



Could Justice40 reproduce injustices in the critical mineral sector?

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ABSTRACT

The United States is reprioritizing domestic extraction and processing of critical minerals, with billions of dollars of investments. Because of their uses in low-carbon technologies, the mining and processing of these resources falls under the scope of the Justice40 Initiative, the Biden administration's flagship environmental justice policy. Justice40 prioritizes green investments to benefit communities deemed disadvantaged, including all recognized Tribes. This can lead to the siting of "green" mineral projects in disadvantaged communities (DACs), which is problematic if such projects are unwelcome or reproduce environmental injustices. These unintended consequences are our focus. We analyze how DACs are defined and operationalized, before examining whether and under what conditions critical mineral projects could be considered beneficial for local communities. We suggest three ways to better align Justice40's spirit with its (currently problematic) application to critical minerals and other controversial projects – (1) centering free, prior, and informed consent (FPIC) and the transparency and power restructuring needed to achieve it; (2) incentivizing community ownership to strengthen economic benefits and democratize decision making; and (3) bringing currently-exempted critical mineral activities within the purview of Justice40, particularly for the Department of Defense.

1. Introduction

Energy transitions are fraught with tension between being rapid and being just (Newell et al., 2022). Critical minerals like lithium, cobalt, and rare earth elements are emblematic of this challenge, as they are needed for low-carbon technologies but their production can reproduce inequality and injustice (Brown et al., 2024). This perspective analyzes and raises concerns about one of the US government's hallmark efforts to center justice in energy transitions. We provide constructive criticism within a context of rapidly proliferating energy transition and critical minerals policies in the US and beyond, suggesting ways justice can be promoted even for inherently challenging projects like mining and refining.

In March 2024, the U.S. Department of Energy (DOE) announced its intention to lend \$2.26 billion to Lithium Americas, accelerating the development of a processing plant for its Thacker Pass mine. Once operational, the project would produce enough lithium each year to power 800,000 electric vehicles (Reuters, 2024). The DOE's announcement touts the company's signing of a binding Community Benefits Agreement (CBA) with the nearby Fort McDermitt Paiute and

Shoshone Tribes but fails to mention the other nearby Indigenous and environmental groups that continue to oppose the mine (DOE, 2024). While some view this and other critical mineral projects as strategic advances for onshoring and the transition to renewable energy systems, others criticize them as new cases of environmental injustice. These examples highlight the dangers and challenges that come with the incorporation of critical minerals mining and refining projects within the Biden Administration's landmark Justice40 Initiative. It is alluring to imagine that critical mineral projects can simultaneously advance climate, economic, geopolitical, and environmental justice goals, but this alluring image may be a mirage.

Justice40 is a flagship of the Biden administration, established by executive order during his first week in office. It aims to reverse environmental and economic injustices by preferentially directing federal investments in climate and clean energy programs to disadvantaged communities (DACs) (White House, 2022; 2023). Since its inception in 2021, the Justice40 Initiative has led to favorable outcomes, including \$43 million for community-led climate solutions over the past two years (Silverstein, 2023).

Despite its many benefits, we highlight ways Justice40 could

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unintentionally reproduce injustices. Although unintended consequences or perverse outcomes may arise in many different contexts in which the initiative is implemented (Schott and Whyte, 2023), we bring attention to the case of the mining and processing of critical minerals as a particularly clear illustration of Justice40's risks and challenges. Critical minerals are metals and materials that are essential to government-identified priorities and are susceptible to supply disruptions. Many critical minerals are central to the technologies envisioned to enable low-carbon energy transitions. These include cobalt, copper, lithium, nickel, and rare earth elements, among others (DOE, 2023). Critical minerals demand is set to increase significantly, with projections ranging widely in scope but with consensus that a significant surge is expected (Calderon et al., 2024). Applying the Justice40 framework to critical mineral development creates challenges because these extractive projects are often located at the intersection of fragile ecosystems and DACs.

Environmental justice scholarship documents how DACs have long been disproportionately impacted by environmental disamenities (Bullard, 1994; Mohai et al., 2009), continuing to the present (Temper et al., 2018; Willow, 2019; McGregor et al., 2020). This includes inequitable distribution of harms and benefits from the mining industry (Velicu, 2019; Hobson, 2007; Scott and Smith, 2017), particularly impacting Indigenous communities (Curley, 2023; Ali, 2009; Gedicks, 2015; Voyles, 2015). If critical mineral developments are interpreted and operationalized as beneficial under Justice40, it will incentivize companies to site these projects in DACs, which could compound injustices.

These questions of distributional justice are mirrored by concerns of procedural justice. Too often, DACs have little say over the industries that impact them (Walker, 2009). Classification of critical mineral projects as beneficial under Justice40 rests on assumptions about what constitutes benefits for extractive projects and for whom. These assumptions could prove to be flawed - DACs might not want critical mineral developments. Thus, another layer of environmental injustice could be added if DACs are not adequately involved in decision making.

