

Economic Opportunities in the Four Corners Area

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Foreword

As a 30-year resident of San Juan County and first-hand observer of the changing economic landscape, I encourage you to read this report. I found the document to be an accurate assessment of the continuing decline of the coal industry in the Four Corners area.

I also was impressed with the comprehensive nature of the economist's suggestions for the development of other economic drivers to replace that of coal. Although the diversification of the local economy has been a goal for many years, it is now imperative that concrete steps be taken as soon as possible so the least disruptive transition to a sounder, more sustainable economy can be developed.

This report deserves to be a part of the important conversation about the future of the Four Corners area.

Steve Ellison
July 2018

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Executive Summary

San Juan, McKinley, and Cibola Counties are at an economic crossroads. Long dependent on fossil fuel extraction and coal-fired power production as sources of high-wage jobs, these counties now must adapt to the markedly diminished global demand for coal. The coal industry is in rapid decline and therefore cannot be a centerpiece of a forward-thinking plan to create prosperity, as it was in the past. The economic development strategies chosen in the coming months will impact the region's prosperity for decades to come.

In an effort to confront this issue head-on, the Northwest New Mexico Council of Governments released a report titled Regional Economic Assessment & Strategy for the Coal-Impacted Four Corners Region by Highland Economics LLC and Catalyst Environmental Solutions in February 2017. In November 2017, San Juan Citizens Alliance retained an independent economist to evaluate the contents of the Assessment. This document presents the findings of that evaluation, with a focus on San Juan County, New Mexico. Top economic development priorities for the Four Corners region should include:

- 1. *Tourism and Recreation*** – The cultural significance and scenic beauty of the Four Corners region are its most valuable assets. Maximizing the return on investment in these assets by restoring, protecting, and promoting them as recreational and tourist attractions should be the region's overarching goal.
- 2. *Solar + Scalable Storage*** – Existing transmission capacity and abundant sunshine position northwest New Mexico to continue to serve as a major producer and exporter of electricity, with solar. San Juan County is an excellent site for a commercial scale energy storage facility to serve as a trading hub for southwest utilities.
- 3. *Mine Reclamation*** – Mine reclamation has the potential to vastly improve environmental quality, increase property values, enhance business opportunities, and generate a substantial number of new, multi-year jobs in the process. As such, it can serve as a bridge between a resource-dependent community's extractive past and a future based on a diverse set of new economies.
- 4. *Healthcare*** – Increasing the supply of healthcare in northwest New Mexico would improve population health, enable the region to compete more effectively for jobs, and stimulate the local economy with infusions of new revenue from Medicaid, Medicare, the Indian Health Service, and private insurers. A shortage of healthcare forces residents to seek care outside their community, exporting economic activity and thus jobs.
- 5. *Local food systems*** – Strengthening the linkages between local food producers and processors through collaborative marketing, community kitchens, co-processing facilities, technical assistance, and support for entrepreneurship, enables local businesses to reach wider markets by better leveraging demand for local food and creating export opportunities.

About the Author

Kelly O'Donnell is an economist, senior research fellow, and research professor at the University of New Mexico School of Public Administration. She has more than 20 years of experience in New Mexico public policy and has consulted with a broad range of public and private sector clients on innovative approaches to sustainable economic development. Her research specialties include economic impact analyses, fiscal policy, and program evaluation. Prior to academia, Dr. O'Donnell held a series of leadership roles in New Mexico state government including Director of State Tax Policy, Deputy Cabinet Secretary for Economic Development, and Superintendent of the New Mexico Regulation and Licensing Department. She holds a PhD in Economics from the University of New Mexico.

Introduction

The coal-impacted New Mexico counties – San Juan, McKinley, and Cibola – are at an economic crossroads. Long dependent on coal extraction and coal-fired power production as sources of high-wage jobs, these counties must adapt to the markedly diminished global demand¹ for coal by re-envisioning the regional economy.

In an effort to confront this issue head-on, the Northwest New Mexico Council of Governments released a report titled *Regional Economic Assessment & Strategy for the Coal-Impacted Four Corners Region* (“the Assessment”) by Highland Economics LLC and Catalyst Environmental Solutions in February 2017². This extensive report, funded through a federal POWER grant, has become the locus around which much of the conversation about the region’s economic future now centers. The question of how best to reduce reliance on resource extraction and energy generation is a critical one. In November 2017, San Juan Citizens Alliance retained an independent economist to evaluate the contents of the Assessment. This document presents the findings of that evaluation, with a focus on San Juan County, New Mexico.

