., and T. Everts. 2002. Electrical Utility Industry Restructuring Transition Advisory Committee: A Report to the Governor and the 58th Legislature. Montana Legislative Services Division, Helena.

Montana Code Annotated. 2019. Part 2. Coal Impacts: Evaluation and Abatement Funding. https://leg.mt.gov.

Montana Department of Commerce. 2020. Funded Projects. Helena.

Montana Department of Labor and Industry. 2020. Montana Power Initiative. http://cciag.mt.gov/Portals/190/POWER_Initiative_Grant_OneSheet-Accessible.pdf?ver=2018-09-24-084430-803

Montana Department of Environmental Quality (DEQ). 2012. Administrative Order on Consent Regarding Impacts Related to Wastewater Facilities Comprising the Closed-Loop System at Colstrip Steam Electric Station, Colstrip Montana. Helena.

———. 2020. Colstrip Steam Electric Station Coal Ash Ponds: FAQs. https://deq.mt.gov/DE-QAdmin/mfs/ColstripSteamElectricStation.

Montana Governor's Office. 2017. Governor Bullock and Attorney General Fox Announce Stakeholder Group to Help Community, Workers and Families of Colstrip Plan for the Future. Press release. Helena.

Montana Legislature. 2020. MIC City and County Finances Report. Helena.

Montana Office of Public Instruction. 2020. Understanding Montana School Finance and School District Budgets. School Finance Division, Helena, MT

MSHA. 2020. Mine Employment and Coal Production. US Department of Labor, Washington, DC.

Newell, R. G., and D. Raimi. 2018. The Fiscal Impacts of Increased U.S. Oil and Gas Development on Local Governments. Energy Policy 117: 14–24.

Northern Plains Resource Council. 2019. Doing It Right II: Job Creation through Colstrip Cleanup. https://northernplains.org/colstrip-jobs-study-2/.

NorthWestern Energy (NWE). 2019. NorthWestern Energy to Acquire 25% Share of Colstrip; Plans to Reduce Carbon by 90%. Press release. www.northwesternenergy.com.

Nowakowski, S. 2018. SJ 5: Coal in Montana: Changing Times, Challenging Times. Report to Montana Legislature. Environmental Quality Council, Legislative Environmental Policy Office, Legislative Services Division, Helena.

PacifiCorp. 2019. 2019 Integrated Resource Plan. https://www.pacificorp.com/energy/integrated-resource-plan.html.

Portland General Electric (PGE). 2019. Integrated Resource Planning. https://www.portlandgeneral.com/our-company/energy-strategy/resource-planning/integrated-re- source-planning.

Public Service Commission. 2020. Minutes for the Week of August 24, 2020. Helena, MT. https://dataportal.mt.gov/t/DOAPSC/views/EDDISearch_15650306559830/PSCEDDISearch?:embed=y&:showShareOptions=true&:display_count=no&:-showVizHome=no&:refresh=true&Type=Minutes

Raimi, D., and R. G. Newell. 2016. Dunn County and Watford City, North Dakota: A Case Study of the Fiscal Effects of Bakken Shale Development. Working paper. Duke University Energy Initiative, Durham, NC.

Rasker, R., P. H. Gude, J. A. Gude, and J. van den Noort. 2009. The Economic Importance of Air Travel in High-Amenity Rural Areas. Journal of Rural Studies 25(3): 343–53.

Rauner, S., N. Bauer, A. Dirnaichner, R. V. Dingenen, C. Mutel, and G. Luderer. 2020. Coal-Exit Health and Environmental Damage Reductions Outweigh Economic Impacts. Nature Climate Change 10(4): 308–12.

Robertson, D. 1979. Power Plant and Industrial Fuel Use of 1978: Fuel Replacement. Harvard Environmental Law Review 3: 214–35.

Roemer, K.F. and Haggerty, J.H. 2021. Coal Communities and the US Coal Transition: A Policy Corridors Assessment (In Press). Energy Policy.

Southeastern Montana Development Corporation (SEMDC). 2017. Colstrip Economic Diversification Strategy. Colstrip, MT: https://www.nado.org/wp-content/uploads/2017/12/Colstrip-Econ-Diversification-Report-Reduced-Size-1.pdf

Smith, K. K., J. H. Haggerty, D. L. Kay, and R. Coupal. 2019. Using Shared Services to Mitigate Boomtown Impacts in the Bakken Shale Play: Resourcefulness or Over-adaptation? Journal of Rural and Community Development 14(2).

State of Washington. 2011. Memorandum of Agreement between the State of Washington and TransAlta Centralia Generation LLC. Olympia, WA. https://ecology.wa.gov/DOE/files/85/858591f6-dd25-47be-ba1d-0f58264ca147.pdf

Talen Energy. 2019. Colstrip Steam Electric Station Units 1 and 2 to Retire. Press release. https://talenenergy.investorroom.com.

Taimerica Management, Competitive Solutions, Trent Lott National Center. 2017. The Changing Coal Industry: Regional Economic Impacts, Workforce Analysis, Transition Strategies. Report prepared for Montana Coal Country Coalition. Mandeville, LA. https://www. bigskyeconomicdevelopment.org/wp-content/uploads/Coal-Country-Coalition-Re- port-FINAL-3-17.pdf

US Bureau of Reclamation. 1971. North Central Power Study. Department of Interior, Washington, DC.

USASpending. 2020. USASpending.gov. Washington, DC.

Wagner, B. 2018. Local Tax Impacts of Colstrips 1&2 Closure. Research and Analysis Bureau, Montana Department of Labor and Industry, Helena.

Westmoreland Mining, LLC. 2019. Westmoreland Rosebud Mining LLC Announces New Coal Supply Agreement for Colstrip Units 3&4. Press release. https://westmoreland.

com/2019/12/westmoreland-rosebud-mining-llc-announces-new-coal-supply-agree- ment-for-colstrip-units-34/

Washington Utilities and Transportation Commission (WUTC). 2017. WUTC v. PSE, UE-170033 and UG-170034, before the Washington Utilities and Transportation Commission (2017)

Washington Utilities and Transportation Commission (WUTC). 2018 Settlement reached in Avista/Hydro One merger case. Press Release. https://www.utc.wa.gov/aboutUs/Lists/News/DispForm.aspx?ID=510

Washington Utilities and Transportation Commission (WUTC). 2019. Washington UTC Approves Multiparty Settlement in Avista Rate Case. Press release. https://www.utc.wa.gov/aboutUs/Lists/News/DispForm.aspx?ID=636&ContentTypeId=0x010400FF58A04FBD57384DB60A5ECF52665206

Washington Utilities and Transportation Commission (WUTC). 2020. UTC Staff Recommend Denying PSE's Request to Sell Colstrip Unit 4 Interests. Docket Number UE-200115. Press release. https://content.govdelivery.com/accounts/ WAUTC/bulletins/2a43d88

Zabel, J. E., and D. Guignet. 2012. A Hedonic Analysis of the Impact of LUST Sites on House Prices. Resource and Energy Economics 34(4): 549–64.

CHAPTER FOUR

THE ENERGY TRANSITION AS FISCAL RUPTURE: PUBLIC SERVICES AND RESILIENCE PATHWAYS IN A COAL COMPANY TOWN

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Introduction

Climate scientists call for a deep decarbonization of the U.S. energy system to reduce greenhouse gas emissions and mitigate the intensifying impacts of climate change (IPCC, 2021; National Academies of Sciences Engineering and Medicine, 2021). Beyond deploying new technologies, a zero-carbon emission transition will cause far-reaching and unprecedented changes in all aspects of society. In fossil-fuel-dependent communities and regions, the energy transition will catalyze deindustrialization and economic restructuring (Gallagher and Glasmeier, 2020; Peluso et al., 2020). Recent scholarship has considered the fiscal relationship between fossil fuel revenue and public finance and its implications for state and local governments (Haggerty, 2019a; Morris et al., 2021; Raimi et al., 2022b). Public finance systems in energy-producing states often rely on fossil fuel revenue sources such as severance taxes, federal mineral payments, sales taxes, income taxes, and property taxes (Raimi et al., 2022b). Fiscal dependence on fossil fuel revenues reinforces political resistance to energy transition (Godby et al., 2019; Righetti et al., 2021) and presents significant risks to maintaining local public service provision after a low-carbon transition (Barro et al., 2021).

Even in the absence of robust climate policy, coal-dependent communities across the U.S. are already in transition: aging coal-fired power plants are retiring, mine extraction is decreasing, and consequently, revenues are in decline (Cates and Eaton, 2019; Godby et al., 2015; Morris et al., 2021). In resource-dependent and rural regions like the interior West (Haggerty et al., 2018), Appalachian Ohio (Jolley et al., 2019), and West Virginia (Morris et al., 2021), public services like education, public safety, and health services are particularly vulnerable to revenue decline. Rural communities must rely on endogenous capacities and

resources to navigate the complexities of the coal transition, with limited policy guidance from federal and state partners (Roemer and Haggerty, 2021). Stable services and infrastructure are critical to rural communities' success and provide the capacities needed to endure social, public health, and economic crises (Brosemer et al., 2020; Sullivan et al., 2014). Resource towns experiencing deindustrialization must sustain public services and infrastructure in order to build a foundation for revitalization (Halseth et al., 2003). However, most federal assistance dedicated to the economic aspects of transition cannot offer direct revenue replacement or stabilize existing services (Look et al., 2021; Roemer and Haggerty, 2021). Therefore, the risks to public services—though profoundly consequential for rural communities in resource peripheries—are often ignored and poorly understood. Further, fiscal pressures to service provision are exacerbated by the ongoing public infrastructure crisis in which rural areas are grappling with severe underinvestment, and aging and neglected systems (American Society of Civil Engineers, 2018).

To respond to calls for increased social science research on the social and economic disruptions experienced in legacy fossil communities (Bazilian et al., 2021), this paper applies community resilience theory to the ongoing industrial transition in Colstrip, Montana. Colstrip—a remote, coal-dependent community in the Powder River Basin, USA—is home to the mine-mouth power plant, the Colstrip Electric Steam Station (hereafter "Colstrip Station"). Colstrip Station's scheduled retirement threatens the town's economic viability and could cause a "transitional rupture" in the community's resilience (Wilson, 2014). According to transition theory, while transitional ruptures represent major inflection points in a community's development trajectory, their outcomes (negative or positive) depend on how the local context

interacts with broader exogenous factors (Wilson, 2012). When applied to industrial transitions, the framework assesses how the dynamics of plant closure, alongside endogenous capacities, will affect the community's ability to embark on resilient future pathways. To better support community resilience through economic transitions, it is important to evaluate how services will be affected by the dynamics of industrial closure embedded in the U.S. energy transition.[15]

This paper first situates public services within the community resilience literature and scholarship on natural resource dependence. The following section outlines our mixed-method approach, which draws on coal revenue and property tax data and qualitative interviews with key stakeholders to understand how closure could impact community service provision and community resilience. Section 4 uses historical narrative to describe case study context. The findings and discussion section are organized in three parts: fiscal assessment, service provision impacts, and implications for community resilience. We conclude with recommended directions for future policy and research.

Community Resilience and Public Services in Resource Peripheries

The concept of community resilience, which describes how a social system responds to disruption, is frequently applied to rural contexts experiencing environmental change and economic uncertainty (Scott, 2013; Wilson, 2010). Here, we conceptualize resilience as a

[15] While the term "energy transition" implies a change from one type of energy infrastructure to another, local economies dependent on fossil fuel activities (e.g., mining, processing, and generation) will actually experience industrial closure. The "transition" *to* alternative economies, including new sources of energy employment and exports, is not guaranteed for such places (Power et al., 2015). In this paper, we refer to transition and closure more or less interchangeably, given the focus on a coal-dependent local economy.

function of the strengths or characteristics that lead to agency and self-organization in place-based communities (Berkes and Ross, 2013). Key features of community resilience include: strong social capital based on trust and relationships between individuals and organizations within and beyond the community (Besser et al., 2008; Harrison et al., 2016; Reimer, 2002); inclusive and collective governance systems (Kulig et al., 2013; Norris et al., 2008); willingness to learn, self-organize, and problem solve (Berkes, 2009; Wilson, 2012); and strong institutions and entrepreneurial social infrastructure (Flora et al., 1997; Morrison, 2014). These factors contribute to a community's adaptive capacity, or actors' capacity to influence community resilience (Berkes and Ross, 2013; Folke et al., 2005). Recently, community resilience literature has incorporated concepts from evolutionary economic geography (e.g., path dependency) to theorize how a community's resilience corresponds with previous development decisions and ongoing processes of change and adaptability (Pike et al., 2010; Scott, 2013). An evolutionary approach to resilience shows how external shocks interact with a community's endogenous capacities and path dependencies, including long-term socio-spatial and restructuring processes (Pike et al., 2010).

Public services and service infrastructure are essential for the success, sustainability, and resilience of rural communities (Halseth et al., 2019). Community health, education, and public safety services protect and advance community health and well-being (Sullivan et al., 2014). Services also facilitate other important aspects of resilience like social cohesion, shared values, sense of place, and social capital (Reimer, 2002). However, the rural context also presents challenges for public services provision (Halseth et al., 2019). Long distances and low population densities increase per capita delivery costs—what Kraenzel (1955) calls the "social

cost of space." Furthermore, decades of neoliberal public policies marked by "reactionary incoherence" have fundamentally restructured rural service delivery, resulting in an uneven spatial distribution of service capacities (Halseth et al., 2019, 2003; Hayter, 2017; Morrison et al., 2015). This economic restructuring can result in the regionalization of services and service reductions, potentially eroding the local support necessary for economic renewal and transition (Halseth and Ryser, 2006). Case studies on health and eldercare services in rural Canada and New Zealand explain how communities fill these gaps, with varying degrees of success, by engaging volunteers and developing partnerships to reorient, stabilize, and 'right-size' services (Nel et al., 2019; Ryser and Halseth, 2014; Skinner et al., 2014). There is an urgent need and opportunity to implement alternative service delivery models in rural contexts – however, efforts to renew and replace outdated infrastructure and the delivery of services are significantly challenged by the fiscal and policy realities of the 21st century (Halseth et al., 2019).

Public services and resilience in resource peripheries are also shaped by historical industrial development and natural resource dependence. Scholarship on resource dependence offers important insight into how the 'unruliness' of natural resource dependence challenges long-term community and economic development outcomes in resource peripheries (Markey et al., 2012; Smith and Haggerty, 2020). Staple commodity-producing regions are often unable to leverage resource production into economic diversification due to remoteness, specialized infrastructure, and specialized labor skills (Innis, 1929; Watkins, 1963). At the community level, an overadaptation of built and social infrastructure reinforces dependence, leading to persistent underinvestment in other areas of community development (Freudenburg, 1992). Moreover, the strong cultural ties that extractive industries engender in host communities perpetuate "addictive

economies" (Freudenburg, 1992) or "cognitive lock-in effects" (Hudson, 2005), influencing stakeholder expectations about employment and economic development, contributing to reluctance of many communities to choose alternative development pathways (Wilson, 2012). Scholars have voiced critical concerns about closely intertwined resource development and service provision. For example, Cheshire's (2010) study of remote mining regions in Australia questions the long-term sustainability of "filling the gaps" with industry-provided essential health, education, and community facilities. Additionally, research from the boomtown context of unconventional oil and gas development in North Dakota describes the dangers of tying public services to volatile and unpredictable extractive industries, including ongoing uncertainty, long-term debt, and the sudden expansion or retraction of services (Smith et al., 2019; Smith and Haggerty, 2020). Depending on uncertain natural resource revenue risks the stability of public service provision (Newell and Raimi, 2018a, 2018b).

The United States' energy transition demands widespread closure of coal-fired power plants and a significant decrease in domestic coal mine extraction. Potential impacts in coal resource peripheries—like the Powder River Basin—include labor disruptions, limited opportunities to replace economic base activity, and the loss of tax revenue to support public services (Cates and Eaton, 2019; Godby et al., 2015; Haggerty et al., 2018; Morris et al., 2021). States and communities with coal extraction and electricity generation facilities have enjoyed decades of substantial, stable revenue through taxes, royalties, and fees (Godby et al., 2015). Losing this revenue could cause "fiscal collapse" in local and state budgets and limit communities' abilities to raise revenue, repay debts, maintain existing infrastructure and provide public services (Haggerty, 2019a; Morris et al., 2021). A successful "fiscal transition" would

allow communities to "replace coal revenue and…fund local services, infrastructure, and institutions with stable and diverse sources" (Haggerty, 2019b, p. 2). However, without policy tools to address the fiscal aspect, local and state governments express a limited willingness to plan for transition (Righetti et al., 2021; Roemer and Haggerty, 2021). Facility closures threaten community economic viability, not only in terms of job losses but with fiscally profound impacts on public services and community resilience. The potential damage to public revenue is intensified in communities hosting mine-mouth coal-fired power plants—losing two industrial facilities erodes multiple sources of revenue. To better support communities navigating disruption, scholars must empirically investigate how the fiscal aspects of transition materialize 'on the ground.'

This article contributes to scholarly and policy discussions about transitions in resource peripheries. Drawing on mixed methods, this paper conceptualizes the resilience of coal-dependent communities experiencing the fiscal transitions associated with plant closure. Specifically, it considers how the U.S. energy transition will (re-)shape the provision of public services in a small, coal-dependent town.

Methods

This study utilized property tax and revenue data, semi-structured interviews with stakeholders, and content analysis of planning documents, financial reports, and news media to answer the following questions: What risks does transition pose for local government revenues? How is transition affecting local service provision funding priorities? What are the implications for resilience in a remote resource periphery? We used publicly available fiscal data from 2010 to 2020 (Table 5) to explore the City of Colstrip and Rosebud County's fiscal relationship to the

coal industry. These data revealed the share of total revenue from coal plant property taxes in Colstrip and from coal plant property taxes and coal extraction payments in Rosebud County.

Table 5. Fiscal Data Sources

Level of government/source of revenue	Data Source
City of Colstrip - Property taxes from the coal-fired power plant	• Property Tax Class - Department of Revenue • Mill Levies - Department of Revenue Biennial Reports • Total Revenue - Audit/Financial Review Reports - Local Government Services • Annual Financial Reports
Rosebud County – Property taxes from the coal-fired power plant; County payments for coal extraction	• Local Share of Coal Gross Proceeds - Biennial Reports • Federal Mineral Royalties - MACO • Total Revenue – Audit/Financial Review Reports - Local Government Services • Annual Financial Reports • Property Tax Class and Mill Levies – Department of Revenue Biennial Reports

To better understand how the transition's fiscal dimensions will affect local service provision, we conducted semi-structured interviews with key stakeholders. We sought to interview people who could speak to service provision in both a contemporary and historical context. These directors, board members, stakeholders, and service providers explained broader transition efforts and provided background and clarifying information (Hibbard and Lurie, 2013). Between August 2021 and December 2021, 25 qualitative, semi-structured interviews were conducted with (city, county, state) government officials (5), community and economic development professionals (4), expert stakeholders (3), and service providers in health care (2), education (3), public safety (3), and municipal water infrastructure (5). Interviews were transcribed verbatim and uploaded into ATLAS.ti for analysis. The interview transcripts were

coded using continually expanding categories that could be collapsed and refined throughout repetitive coding sessions. Additional background research included reviewing news articles, community planning documents, policy memos, and annual financial reports. This content analysis helped characterize Colstrip's public service landscape and the limitations of its industrial history and remote geography. The first author also attended public meetings and community events from 2017 to 2022 to better understand the decision-making environment within which local leaders were responding to the fiscal impacts of coal decline.

Following the community resilience and resource dependence literatures, this study conceptualizes public services as both an adaptive capacity and a vulnerability. Like other community resilience capacities, they evolve over time and respond to past development decisions (Wilson, 2014). The next section identifies three inflection points in the town's history and considers how they impact the contemporary service landscape and revenue models: 1) the early history as a "company town," 2) electric utility deregulation, and 3) the town's incorporation and the subsequent coal decline and economic transition. This historical trajectory underscores the constraints posed by fiscal policy and their implications for service delivery.

Case Study Context: Colstrip, Montana

The town of Colstrip (est. population 2,096) is a rural community in Rosebud County (est. population 8,329) in the high plains of southeastern Montana (U.S. Census Bureau, 2020). The community sits roughly 20 miles north of the Northern Cheyenne and Crow Native American reservations. Rosebud County is considered economically "isolated" (Rasker et al., 2009) because Billings, Montana (est. population 117,116) – the nearest large city with regular air service – is located more than 100 miles to the west. Colstrip is located in the northern part of

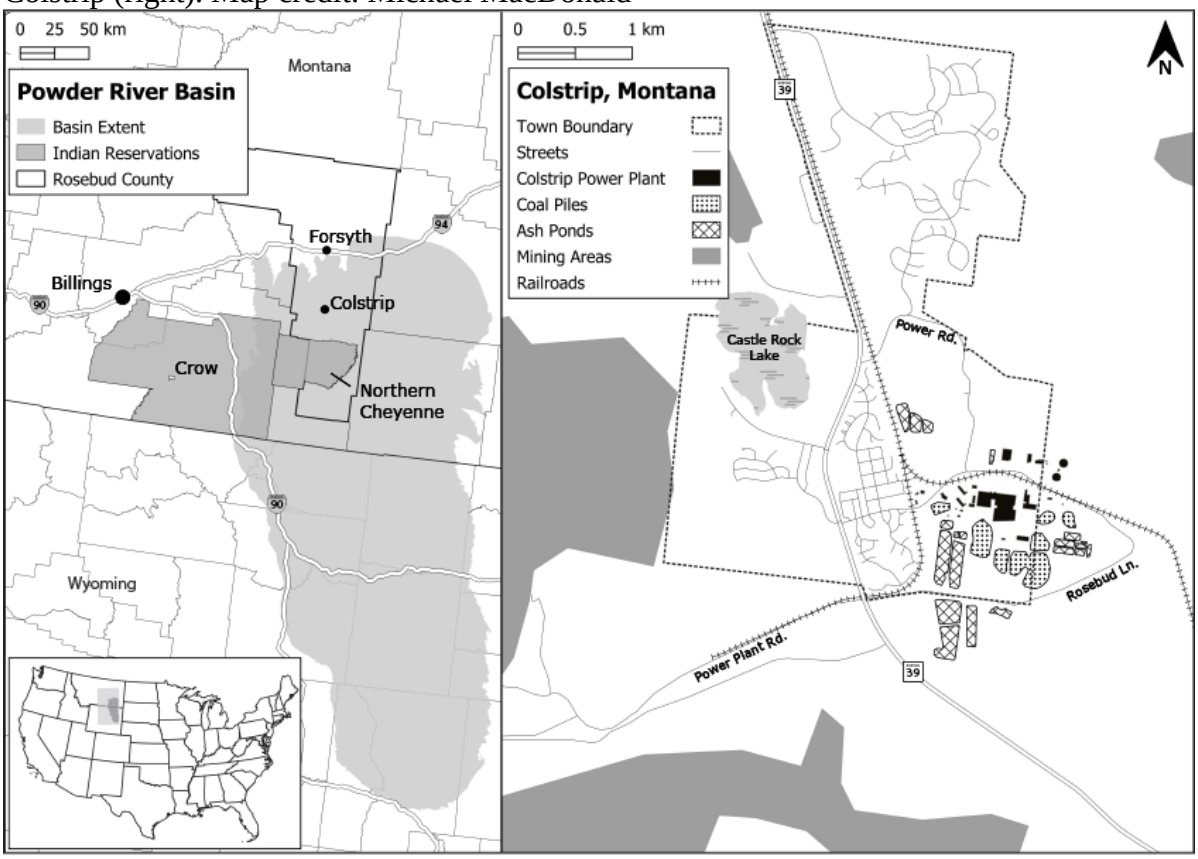
the Powder River Basin (Figure 10), one of the largest deposits of sub-bituminous coal in the world and currently the leading source of thermal coal in the U.S. (U.S. EIA, 2019). In 1970, Rosebud County's population was 6,044 and nearly one-third of jobs were based in farm and agricultural services (U.S. Department of Commerce, 2021). The median household income in Colstrip ($90,263) is more than $30,000 higher than that of Rosebud County ($57,769) or state of Montana ($56,539) (U.S. Census Bureau, 2020). Population in both Colstrip and Rosebud County did not change between the 2010 and 2020 census. The median age in Colstrip has increased by 33.5 percent between 2010 and 2020, from 35.5 to 47.4, and the town exhibits a 1:1 female-to-male gender ratio (U.S. Department of Commerce, 2020).

Coal extraction in the Powder River Basin surged in the mid-1970s (Wyoming Mining Association, 2018) because of federal efforts to address issues of fuel scarcity, energy independence, and the Clean Air Act's restrictions on sulfur dioxide emissions (Robertson, 1979). The 1975 Energy policy and Conservation Act encouraged rapid development of centralized, coal-based electricity infrastructure (consisting of new strip mines, railroads, mine-mouth power plants, and high voltage transmission lines) to export electricity from the remote, isolated communities to urban centers in other states ("The Energy Policy and Conservation Act (P.L. 94-163, 42 U.S.C. 6201)," 1976). Furthermore, the market for western coal exports expanded geographically with rail freight deregulation initiated by the Staggers Rail Act of 1980. Substantial declines in the mine-mouth price of coal, railroad freight rates, and rail transportation costs led to increased utilization of Powder River Basin coal in power plants across the United States (Gerking and Hamilton, 2008). Federal policy and market conditions of the 1970s and

early 1980s enabled rapid development of a built environment highly adapted to coal exports in energy-producing communities such as Colstrip.

For the last 50 years, Colstrip Station—with four coal-fired generating units and a total built generating capacity of 2,094 MW— was the second-largest coal-fired power plant in the U.S. West. It is a mine-mouth power plant, meaning that all its coal arrives by conveyor system from the nearby Rosebud Mine owned by Westmoreland Rosebud Mining, LLC. Units 1 and 2 began operating in 1975 and 1976 respectively and had a combined capacity of 614 MW. Units 3 and 4 began operating in 1984 and 1986, with 1,480 MW of combined generating capacity (Haggerty et al., 2017). Like many coal plants across the U.S. (U.S. EIA, 2021), the aging Colstrip Station faces increased competition from lower-cost alternatives (e.g., natural gas and renewable energy) and pressure from federal and state policies to reduce emissions (Roth, 2022). Colstrip's oldest generating units (1 and 2) were retired suddenly in January 2020; the two remaining units (3 and 4, nameplate capacity of 1,480 MW) will likely close between 2025 and 2030 (Talen Energy, 2022). Colstrip Station and Rosebud Mine employ almost 800 full-time workers – over one-third of the community's population (Zimmerman, 2021). The small, isolated town depends on coal for employment and tax revenue, so closure poses catastrophic risks to the community (Haggerty et al., 2018). Thus far, transition planning in Colstrip has primarily focused on economic development, workforce, and environmental remediation (Northern Plains Resource Council, 2019, 2018; Southeastern Montana Economic Development Corporation, 2017). To understand the potential impacts of closure on local service provision in Colstrip, we must first trace the co-development of the town and coal-fired power plant.

Figure 10. Map of the geological structural basin Powder River Basin (left); map of the town of Colstrip (right). Map credit: Michael MacDonald



A "Model" Company Town

Colstrip, as we know it today, is a product of a specific moment in history (Haggerty et al., 2017). It was one of dozens of sites identified by the North Central Power Study (NCPS), a regional planning initiative to develop western coal resources to provide energy security in the fast-growing west coast metropolitan economies. Though the NCPS's full vision was never achieved, it charted the construction of 42 mine-mouth thermal generating plants and high-voltage long-distance transmission lines spanning seven states (U.S. Bureau of Reclamation, 1971). The original coalition developing Colstrip's generating facilities included Montana Power Company (MPC), an integrated public utility established by the Anaconda Copper Mining

Company in 1912; Western Energy Company, an MPC subsidiary that owned and operated the Rosebud Mine; and Puget Sound Energy, an investor-owned utility in Washington state formally-known as Puget Sound Power and Light (Edgel, 2015).

MPC's proposal to build one of the world's largest coal-fired power plants in a scenic and quiet agricultural region was hugely controversial. Local and state advocacy groups vociferously opposed the impacts of strip mining and boomtowns (Parfit, 1980). In response, MPC executive Paul Schmechel assured groups that, in line with the Anaconda Copper Mining Company's tradition, MPC would retain ownership of the townsite to ensure that Colstrip would operate as a "model" company town (Ward et al., 2020). MPC designed a town that would overcome "Colstrip's geographical isolation with an attractive and functional community" and "pleasant living conditions" (White, 1972). Western Energy Company delivered an award-winning town plan, anchored by a remarkable portfolio of public infrastructure and amenities for a town of Colstrip's size and location (Ward et al., 2020). The Company paved roads, built water and sewer infrastructure, a new post office, and an extensive parks and recreation system. In a region with endemically marginal water quality and quantity (Bauder, 2013), Colstrip's municipal water system was linked to Colstrip Station's water transport system, a 30-mile pipeline pumping water from the Yellowstone River to the plant's surge pond, Castle Rock Lake. Taxing districts were established to maintain and develop community infrastructure, including the Colstrip Park and Recreation District (established in 1987), a special purpose district to operate, maintain, and administer public park and recreation land in and around the town (Colstrip Parks and Recreation Department, 2017). The Colstrip Hospital District was

established in 1993 to provide medical care to patients within the district (Colstrip Medical District, 2019).

