



UNDERSTANDING JUST TRANSITIONS IN COAL-DEPENDENT COMMUNITIES

Case Studies from Mpumalanga, South Africa, and
Jharkhand, India

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Contents

EXECUTIVE SUMMARY	iii
1. INTRODUCTION	1
1.1 OBJECTIVES AND METHODOLOGY	2
2. MPUMALANGA, SOUTH AFRICA	5
2.1 COAL SECTOR ECOSYSTEM IN MPUMALANGA	5
2.2 DIVERSIFYING THE ECONOMY	11
2.3 ENVIRONMENTAL REHABILITATION	16
2.4 STAKEHOLDER MAPPING	20
3. JHARKHAND, INDIA	23
3.1 COAL SECTOR ECOSYSTEM IN JHARKHAND	23
3.2 DIVERSIFYING THE ECONOMY	29
3.3 ENVIRONMENTAL REHABILITATION	35
3.4 STAKEHOLDER MAPPING	38
4. INSIGHTS AND RECOMMENDATIONS	42
4.1 COAL ECOSYSTEM	42
4.2 DIVERSIFYING THE ECONOMY	43
4.3 ENVIRONMENTAL REHABILITATION	45
4.4 STAKEHOLDER MAPPING	46
5. CONCLUSION	48
APPENDIX A: LIST OF INTERVIEWEES	50
ENDNOTES	51

Executive Summary

The world has already warmed to over 1°C above pre-industrial levels, largely due to the burning of fossil fuels such as coal. This is causing ever-increasing rates of climate-related events such as floods, droughts, and wildfires. Any steps to keep global warming well below 2°C, a target enshrined in the Paris Agreement, would require rapid reduction in the use of fossil fuels—particularly coal. Although some Organization for Economic Cooperation and Development (OECD) countries have already made plans to phase out coal-based power, attaining Paris Agreement goals would require large coal-dependent emerging economies, including South Africa and India, to also reduce their long-term dependency on coal. However, beyond the techno-economic challenges of managing a coal phase out, there are complex and multifaceted social concerns associated with a coal phase out, such as the loss of local jobs and revenues. Addressing these concerns will require just transition planning in order to ensure that workers and communities are not left behind in any move away from coal.

In both South Africa and India, coal transitions will likely have an outsized impact in certain areas because of the concentration of coal production in a handful of states. This study focuses on Mpumalanga and Jharkhand—two prominent coal-dependent regions in South Africa and India. The study analyzes coal dependency and just transition prospects in these jurisdictions in order to generate insights and recommendations useful for these regions as well as other coal-dependent emerging economies.

The study explores coal-related socio-economic dependency in Mpumalanga and Jharkhand and investigates the following key elements of just transition planning: (1) the challenges and opportunities associated with diversification of provincial/state economies; (2) the prospects for environmental rehabilitation of coal mines and power plants; and (3) the landscape of stakeholders important for just transition planning, including underrepresented stakeholders.

This study generated the following key insights and recommendations:

- **Additional analysis is needed to identify and quantify points of dependency and transition risks across the coal ecosystem for a just transition.** Both case studies show that local governments and communities in Mpumalanga and Jharkhand are deeply intertwined with the coal industry. In both places, the coal-dependent ecosystem has many layers. Existing literature and data sources clearly show that the industry generates significant local jobs, government revenues, and local mixed infrastructure, among other key services. However, in both Mpumalanga and Jharkhand, many elements of the ecosystem have not been quantified. For example, there is no quantification of the number of induced and informal jobs linked to the coal industry, which is suspected to be significant. Further research and quantification of coal ecosystems, including of dependent stakeholders, will be vital to planning for an inclusive and just transition in coal-dependent states.

i Mpumalanga is a province and Jharkhand is a state.

- **In-depth feasibility and scalability assessments of regional economic diversification options are required to map and assess realistic regeneration pathways.** Mpumalanga and Jharkhand have the potential to diversify their economies to sectors such as agriculture, tourism, and renewable energy to mitigate the impacts of coal transition and generate new opportunities for affected workers and communities. The expansion of provincial and state economies to these non-coal sectors has various challenges. Coordinated investments from stakeholders in feasibility and scalability assessments of proposed diversification sectors will be important to just transition planning.
- **Following a diversification mapping exercise, long-term pathways for diversification to alternate sectors need to be developed and should be grounded in local priorities.** In both Mpumalanga and Jharkhand, there is a need to create diversification strategies that are based on the mapping exercise proposed above and which take into account factors such as local needs and priorities, resource availability, and workforce skills.
- **Government and coal company diversification plans need to be better coordinated to ensure transitions are well planned and inclusive.** Mpumalanga and Jharkhand's coal industries are dominated by state-owned coal companies such as Eskom and Coal India Limited, which are already planning to diversify their businesses into non-coal sectors. There is a need for enhanced coordination between the diversification plans of provincial and state governments and coal companies.
- **Strengthened regulatory regimes are needed for the effective environmental rehabilitation of current and legacy coal mines and power plants as part of the diversification of coal-dependent economies.** Mpumalanga and Jharkhand face various regulatory, institutional, and financial challenges in ensuring adequate rehabilitation of coal mines. Addressing these challenges will require ensuring that regulatory bodies managing the rehabilitation process are adequately resourced to ensure sufficient enforcement capacity; that rehabilitation processes are guided by adequate laws; and that mine closure plans are transparent and made public.
- **Following mine closures, robust land use policies and plans are needed to ensure effective environmental rehabilitation and subsequent diversification pathways.** Without land use policies and plans where mines have closed, the potential for effective environmental rehabilitation that restores the health and productive use of land while generating jobs and diversification pathways is greatly diminished. The rehabilitation of current and legacy coal mines must be based on land use policies and resultant plans that require consultation with local stakeholders for better, more inclusive outcomes.
- **Local stakeholders, including underrepresented stakeholders, must be meaningfully engaged throughout the transition process to ensure inclusive outcomes and buy-in.** There are many underrepresented stakeholders in both Mpumalanga and Jharkhand not currently engaged in transition discussions, such as coal workers in the informal sector in both places. To ensure inclusive and just outcomes, it is important that governments and institutions leading the process create mechanisms and institutional structures for capacity development and dialogue with all relevant stakeholders.

Introduction

The year 2021 has already witnessed severe flooding in China and Germany, heatwaves in India and Canada, and wildfires in the United States and Greece, among other climate disasters. The Economist magazine succinctly summarized the climate crisis in the title of a recent cover story: “A 3°C world has no safe place.”¹ The Intergovernmental Panel on Climate Change in their latest report recognised that the climate crisis is now widespread and intensifying, what they called a “code red for humanity.”² Given the visible impacts of climate change, many have underlined the importance of the 2021 United Nations Climate Change Conference in Glasgow, where world leaders will meet to tease out ways to keep global warming well below 2°C. Yet, any steps to limit the climate crisis would require rapid reduction in the use of fossil fuels, particularly coal.³ According to the International Energy Agency, to keep the global temperatures well below 2°C, unabated coal use needs to be phased out by 2040 in all countries.⁴ The good news is that some Organization for Economic Cooperation and Development (OECD) countries have already made explicit plans to phase out coal-based power; others have declared net-zero targets that would implicitly entail phasing out the coal sector over time. However, attaining Paris Agreement goals would require large coal-dependent emerging economies to also reduce their long-term dependency on coal.⁵

India and South Africa are two prominent emerging economies with a large coal mining and power footprint.⁶ In both countries, coal forms the mainstay of their electricity systems and is the key fuel for the industrial sector. Among the G20 countries, South Africa and India are also the most coal-reliant countries—86 percent and 71 percent of their electricity, respectively, comes from coal.⁷ Although its per capita CO₂ emissions are well below the global average, that places India as the third-largest greenhouse gas emitter in the world and South Africa at fourteenth. They are both vulnerable to the impacts of climate change. Whether these countries will meet their future energy demand using coal or low-carbon sources is crucial to global climate targets.⁸

The government of South Africa aims to make the country net zero by 2050,⁹ and in September 2021, it updated its nationally determined contribution to keep annual greenhouse gas emissions between 350 and 420 megatons of carbon dioxide equivalent by 2030.¹⁰ Its Integrated Resource Plan (IRP) states that the country will add over 20 gigawatts (GW) of new power by 2030, mostly in the form of solar and wind.¹¹ The IRP also underlines that coal will

remain an important energy resource for the next few decades. Similarly, the government of India has declared a renewable energy target of 450 GW by 2030 and made renewable energy a priority. Despite the renewable energy push, the national government and several state governments in India continue to promote both coal mining and power generation to meet their growing energy needs. India's per capita energy consumption is nearly one-third of the world average.¹² Overall, energy access—meeting the energy needs of a growing population while reducing energy poverty as quickly as possible—is a real challenge for both countries.

In South Africa and India, the key techno-economic argument in favor of coal power remains that solar and wind cannot provide uninterrupted power and that energy storage is still expensive, even though solar and wind power is cheaper than coal at a levelized cost basis. The argument in favor of coal power is also that coal power will be required during peak electricity usage times of the day (evenings and mornings) when the sun does not shine, or wind may not blow, and for managing the grid throughout the day resulting from intermittency of renewables.¹³ Moreover, both countries have abundant coal reserves and have already built the infrastructure to mine and generate power from it. However, rapid improvements in storage technologies are bringing down renewable energy storage costs further, which will aid renewables to provide consistent and cheap power throughout the day.

Beyond these techno-economic issues, there are social concerns associated with a coal phase out, including the loss of local jobs and revenues. These challenges influence the political acceptability of an accelerated coal phase-out.¹⁴ In order to mitigate these concerns and to ensure justice in the transition, it is vitally important to plan for the socio-economic dimensions of a coal transition.¹⁵

Globally, a body of literature has emerged that focuses on the need for a “just transition” for fossil fuel workers, including coal. Much of this research has focused on OECD countries.¹⁶ Moreover, much of the literature has focused on national transition issues, despite coal transitions having deeper social implications for individual coal-producing states or provinces within countries. Despite the regional nature of coal-related just transition challenges, the literature focusing on regional just transition issues remains limited (with some notable exceptions).¹⁷ Furthermore, there is limited analysis of the challenges and opportunities associated with just transition planning in different coal-dependent regions in emerging economies. Analyzing and providing insights on just transition aspects in different subnational jurisdictions in emerging economies could be useful for these jurisdictions as well as for other coal-dependent economies.

1.1 Objectives and Methodology

This study focuses on the coal-dependent regions of Mpumalanga, South Africa, and Jharkhand, India, to investigate the key elements of a just transition away from coal in order to provide recommendations for stakeholders involved in just transition planning.¹⁸

The study first explores the province and state-level coal ecosystem in Mpumalanga and Jharkhand.ⁱⁱ Next, it investigates some key elements of just transition planning: (1) the challenges and opportunities associated with diversification of provincial and state economies; (2) the prospects for environmental rehabilitation of coal mines and power plants; and (3) the landscape of stakeholders critical for just transition planning, including underrepresented stakeholders.

TABLE 1: KEY FEATURES OF MPUMALANGA AND JHARKHAND

All data is for the year 2020 unless specified.

COUNTRIES	POPULATION (MILLIONS)	UNEMPLOYMENT RATE ⁱⁱⁱ (%)	GDP PER CAPITA (US\$)	COAL PRODUCTION (MT)	COAL POWER PLANT CAPACITY (GW)
MPUMALANGA	5*	34*	5,284**	222	30**
SOUTH AFRICA	60*	33*	5,091	247	38**
JHARKHAND	39	9*	1,173	130	2
INDIA	1,370	7*	1,900	779	208

*Note: *Data for 2021; **Data for 2019.*

Source: From multiple sources. Please reference the corresponding endnote for a full list of citations.¹⁹

The study focuses on Mpumalanga and Jharkhand because they are by far the most prominent coal-dependent province or state in their respective countries in terms of job dependency and number of local municipalities and districts dependent on coal (Table 1). Both have the highest number of coal jobs in their respective countries.²⁰ Moreover, the coal sector has a long and deep social and political history in these states, leaving the coal sector deeply embedded. Understanding the key elements of a just transition in these places will provide a useful starting point when identifying common just transition challenges and opportunities for coal-dependent emerging economies that are also thinking about a just transition.

While there are many other elements of just transition planning such as skills retraining or understanding coal identity issues²¹, the above three elements (economic diversification, environmental rehabilitation and stakeholder mapping) were chosen as areas of analysis because they are underexplored in the literature but are key areas for a just transition in coal-dependent regions.²²

ii This study defines coal ecosystem as the various ways and processes by which economies are socio-economically dependent on coal.

iii The South African government captures both “official” and “expanded” unemployment rates. In this study, the authors have used the “official” unemployment rate that includes people who are without a job but are actively looking for a job. In India and Jharkhand’s case, the unemployment rate captures those people who are unemployed and are actively looking for a job.

Case study research is used in both locations to explore the coal ecosystem and the three key elements of just transition planning. Research for the study included an extensive review of the academic and policy literature and interviews with key regional stakeholders in Mpumalanga and Jharkhand. A total of 25 expert interviews were conducted spanning representatives from the regional government, trade unions, local activist groups, coal companies, industry associations, and academia (Appendix A). Additionally, data sets were collected and analyzed, including on coal mines and power plants and solar and wind potential, among others, to triangulate the interview findings. This information was sourced from government reports, annual reports of coal companies, and data sets by Global Energy Monitor. Interviews were conducted with five workers from Mpumalanga and five from Jharkhand. Given the Covid-19 travel restrictions, the authors of this study were unable to travel to Mpumalanga and Jharkhand in order to conduct extensive consultation with coal communities.

Overall, the study relies on the literature review and interviewee transcripts to develop a narrative of the coal ecosystem, explore the three key elements of just transition planning, and highlight the unique perspectives of the various stakeholders affected by a coal transition. The methodology developed in this study provides a framework to analyze other elements of just transition planning in future research.

Mpumalanga, South Africa

2.1 Coal Sector Ecosystem in Mpumalanga

Mpumalanga is at the heart of the South African coal sector, with nearly 90 percent of South African coal produced in the province.²³ It is also home to over 70 percent of the coal power plant capacity in the country. In terms of the structure of the coal industry, coal mining is completely in the hands of the private sector, while coal power plants are exclusively run by state-owned power company Eskom. Currently, five companies—Anglo American, South32, Glencore Xstrata, Sasol, and Exxaro—collectively produce well over 80 percent of the coal produced in the country.²⁴ However, in 2021, global coal companies Anglo American, South32, and Glencore Xstrata decided to exit the South African coal mining business. The assets of these majors are being acquired by two South African companies—Thungela Resources and Seriti. With this shift, the new mining regime is now increasingly concentrated in the hands of locally owned mining companies such as Seriti and Exxaro.

