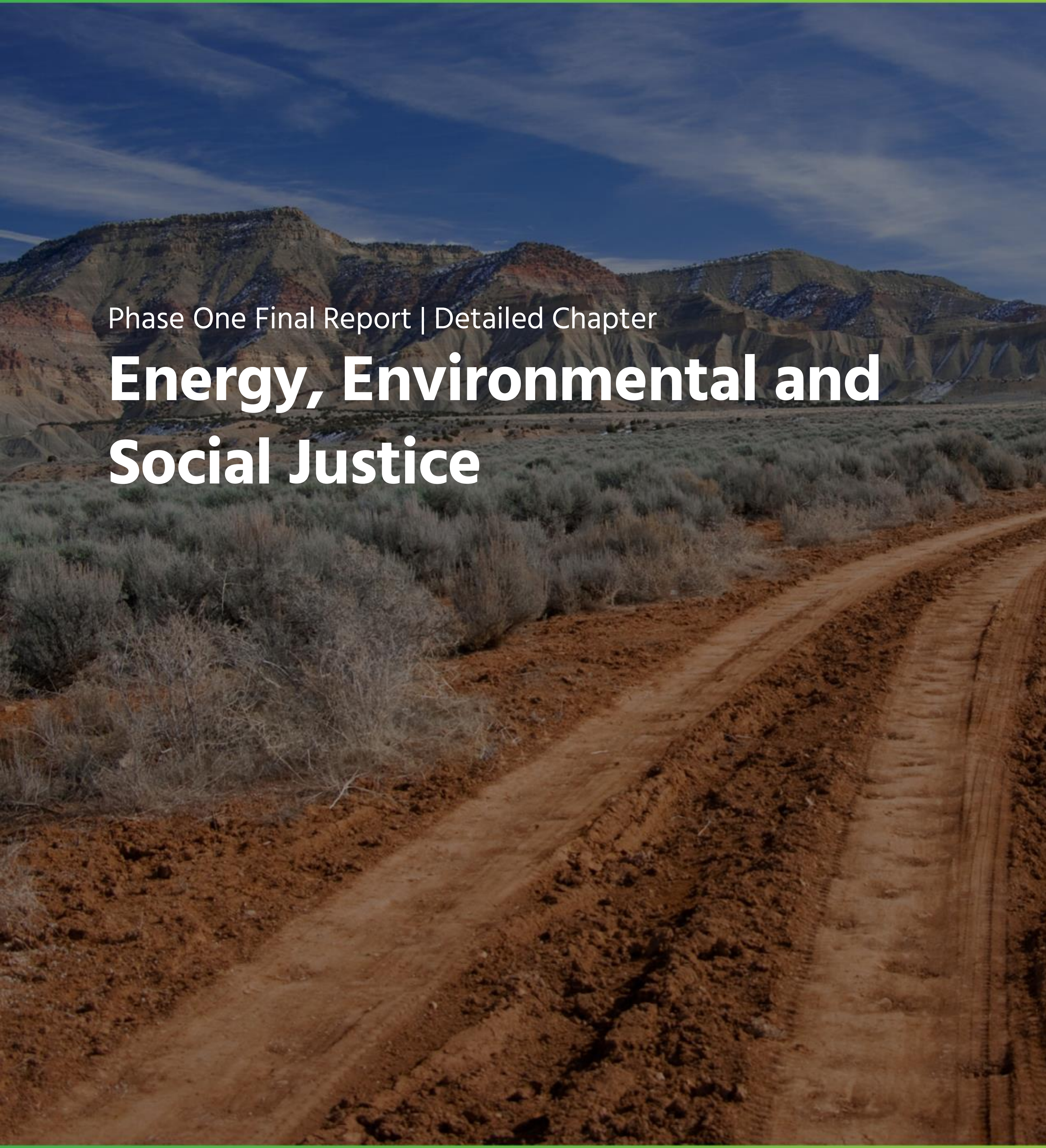

Phase One Final Report | Detailed Chapter

Energy, Environmental and Social Justice

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About this report

The Intermountain West Energy Sustainability & Transitions (I-WEST) initiative is funded by the U.S. Department of Energy to develop a regional technology roadmap to transition six U.S. states to a carbon-neutral energy economy. I-WEST encompasses Arizona, Colorado, Montana, New Mexico, Utah, and Wyoming. Each state is represented in this initiative by a local college, university, or national laboratory. Additional partners from beyond the region were selected for their expertise in applicable fields. In the first phase of I-WEST, the team built the foundation for a regional roadmap that models various energy transition scenarios, including the intersections between technologies, climate, energy policy, economics, and energy, environmental, and social justice. This chapter presents work led by an I-WEST partner on one or more of these focus areas. A summary of the entire I-WEST phase one effort is published online at www.iwest.org.

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Key takeaways

- Environmental justice is evolving. Early emphasis focused primarily on the distribution of harms and later benefits. Now, procedural justice—meaningful engagement and collaborative decision-making—as well as restorative justice— addressing past harms—have become equally important.
- Energy justice is gaining currency, applying justice principles to energy policy, energy consumption, energy security, energy production and systems at different scales, and energy activism (Jenkins et al, 2015). This review uses the term "energy, environmental and social justice" (EESJ) to reflect these interrelated and dynamic concepts.
- Each technology will have local impacts as projects are implemented. Therefore, each project could cause local adverse effects that must be addressed, despite overall benefits.
- The region has 63 sovereign native nations, with differing priorities and perspectives. Policy makers and project developers need to build lasting collaborations for action that advance the goals of all affected nations.
- Given the diversity of communities and perspectives, and the range of projects, no single approach will advance justice. Each project must instead develop a strategy appropriate to the project, technology, and impacted peoples and communities.
- Environmentally just processes are practices that must be adopted and evaluated for all policies and projects and evaluated to determine whether distributive outcomes further environmental justice goals.
- Restorative justice recognizes the reality that some peoples and communities have been systematically disadvantaged by past policy and law. The purpose is to ensure that new investments and projects will begin to repair past harms rather than perpetuating or deepening inequalities.

Introduction

The transition to carbon neutrality will touch all communities. At the same time, the numerous technologies, implementation pathways, initiatives, and regulations will impact peoples and communities differently. The transition will have positive impacts by reducing carbon emissions, closing some polluting facilities and mines, and creating jobs in the new energy economy. Some communities also will experience localized negative effects when facilities and mines close without equivalent or better jobs available, and new technologies may negatively impact fence line communities, or those that abut or are in near proximity to them. New facilities might compete for water, emit pollutants, or visually disrupt valued landscapes. A given change may cause intersecting improvements and negative new circumstances, and job needs may not parallel a community's goals for health and environmental conditions. For instance, a closed coal mine or generating station can reduce environmental burdens on the local communities while also causing economic precarity. Without ongoing monitoring and investment, coal ash ponds or abandoned mines can have ongoing harmful and costly environmental and health effects. According to the Department of the Interior, the Bipartisan Infrastructure Deal, for example, allocated $11.3 billion for clean-up efforts, which can lead to new jobs in impacted communities.

The purpose of this chapter is to explore the potential for advancing energy, environmental, and social justice (EESJ) in the Intermountain West energy transition. This includes increasing and fairly distributing benefits and addressing adverse environmental impacts as well as facilitating engagement processes and partnerships that advance EESJ. The Biden Administration's Justice40 Initiative directs federal agencies to ensure that disadvantaged communities receive at least 40% of overall benefits from federal climate and clean energy investments. Justice40 takes a wide-ranging approach, recognizing the potential benefits and harms to communities by discontinuing fossil-fuel energy and establishing new energy production.

Justice40 is an important step that furthers almost two decades of federal environmental justice action following the 1994 Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. Indigenous peoples, communities of color, and low-income communities are at risk of disproportionate environmental burdens. The Environmental Protection Agency (EPA) defines environmental justice as the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (EPA, 2022; Schlosberg, 2009; DOE Office of Legacy Management, 2022).[1] What constitutes fair treatment and meaningful involvement varies across contexts. Early environmental justice frameworks focused primarily on fair treatment and addressing the inequitable distribution of environmental "bads," also known as distributive justice.

Environmental justice initiatives within the EPA, DOE, and nongovernmental organizations recognize that distributive justice is only one dimension of justice in an energy transition. Over the last several decades, additional environmental justice frameworks have emerged. Procedural justice denotes the meaningful involvement of all affected parties in decision-making, and recognition justice ensures that community values, interests, and histories of injustice are taken into account in decision-making processes (Schlosberg, 2009; Bell & Cayne, 2017; Whyte, 2011). Likewise, in recent years environmental justice as a concept has become more capacious, moving beyond documenting inequity to understanding underlying reasons for injustice. Within present understandings of environmental justice, ecological concerns intersect with racial justice, indigenous rights, food security, immigrant rights, energy access, and climate justice (Schlosberg, 2013).

This chapter takes a multidimensional approach to justice as necessary for diverse communities and stakeholders to accept promising technology pathways, and for the transition to reflect diverse goals and values. The benefits and harms must be fairly distributed, diverse stakeholders must be active participants in decision-making processes, and policy and projects must recognize and account for how historical actions shaped contemporary opportunities. This approach recognizes the need for **distributive justice** to attend to how the benefits and harms will be distributed, while elevating the important call within the environmental justice movement to reduce environmental harm overall. At the same time, **procedural justice** for a collaborative, participatory transition is equally important albeit more complex. People have a right to shape projects and processes that will impact them, and different values, cultures and lifeways must be respected and reflected in broader visions and specific projects. Finally, we include **restorative justice** and the need for climate action to lead to better outcomes for communities that now live with the inequities caused by previous policy and program implementation, and legal and regulatory structures. Restorative justice is necessary to prevent people from being forced to choose one harm over another, or in other words, ensure communities that were

[1] Fair treatment signifies that no population bears an unequal share of the negative environmental consequences from a private operation or from the execution of a public action (DOE Office of Legacy Management, 2022). Meaningful involvement requires all members of a community to have active, equal access to decision makers and the ability to make informed decisions to produce positive results for their communities (DOE Office of Legacy Management, 2022).

previously disadvantaged have increased opportunity without disproportionate environmental burden in the new economy. The six-state Intermountain West also encompasses 63 sovereign nations. Policy developers and project leads will need to build relationships with the nations or peoples that may be impacted in order to develop policy and projects for a shared energy future.

Current EESJ energy transition research trajectories

Assessing whether policy supports justice is neither nontrivial nor straightforward. All policy pathways generate trade-offs and unforeseen outcomes, yielding and in some cases further perpetuating structures of inequality (Carley & Konisky, 2020). Determining what constitutes justice in each community requires identifying how different community members might be impacted by a particular policy pathway and a given project. This requires identifying existing inequities, the availability of existing or need for future social insurance or relief programs, and the present and future priorities and needs of communities (Bates, et al, 2021; Pellow, Weinberg, & Schnaiberg, 2001; Carley & Konisky, 2020). Direct connections and communication with community stakeholder groups and other local organizations can provide some insight (I-WEST, 2022; Carley & Konisky, 2020). Ensuring meaningful participation is especially important considering a growing body of literature demonstrating that traditional avenues for relief for environmental injustice, such as judicial action, have not been successful beyond halting or preventing the expansion of projects that threaten quality of life for marginalized persons (Pulido, Kohl, and Cotton, 2016). In the literature, the impacts of environmental justice are often presented in terms of trade-offs related to the environmental risks (e.g., ecosystem degradation) and rewards (e.g., cleaner air) and the gains or losses of economic opportunities (e.g., job growth, revenue generation) (Bowen, 2002; Carley & Konisky, 2020). Additionally, sociocultural considerations have become increasingly central to questions of environmental justice. Key issues include restoration of indigenous cultural and territorial sovereignty, reparations for slavery, climate change and the legacies of colonialism, as well as the need to ensure a just transition in rural communities historically dependent on the fossil fuel economy (Sze, 2020).

