



Just Energy Transition: Economic Implications for Jharkhand

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POLICY
INITIATIVE

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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

EXECUTIVE SUMMARY

India's large-scale power generation infrastructure has predominantly relied on domestic solid fossil fuel resources for the past 50 years, providing access to electricity to millions of people, even in remote areas of the country. However, as India moves on the path of low-carbon development through its ambitious clean energy targets, net-zero emission goals by 2070, such a transition would require a significant shift in the country's energy mix, which includes moving away from fossil fuels to greener energy sources.

About 85% of India's solid fossil fuel production is concentrated in a few mineral-rich states—the five eastern states of Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, and West Bengal. These states rely heavily on solid fossil fuel mining and their downstream industries (mainly electricity generation) for output, employment, state revenues, and social welfare funding. The low-carbon transition is likely to be accelerated by the falling costs of renewable energy generation compared with that of fossil fuel-based energy generation. Fossil fuel-reliant states could face competition from renewable energy-rich states, and the viability of many economic activities revolving around solid fossil fuel mining and consumption could be fundamentally altered. Amongst the mineral-rich states mentioned above, Jharkhand is most likely to face adverse short-term impacts of a low-carbon transition; it is also the first Indian state to set up a task force to enable a Just energy transition so that the economic and social impact of the energy transition is minimized.

The cumulative economic implication of the low-carbon transition for stakeholders, ranging from Public Sector Undertakings (PSUs) and their workforce, the state government, and the community at large in Jharkhand is significant, amounting to INR 725.9 billion per year (USD 8.7 billion). While this is a gross measure of the economic impact on the state, the fiscal implication for Jharkhand includes the following: (a) impact on state revenues could be in the order of 5% of its current revenue levels (b) loss of livelihoods could contribute to erosion of 7% of the state's output- GSDP (Gross State Domestic Product).

To offset the adverse effects of the transition, several policy and financing interventions would be needed, including investment in alternative industries and livelihoods; large-scale reskilling of workforce, job creation, and targeted social spending.

This report provides the following broad recommendations on how the adverse effects of an energy transition in the state of Jharkhand could be minimized which include:

- State-owned mining and power generation companies leveraging their large balance sheets and in-house expertise to diversify into other related businesses, that are likely to gain from the transition, such as energy storage, green hydrogen, clean mobility, and solar energy.
- The state government of Jharkhand needs to develop a transition plan that bridges the gap between projected revenue and expenditure in the medium-to long-term by attracting new low-carbon businesses, and creating new opportunities that foster sustainable economic pathways.

- State-owned large employers such as NTPC, DVC, CIL, and its subsidiaries, etc., along with the state government, could develop initiatives /programs for skill development and reskilling of the entire workforce, including for contractual or indirect employees.

An overarching Just Transition (JT) plan could be the first step for the state government to ensure a more diverse, resilient, and sustainable economy. This plan should explore measures (such as obtaining central financial assistance) to compensate the state exchequer for loss of revenue, as the state may not be able to cover such losses in the short term. In addition, the JT plan would need to provide for social safety nets; provide financial support to affected employees; and at the same time, create new investment opportunities in sectors that are likely to benefit from, or remain unaffected by, the transition. Other important considerations are investment in skill development of local people, increased public spending on districts likely to be affected by the transition, and preparation for internal migration of workers to new economic centers.

This report and CPI's subsequent Just Transition work programs aims to support the state government in designing suitable policies and programs by developing differentiated approaches; enabling discussions with relevant stakeholders; facilitating capacity-building and skilling solutions, while driving economic growth and development. Public policy interventions and financial support could be based on the ILO's principles of justice-recognition, distributive, restorative and procedural.

While the report provides a first-cut assessment of the adverse economic implications of energy transition in Jharkhand, a detailed analysis of transition trajectories would follow in the next phase of CPI's Just Transition work, along with an estimate of financing requirements and institutional mechanisms for a **Just Transition Finance Facility** that would endeavor to facilitate a just and equitable energy transition for Jharkhand.

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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 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 mining and downstream industries for output and employment, state revenues, and social welfare funding. 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 economic implications of low-carbon transition for stakeholders¹ in the state of Jharkhand, India. The report builds on previous work findings that amongst the mineral-rich states, Jharkhand is most likely to face significant adverse short-term impact of a low-carbon transition (Habib et al. 2023).

However, Jharkhand has recognized the importance of acting swiftly. 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 Jharkhand's Just Transition Task Force to better plan its interventions and minimize downside impact.

Though low-carbon 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 alternative economic growth 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 economic implications

¹ Stakeholders considered in this report include mining and power generation PSUs, their workforce, state government, and the community at large.

for businesses, communities, and states. If such issues are not addressed, the 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 the stakeholders likely to be impacted as the low-carbon transition unfolds in Jharkhand. It encompasses the impact on solid fossil fuel mining and solid fossil fuel-based power generation by PSUs in Jharkhand, and the wider implications on direct and indirect employment, livelihood creation, community development, and state revenue.

