

# Towns in Transition:

Kern County, CA as a Case Study  
for Justice Considerations in Decarbonization

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## Preface

Bakersfield, California is an iconic image of today's American West: the trucks are big, the diners aren't ironic, the land alternates between dust and crops, and the horizon is marked by the see-saw motion of wells. The mascot of the local high school is The Driller, and when I first visited the downtown theatre proudly advertised a showing of "'The Princess Bride' presented by Chevron." But some are afraid that the oil economy of Bakersfield may have the city and the rest of Kern County, California headed toward another Western tradition: boom and bust.

I first learned about Kern County in the summer of 2016 as an intern with an environmental organization working to slow down the development of large renewable energy projects in the area. For many people, this is a confusing sentence: in light of the overwhelming evidence supporting anthropogenic climate change, why would an environmental organization oppose the fast deployment of carbon-free energy sources?

Answering this question, like so many topics in the environmental space, becomes more complicated the more time and effort that you put into finding the answer. As a basic answer, however, the organization I was working with came with a wildlife-first mission and the privilege of knowing that it was operating in the most pro-renewable energy state in the country. Within this framework, it made sense for an environmental organization to not just want renewable energy, but to push for renewable energy that doesn't disturb pristine desert ecosystems and the birds, tortoises, and other wildlife that call such habitat home.

This particular anecdote is neither here nor there, however, for after a summer of work on the question of wildlife-friendly renewable energy siting, I began instead to wonder about the human beings in this desert-energy-wildlife ecosystem. Rather than wildlife-friendly renewable energy, I thought about what people-friendly renewable energy looks like. In my short visit, I had

seen the massive amounts of renewable energy infrastructure, and I had seen vast fields of pumping oil jacks. When I returned to the Bay Area, I often found myself thinking about those massive developments in the desert as I filled up my car's gas tank or turned on the air conditioning in my house. I marveled that despite my environmental proclivities, I hadn't ever taken much time to think about the place my electricity and gasoline was actually coming from, and the people that made it all possible.

In all likelihood, however, I would have never returned to Kern County in a substantial way had the 2016 presidential election turned out differently. But as it was, I paid attention during campaign season as it seemed like the most substantial conversation related to energy and the environment was the future of the coal industry. In responding to a question in a presidential debate, Democratic candidate Hillary Clinton said the following:

“Let's reunite around politics that will bring jobs and opportunities to all these under-served poor communities. So, for example, I'm the only candidate who has a policy about how to bring economic opportunity using clean renewable energy as the key into coal country. Because we're going to put a lot of coal miners and coal companies out of business, right? ... We're going to make it clear that we don't want to forget those people. Those people labored in those mines for generations, losing their health, often losing their lives to turn on our lights and power our factories. Now we've got to move away from coal and all the other fossil fuels, but I don't want to move away from the people who did the best they could to produce energy that we relied on.”

Despite the greater context and intended message of inclusivity, the soundbite that would be perpetuated and remembered by many voters was simply “we're going to put a lot of coal miners and coal companies out of business.” The timeless rhetoric of climate change policy being a job-killer had seemingly been confirmed by the Democratic candidate.

Of course, part of the ironic tragedy of the discourse about the coal industry is that there haven't been that many coal jobs in this country for years, and that almost all economists agree such jobs won't be coming back thanks to non-environmentally-related factors such as automated

coal mining and widespread availability of cheap natural gas. But if coal towns could nevertheless capture the political spotlight so effectively, I began to wonder: could oil towns be next? If the oil industry collapses, will it be another rhetorical battle for those in favor of environmental policy to have to fight?

As I conducted a short scan on Google, it became clear that despite the substantial consequences of the collapse of coal communities and despite the recent instability in the American oil sector, very few people were looking at the future viability of America's oil towns. This was the precise moment that I knew I needed to go back to Kern County and find out for myself just how oil and renewable energy coexisted so extremely in such a small place.

I am fortunate to be able to write this thesis in the interdisciplinary Earth Systems program. As Earth Systems majors will often explain in a variety of ways, the goal of the program is to study global environmental changes with a special attention to the social-human impacts of these changes. Often times, the latter half of this goal requires looking not just at the global picture, but rather small aspects of systems or small areas that are representative of global systems. We think globally but study locally.

Thinking globally but studying locally is obvious to see in ecological studies of a threatened species or even of an economic study of the impacts of drought on a region's farming. But it also has a place in the solutions literature, and in the renewable energy transition. As a recent case study of renewable energy transitions in a German town found, "understandings about socio-geographic places of energy transition and their underlying social processes and structures are insufficiently studied and often remain underestimated" (Susser *et al*, 2017). We must strengthen our efforts to understand the underlying social processes in hotbeds of climate and energy solutions-- in places like Kern County.

## Introduction

Not too far out of Bakersfield, more toward the eastern part of Kern County, there's a quiet road called Comanche. It's one lane on either side, and the traffic is mostly farming equipment and semi-trucks. One side of the road presents alternating patches of row crops and slowly-bobbing oil derricks. On the other side, rows of shimmering black solar panels stretch back from behind the industrial fencing and fade into the landscape. Drive another half hour into the mountains, and the sleek white blades of wind turbines take over the sky. These renewable energy developments and the jobs they bring with them are popular in Bakersfield for the economic boost they provide the county. Often funded by parties from elsewhere in the state, the renewable energy developments and the minimal carbon they emit are popular with environmentalists throughout California. But if the oil industry is truly set to follow the boom and bust pattern of local resource-based economies, is renewable energy ready to fill the void?

This question has no consensus answer. In this thesis, I examine Kern County as a case study of a locality with a history of oil and gas development overlapping with potential renewable energy resources. I will consider Kern County's industries and culture in the context of California's extensive climate and energy policy in order to argue that the groundwork for a socially and economically inclusive transition to renewable energy has been laid, even if greater attention ought to be paid to compensating for lost local revenue from struggling oil resources. I approach the question from a social perspective, conducting in-depth interviews with Kern County residents and analyzing available economic indicators of the county and each industry. I then analyze the case study under the academic frameworks for just transitions, energy justice, and climate policy equity. Because each of these frameworks is still emerging in the academic literature, I will also explore

the relative merits and comprehensiveness of each theoretical framework. Finally, I will examine how the lessons from each of these investigations can guide additional research and policymaking.

The first chapter provides a relevant review of the economic and cultural studies surrounding the interaction between renewable and fossil-based energy sectors. I first analyze the most relevant empirical example for transitions within local energy economies: coal communities. I review frameworks of resource economics and identify similarities between the coal and oil industries. Next, I provide context for the growth of the renewable energy sector in the United States and public opinion regarding renewables. Finally, I provide demographic context through which to understand the case study of Kern County. I conclude that the unique overlap of high climate vulnerability, strong fossil fuel and renewable energy resources, and complicated political setting make Kern County an ideal place to study the idea of an equitable low-carbon transition.

The second chapter explains my interview methods and analyzes the themes that emerged in talking to energy stakeholders across Kern. I will discuss stakeholder recruitment and interview goals, as well as work to identify where different stakeholders see differently or similarly. The interview analysis will be segmented into perspectives on resource boom and bust patterns, growth potential (and limits) of the solar industry, the interface of cultural identity and energy policy, and environmental-health impacts of industry. The findings reveal that while the cyclical ups and downs of the oil industry have generally been expected, there is increasing concern that the industry won't fully recover from the most recent downturns. Solar, meanwhile, is viewed as an exciting economic growth opportunity, but generally not perceived as a potential replacement for the cultural and economic contributions historically provided by big oil. And although residents across the stakeholder spectrum acknowledge the poor air quality of their home region, they resent what feels like cultural condescension from coastal environmentalists.

The third chapter evaluates the links between energy sector performance in Kern County and state and local policy in order to supplement the qualitative interview data with quantitative assessment of economic impact. I draw from reports on the economic impact of California's major climate programs on the San Joaquin Valley, as well as county-level budget and employment data. I find that while both industries support high quality jobs, employment in solar work is not yet of the same local magnitude as that of oil. That being said, growth in solar employment opportunity has helped cushion the blow during layoff periods in the oil industry. I also find that local revenue from solar is limited due to a property tax exemption—a problem to which solutions are just beginning to emerge. However, the benefits of lower electricity bills thanks to solar deployment is especially significant in an area such as Kern County, where energy usage is traditionally higher than the rest of the state. This is also in contrast to the economic costs of healthcare necessitated by poor air quality caused by oil and other industry. Additionally, I argue that the economic benefits from California's greater climate and energy program have furthered the prospects for a low carbon transition beyond the potential of solar alone.

The fourth chapter explores the literature on justice and energy transitions. I will outline current frameworks for understanding just transitions, energy justice and climate policy equity as related but distinct principles for equitable decarbonization. I will discuss how each can be applied to Kern County, and investigate which nuances fail to be captured by the frameworks and which aspects of the frameworks are particularly illuminating in practice. The climate policy equity framework shows particular promise in its nuanced incorporation of environmental justice, economic equity, and accountability concerns. All of the frameworks, however, would benefit from greater incorporation of non-employment-related economic considerations, such as examining local government revenue streams.

The fifth and final chapter demonstrates the relevance of this research beyond planning for Kern County. In addition to making recommendations for California policy, I will provide a brief survey of additional locations in the United States and even globally that could benefit from similar analysis and potentially be further examples of just energy transitions. Ultimately, I will conclude on a note of the importance of social environmental work and the role of hope in such work.

## Chapter 1: The renewable energy – oil landscape

Examining Kern County as a case study for the economic, social and political intersection of oil and renewable energy requires an interdisciplinary systems approach. This chapter reviews and integrates the relevant literature from resource economics to rural sociology to recent news media coverage. The review will provide context for the themes emerging from the interviews with Kern County stakeholders and provide support for the policy recommendations made in the final chapter of this thesis. I will start with an examination of local resource economics and the consequences of single-resource dependency. Next, I will examine the impetus for renewable energy growth in the US and in California, discussing the relationship between renewables, climate change, political ideology, and public opinion. Finally, I will provide context for resource dependency and the rise of renewables in Kern County.

### Local resource economics and comparisons from Coal Country

The most relevant concept to this thesis from the literature on extractive economies is the idea of “Dutch disease,” or the resource curse. These terms refer to the fact that many historically resource-rich countries haven’t benefited from these resources as much as expected; indeed, many such countries have empirically had higher rates of conflict, lower economic stability, and more time spent under authoritarian regimes (Natural Resource Governance Institute, 2015). Such countries are often said to have grown too dependent on a singular industry. However, while the resource curse is well studied at the national scale and particularly in emerging economies, fewer studies have questioned the long-term economic impact of resources in a local setting such as the county level.

Haggerty, Gude, Delorey and Rasker (2014) took on this issue in their statistical analysis of oil producing localities in the American West from 1980-2011. In this period, the researchers

found that counties with above average per capita income from oil and gas had decreased overall per capita income. Essentially, when the ratio of oil income to population in a county is higher, the overall county level wealth is lower. In counties where this oil and gas boom lasted for more than 10 years, the decreased overall per capita income was as much as \$7000 a year. In other words, the negative impacts of oil production on overall per capita county income become more substantial with time.

Haggerty *et al* (2014) also found that college education rates decreased by an average of 2.5 percent in county populations with strong oil industry presence. The hypothesis for the education effect is that specialization in an industry in which many jobs offer relatively low education requirements does not incentivize acquiring a college education (Haggerty *et al*, 2014). The researchers also observed that such communities often welcomed the immediate employment benefits of oil and gas development with limited public political discussion on long-term tradeoffs potentially associated with this economic shift. While in the short term non-college graduates can make comfortable incomes in oil and gas, these workers have a more difficult time finding work amid oil industry layoffs. And on the other side of the same coin, many of the highest paying jobs in the oil sector belong to engineers that were raised and educated elsewhere, only moving into an area for work (Haggerty *et al*, 2014). While these engineers certainly boost the local economy through their purchasing power, this nuance detracts from the narrative of oil employment offering extreme socio-economic mobility to rural-born residents.

In another prominent study of oil boomtowns of the American West, Tsvetkova and Partridge (2016) found that while the economic co-benefits of a growing oil industry are substantial for the first six years, decline tends to occur around the 10-year horizon. Like Haggerty *et al* (2014), these researchers were curious if the resource curse theory applied locally. However,

the focus is narrower: on industry-industry tradeoffs in communities rather than employment. Proponents of the oil industry will often site the multiplier effect of drilling operations—that is, that new oil wells stimulate employment in directly-related sectors such as construction, transportation and warehousing, as well as indirect sectors such as food services and hospitality supported by the influx of oil workers. They concluded that such spinoff benefits were only statistically significant during the first six years of the oil operation, and that a negative correlation (or tradeoff) is seen between the traded goods sector and oil booms (Tsvetkova and Partridge, 2016).

While oil is still booming in many places, the majority of coal-centered communities in the United States have already experienced the bust aspect of the resource curse. The raging political discourse over the loss of coalmining jobs in the 2016 presidential election has underscored the importance that such topics hold in American culture. Potential parallels between the boom and bust of local coal and oil sectors in the United States are readily available, going beyond political rhetoric and into the more-studied academic topics such as causes of industry decline and nature of employment. The factors leading to the decline of the coal industry have been commonly accepted as 1) price competition from other fuel sources, 2) increasingly strict environmental regulations, 3) slow growth in overall demand and 4) depletion of easily-accessible resources (Louie and Pearce, 2016). Indeed, each of these has interesting parallel implications when considering the future of the oil industry.

First, when it comes to competition, the coal industry struggled to keep up with the steeply ramping production of cheap natural gas in the United States made possible by hydraulic fracturing, as well as – but to a lesser extent – the rise of solar and wind energy (Magill, 2017). Although petroleum can also be used in the production of asphalt or plastics, more than 70 percent

of oil consumed in the United States is by transportation vehicles (Ori, 2016). As such, oil's competitors are alternative transportation fuels and electric vehicles (EVs). Currently EVs pose the greatest threat, with US car sales that increased by 60 percent in 2016. Admittedly, the number of EVs remains small in contrast to the total percentage of vehicles on the roads-- yet even oil companies are rapidly beginning to take notice. Indeed, the Organization of Petroleum Exporting Countries (OPEC) raised its global EV road count estimate from 46 million in 2016 to 266 million in 2017—a rapid change in outlook over just one year (Shankleman, 2017). Thus, while the oil industry doesn't currently face substantial competition, it likely will have greater competition from the EV market in the medium to long-term future. Because locally produced oil in the United States also tends to be consumed locally thanks to a strong desire energy independence, the competition from EVs will likely have a larger impact on oil communities such as Kern County given California's strong incentives for electric vehicles.

Second, in addition to competition, environmental regulations in both the coal and oil industry have had effects on production cost. Further, both industries have been vocal about the impact they believe stricter rules can have on their bottom line, from coal's opposition to Obama's Clean Power Plan to oil's opposition to Corporate Average Fuel Economy (CAFE) standards. Although political fluctuations can cause regulations to be inconsistent, there is reason to believe that the general trend is toward increasing environmental regulation (Meyer, 2017). Further, even if regulation at the federal level is stalled, many states such as California are moving toward greater environmental protections. That being said, it is important to recognize that in both cases the blame assigned to regulations such as cap and trade, renewable portfolio standards, and renewable fuel standards may be higher than deserved. Automation and competition from natural gas are well-accepted as the largest contributors to the decline of coal, and even in highly regulated states like

California environmental regulations on oil production are only about 1.33 percent of total production costs (Jones *et al*, 2017).

Third, even in the absence of competition and direct regulations, coal suffered because overall electricity demand in the US did not grow as predicted but instead was stabilized by increasingly efficient usage. While many industry analysts are wise to be skeptical of “peak oil” production—a phenomenon long predicted that never came to fruition—the conversation has recently transitioned among experts to the subject of peak oil demand. Indeed, researchers at Stanford and the University of California – Santa Cruz have predicted peak oil demand to occur globally in the early 2030s, with the most substantial decline in demand occurring in Europe and then North America (Brandt *et al*, 2013). Everything from EVs to increasingly efficient engines to climate awareness spurring public transportation and carpooling could help drive down demand to this extent (Shankleman and Warren, 2017).

Fourth, coal declined as the richest seams became depleted and extraction from less concentrated seams became even further outpriced by alternatives. Again, this is another factor where California oil fields are ahead of the curve so to speak. Because many of the oil patches have been active for around 100 years, they have already produced much more of the easily accessible oil compared with newer fields in Texas and other parts of the country. Brandt delved into the California case study from an energy engineering standpoint. The findings suggested that in ~300 aging wells in California over the last 50 years, energy intensity requirements to extract the oil increased significantly (Brandt, 2011).

In addition to these economic insights, the coal literature is also rich in perspective with regard to the intersection of resource development and identity. Qualitative research has uncovered that mono-industry and extractive mono-industries in particular form a strong sense of identity,

which lends to political poignancy of related issues (Carley *et al*, 2017). Given that coal mining jobs have been cut in number by over 70 percent since 1985, the coal miner identity has been caught in a crisis (Carley *et al*, 2017). Further exacerbating the employment impact of coal's decline, the main cost-efficiency solution practiced by the coal industry has been mechanization (Lobao *et al*, 2016). While this has helped the coal companies' bottom lines, it has devastated mining communities. Likewise, oil companies have increasingly turned to mechanization as a solution for difficult-to-drill wells; an automated well requires five workers to operate, compared to the 20 workers per well previously needed (Wethe, 2017). As the oil decline deepens or as jobs are cut by mechanization in order to soften the blow to the overall oil industry, the oil driller identity could become another cultural and political flashpoint.

