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INTERNATIONAL FORUM FOR ENVIRONMENT, SUSTAINABILITY & TECHNOLOGY

TRANSFORMING INDIA'S COAL CAPITAL

Just Transition Plan for Dhanbad and Damodar Valley's Green Future

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ADB	Asian Development Bank
ANC	Antenatal Care
ATMA	Agricultural Technology Management Agency
BCCL	Bharat Coking Coal Limited
BCM	Billion Cubic Metres
BIS	Bureau of Indian Standards
CBM	coal bed methane
CCA	Culturable Command Area
CCL	Central Coalfields Limited
CEA	Central Electricity Authority
CEPI	Comprehensive Environmental Pollution Index
CHC	Community Health Centres
CIL	Coal India Limited
CMMIS	Community Managed Micro Irrigation Scheme
CO	Carbon Monoxide
CO_2	Carbon dioxide
CPCB	Central Pollution Control Board
CSC	Common Service Centers
CSE	Corporate Social Responsibility
CSR	Corporate Social Responsibility
DBR	Dhanbad, Bokaro, Ramgarh
DLD	Desertification/Land Degradation
DMF	District Mineral Foundation
DMFT	District Mineral Foundation Trust
DST	Department of Science and Technology
DVC	Damodar Valley Corporation
DVR	Damodar Valley Region
EC	Environment Clearance
ECL	Eastern Coalfields Limited
EPR	Extended Producer Responsibility
EV	Electric Vehicle
FCIL	Fertilizer Corporation of India Limited
FGD	Focus Group Discussions
FMCG	Fast-Moving Consumer Goods
FRA	Forest Rights Act
FRL	Full Reservoir Level
GDDP	Gross District Domestic Product
GDP	Gross Domestic Product
GIC	Green Industry Corridor
GoI	Government of India
GVA	Gross Value Added
GW	Gigawatt
Ha	Hectares
HH	Households
HSC	Health Sub-Centres
HURL	Hindustan Urvarak & Rasayan Limited
ICT	Information and Communication Technolog
IISCO	Indian Iron and Steel Company
INR	Indian Rupee
IPHS	Indian Public Health Standards
ITI	Industrial Training Institute
JBIC	Japan Bank for International Cooperation
JEPC	Jharkhand Education Project Council
JHASCOFISH	Jharkhand State Co-operative Fisheries Federation Limited
JIADA	Jharkhand Industrial Area Development Authority
JICA	Japan International Cooperation Agency
JREDA	Jharkhand Renewable Energy Development Agency
JSDMS	Jharkhand Skill Development Mission Society
JSLPS	Jharkhand State Livelihood Promotion Society
JSOS	Jharkhand State Open School
JSPCB	Jharkhand State Pollution Control Board
JTP	Just Transition Plan
Kg	kilogram
Kt	kiloton
LPG	Liquefied Petroleum Gas
LULC	Land Use Land Cover
MIDH	Mission for Integrated Development of Horticulture
MMT	Million Metric Tonnes
MMTPA	Million Metric Tonnes Per Annum
MNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MOEFCC	Ministry of Environment, Forest and Climate Change
MPI	Multidimensional Poverty Index
MSME	Micro, Small, and Medium Enterprises
MW	Megawatt
NABARD	National Bank for Agriculture and Rural Development
NH	National Highway
NITI	National Institution for Transforming India

NO_x	Nitrogen Oxides
NRLM	National Rural Livelihoods Mission
NTFP	Non Timber Forest Products
OB	Overburden
OC	Open Cast
PCI	Per Capita Income
pH	potential of Hydrogen
PHC	Primary Health Centres
PM	Particulate Matter
PMAY	Pradhan Mantri Awas Yojana
PMKSY	Pradhan Mantri Krishi Sinchai Yojana
PMSSY	Pradhan Mantri Swasthya Suraksha Yojana
PMUY	Pradhan Mantri Ujjwala Yojana
PNC	Postnatal Care
PNG	Piped Natural Gas
PRI	Panchayati Raj Institutions
PSU	Public Sector Undertaking
PV	Photovoltaic
R&D	Research and Development
RE	Renewable Energy
RKVY	Rashtriya Krishi Vikas Yojana
RPL	Recognition of Prior Learning
SAIL	Steel Authority of India Limited
SAPCC	State Action Plan on Climate Change
SC	Scheduled Castes
SCA	Special Central Assistance
SDG	Sustainable Development Goals
SECC	Socio-Economic & Caste Census
SEZ	Special Economic Zone
SHG	Self-Help Groups
SME	Small and Medium Enterprises
SO_2	Sulfur Dioxide
SPCB	State Pollution Control Board
ST	Scheduled Tribes
SWOC	Strengths, Weaknesses, Opportunities, Challenges
TISCO	Tata Iron and Steel Company Limited
TPP	Thermal Power Plant
TSP	Tribal Sub-Plan
UDISE	Unified District Information System for Education
UG	Underground
UNDP	United Nations Development Programme
URDPFI	urban and regional development plans formulation and implementation
USD	United States Dollar
VI	Vulnerability Index
WHO	World Health Organization
YOY	Year-on-Year

SUMMARY FOR STAKEHOLDERS

Dhanbad is almost synonymous with India's coal mining history. Popularly referred to as the country's 'coal capital,' coal mining here dates back nearly 200 years. Along with adjoining districts like Bokaro, Ramgarh, and Hazaribagh, it has long been a core hub of Jharkhand's coal and industrial economy.

However, Dhanbad along with these districts, is facing transition challenges due to depleting coal resources in old mines and the necessity of moving towards a low-carbon economy. However, this transition offers an opportunity to reposition the region as a hub for green energy and industry, leveraging existing land, infrastructure, and strategic location. Drawing on extensive primary research, including 880 household surveys, focus group discussions, and interviews, and technical and socio-economic assessments, the study examines how Dhanbad can plan an inclusive, diversified, low-carbon economy. While also evaluating opportunities to redevelop the Dhanbad-Bokaro-Ramgarh area in the Damodar valley region.

A. Key Observations

Dhanbad is facing the challenges of a just transition with many operational mines reaching the end of their lives and being economically unviable.

Dhanbad faces the challenges of a just transition as many operational mines reach the end of their productive lives and are also unprofitable. Historically one of India's oldest and largest coal-producing districts, it accounts for over 25% of Jharkhand's coal production capacity—69.5 million metric tonnes (MMT). In 2023–24, the district produced nearly 43 MMT from 48 operational mines (40.8 MMT from opencast and mixed mines, and 2.3 MMT from underground mines).

Remaining mine life estimates indicate a decline over the next 25 years. In fact, as per currently estimated mine life (as per official documents) and economic status (unprofitability), by 2030, about 67% of the operational mines, can potentially close.

The closure of these mines will add to the challenge of already abandoned coal mines in the district. As per government estimates of 2022, there are 39 abandoned/discontinued mines of BCCL. As per the latest estimated of the Ministry of Coal, 10 BCCL mines in Dhanbad are closed and slated for repurposing within next three to five years. Overall, this trajectory underscores the urgent need for planning a just transition in the district to support alternative economic opportunities, including developing green industries and green energy, and safeguarding local livelihoods.

Closure of mines will impact other industrial and economic activities, with implications for the district's economic output.

While mining as a standalone sector contributes to only about 8% of Dhanbad's GVA, the district's industrial landscape is significantly coal-dependent, with the presence of coal-based power plant, coal washeries, coke oven plants, brick kilns, and other coal-dependent industries. Overall, the industry sector (including mining, manufacturing, along with electricity and gas) accounts for nearly 58% of the district's gross value added (GVA). The transition of coal mines will thus ripple across the wider industrial ecosystem, with potential impacts on the district's GVA and employment.

Table 1: Industrial GVA of Dhanbad

Parameters	Sectoral GVA (INR Lakhs)
Total district GVA	49,36,143
Mining and Quarrying	3,85,682
Manufacturing	24,26,944
Electricity/Gas	45,744
Total industry GVA	28,58,370
Share of total district GVA (%)	57.9

Source: iFOREST analysis based on data of Directorate of Economics and Statistics, Jharkhand, 2023

Nearly 1.4 lakh workers are directly engaged by the coal mining, coal-based industries, and coal transport sectors that will face challenges of job contraction.

Approximately 1.37 lakh workers are formally and informally dependent on coal mining, coal transport, washeries, brick units, coal-based thermal power plant, and coal-gathering and selling for an income. About 70% them are engaged in informal roles.

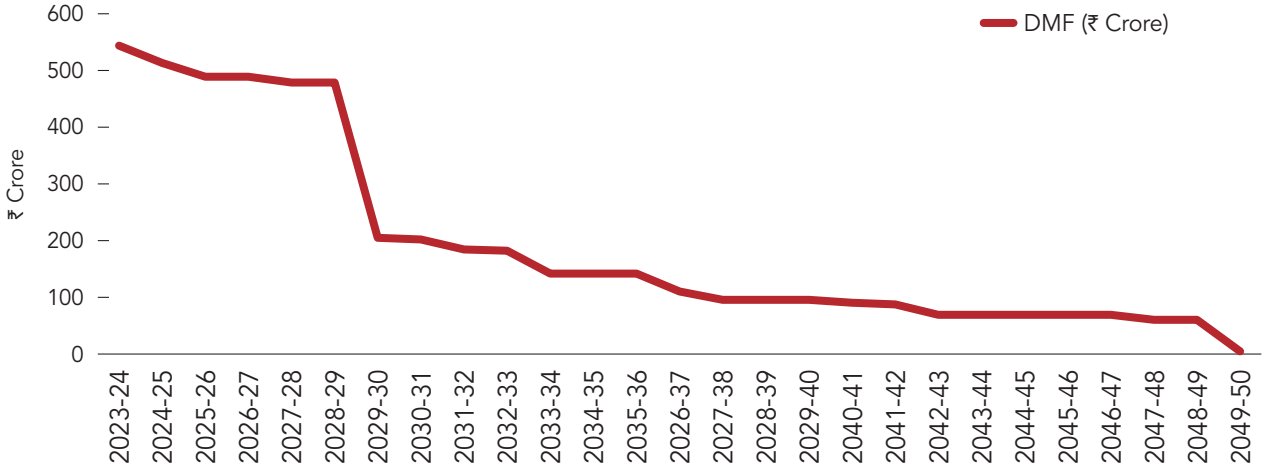
With almost half of Dhanbad's currently operational mines expected to face transition issues in the next five years, there will be significant impact on jobs and income, particularly among the informal workers and low-paid contractual workers associated with these operations and activities. In the absence of timely intervention measures for livelihood diversification, targeted skilling, and access to alternative employment, the workers face heightened risks of job insecurity and income loss, which will also result in social instability.

The decline in coal production will impact welfare investments, such as through DMF funds

Dhanbad is among the top districts in Jharkhand, and also in India, in terms District Mineral Foundation (DMF) fund accrual, given its coal mining activities. As of latest estimates of the Ministry of Mines, Government of India (2025), the district has a cumulative accrual of over ₹3,851 crore in DMF. The fund has been critical for supporting social infrastructure and welfare investments in the district, such as in sectors like drinking water supply, health care, education, etc.

However, as coal production declines, the scale of annual DMF accruals will also shrink, constraining the district's capacity to sustain welfare programmes and invest in future development priorities. This makes it imperative to plan for effective utilisation of the fund to strengthen sustainable livelihood and income opportunities, invest in education, support skilling measures especially for youth and informal and low-paid workers, so that the future of these communities are secured. The district also needs to develop an endowment fund for future security of the local community.

Figure 1: Potential decline in DMF funds



Source: iFOREST analysis

The next five years will be a critical window to shape Dhanbad's just transition pathway

The next five years will be pivotal for Dhanbad, as assessments suggest that a large number of coal mines in the district are facing/going to face transition challenges. This will have direct consequences for employment, revenue and welfare investments.

However, this transition timeline provides a clear opportunity to put in place measures that can minimise the potential economic shock and lay the foundation for new growth pathways. Strategic investments for economic and industrial diversification, skill development, and social protection systems will be essential. By acting proactively, Dhanbad can mitigate the economic and social risks of the transition while positioning itself as a hub for emerging industries in Jharkhand.

B. Planning a Just Transition for Dhanbad

A just transition plan of Dhanbad need to be anchored in green investments to diversify local economy and generate new employment opportunities.

A just transition for Dhanbad is primarily related to transition from a coal-dependent industrial economy, to building a green energy and industrial economy, alongside strengthening agriculture and allied sectors.

A key opportunity for the green energy and industry development is redeveloping the barren land, and repurposing mining land, after mines are closed and reclaimed. The immediate opportunity is planning for redevelopment of over 27,000 hectares (ha) of uncultivable barren land, and repurposing the closed and abandoned mining land. Also, repurposing can be planned for about 2,200 ha of mining land that can become available from mines that can potentially closed in the next five years (setting aside land for ecological restoration). Overall, about 10,000 ha of mining land can be planned for repurposing in the next 20-25 years.

This land can be used for developing renewable energy (RE) clusters, green industrial parks including MSMEs, value added agro and forest resource-based enterprises, etc. This will also promote climate resilient and environmentally responsible development, reduce land diversion and protect ecological habitats.

Workforce transition and workforce development through timeline interventions will be required to minimise income loss, and ensure employability in emerging sectors.

Workforce transition and workforce development is a central aspect of just transition. Given the large-scale employment dependence on coal mining and coal-dependent industries, a majority of whom are informal workers, coordinated action by the State Government departments and agencies, district administration, coal companies, and the private sector will be essential.

Three critical issues will influence the labour transition pathway. First, demand for skilled workers is increasing in RE, green manufacturing, agro-processing, and other future-oriented sectors, creating need for reskilling. Second, the share of contractual and informal workers are likely to rise as PSUs reduce new permanent recruitment. Third, the formal workforce is ageing, with many in the 50–58 age bracket, making planned retirement support and knowledge transfer important considerations.

To address these it will be important to augment and revamp skilling and reskilling measures, and improve employability of workers, including assurance of jobs and income. A starting point for Dhanbad will be to build on its base of industrial training institutes (ITIs) and leverage the knowledge and capacity of IIT-ISM, and other technical colleges. Coal companies can play a leading role by funding large-scale skilling and livelihood diversification programmes such as through CSR funds, while also integrating workforce transition into mine closure and repurposing plans. The private sector can complement this by creating apprenticeship models, partnering with ITIs for industry-oriented training, and generating employment opportunities in new green enterprises and supply chains.

These measures, combined with the redesign and revamp of government skilling programmes to align with the needs of the green energy and industrial sectors, circular economy practices, etc., will strengthen the employability of the workforce. At the same time, social protection measures and DMF-supported livelihood and skilling initiatives will be critical in safeguarding incomes and enabling a smooth transition for workers, especially informal workers, women and youth.

Improvement in social infrastructure and services, particularly in rural areas and for low-income groups

While Dhanbad has made significant improvement in human development indicators, survey results show that there is significant gaps in rural health service, education, and gender equity. A just transition provides an opportunity to bridge these deficits and ensure that social development keeps pace with economic development.

Priority interventions must include strengthening maternal and child health services through expanded rural health centres and mobile health units, reducing school dropouts, and by improving secondary education access and skilling linkages.

Equally important is the adoption of clean cooking energy which will have transformative impacts on women's health, household well-being, and gender equity. Survey results indicate that 72% of households rely on coal as their main cooking fuel. On average, households with four to seven members consume 40–50 kg of coal per month, while local eateries and small businesses also use coal extensively for food preparation. Women and children, who spend more time in poorly ventilated kitchens, are particularly exposed, resulting in heightened risks of respiratory illnesses, eye irritation, and other chronic health impacts. Expanding access to clean cooking energy—including LPG, piped natural gas, biogas, and electric/induction stoves—will reduce health burdens, lower household coal dependence, and curb local emissions.

Overall, aligning these welfare investments with the Sustainable Development Goals (SDGs) will ensure that just transition in Dhanbad strengthens not only economic diversification but also social inclusion and long-term resilience.

C. Redeveloping Damodar valley region as a green energy and industrial corridor

Developing the traditional Dhanbad–Bokaro–Ramgarh industrial belt as a green corridor through coordinated planning.

The just transition of Dhanbad is closely tied to the green industrial transformation of adjoining districts in the Damodar valley region—notably Bokaro and Ramgarh—whose economies and labour markets are deeply interconnected. Together, Dhanbad, Bokaro, and Ramgarh (DBR) form a contiguous industrial belt, historically anchored in coal mining, steel, power generation, and allied industries. This growth was supported by abundant coal reserves, water resources from the Damodar river, robust road and rail connectivity, and established energy infrastructure.

Today, the DBR region faces a dual challenge: the progressive exhaustion of coal reserves in many mines, and the urgent need to shift towards cleaner energy and industry to align with India's climate and net-zero goals. Coal mining and coal-based industries still account for a large share of district GVA and employment, with the DBR belt collectively contributing nearly one-fourth of Jharkhand's industrial economy. This makes the transition both a risk and an opportunity.

A coordinated regional strategy is essential, given the DBR region's geographical proximity, strong economic linkages, and shared transition challenges. The three districts together have over 80,700 ha of barren land that can be redeveloped. Besides, an estimated over 16,000 ha of land that will become available from mine closures and scientific reclamation in the next 20-25 years, out of which more than 6,900 ha can be available for repurposing planning within five years.

Planned reuse and repurposing of land for RE development and green industries (including MSMEs), can transform the DBR traditional energy and industrial belt into a green corridor—making the economy future ready, and contribute to the state's green growth.

Unlocking renewable energy potential and improving clean energy access.

The DBR region has an estimated solar potential of 13.5 GW—nearly three times Jharkhand's 2027 solar target under the State Solar Policy. This includes 8.7 GW of ground-mounted capacity, 1.7 GW from rooftop systems, and 3 GW of floating solar on mine voids and reservoirs.

Notably, several key coal mining blocks have high solar potential—such as Mandu in Ramgarh, Chas in Bokaro, and Nirsa, Jharia, and Baghmara in Dhanbad. Harnessing this opportunity to develop solar parks on closed mining lands, coupled with grid upgrades and decentralised renewable solutions, can both advance the state's RE ambition and improve clean energy access. This dual approach would not only accelerate Jharkhand's energy transition but also ensure that mining regions directly benefit from new investments and reliable, affordable power.

Leveraging existing resources and industry base, the DBR region can build a green industrial backbone through green hydrogen production, and by expanding green steel and green chemicals.

The DBR region already hosts a strong steel sector—identified as one of India's sunrise sectors due to rising domestic demand from construction and industrial expansion. Its growth has historically been supported by the availability of coking coal from the Jharia coalfields, iron ore supplies from West Singhbhum, and reliable water resources. By integrating green hydrogen for steelmaking, the region can position itself as a leader in green steel manufacturing, while also creating synergies for other low-carbon chemical industries. In doing so, the region can anchor the state's low-carbon industrial transition and attract significant investment in future-ready industries.

Abundant industrial water from dams and reservoirs—such as Tenughat, Maithon, Panchet, and Patratu—combined with the region's established steel and chemical clusters, further strengthens the conditions for green hydrogen production and a ready market for its use. This can enable low-carbon steel manufacturing, green fertiliser production, and clean fuel supply chains, reinforcing the DBR region's potential to emerge as a hub for green hydrogen and allied industries.

Strong connectivity and infrastructure can be leveraged for green industry development and attract investments.

The DBR region benefits from strong connectivity through national highways (NH-18, NH-19, NH-33), extensive railway corridors, and proximity to the Amritsar–Kolkata Industrial Corridor. Upcoming projects such as the Raipur–Ranchi–Dhanbad Expressway will further improve logistics, ease the movement of goods, reduce transport costs, and strengthen access to regional and national markets. This is a clear advantage for green industrial development.

Besides transport connectivity, the region has robust energy infrastructure. Dhanbad, Bokaro and Ramgarh districts has a well developed energy infrastructure due to the presence of power plants in the region and associated energy infrastructure. Together, this connectivity and infrastructure base positions DBR as an attractive hub for green industries and logistics-driven growth.

D. Policy agenda

Develop a comprehensive State Just Transition Policy to support just transition at district and regional levels.

Achieving a just transition in Dhanbad and positioning the DBR region as Jharkhand's green growth hub will require a clear, phased set of actions backed by comprehensive policies, strong institutions and targeted investment. A State Just Transition Policy will be essential to guide this process at both district and regional levels.

The policy should support economic diversification and restructuring in districts highly dependent on coal mining and fossil fuel-based industries. It should also promote the development of green energy and green industries, including facilitating the repurposing of land and infrastructure from closed and end-of-life coal mines and power plants for new green investments and employment generation. Equally important will be enabling workforce transition for both formal and informal workers in fossil fuel sectors through skilling, reskilling, and workforce development programmes.

The policy must also create platforms for inclusive decision-making that involve workers, communities, industry, and local governments in shaping transition pathways. Such an approach will help build consensus, ensure social acceptance, and make the transition process fair, participatory, and relevant to the local context.

Prepare an integrated green growth plan for DBR region.

The DBR region requires an integrated green growth plan to redevelop this traditional energy and industrial regions in a green energy and industrial corridor. With over 80,000 hectares of barren land, more than 16,000

hectares expected to be available from scientific closure and reclamation of mines, presence of good rail, road and energy infrastructure, vital resources such as water, and a decent solar potential, the region has the opportunity to emerge as Jharkhand's green growth hub.

The plan should integrate multiple development dimensions, aligning land use planning, RE development, industrial diversification, skills development, and infrastructure upgrades with Jharkhand's economic growth, industrial development, green energy transition, and climate strategies. It should identify priority sites for industrial clusters, including MSME clusters, and RE parks to catalyse private and public investments. Importantly, just transition objectives should be embedded into every stage of planning, ensuring that new projects generate local jobs, build local enterprise capacity, and deliver inclusive development outcomes.

Revise the State DMF Rules to support just transition measures.

The State Government need to revise the Jharkhand DMF Trust Rules to explicitly prioritise livelihood generation, skills development, and economic diversification in the mining districts, where DMF funds will face a decline in the coming years.

To effectively leverage DMF resources, the State Government should amend the Rules to ensure that district DMF perspective plans align and prioritise just transition investments in districts and blocks with closed or soon-to-be-closed mines. This should include targeted interventions for livelihood generation, worker skilling and reskilling, economic diversification, and social development.

Overall, participatory planning processes must be institutionalised to ensure that affected workers, communities, and local institutions are meaningfully engaged in decision-making.

Strengthen institutional mechanisms for implementing a well-planned and coordinated transition.

Strong institutions and comprehensive institutional mechanisms are critical to manage a just transition. Alongside state-level mechanisms, such as developing a dedicated Just Transition Office besides that Task Force set-up by the State Government, district-level mechanisms need to be established. In coal mining districts, such as Dhanbad, etc. a District Just Transition Cell should be developed to plan, monitor, and coordinate local transition initiatives. Overall, strong and dedicated institutional set-up will be required at the state and district level.

At the regional level, a Damodar Valley Transition Authority should be created to anchor cross-district coordination and investment promotion for the DBR Green Industry Corridor.The Authority should plan and implement multi-sector, cross-district projects, maintain a regional inventory of land and water resources for green uses, coordinate financing and investment promotion for RE and green industries, and drive regional economic diversification through targeted incentives and facilitation. This institutional framework would provide coherence across districts, enable efficient resource utilisation, and attract large-scale private and public investments in the green economy.

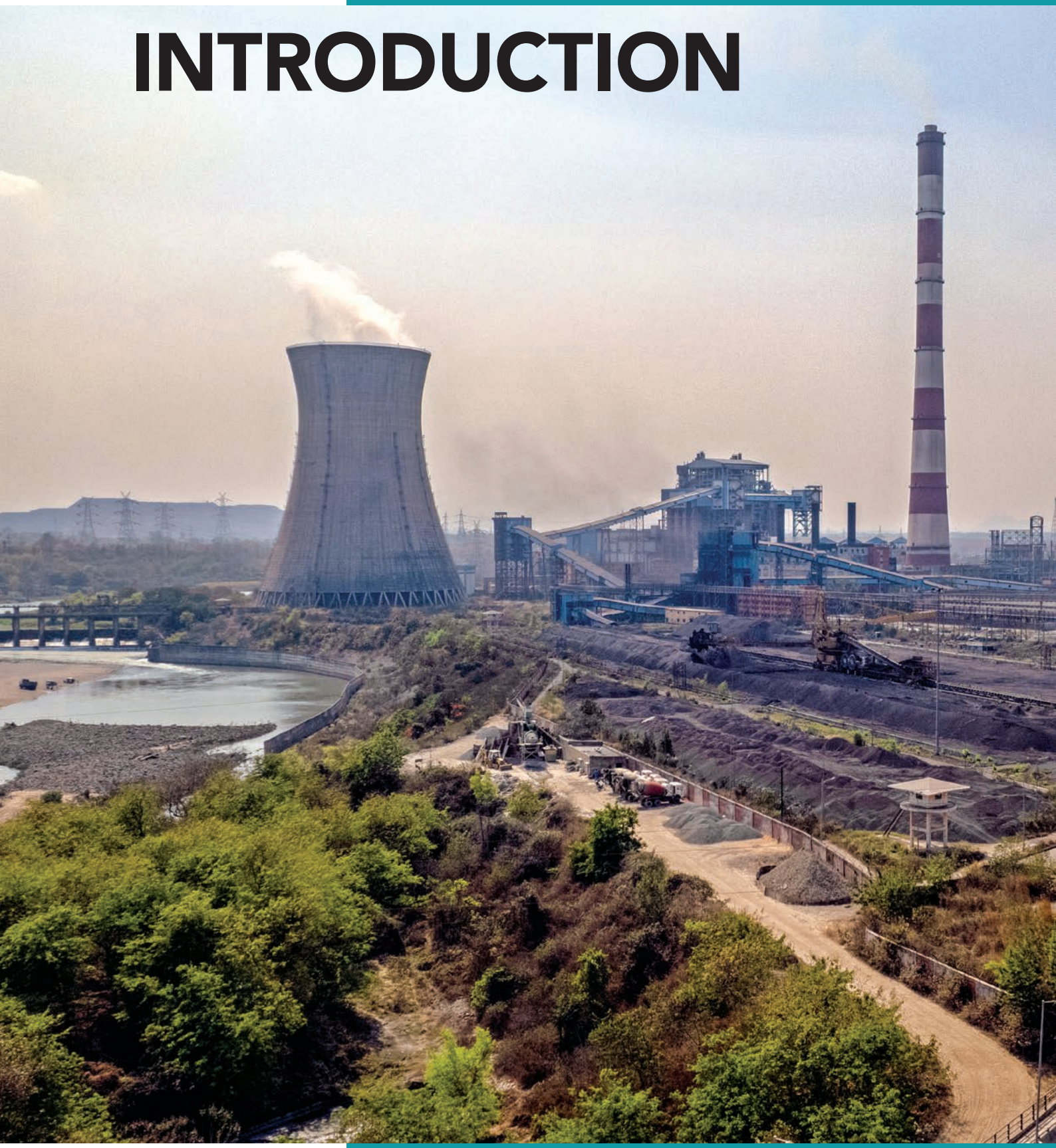
Enhance State Government and industry engagement for promoting green growth and jobs.

A proactive engagement between the State Government and industry will be vital to support a just transition of Dhanbad and position DBR as a hub for Jharkhand's green energy and green industry future. This requires addressing policy and infrastructure bottlenecks, joint investments in technology, research and development (R&D), and infrastructure development, and securing industry commitments for skilling and workforce development.

A clear framework for state–industry collaboration can accelerate the establishment of green energy infrastructure and industries, strengthen supply chains, and ensure that local workers and communities benefit from the transition through new employment and income opportunities.

CHAPTER 1

INTRODUCTION



- *Dhanbad has been India's coal hub for over a century, but the district faces a transition challenge due to a large number of old and unprofitable mines.*
- *Coal mining and coal-based industries, including MSMEs, has created direct, indirect and induced in the district.*
- *The study draws on a survey of 888 households and extensive stakeholder consultations to understand transition challenges, needs and aspirations.*
- *It outlines policy, financial, and institutional pathways to ensure a green and inclusive growth.*
- *The study also positions the Dhanbad–Bokaro–Ramgarh industrial belt as a potential green energy and industrial corridor for Jharkhand.*

1.1 Background

With a pressing need to limit global warming to 1.5°C[1], India has set ambitious targets for a green energy transition, and a net-zero emissions by 2070. A strategic phase-down of the fossil fuel sector and fossil fuel-based industrial activities, along with a phase-in of clean energy alternatives, will be crucial for achieving these targets and transitioning to a low-carbon economy. At the same time, ensuring this transition in a just and inclusive manner is an imperative, since any unplanned transition will have implications for local employment, government revenue, and welfare investments. In India, as in many other parts of the world, the coal mining sector and coal-based industries lie at the centre of this energy transition, alongside other fossil fuel industries.[2]

Dhanbad district of Jharkhand is a focal point in India's transition to a low-carbon economy given the district's long history of coal mining, which dates back to the 1890s. While it still remains one of India's top coal producers, but many mines in the district are going to close in the next five to 10 years due to resource exhaustion and unprofitability. This will have implications for thousands of workers who are directly or indirectly dependent on coal mining and related activities, the induced economy, and local revenue and welfare activities that are related to the sector.

Dhanbad also emerges as a microcosm for understanding the complexities, yet opportunities of India's energy transition. The central question, therefore, this study seeks to answer is what does Dhanbad need to do to transition to an inclusive and sustainable energy future, while protecting jobs and livelihoods and sustaining economic vitality of the district? Answering this question requires delving into the intricate interplay of socio-economic structures, community dependencies on coal mines, and capturing the needs and aspirations of people in the event of a transition.

This report presents a comprehensive assessment of just transition pathways for Dhanbad and outlines a strategic plan to guide the district towards building a low-carbon economy. It highlights the potential economic and social impacts of the transition, while laying emphasis on creating new economic and employment opportunities, fostering inclusive growth, and ensuring environmental sustainability. By considering both the structural strengths of the district and the emerging opportunities that can be harnessed, the report proposes a forward-looking just transition plan tailored to Dhanbad's unique context.

At the same time, the report also evaluates how the transition provides an opportunity to reposition districts like Dhanbad, Ramgarh, and Bokaro—the traditional energy and industrial corridor in Jharkhand's Damodar valley region—as a hub for green energy and industry. By leveraging land resources, industrial infrastructure, and strategic location, the region can be developed into a diversified and resilient green corridor that generates sustainable livelihoods, attracts new investments, and reinforces its role as an economic driver for Jharkhand.

Based on the observations, the report finally outlines policies and institutional mechanisms that need to be considered, along with some of the immediate financial resources that can be leveraged for implementing just transition measures and supporting green growth.

1.2 Study objective

The assessment of just transition in Dhanbad is significant, as it stands as one of India's oldest coal districts, where coal mining has shaped the local economic and social fabric. As India moves toward sustainable energy solutions and a low-carbon economy, it becomes vital to understand the implications of transition for traditional energy hubs, such as Dhanbad. However, the transition also creates an opportunity to design forward-looking strategies that can turn potential risks into pathways for inclusive growth. Drawing on the experiences of Dhanbad, this report aims to show how a traditional coal-dependent district can actively shape its future by planning for economic diversification, green investments, and new employment and income opportunities for the local people.