Because the Intermountain West is lush with both fossil-fuel and commercial-scale renewable resources and is home to many rural communities and tribal nations, it presents a unique opportunity to identify how competing policy pathways to carbon neutrality influence environmental justice. Achieving a low-carbon future in the region is likely to involve a transition away from a fossil-fuel based economy to one powered by low-carbon alternatives, including renewable resources (e.g., wind, solar, biomass, geothermal) and advanced fossil-industries equipped with carbon capture, utilization, and storage [CCUS] technologies (I-WEST, 2022; Carley & Konisky, 2020).

Low-carbon alternatives are often framed as more just and equitable than their carbon-intensive counterparts (O'Sullivan, Golubchikov, & Mehmood, 2020; Lacey-Barnacle, Robinson, & Foulds, 2020; Crow & Li, 2020; Hernández, 2015). However, the reality is more complex. "Embodied energy injustices" can arise at various points along supply chains—from extraction and processing to transport and disposal (Healy, Stephens, & Malin 2016). Likewise, the pace of transitions has historically varied. While long, protracted energy transitions have been the norm, exceptions suggest that certain catalysts, such as social movements, political prioritization, and conflict, can accelerate transition (Sovacool, 2016). The pace of transition can become a justice issue, especially if there is little time to plan for a managed transition that adequately addresses current and future community needs. While recent reports such as the Intergovernmental Panel on Climate Change's Working Group III Report urge a rapid shift to a low-carbon energy economy, rapid transitions can have direct consequences on the economic vitality of marginalized communities (Bumpus & Liverman, 2008; Sovacool, Martiskainen, Hook, & Baker, 2019; Sovacool, 2021). More specifically, rapid transition can negatively impact communities that have long relied on traditional, fossil-fuel based industries to support economic, cultural, social, and physical development within the community over many generations (Della Bosca & Gillespie, 2018; I-WEST, 2022; Mayer, 2018; Abraham, 2017).

When nonrenewable industries such as coal mining, uranium mining, and oil and gas production cease operations, communities surrounding these industries can be left with fewer good paying jobs (Interagency Working Group, 2021). Avoiding worker displacement and sustaining secure jobs, both during and following the energy transition, are primary concerns of public policy and other decision makers in the region (I-WEST, 2022). One way to support these communities would be to make them hubs for the construction and maintenance of renewable energy equipment; invest in critical infrastructure development (e.g., extending broadband connections, water system infrastructure upgrades, and roadway improvements); or sponsor CCUS retrofits of existing fossil-based industries (Interagency Working Group, 2021).

Green-job promotion is often considered to be a key ingredient to a "just transition" away from fossil-based industries, specifically coal mining (Abraham, 2017). While coal mining in the Intermountain West has historically provided well-paying, blue-collar jobs (Rolston 2014), there are associated health risks. Being employed in an underground coal mine has been shown to increase the likelihood of contracting pneumoconiosis (i.e., black lung disease) (Lu, Dasgupta, Cameron, Fritschi, & Baade, 2021; Potera, 2019) and localized exposure to surface mining activities has been shown to lead to higher rates of morbidity and mortality (Mueller R., 2022). Prolonged exposure to surface mining–the dominant form of mining in the West–has been linked to an increased risk of being hospitalized for asthma or asthma-related health issues (Fitzpatrick, 2018). Other potential community health effects include an increased risk of contracting lung and other types of cancer (Buchanich, Balmert, Youk, Woolley, & Tallbott, 2014;

Hendryx, O'Donnell, & Horn, 2008; Christian, Huang, & Rinehart, 2011) and a higher likelihood of having respiratory, cardiovascular, or kidney disease (Hendryx & Ahern, 2009; Esch & Hendryx, 2011). Truly "green" jobs to replace those lost would pay well while minimizing health and safety risks.

Strong sociocultural attachments to mining make transitioning away from coal challenging (Della Bosca & Gillespie, 2018; Sanz-Hernandez, 2020). Regional pride in the cultural heritage of fossil-fuel labor exists alongside, and sometimes in tension with, an affinity for public lands, outdoor recreation, and place-based identity, making discussions about energy transition complex and multilayered (Cha, 2019; Western & Gerace, 2020). Strong politicization of energy transitions has led, on the one hand, to defensiveness on the part of coal miners, many of whom worry about climate change (Smith 2019), to social ostracization and political censorship of those who speak out against fossil-fuel development or even broach the subject of transition (Lockwood, 2017), on the other. While the cost of implementing just transition policies for fossil-dependent workers has been estimated as a modest $600 million, with combination policies tailored to specific communities preferred over single-shot solutions (Pollin & Callaci, 2018), cultural attitudes toward transition can lead to lack of preparedness by community members to receive federal aid to support transition initiatives (Bleizeffer, August 4, 2021).

Justice issues vary by energy source, including renewables. Wind energy projects have been shown to generate instances of environmental injustice for younger, less-educated populations in rural areas (Mueller & Brooks, 2020). Similar to coal mining, social norms, attitudes, and behaviors of community members shape the justice perceptions of wind energy development (Aitken, 2010; Karakislak, Hildebrand, & Schweizer-Ries, 2021). While a wind is a low-carbon alternative, local externalities (e.g., noise, aesthetics) do exist for variable and other renewable energy resources (Devine-Wright, 2014; Ellis, Barry, & Robinson, 2007; Devine-Wright, 2007). In some places, wind turbines have implications for viewshed–an area visible from a specific location–which can impact property values and outdoor recreation and tourism, particularly in regions that expect recreation and tourism revenue to offset dwindling revenue from fossil fuels (Groothius, Groothius, & Whitehead, 2008). Furthermore, large-scale wind and solar projects are land-intensive and can damage local ecosystems and livelihoods. In Mexico, for example, large wind and solar projects risk perpetuating injustices experienced by indigenous communities. Concepts like consent and participation are often paid lip-service in pursuit of social license to operate (Baker, 2018; Barragan-Contreras, 2021; Ramirez and Böhm, 2021).

In addition, injustices also pervade renewable-energy supply chains (Healy, Stevens, and Malin, 2019; Heffron, 2020). Critical minerals and rare-earth elements necessary for renewable energy technology are predominantly imported to the United States from Asia, Latin America, Africa, and elsewhere. Yet, there have been allegations of human rights abuses and forced labor in global supply chains, as well as the inequitable distribution of mineral wealth (Heffron 2020; Murphy and Elimä, 2021; Owen et al, 2022).

Despite recent efforts to onshore production (including in the Intermountain West) to reduce foreign dependence and circumvent supply chain issues, regulatory weaknesses and uncertainty over net benefit to local communities in terms of job creation and taxation exist (Riofrancos, 2022).

Nuclear energy, long a hallmark of the Intermountain West region, also raises concerns about justice. The 2022 Russian invasion of Ukraine has thrown into sharp view the United States' dependence on Russian uranium, with implications for emergent nuclear facilities such as Terrapower's Natrium reactor demonstration project, anticipated to be completed in Kemmerer, Wyoming, in 2028. While the Kemmerer project has been applauded for creating jobs in a rural community that had lost its coal mining industry, researchers at Stanford caution that small modular reactors will produce significant amounts of highly radioactive nuclear waste that will need to be stored and packaged (Shwartz, 2022). The legacies of nuclear energy and domestic uranium mining in the United States are also well known. For example, in impoverished rural communities on the Colorado Plateau, issues of isolation and resource dependence clash with questions on environmentally safe uranium extraction and waste-disposal practices (Malin, 2015). In the southwestern United States, the impacts of uranium mining, nuclear weapons testing, and hazardous waste disposal, including radiation-related illness, have been most acutely felt in indigenous communities that were not involved or properly consulted by government and industry officials (Brugge et al, 2006; Kuletz, 1998).

Emergent carbon dioxide removal (CDR) technologies, such as CCUS, also present unique justice issues. During CCUS development and deployment processes, for example, claims of procedural injustice may arise from locally affected populations over lack of inclusion in planning of deployment processes or lack of transparency and availability of information. Issues like siting; transshipment and storage of captured carbon dioxide; impacts on air quality, and human and ecosystem health; and job creation are all potential sites of conflict and disenfranchisement at the community level (McLaren, 2009; Batres, Wang, Buck, et al, 2021). More broadly, varying local impacts of CDR projects, including impacts on environments and community well-being, are not yet well understood. Justice issues may also arise if technologies like CCS are used to avoid or altogether delay emission reductions and the transition to a low-carbon energy economy (Healy, Scholes, Lefale, & Yanda, 2021).

This body of research acknowledges that environmental inequities exist and are often rooted in histories of exploitation and suggests that inequities and their roots be strongly considered during policy design and implementation processes. This report also recognizes that many transitions are happening at once and at different paces, with different impacts on local communities and ecosystems. Facilitating a just and equitable transition demands consideration of uniquely local factors, including the distribution of environmental "goods" and "bads"; the meaningful participation of affected communities during all phases of policy design and implementation; and the recognition of cultural values.

A multiplicity of energy transitions

Energy transitions are underway throughout the Intermountain West. Each community is situated differently and will face varying economic and energy opportunities. The following energy snapshots show just a few of the complex situations evolving throughout the region. Each situation raises critical questions about environmental and social justice. These are not intended to be comprehensive. Instead, they show numerous opportunities, conflicts, and differing perspectives that help illustrate the intersecting ways that communities will be impacted and respond to energy transition. Regional communities have multifaceted relationships to energy. Uranium and coal mining, and oil and gas production have provided good jobs and opportunities *and* contributed to poor health, poor air quality, contaminated soil, and volatile local economies. These and many other living legacies shape community responses.

The Intermountain West has a rich and varied history of energy production. From the hydro power that fueled 19th century and early 20th century Utah, to the uranium reserves in the Navajo Nation, all six Intermountain West states and tribal nations have diverse energy economies as well as consumption profiles. In Wyoming, commercial coal mining began in the mid-1860s when the Union Pacific Railroad arrived, and since that time over 12.5 billion short tons of coal have been mined; the Powder River Basin has been the largest supplier of coal to the U.S. market since the mid-1990s. Wyoming also has major oil and gas, uranium, and other mineral production operations – alongside a growing wind energy industry – creating financial booms as well as busts. Colorado has rich fossil fuel resources and abundant renewable energy sources including wind, solar, hydroelectric, and geothermal. Colorado coal production began in 1864, although it has decreased in the last decade. Colorado ranks 8th among the U.S. for proven oil reserves, and 29 of the state's counties produce oil (Colorado Geological Survey). Coupled with the rapid growth of suburbs, just under half a million people lived within one mile of an active well in 2018 (Haggerty et al, 2018). Arizona is home to 11 hydroelectric dams as well as uranium mines that are suspected of potential contamination of the Colorado River (Arizona Geological Survey). Utah has natural gas and coal, and New Mexico has significant oil and gas reserves. All southwestern states have opportunities for solar and wind expansion.

Tribes have different energy geographies in the Intermountain West, and varied ways to participate in the new energy economy. The Southern Ute Tribe in Colorado is a major oil and gas producer, and by 2022 was exploring a zero-emission natural gas power plant. The Crow Nation in Montana has a long history of coal production, whereas the Northern Cheyenne, near neighbor to the Crow Nation, have not mined coal on their lands. Half the uranium within the United States is located in Indian Country (Regan, 2014). The Navajo Nation has coal, uranium and oil and gas. The Kayenta Coal Mine closed (see below), and the Black Mesa mine production may cease or be greatly reduced.