### The growth in renewable energy

Simply put: the energy system is central to any discussion of climate change mitigation, with transportation as a close second. Globally, electricity accounts for 25 percent of greenhouse gas emission; transportation accounting for another 14 percent. At the national level, electricity and transportation are neck and neck with 28 percent of US emissions each (Environmental Protection Agency). Thanks to progressive policies targeting electricity generation in California, transportation actually accounts for 39 percent of emissions, and electricity only 19 percent (Air Resources Board).

Renewable energy is on the rise in California, certainly, but also across the country. Renewable energy capacity in the United States more than doubled from 2000-2015, approaching 200,000 MW in 2015 or approximately 18 percent of the US energy portfolio (DOE, 2016). Renewable energy's growth is especially obvious when looking at only the new electricity being added to the grid—it was a full 67 percent of added generating capacity in 2016 (DOE, 2017a). In

California, 30 percent of electricity consumed in 2016 was from renewables, and installed capacity takes up an even greater portion (California Energy Commission, 2017a). The picture is clear: renewable energy is on the rise. As seen in Figure 1, solar in particular has come to dominate in the golden state.

### **Figure 1: Photovoltaic solar resources in California**

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#### California Solar Quick Facts

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- National Ranking: 1st
  - State Homes Powered by Solar: 5,441,189
  - Percentage of State's Electricity from Solar: 15.56%
  - Solar Companies in State: 2545 (450 manufacturers, 1231 installers/developers, 827 others)
  - Total Solar Investment in State: \$42,677.68 million
  - Prices have fallen 55% in the last five years
  - Growth Projection: 13,402 MW over the next 5 years (ranks 1<sup>st</sup>)
- 

(Source: Solar Energy Industries Association)

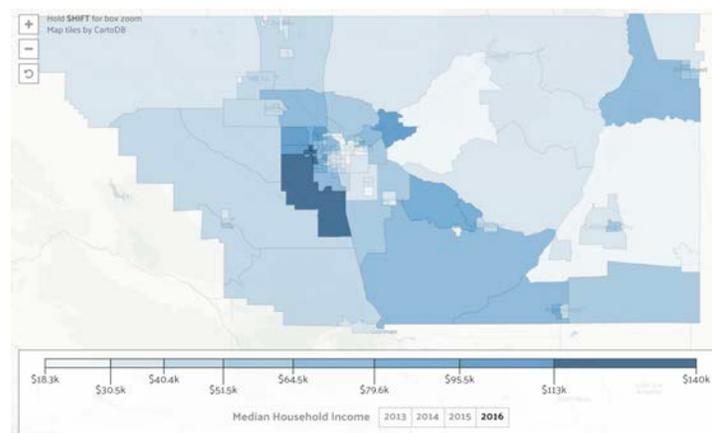
This growth in renewable capacity has corresponded with increasing public support of renewable energy development. Survey after survey demonstrates that at a base level, renewable energy and even renewable energy incentives enjoy bipartisan public approval where more direct climate change policies often do not. A poll by the conservative Public Opinion Services organization in November of 2016 indicated that 61 percent of Trump voters wanted to see more government emphasis on solar energy, compared with 52 percent for both natural gas and wind energy, and only 38 percent for coal (POS, 2016). According to Gallup, 51 percent of Republicans expressed a desire to emphasize renewable energy over oil and gas in 2016, making it the first time in their polling that a majority of Republicans expressed such a sentiment (Auter, 2016). In California, the numbers are even higher: 82 percent of adults statewide support funding renewable energy research, compared with 79 percent of adults in Kern County (Marlon *et al*, 2016).

Part of the reason for this support may be that beyond renewable energy's low carbon footprint, it provides employment in the same way that the fossil fuel industry does. In fact, with 375,000 people working in solar at least part time, there are now more jobs in the US solar industry than there are in the oil and gas industries combined (DOE, 2017b). This is especially true in California, where solar jobs reached 100,000 at a record pace and employ more people than iconic Silicon Valley corporations such as Apple, Google, Facebook and Amazon combined (Roth, 2017).

### Kern County, California

Kern is a county of 880,000 people about an hour north of Los Angeles in the San Joaquin Valley, with Bakersfield as the main population center surrounded by ten smaller cities (US Census, 2017). In many ways, Kern County's demographic profile stands out from the rest of California's. The average income is \$51,000 compared to \$64,000 statewide; 15 percent of adults hold a college degree compared to 33 percent statewide; 23 percent of the population lives below the poverty line compared to 15 percent statewide (US Census, 2017). Notably, wealth is concentrated near the urban center of Bakersfield, whereas median incomes in the more rural outer parts of the county tend to drop.

**Figure 2: Wealth of Kern County households**



(Source: US Census Bureau)

Some of these disadvantages tie directly into energy. For example, 48 percent of households in the San Joaquin Valley experience what is known as a home energy affordability gap, compared to 36 percent statewide. The home energy affordability gap reflects the difference between what a household actually pays for electricity versus the 6 percent of monthly income that is viewed as the standard for what household *should* pay for electricity (Jones *et al*, 2017).

And of course, Kern County is an island of conservative red in California's sea of liberal blue, having voted for the republican candidate in every presidential election since Lyndon Johnson's in 1964. Donald Trump won 53 percent of the presidential vote in 2016, with Hillary Clinton receiving 40 percent and independent candidates Gary Johnson and Jill Stein picking up a few percentage points each. The residents also stand behind their Republican district representatives, including House Majority Leader Kevin McCarthy, who won reelection in 2016 with just under 70 percent of the popular vote (Kern County Elections Department, 2016).

Economically, the county revolves around agriculture and energy production, as it has for more than a century. If the county were a state, it would be the fourth largest oil-producing state in the country, falling just behind Alaska (KEDC, n.d.). This amounts to 5 percent of total United States oil production and approximately 70 percent of oil production in California (Michieka and Gearhart, 2015). It's notable that while in many parts of the country oil and gas are produced side by side, or with natural gas production beginning to overtake oil, this is not the case in Kern. The county produces only 16 percent of California's natural gas. Nevertheless, this doesn't affect the employment power of oil. Roughly 7 percent of the county's workforce is employed directly by the oil industry, meaning that overall employment rates in the county are sensitive to the industry (Michieka, 2017). In addition to employment benefits, property tax revenue from oil makes up 30 percent of total tax revenue in the county in an average year (Duke Energy Initiative, 2015).

Additional economic boons include spinoff infrastructure investment and employment in support industries, although these benefits are less well quantified. Perhaps the easiest way to understand Kern County’s oil dominance in California is visually; in all three of the graphs in Figure 3, Kern stands out as the sole county in the dark blue for greatest production/direct economic benefit.

**Figure 3: California oil revenue, production, and employment**

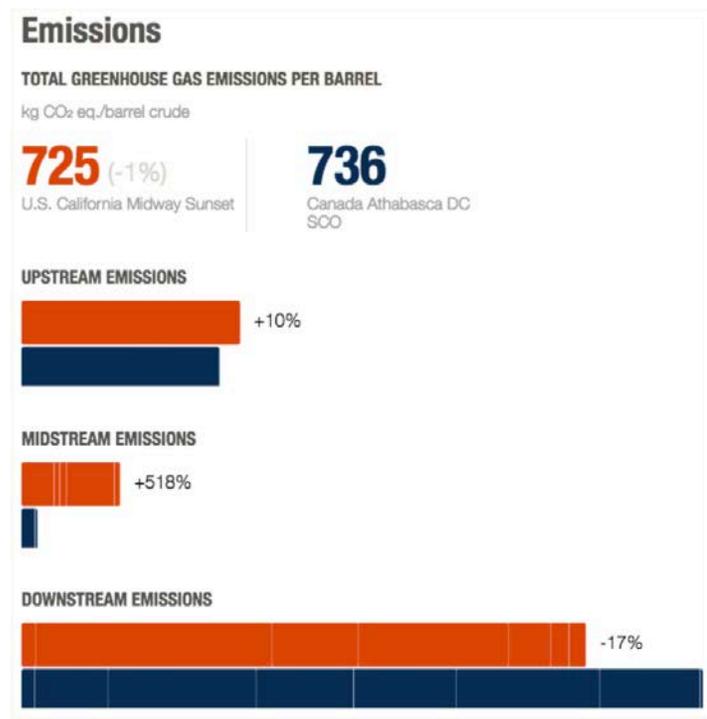


(Source: Bureau of Land Management)

And yet, oil in Kern County has shown instability over multiple periods and has been suffering from a more prolonged downturn. For instance, while the county produced 5 percent of oil produced in the United States during 2015, it had produced a full 10 percent just a year prior (KEDC, 2016). Drops in the global oil price cause less petroleum to be produced in Kern, causing massive layoffs. This unemployment has also led to an observable trend in so-called “domestic migration outflow.” Since 2014, more than 6,000 residents—former oil workers and their dependents—have moved out of the county in order to find work (Mayer, 2017). The price downturns also cause the property tax contributions of the industry to decrease. In 2015, Kern County Supervisors declared a state of emergency when declining oil revenue caused a budgetary shortfall of \$61 million (Hsu, 2015).

While this in itself would be concerning, the reason why Kern County makes a good case study is because the fields there are some of the oldest active sites in the world. A study by Stanford's Adam Brandt has demonstrated that the ecological impacts of oil production increase with time as wells become depleted and more energy is required to extract the resource (Masnadi and Brandt, 2017). For comparison, Figure 4 evaluates oil production in Kern County's well-known Midway-Sunset oil field against the infamous and oft-opposed Alberta tar sands (Mernit, 2017).

**Figure 4: Production-associated emissions of Kern crude oil, Alberta tar sands**



(Source: Carnegie Endowment for International Peace)

Side by side with the oil tradition, there is also an increasingly strong renewable energy sector in both wind and solar electricity generation. With 38 percent of its total generative capacity in wind energy, the Bakersfield area is the highest-ranking metropolitan area in the country when

it comes to renewable capacity (Brookings, 2015). The Alta Wind project is the largest wind farm in the country, and these projects have brought jobs in construction and maintenance: 4,500 in construction and over 1000 permanent jobs with upwards of \$15 billion in private investment (KEDC, n.d.). In total, the county supplies 54 percent of California's wind energy. Although the economic and energy contribution from wind is clearly significant, this paper focuses the majority of its efforts on oil and solar. That's because wind energy development and employment has somewhat plateaued; oil and solar, meanwhile, are two industries remaining in greater flux. Because I am examining the potential for transitions in decarbonization, it is the industries that are still changing that hold the most potential.

Indeed, solar has taken over the Kern County landscape both figuratively and literally. Solar development has drawn over \$28 billion in private investments, with private organizations like Google and Stanford University working with solar companies to build generating farms in the desert-dominated eastern part of Kern (California Energy Commission, 2017b). There is also a thriving rooftop solar industry with over 24,000 distributed generation systems, making three zip codes in Kern County in the top-five for solar saturation in the state (California Energy Commission, 2017b). This development has been accompanied by significant job growth, but notably, not a large contribution of revenue to county government thanks to solar energy's longstanding property tax exemption, which has been extended at least until the end of 2025 by the state legislature (Colthorpe, 2014).

The oil and solar industries of Kern have interesting interactions with one another, as well as with the agricultural industry in the area. Over the past few years, solar technology has increasingly been deployed in oil fields in the extractive process. In fact, one new project by oil field operator Aera Energy and solar power company GlassPoint will create a 26.5 MW panel

array and 850 MW of thermal solar collectors, which would make it the largest solar farm in the state (Merchant, 2017). Aera Energy says the goal is to extract oil more affordably, but also that the solar will make their production operations more environmentally friendly by cutting emissions associated with oil production by up to 80 percent (Mernit, 2017). Solar has likewise been implemented in the regional agricultural industry: panels on resting farmland can be used to operate processing equipment or to pump groundwater independently from utilities. The latter became especially popular given increasing water prices during California's record-breaking drought. This practice has complicated environmental implications—on the one hand, clean energy is preferable, on the other, higher water prices from utilities are intended to incentivize a reduction in water use during drought conditions. Finally, agriculture and oil have long been tied together. The agriculture industry is dependent on oil for everything from running field machinery to manufacturing fertilizer, meaning that changes in oil price can affect food prices and thus employment in the agricultural industry (Michieka and Gearhart, 2015).

Lastly, a primer to Kern County and its energy operations would be incomplete without mention of air quality and climate change. In 2016, Bakersfield ranked in as the worst city in the country for short-term and year-round particulate pollution, and the second worst for ozone (American Lung Association, 2016). Healthcare-wise, this is projected to cost the region \$3 billion a year, or about \$1000 per capita annually (Brajer and Lurmann, 2006). The relative magnitude of the causes is difficult to discern, but these conditions are due to both the geographic disadvantage of poor air circulation in an inland valley as well as local pollutants such as oil and dairy operations. While many residents blame local pollution levels on areas in other parts of the state, the San Joaquin Valley Air Pollution Control District (*n.d.*) reports that only 7 percent of pollutants in Kern County are transported from other locations—the rest is locally produced.

Climate change has also become increasingly apparent in the region. Early-season and particularly destructive wildfires in the summer of 2016 destroyed upwards of 80 homes and forced thousands of evacuations. A combination of heat, bark beetles and drought has been deadly to forests across California, but counties in the southern part of the Sierra Nevada such as Kern have been especially hard hit with upwards of 35 dead trees per acre in many places (Stephen and Knoll, 2016). And yet, only 51 percent of adults in Kern County believe that global warming is mostly caused by humans and only 43 percent believe global warming will harm them personally; both numbers are lower than the state figures of 59 percent and 47 percent respectively (Marlon *et al*, 2016).

All of this background and all of these statistics are to communicate one point: for those interested in social transitions to a low-carbon, climate-adapted future, Kern County is a critical case study. The county is at the intersection of high environmental and economic vulnerability, fossil fuel and renewable energy economics, and political inertia toward climate action. As one interviewee you'll meet shortly told me: "Kern's got it all."

## Chapter 2: The perspective from Kern

If you drive far enough south down the I-5 freeway from San Francisco, at some point you will blink to refresh your eyes in the blurry dullness of the drive, and when your vision returns just a moment later, you will find that a sepia lens has taken over. It colors the ground; it's in the air. It feels like an iPhone filter applied to the world. When you exit the highway and enter Kern County, however, you no longer pay attention to the color of the air. Before my first interview of the summer, I asked a man at a coffee shop if there had been a fire nearby. He shook his head, telling me, "this is just life here."

The motivation for this thesis is to break the sepia-colored outsider filter, to understand life in Kern County and recognize the ways in which it fits into the greater decarbonization process in California. Because the goal is to create an understanding of how the numbers and statistics of progressive energy policy in California mesh with the daily lives of individuals in energy communities, the independent analysis of this thesis begins here, with the people. I apply an interdisciplinary lens to this research, drawing from methods of sociology and anthropology in order to identify pervasive cultural attitudes toward and perceptions of oil and solar in Kern County.

### Methods

Beginning with my coffeeshop meeting that day, I have conducted analysis of 20 in-depth interviews from various energy stakeholders in Kern County, California. Interviewees were recruited via a mix of cold calls/emails and snowball recruiting from successful connections to find subsequent interviewees throughout the course of the summer of 2017. Thanks to generous funding from the Volpert Scholars program, all interviews were able to be conducted in person and in-situ in Kern County.

In this case, stakeholders are defined as parties involved in and with an active interest in a company/industry. This interpretation is founded in Ian Mitroff's stakeholder theory, which extends stakeholders from just being those owning stock in a company to employees, customers, suppliers, financiers, community members, governmental bodies, political organizations, trade groups, labor unions and more (Bourne, 2006). For the purposes of the research, it was desirable to find interviewees with experience in solar, oil, environmental or governmental work, as well as to examine some interviewees with experience in two or more of the basic experience categories. That being said, two interviewees were more lay community members, which served to provide insight as to the cultural reach of the industry.

Interviewee recruitment also focused on acquiring a geologically diverse sample, including representation from the city proper in Bakersfield, the smaller Latino-majority city of Arvin, rural areas in the eastern part of the county, and informally recognized tribal areas. The majority of interviewees were native to the area or had lived there for much of their lives; however, a few interviewees were younger "transplants" that had moved into the area in order to work in the energy industry. Additionally, two interviewees had left the area to find new work and spoke about their experiences of the community more retrospectively.

Due to the connections-based nature of snowball recruiting, in which new interviewees are found based on referrals from previous interviewees, participants can often fall prey to recommending people in their social circle that might have similar experiences. For instance, an engineer at a large oil or solar company might only recommend other engineers at that same company—not lending insight into other company cultures or non-engineering roles within an organization. Effort was made to correct for this via additional cold-contacting to find representation of multiple perspectives from each industry: large company vs. small company,

sales v. engineering v. construction. In the oil industry, both production companies and oil field service companies were represented. In the solar industry, both utility scale and residential/commercial scale companies were represented.