This analysis, 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 impact of the transition on state revenues of Jharkhand, and therefore excludes its impact on central government revenues.

Figure 1: Coverage of study for solid fossil fuel mining²

INCLUDED	Thermal Solid Fossil Fuel
	Coal India Limited (CIL) and its subsidiaries
	Impact on state government revenue
	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 central government revenue

² Thermal coal (also called steaming coal) is typically used for electricity generation. Coking coal (also called metallurgical coal) is mostly used in steel production and other industrial processes.

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

INCLUDED	Central and state conventional power generation utilities
	Impact on state revenue
	Direct and indirect employment generated in power plant
	Induced employment generated in locality of power plant
EXCLUDED	Private power generators and captive generation
	Impact on central government revenue

2.2 RESEARCH METHODOLOGY

This study makes use of publicly available secondary data, sourced from 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:** Coal India Limited (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 Revenue:** 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 its production in the state.
- Community Development by PSUs:** The Corporate Social Responsibility (CSR) spending by the coal mining PSUs operating in the state has been used as a 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 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)³.

- **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, small businesses, and households. 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 (TNVL)—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 this 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 Revenue:** 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 (PAT) earned by its operating power plant in Jharkhand. This has been done in accordance with a mandatory requirement under Section 135 of the 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 Ratio of contractual to permanent employment considered as 2.3. (Link to report)

3. ANNUAL ECONOMIC IMPLICATIONS FOR STAKEHOLDERS

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

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

The potential stakeholder-level economic implications of this transition are outlined below.

3.1 FOSSIL FUEL MINING

Jharkhand is a major producer of solid fossil fuels in India, however, unlike other mineral-rich states where operational mines are typically concentrated in a few districts, more than half of Jharkhand's districts have solid fossil fuel reserves. As a result, the impact of low-carbon transition is likely to be felt 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 (Million Tonne; 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 Economic Implication (INR Billion) ⁴		
		BCCL (Annual Report 2022a)	CCL (Annual Report 2022b)	ECL (Annual Report 2022c)
1	Non-coking solid fossil fuel production	10.3	182.1	80.2
2	Other operating revenue (Mine-end logistics)	6.8	11.3	3.5
Total		17.1	193.4	83.7

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 impact of the low-carbon transition, than BCCL.

3.1.2 STATE REVENUE

The low-carbon transition will open up new avenues for investment and earnings for the state; 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), cess on coal, State Sales Tax, Central Sales Tax, Clean energy cess, and others. (Wadhwa 2018)

This study assesses the direct annual economic impact on state revenue; secondary effects such as decline in revenue due to reduced economic activity have not been evaluated.

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

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

#	Metrics	Annual Economic Implication (INR Billion)		
		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	15.2	21.5	2.7
2	Cess and transit fees	0.5	5.2	0.1

⁴ INR 1 billion = USD 0.12 billion (Currency exchange rate of 1 USD = INR 83)

#	Metrics	Annual Economic Implication (INR Billion)		
		BCCL (Annual Report 2022a)	CCL (Annual Report 2022b)	ECL (Annual Report 2022c)
3	Taxes ⁵	2.1	17.30	0.5
4	Others ⁶	0.05	0.3	0.01
Total revenue (thermal + coking)		17.9	44.4	3.4
Share of thermal production in total		5%	76%	99%
Total Revenue (thermal only)		0.9	33.7	3.4

The decline in solid fossil fuel mining will impact Jharkhand State Government revenue by ~INR 38 billion 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 are 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 Economic Implication (INR Billion)		
	BCCL (Annual Report 2022a)	CCL (Annual Report 2022b)	ECL (Annual Report 2022c)
CSR spend	0.003	0.5	0.05

While the amount of CSR spending by these PSUs may seem modest in the overall social spending context, the impact of this investment is significant, considering its targeted use in addressing local needs.⁷

⁵ Includes – States Goods & Service Tax (SGST), Sales tax/ VAT, Bazar Tax, GST

⁶ Includes – Professional Tax, Management Fees, etc.