Spotlight on Coal Transitions in the Navajo Nation

The Navajo Generating Station, which operated along the Arizona-Utah border for more than forty years, was the biggest coal plant in the Intermountain West. It closed in November 2019, months after the Kayenta mine that fed it closed. According to owners and operators, low natural gas prices, along with increasing access to renewables (e.g., solar and wind), made the coal plant uncompetitive, and the Salt River Project (majority owners and operators of the Navajo Generating Station) reported that low natural gas prices were a driving factor. Additionally, the Navajo Generating Station was the Kayenta mine's sole customer. While the plant's closing is a step toward carbon neutrality, the local impacts are substantial. The generating station employed over 800 indigenous people—over 90% of its workforce were Diné—and it paid higher than average wages. At the Kayenta mine, the average salary was $117,000. At the same time both the plant and mine were responsible for decades of adverse environmental impacts (Arvin, 2020). It emitted high rates of greenhouse gases, and polluted water and soil used by Navajo ranchers. Indigenous-led grassroots organizations guided activism to close the plant and mine and are now closely watching the restoration. The organization Tó Nizhóní Ání was established in 2001 to protect Black Mesa's water source from industrial use and waste including Peabody Energy's Kayenta and Black Mesa mines. Diné C.A.R.E. has also been advocating to retire coal plants and mines and demanding sustainable development practices. In addition, the history of the Navajo Generating Station reflects unequal access to energy. Most of the power went to Phoenix as some Navajo and Hopi households near the generating station went without electricity (Arvin, 2020). The Navajo Generating Station highlights that any given project has people who may benefit and those who may be harmed. Sometimes the people who benefit are also the ones who are harmed. People may benefit in one way, such as from a cleaner environment, while simultaneously experiencing job losses. Environmental justice analyses are needed to account for multiple and, at times, conflicting effects. Nicole Horseherder, a founding member of Tó Nizhóní Ání, has highlighted the many dimensions of a just and equitable transition, including "clean-up and reclamation of mined land and water, new jobs at solar plants, electrification of Native communities, new water infrastructure to ensure reliable clean water and broadband internet access" (Horseherder, 2021).

Fossil fuel communities in transition

Economic dependence on fossil fuels

The coming energy transition will mean that some states and communities will gain new industries, jobs, and sources of tax revenue. Others, however, will lose the fossil industries they currently depend on for revenue. The high degree of fiscal dependence that some states and communities have on revenue from fossil energy makes the people living there particularly vulnerable to the current energy transition and raises environmental justice concerns. Fossil fuels formed the economic and cultural foundation for many Intermountain West communities. The 2021 Executive Order 14008, Tackling the Climate Crisis at Home and Abroad, identifies these areas as priorities for transition investments. The Interagency Working Group on Coal and Power Plant Communities and Economic Revitalization identified 25 of the most impacted coal regions for priority investment.

The top 25 coal-dependent areas, based on the number of direct coal-related jobs as a percentage of total jobs, include the following Intermountain West communities:

- Eastern Wyoming's Powder River Basin (ranked 8)
- Western Wyoming (ranked 9), Arizona non-metropolitan area (ranked 10)
- Central Utah non-metropolitan area (ranked 13)
- Farmington, New Mexico (ranked 16)
- Greeley, Colorado (ranked 19) and
- Grand Junction, Colorado (ranked 22)

The Interagency Working Group identified up to $37.9 billion in existing programs that could be accessed by energy communities for improvements ranging from infrastructure investment and broadband access for future economic development to environmental remediation (Interagency Working Group, 2021).

In fossil fuel states, tribal nations, counties, and municipalities, fossil-based energy continues to produce significant revenue for essential community functions such as schools, governments, and other social services. A 2022 study by Resources for the Future estimates that, between 2015 to 2020, coal, oil, and natural gas generated $138 billion annually for localities, states, tribes, and the federal government. The proportion of state and local revenue that comes directly from development of these fossil resources varies widely, but for some states in the region it is quite high, making them highly dependent on fossil-based revenue. For example, in Wyoming 59% of state and local revenue comes from fossil fuels, a total of $4,264 million annually, averaging over $7,000 per resident. Other

Intermountain West states also get a significant percentage of their revenue from fossil fuels: in New Mexico, 15% of state and local revenue is from fossil fuels, in Montana 7.9%, and in Colorado 4.1% (Raimi et al, 2022). The loss of this revenue would be substantial for these states; the outcomes will have more drastic effects on the fossil-fuel producing communities within the states.

Fossil fuels generate revenue for local and state governments through severance taxes, production taxes, property taxes, petroleum-production taxes, sales taxes, and income taxes. Not all of these taxes are applied to all types of fossil fuels, and some of them generate revenue at some levels of government and not others. See the table below for a list of each type of tax, the fossil energy type it is applied to, and what level of government receives the revenue.

Revenue source	Coal	Oil	Gas	Primary recipient(s)
Severance taxes	✓	✓	✓	States, some tribes
Production on public lands	✓	✓	✓	Federal, tribes, states
Property taxes				Local, some tribes
Production property	✓	✓	✓	
Pipelines		✓	✓	
Refineries		✓		
Power plants	✓		✓	
Petroleum product taxes		✓		States, federal, some tribes
Sales taxes	✓	✓	✓	Local, states, some tribes
Income taxes (corporate and personal)	✓	✓	✓	States, federal

Note: Tribal tax policies are complex and vary widely. In general, tribes do not levy income taxes, though some impose severance taxes (or share revenue with states), sales taxes, and petroleum product taxes; the Navajo Nation's possessory interest tax functions similarly to a property tax. Revenue from production on tribal lands is generally collected by the federal government and distributed to tribes and tribal members.

Table 1. Major coal, oil, and gas revenue sources (Raimi et al, 2022).

While national fossil fuel production increased recently due to global shocks in energy markets (EIA n.d.), overall fossil fuel production has been declining in states in the Intermountain West region. For example, Wyoming coal production has been steadily declining since reaching a peak of over 450 million short tons in 2008. In 2021, just 218 million short tons were produced (Wyoming Geological Survey, n.d.). Natural gas production in Wyoming has been declining since 2009 when over 2.5 billion MCFs were produced, down to less than 1.4 billion MCFs in 2021 (Wyoming Oil and Gas Conservation Commission, n.d.). Oil production has been more volatile in recent years, reaching a low of 51 million barrels in 2009, but increasing to 85 million barrels in 2021 (Wyoming Oil and Gas Conservation Commission, n.d.).

These recent shocks in energy markets, including the global COVID-19 pandemic and the current surge in oil prices, which have caused extreme volatility in fossil fuel production, make it difficult to predict future state and local revenues from these industries. Indeed, some states are experiencing higher than predicted tax revenue. So far for fiscal year 2022, severance taxes collected in Wyoming are almost 13% higher than predicted and federal mineral royalties are 13.5% higher (Wyoming Consensus Revenue Estimating Group, 2022). In 2021, the New Mexico Tax Research Institute reported that the oil and gas industry generated a record $5.3 billion for state and local governments, with $2.96 billion going into the general fund in FY21 (The New Mexico Tax Institute, 2021).

However, in the long term, revenue from fossil fuels is still predicted to decline significantly. A recent study evaluated the impact that restrictions on federal oil and gas leases will have on eight Western states—Wyoming, New Mexico, Colorado, Utah, Montana, North Dakota, California, and Alaska. The findings estimate that a leasing moratorium would decrease state and local tax revenue in these states by $1.6 billion per year for the first five years, and a full drilling ban would decrease state and local tax revenue by $2 billion (Considine, 2020). Considering the impact that restrictions just on oil and gas drilling on federal lands are predicted to have, additional reductions in fossil energy production as a result of new technologies coming online could deeply affect the fiscal health of states, counties, and municipalities in the West. Resources for the Future also estimated declines in fossil-fuel revenue under three scenarios based on different paths to reducing emissions. In each scenario, fossil fuel revenues declined significantly by 2050—between $22 billion to $111 billion (about $340 per person in the U.S.) (Raimi et al, 2022).

Justice considerations

Below is a summary of several of the challenges that may cause a few communities to bear most of the costs of the energy transition while realizing few of the benefits.

New energy industries may be located in different places

Several lower-carbon energy industries are poised to replace conventional fossil industries, including wind, solar, hydrogen, rare earth element and critical mineral extraction and production, bioenergy, and nuclear. These new industries will provide new jobs and new sources of tax revenue for states and communities. Indeed, evidence suggests that these new energy industries will eventually create even more jobs and grow to be larger than fossil energy industries. However, these industries will not always be located in the same places as fossil industries were (Carley and Konisky, 2020). For example, wind farms will be sited where the wind resources are located, which may not be where coal mines or fossil power plants were located. The communities where the new lower-carbon energy industries move in will benefit from new jobs and tax revenue sources, while the communities where fossil energy industries were located will lose jobs and tax revenue with nothing to replace it.

Fiscal policy that incentivizes fossil energy over renewable

Fiscal policy, which includes all the ways that governments generate revenue (e.g., taxes, fees, and royalties) and spend revenue, is a powerful tool for incentivizing specific activities and industries. The way fiscal policy related to energy industries has been designed in many states and communities has strongly incentivized the fossil energy industry, by allowing local governments to collect taxes from their development. However, fiscal policy has often limited local governments from similarly collecting tax revenue from renewable energy development. For example, in Utah, local governments cannot collect revenue from wind and solar projects (Headwaters Economics, 2020). This type of fiscal policy disincentives investment in renewable energy and perpetuates communities' dependence on fossil fuels as a source of revenue. The people and communities that are not able to take advantage of the opportunity to invest in renewable energy projects bear the cost of this type of fiscal policy. They are unable to realize the potential gains of a transition to lower-carbon energy.

Communities bear the costs for experimental industries

Another environmental justice challenge associated with transitioning to new energy industries is the cost that is often borne by the public for investing in experimental industries. For example, in Wyoming many companies have tried to develop industries for alternative uses of coal (e.g., coal drying, coal to liquids, coal gasification, and coal to activated carbon). These projects are often private-public partnerships with different levels of governments investing in them as potential new industries that will continue using fossil resources and bringing in tax revenue. Over the last 30 years, much public money—federal, state, and local—has been invested in these projects and only one has achieved any commercial success. This means that public money that has been invested has not benefited the state of Wyoming or the people of Wyoming, but rather cost them. These investments have continued Wyoming's dependence on fossil resources instead of investing in economic diversification (Powder River Basin Resource Council, 2020).

Lack of access to energy transition opportunities

For communities transitioning away from fossil resources, federal assistance and grant money are needed to assist in economic diversification and opportunities (Roemer & Haggerty, 2020). And while there is much federal grant money currently available for communities in transition, the ability of communities to be successful at being awarded this money depends on them having the resources to apply. States or communities would benefit from experienced personnel with the time and expertise in successful grant writing or resources to hire such personnel. However, communities that are already underfunded and understaffed often do not have sufficient resources to pursue and win federal grants. It will be more difficult for these communities to secure resources for economic diversification and new energy opportunities.

Opportunities

While the transition to lower-carbon energy industries poses many challenges to states and communities that are currently dependent on revenue from fossil resources, it also offers opportunities. Ensuring social and environmental justice for people likely to bear the burden of the energy transition will require long-term planning and investment to increase community resilience. The literature suggests many options that would decrease the financial dependence of states and communities on fossil revenue. Some of these include modifying fiscal policy to incentivize renewables and conservation (Headwaters Economics, 2020); investing in economic development that diversifies regional revenue streams away from fossil resources including land management opportunities, and recommissioning/restoration opportunities (Powder River Basin Resource Council, 2020; Haggerty, Walsh and Pohl, 2021; Haggerty et al, 2018); investing current fossil energy revenue into long-term savings funds (Haggert, Walsh and Pohl, 2021); and adopting policies that coordinate the energy transition, including providing certainty around closure dates, and time and resources for community planning (Roemer & Haggerty, 2020). These may enhance "community resilience," or the capacity of a community to mobilize its resources and work together when faced with a shock (Roemer & Hagggerty, 2020).