In addition to these larger companies, there are many smaller companies that produce small amounts of coal. Beyond the electricity sector, coal has been important to the country's industrial development, as it has been a major input to industrial sectors such as petrochemicals and metals refineries for over a century.²⁵

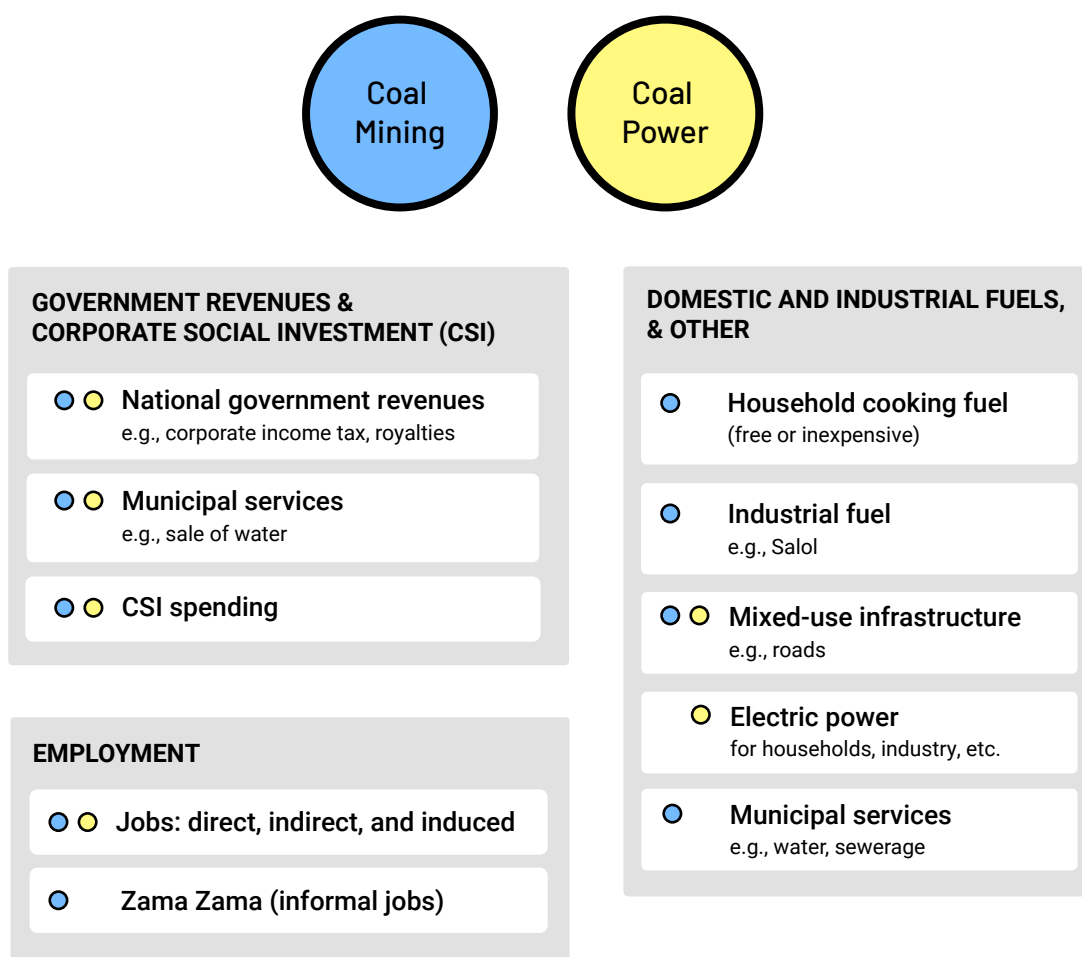
The extraction of coal and its use in power and industrial processes is continuing to have negative health and environmental impacts for local communities in Mpumalanga, including air and water pollution and landscape degradation. Like other coal-dependent regions, Mpumalanga is a hot spot for different air pollutants, such as NO₂. Further, coal-fired power plants and mines require large quantities of water and physically disrupt hydrogeologic systems.²⁶ By-products, including surface runoff and acid mine drainage, contaminate surface water and groundwater, threatening important water resources that originate in the Highveld region,^{iv} including the Vaal and Komati Rivers.²⁷ Moreover, the landscape is degraded from over a century of mining and continues to increase as the quality and availability of coal reserves diminish.²⁸

iv The topography of Mpumalanga is split into three zones: Highveld, Lowveld, and Escarpment. The coal mines and coal-fired power plants are concentrated in the Highveld zone.

While there are negative health and environmental impacts of coal extraction and use in local communities, the sector is also deeply linked to socio-economic outcomes nationally and in Mpumalanga. Figure 1 is based on interviews and literature analysis and shows the different ways the coal sector contributes socio-economically to the province and the country.

FIGURE 1: SOCIO-ECONOMIC CONTRIBUTIONS OF THE COAL SECTOR TO MPUMALANGA AND SOUTH AFRICA

The coal mining and coal power sectors contribute direct revenues to the national government. In some cases, local municipal governments earn their revenues by selling water and other services to the coal industry. In other cases, coal companies provide basic municipal services directly to certain communities. The coal sector also engages in corporate sector investments (CSI)^v spending and provides jobs. Coal is also a source of cheap (or in some cases free) fuel for households and industry. The blue circles indicate coal mining's socio-economic contribution; yellow circles indicate coal power's socio-economic contribution.

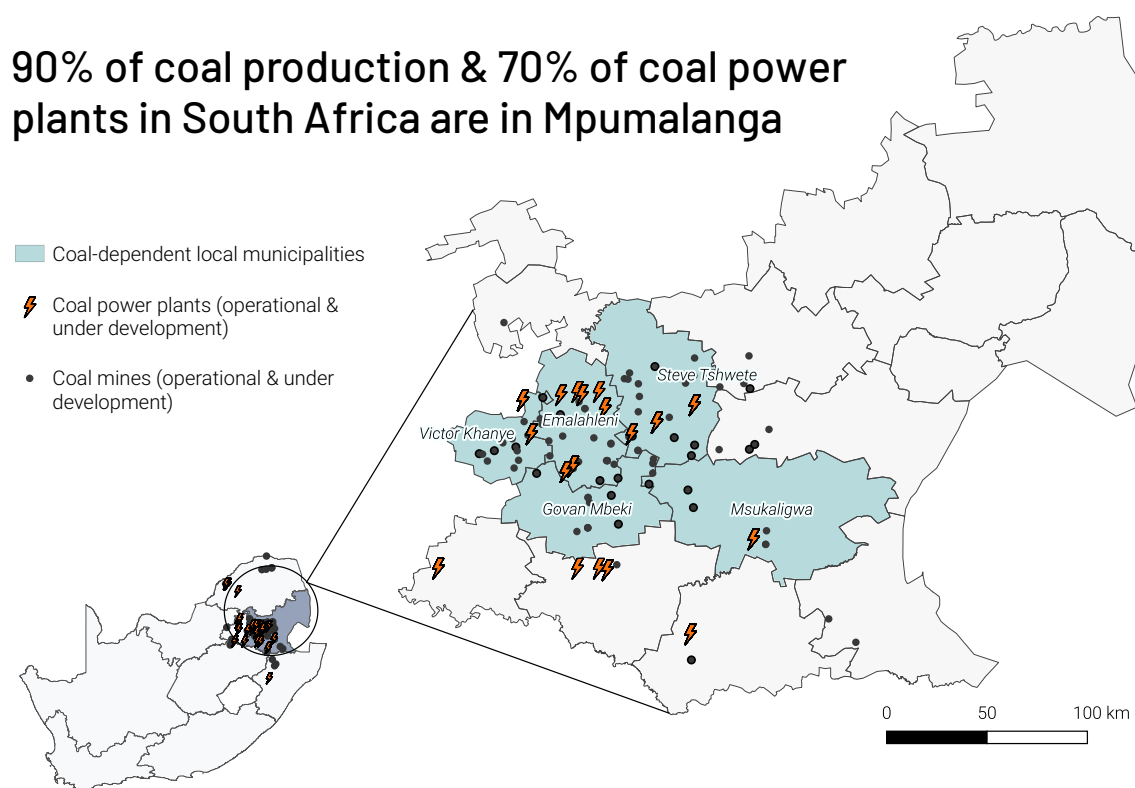


^v Corporate sector investment (CSI) is a form of social spending by companies similar to Corporate Social Responsibility in other countries. Typically, CSI spending in the power sector takes place in local communities where the power plants are located.

It must be noted that most of the mines are concentrated in two of the three district municipalities^{vi} within the province—Nkangala and Gert Sibande.²⁹ Moreover, there are four local municipalities (out of seventeen) that have the most undiversified, coal-dependent economies based on gross value added estimates—eMalahleni (Witbank), Steve Tshwete (Middelburg), Govan Mbeki, and Msukaligwa (Ermelo) (see Figure 2).³⁰

FIGURE 2: MAP OF MPUMALANGA PROVINCE

The coal mines and power plants are concentrated in the western and central parts of the province.



Source: “Global Coal Plant Tracker,” Global Energy Monitor (GEM), n.d., <https://globalenergymonitor.org/projects/global-coal-plant-tracker/>; “Global Coal Mine Tracker,” GEM, n.d., <https://globalenergymonitor.org/projects/global-coal-mine-tracker/>; and “South Africa – Subnational Administrative Boundaries,” OCHA ROSEA, n.d., <https://data.humdata.org/dataset/south-africa-admin-level-1-boundaries>.

Coal companies contribute to the national government coffers in the form of corporate income tax and royalties. In 2018, the South African coal mining industry contributed 1.637 billion rand (\$110 million) in royalties to the national government, which is less than 1 percent of total national revenue collection.³¹ However, the consolidated corporate tax of the

vi At the local governmental level, district municipalities are comprised of several local municipalities. District municipalities are responsible for coordinating development within the entire district, while local municipalities perform local service delivery as well as any other functions.

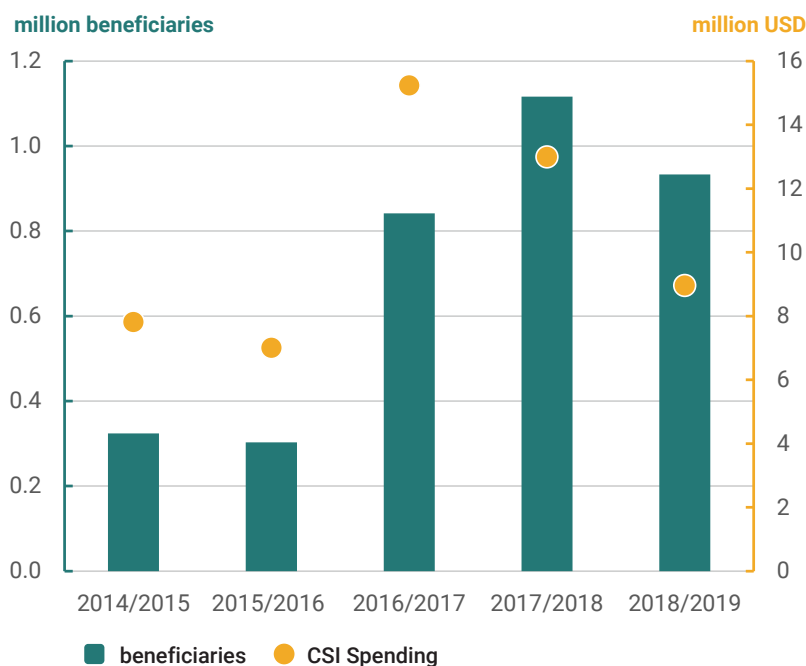
coal mining and power sectors has not been quantified, meaning the actual contribution to national coffers remains unknown. Given the centralized governance structure of South Africa, provincial governments and local governments typically do not collect royalties or taxes directly. The National Treasury collects all taxes and royalties (for all sectors, including coal) and makes budgetary allocations to the different provinces and local municipalities each year based on local needs and available funds. Local municipalities derive important sources of direct income through the supply of water and provide other services to coal mining and power plant operations. Overall, the mining sector contributes 25 percent of Mpumalanga's GDP—more than any other sector.³²

Coal mining and power sectors undertake spending under corporate social investments (CSI). For example, Eskom spent 768.9 million rand (\$52 million) in the last five years in sectors such as “enterprise development, rural infrastructure development, skills development, social development, education and health, as well as philanthropy and welfare” (see Figure 3).³³

FIGURE 3: ESKOM'S FIVE-YEAR CSI SPENDING

The Eskom Development Foundation has spent 768.9 million rand (\$52 million) nationally between 2014/15 to 2018/19 through corporate social investment (CSI). Typically, CSI spending takes place in local communities where the power plants are located.

Eskom's Five-Year CSI Spending



Source: “Eskom Development Foundation NPC.” Eskom, 2021, <https://www.eskom.co.za/OurCompany/CSI/Pages/Eskom%20Development%20Foundation.aspx>



Photo by Daylin Paul

The coal sector also provides direct jobs to around 100,000 people nationally—87,000 in the coal mining sector and 12,000 in power plants.³⁴ Given the heavy concentration of coal mines and power plants in the province, the majority of these jobs are in Mpumalanga, representing around 10 percent of total employment in the province.

Usually, coal sector wages are much higher than those of workers in other industries.³⁵ Median pay in the mining and power sectors are 10,000 rand (\$680) and 15,000 rand (\$1,000) per month, respectively. By comparison, the median wage of other formal workers in South Africa is 5,000 rand (about \$340). Furthermore, nearly 70 percent of mine and power plant workers are unionized.³⁶ The mine workers are mostly represented by the politically powerful National Union of Mineworkers (NUM), and the electricity workers are represented by the National Union of Metalworkers of South Africa (NUMSA) and Solidarity. Many elected politicians in South Africa have previously held senior positions in NUM. As one academic working on just transition stated, “In a country with high levels of unemployment, these high paying jobs make the transition away from coal a contentious political issue.”³⁷

In addition to these direct jobs, there are people who provide goods and services to the coal sector, often classified as indirect jobs.³⁸ The Mineral Council of South Africa estimates that there are around 170,000 indirect jobs linked to the national coal mining sector alone.³⁹ Although the exact number is hard to quantify, an interviewee suggested that for every direct coal worker there are three indirect workers.⁴⁰ There are important race and class

dynamics to note here, as many of these indirect jobs are generated through coal supply chain contracts that are captured under the Broad-Based Black Economic Empowerment Act, which requires Eskom and mining companies to prioritize contracts with local Black-owned businesses for their goods and service providers.

Studies have also shown that several small businesses in local coal-dependent areas have contracts from the coal industry. A recent paper focused on Steve Tshwete in Mpumalanga found that 57 percent of businesses in the study area—90 percent of which typically employ fewer than 500 people—offer services to either coal mines or coal power stations.⁴¹

Furthermore, there is significant coal derived employment for people who provide services to meet the consumption demands of directly and indirectly employed coal workers. This is often referred to as induced employment. As one interviewee put it, “there are hundreds of shops and restaurants in coal-bearing areas that rely on spending by direct and indirect coal workers.”⁴²

Outside of these formal categories of employment, there is a sizable number of people who scavenge coal for either self-use or to sell in the market. These workers are often referred locally as Zama Zamas or people who “try and try.” They are informal workers or illegal miners.

In spite of the known health impacts, Zama Zamas and other local people often use coal as a cheap source of fuel for cooking and heating purposes. Urban households also use coal for domestic heating and cooking.

In addition to the above contributions, coal is a source of fuel for several small- and large-scale industries in the region, including synthetic fuels, petrochemicals, and steel, all of which are big employers.⁴³ Sasol, which produces synthetic fuel using coal, alongside other fuels, employs around 26,000 people nationally, most of them in Mpumalanga.

Given the deep socio-economic reliance on coal, an unplanned, unjust energy transition might adversely impact local communities, from loss of high-paying local jobs, reducing CSI spending, and hindering local fuel use to lowering municipal revenues. If mines and power plants are closed down without planning for new jobs locally, it may lead to the destruction of livelihoods in local municipalities and in the broader region.

“Coal has been our source of income for many households. We use [coal] when we don’t have electricity, and we use it to cook; we depend on it for many things especially household expenses.”