This application of Justice40 links DACs to extractivism, promoting extractive industries as an avenue for development in the hopes of raising entire communities out of poverty (Gudynas, 2009). This is a well-worn narrative (Gamu, Le Billon and Spiegel, 2015) that has been applied in many contexts and crosses ideological lines (e.g. Arsel and Pellegrini, 2022). This model risks reproducing injustices and reinforcing historic patterns of colonial exploitation, including in domestic peripheries and DACs.

The Justice40 Initiative is a powerful step toward preferentially targeting DACs for federal green investments. The list of targeted investments is colossal - climate change, clean energy and energy efficiency, clean transit, affordable and sustainable housing, training and workforce development, remediation and reduction of legacy pollution, and the development of critical clean water and wastewater infrastructure (White House, 2022) and holds the potential to financially support communities among the most vulnerable in the country. As Mullen, Whyte, and Holifield (2023) note, the initiative is only part of the recentering of Tribal and Indigenous issues in the Biden administration, including with the White House Council on Native American Affairs. However, if projects generate harms that outweigh benefits, or if the purported benefits are miscalibrated to the context or not seen as beneficial by communities, this could instead reproduce and deepen injustices.

The stakes for communities and society are high, as the radical remaking of energy systems is a once-in-an-epoch opportunity that could promote equity and justice, or reproduce and further entrench injustices. Policies in the US and beyond increasingly include explicit justice goals but achieving them is not inevitable. This perspective seeks to contribute to the broader goals of a just transition by highlighting risks in current policies and suggesting models for improvement.

2. Operationalizing disadvantage under Justice40

Justice40 was established by Executive Order 14008 on Tackling the Climate Crisis at Home and Abroad and subsequently strengthened by the Executive Order 14096 on Revitalizing Our Nation's Commitment to Environmental Justice for All (White House, 2022). Justice40 plans to direct 40 % of the benefits of specific federal investments to DACs. This builds on earlier environmental justice (EJ) programs, dating back at least to 1994 and the Executive Order 12898, but it goes much further than predecessors, guiding investments under the Inflation Reduction Act, Bipartisan Infrastructure Law, and American Rescue Plan, among others.

Justice40's operationalization rests upon formal definition of DACs. In 2023, the White House issued guidance embracing the Climate and Economic Justice Screening Tool (CEJST) as the core instrument to identify DACs (Fig. 1). The CEJST sets thresholds for 8 burden categories - climate change, energy, health, housing, legacy pollution, transportation, water and wastewater, and workforce development - which are also divided into socioeconomic thresholds. A community is considered a DAC if it (1) meets more than one burden threshold and its associated socioeconomic threshold, or (2) is surrounded by DACs and at or above the 50th percentile for low income. Additionally, all federally recognized Tribes are designated as DACs, thus approving them for Justice40 investments. It is noteworthy that CEJST can only identify spatially concentrated DACs, leaving out any disadvantaged communities that are geographically dispersed. For example, urban Native Americans, representing 78 % of the Indigenous population, would not be eligible for Justice40 benefits, thus ignoring realities of generational trauma and inequalities that are not constrained within reservation boundaries (Whittle, 2017).

The CEJST development process included a formal public comment period for feedback on the beta version, which elicited more than 8000 responses (CEJ, 2022). Version 1.0 was released in November 2022 and is intended to be updated annually, though officials would not project when the next version will be released (email communication, March 2024). The beta testing and public comment led to important improvements. Most notably for our focus, an abandoned mine land indicator was added under the legacy pollution burden category (CEJST, n.d.). This change connects to a critique posed by Mullen, Whyte, and Holifield (2023), who questioned the absence of an explicit mining-related measure in the EJScreen tool, a predecessor of CEJST that was produced by the EPA. They pointed to the fact that 600,000 Indigenous people live within 10 miles of an abandoned mine (Lewis et al., 2017, in Mullen et al., 2023). Although incorporating abandoned mines into CEJST acknowledges the mining industry's troubled and often toxic legacy, it does so only partially. The database used is based on a federal program focused only on abandoned coal mining sites (OSMRE, n.d.). The more than 500,000 abandoned *hard rock* mines on federal lands (GAO, 2020) remain absent from the CEJST.

Operationalizing disadvantage is inherently challenging, but the stakes of Justice40 investments heighten the importance of this classification. Despite its newness, analyses have begun to emerge with suggestions for improvement. Wang et al. (2023) question Justice40's race-blind approach, which they argue fails communities of color and breaks away from race's foundational role in environmental justice (EJ) scholarship (Park and Ruiz, 2020). (Shrestha et al., 2023) note that under the first version of the CEJST, 33 % of the U.S. population is identified within a DAC, which makes the 40 % investment target under Justice40 seem unambitious. They call for later versions to identify cumulative burden (number of burden thresholds met) to prioritize the