Besides proposing a just transition plan for Dhanbad, the study also provides insights on a regional approach to navigate the transition, referring to the districts adjoining Dhanbad in the Damodar valley region of the state. It shows how such regions can become green energy and industrial hubs by leveraging existing strengths and

opportunities, such as land assets, infrastructure, and strategic locations, to diversify their economies, attract new investments, and boost employment opportunities. In doing so, the study underscores the potential of the region to drive sustainable and inclusive growth.

1.3 Study approach

This study relies on both primary and secondary research to address essential issues for planning a just transition. The primary research methods include:

- A household survey undertaken in the district's coal mining areas (largely within a radius of 10 kilometers from the mines), based on a statistically designed survey approach.
- Focus Group Discussions (FGD) were conducted in the administrative block of the districts, such as Jharia (in Dhanbad block), Baghmara, and Nirsa, along with semi-structured interviews with key stakeholders to capture their viewpoints on the challenges of the transition and the needs and opportunities that should be considered for planning.
- The primary household survey was conducted among 888 households in the district. The sample size was determined by considering the estimated district population (as of 2024) and taking a 95% confidence level and 5% confidence interval, for a statistically significant representation. The households were chosen through a combined process of stratified random sampling to minimise the possibility of clustering and selection bias, and purposive sampling to increase the credibility and precision of survey results. Purposive sampling units/locations were chosen based on the field-level observations of researchers/surveyors, including attention to areas that have the presence of closed mines.

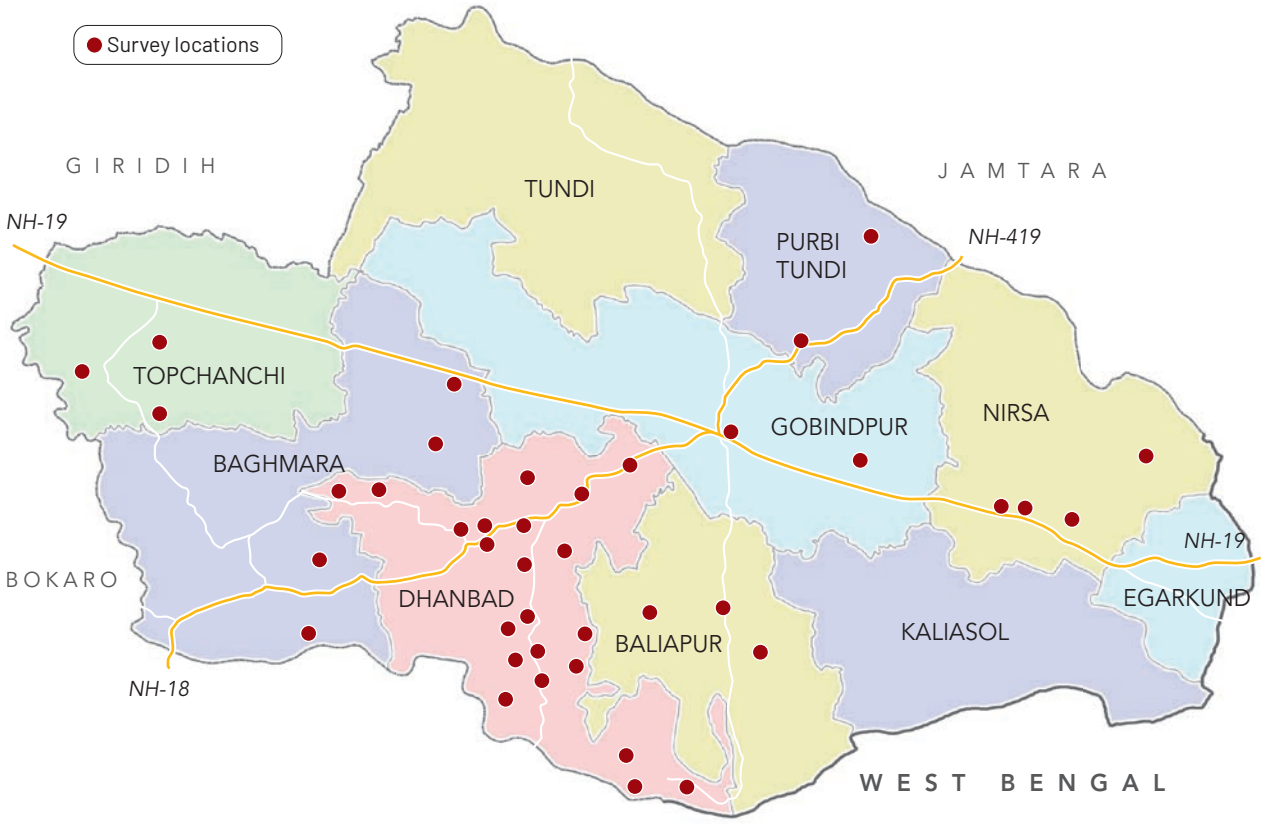
Besides, primary survey, the study relied on an extensive evaluation of secondary data, including government reports, industry data and scholarly resources.

The secondary data and information constitutes the basis for evaluation of the following:

- Coal mining and coal-dependent industry scenario;
- Socio-economic and environmental profile of the district, including the district's economic dependence on coal mining and coal-based industries;
- Scope and resources for economic diversification and industrial restructuring in Dhanbad;
- Prospective revenue sources to support transition measures; and,
- Policy measures that need to be considered to support a just transition.

A SWOC analysis (Strengths, Weaknesses, Opportunities, and Challenges) was also done for the Dhanbad and adjoining districts, such as Ramgarh and Bokaro. Based on analysis from primary survey, secondary data, and SWOC analysis, an indicative plan for just transition for Dhanbad and the region is proposed.

Map 1.1: Survey locations in the coal mine areas of Dhanbad



Source: iFOREST analysis

SAMPLE DISTRIBUTION

Sample locations and number of households from each location were determined based on three key parameters: the presence of coal mines/industries, economic landscape, and population concentration within specific wards/villages. Ground truthing of survey locations was performed post-statistical allocation.

The sample distribution was designed to capture the economic activities of the various blocks in the district. Representation was spread across the major mining blocks, with the share of samples adjusted to reflect both population distribution and the concentration of industrial and economic activity in these areas.

The survey also accounted for demographic profile (share of urban and rural population) for determining sampling locations and sampling numbers. In addition, special attention was given to caste and gender representation to ensure that the findings reflect the diverse social and economic realities of households across the district.

Figure 1.1: Urban-rural distribution of samples

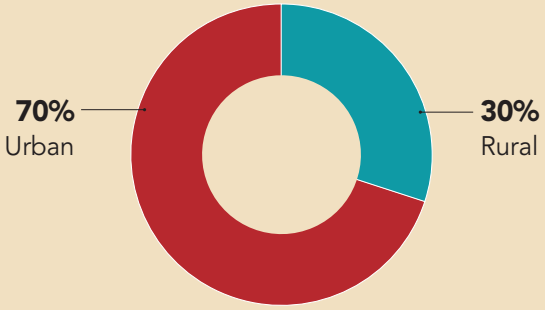
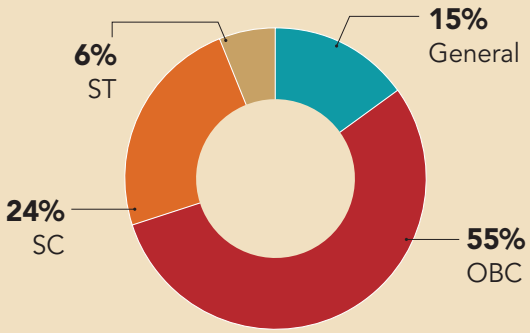
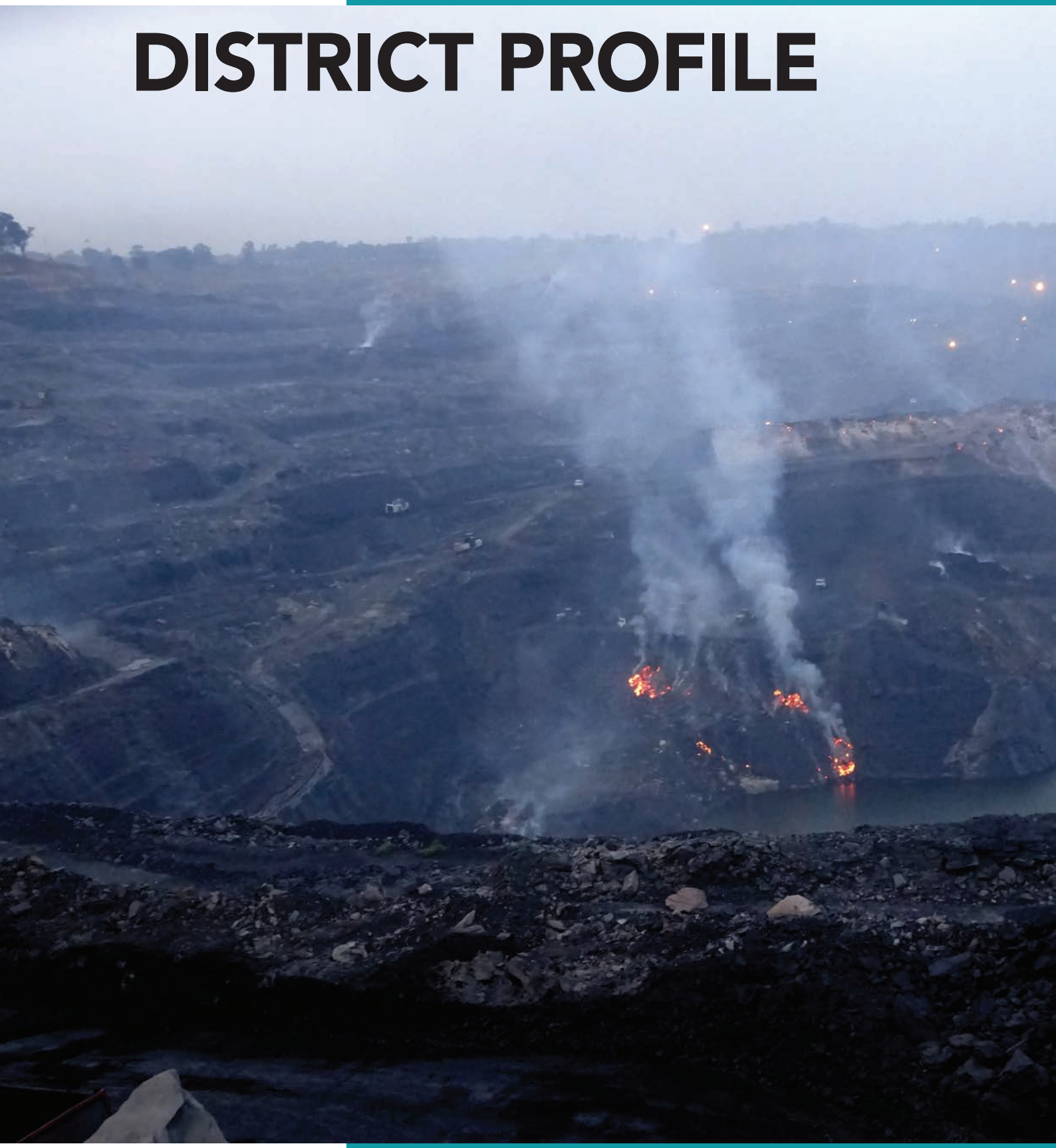


Figure 1.2: Caste-wise distribution of samples



CHAPTER 2

DISTRICT PROFILE



- *Dhanbad contributes to 15% of Jharkhand's GVA given the significant presence of industrial activities and businesses.*
- *Industial manufacturing and service sector collectively account for 80% of the district GVA.*
- *The mining and quarrying sector contributes to about 8% of the district GVA.*
- *Agriculture covers 53.6% of land but suffers from low irrigation and productivity.*
- *Severe environmental stress: high PM2.5, degraded land, low forest cover, and Damodar River pollution.*

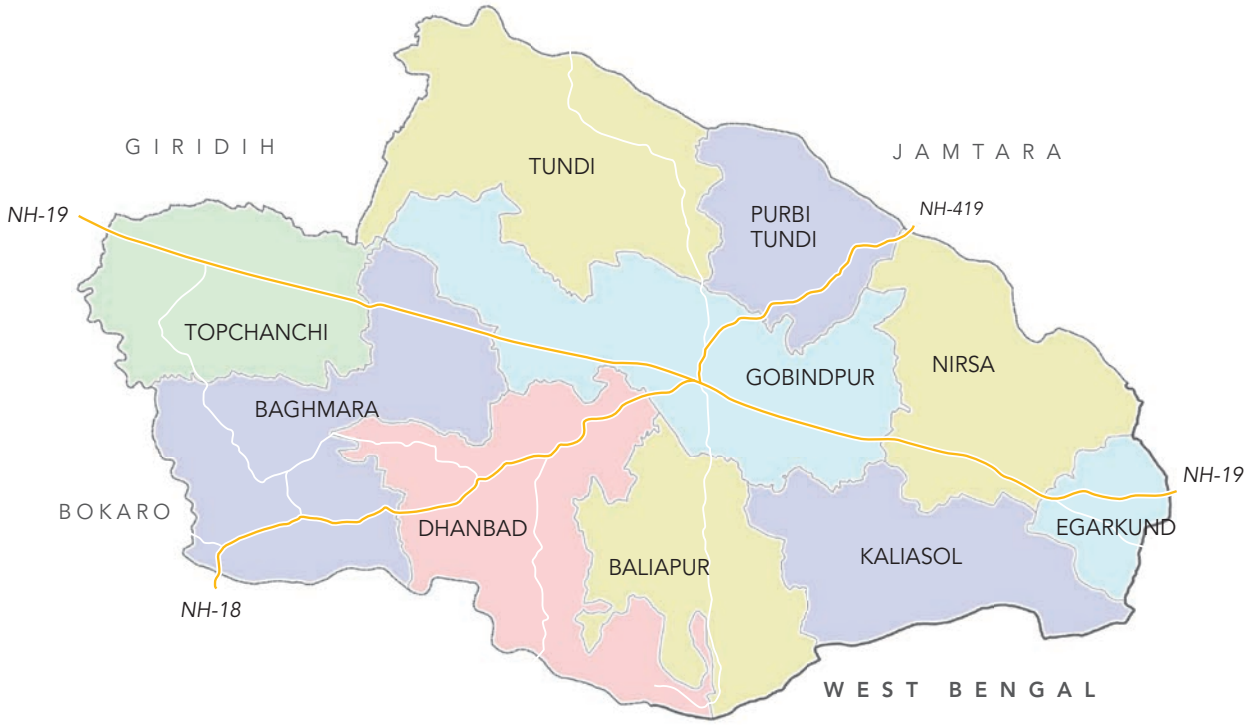
2.1 Administrative profile

Dhanbad continued to exist as a district in the state of Bihar when the state was reorganized in 1956. In 2000, when Jharkhand was carved out of Bihar, Dhanbad became one of its 18 original districts, along with Giridih and Bokaro.

Currently, Dhanbad is the second most populous district among the 24 districts in the state, after Ranchi. In 2024, Dhanbad's population was estimated at 31 lakh, with an increase of 11.9% from the last census of 2011, with an annual population growth rate of 1.2%. Its population density is 1,316 people per sq. km, which is three times more than the state average of 414[1].

The administrative headquarter of the Dhanbad district is located at Dhanbad town. There are presently, 10 blocks in the district. These include, Dhanbad, Baghmara, Nirsa, Gobindpur, Baliapur, Tundi, East Tundi, Topchanchi, Kaliasol and Egarkund.

Map 2.1: Administrative boundary of Dhanbad district



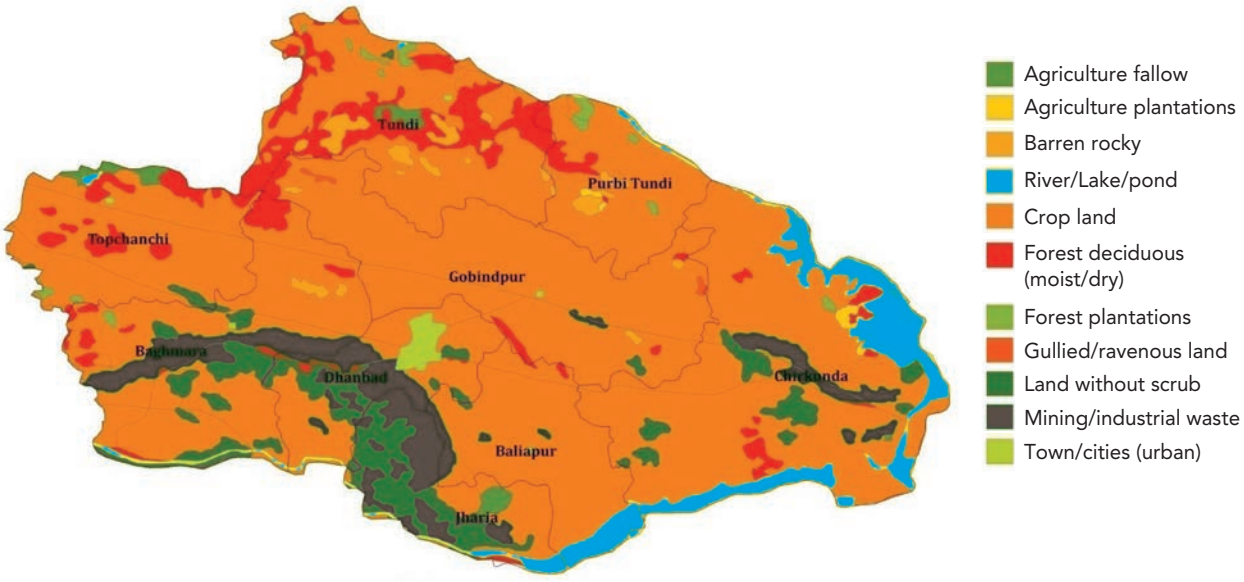
Source: Adopted from Dhanbad administrative division (2024)

2.2 Land use and land cover

Dhanbad has an area of 203,868 ha and is one of the smaller districts area-wise, ranking 19th out of 24 districts of Jharkhand. The largest chunk of the district's land is under agricultural sub-categories, which stands at 53.6%. A total of 30.1% of land is categorised under 'usar and non-agricultural land' and 'non-agricultural land'. Thus, a sizeable portion of the land in the district is non-agricultural land.[2]

Non-agricultural water area comprises 7.8% of Dhanbad, out of which 5.8% is permanent and the rest seasonal. A significant part of the land is also under forest area, which is about 16,950 ha.

Map 2.2: Land use map of Dhanbad district



Source: Adapted from CGWB report on district aquifer maps and ground water management plan, Jharkhand, 2022

Table 2.1: Block-wise land use and land cover

Block	Area (ha)	Forest area (ha)	Usar and Non-agricultural land (ha)	Non-Agricultural land(ha)			Agricultural barren land (ha)	Permanent pastures and other grazing land(ha)	Land under miscellaneous groves not included in net sown area (ha)	Other fallow land (till 2 to 5 years) (ha)	Current Fallow land (ha)	Net sown Area (ha)
				Land area	Water area							
					Permanent	Seasonal						
Dhanbad*	12,821	213	4,024	4,108	307	88	618	12.5	66.7	1,917	1,245	217.2
Jharia*	10,229	0	1,317	5,297	746	82	1,014	164	0	176	1,429	0
Baliapur	18,876	478	1,844	4,226	107	40	973	276	223	5,480	2,414	2,809
Gobindpur	31,010	941	3,187	3,046	2,331	2513	3,094	2,675	2,293	5,841	4,090	995
Tundi	26,734	8,536	2,513	962	278	307	1,561	973	107	4,882	3,921	2,688
Nirsa	41,575	671	6,027	6,560	5,937	646	1,696	484	6	8,540	9,739	1,264
Baghmara	29,029	1,403	6,667	4,805	1,064	0	3,405	83	140	9,017	1,621	819
Topchanchi	19,138	2,453	1,679	2,008	782	414	1,266	719	920	4,491	2,267	2,134
PurbiTundi	14,388	2,251	1,860	1,438	268	40	625	523	224	2,012	3,519	1,624
Total (Ha)	**203,868**	**16,950****	**29,123**	**32,452**	**11,824**	**4,133**	**14,257**	**5,913**	**3,982**	**42,362**	**30,248**	**12,554**
Total (%)	**100**	**8.3**	**14.3**	**15.9**	**5.8**	**2**	**7**	**2.9**	**1.95**	**20.8**	**14.8**	**6.2**

Source: Central Ground Water Board & District Statistics Office, Dhanbad. (2022, July). Aquifer Maps and Ground Water Management Plan of Dhanbad District, Jharkhand, including Land Utilization Pattern for FY 2017–18. Government of India & Government of Jharkhand.

(*) Dhanbad and Jharia, two separate blocks before, now exist as a single Dhanbad block. However, this table shows them separately, as shown in available state-generated data sources.

(**) The figures of this table on block-wise forest land is from the Central Ground Water Board (2017), as the latest Forest Survey of India (FSI) report does not give a block-wise break-up of forest land. However, as per 2023 estimates of FSI, the forest land in the state is about 21,000 ha.

2.3 Demography

The population of Dhanbad in 2024 is estimated at 31 lakh[3]. The district is predominantly urban, with around 58% of the population residing in urban areas and the rest in rural areas. Among the mining blocks, Dhanbad is most urbanized, with about 97% of the people living in municipal areas. The other key mining blocks, such as Nirsa and Baghmara, have predominantly rural population, which is nearly twice the urban share.[4]

With respect to caste distribution, Scheduled Castes (SC) constitute 16.3% of the population, with the highest concentration in Baghmara and Dhanbad blocks, while Scheduled Tribes (ST) make up 8.7% of the district. ST population is mainly concentrated in rural and hilly blocks like Purbi Tundi and Tundi.

Table 2.2: Block-wise demographic distribution for the district

Block	Population					SC/ST population (%)		Literacy rate (%)				
	Total Population 2021	% Rural	% Urban	% Male	% Female	% of SC	% of ST	Total literacy rate	Male literacy rate	Female literacy rate	Rural literacy rate	Urban literacy rate
Tundi	1,14,163	100	--	51.1	48.9	10.7	40.7	59.4	73.1	45.1	59.4	--
Purbi Tundi	56,219	100	--	51	49	10.8	44.6	61.2	75.9	45.8	61.2	--
Topchanchi	1,82,780	68.6	31.4	52	48	11.8	6.4	74.1	72.6	53.2	70.9	81
Baghmara	3,74,092	66.6	33.4	52.5	47.5	20.8	5.3	74.9	73.4	54.3	73.7	77.4
Govindpur	2,74,935	89.7	10.3	51.8	48.2	11.2	13.8	68.5	81	55.2	67.6	76.6
Dhanbad	13,66,697	2.7	97.2	52.9	47.1	17.5	2.1	79.4	86.3	71.7	75.9	79.5
Baliapur	1,57,676	86.2	13.8	52	48	13.9	13.3	70.3	81.7	58	69.6	74.6
Nirsa	4,77,380	61.4	38.6	51.9	48.1	16.8	14.6	70	69	50.3	65.7	76.3
Total	**30,03,941**	**41.9**	**58.1**	**52.4**	**47.6**	**16.3**	**8.7**	**74.5**	**83.8**	**64.3**	**68.2**	**79**

Source: Census of India, 2011; Note: Total block wise population has been calculated assuming that the proportion of each demographic factor in the districts population has remained as in 2011.

The literacy rate in the district is 74% which is much higher than that of Jharkhand's literacy rate of 66%, however the female literacy rate is lagging at 64%. Out of the 24 districts of Jharkhand, Dhanbad has the highest density at 1,316 persons/sq. km compared to the state's density at 414 persons/sq. km.[5]

2.4 Economic sectors

Dhanbad stands out as the top economic contributor to the Gross Value Added (GVA) of Jharkhand state. As per the latest comprehensive data, available for the 2021-22 financial year, the district accounts for 14.8% of the state's GVA, amounting to ₹49,361 crore. The secondary sector (primarily driven by industrial manufacturing) and the tertiary sector dominate the district's economy, accounting for over 88% of the GVA. In fact, the mining sector contributes to only about 8% of the GVA.

Besides, accounting for a significant share of the state's GVA, the district also tops in per capita income (PCI) with ₹154,000 , which is nearly double the state average of ₹84,000.[6]

Table 2.3: Sectoral contribution to the district GVA of Dhanbad

Primary Sector (%)	Secondary Sector (%)	Tertiary Sector (%)
11.7	58.5	29.8

Source: Jharkhand: A Statistical Profile, 2022, Directorate of Economics & Statistics. Govt. of Jharkhand.

Below is an overview of the key existing economic activities and major stakeholders across the primary, secondary, and tertiary sectors.

2.4.1 Primary sector

The primary sector contributes ₹5,799 crore, accounting for 11.7% of the district GVA. It mainly consists of coal mining and mining of other minerals, agriculture, forestry, pisciculture, and sericulture. The mining sector constitutes 66% of the primary sector GVA of the district[7].

Coal mining

Dhanbad has the largest concentration of coal mines in Jharkhand. Around 57% of the total coal mines of the state are in the district. The total coal production capacity in the state is 273.6 MMTPA, of which 25.4% of the capacity lies with mines in Dhanbad. In 2023-24, the actual production in the state stood at 191.2 MMT (65% of the capacity), of which 43 MMT (22.5%) is from Dhanbad district. (Chapters 3 and 4 provide an in-depth analysis of Dhanbad's coal economy and people's dependence on it for livelihoods)[8]. Given the wide-spread of mining-related activities, most blocks in the district, have been identified as mining-affected.

Table 2.4: Number of panchayats/municipalities affected (directly and indirectly) by coal mines in Dhanbad district

Blocks/Urban areas	Directly affected gram panchayats/municipality	Indirectly affected gram panchayats/municipality
Baghmara	44	-
Dhanbad (MC)	4	-
Dhanbad	15	-
Nirsa	18	26
Topchanchi	2	-
Chirkunda	6	-
Kaliasole	16	-
Tundi	-	16
Purvi Tundi	-	7
Total	**105**	**49**

Source: DMF Cell, District Administration, Dhanbad. (2023). Government of Jharkhand.

Other minerals

Extraction of minor minerals, such as sand from its riverbeds, and stone and brick sub-soil from its other geological sites, is also done in the district. There are over 500 ha of sand mining area spread over 19 Baalughats on its Barakar, Damodar, and Jamuna riverbeds. These sites are spread over administrative blocks such as Baghmara, Nirsa, Topchanchi, Purbi Tundi, and Tundi.

Stone mining supplies stone chips, the principal material for civil engineering works, and for the construction of walls, arches, abutments, and dams. It is also used for stone masonry, particularly in places where it is naturally available. Infrastructure projects of public importance, such as the construction of the National Highway, State Highway, Expressways, Pradhan Mantri Gram Sadak Yojna, and Pradhan Mantri Awas Yojna, are the major consumers of stone chips. Its demand is estimated to be increasing further to meet the other emerging infrastructural projects. Currently, there are 29 stone mining sites in the district, and another 66 have lapsed their lease.

Agriculture

In Dhanbad, agriculture faces considerable challenges due to the district's topography and soil composition. Approximately 30.1% of the total land area of the district is categorised as "non-agricultural land", and the predominance of poor, infertile laterite soils further hampers agricultural productivity.[9] Despite these limitations, agriculture remains a vital component of the district's economy, with a cropping intensity of 112%. Major crops cultivated in the region include paddy, maize, finger millet, mustard, chickpea, potato, onion, and a variety of fruits and vegetables. However, the productivity of these crops is hindered by limited access to irrigation and the growing impacts of climate change.[10]

The district's rivers and streams flow through hilly terrain, making them difficult to exploit for irrigation. As a result, agriculture in Dhanbad is largely dependent on rainwater. The region receives annual rainfall ranging from 1,200 to 1,400 mm, primarily during the monsoon months of June to September. However, rainfall distribution is erratic, with drought spells lasting four to six weeks. These periods of water stress significantly affect crop health and yields, leading to a predominance of monocropping in the region. Traditional farming practices persist, largely due to the absence of reliable and widespread irrigation facilities. Table 2.5 presents the major crops, which are dominated by the cultivation of rice, rapeseed, and mustard.

To address water scarcity, various irrigation schemes have been implemented, including reservoir projects, wells, and lift irrigation systems. However, these initiatives currently serve only a small portion of around 12% of the district's net sown area. 75% of the agricultural land is net sown area. However, only about 12% of the land is irrigated. Consequently, most farmers continue to rely heavily on rain-fed agriculture, facing persistent uncertainties due to erratic rainfall patterns.[11]

Table 2.5: Area, production, and yield of major crops in Dhanbad, 2022-2023

Crops	Area (Ha)	% Area	Production (in Tonnes)	Yield (Ton. /Ha.)
Rice (Rabi)	7,130	28	18,895	2.7
Rapeseed &Mustard	7,044	28	6,340	0.9
Rice (Kharif)	2,461	10	3,815	1.6
Gram	2,715	11	3,881	2.4
Wheat	2,132	9	4,477	2.1
Maize	1,183	5	2,119	1.8
Peas & beans	949	4	854	0.9
Tur	486	2	583	1.2
Urad	354	1	248	0.7
Other Rabi pulses	429	2	257	0.6
Other Kharif pulses	159	1	111	0.7

Source: Area, Production and Yield Report of Dhanbad (2022-2023), Directorate of Economics and Statistics, Ministry of Agriculture and Farmers Welfare, Govt. of India. Accessed in April 2025.

Forestry

Dhanbad district has about 8% of the land area under forest. Overall, the district's forest cover primarily consists of moderately dense and open forests. These forests are largely concentrated in the northern part of the district, along the borders shared with Hazaribag and Santhal Pargana districts. The area hosts a diverse range of flora, including species such as *Sal, Sisoo, Siris, Palas, Mahua, Jamun*, and *Simal*. Bamboo groves are also commonly found throughout these forested regions.[12]

Table 2.6: Categories of forests in Dhanbad

Forest types	Share (%)
Very Dense Forest (sq. km)	0
Mod. Dense Forest (sq. km)	2.1
Open Forest (sq. km)	8.7
Total forest (sq. km)	10.8*

Source: India State of Forest Report (ISFR), 2023
*The total forest area shown in Table 2.6 differs from that in Table 2.1 because block-wise land use and land cover data were available only for the year 2017–18, whereas the forest status in Dhanbad used in Table 2.1 is based on the latest available data from 2022.

The Tundi block stands out as having the highest forest cover among all blocks in Dhanbad district. It is also home to approximately 45% of the district's Scheduled Tribe (ST) population and constitutes 77% of the total Santhal tribe population in the district[13]. Despite being surrounded by water bodies and reservoirs, the forested areas in Tundi face agricultural challenges due to patches of alluvial soil with poor irrigation facilities, rendering the land largely infertile. As a result, the local economy in these regions primarily depends on forest produce for livelihoods.