Access to affordable electricity

Ensuring access to reliable and affordable energy is a primary social justice consideration in the energy transition. A primary goal is to supply every household with affordable, reliable electricity. Low-income households face higher energy burdens—the percentage of income spent on energy—than high income households, or the percentage of income spent on energy. Low-income households spend on average 8.6% of their income on energy nationally, an energy burden three times higher than other households. For some households, that amount is as high as 30% of their income. If electricity becomes more expensive, low-income households may increasingly restrict their energy use or reduce spending on other essentials. Key metrics for assessing pathway impacts for residential consumers include energy savings, energy costs savings, changes in household energy burdens, changes in a household-human development index, and impacts to energy insecurity, energy poverty, and energy vulnerability (Preziuso, Tarekegne, & Pennell, 2021). These types of measures require data on energy use and expenditure data, disposable household income, and program data, such as implementation costs and enrollment. In 2019, the Department of Energy (DOE) and National Renewable Energy Laboratory (NREL) launched the Low-income Energy Affordability Data (LEAD) Tool to assist users to address energy burden and develop plans to reduce household energy costs.

In addition to affordable energy, supplying all households with electricity continues to be a challenge. The World Bank Group (2022) reports that 100% of the U.S. population has access to electricity. However, this oversimplifies the situation. In 2019, as many as 30% of homes in the Navajo Nation, or 15,000 houses, did not have electricity (Tanana & Bowman, 2021). The LEAD tool also shows extensive disparities with the energy burden in Indian Country. The average energy burden in New Mexico is 3% of annual income. In Zuni Pueblo, it is 6% and in the Jicarilla Apache Nation, it is 8%. Colorado's average energy burden is 2% but both the Southern Ute and the Ute Mountain nations spend on average 4% of their income on energy. In addition, unreliable infrastructure may be at increased risk from weather related damage. Many residents of Puerto Rico do not have reliable electricity after hurricane damage in 2017 and 2022; the loss of electricity also means that many households lack clean water (Romo, 2022).

Another consideration is the effects of programs that incentivize household energy production. Rooftop solar incentives come in the form of state and federal tax credits. This requires a household to cover the upfront costs of installing the system, and it is less likely that landlords will install a system when the electricity costs are borne by the tenants. Over time, as the systems pay for themselves, rooftop systems reduce household electricity costs.

Spotlight on rooftop and community solar

Renewables, particularly solar, will be implemented at multiple scales. Rooftop solar has the advantage of producing energy while reducing additional land use impacts and will not result in unwanted solar farms in outlying areas. In hot areas with bright sun, rooftop solar can contribute significantly to supplying the daytime energy needs during months when demand for air conditioning is high. Rooftop solar has an advantage of using underutilized roofs in already developed areas, minimizing additional impacts. However, rooftop solar can impact the integrity of historic structures and districts if not thoughtfully designed and implemented. However, the cost reductions from net metering or selling the energy back to utilities could disproportionately benefit wealthier homeowners with large houses (and roof areas) and who can afford the upfront installation costs. Current incentive programs are most likely to be tax credits, which require upfront investment that low-income homeowners may not be able to afford. Owners of rental properties often require tenants to pay electric bills and offer no incentive to provide rooftop solar. Without alternative policy and programs, low-income households are unlikely to participate.

The Colorado Energy Office's Weatherization Assistance Program addresses energy consumption and energy burden at two scales through technical assistance available to all households to increase efficiency and reduce energy usage (Colorado Energy Office, n.d.). On a limited basis, it is installing rooftop solar for eligible low-income households as part of its weatherization assistance program. In addition, the Colorado Energy Office launched a community solar pilot project in 2015 to demonstrate the feasibility of developing 100% low-income community solar projects and to reduce the energy burden on participants. GRID Alternatives received the grant to implement the pilot and developed six community solar models, partnering with seven utilities, and low-income subscribers received credits from the utilities. These initiatives demonstrate the potential to reduce the energy cost burden while increasing community and household scale solar projects.

Community solar also has the potential to support energy sovereignty. In 2018, Picuris Pueblo, in New Mexico, partnered with Kit Carson Electric Cooperative to raise revenues for the tribe, meet 100% of the Tribe's daytime electrical needs, and all Picuris residents received a credit on their electricity bill. Picuris Pueblo is expanding its solar capacity, which will help Kit Carson meet its goal of solar for 100% of daytime needs of all its members (Peart, 2021).

Anticipated local land use and environment impacts in new energy economies

All energy systems and industries have local land use and environmental impacts. Anticipating and mitigating the potential negative impacts of particular projects in the new energy economy through long-term planning and impact assessments will help advance environmental and social justice. When benefits outweigh local burdens or potential harms are mitigated, local populations are more likely to accept new projects and technologies. It is also important for new benefits to reach diverse groups of residents, especially the people in communities that have been disadvantaged or harmed by past policy or programs.

Common local impacts that concern community members include but are not limited to the following:

- Job availability
- Public sector revenues
- New or intensified land uses and land disturbance for renewables, pipelines, facilities, or mines
- Damage to cultural sites or cultural resources
- Water availability
- Water, air, soil pollution
- Ecosystem or species impacts

Because the impacts are varied and community perspectives differ, engaging with each potentially impacted community will be necessary to advance procedural justice, including sharing information about possible impacts, and understanding and incorporating community perspectives into project design or future actions.

The new energy economy will introduce a host of new facilities including solar and wind farms, CCUS facilities, direct air capture (DAC) facilities, and new pipelines. All have the potential for short- or long-term impacts on the communities near or through which they pass. The fracking boom, for example, highlighted the need to also plan for housing, community facilities and transportation when communities will experience an influx of short-term or seasonal residents as well as potential adverse health impacts for nearby residents. Particular attention should be paid to communities relying on self-caught fish or wildlife, and subsistence agriculture. In arid and semi-arid regions, access to water and the implications that purchasing water rights may have on other uses must be considered. Concerns about water rights are compounded in the Intermountain West region because many indigenous nations have unresolved water claims (Sanchez, Edwards & Leondard, 2020).

The emerging energy landscape will have many benefits. A regional EESJ analysis is needed to evaluate where those benefits are located. All technology will bring direct and indirect employment opportunities from manufacturing the devices, operating the farms, and sequestering the CO_2 or turning the carbon into products. However, these may not be located in the same communities where jobs are lost, or local people's skills may misalign with the needs of new industries. Overall, new employment may make up for jobs lost in oil fields, power plants, and strip mines. Some jobs and revenue loss can be compensated for if facilities are converted to use in the new energy economy.

New energy technologies have the potential to create new local businesses and enhance existing ones. For example, greenhouses using CO_2 from DAC ought to be more productive. DAC at small scale could be owned by small entrepreneurs or communities. The DAC device/farm to feed CO_2 for agriculture or other products could be small and locally owned. This also might be an effective way for smaller investors to earn revenue for capture and utilization or sequestration. Likewise, there is an intersection between biofuel production and the agriculture and forestry sectors. Biochar is a byproduct of biomass pyrolysis and can be used to restore carbon to soils. Thinning of forests and forest residues will help reduce risks from wildfires.

The sections below explore some of the potential effects of specific new energy economy technologies. Attention to technology specific impacts underlies assessing distributive equity of both harms and benefits on local communities. It also aligns with procedural justice by providing solid information about potential impacts and community concerns, and engaging the public to understand perceptions, local values, and perspectives. Advancing restorative justice requires understanding community histories and which new investments will create better conditions.

Solar and wind environmental and social justice considerations

Both solar and wind will play a key role in helping to decarbonize U.S. energy systems. While their benefits for reducing greenhouse gas emissions are clear, justice considerations remain for the people and places that host such facilities. Both wind and solar energy provide jobs in manufacturing, construction, and installation, for example, but they create few ongoing local jobs.

Wind power is one of the fastest growing energy sources, typically generated at utility scale facilities located near agricultural land or residential communities. Perceptions of wind energy vary by community, with acceptance documented among rural residents who already have a productive view of nature (Phadke, 2013). Studies of wind farm development highlight a more general dilemma for renewable energy projects: a "social acceptance gap" between professed support of such projects in general, and an opposition toward specific projects (Bell et al, 2013). Large wind farms may have strong regional, local, or global, climate and weather impacts (Baidya, Pacala & Walko, 2004; Barrie & Kirk-Davidoff, 2010). Wind farms also change the visual landscape and can adversely impact endangered or culturally relevant species including birds, bats, and mammals.

Spotlight on wind energy in Montana

Montana has a diversified energy portfolio, with just over 40% of its energy generation coming from coal, 40% from hydroelectricity, 12% from wind, and the remainder from oil and gas. The National Renewable Energy Laboratory ranks Montana fifth in the nation for potential wind-energy generation. By the end of 2020, Montana was home to 16 utility-sized, operational wind-energy facilities with a combined capacity of over 1100 MW (Riek, 2021).

In 2022, construction began on what will become the state's largest facility, NextEra Energy's Clearwater Wind Project (Willardson, 2022). Located in the southeastern region of the state, the facility includes 131 turbines with a capacity of 750 MW – almost doubling the state's wind energy production. The project received praise for helping to decarbonize the national energy grid and provide economic benefits to local governments. Over the next 30 years of its operation, it is projected to generate $217 million in tax revenue and providing approximately $226 million to landowners. While there is evidence of strong support, some local residents criticized the company for exporting the energy outside of the state while asking locals to shoulder the environmental and social burdens of construction and production.

In 2022 construction began on another project that would be a first for Montana: a wind farm integrated with battery storage (Halstead-Acharya, 2022). The Beaver Creek Wind Farms project, located in the south-central region of the state, would add an additional 160 MW of energy production. Battery storage addresses the inconsistency of wind energy generation, as batteries can store excess energy when demand is low and release it when demand increases. The lithium-ion batteries, however, place further demands on the production of rare earth elements and take up additional land space, in this case, an additional three acres of agricultural land. While construction requires 175 workers for one year, only 15 to 20 permanent, on-site workers will remain. The project is criticized for creating economic winners and losers: while some ranchers will benefit from lease payments and/or royalties because the infrastructure is directly located on their land, neighboring ranchers will not, even though they will experience the negative environmental and social impacts. Even critical ranchers, however, expressed curiosity and support for the new integrated storage facilities. While the project is praised for reducing the area's historic economic dependence on mining, residents also wish that it would lower their own energy costs instead of being exported out of state.

Solar plants have similar local land use considerations and nearby residents respond to both the changes to the scenery/landscape, and environmental impacts. Utility-scale solar plants use large tracts of land that fragment wildlife habitat. Because the sites are cleared of vegetation, they can increase dust. Solar panel manufacturing and cooling can use significant amounts of water. Unlike wind, the land is not as easily shared with other uses such as agriculture, although it is possible to install solar on less productive agricultural land or use structures that support solar to shade light sensitive plants. Some adverse effects from large-scale solar installations can be reduced by using lands that are already impacted by prior industrial or mine use, although nearby residents may prefer regenerative proposals over industrial projects, especially if the impacts aren't offset with new jobs.

Rooftop solar has potential as an alternative energy source without the additional land use disruption. In hot areas with bright sun, rooftop solar can contribute significantly to supplying the daytime energy needs during months when air conditioning demands are high. Rooftop solar has an advantage of using underutilized roofs in already developed areas, thereby minimizing additional impacts, although rooftop solar can impact the integrity of historic structures and districts if not designed and implemented sensitively. However, without programs designed otherwise, the cost reductions from net metering or selling the energy back to utilities will disproportionately benefit wealthier homeowners with large houses (and roof areas) and who can afford the upfront installation costs.

CORE-CM environmental and social justice considerations

The acronym CORE-CM denotes carbon ore, rare earth elements, and critical minerals, all of which are critical for manufacturing low-carbon energy technologies and achieving carbon neutrality. Carbon ore processing provides added value to coal by converting it into feedstock for high-value carbon products such as nanomaterials for computers and building materials.