### Themes

Interviews were conducted with the intention to gain a sense of the interviewee's perceptions of 1) the relative impacts of the solar and oil industry in their daily lives, 2) the future of both industries in Kern County, and 3) the past and potential influence of government and policy with regard to issues one and two. In addition, follow-up questions were often used to understand how each interviewee saw their personal and professional background influencing their perceptions of the energy industry. Because of the diverse array of perspectives and backgrounds, the interviews were only semi-structured, with a set list of initial questions, but flexibility in emphasis and additional topics as specifically relevant with each interviewee.

While the expectation might have been that different stakeholders perceived the energy industry in wholly different ways, the reality was more nuanced and interesting—that stakeholders hold remarkably similar views in many respects while only diverging on a few key details. After analyzing the interview transcripts, clear themes emerged in the stakeholders' perspectives on 1) the normalcy of boom and bust cycles, 2) solar as an economic growth area, 3) cultural resentment in energy policy, 4) complicated environmental realities, and 5) inclusivity/equity issues in the county.

The narrative lines flow fairly smoothly from these themes: people have long become accustomed to the ups and downs of the oil industry, so only a select few in governmental and environmental positions worry that the underlying causes may not go away, causing a more permanent economic problem. Many of the same mentalities that drive the support for the oil

industry can also drive support for the solar industry, namely a pride in being able to utilize local resources and employ locals in quality jobs. For these reasons, solar growth is well-supported and viewed as a complement to oil rather than as a replacement. As an extension, criticisms of oil are met strongly by almost everyone, including many working in the solar industry. There is a presumption that these criticisms come from a place of coastal-liberal cultural arrogance, a presumption so strong that local environmentalists are forced to carefully tailor the way they present themselves in order to be effective. Coexisting with these notions, there is not much denial that the environmental realities of the county are harsh. The air is well-accepted as poor quality. The differences in perspective on this theme emerge around who to blame for the poor air quality and resulting health hazards – and those that suffer the biggest brunt of the impact often seem more inclined to recognize its local causes.

1. The normalcy of boom and bust cycles

It quickly became apparent from contract workers and reservoir engineers in major oil fields to county government and environmental activists, a cyclical pattern of small-scale boom and bust has been accepted as a way of life in Kern County. Virtually every interviewee described the same pattern. Oil price goes up, more well drilling is planned, more people are employed, and more economic co-benefits are enjoyed by the county. The county begins to rely on employment and economic co-benefits – private investment, retail stimulus, and tax revenue – from the oil industry. Oil price goes down, fewer new wells are drilled, more contract workers and then salaried employees are laid off, and the county scrambles to operate normally without the often relied-upon co-benefits of a strong oil industry. Everyone in town knows how oil is doing during any given period. “Oil price drives a sort of circadian rhythm throughout the entire town,” said one

interviewee, a former reservoir engineer at a major oil company in the area who has since relocated to work for a Bay Area environmental organization.

However, while the cyclical nature of the oil industry is well-accepted among all stakeholders, it is unsurprisingly those without direct ties to the industry, such as environmentalists or government officials, who feel that the downturns may become more permanent. These interviewees often drew upon the language of Dutch disease and Western boom and bust. In one representative quote from an employee in the county property tax assessment office:

“People get drawn into thinking that the budgetary problems are all about oil price, but reserves are another important component and the fact is that reserves are decreasing. It’s the story of extractive industries in the West. The problems in the oil industry are only going to grow larger, regardless of what regulations are in place or anything else.”

Another interviewee, who occupies a leadership role in the government-contracted workers’ development program in Kern County, shared that the last round of layoffs was especially deep, and that more and more the trend is toward pessimism. He said:

“People thought [oil] jobs might come back when [the] barrel price went back up, but [the] barrel price didn’t go back up for a long time. Some people will go back into oil — people resist training in new things and sometimes you can manage to find another job in oil with a different company or whatever — but most know the layoffs will come again.”

These interviewees nevertheless recognized the prevalence and strong history of oil as they expressed their doubts for its future. As one retiree who now works for a mainstream but local environmental organization put it, “Sure, oil’s been around and the infrastructure and the culture are established, but it’s simply not possible for the next 100 years to be the same as the last 100.”

By contrast, the industry workers – notably, both in oil and solar – tended to express optimism for the future of oil. Many of these beliefs were directly tied to the interviewees’ personal experiences of the cyclical nature of oil as well as an expression of faith in the resilience of “oil people” rather than more large-scale structural observations. Rather than worrying about the

downward part of the cyclical pattern, these interviewees looked toward the hopes for oil's returning high points. As a senior reservoir engineer with over 30 years of experience in a large Bakersfield oil company put it:

“Everyone understands they're paid well but it comes with the risk of being shown the door at any moment. That's what's unique about America, people are willing to take that chance for the new American dream. Oil people are educated, it's not like coal where people didn't know the risks.”

The senior engineer also admitted that he didn't feel safe from the “Russian roulette” of the layoffs until his kids got through college. The interviewee who works in a major solar installation contracts company, meanwhile, took a complementary but more broad-sweeping experiential perspective:

“I think the wave will keep going and that people know how to ride it out. Sure, the perfect world is \$78 a barrel, but sometimes it'll be \$40 and sometimes it'll be \$100 and people will practically have too much work. But that's been the history, that's been my history living in this town all my life. Bakersfield people are built for it.”

## 2. Solar as an economic growth area

As the solar installation manager also strongly suggested, for the majority of people in Kern County, solar and other forms of renewable energy are seen as a positive and promising growth area, but not as any sort of replacement for the oil industry. To begin with the cultural aspect, perhaps no interviewee was more adamant on this topic than a salesman at a prominent residential solar company in the Bakersfield area who had worked both in construction in oil fields out of college and later in a desk job for the same oil company. When asked about his reasons for switching industries, he quickly insisted that there was no “psychological angle” and went on to extrapolate to the community at large:

“Bakersfield industries are like one big family, there's no war between oil and renewables. I just got off a call selling panels to a Chevron engineer. People like what makes sense here, and [oil and solar] both make good business sense.”

Another interviewee – notably one discovered in a list of community testimonials on the website of “Kern Citizens for Energy” – spoke of how impactful the oil industry has been in her social services-related nonprofit work.

“We have one strong solar partner, but frankly, in general the solar commitment to the community feels less strong. Where are the builders? I don’t see them at Chamber [of Commerce] events or on our charity boards, you know? Oil has this corporate worldwide structure that puts a lot into human resources and human capital and leadership and I just don’t see that happening in solar companies yet.”

Other interviewees recounted when they met their first solar representative or wind turbine repair person in the past few years, a stark comparison to stories of childhood with parents or other family members that were long-employed by the oil industry. These anecdotes and more shared by the interviewees supported observations that are easily made in visiting Kern County or even doing a short web search on the area, from the “Oil Queen” pageant to the high school’s “Drillers” mascot.

All of this is not to say, however, that solar is not quickly gaining recognition for the additional economic boon the low-carbon energy has brought to the region. Indeed, even the interviewee from the oil royalty owners’ association described solar as “a great way to help conserve our most valuable and versatile resource, oil.” The existence of this complimentary existence was confirmed by many of the other interviewees, such as the solar installer with oil experience and the non-profit leader respectively:

“I can’t see solar going anywhere. But I also still think oil will bounce back. I mean, really, I think oil is like solar. We need oil, we need solar. Nothing can change that.”

“There’s no monsters on either side here, and I feel like that’s not something everyone gets. Oil and solar both just serve an important role in the community. I’m not worried about either of them.”

Contrary to the idea of a transition from one energy source to another, residents tend to perceive the industries as complementary—or at least not in competition. Indeed, given news coverage of

the solar-powered enhanced oil recovery pilots in Kern County and given the strong history and loyalty to oil, this isn't particularly surprising.

And yet some of this growth in solar energy does still resemble de-carbonization transition narratives. For instance, three solar installation companies gave independent (though informal) estimates that approximately half of their installers had previous work experience in the oil patch. These jobs in solar, meanwhile, are generally perceived as more stable. As the interviewee from the contracting company asserted:

“The sun isn't going to go away, and neither is the need for labor. A 65-pound glass sheet is going to stay about that same weight and size, so we're always going to need more workers, especially as housing continues to go up around the county. Installation is where the jobs are. And there's not really a good way to automate carrying a giant sheet of glass up a ladder to any variety of roof type. You can't be more efficient than is safe or effective when it comes to installation.”

Because of these stable qualities, the interviewee also argued that solar has thrived and provided jobs in many times of struggle, both when the oil industry has layoffs but also during general recessions or periods where public works contracts in other areas of manual labor are rarer. This sentiment surrounding the stability of solar work was also typified by an interviewee that works for the community college system's clean energy training program:

“Demographic-wise, we've got the whole age range. That's because everyone is just looking for a stable job, and our in-and-out, quick style of vocational training in solar installation and maintenance has proven to be much more successful in helping them find reliable employment.”

And finally, employees with experience in both industries – especially those employees in more traditionally “blue collar” work – have reasons to prefer working in solar. From an interviewee:

“All things equal with pay and job security, I'd pick solar for sure. It's been nice not having to clean up every day after coming home covered in thick, tarry oil and needing to find an industrial laundromat, or not having to worry about something catching fire or exploding or falling on my head.”

The previous quote is particularly interesting in its recognition of the fact that pay and job security are often not equal in oil and solar, since solar is not vulnerable to an international commodity price and depleting reserves. That being said, it should be noted that the interviews for this thesis were completed in the summer of 2017, prior to the Trump administration tariff on solar panels implemented in January 2018. These tariffs – which experts predict will cause extensive job loss in the US solar installation business – pose an unprecedented threat. The potential for instability in the solar industry due to such political unpredictability will be addressed in a further chapter.

Meanwhile, the clearest theme throughout all interviews is that solar has succeeded in Kern County at all scales and in all dimensions – from residential to utility, from workers to private investment – because it is an economically incentivized choice. As the head of a large solar company in the area told me, “The solar industry is about the environment for a very few folks. Mostly it’s just about the bigger paycheck or the smaller energy bill.” As the interviewee indicated, solar has grown so rapidly because these economic motivations exist for all stakeholders in the solar process, from employees to consumers to the county at large.

Beginning with the employees, solar jobs are often similar to oil jobs in that they are relatively high paying with relatively low formal training required. Take, for example, another quote from the solar installer who had transitioned from a welding job in the oil patch:

“I didn’t finish high school, but I’m making the same or more than so many of my classmates. Before I got the job, solar never crossed my mind. I really didn’t know anything about it.”

The interviewee also explained that his previous skills like welding and basic construction technique transferred easily to solar installation work. This was echoed by one of the interviewees who worked in the sales side of the solar industry. This second solar employee also expressed his belief in the financial benefits of working in the new industry:

“I’ve always been in channel management and in disruptive industries, and that’s how I see my role now. When I was looking at solar and seeing how the projected growth would upset the utility industry, I was immediately interested. We change the way the world is powered, and to me that is exciting. It’s exciting change and it’s reliable income.”

For consumers, interviewee after interviewee cited statistics about how quickly solar pays off in the ever-sunny, tax-friendly region. Although the exact numbers differed, I heard over and over again how solar panels can double a house’s value while not increasing property tax bills, or how a farmer that buys solar can save millions of dollars per field over the panels’ lifetime. This isn’t to say that there aren’t some barriers for consumers; as one environmental justice advocate told me, “cost is almost never an actual barrier out here thanks to all of the financing options and our location, but the education about these options isn’t always there.” Overall, however, consumers are increasingly aware of the potential benefits of switching to solar.

Likewise, county government is aware of the benefits that increased investment can bring.

As the interviewee from the solar contracting company explained:

“Kern County is very forthcoming with development. The county knows we are in a prime location for solar and it wants to capitalize on that. From its experience in oil, the county knows that permitting delays are where projects can go down the drain, and it works to avoid that with renewables. That’s one of the reasons we’re so far ahead, we recognize what we’ve got.”

Although interviewees commonly expressed that oil provided more local stimulus in terms of support industries such as retail and restaurants near oil patches, they also recognized that renewable development provides general economic stimulus of its own from road construction to direct investment in the community by larger utility-scale companies or the private companies that commission such plants to bolster their own sustainability profiles.

As for environmental motives for the solar industry? There are some individuals that support solar because it is a clean industry—certainly the environmental groups, environmental justice advocates, and the solar entrepreneur who also described himself as “the lone socialist in

Kern County.” But even those that appreciate the low carbon footprint of solar and other renewable energies don’t see that as a primary reason for its success or want to be seen as “pushy” about these benefits. The solar entrepreneur, for example, said that his promotions like buy-solar-get-a-free-gun are more successful than his publicity materials around sustainability. The interviewee who works in the community college’s training program also had a representative perspective on the issue:

“I mean, I do ask myself, what is the harm of improving renewable literacy? It makes sense to at least tell our students about the low greenhouse gases and all that. So I think that’s our philosophy, that but also never to proselytize.”

### 3. Cultural resentment in energy policy

The fear of a sort of cultural, environment proselytization was another clear theme that emerged throughout the interviews. In particular, this manifested in a sort of resentment toward more liberal, coastal cities such as Los Angeles and San Francisco, as well as resentment toward politicians in Sacramento. One anecdote, in fact, was independently brought up by five different interviewees: when the city of San Francisco voted to not allow oil extraction on city-owned land. The November 2016 vote was in response to increased awareness of the approximately \$800,000 in revenue San Francisco had been making each year off of an 800-acre plot in the middle of a Chevron field that had been willed to the city in the early 1940s. San Francisco city council instead made plans to put solar on the land. Only as Kern County residents were quick to argue, the land was not flat enough for solar and the oil infrastructure was already developed. Just to properly shut down the wells would be expensive and energy intensive. As an interviewee who works as a local journalist declared, “what’s happening there in San Francisco is a mentality dominated by emotion, not logic or facts.”

Many of the interviewees used identifiable us-them language with regard to energy users versus producers in California. The interviewee from the community college's renewable program, for example, admitted that the distribution of energy and environmental work within the state can feel unequal:

“I think sometimes people here feel like we've done our part to build renewables and cut carbon at our oil facilities and all that. Like what have they really done?”

On the harsher end of the spectrum, the stakeholder from the oil royalty holders' association described the oil business as being immensely personal. For him, the cultural barrier seemed to have a strong basis in the perception of class-based divide:

“They say grow local buy local eat local, well I say produce local, refine local, use local. Eighty percent of my family's oil has gone to producing asphalt. So when the people from Los Angeles or San Francisco drive through here, that's what their Priuses and Teslas are driving on. Do they want to shut down that oil production, too?”

This stakeholder's insinuation that liberal opposition to oil lacks a fully informed approach to the issue was a sentiment expressed over and over again. As the interviewee from the social work nonprofit shared:

“This stuff can't be conveyed in 500 words. The more people know, the more complex they will realize oil production is. I think people need to put the time into trying to learn more about it. We [in Kern] all see the good that oil has done every day, and you know, that doesn't feel like something my niece who goes to Berkeley considers.”

The stakeholder also explained that while the Kern division of her organization has happily solicited and accepted donations from oil companies and prominent individuals from the oil industry, divisions in other counties have been reluctant to do the same. “I suggest oil money to someone from LA or Santa Barbara at a conference and it's like the crossed fingers go up to block out the devil,” she said.

The interviews with local folks in the environmental space revealed that political and cultural perceptions are factors they consider heavily in both their personal and professional lives.

From the interviewee in the environmental nonprofit:

“I try to appear moderate. I mean, I take these strong positions of course and am in court and whatever, but when I talk to people individually, I try to be careful. I don’t want to seem like one of the elites coming down from the Bay Area, telling us what to do.”

This caution came despite the interviewee’s lifelong history living in Kern County. When I asked the interviewee if the election of President Trump had strengthened the anti-elite sentiment in the county, he just laughed and said it had always been an issue in California, but that people were just now noticing.

#### 4. Complicated environmental, health realities

No one in Kern County denies that the air quality is poor in the area; this is well accepted. In fact, the acceptance of this was notably nonchalant. In one particularly memorable interview with a longtime Kern resident that is now a national-profile political advisor, she reflected on dropping her children off at school. When they walked into the classroom each day, they would put their inhalers in a bucket by the door. Before recess, the students would line up to use their inhalers as needed. After recess, those with especially bad asthma would take another dose. The most startling aspect, as the interviewee reflected, is that this practice was accepted as completely normal. The former reservoir engineer now in the nonprofit sector said something similar:

“They all know their kids are going to have asthma. Like they’re just going to have it. And they’ve got a good chance at getting valley fever too. They’re painfully aware, but that’s just something you accept.”

According to one interviewee, there’s a saying in the county that explains a lot of the cultural sentiment: bad air, great people.

What was more debated, however, was the cause of the air pollution. For the most part, stakeholders outside of the environmental or environmental justice space were reluctant to discuss the role of local point sources of pollution such as oil or dairy operations. As the interviewee from the social nonprofit argued:

“It’s not all our waste, you know. Sacramento is on fire so I get ash in my pool. It all blows down to here. Not to mention all the transportation that comes through here on the highway every day, millions of cars.”