Electricity market deregulation and Colstrip's incorporation.

With the nationwide deregulation and privatization of public utilities in the 1990s, Colstrip's ownership model changed, and with it, the viability of the company town model. When Montana deregulated its electric utility industry in 1997, MPC and Western Energy introduced financial cutbacks. Ultimately, MPC sold its generation assets in Colstrip to independent power producer Pennsylvania Power and Light for $757 million in 1998 (approximately $1.2 billion in 2020 dollars) (Martin and Everts, 2002). This decision had significant implications for Colstrip: the paternalistic MPC, which provided electricity and natural gas services in Montana for over 80 years, was gone, and with it, an occupational identity. One participant who retired from the mine and now works in local government compared the transition to losing a family member, "after [MPC] sold out, it was tough. [You] still had a good job, and you went to work and tried to do your best, but it still wasn't like family".

MPC's financial cutbacks included delegating fiscal responsibility for governing Colstrip to Rosebud County (Bertin, 1998). Colstrip residents responded to MPC's cutbacks, which also included major layoffs at the mine and plant, by organizing a task force to examine economic development in the area and study municipal incorporation. As the sale of MPC's assets to PPL closed in 1998, Colstrip residents voted for incorporation and annexed the coal plant property into the new municipal levy district. The newly formed town government, led by a mayor and four-person council, assumed responsibility for managing the city services originally established

by the company. The city also took on the costs of deferred maintenance neglected by the power plant, including the costs of renovating the water and sewer infrastructure to meet residential, not commercial and industrial, needs (Bohrer, 2000). By annexing the power plant into city boundaries, the City of Colstrip established a substantial tax base that enabled it to absorb these costs and maintain Montana's lowest mill levies (tax rates on assessed property) for two decades. Nevertheless, deregulation – and the local sense of crisis it created – also allowed the corporate owners to shift the costs of maintaining an attractive company town onto the community itself.

At the time of writing, Colstrip's local government and service delivery landscape includes the municipal government, Rosebud County government, and two special districts. The City of Colstrip primarily relies on property taxes to provide police and fire protection and maintain and operate the drinking water and wastewater systems (City of Colstrip, 2020). Rosebud County provides critical health and safety services, including a public health officer, senior care, and solid waste collection, as well as other public programs like libraries, museums, 4-H programs, and fairs. Most of these county services are funded by a combination of property taxes, intergovernmental revenues such as Payment-in-Lieu-of-Taxes (PILT), coal gross proceeds,[16] federal mineral royalties,[17] and state and federal grants (Rosebud County, 2021, 2020).

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[16] State and local governments do not levy or assess any mills against the reported gross proceeds of coal. Instead, the state levies a flat 5% tax against the value of the reported gross proceeds. The revenue is then proportionally distributed back to the taxing jurisdictions where production occurred.

[17] The federal government generates royalties by leasing mineral rights on federal lands in the state (Montana Department of Revenue, 2020). The federal government returns 49% of royalty revenue to the state. The state then distributes 25% back to county governments proportionally to the amount of coal collected in each county.

Finally, Colstrip has two special districts that provide public quality of life and wellbeing amenities. The Colstrip Recreation and Parks District (CRPD) offers recreation programs for adults and children and maintains over 30 parks, 20 miles of walking paths, and a public golf course that is 90% funded by property taxes, with fees-for-services contributing only a small amount (Colstrip Park and Recreation District, 2020). The Colstrip Hospital District provides medical services, including physical therapy, occupational wellness, and emergency care funded both by fees-for-services and property taxes and state entitlements (Colstrip Medical District, 2019). As this review of the town's industrial history has shown, Colstrip's local government and service landscape are deeply adapted to coal industry needs and revenue.

Closure Presents a Fiscal Transition

As the Colstrip economy braces for closure, the vulnerabilities inherent in funding public services based on the plant's value are dramatically exposed. The merchant power company which acquired PPL's interests in and operating responsibility over the plant in 1999, Talen Montana, retired Units 1 and 2 in January 2020–two years ahead of the previously scheduled closure date. Despite years of discussion about transition and economic diversification planning (Colstrip Community Impact Advisory Group (CCIAG), 2018; Southeastern Montana Economic Development Corporation, 2017), Talen's sudden action shocked Colstrip residents. One service provider interviewee described how his neighbors were crying while watching the removal of the plant's cooling towers, "it was emotional for people because it was like reality or finalization [sic]." The sudden closure of Units 1 and 2 also underscored the existing revenue model's limited ability to navigate the economic transition. The interviewee noted how the surprise spurred board meeting conversations about funding and the city's taxable valuation in

preparation for full closure. These conversations were a long-overdue reckoning: though Colstrip's public services and infrastructure could be the cornerstone of a diversification and transition strategy (Southeastern Montana Economic Development Corporation, 2017), the fiscal model established in the 1990s makes local public services and infrastructure practically impossible to maintain without tax revenue from Colstrip Station.

Findings and Discussion

This section examines the vulnerabilities inherent in Colstrip's revenue model to understand the dimensions of the fiscal transition associated with closure and implications for local government and service delivery. We used publicly available fiscal data to assess the share of coal revenue (i.e., property taxes, coal extraction payments) to total governmental revenues in the City of Colstrip and Rosebud County. This fiscal profile was then situated in the local policy context to explain how the process of fiscal decline will be experienced at the community level. This analysis seeks to better understand the 'rupture' in Colstrip's community development pathway, the current decision-making environment, and to determine when local leaders have discretion or are bound by regulatory and statutory mandates.

Characterizing the Fiscal Transition

Local governments in Montana rely on tax and non-tax revenue to fund services and administrative activities. Locally imposed and collected property tax provides the largest source of operating revenue for local governments.[18] Budgetary needs and guidelines determine the

[18] Montana does not levy a broad-based sales tax, instead relying on state personal income tax as the primary source of state revenue (Montana Department of Revenue, 2020).

amount of property tax assessed and collected, while a local mill levy is imposed based on the taxable value of local property.[19] Taxable value is determined by a complex classification system; the state legislature also establishes tax rates and exemptions for different classes of property (Montana Department of Revenue, 2020). County and municipal governments also have access to several non-tax revenue sources, including fees for services, fines and forfeitures, interest earned, and intergovernmental transfer payments. The latter are direct payments from the state and federal government, including federal mineral royalties, gross proceeds payments, PILT, and federal and state grants (Weaver, 2002).

In Colstrip's levy district, mills are levied to fund the City of Colstrip and other service organizations such as the Colstrip Hospital District, Colstrip Recreation and Parks District, and the Colstrip School District. Over 90 percent of the district's taxable value in 2020 ($40,595,723) came from Colstrip Station, a Class 13 "Electric Generation Property." The district's taxable valuation is nearly 20 times that of Forsyth ($2,144,075), the nearby county seat of Rosebud County, with a slightly smaller population of 1,495 (Montana Department of Revenue, 2020). In 2020, property taxes levied on the coal plant property comprised 47% of the City of Colstrip's total revenue (Figure 11). This substantial taxable valuation has allowed the City of Colstrip to provide a high level of service, while maintaining some of the lowest mill levies, or tax rates, in Montana. In 2020, Colstrip levied 98.87 mills while Forsyth levied 264.03 mills, meaning a local homeowner in Forsyth pays nearly three times more in tax than a comparable Colstrip resident.

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[19] Mills are the units used to calculate *ad valorem* property taxes. Mills are multiplied by the certified taxable valuation to generate tax revenue. Units are equal to one-thousandth of one dollar. Property tax owed is computed by multiplying each $1,000 in assessed value by the mill levy (Montana Department of Revenue, 2020).

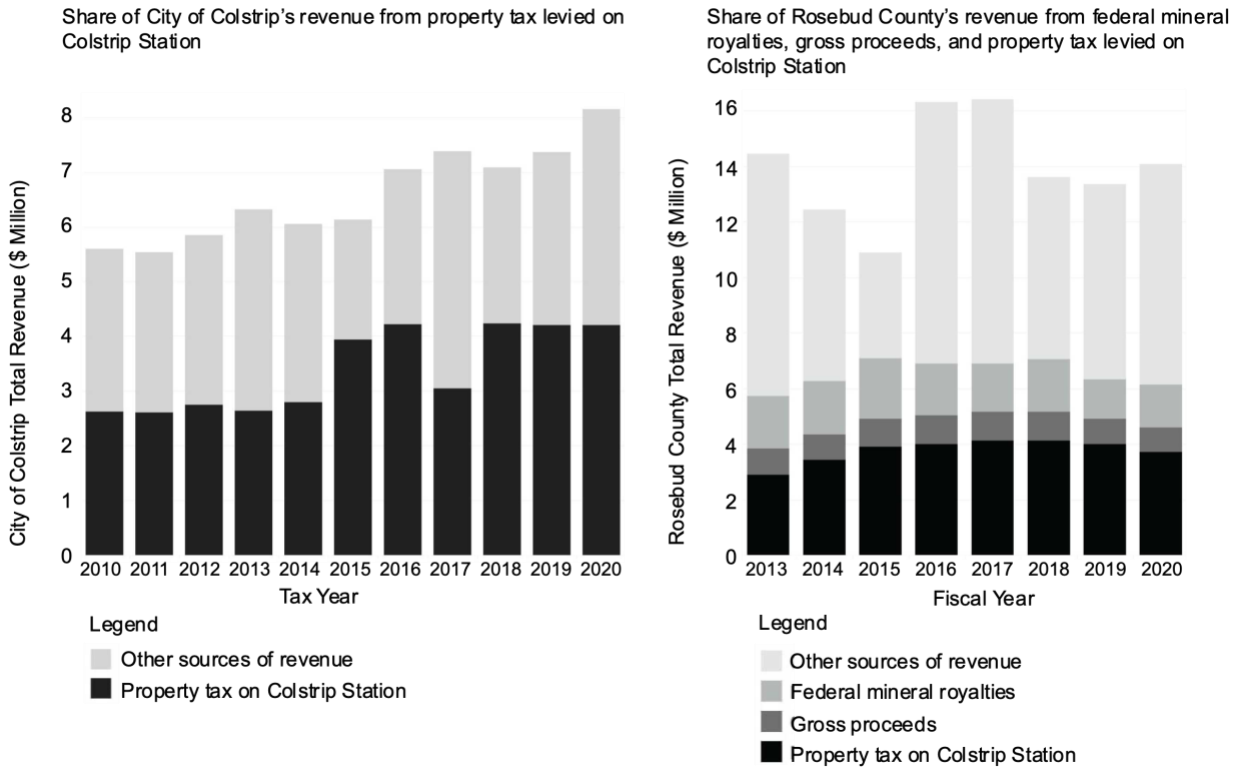
Key public services provided by the City of Colstrip and its associated special districts (e.g., hospital and parks) currently rely on property taxes levied on the coal plant. This revenue hinges on the taxable value of Colstrip Station, a set of tangible assets subject to utility accounting and depreciation schedules (Lehr and O'Boyle, 2018). While the taxable value of Colstrip Station has been gradually depreciating since its initial construction, decommissioning would dramatically reduce the asset's value and accelerate a steep decline in property tax revenue. Fortunately for Colstrip residents, full decommissioning will probably be gradual, and the taxable value of the property is unlikely to hit zero as infrastructure and equipment will remain in the district for some time. Local officials and service providers have time to plan for revenue loss. Indeed, annual financial reports show that the City has incrementally increased its mill levies to the maximum level authorized under state law to pay for sewer, water, and street infrastructure projects (City of Colstrip, 2020).

In addition to property taxes, another major source of revenue for Rosebud County is intergovernmental transfer payments, including gross proceeds taxes and royalties paid to state and federal governments.[20] Between 2013 and 2020, revenue from coal plant property taxes, coal gross proceeds, and federal mineral royalties contributed between 40% and 65% of Rosebud County's total revenue (Figure 11). County officials understood that coal revenue enabled the provision of additional county services, including two libraries and two public health departments, *"it's because we have coal money that we can afford that."* According to our interviews (though without certified public financial data), the County has already experienced a

[20] For an overview of coal extraction revenue policies, see (Haggerty, 2017).

decline in coal extraction payment revenue. The Rosebud Mine only supplies Colstrip Station, so the closure of Units 1 and 2 in 2020 caused a 40% decline in coal extraction at the Rosebud Mine between 2019 and 2020 (U.S. Energy Information Administration, 2022a). Annual payments are based on actual coal extraction; therefore, the county will experience immediate revenue declines if Rosebud Mine does not find another customer when Colstrip Station is retired. If the mine stops extraction, Rosebud County could suddenly face a revenue shortfall of over $2 million in gross proceeds and federal mineral royalties.

Figure 11. Share of City of Colstrip and Rosebud County Revenue from Coal Sources.



Uncertainty and Complexity Challenge Service-Provision Decisions

Facing substantial declines in revenue for local government activities and service provision, local leaders must now make important decisions about their community's future. In transition theory, such decisions are 'key nodes' or inflection points in the community's resilience and development trajectory (Cumming et al., 2005; Wilson, 2012). Data collected from stakeholder interviews and observations of community meetings illustrate the complexity of these decisions—stakeholders must navigate fiscal dependence, service mandates, and uncertainty.

Local officials and service providers must respond to fiscal decline within the parameters of state fiscal policy. Like other western states (Godby et al., 2019), Montana limits the amount of property tax revenue that can be collected[21] (Montana Department of Revenue, 2020). After the property tax level is set, taxing jurisdictions adjust their budgets and may not necessarily provide the same level of services as the prior year. When the cost of providing services increases faster than allowable property tax levels, the jurisdiction either reduces services or asks voters to approve an additional mill levy. In the case of loss of taxable valuation, jurisdictions can "float" or automatically increase mill rates to keep tax revenues relatively level with the prior year (levies can also be floated down to provide tax relief when a large increase in taxable value occurs (Montana Code Annotated, 2001)). This does not require voter approval. Therefore, taxing jurisdictions in Colstrip could hypothetically maintain revenues equal to the prior year by increasing the taxes on all other property owners. However, this is unlikely since replacing the

[21] The local government taxing authority is limited to the number of mills required to generate the inflation-adjusted value of the property tax collected in the prior year (Montana Department of Revenue, 2020).

coal revenue would require the tax rate on local property owners to increase ten-fold– from 98.1 to 1,072 mills[22] (Colstrip Community Impact Advisory Group (CCIAG), 2018; Montana Association of Counties, 2022). Alternatively, local officials could reduce expenditures by cutting services.

Officials are unlikely to pursue an either-or scenario; rather, they will combine budget and service cuts, layoffs, and tax increases. Decisions about which services to prioritize are not straightforward. General uncertainty about how the transition will occur and policy vagaries complicate the situation. To some extent, statutory mandates will inform the prioritization of services. For example, Montana law requires county governments to provide basic services such as law enforcement and detention facilities, fire protection, and solid waste collection and disposal services and facilities (Weaver and Lachapelle, 2010). Other services are required, and partially funded, by the federal government (e.g., the director of public health, and disaster and emergency services) (Montana Code Annotated, n.d.). County officials explained that "non-essential" services would need to be scaled back to maintain minimum service levels required by state and federal policy: "we don't have a choice. It's the libraries and the [county] fair that get cut first. We fund the required [services] first, and then cut from there."

However, even these service requirements are moving targets since they correspond to population class[23]. At its current population, Colstrip is legally required to provide police and fire

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[22] This mill estimate is based on the *ad valorem* tax revenue assessed in 2020 minus the taxable value of Class 13 – Real and Personal Property in Colstrip's levy district (Montana Association of Counties, 2022).

[23] Montana's municipal classification is determined by population: first class (10,000+), second class (5,000 to 9,999), third class (1,000 to 4,999), and town (Less than 1,000). Each class has different service requirements that correspond to population size (Weaver, 2019).

protection, but these specific requirements could change if the population decreases. An estimated 130 positions have been lost with the closure of Units 1 and 2, however the impacts on population remain unclear (Montana Coal Board, 2022). If service costs exceed revenue, local governments and municipalities have to pursue alternative strategies such as consolidation, interlocal agreements, or regionalization (Weaver and Lachapelle, 2010). Coal revenue has long enabled both Colstrip and Rosebud County to provide services beyond the minimum required levels. Now, community leaders and officials must choose which services to bring into the future.

Service providers are forced to make decisions without an assessment of what the community will look like or need in the near future. As one health provider explained, “I don't know how many residents are going to be living here. Obviously, the people that have houses won't want to move. They're going to want medical.” However, this individual acutely understood the precarity of the existing revenue model. They had observed conversations about fiscal dependence in board meetings, “[We have started] talking about what our plans are going to be, and those are tough. Does the community want to have an emergency room? Because that's expensive. I don't see any model [where] that would work without [the] tax revenue [from coal]." The process of right-sizing services is clouded by uncertainty and fiscal dependence.

Colstrip city officials must also decide how to handle their hard infrastructure system, which was designed to support a booming, industrial coal town. Some infrastructure associated with the “model town” could potentially be right-sized (e.g., the consolidation of school buildings or cutting park and trail maintenance). However, to maintain the model-town amenities residents enjoy, officials will likely have to raise taxes—something city leaders seem willing to

do. A local economic development professional explained that a rate increase to maintain some of Colstrip's amenities is reasonable, despite the long history of exceptionally low property taxes:

> I think [our] community considers schools, healthcare, local government to some degree as an investment, and the taxes in Colstrip are too cheap already. I'm embarrassed from what I pay and what I get. Because I know what my mom and dad pay in [another county], and it's like, wow, three times as much.

Other infrastructures—most notably the town's complicated water infrastructure—are inherently less flexible. The City of Colstrip currently depends on the power plant owners to supply its domestic water as local groundwater is not viable (City of Colstrip, 2020). It is unclear *who* will be responsible for maintaining the water supply infrastructure after the coal plant closes. Absorbing the costs of operating and maintaining the aging infrastructure would be a large burden for any community, especially one experiencing economic decline. Therefore, city leaders are pursuing an alternative ownership model that would include state, local, and industry partners:

> Perhaps we need to develop [the surge pond as] Castle Rock State Park. And then the state would be involved with some of the activities associated with that to maintain it. Some of the things that are going on, Montana Fish, Wildlife and Parks, the [Department of Natural Resources], the [Department of Environmental Quality]. Yes, ultimately the [coal] companies have some responsibilities, too. They were the ones who came in and developed it and they have some ongoing responsibilities out unto the undefinable future. I'm not saying that there's free water. I'm not suggesting that. But I'm saying that [the coal companies] have a responsibility. [They] created the issue now you've got to follow through with it.

The future of the water supply system showcases the types of challenges – scale, uncertainty, lack of policy clarity – shaping the environment in which local officials must make critical decisions about which services to sustain or downsize.

Implications for Community Resilience

The fiscal transition associated with industrial closure may rupture Colstrip's community services, public infrastructure, and overall community development trajectory. The disjointed and uncoordinated transition policy environment adds further complexity to this decision-making node (Roemer & Haggerty, 2021). Future resilience and community development pathways are being determined by a patchwork group of stakeholders on a case-by-case basis. Because most major decisions about service provision—to increase taxes or cut services—are not yet made, we cannot declare how this decision node will shape future resilience pathways. However, we observe the community resilience implications of where this policy space meets local conditions and context.

First, the historical context of the community's path dependency reveals how fiscal dependence, over-adaptation of critical public infrastructure, and cultural legacies contribute to the reluctance of community leaders to choose alternative pathways (Hudson, 2005; Wilson, 2014). Quickly replacing nearly 50% of Colstrip's total revenue (or nearly 45% for Rosebud County) would be difficult for any local government, particularly in the absence of tractable options for economic diversification (Haggerty et al., 2018). It will require reducing expenditures and scaling-back services; however, this is not always possible. For example, stakeholders must decide how to manage the fixed costs of maintaining and operating the town's drinking water transport and supply system on less revenue. These factors, alongside a strong "company town" identity, leave community leaders with few perceived options. Strategies to retain a single large employer or remove barriers to coal extraction are overrepresented in local planning documents (Bee, 2017; Southeastern Montana Economic Development Corporation, 2017). Such strategies would likely perpetuate fiscal dependence and risky relationships with industry partners

(Haggerty et al., 2018; Smith and Haggerty, 2020). While researching this project, we did not find substantive ideas on how to diverge from this path dependency, either in terms of new collaborations with industry, local, and state actors or re-imaginings of resilient economic pathways (Halseth et al., 2019).

Next, this study explored how the policy environment interacts with and influences endogenous factors, including choices about how to structure service provision. The fragmented and uncoordinated policy environment works against efficient and forward-looking community responses. The lack of preemptive planning is unsurprising considering the policy landscape in which Colstrip is transitioning. The absence of a coordinated policy framework facilitating the energy transition at the federal level exacerbates uncertainty for frontline communities (Graff et al., 2018). Recent policy proposed at the state level seeks to bolster the coal industry and prevent the closure of the power plant sending mixed signals to community stakeholders who have strong economic and cultural ties to extractive industries (Freudenburg, 1992; Hudson, 2005). Community leaders are thus challenged with conflicting responsibilities of both advocating for the continuation of its industrial legacy and recognizing economic dependence and strategizing for a diverse economy. Service provision decisions are at the periphery of local transition discussions. Thus, community leaders and service providers must navigate complex processes, including politics, statutory mandates, state-determined processes on a service-by-service basis. The time and resources required to coordinate relevant stakeholders will drain social capital and service capacity and are obstacles to coordination. Colstrip's public service response to fiscal rupture shows little promise of 'consensus building' (Besser et al., 2008).

Lastly, as service providers and officials face budget shortfalls, they will be forced to choose from readily-available policy options such as service cuts, consolidation, and regionalization (Weaver and Lachapelle, 2010). Anticipated losses of employees and volunteers will negatively affect key aspects of community resilience such as networks, problem solving, and the generation of new ideas, stressing local human capital (Emery and Flora, 2006). Alternatively, entrepreneurial, innovative, and creative solutions that emerge from place-based and grounded initiatives supported by state and regional partners and public policies will be needed for Colstrip to implement more resilient development pathways (Halseth et al., 2019).

Conclusion and Policy Implications

Future research on the social and economic impacts of decarbonization should center the fiscal relationship between fossil fuel revenue, community resilience, and public services. This case study emphasizes the importance of examining community resilience in its historical context, with particular attention to the relationship between endogenous capacities and external policies and processes. As Colstrip demonstrates, strong ties between the coal industry, revenue, and public finance create local path dependencies that, in the event of decline, could rupture community services. Local leaders must navigate the impacts of decline in a fragmented and uncoordinated policy environment which exhausts their limited time, resources, and human capital. The uncertainties facing community leaders underscore the need to mandate externally-funded integrated assessments of transition impacts as part of the industrial closure process (Bainton and Holcombe, 2018; Everingham and Mackenzie, 2019). In the current environment, local leaders lack a clear mandate, adequate information, and the capacity to undertake this robust exercise in a coordinated manner.

This study identifies critical areas of inquiry for a transition impact assessment to address uncertainties and make decisions in the context of industrial decline. It reiterates calls (2019a) for fiscal impact assessments and policy to make communities aware of the fiscal risks of fossil fuel revenue decline, as well as the policy tools and barriers to response. The fiscal assessment should examine the relationship between revenue, community services, and public infrastructure. Attending to revenue and service provision will help determine when decisions can be made locally and when outside support and partnerships are needed to respond to major challenges and threats. To increase efficiency and coordination with rural communities' limited resources, local transition impact assessments could adapt best practices from existing public health and social impact assessment models, including participatory and scenario-building approaches that yield local benefits both in terms of service efficiencies and broader social capital formation (Julia H Haggerty et al., 2018). Future scholarship should identify how to effectively address closure impacts and continue to co-develop grounded, local processes that support decision-making and manage decline in the context of decarbonization and place-based transitions.

References Cited in Chapter Four

Bainton, N., Holcombe, S., 2018. A critical review of the social aspects of mine closure. Resour. Policy.

Barro, J., Diamond, J.W., Evans, R., 2021. The Effect of Transition to Low-carbon Energy on Texas Tax Revenues: 2021-2050.

Bauder, J.W., 2013. Water Quality and Beneficial Use: Water quality, soils and beneficial use in the Tongue and Powder basins, in: Yellowstone Basin Advisory Council. The Montana Department of Natural Resources & Conservation, Helena.

Bazilian, M.D., Carley, S., Konisky, D., Zerriffi, H., Pai, S., Handler, B., 2021. Expanding the scope of just transitions: Towards localized solutions and community-level dynamics. Energy Res. Soc. Sci. 80, 102245. https://doi.org/https://doi.org/10.1016/j.erss.2021.102245

Bee, E., 2017. The Changing Coal Industry: Regional Economic Impacts, Workforce Analysis, Transition Strategy. Mandeville.

Berkes, F., 2009. Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. J. Environ. Manage. 90, 1692–1702.

Berkes, F., Ross, H., 2013. Community Resilience: Toward an Integrated Approach. Soc. Nat. Resour. 26, 5–20. https://doi.org/10.1080/08941920.2012.736605

Bertin, K., 1998. Changes at MPC spur Colstrip toward move for incorporation. Billings Gaz.

Besser, T.L., Recker, N., Agnitsch, K., 2008. The Impact of Economic Shocks on Quality of Life and Social Capital in Small Towns. Rural Sociol. 73, 580–604. https://doi.org/10.1526/003601108786471530

Bohrer, B., 2000. New Montana Town Seeks to Forge an Identity; Planning: Colstrip voted to incorporate and reinvent itself as an entity independent of its coal mines and power plant. The path is predictably bumpy.: [Bulldog Edition]. Los Angeles Times B6.

Brosemer, K., Schelly, C., Gagnon, V., Arola, K.L., Pearce, J.M., Bessette, D., Schmitt Olabisi, L., 2020. The energy crises revealed by COVID: Intersections of Indigeneity, inequity, and health. Energy Res. Soc. Sci. https://doi.org/10.1016/j.erss.2020.101661

Carley, S., Konisky, D.M., 2020. The justice and equity implications of the clean energy transition. Nat. Energy 2020 58 5, 569–577. https://doi.org/10.1038/s41560-020-0641-6

Cates, K., Eaton, P., 2019. As Coal Economy Collapses, Imminent Public Budget Crisis Confronts Hopi-Navajo Tribes.

Cheshire, L., 2010. A corporate responsibility? The constitution of fly-in, fly-out mining companies as governance partners in remote, mine-affected localities. J. Rural Stud. 26, 12–20. https://doi.org/10.1016/j.jrurstud.2009.06.005

City of Colstrip, 2020. Annual Financial Report. Colstrip.

Colstrip Community Impact Advisory Group (CCIAG), 2018. CCIAG Plan. Colstrip.

Colstrip Medical District, 2019. Annual Financial Report. Colstrip.

Colstrip Park and Recreation District, 2020. Financial Statements. Colstrip.

Colstrip Parks and Recreation Department, 2017. Financial Statements. Colstrip.

Cumming, G., Barnes, G., Perz, S., Schmink, M., Sieving, K., Southworth, J., Binford, M., Holt, R., Stickler, C., Holt, T., 2005. An Exploratory Framework for the Empirical Measurement of Resilience. Ecosystems 8, 975–987.

Davenport, C., Friedman, L., Tankersley, J., 2021. Biden's Bet on a Climate Transition Carries Big Risks. New York TImes.

Desroches, K., 2021. New Law Requires Colstrip Owners to Study Town Water Supply. Yellowstone Public Radio.

Edgel, D., 2015. A History of Colstrip and Coal-Fired Electricity Generation for the Pacific Northwest, Energy Transitions Laboratory. Bellingham.

Emery, M., Flora, C., 2006. Spiraling-Up: Mapping Community Transformation with Community Capitals Framework. J. Community Dev. Soc. 37, 19–35.

Everingham, J.-A., Mackenzie, S., 2019. Assessing social impacts of mine closure.

Feaster, S., Cates, K., 2019. Powder River Basin Coal Industry Is in Long-Term Decline Fast-Changing Markets Indicate Deeper Downturns to Come in Montana and Wyoming.

Flora, J.L., Sharp, J.S., Flora, C., Newlon, B., County, F., 1997. Entrepreneurial social infrastructure and locally initiated economic development in the nonmetropolitan United States. Sociol. Q. 38, 623–645. https://doi.org/10.1111/j.1533-8525.1997.tb00757.x

Folke, C., Hahn, T., Olsson, P., Norberg, J., 2005. ADAPTIVE GOVERNANCE OF SOCIAL-ECOLOGICAL SYSTEMS. Annu. Rev. Environ. Resour. 30, 441–473. https://doi.org/10.1146/annurev.energy.30.050504.144511

Freudenburg, W.R., 1992. Addictive Economies: Extractive Industries and Vulnerable Localities in a Changing World Economy. Rural Sociol. 57, 305–332. https://doi.org/10.1111/j.1549-0831.1992.tb00467.x

Gallagher, D., Glasmeier, A., 2020. Just Institutions for Deep Decarbonization? Essential Lessons from 20th Century Regional Economic and Industrial Transitions in the U.S., The Roosevelt Project Special Series. Boston.

