



Just Energy Transition: Financial Implications for Jharkhand

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ABOUT CPI

Climate Policy Initiative is an analysis and advisory organization with deep expertise in finance and policy. Our mission is to support governments, businesses, and financial institutions to drive economic growth while addressing climate change. CPI has six offices around the world in Brazil, India, Indonesia, the United Kingdom, and the United States.

CPI India Private Ltd. works to support India's clean energy mission directed by Nationally Determined Commitments (NDCs), and helps further India's transition towards a sustainable energy future. CPI India does so through clean energy market catalyzing initiatives such as the US-India Clean Energy Finance (USICEF), India Clean Energy Finance (ICEF), Productive Use of Renewable Energy (PURE), India Distributed Solar Finance Initiative (IDSF), and The Global Innovation Lab for Climate Finance (India Chapter). Additionally, CPI India works on capacity building initiatives such as the Center for Sustainable Finance (CSF), and carries out analytical work such as future-proofing strategies for public sector undertakings (PSUs) and just energy transition frameworks.



ABBREVIATIONS

BCCL	Bharat Coking Coal Limited
CCL	Central Coal Fields Limited
CIL	Coal India Limited
CSR	Corporate Social Responsibility
DMFT	District Mineral Foundation Trust
DVC	Damodar Valley Corporation
ECL	Eastern Coal Fields Limited
ED	Electricity Duty
GST	Goods & Services Tax
MT	Million Tons
PSU	Public Sector Undertaking
TVNL	Tenughat Vidyut Nigam Limited

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1. INTRODUCTION

India's large-scale power generation infrastructure, which developed over the past 50 years, has predominantly used the country's ample domestic solid fossil fuel resources. This has secured significant energy independence and electricity access to millions of people even in remote parts of India. As the country moves forward on the path of sustainability, it has set steep clean energy targets, including reaching net zero by 2070. This will require a substantial shift in the country's energy mix, moving away from fossil fuels to greener energy sources.

In India, solid fuel resource extraction and mining is concentrated in a few mineral-rich states. These are also among the country's most impoverished, because of limited additional economic drivers (Mukherjee 2023). Their economies rely heavily on solid fossil fuel industries for employment, state revenue, and social welfare financing. Without careful planning, the net zero transition could potentially leave these states in a vulnerable economic position.

About 85% of India's solid fossil fuel production is concentrated in the five eastern states of Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, and West Bengal. (Ministry of Coal 2023)

The transition would likely be hastened by falling renewable energy costs viz-a-viz those of fossil fuel energy generation. Thus, fossil fuel-driven state economies would face competition from those of renewable energy rich states, and the viability of many economic activities revolving around solid fossil fuel mining and consumption could be fundamentally altered.

As part of CPI's Facilitating Finance for a Just Transition initiative, this report examines the annual financial implications of energy transition for stakeholders in the state of Jharkhand, India. The report builds on previous work findings that Jharkhand is among the mineral-rich states likely to face the most adverse short-term impacts of an energy transition (Habib et al. 2023).

However, Jharkhand has recognized the importance of acting quickly. In November 2022, it became the first Indian state to set up a task force to enable a Just Energy Transition. This report aims to provide information that can help the Jharkhand Just Transition Task Force to better plan its interventions, and effect minimal downside impacts.

Though energy transition is expected to bring about net positive benefits in the long run, it poses some short-to-medium-term challenges. Creating a smooth transition is contingent upon multiple factors such as the creation of adequate non-fossil fuel generation capacity to ensure energy security; effective and adequate financing for supporting social welfare programs; and the generation of alternate economic drivers. Other issues that need to be addressed include a gradual decline in income and revenues of key stakeholders related to fossil fuel energy generation; related state revenue losses; realignment and diversification of economic activities; reskilling and redeployment of workforce; and other financial implications for businesses, communities, and states.

If such issues are not addressed, the energy transition may not be equitable for all—in other words, it may not be a ‘just’ transition.

2. SCOPE AND RESEARCH DESIGN

2.1 SCOPE

Key stakeholders in a solid fossil fuel-based economy include entities involved in mining, power generation, transportation, and the people who work in sectors supporting these industries.

This report considers the implications for those likely to be most impacted as the energy transition unfolds in Jharkhand. It therefore covers solid fossil fuel mining and solid fossil fuel-based power generation by PSUs in Jharkhand, and the wider implications for direct and indirect employment, livelihood creation, community development, and state finances.

It, however, does not include coking solid fossil fuel resources, as these are used in sectors other than power generation. It also excludes captive (private company-owned) mines, which are predominantly in industries with limited publicly available data. This report focuses only on the impacts of the transition on public finances of the state of Jharkhand, and therefore excludes central public finance.