Other interviewees pointed to the transportation, but also to pollution crossing the ocean from China. This isn’t to say there is consensus. As one the interviewees from the environmental justice space said of his predominantly Latino community about a half hour from the city of Bakersfield:

“The rest of the county blames San Francisco or China... but we see oil and we see agriculture and we experience the impacts of these industries more directly. So no, we don’t deny those impacts.”

While the links between the oil industry and air quality, as well as oil and climate change, did not seem to be a concern for the majority of interviewees, there was much more acknowledgement of potential direct dangers. For example, the interviewee who works as a welder’s assistant in the oil patch spoke of an overwhelming fear of gas explosions or falling objects during the work day. The attitude toward such scary possibilities was articulated by the former reservoir engineer as follows:

“I think there’s an understanding that it’s high risk in terms of magnitude, like what an explosion on a rig can do on any given day. But there’s the hope of keeping it a low probability, that’s what it’s really about. Outside of climate change and things like that, oil companies pride themselves on safety.”

Indeed, all of the interviewees that had experience working in the oil sector talked about how the companies work to create a mindset of family and safety for that family in the field.

Interestingly, when pressed on the issue of addressing climate change there was to some extent actually a similar sentiment expressed by environmentalists and oil employees: that “small” environmental victories in oil are larger than they may seem. As the interviewee from the mainstream environmental group put it:

“In some ways this work is the low hanging fruit. It doesn’t take much for a little success to make a big environmental impact when you start from such a low spot.”

And with strikingly similar language, the long-time reservoir engineer:

“I’m one of the greenest people you’ll ever see, because I work in oil fields and that’s the easiest place to start. Reducing waste there makes a bigger impact than the environmental work you tend to think of, saving more energy and emissions and the whole thing.”

These expressions, of course, come from two people with very different vantage points on the realities and threats of climate change. And yet even those that don’t acknowledge climate change seem to use rhetoric that attempts to use environmental justifications for California oil. As the interviewee from the oil royalty owners’ association said:

“Every drop not produced in Kern County just has to be bought from somewhere else, because we still consume more than we produce. And if California’s got the strictest regulations of anywhere, why not just show the world how to do it and do it right.”

As prefaced in the literature review, this is a factually questionable assertion given the age and resulting energy intensity of oil produced in Kern. Nevertheless, it seems to be a widely held view that California oil is less bad than oil produced elsewhere.

## 5. Experience of inequities

As with any ethnography attempting to identify community norms, there is a danger in studying these themes and consequently painting the entire county with one brush. While many of the attitudes are widely held, there are also clear differences in the experience of various groups in

the county— and in fact, this too was acknowledged in the interviews. While there are probably many examples, the most notable group with a different experience is the previously mentioned community of Arvin in the eastern part of the county. Thanks to its geography, Arvin has even worse air quality than the county average (Kuipers, 2017). Non-coincidentally, the area is more affordable and heavily Latino-majority. The interviewees from Arvin – the mayor and two environmental justice activists – as well as the more traditional environmental activist and the community college vocational training director all observed that many residents in Arvin have a different perspective on the energy industry than the rest of Kern.

A primary aspect of that perspective is the antagonism toward the oil industry. The mayor recounted a city proposal to implement a moratorium on oil and gas operations in 2012; the proposal was widely supported, but ultimately shut down by the county board of supervisors. As one of the environmental justice advocates vented in our interview:

“We experience more leaks and more fumes and more headaches than the rest of the county. We don’t get the money or the engineers. Why should our kids be put at risk and need inhalers every day?”

The same interviewee went on to clarify that oil and gas are far from the only environmental problems facing Arvin. There are also nearby Superfund sites, and the city is host to the treatment centers for much of Los Angeles’ waste.

In response to all these issues, Arvin residents have been some of the most active in both tracking air quality and pursuing green economic opportunities. All of the Arvin interviewees as well as the interviewee from the mainstream environmental organization brought up the so-called Bucket Brigade, a group of citizens that takes daily measurements of air pollution in the area in response to the perceived unreliability of county and state government monitoring. According to the director of the renewables training program at the community college based in Bakersfield,

Arvin sends the second most number of students to the program— second only to Bakersfield, which has an 18-fold larger population and is much more conveniently located.

Why is the momentum in Arvin? The mayor cited a drive for change and a tendency toward stewardship in Latino culture. The traditional environmental activist located in Bakersfield echoed the former sentiment in a way that really stuck with me, especially given this thesis' focus on integrating justice concerns into academic environmental discourse. As he said:

“I often feel like it’s hard to get young people or really anyone out here [in Kern County] to take up the environmental mantle. Except in Arvin. There’s a huge group of people there that are really motivated, really ready to engage. I think it’s because they’ve been in the thick of things for so long and this is the first time they’ve seen potential for change and to really be in on an opportunity from the start.”

#### Discussion of perspectives

Garnering multiple stakeholder perspectives as through this interview process is an important step in capturing the complexity of decarbonization and climate-progressive transitions. Indeed, these interviews reveal that for many people in Kern County – at face value a place with many of the key ingredients for a just transition – the idea of such a transition is not on their radar and/or not appealing. Of course, others more traditionally marginalized within the community are ready and enthusiastic for change. How to resolve this tension? Themes emerging from perceptions are still just perceptions. It is important to work to understand the range and complications of these perceptions, just as it is important to complement these qualitative learnings with other forms of empirical data where possible.

### Chapter 3: A second look at the economics

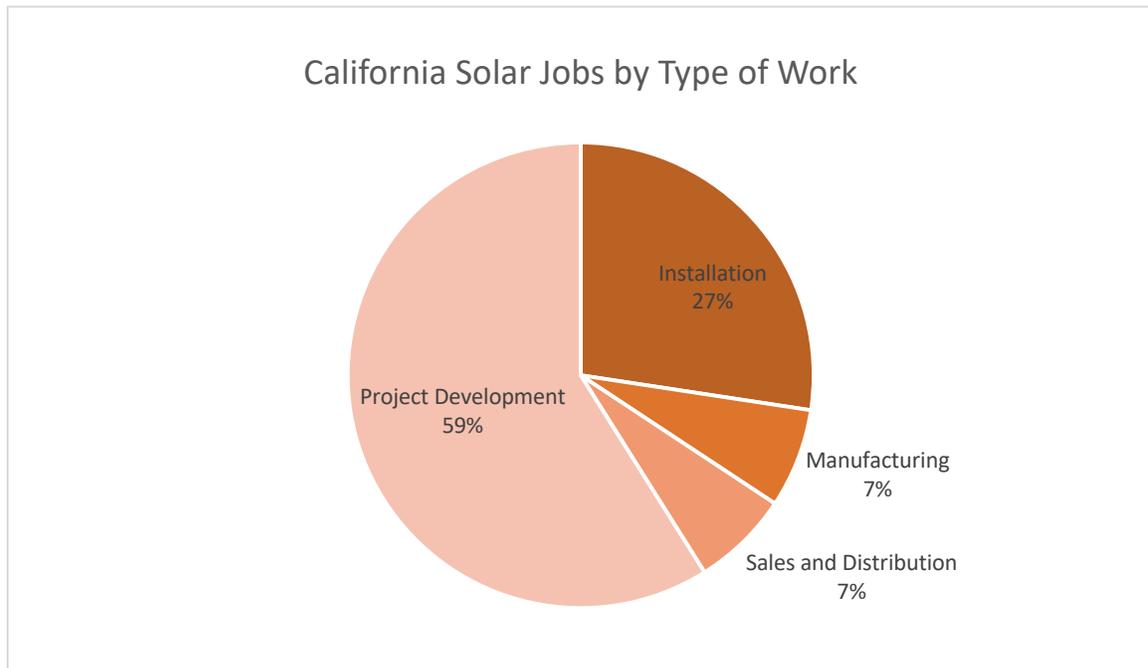
The stories I heard from the people of Kern County could easily fill a book: their character and their background and their unabashed attitude make them a ripe subject for narrative. Behind each anonymized descriptor of an interviewee is a more complete story with complicated backstory and experience. In distilling these experiences into smaller excerpts, the previous chapter attempted to provide a structured and academic window into the narrative of life in Kern County and how the energy sector interacts with life. The purpose of this chapter is to examine how the themes found in stakeholder perspectives align with actual economic data. The comparisons between perception and empirical economic implications will be examined with regard to employment, county tax revenue, and other economic co-benefits in the community. While the nature of oil and solar employment are similar, for example, I find that the magnitude of opportunity is not yet comparable. When it comes to local revenue, oil even in its instability also still offers more budgetary benefit due to solar's exemption; however, alternative county revenue opportunities are emerging from the solar industry. Finally, each industry offers indirect benefits that are unique and thus difficult to compare – individually owned oil royalties versus lower utility bills as a result of solar installations – but are nevertheless important to a holistic evaluation. Oil in particular also causes environmental-health costs.

Additionally, I will examine the economic effects of California climate policies less directly linked the oil-solar comparison and discuss the potential impact of an ever-changing policy environment. While the renewable portfolio standard is to thank for much of the economic benefits of solar development in the county, there are also substantial benefits related to construction and a justice-bent fund stemming from cap and trade and energy efficiency mandates. And of course, all of this analysis is policy and thus sensitive to one important external factor: politics.

### Industry employment

Acknowledging that the goal of this thesis is to keep the economics grounded in context, a discussion of the relative employment of oil and renewable energy industries in Kern County must first discuss the varied types of employment in each industry and not just the numbers. Working as a Chevron reservoir engineer is a different life experience than working as a welder's assistant in the field, just as working as a solar business owner is different than working as a rooftop panel installer. Notably, both industries run the gamut from no-G.E.D.-required, contracted labor to roles requiring advanced degrees. Although the exact breakdown of county by county jobs by type in each sector cannot be found for solar, Figure 5 approximates these numbers based on state data input from Solar Foundation's Solar Jobs Census 2017:

**Figure 5: Solar employment in California by nature of work**



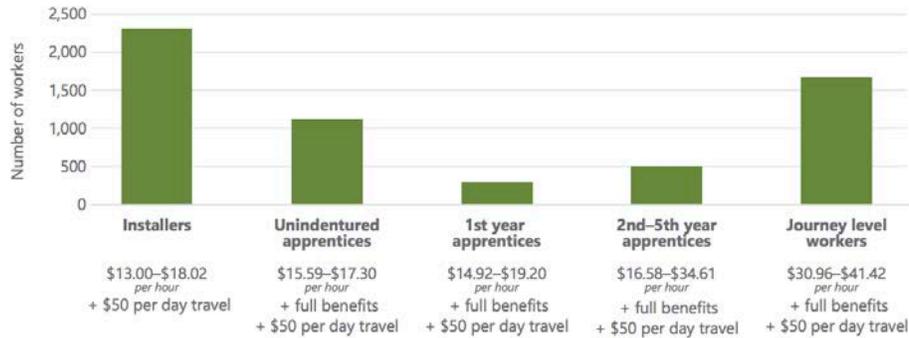
Employment numbers by job type in the oil industry are hotly contested and thus not available for ready comparison. Statistics vary on the categorization of contracted field workers, for example, and gas station employees that only directly interact with non-petroleum retail items

(Bell, 2013). Further, both industries struggle with how to count contracted and part-time workers.

That being said, it is worth at least looking at industry employment estimates. In 2017, the very pro-oil Kern Economic Development Corporation estimated that the oil and gas industry as a whole employed 21,000 in Kern. As noted in the first chapter, these numbers are often in flux with contracted workers and oil service companies being the first to cut jobs. In 2017, even larger companies were forced to cut jobs. Chevron, for example, announced it would lay off between 25 and 30 percent of its area employees (Pierce, 2017). The estimate for permanent fulltime renewable energy employment in the county, meanwhile, is much smaller: 1,800 (Kern Economic Development Corporation). In addition, many of the jobs supported by solar are in construction or fulfilled by utility companies that also complete other electrical projects; these spinoff jobs will be discussed in the economic co-benefits section.

Finally, it is important for justice considerations to observe the diversity of each industry's workforce. Racial and ethnic diversity in California's renewable workforce has historically been higher than that of fossil fuels, and in Kern County, 43 percent of entry level installation jobs have been filled by individuals who live in communities designated as disadvantaged by the California EPA—well above the state average of 25 percent (Luke *et al*, 2017). Greater than 60 percent of those in renewable energy apprenticeship trainings in the county during 2017 were non-white individuals. And even better, a survey of 27 new solar projects in the county between 2012 and 2017 revealed these jobs were relatively high paying:

**Figure 6: Number of workers by wage and skill level on 27 Kern solar projects**



(Source: UC – Berkeley Labor Center)

### County revenue

The several dedicated oil trade groups in Kern County have done a thorough job disseminating the contributions of oil to public service. Factoids such as that seven of the top ten tax payers in the county are oil companies are well known based on the interviews. This contrast truly illuminates the property tax problem for solar—or rather, for counties that might look to solar as an alternative revenue stream in the place of a faltering revenue stream.

**Figure 7: Comparison of property tax-eligible energy facilities in Kern County**

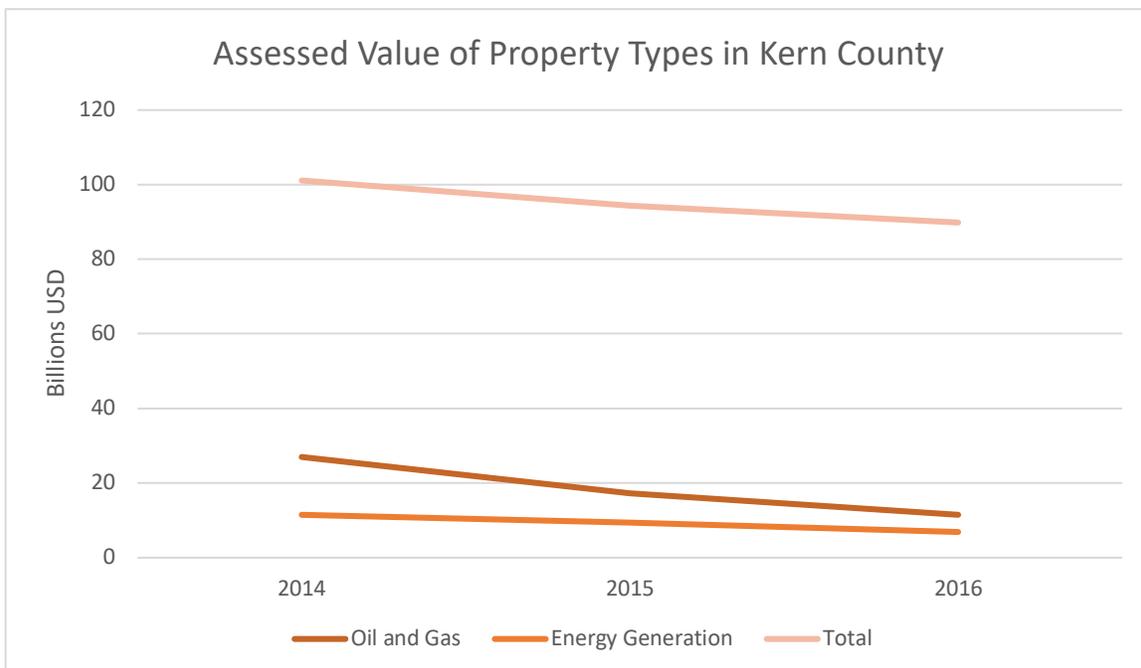
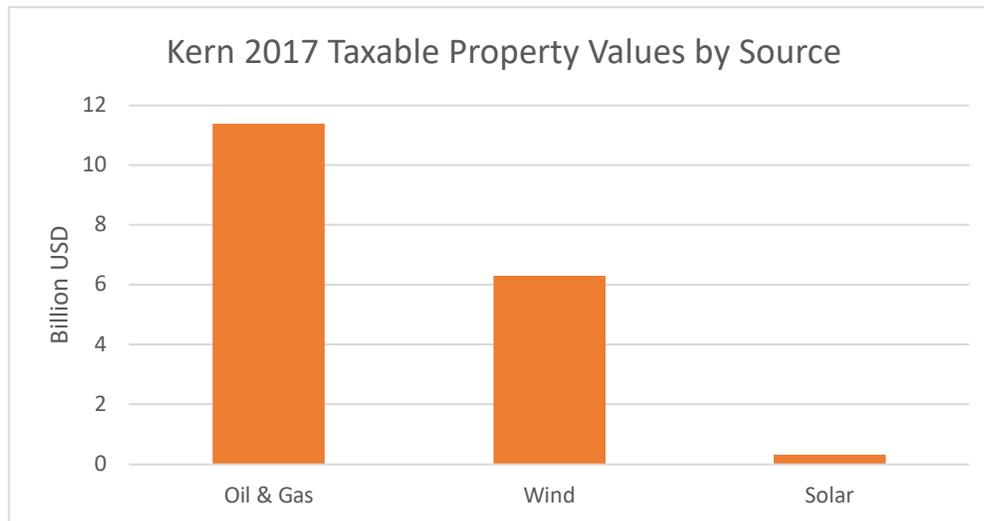


Figure 7 shows the recent decline of property tax evaluations of oil and gas as well as energy generation in absolute figures, which are typically taxed at a rate of 1 to 1.2 percent annually. Oil's more long-term decline as a percent of total property tax value in the county is perhaps most striking: from 53 percent in 1980 to 17 percent in 2017. Because the property tax exemption for solar only applies to technology specifically used in generating electricity and not support infrastructure, there is actually still some tax revenue from large scale solar power plants. These numbers are reflected in Figure 8 below:

**Figure 8: Absolute value of property-tax eligible energy facilities in Kern County**



Property taxes aren't the only ways counties and local governments can fiscally benefit from renewable energy development, however. In California, three methods have been used to gain revenue outside of the property tax exemption: general development impact fees, environmental mitigation fees justified by the California Environmental Quality Act (CEQA), and project-specific fees written into development agreements. Kern county prefers the latter two.