¹ “Demand for coal from Northwest New Mexico is expected to decrease, with little opportunity for local use or coal export.” *Regional Economic Assessment & Strategy for the Coal-Impacted Four Corners Region* (Highland Economics, LLC and Catalyst Environmental Solutions, 2017), 11.

² Partnership for Opportunity and Workforce and Economic Development, Northwest New Mexico Council of Governments, accessed January 24, 2018, <http://www.nwnmcog.com/power-grant.html>

Overview

The Assessment is, overall, a comprehensive and well-researched document. It has, however, three significant shortcomings: First, the estimated economic impact of reductions in coal-fired power generation are somewhat inflated. There is no doubt the shift from coal will, at least initially, result in job losses. However, an impact of the size presented in the Assessment is highly unlikely and not replicable with the model or the inputs used.

In addition, the Assessment's assumption that "coal-fired power generation will continue for at least another 15 to 25 years at Four Corners Power Plant and San Juan Generating Station" is already outdated and calls into question some of the report's findings and recommendations. According to PNM's 2017-2036 Integrated Resource Plan,³ the utility plans to retire its remaining capacity at SJGS in 2022 after the expiration of the existing coal supply agreement. The retired capacity will be replaced with a mix of solar, wind, natural gas peaking capacity, nuclear power from Palo Verde, and potentially energy storage. The Four Corners Power Plant is currently slated for retirement in 2031, not at the end of its lease in 2041 as was previously anticipated. The Assessment's outdated assumptions add even more urgency to the economic development recommendations in this report.

Finally, although most of the Assessment's recommendations are sound, several have potentially negative environmental impacts that do not receive sufficient consideration or appear to be feasible if and only if significant coal production continues in the region, an outcome that is unlikely and suboptimal from an economic perspective. A revised list of recommendations, ranked by order of priority, is provided at the end of this report.

It is important to note that, despite its shortcomings, the Assessment's core recommendations – targeted investments in workforce and business development; quality of life improvements; and regional collaborative marketing – are sound.

If read carefully, the Regional Economic Assessment & Strategy for the Coal-Impacted Four Corners Region makes a solid economic case against continued reliance on coal.

Page 31 of the Assessment states:

"The combined forces of slowing domestic energy demand, cheap and abundant natural gas, renewable energy production that continues to fall in price, and a competitive international coal market, will continue to depress the U.S. coal industry regardless of the nation's political leadership and energy policy."

The Assessment also argues for reduced dependence on the energy sector in general, stating on page 12:

³ PNM 2017- 2036 Integrated Resource Plan (Public Service Company of New Mexico, 2017), <https://www.pnm.com/documents/396023/396193/PNM+2017+IRP+Final.pdf/eae4efd7-3de5-47b4-b686-1ab37641b4ed>

“[W]ith the proper planning, in the long-term a reduced reliance on the energy sector may provide an opportunity for the area to enhance long-term economic resiliency through investments in diversification and workforce training and education.”

Efforts to prop up coal mining in the Four Corners region are in no way supported by any of the Assessment’s data or findings. Rather, the Assessment recommends that the region better leverage its historic, cultural, and outdoor recreation assets, efforts that may be incompatible with the environmental degradation of continued coal extraction.

The cultural significance and scenic beauty of the Four Corners region are its most valuable assets. Maximizing the return on investment in these assets by restoring, protecting, and promoting them as recreational and tourist attractions should be the region’s top economic development priority. Other components of the economic development strategy, including the choice of other industries to actively recruit and foster, must align with this vision. An important finding of the Assessment is that **high solar values and transmission infrastructure linking Four Corners to western population centers make it the ideal location for utility-scale solar installations.** Aggressive development of solar generation and storage capacity should be another key facet of the regional economic development strategy.

The Assessment also notes that significant reclamation of mining sites will be necessary. The history of reliance on fossil fuel extraction in San Juan County has made reclamation, clean up, and natural resource revitalization necessary. **Reclamation activities, if initiated promptly and funded adequately, will be an important source of employment for displaced mine and power plant workers.**

A reasonable conclusion to draw from the Assessment, although not stated in the report, is that **the most direct path to a diversified and sustainably robust Four Corners economy begins with divestiture from coal. Rather than expend resources attempting to forestall the inevitable demise of coal, business leaders of the three-county region should invest fully in the development and marketing of other regional assets, lobby for full and prompt reclamation of the coal-impacted sites, and support equitable transition for displaced workers and their families.**

Diminished Prospects for Coal

The transition away from coal and toward a more diversified economy will be difficult for the families and counties of northwestern New Mexico, but the shift, once executed, will reward participating communities with more stable, robust economies; cleaner air and water; and a better quality of life.