Pisciculture and sericulture

The predominance of coal mining and mining-based industries in Dhanbad has significantly reduced the viability of agriculture in areas surrounding the coal mines. As a result, the local population has increasingly turned to alternative livelihoods such as pisciculture and sericulture. The presence of dams in the region, such as Maithan, Panchet, and Topchanchi, has further supported the growth of pisciculture, making it a prominent source of income in the district. Dhanbad is particularly noted for its contribution to fish seed farming, with the Tundi Fish Farm serving approximately 270 seed growers between 2016 and 2017. These activities not only help meet local demand for fish and silk but also create self-employment opportunities, contributing to livelihood diversification in the region.[14]

Table 2.7: Distribution of pisciculture in Dhanbad

Water bodies	Area (ha)
Govt. tanks	2,975
Private tanks	7,779
Dova	104
Dams	35,190
Total	**46,048**

Source: Fisheries Department portal, Directorate of Fisheries, Department of Agriculture, Animal Husbandry & Co-operatives, Government of Jharkhand.

The Government of India (GoI) launched the Pradhan Mantri Matsya Sampada Yojana (PMMSY)[15] to address critical gaps in fish production and enhance the welfare of those involved in the fisheries sector. The scheme aims to achieve an additional 70 lakh tonnes of fish production nationwide over five years, from 2020 to 2025. In alignment with this initiative, the Directorate of Fisheries, under the Agriculture, Animal Husbandry & Cooperative Department of Jharkhand has implemented several developmental schemes with a total outlay of ₹182.5 crore under the state plan. These initiatives include the reclamation and development of tanks

and reservoir fisheries, fisheries extension services, research and training programs, and grant-in-aid to the Jharkhand State Co-operative Fisheries Federation Ltd. (JHASCOFISH). Additional efforts encompass fish marketing, feed-based fisheries, establishment of fish seed hatcheries, integrated fish farming, and schemes under the *Rashtriya Krishi Vikas Yojana* (RKVY)[16] and *Pradhan Mantri Swasthya Suraksha Yojana* (PMSSY)[17], including the Group Accident Insurance Scheme.

Sericulture has also emerged as another significant livelihood option in several forested regions of the district. A notable product of this sector is Kosa silk, also known as Tussar silk, which holds considerable economic and cultural value. In 2021, Bharat Coking Coal Limited (BCCL) launched an innovative project under its Corporate Social Responsibility (CSR) initiative to promote sericulture. The project involved the plantation of Arjun and Assan trees over underground mine areas in Dhanbad, with the long-term goal of supporting silk cultivation once the trees mature. Initially, the project considered overburden dumps for plantation, but the plan was later refined to develop a dedicated 20-hectare plantation in the Putki-Balihari locality of the Dhanbad block. Implemented in collaboration with the Forest Department, this initiative is envisioned as a sustainable livelihood opportunity for the local community.[18]

2.4.2 Secondary sector

With a significant contribution of 58.5% to the district's GVA the secondary sector comprises industry and manufacturing, electricity and other utility supplies, and construction sectors.[19] Anchored primarily by coal-based industries and manufacturing units, the industry sector alone contributes 49% to the district's GVA. As this affirms Dhanbad's strong industrial base, this dominance stems from its extensive coal reserves, with major public sector undertakings like Bharat Coking Coal Limited (BCCL) and several coal washeries operating in the district. Other key players in this sector include Eastern Coalfields Limited (ECL), Damodar Valley Corporation (DVC), Tata Iron and Steel Company Ltd. (TISCO), and Indian Iron and Steel Company (IISCO).

The high share of workers in the secondary sector, 30.9%, among the total main workers, portrays the region's dependence on manufacturing.[20] However, this industrial reliance brings challenges such as pollution, land degradation, and occupational hazards. This necessitates diversification into clean industries and green technologies. Dhanbad's future industrial growth hinges on transitioning towards sustainable mining practices, renewable-linked industrial units, and improved labour conditions to balance economic output with environmental and social well-being.

Steel

No steel plants exist in Dhanbad district, but there are 58 steel-dependent or related industries and manufacturing units[21]. It has a good number of coke-making units, an important raw material for steel plants or metal casting units. The primary domestic market for coke includes large steel manufacturing industries within a 200 km area, like Bokaro Steel city, TISCO in Digwadih, Tata Motors Ltd. at Jamshedpur, IISCO in Jamadoba, Steel Authority of India Limited (SAIL) in Durgapur, Alloy steel plant in Durgapur, etc. A small quantity of coke is also exported to neighbouring countries.

The Government of India promulgated the Coking Coal Mines (Emergency Provisions) Ordinance in 1971, under which the management of all coking coal mines was taken over by the Government, except the captive mines of TISCO and IISCO. BCCL was thus formed as a subsidiary company of SAIL that now manages the taken-over mines. In 2023-24, BCCL produced around 40 MMT of coking coal, with varying quality and grades[22].

Cement

The ACC cement plant located in Sindri is the only cement plant in the district, with a production capacity of 4.5 MMTPA, though in 2021-22 it produced about 0.53 MMT. There are 25 other small-scale cement-related industrial units across the district[23].

Power plant

There is one Thermal Power Plant (TPP) in the district. Maithon TPP, at Nirsa block, is a joint venture of Tata Power & Damodar Valley Corporation (DVC). It runs on subcritical technology and has two units of 525 MW power generation capacity, which generated 879 MW in 2024-25 and supplies power to Jharkhand, New Delhi, and West Bengal[24].

Fertiliser

The Sindri fertilizer unit of Hindustan Urvarak & Rasayan Limited (HURL) is the only fertiliser unit in the district and the first in the country. Originally started in 1944, it now produces 11.4 lakh tonnes of Urea and 6.6 lakh tonnes of Ammonia in a year. Apart from this, there are 16 chemicals and fertilizer-related units in the district, including those dealing with the storage of hazardous chemicals and explosives[25].

Micro, Small, and Medium Enterprises (MSMEs)

Some other micro, medium and small-scale industries also exist in the district, which are listed below.

Table 2.8: List of industrial/manufacturing units in Dhanbad

Industry type/sector	No. of units
Automobile servicing	46
Coal crusher & washeries	37
Coal coking units	409
Steel / metal processing units	58
Chemicals and fertilizers units, including storage of hazardous chemicals & explosives	16
Stone mining, and ore beneficiation	45
Stone crusher	223
Ceramics/ refractories	58
Bricks manufacturing	128
Fly-ash brick manufacturing	12
Engineering & Fabrication	10
Agro-based & food processing + poultry units	64
Distillery / brewery	5
Oxygen, biomedical and industrial gas	12
Mineral processing units	22
Battery & Electricals/Electronics manufacturing/repairing	3
Manufacturing of plastic products	30
Oil and gas- extraction, storage and transfer	11
Recycling (including biomedical, E-waste and hazardous waste)	27
Sand mining	5
Rubber/tyre based manufacturing units	8
Wood-based manufacturing units	21

Source: As per the registrations of industries with the Central Pollution Control board and are identified for being active in the region from 2014 – 2024 (last accessed in April 2025).

2.4.3 Tertiary sector

The tertiary sector in Dhanbad district, while not as dominant as the secondary sector, plays a crucial supportive role in sustaining the district's industrial and urban economy. Contributing around 30% to Dhanbad's district GVA, the tertiary sector is well developed compared to the other districts and stands at 3rd rank in sectoral contribution to the state GDP. Dhanbad's urban population share (58%) underpins the demand for a diverse range of services—from retail and logistics to hospitality and finance.[26] And thus, this sector in the district includes transportation, warehousing, trade, banking, education, and health services, largely catering to the needs of the mining and industrial workforce.

The tertiary sector employs 17.2% of total main workers, a proportion that is expected to grow with increasing urbanization and digital penetration.[27] However, the service sector faces constraints such as inadequate urban infrastructure, high pollution levels, and informal employment, which limit its productivity and inclusiveness. Strategic investments in urban infrastructure, digital services, skill development, and formalization of informal enterprises will be key to enhancing the quality and scope of tertiary sector activities in Dhanbad, thereby enabling it to act as a resilient pillar alongside the industrial economy.

2.5 Labour market

Workers constitute 31.5% of Dhanbad's total population, out of which 65% are main workers, and the remaining 35% are marginal workers. Women make up only 22% of the total workforce, with a majority being marginal workers. Table 2.9 shows the employment composition of the district.[28]

Table 2.9: Worker and non-worker composition in Dhanbad district

Category	Total	Male	Female
Total workers (as % of total population)	31.5	78	22
Main workers (%)	65	87.2	12.8
Marginal workers (%)	35	61	39
Non-workers all age-groups (%)	68.5	40.6	59.4
Non-workers in working age group of 15-59 yrs. (%)	52.6	29.3	70.7

Source: Census of India, 2011

There are notable differences in employment characteristics across administrative blocks and municipalities in the district. Purbi Tundi block stands out with the highest percentage of the workers population of the district and Dhanbad block with the least. However, Dhanbad exhibits a higher proportion of main workers compared to other blocks, implying a greater prevalence of stable employment opportunities in the block.

Table 2.10: Block-wise worker composition of Dhanbad district

Block	Total working population (%)	Main workers (%)	Marginal workers (%)	Total non-working population (%)
Dhanbad	27	82	18	73
Baghmara	28	63	37	72
Baliapur	34	51	49	66
Gobindpur	40	49	51	60
Nirsa	34	60	40	66
Topchanchi	34	50	50	66
Tundi	42	39	61	58
Purbi Tundi	50	30	70	50

Source: Census of India, 2011.
*Egarkund and Kaliasole are newly created blocks. Hence, separate data for these blocks was not available; however, they are subsumed in Nirsa block.

2.6 Environmental condition

Dhanbad is critically polluted with its current concentration of PM2.5 at 9.6 times above the WHO's recommended limit for 24 hrs air quality[30]. PM2.5 is considered the most harmful because of its small size as it evades the natural defense mechanism of human bodies, and thus can cause serious health issues, including respiratory problems, cardiovascular diseases, and even premature death. The major sources of PM pollutants in the region include coal-based power plants and industries, cooking smoke, and dust. Further, as per the Dhanbad Action Plan submitted to the Jharkhand State Pollution Control Board (JSPCB), the ambient air at the premises of the Thermal Power Plant (TPP) remains dusty due to uncovered trucks on kutcha roads and uncovered processing of ash. The report also noted the discharge of wastewater affecting the biodiversity of water bodies. Furthermore, JSPCB measured a pH between 7.4 to 8.4, referencing the alkalinity of the water bodies[31].

Concerning the vulnerability to the climate crisis, Dhanbad positions 195th, with a moderate Vulnerability Index (VI) of 0.599. However, the VI for Jharkhand state is the highest in India due to a lack of crop insurance, rain-fed agriculture, low forest area per 100 rural population, and a lack of health infrastructure. In Dhanbad,

this vulnerability is multi-faceted due to the low socio-economic status of the most vulnerable sections of the population, including the poor, women, and children.[32]

Degradation or desertification of land is also prevalent in Dhanbad, as 15% of its total land area is degraded, which amounts to 32,000 Ha. An analysis by the Desertification and Land Degradation Atlas of India, 2021, reveals that 68.8% of Jharkhand's total geographical area is undergoing Desertification/Land Degradation (DLD) (during 2018-19). This was observed as 68.98% and 67.97% for the 2011-13 and 2003-05, respectively. While there is a slight decrease of 0.2% between 2013 and 2019, it is important to note that there was an increase of 1.01% between 2003 and 2013. Water erosion followed by vegetation degradation constitute the two most significant forms of DLD in the state; apart from this, forest land/scrub land is also undergoing vegetation degradation.[33]

There are several studies that suggest that open-cast mining and associated activities cause serious problems of land degradation, dust generation, and deterioration in the environmental quality of the region[34]. Apart from this, underground mining causes land subsidence, and the disposal and management of overburden materials and fly ash are a serious challenge. Mine fire is another serious environmental issue associated with coal mining in the region, and the Jharia mine fire is one of the largest coal mine fires in the world[35]. More than seventy coalmine fires, covering 17.3 sq. km, were reported from the mining areas of Jharia coalfields, which were significantly reduced through mitigation measures[36]. Mine fire gives rise to continuous and uncontrolled emission of greenhouse gases such as CO_2, NO_x, SO_2, CO, CH_4, C_2H_6, and C_3H_6 due to surface and subsurface burning of coal throughout the coalfield areas.[37]

Being part of the catchment area of the Damodar River and Dhanbad being a key industrial hub in its basin, the degradation and water stress observed in the river are also important environmental concerns. The water stress that the river and its basins face could be summarized under the three aspects mentioned below.

a) Pollution-induced water stress (quality stress):

- Industrial Discharges: Over 1,300 lakh liters/day of industrial effluents and 650 lakh liters/day of untreated domestic sewage are discharged into the Damodar River.[38]
- Heavy Metal Contamination: Water contains unsafe levels of lead (up to 0.092 mg/l), mercury, cadmium, and iron, exceeding WHO and BIS guidelines. This makes much of the river water unsuitable for human consumption, agriculture, or aquatic life.
- BOD (Biochemical Oxygen Demand): This often exceeds 6–8 mg/l in urban-industrial stretches, indicating severe organic pollution.[39]

b) Over-extraction and reduced flows (quantity stress):

- Damodar River has seasonal flow variations, with high discharge during monsoon and drastically reduced flow in dry seasons, limiting year-round water availability.[40]
- Overuse by industries (especially steel plants, coal washeries, thermal power plants) reduces water availability for domestic and agricultural uses.

c) Catchment degradation[41]: The upper catchment of the river (fully situated in Jharkhand) is heavily mined (Jharia, Bokaro, Ramgarh coal belts), leading to loss of vegetation and surface water retention capacity; increased siltation in the river and reservoirs; and disrupted groundwater recharge.

CHAPTER 3

THE COAL ECONOMY

- *Jharkhand holds 23% of India's 389 billion tonnes coal reserves; Dhanbad central to coking coal for steel.*
- *Dhanbad has 48 operational mines producing 43 MMT of coal.*
- *Only 16 mines operational mines are profitable; many continue despite economic challenges.*
- *BCCL has 10 non-operational mines, however, there are about 34 abandoned/ discontinued mines.*
- *The concentration of old mines and economic viability of a large number of mines, d highlights the urgency of creating alternative employment pathways.*

3.1 Overview

Dhanbad is almost synonymous with India's coal mining history. Popularly referred to as the country's 'coal capital,' coal mining in the district dates back to the British colonial era. The presence of coal in the region was first documented in the 18th century, starting to play a crucial role in shaping the industrial landscape of eastern India. The systematic mining in the area began in the late 19th century, following the expansion of the railway network and industries, which created a demand for coal as a fuel. Coal mining in the region was initially dominated by private British and Indian enterprises. After India's independence, concerns over unsafe practices and poor labour conditions led to the nationalization of coal mines in the early 1970s, resulting in the formation of Coal India Limited (CIL) and its subsidiary Bharat Coking Coal Limited (BCCL). While the region has remained a major coal-producing hub, it has also faced persistent challenges such as underground fires, land subsidence, environmental degradation, and displacement.

The district's economy has been shaped over decades by the centrality of coal, which became the backbone of Dhanbad's industrial and commercial growth. In various ways coal mining activities drove the development of transport infrastructure, urban settlements, and industrial clusters, anchoring the district as a critical energy and manufacturing hub in eastern India. The expansion of railways and highways facilitated not only coal transport but also the movement of labour and goods, integrating Dhanbad into national and regional markets. Over time, coal mining underpinned the growth of power plants like Maithon and supported cement, steel, and allied industries, forging an industrial ecosystem that positioned Dhanbad as a vital node in Jharkhand's energy and industrial landscape.

3.2 Coal mining

As of 2024 estimates of the Ministry of Coal, India's coal reserves stand at about 389 billion tonnes. Jharkhand state accounts for about 23% of the total coal reserves of the country (87,838 MMT). The state's coal reserves are particularly significant for coking coal, which forms the backbone of India's steel-making industry.[1]

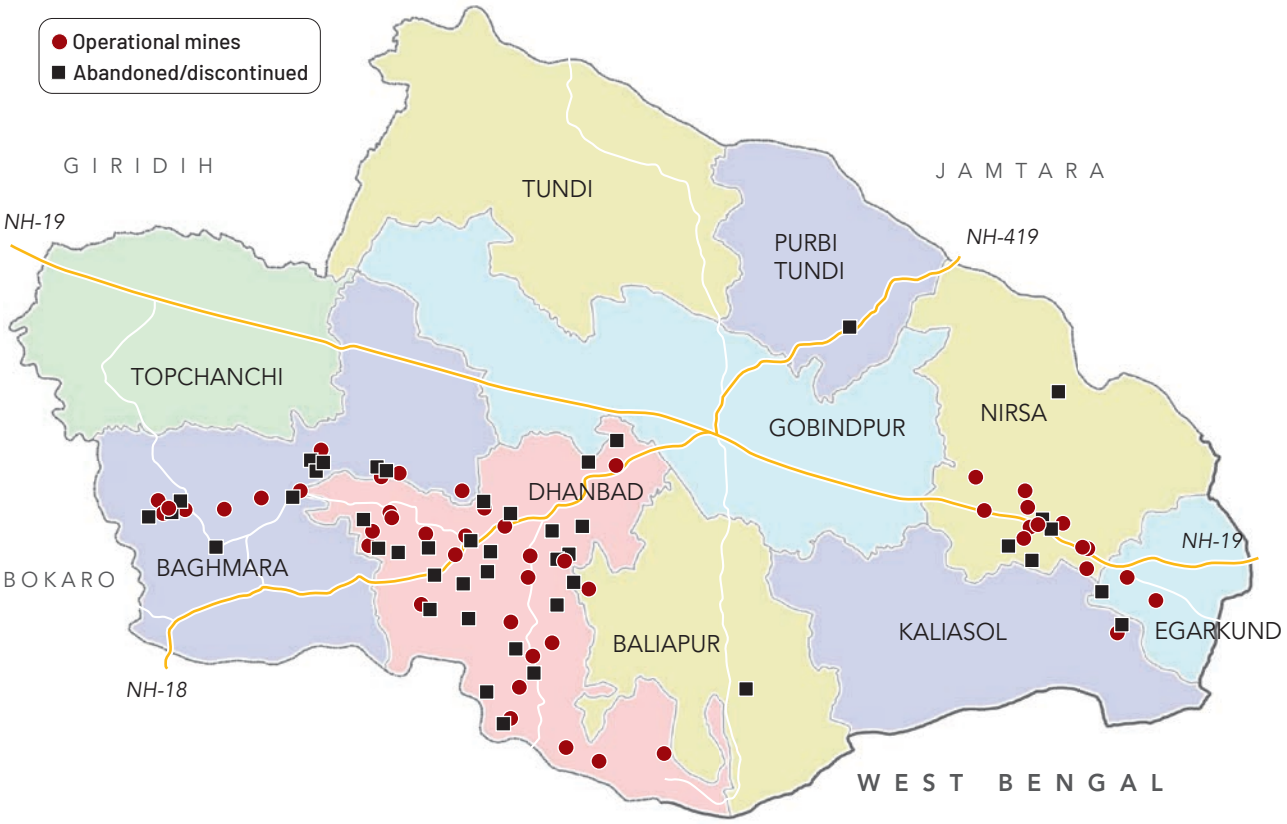
Within Jharkhand, the Dhanbad district—home to the Jharia and a small portion of the Raniganj coalfields—holds a total of 21,572 MMT of coal, making up 24.6% of Jharkhand's coal reserves. The Jharia coalfield and a portion of the Raniganj coalfields in the district alone contribute 19,273 MMT of proved reserves in the state, accounting for 34.7% of Jharkhand's total proved reserves. Coal reserve in the district underscores its critical role in India's coal economy, particularly for coking coal (as noted above), as Dhanbad meets 50% of the country's total demand for coking coal.[2]

Table 3.1: Coal resources in Dhanbad

Coal reserves	Proved (MMT)	Indicated (MMT)	Inferred (MMT)	Total (MMT)
Jharkhand	55,749	26,994	5,095	**87,838**
Dhanbad (Jharia coalfields)	17,735	1,798	-	**19,533**
Dhanbad (Raniganj)*	1,594	445	-	**2,039**
% of Dhanbad to Jharkhand's coal reserve	34.7	8.3	-	**24.6**

Source: Ministry of Mines, Govt. of India. (2024). Indian Mineral Yearbook 2022; Ministry of Coal, Govt. of India. (2024). Annual Report 2023-24.
* A small part of Raniganj coalfields, which largely belong to the West Bengal state, falls in the Nirsa block of the Dhanbad district.

Map 3.1: Location of coal mines



3.2.1 Operational mines

There are currently 48 operational mines in Dhanbad. The total coal production capacity of these mines is about 69.5 MMT, which is about 25.4% of the state's capacity. While the actual production in the state in 2023-24 stood at 191.2 MMT (65% of the state's production capacity), 43 MMT was contributed by the operational mines in Dhanbad. In 2023-24 the district produced at 62% of its capacity, which is considered as one of the highest-ever production efficiency in the district.[3] However, the district's long-term coal mining future still remains challenging given the challenges of economic viability of operations of many of the mines, and also resources.

Out of 48 operational mines in Dhanbad, BCCL operates 31 mines with a cumulative production capacity for producing 56.8 MMTPA (81.7% of the production capacity in the district). ECL operates 11 mines (23%) with a cumulative production capacity of 3.7 MMTPA (5.4%) and contributed 1.5 MMT (3.5%) to the actual production in 2023-24. Three mines are operated by SAIL with a production capacity of 8 MMTPA (11.5%), and the remaining three mines are operated by Tata Steel, with a production capacity of 1 MTPA.

Table 3.2: Block-wise distribution of operational mines and their production details

Block	No. of operational mines			Production capacity (MMTPA)			Production in 2023-24 (MMT)		
	OC+ mixed	UG	Total	OC+ mixed	UG	Total	OC+ mixed	UG	Total
Dhanbad	19	5	24	30.0	10.0	40.0	21.6	1.6	23.2
Nirsa	7	3	10	17.0	0.8	17.8	11.7	0.5	12.2
Baghmara	11	3	14	11.5	0.3	11.7	7.5	0.2	7.6
Total	**37**	**11**	**48**	**58.5**	**11.0**	**69.5**	**40.8**	**2.3**	**43.0**

Source: Rajya Sabha Unstarred Question (No. 2269, answered on 16 December 2024), Ministry of Coal, Government of India.

A block-wise distribution of the operational mines shows that Dhanbad block has the largest share of mines, hosting 24 operational mines (19 OC + mixed and five UG). It is followed by the adjacent Baghmara block, both in terms of production capacity and actual production. Nirsa block, despite having 14 mines, had the lowest output of 7.6 MMT (17.8%) in the district in 2023-24.

3.2.2 Economic status of operational mines

Out of the 48 operational mines, only 16 are profitable (33%), with almost all the the UG mines being unprofitable. Of the 16 profitable mines, 11 belong to BCCL, which has 31 operational mines in the district. Five profitable mines belong to ECL, which has 11 operational mines in the district. That is, only 35% of mines under BCCL and 45% under ECL make a profit.

To improve the economic viability of UG and certain OC mines in the district, a cluster mining approach has been adopted in recent years. This model allows for consolidated planning, shared infrastructure, and optimised resource utilisation across multiple mines, thereby reducing operational costs and improving productivity. In addition, a significant strategy to boost UG production has been the re-opening of abandoned or discontinued mines through the Mine Developer and Operator (MDO) route, operating under a revenue-sharing framework with CIL subsidiaries.

Table 3.3: Block-wise profitable and unprofitable mines

Block	Total no. of operational mines	No. of profitable mines	Production capacity of profitable mines (MMTPA)	Production from profitable mines in 2023-24 (MMT)
Dhanbad	24	9	9.2	7.9
Nirsa	14	5	6.9	6.1
Baghmara	10	2	8.5	5.3
Total	**48**	**16**	**24.6**	**19.3**

Source: Rajya Sabha Unstarred Question (No. 2269, answered on 16 December 2024), Ministry of Coal, Government of India; Coal India Limited (CIL), September 2023.

Overall, the data suggests that while a significant portion of Dhanbad's coal production comes from a relatively small number of profitable mines, a large share of mines remain operationally inefficient or financially unviable. This has critical implications for future investment prioritization, resource rationalization, and mine closure planning in the context of just energy transition.

3.2.3 Closed mines

A mine is officially considered closed, as stipulated by the Ministry of Coal if it has submitted a notice of closure and obtained a mine closure certificate. However, none of the non-operating mines in the Dhanbad district have submitted/received a closure notice/certificate. Thus this mines are considered as temporarily closed/discontinued operations.

As per the latest estimates of Ministry of Coal and CIL (2025), the total number of non-operational mines of BCCL are 10. Out of these 10 non-operational mines 9 are UG and 1 is OC. However, as per government estimates of December 2022 (as Per responses in Rajya Sabha), there are about 34 abandoned/discontinued mines of BCCL. However, as per industry feedback, many of these mines are being considered for amalgamation and re-opening.

As per Annual Report of BCCL, the company has been in the process of re-opening some of its discontinued mines. These are largely UG mines, as outlined below. The mines so far identified for reopening are located in Dhanbad and Baghmara blocks.

Table 3.4: Current status of BCCL's re-opening mines

Mine	Block	Operation type	Mineable reserve	Production capacity (MMTPA)	Lease area (ha)	Date of agreement	Current status as of May 2025
Salanpur Colliery	Baghmara	UG	NA	0.15	177.5	27.06.2023	LOA issued
PB Project	Dhanbad	UG	NA	0.8	89	15.9.2023	LOA issued
Loyabad	Dhanbad	UG	NA	NA	499.6	28.10.2023	LOA issued
Kharkharee	Baghmara	UG	NA	0.09	584	22.1.2024	LOA issued
Madhuband	Baghmara	UG	NA	0.11	393.8	11.12.2023	LOA issued
Amlabad	Dhanbad	UG	NA	NA	387	Extended date of BG submission is 8th April 2024. Agreement to follow.	LOA issued
Amalgamated East Bhagatdih Simlabahal Colliery	Dhanbad	OC	NA	NA	420.8		Bid under evaluation
Amalgamated Dharmaband Colliery	Baghmara	UG	NA	NA	377.9		Retendered on 15.04.2024

Source: BCCL Annual Report 2023-24. 'NA' indicates data is not available.

3.2.4 Revenue contribution

Mines in Dhanbad contribute significantly to the government exchequer. BCCL's mines are the highest contributor since all of its mines in the state is operating in Dhanbad, except one mine operating in Bokaro (which has the production capacity of 0.9 MMTPA).

BCCL contributed a total of ₹2,806 crores (USD 327 million) to the Jharkhand government in 2024, out of which 64% was royalty from coal. Another ₹540 crores was contributed to the District Mineral Foundation Trust (DMFT). Apart from this, BCCL remitted ₹1,573 crore to the Central Government as GST compensation cess (which is the coal cess) in the reference year.[4]

As part of Corporate Social Responsibility (CSR), the company significantly contributes to the physical and social infrastructure of the surrounding communities and conducts various types of training activities, upskilling the local population. Activities included part construction and repair of schools and colleges, facilitating drinking water for some communities, and various health and education drives. The expenditure for the upgradation of social infrastructure in 2023-24 was ₹4.4 crores, for training programmes was ₹86 lakhs, and other expenses, which totalled to ₹7.2 crores.[5]

Table 3.5: BCCL's contribution to Jharkhand government exchequer in 2023-24

Heads	Amount (₹ in crores)	% Percentage of total
Royalty on coal	1,808	64.4
DMFT	540	19.2
Covid cess	43	1.5
Forest transit fee	20	0.7
Central sales tax	54	1.9
Bazar tax	103	3.7
Professional tax	8	0.3
SGST	230	8.2
Total	**2,806**	**100**

Source: Annual Report 2023-24, BCCL (2024)

3.3 Coal-based thermal power plants

Dhanbad has one coal-based thermal power plant, namely Maithon Thermal Power Plant (TPP), with a total installed grid-connected capacity of 1,050 MW. The capacity accounts for 64% of the state's total installed capacity.[6]

The plant is under public public-private partnership of Tata Power and Damodar Valley Corporation (DVC). The daily coal consumption by the TPP is around 6,900 tonnes, which is transported by the existing railway network.[7]

Table 3.6: Coal-based TPPs

Owner	Name of TPP	Installed capacity (MW)	Net generation (MWh) in 2024-25	Year of commissioning
Tata Power & DVC	Maithon TPP	525	468	2011
		525	411	2012
Total		**1,050**	**879**	

Source: Central Electricity Authority, Govt. of India. Coal Stock Report (May 2025) & Report on the Energy Generation Programme 2024-25.

The TPP has no plans for expansion at the moment. However, there are plans for installing 1600 MW TPP in Koderma, which is 40 km from Dhanbad, by 2030.[8]

3.4 Coal washeries

Coal washeries are crucial for processing coal for power plants, steel plants, and other industrial applications. BCCL owns all eight coal washeries (including the three proposed ones) in Dhanbad, with a total capacity of 21.1 MMTPA. In total, it supplied 14.7 MMT of washed and direct feed coal to the steel sector in 2023-24. The company has identified two blocks for the exploration and exploitation of coal bed methane (CBM) at Jharia CBM Block I & II. It has also decided to monetise its four old washeries.

Table 3.7: Coal washeries operated by BCCL in Dhanbad

S. No.	Name of the washery	Capacity (MMTPA)
1	Moonidih washery-I	1.6
2	Sudamidih washery	1.6
3	Dahibari washery	1.6
4	Patherdih washery	5
5	Madhuban washery	5
Proposed new washeries		
6	Patherdih washery- II	2.5
7	Moonidih washery	2.5
8	Bhojudih washery	2
Total		**21.8**

Source: BCCL Annual Report 2023-24.

3.5 Coal transportation

The coal from Dhanbad is transported by both rail and road. BCCL transports the majority of its coal by rail due to the presence of its extensive network and the rest by trucks.[9] In 2023-24, 25.18 MMT of coal was transported by the railway network. The truck transportation business is mainly privately operated.

Table 3.8: Mode of coal transportation by BCCL

Particulars	Target (MMT)	Actual (MMT)
Rail	21.4	25.1
Road	9.8	10.5
Offtake	**31.2**	**33.9**

Source: Monthly Statistical Report, Ministry of Coal, Govt. of India (March 2025).

3.6 Other coal-dependent industries

Coal mining in the district has established a network of various coal-based industries like cement plants, fertilizer plants, and brick units, including fly ash brick. Apart from larger players in these categories, there are many small and medium-scale industries spread across the district.

3.6.1 Cement

Dhanbad has one major ACC cement plant owned by Adani, with a production capacity of 4.5 MMTPA. The plant operates with energy-efficient and environmental controls (bag filters, noise control, automated loading).[10] Other small and medium industries operate in the district, namely, Shree Vinayak Cement Co., operating since 2010, Shubham Cement Co., Khatu Shyamji Cement, and distributors like Nuvoco Dealers.

Table 3.9: Cement plants

Name of the plant	Location	Size	Type of unit	Capacity (MMTPA)
ACC Ltd.	Sindri, Dhanbad block	Large	Grinding	4.5

Source: Indian Bureau of Mines, Ministry of Mines, Govt. of India (2024). Indian Minerals Yearbook 2022; Web portal of Adani Cement Company (May 2025).