Critical minerals and rare earth elements are particularly important for the development and deployment of electric vehicles and wind, solar, and nuclear energy. The need for these minerals requires mining in new locations and additional manufacturing. Materials are predominantly imported to the United States from Asia, Latin America, Africa, and elsewhere. Injustices exist upstream in the supply chain, including allegations of human rights abuses, forced labor at extraction sites, and the inequitable distribution of mineral wealth. A recent study suggests that the majority of these projects "are located either on or near Indigenous Peoples' or Peasant lands with adverse conditions for human rights-compatible permitting, consultation, and consent," (Owen et al, 2022). Moreover, the urgency associated with energy transition raises a serious concern that projects will be "fast tracked," or approved without proper assessment and consultation (Owen et al, 2022).

There have been recent efforts to onshore production (including in the Intermountain West states) to reduce foreign dependence and circumvent supply chain issues. The Department of Energy's ongoing CORE-CM initiative for U.S. Basins, for example, is intended to explore the extent to which the materials extraction can promote local and regional economic growth and job creation. However, concerns exist over possible regulatory weaknesses and uncertainty over net benefit to local communities in terms of job creation and taxation. For example, workers in Nevada are preparing the first new domestic lithium mine to be opened in decades, drawing protesters, including some from Native American tribes, because of concerns over water use, waste, and improper consultation (Penn &Lipton, 2021).

Spotlight on critical minerals production in Utah

Utah has long been a mining powerhouse. The state is home to the Bingham Canyon copper mine, which is visible from space and claimed to be the largest man-made excavation and deepest open-pit mine in the world. The state also produces beryllium, magnesium metal, high-value potash, and helium, and it has known reserves of indium, aluminum, and fluorspar. The growing market for critical minerals and rare earth elements has created a market for the byproducts of mining. The state already produces lithium byproduct material and byproducts of the Bingham Mine include platinum, palladium, and rhenium. There is also rare earth element byproduct material in the tailings (mine waste) from beryllium production at the Spor Mountain mine (Mills & Rupke, 2020).

The industry's adaptive management of byproducts has raised significant social and environmental justice concerns. The White Mesa Mill is the only operating conventional uranium mill in the United States. Located in the Four Corners region of southeast Utah, just outside of the Bears Ears National Monument, it is only a few miles from the Ute Mountain Ute Tribal reservation. It is currently operated by Energy Fuels, a Denver-based company that previously operated multiple uranium mines and mills on Colorado's western slope. The White Mesa Mill began producing mixed rare earth carbonate in 2021 and planned to process up to 15,000 tons of monazite per year. The mill is one of the largest economic drivers in the county, where almost a fifth of residents live at or below the federal poverty line.

While industry boosters praised the mill for creatively helping to meet growing demand for rare earth elements, tribal members and activists drew attention to the mill's questionable environmental management practices. The mill was originally built in the late 1970s to produce yellowcake from uranium ore. When the uranium industry collapsed in the early 1980s, it began charging fees to process waste from military and industrial sites around the country and the world, recovering trace amounts of uranium and discarding the remainder in its waste ponds. What the mill and the Nuclear Regulatory Commission consider to be "alternate feeds," critics view as radioactive waste. Tribal members, activists, and some state regulators argue that the waste ponds were not designed to manage these materials and that they pose a significant risk to water sources. Leaks have been documented in several of the ponds' plastic liners, and nitrate and chloroform plumes have been detected in the groundwater beneath the mill. Other radioactive and toxic pollutants emitted by the mill include radon, sulfur dioxide, and nitrogen oxide (Grand Canyon Trust, nd). As of 2022, the EPA prohibited the mill from accepting waste from Superfund sites. The company maintained that the pollution was not coming from their operations and was aggressively pursuing continued expansion.

Nuclear energy environmental and social justice considerations

Nuclear technologies have the advantage of producing significant amounts of carbon free energy. The technologies are well developed. The United States has 55 nuclear power plants with 93 nuclear reactors generating nearly 20% of U.S. electricity. Nuclear power plants are costly and slow to develop. Small modular reactors, however, can be manufactured in factories and placed on former coal generating plants—this new technology has the potential to maintain electricity production and distribution at existing facilities, which would help retain local jobs.

Despite these benefits, there are environmental costs associated with nuclear energy. Radioactive elements such as uranium are toxic to people and their environments. Increased nuclear energy will require increased uranium mining, and uranium tailings can contaminate soil and water, as has already occurred at sites around the globe. Nuclear waste must be managed for thousands of years. Power plants can be a source of low-level radiation that may impact workers and those living near the plants, especially children (Kyne & Bolin, 2016). Uranium mining and uranium tailing have contaminated communities in the Intermountain West, notably on the Navajo Nation (Voyles, 2015).

Unlike wind and solar, which have widespread support even though people may oppose specific facilities, nuclear energy has opponents that extend beyond those potentially impacted by a given facility or uranium mine. Both the scale and longevity of the adverse effects that followed the 1986 Chernobyl disaster and 2011 Fukushima disaster raised awareness of the dangers of nuclear energy and created skepticism about safety claims. In addition, nuclear energy production raises concerns about the potential for nuclear weapon proliferation.

To ensure safe nuclear power, “cradle to grave” or “cradle to cradle” management practices are needed. Researchers from Stanford and the University of British Columbia found that small modular reactors may increase the volume of nuclear waste that would need to be disposed of and managed by factors of 2 to 30 when compared with nuclear power plants and will have increased neutron leakage.

Bioenergy environmental and social justice considerations

Biomass can be converted to liquid transportation fuels and can be used to generate electricity. When new facilities are built, they will have land use impacts for local communities. Refineries raise soil and water pollution concerns and have local water demands. In one case, protests emerged against a proposed bioethanol facility because residents feared health risks and dangers of explosions (Tittor & López, 2020). Converting existing fossil refineries or other fuel production facilities may lessen the local land-use impacts, but they may raise concerns for local communities who already live with the impacts from the former refineries.

Biofuel crop production is another area of concern. First-generation biofuels are produced from food crops such as corn and raise concerns about competition between energy production and food security, and water use. Crops also have local impacts, such as land-use change if crop production is expanded, or pesticide contamination of soil and water (Lehmann & Tittor, 2021). Second-generation biofuels use feedstocks such as agriculture residues or forest waste such as dead trees. This approach has the opportunity to create additional value for farmers or ranchers, or create value by clearing overgrown forests of downed, combustible material. Third-generation biofuels are produced from microalgae, which could be produced on land not suitable for food crops and utilize non freshwater sources for cultivation.

Because refineries and fuel sources may be located in different areas from one another, biofuel production may lead to new transportation and storage demands that will impact nearby communities. Other options, under development, include use of small modular technologies that can be brought to the feedstocks and used to do pretreatment or processing on site, reducing transportation and storage demands.

CCUS environmental and social justice considerations

Carbon capture, utilization, and storage refers to a combination of technologies that include: (1) technologies that capture CO_2 at facilities such as fossil-fuel fired power plants, refineries, oil/gas processing plants, steel manufacturing plants, cement plants, bioethanol plants, etc., (2) technologies that transport captured CO_2 such as pipelines, trucks, rails, and (3) technologies that either inject CO_2 underground for geologic storage or enhanced oil recovery or that convert CO_2 into value-added products such as fuels, aggregates, and others. Deployment of CCUS technologies requires either construction of entirely new facilities (e.g., pipelines or plants where CO_2 is converted into value-added products) or modification of existing facilities (e.g., capture technologies). Multiple justice concerns are associated with CCUS. Distributive justice would ensure that the populations who shoulder the potential risks of CCUS also experience its benefits (Buck, 2019).

Pipelines, in particular, have raised concerns about distributive, procedural, and recognition justice. CO_2 capture facilities deployed at point sources will typically be sited within the close vicinity of the source facilities and occupy only a fraction of the land area of the original facilities. The length of the pipelines transporting captured CO_2 to storage or utilization facilities will vary depending on how far these facilities are located from the CO_2 source and may range from a few hundred meters (such as the pipeline at the ADM CCS facility in Illinois) to a few hundreds of miles. The land-based impacts resulting from construction of new CO_2 transport pipelines will depend on the locations where the pipeline will have to be constructed. Irrespective, any construction of new CO_2 transport pipelines will have to follow existing regulations governing them and the land-based impact will have to be managed according to the requirements of those regulations. The failure to properly consult indigenous communities in Saskatchewan on a proposed CO_2 pipeline led scholars to conclude that CCUS was a form of settler colonialism that threatens indigenous sovereignty (Alexander & Stanley, 2021). Rural communities in the U.S. also worry that pipelines will interrupt local livelihoods, thus contributing to rural depopulation, without creating substantial jobs (Buck, 2021).

Geologic CO_2 storage facilities require construction of one or multiple underground wells (including for CO_2 injection and monitoring) as well as above ground facilities for injection and distribution of CO_2. The land-based impacts during the construction of new wells would be similar to the impacts associated with drilling underground wells in general, such as in oil and gas production. Experts proposed that the land-based impacts of these facilities will be primarily associated with the construction phase and will become minimal once the facilities have been built and are operational. The question of risk, however, is complicated: local residents who live close to CCUS facilities, such as storage sites, hold different perceptions of risks, such as leakage, than do technical experts (Boyd, 2013, Low &Schafer, 2020). Many are aware that fracking has the unintended effect of causing earthquakes, which causes people to be skeptical of claims that new injections will have no effect.

Spotlight on BE-CCUS (Bio-Energy Carbon Capture, Use, and Storage)

Coupling bioenergy generation with CCUS holds the promise of generating energy while reducing CO2 concentrations, but generally remains at a pilot scale. The intermountain West is one geography that presents overlaps between industrial agriculture and suitable CCUS sites. For example, in 2022 a company named Carbon America proposed to gather 350,000 tons of CO_2 a year from ethanol-fermentation plants in Yuma and Sterling–two small agricultural communities in the northeastern region of Colorado—and inject it into underground wells in the Denver-Julesburg Basin, a center of oil and gas production. The project needs to be approved through an EPA impact assessment process to be built. While proponents emphasize that the project is a win-win, sustaining rural livelihoods while capturing CO_2, thus helping Colorado meet its aggressive decarbonization goals (Booth, 2022), existing research on CCS would ask the following questions: Which kinds of jobs would be created and for whom? What risks are associated with the required pipelines? How will determinations of feasibility recognize different judgments of the world, including acceptable risk?

The Intermountain West is home to other community-scale BE-CCUS projects that have the potential to distribute benefits more equitably, and in some cases, reduce environmental harms. Tucumcari Bio-Energy Company, in Tucumcari New Mexico, is proposing to retrofit an idle ethanol plant to meet multiple environmental objectives while creating a new income stream for agriculture and ranching operations. The intent is to use manure and bio waste to produce fertilizer while capturing methane, carbon dioxide, and hydrogen. Greenhouse and aquaponics growers can use the carbon dioxide and the fertilizer can be returned to agricultural uses. The proposal reflects the fuel available because of intense feedlots and dairy operations in the area. It has the potential to turn sources of pollution and waste into multiple usable products, creating value from waste products, producing energy, and increasing food production productivity.

Hydrogen production environmental and social justice considerations

Hydrogen can be produced in myriad ways, drawing on different forms of energy and inputs. Each has different local and potential environmental effects that may influence neighboring communities or elicit a response from interested organizations. All hydrogen production will involve industrial-scale facilities. If these can be co-located with operating facilities, or re-use obsolete industrial sites, they will have limited increased land use. New facilities, in contrast, will create localized impacts when they are sited. Blue hydrogen is made from non-renewable energy sources, and its production processes produce CO_2, necessitating CCUS. It also engenders diverse responses from communities, both negative and positive, often related to how it might prolong the use of fossil fuels.