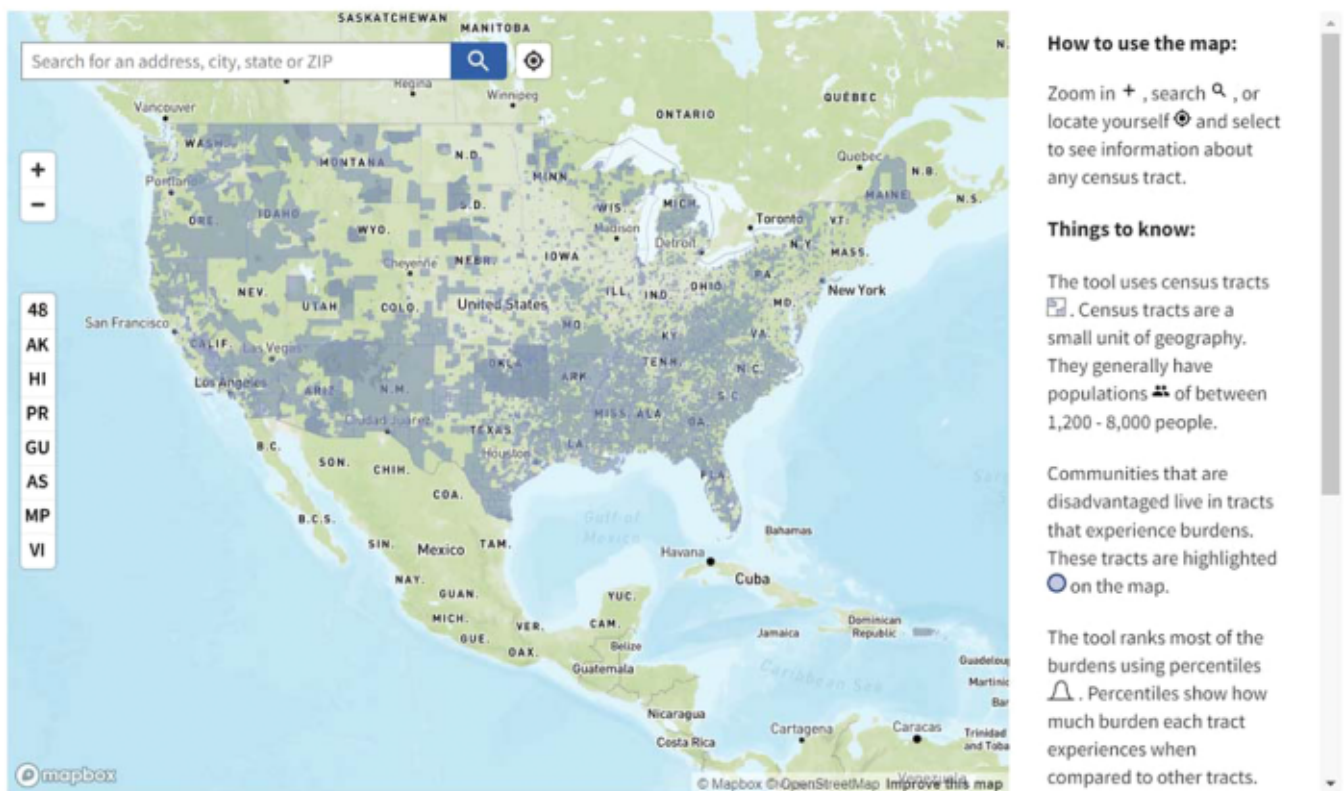


Fig. 1. Climate and Economic Justice Screening Tool map for the lower 48 states (Screen capture from: <https://screeningtool.geoplatform.gov>).

most disadvantaged areas, rather than treating all DACs equally.¹ A National Academies workshop called attention to CEJST's problematic reliance on quantitative data with national availability, which can lead to misidentification of (dis)advantage and ignores other types of knowledge (NASEM, 2023). Smith (2024) similarly critiques the "informing" of EJ in CEJST and Justice40, arguing that rigid, quantitative approaches simplify and flatten difference to create functional categories of disadvantage, which might not align with more holistic or experiential conceptualizations.

Due to our focus on critical minerals, we centrally analyze the Department of Energy's (DOE) application of Justice40 because it leads most federal investments in critical mineral development. Notably, the Department of Defense (DOD), the other key federal agency funding critical mineral development, is not currently implementing Justice40 (White House, 2023).

Some commentators have lauded the DOE for advancing further than other agencies in Justice40 implementation (Walls et al., 2024), including by requiring applicants to submit a Community Benefits Plan (CBP) addressing Justice40 requirements, oriented around eight DOE-specific policy priorities (Fig. 2). Still, critics note the DOE's problematic overreliance on quantification and highlight that its operationalization of Justice40 is becoming increasingly bureaucratic rather than decreasing (Smith, 2024).

3. Green extractivism and the mitigation of climate change

The Biden Administration views critical mineral development as an opportunity to advance multiple goals related to climate change,

economic growth, supply chain resilience, and national security. These are not inherently in conflict with EJ goals, but neither are they necessarily aligned. Green extractivism, or "the deepening of extractivist logics and practices under the guise of environmental redemption" (Deberdt and Le Billon, 2024, 2; see also Bruna, 2022) is a defining trend of the fight against climate change under the paradigm of a resource-hungry transition. The process accumulates so-called *green minerals* (i.e. the minerals needed for green technology development), often extracted within lands under Indigenous or agrarian stewardship (Owen et al., 2023; Curley, 2021), while transferring the impacts to the same communities. These dynamics are planetary in scope, impacting the Global North and South (Matanzima and Loginova, 2024). Water contamination, air pollution, and/or landscape destruction have significant socio-economic impacts on the ability of impacted communities to sustain their livelihoods (Jacka, 2018; Wilson et al., 2021; Curley, 2018). Additionally, as governments increasingly establish legal rules pushing for green requirements, such as limiting or eventually banning internal combustion car sales, the economic impacts on these communities are compounded. In this part, we provide an overview of the critiques of green extractivism practices and its techno-utopian corollary.