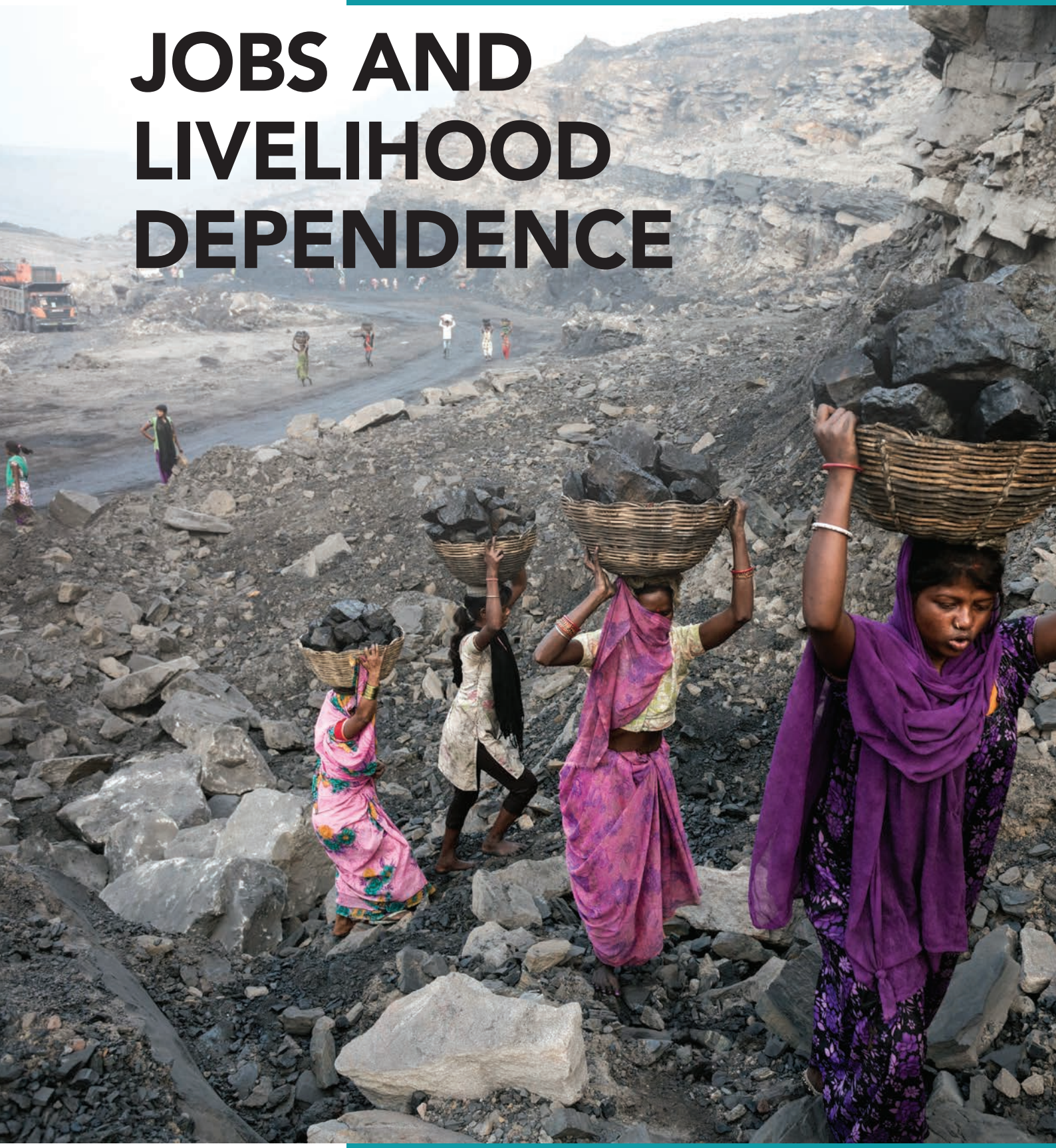
3.6.2 Small and medium enterprises

Apart from the large industrial units, as per the State Pollution Control Board (2025), there are several micro, small and medium enterprises (MSMEs), that have developed due to coal availability. As per information of the Sate Pollution Control Board (2024), there are nearly 650 such units, including, coking coal units (409), brick making units (128), fly ash unit (22), small steel, iron and metal processing units (58), mini cement plants and related industries (25), etc. These units significantly contribute to the districts manufacturing economy and local employment.

In conclusion, with nearly 200 years of coal mining legacy, the sector has a central role in Dhanbad's industrial economy. With a share of nearly 50% of coking coal, the district has been important for supplying coal to industries like steel in other districts of the state and India. However, the local industrial landscape will be impacted as mines close in the coming years. While BCCL has initiated steps to reopen a few discontinued mines, the long-term outlook uncertain in the face of economic inefficiencies, environmental challenges, and India's broader energy transition commitments. The way forward for Dhanbad lies not only in adopting cleaner and more efficient mining practices but also in preparing for gradual industrial diversification and decarbonisation. Leveraging its industrial base, the district has an opportunity to build green energy infrastructure and industries, while ensuring that workers and communities dependent on coal are supported through a just transition.

CHAPTER 4

JOBS AND LIVELIHOOD DEPENDENCE



- *There is significant amount of non-working population within the working age group, about 54% are non-workers.*
- *About 1.4 lakh workers are formally and informally dependent on coal mining and related activities for income.*
- *The coal mining sector employs over 31,500 workers formally, and at least twice informally.*
- *Despite district per capita income being two times the state average, most informal workers earn below ₹10,000/month.*
- *Overall, there is a high dependence in the district on businesses, with about 30% households being dependent on it.*

4.1 Overview

With Dhanbad's long history of coal mining, the livelihoods and incomes of its people are significantly dependent on coal, either directly or indirectly. Moreover, the sector has created very substantial induced dependence among the local community. This chapter focuses on people's employment and livelihood dependence on coal in the district. The dependence has been determined based on the results of the primary survey, along with workforce data as obtained from the mining companies and other industries operating in the district.

The primary survey yielded two distinct sets of data:

- Household dependence for primary income; and,
- Workers' dependence, which includes all working members captured in the surveyed sample.

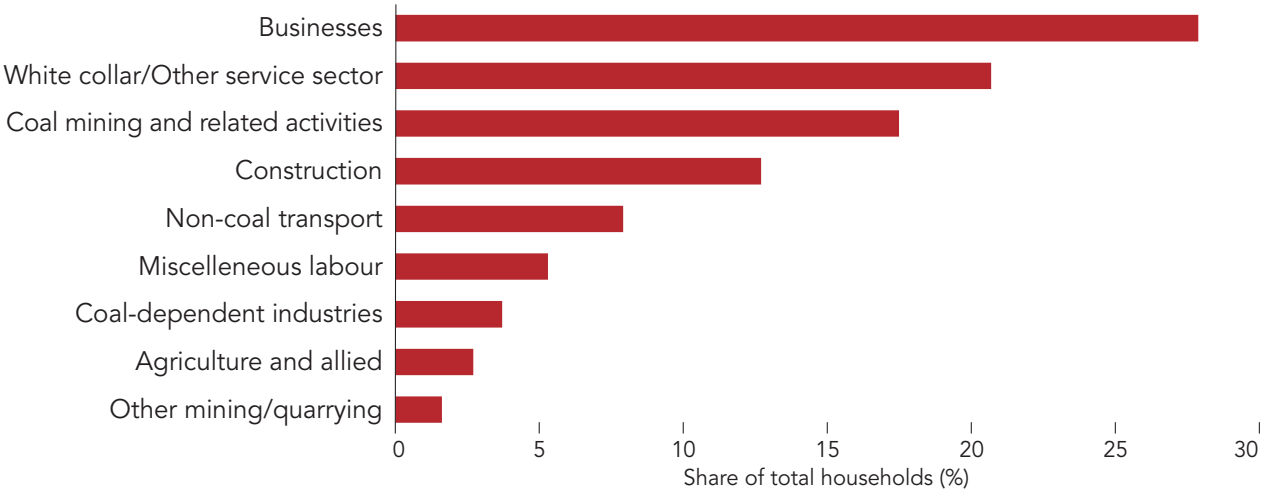
4.2 Household income dependence

4.2.1 Primary income source

The primary survey revealed the following for the primary income source for various sectors:

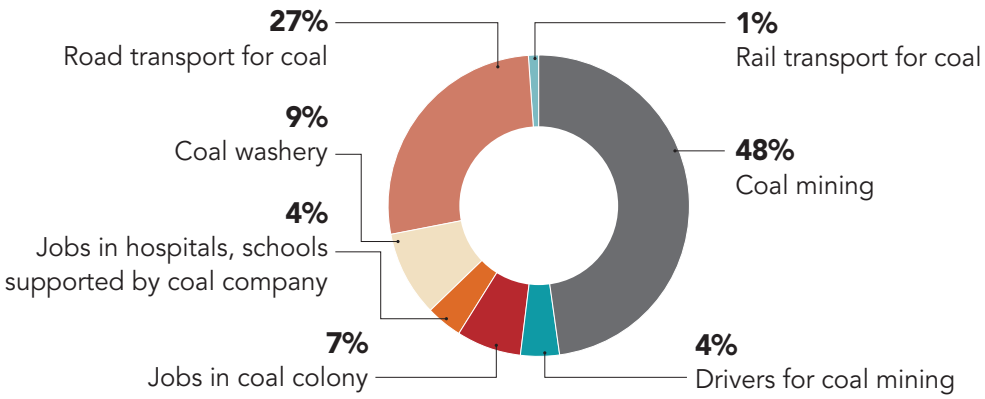
- Businesses around the mining areas are the largest source of primary income, with about 30% of households depending on them. These businesses are largely influenced by the long-standing coal mining industry in the district.
- White-collar occupations (other service sectors) are the next major source, providing primary income for about 21% of households. Together, businesses and white-collar jobs account for the primary income of roughly half of all surveyed households in the district.
- Coal mining remains a key source of livelihood, with about 17% of households dependent directly on it. Additionally, 4% of households rely on other coal-related industries.
- Construction work is a primary source of income for about 13% of households.
- Agriculture and allied sectors contribute the least to primary household income, with survey responses and community interactions indicating a general lack of interest in agriculture due to low earnings, as mining-related activities and businesses are considered more lucrative.

Figure 4.1: Overall distribution of households based on primary income source



Source: iFOREST survey

Figure 4.2: Households with primary income source directly dependent on coal mining sector



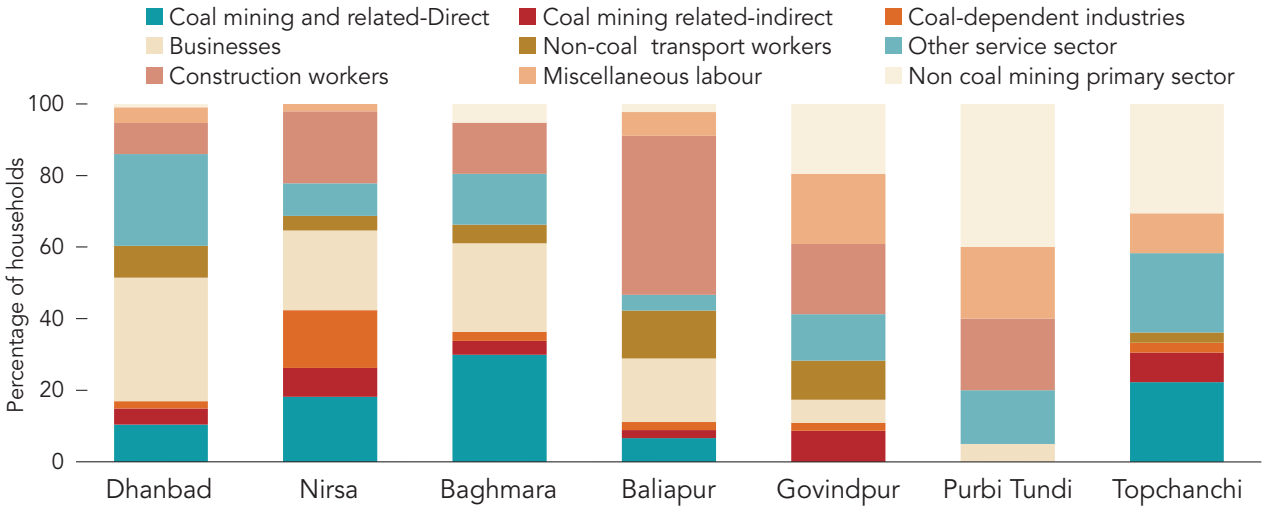
Source: iFOREST analysis

Spatially, the household's primary income source is distributed as follows:

- Coal is the dominant employment source in Dhanbad, Nirsa, and Baghmara blocks, with a mix of direct, indirect, and coal-dependent industry jobs.
- The construction sector is a primary income source in Baliapur, Nirsa, Purbi Tundi, and Govindpur blocks.
- Rural blocks like Purbi Tundi and Topchanchi, have high dependency on agriculture, forestry and non-coal mining activities.
- Dhanbad block serves as the district's economic hub, hosting a high concentration of mines, businesses, and diverse employment opportunities.
  - » Over 35% of households depend on various businesses.
  - » 26% rely on service sector jobs.
  - » 17% are dependent on coal mining-related work (directly and indirectly).

Overall, a just transition and economic diversification strategy for the district should target interventions for economic diversification, including green energy and industry investments, and supporting entrepreneurship around them, boosting green construction, fostering the service sector, and promoting sustainable enterprises in the rural areas to mitigate job and income losses, and create a resilient local economy.

Figure 4.3: Block-wise primary income source



Source: iFOREST survey

4.2.2 Income level

The survey findings from the mining areas of Dhanbad reveal a significant concentration of low-income earners. The results show that:

- Low-income households dominate the mining areas of Dhanbad, with around 67% of primary earners having a monthly income below ₹10,000. The majority of these earners work as casual labourers and daily wage workers in coal mining, coal transportation,coal gathering and selling, construction, agriculture, and other labour-intensive jobs.
- Higher-income households are largely engaged in service sector employment or run their own businesses.
- The data indicates a strong link between occupation type and income levels, with mining-linked and informal jobs offering lower earnings compared to services and businesses.

Table 4.1: Income distribution of households' primary earners

Monthly income (in INR)	Count of primary earner	Share of primary earner (%)
Below 10,000	595	67
10,000-20,000	176	19.8
20,000-40,000	71	8
40,000-60,000	26	2.9
60,000-80,000	12	1.4
80,000-1,00,000	5	0.6
Above 1,00,000	3	0.3
Total	**888**	**100**

Source: iFOREST survey

- Significant income disparity exists between rural and urban areas, with urban workers more prevalent in higher-income categories due to better access to formal employment and business opportunities.
- Rural workers are largely concentrated in lower-income brackets, where wages are low and employment is often informal and seasonal.
- Despite this, urban areas also have a large share of low-income households, with many primary earners making below ₹10,000 or ₹10,000–₹20,000 per month. The prevalence of low-income earners in urban areas is linked to coal gatherers and sellers, given the proximity of active, closed, and abandoned mines. Urban centres also attract construction and casual labourers migrating for work, adding to the high proportion of low-income households.

Table 4.2: Income distribution in urban and rural areas

Monthly income	Rural(%)	Urban(%)	Total (%)
Below 10,000	26.8	40.2	67
10,000-20,000	5.9	13.8	19.7
20,000-40,000	1.6	6.4	8
40,000-60,000	0.9	2.0	2.9
60,000-80,000	0.5	0.9	1.4
80,000-1,00,000	0.2	0.4	0.6
Above 1,00,000	-	0.3	0.3
Grand Total	**36**	**64**	**100**

Source: iFOREST survey

4.3 Worker profile

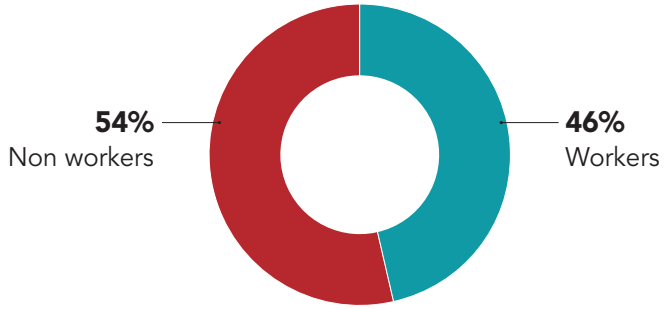
The worker's profile of Dhanbad district has been analysed based on the survey results, specifically considering the working-age population (15-59 years) across 888 households. A total of 2,661 individuals fall within this age group, including both earning and non-earning members. The findings highlight employment trends within this age group, gender disparities, and prospective reasons for non-employment in the region.

4.3.1 Worker participation

Overall, the assessment shows the following trends:

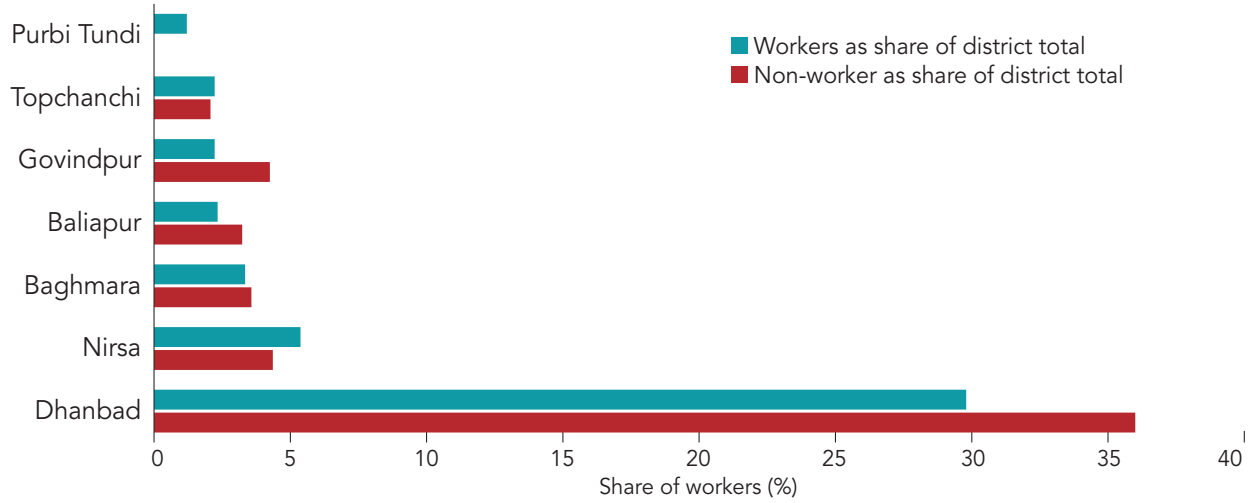
- There is a high level of unemployment among the working-age population. Among those surveyed, over 54% in the working-age group are non-workers, while 46% are workers/employed.
- The non-working population is significant even in economic hubs like the Dhanbad block, which accounts for over 36% of the total non-workers in the district.
- Nearly 50% of the unemployed individuals cited a lack of suitable job opportunities, while another 48% are engaged in household responsibilities, limiting their participation in the labour market.
- There exists also a distinct gender imbalance with merely 13.6% of women's participation among the employed. 75.3% of non-workers in the working-age population are also women.

Figure 4.4: Distribution of wokers and non-workers in working-age group



Source: iFOREST survey

Figure 4.5: Block-wise distribution of working-age population



Source: iFOREST survey

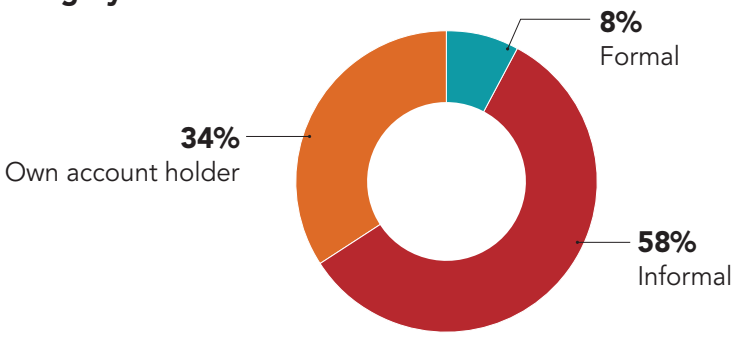
4.3.2 Worker distribution

An analysis of workers distribution across major economic sectors and job categories in Dhanbad district reveals the following key trends:

- Coal mining and coal-dependent industries account for a significant share of the total surveyed workers, accounting for about 17% collectively.
- Various businesses that are potentially induced by coal mining activities in the district (located in wards and villages near the mines) employ about 27% of the workforce, the largest percentage of the workforce. This includes a diverse range of businesses, such as local retail and small shop owners, owners and workers in servicing and repairing businesses/shops, and individuals in the hotel and restaurant industry.
- Various other service sector jobs, such as government jobs, teaching, and healthcare, make up another 23.4% of the workforce, reflecting a significant presence of educated professionals.
- Construction activities employ about 12.8% of workers, underscoring their contribution to local infrastructure development and construction projects.
- A significant percentage of the workforce, over 9%, engaged as miscellaneous labour contributes to the local economy, who are employed in various work, such as working in shops, local vegetable markets, factories, etc.

Overall, the survey results show that the workers in the district are predominantly engaged as informal workers across sectors, comprising about 58% of the workers. Additionally, about 34% are own account holders who own small businesses, run their own establishments, are brokers, etc., who overall are self-employed. The proportion of formal workers (with regular salaries, a contract, and employer-provided benefits) is only about 8%.

Figure 4.6: Category-wise worker distribution



Source: iFOREST survey

4.4 Coal-dependent workforce

A deeper assessment of the coal dependent workforce suggests the various sectors/activities, they are engaged in this section provides a detailed understanding of the workforce directly and indirectly dependent on coal mining-related activities , establishments (such as coal company colonies, hospitals, schools, etc.) and coal-dependent industries. Out of 226 surveyed workers a major proportion are engaged in coal mining and coal transport. Besides, there is significant dependence of coal-dependent industries. Overall, about 77% are informal workers, and the rest are formal workers.

Table 4.3: Distribution of surveyed formal and informal workers in the coal-dependent workforce

Category of work	Current sector of works	No. of workers	Formal %	Informal %
Coal mining and related activities and establishments	Coal mining	80	36	64
	Coal washery	14	25	75
	Drivers for coal mining company	6	33	67
	Jobs in coal colony, coal company supported hospitals, schools, education, centres etc.	18	50	50
	Rail transport for coal	1	0	100
	Road transport for coal	49	8	92
	Business supplying materials/equipment to coal mining and coal-dependent industries	4	0	100
Coal mining related activities and establishments sub total		172	28.1	71.9
Coal-dependent industries	Cement plant	1	0	100
	Coke oven	3	25	75
	Brick and Fly ash Brick	14	0	100
	Steel plant	8	12.5	87.5
	Jobs in other small industries	13	0	100
	Thermal power plant	11	25	75
Coal-dependent industries total		**54**	**9**	**91**
Total		**226**		

Source: iFOREST survey

4.4.1 Coal mines

As per the primary survey, 13.5% of the total workers surveyed are directly working in the coal mining sector. BCCL, being one of the largest mine operators in the district, has a share of about 90% of the coal mining workers.

Table 4.4: Formal employment in coal mines

Cluster	Owner	Covered blocks	Departmental	Contractual	Total
Cluster 1 (ECL)	ECL	Nirsa	743	68	811
Cluster 2 (ECL)	ECL	Nirsa	320	22	342
Cluster 2 (BCCL)	BCCL	Dhanbad & Baghmara	6,463	963	7,426
Cluster 3 (BCCL)	BCCL	Baghmara	1,695	245	1,940
Cluster 4 (BCCL)	BCCL	Baghmara	4,110	576	4,686
Cluster 5 (BCCL)	BCCL	Dhanbad & Baghmara	2,485	538	3,023
Cluster 6 (BCCL)	BCCL	Dhanbad	1,993	269	2,262
Cluster 7 (BCCL)	BCCL	Dhanbad	788	81	869
Cluster 8 (BCCL)	BCCL	Dhanbad	1,852	178	2,030
Cluster 9 (BCCL)	BCCL	Dhanbad & Baliapur	1,666	241	1,907
Cluster 10 (BCCL)	BCCL	Dhanbad	617	13	630
Cluster 11 (BCCL)	BCCL	Dhanbad	921	98	1,019
Cluster 15 (BCCL)	BCCL	Baghmara	362	17	379
Cluster 16 (BCCL)	BCCL	Dhanbad	785	117	902
Jamadoba	TISCOJH	Dhanbad	622	474	1,096
Tasra (Captive)	Steel Authority of India Limited (SAIL)	Dhanbad	746	77	823
Noonudih Jitpur	Indian Iron & Steel Company (IISCO)	Dhanbad	533	55	588
Chasnala (Captive)	Indian Iron & Steel Company (IISCO)	Dhanbad	320	33	353
Bhelathand	Tata Steel Limited	Baghmara	248	37	285
Sijua	Tata Steel Limited	Baghmara	151	23	174
Total			**27,420**	**4,125**	**31,545***

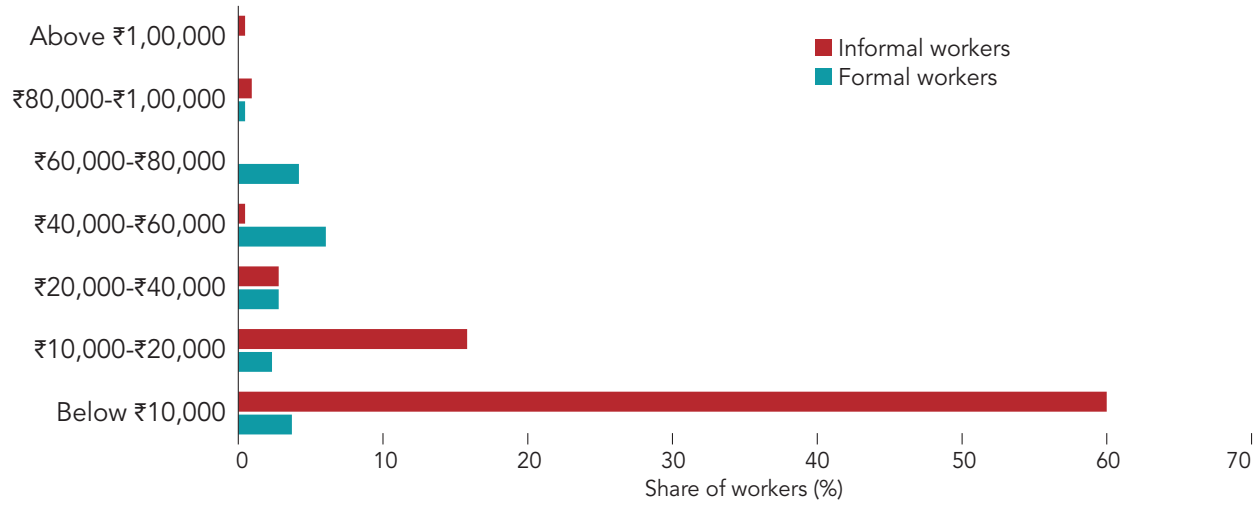
Source: Coal India Limited (CIL), September 2023.
(*) Employment factor approach was applied for estimating coal mine workers in cases where worker data was not available.

The total number of mine workers in the district is estimated to be 31,545, out of which 87% are departmental workers, and the rest are contract workers. However, future uncertainty looms among the coal-dependent workforce as the area has been witnessing mine transitions. Over one-third (36%) of the workforce associated with the coal industry expressed concern about potential job losses in the coming years during the primary survey.

An analysis of the income distribution of the coal-dependent workforce showed a stark disparity between the formal and informal workers:

- A significant majority of workers (63.7%) earn below ₹10,000 per month, with informal workers dominating this bracket (60%), indicating high income vulnerability and limited access to formal, stable employment.
- Formal workers are more represented in higher income categories, especially in the ₹40,000–₹80,000 range (10.3%), while informal workers have almost no presence above ₹40,000, showing a sharp income disparity between the formal and informal workforce.

Figure 4.7: Income distribution of formal and informal workers



Source: iFOREST survey

TRANSITION ISSUES IN OPERATIONAL VERSUS NON-OPERATIONAL MINING AREAS

A purpose survey of about 300 workers was undertaken in Dhanbad (out of the total sample surveyed), in villages and wards where there are closed mines, and also where some mines are closed while some remain operational. This was undertaken has how coal mine closure has been affecting the local community.

The survey findings show that in wards and villages with operational coal mines, household dependence on mining-related income continues to remain high. Approximately 67.5% of the surveyed workers were from areas where mines are still functional, compared to 32.5% from areas with closed or partly closed mines. In the latter, the contraction of mining-related opportunities has particularly impacted informal workers and daily wagers, as formal workers get redeployed to other mines.

Qualitative insights from FGDs in closed mining localities further validate these patterns. Residents repeatedly pointed out that with the phasing down of employment opportunities in collieries, the workers have been engaging in casual construction labour, retail shops, and other forms of daily-wage work. Such work provides meagre and unstable earnings, often lacking any social protection, underscoring the heightened vulnerability of communities living in closed mining belts.

Alongside this economic shift, workers across both categories of locations—especially younger respondents—expressed strong concerns about the future of jobs if more mines are closed. Those currently engaged in mining feared that, in the absence of alternative employment pathways, they too would be pushed into informal and insecure livelihoods similar to what they observed in closed mine areas. This sentiment underscores the urgency of planned just transition measures in Dhanbad: with proactive investments in skilling, livelihood diversification, and social safety nets.

4.4.2 Coal transport

As the primary survey shows, a large number of workers are dependent on the coal sector, and a major one is coal transportation. At the same time, no estimate was provided by the transporters or the industry on the number of coal transport workers. By extrapolation from the focus group discussion (FGD) with truck drivers, it can be estimated that about 4,000 workers are engaged in coal transportation.

4.4.3 Coal washeries

BCCL operates all seven coal washeries in the Dhanbad district with a total production capacity of 15 MMTPA. These washeries together employ 4,600 workers. Three new washeries with a capacity of 7 MMTPA are also upcoming (Patherdih-II, Moonidih, and Bhojudih), which will employ an additional 2,170 workers.

Table 4.5: Employment in coal washeries

Name of the washeries	Capacity (MMTPA)	No. of workers
Dugda-II	2	*620
Bhojudih	1.7	443
Moonidih	1.6	*496
Mohuda	0.6	227
Madhuban	2.5	*775
Dahibari	1.6	*496
Patherdih-I Madhuband	5	*1550
Total	**15.0**	**4,607**
Upcoming Washeries		
Patherdih-II	2.5	775
Moonidih	2.5	775
Bhojudih	2	620
Total	**7**	**2,170**

Source: BCCL India. (2024). Annual Report 2023–24. Government of India. https://www.bcclweb.in/files/2024/08/BCCL_ANNUAL_REPORT_2023-24_060824.pdf
(*) Employment factor approach applied to Dugda-II, Moonidih, Madhuban, Dahibari & Patherdih-I Madhuband coal washeries.