Green hydrogen splits hydrogen from water molecules. While green hydrogen production does not create CO_2 if produced using renewables, it is water intensive and may impact local water availability. It could be produced by renewables during times that supply exceeds demand, creating energy that can be used when energy demands exceed supply. Nevertheless, it is also expensive and could impact energy costs to consumers.

Both blue and green hydrogen are improvements over gray hydrogen, which is produced from natural gas without CCUS. Because of the usefulness of hydrogen as a fuel, both will play a role in the transition. Both the facilities and distribution systems have the potential for local land impacts. Hydrogen can be transported through pipelines, and similar to natural gas, it may be possible to adapt current pipelines and distribution systems.

Direct air capture environmental and social justice considerations

Direct Air Capture (DAC) is a set of technologies that aim to capture CO_2 from the air and then sequester or use it. The potential impacts involve both how the CO_2 is captured and whether it will be used or sequestered. DAC could be deployed in different ways. Fan-based (active) capture has a large energy draw and tends to use large and complex devices. Industrial capture using existing airflows within a factory may be less energy intensive, as the DAC scavenges energy that has been employed for another purpose. Passive DAC is the least energy intensive with devices likely to be manufactured in factories, reducing cost, and increasing quality.

DAC has the possibility to be effective in any location and devices could be co-located with an end use, often with little or no additional impact. For the end use of sequestration, DAC will be positioned near or co-located with sequestration sites. Mineralization would be open to locations that are not dictated by existing wells or geology. This technology only has been evaluated at lab scale. For the end use of utilization, products from captured carbon will also result in siting facilities near labor centers. Products could result in different locational decisions. For example, a small DAC facility to provide CO_2 for a beverage facility or a greenhouse would be located on the industrial site or farm, respectively. The DAC footprint would be quite small for most of these applications, possibly 100 square feet. If the captured carbon is to be used to make methane (natural gas) then the focus would be sites near natural gas pipelines co-located to a source of hydrogen. Impacts from construction will depend on the DAC technology.

The impact of DAC on land-use will scale with sequestration needs. Early DAC locations will be near oil and gas wells. DAC could impact forestry or agriculture depending on the geologic formations that are used for storage. As CO_2 can be piped, one would assume less valued land will be used for a DAC farm and piping would be applied where required to reach sequestration sites that have other values. As DAC can be co-located with end use, the current push for long pipelines to carry CO_2 does not seem justified. CO_2 pipelines would need to be built at 700psi or above. At these pressures, leakage, safety, and environmental concerns would be significant. Pipelines are costly to build and operate, take a long time to permit and construct, and come with many environmental challenges. DAC is best if there is little piping of CO_2. DAC developed for the end use of fuel should be placed near natural gas pipelines, and existing pipeline infrastructure will suffice. There is a lot of dialogue within the Intermountain West about CO_2 pipelines, but the Arizona State University DAC team does not envision they will play a part in the region.

While DAC systems will likely have little impact on air quality, it will be important to monitor this and recognize that communities may be concerned about the impacts. Given that new sorbents are being developed in labs around the world, care needs to be taken at each step to assure that contaminants, volatiles, or small particulates are not introduced into the environment. Current testing indicates that this is not yet a problem. DAC systems use differing amounts of water so reducing water use may be a primary design consideration. DAC is an emerging technology that will come in many forms and configurations, including some that use significant energy. If DAC is employed in ways that are passive or borrow from existing energy use, such as in industrial applications, the effects will be lessened. If DAC facilities reuse existing fossil facilities, the impacts will be lessened. Nevertheless, if DAC technologies are used extensively, they will take up significant space.

A framework to advance justice in the Intermountain West energy transition

Environmental justice is an evolving concept. The 1994 Presidential Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, directed each federal agency to make achieving environmental justice part of its mission. Since that time, DOE and other federal agencies collaborated on how to meet this goal, and the DOE adopted its first strategy in 1995 (U.S. Department of Energy Environmental Justice Strategy). In 2007, DOE updated this strategy and adopted an implementation plan. The strategy was subsequently updated in 2017 with an updated implementation plan issued in 2019.

The DOE strategies recognize the need for distributive justice and for meaningful engagement, discussed below as procedural justice. More recently, increased public actions have amplified the call for restorative justice to reflect the multigenerational impacts of prior harms that led to the conditions people live and work in today. In energy communities, this includes air and water pollution from mines, generating stations, and oil fields. Distributive justice also includes providing access to jobs in the new energy economy for community members who may lose fossil fuel-related jobs or those who were previously denied good jobs and training. Generational discrimination and disadvantage make these communities more vulnerable to receiving undesirable facilities in the new energy economies. Advancing environmental and social justice requires attention to procedural, distributive, and restorative justice (McCauley & Heffron, 2018).

Tribal sovereignty

Sovereign tribal nations hold a unique position. The U.S. government has mandated consultation with tribal nations on a government-to-government basis in good faith, with a commitment to respecting tribal sovereignty and self-determination. Despite this mandate, consultation processes often fall short. If a proposed action might influence an indigenous nation, shared governance needs to extend from initial steps such as setting policy goals, all the way to project development. Building lasting relationships is the first step. All projects and policy must address potential impacts to cultural sites, whether on or off tribal land, and follow appropriate engagement processes.

When working with or on projects that may impact sovereign tribal nations, Roger Fragua and Ryan Mast of [Flower Hill Institute](#) of Jemez Pueblo, New Mexico, have emphasized the need for partnerships. This differs from acting as if tribal nations are applicants in federal programs or establishing minimal consultation processes. Project leads must recognize that tribal nations have national governmental structures, and they approach the nation according to its established processes, laws, regulations, and customs.

Advancing social and environmental justice requires particular care to consider how new actions could affect tribal lands and cultural and sacred sites that may be located outside of the tribal nation's boundaries. One example is the federal initiative and public support to create a 10-mile buffer zone to protect Chaco Canyon from oil and gas development on federal lands, which emerged because the national park boundaries were determined to be inadequate to honor and protect Chaco Canyon's significance (Black, Toledo, & Brown, 2022). Due diligence about areas that may be impacted, and early conversations with indigenous nations and communities that may have claims to lands, are necessary to ensure that these conversations occur prior to intense facility planning, pipeline routing or regional changes that could impact the local environment.

Programs that are designed without native involvement fail to recognize indigenous expertise (Fragua & Mast, 2022). In all project development and engagement processes, recognizing and respecting indigenous sovereignty is paramount, and this includes following research and engagement protocols established by the nation or community, respecting differences in land tenure and tribal enterprises, recognizing that tribal nations and indigenous communities who do not live on tribal trust land retain their interests in an issue or place whether or not they develop partnerships or participate in established engagement processes.

Spotlight on respecting indigenous sovereignty: pipelines

The Dakota Access Pipeline highlights the profound need for partnerships with tribal nations that reflect tribal sovereignty and culture. Though outside the Intermountain West region, this 1,172-mile-long (1,886 km) underground oil pipeline that runs through North Dakota, South Dakota, Iowa, and Illinois, demonstrates how much is at stake when there are divergent perspectives during construction on pipelines or new facilities. In 2016, Energy Transfers Partners, LLC, through its subsidiary Dakota Access, LLC, successfully obtained the four-state approvals necessary to build the pipeline. The original plan had the pipeline running north of Bismarck but the potential threat to the city's water supply led to a redesign; its current route runs through the Standing Rock reservation, in a clear example of environmental injustice (McKibben, 2016). The pipeline was permitted to cross under the Missouri River, a key water supply, and under Lake Oahe, a sacred site to the Standing Rock Sioux.

As a sovereign nation, the Standing Rock Sioux opposed the pipeline because its construction violated Article II of the Fort Laramie Treaty, which guarantees undisturbed use, and occupation of their lands. The Tribe also opposed the pipeline based on intersecting harms of a threat to its lands and water, tribal sovereignty, and religious and spiritual freedom. The Cheyenne River Sioux also opposed the pipeline. While the water source as a supply of drinking water was important, for many Lakota participants, the spiritual dimensions were equally important (Goeckner et al, 2020).

The Tribes organized numerous actions and established a camp. Over 15,000 people came from across the globe to protest the pipeline with additional actions held in solidarity elsewhere. Many people, including elders, were arrested, beaten, and had their camps destroyed. The pipeline was eventually approved by the Trump administration and became operational in 2017. Because of the actions by the Standing Rock Sioux and their allies, the U.S. Army Corps of Engineers (USACE) revoked the permit allowing the pipeline's Lake Oahe crossing and instead required a full environmental review (Sisk, 2021). As of 2022, the USACE is still embroiled in disputes about the Dakota Access Pipeline and as of May, the draft environmental impact statement (EIS) had not yet been released. In January 2022, the Standing Rock Sioux who had served as a cooperating agency, withdrew from the development of the EIS (USACE, n.d.), signaling that the EIS process was not sufficient to guarantee procedural justice.

Pipelines are a challenging infrastructure. While the Dakota Access Pipeline is associated with transporting oil and gas, larger pipelines are being proposed to transport carbon. Summit Carbon Solutions, LLC is currently working on a pipeline to move carbon through North and South Dakota, Minnesota, Nebraska, and Iowa. Property owners along Summit's line worry about the use of eminent domain and the pipeline effects on their property (Sisk, 2022). These examples highlight the widespread potential impact from pipelines and other energy projects, and the need for engaging stakeholders early, and for co-designing projects with tribal nations whose lands may be impacted.

Assessing the distribution of impacts and outcomes

According to the EPA, no group of people should bear a disproportionate burden of environmental harms and risks, including those resulting from the negative environmental consequences of industrial, governmental, and commercial operations or programs and policies (U.S. EPA, 2011), and more recently that positive environmental and health outcomes and reduction of risks should be experienced fairly across populations (U.S. EPA, 2015). Distributive justice focuses on *who* enjoys the benefits or shoulders the harm and *what* will be distributed in terms of harms and goods (Bell, 2004; Svarstad & Benjaminsen, 2020). Assessing distributive justice has three components: (1) a given action or project's anticipated effects including changes to land uses, environmental impacts, job gains or losses, and community impacts; (2) where these will occur, the geographical areas that will be impacted, which may differ by impact, as well as the cultural meanings of the places; and (3) the people it will impact with attention to the diversity within the impacted community and the relative situation of one community when compared with others. Analyzing these in conjunction with one another lays the groundwork to assess the distribution of harms and benefits, and to determine with whom to engage (discussed in more detail in the next section). For some environmental situations, such as clean water or air, the goal is for everyone to have access to a minimum standard. In other cases, equality may be the goal, or differences based on a community's priorities and values (Bell, 2004; Svarstad & Benjaminsen, 2020).

Research has demonstrated that race and ethnicity, immigration status, income, indigeneity, and gender have been influential factors when understanding distribution of and exposure to environmental harms and may influence perspectives about proposed projects. There are also group differences that may influence views on goals and desired outcomes, exposure to hazards or opportunities to take advantage of benefits, and local knowledge bases. Residents in rural and urban areas also may have divergent perspectives. All analyses need to begin with an understanding of local demographic differences, employment landscapes, and environmental exposure of the local populations.

Numerous screening tools have been developed to help determine environmental justice considerations for given populations in an area. The EPA's Environmental Justice Screening and Mapping Tool called EJScreen combines environmental and demographic information to help communities and other interested parties understand both demographic and environmental factors in a community. The Council on Environmental Quality has developed a Climate and Economic Justice Screening Tool (currently in beta form) to help federal agencies identify communities that are underserved and overburdened by environmental harms. Both tools can help identify who lives in an area and existing circumstances. They can also evaluate what types of environmental risks community members face and how the risks are concentrated to consider cumulative impacts. The American Community Survey has data tables at different geographies that can help understand housing and community characteristics.