Under the CEQA justification, the county charges a "Public Facilities Mitigation Fee" of \$29.59/1000 square feet of development on solar projects. Legal experts suggest this is a misuse

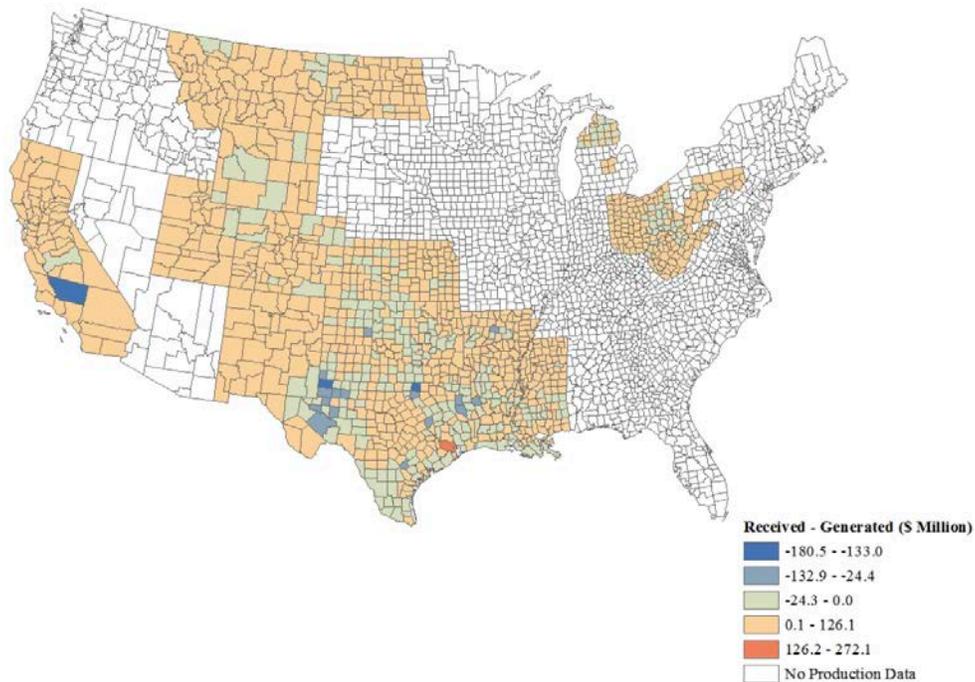
of CEQA – the justification used by the county cites needing funds to minimize environmental impacts, and yet CEQA separates environmental impacts from economic impacts of individual projects. Project-specific fees also rest on questionable legal ground: development agreements are typically requested by risky developers for protection, not imposed on low-risk projects by local governments, as in the case of solar in Kern (Mudge, 2014). Because these methods are rather legally questionable and highly individualized, it is hard to track overall impact on the solar developers and on the county budget. What is notable is that it hasn't mattered enough for solar companies in Kern to sue, nor for the county government to attempt to repeal the solar property tax exemption.

#### Co-benefits and externalities

Finally, one more hard-to-quantify but important-to-mention benefit each for oil and solar respectively: royalties owned by landowners and lower electricity bills for solar owners/lesers. Additionally, oil and gas operations contribute to local air pollution and thus rising healthcare costs—a notable community externality. With the first benefit, there was a total of \$1.7 billion of oil royalty payouts to private citizens in California in 2011, the most recent year for which data are available (Fitzgerald, 2016). The best estimates at county-level data indicate that while Kern performs fairly well in the aggregate amount of royalty income, the per-person payout for each royalty owner is surprisingly low (Fitzgerald, 2016). This is demonstrated in Figure 9, in which Kern County stands out in dark blue even at the national level. This is because while there are many oil fields partially-owned by private royalty owners, many of these owners don't actually live in the county. Essentially, while some individuals are making money on royalties in Kern, on the net, the county is exporting private oil wealth. This local “benefit” that was espoused by several

of the stakeholders I talked to – not just the interviewee from the oil royalty owners association – appears to be more of a bust.

**Figure 9: Heat map of incoming, outgoing money from individual oil royalties**



(SOURCE: Fitzgerald 2016)

Solar's large co-benefit of lower energy costs is hard to quantify in a different way: every user has different energy needs and different micro-siting conditions for their panels. However, there are many well-documented cases of these benefits in a range of applications. I will cite a few for consideration: Kern High School District predicts solar power will cut costs by \$80 million in energy bills over the next 25 years (Grist, 2018); Bakersfield's Community Action Partnership Food Bank has saved \$50,000 in electricity bills a year since installing solar (Medina, 2017); and notably, solar-powered production in oil fields can cut the most expensive operating cost by a third

(Merchant, 2017). And of course, these same benefits can apply to homeowners who lease or buy their own panels.

While both of royalties and lowered electricity costs are community benefits, there are also community costs. Most notably, localized air pollution to which the oil and gas industry contributed necessitates healthcare spending on impacts ranging from preterm birth to asthma to increased elderly care. Such externalities are felt by individuals and healthcare providers in an area and yet are less talked about in the interviewees as it is admittedly difficult to attribute these costs to particular sources of pollution.

However, we can examine the components of air pollution. Smog, for example, is primarily attributed to two components: volatile organic compounds (VOCs) and nitrous oxides (NO<sub>x</sub>). Among VOCs in the greater San Joaquin Valley, the air pollution district reports that the largest stationary sources are agriculture at 31 percent of emissions, and oil production at 7 percent, with mobile sources (cars, trucks, and other vehicles) contributing another 21 percent. Of the nitrous oxides, over 60 percent comes from mobile sources, with farm equipment and fuel combustion making up the next largest blocks at 17 percent and 10 percent (San Joaquin Valley Air Pollution District, n.d.). The oil industry also contributes certain less-discussed pollutants in higher quantities. Specifically, oil and gas operations in the San Joaquin Valley are responsible for 31 percent of sulfur oxides and 70 percent of hydrogen sulfide. Sulfur oxides can contribute to smog as well as directly harming the respiratory system and triggering asthma attacks; hydrogen sulfide can cause nausea and vomiting, as well as once again triggering asthmatic symptoms (Brandt *et al*, 2015).

The aggregate impact of this pollution – again, caused by oil and gas but also other factors such as agriculture, geography, and heavy vehicular traffic – has a surprisingly high price tag. In

the valley as a whole, healthcare costs and missed labor compensation due to poor air quality are estimated at \$11 billion annually (American Lung Association, 2016). In just Kern County, preterm births due to particulate matter pollution, for example, pose an annual cost of over \$45 million (California Environmental Health Tracking Program, 2013). In a county where 45 percent of residents are on Medi-Cal and 9 percent are uninsured altogether, all preventable healthcare costs are of particular community significance (Kern County Public Health Services, 2017).

### Additional climate policy impacts

The previous three subsections have focused only on the economic implications of solar and oil in Kern County, as this was the focus of the interviews. However, this thesis also explores the notion of justice in decarbonization, and to do so we must look at the greater policies surrounding decarbonization. For this analysis, I draw from a regional study of the economic impacts of California's climate and energy policies produced by Next 10 and Berkeley Law's Center for Law, Energy & the Environment. The study is quite comprehensive, breaking down the \$13.4 billion invested into low-carbon energy technologies in the San Joaquin Valley, which is a 10-county region that includes but is *not* limited to Kern. The paper addresses each major aspect of California's climate and energy policy: cap and trade, the renewable portfolio standard, and energy efficiency standards. In this section, I will focus on cap and trade and energy efficiency standards because the impacts of the renewable portfolio standard in Kern County are simply increased renewable energy, the benefit of which has been discussed at length already in the direct comparison between solar and oil.

As the study notes, cap and trade is the most well-known climate policy in California. Thus far into its implementation, however, it has had a smaller impact on state and local tax revenues

than anticipated. In the San Joaquin region, for instance, this policy tool is only responsible for about \$4.7 million in local taxes—much less significant than more direct sales and property taxes from electricity sources discussed above (Jones *et al*, 2017). This is in part due to the fact that California’s cap and trade system applies more strictly to fossil fuel power plants than transportation fuels—the latter of which is more abundant in the area.

In addition to this local tax revenue, there are many jobs created by the reinvestment of the Greenhouse Gas Reduction Fund (GGRF). These jobs are separate from the spinoff employment from renewable energy and oil jobs discussed previously. Instead, this section refers to jobs that are created by the investment of funds raised from around the state into disadvantaged areas as legislated by SB 535, the part of California’s Global Warming Solutions Act that created the GGRF. The legislature specifically included provisions to direct investment toward the most disadvantaged communities and consider localized impacts of market mechanisms (Farell, 2012).

As it turns out, the region is a major beneficiary of the provision: The San Joaquin Valley represents about 12 percent of the state’s population but has received 35 percent (or \$320 million) of the investment from the GGRF. The money has been spent on a variety of projects ranging from construction of high speed rail to methane digesters to community solar facilities to affordable housing projects. The vast majority of these construction jobs are guaranteed under Project Labor Agreements resulting from union negotiations to make them more favorable, stable forms of employment. At a multiplier estimated between 2.7 and 3.4 permanent jobs per million dollars of investment, this has resulted in an additional 850 – 1100 jobs in the region. The economic co-benefits of this high speed rail have also been studied in depth, with estimates that every dollar invested into high speed rail supports another \$1.50 throughout the rest of the economy (Jones *et al*, 2017).

Perhaps as unexpected as the large job growth from high speed rail is the even larger job growth from energy efficiency standards—and moreover, as the Next 10 study puts it, the “unambiguously evident success” of these standards. To begin with employment, the study found that 6,660 direct job years and 10,730 indirect and induced job years were created in the Valley, for a total of 17,390. These jobs tend to be in maintenance and construction to reach compliance.

The other elements of energy efficiency standards’ economic success are realized by electricity consumers. This is especially true in the San Joaquin Valley, which has the highest per capita energy use in the state thanks to the area’s more extreme temperatures. The benefits – which combined with the previously mentioned employment net to an impressive \$1.18 billion in benefits to the San Joaquin region – include lower absolute electricity costs, savings from reduced usage, and increased consumer spending and employment stemming from the boost from lower utility bills (Jones *et al*, 2017). The policy tool itself might not seem particularly flashy or innovative, but the energy efficiency has impressive results from both an economic and justice perspective in a region where high energy costs have traditionally put strain on low-income residents.

#### Discussion of the economics

It is clear from the numbers that if oil prices suffered a drastic and prolonged drop today and the oil industry in Kern County were to collapse under the low prices, the solar industry is not yet ready to smoothly replace the jobs and local revenue that oil production currently provides. The magnitude of jobs availability is not yet equivalent to those provided by the oil industry, and the alternative fees that have sprung up as a response to the solar property tax exemption do not yet close the county revenue gap. Solar does, however, provide the same or higher quality jobs than the oil industry, and the transition from oil work to solar is relatively smooth. And in comparing the major co-benefits of each industry – royalties for oil, electricity savings for solar –

solar comes out as a fairly clear winner benefitting both individuals, small businesses, and larger industries such as agriculture and even oil.

Furthermore, the setting for decarbonization in Kern County doesn't just include oil and solar in a vacuum; California's climate program suite provides many supplemental jobs in construction and energy efficiency projects. Additionally, the Greenhouse Gas Reduction Fund benefits the San Joaquin Valley region more than any other part of the state. These are economic benefits that should not be discounted.

#### [A note on evolving policy landscapes](#)

Going into this thesis, it was easy to take general assumptions and even assertions in the literature for granted that solar is an inherently more stable industry than oil. The sun will reliably come back day after day; oil takes thousands of years to be created. Of course, this view forgets the most basic premise of this paper: the human element of energy resource sustainability is crucial. About halfway through the work on this thesis, President Trump announced a 30 percent tariff on foreign solar panels. Solar and environmental groups immediately expressed their outrage—while the Trump administration spoke of bringing back manufacturing jobs, solar advocates spoke of thousands of jobs to be lost and costly project delays.

The estimates for the impact of the tariffs vary widely, from the Solar Energy Industries Association's dire prediction that 23,000 jobs will be lost (mainly in installation) to a more optimistic survey of solar installers finding that two thirds of those surveyed plan to absorb the majority of the tariff's costs rather than passing the cost to consumers (Case, 2018). Other voices in industry say that blue states such as California where electricity costs are already high will have a relatively resilient solar industry as there is less competition (Mattzie, 2018).

The exact impact of the tariffs is not the point; rather, I hope to illustrate in this thesis that political factors play a large role in the viability of energy economies. Oil, gas, solar and wind have all benefitted from various state and federal economic incentives from tax credits and exemptions to subsidies and positive mandates. Likewise, all are vulnerable to changes in these incentives in the future.

## Chapter 4: Examining frameworks for justice and energy

Discussions of ways to smoothly and equitably transition economies away from fossil fuels that have long existed in the activist space have only slowly been pushed into the worlds of policymaking and academia. As such, the existing frameworks to evaluate justice and equity concerns in the process of decarbonizing economies are relatively limited. This chapter of the thesis hopes to contribute to the academic codification of inclusive energy policy by applying the just transitions, energy justice, and climate policy equity frameworks to the previous quantitative and qualitative analysis of the changes in Kern County. In some regards, the criteria laid out by these frameworks will illuminate how the changes in Kern County's energy sector could better accommodate for equity. In other regards, the nuances of the Kern County case study will demonstrate that the academic frameworks of energy transitions are not yet complete and need further tailoring to offer a practical tool to policymakers.

I selected the frameworks of energy justice, just transitions, and climate policy equity for comparison because though they come from different vantage points, they are the most concretely developed. Energy justice offers a perspective drawing heavily on philosophical ethics and examining energy access and direct impacts at the community level. Just transitions theory, in contrast, takes a more focused look at justice in employment effects. Finally, climate policy equity is an even more nascent framework that works to integrate justice, economic equity and public accountability. The final section of the chapter will offer an evaluation of each of these frameworks, arguing that while all have their relative merits, climate policy equity is the most comprehensive framework and best suited for case studies with overlapping governance. I will also argue that each framework should better account for economic impacts aside from energy costs and employment, such as government revenue from industry tax contributions.

Before delving into each framework and the discussion of evaluation, a comment on the incorporation of justice concerns into policy discourse is required. On the one hand, justice is newly being incorporated into transition frameworks. Many such frameworks are still in the working paper stages and are not peer reviewed. And yet, it is also true that climate justice between countries of different wealth and vulnerability has long been an issue at the international negotiation table. Indeed, the United Nations' "2030 Agenda for Sustainable Development" as adopted in 2015 added many justice elements to the Millennium Development Goals. Of particular significance to this thesis are Goal 7 – Access to affordable, reliable, sustainable and modern energy for all – and Goal 8 – Sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Finally, these objectives were clearly intended to scale to all levels as noted in Goal 16: "Provide access to justice for all and build effective, accountable and inclusive institutions at all levels," (UN Department of Economic and Social Affairs, 2016).

There is an engaged public audience for justice work in Kern County; environmental justice as a whole has been increasingly present in California climate and energy discourse. CalEPA's enforcement division includes an Environmental Justice Program dedicated to air quality monitoring, and there have been multiple legislative hearings on the nexus of employment and energy, including a joint-legislative hearing on just transitions in the summer of 2017 with extensive public comment. In addition to this formal governmental activity, there have also been activists and media headlines questioning California's "love affair" with Big Oil even amidst the state's groundbreakingly progressive energy policy (Kuipers, 2017).

This chapter provides analyses for the clearly on-going conversation. To do so, the evaluator frameworks zoom into the actions of institutions at the county and state level, which

provides the most insight into the Kern County case study. While there are certainly some federal policies that have affected the transition in the area – i.e. funding for renewable energy vocational training under Obama’s 2008 stimulus package– the most substantial impact has been driven by more localized policy programs. As such, many of the impacts evaluated in this chapter relate to cap and trade, renewable portfolio standards, energy efficiency mandates, and local tax and construction codes.