4.4.4 Coal-based TPP

There is only one TPP in Dhanbad the Maithon TPP. The formal worker numbers in the 1,050 MW TPP were estimated using CEA's manpower norms and considering Maithon Power's Annual Report, while the informal workers were estimated by extrapolating from the household survey. By these measures, it is estimated that the Maithon TPP has about 387 formal workers (officers are estimated to be 222 as per the company's report of 2022), and about 770 informal workers.

4.4.5 Brick making

Employment in the brick sector in Dhanbad, as extrapolated from the primary household survey, is estimated at over 9,000 workers. The sector is predominantly characterised by seasonal employment. Workers often migrate temporarily from rural areas or shift to other informal occupations when kilns are not operational.

To estimate formal workers an employment factor has been applied based on industry feedback (12 per unit). As the this, the total formal employment in 22 fly ash brick units is estimated to be 264.

4.4.6 Total direct dependence on coal

The data, as extrapolated from the primary survey and official data, estimates that about 1.4 lakh people are directly dependent on coal mining and coal-based industries that are highly vulnerable to the transition. A high proportion of these workers, 73% are informal workers.

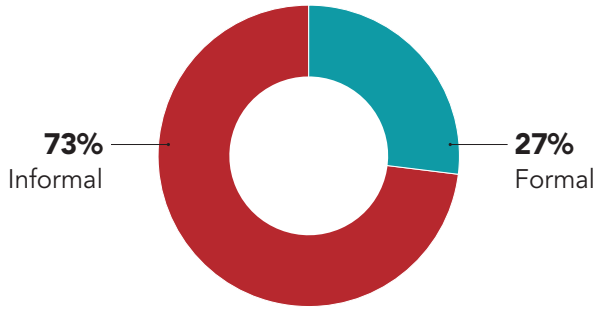
The survey revealed that around 52% of the workers in coal and coal-based industries are below 40 years of age, and the remaining are between the ages of 41-60. This indicates that a wide range of reskilling and training options should be made available to the workers to accommodate all working age groups in the region.

Table 4.6: Total direct dependence on coal mining and coal-based industries

Sector	Formal	Informal	Total
Coal mining	31,545	56,080	87,625
Coal transport	804	3,396	4,200
Coal washery	4,607	13,821	18,428
Coal gatherer and seller	0	16,890	16,890
Brick	264	9,290	9,554
Coal-based TPP	387	700	1,087
Total	**37,607**	**1,00,177**	**1,37,784**

Source: iFOREST estimate from survey data & official reports.

Figure 4.8: Formal and informal dependence



Therefore, planning a just transition in Dhanbad requires a support mechanism that will upskill and reskill this large workforce, with a specific focus on informal workers , to increase their employability in new economic sectors, with secure employment terms and better income.

CHAPTER 5

SOCIAL INFRASTRUCTURE AND COMMUNITY RESILIENCE

- *Over 17% of the population in Dhanbad still remains multidimensinally poor, higher than the national average.*
- *Despite a 75% literacy rate, gender gaps in education and employment persist.*
- *71% of households rely on government schools for children's education, private schools are concentrated in urban areas.*
- *The companies, especially BCCL, have historically supported social infrastructure, operating such as hospitals, dispensaries, and schools.*
- *Coal remains the dominant household cooking fuel in Dhanbad, with 72% of surveyed households relying on it due to easy availability and low cost.*

5.1 Overview

The evaluation of social infrastructure and services is important as in coal districts there are health care , educational institutions, etc. that are supported by the mining companies. In the event of coal transition, the infrastructure supported by the companies and the services provided by them will be compromised. To assess prospective transition challenges, key infrastructure indicators, covering housing, water, electricity, cooking fuel, education, and healthcare, have been analysed. The evaluation is also important to ensure timely interventions, as the district has over 17% of the population who are multidimensionally poor, which is higher than India average of 15%.[1]

5.2 Healthcare

The health care facilities in the blocks, except Dhanbad, are measured against the Indian Public Health Standards (IPHS), revised in 2022.[2] Tundi and Purbi Tundi were considered tribal blocks due to their large tribal population and were also measured against the IPHS standard. Similar facilities in Dhanbad, having 58% of its population in urban areas, were measured against the Urban and Regional Development Plans Formulation and Implementation (URDPFI) guidelines[3].

Overall, the district has 25 Primary Health Centres (PHCs), 126 Health Sub-Centres (HSC), nine Community Health Centres (CHCs), and one district hospital. The district has one government medical college (Shaheed Nirmal Mahto Medical College) and the Dhanbad Sadar Hospital[4].

There lies a significant gap in health care facilities in the region, with only Topchanchi having sufficient PHC and CSCs and Dhanbad and Baliapur having sufficient CSCs. The gap in the government health care centres is fairly filled up by the presence of private health care facilities, and facilities run by BCCL.

Table 5.1: Status of healthcare facilities

Block	PHC as per standard	PHC present	PHC Gap	HSC as per standard	HSC present	HSC Gap	CSC as per standard	CSC present	CSC Gap
Tundi	5	0	5	34	12	22	1	0	1
Purbi Tundi	3	0	3	17	1	16	1	0	1
Topchanchi	6	5	1	33	13	20	1	1	0
Baghmara	11	6	5	67	18	49	3	1	2
Govindpur	8	4	4	49	25	24	2	1	1
Dhanbad	24	3	21	61	27	34	2	3	-1
Baliapur	5	1	4	28	13	15	1	2	-1
Nirsa	14	6	8	85	17	68	4	1	3
Total	**90**	**25**	**65**	**374**	**126**	**248**	**15**	**9**	**6**

Tertiary healthcare facilities	
SNM Medical College Hospital, Dhanbad	1
Sadar Hospital, Dhanbad	1
Private health care facilities	120

Source: District Statistical Handbook Dhanbad (2022)
Note: The data provided was consolidated and has been benchmarked against IPHS norms for the calculation of deficits

Public medical facilities offering comprehensive services, including secondary and tertiary-level referral centers, are minimal in the district. According to records from the Civil Surgeon Department, the total number of medical experts/doctors in these government health institutions is 88. At the same time, there are a considerable number of private health care facilities at secondary and tertiary levels, located largely in urban areas.

Table 5.2: Number of medical experts/doctors in government health facilities

Category of Health Staff	Numbers
No. of doctors at PHCs	29
No. of doctors at CHCs	38
No. of specialists at CHCs	6
No. of specialists at sub-divisional hospitals	8
No. of specialists at district hospital	2
Number of pulmonologists at district hospital	0
No. of staff nurses at district hospital	5

Source: Office of the Civil Surgeon cum chief medical officer, Dhanbad (2024)

In terms of coal company-supported facilities, Bharat Coking Coal Limited (BCCL) operates nine hospitals and 65 dispensaries. These facilities are primarily concentrated in the Dhanbad block, which alone has seven hospitals and 56 dispensaries. BCCL also organises several healthcare camps in the district every year. For example, in 2023-24, 38 such camps organised by the company covered over 2,700 beneficiaries as per company information.[5]

Table 5.3: Health facilities run by BCCL

Block	Number of hospitals	No. of dispensaries	Total
Dhanbad	7	56	63
Baghmara	2	2	4
Govindpur	-	7	7
Total	**9**	**65**	**74**

Source: Healthcare Department, BCCL, 2024

5.3 Education

The assessment of educational access involves examining two key parameters:

- Level of education, determined by the educational attainment of the primary earner in a household; and
- Status of educational facilities available in the district.

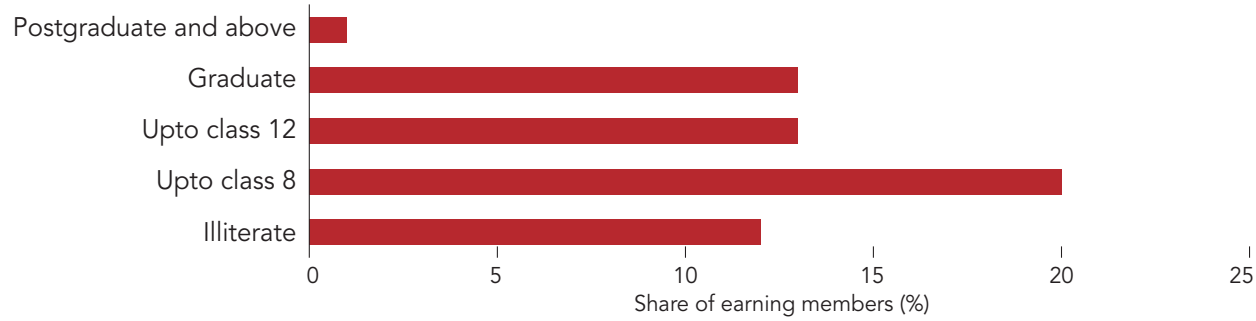
5.3.1 Education level of primary earning member

The education level of primary earning members was determined through a primary survey. The findings reveal the following:

The educational attainment of primary earners in the region is generally low, posing a significant barrier to economic mobility and employment diversification. Around 12% of primary earners are illiterate, while over 8% are literate but have never attended formal schooling. Approximately 9% have studied up to Class 5, and another 20% have completed their education up to Class 8. About 24% have completed secondary education (Class 10), and 13% have finished higher secondary (Class 12). A small proportion, roughly 13%, hold undergraduate degrees, while another 13% possess diplomas or equivalent technical qualifications. However, postgraduate attainment is negligible, at just 1%. This profile underscores the urgent need for targeted skilling and education support to enable workers, especially from coal-dependent households, to participate meaningfully in emerging sectors.

This analysis underscores the need for greater investment in higher education within the district to develop a skilled workforce capable of meeting future demands.

Figure 5.1: Education levels of the primary earning member in surveyed households



5.3.2 Educational infrastructure

The survey reveals that government-supported education serves as the primary source of schooling for the majority of households. This trend holds for both areas with operational mines and those with non-operational mines. Overall, 71% of households reported relying on government schools. This finding is consistent with data from the Unified District Information System for Education (UDISE) for the district.

Table 5.4: Education infrastructure status

Block	Primary School Standard	Primary Schools	Gap	Upper primary standard	Upper primary schools	Gap	Secondary school standard	Secondary schools	Gap	Higher secondary school standard	Higher secondary schools	Gap
Tundi	20	133	No gap	14	49	No gap	7	11	No gap	3	5	No gap
Purbi Tundi	10	75	No gap	7	25	No gap	3	6	No gap	2	3	No gap
Topchanchi	33	101	No gap	22	67	No gap	11	18	No gap	5	11	No gap
Baghmara	67	398	No gap	45	165	No gap	22	27	No gap	11	18	No gap
Govindpur	49	202	No gap	33	124	No gap	16	16	No gap	8	13	No gap
Dhanbad	244	206	67	163	278	No gap	81	58	23	41	54	No gap
Baliapur	28	109	No gap	19	85	No gap	9	14	No gap	5	7	No gap
Nirsa	85	82	13	57	61	3	28	5	23	14	5	9
Total	**537**	**1,306**		**358**	**854**		**179**	**155**				

Source: Jharkhand Education Project, Dhanbad (2025)

Private institutions play a growing role at higher levels, 44.2% of secondary and 68.5% of higher secondary schools are privately managed. Private schools are concentrated in urban and mining areas, especially in the Dhanbad block, where they account for 65.5% of upper-primary, 55.2% of secondary, and 79.6% of higher-secondary schools. Despite the coal industry's presence, less than 0.5% of households rely on company-supported schools. Both government and private schools cater to diverse livelihoods, including families working in construction, retail, government jobs, and coal-related sectors.

The status of both public and private schools when compared to the URDPFI guidelines[6] shows a surplus number of schools in each of the blocks, except in Dhanbad and Nirsa blocks. The split of public and private schools is elaborated in the annexure for this chapter.

In Dhanbad, the gaps in public schooling infrastructure, particularly in mining-affected areas, are partially filled by schools operated by Bharat Coking Coal Limited (BCCL).

Table 5.5: Schools supported by BCCL

Sl. No.	Schools	Numbers
1	Project schools (Fully financed)	8
2	Semi-Project Schools (Given infrastructural facilities)	3
3	Privately managed schools (Grant-in-aid by BCCL)	12
Total		**23**

Source: BCCL Annual Report (2023-24)

BCCL supports several public schools through its Corporate Social Responsibility (CSR) initiatives. This support includes the development of classrooms, multipurpose buildings, smart classrooms, libraries, auditoriums, skill development training, and the provision of water, electricity, and sanitary facilities. For the financial years 2023-24 and 2024-25, BCCL has allocated ₹724.2 lakh for these activities[7].

The more pressing challenge in the region is the rising cost of education, where 50% of respondent households expressed concerns about the expensive education. This is a key reason why many families heavily depend on government schools.

There are approximately 23 private/trust-run ITIs located in Dhanbad block and 3 government ITIs in the district, one each in Dhanbad, Baghmara, and Govindpur. These can be initially used for re-skilling the mine-affected workers after their curriculum is revised for green and other industries.

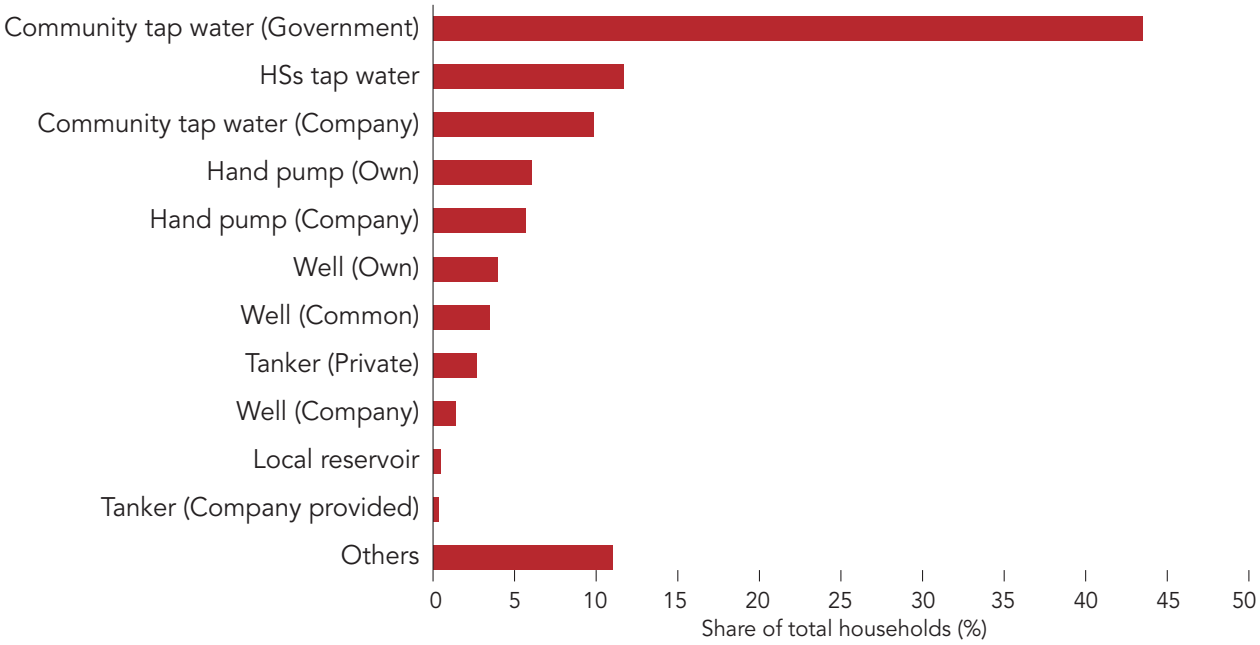
5.4 Basic amenities

5.4.1 Drinking water

Access to clean drinking water remains a significant challenge in the mining areas of Dhanbad. Interactions with the local community underscored the difficulties in securing reliable drinking water. Survey results reveal that most residents depend on government-supported drinking water infrastructure. Investments in drinking water facilities have been a high priority, with substantial funds allocated from the District Mineral Foundation Trust (DMFT). As of 2024-25, over ₹1,600 crore has been invested through DMFT for this purpose[8].

- The highest reliance is on community tap water, with over 43% of households depending on government-provided tap water.
- Approximately 17% of households reported using company-provided drinking water facilities, primarily tap water and handpumps.
- Dhanbad block has a diverse mix of water sources, including government tap connections, private handpumps, and wells. Govindpur and Nirsa blocks also rely on water tankers.
- The highest usage of company-provided community tap water is observed in Baghmara (2.7%) and Dhanbad (6.4%) blocks, highlighting regional variations in drinking water access.

Figure 5.2: Sources of drinking water for households in Dhanbad



5.4.2 Electricity

Official estimates suggest that Dhanbad is fully electrified under the Pradhan Mantri Sahaj Bijli Har Ghar Yojana (2023). The results of the primary survey also aligned with the official data, with about 96% of the households reporting having access to electricity.

5.4.3 Cooking fuel

Coal is the primary source of cooking fuel in Dhanbad district, particularly in mining areas, due to its easy availability and low cost in the local market. Survey results indicate that 72% of households rely on coal as their main cooking fuel. As assessment of coal use by respondents show that:

- On average, households with four to seven members use 40 to 50 kg coal per month for cooking and an additional 100 kg coal per month for heating for two to four months in a year.
- In areas with closed mines, the availability of coal has become limited, forcing residents to purchase it from markets supplied by other coal mining regions. This has led to economic challenges, prompting some households to transition away from coal as a cooking fuel.
- Approximately 18% of households use Liquefied Petroleum Gas (LPG) regularly for cooking, while only 0.3% have Piped Natural Gas (PNG) connections and utilize them.
- Around 9% of households prefer firewood, a choice more common in less urbanized and rural areas with limited access to alternative fuels.

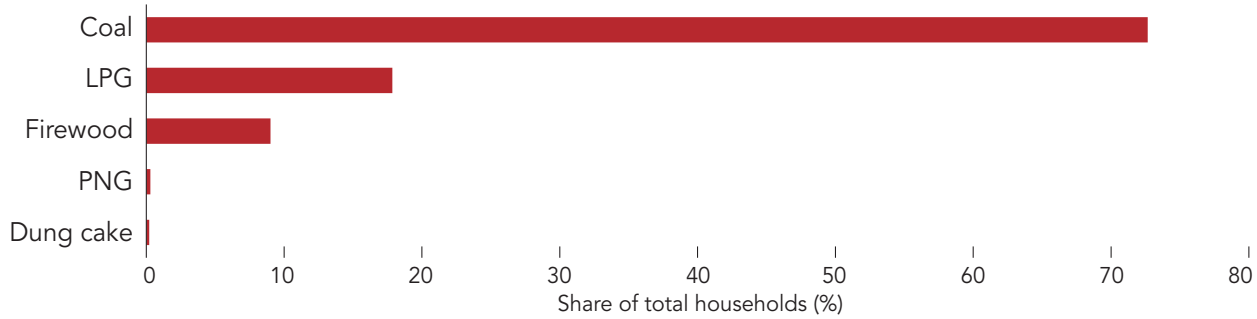
Overall, the results indicate households in Dhanbad uses about 360 kilotonnes of coal annually for cooking and heating purposes. This results in approximately 818 kilotonnes of CO_2 emissions per year from household fuel use alone.

Table 5.6: Estimation of emissions from cooking fuel and heating using coal

	Emissions from cooking fuel	Emissions from heating
No. of HH (District census handbook, 2011)	5,05,568	
HH estimated for 2025*	5,97,457	
Percentage of HHs using coal for cooking**	72%	
No. of HHs using coal for cooking	4,30,169	
HHs average use of coal per month of coal (kg)	45	100
Total coal use per month for HHs (kt)	19.4	43.0
Total coal use per year for HHs (kt)	232.3	129.1
CO_2 emissions (kt) per year***	525.8	292.2
Total CO_2 emissions (kt) per year	818	

*Estimated number calculated with 1.2% annual population growth rate
**iFOREST HH survey
***Using a factor for residential coal: GHG Platform India. (n.d.). Emissions Estimates Phase I: GHG emissions estimates 2007 to 2012 – National level. GHG Platform India. Retrieved July 15, 2025, from https://www.ghgplatform-india.org/emissions-estimates-phase-1/

Figure 5.3: Sources of cooking fuel for households in Dhanbad



5.5 Assets

5.5.1 Housing

While Dhanbad is a district that is dominated by businesses and service sector workers, proper housing is still a challenge for a significant proportion of the population. The results of the household survey show that 27% of the households in Dhanbad live in kutcha houses, constructed with less durable materials like mud or thatch. People with pucca houses accounted for over 35% of the respondents, and another 38% had mixed houses. Around 15% of the casual labour population reside in the kutcha housing, whilst around 13% of the self-employed population have pucca housing.

5.5.2 Land ownership

Comprehensive recent data on household ownership in the district is unavailable. However, the 2011 Census indicated that out of 5.1 lakh households in Dhanbad, over 3.5 lakh (around 70%) lived in self-owned homes. Approximately 15% resided in rented accommodations, while 12.5% lived in other housing arrangements. In comparison, The survey shows a higher rate of ownership, with 81.6% of respondents living in their own homes, 7% in rented housing, 4% in other types of housing, and another 4% in company-provided accommodation. About 3% of respondents did not disclose their housing status.

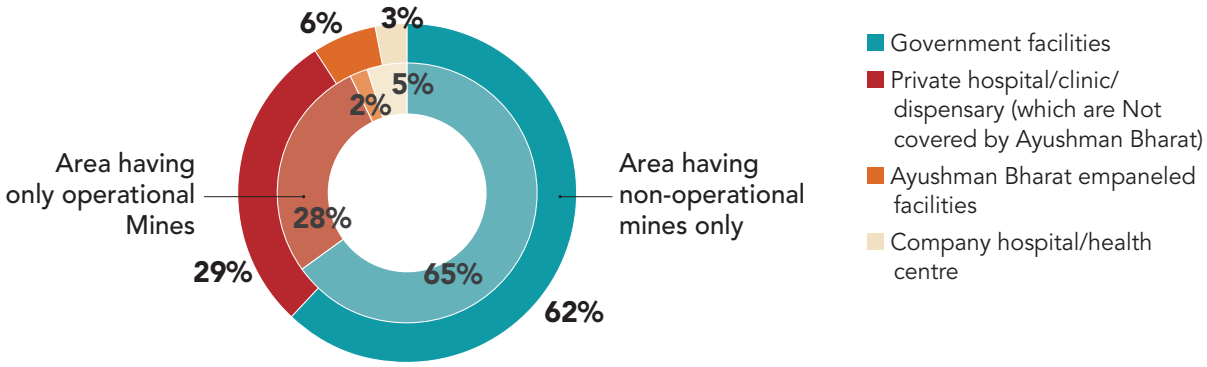
5.6 Comparative assessment of areas with operational and non-operational mines

It is important to note that there are no clear boundaries between people living near operational and non-operational mines. Many closed mines are located adjacent to operational mines, enabling residents to switch between these areas for their livelihoods. This creates a similar pattern in both regions regarding access to and dependence on social infrastructure, such as health and education.

5.6.1 Health care

The analysis shows that in both operational and non-operational mine areas, there is a significant reliance on government healthcare facilities, albeit with some distinctions.

Figure 5.4: Healthcare facilities accessed in operational and non-operational mine areas



Around 65% of households in operational mine areas and 62% in non-operational areas rely on government health facilities, followed by 30% accessing private providers. Company-run health facilities are used by over 5% of households in operational areas, 75% of whom are in rural locations, compared to only 3% in non-operational areas. While 65% of respondents do not expect mine closures to affect healthcare services, 35% expressed concern about future impacts on access and infrastructure.

5.6.2 Education

Non-operational areas show even greater dependence on government schools across all levels. In contrast, urban households in operational mine areas rely more on private institutions, but mine closures are perceived to reduce access due to falling household incomes.

Concerns persist, 11% of respondents feared the closure of company-sponsored schools, 28% reported rising education costs, and 3% noted students had dropped out due to a lack of nearby institutions. Among coal-dependent households, 52% reported no impact, but 18% cited closure of company facilities and 21% noted increased costs.

Overall, the survey underscores a strong reliance on government-provided social infrastructure in Dhanbad, with some dependence on BCCL-supported services in mining areas of Dhanbad block. Challenges in both education and healthcare stem from limited infrastructure, high population density, and the unaffordability of private services for many families.

5.7 District resilience assessment

The socio-economic conditions of a district, along with its infrastructure, are crucial determinants for the ability of the local community to adjust to any disruptions, such as the energy transition. Considering the various socio-economic and environmental parameters of Dhanbad as analysed in the previous chapters (Chapters 2 and 3), and the social and physical infrastructure, the resilience of the district is evaluated. The assessment takes into account the indicators considered by the Department of Science and Technology (DST) of the Government of India (GoI) to evaluate district climate vulnerability, along with other pertinent indicators that require attention in the district's context.

Table 5.7: Resilience assessment

Category	Criteria	Indicators	Status	Inference on resilience
Socio-economic	Poverty	i. Percentage of BPL population. ii. Percentage of households having a monthly income of less than ₹5000/- by the highest earning member in rural areas.	i. 64% of the population are BPL, as per the Jharkhand Economic Survey 2023-24. ii. 74% of rural HHs have their highest earning member earning less than ₹5,000 per month, as per the previous Socio-Economic and Caste Census (SECCC) 2011.	Poor
	Deprivation	i. Percentage of multidimensionally poor people.	i. 17.2% of the population in the district are multidimensionally poor. This is relatively above the state average of 28.8%, as per the 2023 estimates by NITI Ayog.	Moderate
Agriculture	Total agricultural land & net sown area	i. Proportion of total agricultural land area in the district.	i. 19.8% of the land in the district is agricultural land. Of this, only 24.5% constitutes the net sown area.	Poor
		ii. Irrigated land area	ii. Irrigated land area is very low. iii. Various state and central level schemes in place for drip irrigation (Pradhan Mantri Krishi Sinchai Yojana (PMKSY), Johar Community-Managed Micro-Irrigation Scheme (CMMIS) etc.)	Low (with potential for development)
		iii. Proportion of single-cropped area	iv. 75% of the agricultural land is single-cropped.	Poor
	Agricultural contribution to district GDP	i. % of Agricultural contribution to district GDP.	i. Agriculture constitutes only 0.7% of the district's GDP and 6% of the primary sector share.	Poor
	Horticulture	i. Contribution to district GDP	i. Around 0.5% of the district's GDP. ii. Mission for Integrated Development of Horticulture, Directorate of Horticulture, Jharkhand.	Low (with potential for development)
	Livestock	ii. Contribution to district GDP	iii. Around 2.5% of the district's GDP.	Poor

Table 5.7 continued

Category	Criteria	Indicators	Status	Inference on resilience
Infrastructure	Health care infrastructure	i. Healthcare facilities and resources. ii. Access to healthcare facilities, resources, and reliance.	i. When compared to Indian Public Health Standards (IPHS), there is a gap of 60 PHCs, 293 HSCs, and 8 CSCs. ii. There are 74 health facilities run by BCCL iii. The overall access to health care facilities is not adequate in the district, with the prevalence of private players. Public health facilities in rural and tribal regions still need improvement. iv. As per the survey, 67% of the households depend on the public health facilities, and 27% depend on private. The rest of BCCL facilities.	Moderate
	Education	i. Educational infrastructure ii. Enrolment and completion iii. Female literacy	i. Only Dhanbad block has gaps in the number of primary (67) and secondary schools (33), and Nirsa block has gaps in all three school levels. ii. BCCL somewhat plugs these gaps with its 23 schools. iii. Private educational institutions play a significant role, particularly at the upper-primary, secondary, and higher-secondary levels. iv. As per the survey, around 68% of the school-going person attended government schools, 29% attended private school and around 0.35% attended coal company schools. v. Female literacy in the district is 64.30%.	Moderate to Good
	Access to clean drinking water	i. Percentage of households with improved drinking water source (piped water supply)	i. As per the survey, 43% of the households depends on piped water supply by the government and 17% on the same provided by coal companies.	Poor
	Road and rail network	i. Access and connectivity	i. Excluding National highways and rural roads, the district has a road network of 498 (with 239 km road density). ii. It has a 571 km two-way railway network.	Good

Table 5.7 continued

Category	Criteria	Indicators	Status	Inference on resilience
Workforce	Labour participation in work	i. Proportion of non-workers. ii. Proportion of women's participation in the workforce. iii. Worker distribution.	i. 52.6% of the working age group population are non-workers. ii. 22% of the total workers are women. iii. Around 21% of surveyed households directly or indirectly depend on coal and related work for their primary income. iv. Around 28% depend on business and services induced by coal. v. Another 21% in other service sectors (such as schools, hospitals, banking and other private companies).	Moderate
Income	Income shares from natural resources	i. Output and income from agriculture, livestock and fisheries. ii. Income from forest products/resources.	i. Contribution from agriculture, livestock, fisheries and forest resources to district GDP together is 3.7%. ii. Among the survey samples, only 2.2% households reported to have primary earnings from agriculture and forestry.	Poor
	Dependence on coal for earning	i. District GDP dependence	ii. The contribution of coal mining in the district GDP is around 8%. At the same time, contribution from industries and manufacturing induced by coal to the district GDP is 58%.	Poor

Source: iFOREST assessment based on Survey

CHAPTER 6

DHANBAD JUST TRANSITION PLAN

- *Dhanbad faces an imminent challenge of just transition with about 67% of its mines to face transition issues in various clusters in next five years.*
- *Repurposing uncultivable barren land provides huge opportunity for renewables infrastructure and green industry development.*
- *Over 10,700 hectares of mining land can become available in next 25 years for repurposing, following scientific closures and reclamation.*
- *Over 50% of coal-dependent workers are under 40 years, making reskilling a critical issue to support workforce transition.*
- *DMF funds provide a crucial opportunity to support just transition measures acting as a seed money.*

6.1 Introduction

Dhanbad is facing an imminent challenge of fossil fuel transition, with a significant share of its coal mines becoming economically unviable and many nearing the end of their operational life. This has implications for the region's socio-economic fabric. Employment and livelihoods directly and indirectly linked to coal mining and coal-based industries are at risk. Furthermore, the decline in coal mining will reduce government revenues, constraining investments in development, infrastructure, and welfare, and undermining the district's long-term growth and resilience.