Figure 1: Coverage of study for solid fossil fuel mining

INCLUDED	Thermal Solid Fossil Fuel
	Coal India Limited (CIL) and its subsidiaries
	Impact on public finances at state level
	Direct and indirect employment generated by mines
	Induced employment generated in locality of mines
EXCLUDED	Coking solid fossil fuel
	Other smaller thermal solid fossil fuel mines including captive
	Impact on public financed at central level

Figure 2: Coverage of study for solid fossil fuel power generation

INCLUDED	Central and state conventional power generation utilities
	Impact on public finances at state level
	Direct and indirect employment generated in power plant
	Induced employment generated in locality of power plant
<hr/>	
EXCLUDED	Private power generators and captive generation
	Impact on public finances at central level

2.2 RESEARCH METHODOLOGY

This study makes use of publicly available secondary data, sourced from the government websites, PSU annual reports, and analyses by reputed organizations such as the Centre for Environment and Energy Development (CEED), PRS Legislative Research, etc.

2.2.1 SOLID FOSSIL FUEL MINING

- **PSU Revenue:** CIL, a publicly listed company mostly owned by the Indian Government, produces over 80% of the country's solid fossil fuels. It has eight subsidiaries spread across India, with three of them—Bharat Coking Coal Limited (BCCL), Central Coal Fields Limited (CCL), and Eastern Coal Fields Limited (ECL)—operating either in part or exclusively, in the state of Jharkhand. For the purpose of this report, revenues of these three subsidiaries, generated from thermal solid fossil fuel mining in Jharkhand, have been calculated based on their production of thermal solid fossil fuel. Data from the annual reports of these PSUs has been used to calculate production and revenue figures.
- **State Public Finance:** Annual reports of the CIL subsidiaries were used to calculate taxes, royalties, and other payments made to the state of Jharkhand. Given that these payments were consolidated (coking and thermal) in the annual reports, we apportioned the amount from thermal solid fossil fuel based on the proportion of production in the state.
- **Community Development by PSUs:** The Corporate Social Responsibility (CSR) spending has been used as proxy for community development. CSR spent by CIL subsidiaries has been calculated based on the production of thermal solid fossil fuel in the state.
- **Employment:** The number of direct jobs created by thermal solid fossil fuel mining in the state was obtained from the CIL subsidiaries' annual reports. To estimate the number of indirect (contractual) jobs, a multiplier was derived, based on other relevant reports available in the public domain (Dsouza and Singhal 2021)¹.

¹ Ratio of contractual to permanent employment considered as 2.3. ([Link to report](#))

- **Associated Livelihoods:** Solid fossil fuel mines create an economic ecosystem in their vicinity to support the mining activity and workforce. Jobs and livelihoods are created in local shops, grocery stores, and for domestic help. As data on these sectors are not readily available due to their informal nature, CPI has used a case study approach to determine associated livelihoods generated per million tons (MT) of thermal solid fossil fuel production. The deduced number was extrapolated for all mining PSUs operating in Jharkhand, by multiplying deduced associated livelihoods per MT of thermal solid fossil fuel production with total thermal solid fossil fuel production by each PSU in the state.

2.2.2 SOLID FOSSIL FUEL BASED POWER GENERATION

- **PSU Revenue:** Revenues of the three state-owned power generators—Damodar Valley Corporation (DVC), NTPC, and Tenughat Vidyut Limited (TVNL)—were assessed in this study. The revenue dependency of DVC and TVNL on solid fossil fuel-based power plants is available in their annual reports, while NTPC does not report them exclusively for Jharkhand. Hence, we calculated NTPC's revenue from operating solid fossil fuel-based power plant in the state, basis the average revenue earned per MW across all its assets in the country.
- **State Public Finance:** States generate revenue from power generation through two main sources: electricity duty and water charges. The data for electricity duty was sourced from multiple datasets, while the data for water charges was calculated based on regulatory filings (Tariff order 2019; Gambhir et al.).
- **Community Development by PSUs:** CSR funds used by DVC and TVNL in Jharkhand are mentioned, in their annual reports, and we calculated this for NTPC by apportioning 2% of Profit After Tax earned by its operating power plant in Jharkhand. This has been done in accordance with a mandatory requirement under Section 135 of Companies Act 2013 (Government of India 2018).
- **Employment:** The number of direct jobs created by DVC and TVNL was obtained from their annual reports, while the number of both direct and indirect (contractual) jobs created by NTPC was obtained from its annual report. A multiplier of direct and indirect employment derived from NTPC's annual report was then used to estimate the number of indirect jobs created by DVC and TVNL.
- **Associated Livelihoods:** Similar to the approach used for solid fossil fuel mining, a case study was used to estimate the associated livelihoods generated per MW of installed capacity. This number was then multiplied by the total installed capacity of PSUs in the state, to approximate the total number of associated livelihoods.