Green extractivism is often heralded by its proponents in light of the urgency of climate change. With a growing imbalance in the impacts of global warming and a continuous string of environmental disasters, the economic centers of power are pushing their industries to develop green solutions through the disbursement of billions of dollars in subsidies and other inducements. The push to secure supplies of critical minerals has led to a process of green capital landing, through which the extractive complex is opening new frontiers for mineral accumulation, with the blessing of state authorities. In the US, for example, the opening of the Thacker Pass lithium mine on land held sacred by the Paiute and Shoshone Tribes, has been presented as a strategic priority by the Biden administration while receiving more than USD 650 million in investments from General Motors. The mobilization of significant

¹ The DOE's own tool allowed prioritization by identifying cumulative disadvantages (see <https://energyjustice.egs.anl.gov/>), but it is unclear whether agency specific tools like this can be considered now that the government-wide CEJST is officially established.

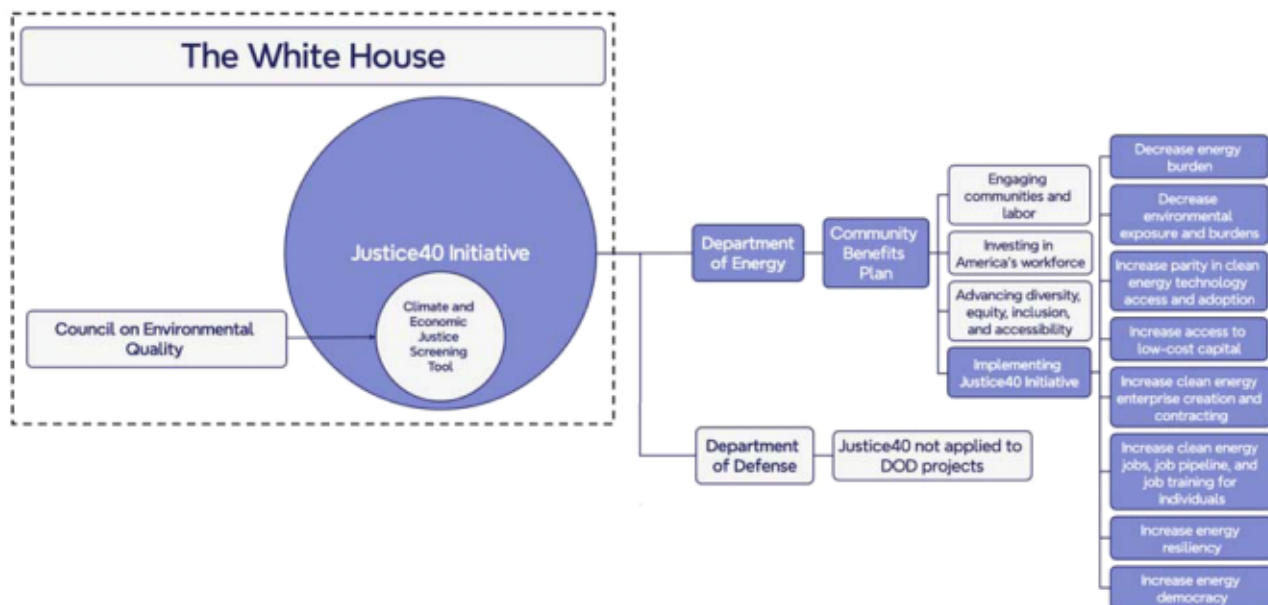


Fig. 2. Diagram of Justice40 Initiative's implementation pathways, in blue, for critical mineral development. Designed by Farnaz Gholami, DOE information from <https://www.energy.gov/justice/justice40-initiative>.

extractive (green) financing, historically imbued with colonial undertones, threatens to reproduce the injustices and abuses that the narrative of a *just transition* aims to tackle, particularly as the incumbent firms mobilized in the name of transition are invested in maintaining status quo economic and power structures (Newell et al., 2022).

Green extractivism has been under scrutiny in the past few years for its disproportionate impacts on agrarian and Indigenous communities globally and the inadequacy of its prescriptions in the face of polycrisis (Fernandes, 2024). Resulting from the booming needs of the transition to low-carbon consumption, the extraction of minerals deemed critical risks exacerbating historical injustices sustained by capitalist productive systems. From lithium in Nevada's Thacker Pass to copper in Arizona's Resolution mine, the linkages of green extractivism with Indigenous communities are clear. While conflating perspectives and experiences across Indigenous communities should be avoided, there are clear throughlines in the dynamics of green extractivism.