⁷ 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 one 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 directly⁸ and indirectly⁹ 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) ¹⁰ (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 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 Economic Implication (INR Billion)		
		BCCL (Annual Report 2022a)	CCL (Annual Report 2022b)	ECL (Annual Report 2022c)
1	Income of direct employees	2.9	41.5	33.5
2	Income of indirect employees ¹¹ (MOSPI 2015)	2.8	38.5	54.1
Total		5.7	80.0	87.6

8 Direct Employment – Workforce directly on the payroll of PSU

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

10 Ratio of contractual to permanent employment is considered as 2.3.

11 Analysis based on data from the [Directorate General of Mine Safety, Ministry of Labour, GoI](#).

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 impact of the low-carbon 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 has 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)	117,84
2	Total Income - Associated livelihoods per MT (INR Billion/Year)	1.5

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 low-carbon 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)	797,967
2	Income through associated livelihoods (INR Billion/Year)	101.8

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 1st 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 1st 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 Economic Implication (INR Billion)		
		DVC (Annual Report 2022d)	NTPC (Annual Report 2022e)	TVNL (Annual Report 2022f)
1	Revenue from solid fossil fuel-based power generation in Jharkhand	72.6	13.7	7.8

NTPC operates thermal assets across India, and also 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.

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 low-carbon transition in the state.

3.2.2 STATE REVENUE

State revenue 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 these 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 revenue generated 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 Economic Implication (INR Billion)		
		DVC	NTPC	TVNL
1	Taxes and duties on power generation (Gambhir et al.) (Tariff order 2019)	0.3		
2	Water charges	0.7		
3	Dividends from state-owned power generation companies	-	Not Applicable (NA)	Nil-
Total		1.0		

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 Economic Implication (In INR Billion)		
		DVC (Annual Report 2022d)	NTPC (Annual Report 2022e)	TVNL (Annual Report 2022f)
1	Community investment	0.05	0.05	0.01

While the CSR spending of these PSUs may seem modest in the larger economic context, its impact is significant considering that it is targeted to address local needs.¹²

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.

¹² 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 ¹³ (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 Billion/ Year) (FY 2021-22)

#	Metrics	DVC (Annual Report 2022d)	NTPC (Annual Report 2022e)	TVNL (Annual Report 2022f)
1	Income of direct employees	2.4	0.6	0.6
2	Income of indirect employees ¹⁴	2.8	0.3	0.2
Total		5.2	0.9	0.8

In the event of asset closure, direct employees are typically relocated or given severance pay. However, low-carbon 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 low-carbon 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.

¹³ NTPC's multiplier (5.1) for indirect employment used.

¹⁴ NTPC average salary of contract employee used.

Table 14: Associated livelihoods 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 Billion/ Year)	0.0049

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 livelihoods number and income (FY 2021-22)

#	Metrics	Details
1	Associated livelihoods (Number)	118,375
2	Total Income from Associated livelihoods (INR Billion/ Year)	15.1

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 impact of the low-carbon transition.

4. KEY FINDINGS AND WAY FORWARD FOR JHARKHAND

Jharkhand's solid fossil fuel extraction industries and their key stakeholders stand to lose almost INR 608.3 billion (USD 7.3 billion) a year, while those in related energy generation industries stand to lose INR 117.9 billion (USD 1.4 billion) annually.

PSUs and supporting industries are likely to bear a significant proportion of this loss with knock-on impacts on the overall workforce, and in the volume of their contribution towards community development.

The cumulative economic implication of a low-carbon transition for stakeholders ranging from PSUs, their workforce, state government and community at large in Jharkhand is significant, amounting to INR 725.9 billion per year (USD 8.7 Billion annually¹⁵). This highlights the magnitude of economic complexities associated with enabling a low-carbon transition in the state.

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

Table 16: Annual economic implications of low-carbon transition in Jharkhand

#	Metrics	Annual Economic Implications (INR Billion)		Scale of Economic Impacts
		Solid Fossil Fuel Mining (A)	Solid Fossil Fuel-Based Power Generation (B)	
1. Impact on PSU Revenues		294.3	94.1	26.1% revenue of impacted PSUs
2. Economic Impact on State Exchequer				5.1% of state revenue receipts (PRS 2023)
2.A	State Revenue	38.0	1.1	5%
2.B	Community Development	0.6	0.2	0.1%
3. Economic Impact on Local Population				7.7% of state GSDP (PRS 2023)
3.A	Employment	173.5	7.1	4.7%
3.B	Associated Livelihoods	101.9	15.1	3.0%
Aggregate Annual Economic Implications (1+2+3)		608.3	117.6	Total: INR 725.9 billion

¹⁵ Considering USD 1 = INR 83

The above figures are conservative estimates; the actual impact is likely to be significantly higher with ripple effects across various industries/sectors. For example, a decline in incomes of employees would erode their purchasing power, leading to a direct reduction in sales of other products such as consumer durables. This, in turn, will negatively impact other businesses in the state and reduce government tax revenue. Similarly, property rentals and real estate transaction frequency will decline, affecting employment in the sector and government revenues generated from these transactions.