3. ANNUAL FINANCIAL IMPLICATIONS

While low-carbon transition offers vast new opportunities, stakeholders in existing solid fossil fuel-based ecosystems are likely to face financial impacts that could accumulate significantly over time. To assess this, our analysis assumes the transition to be immediate and identifies the financial implications for various affected stakeholders on an annual basis.

Annual financial implications in this report are the estimated immediate financial impacts of low-carbon energy transition on identified stakeholders, calculated on a per-year basis.

The potential business- and stakeholder-level financial implications of this transition are outlined below.

3.1 FOSSIL FUEL MINING

Jharkhand is a major producer of solid fossil fuels in India, unlike other mineral-rich states where operational mines are typically concentrated in a few districts. As a result, impacts of the energy transition in Jharkhand are likely to be felt more widely across the state.

3.1.1 PSU REVENUE

Three national solid fossil fuel mining companies operate in Jharkhand, all of which are subsidiaries of CIL, as shown below.

Table 1: Thermal solid fossil fuel production by PSUs in Jharkhand (FY 2021-22)

Subsidiary	Operations		Thermal solid fossil fuel production in Jharkhand (MT; FY2021-22) (GoI 2021)
	Location	Type of fuel	
Central Coalfields Limited	Jharkhand	Thermal, coking	47
Eastern Coalfields Limited	Jharkhand, West Bengal	Mostly thermal, limited coking	18.9
Bharat Coking Coal Limited	Jharkhand, West Bengal	~95% coking	1.2
Total			67.6

The table below summarizes the revenue of each CIL subsidiary from the production of non-coking solid fossil fuel in Jharkhand.

Table 2: Revenue of mining PSUs from Jharkhand (FY 2021-22)

#	Revenue source in Jharkhand	Annual financial implication (INR Cr) ²		
		BCCL (Annual Report 2022a)	CCL (Annual Report 2022b)	ECL (Annual Report 2022c)
1	Non-coking solid fossil fuel production	1,034.9	18,213.8	8,019.9
2	Other operating revenue (Mine-end logistics)	680.7	1,134.3	349.8
Total		1,715.6	19,348.1	8,369.7

CIL generates 25% of its revenue in Jharkhand from non-coking solid fossil fuel mining. Any impact on CIL's top line could affect its ability to pay dividends, including to the Government of India as its majority shareholder.

CCL and ECL's stronger dependence on thermal fuel for revenue makes them more susceptible to the impacts of the low-carbon energy transition, than BCCL.

3.1.2 STATE PUBLIC FINANCE

The low-carbon transition will open new avenues for investment and earnings for public finance; however, this will be paired with a progressive decline of existing revenue sources. Central and state governments currently receive revenue from the solid fossil fuel mining industry through taxes including royalties, goods and services tax (GST), GST compensation cess, cess on coal, state sales tax, central sales tax, clean energy cess, and others. (Wadhwa 2018)

This study assesses the direct annual financial impacts on state public finance; secondary effects such a decline in revenue due to reduced economic activity have not been evaluated.

² 1 Cr INR = 0.12 million USD (Currency exchange rate of 1 USD = INR 83)

The table below summarizes the revenue contribution of each PSU to state finance through the production of non-coking solid fossil fuels.

Table 3: State revenue from mining of solid fossil fuel (FY 2021-22)

#	Metrics	Annual Financial Implication (INR Cr)		
		BCCL (Annual Report 2022a)	CCL (Annual Report 2022b)	ECL (Annual Report 2022c)
1	Royalty on solid fossil fuel and contribution to District Mineral Foundation Trust	1,523.4	2,151.2	271.5
2	Cess and transit fees	53.4	528.2	13.6
3	Taxes ³	215.9	1,730.1	53.6
4	Others ⁴	5.9	31.5	1.3
Total revenue (thermal + coking)		1,798.6	4,441	340
Share of thermal production in total		5%	76%	99%
Total Revenue (thermal only)		92.5	3,373.6	339.8

The transition from solid fossil fuel mining will impact Jharkhand state government revenue by ~INR 3,800 crore a year, which would severely impact the state's ability to maintain the delivery of social services.