The techno-utopian responses to climate change remain based on high consumption of "green" products. As currently imagined, the low-carbon transition would not decrease the number of cars on the roads but only shift to electric vehicles (EVs). The need for minerals is, however, compounded, as the average EV requires more than 206 kg of critical minerals compared to just 34 kg for a conventional vehicle (IEA, 2021). Thus, the mitigation of human-produced environmental catastrophes relies primarily on continuous consumption patterns that are modified to fit the emission targets defined in the different United Nations Climate Change Conferences (COPs) and embraced by countries around the world. These moves also rely on techno-utopianism in which technical and technological fixes (Deberdt and Le Billon, 2024; Le Billon and Spiegel, 2021) are perceived as the logical solutions to saving human existence. This "capitalist realism," articulated by Fisher (2009), hides alternative solutions to societies' most pressing challenges. Stuart et al. (2023), 434) describe it as the "promot[ion of] technological solutions to problems caused by social forces [as] a social reproduction strategy consistent with capitalist realism." Furthermore, these visions flatten difference behind a universalizing "we" (Köppel and Scoville-Simonds, 2024) that occludes class and core-periphery differences in culpability, vulnerability, and access in the face of climate crisis and energy transition (Deberdt and Le Billon, 2024).

In the climate crisis, techno-utopian projects align with these discussions. These strategies often support the opening of new frontiers of

extraction in which technological prowess is rendered possible by mobilizing significant green capital. From outer space to the deep seas and latest techniques of processing and reprocessing, technical fixes define the boom in extractivism. The recent use of artificial intelligence for deposit identification, regardless of location within socio-economic and political structures (Goldman and House, 2023), only reinforces the imperative nature of green extractivism. The model depends on achieving new levels of critical mineral provisioning through a new colonization of the commons while continuing the colonization of Indigenous lands. Thus, the processes of green extractivism and techno-utopianism often reiterate inequalities that have defined the mining industry for centuries.

The Justice40 framework lands at the intersection of the two imperatives of green extractivism and just transition. It also intersects with the reality that most mapped critical mineral deposits are near Native American reservations (Block, 2021; Owen et al., 2023). Thus, two competing interpretations arise: critical minerals as a win-win, creating opportunity for Indigenous and DACs while advancing national interests (Fig. 3); or critical minerals as green colonialism, reproducing and intensifying historic patterns of environmental injustice in service to myopic green consumerist transition models (Fig. 4).

4. Are critical mineral developments beneficial for disadvantaged communities?

Recognizing the dilemma above, we ask whether critical mineral developments should be considered beneficial for DACs? Justice40 seeks to channel benefits to DACs but the inclusion of extractive and industrial projects raises concerns about how "beneficial" is defined and operationalized. Many communities might not welcome mines or refineries, even if the end use is for green technologies.

Mining ranks at the bottom of global perceptions of fulfilling responsibilities to society, trailing even the oil and gas industry (ICMM, 2023). Many mining projects exhibit capitalism's worst traits, creating environmental and economic problems. Environmental externalities have harmed surrounding communities and ecosystems throughout the mine life cycle (Veiga, Scoble and McAllister, 2001; Bainton and Holcombe, 2018), frequently capped off by the ultimate externalization process as companies entered bankruptcy, shed liabilities, or simply disappeared, leaving communities to suffer consequences in perpetuity