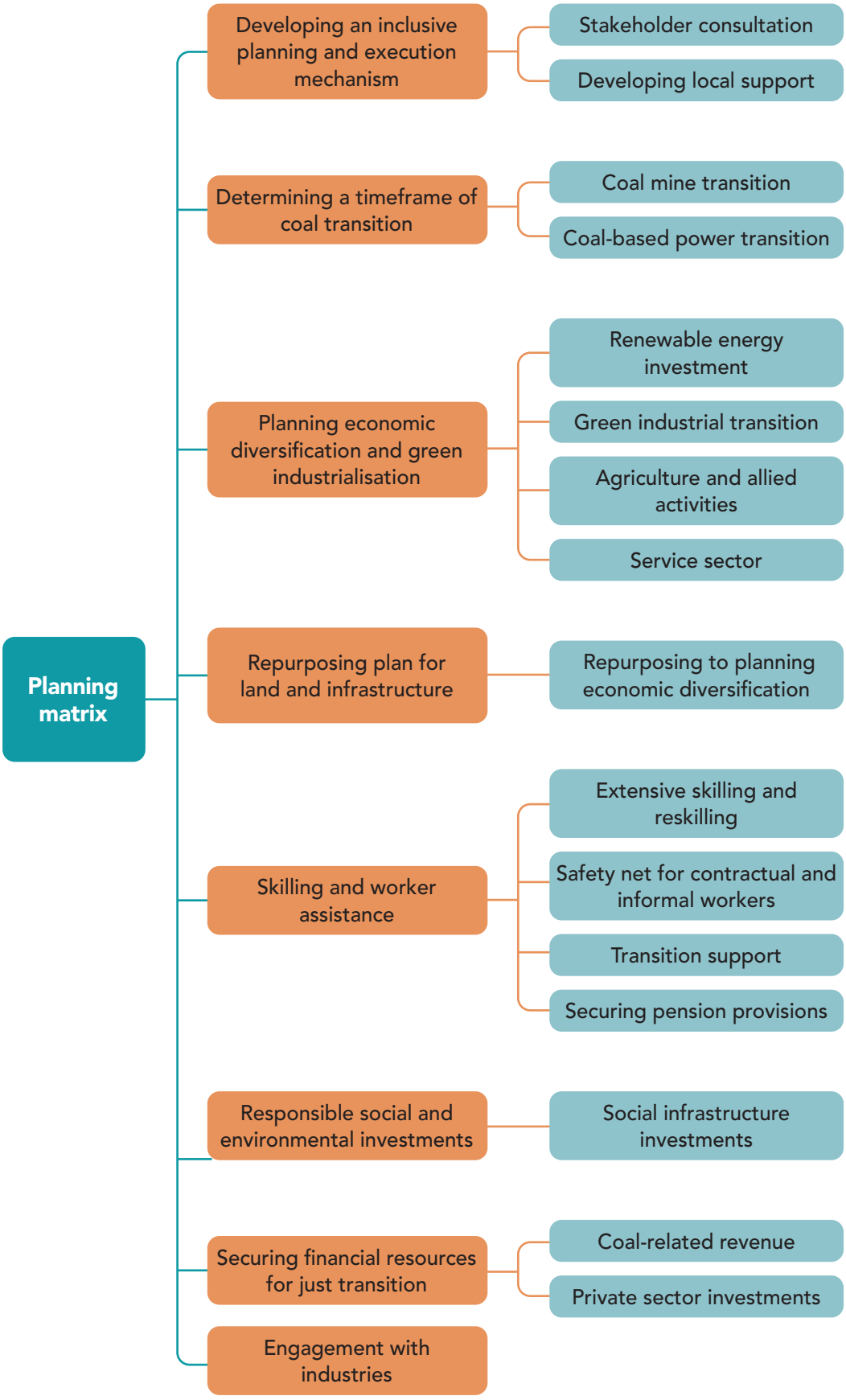
A Just Transition Plan (JTP) is urgently needed for Dhanbad to minimise socio-economic disruptions in the event of a transition. In the absence of it, the region could face rising unemployment, outmigration, and increased socio-economic vulnerability. A well-designed JTP can guide the diversification of the local economy, support green investments, generate local employment, minimise outmigration, and support long-term environmental and economic resilience of the district.

Considering this, a just transition planning matrix for Dhanbad is proposed. Eight key aspects have been considered for developing the plan. These include:

i. An inclusive planning and execution mechanism;
ii. Determining the timeframe for a just transition, considering a phased closure of coal mines and the coal-based power plant;
iii. Repurposing of land and infrastructure;
iv. Planning economic diversification, including green energy and industries;
v. Skilling and reskilling of the workforce and providing worker assistance;
vi. Responsible social and environmental investments;
vii. Securing finances for just transition; and,
viii. Engaging PSUs and private industries.

The details of each of these components in provided in the following sections.

Figure 6.1: Planning matrix for just transition

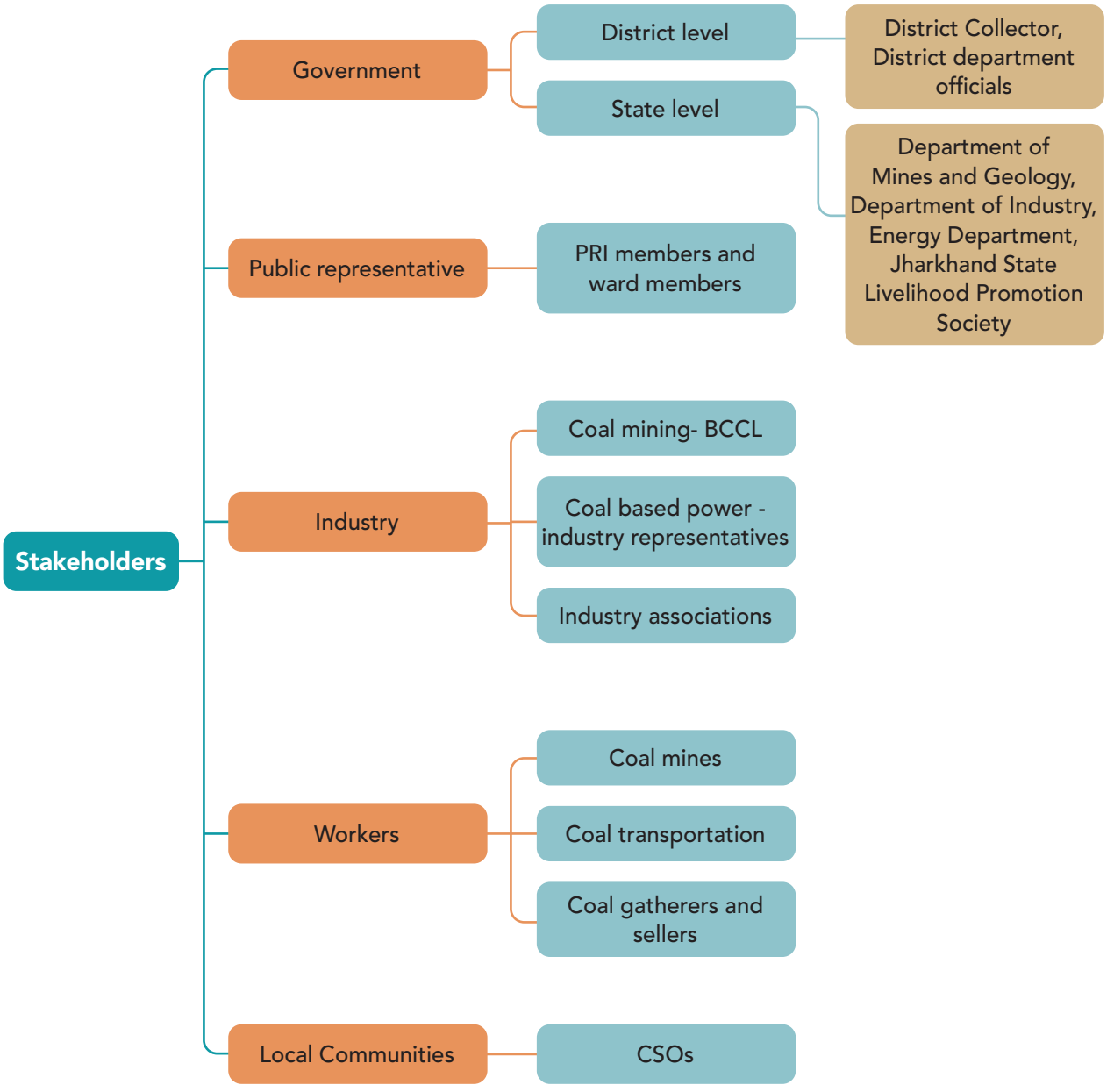


6.2 Inclusive planning mechanism

Planning a just transition requires an inclusive approach to ensure that the needs and aspirations of local communities shape both the planning process and the resulting investments. Moreover, inclusive processes help build broad-based support and foster local ownership of the transition.

To support inclusive planning and capture a wide range of perspectives, focus group discussions (FGDs) and interviews were conducted with diverse stakeholders in Dhanbad. These included coal gatherers and sellers, local communities, representatives of panchayati raj institutions (PRIs), coal transporters, and owners of local industries and businesses. Additional consultations were held with state and district officials, industry representatives, and labour union members to understand key concerns, opportunities, and priorities for just transition planning in the district. The responses bring out the diversity of opinions of various stakeholders on how a just transition can be managed in the district, considering challenges of jobs and livelihood security, economic opportunities, and supporting inclusive development.

Figure 6.2: Stakeholder engagement matrix



STAKEHOLDER PERCEPTION

The FGDs undertaken in Dhanbad district provide important insights on needs and aspirations about jobs and livelihood, economic diversification and opportunities in the district and other environmental and developmental issues. The key observations on these components, as captured from stakeholders, is summarised below.

Jobs and livelihood

Coal gatherers and sellers

- Implement skill development programs in diverse sectors, strong demand for training in sectors like:
  - » Servicing and repair (electrician, mechanic, welder, etc.)
  - » Construction (masonry)
  - » Information technology (computer operations, office jobs)
  - » Transportation (driving)
- Involve youth and educated individuals.
- Enroll individuals aged 30+ or school dropouts in vocational training centers.

Industry associations and businesses

- Investment in education and training for creating jobs and readiness for such jobs among students, youth and younger generation.
- Associations like the Purana Bazar Chamber of Commerce are experiencing increased competition in national tenders and facing the scarcity of manpower in underground mines.

Economic diversification

District officials

- Green industry investments, considering the district's industrial and economic base and connectivity.
- Employment opportunities for coal gatherer and sellers, and also in areas around Jharia resettlement areas.

Panchayati Raj Institution (PRIs) and ward members

- Diversify livelihoods through activities like livestock-based industries and MSMEs (e.g., FMCGs, beauty parlors, computer learning centers, mobile repair shops, fly-ash brick manufacturing).
- Develop green jobs, especially for women, including home-based opportunities.

Coal transporters

- Prevent migration through skill development and alternative livelihood opportunities.
  - » Diversify into industries like tourism or other transportation services.
  - » Establish local industries to sustain transport businesses.

Industry associations and businesses

- Give focus to sectors such as food processing, poultry, dairy-based industries, and tourism for economic sustainability.
- Bring in new investments through government support, as most people in urban areas want to work in industries, businesses, or other salaried jobs.

Opportunities for the district

Coal gatherers and sellers

- Increase government investments in social and community infrastructure.
- Redirect CSR initiatives to address these gaps.

Panchayati Raj Institution (PRIs) and ward members

- Lack of basic amenities like clean drinking water, sanitation (toilets), electricity, proper drainage, and cooking fuel in coal mining areas
- Enhance local participation in welfare programs and decision-making processes. Empower women through self-help groups (SHGs).
- Align CSR initiatives with community needs. Also, utilise DMF funds for livelihood generation.

Coal transporters

- Develop policies to mitigate tax burdens and manage rising costs.
- Improve local infrastructure for rail and road connectivity.

Industry associations and businesses

- Provision of initial financial support and incentives by the government to attract businesses.
- Improvement of local connectivity through rail and road for industrial accessibility.
- Development of supportive policies and infrastructure for sectors like MSMEs, fertilisers, and cement industries.
- Collaborative efforts with stakeholders for transitioning to and thriving in alternative sectors.

Way forward from stakeholder perception

- **Suggested requirements for unskilled workers:**
  - » Servicing and repair (electrician, mechanic, welder, etc.).
  - » Construction (masonry).
  - » Information technology (computer operations, office jobs).
  - » Transportation (driving).
- **Certification programs** focused on enhancing industry-relevant skills can:
  - » Empower district youth.
  - » Improve livelihood opportunities through job-linked trainings.
  - » Support economic diversification.
- **Recognition of Prior Learning (RPL)** should be emphasized to:
  - » Validate informally acquired skills.
  - » Increase employment prospects for workers.
- **Existing Industrial Training Institutes (ITIs)** can be:
  - » Re-modelled to integrate skilling and RPL.
  - » Used for partnerships with public and private sector industries.
  - » Jharkhand Education Project Council (JEPC) and Jharkhand State Open School (JSOS) can be aligned to strengthen foundational skills and support inclusive skill development.
- **Promoting women's participation in paid work** is critical:
  - » Expand income-generating activities.
  - » Redistribute economic opportunities to household spaces.
- **MSMEs and local industries** (e.g., food processing, paper, forest, and agricultural products):
  - » Can engage home-based workers.
  - » Tailor activities to leverage the underutilized workforce.
  - » Strengthen local employment opportunities for semi-skilled workers,who can be easily skilled for these units.

6.3 Transition timeframe

While Dhanbad has been a top coal-producing district of Jharkhand and the country, the district's coal mines are facing transition challenges due to resource exhaustion[1] and economic unviability. As noted earlier (in Chapter 3), 44 mines are already temporarily or permanently closed, and only 33% are profitable. Considering this, it is essential to assess a clear transition timeline for coal mines in the district. This will enable proactive planning for economic diversification and green investments, while ensuring the retention of existing jobs and the creation of new employment opportunities. Considering remaining mine life (as per current estimated reserves) and economic viability of the mines (those that are already unprofitable), a transition timeframe is outlined below in three phases.

6.3.1 Phase I: by 2030

There are 32 operational mines, which will potentially close by 2030 with a total of about 42 MMTPA of production capacity, which is over 60% of the total production capacity of the district. All three mining blocks, Dhanbad, Nirsa and Baghmara will be impacted by such closures.

Table 6.1: Phase I mine closures - 2030

Block	No. of mines to be closed			Production capacity (MMTPA)		
	OC + mixed mines	UG mines	Total	OC + Mixed mines	UG mines	Cumulative production capacity
Dhanbad	11	2	13	19.7	4.7	24.4
Baghmara	6	1	7	11.5	0.1	11.6
Nirsa	9	3	12	5.9	0.3	6.1
Total	**26**	**6**	**32**	**37.2**	**5.0**	**42.1**

Source: iFOREST assessment

6.3.2 Phase II: 2031-2040

Seven mines will additionally close during this phase, with a cumulative production capacity of 14.9 MMTPA. Therefore, by 2040, the district will potentially face a decline of about 82% of its total production capacity.

Table 6.2: Phase II mine closures - 2040

Block	No. of mines to be closed			Production capacity foregone (MMTPA)		
	OC + mixed	UG mines	Total	OC + Mixed mines	UG mines	Cumulative production
Dhanbad	3	2	5	6.2	2.8	9.0
Baghmara	1	0	1	0.4	0.0	0.4
Nirsa	1	0	1	5.5	0.0	5.5
Total	**5**	**2**	**7**	**12.1**	**2.8**	**14.9**

Source: iFOREST assessment

6.3.3 Phase III: 2041-2050

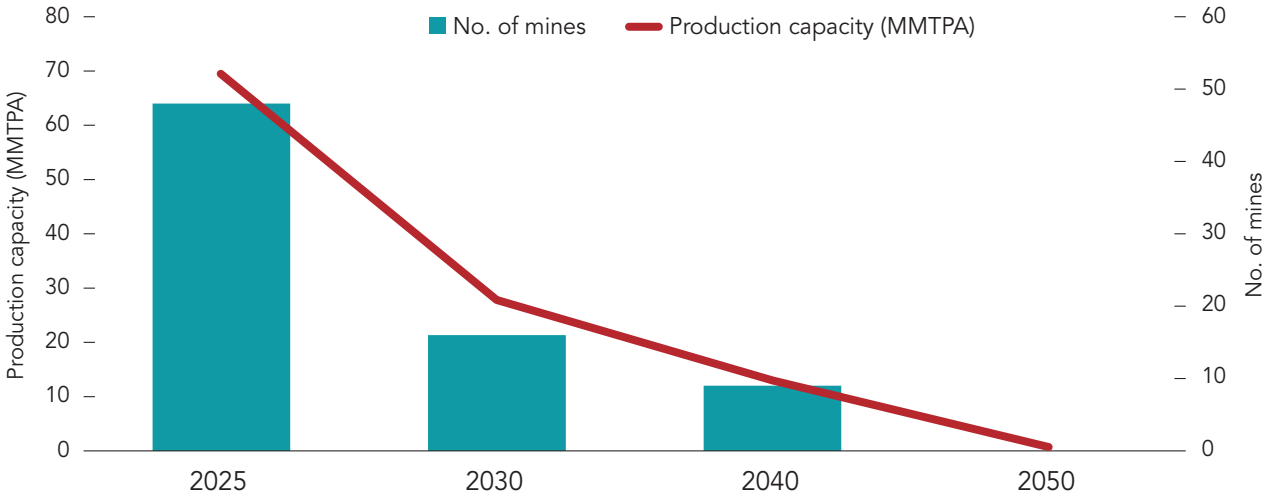
All nine remaining mines, with a remaining production capacity of 12.4 MMTPA, will close by 2050.

Table 6.3: Phase III mine closures - 2050

Block	No. of mines to be closed			Production capacity foregone (MMTPA)		
	OC+ mixed mines	UG mines	Total	OC+ mixed mines	UG mines	Cumulative production capacity
Dhanbad	5	1	6	4.0	2.5	6.5
Baghmara	0	2	2	0.0	0.7	0.7
Nirsa	1	0	1	5.2	0	5.2
Total	**6**	**3**	**9**	**9.2**	**3.2**	**12.4**

Source: iFOREST assessment

Figure 6.3: Coal mine closure scenario in Dhanbad



6.3.4 Phase-down of thermal power plants

The one TPP in Dhanbad district with two power generation units consumes 4 MMTPA coal for power generation. The operational life of a TPP is designed for 25 years, and we consider 35 years, which is 10 years more than the 'design life' as stipulated by the Central Electricity Authority[2]. Accordingly, Maithon TPP is expected to retire by 2050. The closure of TPP aligns with the final mine closure timeframe in the district.

Table 6.4: Closure timeframe for TPPs in Dhanbad district

Owner	Name of TPP	Unit no.	Installed capacity (MW)	Net generation (MW) in 2024-25	Coal consumption (MMTPA)	Year of commissioning	Year of reaching 25-year age	Year of reaching 35-year age
Tata Power and DVC	Maithon TPP	1	525	468	4	2011	2036	2046
		2	525	411		2012	2037	2047

Source: Coal Stock Report (May 2025) and Report on the Energy Generation Programme 2024-25, Central Electricity Authority, Govt. of India (2025).

6.4 Repurposing coal mining land

Dhanbad has a significant expanse of land under active and closed coal mines. A review of post-closure land use plans, especially for operational mine clusters in the district indicates that approximately 10,764 ha of land could become available for repurposing as mines reach the end of their operational life. Of this, around 2,232 ha may become available by 2030. This estimate excludes land associated with UG mines, given the risks posed by surface subsidence.[3]

Following scientific mine closure and reclamation, these lands can be transformed into valuable assets for economic diversification, green growth, and community development. The potential repurposing options are as follows:

- Over 3,200 ha from reclaimed quarries, overburden dumps, and similar sites — ideal for renewable energy (RE) projects, particularly large-scale solar PV.
- Around 5,300 ha of scrubland and wasteland — suitable for RE development, green industries, agroforestry, or hybrid land use models.
- 284 ha of water bodies — offering opportunities for floating solar installations or sustainable pisciculture (subject to scientific feasibility).
- 1,880 ha of cropland and fallow land — suitable for horticulture and agroforestry, boosting rural livelihoods and supporting local economic diversification.

Table 6.5: Estimated mine land available in Dhanbad for repurposing (ha)*

Type of land	Land Use	By 2030	2030-2040	2040-2050	Total	Potential Use
Disturbed area	Coal Quarry, Advance Quarry Site, Coal Dump	186	178	488	853	Solar PV
	Barren OB Dump	247	111	603	961	
	Area under Backfilling (Technical Reclamation)	251	353	876	1,479	
Undisturbed area	Scrubs (100%)	497	533	1,895	2,925	Solar PV, green industries
	Social Forestry (50%)	74	95	275	444	
	Waste Land	546	369	1,024	1,938	
Water body	Reservoir, Nallah, Pond	35	30	219	284	Floating solar
Agriculture	Crop Land + Fallow Land	396	112	1,372	1,880	Agro-forestry / Horticulture
Total		**2,232**	**1,780**	**6,752**	**10,764**	

Source: iFOREST estimation from Environmental Clearance (EC) letters of respective coal mines CMPDI mine database

(*) Assumptions:

a) In the mines having diverted forest land where there is dense or open forest, the entire diverted forested area has not been taken for land repurposing.

b) Plantation on OB and backfilled areas has not been considered, as these constitute only around 4% of the total area across the region and have been left as green zones.

c) By definition Social Forestry area does not come under protected forests, and hence no NOC is required - 50% of the land is taken for repurposing activities.

d) 100% barren OB dump and area under backfilling are included.

e) 100% of scrubland is included.

f) 100% area under coal quarries, advanced coal quarries, coal dumps, and waste land has been considered for land repurposing.

g) Final mine void and land reserved for settlements- Urban, Rural, and Industrial is not considered in the calculation due to inconclusive information.

h) The entire area of reservoirs, nallas, ponds, cropland, and fallow land has been considered for repurposing.

6.5 Economic diversification and green investments

Economic diversification, driven by effective local resource utilisation and green investments, will be essential to enable a just transition in Dhanbad. With proactive planning and strong policy support, the district can generate new economic and employment opportunities that replace coal dependence with sustainable growth pathways.

The following are some of the key opportunities of economic diversification and green investments.

6.5.1 Strengthening agriculture and allied sectors

Agriculture

With 64,060.3 ha (31%) of its area under agriculture (Chapter 2), Dhanbad must strengthen farming and allied sectors to ensure rural livelihoods and food security. The sector is constrained by a number of challenges, such as, heavy reliance on single cropping, inadequate irrigation facilities, fragmented landholdings, limited mechanisation, and insufficient value addition.

Most cultivation in Dhanbad is rain-fed, making farmers heavily dependent on the monsoon. This restricts the cropping cycle largely to the Kharif season, leaving agricultural land underutilised during Rabi and Zaid seasons. Yields are further limited by outdated farming practices, poor soil health, and insufficient adoption of high-yield or climate-resilient crop varieties. Market access remains weak due to inadequate storage, transportation bottlenecks, and limited farmer participation in producer cooperatives.[4]

Revitalising agriculture through enhanced irrigation, improved market access, and the adoption of climate-resilient crops[5] can provide sustainable livelihoods, particularly in rural parts of the district for communities formerly dependent on mining. Complementary activities such as animal husbandry and horticulture can further diversify and stabilise rural incomes.[6] Coal mining land and other barren areas in the district offer significant potential for conversion into agro-industrial hubs, enabling value addition and local job creation. This transition will require strong government support, targeted capacity building, and substantial investment in agricultural infrastructure.

Horticulture

Horticulture offers significant potential to diversify agriculture and enhance farm incomes, particularly for small and marginal farmers. The district's agro-climatic conditions are suitable for cultivating a variety of fruits and vegetables such as mango, guava, papaya, tomato, brinjal, and leafy greens.[7] Despite this potential, the sector remains underutilised due to limited irrigation infrastructure, post-harvest losses, and weak market linkages.

Scaling up horticulture will require a package of interventions:

- Expanding extension services to disseminate best practices in crop management, pest control, and organic farming.
- Developing quality nursery infrastructure for high-yield and disease-resistant planting material.
- Deploying drip irrigation and mulching techniques to improve water use efficiency.
- Establishing cold chain infrastructure, packhouses, and food processing units to reduce wastage and increase value addition.

Policy convergence with schemes like the Mission for Integrated Development of Horticulture (MIDH) and Rashtriya Krishi Vikas Yojana (RKVY) will be critical in providing subsidies, technical support, and market infrastructure to scale horticultural production and marketing.

Animal husbandry and dairy

Livestock rearing, especially cattle, goats, and poultry, is a traditional livelihood for rural households. However, productivity is constrained by poor access to veterinary services, limited fodder availability, and a lack of breed improvement programs.[8]

Strengthening animal husbandry will require:

- Establishing veterinary clinics and mobile veterinary units for remote villages.
- Developing fodder banks and encouraging fodder cultivation alongside crops.
- Expanding artificial insemination services to improve breeds for higher milk and meat yields.
- Supporting dairy cooperatives and producer companies for efficient milk collection, chilling, and processing.

Such interventions can significantly raise farm incomes, reduce rural distress migration, and build a more resilient rural economy.

Agro-forestry on degraded lands

Agroforestry offers a productive use of degraded and fallow land. By integrating trees, such as fruit-bearing, timber, and medicinal species, with food and fodder crops, these lands can serve multiple purposes: restoring soil fertility, improving water retention, sequestering carbon, and providing steady income sources for rural households. Agroforestry can also act as a natural buffer against climate variability and generate additional stable income for rural households.[9]

To scale this approach, programmes such as MGNREGA and state forestry initiatives can be leveraged to provide labour, saplings, and technical support. Community-led models, supported by training in plantation management and value-chain development, can ensure both environmental restoration and livelihood generation. Over time, such interventions can turn degraded landscapes into thriving green zones that support both biodiversity and rural economies.

To strengthen agriculture and allied sectors in Dhanbad and position them as key pillars of the district's post-coal economy, the following priorities should be pursued:

- Expand irrigation access by scaling up solar-powered pumps, drip and sprinkler systems, and decentralised rainwater harvesting to reduce dependence on erratic monsoons and enable multi-cropping.
- Promote integrated farming systems by encouraging diversification through combinations of crops, livestock, fisheries, and agroforestry to optimise land and resource use while reducing risks.
- Strengthen rural infrastructure through investments in veterinary clinics, fish hatcheries, livestock feed units, rural cold storages, and agro-processing facilities to improve productivity and value addition.
- Enable policy convergence by leveraging schemes such as RKVY, PM Matsya Sampada Yojana, National Livestock Mission, and Agricultural Technology Management Agency (ATMA) for input support, technical training, and market access.
- Improve financial access by expanding institutional credit through NABARD, regional rural banks, and cooperatives, along with providing working capital, insurance, and infrastructure loans to de-risk smallholder investments.

By addressing these priorities in an integrated manner, Dhanbad can unlock the full potential of its agricultural and allied sectors, building a resilient, inclusive, and diversified rural economy that complements the broader just transition agenda and safeguard livelihoods.

6.5.2 Green industries

Developing and investing in green industries, including MSMEs, will be central to driving economic diversification in Dhanbad, a district where over half of the GDP currently comes from industries such as mining, electricity, and manufacturing. As the economy transitions, Dhanbad offers a uniquely strong platform for future growth, combining industrial heritage, abundant land resources, and expanding connectivity.

The district has an estimated 27,218 ha of barren, 'usar' (saline/alkaline), and non-agricultural land that can be rapidly repurposed for high-impact green ventures. These include renewable energy parks, agro-industrial clusters, low-carbon logistics hubs, and advanced manufacturing facilities. The scale of available land offers investors rare flexibility, enabling large-scale anchor projects as well as modular MSME clusters.

Dhanbad's infrastructure backbone is another compelling advantage. The district's road network is already denser than the state average,[10] and upcoming projects like the Raipur–Ranchi–Dhanbad Expressway will sharply reduce travel times to major industrial and consumer markets. Rail connectivity is even stronger, well above the national average, providing cost-effective freight movement for bulk goods and manufactured products. Power infrastructure is robust, anchored by the Damodar Valley Corporation's (DVC) transmission network, ensuring reliable supply for energy-intensive industries and green manufacturing.

Water availability is a further asset. With 822 water bodies, 248 waterways,[11] and two major dams (Maithon and Panchet Hill) holding a combined 0.7 billion cubic metres,[12] Dhanbad can support both industrial water needs and expanded irrigation for agri-based value chains.

The district's urban service base, home to prominent educational institutions, administrative infrastructure, and a growing tertiary sector, further offers an enabling ecosystem for skilled workforce development and modern business services.

In essence, Dhanbad is uniquely positioned to become a regional hub for renewable energy, green manufacturing, agro-based industries, and logistics. With strategic investment and policy alignment, the district can transform its post-coal economy into one of eastern India's most dynamic growth stories, anchored in sustainability, resilience, and inclusive development. Targeted incentives should be provided to geren MSMEs and start-ups. The Jharkhand Industrial Area Development Authority (JIADA) and Jharkhand Renewable Energy Development Agency (JREDA) may offer targeted incentives and land access for MSMEs and cooperatives for promoting green industries, including agro and forest-resource based industries. Linking these units to Startup Jharkhand and Jharkhand State Livelihood Promotion Society (JSLPS) will enable inclusive entrepreneurship and job creation. *(Refer to Chapter 7 for a detailed regional plan)*

Table 6.6: Physical infrastructure status of Dhanbad

Parameter	Dhanbad	Jharkhand	India
Road density, km per 1000 sq. km (year)	246[1] (2023)	177 (2023)	1,934[2] (2020)
Rail network, km per 100 sq.km (year)	7.3-10[3] (2015)	7.3[4] (2015)	2.1[5] (2023)
Power supply ckt km (year)	104[6] (2025)	4,792[6] (2025)	4,85,935[7] (2024)

Source:
1 Finance Department, Government of Jharkhand. (2024). Jharkhand Economic Survey 2023–24.
2 Ministry of Road Transport and Highways, Government of India. (2020). Basic Road Statistics of India 2019–20.
3 iFOREST estimate based on Ministry of Railways reports, East Central Railway data, and district area statistics (no direct official figure available).
4 Ministry of Railways, Government of India. (2015, March 11). Railway network density in Jharkhand [Lok Sabha Unstarred Question No. 2798].
5 Ministry of Railways, Government of India. (2023). Indian Railways Year Book 2022–23.
6 Damodar Valley Corporation. (n.d.). Transmission Lines.
7 Indian Infrastructure. (2024, June 27). Transmission Transformation: Building a Robust Network to Meet India's Energy Ambitions.

6.6 Workforce transition and skilling

Workforce transition and development are central pillars of just transition planning. Dhanbad, the gradual phase-down of coal mining over the next three decades will directly affect an estimated 137,325 formal and informal workers who depend on coal mining and related activities. Around 50% of these workers are under the age of 40, presenting both a major challenge and a strategic opportunity for targeted reskilling and employment diversification. The district will require reskilling for about 68,000 workers, alongside broader measures for social protection, livelihood security, and preparing the workforce for new green industries.

6.6.1 Key issues in workforce transition

The design of labour transition measures in Dhanbad must take into account three critical factors:

a. Demand for skilled workers in both existing industries and emerging green sectors;

b. High and growing share of contractual and informal labour; and,

c. An ageing formal workforce, with a large share nearing retirement.

a. Demand for skilled workers in emerging sectors

The economic and industrial diversification in Dhanbad, along with opportunities emerging in surrounding districts in the coming years—backed by government policies and public and private investments—will require a steady supply of skilled workers. This demand is expected to grow in industries such as RE, green manufacturing, agro-processing, and related sectors. Moreover, the shift towards modern mining, digitisation, and decarbonised production processes will create the need for specialised technical skills.

Skilling and reskilling the workforce will be critical to retaining local jobs and improving the employability of young workers in the district.

b. Rising share of contractual and informal labour

Informal employment dominates the coal sector, accounting for over 70% of the workforce in mines, washeries, and power plants. Outsourced workers are concentrated in tasks such as overburden removal, transport, loading/unloading, and sanitation.