Gerking, S., Hamilton, S.F., 2008. What explains the increased utilization of powder river basin coal in electric power generation? Am. J. Agric. Econ. 90, 933–950. https://doi.org/10.1111/j.1467-8276.2008.01147.x

Godby, R., Coupal, R., Haggerty, M.N., 2019. The Overlooked Importance of Federal Public Land Fiscal Policy. Bozeman.

Godby, R., Coupal, R., Taylor, D., Considine, T., 2015. Potential Impacts on Wyoming Coal Production of EPA's Greenhouse Gas Proposals. Electr. J. 28, 68–79.

Graff, M., Carley, S., Konisky, D.M., 2018. Stakeholder perceptions of the United States energy transition: Local-level dynamics and community responses to national politics and policy. Energy Res. Soc. Sci. https://doi.org/10.1016/j.erss.2018.05.017

Haggerty, J.H., Bills Walsh, K., Rose, J., 2017. The Status of Key Policies and Decision Processes.

Haggerty, Julia H., Haggerty, M., Roemer, K.F., Rose, J., 2018. Planning for the local impacts of coal facility closure: Emerging strategies in the U.S. West. Resour. Policy. https://doi.org/10.1016/j.resourpol.2018.01.010

Haggerty, J.H., Jacquet, J.B., Taylor, S., Theodori, G.L., Walsh, K.B., 2020. Engaging in Energy Communities: The role of the researcher. A workbook and planning guide. Bozeman.

Haggerty, Julia H, Smith, K., Mastel, T., Lapan, J., Lachapelle, P., 2018. Assessing, monitoring, and addressing boomtown impacts in the US: evaluating an existing public health model. Impact Assess. Proj. Apprais. 36, 115–127.

Haggerty, J.H., Smith, K.K., 2020. What is Research Fatigue? [WWW Document]. Mont. State Univ. Energy Communities.

Haggerty, M., 2020. Fiscal Policy is Failing Rural America. Bozeman, Montana.

Haggerty, M., 2019a. Replacing Coal Revenue and Investing in Economic Transition: Solutions for Coal-Dependent Communities. Bozeman.

Haggerty, M., 2019b. Replacing Coal Revenue and Investing in Economic Transition: Solutions for Coal-Dependent Communities. Bozeman.

Haggerty, M., 2017. Coal Extraction Revenue and Spending: A Comparison Among Western States. Bozeman.

Halseth, G., Markey, S., Ryser, L., 2019. Service Provision and Rural Sustainability: Infrastructure and Inovation, Service Provision and Rural Sustainability. Routeledge, Oxon.

Halseth, G., Ryser, L., 2006. Trends in service delivery: Examples from rural and small town Canada, 1998-2005. J. Rural Community Dev. 1, 69–90.

Halseth, G., Sullivan, L., Ryser, L., 2003. Service provision as part of resource town transition planning: A case from northern British Columbia, in: Bruce, D., Lister, G. (Eds.), Opportunities and Actions in the New Rural Economy. Sackville.

Harrison, J.L., Montgomery, C.A., Bliss, J.C., 2016. Beyond the monolith: the role of bonding, bridging, and linking social capital in the cycle of adaptive capacity. Soc. Nat. Resour. 29, 525–539.

Hayter, R., 2017. Geography and History Matter, in: Halseth, G. (Ed.), Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routledge, New York.

Hibbard, M., Lurie, S., 2013. The New Natural Resource Economy: Environment and Economy

in Transitional Rural Communities. Soc. Nat. Resour. 26, 827–844. https://doi.org/10.1080/08941920.2012.720358

Hudson, R., 2005. Rethinking Change in Old Industrial Regions: Reflecting on the Experiences of North East England. Environ. Plan. A Econ. Sp. 37, 581–596. https://doi.org/10.1068/a36274

Innis, H.A., 1929. The Teaching of Economic History in Canada. Contrib. to Can. Econ. 2, 52. https://doi.org/10.2307/136518

IPCC, 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

Jacquet, J.B., Pathak, R., Haggerty, J.H., Theodori, G.L., Kroepsch, A.C., 2021. Research fatigue in unconventional oil and gas boomtowns: Perceptions, strategies and obstacles among social scientists collecting human subjects data. Energy Res. Soc. Sci. 73.

Jolley, G.J., Khalaf, C., Michaud, G., Sandler, A.M., 2019. The economic, fiscal, and workforce impacts of coal-fired power plant closures in Appalachian Ohio. Reg. Sci. Policy Pract. 11, 403–422. https://doi.org/10.1111/RSP3.12191

Joskow, P.L., 2000. Deregulation and Regulatory Reform in the U.S. Electric Power Sector by DEREGULATION AND REGULATORY REFORM IN THE U.S. ELECTRIC POWER SECTOR. MIT Center for Energy and Environmental Policy Research.

Kraenzel, C.F., 1955. The Great Plains in Transition, [1st ed.]. ed. University of Oklahoma Press, Norman.

Kulig, J.C., Edge, D.S., Townshend, I., Lightfoot, N., Reimer, W., 2013. Community resiliency: Emerging theoretical insights. J. Community Psychol. 41, 758–775. https://doi.org/10.1002/jcop.21569

Lawrence, R., O'Faircheallaigh, C., 2022. Ignorance as strategy: 'Shadow places' and the social impacts of the ranger uranium mine. Environ. Impact Assess. Rev. 93, 106723. https://doi.org/https://doi.org/10.1016/j.eiar.2021.106723

Lehr, R., O'Boyle, M., 2018. Depreciation and Early Plant Retirements. San Francisco.

Look, W., Raimi, D., Robertson, M., Higdon, J., Propp, D., 2021. Enabling Fairness for Energy Workers and Communities in Transition. Washington, D.C.

Lutey, T., 2022a. Newly-passed Colstrip laws unconstitutional, court rules. Billings Gaz.

Lutey, T., 2022b. Colstrip operator Talen Energy files for bankruptcy. Billings Gaz.

Lutey, T., 2020. Colstrip sale hits snag in Washington state. Billings Gaz.

Markey, S., Halseth, G., 2017. Rural Restructuring: Conclusion, in: Halseth, G. (Ed.), Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routeledge.

Markey, S., Halseth, G., Manson, D., 2012. Investing in place: Economic renewal in northern British Columbia. UBC Press.

Martin, J., Everts, T., 2002. The Electrical Utility Industry Restructuring Transition Advisory Committee. Helena.

Montana Association of Counties, 2022. Mill Levy Computation Form [WWW Document]. MACo Resour. Data. URL https://www.mtcounties.org/resources-data/

Montana Coal Board, 2022. Montana Coal Board Meeting. Helena.

Montana Code Annotated, 2021. Water Feasibility Study.

Montana Code Annotated, 2001. Taxing Authority Budget Limitation.

Montana Code Annotated, n.d. Local and interjurisdictional disaster and emergency plan - distribution.

Montana Department of Revenue, 2020. Biennial Report. Helena.

Morris, A.C., Kaufman, N., Doshi, S., 2021. Revenue at Risk in Coal-Reliant Counties. Environ. Energy Policy Econ. 2, 83–116. https://doi.org/10.1086/711307

Morris, A.C., Kaufman, N., Doshi, S., 2019. The Risk of Fiscal Collapse in Coal-Reliant Communities.

Morrison, T.H., 2014. Developing a regional governance index: The institutional potential ofrural regions. J. Rural Stud. 35, 101–111. https://doi.org/10.1016/j.jrurstud.2014.04.004

Morrison, T.H., Lane, M.B., Hibbard, M., 2015. Planning, governance and rural futures in Australia and the USA: revisiting the case for rural regional planning. J. Environ. Plan. Manag. 58, 1601–1616. https://doi.org/10.1080/09640568.2014.940514

National Academies of Sciences Engineering and Medicine, 2021. Accelerating Decarbonization of the U.S. Energy System. Washington, D.C.

Nel, E., Connelly, S., Stevenson, T., 2019. New Zealand's small town transition: The experience of demographic and economic change and place based responses. N. Z. Geog. 75. https://doi.org/10.1111/nzg.12240

Newell, R.G., Raimi, D., 2018a. The fiscal impacts of increased U.S. oil and gas development on local governments. Energy Policy 117, 14–24.

Newell, R.G., Raimi, D., 2018b. US state and local oil and gas revenue sources and uses. Energy Policy 112, 12–18. https://doi.org/https://doi.org/10.1016/j.enpol.2017.10.002

Norris, F.H., Stevens, S.P., Pfefferbaum, B., Wyche, K.F., Pfefferbaum, R.L., 2008. Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. Am. J. Community Psychol. 41, 127–150.

Northern Plains Resource Council, 2019. DOING IT RIGHT II: Job creation through Colstrip cleanup. Billings.

Northern Plains Resource Council, 2018. DOING IT RIGHT: COLSTRIP"S BRIGHT FUTURE WITH CLEAN UP. Billings.

Pai, S., Zerriffi, H., Jewell, J., Pathak, J., 2020. Solar has greater techno-economic resource suitability than wind for replacing coal mining jobs. Environ. Res. Lett. 15, 034065. https://doi.org/10.1088/1748-9326/ab6c6d

Parfit, M., 1980. Last Stand at Rosebud Creek: Coal, Power, and People. E. P. Dutton, New York.

Peluso, N., Kearney, M., Lester, R., 2020. Assessing the Role of Public Policy in Industrial Transitions: How Distinct Regional Contexts Inform Comprehensive Planning, The Roosevelt Project Special Series. Boston.

Pike, A., Dawley, S., Tomaney, J., 2010. Resilience, adaptation and adaptability. Cambridge J. Reg. Econ. Soc. 3, 59–70.

Power, M., Williams, M.G., Mosley, K., Frankel, J., Hanser, P., 2015. Managing the Employment Impact of Energy Transition in Pennsylvania Coal Country. Boston.

Raimi, D., 2017. Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

Raimi, D., Carley, S., Konisky, D., 2022a. Mapping county-level vulnerability to the energy transition in US fossil fuel communities. Sci. Rep. 12, 15748. https://doi.org/10.1038/s41598-022-19927-6

Raimi, D., Grubert, E., Higdon, J., Metcalf, G., Pesek, S., Singh, D., 2022b. The Fiscal Implications of the U.S. Transition away from Fossil Fuels.

Ramage, J., Everette, B., 2012. Coal, in: Everett, B., Boyle, G., Peake, S., Ramage, J. (Eds.), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford, pp. 141–178.

Rasker, R., Gude, P.H., Gude, J.A., van den Noort, J., 2009. The economic importance of air travel in high-amenity rural areas. J. Rural Stud. 25, 343–353. https://doi.org/10.1016/j.jrurstud.2009.03.004

Reimer, B., 2002. Understanding and measuring social capital and social cohesion. New Rural Econ. 23.

Righetti, T.K., Stoellinger, T., Godby, R., Coddington, K., 2021. Adapting to Coal Plant Closures: A Framework to Understand State Energy Transition Resistance by Tara Kathleen Righetti, Temple Stoellinger, Robert Godby, Kipp Coddington :: SSRN.

Robertson, D., 1979. Power Plant and Industrial Fuel Use of 1978: Fuel Replacement. Harvard Environ. Law Rev. 3, 214–235.

Roemer, K.F., Haggerty, J.H., 2021. Coal communities and the U.S. energy transition: A policy corridors assessment. Energy Policy 151. https://doi.org/10.1016/j.enpol.2020.112112

Rosebud County, 2021. Annual Financial Report. Forsyth.

Rosebud County, 2020. Annual Financial Report. Forsyth.

Roth, S., 2022. Here are the last coal plants clinging to life in the American West. Los Angeles Times.

Ryser, L., Halseth, G., 2014. View of On the Edge in Rural Canada: The Changing Capacity and Role of the Voluntary Sector. Can. J. Nonprofit Soc. Econ. Res.

Sandlos, J., Keeling, A., 2016. Aboriginal communities, traditional knowledge, and the environmental legacies of extractive development in Canada. Extr. Ind. Soc. 3, 278–287.

Scott, M., 2013. Resilience: a Conceptual Lens for Rural Studies? Geogr. Compass 7, 597–610.

Skinner, M.W., Joseph, A.E., Hanlon, N., Halseth, G., Ryser, L., 2014. Growing old in resource communities: Exploring the links among voluntarism, aging, and community development. Can. Geogr. 58, 418–428. https://doi.org/10.1111/cag.12087

Smith, K.K., Haggerty, J.H., 2020. Exploitable ambiguities & the unruliness of natural resource dependence: Public infrastructure in North Dakota's Bakken shale formation. J. Rural Stud. 80. https://doi.org/10.1016/j.jrurstud.2020.05.006

Smith, K.K., Haggerty, J.H., Kay, D.L., Coupal, R., 2019. Using Shared Services to Mitigate Boomtown Impacts in the Bakken Shale Play: Resourcefulness or Over-adaptation? J. Rural COMMUNITY Dev. 14.

Southeastern Montana Economic Development Corporation, 2017. Cosltrip Economic Diversification Strategy. Colstrip.

Sovacool, B.K., Dworkin, M.H., 2015. Energy justice: Conceptual insights and practical applications. Appl. Energy 142, 435–444. https://doi.org/https://doi.org/10.1016/j.apenergy.2015.01.002

Sullivan, L., Ryser, L., Halseth, G., 2014. Recognizing Change, Recognizing Rural: The New Rural Economy and Towards a New Model of Rural Service. J. Rural Community Dev. 9.

Talen Energy, 2022. Colstrip Steam Electric Station - Colstrip Montana [WWW Document].

The Energy Policy and Conservation Act (P.L. 94-163, 42 U.S.C. 6201), 1976. . William Mary Environ. Law Policy Rev. 1.

U.S. Bureau of Reclamation, 1971. North Central Power Study: Report of Phase I.

U.S. Census Bureau, 2020. Total Population [WWW Document]. 2020 Decenn. Census. URL https://data.census.gov/cedsci/all?q=colstrip, montana (accessed 4.4.22).

U.S. Department of Commerce, 2021. Rosebud County: Employment by Industry (1970-2000). Washington, D.C.

U.S. Department of Commerce, 2020. ACS 5-year estimates [WWW Document]. Census Bur.

U.S. EIA, 2022. Table 6.6 Planned U.S. Electric Generating Unit Retirements [WWW Document]. Electr. Power Mon.

U.S. EIA, 2021. Of the operating U.S. coal-fired power plants, 28% plant to retire by 2035 [WWW Document]. URL https://www.eia.gov/todayinenergy/detail.php?id=50658

U.S. EIA, 2019. Sixteen mines in the Powder River Basin produce 43% of U.S. coal [WWW Document]. U.S. Energy Inf. Adm. URL https://www.eia.gov/todayinenergy/detail.php?id=41053 (accessed 5.3.22).

U.S. Energy Information Administration, 2022a. Coal Data Browser [WWW Document]. Annu. Coal Rep. URL https://www.eia.gov/coal/data/browser/#/mine/2401747/?freq=A&pin= (accessed 4.4.22).

U.S. Energy Information Administration, 2022b. Rosebud Mine & Crusher/Conveyor, Annual [WWW Document]. Coal Data Brows.

Wallerstein, I.M., 2004. World-systems analysis: An introduction. Duke University Press.

Ward, C.J., Cope, M.R., Wilson, D.R., Muirbrook, K.A., Poff, J.M., 2020. Powerless in a Western US Energy Town: Exploring Challenges to Socially Sustainable Rural Development. Sustain. (Basel, Switzerland) 12, 8426.

Watkins, M.H., 1963. A Staple Theory of Economic Growth. Can. J. Econ. Polit. Sci. 29, 141–158.

Weaver, K.L., 2019. Municipal Government Divide. Bozeman.

Weaver, K.L., 2002. Governing Montana at the grass roots : local government structure, process

and politics. Local Government Center, Montana State University-Bozeman, Bozeman, Mont.

Weaver, K.L., Lachapelle, P.R., 2010. Governing Montana at the grass roots : local government structure, process and politics, 3rd ed.. ed. Local Government Center, Montana State University, Bozeman, Mont.

White, K., 1972. The Plan for Colstrip. Denver.

White, R., 1991. "It's Your Misfortune and None of My Own": A New History of the American West. University of Oklahoma Press, Norman.

Wilson, G.A., 2014. Community resilience: path dependency, lock-in effects and transitional ruptures. J. Environ. Plan. Manag. 57, 1–26. https://doi.org/10.1080/09640568.2012.741519

Wilson, G.A., 2013. Community resilience, policy corridors and the policy challenge. Land use policy 31, 298–310. https://doi.org/10.1016/j.landusepol.2012.07.011

Wilson, G.A., 2012. Community resilience and environmental transitions, Community Resilience and Environmental Transitions. https://doi.org/10.4324/9780203144916

Wilson, G.A., 2010. Multifunctional 'quality' and rural community resilience. Trans. Inst. Br. Geogr. 35, 364–381.

Wyoming Mining Association, 2018. 2018 Wyoming Coal Overview.

Zimmerman, P., 2021. Montana looks at next steps for Colstrip. Dly. Mont.

CHAPTER FIVE

PLANNING FOR CLOSURE RISK TO PUBLIC REVENUE AND SERVICES: OPPORTUNITIES AND CONSIDERATIONS FOR SOCIAL IMPACT ASSESSMENT IN COAL-DEPENDENT COMMUNITIES IN THE US WEST

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Introduction

Driven by a combination of market and policy factors, the US energy transition away from coal-fired electricity is underway. In the US West, 25 coal-fired generating units and 9.7 gigawatts (GW) of coal-fired electricity generating capacity will retire over the next ten years (US EIA, 2022). Although this energy transition promises societal benefits, such as reducing greenhouse gas emissions, coal-fired power plant closures pose immediate challenges for communities that host them (Raimi, 2017). Closure impacts will involve significant revenue losses for tribes and local governments heavily dependent on property tax, royalties, and fees from coal extraction and electricity generation (Cates and Eaton, 2019; Morris et al., 2021). In the US West, the fiscal risk associated with closure is particularly acute in rural and remote communities where there are few opportunities to replace revenue (Haggerty et al., 2018). Substantial declines in revenue due to closure can threaten a municipal government's ability to service debt, provide public services, maintain critical infrastructure, and ultimately, undermine critical resilience capacities necessary to successfully transition (Beckett et al., 2020; Jolley et al., 2019; Morris et al., 2021).

The degree to which closure threatens local public services and community vitality underscores the importance of treating closure as more than a managerial and technical aspect of the industrial lifecycle but as a social process that requires strategic assessment, planning, and financial and technical resources (Chaloping-March, 2008; Look et al., 2021). In the last five years, economic development resources (EDA, 2017), community planning materials (Just Transition Fund, n.d.), and decommissioning checklists (Tarekegne et al., 2022) have been developed to support decision-making and transition planning at the local level. However, none

of these tools directly address the challenge of revenue decline. In this white paper, we argue that a social impact assessment (SIA) framework can and should play a key role in the management of the coal transition. A successful coal transition plan should include assessing risk to public revenue and services in coal-dependent communities.

In the first section of this paper, we clarify the importance of impacts to public revenue and service in the pursuit of a just transition and community resilience. We discuss the US West's coal transition context, which includes seven states with active coal facilities (Arizona, Colorado, Montana, New Mexico, Utah, Washington, and Wyoming), to understand how revenue impacts are addressed during coal-fired power plants' siting and closure processes. Then, we offer six considerations and best practices for applying an SIA framework to assess closure risk to public revenue and services. The last section discusses policy implications and opportunities to integrate this framework into current transition planning efforts.

Just Transition, Community Resilience, and Fiscal Collapse in Western Coal Communities

Just transitions – or the need to ensure that proposed energy transitions maintain material well-being and distributional justice for affected individuals and communities – is an increasingly pressing policy problem (Carley and Konisky, 2020; Healy and Barry, 2017). A just transition needs to address employment impacts and account for the many ways fossil fuel industries are part of and create the fabric of communities (Bazilian et al., 2021). Social and economic impacts to coal-dependent communities may include the loss of shared identity, the town's largest employer and sponsor of social and cultural affairs, the largest source of tax revenue, and the ability to provide public services and infrastructure (Carley et al., 2018; Della

Bosca and Gillespie, 2018; Healy and Barry, 2017; Mayer, 2018). These impacts directly affect critical community capacities necessary to implement resilient community pathways.

Community resilience describes how a social system responds to disruption (Wilson, 2010). Resilience is a function of a community's strengths, assets, and resources that contribute to agency and self-organization (Berkes and Ross, 2013). Critical features of resilient communities include social capital based on trust and relationships between individuals and organizations within and beyond the community (Besser et al., 2008; Harrison et al., 2016; Reimer, 2002); inclusive and collective governance systems (Kulig et al., 2013; Norris et al., 2008); willingness to learn, self-organize, and problem-solve (Berkes, 2009; Wilson, 2012); and strong institutions and social infrastructure (Flora et al., 1997; Morrison, 2014).

Municipal governments, public services, and service infrastructure are essential to community resilience and adaptive capacity (Halseth et al., 2019; Helmke-Long et al., 2022). Community health, education, and public safety services protect and advance community health and well-being (Sullivan et al., 2014). Services also facilitate other aspects of resilience, like social cohesion, shared values, a sense of place, and social capital (Reimer, 2002). Local-level services and governments are vital to help manage the adverse impacts of energy transition (Helmke-Long et al., 2022). These organizations are also well-positioned to identify members of the community who may be at greater risk or are already compromised, due to their proximity to the problems, and to implement targeted programs and polices (Swann and Deslatte, 2018). Stable and sustained governments and public services are essential to a community's resilience and ability to achieve a successful economic transition (Reimer and Markey, 2008; Sullivan et al., 2014).

Coal Communities in the US West Confront Fiscal Collapse

The West's energy system strongly influences community transition dynamics. In the early 1970s, federal energy policy and regional infrastructure planning drove the massive scaling up of coal extraction and electricity infrastructure (US Bureau of Reclamation, 1971). These processes resulted in a regional system where large mine-mouth facilities located in remote, interior regions export electricity long distances over high-voltage transmission lines to meet the needs of urban centers in other states (Ramage and Everett, 2012). This system established the interior West's coal regions as resource peripheries, economically dependent on and vulnerable to changes in demand from urban cores (Wallerstein, 2004; White, 1991). In addition, economic restructuring and state fiscal policies furthered dependence on natural resource revenues and constrained local governments' ability to invest revenues and diversify their economies, ultimately undermining coal communities' ability to transition today (Haggerty, 2020).

Taxes, royalties, and fees from coal extraction and electricity generation have provided substantial and stable revenue to states and communities for decades (Godby et al., 2015). Losing this revenue could cause "fiscal collapse" in local and state budgets and limit communities' abilities to raise revenue, repay debts, maintain existing infrastructure, and provide public services (Haggerty, 2019a; Morris et al., 2021). The substantial fiscal risk coal plant and mine closure pose to local governments and critical public services – school districts, health, and senior care, and public safety – is well-documented in rural and indigenous communities across the West, including Big Horn and Rosebud counties in Montana, Moffat County, Colorado, Crow Agency, Hopi, and the Navajo Nation (Bryan, 2022; Carlson, 2022; Cates and Eaton, 2019; Nieberg, 2022; Roemer and Haggerty, 2022; Wilson, 2017). Moreover, the vulnerability of local governments and public services to fiscal impacts of coal facility closure is exacerbated in

remote communities since access to alternatives may be a considerable distance and many communities are already affected by high levels of social vulnerability.

A successful "fiscal transition" would allow communities to "replace coal revenue and…fund local services, infrastructure, and institutions with stable and diverse sources" (Haggerty, 2019a, p. 2). However, the absence of policy and planning tools to assess and manage revenue impacts has profound consequences for coal communities: First, the absence of a strategy to address revenue loss contributes to resistance to plan for decline and support clean energy transitions (Righetti et al., 2021). Second, without resources to support planning, the responsibility to plan, apply for assistance, and negotiate with companies falls to individual stakeholders and service providers, draining already limited capacity from institutions that may or may not have access to necessary resources. Last, community members will be forced to make critical decisions – raise taxes, cut services, and layoffs – without certainty about what they can afford and need (Roemer and Haggerty, 2022). Applying a Social Impact Assessment (SIA) framework to fiscal impact assessment can help address aspects of uncertainty by assessing and managing the local impacts of resource revenue decline.

Social Impact Assessment: What Is It, and Why Is It Useful?

Impact Assessment (IA) is the process of identifying future consequences of current or proposed actions. When conducted as part of planning processes, IAs provide critical information on the consequences of actions, help avoid or minimize adverse impacts, plan for mitigation of unavoidable negative effects, and assist affected publics in understanding the consequences of actions (Burdge, 2015). In addition, IAs can promote transparency and participation in the decision-making processes and help to identify procedures for follow-up

planning or policy (de Jesus, 2009). The most established and commonly practiced form of IA in the United States is the Environmental Impact Assessment (EIA), which was established by the National Environmental Policy Act (NEPA) in 1969. EIAs are a decision-support instrument to assess the environmental implications of a proposed development. Closely associated with NEPA, the Social Impact Assessment (SIA) was first conceptualized as a technique for predicting social impacts as part of EIAs (Burdge, 2015).

Today, SIA is an international field of research and practice concerned with the processes of identifying and managing all the social issues associated with a planned intervention, including the effective engagement of affected communities (Esteves et al., 2012; Vanclay et al., 2015). SIAs are applied in a wide range of contexts and have been used to support adaptative management of sustainable development goals, deployed to improve community development outcomes after a natural disaster, and used to manage social processes of mine closures (Everingham et al., 2020; Everingham and Mackenzie, 2019; Imperiale and Vanclay, 2016; Joao et al., 2011; Vanclay, 2003).

SIAs for Closure Management

SIAs are most frequently conducted before project development and as part of an EIA to obtain a permit or meet a regulatory requirement of a government or financial institution (The World Bank Group, 2017). SIA guidelines explicitly advocate for iterative assessment and monitoring throughout the project lifecycle, including closure and decommissioning (Burdge, 2015). In reality, social aspects of closure are unregulated and often underestimated with respect to complexity and importance relative to environmental and technical issues (Bainton and Holcombe, 2018; Vivoda et al., 2019). By ignoring social dimensions of closure, the industry can

avoid or externalize closure costs, suspend responsibility, and divest liability (Bainton and Holcombe, 2018; Vivoda et al., 2019).

The ideal outcome for post-coal communities will include net benefits of community self-reliance, economic diversity, and resilience, constituting a positive legacy rather than a ghost town or socioeconomic vacuum that harbors socio-environmental risks (Bainton & Holcombe, 2018). Resource geographers and transition specialists advocate for assessments and participatory processes to provide communities with the necessary information to plan, strategize, and transition to more diversified economies (Haggerty et al., 2018; Haggerty, 2019a; Robertson et al., 2017). Research in international contexts has applied SIA guidelines to mine closure processes (Table 6) (Everingham and Mackenzie, 2019).

Table 6. Tasks of SIA applied to mine closure (Everingham and Mackenzie, 2019)

Key phases of SIA	**Socioeconomic aspects of mine closure**
Understand	Understanding the context and trends with respect to community assets and the options for rehabilitation and closure activities
Predict, analyze, and assess	Predicting the changes as the planned/possible closure activities interact with the context and the likely extent, direction, and intensity of experiences of changes
Develop and implement strategies	Creating responses to avoid and mitigate potential negative impacts and enhance possible opportunities
Design and implement monitoring programs	Tracking, monitoring, and reporting changes and impacts during implementation of plans
Evaluate	Assessing process and outcomes to adjust or improvements and manage adaptively

SIAs to Assess Fiscal and Public Service Impacts

Fiscal impact analyses or assessments (FIAs) are studies frequently conducted within SIAs. Local governments and community development practitioners commonly use them to evaluate the potential impacts to public services and facilities and changes in revenues and costs among local jurisdictions (Edwards, 2001; Leistritz, 1994). These analyses project the differences in costs and revenues of governmental units that are likely to occur as the result of the development of new projects and are informed by a range of factors, including the magnitude of investment, size and scheduling of the workforce, state and local tax structure, existing delivery systems, and the nature of resulting economic and demographic effects (Bunnell, 1998; Leistritz, 1994). This approach has been applied to assess fiscal risk associated with fossil fuel revenue decline in states, counties, municipalities, and special districts (Barro et al., 2021; Haggerty, 2019b; Newell and Raimi, 2018a), though typically on an ad hoc basis or for the purposes of research rather than as part of a concerted transition strategy or policy framework.

To understand and characterize the "fiscal transition" associated with coal plant closure and revenue decline, an SIA needs to be situated in resource and fiscal policy context and there must be an understanding of how local budgets are tied to critical services, infrastructure, or other resilience capacities. It is essential to recognize and understand how state fiscal policy enables or constrains county and municipal government's ability to save resource revenue and respond to budget shortfalls (Haggerty, 2020). Conversations with local stakeholders and service providers are necessary to understand the decision-making environment and the fiscal relationships between revenue, community services, and public infrastructure (Haggerty, 2019a, 2017; Newell and Raimi, 2018b; Roemer and Haggerty, 2022).