### Kern County through the energy justice lens

The goal of energy justice is to fairly distribute the benefits and burdens of energy services while moving toward a more inclusive decision-making process in the energy-government intersection (Sovacool *et al*, 2017). Energy justice is further outlined by Jenkins, McCauley, Heffron, Stephan, and Rehner as having three central components from broader justice scholarship: distributional, recognition, and procedural justice. Distributional justice examines the unequal allocations of environmental impacts as well as uneven distribution of associated responsibilities. Distribution applies to both siting of infrastructure and access to services. Recognition justice looks at when parties are acknowledged or not, and potential devaluation/superficial consideration of parties that are at face-value being recognized. Finally, procedural justice more directly involves access to the decision-making process (Jenkins *et al*, 2017). The seminal paper by Jenkins *et al* led to a relatively well-accepted eight principle framework to apply these general aspects of justice more concretely (2017). That framework has since been revised to the following ten principles by Sovacool, Burke, Baker, Kumar and Wlokas (2017):

**Figure 10: Summary of the Sovacool *et al* energy justice framework**


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 Energy justice framework
 

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- Availability: People deserve sufficient energy resources of high quality, suitable to meet their end uses
  - Affordability: All people, including the poor, should pay no more than 10% of income for energy services
  - Due process: Countries should respect due process and human rights in production, use of energy
  - Transparency and accountability: All people should have access to high quality information about energy and the environment; fair transparent and accountable forms of energy decision-making
  - Sustainability: Energy resources should be depleted with consideration for savings, community development, and precaution
  - Intragenerational equity: All people have a right to fairly access energy services
  - Intergenerational equity: Future generations have a right to enjoy a good life undisturbed by the damage our energy systems inflict on the world today
  - Resistance: Energy injustices must be actively, deliberately opposed
  - Intersectionality: Expanding the idea of recognition justice to encapsulate new and evolving identities and acknowledge how energy justice is linked to other forms of justice
- 

Notably, the principle of due process dictates what “countries” should do—and yet, energy justice is also applicable to more local scales. Shifting from energy justice in the universal sense to a more particular sense is important in order to evaluate case studies and be useful to policymakers (LaBelle, 2017). Unlike many policy analyses, the energy justice framework is not particularly quantitative. As the Sovacool *et al.* (2017) framework paper concludes: “energy analysis and planning should be informed by more than the usual tools of cost benefit analyses, techno-economic models, or scientific and engineering projections about new technologies or penetration scenarios.” Consider Kern County evaluated under this framework on the next page:

**Table 1: Evaluation of Kern County under the Sovacool *et al* energy justice framework**

Energy Justice	
Consideration	Kern County Performance
Availability	Grid reliability in the Kern County area is generally rather high, but inconsistent. Predictably, areas like Arvin and other more rural areas suffer more sustained power interruptions.
Affordability	While the home energy affordability gap has a slightly stricter standard of 6 percent of income versus 10 percent, 48 percent of households in Kern do not meet this threshold. However, home solar installations and energy efficiency standards have begun to start lowering these costs for consumers.
Due process	The themes emerging from the interviews did not touch on this subject, but it is a positive sign that there are not obvious claims of human rights abuses.
Transparency, accountability	For air quality and climate action more directly, Community Air Quality AB 617 and CARB Oversight and Reporting AB 197 both attempt to increase pollutant monitoring and government accountability. However, both were criticized by interviewees who felt enforcement agencies were subject to special interest and instead created citizen-run air quality monitoring efforts.
Sustainability	Renewable energy clearly has a strong sustainability component. However, the common practice of using solar energy for enhanced our recovery or independent ground water wells is not a long-term sustainable option based on the limited nature of these resources, and despite the lower carbon emissions of such extractive processes.
Intragenerational equity	The historical differences in access to economic benefits from the energy industry combined with differences in exposure to environmental/health harms from energy production in Kern County place this principle in the “work in progress” category.
Intergenerational equity	Overall reliance on oil based on metrics of county revenue and employment have both decreased over time; likewise, renewable energy and vocation training for employment in these areas is paving the way for a better future for new generations.
Responsibility	On the one hand, California’s state policies are guided by a sense of environmental obligation. On the other hand, the local implementation of these goals is motivated by economics (and as a result, often has localized habitat damages that might have been avoidable).
Resistance	While positive mechanisms (i.e. the GGRF) have been created to reduce the occurrences of new injustices, it is a stretch to say that energy injustices are being opposed at every turn in Kern. The blocking of proposed oil moratoriums in vulnerable communities, for instance, shows that there is still much work to be done.
Intersectionality	Both the GGRF and the high diversity in the renewable workforce indicates a certain level of intersectionality in the transition. However, progress on gender inclusion in this workforce still has significant room for improvement.

Under the energy justice framework, Kern County appears to have mixed success as an example of an inclusive path to decarbonization. State policy has done a relatively good job of creating intersectional positive outcomes such as a diverse green workforce and lowering energy costs in regions that have traditionally been most income-burdened in paying utility bills. However, the positive economic change doesn't do enough to account for the continuation of negative environmental and public health impacts in these areas – areas like Arvin still suffer the brunt of such harms.

Kern County also offers a clear test case to evaluate the energy justice framework. In this case study, the framework successfully hones in on energy access and environmental exposure issues. The framework also highlights transparency and accountability issues. That being said, the energy justice framework faces a significant potential shortcoming in the way it isolates energy from other societal systems. The framework fails to examine consequences of energy system changes on employment and other potential negative aspects of new policies.

### Kern County through the just transitions lens

Just transition framework is in some ways more easily applied to the Kern County case study as it was born from the labor movement rather than philosophy, and as made clear by the interviews and literature review, jobs are a primary topic of discourse in California. It is also helpful that the just transition framework utilizes more narrow, concrete dimensions to evaluate local economies, such as investments, social dialogue, skills and training, and social protection (Rosemberg, 2010). There is hope that the growing employment opportunities in renewable energy work could offset fossil fuel jobs lost in the clean energy transition—part of a greater framework of just transitions in the intended de-carbonization of the economy.

For my analysis, I will utilize the International Trade Union’s “Demands” as the movement’s most accepted framework (Rosemberg, 2010):

**Figure 11: Summary of the International Trade Union’s just transition framework**

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ITUC demands for a just transition:

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- Respect the contribution that workers in fossil fuel industries have made to today’s prosperity and provide income support, retraining, redeployment and secure pensions for older workers
  - Recognize that investing in community renewal is critical to gain the hope and trust of affected regions and townships whether energy transition, industrial transformation or disaster
  - Support innovation and shared technology to enable energy and manufacturing companies to make the transition with 2020 and 2030 targets for emission reductions and for jobs
  - Involve workers in the sectoral plans for the development of clean mega cities
  - Formalize the jobs in rescue, rebuilding and resilience associated with climate disasters
  - Ensure investment in the jobs and decent work vital to both adaptation and mitigation
  - Guarantee essential social protection and human rights
  - Be backed up by a just transition fund
  - Be based on social dialogue with all relevant parties, collective bargaining with workers and their unions and the monitoring of agreements which are public and legally enforceable
- 

Perhaps also due to its origin in the labor movement, which requires experience in many scales of union negotiations and employment inequities, the just transition framework offers a clear understanding that there are differing levels of transitions and accompanying vulnerability to decarbonization’s more burdensome qualities, ranging from job loss to regional economic downturn. The movement also focuses on capturing the complexity of a low-carbon and climate-resilient economy and aims to highlight public policy needs in the transition (Rosemberg, 2010). With this in mind, the application of the framework to Kern’s circumstances in Table 2:

**Table 2: Evaluation of Kern County under the ITUC’s just transition framework**

Just Transitions	
Consideration	Kern County, California Performance
Inclusion of displaced workers	Anecdotally, the solar industry’s hiring of laid off oil workers is a fairly common place practice. Additionally, both federal funds and private donation from oil companies has been funneled toward renewable energy vocational training. Neither practice is well quantified.
Community renewal investments	The Greenhouse Gas Reduction Fund reallocates money raised from climate and energy policies to disadvantaged communities; however, the projects it is spent on (like high speed rail) do not directly work toward community needs such as improving air quality and health care, which are well-acknowledged issues.
Technological innovation funding	At the county and state level, direct policy in this category is relatively limited and did not emerge as a theme (either positive or negative) in the interviews. That being said, energy efficiency standards in particular have encouraged infrastructure innovation.
Worker input in sectoral planning	Project labor agreements for construction projects offer a limited avenue for worker input. In general, however, this category could be improved upon given the high number of contract workers in the energy industry.
Formal disaster response jobs	Personnel trained in disaster relief has not been a top policy priority in California. Although this theme did not emerge in the interviews, the deployment of thousands of California prisoners to combat wildfires in 2017 revealed a potential labor shortage.
Balanced employment in adaptation, mitigation	The majority of employment in this thesis is naturally in mitigation given the nature of energy employment. That being said, some employment under projects funded by the Greenhouse Gas Reduction Fund focus on resilient infrastructure and other adaptive construction.
Guaranteed human rights	The themes emerging from the interviews did not touch on this subject, but it is a positive sign that there are not obvious claims of human rights abuses.
Just transition-specific fund	See note on the Greenhouse Gas Reduction Fund above; money is allocated toward most heavily disadvantaged communities including Kern County and the rest of the San Joaquin Valley.
Monitorable, enforceable agreements	For employment, project labor agreements are a positive mechanism prevalent in California that protect workers and hold government accountable. For air quality and climate action more directly, Community Air Quality AB 617 and CARB Oversight and Reporting AB 197 both attempt to increase pollutant monitoring and government accountability. However, both were criticized by interviewees who felt enforcement agencies were subject to special interest.

The case study performs strongly under the just transitions framework. California state policy accounts for many of the criteria— the GGRF serves as a just transition fund and works toward investment in community renewal, and project labor agreements provide worker input. Further, more local policies such as the county workforce development program includes displaced

workers, which is heavily emphasized in the framework. As noted in the chart, Kern County would benefit from greater funding of many of these initiatives, but the groundworks for a just transition have been laid. The one area where Kern County falls particularly short under this framework is in adaptation. Most of the policies and job creation in the case study are in renewable energy or other ways of mitigating climate change; fewer resources have been diverted toward adaptation.

The Kern County case study also reveals strengths and weakness of the just transitions framework. First, it is clear from Kern that the just transitions framework thoroughly addresses employment-related elements. Second, the framework offers a nuanced perspective on jobs lost as well as created. Finally, the criteria cover enforceability and monitoring of employment progress, as well as investment back into the community. The most notable issue not covered under the criteria relates to the economic and environmental experience of community members that do not work in an energy industry. General reinvestment into community renewal is important, but this leaves questions unanswered. Is the new energy affordable for all? Will damages to public health be addressed or reversed? Do disadvantaged communities have an opportunity for advancement?

#### Kern County through the climate policy equity lens

Finally, climate policy equity has emerged most recently in a “New Social Contract for Low-Carbon Transition” from UC-Berkeley’s Center for Labor Research and Education and is unsurprisingly well-suited for the case study given its origins (Zabin *et al*, 2016). The central principles are environmental justice, economic equity, and public accountability, each with specific equity goals and criteria through which to evaluate progress (Zabin *et al*, 2016). This specificity is useful for bridging the gap between academia, activism, and policy making. These criteria are detailed, and Kern’s performance is evaluated, in Table 3.

**Table 3: Evaluation of Kern County under the climate policy equity framework**

<b>Climate Policy Equity</b>		
<b>1. Environmental Justice</b>		
<b>Consideration</b>	<b>Criteria</b>	<b>Kern County, California Performance</b>
Health risk to disadvantaged communities	Decreases regional pollution and local hotspots	While regional pollution may be incidentally reduced, local hotspots are not well accounted for.
	Improves public health outcomes for climate vulnerability	Although GGRF funds may be allocated for this purpose, there is not much of a preventative public health aspect for vulnerable communities.
Access to benefits	Greater access to clean goods, services, employment	This criterion is more fulfilled, from lowering electricity costs to strong diversity numbers among county solar jobs.
Protection from adverse economic consequences	Avoids raising costs of resources, utilities	The rise of solar energy both lowers electricity costs and potentially water costs, especially for those in agriculture.
	Increases resilience to gentrification	This criterion has not been particularly addressed in interviews or the literature.
<b>2. Economic Equity</b>		
<b>Consideration</b>	<b>Criteria</b>	<b>Kern County, California Performance</b>
High quality, career-track jobs	Generates safe jobs with good wages, benefits	Jobs in the renewable/efficiency sectors are high quality; however, their quantity is still somewhat limited locally.
	Supports wage and skill standards in industry	The involvement of unions under project labor agreements as well as apprenticeship programs supports such standards.
	Increases access to career-track for disadvantaged	Access is improving, re: diversity numbers, but rural training programs still receive fewer funds.
Just transition for workers at risk from climate policies	Provides income support, retraining, placement services	While retraining and placement services exist, they ought to be increased. Income support programs are lacking.
	Supports development for areas affected by plant closures, industry decline	This criterion has not been particularly addressed in interviews or the literature.
<b>3. Public Accountability</b>		
<b>Consideration</b>	<b>Criteria</b>	<b>Kern County, California Performance</b>
Participation in decision making	Fosters inclusive, effective participation at all stages	There are technically opportunities for input, but “effective participation” seems to have barriers ranging from language barriers to competition from special interests.
Transparent monitoring of equity outcomes	Translates goals into trackable metrics	Metrics for air quality and emissions are more clear than for green job counts and other economic measures of equity.
	Generates reliable, public data sets	Air quality data is public but largely distrusted. Job numbers are not well tracked and have largely been left to academics.
Continuous learning and improvement	Allows for midcourse policy corrections	Changes are possible but often slow due to legislative hurdles; for example, activist efforts to change oversight structures of CARB and air quality monitoring districts.

Kern County's performance by this third framework once again does fairly well. In environmental justice, money and educational/employment opportunities are generally directed toward the communities that need it— although the framework does identify a shortcoming in terms of actually reducing local pollution and health hazard hotspots. In economic equity, most of the employment and “just transition” indicators (as defined by this framework) perform well. The main room for growth in this aspect of the case study seems to be quantity of employment rather than quality. Further, while there are structures for public input and governmental accountability such as through the Environmental Justice Advisory Committee, these avenues were often criticized for their superficiality in interviews with multiple stakeholders.

Examining the climate policy equity framework with the Kern County case reveals the benefits of its specificity and places where the frameworks still falls short. The environmental justice principle of the framework captures much of the more useful aspects of the energy justice framework while the economic equity principle captures much of the more useful aspects of the just transitions framework. The third climate policy equity principle of public accountability serves to formalize and emphasize themes of actor responsibility that is touched on in only a cursory manner in both of the prior frameworks. In these ways and in its specificity, the social contract's criteria excel. As mentioned for both of the prior frameworks, climate policy equity could still encapsulate non-employment related economics to a greater extent. Admittedly, the criteria of supporting development for areas affected by plant closure/industry decline (under the “just transitions” goal of the economic equity principle) scratches the surface of this topic and could be broken into its own goal with further criteria in order to better consider this dimension.

### Discussion of frameworks

This section more methodically evaluates the successes and failures of current frameworks for energy justice, just transitions, and climate policy equity – supporting the ultimate conclusion that while climate policy equity comes the closest to providing a comprehensive evaluation for policy makers, there is still work to be done to incorporate all the relevant economic equity considerations. Implementing criteria to evaluate framework criteria is an important process in emerging disciplines. As UCLA’s Luskin Center for Innovation notes, the importance of environmental justice is increasingly widely recognized, but tools for discerning its effectiveness are in need of work. As the center argues, carefully structured evaluation often serves as a critical tool to generate knowledge to improve the program or policy, inform future efforts, highlight success stories, hold governmental actors accountable, and integrate justice strategies into additional policies (Callahan *et al*, 2011).

The European Commission’s Pathways Project has since outlined criteria for evaluating frameworks on justice in transitions. The Project points out that academic frameworks for policymaking tend to differ in their objectives, ideal scale, consideration of actors and processes of governance. While their project evaluates the difference between broader categories of criteria systems – namely quantitative modeling versus initiative-based learning – the same considerations can readily be applied to energy justice, just transitions, and climate policy equity (Nykvist *et al*, 2015). Table 4 summarizes the reflections on each framework as learned through applying Kern County as a test case and organizes them according to the Pathways Project considerations.

**Table 4: Evaluation of energy justice, just transitions and climate policy equity frameworks**

<b>Comparing Frameworks</b>			
	<b>Energy Justice</b>	<b>Just Transitions</b>	<b>Climate Policy Equity</b>
<b>Objectives</b>	Focus is equitable distribution of energy as a product and the distribution of environmental impacts. Less attention to overall employment and other aspects of production.	Focus is primarily on employment, secondarily on community development in areas adversely affected by climate policies. Less attention to non-labor related economic issues.	Focus is the balance of needs between environmental/health impacts, employment, and representation while noting potential tradeoffs. Relatively less narrowly defined objective.
<b>Ideal scale</b>	Most fitted to national and even international plans, but applicable anywhere with equity issues.	Fits a range of scales, with applicability corresponding with the scale of organized labor under consideration.	Theoretically fitted to a range of scales, but more practical on smaller scales given the complexity of analysis required.
<b>Treatment of actors and governance</b>	Only indirectly deals with actions of individuals and institutions, generally evaluates outcomes instead. Limited engagement with modes of governance.	Closer examination of exchanges between labor, industry and government actors. Limited engagement with modes of governance.	Emphasizes accountability and transparency of actors as part of criteria. More in-depth engagement with governance structures.