While taxes and royalties go to the state treasury and are used for the entire state, a District Mineral Foundation Trust (DMFT) is set up in each district where mining takes place, to benefit the people and areas affected by mining activities (Ministry of Mines 2016). With potential reductions in DMFT contributions, social spending for mining areas could be significantly reduced.

3.1.3 COMMUNITY DEVELOPMENT BY PSUS

CSR activities support communities through improvements in education, healthcare, and infrastructure. If PSUs become unable to contribute CSR funds, the state may have to fill this gap.

The table below shows the amount of CSR spending of each PSU attributed to thermal solid fossil fuel production.

Table 4: Community investment by mining PSUs (FY 2021-22)

Metrics	Annual Financial Implication (INR Cr)		
	BCCL (Annual Report 2022a)	CCL (Annual Report 2022b)	ECL (Annual Report 2022c)
CSR spend	0.3	53.1	5.8

While the amount of CSR spending by these PSUs may be small in the overall social spending context, the impact of this investment is significant, considering its targeted use to address local needs.⁵

³ Includes – States Goods & Service Tax (SGST), Sales tax/ VAT, Bazar Tax, GST

⁴ Includes – Professional Tax, Management Fees, etc.

⁵ Does not include contribution to central/ national social programs (e.g., PM relief fund)

3.1.4 EMPLOYMENT

Solid fossil fuel mining is a major source of employment in Jharkhand, employing more people than any sector other than agriculture. Reports estimate that 0.3 million people work in this sector, with another 1 million employed across the value chain (CEED 2023). However, the mechanization of mining activities has led to a decline in labor intensity, meaning that while production has increased, the total number of people employed in the sector has remained constant in recent years.

Any further decline in labor intensity in the sector would indicate a potential decline in mining jobs in the state. The below table shows the number of people directly⁶ and indirectly⁷ employed in the mining of thermal solid fossil fuel in the state.

Table 5: Direct and indirect employment generated by mining PSUs (FY 2021-22)

#	Metrics	Number of Employees		
		BCCL (Annual Report 2022a)	CCL (Annual Report 2022b)	ECL (Annual Report 2022c)
1	Direct	2,023	27,567	22,636
2	Indirect (contractual) ⁸ (D'Souza and Singhal 2021)	4,722	64,322	90,544
Total		6,745	91,889	113,180

The remuneration and benefits of direct employees are significantly higher than those of contractual employees. The table below shows the remuneration for direct and indirect employees working for PSUs in the mining of thermal solid fossil fuels.

One in four of formally trained workers in Jharkhand are directly employed in solid fossil fuel mining by PSUs. A low-carbon transition would require substantial reskilling of this workforce. (Skill India 2022)

Table 6: Income of direct and indirect employees (FY 2021-22)

#	Metrics	Annual Financial Implication (INR Cr)		
		BCCL (Annual Report 2022a)	CCL (Annual Report 2022b)	ECL (Annual Report 2022c)
1	Income of direct employees	297.5	4,159.6	3,352.8
2	Income of indirect employees ⁹ (MOSPI 2015)	282.3	3,845	5,413
Total		579.8	8,004.6	8,765.8

⁶ Direct Employment – Workforce directly on the payroll of PSU

⁷ Indirect Employment – Workforce hired by these PSUs on contract basis.

⁸ Ratio of contractual to permanent employment considered as 2.3.

⁹ Analysis based on data from [Directorate General of Mine Safety, Ministry of Labour](#)

In the case of asset closure, direct employees are typically relocated or given severance pay, whereas indirect employees do not receive such benefits, making them more vulnerable to the potential effects of the energy transition.

3.1.5 ASSOCIATED LIVELIHOODS

Solid fossil fuel mining generates a local economic ecosystem supporting mine workers. Given the lack of data on associated livelihoods, CPI used the case study of Bhowra (South) colliery in Dhanbad to estimate the number of jobs created in the vicinity of mines (Annexure A). The table below shows data based on this case study.

Table 7: Associated livelihoods multiplier: case study of Bhowra (South) Colliery (FY 2021-22)

#	Metrics	Numbers
1	Associated livelihoods supported per MT of solid fossil fuel mined (number)	11,784
2	Total Income – Associated livelihoods per MT (INR Cr/Year)	150.5

Employment generated in the vicinity of mines is a proxy for associated livelihood opportunities not captured in official records. Such employment could be significantly impacted by the energy transition in the absence of social safety nets, potentially leading to internal migration of a section of the population.

The table below shows the number and income from such employment in Jharkhand for thermal solid fossil fuel production, based on the case study mentioned above.