State Policy Addressing Coal-fired Power Plants and Revenue

Federal and state policies set expectations and processes for managing the impacts of coal-fired power plant siting and closure. Multiple state and federal policies set the terms of environmental remediation and waste management while various financial regulations establish responsibilities for costs. Within this framework, individual plant owners negotiate their internal priorities for plant retirement and site decommissioning (Raimi, 2017). However, policy at the federal level does not establish the same closure requirements for social and economic impacts. Thus, we examine two types of state policies that form the regulatory environment governing coal facility closure. The first section examines industrial siting policies to understand how states consider revenue impacts when siting a coal-fired power plant. Next, we examine how energy transition policies influence the fiscal challenges associated with the coal transition. This policy section discusses seven western states: Arizona, Colorado, Montana, New Mexico, Utah, Washington, and Wyoming.

Siting of Industrial Energy Facilities

State siting statutes often issue construction permits to assess the compatibility of the proposed land use with surrounding uses (Hamilton, 1979). However, what impacts are assessed and who has regulatory authority to set criteria for siting and issuing permits for constructing a coal-fired power plant facility varies widely among states (Table 7).

In Arizona, Colorado, New Mexico, and Utah, the primary regulatory authority of the siting of energy facilities belongs to public utility commissions (PUCs) or state agencies responsible for regulating utilities that provide customers with services such as electricity, natural gas, water, and telecommunications (Zitelman and McAdams, 2021). The utility

commission's role in determining the public evaluation processes and the necessary requirements and permits for siting facilities looks different in different states. For example, the Arizona Power Plant and Transmission Line Siting Committee was established to provide an opportunity for public engagement in the siting process and identify specific environmental criteria needed to obtain a Certificate of Environmental Compatibility (ARS § 40-360.01-06). In other states, utility commissions defer to siting criteria set by local jurisdictions. For example, Colorado cities and counties are authorized by "1041 powers" to identify, designate, and regulate areas and activities of state interest through a local permitting process, including the siting and construction of major public utility facilities (CRS § 24-65.1-101.). Proponents require a certificate of public convenience and necessity from the Colorado Public Utilities Commission, but the decision needs to be consistent with the 1041 permit program (Holtkamp and Davidson, 2009). Similarly, in Utah, the purpose of the Utility Facility Review Board is to resolve siting disputes between local governments and public utilities (Utah Revised Code, 2007). It is unclear whether alternative criteria, beyond environmental impact assessments, are required in each of these processes.

Alternatively, three states have a centralized siting authority with jurisdiction over a proposed project (Holtkamp and Davidson, 2009). For example, Montana, Washington, and Wyoming empower an existing state agency or establish a council to be a "one-stop" regulatory authority to coordinate and oversee permitting and assessment processes for the siting of major industrial facilities. These policies clarify who has permitting authority, what criteria are assessed, when impacts of industrial utilities construction and development are assessed, and how the process for managing and monitoring impacts will occur. Montana, Washington, and

Wyoming enacted these policies in response to federal efforts to promote and develop electricity generation and infrastructure. For example, the Major Facilities Siting Act (MFSA) in Montana and the Industrial Siting Act in Wyoming were enacted shortly after the 1971 North Central Power Study (Carter, 1984; US Bureau of Reclamation, 1971). In 1970, Washington passed the Energy Facility Site Location Act (EFSLA) in response to the federal exploration of nuclear facility siting (Luce and Fiksdal, 2013). These policies were initially designed after the 1969 National Environmental Policy Act (NEPA) to ensure environmental protection, assess adverse effects, and provide a mechanism for addressing public comment and concerns (Environmental Quality Council, n.d.; Novotny, 2004; Parfitt, 2009).

In addition to environmental concerns, each permitting process in these three states requires a review of the facility siting that includes socioeconomic impacts. Wyoming and Washington's policies specify assessing effects on local government revenues and services. In Wyoming, the Industrial Siting Act also requires the consideration of the cumulative impact of socioeconomic conditions that have implications for public safety, education, and health care (Hyman, 1982). Washington's EFSLA's application for site certification requires the most detailed and comprehensive assessment of socioeconomic impacts, including evaluation of local government revenues generated by the project with associated service expenditures (WAC 463-60-535, 2019).

Nearly every state requires an assessment of environmental and socioeconomic impacts during the permitting and construction phase, but few policies address closure. The exception is Montana's Coal-fired Unit Remediation Act, which outlines state requirements for decommissioning and remediation of coal facilities. In 2021, Montana amended this legislation

to require the owners of the Colstrip Station to conduct a feasibility study relating to the City of Colstrip's water supply system (Desroches, 2021). Environmental impact monitoring often continues throughout the industrial lifecycle. However, socioeconomic impacts, such as impacts to local government revenue and services, are not considered beyond the construction phase of industrial siting – which is out of step with best practices for impact assessment.

Table 7. State Policy Addressing Coal-fired Power Plant Siting

State	Utility and Industrial Siting Policy
Arizona	Power Plant and Transmission Line Siting Committee, ARS § 40-360-360.13
Colorado	Certificate of public convenience and necessity, CRS § 40-5-102 New construction -extension -compliance with local zoning rules, CRS § 40-5-101
Montana	Major Facilities Siting Act, MCA § 75-20-1-12
New Mexico	New construction; ratemaking principles, NMSA § 62-9-1
Utah	Certificate of convenience and necessity prerequisite to construction and operation- electrical suppliers, UC § 54-4-25 Utility Facility Review Board, UC § 54-14-201-308
Washington	Energy Facility Site Location Act, RCW § 80-50-030
Wyoming	Industrial Development Information and Siting, WS § 35-12-101-119

Energy Transition Policy

State legislatures have started to address the socioeconomic impacts of the coal phase-out, especially in the last five years (Table 8). Colorado, Montana, New Mexico, and Washington have passed coal transition legislation since 2019. The most common issues addressed by state energy transition policy include providing transition support for workers, primarily focused on training or education; providing economic planning and implementation assistance for coal communities; and issuing funding, incentives, or mandates for reinvestment for coal communities (Wange et al., 2022). These transition supports are essential, yet there are

still critical gaps in state policies to ensure communities can be resilient to closure. Specifically, there is a need to address the lack of adequate knowledge about closure impacts, loss of local revenue, and cuts to public services.

Colorado's transition policies address these issues most effectively. The state's SB 19-236 Sunset Public Utilities Commission is the only legislation that provides a funding mechanism to compensate local governments for property tax lost due to accelerated plant depreciation or if securitization is used for cost recovery (SB19-236, 2019). Additionally, Just Transition from a Coal-Based Electrical Energy Economy (HB19-1314) requires regulated utilities to submit a workforce transition plan at least six months before plant closure. Further, the state has established a $6 million "bucket" for direct support to transitioning communities and eligible entities to address the fiscal impacts of closure (Colorado Revised Statutes, 2021; The Office of Just Transition, 2021). While these policies begin to address some of the challenges faced by communities, they do not require an assessment of closure impacts on public revenue and services, and therefore may not be allocating resources as effectively as possible. The provision of transition funds is another common strategy to address the community impacts of closure. Washington and New Mexico have enacted legislation that clarifies closure timelines and establishes funds for transition assistance. However, these transition funds are tied to strategies other than revenue replacement, including economic development, workforce retraining, or investment in renewable energy development (State of New Mexico, 2019; State of Washington and TransAlta Centralia, 2011). As states implement renewable energy generation goals, legislatures in some states grant PUCs more explicit authority to consider non-energy economic impacts in traditional rate-setting practices. Thus, several examples of transition funds

are negotiated and secured through rate case settlements in PUC hearings (Cates et al., 2020). These funds are critical to support community transition strategies (Haggerty, 2019a). However, there is no evidence that the amount set aside in these funds – ranging from $6 million in Colorado for multiple communities to $55 million for a single plant closure in Washington – aligns with the specific revenue impacts to local governments and services. SIAs have the potential to solve this misalignment.

Table 8. State Energy Transition Policy

State	Energy Transition Policy
Arizona	---
Colorado	Just Transition Support for Coal-Related Jobs, C.R.S. § 8-83-501-506 Sunset Public Utilities Commission, CRS 40-2-125
Montana	Coal-fired Unit Remediation Act, MCA § 75-8-1-2
New Mexico	Energy Transition Act, NMSA § 62-18-1-23
Utah	---
Washington	Closure of Coal-fired Electric Generation Facilities, RCW § 80-82-01-02
Wyoming	---

Findings from Policy Review

Our review of state approaches to industrial siting and energy transition highlights three findings relevant to closure impact assessments:

- Few industrial siting policies and approaches consider revenue and service impacts at the permitting stage of development, and impact assessment is not required at the end of the industrial lifecycle. Without the backing of a legal framework, impacts on local government revenue, services, and infrastructure are insufficiently considered or forgo assessment altogether (Everingham et al., 2013).
- State energy transition policy does not adequately assess impacts to local government revenue and services (Wange et al., 2022). While waiting for energy transition legislation to

catch up, stakeholders such as community practitioners or university partners, must take the lead in conducting a fiscal impact assessment for closure.

- Public Utility Commissions (PUCs) often determine what impacts are assessed during the permitting phase of projects and also hold a "consequential authority" of coal-facility closure, transition processes, and decisions about how to mitigate the economic fallout of retirements (Zitelman and McAdams, 2021, p. 11). Therefore, PUC authority has important implications for coal communities.

SIA Considerations and Best Practices

An SIA does not necessarily need to be mandated to be implemented. All stakeholders in coal facility closures could benefit from an impact assessment that estimates socioeconomic costs associated with closure to inform monitoring and mitigation of impacts and reduce the risk of socioeconomic legacy issues. This section draws on best practices of SIA to identify six recommendations for practitioners to consider for a fiscal and service risk assessment for coal-facility closure.

- **Determining the scale and geographical boundaries of assessment is an integral part of the scoping process.** The area of impact depends directly on the project's magnitude, and the social repercussions associated with the closure of a coal-fired power plant can affect multiple counties, communities, or regions (Burdge, 2015). The decline of the coal industry in the West will have cumulative and regional impacts that need to be considered and integrated into transition planning processes (Feaster and Cates, 2019). However, the narrow focus of a fiscal impact assessment requires the unit of analysis to start with the taxing districts and jurisdictions – municipalities, counties, and special districts – that collect

revenue associated with coal-fired electricity generation or coal extraction payments. Special districts for services may have different or overlapping spatial boundaries.

- **SIAs must be grounded in local, geographical, and historical context.** Best practice in SIA requires a solid understanding of local social issues and demographic, economic, and geographical processes resulting from past regional development projects (Vanclay, 2002). In settler-colonial contexts, closure assessments need to recognize historical harms and colonial violence that may be core to the community's relationship to the extractive industry development and decline (Curley, 2018; Sandlos and Keeling, 2016). Appreciating context is especially important in coal-dependent communities for three reasons: First, understanding the demographic changes can help to focus the assessment on the community's current and projected service needs. Second, many coal-dependent communities possess geographical factors that contribute to service risk. For example, service provision is challenging in rural areas, and losing a critical service could add substantial distance to accessing those services. Finally, understanding the historical development history is particularly important in resource-dependent communities where revenue models and infrastructure may be over-adapted to the extractive industry (Freudenburg, 1992; Smith and Haggerty, 2020). For example, services and physical infrastructure designed to support a booming coal town may be overbuilt for the community's future needs and present a financial risk to local budgets (Roemer and Haggerty, 2022).
- **Fiscal impact assessments must be situated in local and state policy contexts.** Fiscal policy – how governments generate revenue from economic activity and use this revenue to pay for services – shapes transition dynamics in the West's coal communities (Haggerty,

2020). Fiscal policies perpetuate dependence on extractive industries and constrain the ability of local governments to grow and invest revenues in ways aligned with economic diversification (Haggerty, 2020; Morris, 2016). Fiscal policies related to coal revenue and local government taxation vary by state. Still, a common challenge is relying on coal revenue on annual operating budgets, using coal revenue to lower other sources of tax revenue that increase dependence on coal production, and limiting local government taxation, spending, and saving authority (Haggerty, 2017).

- **Fiscal impact assessment for closure needs to characterize the 'fiscal transition**.' A fiscal impact assessment for the decline will follow the same process as prospective fiscal analyses. This process begins with identifying relevant revenue and fiscal data from state sources, local jurisdictions, and special districts to understand what portion of local budgets will be impacted by the closure. Quantifying fiscal exposure can be difficult because state and local governments collect coal-related revenue in various ways, including royalties, lease bonuses, severance taxes, sales taxes, property taxes, business taxes, and personal income taxes (Haggerty, 2017). Sometimes, coal revenue goes directly to county governments and school districts. In others, it flows to those jurisdictions via state trust funds. Regardless, focusing on estimates of the coal industry's direct contributions to county revenues is likely to understate the fiscal risks of decline (Morris et al., 2019). The assessment needs to consider how coal revenue policy will affect the pace of fiscal decline. For example, revenue based on the assessed taxable value of a coal-fired power plant may see gradual reductions compared to revenue based on annual coal extraction that could disappear suddenly. Finally, to understand how fiscal decline may play out and affect decisions made at the local level, it is critical to

ground fiscal data in the local context through conversations and interviews with key stakeholders (Haggerty, 1997; Roemer and Haggerty, 2022).

- **Fiscal assessment needs to include public service risk assessments, industrial infrastructure legacies, and impacts on human capital.** Identifying which services to include in the risk assessment is an essential first step in the public service risk assessment. Certain services are associated with community resilience, such as health, education, public safety, and municipal services. It will be important to include community and stakeholder input in this process to identify services most relevant to the community (Reimer, 2002; Sullivan et al., 2014). Different public services rely on different sources of revenue, which will affect their vulnerability to decline. For example, some services are funded by special taxing districts, which may be affected by changes to property taxes. In contrast, others might face the risk of cuts when revenue decline impacts general funds at the county or municipal level. Working with county commissioners and providers can help to clarify funding models and risks to each service.

  Next, the service risk assessment needs to consider the physical infrastructure that is left behind. This may include critical infrastructure that is still owned by the industry. Such infrastructure can be aging, be costly to maintain, and pose a burden to communities and local government revenue (Boerchers et al., 2018; Roemer and Haggerty, 2022). For example, the City of Colstrip currently depends on the power plant owners to supply its domestic water as local groundwater(City of Colstrip, 2020). It is unclear who will be responsible for maintaining the water supply infrastructure after the coal plant closes. Absorbing the costs of operating and maintaining the aging infrastructure would be a large

burden for any community, especially one experiencing economic decline. Assessment of these challenges can help to identify the appropriate stakeholders that need to be involved in figuring out the future of these infrastructures. Lastly, the service risk assessment must consider how closure and fiscal decline impact a community's human capital. Anticipated losses of employees and volunteers will negatively affect critical aspects of community resilience, such as networks, problem-solving, and the generation of new ideas (Emery and Flora, 2006).

- **The SIA process must involve the meaningful participation of those most affected.** Literature on the social impacts of mine closure and energy justice draws attention to the importance of procedural fairness or assurance that those most impacted have a meaningful role in shaping the process (Sovacool and Dworkin, 2015). Public participation involves individuals and groups affected by a proposed intervention to be the subject of a decision-making process (Andre et al., 2006). SIA principles of public participation emphasize the importance of the process being adapted to the local context, informative and proactive, inclusive and equitable, initiated early and sustained, and supportive to participants. Participatory processes need to be appropriate and tailored to each community's needs. Practitioners have applied a range of participatory modes and collaborative planning frameworks to the closure context. Case studies provide excellent examples of participatory budgeting, public health models, and scenario planning (Carlson, 2021; Everingham et al., 2020; Haggerty et al., 2018).

Implications for Policy and Practice

State industrial and major utility siting policies fail to account for closure impacts on communities that host coal-fired power plants. As a result, the extent of social impact assessment required during permitting and construction phases is limited and not occurring throughout or at the end of the project lifecycle. States with centralized industrial siting policies set more explicit expectations for assessing social and economic impacts than those without siting policies. For example, Washington's Energy Facility Site Location Act enumerates the most detailed assessment criteria, including evaluation of local government revenues and service expenditures. However, it does not require assessment for closure.

Policies from the hard rock mining context provide a framework which might be transferred to the coal sector. For instance, Montana's Hard Rock Mining Impact Assessment (MCA 90-6-3) and Hard Rock Mining Impact Property Tax Base Sharing Act (MCA 90-6-4) address these issues by 1) providing a system to assist in identifying affected jurisdictions and local government units; 2) assessing impacts associated with development to local government facilities and services; 3) requiring impact plans in addition to environmental impact states that focus on local economic impacts and consider project lifecycle; and 4) establishing a hard-rock mining impact account that holds payments to address issues outlined in the impact plan.

Currently, no western state policies to address the decline in the coal industry mandate performing an impact assessment or providing revenue replacement. A recent report shows that these issues are also unaddressed on a national scope, except for a few exceptions (Wange et al., 2022). Colorado's Sunset Public Utilities Commission (SB19-236) is the only example in the region that requires utilities to compensate local governments for losses if coal plant depreciation

is accelerated. Further, there are examples of state policies outside of the West that provide opportunities to replace revenue. For example, New York has created an Electric Generation Cessation Mitigation Fund that provides up to five years of revenue replacement funding to local government entities affected by the closure of an electric generation facility, up to 80% of lost tax revenues (S6408-C, 2015). Illinois Energy Transition policy creates the Energy Transition Community Grants program, where funding can supplement tax revenue loss (SB 2408-21). Short-term and temporary assistance can provide a bridge but transitioning communities will need long-term support to effectively transition their economies. Furthermore, there is a need to address the underlying fiscal policy structures that perpetuate dependence and resistance to an energy transition (Haggerty and Gentile, 2022). National legislative solutions establishing resource endowments to decouple resource revenue from local budgets and provide a stable source of income to resource communities have recently been introduced (Bennet, 2022).

State PUCs provide a critical venue for determining coal-fired power plant closure procedures and mechanisms for securing funds for impact mitigation and utility-company reinvestment (Zitelman and McAdams, 2021). For example, both Colstrip, Montana and Pueblo, Colorado have transition funds that have been established on a utility-by-utility basis through rate case negotiations. New Mexico and Washington state legislatures have passed legislation requiring utilities to provide transition funds. Through rate case initiatives or rule-making, PUCs can require the regulated utilities to reinvest in impacted communities, as opposed to rate case settlements which are utility-specific (Cates et al., 2020). In Arizona, state stakeholders organized a series of Just Transition town halls for commissioners to hear from members of the communities who have been or will be impacted by past or future closures of power plants in the

region (Arizona Corporation Commission, 2022). A fiscal impact assessment for closure could help ensure that transition assistance correlates with the specific needs of affected communities and prevent overpayment by ratepayers.

Fiscal impact assessments that consider service risks provide an opportunity for policymakers and utilities to understand the extent of local impacts and tailor policies to meet those needs. More importantly, applying an SIA framework to a fiscal assessment can help stakeholders and service providers manage local impacts. This approach can be easily integrated into existing transition planning and assistance programs by state or federal partners such as the Economic Development Administrations, Communities of Practice, and the Energy Communities Interagency Working Group's Rapid Response Team tool kits (Interagency Working Group on Coal & Power Plant Communities & Economic Revitalization, n.d.; US Economic Development Administration, n.d.).

These assessments can also be beneficial if only practiced at the local level. Understanding potential risks as early as possible is important. Some coal communities in the West are already dealing with closure and decline, and others might still have time to assess risk, adjust, and work with neighboring districts and state partners to prepare for the transition. Finally, community-led social impact assessments show that these processes can facilitate participatory, equitable dialogue that helps community leaders coordinate development outcomes and adapt to the changing social and economic context (Haggerty et al., 2018).

Social impact assessments offer a framework and process for identifying and evaluating critical issues impacting coal-dependent communities. Still, it is unclear whether SIAs can effectively capture all the social and economic impacts associated with the termination of a 50-

year industry. Best practices in industrial siting emphasize the importance of clear regulations, guidelines, and community participation in decision-making about closure and remediation being used to direct project planning from day one. Given industrial coal development's intergenerational socioeconomic and environmental dimensions, restorative justice is a reasonable expectation for communities. However, impact assessment alone cannot fully integrate this scope (Sandlos and Keeling, 2016). As a society, there is a need to actively work to ensure that community impacts are not strategically ignored and that impacted communities and legacy issues are not relegated to "shadow places" (Lawrence and O'Faircheallaigh, 2022).

We must take the time to learn lessons from the challenges of the US coal transition – to understand and modify the underlying structures and policies that undermine and constrain community transition, identify frameworks and participatory processes to manage impacts in other types of fossil fuel transitions, and ensure that we account for the impacts associated with the entire lifecycle of developments, including renewable energy infrastructure.

References Cited in Chapter Five

Andre, P., Enserink, B., Connor, D., Croal, P., 2006. Public Participation International Best Practice Principles. IAIA, Fargo.

Arizona Corporation Commission, 2022. Arizona Corporation Commission to host town hall meetings in Page, Holbrook, and Eagar. https://azcc.gov/news/2022/05/17/arizona-corporation-commission-to-host-town-hall-meetings-in-page-holbrook-and-eager (accessed 26 October 2022).

Bainton, N., Holcombe, S., 2018. A critical review of the social aspects of mine closure. Resour. Policy. 59, 468–478. https://doi.org/10.1016/j.resourpol.2018.08.020.

Barro, J., Diamond, J.W., Evans, R., 2021. The Effect of Transition to Low-carbon Energy on Texas Tax Revenues: 2021–2050. Rice University's Baker Institute for Public Policy, Houston.

Bazilian, M.D., Carley, S., Konisky, D., Zerriffi, H., Pai, S., Handler, B., 2021. Expanding the scope of just transitions: Towards localized solutions and community-level dynamics. Energy Res. Soc. Sci. 80, 102245. https://doi.org/https://doi.org/10.1016/j.erss.2021.102245.

Beckett, C., Dowdell, E., Monosky, M., Keeling, A., 2020. Integrating Socio-Economic Objectives for Mine Closure and Remediation into Impact Assessment in Canada. Memorial University of Newfoundland, Newfoundland, Canada.

Bennet, M., 2022. National Energy Community Transition Act. Washington, D.C.

Berkes, F., 2009. Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. J. Environ. Manage. 90, 1692–1702. https://doi.org/10.1016/j.jenvman.2008.12.001.

Berkes, F., Ross, H., 2013. Community resilience: Toward an integrated approach. Soc. Nat. Resour. 26, 5–20. https://doi.org/10.1080/08941920.2012.736605.

Besser, T.L., Recker, N., Agnitsch, K., 2008. The impact of economic shocks on quality of life and social capital in small towns. Rural Sociol. 73, 580–604. https://doi.org/10.1526/003601108786471530.

Boerchers, M., Sinclair, A.J., Gibson, R.B., Halden, N.M., 2018. "Sustainability is finding the next mine": The complicated relationships among legacies, sustainability, and EA. Environ. Impact Assess. Rev. 71, 84–93. https://doi.org/https://doi.org/10.1016/j.eiar.2018.01.002.

Bryan, S.M., 2022. US shift away from coal hits tribal community in New Mexico. The Sun Chronicle, October 2.

Bunnell, G., 1998. Analyzing the fiscal impacts of development: Lessons for building successful communities. Community Dev. Soc. J. 29, 38–57. https://doi.org/10.1080/15575339809489772.

Burdge, R.J., 2015. The Concepts, Process and Methods of Social Impact Assessment. Society and Natural Resources Press, Huntsville.

Carley, S., Evans, T.P., Konisky, D.M., 2018. Adaptation, culture, and the energy transition in American coal country. Energy Res. Soc. Sci. https://doi.org/10.1016/j.erss.2017.10.007.

Carley, S., Konisky, D.M., 2020. The justice and equity implications of the clean energy transition. Nat. Energy 5, 569–577. https://doi.org/10.1038/s41560-020-0641-6.

Carlson, J., 2021. Priority based budgeting creates community alignment in Duluth. Government Finance Review April, 19–29.

Carlson, S., 2022. Central Consolidated District Overview, Responses to Yazzie/Martinez and

Plans to Spend At-Risk Funding, in: Presentation to NM LESC & NM IAC. Central Consolidated School District.

Carter, M., 1984. The Montana Major Facility Siting Act. Mont. Law Rev. 45.

Cates, K., Eaton, P., 2019. As Coal Economy Collapses, Imminent Public Budget Crisis confronts Hopi-Navajo Tribes. Institute for Energy Economics and Financial Analysis, Lakewood.

Cates, K., Ormund, A., Feaster, S., Roemer, K., 2020. The case (and the mechanisms) for utility-company reinvestment in Arizona's coalfield communities. Energy Policy 151, 112112.

Chaloping-March, M., 2008. Business expediency, contingency and socio-political realities - A case of unplanned mine closure, in: Fourie, A., Tibbett, M., Weiersbye, I., Dye, P. (Eds.), Mine Closure 2008: Proceedings of the Third International Seminar on Mine Closure. Australian Centre for Geomechanics PP, Perth, pp. 863–871.

Colorado Revised Statutes, 2021. HB 21-1290 Concerning Funding to Provide Just Transition for Coal Transition Workers and Coal Transition Communities.

Curley, A., 2018. A failed green future: Navajo green jobs and energy "transition" in the Navajo Nation. Geoforum 88, 57–65. https://doi.org/10.1016/j.geoforum.2017.11.012.

de Jesus, J., 2009. What is Impact Assessment? International Association for Impact Assessment, Fargo.

Della Bosca, H., Gillespie, J., 2018. The coal story: Generational coal mining communities and strategies of energy transition in Australia. Energy Policy 120, 734–740. https://doi.org/https://doi.org/10.1016/j.enpol.2018.04.032.

Desroches, K., 2021. New Law Requires Colstrip Owners to Study Town Water Supply. Yellowstone Public Radio, May 12.

Edwards, M., 2001. Fiscal impact analysis: Does method matter? J. Community Dev. Soc. 32, 106–129. https://doi.org/10.1080/15575330109489695.

Emery, M., Flora, C., 2006. Spiraling-up: Mapping community transformation with community capitals framework. J. Community Dev. Soc. 37, 19–35.

Environmental Quality Council, n.d. Major Facility Siting Act.

Esteves, A.M., Franks, D., Vanclay, F., 2012. Social impact assessment: The state of the art. Impact Assess. Proj. Apprais. 30, 34–42. https://doi.org/10.1080/14615517.2012.660356.

Everingham, J.-A., Mackenzie, S., 2019. Assessing social impacts of mine closure. IAIA19 Conference: Evolution or Revolution: Where next for impact assessment? Brisbane,

Australia.

Everingham, J.-A., Mackenzie, S., Svobodova, K., Witt, K., 2020. Participatory processes, mine closure and social transitions. Centre for Social Responsibility in Mining, University of Queensland.

Everingham, J.-A., Pattenden, C., Klimenko, V., Parmenter, J., 2013. Regulation of resource-based development: governance challenges and responses in mining regions of Australia. Environ. Plan. C Gov. Policy 31, 585–602. https://doi.org/10.1068/c10184.

Feaster, S., Cates, K., 2019. Powder River Basin Coal Industry Is in Long-Term Decline Fast-Changing Markets Indicate Deeper Downturns to Come in Montana and Wyoming. Institute for Energy Economics and Financial Analysis, Lakewood.

Flora, J.L., Sharp, J.S., Flora, C., Newlon, B., County, F., 1997. Entrepreneurial social infrastructure and locally initiated economic development in the nonmetropolitan United States. Sociol. Q. 38, 623–645. https://doi.org/10.1111/j.1533-8525.1997.tb00757.x.

Freudenburg, W.R., 1992. Addictive Economies: Extractive Industries and Vulnerable Localities in a Changing World Economy. Rural Sociol. 57, 305–332. https://doi.org/10.1111/j.1549-0831.1992.tb00467.x.

Godby, R., Coupal, R., Taylor, D., Considine, T., 2015. Potential Impacts on Wyoming Coal Production of EPA's Greenhouse Gas Proposals. Electr. J. 28, 68–79. https://doi.org/10.1016/j.tej.2015.05.004.

Haggerty, J.H., Haggerty, M., Roemer, K.F., Rose, J., 2018. Planning for the local impacts of coal facility closure: Emerging strategies in the U.S. West. Resour. Policy. https://doi.org/10.1016/j.resourpol.2018.01.010.

Haggerty, J.H, Smith, K., Mastel, T., Lapan, J., Lachapelle, P., 2018. Assessing, monitoring, and addressing boomtown impacts in the US: evaluating an existing public health model. Impact Assess. Proj. Apprais. 36, 115–127.

Haggerty, M., Gentile, N. 2022. Quitting Fossil Fuels and Reviving Rural America. CAP, Washington, D.C.

Haggerty, M., 2020. Fiscal Policy is Failing Rural America. Headwaters Economics, Bozeman.

Haggerty, M., 2019a. Replacing Coal Revenue and Investing in Economic Transition: Solutions for Coal-Dependent Communities. Headwaters Economics, Bozeman.

Haggerty, M., 2019b. Coal Transition in Montrose County, Colorado Fiscal Assessment. Headwaters Economics, Bozeman.

Haggerty, M., 2017. Coal Extraction Revenue and Spending: A Comparison Among Western

States. Headwaters Economics, Bozeman.

Haggerty, M.N., 1997. Fiscal impacts of alternative development patterns: Broadwater and Gallatin Counties. Mont. Policy Rev. 19–31.

Halseth, G., Markey, S., Ryser, L., 2019. Service Provision and Rural Sustainability: Infrastructure and Inovation, Service Provision and Rural Sustainability. Routeledge, Oxon.