There is much discussion of alternative uses and markets for San Juan Basin coal in the Regional Economic Assessment & Strategy for the Coal-Impacted Four Corners Region. However, the report ultimately makes a strong economic case *against* continued dependence on coal:

- Rapidly shrinking global demand and high transportation costs make coal exports from the region currently unfeasible.
- “Clean coal” is not realistic for the future in the Four Corners region. Gasification and carbon-capture technologies are still speculative at best, unreliable, and very expensive to implement, particularly at scale.⁴
- Manufacturing of coal-based products like liquid fuels and coatings is likely unfeasible for the region at this time.⁵
- Even if the current federal administration succeeds in temporarily resuscitating some portion of the coal industry, San Juan County coal will remain uncompetitive with coal from other western sources. On page 19, the Assessment states, “Coal mining jobs are unlikely to rebound, even with a new federal administration, as market impacts are a driving force in reduced coal mining nation-wide.”

Overcoming the Paradox of Plenty

Reduced generation of coal fired power will create serious economic challenges for Four Corners communities, but there is evidence that a heavy reliance on fossil fuel extraction may actually undermine long-term economic growth. A substantial body of research documents a phenomenon known as “the paradox of plenty,” wherein resource-rich regions that depend heavily on extractive industries demonstrate lower levels of long-term economic growth than otherwise comparable but less resource- dependent areas. Research comparing western counties that were economically dependent on fossil fuel extraction to western counties with more diverse economies found that

⁴David Schlissel, *Using Coal Gasification to Generate Electricity: A Multibillion-Dollar Failure* (Institute for Energy Economics and Financial Analysis: 2017), http://ieefa.org/wp-content/uploads/2017/09/Using-Coal-Gasification-to-Generate-Electricity-_A-Multibillion-Dollar-Failure_September-2017.pdf

⁵ The Assessment notes that “changes in resource availability, markets, or technology could make this a viable use for coal at some point in the distant future,” a statement that, while not false, could be made about virtually anything. *Regional Economic Assessment*, 11.

energy-dependent counties lagged comparison counties on key economic measures, including real personal income, employment, and population.⁶

The Assessment acknowledges this evidence, noting several possible contributors to what they call the “resource curse,” including the following:

- Because many extractive jobs require relatively little formal education, there may be little incentive to invest in higher education or economic diversification.
- “The boom and bust cycles related to commodity prices of raw materials such as coal, uranium, oil, timber and natural gas can lead to lack of local investment by both private and public entities due to uncertainties regarding future economic conditions.”⁷
- Abundant natural resources have slowed the transition to a service-oriented, knowledge-based economy.

Environmental degradation is another likely contributor to the paradox of plenty. Recreation and tourism are often major potential growth sectors in resource-rich areas. Extractive industries and related industrial activity crowd out growth of these industries by diminishing environmental quality.

⁶ *Fossil Fuel Extraction as a County Economic Development Strategy* (Bozeman: Headwaters Economics, 2008), https://headwaterseconomics.org/wp-content/uploads/energy-HeadwatersEconomics_EnergyFocusing.pdf

⁷ *Regional Economic Assessment*, 12

Economic Impact

The Assessment includes an estimate of the likely economic impact of reductions in coal-fired power generation in the three-county region. The analysis purports to use a standard input-output (I-O) methodology and software (IMPLAN™) commonly used for economic impact estimation. However, an IMPLAN model of the three-county region that includes the inputs reported in the Assessment supports only the bottom-most values of the range of possible impacts reported. I-O modeling suggests that, at a maximum, a total of about 2,230 jobs with income totaling about \$187 million will be lost over the course of several years. In contrast, the job impacts reported in the Assessment range from 2,260 to 3,180, and the income impacts range from \$195 million to \$213 million.

<i>Comparison of Assessment and Standard I-O Model Result</i>		
	Standard I-O	Assessment
Jobs	2,230	-2,260 to -3,180
Labor Income	-\$186.9	-\$195.2 to -\$213.3

It is also important to note that although job and income impacts are expressed as lump sums, they will, in fact, be spread out over several years and occur, at least initially, through attrition, providing a window during which workers can retrain, be redeployed to other jobs by their employer, or retire.

Other factors, including a slight over-estimate of average compensation of power plant and coal workers⁸ and the implicit assumption that, in the absence of the coal-fired power plants, New Mexico would import all the electric power it currently obtains from the Four Corners from sources outside the state, further inflate the estimate, making the economic challenges facing the region appear larger than they actually are. The reality is that the Public Service Company of New Mexico (PNM) plans to replace much of the coal-fired power produced in the Four Corners with new in-state gas-fired and renewable capacity and, according to PNM's 2017-2036 Integrated Resource Plan (IRP), the utility will need to replace the voltage support service provided by San Juan Generating Station (SJGS) with other generation at the Four Corners Hub. The IRP goes on to note that new generation at SJGS would benefit from the site's existing transmission facilities.⁹

⁸ The Assessment assumes coal miners earn an annual average of \$85,000, about 30 percent more than the amount reported by the New Mexico Department of Energy and Minerals. The Assessment also assumes that non-wage labor expenses average 50 percent of wages for both coal mine and power plant employees. Bureau of Labor Statistics data indicate that they average about 37 percent. Ibid.