To achieve distributional justice, an EESJ approach must be used at the project scale, assessing within the project area who is impacted and in what ways. A project or a program intended to benefit particular populations (such as residents with low incomes or people who formerly worked in an industry) requires knowledge of the distribution of the population within an area of interest. An analysis of target populations can identify how many persons within an area are eligible for support programs, and where people are concentrated in a specific area (e.g., neighborhood). This helps identify outreach techniques.

These outcomes also need to be tracked across the region and within the different states to understand the overall redistribution of both benefits and harms. Measuring the equity implications of competing policy pathways will require a process to develop sound, agreed upon equity and justice metrics. The ways to measure progress towards environmental justice and equity are still being defined. Most of the environmental justice and equity metrics developed to date focus on measures or assessments of inequity or injustice, rather than equity and justice. Measuring equity and justice would recognize that an equitable policy pathway must address and remediate historical inequities and injustices (Lanckton & DeVar, 2021), discussed later in this chapter.

Metrics, indicators, and indices are three mechanisms available to aid in efforts to quantify the environmental justice and equity implications of competing policy pathways to carbon neutrality (Preziuso, Tarekegne, & Pennell, 2021). While oftentimes used interchangeably, metrics, indicators, and indices are different from one another and can each uniquely contribute to advancing our understanding of the equity and justice impacts of competing policy pathways (Preziuso, Tarekegne, & Pennell, 2021).

Metrics are quantitative measurements of a qualitative outcome. Metrics can measure a specific equity outcome and are instrumental for tracking progress toward the goals of justice and equity (Preziuso, Tarekegne, & Pennell, 2021). Indicators are a representation of a specific equity or justice outcome within a community, municipality, state, or other area (Lanckton & DeVar, 2021). Indicators are used to discern the status of equity or justice at a single point in time and are therefore effective tools for establishing a baseline level of equity or justice (Preziuso, Tarekegne, & Pennell, 2021; Lanckton & DeVar, 2021). Multiple indicators can be aggregated to form an index (e.g., energy insecurity index, human development index) (Preziuso, Tarekegne, & Pennell, 2021).

Metrics that can be leveraged to understand the effects of investments across different types of impacts can help demonstrate how specific types of investments or projects will contribute to or detract from an equitable and just system. Some of these include community-acceptance ratings, estimates of program funding impacts, energy use impacts, energy quality, and workforce impacts. Investment metrics require data on community satisfaction, the impacts of investments on health and the environment, as well as the budget available to support community programs and the number of jobs created or supported (Preziuso, Tarekegne, & Pennell, 2021). Deciding future investments requires an understanding of previous investments, their positive and negatives outcomes, what is needed, which communities are likely to support a specific type of investment, and to what extent and which ways a community's members will be impacted (e.g., how many jobs will be gained, potential environmental impacts).

Targeting injustice and inequity requires an understanding of who the target population is, what types of investment or programs are needed, and what the impacts of those investments or programs might be (Preziuso, Tarekegne, & Pennell, 2021). Community descriptive metrics to identify a target population include but are not limited to a program equity index, an energy cost index, an energy burden index, a late payment index, and measures of program accessibility. Each index mentioned requires data on the cost of energy bills, the frequency of late payments, area level demographics, and the type of assistance offered through specific programs (Preziuso, Tarekegne, & Pennell, 2021). While the above outlines several dimensions of measuring the equity implications of carbon neutrality pathways in the Intermountain West, metrics for measuring equity and justice is a robust area of research with new ideas being born each day. Metrics are still needed that can discern the effects of past policies, capture community needs, assess the quality of the jobs generated, the non-cost benefits of lessening home energy burdens, and measuring health and safety (Preziuso, Tarekegne, & Pennell, 2021).

It is important to recognize that using a EESJ justice lens differs from other approaches to assessing when projects or policies are functioning well. Welfare economics, the basis of the science behind how economists make policy recommendations related to the dissemination (i.e., allocation) of scarce resources (Perman, Ma, McGilvray, & Common, 2003), assumes policy pathways are economically efficient when they result in an allocation that makes someone better off without making anyone else worse off (Bergstrom & Randall, 2016). This does not necessitate an equitable or just distribution of society's scarce resources (Harker Steele, 2019; Bergstrom & Randall, 2016). Efficiency also ignores which individuals/groups gain and which lose, so long as no one is made worse off (Bergstrom & Randall, 2016). In contrast, an EESJ approach should take into consideration how the benefits and costs will be distributed across groups (Goulder & Parry, 2008).

Processes to engage communities and sharing decision-making power

Environmental and social justice analyses require a baseline assessment of the current distribution of harms and goods, and the inequalities facing diverse groups. This information helps inform processes to engage diverse rightsholders and relevant stakeholders, particularly those who otherwise would have systematically less power in established policy and project development processes that rely heavily on expert, technical information that is not grounded in a given location, or local knowledge and value systems. Procedural justice refers to developing processes that share decision-making power with communities to shape project and policy formation. An underlying premise of procedural justice in the energy transitions is that impacted communities must both benefit from *and* have meaningful opportunities to shape actions including energy projects that will impact them. To advance an EESJ approach, the processes need to recognize differences among peoples and communities and engage in appropriate ways with each.

David-Chavez and Gavin (2018) have developed a scale of community participation for research projects with indigenous communities that can be useful for energy transition engagement processes. They develop a participation continuum from "contractual" where community members are hired but outside researchers make decisions to an "indigenous" process where the community has decision-making authority on all aspects of the project. In between "contractual" and" indigenous" are "consultative," "collaborative," and "collegial." They also develop indicators in the form of questions for responsible research practices with indigenous communities. The questions below are adapted from David-Chavez and Gavin (2018) to apply to energy projects. It is important to recognize the indigenous communities have maintained diverse knowledge systems that therefore may bring different perspectives that do not align with the project development process. Relationship-building must begin early to incorporate new knowledge and perspectives.

- Indicator 1—Access: are benefits accessible to indigenous community members? Are indigenous community members engaged in decision making processes?
- Indicator 2—Relevance: are potential options, issues, and benefits reported in the context of concerns, issues, or interests defined by indigenous community members?
- Indicator 3—Credit: how were indigenous community members credited for their knowledge contributions and efforts?
- Indicator 4—Ethics: how does the project report ethical guidelines followed?
- Indicator 5—Cause no harm: did the engagement process address intellectual property rights or risks for indigenous communities?
- Indicator 6—Outputs: did the project report any outputs or outcomes for the indigenous community?

The screening tools discussed in the previous section or a demographic analysis that considers the range of scales and types of impacts can identify which communities to engage in participatory processes. In many cases, communities are place based, or connected because they live or work in an area. In other cases, it is equally important to engage with communities of interest, those that have common circumstances. These communities may be based on race or ethnicity, or job type such as migrant workers or agricultural workers. One step in developing a process to advance procedural justice is to determine who needs to be engaged in project or policy development. Understanding local demographics and situations is important, and it is equally necessary to consult with local public officials and local leaders to understand the regional power landscapes.

Engagement processes have two main objectives beyond fulfilling public meeting requirements. Participatory processes contribute knowledge otherwise unavailable to project development. Participants bring knowledge about their communities, history and values, and their lived experiences. They also bring knowledge about community members' perspectives on given technologies or concerns about how their communities might change. Projects that are focused on technical solutions may overlook relevant historical, political, and social dimensions.

The second important contribution of participatory processes is that they assist with project or policy acceptance, whether participatory decision-making processes are associated with the public sector, private sector, or community-led initiatives. How people understand a project will influence how they respond to it, and opposition can slow or halt a process. Participatory processes that appear fair can help build trust which makes shared benefits and solution building more possible. Conversely, weak processes can erode trust. Trust in an industry greatly influences residents' views of technologies, and its risks and benefits (Mayer, 2016).

Specialized expertise in developing and facilitating participatory processes can help to effectively navigate and integrate diverse viewpoints on needs, objectives, and preferences. Acknowledging and incorporating differing expectations, perceptions, and experiences in participatory decision processes and the solutions or outcomes are steps to advancing procedural justice (Simcock, 2016).

Justice as recognition is a critical component, where recognition is connected to social status, and misrecognition takes the form of cultural domination or disrespect (Svarstad & Benjaminsen, 2020). At the same time, it's important to acknowledge that recognition does not have to come from the state in the sense of formal recognition of an ethnic group or tribal nation (Pulido and de Lara, 2018). Acknowledging the lived experiences of people affected by environmental injustice, or affected people's senses of justice, "the ways they subjectively perceive, evaluate and narrate an issue, such as their perspectives on an environmental intervention" is a component of countering power asymmetry and conveys knowledge that aids informed policy-making processes (Svarstad & Benjaminsen, 2020, 4). This validates values, lifeways, and worldviews, which also must be built into the engagement processes.

During the I-WEST workshops, participants repeatedly stated that having one public meeting was inadequate to engage community members at any level, and a far cry from developing the partnerships necessary to develop an energy transition that reflects the multiple perspectives of the indigenous nations and diverse communities. When designing projects, numerous participatory tools can be used, and employing more than one will help reach a wide range of participants. The appropriate tools depend on the particular circumstances in a community and the broader area. Because of the uniqueness of each community and its circumstances, collaboratively identifying appropriate tools occurs at the beginning of the participatory process (David-Chavez & Gavin, 2018).

- Hired community liaisons to help develop engagement plans and spearhead outreach can bring local knowledge into the engagement process.
- Advisory or guiding community committees can create a formal structure that develops in-depth knowledge about the process. It is necessary to create a broadly inclusive committee and to mitigate potential power imbalances within the committee.
- Public meetings can reach any interested parties. However, some residents have more opportunity to participate so care must be given to ensure the participants reflect the range of impacted and targeted communities.
- Focus groups can facilitate conversations among sections of the communities with common interests such as a neighborhood, or workers in an industry or ethnic group.
- Surveys can elicit feedback from people who otherwise do not participate in a public meeting or other form of engagement.

Engaging a wide range of participants comes with challenges. As the energy sector changes, decision-making processes grow more complex (Bertsch & Fichtner, 2016). Intentional ongoing participatory processes have slower timelines than project development without local engagement, and the time and engagement work adds expenses. Co-developing realistic and reasonable work plans with engaged rights holders and stakeholders that center on inclusivity and equity can result in an achievable timeline with fewer conflicts or community-initiated delays. Decision-making processes require that all participants are treated with dignity and respect, have opportunities to voice viewpoints freely, and have their perspectives heard and considered. Transparent decision-making processes and trustworthy intentions and motivations are also essential.

Discussions about the energy transition embody a sense of urgency that is a barrier to engage in inclusive and meaningful decision-making processes. Thoughtful dialogues require relationship building, which in turn require trust and time to establish (Dismantling Racism Works, n.d.). Kyle Whyte (2020, 2) has written that, without refocusing on reconstituting relationships, rather than the urgent adoption of climate solutions such as transitions to carbon neutrality, the proliferation of dangers to indigenous people will continue. "Indigenous peoples often show that the relationships they have with other societies are lacking in certain qualities. For example, indigenous peoples are concerned about ongoing disrespect against their *consent* (or dissent) to oil and gas pipelines, the *distrustful* behavior of nations seeking to dispossess indigenous peoples of their lands through forest conservation or hydropower, and the failure of *accountability* and *reciprocity* in governmental programs that seek to foster clean energy development or community resettlement." The pace of rebuilding relationships is different from implementing a given energy project.

In participatory approaches to policy making, power dynamics shape interactions between nature, society, and science (Hejnowicz & Thorn, 2022). Therefore, understanding power dynamics and paying close attention to language use could prevent stigmatizing and othering of engaged community members during participatory processes. Consideration for the role of knowledge in environmental governance is critical for "enabling well-informed governance arrangements" (Van der Molen, 2018). Lived experiences of the involved communities and their subjective perceptions must be viewed as critical knowledge and integrated into policy-making processes (Beauchamp et al., 2021).