—Bonginkosi Mhlangu, Zama Zama in Mpumalanga

It is therefore key that thorough analysis is undertaken to fully understand the extent of dependency across the coal ecosystem in Mpumalanga before any transition planning is developed. Once this is completed, plans can begin to explore and incorporate opportunities for replacement industries.

2.2 Diversifying the Economy

Given the reliance on the coal sector for jobs, revenues, social spending, and industrial production, and given general high levels of unemployment in the province and the country's commitment to net zero, any just transition plans would need to focus on a broader diversification of the provincial economy, with a special focus on creating new industries in local coal-dependent municipalities. Failure to diversify away from the coal-based economy toward low-carbon industries will have negative consequences for local workers and community members.

Interviewees and literature analysis suggested that the province and municipalities have some natural advantages that can aid general diversification.

First, Mpumalanga has a well-connected infrastructure network such as road connectivity, broadband connection, and electricity transmission lines built for expansion of the coal mining and power sectors. Future low-carbon manufacturing industries or renewable energy generation facilities could benefit from this existing infrastructure.

Second, the province also possesses nearly 50 percent of South Africa's high potential arable land, critical water resources, and abundantly diverse species and habitats.⁴⁴ The province already is a leading producer of fruits and nuts among other agricultural crops. Table 2 depicts the crop potential for the four coal-dependent local municipalities mentioned above in comparison to the provincial average.⁴⁵ Over 21 percent of the total provincial area has crop potential. Each of the four key coal dependent municipalities have greater crop potential than the provincial average. These natural resources create potential for promoting agricultural industries, as well as tourism.

Third, the province has the youngest population in the country, which means the availability of a young workforce that can be trained and deployed in the new industries.

Finally, some of the largest companies in the country, among them Eskom, are present in Mpumalanga. (See section on Eskom diversification below.) Companies like Eskom have the capacity, resources, and know-how to attract investments into new industries. These companies also have vast supply chain networks that could be oriented toward new industries, should there be impetus.

TABLE 2: CROP POTENTIAL OF KEY COAL-DEPENDENT LOCAL MUNICIPALITIES

Mpumalanga, and particularly the Highveld region, is known for its high-potential soils. This table depicts the crop potential of four coal-dependent local municipalities. The crop potential in these areas exceeds the provincial average. Areas with crop potential are defined as those that are either commercial dry land, commercial irrigated land, or subsistence agricultural land.⁴⁶

LOCAL MUNICIPALITY	CROP POTENTIAL (% OF THE TOTAL AREA)
Msulkaligwa	22
Goven Mbeki	55
Steve Tshwete	33
Emalahleni	30
Mpumalanga Province	21

Source: Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs, Annual Performance Plan for the Fiscal Year 2018/19 (Mbombela, South Africa: April 2018), https://dardlea.mpg.gov.za/publications/annual_reports/ANNUAL_PERFORMANCE_PLAN_2018_2019.pdf.

Based on Mpumalanga's competitive advantages, this study explores two distinct but connected options for diversification which could provide viable just transition pathways for its coal-dependent communities.

- 1. Provincial diversification**, led by the provincial government and in consultation with academia, communities, businesses and investors, and labor; and
- 2. Business diversification of coal companies such as Eskom**, led by companies themselves and focused on corporate diversification of their businesses.

Diversification of the Province

Many interviewees, including officials of the provincial government, proposed sectors which could become engines of diversification. These were then divided into two types of sectors (see Table 3): (1) existing sectors that already have a footprint in the state, and (2) new sectors that have a low or limited presence but have significant future potential.

Although the existing sectors such as agriculture and tourism, among others, have potential for expansion, bringing these sectors into the coal-dependent municipalities involves unique challenges. (Table 3 explains the drivers and barriers for transitioning to each of these sectors.) For example, the province produces several high-value agricultural commodities, including nuts and fruits in the Ehlanzeni district and grains and beef in the Nkangala and Gert Sibande districts, respectively.⁴⁷ However, agriculture and coal mining currently compete for land and water resources, making a transition from one to the other fraught with potential tension and complication. Furthermore, due to ongoing environmental degradation from coal mining, the available area of high potential arable land in Mpumalanga is under threat.⁴⁸ Proper environmental rehabilitation of coal mines and power plants and sustainable water

management practices will therefore be important for promoting future industries such as agriculture in coal-dependent municipalities. (See next section for details.) As with all diversification options, it is, however, important that the development and promotion of agriculture be done in a sustainable manner in close alignment with regional and national priorities, and in a manner that does not undermine climate goals nor negatively impact local environments and their communities.

In terms of new sectors, renewable energy projects in certain coal-dependent municipalities in Mpumalanga have significant future potential. The availability of suitable solar radiation resources and transmission and distribution lines makes former coal mining and power plant sites ideal places for installing solar power plants. One study focusing on Steve Tshwete suggests that many local businesses are interested in solar but lack understanding of solar markets.⁴⁹ Moreover, South African national regulations currently allow private companies to install a maximum of 100 megawatts (MW) of renewables per site without obtaining onerous licenses, which could limit renewable energy expansion and therefore green job creation potential in coal-dependent municipalities.⁵⁰ The threshold was raised from 1 MW recently, which is seen as a positive step.

TABLE 3: KEY SECTORS FOR ECONOMIC DIVERSIFICATION OF MPUMALANGA

The table below details existing sectors (colored blue) and new sectors (colored yellow) that provincial and government experts suggest could be future sectors for diversification. This list was compiled by researchers based on interviews and document analysis.

GENERAL DRIVERS	BARRIERS TO EXPANSION
AGRICULTURE	
<ul style="list-style-type: none"> • About 24 percent of the provincial land is arable, and 14 percent of the land is available for natural grazing. • Only 1.5 percent of South Africa's soil is considered high potential, and 47 percent of this land is in Mpumalanga.⁵¹ • The province is a leading producer of fruits and nuts, among other agricultural crops. • Increased access to affordable food could help alleviate the high levels of food insecurity.⁵² 	<ul style="list-style-type: none"> • The wages in the agriculture sector are low in comparison to those in coal-related sectors, and many view conditions on white farms as "a return to the slavery of the past."⁵³ • The land is badly degraded in places where coal mining happens, making expansion of agriculture in these areas difficult. • The agricultural sector will compete with coal mining sectors for water and land resources until the coal sector is phased out.⁵⁴
TOURISM	
<ul style="list-style-type: none"> • The province attracts millions of national and international tourists every year. • The eastern part of the province is home to tourist hot spots, such as Kruger National Park. • There are several sites of historical and cultural significance, including the Botshabelo Heritage Site and the Loskop and Middleburg dams, in coal-dependent municipalities such as Steve Tshwete that could become tourism hot spots.⁵⁵ 	<ul style="list-style-type: none"> • Coal mines and power plants are located in the western and central parts of the province, but the tourism centers are located in the east. There is a spatial mismatch between these two sectors, making it hard to determine who will derive benefits from a transition. • Coal-dependent local municipalities face severe environmental threats such as water pollution and land degradation. This remains a challenge for converting coal-dependent municipalities into tourism centers

MANUFACTURING	
<ul style="list-style-type: none"> Manufacturing industries, including petrochemicals, steel, and metals, already account for about 14 percent of provincial GDP. There is high availability of skilled manufacturing labor, a quality electricity network, and emerging service industries. 	<ul style="list-style-type: none"> The manufacturing industries largely rely on coal as an input fuel. The Mpumalanga Industrial Development Plan (MIDP) and its roadmap identify manufacturing industries linked to mining sectors as “centers of competence” for promoting the manufacturing sector. This implies that existing provincial plans continue to promote coal mining as a raw material for manufacturing industries.
RENEWABLE ENERGY PRODUCTION	
<ul style="list-style-type: none"> There is high availability of existing land and transmission and distribution lines. There are suitable solar resources in most coal areas. 	<ul style="list-style-type: none"> South African laws do not allow private companies to build more than 100 MW of generating capacity without obtaining a generating license. Given the low employment intensity of renewables compared to coal mining or power, and the onerous licensing procedures, the 100 MW limit restricts job creation potential for these sectors. Local entrepreneurs lack understanding of solar-sector opportunities.

To initiate the diversification process, the provincial Department of Economic Affairs and Tourism has recently formed a cluster entity for the promotion of these sectors. This cluster entity is at the initial stages of operation, so the exact way in which the cluster will promote these industries is not yet clear. The province lacks funds to directly invest itself in diversification programs and will remain reliant on national funding or private investors. Currently, only 3 percent of total provincial revenue is collected by internal sources; the rest is transferred to it by the national government.⁵⁶ Therefore, the national government will have a crucial role in allocating funds to help diversify the province and coal-dependent regions within the province. Several interviewees recommended that what is lacking right now is an integrated industrial policy to promote these investments throughout the province and in local coal-dependent municipalities. Also, there is lack of alignment between national, provincial, and local-level planning, which discourages private sector companies from investing in sectors such as renewable energy.

Business Diversification of Coal Companies Such as Eskom

Eskom provides jobs, spends money through CSI, provides municipal services at the local level, and invests in local infrastructure. The success of Eskom’s diversification plans could play a crucial role in facilitating a just transition for local coal-dependent municipalities.

In 2020, Eskom created a Just Energy Transition office to help create plans for diversifying its core business away from coal-based power. The company has committed to “repower” and “repurpose” its power plants in a phased manner. As part of the repurposing strategy, it

intends to utilize its existing coal assets to deploy scaled-up renewable energy technologies, battery storage, and hydrogen technologies, among others.⁵⁷ The strategy also references repurposing assets for new services, including converting former power plants into green industrial parks and creating potable water infrastructure for bottled water packaging and supply.⁵⁸ This strategy, it hopes, will help mitigate job losses that might arise from decommissioning its power plants. The company is undertaking socio-economic impact studies on how a power plant shutdown will impact workers and local communities so that it can incorporate those concerns into its repower and repurpose strategies.



Photo by Daylin Paul

Interviewees identified a number of key challenges for implementing Eskom's repurposing and repowering strategy. First, Eskom is a highly indebted company, with its current debt in excess of 400 billion rand (\$27 billion).⁵⁹ Eskom has not been generating enough electricity to meet South African power needs, resulting in intermittent power shortages, and is not generating enough cash to cover its operating expenses and interest bills, leaving it dependent on government support to survive. Eskom is exploring various mechanisms to address this capital crunch. One such model involves the design of a multi-lender facility involving various sources of capital such as private, bilateral, and multilateral development financiers to mobilize additional capital to support its transition away from coal and toward renewable sources of energy.⁶⁰

2.3 Environmental Rehabilitation

Rehabilitating coal mines and power plants will be vital for promoting future industries—from renewables to agriculture—in coal-dependent municipalities. Additionally, failure to focus on remediation will further disadvantage already vulnerable and marginalized groups that are suffering from coal mining and power operations. Interviews and document analysis suggest that the rehabilitation of mines presents a significant challenge given the degree of environmental degradation, regulation shortfalls, and the plethora of stakeholders in play. This section discusses rehabilitation issues regarding coal mining and the rehabilitation, repowering, and repurposing of power plants.

Coal Mining Rehabilitation: Regulations and Challenges

The 2014 Environmental Impact Assessment (EIA) Regulations, within South Africa's framework National Environmental Management Act (NEMA), require companies to submit environmental management and closure plans to the appropriate department to obtain environmental authorizations.⁶¹ Normally, the National Department of Forestry, Fisheries and Environment is responsible for issuing and enforcing these authorizations.⁶² However, in the case of mining-related activities, the National Department of Mineral Resources and Energy (DMRE) has managed these authorizations since the promulgation of the "one environmental system"^{vii} in 2014.⁶³ Specifically, to operate a coal mine, mining companies must conduct and submit an environmental impact assessment (EIA) that includes a Social and Labor Plan (SLP) and an Environmental Management Program (EMPR) to obtain authorization from the DMRE.⁶⁴ The SLP details the company's plan and financial commitment to promote local employment and development and to manage downscaling and retrenchment.⁶⁵ Meanwhile, the EMPR requires companies to provide an annual rehabilitation plan; a final rehabilitation, decommissioning, and closure plan; and financial provisions necessary to fund these activities in the form of trust funds, financial guarantees, or cash deposits administered by the DMRE.⁶⁶ In addition to the above, companies are usually required to obtain a water use license from the Department of Water and Sanitation.

Many consider South Africa's environmental regulations "amongst the best in the world,"⁶⁷ and the above regulations should, in theory, proactively ensure rehabilitation to support a just transition and diversification of the local economy.⁶⁸ But these environmental mandates do not always translate into the proper rehabilitation of coal mines due to three key reasons.

vii Environmental authorizations for mining issued prior to the OES system (2014) are still regulated under the previous regulatory system (Mineral and Petroleum Resources Development Act, or MPRDA), despite efforts to bring these mines into compliance with current regulations.



Photo by Daylin Paul

First, the SLPs, EMPRs, and the financial provisions within them are not openly available for review, making it challenging for stakeholders to assess the adequacy of mining companies' plans.⁶⁹ Typically, the rehabilitation plans under the EMPR are prepared by the mining companies, with input from external experts, in accordance with industry guidelines for "best practices" issued by the Chamber of Mines (now the Minerals Council).⁷⁰ Several interviewees confirmed there is no input from local communities. Although, large mining companies in their annual financial statements disclose consolidated figures for financial provisions for rehabilitation and closure, this information is usually inadequate to assess mine-level provisions.⁷¹ On various occasions, the DMRE has not been able to secure sufficient financial provisions for the calculated costs of rehabilitation for mines.⁷² While the Department of Water and Sanitation can also legally require financial provisions for water treatment, such provisions are rarely, if ever, required during the water use license application process.⁷³ In fact, many mines allegedly operate without proper water use licenses.⁷⁴ The result of this lack of transparency around SLPs and EMPRs and the associated financial provisions is that, on many occasions, companies fail to fulfill their obligations; dissolve or restructure once operations are no longer profitable; place mines under "care and maintenance" to postpone proper closure; or sell their operations to smaller companies that are unable or unwilling to finance rehabilitation.⁷⁵

Second, the DMRE's constrained human resources present additional challenges for proper rehabilitation. The rehabilitation of mines is a mammoth task, and the DMRE has limited capacity to monitor compliance and enforcement of environmental regulations at some 239 operational mines and 788 abandoned mines in the Mpumalanga province.⁷⁶

Third, the DMRE is also responsible for addressing legacy contamination from the nearly 6,000 "derelict and ownerless"^{viii} mines in South Africa.⁷⁷ These mines continue to pollute the environment and the rate of rehabilitation is slow, in large part because the cost of rehabilitation exceeds the DMRE's budgetary capacity.⁷⁸

Coal Power Rehabilitation: Regulations and Challenges

Under the National Environmental Management Act, Eskom is similarly required to develop environmental management and closure plans for coal-fired power plants during the application process to ensure proper rehabilitation. Unlike the mining sector, however, environmental authorizations for electricity generation are issued and enforced by the National Department of Forestry, Fisheries and Environment. Furthermore, developers are not required to put up financial provisions for their environmental liabilities as determined in the EIA process. Only mining companies are required to do so at the outset.⁷⁹ There is not much experience with the rehabilitation of power plants given that they are fewer in number and very few (if any) have ever been shut down. Eskom is undergoing environmental and social impact studies to understand the criteria and various challenges of repowering and repurposing four of its coal-fired power plants slated for closure.⁸⁰

Rehabilitation Opportunities

Despite these challenges, environmental rehabilitation presents strategic opportunities to support a just transition. Rehabilitation of mines and power plants will create short-term jobs with skills that could be readily transferred from the mining industry with little retraining.⁸¹ Cleaning up coal mining and power plant sites could be an important component of diversification of local coal-dependent municipalities such as eMalahleni (Witbank) and Steve Tshwete.