⁹ *PNM 2017- 2036 Integrated Resource Plan*

Quality of Life

A great place to do business must, first and foremost, be a great place to live. Thus, attending to the fundamentals – health, education, and quality of life – are critical first steps in any economic development endeavor. The three-county region has serious obstacles to overcome in these areas – graduation rates of under 70 percent in all three counties,¹⁰ high rates of chronic disease and preventable death,¹¹ and an environment degraded by decades of resource extraction and coal-fired power production.

Workforce and Business Development

Coal miners and power plant workers have skills that are needed in a variety of other industries. Helping displaced workers match their skills and interests to other occupations and industries and obtain the training they need to successfully transition is the single most critical component of a successful transition. The coal companies and utilities reducing jobs in the region should fund a vigorous, multifaceted workforce development and retraining initiative that includes social supports for transitioning workers and their families, educational subsidies, and support for entrepreneurship.

Public Health and Economic Development

As is the case for other core quality of life issues, communities with major environmental health hazards must address those first before other economic development tools can be used effectively. Coal-fired power plants can impede other forms of economic development by undermining population health and degrading the environment. Emissions from coal-fired power plants are believed to contribute to high rates of cardiovascular disease, respiratory illness, and premature death in surrounding communities. Coal plants generate millions of pounds of solid waste, much of which is stored nearby. Emissions also visibly degrade the environment. Lingering smog is a constant reminder of the health hazards ever-present in the environment. The San Juan River, considered one of the best trout-fishing streams in the country, is polluted with mercury, selenium, and other deadly toxins that threaten the survival of many aquatic species and pose hazards to human health.

Scenic Beauty, Cultural Heritage, and Outdoor Recreation

The cultural significance and scenic beauty of the Four Corners region are its most valuable assets. Maximizing the return on investment in these assets by restoring, protecting, and promoting them as recreational and tourist attractions should be the region's top economic development priority. Other components of the economic development strategy, including the choice of other industries to actively recruit and foster, must align with this vision if it is to be realized. It therefore follows that economic opportunities with the potential to further degrade the environment or perpetuate dependence on industries that degrade the environment, may create obstacles to maximizing recreational and tourism potential.

¹⁰ New Mexico Public Education Department, *Cohort of 2014 4-Year Graduation Rates* (Santa Fe, NM: 2014), <http://webnew.ped.state.nm.us/bureaus/accountability/graduation/>

¹¹ New Mexico Department of Health, *New Mexico's Indicator-Based Information System for Public Health* (Santa Fe, NM: 2018), <http://ibis.health.state.nm.us/>

A Path Forward In Energy

In the last five years, coal jobs in the U.S. have declined by almost 50 percent. However, based on employment data from the U.S. Department of Energy,¹² each job lost in coal has been replaced by a new job in another electricity-generation-related industry. The wind and solar industries already employ three times more people than the coal industry.¹³ Recently, the most rapid job growth has been in solar, which has increased employment by an annual average of more than 20 percent for each of the past several years.¹⁴

Energy is, and will continue to be, a key asset and export of the three-county region. The coal-fired electricity generation capacity lost with the full or partial shutdown of the region's major generating stations will have to be replaced with cleaner technologies, and the region is well-suited to be the site of that new generation.

Northwest New Mexico is well-positioned to become a major producer and exporter of solar electricity. The area includes a number of sites suitable for a commercial scale solar facility.¹⁵ While there are western sites that have solar resources as good or better than those of the Four Corners, few, if any, have the transmission infrastructure needed to cost-effectively deliver power to multiple out-of-state utilities. Thus, in addition to meeting the growing in-state demand for renewable power, commercial generators in the Four Corners will be able to supply large markets in Arizona and California.

Nationally, the solar industry is growing fast enough to employ most of the workers displaced by the decline of coal. A 2016 study found that "a relatively minor investment in retraining would allow the vast majority of coal workers to switch to solar photovoltaic-related positions even in the event of the elimination of the coal industry."¹⁶

¹² Energy Information Administration, *U.S. Energy and Employment Report*, (2017),

https://energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf

¹³ Ibid. In 2016, U.S. coal power plants and mines employed about 160,000 people, while employment in the wind and solar industries totaled roughly 475,000 jobs.