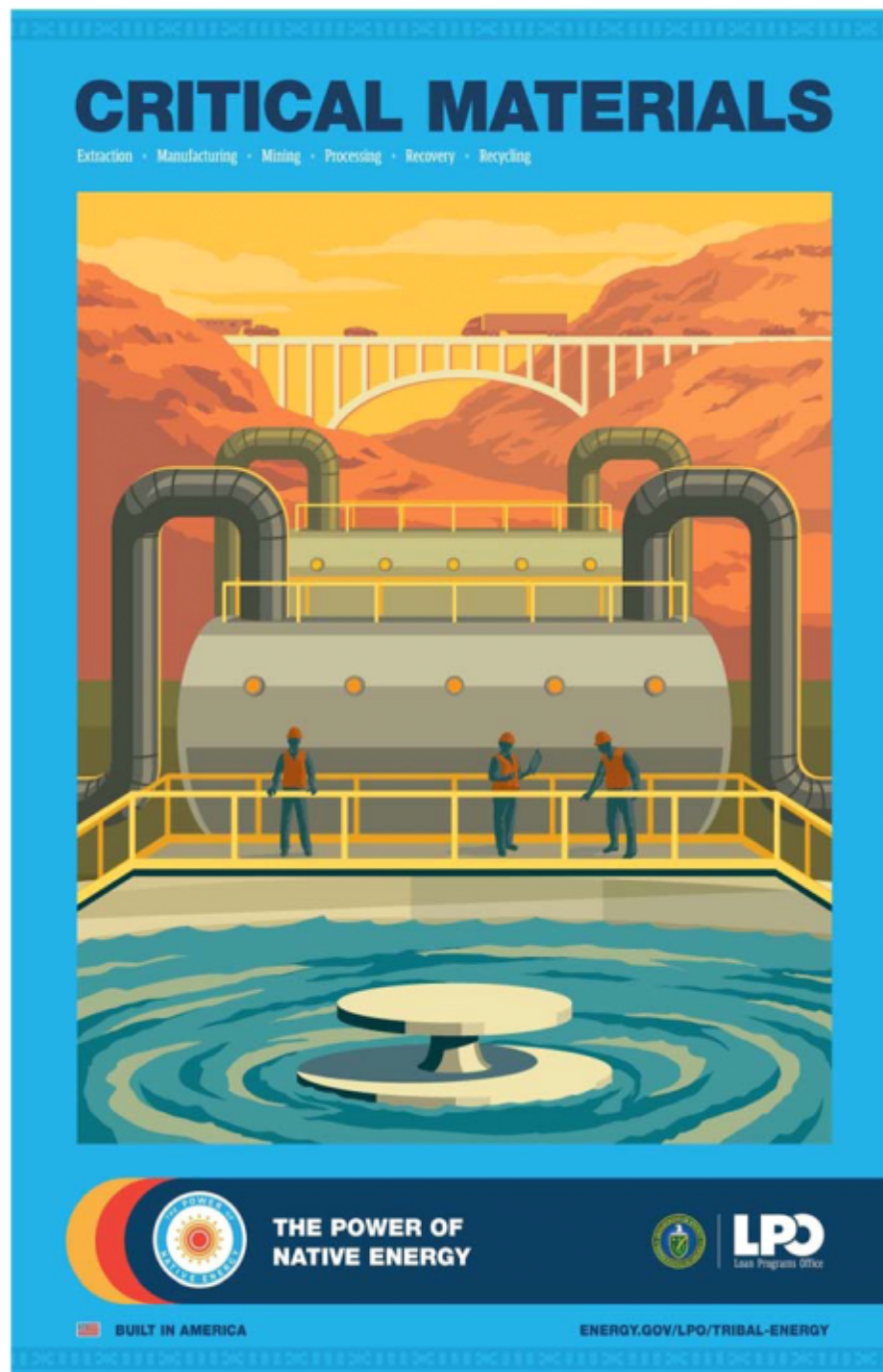


Fig. 3. Poster created by the Department of Energy, demonstrating the vision of critical minerals as an opportunity for Indigenous communities. Source: <https://www.energy.gov/lpo/tribal-energy-posters#tribalcriticalmaterials>.

and governments (if anyone) to clean up many abandoned and legacy sites (Lèbre et al., 2021; Hilson, 2011). For example, a report examining just 43 abandoned mining sites found that 50 million gallons of water contaminated with arsenic, lead, and other toxic metals flows out of these sites every day (PBS, 2019). The scope of mining's legacy environmental harm is immense, considering there are hundreds of thousands of abandoned mines dotting the U.S. (OSMRE, n.d; GAO, 2020). Even as harms were externalized, profits and benefits accrued disproportionately to investors and the managerial class, both of which were frequently foreign or external to the sites of extraction, while localized economic benefits were often fleeting and stratified (Söderholm and Svahn, 2015; Freudenburg and Wilson, 2002). In parallel, the

boom-and-bust nature of the industry devastated the social fabric of entire regions with repeated economic shocks (Matheis, 2016; Amundson, 1995).

These problems persist in contemporary extractive projects. Despite curtailing some of its worst abuses through a mix of strengthened regulations, evolving corporate practices, and technological advancements, the industry's underlying models have not changed enough to resolve its structural inequality, much less absolve its legacies. Critics argue the mining industry produces capital accumulation in economic centers through processes of environmental degradation, dispossession, and displacement, with DACs often bearing the brunt (Kirsch, 2014; Fredriksen and Himley, 2020).