Table 8: Associated livelihoods number and income (FY 2021-22)

#	Metrics	Numbers
1	Associated livelihoods supported (Number)	7,97,967
2	Income through associated livelihoods (INR Cr)	10,188

The estimation of associated livelihoods will help in developing policies and actions to attract new industries with job creation potential to these locations, reduce migration and benefit from the already developed ecosystem.

3.2 SOLID FOSSIL FUEL-BASED POWER GENERATION

Jharkhand's rich solid fossil fuel reserves have prompted power generators to construct and operate ~5 GW capacity of solid fossil fuel-based power plants in the state. Considering that around 2 GW of this capacity is owned by private players, this study only examines the rest of the capacity owned by PSUs.

3.2.1 PSU REVENUE

Jharkhand has three power generating PSUs, with a combined 3 GW installed generation capacity, representing more than half of the state's installed capacity.

- I. **DVC** is a Joint Venture (JV) between the Central Government and the State Governments of West Bengal and Jharkhand. It operates conventional and RE capacities in West Bengal and Jharkhand. DVC has ~ 2 GW of solid fossil fuel-based power generation capacity in Jharkhand alone.
- II. **NTPC's** North Karanpura power station had one 660 MW unit in operation as of 1 September 2023. Two more units under construction, each with 660 MW capacity, have not been considered in this study.
- III. **TVNL**, a Jharkhand state-owned generation company, has a capacity of 420 MW with another 1,320 MW capacity (2*660 MW) being developed. For this study, TVNL's operational capacity as of 1 September 2023 has been considered.

The table below summarizes the revenue of each PSU from operating a solid fossil fuel-based power plant in the state.

Table 9: Revenue of power generation PSUs from Jharkhand (FY 2021-22)

#	Metrics	Annual Financial Implication (INR Cr)		
		DVC (Annual Report 2022d)	NTPC (Annual Report 2022e)	TVNL (Annual Report 2022f)
1	Revenue from solid fossil fuel-based power generation in Jharkhand	7,266.4	1,375.1	778

NTPC operates across India and has renewable energy assets in its portfolio. In contrast, TVNL operates exclusively through its solid fossil fuel-based power plant, while DVC's power generation portfolio is dominated by solid fossil fuels. Therefore, DVC and TVNL may need to diversify to future-proof their revenue and operations to avoid the comparatively greater impacts of a low-carbon energy transition.

Aside from supplying power to the region, DVC also provides critical services like flood control and irrigation. Since it earns 33% of its total revenue from solid fossil fuel-based power plants in Jharkhand alone DVC would be significantly impacted by a low-carbon transition in the state.

3.2.2 STATE PUBLIC FINANCE

State-level public finance from power generation comes in the form of taxes and duties from power generation and distribution, charges paid by power generators to utilize water for power plant operations, and dividends from state-owned power generation companies. The Jharkhand Government holds shares in DVC and TVNL, and could therefore receive dividends from the companies. However, information on dividend payments by DVC has not been published in the public domain, and TVNL, being a loss-making entity, is currently unable to pay any dividends.

The following table shows the state public finances accumulated from solid fossil fuel-based power generation by PSUs in the state.

Table 10: State revenue from solid fossil fuel-based power generation (FY 2021-22)

#	Metrics	Annual Financial Implication (INR Cr)		
		DVC	NTPC	TVNL
1	Taxes and duties on power generation (Gambhir et al.) (Tariff order 2019)	32.8		
2	Water charges	76.6		
3	Dividends from state-owned power generation companies	-	Not Applicable (NA)	Nil-
Total		109.4		

Revenue losses from taxes and duties on solid fossil fuel-based power generation could be offset by those from taxes and duties on newer solutions, such as renewable energy.

3.2.3 COMMUNITY DEVELOPMENT BY PSUs

Both DVC and NTPC have contributed to community development through various CSR activities in the vicinity of their power plants, including in Jharkhand. TVNL, being the state power generation company, has undertaken CSR activities in Jharkhand despite operating at a loss.

The table below shows the amount of community investment, or CSR, made by these PSUs in a single year.

Table 11: Community investment by solid fossil fuel-based power generators (FY 2021-22)

#	Metrics	Annual Financial Implication (In INR Cr)		
		DVC (Annual Report 2022d)	NTPC (Annual Report 2022e)	TVNL (Annual Report 2022f)
1	Community investment	5.3	5.3	1.7

While the CSR spending of these PSUs may seem small in the larger financial context, its impact is significant considering that it is targeted to address local needs.¹⁰

3.2.4 EMPLOYMENT

Employment in solid fossil fuel-based power generation is more formalized than in mining, given that power generation takes place in closed facilities, and is thus better documented.