¹⁴ National Solar Jobs Census, The Solar Foundation, last modified 2016, <https://www.thesolarfoundation.org/national/>

¹⁵ Solar Maps, National Renewable Energy Laboratory, accessed January 27, 2018, <https://www.nrel.gov/gis/solar.html>

¹⁶ Edward P. Louie and Joshua M. Pearce, "Retraining Investment for U.S. Transition from Coal to Solar Photovoltaic Employment" *Energy Economics* 57 (June 2016): 295-302.

Recommendations Reconsidered

The Assessment evaluates a number of industries thought to have high growth potential in the three-county region, including petrochemical manufacturing, industrial gas manufacturing, electronic component manufacturing, forest restoration, mine reclamation, transloading/warehousing, tourism, recreation, agricultural production, food processing, and the manufacture of specialty food products. The Assessment uses standard economic criteria – current and expected market conditions, availability of inputs, and potential economic impact – to evaluate the various options.

As noted in the Assessment: “investments in quality of life are key to long-term, resilient economic development. *Regions with high quality of life are better able to attract and retain residents and businesses, as well as provide an attractive destination for tourists.* Residents and visitors alike are drawn to live and to recreate in areas with nice amenities – including cultural, natural, and built-environment amenities.” In recognition of this, our approach adds two additional evaluation criteria to the analysis – dependence on continued coal production and environmental impact – and then ranks the various options. As a result, four industries – petrochemical manufacturing, industrial gas manufacturing, electronic component manufacturing, and dimension stone – drop off the list entirely, and one, healthcare, is added.

Priority Industries

1. Tourism and Recreation

Tourism is the ultimate “economic base” activity, because, by definition, it draws new spending into the regional economy. The Four Corners region has an abundance of environmental and cultural amenities including Chaco Canyon, Mesa Verde National Park, Navajo State Park, Monument Valley Tribal Park, Canyon De Chelly National Monument, Glen Canyon National Recreational Area, and the Grand Canyon, making it an ideal “geotourism” destination.¹⁷ It is also a prime location for outdoor recreation and agritourism. Thus, the region’s top and overarching economic development priority should be further development of the region’s cultural and outdoor tourism potential.

2. Solar + Scalable Storage

As noted earlier, northwest New Mexico is well-positioned to become a major producer and exporter of solar electricity. San Juan County is an excellent site for a commercial scale energy storage facility to serve as a trading hub for southwest utilities. According to the Assessment: “New renewable energy projects throughout the Four Corners region could feed power to the storage facility where utilities could buy and transmit renewable energy through existing/upgraded transmission lines from Four Corners Power Plant.”

¹⁷ “Geotourism” is defined as tourism that sustains or enhances the distinctive geographical character of a place—its environment, heritage, aesthetics, culture, and the well-being of its residents. See: Geotourism, National Geographic, last modified 2018, <https://www.nationalgeographic.com/maps/geotourism/>

Commercial solar installations are sometimes undervalued by economic developers because they are not particularly labor intensive during the operations phase. However, the jobs they support are good ones. The commercial/utility scale solar power industry supports a wide variety of jobs requiring various degrees of expertise. Training in solar-specific technologies enables workers in relatively low-wage construction and laborer jobs to increase their skills substantially in a relatively short period of time and move into reasonably well-paying jobs. In 2016, non-residential solar PV technicians earned a median annual salary of \$61,580/year, electricians with solar experience made around \$47,180/year, and solar PV installers averaged around \$40,020 annually.¹⁸

Although solar jobs do not, on average, pay as well as coal jobs, particularly for workers with only a high school diploma, they are in high demand.¹⁹ Solar jobs increased by 54 percent in New Mexico between 2015 and 2016, and New Mexico currently ranks 8th in the nation for solar jobs per capita.

Construction of solar plants is highly labor intensive and thus a good source of temporary employment that can help bridge the employment gap during the transition to a more diverse economy.

In addition, solar development of previously vacant rural land increases property values and, thus, state and local property tax revenue. A 50 MW solar PV farm on private acreage in San Juan County previously taxed as grazing land could generate upward of \$800,000 annually in additional county tax revenue.²⁰

3. Mine Reclamation

Mine reclamation has the potential to vastly improve environmental quality, increase property values, enhance business opportunities, and generate a substantial number of new, multi-year jobs in the process. As such, it can serve as a bridge between a resource-dependent community's extractive past and a future based on a diverse set of new economies.²¹

Since the early 1980s, mining companies have been required to create reclamation plans and provide some form of financial assurance, typically bonds, as part of the mine permitting process. The New Mexico Energy and Minerals Department Coal Mine Reclamation Program currently