Many interviews suggested that dealing with the coal mine closure problem requires mineral authorities and oversight bodies taking the lead and a whole-of-government response.⁸² Interviewees also suggested that plans for mine closure should be made public to increase transparency in the planning process, that the DMRE needs to be better resourced with personnel for undertaking these tasks, and that mining companies and government alike should adopt a regional approach to rehabilitation. This regional approach should be in line with a post-mining vision of the landscape. To this end, the DMRE's 2021 Draft National Mine Closure Strategy

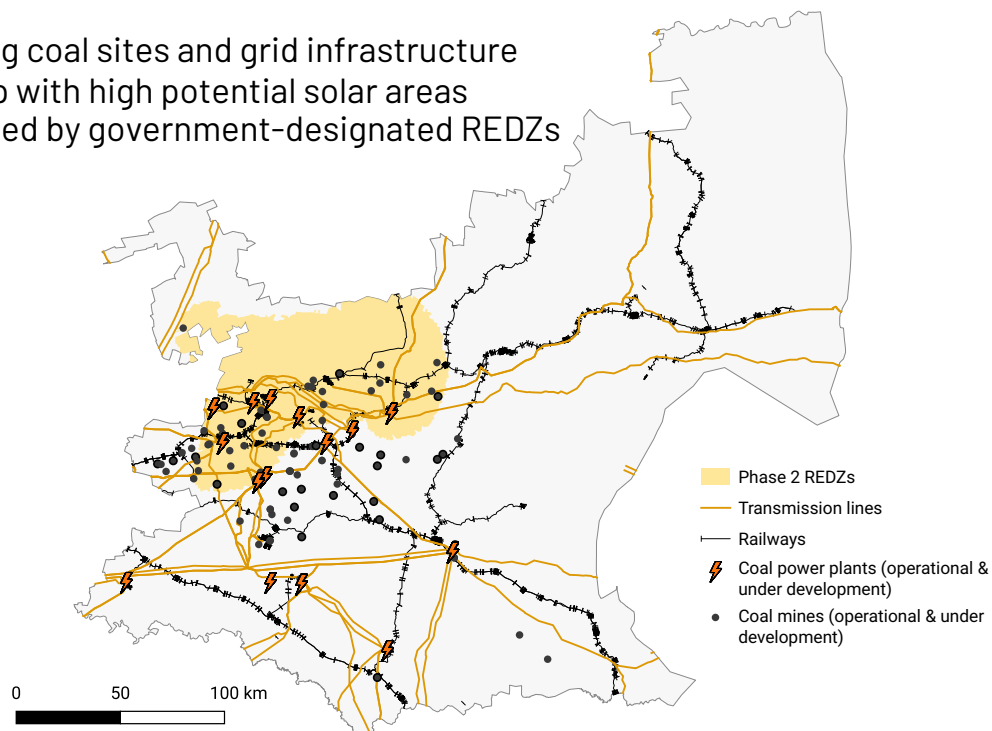
viii Derelict and ownerless mines are mines that have been abandoned and whose owners or lease holders can no longer be traced. These mines were typically operational when environmental management of mines was not well regulated.

embraced the importance of developing predetermined post-mining land use policy, but this strategy is still at a draft stage.⁸³

FIGURE 4: RENEWABLE ENERGY DEVELOPMENT ZONES IN MPUMALANGA

The Council for Scientific and Industrial Research conducted a Strategic Environmental Assessment for solar photovoltaics focusing on coal-dependent areas. The second phase identifies Renewable Energy Development Zones for solar photovoltaic energy projects, including in coal-dependent areas. These areas have an excellent network of high-voltage transmission lines.

Existing coal sites and grid infrastructure overlap with high potential solar areas indicated by government-designated REDZs



Source: "Global Coal Plant Tracker," Global Energy Monitor (GEM); "Global Coal Mine Tracker," GEM; "South Africa – Subnational Administrative Boundaries," OCHA ROSEA; "Phase 2 REDZs," Department of Forest, Fisheries and the Environment, n.d., <https://egis.environment.gov.za/redz>; "HOTOSM South Africa Railways," Humanitarian OpenStreetMap Team, n.d., https://data.humdata.com/dataset/hotosm_zaf_railways; "Sub-Saharan Africa – Electricity Transmission Network," World Bank Group, n.d., <https://datacatalog.worldbank.org/dataset/sub-saharan-africa-electricity-transmission-network-2007>.

Research is required to understand options for rehabilitation that can also help diversify the local economy and create jobs. Various research groups are already starting to explore specific ideas for post-mining activities.⁸⁴ For example, ongoing research is exploring whether fibre-rich biomass, including bamboo, can be used to remediate degraded mining land, which can suffer from 30 to 90 percent reduction in soil potential and can be laden with heavy metals, while generating jobs and revenue for post-mining economies. Meanwhile, the government is seeking to promote mine rehabilitation through renewable energy development in the area (Figure 4). The Council for Scientific and Industrial Research, a leading scientific research institution, conducted

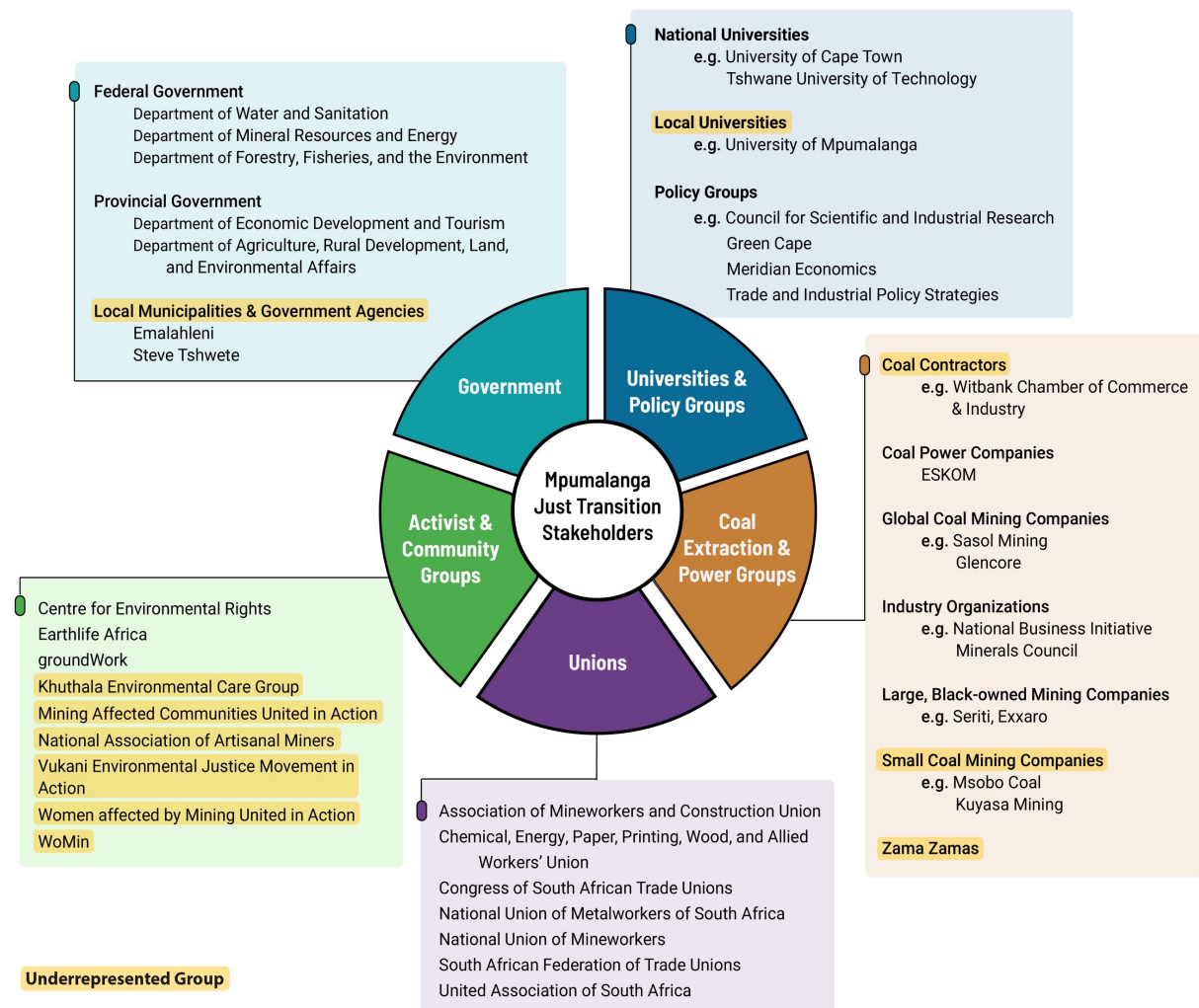
a Strategic Environmental Assessment for wind and solar photovoltaics. It identified Emalahleni/Witbank as a Renewable Energy Development Zone (REDZ) based on its resource potential for solar, its land use, and its proximity to transmission infrastructure.⁸⁵

2.4 Stakeholder Mapping

If the transition is to be just, various stakeholders, including underrepresented groups, need to be consulted and engaged in the decisions that will affect their livelihoods and communities. Based on interviews, this study identified five stakeholder groups important to any just transition planning in Mpumalanga (Figure 5).

FIGURE 5: MPUMALANGA JUST TRANSITION STAKEHOLDERS DIAGRAM

Based on interviews, these are the critical stakeholders important to any just transition planning in Mpumalanga, including those that are currently underrepresented in the just transition planning process.



Universities and Policy Groups: The first group broadly includes universities and policy groups that carry out modeling studies and other qualitative and quantitative studies focusing on just transitions. Specialized economic groups such as Meridian Economics and Trade and Industrial Policy Strategies (TIPS) analyze just transitions spatially and temporally to determine where and how declines will appear in the future. TIPS has also been instrumental in organizing seminars on various aspects of just transitions, often through inclusive multi-stakeholder engagements involving labor and local community members. Additionally, energy and climate policy experts at South African universities, such as the University of Cape Town, have performed analyses to identify successful transition strategies. However, academics at local universities, such as the University of Mpumalanga, who specialize in subjects that can aid the provincial government lack research representation.

Coal Extraction and Power Groups: The second category includes coal extraction and power groups. Aside from Eskom, global mining companies, larger Black-owned mining companies, and small mining companies are also active in South Africa. Some large global companies, such as South32 and Anglo American, are planning to exit the coal market through sales and demergers largely due to investor pressure, and their assets are now getting concentrated in the hands of large, locally owned mining companies such as Seriti and Exxaro.⁸⁶ These local mining companies will therefore have to play a key role in just transition planning and implementation. Mining interest groups that promote mining operations, such as the Minerals Council, are also key stakeholders in a just transition. There are also several smaller underrepresented companies that produce small amounts of coal. Zama Zamas, or the informal laborers who mine coal illegally, are often excluded in just transition discussions. Moreover, contractors or supply chain businesses that support the mining and power operations are also largely underrepresented.

Unions: The third category includes unions that advocate for social protection, job security, and training opportunities for coal workers. Most mining-related unions belong to one of the primary national federations in South Africa, such as the Congress of South African Trade Unions (COSATU). For example, the National Union of Mineworkers is the largest mining union affiliated with COSATU and has clearly expressed concerns about mine closures.⁸⁷ Some union leaders claim that unions are inadequately consulted in dialogues surrounding a transition.⁸⁸

“If the coal industry shuts down, I’d really love to do rehabilitation work. It is the one job I’d love because it involves protecting the environment.”

—Shlangu Jerry Dube, Zama Zama in Mpumalanga

Activist and Community Groups: The fourth category includes activist and community groups that promote environmental conservation, social justice, and economic prosperity while elevating historically underrepresented groups such as women, minorities, and artisanal miners. National groups such as groundWork and the Centre for Environmental Rights produce reports on social issues and litigate for environmental justice, a recent case being the Mpumalanga “Deadly Air” case and “Mabola” campaign.⁸⁹ Several smaller local activist groups also operate within coal-dependent municipalities, typically comprised of community members who see a need for action but whose voices are rarely heard.⁹⁰

Government: The fifth category includes governmental departments at the national, provincial, and local levels. Most coal mines and coal-fired power plants remain concentrated in relatively few local municipalities. All levels of government have constrained capacity to deal with these complex and, in many instances, legacy issues. This is especially true for local governments.



Photo by Daylin Paul

Jharkhand, India

3.1 Coal Sector Ecosystem in Jharkhand

Jharkhand forms an important part of the coal mining belt in India, with over 144 operational mines that collectively produce over 130 million tonnes (MT) of coal every year. This includes 44 MT of prime coking coal, representing nearly all the coking coal produced in the country. Three of eight subsidiary companies of Coal India Limited (CIL)—Central Coalfields Limited (CCL), Bharat Coking Coal Limited (BCCL), and Central Mine Planning & Design Institute (CMPDI)—are headquartered in Jharkhand.^{ix} Another subsidiary company, Eastern Coalfields Limited (ECL), also operates several mines in the state, although the company is headquartered in the neighboring state of West Bengal. Among the private companies, the Indian conglomerate Tata Group is another key player in Jharkhand and has been producing and using coal for its steel plants for over a century. In fact, Jharkhand's most populous city of Jamshedpur (also known as Tata Nagar) was built from the ground up by the Tata Group when it set up its first steel plant in the area in the early twentieth century. While Jharkhand produces large amounts of coal, the state does not have many power plants, with less than 2 gigawatts (GW) of installed capacity. Most of the coal produced in the state is shipped to other states for power generation. Most of the power plants are owned by the national-government-owned company Damodar Valley Corporation and a few other small private companies.^x

It has been well documented that large-scale coal extraction over the last century has impacted the local environment and the health of people living in these areas.⁹¹ Coalfields such as Jharia are infamous “for widespread development of surface and subsurface fires due to unsustainable mining practices,” and for land subsidence.⁹² Moreover, coal mining activities have resulted in surface and groundwater pollution and have also disrupted the water table, causing shortages in potable water resources in many areas.⁹³ The Damodar River, considered sacred

ix For context, CIL and its eight subsidiary companies collectively produce around 83 percent of coal in India. Apart from CIL, Singareni Collieries Company Limited and Neyveli Lignite are two other coal mining companies, but they do not operate in Jharkhand. Collectively these three state-owned companies produce over 93 percent of coal in India—the remaining 7 percent are produced by a small number of other government-owned and private coal companies.

x The power sector is very small in Jharkhand, so the report focuses on the much larger coal mining sector in the state.

by local tribes, is “one of the most polluted rivers in the country today, thanks to mining operations and coal-based industries that have sprouted up on its mineral rich banks.”⁹⁴ Despite the negative health and environmental impacts of coal mining, the sector is also deeply embedded socio-economically in Jharkhand and nationally (Figure 6). According to a recent study, coal mining occurs in 11 of the state’s 24 districts (Figure 7).⁹⁵

FIGURE 6: THE COAL SECTOR’S SOCIO-ECONOMIC CONTRIBUTIONS TO JHARKHAND

The coal mining and coal power sectors contribute direct revenues to all levels of government as well as to railways. The coal sector also engages in corporate social responsibility (CSR) spending and provides jobs and pensions to locals. Coal is also a source of cheap (or, in some cases, free) fuel for households and industry and is a source of other benefits. In the diagram, blue indicates socio-economic contributions from coal mining and yellow indicates socio-economic contributions from coal power plants.