Power imbalances are frequent barriers to legitimate and co-produced sustainable development (Hejnowicz, 2022). Without balanced power in decision-making processes, policies may not adequately address forces that uphold injustice. Acknowledging power dynamics, along with local social and cultural norms, is critical to avoid negative outcomes coming from positive intentions (Beauchamp et al., 2021). Engagement processes must identify and address power imbalances to ensure meaningful inclusion of intersecting and marginalized communities to respecting indigenous self-determinism in policy making processes; we have meaningful ways to shape energy policies that impact the local communities as intended. It is critical to acknowledge environmental justice as a process and a practice because centuries of environmental racism require ongoing and constant practice of restorative justice. While conventional outcome assessments and accountability measures for energy policies are useful metrics for evaluating energy policy efficacy, community resilience and wellbeing beyond such qualitative and technocratic methods must be integrated to adequately engage in environmental justice as a practice.

Considerations for empowering collective decision making

- Recognize manifestations of privileged positionality, particularly the detrimental effects of power hoarding that is outlined here.
- Identify intersectional power dynamics, particularly those that lead to boundaries and barriers to collective decision making (Ryder, 2018).
- Examine the impacts of power dynamics on the collective in order to develop strategies for managing and mitigating resulting boundaries and power differentials (Kellam, 2020).
- Co-develop protocols to engage in collaborative decision making during designing outreach and engagement processes by paying particular attention to power differentials.

Considerations when designing outreach and engagement processes

- Respect indigenous sovereignty and all processes that a tribal government has in place. Such practices include investing in relationship-building and approaching potential nations as partners and rightsholders from the beginning.
- Engage indigenous communities in collaborative decision-making throughout a project development including initiation, design, implementation, analysis, dissemination, and areas for future action (David-Chavez & Gavin, 2018).
- Avoid overburdening stakeholders and rightsholders while ensuring reciprocal relationships and mutual benefits. Such practices include recognizing the rights of stakeholders, rightsholders, and communities to refuse to engage without diminishing their stakes or interests.
- Recognize forms of privilege (race, ethnicity, gender, class) and intersectional marginalization (such as how gender intersects with race and ethnicity) in participatory decision-making processes. Recognize manifestations of privilege positioning outlined here and determine ways to counter them in an immediate and consistent manner.
- Recognize relational power dynamics (Young, 2020). Assessing who is given the opportunity to participate in decision processes is critical from the beginning of the participatory process. Particularly during the policy planning phase, ensuring an inclusive and collective decision-making process by attending to the existing power dynamics and counteracting its impact through power sharing. Such strategies may include engaging facilitators with EESJ expertise and fostering an environment to openly discuss power.
- Identify local stakeholders to co-develop outreach and engagement plans, and timelines that reflect local cultures to ensure inclusivity and equity in participatory decision processes.
- Consider both land tenure rights and claims, and who could improve resource stewardship if they secured them (Mbidzo et al., 2021). Land claims can be diverse such as residents or workers who rent or lease land, those who use the land or for whom the land is sacred.
- Recognizing the lived experiences of the involved communities and their subjective perceptions are critical knowledge to be integrated in the process (Beauchamp et al., 2021).
- Solicit household-level responses to planned policy adaptations (Angula et al., 2021). This can be accomplished through surveys or other mechanisms to reach those who do not participate in meetings or focus groups.

Addressing past harms to advance just futures

Restorative justice has often been overlooked in energy policy processes. Restorative justice centers on those who have been harmed by past actions with the intent on repairing past harms, stopping ongoing harm, and preventing the reproduction of the harm. The inequities that people experience today were created by past public policy and actions.

Black, brown, and indigenous people were denied the same access to property ownership, and their property was devalued through practices such as redlining, leading to the stark inequalities in median family wealth today. Based on 2019 Survey of Consumer Finances data, white families' mean wealth was $188,200, while black families' was 15% of that at $24,100, and Hispanic families' was $36,100. In 2000, native households had 8 cents for every dollar of white household wealth. The Center for Community Economic Development's work on the racial wealth gap also shows that it is critical to consider wealth and income through an intersectional lens because women and men have different income and opportunities within all groups. Communities of color have also been denied the same educational opportunities and subjected to state violence through various means when they sought work or new residential opportunities. These inequalities are visible in the Intermountain West and have ongoing impacts. Communities with less wealth and lower incomes are more likely to accept jobs that may damage their health and environment without making demands for fair wages and environmental protections.

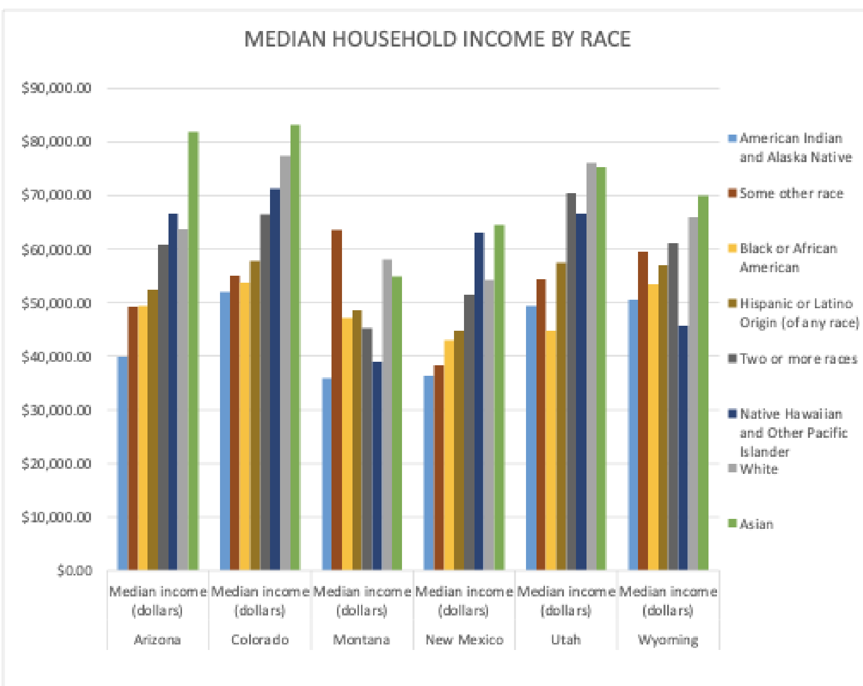

Figure 2. Median household income by race for states in the Intermountain West. From U.S. Census Table S1903, ACS 2019 5-year estimates.

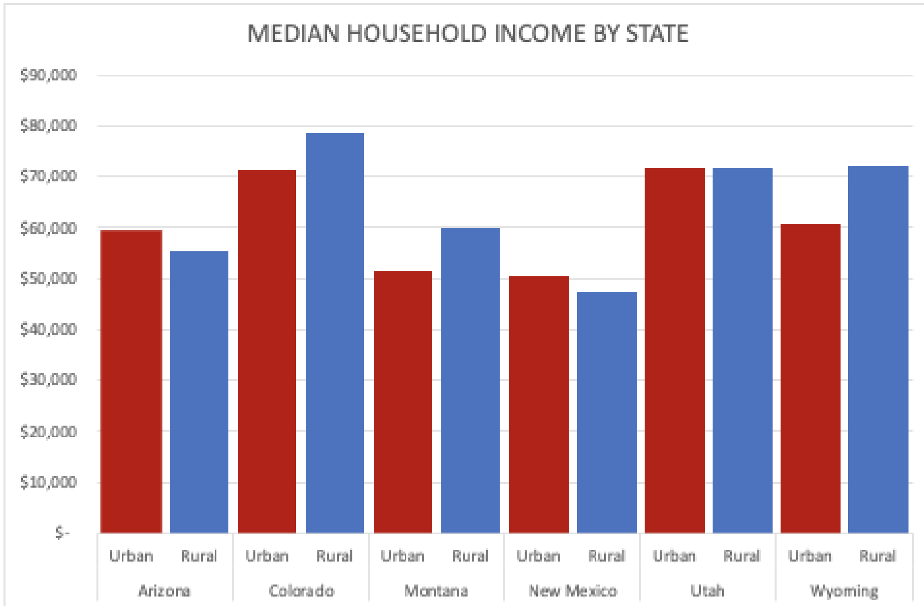

Figure 3. Median household income by state, rural and urban populations. From U.S. Census Table S1903, ACS 2019 5-year estimates.

Environmental justice research has shown that communities of color and low-income communities also face disproportionate pollution and other exposures that lead to poor health and financial loss. These factors cumulatively result in less expensive land. Low land cost becomes a 'non-racialized' decision-making factor that can lead to reproducing inequalities. Because environmental burdens are disproportionately borne by communities of color and low-income communities, closing a mine, or generating station could improve environmental qualities. A restorative lens considers how varied factors interact, recognizing that people can lose jobs while environmental conditions improve without obscuring the interactive effects, and adding actions that address legacy impacts.

A restorative approach addresses these realities directly and provides financial and technical assistance to ensure communities that have been disadvantaged do not have to accept disproportionate tradeoffs. These are complex decisions, and impacted people need power in the decision-making processes, focusing attention back on the relationship building rather than only measuring distributive effects of the outcomes.

Recommendations and next steps

Advancing environmental and social justice requires that EESJ advancing practices are built into all projects, all participants have the training and resources to implement them well, and that accountability measures track what is occurring in ways that lead to further improvement. In addition to guidelines at the project scale, and tracking the cumulative outcomes of projects and actions, the I-WEST initiative might also benefit from an advisory committee or other mechanisms to bring additional voices to decision-making processes.

Develop guidelines

Action step

Develop guidelines for working with and developing partnerships with tribal nations to assist teams who are developing energy projects that could affect tribal lands, communities, or important places. These must be developed in partnership with tribal representatives who are working on energy issues. The tribal partners' expertise must lead the conversation and the representatives compensated for participation in developing the guidelines.

Action step

Develop guidelines for working with impacted communities, that include how to conduct a local and regional power analysis to determine who needs to be included in subsequent engagement processes. When developing the guidelines, identify people and organizations with specific expertise in engagement and tools to advance justice, and compensate for their contributions.

Considerations

- Recognize the barriers to participation and identify strategies to overcome these barriers
- Include adequate resources to facilitate meaningful engagement
- Include metrics to evaluate community engagement
- Recognize that different stakeholders bring their expertise to the conversation and value the expertise
    - This may involve compensating people for time and expertise
    - This may involve incorporating different worldviews, lifeways, and value systems

Requiring EESJ practices

Action step

Require that all proposals include an EESJ component that includes a preliminary demographic analysis of potentially affected areas, potential adverse effects and benefits on local communities, metrics, and evaluation tools for evaluating both the engagement processes and project outcomes, and a budget that shows the costs of implementing the EESJ component.

Considerations

- This can expand on the increasingly common DEI plans in proposed projects
- Recognize the need for ongoing engagement
- Recognize the need for project teams to have expertise for implementing strategies that will advance EESJ
- Recognize that diverse teams lead to better creative and community outcomes
- Possible need for a budgeting tool to use during project development
- Ongoing training about environmental justice to research teams about what it means to incorporate environmental justice and what is expected, including the difference between societal benefits and localized impacts

Evaluating EESJ outcomes

Action step

Create reporting and accountability mechanisms.

Considerations

- Develop metrics to assess community engagement and project outcomes
- Develop reporting systems that create ways to be honest about challenges as well as successes, and to report barriers to full success
- Develop mechanisms for accountability external to individual projects within DOE
- Develop indicators for different dimensions and an index to track progress in the Intermountain West, and to help with future prioritization

Learning from and highlighting successful EESJ processes and outcomes

Action step

Create mechanisms to recognize and share promising practices.

Considerations

- Highlight successful projects that include different dimensions of energy, environmental, and social justice
- Highlight and recognize meaningful partnerships
- Create incentives to share challenges and “lessons learned” in productive ways
- Develop a resource guide that includes cases and lessons learned

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