¹⁸ Solar Career Map, Interstate Renewable Energy Council, last modified 2018, <http://irecsolarcareermap.org/resources>

¹⁹ The New Mexico Energy, Minerals, and Natural Resources Department Mining and Minerals Division, 2015 New Mexico Solar Jobs Census. <http://www.emnrd.state.nm.us/ECMD/documents/New-Mexico-Solar-Jobs-Census-2015.pdf>; and Emery Cowan, "Coal plant pumps \$51 million into Page economy," *Arizona Daily Sun*, October 1, 2017, https://azdailysun.com/news/local/coal-plant-pumps-million-into-page-economy/article_d6e22775-b8f3-5210-b7bd-e8b28e415f93.html

²⁰ Estimate assumes 450 acres, facility valued at \$105 million and property tax rate of 25 mills

²¹ John Talberth, Rachel Conn, Robert Berrens, and Mike McKee, *A Case Study Addressing Reclamation of the Molycorp Mine*, (Questa, New Mexico: Ecology and Law Institute and Amigos Bravos, 2001), retrieved from: https://amigosbravos.org/uploads/fck//file/Molycorp%20case_study-economic%20benefits.pdf

oversees more than \$300 million in financial assurance.²² Mining operations often begin closure and remediation of one part of a mine while other parts continue active mining. Areas of the San Juan and La Plata mines (La Plata is currently closed), both of which historically serve SJGS, have already undergone partial reclamation. Thus, it seems reasonable to anticipate that a more extensive reclamation process could be initiated fairly quickly.

An example of reclamation's potential to transform coal-based economies is the \$26 million, three-year Ehrenfield reclamation project currently underway in Pennsylvania, which is expected to create 50 jobs to be filled by displaced coal miners.²³ Reclaimed areas have several important advantages for clean power production: they tend to be fairly remote; they do not require extensive environmental impact clearances; and they often have existing roads, identified rights-of-way, and other infrastructure. Pairing economic development proposals with reclamation projects can multiply the benefits of reclamation. A solar farm on a reclaimed molybdenum mine in Taos County powers the town of Questa.²⁴ In Kentucky, there are plans to turn a strip mine site just outside Pikeville into a 50 to 100 MW solar farm. The \$100 million dollar project will employ displaced coal miners.²⁵

The Lee Ranch, Kayenta, and San Juan mines total 56,685 permitted acres. Assuming 6 to 8 acres are needed per MW solar capacity,²⁶ the three mine sites, once reclaimed, have the land area to support over 7,000 MW of solar power. Combined with the region's transmission capacity, this creates enormous solar electric export potential.

Proximity to a mining site has been shown to markedly deflate property values by marring the landscape and contaminating the air, water, and soil.²⁷ As noted earlier in the discussion of the paradox of plenty, the environmental degradation that accompanies mining can threaten a community's long-run economic future. Reclamation can be at least a partial antidote, giving former mining communities the opportunity to redefine themselves as good places to live, visit, and do business.

As noted earlier, New Mexico coal mines currently have hundreds of millions of dollars in reclamation liability. Reclamation creates somewhere between 5 and 33 jobs per million dollars

²² The New Mexico Energy, Minerals, and Natural Resources Department Mining and Minerals Division, *2016 Annual Report*, (NM: 2016), http://www.emnrd.state.nm.us/MMD/Publications/documents/Final_2016_EMNRD_MMD_AnnualReport.pdf

²³ Don Hopey, "Reclamation projects could provide jobs for former coal miners," *Pittsburgh Post-Gazette*, August 4, 2016, <http://www.post-gazette.com/powersource/policy-powersource/2016/08/05/Reclamation-projects-could-provide-jobs-for-former-coal-miners/stories/201608050129>

²⁴ "Producing solar power at a mine," Chevron Corporation, last modified August 2012, <https://www.chevron.com/stories/producing-solar-power-at-a-mine>

²⁵ Kevin Ridder, "Kentucky Coal Mine Has Brighter Future as Solar Farm," *Appalachian Voices*, last modified June 15, 2017, <http://appvoices.org/2017/06/15/kentucky-coal-mine-solar-farm/>

²⁶ Sean Ong, Clinton Campbell, Paul Denholm, Robert Margolis, and Garvin Heath, *Land-Use Requirements for Solar Power Plants in the United States*, (Golden, CO: National Renewable Energy Laboratory, 2013), <https://www.nrel.gov/docs/fy13osti/56290.pdf>

²⁷ op. cit. Ong et al.

invested.²⁸ Thus, mine reclamation, if undertaken promptly and adequately funded, has the capacity to employ thousands of former mine and power plant workers. The amounts currently bonded likely will be insufficient to fully remediate the damaged areas, particularly if groundwater depletion is to be addressed. The divestiture from coal of major mining companies, including BHP Billiton, and the spate of coal company bankruptcies and declining valuation, including that of Westmoreland (owner of San Juan Mine that serves San Juan Generating Station), make the need to assure corporate financial accountability even more pressing. Therefore, the momentum of the present moment should be harnessed to coalesce a unified regional voice to advocate for federal reclamation funding and prompt initiation of reclamation projects, decommissioning, site cleanup, and revitalization/reuse of coal plant sites.