For the purpose of this thesis and similar case study analyses, the climate policy equity offers the most comprehensive system of evaluation given the complexity of overlapping governance systems and the importance of energy to the economy, from basic quality of life to large-scale employment. However, even the climate policy equity framework could better account for a broader range of economic impacts. While the framework begins to approach this under its economic equity principle, a more comprehensive version of this framework would include a third equity goal related to local government revenue and services. Indeed, the criteria considers employment lost from plant closures or well decline, but not lost revenue to the community as a whole. Drawing from the discussions on property tax revenue in the earlier chapters, it is clear that lost local government revenue can cause literal budgetary crises and cause resulting cuts in services such as infrastructure maintenance/construction and education funding.

## Chapter 5: Beyond Kern County

In explaining my work, I am also often tasked with explaining where in the world Kern County is. Lifetime California residents have often never been – or rather, don't realize that they have passed through. Bakersfield may ring a bell or two, or else I will describe it as just a little way north of LA, and inland. I find that the lack of awareness of Kern County underscores some of the cultural findings from the interviews in a way that is unfortunate given the snowballing interest in low-carbon transitions. Indeed, Kern County is a complex and fascinating case study at the intersection of high environmental and economic vulnerability, strong fossil fuel and renewable energy economics, and high local political inertia toward climate action stuck in the middle of a climate progressive state. Kern truly does have it all.

To wrap up, I outline the largest policy-related questions for Californians as raised by this case study. Then, I identify other places in the United States and abroad that might benefit from similar considerations. And finally, I ask what's next and work to aim an admittedly academic thesis on an accessible, hopeful note.

### California policy considerations

Although the main thrust of this thesis is not to recommend in-depth policy solutions – to do so would require an entirely separate set of methods – at the end of the day, the goal of evaluating case studies under justice-based criteria is to move toward a state where academics and policy makers can converge on more inclusive energy and climate solutions strategy. And the evaluation of the case study under the various frameworks and the review of energy policy tools did reveal several areas potentially in need of a policy remedy in order for the California climate program to reach its full equity potential in areas such as Kern County.

With regard to community level economic supports during transition, two considerations stand out in particular. First, vocational training programs in the community college district have been effective both at helping displaced workers from the oil fields find meaningful employment and providing opportunity for individuals historically excluded from such high-paying opportunities to take part in the burgeoning new green economy. Support for such programs has been unstable and would benefit from greater governmental support at the state level rather than relying on single federal stimulus packages or private donors. Second, economic approaches that look at employment as the primary or sole cost of fossil fuel industry decline are incomplete given the substantial contributions these industries can make to local budgets. Tax policy and incentive structures should be examined in order to account for these disparities.

In terms of reducing environmental harms, some of those same individuals traditionally excluded from high-paying work also continue to suffer from pollution hotspots. Cap and trade policies reduce overall pollution, but do not require in any way that these cuts be made on the basis of where they are needed for environmental public health concerns. As a result, additional policy tools to fill in this shortcoming should be explored in order to improve conditions for those who have long suffered the worst.

And finally, when it comes to transparency and accountability in reaching these goals, there is distrust across the board of energy and air quality regulatory commissions. While the discontent of everyone from completely anti-oil environmental justice advocates to oil companies themselves could be taken as a sign that government agencies are successfully taking a middle road, a more effective governance might look like more complete transparency. Air quality ought to be tracked in a way that is both standardized and satisfactory to the residents depending on the measurements. Employment numbers in different industries ought to be tracked under uniform metrics, as should

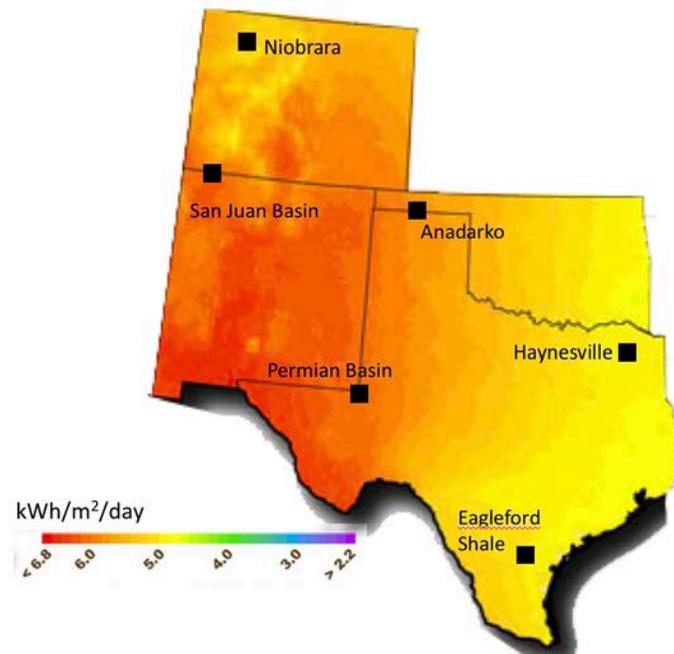
local tax revenues and additional investments. And although it is a positive sign that unions have had a voice in designing climate policy, voices other than large unions and corporations ought to have a voice in policy design.

### Applicability of the case study

As this thesis works hard to demonstrate, the case study on Kern County has value in its own right: Kern is the energy powerhouse of California, which in turn is the world's sixth largest economy by GDP and the fourth largest carbon market (Center for Climate and Energy Solutions). But like any case study, what makes it essential is the way its lessons can be used moving forward. Fortunately, there are many other locations across the United States and even around the globe that are looking to decarbonize. In particular, locations with a strong oil history and high solar potential should look to Kern County in their own planning processes.

Practically speaking, Figure 12 was created to identify some of these locations by overlapping high solar resource potential with active, high-producing oil fields. Notably, many of the areas that are most similar to Kern County when it comes to natural resources are also politically similar at the local level: conservative. Given the empirical divide between support for climate action and conservative ideologies, this only underscores the importance of interdisciplinary approaches that incorporate empathy into research and justice frameworks into policymaking.

**Figure 12: Sample map of other oil producing areas with high solar potential**



(SOURCE: Solar data from NREL)

Interestingly, there are also international case studies for the solar-oil transition interplay that could be explored. Saudi Arabia, for example, has produced more conventional oil over the past decade than any other country and boasts the largest oilfield in the world. However, they also announced a \$200 billion investment into solar this year, planning to on-line 200 GW of solar capacity over a decade of construction and an anticipated 100,000 jobs created (Rapier, 2018). More close-to-home, native communities in Alberta, Canada have created nonprofits to retrain oil workers in solar installation (Kornik, 2017).

Many of the aspects discussed in the economic analysis of this thesis would be important to keep in mind in applying these lessons to future case studies. For example, the guarantee of Project Labor Agreements – a strong benefit of employment from renewable energy projects in California – is not necessarily a guarantee elsewhere. Likewise, the treatment of renewable energy

under property tax systems vary from place to place, affecting the revenue streams to local governments. For every \$100 million invested in renewable energy generation, the proportion that comes back as property tax revenue to the county ranges from \$32,000 to \$850,000 (Haggerty, Haggerty and Rasker, 2014). Accounting for these differences – or working to change them – will be crucial in developing locally-tailored transition plans for decarbonization.

Of course, part of the lesson in this work is that local dynamics matter—the themes in public attitude toward Kern are essential to understand to design effective policy related to culturally beloved industries such as oil. It is possible that other areas experience similar qualitatively observable phenomena such as a rural-urban cultural divide, but such themes should be independently investigated and identified in new local contexts.

And after identifying these local contexts, justice concerns can and should play a major role in creating subsequent plans. Beyond the potential political impact of collapsing oil towns, there is a large positive potential for change in places with high renewable energy resources. One mapping study found that of the 20 most high-potential counties in the American West for renewable energy, more than half were also “among the West’s most challenged counties in terms of economic opportunity” (Haggerty, Haggerty, Rasker and Gude, 2014). Taking advantage of these resources not only helps lower the nation’s carbon footprint, but also has the potential to reinvigorate struggling local economies with quality jobs, local tax revenue and direct investments, and affordable energy.

#### Limits and future directions

As is evidenced in the tone of this thesis: I am present in my research. This is true in any ethnographic work, although efforts can and should be made to limit the influence of a researcher’s identity on interviews. In my own work, I observed how the fluidity of my identity helped recruit

and build trust with interviewees. For environmental activists and some of the solar employees and local government officials, introducing myself as an environmental policy student at Stanford helped to create a connection. For oil workers and other less environmentally-minded members of the community, my Midwestern upbringing seemed to be a point of shared cultural experience that mooted some of the “Bay Area Greenie” vibes, as one interviewee put it.

One limitation to this research is that while ethnography can reveal perceptions, the reality behind such themes may be more of a question. However, this is merely a limitation that provides fruitful directions for future study. For instance, several interviewees expressed the scientifically false opinion that Kern County oil production is environmentally superior to oil produced elsewhere. How was this opinion formed? How can such misperceptions be corrected? Other new directions for research emerge from anecdotal observations that are not yet quantified; for instance, the estimate from multiple solar installation companies that about half of their employees had previously worked in the oil patch. Quantifying this statistic could prove valuable to future policymaking.

Indeed, exploring ways the findings of this thesis can be applied to policymaking is the most obvious and perhaps the most important next step of this project. And because the academic literature connecting inclusive energy transitions to state and local level policy is still nascent, this thesis highlights several areas in which the theoretical frameworks must be clarified. Jobs across the energy sector ought to be defined and tracked more carefully, taking notice of different types of labor within an industry. As for the academic integration of justice into these discussions, energy justice offers a particularly philosophical approach based on energy access; just transitions offers a labor-based approach focusing heavily on employment and secondarily on community renewal; and climate policy equity balances the principles of environmental justice, economic equity, and

accountability. Each could benefit from further testing with diverse case studies, and if Kern is a good example, would benefit from greater attention placed on non-employment economics.

And my future direction? One of the main objectives of this thesis was to contribute to the ongoing integration of social research and activist-initiated frameworks into academia under the belief that such perspectives are critical to well-informed policy research. On the other side of the same coin, I believe it is essential that intensively-researched academic findings are communicated back into the public sphere, and when possible, that this is done in a hopeful manner. Indeed, this is somewhat coming full circle given that my thesis research began as a more environmental communication-inclined project in building empathy and sharing stories. Another contribution that the world of social science brings to the world of communication is the literature on environmental optimism and the importance of refocusing with hope (Kelsey and Armstrong, 2012). If you care to join me, see my contributions to such optimistic environmental communications in the end note.

## End Note: Refocusing

If you drive far enough south down the I-5 freeway from San Francisco, at some point you will blink to refresh your eyes in the blurry dullness of the drive, and when your vision returns just a moment later, you will find that a sepia lens has taken over. It colors the ground, it's in the air. Your stomach may become heavy, giving up the fight against gravity and tugging incessantly down toward your ankles as you realize the sepia color is not a trendy Instagram filter. That lens is life in Kern County, California, where the valley geography and preeminence of dairy farms and oil operations create the worst air quality in the country.

Even within this filter, I can pinpoint the moment deserts stopped being synonymous with death; not vacant stretches of doom and dry throats, but places of hope and resilience. It was 104 degrees, the type of heat where sweat is more of a second layer glossing your skin than individual beads of salted water, and I watched a man watch a turtle among rows and rows of industrial solar panels. The turtle – a threatened desert Mojave tortoise – seemed to be enjoying itself, nibbling at a small sprig of green emerging from the metal base of the steel scaffolding, taking refuge in the shade of the glassy expanse of panels the scaffolding supported. The man leaned against the chain link fence, wiping sweat from his tanned brow, then pulling down the red bandana from over his mouth. He was smiling. He untied his bandana and reached down to the tortoise, wiping dust from its shell. He uncapped his water bottle, first taking a swig himself, and then pouring a little bit of it onto the ground near the tortoise. He tied the bandana back around his neck, pulled it over his smile, and resumed clearing the coating of desert grit from the panels.

The worker I watched, like many in the emerging desert renewable energy sector, lives in Bakersfield and commutes to the energy projects in the eastern part of the county. As I think about the worker, I realize that the story of desert ghost towns and negative population growth in an area

sometimes mocked as the “armpit of California” ignores the desert tortoise, the man in the red bandana, and the seemingly endless stretches of solar panels.

Driving through the roads of Kern County is like driving through a museum. Each stop offers a vignette of the rural lifestyle, an insight into a different time. First come the oilrigs. Some are remnants of a former West, the West of the movies, with wooden trellises fighting the battle of age. Driving further, the gradient of oil derricks turns into a more uniformly-mechanized motion, sleek steel painted black and pumping rhythmically. From a distance the rigs look like charred trees spotting a desert landscape.

In an odd way, passing through the wind farm ten minutes down the road doesn’t feel too different from the oil field. The age of each section of wind turbines is easily discernible. The older infrastructure is smaller, often strikingly similar to the derricks with their wooden bases. Ominous black spots appear to be growing near the hub of some of the middle-aged turbines; oil leaking from the seals connecting the blades and the support tower of the otherwise modern-minimalist-chic apparatus. And then there’s the newer turbines, blades the size of airplanes cleanly slicing through the air. No jolts, no shaking, just smooth rotations. The turbines stretch from the basin up into the rolling hills, growing in newness and size and at some points stretching as far as the eye can see.

From certain hilltops, solar farms down below appear to be desert lakes; the oasis metaphor creates itself. The panels lose their crisp square edges and sterile quality in favor of a dark glistening against the tan ground. The lake effect fades upon approach and perspective flattens the panels, of which the surface can’t be seen from the road. It’s more like driving through hundreds of plain grey tables. As you drive back into town, the solar panels are in the communities too, shading school parking lots or resting discreetly across the rooftops.

The problem with filters and narratives is that we become so used to them we don't realize we're in them. Social scientists call these norms. The norms of Kern County have been teenagers leaving high school to enter the oil patch at \$20/hour starting wages, and second graders lining up to grab their inhaler from the communal inhaler bucket before and after recess. The norms of our media and political discourse have been the collapse of coal towns and the nevertheless unresolved problem of a perilous global warming. And dating back to biblical times, the normative interpretation of the desert has been as a barren land with only hazards to be traversed. But counter-narratives can emerge without us noticing, overturning and shifting norms from within. We can embrace these new norms.

In the eastern part of Kern County, there's a quiet road called Comanche. It's one lane on either side, and the traffic is mostly farming equipment and semi-trucks. One side of the road presents alternating patches of row crops and slowly-bobbing oil derricks. On the other side, rows of shimmering black solar panels stretch back from behind the industrial fencing and fade into the landscape. The air is still tinted red and brown, but as the breeze brushes dust against my ankles, I am convinced the winds of change will be brought into focus regardless.

## Works Cited

- American Lung Association. (2016). *State of the Air 2016*. Retrieved from: <http://www.lung.org/assets/documents/healthy-air/state-of-the-air/sota-2016-full.pdf>
- Auter, Z. (March 24, 2016). *In U.S., 73% Now Prioritize Alternative Energy Over Oil, Gas*. Gallup. Retrieved from: <http://news.gallup.com/poll/190268/prioritize-alternative-energy-oil-gas.aspx>
- Bell, M. (January 22, 2013). *Big Oil, Small Jobs: A Look at the Oil Industry's Dubious Job Claims*. American Progress. Retrieved from: <https://www.americanprogress.org/issues/green/news/2014/01/22/82571/big-oil-small-jobs-a-look-at-the-oil-industrys-dubious-job-claims/>
- Bourne, L. (July 2006). *Project Relationships and the Stakeholder Circle*. Melbourne: Mosaic Project. Retrieved from [https://mosaicprojects.com.au/PDF\\_Papers/P010\\_Stakeholder\\_Circle.pdf](https://mosaicprojects.com.au/PDF_Papers/P010_Stakeholder_Circle.pdf)
- Brajer, V. and F. Lurmann (March 29, 2006). *Air Pollution Costs San Joaquin Valley \$3 Billion a Year*. Cal State Fullerton News. Retrieved from: [http://calstate.fullerton.edu/news/2006/185\\_airpollutionreport.html](http://calstate.fullerton.edu/news/2006/185_airpollutionreport.html)
- Brandt, A. (October 12, 2011). *Oil Depletion and the Energy Efficiency of Oil Production: The Case of California*. *Sustainability*, 3(10), 1833-1854. Retrieved from: <http://www.mdpi.com/2071-1050/3/10/1833/htm>
- Brandt, A., A. Millard-Ball, M. Ganser and S. Gorelick. (May 22, 2013) *Peak Oil Demand: The Role of Fuel Efficiency and Alternative Fuels in a Global Oil Production Decline*. *Environmental Science & Technology*, 47 (14), 8031–8041. Retrieved from: <http://pubs.acs.org/doi/abs/10.1021/es401419t>
- Brandt, A., D. Millstein, L. Jin, and J. Englander. (2015). *Air Quality Impacts from Well Stimulation*. California Council on Science and Technology. Retrieved from <https://ccst.us/publications/2015/vol-II-chapter-3.pdf>
- Brookings. (September 11, 2015). *Kern County Tops List for Wind Power Capacity in US*. Retrieved from: <http://kedc.com/kern-county-tops-the-list-for-wind-power-capacity-in-us/>
- CA Air Resources Board. (June 16, 2017). *California Greenhouse Gas Emission Inventory - 2017 Edition*. Retrieved from <https://www.arb.ca.gov/cc/inventory/data/data.htm>
- California Energy Commission A. (2017). *California Energy Commission – Tracking Progress*. Retrieved from: [http://www.energy.ca.gov/renewables/tracking\\_progress/documents/renewable.pdf](http://www.energy.ca.gov/renewables/tracking_progress/documents/renewable.pdf)