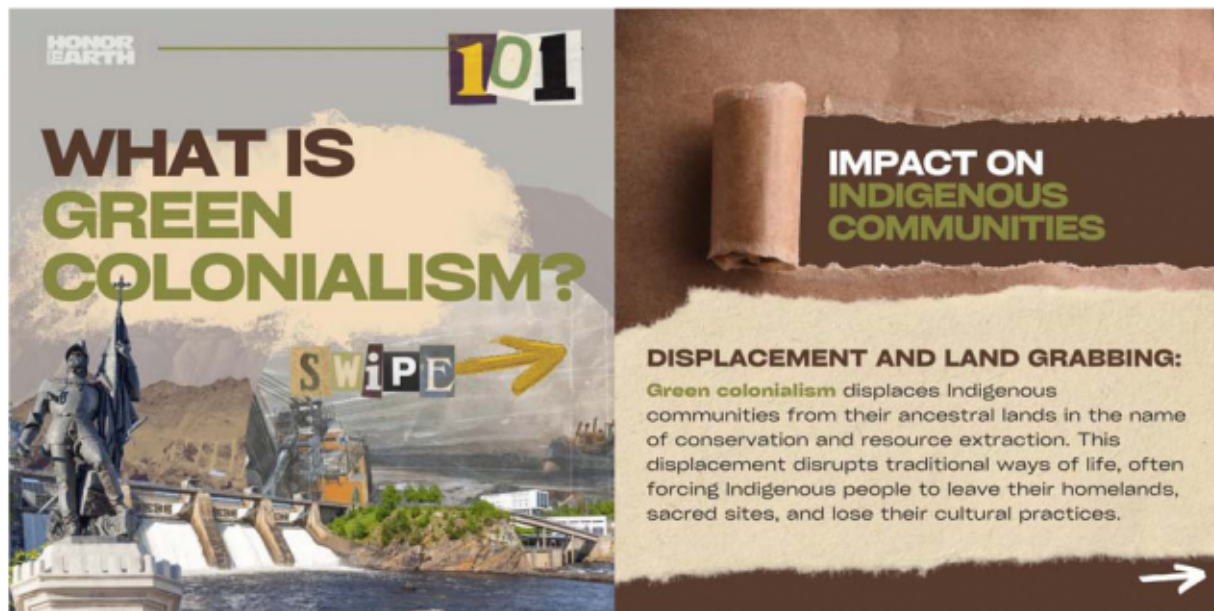


Fig. 4. Images posted on Twitter by Honor the Earth, an Indigenous-led environmental organization, demonstrating a vision of extractivism as part of a process of green colonialism, which continues settler colonial injustices and environmental destruction (July 19, 2023). Source: <https://twitter.com/HonorTheEarth/status/1681695924462993408/photo/1>.

Given this baggage, it is no surprise that the industry has embraced narratives that emphasize its role producing critical minerals for energy transitions, attempting to align itself with climate change action and EJ (e.g. Phadke, 2024). The mining industry sees an opportunity to play the role of climate hero, rather than the more accustomed role of environmental villain. These claims, however, demand scrutiny. The mining industry's desired shift from environmental villain to climate hero can only be achieved through deep integration of environmental justice priorities.

Examining the economic impacts of mining and refining in sites of extraction raises further questions about the potential benefits of critical mineral developments in DACs. Projects are often justified with promises of job creation, tax contributions, and economic spillover effects. If economic benefits for DACs are limited to these timeworn promises, experience suggests that such projects are unlikely to break established patterns of inequity. For example, even when Indigenous workers are integrated into extractive projects, eventual closure or boom and bust cycles can displace workers and disrupt connections to place and the land, creating another form of colonial dispossession (Hall and Pryce, 2023). Indeed, outmigration of Indigenous workers can occur even before mines close (Berman et al., 2020). The complex and ambivalent relationship between extractive economies and Indigenous peoples extends to the community and Tribal levels, as seen in the Navajo Nation's history with coal development and the dislocations that it faces with the industry's demise (Curley, 2023). As a corrective, critics have called for the centering of broader and culturally relevant concepts of wellbeing, rather than problematic reliance on jobs-and-taxes models (Parmenter et al., 2023).

For procedural justice to be realized, DACs must be able to advocate for their own interests and shape the decisions affecting them. In the case of Indigenous communities, this ideal is inextricable from the concept of Tribal sovereignty (Ishiyama, 2003; Curley and Lister, 2020). The right to say 'no' to projects deemed undesirable is an essential component.

Mining and refining projects carry significant risks of establishing new sacrifice zones or worsening those already in existence. Sacrifice zones normalize harm to local environments and communities, justified through invocations of a greater good, or simply dismiss such harms as unimportant (Bullard, 1994). Already, low-carbon transitions are being

linked to sacrifice zones (Zografos and Robbins, 2020). The proliferation of sacrifice zones is antithetical to the goals of Justice40, which seeks to reverse the entrenched pattern of harms disproportionately borne by DACs.

The tensions surrounding environmental impacts are made clear through the example of legacy and abandoned mine sites. On one hand, the presence of legacy mining sites is used as an indicator of disadvantage in the CEJST, while on the other hand, new mining projects are being treated as beneficial developments in DACs. This ironic juxtaposition reinforces our concern about the inclusion of critical mineral development under the umbrella of Justice40.

Given the industry's patterns of inequitable environmental and economic impacts, mining and refining projects should not be assumed beneficial. The onus should be on developers to demonstrate their projects' benefits outweigh harms and that both benefits and harms are equitably distributed. The DOE should reject CBPs that do not address these concerns. In some cases, justice might best be advanced by locating projects away from DACs.

5. Conclusion and policy implications

Many applications of Justice40 are welcomed and necessary avenues to promote economic and environmental justice for DACs, including Indigenous communities. However, in other applications, the initiative could misalign with realities and priorities of DACs. For Indigenous people, Mullen (2022); see also Mullen, Whyte and Holifield, (2023) argues that the lack of focus on sovereignty and especially free, prior, and informed consent (FPIC) weakens the frameworks used to classify DACs and guide benefits. Additionally, they find that Justice40's positive impacts are limited by the discrepancies between the geographical representation of tribes as well as the embedded conceptualization of EJ. The US experience has been built on centuries of oppression, colonial dynamics, and racist structures, a reality that the initiative must also recognize (Dunbar-Ortiz, 2015; Cohen et al., 2023). Bringing justice for DACs will not be achieved through small, selective measures, but can only be reached with a complete overhaul of conceptions and political priorities (Schott and Whyte, 2023).

In this context, how will Justice40 deliver on its promises to DACs? For many projects, benefits can be obvious and unproblematic, such as

addressing health and environmental hazards, improving infrastructure, and supporting community-controlled projects. This is true even of some critical mineral development projects, including through the remediation of historical mine sites and reprocessing of tailings to recover critical minerals. These projects often are not economically viable under market conditions, so incentives linked to Justice40 could make them feasible by recognizing and valorizing the environmental and justice benefits produced.