4. Healthcare

Healthcare is the region's largest employer, accounting for roughly one-in-five jobs. But, as is the case in much of New Mexico, the demand for healthcare in the three-county region exceeds supply. The region has severe shortages of key health professionals including primary care practitioners, mental health specialists, and pharmacists.²⁹ Despite marked increases in the rates of insurance coverage since 2014, 46 percent of McKinley County adults, 35 percent of San Juan County adults, and 31 percent of adults in Cibola County have no primary medical provider. Forty-three percent of respondents to the 2016 San Juan County Community Health Assessment Survey said they experienced difficulties or delays in obtaining healthcare services in the past year and nearly one-in-four said they had gone without needed healthcare entirely. Forty percent of respondents to the San Juan County survey rated the area's mental health services as "poor."

The quality of the local health care system is a deciding factor in where businesses choose to locate and/or expand. Access to healthcare is also a key consideration for retirees, families, and location-neutral professionals in deciding where to live. Although not generally considered an economic base industry, healthcare brings substantial sums of outside revenue into a community in the form of reimbursements from Medicaid, Medicare, the Indian Health Service, and private insurers. A shortage of healthcare providers forces residents to seek care outside their

²⁸ Estimates of job creation per million dollars invested in environmental remediation vary widely. However, all estimates reviewed were well above the roughly 2 jobs created per million dollars invested in coal mining. See: Todd BenDor, T. William Lester, Avery Livengood, Adam Davis, and Logan Yonavjak, "Estimating the Size and Impact of the Ecological Restoration Economy," *PLoS ONE* 10, no. 6 e0128339 (2015), <https://doi.org/10.1371/journal.pone.0128339>; "The Clean Energy Future: Protecting the Climate, Creating Jobs, and Saving Money," Labor Network for Sustainability, accessed January 27, 2018, http://www.labor4sustainability.org/wp-content/uploads/2015/10/cleanenergy_10212015_main.pdf; Frank Ackerman and Tyler Comings, "Employment after Coal: Creating New Jobs in Eastern Kentucky," (Labor Network for Sustainability and Synapse Energy Economics, accessed January 27, 2018), http://labor4sustainability.org/files/KYcleanenergy_final_03032016.pdf; Mark Baker, *Socioeconomic Characteristics of the Natural Resources Restoration System in Humboldt County, California* (Taylorsville, CA: Forest Community Research, 2004) <https://community-wealth.org/content/socioeconomic-characteristics-natural-resources-restoration-system-humboldt-county>; and Montana Department of Natural Resources, *An Estimation of Montana's Restoration Economy*, (2009), <https://deq.mt.gov/Portals/112/Land/FedSuperFund/Documents/sst/RestorationEconomyRPT9-17-09.pdf>

²⁹ *Meeting New Mexico's Healthcare Workforce Needs, 2016*, (University of New Mexico Health Sciences Center, 2016), <https://hsc.unm.edu/assets/doc/economic-development/nmhcwc-exec-summary-2016.pdf>

community, exporting economic activity and thus jobs. A rural primary care physician practicing in a community with a local hospital creates an estimated 26.3 local jobs and nearly \$1.4 million in income (wages, salaries and benefits) from the clinic and the hospital.³⁰

Increasing the supply of healthcare in northwest New Mexico would improve the population's health, enable the region to compete more effectively for jobs, and stimulate the local economy with infusions of new revenue. Expanding the healthcare sector requires attracting and retaining practitioners, many of whom are in high demand. Incentives such as loan forgiveness, recruitment bonuses, housing stipends, and job training could help communities in the three-county region compete more effectively for healthcare providers.

5. Local Food Systems

Strengthening the linkages between local food producers and processors through collaborative marketing, community kitchens, co-processing facilities, technical assistance, and support for entrepreneurship, enables local businesses to reach wider markets by better leveraging demand for local food and creating export opportunities. The Four Corners region includes productive agricultural assets. Navajo Agricultural Products Industry (NAPI) is one of the nation's largest contiguous farms and exports Navajo Pride products throughout the U.S. and to several foreign countries. Other regional food system assets include family farms and ranches, local growers' markets, wineries, breweries, and apiaries. Support for local food system entrepreneurs should include support for small-scale livestock producers on the Navajo reservation.