- California Energy Commission B. (May 2017). *Kern County Renewable Energy Fact Sheet*. Retrieved from: [http://www.drecp.org/counties/factsheets/Kern\\_county.pdf](http://www.drecp.org/counties/factsheets/Kern_county.pdf)
- California Environmental Health Tracking Program. (2013). *The Cost of Premature Birth from Preventable Air Pollution in California*. Retrieved from: <http://www.cehtp.org/page/mih/the-cost-of-premature-birth-from-preventable-air-pollution-in-california>
- Callahan, C., J DeShazo, C. Kenyon. (2011). *Pathways to Environmental Justice: Advancing a Framework for Evaluation*. UCLA Luskin Center for Innovation. Retrieved from: <https://luskin.ucla.edu/sites/default/files/Pathways%20to%20Environmental%20Justice.pdf>
- Carley, S., T. Evans, and D. Konisky. (2018). Adaptation, culture and the energy transition in American coal country. *Energy Research & Social Science*, 37: 133-139.
- Casey, T. (February 28, 2018). *Solar Tariff? What Solar Tariff? State-Level Regs Have Greater Impact*. Clean Technica. Retrieved from: <https://cleantechnica.com/2018/02/26/solar-tariff-solar-tariff-state-level-regs-greater-impact/>
- Center for Climate and Energy Solutions. (n.d.) *California Cap and Trade*. Retrieved from <https://www.c2es.org/content/california-cap-and-trade/>
- Colthorpe, A. (June 23, 2014). *California property tax exemptions for PV systems extended to 2025*. PV Tech. Retrieved from: [https://www.pv-tech.org/news/california\\_property\\_tax\\_exemptions\\_for\\_pv\\_systems\\_extended\\_to\\_2025](https://www.pv-tech.org/news/california_property_tax_exemptions_for_pv_systems_extended_to_2025)
- Department of Energy. (November 14, 2016). *4 Charts That Show Renewable Energy is on the Rise in America*. Retrieved from: <https://energy.gov/eere/articles/4-charts-show-renewable-energy-rise-america>
- Department of Energy A. (2017). *Renewable Energy Factbook 2017*. Retrieved from: <https://www.nrel.gov/docs/fy18osti/70231.pdf>
- Department of Energy B. (January 2017). *US Energy and Employment Report*. Retrieved from: [https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report\\_0.pdf](https://www.energy.gov/sites/prod/files/2017/01/f34/2017%20US%20Energy%20and%20Jobs%20Report_0.pdf)
- Duke Energy Initiative (2015). *Oil, gas play key role for Kern County public finances*. Retrieved from: <https://energy.duke.edu/content/oil-gas-play-key-role-kern-county-public-finances>
- EPA (n.d.) *Sources of Greenhouse Gas Emissions*. Retrieved from: <https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions>

- Farrell, C. (2012) A just transition: lessons learned from the environmental justice movement. *Forum for Law and Social Change*, 4 (45) 45-63. Retrieved from: <https://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=1026&context=dfllsc>
- Fitzgerald, T. (April 21, 2016) *Economics of Oil and Gas Royalties*. Texas Tech University Research Symposium. Retrieved from [http://www.usaee.org/chapters/documents/Houston\\_0416.pdf](http://www.usaee.org/chapters/documents/Houston_0416.pdf)
- Grist. (January 29, 2018) *10 ways solar is transforming the US*. Grist. Retrieved from: <https://grist.org/article/10-ways-solar-is-transforming-the-u-s/>
- Haggerty, J., M. Haggerty and R. Rasker. (2014). Uneven Local Benefits of Renewable Energy in the U.S. West: Property Tax Policy Effects. *Western Economics Forum*, 13(1). Retrieved from: [https://headwaterseconomics.org/wp-content/uploads/Uneven\\_Local\\_Renewable\\_Tax\\_Benefits.pdf](https://headwaterseconomics.org/wp-content/uploads/Uneven_Local_Renewable_Tax_Benefits.pdf)
- Haggerty, J., M. Haggerty, R. Rasker and P. Gude. (2014). County Economic Development at a Glance: A Single Measure of Opportunity. *Western Economics Forum*, 13(1). Retrieved from: [https://headwaterseconomics.org/wp-content/uploads/County\\_Economic\\_Performance\\_Index.pdf](https://headwaterseconomics.org/wp-content/uploads/County_Economic_Performance_Index.pdf)
- Hart, A. and J. Miller (May 8, 2017). *Here's who spent the most lobbying California government this year*. Sacramento Bee. Retrieved from: <http://www.sacbee.com/news/politics-government/capitol-alert/article149176389.html>
- Hsu, T. (January 27, 2015). *Kern County declares a fiscal emergency amid plunging oil prices*. LA Times. Retrieved from: <http://www.latimes.com/business/la-fi-kern-fiscal-emergency-20150127-story.html>
- Jenkins, K., A. Forman, D. McCauley. (February 2017). Energy justice: A policy approach. *Energy Policy*. Retrieved from: [https://www.researchgate.net/publication/313254633\\_Energy\\_justice\\_A\\_policy\\_approach](https://www.researchgate.net/publication/313254633_Energy_justice_A_policy_approach)
- Jones, B. and K. Duncan. (2017). *The economic impacts of California's major climate programs on the San Joaquin Valley*. UC Berkeley Center for Law, Energy & the Environment. Retrieved from: <http://laborcenter.berkeley.edu/pdf/2017/economic-impacts-climate-programs-san-joaquin-valley.pdf>
- Kern Economic Development Corporation (KEDC). (n.d.). *Labor & Industry Data*. Retrieved from: <http://kedc.com/resources/labor-force-and-industry-employment-data/>
- KEDC. (2014). *Oil and Gas Economic Report*. Retrieved from: <http://kedc.com/wp-content/uploads/2013/11/KEDF-Oil-and-Gas-Economic-Impact-Report.pdf>
- Kelsey, E. and J. Armstrong. (2012). Chapter 12: Finding hope in a world of environmental catastrophe. *Learning for sustainability in times of accelerating change*, 188-202.

Retrieved from: <https://www.wageningenacademic.com/doi/pdf/10.3920/978-90-8686-757-8#page=188>

Kern County Elections Department. (November 9, 2016). *Kern County Election Results*. Kern County.

Kern County Public Health Services Department. (April 2017). *Community Health Assessment: 2015-2017*. Retrieved from: [http://kernpublichealth.com/wp-content/uploads/2017/04/Community-Health-Assessment\\_04.18.17\\_1.pdf](http://kernpublichealth.com/wp-content/uploads/2017/04/Community-Health-Assessment_04.18.17_1.pdf)

Kornick, S. (October 20, 2017). *Alberta oil and gas workers get solar energy training*. Global News. Retrieved from <https://globalnews.ca/news/3815702/alberta-oil-and-gas-workers-get-solar-energy-training/>

Kuipers, D. (April 17, 2017). *Small California towns are facing off against oil companies — and winning*. Grist. Retrieved from <https://grist.org/article/small-california-towns-are-facing-off-against-oil-companies-and-winning/>

Labelle, M. (August 2017). In pursuit of energy justice. *Energy Policy*, 107: 615-620. Retrieved from: <https://www.sciencedirect.com/science/article/pii/S0301421517302082>

Lobao, L., M. Zhou, M. Partridge, and M. Betz. (September 2016). Poverty, place, and coal employment across Appalachia and the United States in a New Economic Era. *Rural Sociology*, 81 (3) 343-386.

Louie, E. and Pearce, J. (June 11, 2016). Retraining investment for US transition from coal to solar photovoltaic employment. *Energy Economics*, 57: 295-302.

Luke, N., C. Zabin, D. Valasco, R. Collier. (August 2017) *Diversity in California's Clean Energy Workforce: Access to Jobs for Disadvantaged Workers in Renewable Energy Construction*. UC Berkeley Labor Center. Retrieved from: <http://laborcenter.berkeley.edu/pdf/2017/Diversity-in-Californias-Clean-Energy-Workforce.pdf>

Magill, B. (April 8, 2017). *Americans Used a Lot Less Coal in 2016*. Scientific American. Retrieved from: <https://www.scientificamerican.com/article/americans-used-a-lot-less-coal-in-2016/>

Marlon, J., P. Howe, M. Mildenerger, and A. Leiserowitz. (2016). *Yale Climate Opinion Maps – U.S. 2016*. Retrieved from: <http://climatecommunication.yale.edu/visualizations-data/ycom-us-2016/?est=fundrenewables&type=value&geo=county>

Masnadi, M. and A. Brandt. (June 17, 2017). Climate impacts of oil extraction increase significantly with oilfield age. *Nature Climate Change*, 7: 551-556. Retrieved from: <https://www.nature.com/articles/nclimate3347>

- Mattzie, T. (January 27, 2018). *Red states will be the real losers from Trump's solar tariff*. The Hill. Retrieved from: <http://thehill.com/opinion/energy-environment/370953-red-states-will-be-the-real-losers-from-trumps-solar-tariff>
- Mayer, S. (December 27, 2017). *Signs of recovery: Is exodus of workers due to oil slump over?* Bakersfield California. Retrieved from: [http://www.bakersfield.com/news/signs-of-recovery-is-exodus-of-workers-due-to-oil/article\\_888e67a6-eb56-11e7-bab7-af52edc0bddf.html](http://www.bakersfield.com/news/signs-of-recovery-is-exodus-of-workers-due-to-oil/article_888e67a6-eb56-11e7-bab7-af52edc0bddf.html)
- Medina, L. (June 12, 2017) *Harnessing solar energy to fight local hunger*. Bakersfield Californian. Retrieved from: [http://www.bakersfield.com/kern-business-journal/harnessing-solar-energy-to-fight-local-hunger/article\\_de7c8417-10b3-59ab-bffe-3265321d6881.html](http://www.bakersfield.com/kern-business-journal/harnessing-solar-energy-to-fight-local-hunger/article_de7c8417-10b3-59ab-bffe-3265321d6881.html)
- Merchant, E. (December 11, 2017). *One of California's Biggest Solar Projects Will be Located at an Oil Field*. Green Tech Media. Retrieved from: <https://www.greentechmedia.com/articles/read/california-glasspoint-solar-enhanced-oil-recovery>
- Mernit, J. (October 19, 2017). *Why Does Green California Pump the Dirtiest Oil in the U.S.?* Retrieved from: <https://e360.yale.edu/features/why-does-green-california-pump-the-dirtiest-oil-in-the-u-s>
- Meyer, R. (March 29, 2017). *How the U.S. Protects the Environment, From Nixon to Trump*. The Atlantic. Retrieved from: <https://www.theatlantic.com/science/archive/2017/03/how-the-epa-and-us-environmental-law-works-a-civics-guide-pruitt-trump/521001/>
- Michieka, N. (June 22, 2017). Do changes in oil prices affect welfare programs? Evidence from Kern County. *Energy Economics*, 66: 116-121.
- Michieka, N. and R. Gearhart. (September 20, 2015). Oil price fluctuations and employment in Kern County: A Vector Error Correction approach. *Energy Policy*, 87: 584-590.
- Mudge, A. (February 14, 2014). *The Unintended Consequences of California's Solar Tax Exclusion*. Renewable Energy World. Retrieved from: <https://www.renewableenergyworld.com/articles/2014/02/the-unintended-consequences-of-californias-solar-tax-exclusion.html>
- Natural Resource Governance Institute (NRGI). (March 2015). *The Political and Economic Challenges of Natural Resource Wealth*. Retrieved from: [https://resourcegovernance.org/sites/default/files/nrgi\\_Resource-Curse.pdf](https://resourcegovernance.org/sites/default/files/nrgi_Resource-Curse.pdf)
- Nykvist B. and B. Turnheim. (May 28, 2015). *PATHWAYS project Exploring transition pathways to sustainable, low carbon societies*. Retrieved from: [http://www.pathways-project.eu/sites/default/files/PATHWAYS\\_D4%20Governance%20literature%20review%2020150528%20FINAL.pdf](http://www.pathways-project.eu/sites/default/files/PATHWAYS_D4%20Governance%20literature%20review%2020150528%20FINAL.pdf)

- Ori, S. (March 30, 2016). *The Disruption In Oil Markets Is Just Beginning Retrieved*. Forbes. Retrieved from: <https://www.forbes.com/sites/ucenergy/2016/03/30/the-disruption-in-oil-markets-is-just-beginning/#71fa6eb768c9>
- Pierce, H. (October 18, 2017). *Is Chevron's job-cutting 'transformation' evidence of an industry death spiral in California? Not necessarily*. Bakersfield Californian. Retrieved from: [http://www.bakersfield.com/news/is-chevron-s-job-cutting-transformation-evidence-of-an-industry/article\\_8fa24ab4-b526-11e7-a22b-8ffa2714789a.html](http://www.bakersfield.com/news/is-chevron-s-job-cutting-transformation-evidence-of-an-industry/article_8fa24ab4-b526-11e7-a22b-8ffa2714789a.html)
- Public Opinion Strategies (PON). (November 13, 2016). *Post-Election National Energy Survey*. Retrieved from: <http://www.conservativeenergynetwork.org/wp-content/uploads/2016/11/Clean-Energy-Survey4.pdf>
- Rappier, R. (February 4, 2018). *Saudi Arabia To Fund Giant Solar Project With Oil Riches*. Oil Price. Retrieved from: <https://oilprice.com/Alternative-Energy/Solar-Energy/Saudi-Arabia-To-Fund-Giant-Solar-Project-With-Oil-Riches.html>
- Rosemberg, A. (2010). Building a Just Transition: The linkages between climate change and employment. *International Journal of Labor Research*, 2 (2), 125-162. Retrieved from: [http://www.ilo.org/wcmsp5/groups/public/@ed\\_dialogue/@actrav/documents/publication/wcms\\_153352.pdf](http://www.ilo.org/wcmsp5/groups/public/@ed_dialogue/@actrav/documents/publication/wcms_153352.pdf)
- San Joaquin Valley Air Pollution Control District. N.d. *Frequently Asked Questions*. Retrieved from: [http://www.valleyair.org/General\\_info/Frequently\\_Asked\\_Questions.htm#Why%20is%20it%20so%20severe](http://www.valleyair.org/General_info/Frequently_Asked_Questions.htm#Why%20is%20it%20so%20severe)
- Shankleman, J. (July 14, 2017) *Big Oil Just Woke Up to Threat of Rising Electric Car Demand*. Bloomberg. Retrieved from: <https://www.bloomberg.com/news/articles/2017-07-14/big-oil-just-woke-up-to-the-threat-of-rising-electric-car-demand>
- Shankleman, J. and H. Warren. (July 26, 2017). *This Is What the Demise of Oil Looks Like*. Bloomberg. Retrieved from: <https://www.bloomberg.com/graphics/2017-oil-projections/>
- Solar Foundation. (2017). *Solar Jobs Census – 2017*. Retrieved from: <https://www.solarstates.org/#state/california/county/064029/solar-jobs/2017>
- Sovacool, B., M. Burke, L. Baker, C. Koticalapuda, and H. Wlokas. (June 2017). New frontiers and conceptual frameworks for energy justice. *Energy Policy*, special issue 677-691. Retrieved from: <https://reader.elsevier.com/reader/sd/61FDC0FD10829CFDB0C38A1EF76A71034472DDE5292DF1CEB585DE5133A9ADA02C1BFD9E401E193AD275CCDCB5C8339>
- Stephens, M., and C. Knoll. (June 22, 2016). *26 Million Trees Have Died in the Sierra since October, Raising Fire Risk*. Los Angeles Times. Retrieved from:

<http://www.latimes.com/local/lanow/la-me-ln-drought-dead-trees-20160622-snap-story.html>

Susser, D., M. Doring, and B. Ratter. (February 2017). Harvesting energy: Place and local entrepreneurship in community-based renewable energy transition. *Energy Policy*, 101: 332-341. Retrieved from: <https://www.sciencedirect.com/science/article/pii/S0301421516305638>

Tsvetkova, A. and M. Partridge. (August 6, 2016). Economics of modern energy boomtowns: Do oil and gas shocks differ from shocks in the rest of the economy? *Energy Economics*, 45: 81-95.

US Census. (July 2015). *Population Estimates*, Kern County California QuickFacts. Retrieved from: <https://www.census.gov/quickfacts/fact/table/kerncountycalifornia/PST045216>

Wethe, D. (January 23, 2017). *Robots Are Taking Over Oil Rigs*. Bloomberg. Retrieved from: <https://www.bloomberg.com/news/articles/2017-01-24/robots-are-taking-over-oil-rigs-as-roughnecks-become-expendable>

Zabin, C., A. Martin, and R. Morello-Frosch. (September 16, 2017). *Advancing Equity in California Climate Policy: A New Social Contract for Low-Carbon Transition*. UC Berkeley Center for Labor Research and Education. Retrieved from: <http://laborcenter.berkeley.edu/pdf/2016/Advancing-Equity.pdf>