More commonly, however, applying the Justice40 framework to critical mineral development raises complex questions. Most critical mineral developments remain marked by the perpetuation of extractive models with environmental downsides and few long-term benefits for neighboring communities. This is especially true of refining operations, with significant pollution implications which have historically burdened marginalized and minoritized communities disproportionately (e.g. Sullivan, 2014). On the other hand, processing and refining operations are not geologically constrained in the same ways as mines, giving more flexibility in where to build. For some projects, Justice40 goals might best be served by prioritizing greater distance from DACs. Brownfield revitalization also raises complex questions. It is generally seen as having a lower impact than breaking ground on new greenfield sites, but given the historically inequitable distribution of industrial sites and pollution in DACs, building critical mineral processing facilities on brownfields could reinforce existing injustices. Even for projects that are perceived as beneficial, there are further challenges to define who benefits and how much (see Walls et al., 2024), for example where large project footprints span multiple communities or when workers are drawn from a broad region. In light of the difficulty of Justice40 implementation in challenging areas like critical mineral development, we highlight some key considerations.

First, we echo Indigenous critics who call for a more explicit focus on sovereignty and free, prior, and informed consent (FPIC) (Indigenous Environmental Network, n.d). Justice for communities long oppressed and excluded from economic, social, and environmental benefits can only be achieved with an overhaul of power dynamics. Calls for FPIC align with the core EJ tenant of procedural justice. Communities need full transparency to understand proposed projects, debate the pros and cons, and influence the outcomes. Especially in cases where Justice40 is applied to potentially objectionable or ambivalent projects, there should be higher standards for transparency, greater scrutiny of what is being counted as a benefit, and enhanced focus on community input and self-determination. This applies to critical mineral development, but also projects like large-scale solar and wind developments, which have often been opposed by impacted DACs (Levenda et al., 2021; Heckert and Rosan, 2016).

The DOE's requirement for CBPs in funding applications takes an important step in this direction. However, it confers power to applicants usually external organizations such as companies or universities to decide which communities to involve and the extent of that involvement. This risks repeating well known problems with top-down participation models that create a veneer of legitimacy without challenging existing power dynamics (Cooke and Kothari, 2001; Cornwall, 2008).

Second, to counteract these power imbalances, Justice40 should incentivize community ownership and similar models that redistribute power and benefits. This is especially important for contentious projects like critical mineral developments. Models of direct or indirect community ownership could provide DACs with direct financial stake as well as greater control over decision making. Such models exist and have been shown to decrease conflict and financially benefit DACs. For example, the Alaska Native Claims Settlement Act (ANCSA) led to the establishment of village and regional Native corporations and codified their rights for millions of acres of land, under which natural resources are extracted and their proceeds redistributed to Indigenous shareholders (Zellen, 2019). Conflicts over the mining of critical minerals still occur under this framework (Barrett Ristorph, 2022) but remain limited compared to other regions, while financially benefiting DACs (Berman

et al., 2020). Community ownership as shareholders is a central feature of this model, granting both income through dividends and influence over development and management decisions. Community ownership is also compatible with calls for a radical restructuring of mining as a service industry, which would bring its considerable technical expertise into service of community owners for more equitable distribution of benefits and minimization of conflict (Dunbar et al., 2019). Requiring or incentivizing community ownership would align with DOE's eight priorities for Justice40 (Fig. 2) and push further to advance economic and procedural justice.

Third, despite the challenges of applying the Justice40 framework to economic sectors like critical minerals, pursuing such developments without the initiative could be even worse. Current application of Justice 40 for critical mineral developments almost exclusively centers on the DOE. The initiative is not being applied to the DOD (White House, 2023), which is at the core of much federal government critical mineral activity. Under programs like the National Defense Stockpile and Defense Production Act, DOD has provided more than \$500 million to critical mineral developments from 2021 to 2024 (compared to \$1.2 billion critical minerals funding from DOE) (Shemer, 2024). Other government entities are also becoming involved in critical mineral developments, such as the US Export-Import Bank's \$1.8 billion loan to a controversial gold and antimony operation (Perpetua Resources, 2024). These agencies' critical mineral activities create the same challenges and tradeoffs as DOE's, so leaving them outside the reach of Justice40 creates inconsistencies and hinders efforts to achieve a just transition. If unchecked, defense funding could repeat injustices like those borne by Navajo communities when urgency for uranium production created a multi-generational toxic legacy (see Voyles, 2015).

The examples we draw from mining illustrate how difficult it is to simultaneously advance climate, geopolitical, economic, and environmental justice goals. Uncritical acceptance of win-win narratives around critical mineral development could reproduce injustices instead of resolving them. While mining is perhaps the clearest example, these issues are likely to emerge in other contentious energy transition projects, such as large-scale wind or electric transmission expansions. Confronting these challenges in the critical minerals space could define a path for a more just transition; ignoring them could do the opposite. Energy transitions present unparalleled openings for more just outcomes, which if missed through poorly aligned policies, are unlikely to be repeated.

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Declaration of Competing Interest

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