Hamilton, M.S., 1979. Power plant siting: A literature review. Nat. Resour. J. 19.1, 75–95.

Harrison, J.L., Montgomery, C.A., Bliss, J.C., 2016. Beyond the monolith: The role of bonding, bridging, and linking social capital in the cycle of adaptive capacity. Soc. Nat. Resour. 29, 525–539.

Healy, N., Barry, J., 2017. Politicizing energy justice and energy system transitions: Fossil fuel divestment and a "just transition." Energy Policy 108, 451–459.

Helmke-Long, L., Carley, S., Konisky, D.M., 2022. Municipal government adaptive capacity programs for vulnerable populations during the U.S. energy transition. Energy Policy 167, 113058. https://doi.org/https://doi.org/10.1016/j.enpol.2022.113058.

Holtkamp, J.A., Davidson, M.A., 2009. Transmission Siting in the Western United States. Holland & Hart, Denver.

Hyman, E.L., 1982. Wyoming's industrial siting permit process and environmental impact assessment. Environ. Manag. 6, 1–7.

Imperiale, A.J., Vanclay, F., 2016. Experiencing local community resilience in action: Learning from post-disaster communities. J. Rural Stud. 47, 204–219. https://doi.org/10.1016/J.JRURSTUD.2016.08.002.

Interagency Working Group on Coal & Power Plant Communities & Economic Revitalization, n.d. Resources. https://energycommunities.gov/resources/ (accessed 26 October 2022).

Joao, E., Vanclay, F., den Broeder, L., 2011. Emphasising enhancement in all forms of impact assessment: Introduction to a special issue. Impact Assess. Proj. Apprais. 170–180. https://doi.org/10.3152/146155111X12959673796326.

Jolley, G.J., Khalaf, C., Michaud, G., Sandler, A.M., 2019. The economic, fiscal, and workforce impacts of coal-fired power plant closures in Appalachian Ohio. Reg. Sci. Policy Pract. 11, 403–422. https://doi.org/10.1111/RSP3.12191.

Kulig, J.C., Edge, D.S., Townshend, I., Lightfoot, N., Reimer, W., 2013. Community resiliency: Emerging theoretical insights. J. Community Psychol. 41, 758–775. https://doi.org/10.1002/jcop.21569.

Lawrence, R., O'Faircheallaigh, C., 2022. Ignorance as strategy: "Shadow places" and the social impacts of the ranger uranium mine. Environ. Impact Assess. Rev. 93, 106723. https://doi.org/https://doi.org/10.1016/j.eiar.2021.106723.

Leistritz, F.L., 1994. Economic and fiscal impact assessment. Impact Assess. 12, 305–317. https://doi.org/10.1080/07349165.1994.9725868.

Look, W., Raimi, D., Robertson, M., Higdon, J., Propp, D., 2021. Enabling Fairness for Energy Workers and Communities in Transition. Resources for the Future and Environmental Defense Fund, Washington, D.C.

Luce, J., Fiksdal, A., 2013. Washington State Energy Facility Site Evaluation Council.

Mayer, A., 2018. A just transition for coal miners? Community identity and support from local policy actors. Environ. Innov. Soc. Transitions 28, 1–13. https://doi.org/https://doi.org/10.1016/j.eist.2018.03.006.

Morris, A.C., 2016. The Challenge of State Reliance on Revenue from Fossil Fuel Production. Brookings, Washington, D.C.

Morris, A.C., Kaufman, N., Doshi, S., 2021. Revenue at Risk in Coal-Reliant Counties. Environ. Energy Policy Econ. 2, 83–116. https://doi.org/10.1086/711307.

Morris, A.C., Kaufman, N., Doshi, S., 2019. Why Local Governments Should Prepare for the Fiscal Effects of a Dwindling Coal Industry. Tax Policy Center, Washington, D.C.

Morrison, T.H., 2014. Developing a regional governance index: The institutional potential of rural regions. J. Rural Stud. 35, 101–111. https://doi.org/10.1016/j.jrurstud.2014.04.004.

Newell, R.G., Raimi, D., 2018a. The fiscal impacts of increased U.S. oil and gas development on local governments. Energy Policy 117, 14–24.

Newell, R.G., Raimi, D., 2018b. US state and local oil and gas revenue sources and uses. Energy Policy 112, 12–18. https://doi.org/https://doi.org/10.1016/j.enpol.2017.10.002.

Nieberg, P., 2022. Craig, Colorado grapples with the future as its coal mine and power plant shut down. KUNC, January 24.

Norris, F.H., Stevens, S.P., Pfefferbaum, B., Wyche, K.F., Pfefferbaum, R.L., 2008. Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. Am. J. Community Psychol. 41, 127–150.

Novotny, N., 2004. Wyoming Industrial Siting Act: Creations and Exemptions. Wyoming Legislative Service Office, Cheyenne.

Parfitt, T., 2009. Industrial Siting Overview. Presentation to Legislative Wind Energy Task

Force, Cheynne.

Raimi, D., 2017. Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future, Washington, D.C.

Reimer, B., 2002. Understanding and measuring social capital and social cohesion. New Rural Econ. 23.

Righetti, T.K., Stoellinger, T., Godby, R., Coddington, K., 2021. Adapting to coal plant closures: A framework to understand state energy transition resistance. Envtl. L. 51, 957–990.

Robertson, S.A., Blackwell, B.D., McFarlane, J.A., 2017. The viability of remote mining communities: Insights from community perceptions and employment impact assessments. Impact Assess. Proj. Apprais. 35, 310–324. https://doi.org/10.1080/14615517.2017.1354640

Roemer, K.F., Haggerty, J.H., 2022. The energy transition as fiscal rupture: Public services and resilience pathways in a coal company town. Energy Res. Soc. Sci. 91.

Sandlos, J., Keeling, A., 2016. Aboriginal communities, traditional knowledge, and the environmental legacies of extractive development in Canada. Extr. Ind. Soc. 3, 278–287.

Smith, K.K., Haggerty, J.H., 2020. Exploitable ambiguities & the unruliness of natural resource dependence: Public infrastructure in North Dakota's Bakken shale formation. J. Rural Stud. 80, 13–22. https://doi.org/10.1016/j.jrurstud.2020.05.006.

Sovacool, B.K., Dworkin, M.H., 2015. Energy justice: Conceptual insights and practical applications. Appl. Energy 142, 435–444. https://doi.org/https://doi.org/10.1016/j.apenergy.2015.01.002.

State of New Mexico, 2019. Energy Transition Act.

State of Washington, TransAlta Centralia, 2011. Memorandum of Agreement.

Sullivan, L., Ryser, L., Halseth, G., 2014. Recognizing change, recognizing rural: The new rural economy and towards a new model of rural service. J. Rural Community Dev. 9.4, 219–244.

Swann, W.L., Deslatte, A., 2018. What do we know about urban sustainability? A research synthesis and nonparametric assessment. Urban Stud. 56, 1729–1747. https://doi.org/10.1177/0042098018779713.

The Office of Just Transition, 2021. Guidance for Colorado Just Transition Community Funding Opportunities. Colorado Department of Labor and Employment, Denver. https://cdle.colorado.gov/sites/cdle/files/documents/FINAL_OJT_Community_Funding_Guidance_11-21.pdf (accessed 26 October 2022).

The World Bank Group, 2017. The World Bank Environmental and Social Framework. The World Bank, Washington, D.C.

U.S. Bureau of Reclamation, 1971. North Central Power Study: Report of Phase I.

U.S. Economic Development Administration, n.d. EDA Communities of Practice. https://eda.gov/communities/ (accessed 27 October 2022).

U.S. EIA, 2022. Table 6.6 Planned U.S. Electric Generating Unit Retirements Electr. Power Mon.

US Environmental Protection Agency, 2015. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities: Final Rule. Environmental Protection Agency, Washington, D.C.

Utah Revised Code, 2007. Chapter 14. Utility Facility Review Board Act.

Vanclay, F., 2003. International principles for social impact assessment. Impact Assess. Proj. Apprais. 21, 5–11.

Vanclay, F., 2002. Conceptualising social impacts. Environ. Impact Assess. Rev. 22, 183–211.

Vanclay, F., Esteves, A.M., Aucamp, I., Franks, D.M., 2015. Social Impact Assessment: Guidance for Assessing and Managing the Social Impacts of Projects. International Association for Impact Assessment, Fargo.

Vivoda, V., Kemp, D., Owen, J., 2019. Regulating the social aspects of mine closure in three Australian states. J. Energy Nat. Resour. Law 37, 405–424.

WAC 463-60-535 Socioeconomic impact, 2019.

Wallerstein, I.M., 2004. World-systems analysis: An introduction. Duke University Press, Durham.

Wange, C., Mardell, S., Richardson, J., Varadarajan, U., 2022. Coal Community Transition Policy: How State Legislation is Supporting Coal Communities and Workers as the Economy Shifts to Clean Energy.

Watson, S.T., 2020. Tonawanda considers drastic measures to keep cheap water supply from drying up. Buffalo News, August 14.

White, R., 1991. “It’s Your Misfortune and None of My Own”: A New History of the American West. University of Oklahoma Press, Norman.

Wilson, G.A., 2012. Community Resilience and Environmental Transitions. Routledge, London. https://doi.org/10.4324/9780203144916.

Wilson, G.A., 2010. Multifunctional “quality” and rural community resilience. Trans. Inst. Br. Geogr. 35, 364–381.

Wilson, S., 2017. Crow government’s future uncertain as budget woes hit tribe. Billings Gazette, October 3.

Zitelman, K., McAdams, J., 2021. The Role of State Utility Regulators in a Just and Reasonable Energy Transition. National Association of Regulatory Utility Commissioners, Washington, D.C.

CHAPTER SIX

CONCLUSION

This dissertation seeks to understand community resilience in transitioning communities and regions. Its geographical focus is the US West, where the national energy transition away from coal-fired electricity is initiating processes of industrial decline in remote, resource-dependent communities. Drawing from the literature on resource geography, community resilience, and transition theory, this work situates the community experiences of transition within a broader context of regional deindustrialization driven by policy and market factors. Doing so illustrates how the dynamics of the decline of the coal industry interact with existing policy corridors to intensify structural vulnerabilities underlying resource peripheries to create significant challenges for transitioning coal-dependent communities. At the same time, and in line with scholarship advocating for just energy transitions, this work has sought to foreground the insights of community experts and development practitioners to provide a set of grounded insights and recommendations relevant to policy and practice at community and regional levels.

Informed by a mixed method, predominantly qualitative approach, the chapters featured in this dissertation provide four discrete analyses of the processes influencing community resilience in transitioning coal-dependent communities. Chapter Two demonstrates how the absence of a national energy transition policy exacerbates uncertainty for coal communities and results in diverging policy corridors at the state level. Informed by a series of targeted discussions with policy experts and practitioners, the chapter illustrates that existing transition assistance policies do not address the specific needs of remote, coal-dependent communities. Chapter Three extends this policy analysis to examine how the complex policy environment,

economic dependence, and uncertainty compound to make planning for the impacts of the coal transition difficult, if not impossible, for remote communities like Colstrip, Montana. Chapter Four provides an in-depth case study focused on the fiscal impacts of the coal transition in Colstrip, Montana. This study uses historical narrative, fiscal data, and policy analysis with key informant interviews to characterize the "fiscal rupture" of coal-facility closure to local government revenue and public services, which ultimately undermines community resilience and development potential in the transition context. Finally, Chapter Five demonstrates that the impacts on local government revenue are not adequately considered in industrial siting and energy transition policy processes and offers a road map for community practitioners to apply a social impact assessment framework to assess and manage the fiscal impacts of coal-fired power plant closure.

Synthetic Findings

Beyond the contributions of each individual study, several synthetic findings emerge from this research. More specifically, this dissertation advances knowledge and understanding of transitions in rural resource-dependent communities and regions. First, this dissertation demonstrates the unevenness of the current policy environment to support resilient responses to the economic rupture associated with the coal transition. Second, this dissertation identifies three areas where endogenous and exogenous factors interact to influence community resilience to transition, which include institutional accountability, community development and infrastructure, and fiscal policy and practice. Finally, this dissertation offers grounded insights into the application of community resilience and transition theory to study change in place-based research in resource peripheries. I consider each of these synthetic findings in turn in the

paragraphs below. Afterward, I reflect on the implications for policy and practice, limitations of this study, and offer recommendations for future research.

First, this dissertation illustrates how the contemporary policy environment in the US exacerbates transition risk at the local level—and does so unevenly, meaning that different coal communities experience different levels of risk as a function of variable policy contexts. The absence of a coordinated national energy policy increases uncertainty for coal communities as states become responsible for their legislation, resulting in various strategies and levels of support. Two distinct policy corridors emerge among states reviewed in Chapter Two. The first corridor accelerates the energy transition and seeks to clarify the pace of transition by negotiating closure dates or incentives to expedite coal plant retirements. The second corridor works to slow the transition by bolstering the coal industry and aims to postpone coal plant retirements. While it is too soon to know how these policy corridors will shape community pathways, the literature and expert interviews agree that strategies that provide more certainty around closure dates, provide time and resources for early planning, and secure transition funds better equip communities to navigate transitional ruptures.

Second, in its attention to the experience of transition at the community level, this dissertation delineates three areas where exogenous and endogenous factors interact to influence community resilience to industrial decline. The first concerns the issue of institutional accountability or responsibility for managing the social and economic impacts of closure. In Chapter Five, I examined state industrial and major utility siting policies to understand the expectations for impact mitigation established at the onset of the project and found that most policies fail to account for social and economic impacts of closure. Although environmental

impact management and remediation needs are more clearly articulated by policy with bonding requirements, the extent of social impact assessment is limited and is not required throughout or at the end of the project lifecycle. Without the backing of a legal framework, social impacts such as the impacts to local government revenue, services, and infrastructure are insufficiently considered. The absence of a comprehensive assessment means that critical issues may be addressed on a case-by-case basis or ignored altogether. Furthermore, the challenges of institutional accountability at time of closure are worsened because of historical energy policy that enabled the deregulation of electricity markets. Deregulation has resulted in the complex ownership regime that diffuses responsibility for critical decisions regarding facility closure. For individual owners who are public utilities, closure processes are negotiated with their state Public Utility Commissions. Thus, for transitioning coal communities, the "consequential authority" that determines coal-facility closure timing and how to mitigate the economic fallout may lie in out-of-state venues (Zitelman and McAdams, 2021, p. 11).

The in-depth investigation of the coal transition in Colstrip, Montana highlights two distinct areas where exogenous and endogenous factors interact to shape community transition context: community planning and infrastructure and fiscal policy and practice. First, the historical narrative identified several key moments in Colstrip's development history – its establishment, incorporation, and decline – where major community planning and infrastructure decisions were made in response to external drivers such as industry, energy policy, or economic markets. This analysis illustrates how exogenous drivers contribute to community path dependence by reinforcing fiscal reliance on coal revenue and increase vulnerability of community assets and infrastructure to closure. It is increasingly recognized that fiscal

dependence on fossil fuel revenue creates barriers to rural community development and a clean energy transition (Haggerty, 2020; Morris et al., 2019; Raimi et al., 2022b). The second part of Chapter Four's analysis focuses on how the fiscal rupture associated with facility closure unfolds 'on the ground'. Interviews with local officials and service providers show that the coal transition will likely result in a combination of tax increases, layoffs, and scaling back of critical services. Further, while stakeholders are acutely aware of fiscal decline as a critical risk, the path forward is unclear and there is a need for support that helps to address the uncertainty with which community members are making critical decisions. Overadaptation of critical community infrastructure and revenue models is common in resource peripheries and energy communities (Freudenburg, 1992; Smith and Haggerty, 2020), and needs to be considered and addressed in place-based energy transition efforts.

Finally, this dissertation offers critical insights for applying and empirically grounding community resilience and transition theory to understand change in place-based research in resource peripheries. Building on literature that explicates the ways that resource-dependence materializes through economic development and community infrastructure (Cheshire, 2010; Smith et al., 2019; Smith and Haggerty, 2020), this dissertation's examination of community resilience to industrial decline through the lens of public services offers a new and material way to assess a community's adaptive capacity and vulnerability. Attention to the fiscal relationship between resource revenue and critical services highlights the set of risks and challenges community leaders are facing. This research expands the traditional set of indicators and data used to assess social and economic capital in other resilience research. With respect to Wilson's (2012) transition theory, this research has shown how complex and idiosyncratic these transitions

can be and that it is impossible to predict the future pathways of affected communities with any certainty. However, in its application of transition theory concepts of policy corridors and transitional rupture – this research has demonstrated the explanatory potential of these concepts to understand how external policies or ruptures can interact with local development decisions and resilience capacities. The examination of these patterns can be applied to understand processes of change in other resource-dependent contexts.

Implications for Policy and Practice

In pointing out and clearly delineating the interactions between endogenous and exogenous drivers of community resilience in the context of coal transition, this dissertation emphasizes the need to (1) integrate policy and practical action across scales of government; and (2) develop place-based approaches to policy implementation which account for local context as thoroughly and empathically as possible. My focus for evaluating multiscalar governance issues and recommending attention to integration across them is developed in my work on fiscal risk and its implications for community resilience. Chapter Four details these efforts through an examination of public services to provide a new lens on the challenges closures pose at the local level. Through interviews with community professionals and a review of financial documents, I learned that the decision-making process for public service provision is complex and disintegrated, even in a small jurisdiction like Colstrip. Because of the mandate to balance budgets and maintain minimum levels of services, clear steps down or shutoffs of critical services are unlikely to emerge at one distinct moment. The result of this context directly burdens communities and community service providers, who must address service loss on a case-by-case basis, exhausting limited time, resources, and human capital.

Still, Chapter Four made it clear that the uncertainties facing community leaders underscore the need to mandate externally-funded integrated assessments of transition impacts as part of the industrial closure process (Bainton and Holcombe, 2018; Everingham and Mackenzie, 2019). In the current environment, local leaders lack a clear mandate, adequate information, and the capacity to undertake this robust exercise in a coordinated manner. In this way, the situation is maybe better characterized as a fiscal storm on the horizon rather than a fiscal cliff, which is the term often used in the literature (Morris et al., 2019). In Chapter Five, I show that social impact assessments offer a framework for identifying and managing emerging issues in coal-dependent communities undergoing the loss of revenue and employment from mine or plant closures. Still, it is unclear whether SIAs can effectively capture all the social and economic impacts associated with the termination of a 50-year industry. Best practices in industrial siting emphasize the importance of clear regulations, guidelines, and community participation in decision-making about closure and remediation being used to direct project planning from day one. Given industrial coal development's intergenerational socioeconomic and environmental dimensions, restorative justice is a reasonable expectation for communities. However, impact assessment alone cannot fully integrate this scope, and there is an urgent need to address community impacts and legacy issues (Lawrence and O'Faircheallaigh, 2022; Sandlos and Keeling, 2016).

Limitations and Future Directions

Despite making significant contributions, this dissertation is not without its limitations. First, I encountered some challenges while recruiting study participants across my sample range. Although, as the preceding chapters document, a portion of my interviewees comprise policy

professionals and experts working at the regional (US West) and state level, these included 30 interviews with policy experts and practitioners in Washington, Colorado, New Mexico, and Utah and Washington, DC. However, the recruitment of professionals who could speak directly to the implementation of transition policy and assistance programs in Montana was more difficult than in other contexts. Though I gained access to three informants throughout my study, multiple individuals declined to participate in a formal interview, despite creative efforts such as participants' willingness to share interview requests on my behalf. I believe this was difficult because of the political sensitivity surrounding the issue of the closure of the Colstrip Station. Accordingly, I sought to provide multiple additional pathways for research participation beyond formal interviews. For example, several invited participants were willing to confirm or clarify specific follow-up questions over email. Taking advantage of these opportunities for data collection, in addition to four years of participant observation and engagement in local public meetings, enabled me to develop a rich understanding of the Montana policy context.

There are also some noted limitations with my sampling frame at the community level. For example, it was difficult to recruit participants who represented services such as child and elder care to inform data collection activities associated with Chapter Five. However, while the political nature of my dissertation's focal subject was a possible hindrance to sampling at the regional and national-level informants' level, different conditions may have been at play with sampling efforts in Colstrip. Recent scholarly reflections on research in energy communities suggest that one contributing factor may relate to research fatigue. Research fatigue is, simply put, being tired of being researched (Haggerty and Smith, 2020). In energy communities like Colstrip, research fatigue can result when community members engage with many media

requests, multiple projects, and research teams over time without clear benefits for participation. This can leave community members feeling fatigued, exhausted, or disinterested in the research process (Jacquet et al., 2021). I took this concern to heart in my study design by making sure that I sought out an "alignment of interest" (Jacquet et al., 2021, p. 4) for my research participants by carefully explaining the relevancy of my project and the role of the interview data in my interview guide (Jacquet et al., 2021, p. 4). Ultimately, however, while many of my research participants were very generous with their time and forthcoming in interviews, I could not ignore a palpable wariness and concern of being misconstrued or misrepresented in the findings by several interviewees. These experiences underscore a need for researchers to maximize transparency by carefully explaining the role and positionality of the research (Haggerty et al., 2020). Researchers may also need to modify approaches to meet participant needs. In my own work, I have sought to limit research fatigue by seeking out other data sources to learn about public service conditions in Colstrip, such as budget documents, board meeting minutes, and local history reference collections available at the public library. In addition, I am taking steps to ensure that these research results are accessible to participants. I plan to work with local community contacts to determine how best to share findings with community participants. I will make a final version of this dissertation available in the Colstrip Bicentennial Library.

Finally, important limitations emerged in my efforts to operationalize Wilson's (2012) community resilience and transition theory. While the framework offers a set of tools to engage with the vast complexities of community transition, many of its key concepts are highly abstract, with few empirical examples of how to implement them in community contexts. In my efforts to ground abstract concepts within the dynamics of the energy transition and rural communities, I

defined community and community resilience narrowly and focused analysis on formal aspects of the coal transition, such as legislation, fiscal data, financial documents, impact assessment, and public meetings conducted with parliamentary procedure. This analysis gleaned valuable insights into key challenges facing coal-dependent communities; however, its restricted scope only scratches the surface of understanding community resilience in this context.

Much more work must be done to understand community resilience across the diverse communities in southeastern Montana. Future research needs to explore the range of local processes – formal and informal – that contribute to community resilience to the coal transition. These efforts should consider the different configurations of community and diverse set of stakeholders affected by coal decline in this region and engage theory suited to engage with critical issues of equity and justice in the transition.

Further research efforts are also needed to co-develop grounded, local processes that support decision-making and manage the decline in the context of decarbonization and place-based transitions. To increase efficiency and coordination with rural communities' limited resources, processes could adapt best practices from existing public health and social impact assessment models, including participatory and scenario-building approaches that yield local benefits in terms of service efficiencies and broader social capital formation (Haggerty et al., 2018). Furthermore, practice is needed to test the applicability and refine the recommendations of the framework proposed in Chapter Five to assess and manage risk to local government revenue and public services. Processes should be engaged at both local and regional scales to better understand how processes of restructuring and deindustrialization will result in changes to critical infrastructure and service provision across the region.

A Final Word on Colstrip, Montana

> … I walk up past the plant toward the Colstrip Community Center, a new building that looks like a pair of sandstone monoliths lying tilted in the earth. The Community Center, is in some ways, a monument to [the] determination to make Colstrip a pleasant place to live, and to the death of the old town that was once here. (Parfit, 1980, p. 267)

The quote above is from author Michael Parfit towards the end of his book, *Last Stand at Rosebud Creek: Coal, Power, and People.* This book examines the controversy and events that preceded the construction of the Colstrip Electric Generating Station. Based on interviews with individuals who lived in or near Colstrip, Montana, the describes a range of perspectives on the transitional rupture to community development that took place nearly 50 years ago. For some, the prospect of the power plant represented an opportunity and a new beginning; for others, however, it marked a decisive ending.

Today, Colstrip—the town and its industrial facilities faces another moment of contentious transition. The two older generating units at the power plant are retired, and the longevity of Units 3 and 4 is highly uncertain. Coal production at the Rosebud Mine has declined over 20 percent since the closure of Units 1 and 2 in early 2020 (US EIA, 2022). The plant is the object of multiple competing public ambitions and sits in a complex, somewhat dynamic institutional landscape. The Montana state legislature has passed laws prohibiting the majority owners of Colstrip from closing the power plant, but courts have found those laws unconstitutional (Lutey, 2022a).

Despite efforts at the state level in Montana to mandate continued operation of the plant, Colstrip is—as it has always been—subject to the preferences and priorities of faraway customers. The four owners from the Pacific Northwest (Avista Corporation, Puget Sound

Energy (PSE), Portland General Electric, and PacifiCorp) own 70% of the 1480 MW and operate in states with urgent clean energy mandates. For example, Washington utilities must phase out coal by 2025, and Oregon utilities must phase out coal by 2030. Co-owner and operator Talen Energy has filed for bankruptcy, adding more uncertainty to the timeline and processes surrounding closure (Lutey, 2022b). This leaves Northwestern Energy as the only utility with an obvious stake in the plant's continued operation, yet the utility's proposal to acquire Puget Sound Energy's shares of the plant was rejected by the Washington Utility and Transportation Commission on the basis that it would be harmful to Washington consumers (Lutey, 2020).

Despite the many unknowns, Colstrip *is* experiencing transition—declining levels of coal mining and a lurching process of plant closure. The spirited defense of the coal economy by Colstrip's local leaders and residents in the past decade ties directly into the success of making Colstrip "a pleasant place to live" in and after the tumultuous period of the plant's siting and construction in the 1970s and 1980s. Despite a very real environmental legacy in terms of climate and water impacts, over the period of four decades, Colstrip was a pleasant place to live—a place that engendered intense and authentic local pride and place attachment. This dissertation demonstrates how challenging it will be for Colstrip's leaders and residents to navigate the coal transition with these assets intact, as there are many ways in which local, state, and federal policies fail to clarify, assess, and mitigate transition impacts.

Social, economic, and environmental legacy issues will continue to emerge as this transition unfolds. Ensuring that these issues are addressed will be critical to Colstrip's ability to transition to its next stage. There are signs of progress on some of these issues. For example, interviews with environmental specialists emphasize compliance with remediation efforts of the

coal ash ponds. In addition, in November 2022, the owners of the Colstrip coal-fired power plant are expected to provide a plan to the Montana Department of Environmental Quality, which will clarify issues around access and responsibility for the future ownership and maintenance of the town's public water supply (Desroches, 2021; Montana Code Annotated, 2021). The complexity and persistence of legal proceedings around these fundamental town assets—primarily safe and reliable drinking water—provide just one example of how outsized transition challenges are relative to local capacity. However, efforts to transition their economy will be fundamentally challenged if fiscal dependence is unaddressed. Navigating fiscal ruptures and gaps in policy and planning are thus key challenges for enhancing community resilience in places where individuals are responsible for architecting community futures. That said, there *are* people invested and dedicated to the future of Colstrip, which will ultimately be the reason for a successful transition.

References Cited in Chapter Six

Bainton, N., Holcombe, S., 2018. A critical review of the social aspects of mine closure. Resour. Policy.

Barro, J., Diamond, J.W., Evans, R., 2021. The Effect of Transition to Low-carbon Energy on Texas Tax Revenues: 2021-2050.

Bauder, J.W., 2013. Water Quality and Beneficial Use: Water quality, soils and beneficial use in the Tongue and Powder basins, in: Yellowstone Basin Advisory Council. The Montana Department of Natural Resources & Conservation, Helena.

Bazilian, M.D., Carley, S., Konisky, D., Zerriffi, H., Pai, S., Handler, B., 2021. Expanding the scope of just transitions: Towards localized solutions and community-level dynamics. Energy Res. Soc. Sci. 80, 102245. https://doi.org/https://doi.org/10.1016/j.erss.2021.102245

Bee, E., 2017. The Changing Coal Industry: Regional Economic Impacts, Workforce Analysis, Transition Strategy. Mandeville.

Berkes, F., 2009. Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. J. Environ. Manage. 90, 1692–1702.

Berkes, F., Ross, H., 2013. Community Resilience: Toward an Integrated Approach. Soc. Nat. Resour. 26, 5–20. https://doi.org/10.1080/08941920.2012.736605

Bertin, K., 1998. Changes at MPC spur Colstrip toward move for incorporation. Billings Gaz.

Besser, T.L., Recker, N., Agnitsch, K., 2008. The Impact of Economic Shocks on Quality of Life and Social Capital in Small Towns. Rural Sociol. 73, 580–604. https://doi.org/10.1526/003601108786471530

Bohrer, B., 2000. New Montana Town Seeks to Forge an Identity; Planning: Colstrip voted to incorporate and reinvent itself as an entity independent of its coal mines and power plant. The path is predictably bumpy.: [Bulldog Edition]. Los Angeles Times B6.

Brosemer, K., Schelly, C., Gagnon, V., Arola, K.L., Pearce, J.M., Bessette, D., Schmitt Olabisi, L., 2020. The energy crises revealed by COVID: Intersections of Indigeneity, inequity, and health. Energy Res. Soc. Sci. https://doi.org/10.1016/j.erss.2020.101661

Carley, S., Konisky, D.M., 2020. The justice and equity implications of the clean energy transition. Nat. Energy 2020 58 5, 569–577. https://doi.org/10.1038/s41560-020-0641-6

Cates, K., Eaton, P., 2019. As Coal Economy Collapses, Imminent Public Budget Crisis Confronts Hopi-Navajo Tribes.