The following table shows the number of people directly and indirectly employed in solid fossil fuel-based power generation in Jharkhand.

¹⁰ Does not include contribution to central/ national social programs (e.g., PM relief fund)

Table 12: Number of direct and indirect employees (FY 2021-22)

#	Metrics	DVC ¹¹ (Annual Report 2022d)	NTPC (Annual Report 2022e)	TVNL (CAG 2016)
1	Number of direct employees	1,832	191	596
2	Number of indirect (contracted) employees	9,407	980	800
Total		11,239	1,171	1,396

The remuneration of direct employees is significantly higher than that of indirect employees, with direct employees also enjoying retirement benefits and other non-financial benefits. Therefore, despite significantly lower numbers, the consolidated workforce income for direct employees is higher or comparable to that of indirect employees.

The table below provides data on the remuneration for direct and indirect employees working for these PSUs in solid fossil fuel-based power generation.

Table 13: Income of direct and indirect employees (INR Cr) (FY 2021-22)

#	Metrics	DVC (Annual Report 2022d)	NTPC (Annual Report 2022e)	TVNL (Annual Report 2022f)
1	Income of direct employees	247.4	65.2	58.3
2	Income of indirect employees ¹²	282.2	29.4	24
Total		529.6	94.6	82.3

In the event of asset closure, direct employees are typically relocated or given severance pay. However, energy transition may have a greater impact on indirect (contractual) employees as they do not receive any such benefits.

3.2.5 ASSOCIATED LIVELIHOODS

Solid fossil fuel-based power plants were often built in remote areas, with limited access to necessities. In such cases, townships were often established alongside the power plant to provide essential services and amenities to workers and their families. These townships created business opportunities for entrepreneurs, which in turn supported the local economy.

However, in the case of energy transition, new sites of renewable energy plants may lead to relocation or reduced employment opportunities for those living in and around traditional plant townships.

The Tenughat Thermal Power Plant in Lalpania was used as a case study to estimate the employment generated by solid fossil fuel-based power plants in their vicinity (Annexure B). Details are presented in the table below.

¹¹ NTPC's multiplier (5.1) for indirect employment used.

¹² NTPC average salary of contract employee used.

Table 14: Associated livelihood multiplier (FY 2021- 22)

#	Metrics	Numbers
1	Associated livelihoods per MW of fossil fuel-based power generation capacity	38
2	Income from associated livelihoods per MW (INR Cr/ Year)	0.49

Employment generated around power plants is a proxy for associated livelihood opportunities, which often do not get captured in official records. The table below captures data on such employment generated by solid fossil fuel-based power plants in the state.

Table 15: Associated livelihood number and income (FY 2021-22)

#	Metrics	Details
1	Associated livelihoods (Number)	1,18,375
2	Total Income from Associated livelihoods (INR Cr)	1,511.4

Estimating associated livelihoods around solid fossil fuel-based power plants may help to develop plans for reusing and repurposing the existing plant infrastructure and townships, to minimize the impacts of the energy transition.

4. KEY FINDINGS AND WAY FORWARD FOR JHARKHAND

Key stakeholders related to Jharkhand's solid fossil fuel extraction industries stand to lose almost INR 60,836 Crore (USD 7.3 Billion) a year, while those in related energy generation industries stand to lose INR 11,796 Crore (USD 1.4 billion) annually. This equates to 19% of gross domestic state revenue and 87% of the state's total receipts.

Losses will likely be incurred by PSUs and their employees, as well as those working in supporting industries. Effectively, state public finance and funding from PSUs towards community development will be impacted.

The direct financial implication of an energy transition in Jharkhand amounts to INR 72,596 Crore per year (USD 8.7 Billion annually),¹³ which is 19% of Jharkhand's GSDP (FY23). When compared with government receipts, this amounts to 87% of total receipts as of 2022-23, which highlights the scale of financial complexity involved in the low-carbon transition.

A breakdown of the financial implications based on our analysis is shown in the table below.