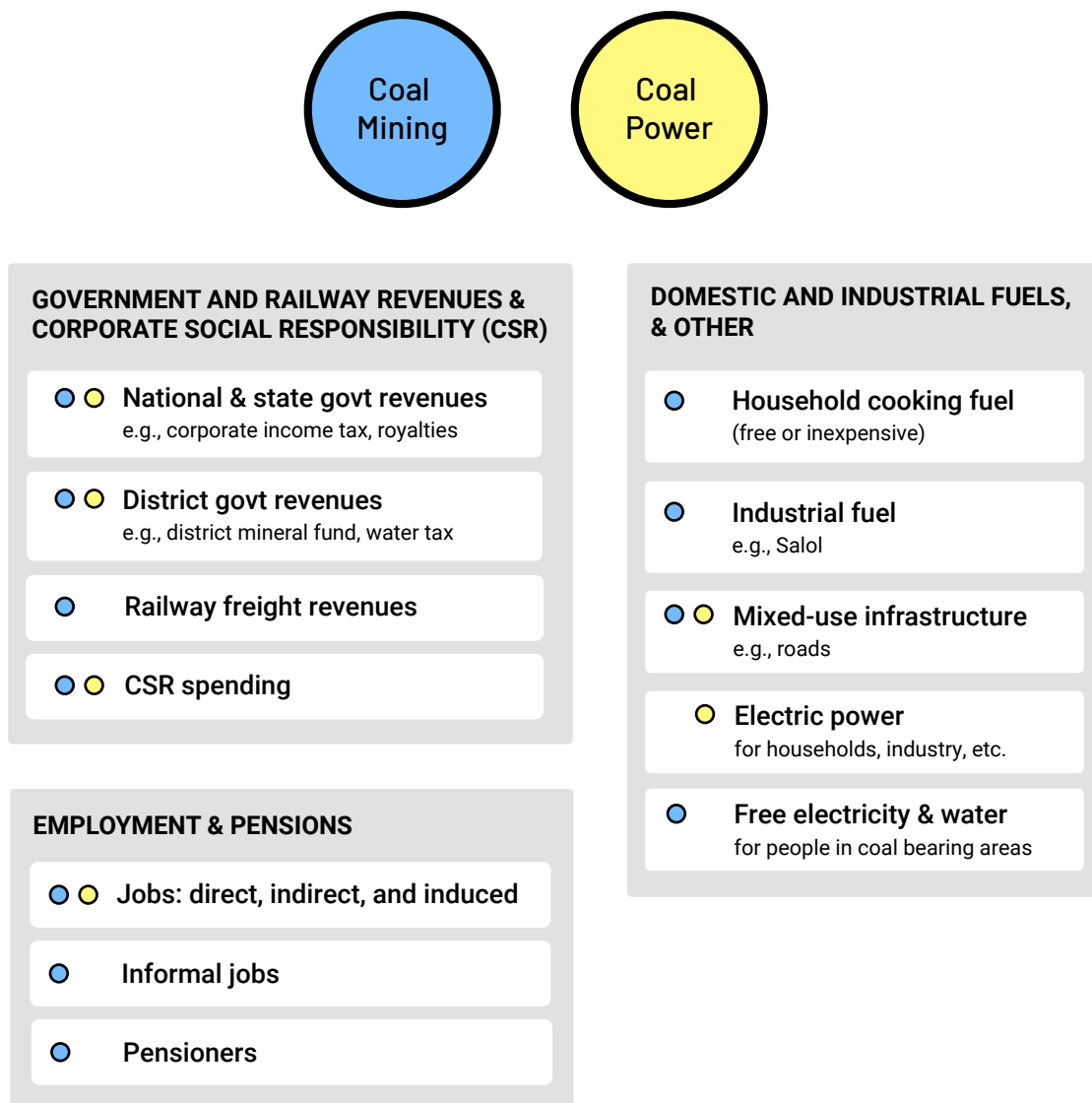
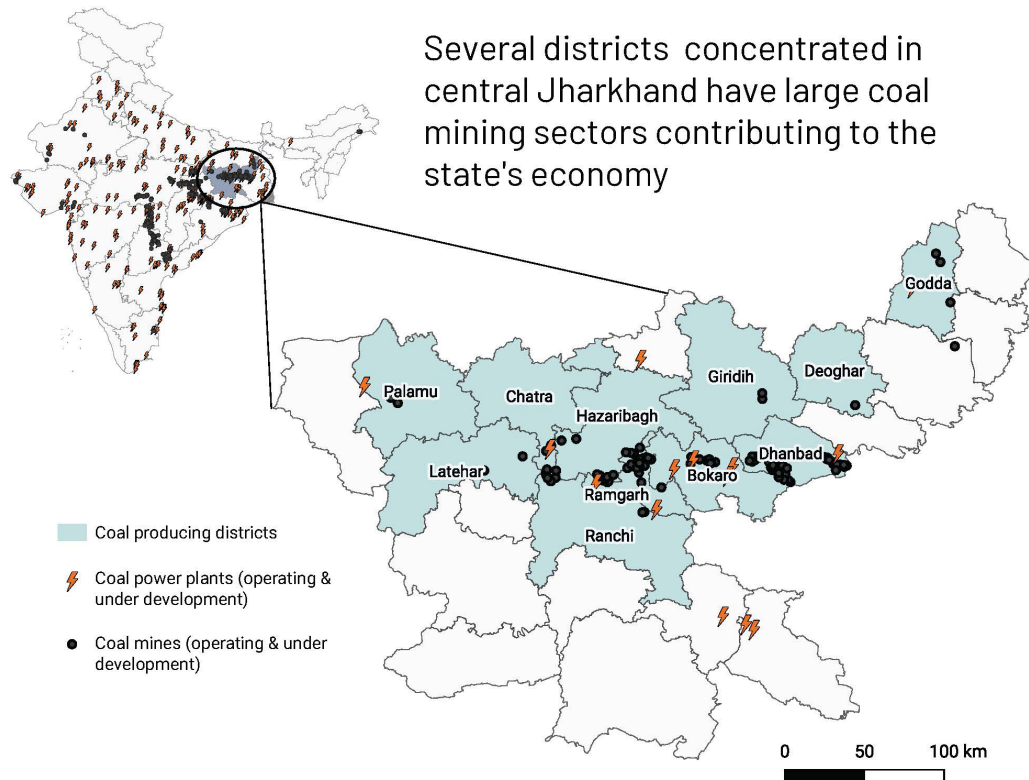


FIGURE 7: COAL MINES AND POWER PLANTS IN JHARKHAND

The coal mines and power plants are concentrated in the central and eastern part of the state in districts such as Dhanbad and Ramgarh.



Source: "Global Coal Plant Tracker," Global Energy Monitor (GEM); and S. Pai, H. Zerriffi, and S. Kaluarachchi, "Indical coal mine location and production – December 2020," Harvard Dataverse, January 14, 2021, doi:107910/DVN/TDEK80.

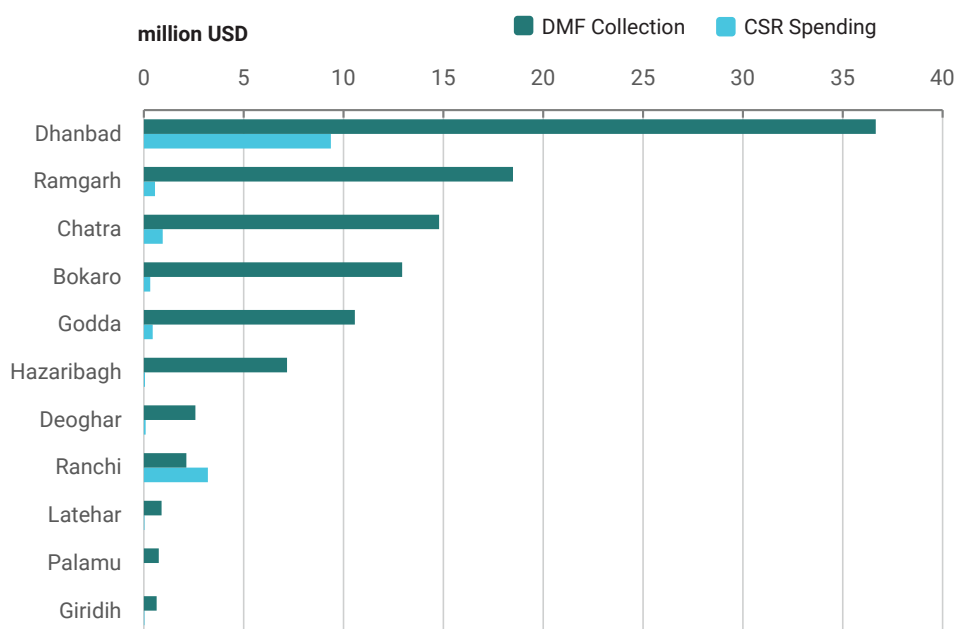
All coal mining and coal power companies pay taxes and royalties to the national, state, and district governments. According to one study, CIL and NTPC (India's largest power producer) together contribute nearly 3 percent of the national government's total annual revenue.⁹⁶ In Jharkhand, coal mining taxes and royalties constitute nearly 8 percent of state government revenue.⁹⁷ The local district governments in Jharkhand collected nearly 800 crore rupees (\$110 million) under the District Mineral Foundation (DMF) in 2020. The DMF is a levy on coal production collected directly by district governments and is meant to be used for local projects to enhance health, education, and rural development.⁹⁸ According to DMF rules, district governments should collect a DMF of 30 percent of the royalty paid to the state government for coal mines operational before January 2015 and 10 percent for those operational after. The royalty itself is calculated based on the price of coal, with higher-quality coal resulting in a higher price. These differences result in different districts collecting different amounts of funds under the DMF.

In addition, district governments also collect other local coal-related taxes, the details of which are not available. Beyond local revenue, coal companies carry out social spending in the state

under mandatory corporate social responsibility (CSR) spending. According to the National Ministry of Corporate Affairs, Indian companies are required to spend 2 percent of their net profits on local projects in areas where they operate.⁹⁹ The data collected under the 2005 Right to Information Act shows that in 2020, coal companies spent 116 crore rupees (\$16 million) in Jharkhand (Figure 8) on projects such as schools and hospitals. However, this spending varies across districts, which shows the different levels of dependency on coal (Figure 8).

FIGURE 8: DMF COLLECTION AND CSR SPENDING IN COAL-PRODUCING DISTRICTS OF JHARKHAND

Coal-producing district governments in Jharkhand collectively collected nearly 800 crore rupees (\$110 million) under District Mineral Foundation funds in 2020. Moreover, coal companies spent nearly 116 crore rupees (\$16 million) through corporate social responsibility (CSR) payments. This data was collected under the Right to Information Act.



Source: Sandeep Pai, "Fossil Fuel Phase Outs to Meet Global Climate Targets: Investigating the Spatial and Temporal Dimensions of Just Transitions," (PhD dissertation, University of British Columbia, 2021), doi:10.14288/1.0398719.

Government-owned Indian Railways is also heavily reliant on revenues from coal transport—it is responsible for moving nearly 60 percent of domestic coal. The company uses the revenue from coal to subsidize passenger fares, a politically and socially salient issue "as Indian Railways sees over 8 billion passenger trips each year."¹⁰⁰ Therefore, Indian Railways, locally referred to as the "Lifeline of the Nation," is also exposed to the impact of the energy transition.

The coal sector provides over 300,000 direct jobs in the coal industry in the state. The median wage of direct workers in the coal industry is perceived to be much higher than those in other sectors, but there is a lack of research on the wage differentials between coal and non-coal sectors. The direct jobs in the coal sector can be divided into two: those

employed by coal mining companies such as CIL and its subsidiaries and those employed by CIL contractors engaged in coal mining operations.¹⁰¹ The CIL employees are completely unionized, and unionization rates for contractor workers are also high, although the exact rates are not available.¹⁰² Local union leaders often carry significant influence and in many cases are current or former members of parliament, state ministers, and members of Jharkhand's state assembly.

“I’ve been working in the coal mines for the last 25 years. If coal is finished, I will have to work as a daily wage worker. What else can we do.”

—Nakul Ravidas, a coal worker in Jharkhand

Nearly 1 million people are working in the coal sector supply chains and service sectors in the state.¹⁰³ Collectively, direct and indirect jobs constitute nearly 10 percent of current jobs in the state. This is in part because coal companies offer hundreds of contracts for different aspects of their operations. These range from overburden removal and cleaning to equipment delivery and procuring explosives. The contract ecosystem is complex, but these contracts form the core of the political economy of coal in the state, with many local influential individuals benefitting from such contracts. As a union representative put it, “reconciling with union leaders and coal contractors would be a key political economy question for any future coal transition in the state.”¹⁰⁴

Induced jobs have not been quantified, but experts suggest there are nearly two to three times as many induced jobs as direct and indirect jobs.¹⁰⁵ Jharkhand is also home to a few million informal or illegal coal miners.¹⁰⁶ These informal workers are mostly local villagers who scavenge coal from abandoned coal mines.¹⁰⁷ They either use the extracted coal as domestic fuel or sell it in the open market.¹⁰⁸ The actual numbers of these workers have not been quantified, but one study claims that the informal sector collectively produces over 15 million tons of coal in India every year.¹⁰⁹ Another study estimates that for every formal job, there are at least four informal jobs.¹¹⁰

According to data provided by coal industry unions, over 147,000 coal industry pensioners live in the state. The government's Coal Mines Provident Fund Organization “collects equal contributions from coal mining companies and workers, then pays pensions to coal mine workers after their retirement. In practice, the money from existing workers and coal companies is paid out to current retired workers, meaning any coal contraction will have consequences for present and future coal industry pensioners.”¹¹¹



Photo by Parwaz Khan

Beyond the use of coal in the electricity sector, coal is an important fuel for small- and large-scale manufacturing industries such as steel, cement, and brick production.¹¹² According to parliamentary records, beyond the power companies, nearly 80 industrial units have long-term fuel supply contracts with CIL's subsidiaries in the state. Further, coal companies typically sell 10 percent of produced coal to private companies using an e-auction method. Data obtained under the 2005 Right to Information Act for CIL's subsidiary company ECL shows that the company sold coal to about 400 different units in Jharkhand in 2019–2020. Many of these industrial units might also pay taxes, employ people, and spend money under CSR, although the data for these are not available. In addition, it has also been well documented that companies such as CIL have traditionally provided key infrastructure and services such as roads and provided free electricity to many local people as part of its “social contract” with local communities.¹¹³

An unplanned, unjust energy transition might adversely impact the entire coal ecosystem, including by taking away local jobs, cutting local or state government revenues, reducing DMF and CSR, and lowering railway revenues. There is also fear that unplanned closure would turn coal-dependent districts into ghost towns, with severe consequences for people and communities.¹¹⁴ Thus, it is important to understand and create implementation pathways for a just transition in Jharkhand.

3.2 Diversifying the Economy

Given Jharkhand's large dependence on the coal ecosystem, any future just transition plans would need to focus on diversification of the state economy, with a special focus on creating new industries in local coal-dependent districts. This could help ensure that new investments and jobs compensate for any losses arising from the closure of coal infrastructure.

In Jharkhand, just transitions are a new concept and the ideas of what constitutes a just transition are not fully formed. In the context of a just transition away from coal, this means that there is limited discourse regarding sectors that the state could diversify into. As a result, many of the observations and options described are based on a literature review and interviews.