With PSUs limiting permanent recruitment, the proportion of casualised and contract-based jobs will increase. The 2018 amendment to the Industrial Employment (Standing Orders) Act, intended to improve

transparency in employment practices, has reinforced this trend. Most new industrial jobs are expected to be contractual, making safety nets and skills development for this group a priority.

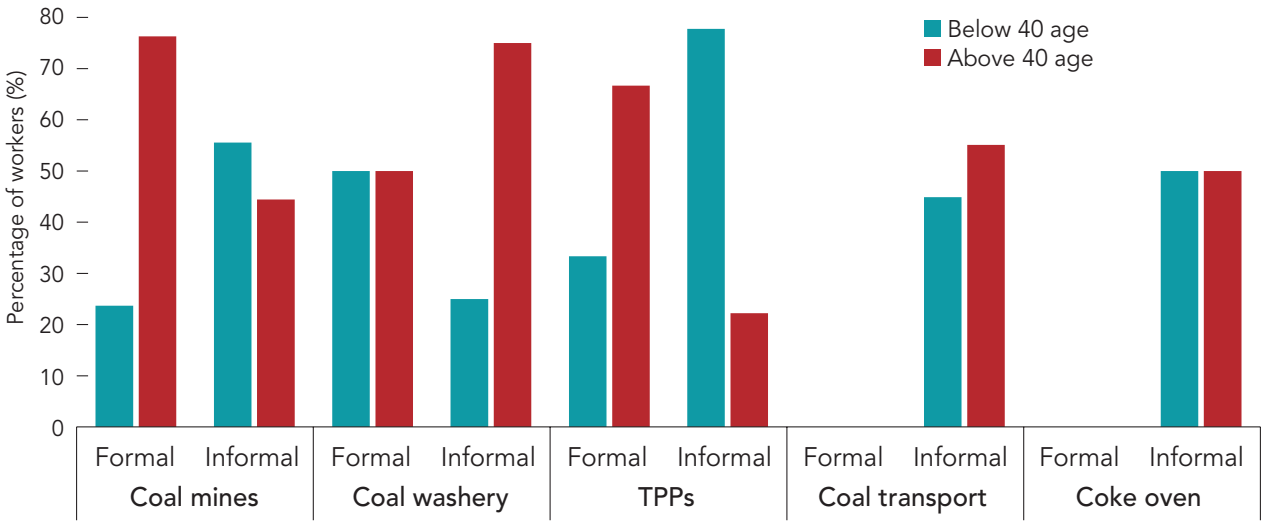
Therefore, the transition of contractual and informal workers through targeted skilling programmes and social support schemes will be important for the just transition of the workforce.

c. Ageing formal workforce and pension support

The ageing workforce issue is particularly significant for the formal coal mining workers in the district, as is the case in many other coal-dependent regions. Survey data show that most formal employees in coal mines, washeries, and thermal power plants are above the age of 40, with a substantial proportion in the 50–58 age bracket. Many are expected to retire within the next decade, leading to a simultaneous loss of experienced operational and supervisory talent and a reduction in the number of permanent jobs available in the formal sector.

This shift underscores the need for dual strategies—ensuring robust retirement and pension planning for older workers, while providing targeted training and placement support to younger entrants in the workforce.

Figure 6.4: Age distribution of workers in various coal-dependent industries



Source: iFOREST assessment from survey results

6.6.2 Intervention measures

The intervention framework for Dhanbad's workforce transition is designed to address the three critical challenges identified above.

Skilling and reskilling of the workforce

The skilling and reskilling of the workforce will require the following intervention measures: .

- Leverage the district's network of 3 government and 44 private ITIs,[13] along with IIT-ISM Dhanbad, to deliver targeted training for green and diversified industries such as renewable energy, green manufacturing, agro-processing, and ICT.
- Upgrade ITIs, polytechnics, and skill centres to offer market-relevant, future-ready training in modern mining, RE, green industrial processes, digital systems, and decarbonised production processes.
- Expand Recognition of Prior Learning (RPL) to certify informal workers' skills and align them with market needs.
- Collaborate with Jharkhand Skill Development Mission Society (JSDMS) to anchor a district-wide skilling initiative focused on green sectors.

- Create skill–job pipelines by linking training programmes with Jharkhand Industrial Area Development Authority (JIADA), Jharkhand Renewable Energy Development Agency (JREDA), and private employers.
- Forge partnerships with BCCL and other industries to co-develop training curricula, provide on-the-job training, and guarantee placement opportunities in both existing and emerging sectors.

Transitioning contractual and informal workers

The transition of contractual and informal workers—many of whom are concentrated in coal mining, transport, and ancillary services—will require a combined approach of social protection, income security, and targeted skill development to prevent livelihood loss and economic exclusion. The following measures will be critical:

- Strengthen social security delivery by enhancing the capacity of Jharkhand's Unorganised Workers Social Security Board and State Labour Welfare Board to provide transitional income support, universal health coverage under Ayushman Bharat Mukhya Mantri Jan Arogya Yojana, and pension benefits through Mukhyamantri Asangathit Shramik Samajik Suraksha Yojana.
- Expand and accelerate E-Shram registration to cover all unorganised workers in the district, ensuring portability of welfare benefits across sectors and geographies.
- Deliver industry-linked skilling programmes specifically tailored for contract and casual workers, focusing on high-demand green sectors such as RE, installation and maintenance, green construction, agro-processing, sustainable logistics, etc.
- Integrate placement and entrepreneurship pathways by connecting workers to job matching platforms, microenterprise financing, and cooperative-based employment models in green MSMEs, with active facilitation from the Jharkhand Industrial Area Development Authority (JIADA) and private industry associations.

- Leverage industry CSR and DMF fundstosupport targeted skilling programmes for low paid contractual and informal workers, and also for workforce development among the youth.
- Improve social and digital inclusion. The Jharkhand State Livelihood Promotion Society in coordination with Jharkhand State Co-operative Bank and Common Service Centres (CSCs) may scale digital literacy, mobile banking, SHG-led fintech services, and last-mile digital skilling. Special focus should be given to rural women, youth, tribal population and microenterprises for accessing loans through Mudra, insurance, and direct benefit transfers.

Addressing the ageing workforce challenge

Pension is going to be a major financial liability of the PSUs that the industry and the government will need to consider in the event of a just transition. A trend analysis of past six years (since 2015) of CIL pension demand shows that pensioners with the coal PSUs have been increasing at the rate of 4% to 5% per year.

With a further aging workforce, securing pensions will be an important consideration for the departmental employees of the PSUs. The timeframe of coal mine closure suggest that most departmental employees of BCCL can be retired in sync with closure of the coal mines. The contributory pension fund of Coal India Limited (CIL), should have adequate funds to support this.

Overall, coherent policies across labour, economic, education and training and social welfare will be necessary to ensure that the transition is just and creates better employment opportunities, wages and security.

6.7 Social infrastructure investment

Investments in social infrastructure and resources are crucial for achieving developmental objectives while transitioning toward a green and inclusive economy. These investments must be designed with a long-term vision to ensure resilience and equity in the post-coal economy.

Dhanbad, though economically significant and relatively urbanised, continues to face deep-rooted challenges in human development outcomes. Historical dependence on coal has led to uneven social development, particularly in rural and mining-affected communities. There are critical gaps in areas such as women and child development, public health infrastructure, quality education, and access to clean drinking water and cooking energy.

To address these, targeted social investments must be undertaken. Priorities include:

- Strengthening maternal and child health services in underserved blocks,
- Expanding community-based nutrition and early childhood care,
- Improving the availability and quality of health infrastructure, especially in areas with gaps (Chapter 5),
- Ensuring universal access to piped drinking water and promoting household-level clean cooking solutions,
- Facilitating women's economic empowerment through skills, credit, and enterprise support, and
- Ensuring the development of the tribal population to bridge the development disparities.

These interventions must be closely aligned with the Sustainable Development Goals (SDGs), especially SDG 3 (Good Health and Well-being), SDG 4 (Quality Education), SDG 5 (Gender Equality), SDG 6 (Clean Water and Sanitation), and SDG 10 (Reduced Inequalities). By focusing on inclusive social infrastructure, Dhanbad can ensure that its development pathway supports both current needs and long-term transitions to a just, equitable future.

Table 6.7: Social development infrastructure interventions

SDG Goal	Social targets	Dhanbad statistics	Necessary interventions
SDG 3: Good Health and Well-being	• Improve maternal and child health outcomes • Reduce malnutrition and disease burden in mining-affected populations	IMR 36, Full immunisation 71.4%	• Upgrade primary health centres (PHCs) in rural and mining areas • Strengthen immunisation and ANC/PNC services • Community-based malnutrition surveillance and treatment • Mobile medical units in remote mining-affected areas
SDG 4: Quality Education	• Increase access to and retention in quality primary and secondary education • Reduce dropout rates, especially among girls	Literacy 74.5%, Dropout (Class 1–8): ~18%	• Infrastructure development in rural schools (toilets, electricity, digital tools) • Recruitment and training of teachers • Bridge learning programmes and remedial classes • School meal improvement with the introduction of protein-rich foods • Scholarship schemes for girls and SC/ST children
SDG 5: Gender Equality	• Promote economic participation of women • Ensure safety and dignity in workplaces and public spaces	Female WPR 11.7%, SHG coverage: ~45% blocks	• Establishment of women-led self-help groups (SHGs) and enterprises • Vocational and digital skills training for women
SDG 7: Affordable and Clean Energy	Ensure access to clean cooking energy to reduce indoor air pollution and improve women's health	LPG access ~62%, rural refill rate low	• Promotion of LPG and improved cookstove adoption through PMUY+ schemes • Behavioural campaigns for clean fuel use • Subsidised refills and last-mile delivery mechanisms in remote habitations
SDG 10: Reduced Inequalities	Address the specific needs of tribal populations in accessing services, land rights, education, and livelihoods	ST pop. 9.1%, SC 17.6%	• Focused implementation of Forest Rights Act (FRA) • Multilingual education and tribal school strengthening • Tribal health camps and traditional healer integration • Livelihood support via forest produce value chains, tribal SHGs, and minor irrigation schemes • Dedicated Tribal Sub-Plan (TSP) budgeting and monitoring

Sources: Data compiled from NFHS-5 (2019–21); Census 2011 (provisional updates); Ministry of Jal Shakti GoI (2025); Ministry of Health and Family Welfare, GoI (2025); UDISE+ Report 2023-24, Ministry of Education GoI (2025); Socio Economic Caste Census, GoI (2011); PMUY Dashboard, Ministry of Petroleum and Natural Gas, GoI (2025); SHG data sets, National Rural Livelihood Mission, GoI (2025); and Jharkhand Economic Survey (2023-24).

6.8 Securing financial resources

A crucial aspect for just transition is mobilising financial resources. Just transition cost assessments undertaken by iFOREST shows that the key costs associated with just transition in coal mining districts include, reclamation and repurposing of mining land, basic infrastructure development to support and attract green industries, economic diversification measures, labour support and social welfare and costs for planning and capacity building to plan and implement transition measures.

Besides the direct costs of just transition, significant investments area required to catalyse green economic growth. These include, investments in green energy infrastructure, green industries, nature-based economic activities, etc., as suited to the local conditions and demand.

Considering the quantum of financing necessary, just transition measures need to be supported by both public and private funds. Public funds should be used to support interventions measures, such as, workforce transition (especially for informal and low-paid workers), education and building foundational skills, supporting local business and entrepreneurship, basic infrastructure development to attract investments, and planning and capacity building. Engaging the PSUs and private sector will be important for green investments.

For public financing, the use of DMF and CSR funds provides an immediate opportunity. The intended objectives and intervention areas of these funds are also aligned to just transition measures, such as sustainable livelihood development, skilling, education investments, etc. Dhanbad being one of India's largest mining districts, already has has a cumulative accrual of over ₹3,851 crore in DMF (Ministry of Mines, July 2025). The State Government need to institute necessary reforms to align the DMF fund utilisation with just transition (See Chapter 8). Going ahead, coal cess can also be a critical green fund for a just transition in the district (which is currently subsumed under the GST compensation cess). As per company records, BCCL annually pays about ₹1,573 crore as GST compensation cess. A reform of this cess as a just energy transition cess by the central government can be significant for supporting a just transition.

Overall, even as mines phase-down, by 2050 Dhanbad is projected to have nearly ₹4,600 crore through DMF collections and ₹14,427 crore from coal cess, which can constitute important resources for localised just transition measures backed by necessary policy reforms.

6.9 Engagement with industries

Industry engagement will be important to support a just transition. For example, the State Government and the industry need to work together on repurposing of coal mining land that support socio-economic growth in the district aligned to the district's and state's developmental goals. Similarly, for workforce transition and skilling, the Department of Labour, Employment, Training and Skill Development in collaboration with industry partners, can develop and offer skilling and upskilling programmes tailored to emerging sectors such as RE, energy efficiency, EV, and green construction, among others.

Besides, as noted above, industry participation will also play a catalytic role in diversifying the district's economic base. Besides setting up green energy or industrial facilities, industry engagement will also be helpful in forging technology partnerships, building market linkages, supporting green start-ups, and fostering local entrepreneurship. Together, these measures can anchor the district's transition in a way that safeguards livelihoods while driving new pathways of sustainable growth.

CHAPTER 7

A GREEN TRANSITION OF DAMODAR VALLEY REGION

- *The Dhanbad–Bokaro–Ramgarh region in the Damodar valley contributes 23.5% of Jharkhand's GVA, with an integrated industrial value chain of coal, steel, and power.*
- *Over 80,700 ha of barren land are available for renewable energy and green industry development.*
- *About 7,000 hectares of coal mining land can become available by 2030 for repurposing, aligning with the mine closure guidelines of the Coal Ministry.*
- *The region has 13.5 GW solar potential more than three times Jharkhand's 2027 solar target.*
- *The region's water resources, extensive road–rail connectivity, and existing energy infrastructure, make it investment-ready for green industries.*

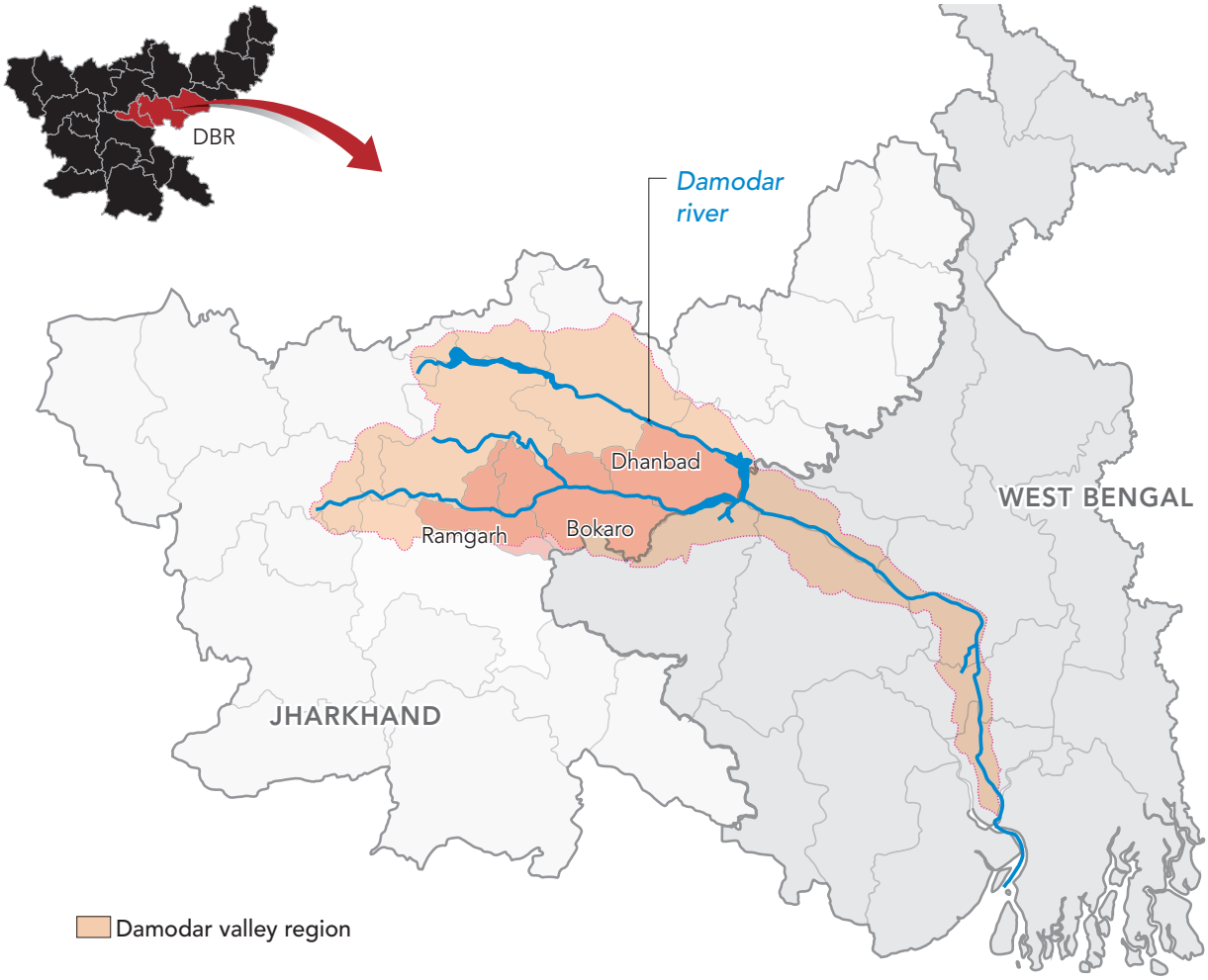
7.1 Context

The just transition of Dhanbad is intrinsically linked to the green industrial transformation of adjoining districts in the Damodar valley region—most notably Bokaro and Ramgarh—whose economies and labour markets are deeply interconnected. Together, Dhanbad, Bokaro, and Ramgarh (DBR) form a contiguous industrial belt in Jharkhand, historically anchored in coal mining and allied industries. This growth has been underpinned by abundant coking and non-coking coal from the region's coalfields, water resources from the Damodar River, strong road and rail connectivity, and well-developed energy infrastructure.

At present, the region faces a dual challenge: the progressive exhaustion of coal reserves in many mines, and the urgent imperative to shift towards cleaner energy and industry to meet climate and net-zero goals. Economic dependence on coal mining and coal-based industries remains high, both in terms of GVA and employment. Collectively, DBR contributes nearly one-fourth of Jharkhand's industrial economy, spanning mining, manufacturing, and electricity/gas sectors.

Given their geographical proximity, strong economic linkages, and shared transition risks, a coordinated regional strategy is essential. Labour, goods, and services move seamlessly across district boundaries, while industrial supply chains, transport corridors, and markets operate on a regional scale. Bokaro's steel industry, Dhanbad's coal mining, and Ramgarh's thermal power plants form an integrated value chain, supported by shared infrastructure and logistics. A well-designed, region-wide approach to green energy and industrial investments can unlock synergies, maximise resource use, strengthen industrial competitiveness, build investor confidence, and position DBR as a model for sustainable growth in coal-dependent regions.

Map 7.1: DBR in Damodar valley region



7.2 Regional SWOC analysis

A regional SWOC (Strengths, Weaknesses, Opportunities, Challenges) assessment of the three districts, DBR, highlights its strong industrial heritage, abundant natural resources, and strategic location that provide some of the foundational requirements to transform this area into a green industry and energy hub of Jharkhand. The need for this transformation is further reinforced by the fact that, in the absence of such interventions, the region will face challenges of employment loss, outmigration, and social instability, as traditional fossil fuel industries, such as coal mines and thermal power plants, will undergo a phase-down.

The SWOC assessment of DBR is structured around five important pillars that collectively determine the region's green investment preparedness and transition readiness. These include:

i. Economic structure

ii. Land

iii. Infrastructure and amenities

iv. Natural resources

v. Labour market

The following section highlights the key takeaways under each pillar to inform opportunities for green investments and strategies and policy measures that need to be adopted.

i. Economic structure[1]

The composition of the economy determines the ability to manage sectoral transitions and support new forms of economic activity. A highly concentrated economic structure exposes districts to higher transition risks. Two key indicators have been considered under this pillar- sectoral Gross Value Added (GVA) contributions and per capita income.

The assessment of the economic structure highlights the following observations:

- The three districts collectively contribute to over 23.5% of Jharkhand's GVA, which is extremely significant. Among them, Dhanbad contributes 14.8%, Bokaro 5.3% and Ramgarh 3.4% respectively.[2]
- The industry sector (mining + manufacturing + electricity) dominates the district economy in all three districts. Overall, the industry sector accounts for over 50% of Dhanbad's GVA, and about 40% and 30% for Bokaro and Ramgarh, respectively.
- The tertiary or service sector is also strong in all three districts, with a share of about 30% of district GVA in Dhanbad, 41% in Bokaro, and 37% in Ramgarh. A key contributor to the tertiary sector GVA in all three districts is trade and repair services.

For income levels, Dhanbad has the highest per capita income (PCI) at ₹1.54 lakh, which is nearly double the state average of ₹84,000. For Bokaro and Ramgarh, it is ₹66,000 and ₹99,000, respectively.[3]

Table 7.1: Economic structure of DBR region

Parameter	Jharkhand	Dhanbad	Bokaro	Ramgarh
GVA (₹ Lakhs)	3,33,21,613	49,36,143	17,74,824	11,45,814
Mining and Quarrying (₹ Lakhs)	20,49,263	3,85,682	1,34,807	1,20,705
Share of total GVA (%)	6.1	7.8	7.6	10.5
Manufacturing (₹ Lakhs)	69,45,527	24,26,944	5,74,986	1,68,450
Share of total GVA (%)	20.8	49.2	32.4	14.7
Electricity/Gas (₹ Lakhs)	7,17,537	45,744	8,374	69,116
Share of total GVA (%)	2.2	0.9	0.5	6
Total industry share (%)	29.1	57.9	40.5	31.3

Source: Directorate of Economics and Statistics, 2022-23

ii. Land

The availability of land for developing green industries and RE infrastructure is central to investment. Two parameters have been considered to evaluate land potential. These include, potential of coal mining land and wasteland for green industry and green energy development.

The assessment of potential land availability highlights the following observations:

- A key opportunity lies in redeveloping the uncultivable barren land of which the region has vast potential. The assessment of land use land cover (LULC) shows that there is over 80,700 ha of such land collectively in the three districts (Dhanbad 27,218 ha, Bokaro 40,970 ha, and Ramgarh 12,538 ha).
- Besides, repurposing the coal mining land available with closed mines, and that can become available following scientific closure of operational mines at the end of their life, also holds significant opportunity. While detailed land data of closed mine land was not available, as per the latest estimates of the Ministry of Coal and CIL (2025), 10 mines of BCCL are closed (in Dhanbad) and are in the pipeline of repurposing in the next three to five years. Out of this, one mine is an OC mine with a land area of about 305 ha. Besides, there are other abandoned mines in the region (as per 2022 records, there were about 39 abandoned mines of BCCL), out of which some may be considered for re-evaluation.
- Further, the assessment of post-closure land use plans of all 12 mine clusters of Dhanbad (as the district now only operates through mine clusters encompassing both OC and UG mine; and the 12 clusters include 39 operational BCCL and ECL mines), and 16 OC mines of Bokaro and Ramgarh, shows that over 16,000 ha of land can become available for repurposing in the next three decades. Out of this, over 6,900 ha of land will become available by 2030 (See box: Coal mine land repurposing potential).

REPURPOSING COAL MINING LAND IN THE REGION

In January 2025, the Ministry of Coal revised the Guidelines for Preparation of Mining Plan and Mine Closure Plan for Coal and Lignite blocks. This guideline marked a significant step forward from earlier guidelines, specifically focusing on two important aspects- the concept of Just Transformation and mine land repurposing for all mines.

The guidelines (Para 3.2) elaborates that 'just transformation' of coal/lignite mines and areas dependent on such mines, refers to "the equitable process of transitioning from traditional coal/lignite mining toward more sustainable and environmentally friendly and socially responsible manners, ensuring that the environment is protected, the land is restored, and affected workers, communities, and regions are supported and empowered throughout the transformation. It involves recognizing and addressing the social, economic, and environmental challenges associated with mine closure activities".

The repurposing of coal mining land is noted as a key mechanism to support just transformation. It specifies that (Para 3.2.1) "with aims to minimize the long-term ecological damage caused by mining and to ensure that the land can support various ecosystems, regarding the land, replanting native vegetation, restoring water bodies, and rehabilitating wildlife habitats, the project proponent shall complete all activities related to technical, biological reclamation and repurposing like agriculture, pisciculture, eco-park, recreational, landscaping, waterbody conservation or creation as per Mission Amrit Sarovar, irrigation, solar, green energy and green industries including micro, small and medium enterprises etc. wherever it is applicable related to just transformation".

The promulgation of these guidelines is of enormous importance for green investments and sustainable economic activities in closed coal mining land, besides measures of ecological restoration. The land assessment of DBR shows that potentially over 16,000 ha of land can become available in the districts over the next three decades following the scientific closure of coal mines and land reclamation. Out of this, over 6,900 ha can become available in the next five years, with about 10,000 ha becoming available in the next decade.

The land can be used for green energy development alongside other economic activities. For example, a significant portion comprises disturbed mining land (e.g., coal quarries, overburden dumps, backfilled areas), which can be leveraged primarily for solar PV development. Undisturbed areas, including scrubland, social forestry, and wasteland, offer further opportunities for RE (solar installations) and green industries. Additionally, the voids can be used for floating solar projects, while agricultural and fallow land holds potential for agroforestry and horticulture-based livelihoods.

Table 7.2: Phase-wise and block/cluster-wise land availability in the region (ha)

Type of Land	Land Use	By 2030	2030-2040	2040-2050	Total	Potential Use
Disturbed area	Coal quarry, advanced quarry site, coal dump	805	297	488	1,590	Solar PV, infrastructure
	Barren OB dump	769	158	603	1,529	
	Area under backfilling (technical reclamation)	1,062	519	876	2,456	
Undisturbed area	Scrubs (100%)	1,834	744	1,895	4,474	Green industries, industrial parks
	Social forestry (50%)	295	107	275	677	
	Waste land	1,069	479	1,024	2,571	
Water body	Reservoir, nallah, pond	129	31	219	379	Floating Solar
Agriculture	Crop and fallow land	967	145	1,372	2,484	Agriculture and Horticulture
	Total	**6,929**	**2,480**	**6,751**	**16,160***	

Note:
1. All mines in Bokaro will close by 2035.
2. The closure of two mines in Ramgrah by 2035 will also mark the closure of all mines in the district. These two mines together have a land area of 2027 ha, but details on their repurposing potential are not available.

Source: iFOREST assessment based on Environmental Clearance (EC) letters of respective coal mines

iii. Infrastructure and amenities

The status of basic infrastructure, such as power and digital infrastructure, and connectivity influences investor confidence and determines whether new industries can be developed. Two key indicators have been considered under this pillar. These include rail and road connectivity and energy infrastructure.

The analysis shows that the region has very good connectivity through road and rail networks. For instance:

- Dhanbad serves as a major junction on the Grand Chord section of the Eastern Railway, providing direct connectivity to metro cities, such as Delhi, Kolkata, and many industrial towns. NH-18 and NH-19 traverse the district, supporting coal and goods transport. Upcoming projects like the Raipur–Ranchi–Dhanbad Expressway will enhance road connectivity.
- Bokaro is connected through the Howrah–Delhi main rail line, Bokaro Steel City station, and multiple state highways. Road connectivity via NH-18 and NH-320 ensures smooth supply chain operations for industrial clusters. Its location on the upcoming Amritsar–Kolkata Industrial Corridor will further strengthen transport efficiency.
- Ramgarh is linked to NH-33, offering connections to Ranchi, Hazaribagh, and Dhanbad. While its road density is moderate (192 km per 1,000 sq km), it is strategically located to serve as a link between industrial hubs and coalfield areas.

Besides rail and road connectivity, the region also has good energy infrastructure.

- Dhanbad hosts the Maithon Thermal Power Station. High-capacity transmission lines enable potential integration of solar, floating solar, and green hydrogen projects.
- Bokaro is home to Bokaro Thermal Power Station, Tenughat Thermal Power Station, and extensive transmission infrastructure. The proximity to steel plants and industrial estates provides opportunities for captive renewable power generation.
- The Patratu Thermal Power Station is located in Ramgarh.

iv. Natural resources

The availability of natural resources not only influences ecological sustainability, but also the feasibility of resource-based investments and the viability of various projects. Climate vulnerability of a region is also emerging as a key factor in investment decisions. Three indicators, water, forest resources, and climate vulnerability, have been considered under this pillar.

The assessment shows that:

- The three districts collectively have about 11,375 ha of area under water bodies, which include dams and also small water bodies: Dhanbad 3,584.6 ha, Bokaro 5,259.9 ha, and Ramgarh 2,530.1 ha. The availability of water is vital for supporting industries in the region, including green investments such as green hydrogen and green steel.[4]
- The water bodies are also important for developing floating solar projects, which can also boost the state's RE production through land-neutral means, and minimise issues of land diversion.
- Another important one is forest resources. Both Bokaro and Ramgarh have significant areas under forest land (74,182 ha and 42,276 ha, respectively)[5], which, besides providing ecological value, will be important for supporting forest-resource-based MSMEs in the region.
- In terms of climate vulnerability, Dhanbad faces a relatively moderate risk profile, suggesting that future industrial development will require robust environmental safeguards but may proceed without severe climate-related disruptions. Bokaro, however, experiences relatively high vulnerability due to its concentration of heavy industry, degraded land, and variability in rainfall patterns—factors that could increase operational risks for resource-intensive industries and necessitate substantial investments in climate-resilient infrastructure and processes. Ramgarh has a comparatively low vulnerability, supported by better vegetation cover, lower industrial density, and higher ecosystem resilience, making it potentially more attractive for new green industrial investments that benefit from stable environmental conditions and reduced climate adaptation costs.[6]

v. Labour market

A region's labour profile, employment base, and workforce characteristics are important factors for its economic growth.

The assessment of the three districts shows that the closure of coal mines in Dhanbad will potentially impact about 1.3 lakh coal-mining workers (including formal and informal workers) in Dhanbad and overall, over two lakh workers in the DBR region.

Without timely intervention, this could significantly worsen the unemployment situation in these districts, where a large section of the population is already outside the workforce. As per Census data, the workforce participation rate in Dhanbad is just over 31%, while in Bokaro and Ramgarh it is about 33% each. This low participation reflects both limited employment opportunities and a high dependency on coal-related jobs, particularly for low-skilled and informal workers. Any reduction in mining employment, therefore, risks deepening economic distress, increasing underemployment, and pushing more households into poverty unless alternative and sustainable livelihood options are created.

Overall, the SWOC assessment shows that the region's strength lies in its robust industrial and economic foundations, land availability, availability of water, and well-developed infrastructure.

7.3 Strategic takeaways

The SWOC analysis of Dhanbad, Bokaro, and Ramgarh brings out some important strengths and opportunities that the region can leverage to develop itself as a green energy and green industry corridor of the state. The overall weaknesses and challenges need to be addressed through targeted policy interventions by the government and by a collaborative engagement of the public and private sectors and financial institutions.