Cheshire, L., 2010. A corporate responsibility? The constitution of fly-in, fly-out mining companies as governance partners in remote, mine-affected localities. J. Rural Stud. 26, 12–20. https://doi.org/10.1016/j.jrurstud.2009.06.005

City of Colstrip, 2020. Annual Financial Report. Colstrip.

Colstrip Community Impact Advisory Group (CCIAG), 2018. CCIAG Plan. Colstrip.

Colstrip Medical District, 2019. Annual Financial Report. Colstrip.

Colstrip Park and Recreation District, 2020. Financial Statements. Colstrip.

Colstrip Parks and Recreation Department, 2017. Financial Statements. Colstrip.

Cumming, G., Barnes, G., Perz, S., Schmink, M., Sieving, K., Southworth, J., Binford, M., Holt, R., Stickler, C., Holt, T., 2005. An Exploratory Framework for the Empirical Measurement of Resilience. Ecosystems 8, 975–987.

Davenport, C., Friedman, L., Tankersley, J., 2021. Biden’s Bet on a Climate Transition Carries Big Risks. New York TImes.

Desroches, K., 2021. New Law Requires Colstrip Owners to Study Town Water Supply. Yellowstone Public Radio.

Edgel, D., 2015. A History of Colstrip and Coal-Fired Electricity Generation for the Pacific Northwest, Energy Transitions Laboratory. Bellingham.

Emery, M., Flora, C., 2006. Spiraling-Up: Mapping Community Transformation with Community Capitals Framework. J. Community Dev. Soc. 37, 19–35.

Everingham, J.-A., Mackenzie, S., 2019. Assessing social impacts of mine closure.

Feaster, S., Cates, K., 2019. Powder River Basin Coal Industry Is in Long-Term Decline Fast-Changing Markets Indicate Deeper Downturns to Come in Montana and Wyoming.

Flora, J.L., Sharp, J.S., Flora, C., Newlon, B., County, F., 1997. Entrepreneurial social infrastructure and locally initiated economic development in the nonmetropolitan United States. Sociol. Q. 38, 623–645. https://doi.org/10.1111/j.1533-8525.1997.tb00757.x

Folke, C., Hahn, T., Olsson, P., Norberg, J., 2005. ADAPTIVE GOVERNANCE OF SOCIAL-ECOLOGICAL SYSTEMS. Annu. Rev. Environ. Resour. 30, 441–473. https://doi.org/10.1146/annurev.energy.30.050504.144511

Freudenburg, W.R., 1992. Addictive Economies: Extractive Industries and Vulnerable Localities in a Changing World Economy. Rural Sociol. 57, 305–332. https://doi.org/10.1111/j.1549-0831.1992.tb00467.x

Gallagher, D., Glasmeier, A., 2020. Just Institutions for Deep Decarbonization? Essential Lessons from 20th Century Regional Economic and Industrial Transitions in the U.S., The Roosevelt Project Special Series. Boston.

Gerking, S., Hamilton, S.F., 2008. What explains the increased utilization of powder river basin coal in electric power generation? Am. J. Agric. Econ. 90, 933–950. https://doi.org/10.1111/j.1467-8276.2008.01147.x

Godby, R., Coupal, R., Haggerty, M.N., 2019. The Overlooked Importance of Federal Public Land Fiscal Policy. Bozeman.

Godby, R., Coupal, R., Taylor, D., Considine, T., 2015. Potential Impacts on Wyoming Coal Production of EPA's Greenhouse Gas Proposals. Electr. J. 28, 68–79.

Graff, M., Carley, S., Konisky, D.M., 2018. Stakeholder perceptions of the United States energy transition: Local-level dynamics and community responses to national politics and policy. Energy Res. Soc. Sci. https://doi.org/10.1016/j.erss.2018.05.017

Haggerty, J.H., Bills Walsh, K., Rose, J., 2017. The Status of Key Policies and Decision Processes.

Haggerty, Julia H., Haggerty, M., Roemer, K.F., Rose, J., 2018. Planning for the local impacts of coal facility closure: Emerging strategies in the U.S. West. Resour. Policy.

https://doi.org/10.1016/j.resourpol.2018.01.010

Haggerty, J.H., Jacquet, J.B., Taylor, S., Theodori, G.L., Walsh, K.B., 2020. Engaging in Energy Communities: The role of the researcher. A workbook and planning guide. Bozeman.

Haggerty, Julia H, Smith, K., Mastel, T., Lapan, J., Lachapelle, P., 2018. Assessing, monitoring, and addressing boomtown impacts in the US: evaluating an existing public health model. Impact Assess. Proj. Apprais. 36, 115–127.

Haggerty, J.H., Smith, K.K., 2020. What is Research Fatigue? [WWW Document]. Mont. State Univ. Energy Communities.

Haggerty, M., 2020. Fiscal Policy is Failing Rural America. Bozeman, Montana.

Haggerty, M., 2019a. Replacing Coal Revenue and Investing in Economic Transition: Solutions for Coal-Dependent Communities. Bozeman.

Haggerty, M., 2019b. Replacing Coal Revenue and Investing in Economic Transition: Solutions for Coal-Dependent Communities. Bozeman.

Haggerty, M., 2017. Coal Extraction Revenue and Spending: A Comparison Among Western States. Bozeman.

Halseth, G., Markey, S., Ryser, L., 2019. Service Provision and Rural Sustainability: Infrastructure and Inovation, Service Provision and Rural Sustainability. Routeledge, Oxon.

Halseth, G., Ryser, L., 2006. Trends in service delivery: Examples from rural and small town Canada, 1998-2005. J. Rural Community Dev. 1, 69–90.

Halseth, G., Sullivan, L., Ryser, L., 2003. Service provision as part of resource town transition planning: A case from northern British Columbia, in: Bruce, D., Lister, G. (Eds.), Opportunities and Actions in the New Rural Economy. Sackville.

Harrison, J.L., Montgomery, C.A., Bliss, J.C., 2016. Beyond the monolith: the role of bonding, bridging, and linking social capital in the cycle of adaptive capacity. Soc. Nat. Resour. 29, 525–539.

Hayter, R., 2017. Geography and History Matter, in: Halseth, G. (Ed.), Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routledge, New York.

Hibbard, M., Lurie, S., 2013. The New Natural Resource Economy: Environment and Economy in Transitional Rural Communities. Soc. Nat. Resour. 26, 827–844. https://doi.org/10.1080/08941920.2012.720358

Hudson, R., 2005. Rethinking Change in Old Industrial Regions: Reflecting on the Experiences of North East England. Environ. Plan. A Econ. Sp. 37, 581–596.

https://doi.org/10.1068/a36274

Innis, H.A., 1929. The Teaching of Economic History in Canada. Contrib. to Can. Econ. 2, 52. https://doi.org/10.2307/136518

IPCC, 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

Jacquet, J.B., Pathak, R., Haggerty, J.H., Theodori, G.L., Kroepsch, A.C., 2021. Research fatigue in unconventional oil and gas boomtowns: Perceptions, strategies and obstacles among social scientists collecting human subjects data. Energy Res. Soc. Sci. 73.

Jolley, G.J., Khalaf, C., Michaud, G., Sandler, A.M., 2019. The economic, fiscal, and workforce impacts of coal-fired power plant closures in Appalachian Ohio. Reg. Sci. Policy Pract. 11, 403–422. https://doi.org/10.1111/RSP3.12191

Joskow, P.L., 2000. Deregulation and Regulatory Reform in the U.S. Electric Power Sector by DEREGULATION AND REGULATORY REFORM IN THE U.S. ELECTRIC POWER SECTOR. MIT Center for Energy and Environmental Policy Research.

Kraenzel, C.F., 1955. The Great Plains in Transition, [1st ed.]. ed. University of Oklahoma Press, Norman.

Kulig, J.C., Edge, D.S., Townshend, I., Lightfoot, N., Reimer, W., 2013. Community resiliency: Emerging theoretical insights. J. Community Psychol. 41, 758–775. https://doi.org/10.1002/jcop.21569

Lawrence, R., O'Faircheallaigh, C., 2022. Ignorance as strategy: 'Shadow places' and the social impacts of the ranger uranium mine. Environ. Impact Assess. Rev. 93, 106723. https://doi.org/https://doi.org/10.1016/j.eiar.2021.106723

Lehr, R., O'Boyle, M., 2018. Depreciation and Early Plant Retirements. San Francisco.

Look, W., Raimi, D., Robertson, M., Higdon, J., Propp, D., 2021. Enabling Fairness for Energy Workers and Communities in Transition. Washington, D.C.

Lutey, T., 2022a. Newly-passed Colstrip laws unconstitutional, court rules. Billings Gaz.

Lutey, T., 2022b. Colstrip operator Talen Energy files for bankruptcy. Billings Gaz.

Lutey, T., 2020. Colstrip sale hits snag in Washington state. Billings Gaz.

Markey, S., Halseth, G., 2017. Rural Restructuring: Conclusion, in: Halseth, G. (Ed.), Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routeledge.

Markey, S., Halseth, G., Manson, D., 2012. Investing in place: Economic renewal in northern British Columbia. UBC Press.

Martin, J., Everts, T., 2002. The Electrical Utility Industry Restructuring Transition Advisory Committee. Helena.

Montana Association of Counties, 2022. Mill Levy Computation Form [WWW Document]. MACo Resour. Data. URL https://www.mtcounties.org/resources-data/

Montana Coal Board, 2022. Montana Coal Board Meeting. Helena.

Montana Code Annotated, 2021. Water Feasibility Study.

Montana Code Annotated, 2001. Taxing Authority Budget Limitation.

Montana Code Annotated, n.d. Local and interjurisdictional disaster and emergency plan - distribution.

Montana Department of Revenue, 2020. Biennial Report. Helena.

Morris, A.C., Kaufman, N., Doshi, S., 2021. Revenue at Risk in Coal-Reliant Counties. Environ. Energy Policy Econ. 2, 83–116. https://doi.org/10.1086/711307

Morris, A.C., Kaufman, N., Doshi, S., 2019. The Risk of Fiscal Collapse in Coal-Reliant Communities.

Morrison, T.H., 2014. Developing a regional governance index: The institutional potential ofrural regions. J. Rural Stud. 35, 101–111. https://doi.org/10.1016/j.jrurstud.2014.04.004

Morrison, T.H., Lane, M.B., Hibbard, M., 2015. Planning, governance and rural futures in Australia and the USA: revisiting the case for rural regional planning. J. Environ. Plan. Manag. 58, 1601–1616. https://doi.org/10.1080/09640568.2014.940514

National Academies of Sciences Engineering and Medicine, 2021. Accelerating Decarbonization of the U.S. Energy System. Washington, D.C.

Nel, E., Connelly, S., Stevenson, T., 2019. New Zealand's small town transition: The experience of demographic and economic change and place based responses. N. Z. Geog. 75. https://doi.org/10.1111/nzg.12240

Newell, R.G., Raimi, D., 2018a. The fiscal impacts of increased U.S. oil and gas development on local governments. Energy Policy 117, 14–24.

Newell, R.G., Raimi, D., 2018b. US state and local oil and gas revenue sources and uses. Energy Policy 112, 12–18. https://doi.org/https://doi.org/10.1016/j.enpol.2017.10.002

Norris, F.H., Stevens, S.P., Pfefferbaum, B., Wyche, K.F., Pfefferbaum, R.L., 2008. Community

resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. Am. J. Community Psychol. 41, 127–150.

Northern Plains Resource Council, 2019. DOING IT RIGHT II: Job creation through Colstrip cleanup. Billings.

Northern Plains Resource Council, 2018. DOING IT RIGHT: COLSTRIP"S BRIGHT FUTURE WITH CLEAN UP. Billings.

Pai, S., Zerriffi, H., Jewell, J., Pathak, J., 2020. Solar has greater techno-economic resource suitability than wind for replacing coal mining jobs. Environ. Res. Lett. 15, 034065. https://doi.org/10.1088/1748-9326/ab6c6d

Parfit, M., 1980. Last Stand at Rosebud Creek: Coal, Power, and People. E. P. Dutton, New York.

Peluso, N., Kearney, M., Lester, R., 2020. Assessing the Role of Public Policy in Industrial Transitions: How Distinct Regional Contexts Inform Comprehensive Planning, The Roosevelt Project Special Series. Boston.

Pike, A., Dawley, S., Tomaney, J., 2010. Resilience, adaptation and adaptability. Cambridge J. Reg. Econ. Soc. 3, 59–70.

Power, M., Williams, M.G., Mosley, K., Frankel, J., Hanser, P., 2015. Managing the Employment Impact of Energy Transition in Pennsylvania Coal Country. Boston.

Raimi, D., 2017. Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

Raimi, D., Carley, S., Konisky, D., 2022a. Mapping county-level vulnerability to the energy transition in US fossil fuel communities. Sci. Rep. 12, 15748. https://doi.org/10.1038/s41598-022-19927-6

Raimi, D., Grubert, E., Higdon, J., Metcalf, G., Pesek, S., Singh, D., 2022b. The Fiscal Implications of the U.S. Transition away from Fossil Fuels.

Ramage, J., Everette, B., 2012. Coal, in: Everett, B., Boyle, G., Peake, S., Ramage, J. (Eds.), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford, pp. 141–178.

Rasker, R., Gude, P.H., Gude, J.A., van den Noort, J., 2009. The economic importance of air travel in high-amenity rural areas. J. Rural Stud. 25, 343–353. https://doi.org/10.1016/j.jrurstud.2009.03.004

Reimer, B., 2002. Understanding and measuring social capital and social cohesion. New Rural Econ. 23.

Righetti, T.K., Stoellinger, T., Godby, R., Coddington, K., 2021. Adapting to Coal Plant Closures: A Framework to Understand State Energy Transition Resistance by Tara Kathleen Righetti, Temple Stoellinger, Robert Godby, Kipp Coddington :: SSRN.

Robertson, D., 1979. Power Plant and Industrial Fuel Use of 1978: Fuel Replacement. Harvard Environ. Law Rev. 3, 214–235.

Roemer, K.F., Haggerty, J.H., 2021. Coal communities and the U.S. energy transition: A policy corridors assessment. Energy Policy 151. https://doi.org/10.1016/j.enpol.2020.112112

Rosebud County, 2021. Annual Financial Report. Forsyth.

Rosebud County, 2020. Annual Financial Report. Forsyth.

Roth, S., 2022. Here are the last coal plants clinging to life in the American West. Los Angeles Times.

Ryser, L., Halseth, G., 2014. View of On the Edge in Rural Canada: The Changing Capacity and Role of the Voluntary Sector. Can. J. Nonprofit Soc. Econ. Res.

Sandlos, J., Keeling, A., 2016. Aboriginal communities, traditional knowledge, and the environmental legacies of extractive development in Canada. Extr. Ind. Soc. 3, 278–287.

Scott, M., 2013. Resilience: a Conceptual Lens for Rural Studies? Geogr. Compass 7, 597–610.

Skinner, M.W., Joseph, A.E., Hanlon, N., Halseth, G., Ryser, L., 2014. Growing old in resource communities: Exploring the links among voluntarism, aging, and community development. Can. Geogr. 58, 418–428. https://doi.org/10.1111/cag.12087

Smith, K.K., Haggerty, J.H., 2020. Exploitable ambiguities & the unruliness of natural resource dependence: Public infrastructure in North Dakota's Bakken shale formation. J. Rural Stud. 80. https://doi.org/10.1016/j.jrurstud.2020.05.006

Smith, K.K., Haggerty, J.H., Kay, D.L., Coupal, R., 2019. Using Shared Services to Mitigate Boomtown Impacts in the Bakken Shale Play: Resourcefulness or Over-adaptation? J. Rural COMMUNITY Dev. 14.

Southeastern Montana Economic Development Corporation, 2017. Cosltrip Economic Diversification Strategy. Colstrip.

Sovacool, B.K., Dworkin, M.H., 2015. Energy justice: Conceptual insights and practical applications. Appl. Energy 142, 435–444. https://doi.org/https://doi.org/10.1016/j.apenergy.2015.01.002

Sullivan, L., Ryser, L., Halseth, G., 2014. Recognizing Change, Recognizing Rural: The New Rural Economy and Towards a New Model of Rural Service. J. Rural Community Dev. 9.

Talen Energy, 2022. Colstrip Steam Electric Station - Colstrip Montana [WWW Document].

The Energy Policy and Conservation Act (P.L. 94-163, 42 U.S.C. 6201), 1976. . William Mary Environ. Law Policy Rev. 1.

U.S. Bureau of Reclamation, 1971. North Central Power Study: Report of Phase I.

U.S. Census Bureau, 2020. Total Population [WWW Document]. 2020 Decenn. Census. URL https://data.census.gov/cedsci/all?q=colstrip, montana (accessed 4.4.22).

U.S. Department of Commerce, 2021. Rosebud County: Employment by Industry (1970-2000). Washington, D.C.

U.S. Department of Commerce, 2020. ACS 5-year estimates [WWW Document]. Census Bur.

U.S. EIA, 2022. Table 6.6 Planned U.S. Electric Generating Unit Retirements [WWW Document]. Electr. Power Mon.

U.S. EIA, 2021. Of the operating U.S. coal-fired power plants, 28% plant to retire by 2035 [WWW Document]. URL https://www.eia.gov/todayinenergy/detail.php?id=50658

U.S. EIA, 2019. Sixteen mines in the Powder River Basin produce 43% of U.S. coal [WWW Document]. U.S. Energy Inf. Adm. URL https://www.eia.gov/todayinenergy/detail.php?id=41053 (accessed 5.3.22).

U.S. Energy Information Administration, 2022a. Coal Data Browser [WWW Document]. Annu. Coal Rep. URL https://www.eia.gov/coal/data/browser/#/mine/2401747/?freq=A&pin= (accessed 4.4.22).

U.S. Energy Information Administration, 2022b. Rosebud Mine & Crusher/Conveyor, Annual [WWW Document]. Coal Data Brows.

Wallerstein, I.M., 2004. World-systems analysis: An introduction. Duke University Press.

Ward, C.J., Cope, M.R., Wilson, D.R., Muirbrook, K.A., Poff, J.M., 2020. Powerless in a Western US Energy Town: Exploring Challenges to Socially Sustainable Rural Development. Sustain. (Basel, Switzerland) 12, 8426.

Watkins, M.H., 1963. A Staple Theory of Economic Growth. Can. J. Econ. Polit. Sci. 29, 141–158.

Weaver, K.L., 2019. Municipal Government Divide. Bozeman.

Weaver, K.L., 2002. Governing Montana at the grass roots : local government structure, process and politics. Local Government Center, Montana State University-Bozeman, Bozeman, Mont.

Weaver, K.L., Lachapelle, P.R., 2010. Governing Montana at the grass roots : local government structure, process and politics, 3rd ed.. ed. Local Government Center, Montana State University, Bozeman, Mont.

White, K., 1972. The Plan for Colstrip. Denver.

White, R., 1991. "It's Your Misfortune and None of My Own": A New History of the American West. University of Oklahoma Press, Norman.

Wilson, G.A., 2014. Community resilience: path dependency, lock-in effects and transitional ruptures. J. Environ. Plan. Manag. 57, 1–26. https://doi.org/10.1080/09640568.2012.741519

Wilson, G.A., 2013. Community resilience, policy corridors and the policy challenge. Land use policy 31, 298–310. https://doi.org/10.1016/j.landusepol.2012.07.011

Wilson, G.A., 2012. Community resilience and environmental transitions, Community Resilience and Environmental Transitions. https://doi.org/10.4324/9780203144916

Wilson, G.A., 2010. Multifunctional 'quality' and rural community resilience. Trans. Inst. Br. Geogr. 35, 364–381.

Wyoming Mining Association, 2018. 2018 Wyoming Coal Overview.

Zimmerman, P., 2021. Montana looks at next steps for Colstrip. Dly. Mont.

REFERENCES CITED

Adger, W.N., 2000. Social and ecological resilience: Are they related? Prog. Hum. Geogr. 24, 347–364. https://doi.org/10.1191/030913200701540465

Anderies, J.M., Janssen, M.A., Ostrom, E., 2004. A framework to analyze the robustness of social-ecological systems from an institutional perspective. Ecol. Soc. 9, 18. http://www.ecologyandsociety.org/vol9/iss1/art18.

Andre, P., Enserink, B., Connor, D., Croal, P., 2006. Public Participation International Best Practice Principles. IAIA, Fargo.

Appalachian Regional Commission, 2020. Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative - Appalachian Regional Commission. https://www.arc.gov/funding/power.asp (accessed 19 March 2020).

Argent, N., 2017. Trap or Opportunity? Natural resource dependence, scale, and the evolution of new economies in the space/time of New South Wales' northern tablelands, in: Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routledge, New York, pp. 18–50. https://doi.org/10.4324/9781315660110

Arizona Corporation Commission, 2022. Arizona Corporation Commission to host town hall meetings in Page, Holbrook, and Eagar. https://azcc.gov/news/2022/05/17/arizona-corporation-commission-to-host-town-hall-meetings-in-page-holbrook-and-eager (accessed 26 October 2022).

Bainton, N., Holcombe, S., 2018. A critical review of the social aspects of mine closure. Resour. Policy. 59, 468-478. https://doi.org/10.1016/j.resourpol.2018.08.020

Barro, J., Diamond, J.W., Evans, R., 2021. The Effect of Transition to Low-carbon Energy on Texas Tax Revenues: 2021–2050. Rice University's Baker Institute for Public Policy, Houston.

Bauder, J.W., 2013. Water Quality and Beneficial Use: Water quality, soils and beneficial use in the Tongue and Powder basins, in: Yellowstone Basin Advisory Council. The Montana Department of Natural Resources & Conservation, Helena.

Bazilian, M.D., Carley, S., Konisky, D., Zerriffi, H., Pai, S., Handler, B., 2021. Expanding the scope of just transitions: Towards localized solutions and community-level dynamics. Energy Res. Soc. Sci. 80, 102245. https://doi.org/https://doi.org/10.1016/j.erss.2021.102245

Beckett, C., Dowdell, E., Monosky, M., Keeling, A., 2020. Integrating Socio-Economic Objectives for Mine Closure and Remediation into Impact Assessment in Canada. Memorial University of Newfoundland, Newfoundland, Canada.

Bee, E., 2017. The Changing Coal Industry: Regional Economic Impacts, Workforce Analysis, Transition Strategy. Mandeville.

BenDor, T., T. W. Lester, A. Livengood, A. Davis, and L. Yonavjak. 2015. Estimating the Size and Impact of the Ecological Restoration Economy. PLOS ONE 10(6):e0128339

Bennet, M., 2022. National Energy Community Transition Act. Washington, D.C.

Berkes, F., 2009. Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. J. Environ. Manage. 90, 1692–1702.

Berkes, F., Ross, H., 2013. Community Resilience: Toward an Integrated Approach. Soc. Nat. Resour. 26, 5–20. https://doi.org/10.1080/08941920.2012.736605

Bertin, K., 1998. Changes at MPC spur Colstrip toward move for incorporation. Billings Gaz.

Besser, T.L., Miller, N.J., 2013. Social capital, local businesses, and amenities in U.S. rural prairie communities. J. Rural Stud. 32, 186-195. https://doi.org/10.1016/j.jrurstud.2013.06.004

Besser, T.L., Recker, N., Agnitsch, K., 2008. The Impact of Economic Shocks on Quality of Life and Social Capital in Small Towns. Rural Sociol. 73, 580–604. https://doi.org/10.1526/003601108786471530

Bickman, L., Rog, D.J., 2009. Applied Research Design. A Practical Approach, in: SAGE Handbook of Applied Social Research Methods. pp. 3–43. https://doi.org/10.4135/9781483348858.n1

Bleizeffer, D., 2019. Can Wyoming law delay coal plant closures? https://www.wyofile.com/can-wyoming-law-delay-coal-plant-closures/

Bodnar, P., M. Gray, T. Grbusic, S. Herz, A. Lonsdale, et al. 2020. How to Retire Early: Makin Accelerated Coal Phaseout Feasible and Just. Basalt, CO: Rocky Mountain Institute.

Boerchers, M., Sinclair, A.J., Gibson, R.B., Halden, N.M., 2018. “Sustainability is finding the next mine”: The complicated relationships among legacies, sustainability, and EA. Environ. Impact Assess. Rev. 71, 84–93. https://doi.org/https://doi.org/10.1016/j.eiar.2018.01.002.

Bohrer, B., 2000. New Montana Town Seeks to Forge an Identity; Planning: Colstrip voted to incorporate and reinvent itself as an entity independent of its coal mines and power plant. The path is predictably bumpy.: [Bulldog Edition]. Los Angeles Times B6.

Boschma, R., Martin, R., 2010. The handbook of evolutionary economic geography. Edward Elgar, Cheltenham.

Brosemer, K., Schelly, C., Gagnon, V., Arola, K.L., Pearce, J.M., Bessette, D., Schmitt Olabisi, L., 2020. The energy crises revealed by COVID: Intersections of Indigeneity, inequity, and health. Energy Res. Soc. Sci. https://doi.org/10.1016/j.erss.2020.101661

Brown, M. 2015. Colstrip Gets New Operator as PPL Spins Off Montana Assets. Billings Gazette, June 1.

Bryan, S.M., 2022. US shift away from coal hits tribal community in New Mexico. The Sun Chronicle, October 2.

Bunnell, G., 1998. Analyzing the fiscal impacts of development: Lessons for building successful communities. Community Dev. Soc. J. 29, 38–57. https://doi.org/10.1080/15575339809489772.

Burdge, R.J., 2015. The Concepts, Process and Methods of Social Impact Assessment. Society and Natural Resources Press, Huntsville.

Carley, S., Evans, T.P., Graff, M., Konisky, D.M., 2018a. A framework for evaluating geographic disparities in energy transition vulnerability. Nat. Energy 3, 621–627. https://doi.org/10.1038/s41560-018-0142-z

Carley, S., Evans, T.P., Konisky, D.M., 2018b. Adaptation, culture, and the energy transition in American coal country. Energy Res. Soc. Sci. 37, 133-139. https://doi.org/10.1016/j.erss.2017.10.007

Carley, S., Konisky, D.M., 2020. The justice and equity implications of the clean energy transition. Nat. Energy 2020 58 5, 569–577. https://doi.org/10.1038/s41560-020-0641-6

Carlson, J., 2021. Priority based budgeting creates community alignment in Duluth. Government Finance Review April, 19–29.

Carlson, S., 2022. Central Consolidated District Overview, Responses to Yazzie/Martinez and Plans to Spend At-Risk Funding, in: Presentation to NM LESC & NM IAC. Central Consolidated School District.

Carter, M., 1984. The Montana Major Facility Siting Act. Mont. Law Rev. 45.

Cates-Carney, C. 2019. House Committee Hears Controversial “Save Colstrip” Bill. Montana Public Radio, April 8.

Cates, K., Eaton, P., 2019. As Coal Economy Collapses, Imminent Public Budget Crisis Confronts Hopi-Navajo Tribes. https://ieefa.org/wp-content/uploads/2019/05/Imminent-Public-Budget-Crisis-Confronts-Hopi-Navajo-Tribes-With-Coal-Economy-Collapse_May-2019.pdf

Cates, K., Ormund, A., Feaster, S., Roemer, K., 2020. The case (and the mechanisms) for utility-company reinvestment in Arizona's coalfield communities. https://ieefa.org/wp-content/uploads/2020/03/The-Case-for-Utility-Company-Reinvestment_AZ-Coalfield-Communities_March-2020.pdf

Cates, K., Skrelunas, T., 2019. Bill to spark federal post-coal reinvestment in Arizona tribal communities is a good beginning. http://ieefa.org/wp-content/uploads/2019/09/PROMISE-Act-Bill-Is-a-Good-Beginning_September-2019.pdf

Cecire, M.H., 2019. The POWER Initiative: Energy transition as economic development. https://fas.org/sgp/crs/misc/R46015.pdf

Chaloping-March, M., 2008. Business expediency, contingency and socio-political realities - A case of unplanned mine closure, in: Fourie, A., Tibbett, M., Weiersbye, I., Dye, P. (Eds.), Mine Closure 2008: Proceedings of the Third International Seminar on Mine Closure. Australian Centre for Geomechanics PP, Perth, pp. 863–871.

Charmaz, K, 2006. Constructing grounded theory: A practical guide through qualitative analysis. Sage Publications, Thousand Oaks.

Cheshire, L., 2010. A corporate responsibility? The constitution of fly-in, fly-out mining companies as governance partners in remote, mine-affected localities. J. Rural Stud. 26, 12–20. https://doi.org/10.1016/j.jrurstud.2009.06.005

City of Colstrip, 2020a. Annual Financial Report. Colstrip.

City of Colstrip. 2020b. About Colstrip. https://cityofcolstrip.com.

City of Colstrip. 2020c. Water Treatment. www.cityofcolstrip.com.

Clarke, A. 2007. Grounded theory: Critiques, debates and situational analysis. In The SAGE Handbook of Social Science Methodology. (eds. Outhwaite, W. and Turner, S.P.). London, UK: SAGE Publications Ltd.