Significant interventions will be required to mitigate the cascading implications posed by low-carbon transition pathways to the state economy. These include investment in alternative industries and livelihoods, large-scale reskilling and job creation, as well as extensive planning of targeted social spending. The section below briefly outlines some steps that key stakeholders can take to cushion the impact of the energy transition.

1. **PSUs:** Mining and power generation PSUs may 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. Compared to power generators that have viable alternatives for venturing into clean energy solutions, mining businesses have limited options unless they opt for dramatic business diversification.
2. **State Exchequer:** The State Government may develop a transition plan that bridges the gap between projected revenue and expenditure in the medium-to long-term by attracting new low carbon businesses which creates new opportunities fostering sustainable economic pathways. The low-carbon transition plan can help the state to systematically tackle challenges such as the decline in revenue from solid fossil fuel businesses, and associated rise in social spending; and indirect impacts such as the decline in indirect taxes, a fall in the share of central allocations and GST, and a decrease in stamp duty revenue.
3. **Employees:** The PSUs along with the State Government may prepare a robust and inclusive plan for skill advancement and reskilling of the entire workforce, especially for indirect or contractual 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, may 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. The plan may be developed with guidance from relevant agencies such as the National Skill Development Council and existing employers, and could include key stakeholders in the decision-making process.
4. **Associated livelihoods:** Government investment, the creation of new opportunities, and skill enhancement of workers employed in informal livelihood sectors need to be planned in tandem. 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 fewer options for receiving 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. A systemic approach to the planning of skilling and employment initiatives could help move this workforce into the formal sector. This will 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 low-carbon transition. However, given the amount of support required and competing priorities, the current business-as-usual approach may be insufficient.

WAY FORWARD FOR JHARKHAND

- A just energy transition plan could be the first step of the Jharkhand State Government to ensure a more diverse, resilient, and sustainable economy. Such a plan will 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.

Alongside this, it is crucial to estimate costs related to enabling the energy transition, and explore means of financing them. The planning process should be informed by the costs associated with the adverse impact of the transition, and also leverage opportunities that the transition presents. One of the ways of financing the transition could be through leveraging returns from current fossil fuel-based businesses into long-term transition planning and investment. However, considering the scale of investments required, new and innovative financing solutions may be needed. CPI's Facilitating Finance for a Just Transition initiative will continue exploring and designing novel financial mechanisms that can enable just energy transition.

5. CONCLUSION

A low-carbon transition can be truly successful if it facilitates the shift to a low-carbon economy while addressing the socio-economic implications of the transition itself. The complex and dynamic challenges presented by different facets of the transition require a diverse array of approaches to ensure no stakeholder is left behind in the process. At a more macro level, different socio-economic, political, cultural, and environmental contexts; resource and capacity-related considerations; and growth and development priorities across states will require highly tailored transition trajectories.

This report and CPI's Just Transition work series aim to support the four pillars of a just transition by: (1) developing differentiated approaches which would incorporate inputs on all the stakeholders likely to be impacted by low-carbon transition; (2) enabling discussions with relevant stakeholders to formulate a suitable transition plan; (3) facilitating capacity building and upskilling solutions to minimize the impact on vulnerable sections/ stakeholders; and (4) driving 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 empowering.

To achieve Just Transition that leaves no one behind, government assistance should be based on the broad principles of Recognition Justice, Procedural Justice, Distributive Justice, and Restoration Justice, as outlined by the International Labor Organization (ILO).

This report provides initial insights on the economic implications of energy transition if it were to happen immediately. However, to better create a just transition plan, this study should be followed by an in-depth assessment of the likely transition trajectories, including modeling of the associated year-on-year costs of mitigation. This will be in line with technological shifts, finance 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 conduct this assessment, using this report as a baseline for modeling the implications of low-carbon transition over time. Specifically, the assessment will focus on modeling the different scenarios of the likely impact of low-carbon transition trajectories, and the financial 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 ¹⁶	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 ¹⁷ (Census 2011 2023)	1,632	43% of the working population is employed in main work
G	Number of people employed in marginal work ¹⁸	2,139	57% of the working population is employed in marginal work
H	Average salary of population employed in main work (INR/ month) ¹⁹	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 Billion/Year) [(F*H*12)+(G*I*12)]	0.48	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 Billion/Year) [J/A]	1.50	N/A

¹⁶ As per BCCL production and employment data (Direct employment per MT = 1596, Indirect Employment per MT = 3724)

¹⁷ Workers employed for more than six months in a year.

¹⁸ Workers employed for less than six months in a year.

¹⁹ As per minimum wages - Jharkhand

ANNEXURE B. CASE STUDY: POWER GENERATION

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 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 Billion/Year) [(G*I*12)+(F*H*12)]	2.06	Sum product of number and wages of main and marginal workers
K	Associated Livelihoods per MW [E/A]	38	N/A

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