The state of Jharkhand has three competitive advantages that could aid the general diversification of the state and that of the coal-dependent districts.

First, the state is endowed with a wide range of natural resources and minerals (Table 4). Aside from coal, there are large deposits of "Iron ore (26% of India's reserves), copper ore (18.5% of India's reserves), uranium, mica, bauxite, granite, limestone, silver, graphite, magnetite and dolomite."¹¹⁵ Nearly 30 percent of the state is covered by forests. Several interviewees suggested that due to available natural resources, diversification based on sustainable forest-based industries and products, non-coal mining, and tourism have strong potential in the state.

Second, the state is close to big ports such as Kolkata, Haldia, and Paradip, which could aid in the transportation of produced goods (from food grains to auto parts) for export markets.

Finally, the presence of some of the largest and most profitable companies in the country, such as CIL, provides a diversification opportunity since these companies have the capacity, know-how, and connections to attract new investments. (See section on CIL diversification below.)

Based on these competitive advantages, the study explores two distinct but connected strands of diversification options: general diversification of the state and business diversification of CIL.

1. State diversification, led by the provincial government and in consultation with academia, communities, businesses and investors, and labor; and
2. Business diversification of coal companies such as CIL, led by companies themselves and focused on corporate diversification of their businesses.

Diversification of the State

Diversification options were divided into existing and new sectors (Table 4). In Jharkhand, the authors identified sectors based on state government economic surveys and then interviewed individual sector experts to identify drivers and barriers.

Among the sectors that have a footprint in the state are agriculture, tourism, non-coal mining, forestry, and manufacturing. Table 4 explains the drivers and barriers for transitioning to each of these sectors. However, each of these sectors currently faces significant challenges of their own. For instance, while agriculture and allied sectors add 13 percent of gross state value added, 50 percent of households that practice agriculture are in debt in the state.¹¹⁶ One interviewee noted, “it is not a very attractive profession and is not profitable because the land is not irrigated, and the crops are mostly weather dependent.”¹¹⁷ Moreover, in coal mining districts such as Dhanbad, the land is badly degraded and the water is polluted.¹¹⁸ Thus, irrigation of agricultural fields and proper environmental rehabilitation of coal mines, along with sustainable water management practices, are crucial for promoting future industries such as agriculture in coal-dependent municipalities. Moreover, environmental remediation would also be crucial for restoring areas of natural beauty and stimulating tourism because “no one wants to visit a filthy and polluted place, not even domestic tourists.”¹¹⁹



Photo by Parwaz Khan

While Jharkhand has potential for non-coal minerals, many interviewees raised concerns about the environmental harm associated with any form of mining. For example, the Saranda forest in Jharkhand’s West Singhbhum district is home to local tribes who collect and sell herbs and other medicinal plants for their livelihoods. Relentless iron ore mining has led to an overall decrease in biodiversity in the forest.¹²⁰ A study by the Wildlife Institute of India found that the number of plant species in Saranda has fallen from 300 to 87 due to

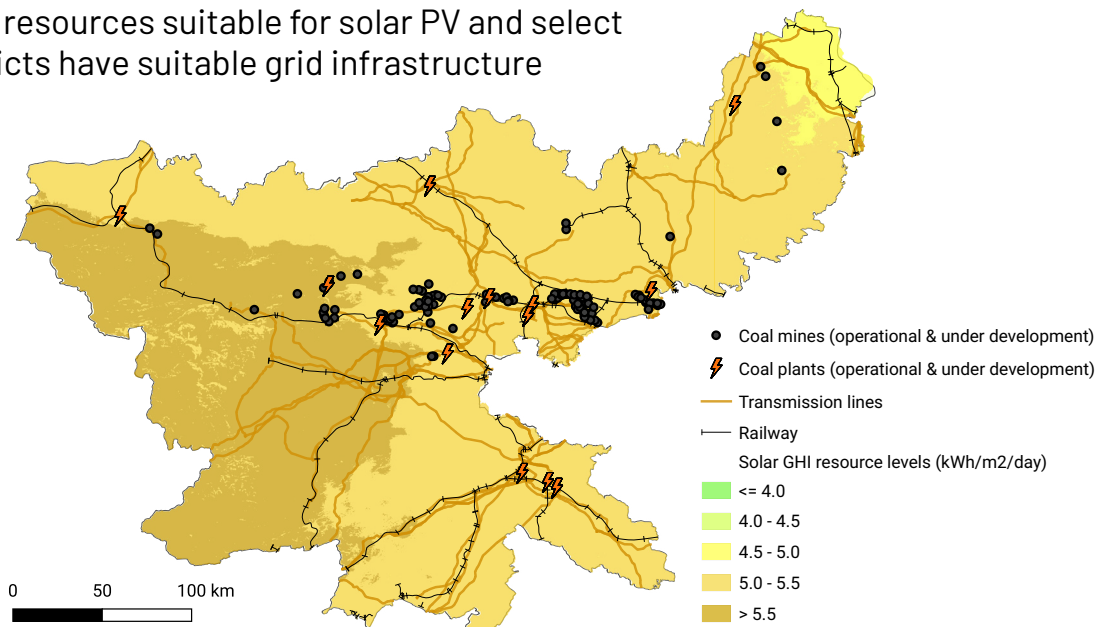
mining.¹²¹ Thus, despite deposits of non-coal minerals, there are serious questions about the potential of expanding this sector.

In terms of new sectors, there is strong potential for solar energy projects in the state, including in coal-dependent districts (Figure 9). Currently, however, the state distribution company, Jharkhand Bijli Vitran Nigam Limited, is unable to sign contracts with solar developers due partly to its poor financial health. Today, most of the investments in the solar sector are going to western and southern states such as Gujarat, Rajasthan, and Karnataka. These states have suitable solar resources, available land, and policies for promoting the solar sector, such as net metering and tax holidays.

FIGURE 9: SOLAR AND WIND POTENTIAL NEAR COAL MINES AND POWER PLANTS IN JHARKHAND

Areas with an average Global Horizontal Irradiance (GHI) above 4.0 kWh/m²/day are considered suitable for solar power, while areas with wind power Class 3 and above are considered suitable for wind power. With its high GHI levels, renewable energy production in Jharkhand lends itself to solar power. However, its wind resources are unsuitable for wind development.

All coal sites have solar Global Horizontal Irradiation (GHI) resources suitable for solar PV and select districts have suitable grid infrastructure



Source: "Global Coal Plant Tracker," Global Energy Monitor (GEM); Pai, Zerriffi, and Kaluarachchi, "India coal mine location and production – December 2020"; "Global Transmission Network," World Bank Group; "Railroads, India, 2016," International

Steering Committee for Global Mapping and Survey of India, <https://geodata.mit.edu/catalog/stanford-zf546fb9425>; and "India – Global Horizontal Irradiation," *Global Solar Atlas*, n.d., <https://globalsolaratlas.info/download/media>.

TABLE 4: KEY SECTORS FOR ECONOMIC DIVERSIFICATION OF JHARKHAND

The table below details existing sectors (colored blue) and niche sectors (colored yellow) that could anchor the diversification process. This list was based on interviews and document analysis.

GENERAL DRIVERS	BARRIERS FOR EXPANSION
AGRICULTURE	
<ul style="list-style-type: none"> • Agriculture and allied sectors already add 13 percent of the state's gross value added, compared to 9 percent by mining sector.¹²² This means that skills and knowledge about the sector already exist. • Around 80 percent of Jharkhand's rural population depends on agriculture for their livelihoods, meaning many people have know-how and understanding of the sector.¹²³ 	<ul style="list-style-type: none"> • Crop production is mostly dependent on rain. Only 15 percent of the total cropped area is under irrigation.¹²⁴ • Agriculture is largely monocropped, and nearly 70 percent of land in the state falls in the marginal category (i.e., less than one hectare in size). • Nearly 50 percent of agricultural households are indebted, as income from agriculture is often insufficient to cover input costs.¹²⁵ • According to the 2017–2018 Periodic Labour Force Survey, nearly 30 percent of agricultural workers are engaged in secondary off-farm employment. In fact, approximately 7 percent of agricultural workers are currently working in the mining sector as their second job.¹²⁶ As the sector currently is not high paying enough, it may not be attractive for coal workers. • The land is badly degraded in coal mining districts, making expansion of agriculture in these places difficult. • In coal mining districts, the agricultural sector will compete with mining and other manufacturing sectors for availability of water and land resources. • Farmers are not able to reach larger markets. The lack of marketing of agricultural produce is a challenge.
TOURISM	
<ul style="list-style-type: none"> • Called "the land of forests," Jharkhand is home to areas of natural beauty with rich varieties of flora and fauna, lending it to rural, eco, adventure, and heritage tourism. • Jharkhand's tourist numbers have doubled in the last four and a half years, increasing to 3.54 crore (35 million).¹²⁷ • For every million rupees invested in the tourism sector, 89 jobs are created, versus 4 jobs in the primary sector and 13 jobs in the secondary sector.¹²⁸ • The region could attract tourists with major spots such as Ranchi hill, Dassam Falls, the Konark Sun Temple, and the Baidyanath dham temple. 	<ul style="list-style-type: none"> • There is a history of travel safety warnings in the area due to security threats. This discourages tourist travel. • The region lacks infrastructure to support tourism, such as comfortable lodging facilities and connectivity through road and rail.¹²⁹ • It is a challenge to balance tourism with the need to preserve tribal lands, heritage sites, and natural resources.¹³⁰ • Tourist inflows vary monthly, with lower tourist numbers during the rainy season and higher numbers during the winter and festival seasons. This results in largely seasonal work.¹³¹ • The land is badly degraded in coal mining districts, making them less attractive for tourism.

NON-COAL MINING	
<ul style="list-style-type: none"> • Forty percent of the country's mineral reserves are in Jharkhand.¹³² • There are substantial reserves of iron ore, copper, bauxite, dolomite, manganese, and mica, among other minerals. • For any clean energy transition, India is likely to rely on domestic production of key minerals such as copper and iron ore. 	<ul style="list-style-type: none"> • The expansion of mineral industries has severe environmental impacts, including on the forests that sustain biodiversity and communities. • Non-coal mining reserves are in districts that do not produce coal. Thus, a shift to non-coal mining could require the relocation of workers.¹³³ • About 30 percent of land in Jharkhand is forested, and most of the minerals are found in these areas. This often results in a conflict between mining companies, conservation efforts, and local, often tribal populations.¹³⁴
NON-TIMBER FOREST PRODUCE	
<ul style="list-style-type: none"> • Thirty percent of the state is covered by forests. • Due to different government initiatives, forested areas are expanding consistently. • Among non-timber forest products, Jharkhand is the largest producer of Tussar silk (a non-mulberry silk), which is a leading example of sericulture. The sector is growing rapidly, registering a year-on-year growth rate of 15 percent. This growth makes it an attractive sector for diversification. • Wild edible plants, another non-timber forest product, form an important constituent of traditional diets of scheduled tribes in Jharkhand. Most tribal groups use wild fruits, vegetables, and herbs to fulfill their food requirements and have sophisticated knowledge about their utilization.¹³⁵ If this sector is scaled, it could become one of the diversification sectors. 	<ul style="list-style-type: none"> • Opportunities in forest-based industries have not been quantified. • Most people who rely on non-timber forest produce lack access to larger markets.¹³⁶ • Policymakers often focus on promoting large industries as opposed to small-scale, forest- and produce-based industries.¹³⁷ • Currently, sericulture provides mostly supplementary income, as the wages are low.¹³⁸ • The diversity of wild edible plants is falling in Jharkhand due to unsustainable harvesting for food and medicines. These plants are also being disturbed due to overgrazing, forest fires, and other factors.¹³⁹ • Edible plants cannot be planted in mining-contaminated areas due to human health hazards resulting from bioaccumulation of metals absorbed by plants.¹⁴⁰
MANUFACTURING	
<ul style="list-style-type: none"> • The state has a well-established manufacturing base, with many companies producing steel, cement, and auto parts, among other products. • There is a strong base of existing of skilled manufacturing labor. 	<ul style="list-style-type: none"> • The current manufacturing base uses coal as a major raw material. For example, the state accounts for 25 percent of steel production in the country.¹⁴¹ • There is a lack of cost-effective technological alternatives for manufacturing steel and cement. • Many manufacturers are small- or medium-scale units that lack the investment required to transition to non-coal powered manufacturing.
RENEWABLE ENERGY PRODUCTION	
<ul style="list-style-type: none"> • The entire state and coal-reliant districts have high potential for solar energy generation, based on Global Horizontal Irradiance (GHI) levels.¹⁴² • State-wide solar potential is 150 GW, which is nearly 40 percent of India's current total power capacity.¹⁴³ 	<ul style="list-style-type: none"> • Most of India's solar power investments are currently going to western and southern states such as Gujarat, Maharashtra, and Karnataka due to land availability, proactive policies, and grid infrastructure availability. • Jharkhand's state distribution companies are in financial distress and have not been able to sign any power purchase agreements with solar developers to buy their power. Hence, the developers have been reluctant to invest in the state • Land availability remains a major constraint for setting up industrial projects, including solar projects.

Business Diversification of Coal Companies Such as CIL

Given the notable contribution of CIL to the state and local economies, the success of CIL's diversification plans could play a crucial role in facilitating a just transition in local coal-dependent districts. CIL has initiated its diversification planning process, mostly due to the changing economics of energy generation, but the plans are still early stage. It has identified four key sectors to be its pillars of diversification—solar power generation, solar photovoltaics (PV) manufacturing, aluminum smelting, and surface coal gasification (Table 5). The company has also received budgetary investment approvals from the CIL board and has established two wholly owned subsidiaries for undertaking solar power generation and solar PV manufacturing projects. In addition, CIL plans to invest in aluminum smelting in collaboration with the National Aluminium Company Limited (a leading aluminum producer company) and invest in surface coal gasification projects. However, there are many technical and policy challenges associated with diversification into each of these sectors (see Table 5). And while CIL is financially strong and could invest in these projects, it has not done so yet in Jharkhand.¹⁴⁴ In fact, all of its solar projects are planned in non-coal states. If this trend continues, the benefits of the clean energy transition may not go to states that will see declines in coal jobs or revenues. From a just transition perspective, it is extremely important that CIL's investment plans consider continued investment in coal-dependent communities in Jharkhand where they have a major presence.

TABLE 5: PLANNED DIVERSIFICATION OF COAL INDIA LIMITED

The table below provides details of sectors in which CIL plans to diversify. This list is based on interviews and document analysis.

SECTOR NAME	PROJECT DETAILS	TECHNICAL AND POLICY CHALLENGES ^{xi}	LOCATION
SOLAR POWER GENERATION	<ul style="list-style-type: none"> CIL formed the subsidiary company CIL Navikarniya Urja Limited. Investments will be project specific. 	<ul style="list-style-type: none"> Land availability for solar projects is limited. The Basic Customs Duty, imposed by the national government on the import of solar panels, creates volatility that could impact project financials. 	Pan India; first project approved in Gujarat
SOLAR PV MANUFACTURING	<ul style="list-style-type: none"> CIL formed the subsidiary company CIL Solar PV Limited. The company plans to build 4 GW wafer-cell-module manufacturing by 2024. Estimated investments total 7,200 crore rupees (\$1 billion). 	<ul style="list-style-type: none"> Solar manufacturing projects are highly sensitive to electricity tariffs. Projects are contingent on various government subsidies. 	Gujarat/Andhra Pradesh

xi Despite not featuring prominently in the interviews and document analysis for this study, there are numerous challenges related to land use and the environmental sustainability of these diversification plans that require further investigation.