Coal Transportation Agreement between the Montana Power Company and Puget Sound Power & Light. 1981. Accessed via US Securities and Exchange Commission website via: https://www.sec.gov/Archives/edgar/data/106455/000103570407000530/d48339ex-v10w2.htm.

Colorado Revised Statutes, 2021. HB 21-1290 Concerning Funding to Provide Just Transition for Coal Transition Workers and Coal Transition Communities.

Colstrip City Council Chambers. 2018. CCIAG Meeting Minutes, April 16.

Colstrip Community Impact Advisory Group (CCIAG). 2018. CCIAG Plan. http://cciag.mt.gov/Portals/190/Documents/2018%20Final%20CCIAG%20Plan.pdf?ver=2019-01-11-112905-077

Colstrip Medical District, 2019. Annual Financial Report. Colstrip.

Colstrip Park and Recreation District, 2020. Financial Statements. Colstrip.

Colstrip Parks and Recreation Department, 2017. Financial Statements. Colstrip.

Commander, S. 2018. One-Company Towns: Scale and Consequences. IZA World of Labor,

Connelly, S., Nel, E., 2017. Global-Local links and evidence from the West Coast and Southland regions, in: Halseth, G. (Ed.), Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routledge, New York, pp. 98-123.

Corbin, J. and N. L. Holt. 2005. Grounded theory. In Research Methods in the Social Sciences. (eds. Somekh, B. and Lewin, C.). London, UK: SAGE Publications Ltd.

Creswell, J.W., 2014. Research design: qualitative, quantitative, and mixed methods approach.

Cumming, G., Barnes, G., Perz, S., Schmink, M., Sieving, K., Southworth, J., Binford, M., Holt, R., Stickler, C., Holt, T., 2005. An Exploratory Framework for the Empirical Measurement of Resilience. Ecosystems 8, 975–987.

Cumming, G.S., Cumming, D.H.M., Redman, C.L., 2006. Scale mismatches in social-ecological systems: Causes, consequences, and solutions. Ecol. Soc. 11. https://doi.org/10.5751/ES-01569-110114

Curley, A., 2018. A failed green future: Navajo green jobs and energy "transition" in the Navajo Nation. Geoforum 88, 57–65. https://doi.org/10.1016/j.geoforum.2017.11.012.

Davenport, C., Friedman, L., Tankersley, J., 2021. Biden's Bet on a Climate Transition Carries Big Risks. New York Times.

Davidson, D.J., 2010. The Applicability of the Concept of Resilience to Social Systems: Some Sources of Optimism and Nagging Doubts. Soc. Nat. Resour. 23, 1135–1149.

de Jesus, J., 2009. What is Impact Assessment? International Association for Impact Assessment, Fargo.

Della Bosca, H., Gillespie, J., 2018. The coal story: Generational coal mining communities and strategies of energy transition in Australia. Energy Policy 120, 734–740. https://doi.org/https://doi.org/10.1016/j.enpol.2018.04.032.

Desroches, K., 2021. New Law Requires Colstrip Owners to Study Town Water Supply. Yellowstone Public Radio, May 12.

Dryzek, J., 2005. The politics of the Earth: Environmental discourses (2nd ed.). Oxford: Oxford University Press. Hum. Ecol. Rev. 5, 65. https://doi.org/10.1177/107049659800700312

Edgel, D., 2015. A History of Colstrip and Coal-Fired Electricity Generation for the Pacific Northwest, Energy Transitions Laboratory. Bellingham.

Edwards, M., 2001. Fiscal impact analysis: Does method matter? J. Community Dev. Soc. 32, 106–129. https://doi.org/10.1080/15575330109489695.

Ehrenfeucht, R., and M. Nelson. 2011. Planning, Population Loss and Equity in New Orleans after Hurricane Katrina. Planning Practice & Research 26(2): 129–46.

Emery, M., Flora, C., 2006. Spiraling-Up: Mapping Community Transformation with Community Capitals Framework. J. Community Dev. Soc. 37, 19–35.

Environmental Quality Council, n.d. Major Facility Siting Act.

Erickson, C., 2020. Peabody Energy reduces workforce at three Powder River Basin mines | Energy Journal | trib.com. Casper Star Trib.

Esteves, A.M., Franks, D., Vanclay, F., 2012. Social impact assessment: The state of the art. Impact Assess. Proj. Apprais. 30, 34–42. https://doi.org/10.1080/14615517.2012.660356.

Everingham, J.-A., Mackenzie, S., 2019. Assessing social impacts of mine closure. IAIA19 Conference: Evolution or Revolution: Where next for impact assessment? Brisbane, Australia.

Everingham, J.-A., Mackenzie, S., Svobodova, K., Witt, K., 2020. Participatory processes, mine closure and social transitions. Centre for Social Responsibility in Mining, University of Queensland.

Everingham, J.-A., Pattenden, C., Klimenko, V., Parmenter, J., 2013. Regulation of resource-based development: governance challenges and responses in mining regions of Australia. Environ. Plan. C Gov. Policy 31, 585–602. https://doi.org/10.1068/c10184.

Feaster, S., Cates, K., 2019. Powder River Basin Coal Industry Is in Long-Term Decline Fast-Changing Markets Indicate Deeper Downturns to Come in Montana and Wyoming. Institute for Energy Economics and Financial Analysis, Lakewood.

Flora, J.L., Sharp, J.S., Flora, C., Newlon, B., County, F., 1997. Entrepreneurial social infrastructure and locally initiated economic development in the nonmetropolitan United States. Sociol. Q. 38, 623–645. https://doi.org/10.1111/j.1533-8525.1997.tb00757.x

Folke, C., Hahn, T., Olsson, P., Norberg, J., 2005. Adaptive Governance of Social-Ecological Systems. Annu. Rev. Environ. Resour. 30, 441–473. https://doi.org/10.1146/annurev.energy.30.050504.144511

Frank, K.I., Hibbard, M., 2016. Production, consumption, and protection: perspectives from North America on the multifunctional transition in rural planning. Int. Plan. Stud. 21, 245–260. https://doi.org/10.1080/13563475.2016.1188685

Freudenburg, W.R., 1992. Addictive Economies: Extractive Industries and Vulnerable Localities in a Changing World Economy. Rural Sociol. 57, 305–332. https://doi.org/10.1111/j.1549-0831.1992.tb00467.x

Frosch, D., 2019. Coal-Mine Closures Shake Wyoming. Wall Str. J.

Gallagher, D., Glasmeier, A., 2020. Just Institutions for Deep Decarbonization? Essential Lessons from 20th Century Regional Economic and Industrial Transitions in the U.S., The Roosevelt Project Special Series. Boston.

Gamper-Rabindran, S., and C. Timmins. 2013. Does Cleanup of Hazardous Waste Sites Raise Housing Values? Evidence of Spatially Localized Benefits. Journal of Environmental Economics and Management 65(3): 345–60.

Geels, F.W., 2006. Technological Transitions and System Innovations, A Co-Evolutionary and Socio-Technical Analysis, Edward Elgar Publishing Limited. https://doi.org/10.1016/j.techfore.2006.05.008

Geels, F.W., Schot, J., 2007. Typology of sociotechnical transition pathways. Res. Policy 36, 399–417. https://doi.org/10.1016/J.RESPOL.2007.01.003

Gerking, S., Hamilton, S.F., 2008. What explains the increased utilization of powder river basin coal in electric power generation? Am. J. Agric. Econ. 90, 933–950. https://doi.org/10.1111/j.1467-8276.2008.01147.x

Gilmore, J.S., 1976. Boom towns may hinder energy resource development. Science 191.

Glaser, B. G. 1978. Theoretical Sensitivity. Mill Valley, CA: Sociology Press.

Godby, R., Coupal, R., Haggerty, M.N., 2019. The Overlooked Importance of Federal Public Land Fiscal Policy. Bozeman.

Godby, R., Coupal, R., Taylor, D., Considine, T., 2015. Potential Impacts on Wyoming Coal Production of EPA's Greenhouse Gas Proposals. Electr. J. 28, 68–79. https://doi.org/10.1016/j.tej.2015.05.004.

Graff, M., Carley, S., Konisky, D.M., 2018. Stakeholder perceptions of the United States energy transition: Local-level dynamics and community responses to national politics and policy. Energy Res. Soc. Sci. https://doi.org/10.1016/j.erss.2018.05.017

Grubler, A., 2012. Energy transitions research: Insights and cautionary tales. Energy Policy. https://doi.org/10.1016/j.enpol.2012.02.070

Grubler, A., Wilson, C., 2014. Energy technology innovation. Cambridge University Press.

Guignet, D., P. J. Walsh, and R. Northcutt. 2016. Impacts of Ground Water Contamination on Property Values: Agricultural Run-off and Private Wells. Agricultural and Resource Economics Review 45(2): 293–318.

Haggerty, J. H., K. B. Walsh, M. Haggerty, and J. Rose. 2017. Colstrip: The Status of Key Policies and Decision Processes. Montana State University, Bozeman.

Haggerty, J.H. Smith, K., Mastel, T., Lapan, J., Lachapelle, P., 2018. Assessing, monitoring, and addressing boomtown impacts in the US: evaluating an existing public health model. Impact Assess. Proj. Apprais. 36, 115–127.

Haggerty, J.H., Bills Walsh, K., Rose, J., 2017. The Status of Key Policies and Decision Processes.

Haggerty, J.H., Haggerty, M., Roemer, K.F., Rose, J., 2018. Planning for the local impacts of coal facility closure: Emerging strategies in the U.S. West. Resour. Policy. https://doi.org/10.1016/j.resourpol.2018.01.010

Haggerty, J.H., Jacquet, J.B., Taylor, S., Theodori, G.L., Walsh, K.B., 2020. Engaging in Energy Communities: The role of the researcher. A workbook and planning guide. Bozeman.

Haggerty, J.H., Smith, K.K., 2020. What is Research Fatigue?. Mont. State Univ. Energy Communities.

Haggerty, M. 2019b. Replacing Coal Revenue and Investing in Economic Transition: Solutions for Coal-Dependent Communities. Headwaters Economics, https://headwaterseconomics.org/energy/coal/solutions-for-coal-communities/.

Haggerty, M. 2020b. Financial Modernization and Risk Analysis Study (MARA). Report prepared for Montana Legislative Fiscal Division, Helena.

Haggerty, M., 1997. Fiscal impacts of alternative development patterns: Broadwater and Gallatin Counties. Mont. Policy Rev. 19–31.

Haggerty, M., 2017. Coal Extraction Revenue and Spending: A Comparison Among Western States. Bozeman.

Haggerty, M., 2019a. Coal Transition in Montrose County, Colorado Fiscal Assessment. Headwaters Economics, Bozeman.

Haggerty, M., 2020 Fiscal Policy is Failing Rural America. Headwaters Economics, Bozeman.

Haggerty, M., Gentile, N. 2022. Quitting Fossil Fuels and Reviving Rural America. CAP, Washington, D.C.

Halseth, G., 2017. Transformation of Resource Towns and Peripheries: Political economy perspectives. Routledge, Abingdon.

Halseth, G., Markey, S., Ryser, L., 2019. Service Provision and Rural Sustainability: Infrastructure and Innovation, Service Provision and Rural Sustainability. Routeledge, Oxon.

Halseth, G., Ryser, L., 2006. Trends in service delivery: Examples from rural and small town Canada, 1998-2005. J. Rural Community Dev. 1, 69–90.

Halseth, G., Sullivan, L., Ryser, L., 2003. Service provision as part of resource town transition planning: A case from northern British Columbia, in: Bruce, D., Lister, G. (Eds.), Opportunities and Actions in the New Rural Economy. Sackville.

Halstead-Acharya, L. 2008. Colstrip Companies Paying $25M in Water Lawsuit. Billings Gazette, May 2.

Hamilton, M.S., 1979. Power plant siting: A literature review. Nat. Resour. J. 19.1, 75–95.

Haninger, K., L. Ma, and C. Timmins. 2017. The Value of Brownfield Remediation. Journal of the Association of Environmental and Resource Economists 4(1): 197–241

Harrahill, K., Douglas, O., 2019. Framework development for 'just transition' in coal producing jurisdictions. Energy Policy. https://doi.org/10.1016/j.enpol.2019.110990

Harrison, J.L., Montgomery, C.A., Bliss, J.C., 2016. Beyond the monolith: the role of bonding, bridging, and linking social capital in the cycle of adaptive capacity. Soc. Nat. Resour. 29, 525–539.

Hausman, C., and S. Stolper. 2020. Inequality, Information Failures, and Air Pollution. Working Paper Series 26682, National Bureau of Economic Research, Cambridge, MA.

Hayes, L.R., 1980. Energy, economic growth, and regionalism in the West. University of New Mexico Press, Albuquerque.

Haynes, K.E., Xie, Q., Ding, L., 2004. Political geography, public policy, and the rise of policy analysis, in: Bailly, A., Gibson, L.J. (Eds.), Applied Geography A World Perspective, GeoJournal Library, 77. Springer Netherlands, Dordrecht, pp. 69–93.

Hayter, R., 2017. Geography and History Matter, in: Halseth, G. (Ed.), Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routledge, New York.

Hayter, R., Barnes, T., 1990. Innis' Staple Theory, Exports, and Recession: British Columbia, 1981-86. Econ. Geogr. 66, 156. https://doi.org/10.2307/143744

Hayter, R., Patchel, J., 2015. Resource Geography, in: J.D. Wright (Ed.), International Encyclopedia of the Social & Behavioral Sciences. Elsevier Science & Technology, Oxford.

Healey, P., 1998. Building Institutional Capacity through Collaborative Approaches to Urban Planning. Environ. Plan. A Econ. Sp. 30, 1531–1546. https://doi.org/10.1068/a301531

Healy, N., Barry, J., 2017. Politicizing energy justice and energy system transitions: Fossil fuel divestment and a "just transition." Energy Policy 108, 451–459.

Helmke-Long, L., Carley, S., Konisky, D.M., 2022. Municipal government adaptive capacity programs for vulnerable populations during the U.S. energy transition. Energy Policy 167, 113058. https://doi.org/https://doi.org/10.1016/j.enpol.2022.113058.

Henneman, L. R. F., C. Choirat, and C. M. Zigler. 2019. Accountability Assessment of Health Improvements in the United States Associated with Reduced Coal Emissions between 2005 and 2012. Epidemiology 30(4): 477–85.

Hibbard, M., Lurie, S., 2013. The New Natural Resource Economy: Environment and Economy in Transitional Rural Communities. Soc. Nat. Resour. 26, 827–844. https://doi.org/10.1080/08941920.2012.720358

Hollander, J.B., Németh, J., 2011. The bounds of smart decline: A foundational theory for planning shrinking cities. Hous. Policy Debate 21, 349–367. https://doi.org/10.1080/10511482.2011.585164

Holling, C.S., 1973. Resilience and Stability of Ecological Systems. Annu. Rev. Ecol. Syst. 4, 1–23. https://doi.org/10.1146/annurev.es.04.110173.000245

Holling, C.S., 1996. Engineering Resilience versus Ecological Resilience, in: Engineering Within Ecological Constraints. pp. 31–44. https://doi.org/10.17226/4919

Holtkamp, J.A., Davidson, M.A., 2009. Transmission Siting in the Western United States. Holland & Hart, Denver.

Holton, J. A. 2007. The coding process and its challenges. In The SAGE Handbook of Grounded Theory. (eds. Bryant, A. and Charmaz, K.). London, UK: SAGE Publications Ltd.

Hudson, R., 2005. Rethinking Change in Old Industrial Regions: Reflecting on the Experiences of Northeast England. Environ. Plan. A Econ. Sp. 37, 581–596. https://doi.org/10.1068/a36274

Hudson, R., 2010. Resilient regions in an uncertain world: wishful thinking or a practical reality? Cambridge J. Reg. Econ. Soc. 3, 11–25.

Hummel, D. 2015. Right-Sizing Cities: A Look at Five Cities. Public Budgeting and Finance 35(2): 1–18.

Hydrometrics, Inc. 2020. 2019 Annual Groundwater Monitoring and Corrective Action Report: Talen Energy, LLC Colstrip Steam Electric Station. Prepared for Talen Montana, LLC, Per 40 CFR Section 257.90(e), Billings, MT.

Hyman, E.L., 1982. Wyoming's industrial siting permit process and environmental impact assessment. Environ. Manag. 6, 1–7.

Iglesias, D., 2019. Fiscal Impact Report.

Imperiale, A.J., Vanclay, F., 2016. Experiencing local community resilience in action: Learning from post-disaster communities. Journal of Rural Studies, 47, pp. 204-219. http://dx.doi.org/10.1016/j.jrurstud.2016.08.002

Innis, H.A., 1929. The Teaching of Economic History in Canada. Contrib. to Can. Econ. 2, 52. https://doi.org/10.2307/136518

Interagency Working Group on Coal & Power Plant Communities & Economic Revitalization, n.d. Resources. https://energycommunities.gov/resources/ (accessed 26 October 2022).

IPCC, 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.

Jacquet, J.B., Pathak, R., Haggerty, J.H., Theodori, G.L., Kroepsch, A.C., 2021. Research fatigue in unconventional oil and gas boomtowns: Perceptions, strategies and obstacles among social scientists collecting human subjects data. Energy Res. Soc. Sci. 73.

Joao, E., Vanclay, F., den Broeder, L., 2011. Emphasising enhancement in all forms of impact assessment: Introduction to a special issue. Impact Assess. Proj. Apprais. 170–180. https://doi.org/10.3152/146155111X12959673796326.

Jolley, G.J., Khalaf, C., Michaud, G., Sandler, A.M., 2019. The economic, fiscal, and workforce impacts of coal-fired power plant closures in Appalachian Ohio. Reg. Sci. Policy Pract. 11, 403–422. https://doi.org/10.1111/RSP3.12191

Jordan, A., 2005. Environmental Policy in the European Union. Earthscan, London.

Joskow, P.L., 2000. Deregulation and Regulatory Reform in the U.S. Electric Power Sector by DEREGULATION AND REGULATORY REFORM IN THE U.S. ELECTRIC POWER SECTOR. MIT Center for Energy and Environmental Policy Research.

Just Transition Fund. Planning for the Long-Term: How to Replace Lost Revenue. https://www.justtransitionfund.org/overview.

Kraenzel, C.F., 1955. The Great Plains in Transition, [1st ed.]. ed. University of Oklahoma Press, Norman.

Kulig, J.C., Botey, A.P., 2016. Facing a wildfire: What did we learn about individual and community resilience? Nat. Hazards. 82, 1919-1929 https://doi.org/10.1007/s11069-016-2277-1

Kulig, J.C., Edge, D.S., Townshend, I., Lightfoot, N., Reimer, W., 2013. Community resiliency: Emerging theoretical insights. J. Community Psychol. 41, 758–775. https://doi.org/10.1002/jcop.21569

Larson. 2019. Ownership Shakeup at Colstrip Coal Power Plant. POWER, December 12. Leonardo Technologies, Inc. 2018. Colstrip Power Plant Study. Contract No. GS-23F-0231R,

Lawrence, R., O'Faircheallaigh, C., 2022. Ignorance as strategy: "Shadow places" and the social impacts of the ranger uranium mine. Environ. Impact Assess. Rev. 93, 106723. https://doi.org/https://doi.org/10.1016/j.eiar.2021.106723.

Lehr, R., O'Boyle, M., 2018. Depreciation and Early Plant Retirements. San Francisco.

Leistritz, F.L., 1994. Economic and fiscal impact assessment. Impact Assess. 12, 305–317. https://doi.org/10.1080/07349165.1994.9725868.

Littig, B., 2011. Interviews, expert, in: Badie, B., Berg-Schlosser, D., Morlino, L. (Eds.), International encyclopedia of political science. Sage Publications, Thousand Oaks.

Look, W., Raimi, D., Robertson, M., Higdon, J., Propp, D., 2021. Enabling Fairness for Energy Workers and Communities in Transition. Resources for the Future and Environmental Defense Fund, Washington, D.C.

Loorbach, D., 2007. Transition management: new mode of governance for sustainable development.

Loorbach, D., Rotmans, J., 2010. The practice of transition management: Examples and lessons from four distinct cases. Futures 42, 237–246. https://doi.org/10.1016/j.futures.2009.11.009

Luce, J., Fiksdal, A., 2013. Washington State Energy Facility Site Evaluation Council.

Lutey T. 2019a. Rosebud Mine, Post Bankruptcy, Is Stable until Year's End. Billings Gazette, March 21.

Lutey, T., 2019b. Colstrip Units 1 and 2 will close in 2019 | State & Regional | billingsgazette.com. Billings Gaz.

Lutey, T., 2019c. Washington state lawmakers eyeing earlier closure of Colstrip. Billings Gaz.

Lutey, T., 2019d. $2M grant for Colstrip coal worker retraining sits unused after two years | State & Regional | helenair.com. Indep. Rec.

Lutey, T., 2020. Colstrip sale hits snag in Washington state. Billings Gaz.

Lutey, T., 2022a. Newly-passed Colstrip laws unconstitutional, court rules. Billings Gaz.

Lutey, T., 2022b. Colstrip operator Talen Energy files for bankruptcy. Billings Gaz.

Magis, K., 2010. Community Resilience: An Indicator of Social Sustainability. Soc. Nat. Resour. 23, 401–416. https://doi.org/10.1080/08941920903305674

Markantoni, M., Steiner, A., Meador, J.E., Farmer, J., 2018. Do community empowerment and enabling state policies work in practice? Insights from a community development intervention in rural Scotland. Geoforum 97, 142–154. https://doi.org/10.1016/J.GEOFORUM.2018.10.022

Markard, J., Raven, R., Truffer, B., 2012. Sustainability transitions: An emerging field of research and its prospects. Res. Policy. https://doi.org/10.1016/j.respol.2012.02.013

Markey, S., Halseth, G., 2017. Rural Restructuring: Conclusion, in: Halseth, G. (Ed.), Transformation of Resource Towns and Peripheries: Political Economy Perspectives. Routeledge.

Markey, S., Halseth, G., Manson, D., 2012. Investing in place: Economic renewal in northern British Columbia. UBC Press.

Martens, P., Rotmans, J., 2005. Transitions in a globalising world. Futures 37, 1133–1144. https://doi.org/10.1016/j.futures.2005.02.010

Martin, J., and T. Everts. 2002. Electrical Utility Industry Restructuring Transition Advisory Committee: A Report to the Governor and the 58th Legislature. Montana Legislative Services Division, Helena..

Matarrita-Cascante, D., Trejos, B., 2013. Community resilience in resource-dependent communities: a comparative case study. Environ. Plan. A 45, 1387–1402. https://doi.org/10.1068/a45361

Mayer, A., 2018. A just transition for coal miners? Community identity and support from local policy actors. Environ. Innov. Soc. Transitions 28, 1–13. https://doi.org/https://doi.org/10.1016/j.eist.2018.03.006.

Mendelevitch, R., Hauenstein, C., Holz, F., 2019. Climate Policy The death spiral of coal in the U.S.: will changes in U.S. Policy turn the tide? The death spiral of coal in the U.S.: will changes in U.S. Policy turn the tide? Technology. https://doi.org/10.1080/14693062.2019.1641462

Miles, M.., Huberman, M.B., 1994. Qualitative data analysis: An expanded sourcebook (2nd ed.). Qual. data Anal. An Expand. Sourceb. (2nd ed.). 20, 159–160. https://doi.org/10.1016/S1098-2140(99)80125-8

Montana Association of Counties, 2022. Mill Levy Computation Form. MACo Resour. Data. URL https://www.mtcounties.org/resources-data/

Montana Coal Board, 2022. Montana Coal Board Meeting. Helena.

Montana Code Annotated, 2001. Taxing Authority Budget Limitation.

Montana Code Annotated, 2021. Water Feasibility Study.

Montana Code Annotated, n.d. Local and interjurisdictional disaster and emergency plan - distribution.

Montana Code Annotated. 2019. Part 2. Coal Impacts: Evaluation and Abatement Funding. https://leg.mt.gov.

Montana Department of Commerce. 2020. Funded Projects. Helena.

Montana Department of Environmental Quality (DEQ). 2012. Administrative Order on Consent Regarding Impacts Related to Wastewater Facilities Comprising the Closed-Loop System at Colstrip Steam Electric Station, Colstrip Montana. Helena.

Montana Department of Labor and Industry. 2020. Montana Power Initiative. http:// cciag.mt.gov/Portals/190/POWER_Initiative_Grant_OneSheet-Accessible.pd-f?ver=2018-09-24-084430-803

Montana Department of Revenue, 2020. Biennial Report. Helena.

Montana Governor's Office. 2017. Governor Bullock and Attorney General Fox Announce Stakeholder Group to Help Community, Workers and Families of Colstrip Plan for the Future. Press release. Helena.

Montana Legislature. 2020. MIC City and County Finances Report. Helena.

Montana Office of Public Instruction. 2020. Understanding Montana School Finance and School District Budgets. School Finance Division, Helena, MT

Montana State University, n.d. Institutional Review Board - Office of Research Compliance | Montana State University. 2019. URL http://www.montana.edu/orc/irb/index.html (accessed 2.16.19).

Morehouse, C., 2020. “Beyond frustrating” Senate dispute stalls bipartisan energy legislation | Utility Dive. Util. Dive.

Morris, A.C., 2016. The Challenge of State Reliance on Revenue from Fossil Fuel Production. Brookings, Washington, D.C.

Morris, A.C., Kaufman, N., Doshi, S., 2019. The Risk of Fiscal Collapse in Coal-Reliant Communities.

Morris, A.C., Kaufman, N., Doshi, S., 2019. Why Local Governments Should Prepare for the Fiscal Effects of a Dwindling Coal Industry. Tax Policy Center, Washington, D.C.

Morris, A.C., Kaufman, N., Doshi, S., 2021. Revenue at Risk in Coal-Reliant Counties. Environ. Energy Policy Econ. 2, 83–116. https://doi.org/10.1086/711307

Morrison, T.H., 2014. Developing a regional governance index: The institutional potential ofrural regions. J. Rural Stud. 35, 101–111. https://doi.org/10.1016/j.jrurstud.2014.04.004

Morrison, T.H., Lane, M.B., Hibbard, M., 2015. Planning, governance and rural futures in Australia and the USA: revisiting the case for rural regional planning. J. Environ. Plan. Manag. 58, 1601–1616. https://doi.org/10.1080/09640568.2014.940514

MSHA. 2020. Mine Employment and Coal Production. US Department of Labor, Washington, DC.

Murphy, J., Smith, A., 2013. Understanding Transition—Periphery Dynamics: Renewable Energy in the Highlands and Islands of Scotland. Environ. Plan. A Econ. Sp. 45, 691–709. https://doi.org/10.1068/a45190

National Academies of Sciences Engineering and Medicine (NASEM), 2021. Accelerating Decarbonization of the U.S. Energy System. Washington, D.C.

Nel, E., Connelly, S., Stevenson, T., 2019. New Zealand’s small-town transition: The experience of demographic and economic change and place based responses. N. Z. Geog. 75. https://doi.org/10.1111/nzg.12240

Newell, R. G., and D. Raimi. 2018a. The Fiscal Impacts of Increased U.S. Oil and Gas Development on Local Governments. Energy Policy 117: 14–24.

Newell, R.G., Raimi, D., 2018b. US state and local oil and gas revenue sources and uses. Energy Policy 112, 12–18. https://doi.org/https://doi.org/10.1016/j.enpol.2017.10.002

Nieberg, P., 2022. Craig, Colorado grapples with the future as its coal mine and power plant shut down. KUNC, January 24.

Norris, F.H., Stevens, S.P., Pfefferbaum, B., Wyche, K.F., Pfefferbaum, R.L., 2008. Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. Am. J. Community Psychol. 41, 127–150.

Northern Plains Resource Council, 2018. Doing It Right: Colstrip's Bright Future with Clean Up. Billings.

Northern Plains Resource Council. 2019. Doing It Right II: Job Creation through Colstrip Cleanup. https://northernplains.org/colstrip-jobs-study-2/.

NorthWestern Energy (NWE). 2019. NorthWestern Energy to Acquire 25% Share of Colstrip; Plans to Reduce Carbon by 90%. Press release. www.northwesternenergy.com.

Novotny, N., 2004. Wyoming Industrial Siting Act: Creations and Exemptions. Wyoming Legislative Service Office, Cheyenne.

Nowakowski, S. 2018. SJ 5: Coal in Montana: Changing Times, Challenging Times. Report to Montana Legislature. Environmental Quality Council, Legislative Environmental Policy Office, Legislative Services Division, Helena.

Order No. DE-FE0022594; DE-BP0005235. Prepared for Office of Fossil Energy, US Department of Energy.

PacifiCorp. 2019. 2019 Integrated Resource Plan. https://www.pacificorp.com/energy/integrated-resource-plan.html.

Pai, S., Zerriffi, H., Jewell, J., Pathak, J., 2020. Solar has greater techno-economic resource suitability than wind for replacing coal mining jobs. Environ. Res. Lett. 15, 034065. https://doi.org/10.1088/1748-9326/ab6c6d

Parfit, M., 1980. Last Stand at Rosebud Creek: Coal, Power, and People. E. P. Dutton, New York.