Table 16: Annual financial implications of a net-zero transition for Jharkhand

#	Metrics	Annual Financial Implications (INR Cr)		% of State GSDP [(A+B)/ State GSDP] (PRS 2023)	% of State Revenue [(A+B)/ State Govt. Receipts] (PRS 2023)	Affected Stakeholders
		Solid Fossil Fuel Mining (A)	Solid Fossil Fuel-Based Power Generation (B)			
Aggregate Annual Financial Implication		60,836	11,760	18.9%	86.9%	State, PSUs & local populace
1	PSU Revenue	29,433	9,419.5	10.2%	46.5%	PSUs
2	State Public Finance	3,806	109.4	1.03%	4.7%	State Exchequer
3	Community Development	59.2	12.3	0.02%	0.1%	State Exchequer
4	Employment	17,349.9	707	4.7%	21.6%	Local Populace
5	Associated Livelihoods	10,188.1	1,511.4	3.0%	14%	Local Populace

¹³ Considering USD 1 = INR 83

To mitigate such impacts on the state economy, significant steps would be needed including investment into alternative industries and livelihoods, large-scale reskilling and job creation, as well as extensive planning of social spending. The section below briefly outlines some steps that these key stakeholders can take to cushion the implications of the energy transition.

1. **PSUs:** The transition from solid fossil fuels is likely to have a significant impact on mining and power generation PSUs. Power generators have viable alternatives for venturing into clean energy solutions, but mining businesses have limited options unless they go in for dramatic business diversification. It may be advisable for these entities to leverage their large balance sheets and expertise, to diversify into other domains that are likely to gain from the transition—such as Energy Storage, Green Hydrogen, Solar PV, etc.
2. **State Exchequer:** The state is likely to face a decline in revenue from solid fossil fuel businesses, paired with growing social spending requirements. Aside from the implications highlighted above, Jharkhand may have to manage indirect impacts such as a decline in indirect taxes, a fall in the share of central allocations and GST, along with decline in stamp duty revenue. Ideally, the State Government should develop a transition plan that bridges the gap between projected revenue and expenditure in the medium-to-long-term by attracting new businesses and creating new opportunities.
3. **Employees:** Direct employees may be less affected by this transition as they may be offered employment at other sites or receive compensation via Voluntary Retirement Schemes and other severance benefits. Indirect or contractual employees, however, could lack such benefits, as applicable labor laws cover a limited period for supporting them. Additionally, indirect employees are more likely to face job extinction. In the absence of a just and inclusive transition plan, indirect employees may have to seek alternative employment opportunities that may not be at the same pay level or location. An imperative in mitigating such impact would be the development of a systematic plan for skill advancement and reskilling of the workforce likely to be affected. This could be developed with guidance from relevant agencies such as the National Skill Development Council and supported by the State Government and existing employers.
4. **Associated livelihoods:** Livelihoods associated with solid fossil fuel production sites and power generation assets are expected to be affected significantly by the transition. Considering the informal nature of such work, people in these sectors may have few options for assistance from the Government or PSUs. This could lead to migration to areas with new industries or renewable energy power plants, entailing relocation from native areas where many rely on ancestral agricultural land and livestock to support their income. Therefore, government investment and the creation of new job opportunities in the same area is required. Along with new employment opportunities, upskilling of workers employed in the informal associated livelihood sectors would be of critical importance. Such initiatives could help move this workforce into the formal sector and would require partnering with recognized skilling bodies, civil society groups, and local (sub-state) governments, along with requisite support from the State Government.

The Central Government may provide some financial assistance to help states manage their energy transition. However, given the amount of support required and competing priorities, the current business-as-usual approach may be insufficient.

Way forward for Jharkhand

The Jharkhand State Government could start planning for the transition, by estimating related costs and exploring means to finance them. Returns from current fossil fuel-based businesses could be leveraged into long-term transition planning and investment. This could include mitigating adverse impacts as well as leveraging opportunities that the transition presents, to emerge as a more diverse and resilient economy.

Such a plan would likely include measures on:

- Compensating the State Exchequer for loss of revenue.
- Providing social safety nets and support to affected direct and indirect employees.
- Creating new investment opportunities in sectors that are likely to benefit from, or remain unaffected by, the transition.
- Investing in skill development for local people to leverage new business opportunities that may arise from the transition.
- Planning government spending in districts most likely to be affected by the transition, to help develop the local economy and encourage entrepreneurship.
- Preparing for internal migration of workers to new economic centers that could emerge through government initiatives.

5. CONCLUSION

Successful energy transition will mitigate not only climate change impacts but also the socio-economic impacts created by the transition itself.

Considering the complex financial implications, differentiated approaches will be needed to handle transition assistance for the diverse set of affected stakeholders involved. A just transition plan would need to be formulated for each state, considering their current economic and socio-political complexities, the resources available, the likely transition trajectory (in line with national commitments), and the longer-term socio-economic goals for the state.