ALUMINIUM SMELTING	<ul style="list-style-type: none"> • CIL is in the process of signing a joint venture with National Aluminium Company Limited, another state-owned company which specializes in aluminum production. • Estimated investments total 22,012 crore rupees (\$3 billion). 	<ul style="list-style-type: none"> • Import duties on raw material for refining and smelting are volatile. 	Odisha
SURFACE COAL GASIFICATION	<ul style="list-style-type: none"> • A coal-to-methanol plant is set to be established in the Dankuni Coal Complex. • Estimated investments 5,842 crore rupees (\$0.8 billion). 	<ul style="list-style-type: none"> • CIL floated a build-own-operate contract but had limited participation from companies. • CIL has no experience in marketing and selling methanol. 	West Bengal

Besides technical and policy challenges, there are some key organizational challenges that the company needs to address. Despite the importance of coal-sector unions within the CIL, there is no evidence to suggest that they have been consulted. Union representatives have already flagged this as an issue in the May 2021 Apex Joint Consultative Committee (JCC) meeting. Apex JCC is a committee comprised of the CIL chairman and the directors and representatives of five central trade unions (CTUs). The minutes of meeting notes state that “Representatives of CTUs have been receiving information regarding [CIL diversification plans] through external sources. Trade unions do not oppose the idea of diversification as it is a reality that the energy transition from fossil fuels to renewables is bound to happen. The plan of diversification should be chalked out in a way that none of the stakeholders are adversely affected.”¹⁴⁵ They demanded that, “the diversification plan should be discussed in Apex JCC and that representatives of CTUs should have firsthand information about it.”

Without the unions on board, the diversification plans may face opposition from within the company. While the top management of CIL appears supportive of diversification plans, according to personnel interviewed for this study, the middle and low management staff who will implement these plans are still very much attached to coal, a sector where they have spent most of their working lives. One interviewee noted that “unions can play a role in getting employees’ support for these diversification plans.”¹⁴⁶

3.3 Environmental Rehabilitation

Environmental rehabilitation will be critical to planning for a just transition in Jharkhand. Failure to rehabilitate will not only make the diversification process more difficult but also further disadvantage already vulnerable and marginalized groups. This section focuses specifically on the rehabilitation of coal mines as coal power plants are largely located in other Indian states.

Coal Mining Rehabilitation: Regulations and Challenges

In accordance with India's 1986 Environmental Protection Act, coal mining companies must obtain "environmental clearance" from the National Ministry of Environment, Forest and Climate Change (MoEF&CC) to establish a new mine or expand existing operations.¹⁴⁷ When applicable, mining companies must also obtain forest clearance from the MoEF&CC to divert forest land for non-forest purposes.¹⁴⁸ Additionally, mining companies must obtain "consent to establish" and "consent to operate" from Jharkhand's State Pollution Control Board.¹⁴⁹

National environmental clearance is contingent upon an Environment Impact Assessment and Environment Management Plan (EIA-EMP).¹⁵⁰ The EIA-EMP must document approval of a mining plan^{xii} from the Ministry of Coal (MoC).¹⁵¹ This mining plan must include a mine closure plan. In 2009, the MoC issued guidelines for the preparation of mine closure plans, which were subsequently updated in 2019.¹⁵² These provide guidance for: (1) progressive rehabilitation (land use activities such as planting trees to be done continuously); and (2) end-of-life closure requirements (which start toward the end of life, with the goal to restore land back to "acceptable" levels).¹⁵³ For the latter, what constitutes "acceptable" levels has not been defined, and there is no guidance on how to plan for post-mining land use or economic activities.

Before the companies are granted environmental clearance, mining companies must establish a fixed deposit account to provide financial assurances for covering the cost of closure.¹⁵⁴ The amount is determined based on a flat annual rate of 1.5 lakh rupees per hectare (\$2,000 per hectare) for underground mines and 9 lakh rupees per hectare (\$12,000 per hectare) for opencast mines, according to the recently updated guidance.¹⁵⁵ These funds are overseen by the Coal Controller Organization (CCO), which is the coal sector's regulator.¹⁵⁶



Photo by Parwaz Khan

xii Per a memorandum issued by the MoC in May 2020, Progressive and Final Mining Closure Plans have been integrated into the Mining Plan and therefore no longer require separate approval.

In terms of reporting on progressive closure, coal companies are required to send a report to the CCO on mining activities undertaken each year. Furthermore, the updated end-of-life mine closure plans, along with any cost updates, are required to also be sent to the CCO again at least five years prior to the final closure.¹⁵⁷

Despite the guidelines and financial provisions, interviewees and document analysis reveal four significant barriers to proper rehabilitation.

First, there is a general lack of enforcement and compliance.¹⁵⁸ While the mining companies are legally required to provide financial provisions for rehabilitation, the rehabilitation process is governed by guidelines for coal mine closure.¹⁵⁹ Thus, the regulations for how to conduct environmental rehabilitation and closure do not have clear legal enforcement. There are also compliance issues. In a recent audit, the comptroller and auditor general of India highlighted the “deficiencies of the public sector coal companies to mitigate the environmental hazards of mining and adherence to various statutory compliances related to environmental stipulations.”¹⁶⁰

A second issue is the way in which financial provisions are structured. The required amount for financial assurances is based on fixed rates rather than site-specific conditions or plans, meaning it is often inadequate.¹⁶¹ As a CIL representative noted: “Each mine is different, and to do proper rehabilitation, you may require different amounts of money. Therefore, this approach often leads to inadequate rehabilitation.”¹⁶²

A third issue is the legacy of environmental degradation from an unquantified number of abandoned mines.¹⁶³ No financial assurances are available for mines in existence prior to 2009.¹⁶⁴ Prior to nationalization in 1973, private coal mining companies conducted operations without any regard for the environment, often referred to as “slaughter mining.”¹⁶⁵ The Jharia coalfield in the Dhanbad and Bokaro districts, for example, has been subject to over 100 years of coal mining and is severely degraded as a result.¹⁶⁶ Today, the area is littered with unstable abandoned mines and has garnered international notoriety for the resulting underground fires and land subsidence.¹⁶⁷ In response to mounting safety concerns, the national government allocated money for the Jharia Master Plan—a plan to remediate underground fires and subsidence and divert surface infrastructure.¹⁶⁸ In spite of significant funding provisions, there has been little progress in terms of implementation.¹⁶⁹ Barring this particular coalfield, there is no comprehensive plan or funding to rehabilitate abandoned mines.¹⁷⁰ The question also arises as to whether the national or state governments have the ability to bear the costs of rehabilitating all abandoned coal mines.

Lastly, the regulatory landscape pertaining to the reclamation and closure of coal mines is often convoluted. Some interviewees also allege a conflict of interest in some cases regarding the approval of institutions to conduct mine closure audits.¹⁷¹

Rehabilitation Opportunities

Environmental rehabilitation in the context of just transition in Jharkhand should be seen not only as a job creator but also as a necessary precondition for economic diversification of coal-producing districts into sectors such as tourism and agriculture, among others. When discussing opportunities for investment in coal-dependent districts, one interviewee stated, “Why would someone want to invest in land like that?”¹⁷²

Interviewees suggested that the government should develop a post-mining land use policy that is oriented around peoples’ needs, taking into consideration the local geology and feasible land uses.¹⁷³ Typically, when mining companies complete mining, and even if they do rehabilitate mines, they fall short of making a plan for post-mining land use or economic activities.¹⁷⁴ The local stakeholders are also rarely consulted even when post-mining land use plans are made.¹⁷⁵ However, there are some examples of good practices for mine rehabilitation that support local livelihoods. For example, after local non-governmental organizations took CIL’s subsidiary BCCL to court over a lack of environmental rehabilitation, the company conducted ecological restoration projects in a few coal mines in the Dhanbad district with notable success.¹⁷⁶ The ecological restoration approach adopted a three-tier plantation system—planting grass (tier 1), shrubs (tier 2), and trees (tier 3). It was important to identify the right kinds of plants that can grow under the given soil and climactic conditions. A former CIL official who worked on the project said, “By the time we finished the tier 3 plantation, we saw that birds, bees, spiders, insects, and grasshoppers started making these abandoned mines their homes. Slowly, these areas became ripe for planting food crops such as paddies and for local people to visit and enjoy nature. During the entire process that spanned five to seven years, BCCL was able to employ local villagers.”¹⁷⁷ This work has received significant attention and is being considered by MoEF&CC for guidance to the coal industry as a replicable intervention.¹⁷⁸

There are also some examples of abandoned open-cast coal mines being turned into fisheries. In 2015, CIL subsidiary CCL started another project in Jharkhand for the development of abandoned open-cast mines into fisheries. In Ramgarh district, an abandoned mine was cleaned up and suitable fish varieties introduced, which has created livelihoods for many local villagers.

Although these initiatives are noteworthy, interviewees suggested that these are exceptions rather than the rule. One expert suggested that the government use abandoned mines to pilot such initiatives, using funds available through CSR, Clean Energy Cess (tax), or even DMF.¹⁷⁹

3.4 Stakeholder Mapping

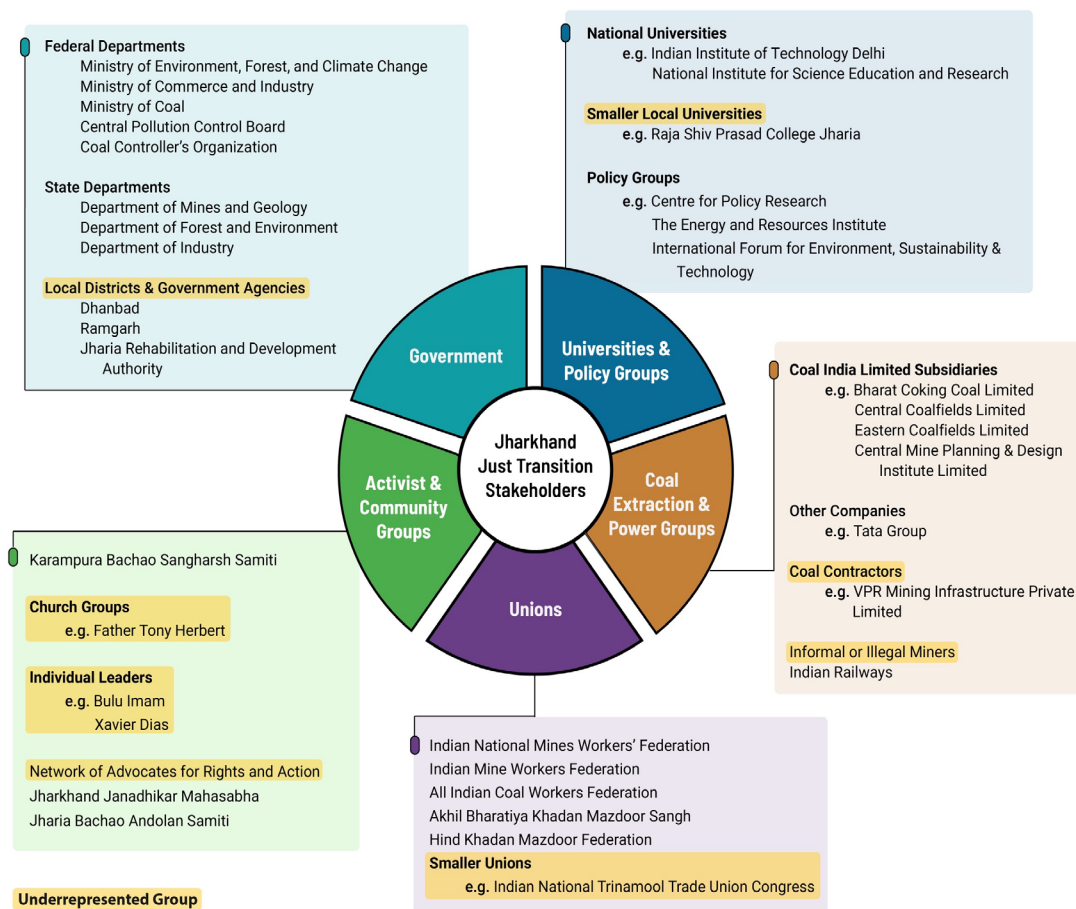
Based on interviews, this study identified several stakeholders important to any just transition planning in Jharkhand. Interviewees highlighted underrepresented stakeholders in the just transition discourse, recognizing that the topic is in nascent stages of discussion in the state. The

stakeholder mapping of Jharkhand involved grouping stakeholders under five different categories (Figure 10). These categories serve as a starting point for stakeholder identification for just transition planning in Jharkhand.

University and Policy Groups: Unlike in South Africa, the concept of a just transition has not yet taken hold in India. However, policy groups such as iForest and TERI are highly active and at the forefront of just transitions research. They analyze socio-economic disruptions related to the coal transition such as mine closures, conduct regional case studies, and suggest economic diversification opportunities as coal mining phases out. National universities such as IIT-Delhi are also starting to initiate projects to understand just transition in Jharkhand. Meanwhile, local universities such as Central University in Jharkhand, which could offer a more contextual understanding of the issues, are not part of the just transition conversation thus far. Many scholars and professors at Central University are researching relevant topics such as the economy of Jharkhand, agricultural growth, and tourism, which could be valuable for future just transition planning.

FIGURE 10: JHARKHAND JUST TRANSITION STAKEHOLDERS DIAGRAM

Based on interviews, this study identified several stakeholders important to any just transition planning in Jharkhand. Stakeholders that are currently underrepresented in the just transition discourse are highlighted.



Coal Extraction and Power Groups: Over 90 percent of India's coal mining industry is government owned, while private corporations hold large shares of the power sector. Four of CIL's seven subsidiaries dominate coal production within Jharkhand, owning over 90 percent of all active coal mines.¹⁸⁰ Additionally, private enterprises such as Tata Steel and small government-run companies own mines as well. India has a widespread informal and illegal mining sector where coal is scavenged to use for domestic fuel or to sell on the market. Though there are more jobs in the informal coal sector than the formal sector, the informal workers remain largely underrepresented and unprotected.¹⁸¹ Given the importance of Indian Railways, it remains an important stakeholder for just transition planning in Jharkhand and nationally.



Photo by Parwaz Khan

Unions: There are five coal industry unions at the national level in India and in Jharkhand, each associated with a major political party.¹⁸² The coal industry has a tripartite governance structure consisting of MoC officials, coal company officials, and union representatives. This means that every major decision related to the coal industry (such as fixing worker wages to coal production targets) is taken by different committees under the tripartite governance structure.¹⁸³ In addition to the national unions, there are smaller unions at the local level that are underrepresented and are not part of the tripartite committees.

“If coal is finished here, I will be forced to migrate.”