Parfitt, T., 2009. Industrial Siting Overview. Presentation to Legislative Wind Energy Task Force, Cheynne.

Patton, M., 1990. Qualitative Evaluation and Research Methods. Qual. Eval. Res. Methods 169–186. https://doi.org/10.1002/nur.4770140111

Peluso, N., Kearney, M., Lester, R., 2020. Assessing the Role of Public Policy in Industrial Transitions: How Distinct Regional Contexts Inform Comprehensive Planning, The Roosevelt Project Special Series. Boston.

Pike, A., Dawley, S., Tomaney, J., 2010. Resilience, adaptation and adaptability. Cambridge J. Reg. Econ. Soc. 3, 59–70.

Plummer, P., Tonts, M., Argent, N., 2018. Sustainable rural economies, evolutionary dynamics and regional policy. Appl. Geogr. 90, 308–320. https://doi.org/10.1016/J.APGEOG.2017.01.005

Portland General Electric (PGE). 2019. Integrated Resource Planning. https://www.port-landgeneral.com/our-company/energy-strategy/resource-planning/integrated-re- source-planning.

Power, M., Williams, M.G., Mosley, K., Frankel, J., Hanser, P., 2015. Managing the Employment Impact of Energy Transition in Pennsylvania Coal Country. Boston.

Pretty, J.N., 1995. Regenerating Agriculture: Policies and Practice for Sustainability and Self-Reliance. Earthscan, London.

Public Service Commission. 2020. Minutes for the Week of August 24, 2020. Helena, MT. https://dataportal.mt.gov/t/DOAPSC/views/EDDISearch_15650306559830/ PSCEDDISearch?:embed=y&:showShareOptions=true&:display_count=no&:-showVizHome=no&:refresh=true&Type=Minutes

Raimi, D., 2017. Decommissioning US Power Plants: Decisions, Costs, and Key Issues. Resources for the Future.

Raimi, D., and R. G. Newell. 2016. Dunn County and Watford City, North Dakota: A Case Study of the Fiscal Effects of Bakken Shale Development. Working paper. Duke University Energy Initiative, Durham, NC.

Raimi, D., Carley, S., Konisky, D., 2022. Mapping county-level vulnerability to the energy transition in US fossil fuel communities. Sci. Rep. 12, 15748. https://doi.org/10.1038/s41598-022-19927-6

Raimi, D., Grubert, E., Higdon, J., Metcalf, G., Pesek, S., Singh, D., 2022. The Fiscal Implications of the U.S. Transition away from Fossil Fuels.

Ramage J., Everette, B., 2012. Coal, in: Energy Systems and Sustainability: Power for a Sustainable Future, in: Everett, B., Boyle, G., Peake, S., Ramage, J. (Eds.) 2nd edition. Oxford University Press, Oxford, pp. 141-178.

Rasker, R., 2017. The Transition from Western Timber Dependence: Lessons for Counties The Transition from Western Timber Dependence: Lessons for Counties.

Rasker, R., Gude, P.H., Gude, J.A., van den Noort, J., 2009. The economic importance of air travel in high-amenity rural areas. J. Rural Stud. 25, 343–353. https://doi.org/10.1016/j.jrurstud.2009.03.004

Rauner, S., N. Bauer, A. Dirnaichner, R. V. Dingenen, C. Mutel, and G. Luderer. 2020. Coal-Exit Health and Environmental Damage Reductions Outweigh Economic Impacts. Nature Climate Change 10(4): 308–12.

Ray, C., 2000. Editorial. The EU leader Programme: Rural Development Laboratory. Sociol. Ruralis 40, 163–171.

Reimer, B., 2002. Understanding and measuring social capital and social cohesion. New Rural Econ. 23.

Rhodes, J., Russo, J., 2013. Shrinking smart?: Urban redevelopment and shrinkage in Youngstown, Ohio. Urban Geogr. 34, 305–326. https://doi.org/10.1080/02723638.2013.778672

Rigg, J., Law, L., Tan-Mullins, M., Grundy-Warr, C., 2005. The Indian Ocean tscunami: socio-economic impacts in Thailand. The Geographic Journal. 171, 4. Pp. 374-379. https://doi.org/10.1111/j.1475-4959.2005.00175_3.x

Righetti, T.K., Stoellinger, T., Godby, R., Coddington, K., 2021. Adapting to coal plant closures: A framework to understand state energy transition resistance. Envtl. L. 51, 957–990.

Robertson, D. 1979. Power Plant and Industrial Fuel Use of 1978: Fuel Replacement. Harvard Environmental Law Review 3: 214–35.

Robertson, S.A., Blackwell, B.D., McFarlane, J.A., 2017. The viability of remote mining communities: Insights from community perceptions and employment impact assessments. Impact Assess. Proj. Apprais. 35, 310–324. https://doi.org/10.1080/14615517.2017.1354640

Roemer, K.F., Haggerty, J.H., 2021. Coal communities and the U.S. energy transition: A policy corridors assessment. Energy Policy 151. https://doi.org/10.1016/j.enpol.2020.112112

Roemer, K.F., Haggerty, J.H., 2022. The energy transition as fiscal rupture: Public services and resilience pathways in a coal company town. Energy Res. Soc. Sci. 91.

Rosebud County, 2020. Annual Financial Report. Forsyth.

Rosebud County, 2021. Annual Financial Report. Forsyth.

Rossiter, D.A., Rossiter, 2010. Resource Geography, in: Encyclopedia of Geography. Sage Publications, Thousand Oaks.

Roth, S., 2022. Here are the last coal plants clinging to life in the American West. Los Angeles Times.

Ryser, L., Halseth, G., 2014. View of On the Edge in Rural Canada: The Changing Capacity and Role of the Voluntary Sector. Can. J. Nonprofit Soc. Econ. Res.

Ryser, L., Halseth, G., Markey, S., Gunton, C., Argent, N., 2019. Path dependency or investing in place: Understanding the changing conditions for rural resource regions. Extr. Ind. Soc. 6, 29–40. https://doi.org/10.1016/J.EXIS.2018.10.009

Sandlos, J., Keeling, A., 2016. Aboriginal communities, traditional knowledge, and the environmental legacies of extractive development in Canada. Extr. Ind. Soc. 3, 278–287.

Sartor, O., 2018. Implementing coal transitions: Insights from case studies of major coal-consuming economies.

Scott, M., 2013. Resilience: A Conceptual Lens for Rural Studies? Geogr. Compass 7, 597–610.

Sisto, R., Lopolito, A., van Vliet, M., 2018. Stakeholder participation in planning rural development strategies: Using backcasting to support Local Action Groups in complying with CLLD requirements. Land use policy 70, 442–450. https://doi.org/10.1016/J.LANDUSEPOL.2017.11.022

Skinner, M.W., Joseph, A.E., Hanlon, N., Halseth, G., Ryser, L., 2014. Growing old in resource communities: Exploring the links among voluntarism, aging, and community development. Can. Geogr. 58, 418–428. https://doi.org/10.1111/cag.12087

Smil, V., 2010. Energy Transitions: History, Requirements. Prospects 1.

Smit, B., Wandel, J., 2006. Adaptation, adaptive capacity and vulnerability. Glob. Environ. Chang. 16, 282–292. https://doi.org/10.1016/J.GLOENVCHA.2006.03.008

Smith, K. K., J. H. Haggerty, D. L. Kay, and R. Coupal. 2019. Using Shared Services to Mitigate Boomtown Impacts in the Bakken Shale Play: Resourcefulness or Over-adaptation? Journal of Rural and Community Development 14(2).

Smith, K.K., Haggerty, J.H., 2020. Exploitable ambiguities & the unruliness of natural resource dependence: Public infrastructure in North Dakota's Bakken shale formation. J. Rural Stud. 80. https://doi.org/10.1016/j.jrurstud.2020.05.006

Snyder, B.F., 2018. Vulnerability to decarbonization in hydrocarbon-intensive counties in the United States: A just transition to avoid post-industrial decay. Energy Res. Soc. Sci. 42, 34–43.

Southeastern Montana Development Corporation (SEMDC). 2017. Colstrip Economic Diversification Strategy. Colstrip, MT: https://www.nado.org/wp-content/uploads/2017/12/ Colstrip-Econ-Diversification-Report-Reduced-Size-1.pdf

Sovacool, B.K., Dworkin, M.H., 2015. Energy justice: Conceptual insights and practical applications. Appl. Energy 142, 435–444. https://doi.org/https://doi.org/10.1016/j.apenergy.2015.01.002

Stark, D., 1991. Path Dependence and Privatization Strategies in East Central Europe. East Eur. Polit. Soc. Cult. 6, 17–54. https://doi.org/10.1177/0888325492006001003

State of New Mexico, 2019. Energy Transition Act.

State of Washington. 2011. Memorandum of Agreement between the State of Washington and TransAlta Centralia Generation LLC. Olympia, WA. https://ecology.wa.gov/DOE/files/85/858591f6-dd25-47be-ba1d-0f58264ca147.pdf

Stokes, L.C., Breetz, H.L., 2018. Politics in the US energy transition: Case studies of solar, wind, biofuels and electric vehicles policy. Energy Policy 113, 76–86.

Sullivan, L., Ryser, L., Halseth, G., 2014. Recognizing Change, Recognizing Rural: The New Rural Economy and Towards a New Model of Rural Service. J. Rural Community Dev.

Swann, W.L., Deslatte, A., 2018. What do we know about urban sustainability? A research synthesis and nonparametric assessment. Urban Stud. 56, 1729–1747. https://doi.org/10.1177/0042098018779713.

Taimerica Management, Competitive Solutions, Trent Lott National Center. 2017. The Changing Coal Industry: Regional Economic Impacts, Workforce Analysis, Transition Strategies. Report prepared for Montana Coal Country Coalition. Mandeville, LA. https://www. bigskyeconomicdevelopment.org/wp-content/uploads/Coal-Country-Coalition-Re- port-FINAL-3-17.pdf

Talen Energy, 2022. Colstrip Steam Electric Station - Colstrip Montana.

Talen Energy. 2019. Colstrip Steam Electric Station Units 1 and 2 to Retire. Press release. https://talenenergy.investorroom.com.

The Energy Policy and Conservation Act (P.L. 94-163, 42 U.S.C. 6201), 1976. William Mary Environ. Law Policy Rev. 1.

The Office of Just Transition, 2021. Guidance for Colorado Just Transition Community Funding Opportunities. Colorado Department of Labor and Employment, Denver. https://cdle.colorado.gov/sites/cdle/files/documents/FINAL_OJT_Community_Funding_Guidance_11-21.pdf (accessed 26 October 2022).

The White House, 2015. FACT SHEET: The Partnerships for Opportunity and Workforce and Economic Revitalization (POWER) Initiative | whitehouse.gov. URL https://obamawhitehouse.archives.gov/the-press-office/2015/03/27/fact-sheet-partnerships-opportunity-and-workforce-and-economic-revitaliz (accessed 3.18.20).

The World Bank Group, 2017. The World Bank Environmental and Social Framework. The World Bank, Washington, D.C.

U.S. Bureau of Reclamation, 1971. North Central Power Study: Report of Phase I.

U.S. Census Bureau, 2020. Total Population. 2020 Decenn. Census. URL https://data.census.gov/cedsci/all?q=colstrip, montana (accessed 4.4.22).

U.S. Department of Commerce, 2020. ACS 5-year estimates. Census Bur.

U.S. Department of Commerce, 2021. Rosebud County: Employment by Industry (1970-2000). Washington, D.C.

U.S. Economic Development Administration, n.d. EDA Communities of Practice. https://eda.gov/communities/ (accessed 27 October 2022).

U.S. Energy Information Administration (EIA), 2019. More U.S. coal-fired power plants are decommissioning as retirements continue. Today in Energy. URL https://www.eia.gov/todayinenergy/detail.php?id= (EIA)40212 (accessed 5.11.20).

U.S. Energy Information Administration (EIA), 2019. Sixteen mines in the Powder River Basin produce 43% of U.S. coal. U.S. Energy Inf. Adm. URL https://www.eia.gov/todayinenergy/detail.php?id=41053 (accessed 5.3.22).

U.S. Energy Information Administration (EIA), 2020a. Short-Term Energy Outlook. URL https://www.eia.gov/outlooks/steo/ (accessed 5.5.20).

U.S. Energy Information Administration (EIA), 2020b. More U.S. coal-fired power plants are decommissioning as retirements continue. Today in Energy. URL https://www.eia.gov/todayinenergy/detail.php?id=40212 (accessed 3.2.20).

U.S. Energy Information Administration (EIA). 2020c. Detailed data from the EIA-7A and the US Mine Safety and Health Administration. US Department of Energy, Washington, DC

U.S. Energy Information Administration (EIA). 2020d. Form EIA-923 detailed data with previous form data (EIA-906/920). US De- partment of Energy, Washington, DC.

U.S. Energy Information Administration (EIA), 2021. Of the operating U.S. coal-fired power plants, 28% plant to retire by 2035. URL https://www.eia.gov/todayinenergy/detail.php?id=50658

U.S. Energy Information Administration (EIA), 2022a. Table 6.6 Planned U.S. Electric Generating Unit Retirements [WWW Document]. Electr. Power Mon.

U.S. Energy Information Administration (EIA). 2022b. Rosebud Mine & Crusher/Conveyor, Annual [WWW Document]. Coal Data Brows.

U.S. Environmental Protection Agency. 2015. Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric Utilities: Final Rule. Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency. 2020a. Power Plant Data Viewer. Washington, DC.

U.S. Environmental Protection Agency. 2020b. Toxics Release Inventory Database. Washington, DC.

USASpending. 2020. USASpending.gov. Washington, DC.

Utah Revised Code, 2007. Chapter 14. Utility Facility Review Board Act.

Vanclay, F., 2002. Conceptualizing social impacts. Environ. Impact Assess. Rev. 22, 183–211.

Vanclay, F., 2003. International principles for social impact assessment. Impact Assess. Proj. Apprais. 21, 5–11.

Vanclay, F., Esteves, A.M., Aucamp, I., Franks, D.M., 2015. Social Impact Assessment: Guidance for Assessing and Managing the Social Impacts of Projects. International Association for Impact Assessment, Fargo.

Vaneeckhaute, L.E., Vanwing, T., Jacquet, W., Abelshausen, B., Meurs, P., 2017. Community resilience 2.0: Toward a comprehensive conception of community-level resilience. Community Dev. 48, 735–751.

Vivoda, V., Kemp, D., Owen, J., 2019. Regulating the social aspects of mine closure in three Australian states. J. Energy Nat. Resour. Law 37, 405–424.

Wagner, B. 2018. Local Tax Impacts of Colstrip's 1&2 Closure. Research and Analysis Bureau, Montana Department of Labor and Industry, Helena.

Walker, R.A., 2001. California's Golden Road to Riches: Natural Resources and Regional Capitalism, 1848 – 1940. Ann. Assoc. Am. Geogr. 91, 167–199. https://doi.org/10.1111/0004-5608.00238

Wallerstein, I.M., 2004. World-Systems Analysis: An Introduction. Duke University Press, Durham.

Wange, C., Mardell, S., Richardson, J., Varadarajan, U., 2022. Coal Community Transition Policy: How State Legislation is Supporting Coal Communities and Workers as the Economy Shifts to Clean Energy.

Ward, C.J., Cope, M.R., Wilson, D.R., Muirbrook, K.A., Poff, J.M., 2020. Powerless in a Western US Energy Town: Exploring Challenges to Socially Sustainable Rural Development. Sustain. (Basel, Switzerland) 12, 8426.

Washington Annotated Code 463-60-535 Socioeconomic impact, 2019.

Washington Utilities and Transportation Commission (WUTC). 2017. WUTC v. PSE, UE-170033 and UG-170034, before the Washington Utilities and Transportation Commission (2017)

Washington Utilities and Transportation Commission (WUTC). 2018 Settlement reached in Avista/Hydro One merger case. Press Release. https://www.utc.wa.gov/aboutUs/Lists/News/DispForm.aspx?ID=510

Washington Utilities and Transportation Commission (WUTC). 2019. Washington UTC Approves Multiparty Settlement in Avista Rate Case. Press release. https://www.utc.wa.gov/aboutUs/Lists/News/DispForm.aspx?ID=636&ContentTypeId=0x010400FF58A04FBD57384DB60A5ECF52665206

Washington Utilities and Transportation Commission (WUTC). 2020. UTC Staff Recommend Denying PSE's Request to Sell Colstrip Unit 4 Interests. Docket Number UE-200115. Press release. https://content.govdelivery.com/accounts/ WAUTC/bulletins/2a43d88

Watkins, M.H., 1963. A Staple Theory of Economic Growth. Can. J. Econ. Polit. Sci. 29, 141–158.

Watson, S.T., 2020. Tonawanda considers drastic measures to keep cheap water supply from drying up. Buffalo News, August 14.

Weaver, K.L., 2002. Governing Montana at the grass roots: local government structure, process and politics. Local Government Center, Montana State University-Bozeman, Bozeman, Mont.

Weaver, K.L., 2019. Municipal Government Divide. Bozeman.

Weaver, K.L., LaChapelle, P.R., 2010. Governing Montana at the grass roots: local government structure, process and politics, 3rd ed. Local Government Center, Montana State University, Bozeman, Mont.

Werner, E., Smith, R., 1982. Vulnerable but invincible: A longitudinal study of resilient children and youth. McGraw Hill, New York.

Westmoreland Mining, LLC. 2019. Westmoreland Rosebud Mining LLC Announces New Coal Supply Agreement for Colstrip Units 3&4. Press release. https://westmoreland.

White, K., 1972. The Plan for Colstrip. Denver.

White, R., 1991. "It's Your Misfortune and None of My Own": A New History of the American West. University of Oklahoma Press, Norman.

Whitener, L., 2005. Policy Options for a Changing Rural America.

Wilson, G. A, 2013. Community Resilience, Transitional Corridors and Macro-Scalar Lock-in Effects. https://doi.org/10.1002/eet.1620

Wilson, G.A., 2007. Multifunctional agriculture: a transition theory perspective. Cambridge, MA: CABI, Cambridge, MA.

Wilson, G.A., 2010. Multifunctional 'quality' and rural community resilience. Trans. Inst. Br. Geogr. 35, 364–381.

Wilson, G.A., 2012. Community Resilience and Environmental Transitions. Routledge, London. https://doi.org/10.4324/9780203144916.

Wilson, G.A., 2013. Community resilience, policy corridors and the policy challenge. Land use policy 31, 298–310. https://doi.org/10.1016/j.landusepol.2012.07.011

Wilson, G.A., 2014. Community resilience: path dependency, lock-in effects and transitional ruptures. J. Environ. Plan. Manag. 57, 1–26. https://doi.org/10.1080/09640568.2012.741519

Wilson, G.A., 2015. Community Resilience and Social Memory. Environ. values. 24, 227–257.

Wilson, G.A., Bryant, R., 1997. Environmental Management: New Directions for the 21st Century. UCL Press, London.

Wilson, Geoff A, 2013. Community Resilience, Transitional Corridors and Macro-Scalar Lock-in Effects. https://doi.org/10.1002/eet.1620

Wilson, Geoff A., 2013. Community resilience, policy corridors and the policy challenge. Land use policy 31, 298–310. https://doi.org/10.1016/j.landusepol.2012.07.011

Wilson, S., 2017. Crow government's future uncertain as budget woes hit tribe. Billings Gazette, October 3.

Winter, S., 1990. Integrating implementation research, in: Palumbo, D.J., Calista, D. (Eds.), Implementation and the Policy Process: Opening Up the Black Box. Greenwood Press, Westport, pp. 19–38.

Woods, M., Gardner, G., 2011. Applied policy research and critical human geography: Some reflections on swimming in murky waters. Dialogues Hum. Geogr. 1, 198–214.

Wyoming Mining Association, 2018. 2018 Wyoming Coal Overview.

Yacobucci, B.D., 2016. Energy Policy: 114th Congress Issues.

Zabel, J. E., and D. Guignet. 2012. A Hedonic Analysis of the Impact of LUST Sites on House Prices. Resource and Energy Economics 34(4): 549–64.

Zimmerman, P., 2021. Montana looks at next steps for Colstrip. Dly. Mont.

Zitelman, K., McAdams, J., 2021. The Role of State Utility Regulators in a Just and Reasonable Energy Transition. National Association of Regulatory Utility Commissioners, Washington, D.C.

APPENDICES

APPENDIX A

INTERVIEW GUIDE AND QUESTIONS

Semi-structured Interview Guide and Questions

The following is an overview of interview questions used during semi-structured interviews. This protocol was approved under Montana State University IRB applications KR070621-EX and KR061919-EX. This document includes an example of the introduction script and interview questions for this dissertation research.

1. **Example of Interview Guide script:**

   Hi, thank you for your time and willingness to meet with me.

   Project Overview. I am a Ph.D. student at Montana State University. I study resource geography and rural community development. I am researching community resilience in coal communities facing coal facility closure. I am interested in understanding how changes in coal production in SE Montana communities will affect local institutions and service provision. Local institutions and public services provide support for both community and economic development, and their consistent delivery provides for routine and emergency needs. My goal is to learn more about what is needed to support local institutions and services in communities facing decline. My hope is that findings from this study will increase understanding of the opportunities and challenges facing rural, coal-reliant communities, and inform research that supports best practices for rural community resilience.

   Before we begin, I just want to point to the LOI—this document says that this proposed research protocol has been reviewed and approved by the Montana State University Institutional Review Board (IRB). Your participation is voluntary and can be withdrawn at any time. These interviews are strictly confidential, and all records will be de-

identified and password protected. Before we begin, do you have any further questions about participating? May I record this interview?

2. **Questions for policy experts and community practitioners working with coal-dependent communities**
    - Could you describe your position, how long you've worked in it, and the role you play/capacity in which you work with coal-reliant communities?
    - What area of transition is the focus of your work?
    - What are the transition policies/programs that you have experience with?
    - What are the most important policies/programs and why?
    - How would you describe the aspect of focus in the policy/programs (labor/employment, economic & community development, planning, environmental/reclamation, other)?
    - What direction is it pushing for? (i.e place-based, people-based, growth, recruitment, participatory, degrowth) What is the goal?
    - What is the process of or mechanics of implementation? Could you walk me through that? How are they funded? Are they long term?
    - How is it going? Is it working?
    - Opportunities and challenges, barriers to meeting its set objective?
    - As someone who works with policy and programs and communities, what do you think these communities need?
    - Could you talk about the groups, organizations, or people that are thinking or leading different strategies? What are their strategies?
    - If I'm trying to get a sense of the policies and programs addressing coal reliant community transitions, who should I be talking to? These can be local, regional, or state level.
3. **Questions for service providers, community leaders, and state stakeholders**
    - Could you describe your profession/position or role?
    - Primary activities, span of jurisdiction/service area (town, county, region)?

- How long have you worked in this role?
- [Provide a summary of my understanding of the status of the plant, mine, closure, layoffs, transition, policy etc] Is my understanding correct? What am I missing? What is new?
- How will this disruption, changes to the local economy impact institutions, services, and resilience?
- How will key institutions and services (health, protection, education, public infra) be impacted by these changes? With the partial closure of Colstrip Power Station? With the uncertainty of the future of 3&4? The mine?
- If a/n institution/service is at risk - how so? (Revenue loss, employment, out-migration, policy) Are these at the town, county, regional level?
- How do you see these institutions/services changing in the next 5 years? 10 years?
- What is going to be the most important tool, resource, strategy to navigate the changes or be resilient? Who or what are the local institutions or people that are going to make those things happen? How will those resources be affected by the current disruption?
- Interested in knowing about local philanthropy. Worth asking if there are community and/or private company foundations in town that give money for community projects or events?
- What type of external support is needed? Where do you go for assistance?
- What's your ideal future for Colstrip? If the plant closes? Perceived opportunities/barriers for realizing this goal?

APPENDIX B

LETTERS OF INFORMATION

LETTER OF INFORMATION FOR PARTICIPATION IN HUMAN RESEARCH AT MONTANA STATE UNIVERSITY

Coal community transition planning in the U.S. West

Introduction/ Purpose You are being asked to participate in a research study about the dynamics of transition planning in coal communities in the western U.S. to consider the critical factors affecting rural communities' ability to plan for (partial or full) closure of coal-fired power plants. This work will focus on the policies, programs, and processes—at the federal, state, and local levels—that require or resource local transition planning. This work aims to characterize the policy landscape shaping opportunities and barriers for local planning across three Western states—Colorado, Montana, and Washington—and examine how key actors and local processes foster community path creation. The project's results and findings will be shared with policy makers, rural and regional development specialists, and community planners to inform policy and ability to support remote, isolated communities respond to economic shock. You have been asked to take part because you are a policy expert, community and economic development planner and practitioner, federal and state agency personnel, state, and local government representative, or serve in an important community leadership role.

Funding This project is funded by MSU. MSU maintains academic independence in conducting this research and analysis.

Procedures If you agree to take part in this study, we will ask you to participate in an interview. These interviews will be conducted in person and facilitated by Kelli Roemer. Interviews typically last between 45 minutes and 1.5 hours. If you agree, the interviews may be recorded to help us accurately represent your answers in our analysis.

Risks Participation in this research study may involve some added risks or discomforts. These include a minimal risk of loss of confidentiality. However, below we describe steps that we take to protect the individual identity of all participants.

Benefits Your participation in this the project will provide important information about critical policies and processes that may improve ability to support remote, isolated communities respond to economic shock.

Voluntary nature of participation and right to withdraw without consequence Participation in research is entirely voluntary. You may refuse to participate or withdraw at any time without consequence or loss of benefits. You may be withdrawn from this study without your consent by the investigator.

Confidentiality Research records will be kept confidential, consistent with federal and state regulations. Only the investigators and graduate student research staff will have access to the raw data from the interviews (including recordings) which will be kept in a locked file cabinet or on a password protected computer in a locked room. To protect your privacy, personal,

identifiable information will be removed from study documents and replaced with a study identifier. Identifying information will be stored separately from data and will be kept. The interview notes and any recordings and transcripts will be destroyed within two years or as soon as the analysis is completed.

IRB Approval Statement The Institutional Review Board for the protection of human participants at Montana State University has approved this research study. If you have any questions or concerns about your rights or a research-related injury and would like to contact someone other than the research team, you may contact the IRB Administrator at (406) 994-6783 or email mquinn@montana.edu to obtain information or to offer input.

Investigator Statement "I certify that the research study has been explained to the individual, by me or my research staff, and that the individual understands the nature and purpose, the possible risks and benefits associated with taking part in this research study. Any questions that have been raised have been answered."

Signature of Researcher(s)

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LETTER OF INFORMATION FOR PARTICIPATION IN HUMAN RESEARCH AT MONTANA STATE UNIVERSITY

A study on institutions, services, and community resilience in SE Montana

Introduction/ Purpose You are being asked to participate in a research study about community resilience in communities experiencing coal-fired power plant and/or mine closure. Broadly, this study aims to develop a deeper understanding of how the U.S. shift away from coal electricity and production affects resilience in coal communities. Specifically, this research project examines how change in coal production in southeast Montana communities will affect local institutions and public service provision. Local institutions and public services provide support for both community and economic development, and their consistent delivery provides for routine and emergency needs. The project's results and findings will be shared with community stakeholders and state policy makers to provide further insight into how to support community resilience in response to shock. You have been asked to take part because you serve in an important community leadership role and have critical knowledge about the critical institutions and services in coal communities of southeastern Montana.

Funding This project is funded by MSU. MSU maintains academic independence in conducting this research and analysis.

Procedures If you agree to take part in this study, we will ask you to participate in an interview. Interviews will be conducted in person and facilitated by Kelli Roemer and typically last between 45 minutes and 1.5 hours. If you agree, the interviews may be recorded to help us accurately represent your answers in our analysis.

Benefits Your participation in this the project will provide important information for policy makers at the state and federal levels to understand the challenges and opportunities facing coal communities. Findings of this study may be used to improve the ability of policy to support remote, isolated communities facing economic shock such as coal plant closure.

Risks The risks associated with your participation in this study are expected to be minimal.

Confidentiality Research records will be kept confidential, consistent with federal and state regulations. Only the investigators and graduate student research staff will have access to the raw data from the interviews (including recordings) which will be kept in a locked file cabinet or on a password protected computer in a locked room. To protect your privacy, personal, identifiable information will be removed from study documents and replaced with a study identifier. Identifying information will be stored separately from data and will be kept. The interview notes and any recordings and transcripts will be destroyed within two years or as soon as the analysis is completed.

Voluntary nature of participation and right to withdraw without consequence Participation in research is entirely voluntary. You may refuse to participate or withdraw at any time without

consequence or loss of benefits. You may be withdrawn from this study without your consent by the investigator.

IRB Approval Statement The Institutional Review Board at Montana State University has approved this research study for the protection of human participants. If you have any questions or concerns about your rights or a research-related injury and would like to contact someone other than the research team, you may contact the IRB Administrator at (406) 994-4706 or email mquinn@montana.edu to obtain information or to offer input.

Investigator Statement "I certify that the research study has been explained to the individual, by me or my research staff, and that the individual understands the nature and purpose, the possible risks and benefits associated with taking part in this research study. Any questions that have been raised have been answered."

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