This report and CPI's just transition work series aim to support the four pillars of just transition: (1) development of differentiated approaches which would incorporate inputs on all the stakeholders likely to be impacted by energy transition; (2) enable discussions with relevant stakeholders to formulate a suitable transition plan; (3) facilitate capacity building and upskilling solutions to minimize the impact on vulnerable sections; stakeholders; and (4) drive economic growth and development of the state.

Just transition planning is critical to ensure that implications for all stakeholders are mitigated or managed in a manner that is socio-economically acceptable and individually amicable.

To achieve the just transition goal of not leaving anyone behind, government assistance would need to be based on International Labor Organization's (ILO) broad principles of Recognition Justice, Procedural Justice, Distributive Justice, and Restoration Justice.

While this report provides insight into the financial implications of a transition if it were to happen immediately, to better create a just transition plan, an assessment of the likely transition trajectories and the associated year-on-year costs of mitigation would need to be modeled. This would be in line with technological shifts, financing availability, climate change imperatives, and individual targets of countries and states for achieving net-zero emissions.

In the next phase of its just transition work, CPI plans to undertake this exercise using the numbers from this report as a baseline for modeling the implications of energy transition over time.

CPI's next report in this series will focus on modeling the different scenarios of the likely impact of low-carbon transition trajectories, and the finance requirements for making the transition just and equitable for Jharkhand.

ANNEXURE A. CASE STUDY: MINING

Bhowra (South) Colliery is situated 10km from the district headquarters of Dhanbad. Its annual production is 0.32 million tons (MT) (Pai et al. 2021). Bhowra panchayat, which borders the mine, has been considered for deriving multipliers of associated livelihoods. The table below shows various numbers and assertions based on publicly available data.

Table 17: Bhowra (South) Colliery Case Study

#	Particulars	Number	Rationale
A	Production (In MT)	0.32	N/A
B	Population of Bhowra (GoJ 2023)	15,021	N/A
C	Working population (Census 2011 2023)	5,472	N/A
D	Direct and indirect employment in the mine ¹⁴	1,710	N/A
E	Associated livelihood [E=C-D]	3,771	In addition to mine employees, the population in the vicinity also depends upon the mine for their livelihoods
F	Number of people employed in main work ¹⁵ (Census 2011 2023)	1,632	43% of the working population is employed in main work
G	Number of people employed in marginal work ¹⁶	2,139	57% of the working population is employed in marginal work
H	Average salary of population employed in main work (INR/month) ¹⁷	12,928	Assumed highly skilled and skilled
I	Average salary of population employed in marginal work (INR/month)	8,894	Assumed unskilled and semi-skilled
J	Income from associated livelihoods (In INR Cr/Year) [(F*H*12)+(G*I*12)]	48	Sum product of wages and number of main and marginal workers
K	Associated livelihoods per MT [E/A]	11,784	Number of people
L	Income from associated livelihoods per MT (In INR Cr/Year) [J/A]	150.5	N/A

¹⁴ As per BCCL production and employment data (Direct employment per MT = 1596, Indirect Employment per MT = 3724)

¹⁵ Workers employed for more than six months in a year.

¹⁶ Workers employed for less than six months in a year.

¹⁷ As per minimum wages - Jharkhand

ANNEXURE B. CASE STUDY: POWER GENERATION

The Tenughat thermal power station is a state-owned power plant with a capacity of 420 MW. It is located in Lalpania, Bokaro, and is a major source of employment for the local community. For this case study, it is assumed (based on desk research on the local economy of the area) that the working population of Lalpania town is predominantly dependent on the power plant for their livelihoods.

Table 18: Tenughat Thermal Power Plant Case Study

#	Particulars	Number	Rationale
A	Capacity (In MW)	420	N/A
B	Population of Lalpania(Census 2011 2023)	48,141	N/A
C	Working population(Census 2011 2023)	17,538	N/A
D	Direct and indirect employment in the power plant (The Pioneer 2021) (CAG 2016)	1,396	N/A
E	Associated Livelihood [E=C-D]	16,142	In addition to the plant employees, the local population also depends upon the mine for their livelihoods
F	Number of people employed in main work (Census 2011 2023)	6,987	43% of working population employed in main work
G	Number of people employed in marginal work	9,155	57% of working population employed in marginal work
H	Average salary of population employed in main work (INR/ month)(Saral Pay Pack 2023)	12,928	Assumed highly skilled and skilled
I	Average salary of population employed in marginal work (INR/ month)	8,894	Assumed unskilled and semi-skilled
J	Income from associated livelihoods (INR Cr/Year) [(G*I*12)+(F*H*12)]	206	Sum product of number and wages of main and marginal workers
K	Associated Livelihood per MW [E/A]	38	N/A

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