The Wilds Cooperative of Pennsylvania is cited in the Assessment as an example of an organization that leverages local food systems as an engine of job creation. Founded to diversify the economies of Pennsylvania's former coal-producing regions, the Wilds Cooperative focuses on growing, marketing, and linking local tourism-oriented businesses including food production, accommodation, and local artisans under a unified brand.

Transport-related projects

A transloading facility, or dry inland port, is a place where shipments of goods are transferred from one mode of transportation to another. In addition to equipment for transferring goods between trucks and trains, inland ports often include warehouses, facilities for consolidating shipments, as well as vehicle repair and maintenance services. Situated at the confluence of I-40, U.S. 491, and the BNSF TransCon Line, Gallup is a good site for an inland port connecting markets in California, Texas, and the Midwest. In addition to supporting 60 or so jobs on site, many of which would align well with the skillsets of former coal miners and power plant employees, a transloading facility could reduce shipping costs for local businesses like NAPI and attract new industries to the area. Finally, to the extent that such a facility improves the efficiency of the nation's transport system, it could contribute to reduced emissions.

³⁰ Fred C Eilrich, Gerald A. Doeksen, Cheryl F. St. Clair, *Estimate the Economic Impact of a Rural Primary Care Physician*, (National Center for Rural Health Works, 2016), <https://www.ruralhealthinfo.org/resources/8346>

A 2015 feasibility analysis suggested that a McKinley County transloading facility would have a high potential for success, *if coal production continued in the region for the foreseeable future*. Because continued coal production is not consistent with an economic development strategy predicated on diverse industries and excellent quality of life, development of an inland port is only warranted if it can succeed independently of coal. More study is therefore needed to determine if a transloading facility is a good investment.

The same reasoning applies to a proposed 110-mile rail spur that would connect Farmington to the BNSF corridor, Interstate 40, and Thoreau along NM 371. Better access to rail would benefit San Juan County businesses and complement other economic development efforts by reducing transport costs and making the area more attractive to certain industries. A 2015 analysis found that the rail line would be feasible only if an export market was found for coal from the Navajo mine. Developments in the coal industry since the study's release in 2015 further diminish the likelihood that Navajo coal can be exported profitably. Like the transloading facility, the rail spur is only advisable if it can succeed without coal.

Not Recommended

Several of the target industries identified in the Assessment are not recommended because their potential environmental impacts undermine the efforts to restore and preserve scenic values and outdoor amenities critical to healthy communities and a thriving outdoor recreation industry.

1. Petrochemical Manufacturing

Chemical manufacturing is a highly polluting industry. Petrochemical manufacturing would further the region's economic dependence on the extractive industries. The Assessment mentions the manufacture of urea as a particularly good prospect for the three-county region because of its use in power plant emissions control equipment. It is not clear whether the production of urea would remain feasible if the coal-fired power plants were to cease operations. Urea is produced from ammonia and gaseous carbon dioxide at high pressure and relatively high temperature. While urea itself is considered relatively benign, the ammonia from which it is manufactured is toxic.

2. Electronics Manufacturing

Electronics manufacturing is a highly polluting industry that often uses large amounts of water. Most electronics are manufactured in countries with substantially lower labor costs.

3. Industrial Gas Manufacturing

The primary customer for industrial gases would be the oil and gas industry. Investing in this industry would therefore increase the regional economy's vulnerability to fluctuations in oil and gas markets and further diminish its economic resiliency.

4. Dimension Stone

Dimension stone, which includes dolomite, limestone, silica materials, and travertine, is used as a landscaping and building material. It is mined in open pits, resulting in habitat destruction and heavy truck traffic. All major dimension stone deposits in the three-county region are on public land. As one of the region's key assets, the scenic beauty and recreational potential of public lands should be preserved.

Conclusion

Cultural significance, scenic beauty, and opportunities for outdoor recreation are the three-county region's most valuable assets. Effective economic development strategies leverage local assets and comparative advantage. Communities that have successfully transitioned away from industries like mining and timber harvesting have leveraged their region's natural beauty and cultural heritage to attract visitors, businesses, and in-migration.

PNM and others have determined that maintaining the coal industry is not economically practical or sustainable. The region's leaders should commit fully to economic diversification and focus on rebuilding the region's economy on a more stable, sustainable, and health-promoting foundation.

San Juan Citizens Alliance advocates for resilient communities, ecosystems, and economies in the San Juan Basin. For more information, please visit www.sanjuancitizens.org.

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