—Chandan Paswan, a coal worker in Jharkhand

Activist and Community Groups: Most activist groups in Jharkhand are led by church organizations. They are loosely organized groups led by influential individuals. Non-church organizations include the Network of Advocates for Rights and Action, which was formed temporarily by local lawyers to offer free legal consultations to tribal groups in Jharkhand. These groups form and disband cyclically as leaders age and lose influence, resulting in weak civil society groups representing coal-dependent communities.¹⁸⁴ This leaves groups such as informal workers and women working induced jobs in coal-dependent villages and tribal communities underrepresented. An interviewee summarizes this: “The civil society organizations in Jharkhand are extremely weak and fragmented.”¹⁸⁵

Government: This category constitutes government entities at the national, state, and local levels. National departments such as the MoC and MoEF&CC approve mining plans and grant environmental clearances for mining operations. Compared to South African provinces, Indian states hold more authority to make laws and policies and collect revenues. Under the 1957 Coal Bearing Areas Act (CBAA), the Jharkhand government can usurp any private land, including Indigenous land protected under various other state legislative acts, if the purpose is for coal extraction.¹⁸⁶

Insights and Recommendations

This section provides insights and recommendations on different aspects of just transitions away from coal drawn from the case studies of Mpumalanga and Jharkhand. These insights and recommendations may be useful for these regions as well as other coal-dependent emerging economies that are navigating a transition away from coal.

4.1 Coal Ecosystem

Understanding the coal ecosystem is crucial for just transition planning, as it helps show which local regions and communities will be particularly vulnerable to a coal phase out, the potential challenges and opportunities of a transition, and who might need to be engaged in the planning and implementation of transition strategies.

This study shows that coal is central to the regional economy of both Mpumalanga and Jharkhand. While Mpumalanga is socio-economically dependent on both coal mining and coal power plants, Jharkhand is dependent on coal mining alone. In both places, coal mines or coal power plants are geographically concentrated in only a few municipalities or districts.

The coal ecosystems of Mpumalanga and Jharkhand have certain key similarities. In both places, the coal sector provides direct, indirect, and induced jobs. These places are also home to a large number of informal coal workers who scavenge and extract coal for domestic use and sale on the open market. In both places, coal is an important industrial fuel and is used by local households for energy. Furthermore, the coal sector deploys funding to local communities through corporate social measures (i.e., CSR/CSI). Coal companies also create mixed-use infrastructure such as roads, which local communities benefit from.

The coal ecosystems of Mpumalanga and Jharkhand also have key differences. For example, pensioners are an important component of the coal ecosystem in Jharkhand; the same is not true for Mpumalanga. In Mpumalanga, local municipalities supply water and provide other services to coal mines and power plants, which generates important revenue for the local government; the same is not true for Jharkhand. In South Africa, coal-related revenue collection is primarily done by the national government, while coal revenues in India are collected by

national, state, and local governments. In addition, Indian Railways relies on revenue obtained from transporting coal.

The case studies of Mpumalanga and Jharkhand show that coal ecosystems in emerging economies may share common elements, but the different regional and country contexts mean that the coal ecosystems will also have key differences.

Critically, several components of the coal ecosystem have been quantified in both Mpumalanga and Jharkhand, but many remain unknown. For example, details of components of the coal ecosystem such as the number of induced and informal jobs have not been quantified in the literature in either location. Another example is that the difference in median wages between coal and non-coal sectors is available in Mpumalanga, but not in Jharkhand. In regard to coal-dependent industries such as steel and cement, there is a general lack of research or understanding of associated jobs and revenues in both regions. This may be the case in other emerging economies as well. Further quantification is critical to understanding the scale of dependency and the types of intervention required.

Recommendations

- This study recommends identifying the various elements of a region's coal ecosystem (e.g., types of jobs, revenue collection, social spending) as the first step for any just transition planning in coal-dependent economies. This study describes certain common elements of coal ecosystems, which provides a good starting point for understanding coal ecosystems across coal-dependent economies.
- The study also recommends that governments and researchers invest resources for quantifying all elements of the coal ecosystem, including number of induced and informal jobs, median wages between coal and non-coal sectors, and jobs and revenues associated with coal-dependent industries such as steel and cement.

4.2 Diversifying the Economy

Diversification of the economy is a key element of just transitions. Diversifying away from a coal-based economy to an economy based on sustainable sectors has the potential to support the creation of local jobs, improve government finances, and benefit local communities.

This study shows that both Mpumalanga and Jharkhand have the potential to diversify their economies away from coal to other sectors such as agriculture, tourism, and renewable energy, among others. However, there are several unique challenges associated with these diversification options. For example, in both regions, there is solar resource potential for setting up solar power projects, but there are also obstacles to their development. Key barriers for this sector in Mpumalanga include that local entrepreneurs lack understanding of solar-sector opportunities and that South Africa does not allow private companies to build more than 100

MW of generating capacity without obtaining onerous licenses. In Jharkhand, the state distribution companies are in financial distress and are therefore unwilling to sign power purchase agreements with solar developers. Moreover, land availability for setting up solar projects remains a major challenge in the state.

This study also shows that the scalability and feasibility of different diversification options have not yet been systematically explored for either Mpumalanga or Jharkhand. This is a common finding across both case studies. For example, given constraints such as degraded land and water bodies in Steve Tshwete (Mpumalanga) and Dhanbad (Jharkhand), studies need to assess the feasibility and job creation potential of sectors such as sustainable agriculture, tourism, and renewable energy, among others. To do so, such studies and any follow-on plans should systematically engage with local stakeholders.

Mpumalanga and Jharkhand's coal industries are dominated by state-owned coal companies such as Eskom (Mpumalanga) and CIL (Jharkhand) that are planning to diversify their businesses into non-coal sectors. The success of these diversification plans could play an important role in protecting local jobs, revenues, and municipal services. Many interviewees suggested that there is a general lack of coordination between provincial/state government diversification plans and those of coal companies. This may lead to duplication and haphazard planning.

Recommendations

- This study recommends that national and regional governments lead the development of diversification strategies by identifying alternative sectors and alleviating key barriers hindering the growth and prospects of those sectors. Such work should be done in consultation with key stakeholders in the region identified as part of the mapping exercise. Such a strategy should also include a roadmap that not only aims to strengthen upstream enabling environments but also facilitates investment mobilization from both the public and private sectors to develop and scale up activities in a manner that presents real, long-term opportunities for those affected most by the transition.
- This study also recommends that all key stakeholders, including governments, policy-makers, academics, and public financiers, support feasibility and scalability studies associated with potential target diversification sectors, such as those identified in this study, at the province/state level and the level of coal-dependent municipalities and districts.
 - Such studies should identify sectors that present real opportunities that are sustainable, offer long-term potential, and are aligned with core priority areas in the country or region.
 - There is a need to map the competitive advantages of coal-dependent regions based on factors such as available natural resources that can be sustainably utilized, exist-

ing labor demographics and skills, infrastructure needs, and anchor institutions (e.g., universities), among others.

- This examination of target diversification sectors must pay special attention to the potential for green growth that generates positive environmental and social outcomes, particularly for vulnerable groups such as Indigenous peoples.
- This study also recommends that coal company diversification strategies be strongly coordinated with provincial and state-level diversification plans for designing better-integrated just transition pathways.

4.3 Environmental Rehabilitation

Environmental rehabilitation of existing and legacy mines and power plants is very important for the regional diversification process both in Mpumalanga and Jharkhand, as degraded land and waterways make it difficult for industries to invest in these areas. Moreover, environmental rehabilitation can also create short-term jobs for local communities.

However, this study shows that there are several challenges associated with environmental rehabilitation of coal mines in both regions. In Mpumalanga's case, mine closure plans and associated company financial allocations for rehabilitation projects are not transparent. Further, there are capacity gaps that restrict the oversight and enforcement of closure regulations. In Jharkhand's case, there are only guidelines that govern how to carry out the rehabilitation process, and company financial allocations for mine closure are inadequate. There are also challenges concerning the transparent oversight of mine closure processes. Furthermore, the legacy of environmental degradation from an unknown number of abandoned coal mines is a common challenge faced in both locations.

In addition to regulatory challenges, both Mpumalanga and Jharkhand would need to identify additional sources of financing to close down and environmentally rehabilitate legacy mines. In some contexts, initial funding may be available from the local or state government, such as the District Mineral Foundation fund in the case of Jharkhand.

The study also sheds light on the lack of consultation with local communities in current rehabilitation efforts. Both places also lack a post-mining land use policy that incorporates the needs of local communities in the rehabilitation process.

Recommendations

- This study recommends that governments enact policies that ensure the rehabilitation of current and legacy coal mines is based on a post-mining land use policy that requires consultation with local stakeholders.
- This study also recommends that regulatory bodies managing the rehabilitation process

be well resourced to ensure sufficient enforcement capacity; that rehabilitation processes be guided by laws; and that mine closure plans be public and transparent.

- This study also recommends that governments identify adequate sources of financing (either regionally, nationally, or internationally) to environmentally rehabilitate all legacy mines.

4.4 Stakeholder Mapping

Just transition planning requires robust engagement with relevant stakeholders. The case studies show that just transition discourse and planning are at different stages in Mpumalanga and Jharkhand. In Mpumalanga, there is more discourse regarding just transitions, and different stakeholders have strong views about what a just transition entails. However, fewer stakeholder groups in Jharkhand are aware of the concept and its key components. This suggests that different countries, as well as subnational jurisdictions, may be at different stages of just transition thinking and planning. It is therefore important that local stakeholders be sensitized about the topic as a first step. Local media can play an important role in raising awareness on various aspects of just transition.

This study identifies various stakeholders that are important to just transition discourse and planning in both Mpumalanga and Jharkhand, including government organizations and departments, think tanks, coal companies and contractors, activist groups, and unions. This study also identifies several underrepresented stakeholders that have been left out of current discussions on just transitions. Interviewees in Mpumalanga suggested that groups such as Zama Zamas and local coal-related businesses play a limited part of transition discussions at the provincial and the company level. The participation of these groups in both the provincial government's and Eskom's diversification plans will prove critical to Mpumalanga's just transition. In Jharkhand, there have been initial just transition discussions, and these have had limited engagements with certain stakeholder groups such as informal coal workers or smaller unions. Capacity development of underrepresented stakeholders and mechanisms to facilitate their meaningful participation in decisionmaking may be required. Such efforts could significantly enhance inclusive dialogue in both places.

Recommendations

- This study recommends that robust dialogue and engagement plans be developed starting at an early stage to facilitate common buy-in and shared understanding of the key issues among relevant stakeholders affected by the transition.
- As part of this plan, international and national organizations could aim to support long-term initiatives to sensitize local stakeholders about the concept of just transition as a first step.

- International and national philanthropic foundations could support local media to cover just transition topics in regional languages.
- International and national think-tanks, in association with local non-governmental organizations, could organize local workshops and town hall meetings on an ongoing basis to sensitize local communities to the various aspects of just transitions.
- This study also recommends that transition planning and implementation be inclusive of all relevant stakeholders—workers and communities need to define their own futures—and in particular include underrepresented stakeholders by ensuring they have a seat at the table and can meaningfully participate.
 - Governments and policy groups should develop mechanisms for capacity development and create institutional structures to enable underrepresented stakeholders to participate in just transition processes.
 - Given the large number of people engaged informally in the coal sector in these two regions, often without representation in any formal process, extra attention should be paid so that these workers are involved in any just transition planning.

Conclusion

The climate crisis has reached a tipping point; there is an urgent need to phase out fossil fuels such as coal. However, phasing out coal in emerging economies is a complex process, and governments need to play a leading role in managing this transition. Reducing the impact of transition on dependent workers and communities will require strategic just transition interventions in coal-dependent regions. This study focused on Mpumalanga, in South Africa, and Jharkhand, in India, as case studies to investigate certain key elements of just transition planning.

The study shows that local governments and communities in Mpumalanga and Jharkhand are dependent on and intertwined with the coal industry. In each place, the coal-dependent ecosystem has many layers. Coal contributes to local jobs, government revenues, and local mixed infrastructure, alongside other societal contributions. Thus, any unplanned energy transition will have severe consequences for local communities, which may see local job losses, diminishing government revenues, and reductions in municipal services. Moreover, local populations that are already disadvantaged by the environmental impacts of the coal industry will be further disadvantaged if mines and power plants are not safely retired.

Although the phasing out of coal will impact these regions, this study finds that both Mpumalanga and Jharkhand have the potential to diversify their economies to sectors such as sustainable agriculture, tourism, and renewable energy, among others, in order to mitigate such impacts and tap into new sustainable industries. However, the expansion of regional economies to these non-coal sectors has unique challenges due to differences in local contexts and governance structures in each country. This study shows that more work is needed to understand the feasibility and scalability of potential diversification options in these coal-dependent regions. Furthermore, the diversification plans of regional governments and state-owned coal companies, which dominate the energy landscape in Mpumalanga and Jharkhand, can be better coordinated. To ensure that the diversification process is properly planned to maximize benefits for local communities, there is a need to develop further scientific understanding of the feasibility and scalability of proposed diversification sectors in such regions. Such studies should identify sectors that present real opportunities that have long-term potential, are sustainable, and are aligned with the core priorities of national and regional governments.

Environmental rehabilitation of current and legacy coal mines and power plants will also be critical for the diversification of coal-dependent economies. However, this study highlights various regulatory, institutional, and financial challenges that Mpumalanga and Jharkhand face in implementing such rehabilitation. The study further highlights that there is a need for the ongoing rehabilitation of coal mines to be based on post-mine closure land use plans and improved consultation with local stakeholders. To ensure the proper enforcement of such plans and consultative processes, oversight and regulatory bodies need to be mandated and resourced. The governments also need to identify adequate sources of financing (either national or international) to environmentally rehabilitate all legacy mines. Without transparent, well-regulated, and adequately financed post-mine closure land use plans, the benefits of environmental rehabilitation will remain limited from a just transition point of view.

For any just transition planning—whether focused on diversification of coal-based economies or rehabilitation of mines—it is vital that different stakeholders, including underrepresented stakeholders, are meaningfully engaged in the decisionmaking process. This study has identified several underrepresented stakeholders in both Mpumalanga and Jharkhand that are currently not actively engaged in just transition dialogues. It is important that governments and key institutions leading the process create forums and platforms for dialogue, alongside initiatives for capacity development for underrepresented stakeholders as needed, to assist them to meaningfully engage in just transition planning.

In conclusion, phasing out coal in emerging economies will require a nuanced understanding of coal ecosystems and key elements of just transitions in regional contexts. This study illustrates key considerations for just transition planning based on case studies of Mpumalanga and Jharkhand.

Appendix A

List of Interviewees

NAME	DESIGNATION	COUNTRY
Jesse Burton	University of Cape Town	South Africa
Gaylor Montmas-son-Clair	Trade & Industrial Policy Strategies	South Africa
Sandy Lowitt	Trade & Industrial Policy Strategies	South Africa
David Hallows	groundWork	South Africa
Victor Munnik	groundWork	South Africa
Stanley Semelane	Council for Scientific and Industrial Research	South Africa
Mandy Rambharos	ESKOM	South Africa
Nkosinathi Nkonyane	Mpumalanga Government	South Africa
Daylin Paul	Independent Journalist	South Africa
Harald Winkler	University of Cape Town	South Africa
Catherine Horsfield	Centre for Environmental Rights	South Africa
Nabeelah Mia	Centre for Environmental Rights	South Africa
Henk Langenhoven	Minerals Council	South Africa
Bongani Motsa	Minerals Council	South Africa
Ramendra Kumar	All India Trade Union Congress	India
Manish Kumar	Coal India Limited	India
Satyendra Kumar	Prabhat Khabar Newspaper	India
Ashwini Chhatre	Indian School of Business	India
Purabi Saikia	Central University of Jharkhand	India
Saumitra Singh	Coal India Limited	India
Shruti Priya	Gaya College	India
Raju EVR	Ex-Coal India Limited	India
Srestha Banerjee	i-Forest	India
Sanjiv Soni	Coal India Limited	India
Suranjali Tandon	National Institute of Public Finance and Policy	India

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