Strengths

The key strengths of the region include the following:

- **Robust industrial base:** DBR is a major contributor to Jharkhand's economy, collectively accounting for over 23% of the state's GDP. Dhanbad's economy is anchored in coal mining, Bokaro in steel manufacturing, and Ramgarh in power generation and defence manufacturing—forming a well-developed industrial value chain.
- **Significant land availability:** Large tracts of land, including over 80,700 ha of barren land and more than 16,000 ha expected from mine closures by 2050, are available for redevelopment into renewable energy projects, green industries, and other non-agricultural uses.
- **Strong connectivity:** The region benefits from national highways, railway junctions, and proximity to industrial corridors, ensuring efficient movement of goods and labour.
- **Water availability:** Sufficient water availability for developing green energy and industries.
- **Young and adaptable workforce:** A large proportion of workers are under 40 years old, and the presence of over 75 ITIs offers a foundation for rapid reskilling to meet green industry demands.

Opportunities

The key opportunities of the region include the following:

- **Development of RE (solar):** With a total solar potential of 13.5 GW, the region can emerge as a leading area for augmenting the state's RE production. This potential comprises 8 GW from ground-mounted solar, 1.7 GW from rooftop installations, and 3 GW from floating solar on dams and other water bodies (See Box: RE potential of DBR).

  As per the CEA (2025), the total RE capacity of the state is merely 0.4 GW, which is about 13.3% of the State's total power capacity.[7] The solar potential in the region is also more than three times the state's target

of 4 GW of solar capacity addition by 2027 under the Jharkhand State Solar Policy, 2022.[8] Of this state target, 3 GW is allocated to utility-scale solar, with the remainder to be met through distributed and off-grid solar projects.

- **Mine land repurposing:** Repurposing post-mining land for industrial parks (including green SMEs), solar farms, and other such economic activities can accelerate green growth in the region, while also generating local employment.
- **Green steel:** The region has a strong steel sector, which is identified as one of India's "sunrise sectors" given the driver of domestic consumption for construction and industrial expansion. The availability of coking coal in Jharia coalfields, iron ore supply from districts like West Singhbhum, and water availability have helped in the sector's growth. Leveraging hydrogen-based steel production, the region can position itself as a leader in green steel manufacturing in Jharkhand and contribute to India's low-carbon industrial transition.
- **Green hydrogen:** The availability of industrial water and proximity to major steel and chemical industries position the DBR region as an ideal hub for green hydrogen production. This can directly support green steelmaking, fertiliser manufacturing, and clean fuel supply chains. Jharkhand is advancing its own Green Hydrogen Mission in alignment with India's National Green Hydrogen Mission, with a focus on building a complete green hydrogen ecosystem and developing a clear action plan to drive the state's transition to clean energy.
- **Green manufacturing:** The DBR region has strong potential to diversify into green manufacturing beyond its traditional mining base. Low-carbon construction materials already have a foothold, with brick, ceramic, and refractory units accounting for around 14% of existing industries (359 operational units). Also, the region can consider opportunities for other RE-related manufacturing to support RE sector development.
- **Agro-based industries and green MSMEs:** Forest and agricultural resources can support processing units, bamboo and lac-based enterprises, herbal product manufacturing, and climate-resilient supply chains.

Weaknesses

The key limitations or weaknesses of the DBR region include:

- **High coal dependence:** Heavy reliance on coal and allied industries exposes the economy to market volatility and policy shifts in the global energy transition.
- **Infrastructure gaps:** Some mining-affected blocks suffer from weak intra-regional connectivity, and urban infrastructure in smaller towns lags behind industrial requirements.
- **Environmental degradation:** Decades of mining have caused deforestation, water pollution, and land degradation, reducing ecosystem services and affecting agriculture.
- **Economic disparity:** Bokaro, while one of the key industrial districts, has a per capita income (PCI)[9] that is below the state average. This highlights the economic disparity that exists between industrial clusters and the rest of the district. The region's developmental indicators have, however, improved over the years through targeted interventions by the state government and central schemes, and private welfare investments. The share of multidimensionally poor people is nearly half of Jharkhand's average in all three districts, and nearly at par with India average.[10]

Table 7.3: PCI and MPI in the region

	Dhanbad	Bokaro	Ramgarh	Jharkhand
Per Capita Income	1,54,000	66,000	99,000	84,000
Share of multidimensionality poor people (%)	17%	15%	18%	29%

Source: Department of Finance and Department of Planning and Development, 2024; Niti Ayog 2023

Challenges

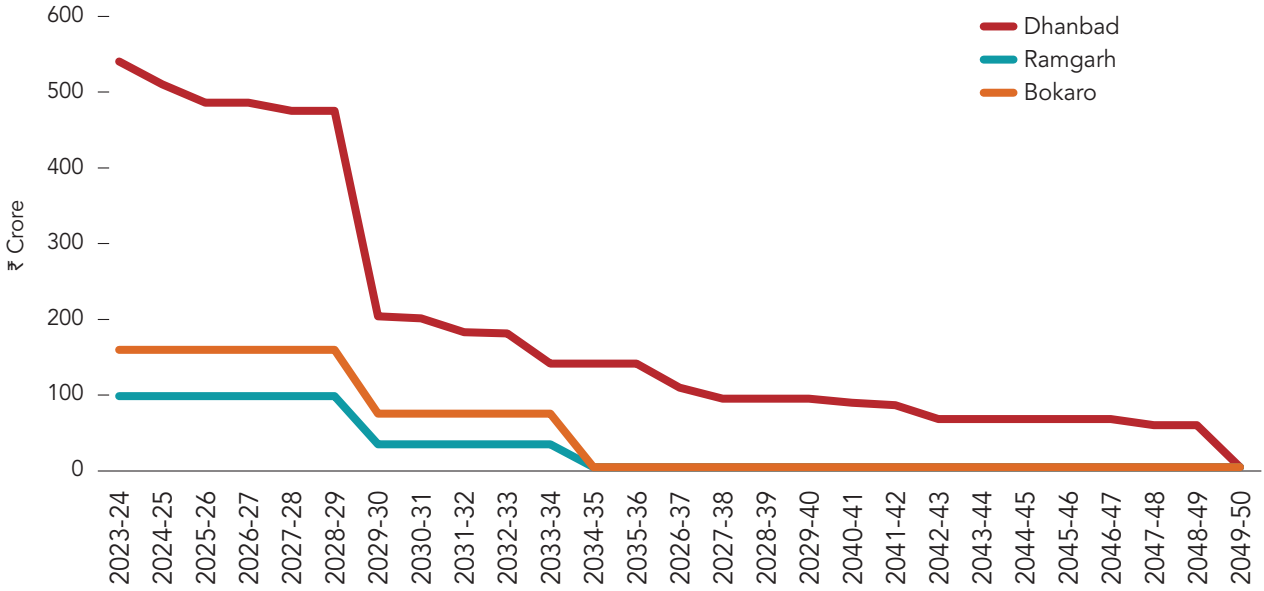
Alongside weaknesses, there are emerging challenges in the DBR region. Some of the key ones include:

- **Potential employment and income loss from coal transition:** The closure of coal mines due to ageing mines and economic unviability is already a challenge. Further, the planned closure of coal mines in the

coming years at the end of their operational lives will impact direct and indirect jobs associated with the sector, as well as income in the induced economy. A major impact will be on the informal workers.

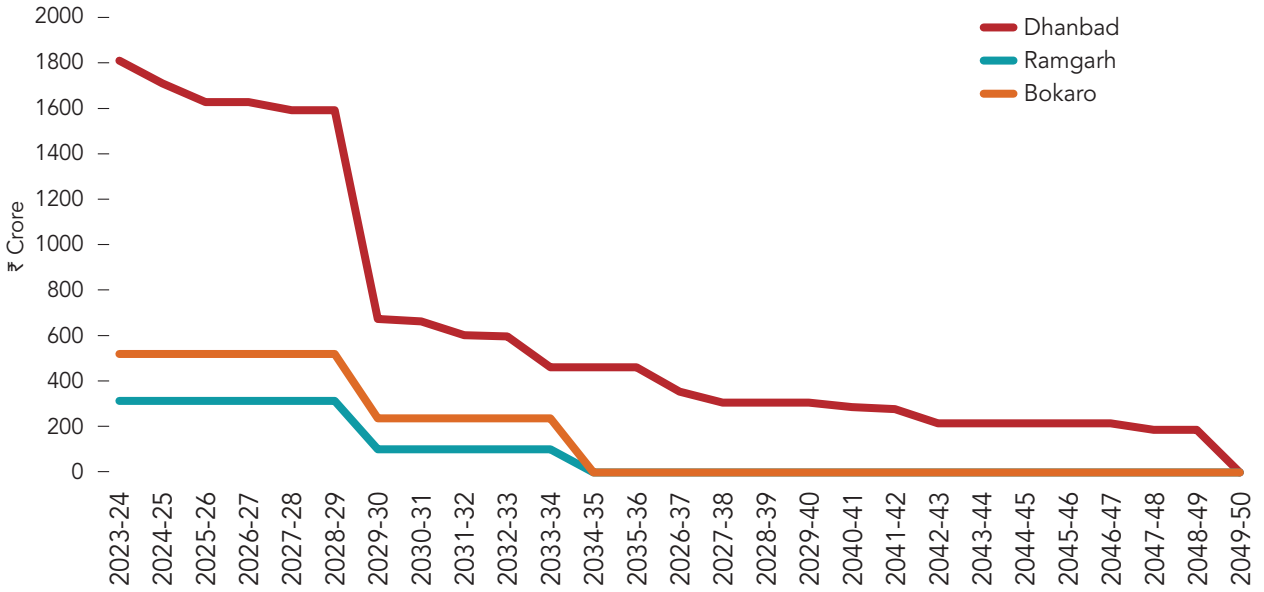
- **Reduced source of welfare funds:** Reduced coal royalties and DMF funds may strain public finances, impacting infrastructure development and social welfare spending.
- **Social impacts of transition:** Without early intervention to enhance employment opportunities, the enhancement of foundational education and skills, and the strengthening of social protection measures, especially for informal workers, the region will face challenges of unemployment and loss of income, outmigration, and social instability.

Figure 7.1: Potential decline in DMF funds



Source: iFOREST analysis

Figure 7.2: Potential decline in royalty



Source: iFOREST analysis

SOLAR POTENTIAL OF DBR

The assessment of solar potential of the DBR region undertaken by iFOREST shows that the region has a total potential of about 13.5 GW. Out of which, the potential of ground-mounted solar is about 8.7 GW, with almost equal potential in all the districts.

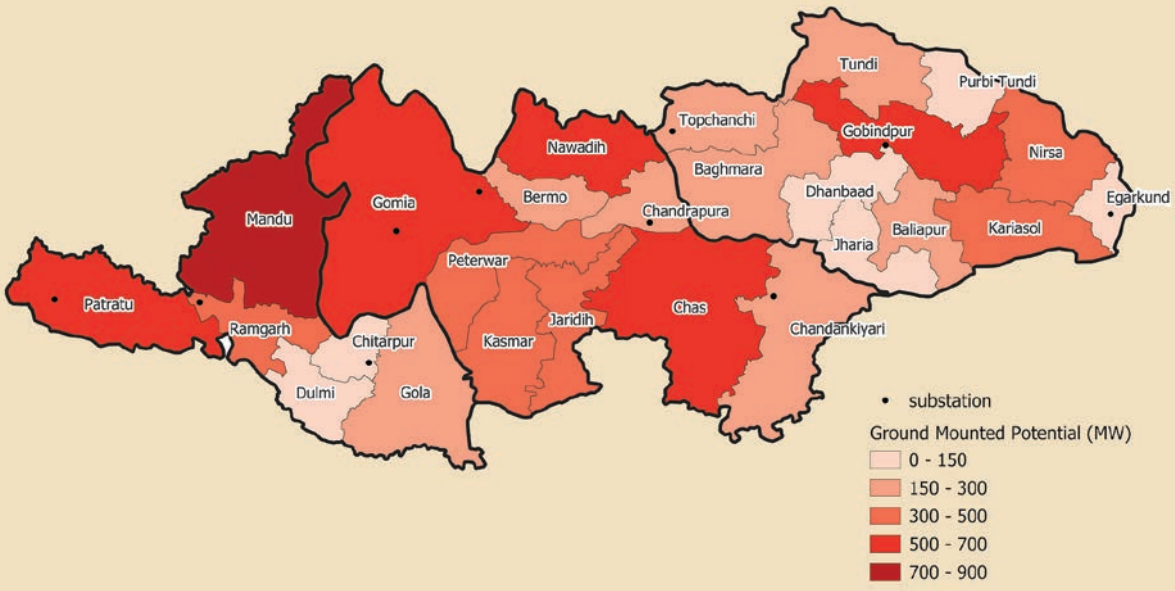
Table 7.4: Total solar potential in the region

District	Ground-mounted Solar (MW)	Rooftop solar (MW)	Floating solar in water bodies (MW)	Floating solar in dams (MW)	Total (MW)
Dhanbad	2,637	687	358	935	4,619
Bokaro	3,728	687	525	819	5,761
Ramgarh	2,357	320	253	162	3,093
Total	**8,723**	**1,696**	**1,137**	**1,918**	**13,475**

Source: iFOREST assessment

Some of the key coal mining blocks also have significant solar potential. This includes Mandu in Ramgarh (897 MW), Chas in Bokaro (663.6 MW), and Nirsa, Jharia, and Baghmara blocks in Dhanbad. Each of these blocks also hosts electrical substations or is located near grid infrastructure, which significantly reduces the cost and complexity of grid integration for solar power projects. The convergence of land availability, solar resource potential, and transmission readiness makes these blocks strategically valuable for cluster-based solar energy development.

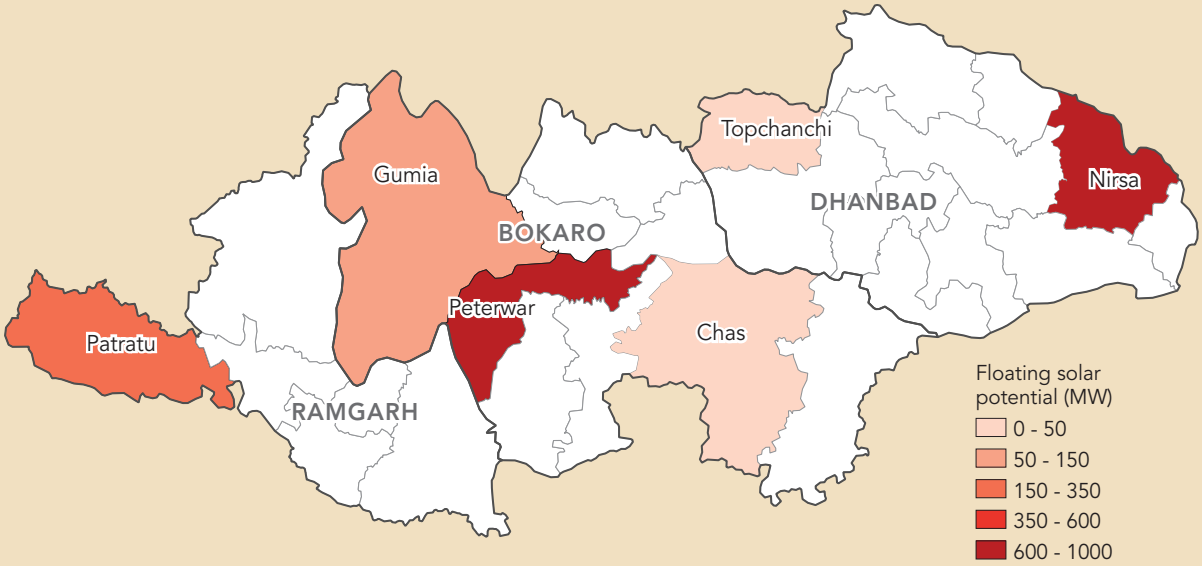
Map 7.2: Regional ground-mounted solar



Source: iFOREST

Besides ground-mounted solar, the region has an estimated floating solar potential of about 3 GW, including about 1.9 GW in dam reservoirs (assuming 20% surface area usage) and about 1.1 GW on other water bodies such as ponds, tanks, and lakes. Ramgarh features high-density clusters of water bodies, making it well-suited for the development of large-scale floating solar parks.

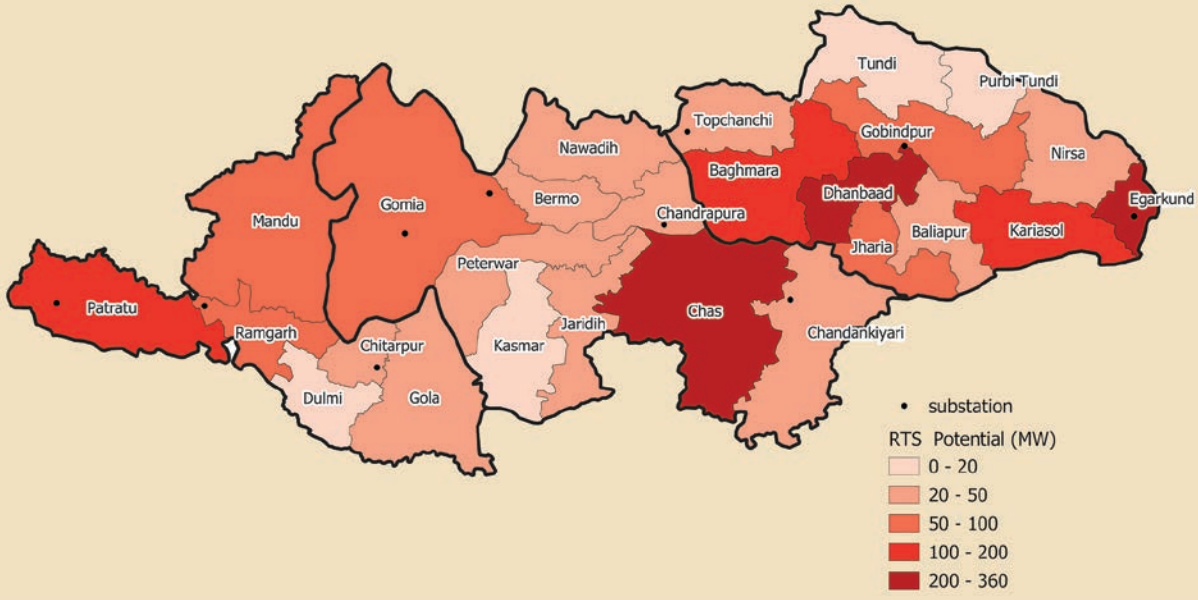
Map 7.3: Floating solar potential in the region



Source: iFOREST assessment
*Reservoirs of Maithon and Panchet dams are spread in Jharkhand and West Bengal states. While estimating floating solar potential for the specific district and its blocks in Jharkhand, we estimated the potential for the whole reservoirs spread in the two states as well. We did the same for the Konar dam reservoir, which is also spread in Hazaribagh district of Jharkhand, which our regional plan doesn't cover.

Finally, with an estimated potential of about 1.8 GW, rooftop solar presents major opportunities for households, MSMEs, institutions, and urban local bodies. It can drive community ownership, lower electricity costs, and expand decentralised energy access.

Map 7.4: Regional rooftop solar potential



Source: iFOREST

7.4 Developing DBR as Jharkhand's green industry corridor

The Dhanbad–Bokaro–Ramgarh (DBR) region has a unique combination of industrial capacity, natural resources, and strategic location that positions it to become Jharkhand's flagship Green Industry Corridor (GIC). Building on its robust industrial base, significant land availability, strong connectivity, water resources, and a young, adaptable workforce, DBR can transition from a coal-dependent economy to a diversified, low-carbon growth hub.

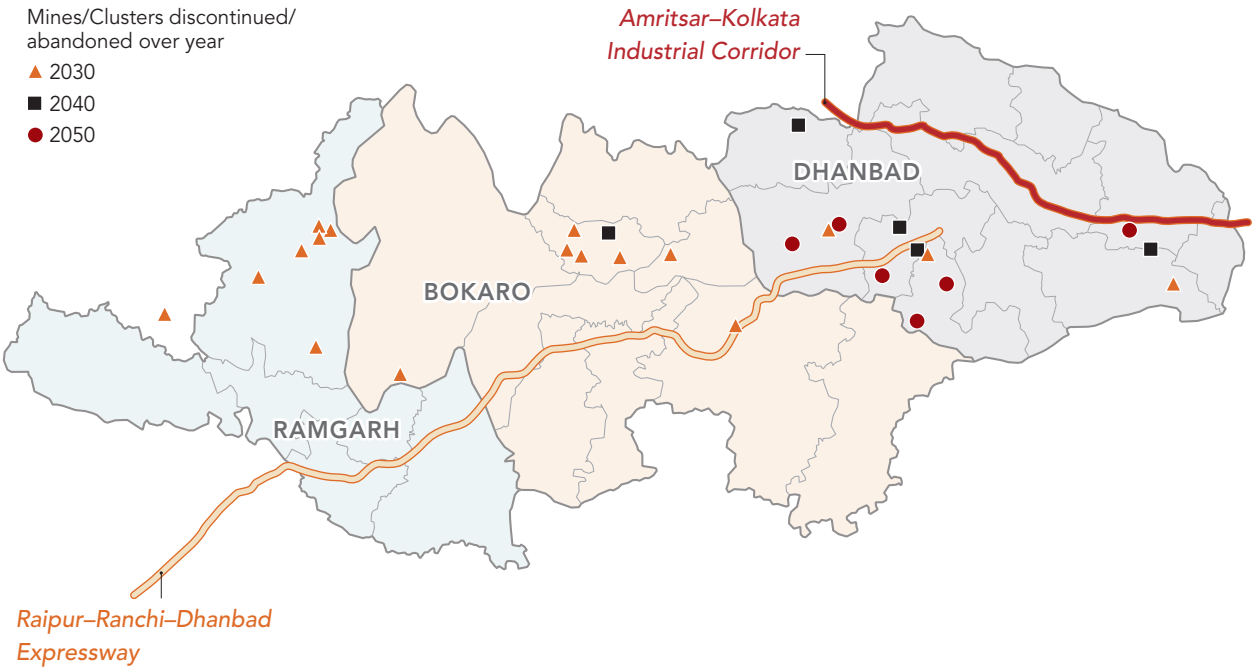
Collectively, DBR accounts for over 23% of Jharkhand's GDP, with each district bringing distinct industrial strengths—Dhanbad in coal mining, Bokaro in steel manufacturing, and Ramgarh in power generation and defence manufacturing—forming a fully integrated industrial value chain. The region has over 80,700 ha of barren land and more than 16,000 ha expected from mine closures by 2050, all of which can be redeveloped for renewable energy projects, green manufacturing units, and other non-agricultural uses. Connectivity is a key asset, with national highways, major railway junctions, and proximity to industrial corridors ensuring efficient movement of goods, labour, and services. Water availability is adequate to support green industry growth, while a young workforce—nearly half under 40—combined with over 75 ITIs, provides the skills base for rapid reskilling into emerging sectors.

The proposed GIC aligns closely with state and national policy priorities. The Jharkhand Industrial and Investment Promotion Policy (2021)[11] and the Industrial Park and Logistics Policy (2022)[12] provide incentives for green and renewable-focused industries, including subsidies for park development, single-window clearances, and skill development support. Infrastructure projects such as the Raipur–Ranchi–Dhanbad Expressway, and Dhanbad's inclusion in the Amritsar–Kolkata Industrial Corridor will enhance logistics, market access, and investor confidence. Together, these strengths provide a ready foundation for operationalising a green manufacturing cluster focused on renewable energy, clean technologies, and sustainable industries.

Building on these strengths and opportunities, the development of the DBR region as a GIC will require comprehensive spatial planning, financial mobilisation, and setting up and strengthening institutional mechanisms to maximise impact.

The following are some of the developmental measures that should be considered for future planning and investments.

Map 7.5: Proposed industrial corridor



Note: Mine locations indicate areas where potential land parcels will become available in the coming years for repurposing.

Strategic design of green SEZs

Special Economic Zones (SEZ) in the DBR region must be strategically located to utilise land from closed and soon-to-be-closed coal mines, barren and wastelands, and underutilised industrial sites. These zones should adopt a plug-and-play model with ready-to-use facilities, streamlined single-window clearances, and essential infrastructure to support SMEs, start-ups, MSMEs, and tech parks, etc.

Strategic connectivity to roads (including industrial corridors) and railways, will be crucial to attract investment and enable efficient supply chain operations. In the initial stages, integration with the DVCs extensive electricity generation and transmission network, along with its managed water resources from reservoirs and dams, can ensure a reliable energy and water supply. As RE capacity, storage systems, and distribution infrastructure are developed, industries within these SEZs can progressively transition to a fully green energy base.

Green hydrogen

The DBR region has the opportunity to become a leading green hydrogen hub in Jharkhand, given the availability of industrial water from its major dams and reservoirs, and with direct proximity to large steel and chemical clusters that form a ready market. This strategic advantage also positions DBR to spearhead hydrogen-based steelmaking, low-carbon fertiliser production, and clean fuel supply chains for heavy industry and transport.

Retired and soon-to-be-closed thermal power plants, in districts like Bokaro, also present cost-effective sites that can be repurposed for setting up hydrogen production facilities after undertaking techno-economic feasibility studies.

Backed by Jharkhand's state-level Green Hydrogen Task Force, which is charting a roadmap for adoption and ecosystem development, the region can leverage policy incentives for industrial retrofitting, RE integration, and infrastructure buildout.

Table 7.5: Large dams in DBR

Dams	Location	FRL (m)	Capacity at FRL (BCM)
Tenughat	Bokaro	269	0.8
Maithon	Dhanbad	146	0.5
Panchet Hill	Dhanbad	124	0.2
Konar	Bokaro	425	0.2
Patratu	Ramgarh	406	0.1

Source: Bulletin on live storage of dams in India by Central Water Commission (March 2025).

RE development

With a total solar potential of 13.5 GW—over three times the state's 2027 target—DBR can be the anchor for Jharkhand's RE expansion, setting ambitious growth targets by 2030. This particularly includes large-scale ground-mounted solar farms and floating solar. Scaling this potential will not only supply clean energy to local industries but also open opportunities for RE manufacturing and service ecosystems within the corridor.

Green manufacturing, including SMEs

The manufacturing sector of the DBR region is crucial for the state's green growth and green jobs pathway, with already a share of over 40% of the combined district GVAs. To maintain a strong manufacturing sector, it will be essential to increase green manufacturing. The region can diversify into green manufacturing units, including RE components, green steel, and low-carbon construction materials.

A key driver of this transformation will be the development of small and medium enterprises (SMEs) and micro, small, and medium enterprises (MSMEs) that can anchor local supply chains, generate employment, and provide specialised services to larger green industries. Target sectors include fabrication of solar components, energy-efficient appliances, electric mobility parts, and processing of agro or forest-based products. Cluster-based industrial parks, common facility centres, technology incubation hubs, and credit support through MSME schemes can accelerate their growth.

Circular economy

Establishing a circular economy is essential for transformation and development in the region. It enables a shift from linear to resource-efficient models, addressing raw material scarcity and reducing waste. Given the currently limited recycling infrastructure, expanding recycling units is critical. Legislative and policy support for circular practices will not only aid industrial transformation but also foster a low-carbon, resource-efficient economy, boosting productivity and delivering environmental and socio-economic benefits.

Figure 7.1: Circular economy possibilities in the region

Green special economic zones (SEZs)	Green hydrogen production	Renewable energy (RE) manufacturing and deployment	Green manufacturing	Cross-cutting enablers
• **Eco-industrial parks**, where industries share utilities, by-products, and infrastructure, creating synergies (e.g., using waste steam or O_2 from one unit as input for another). • **Closed-loop water** systems that recycle and reuse water within industrial operations. • **Centralised waste** treatment and material recovery centres within SEZs. • **Green building** and infrastructure norms that mandate the use of recycled materials and promote adaptive reuse of industrial land and structures.	• **Use of treated mine** water or treated wastewater from industries for electrolysis, reducing pressure on freshwater resources. • **Integration of oxygen** recovery as a co-product from electrolysis for use in steel, chemical, or medical industries. • **Development of** modular electrolyser units with high material recovery potential. • **End-of-life** management for electrolysers and fuel cells, including rare material recycling and safe disposal practices.	• **Promoting local reuse and recycling of solar panels**, and battery components through extended producer responsibility (EPR) norms and dedicated recycling units. • **Designing modular and repairable RE systems** to extend lifespan and reduce material use. • **Utilising waste heat and energy flows** from solar parks for low-temperature industrial processes (such as drying, pre-heating, and pasteurisation) or greenhouse farming.	• **Adopting energy-efficient technologies** in industrial processes, including advanced motors, heat recovery systems, and automation. • **Shifting to renewable energy sources** such as solar, wind, and biomass for powering manufacturing units. • **Implementing circular production models** that minimise waste by reusing scrap, by-products, and wastewater in the production cycle. • **Encouraging low-carbon product design** through material substitution and lifecycle-based manufacturing approaches.	• **Policy support** through fiscal incentives, standards, and public procurement favouring circular products. • **Skilling and R&D** focused on repair, remanufacturing, materials science, and lifecycle engineering. • **Digital tools and platforms** for material tracking, industrial symbiosis matchmaking, and reverse logistics. • **Green public-private** partnerships to invest in recycling infrastructure and technology demonstration.

Overall, the DBR region has the advantage of entering the green growth transition from a position of industrial strength, resource availability, and strategic connectivity. From being the heartland of Jharkhand's traditional fossil fuel economy, the region is poised to become the nerve centre of Jharkhand's green economy and a destination for low-carbon investments.

However, realising its potential as Jharkhand's Green Industry Corridor will require deliberate planning, targeted investment, and strong institutional coordination. A just and inclusive approach—anchored in reusing and repurposing land, RE expansion, green hydrogen development and green manufacturing- can transform DBR into a resilient, diversified, and competitive economic hub. To support this, investments will also be required for skilling and workforce development, so that it can generate local employment and improve economic outcomes.

CHAPTER 8

AGENDA FOR ACTION TO SUPPORT JUST TRANSITION

- *A comprehensive State Just Transition Policy is required to support district and regional just transition planning and green growth.*
- *A Green Growth Plan integrating land use, renewable deployment, industrial diversification, etc., is required for Dhanbad-Bokaro-Ramgarh industry corridor.*
- *A Damodar Valley Transition Authority may be set up to coordinate cross-district planning, manage resources, promote investments, and oversee regional diversification.*
- *The State DMF Rules need to be revised to support just transition measures in coal districts to ensure livelihood security and social resilience.*
- *State Government and industry collaboration will be necessary to support green investments, worker's skilling, and ensure inclusive growth.*

8.1 Context

To implement a just transition plan for Dhanbad and support the development of the Dhanbad Bokaro Ramgarh (DBR) region as Jharkhand's green growth node, the following strategic actions are recommended. These steps aim to shift the regional economy towards sustainability, resilience, and inclusivity, while ensuring that local communities benefit directly from new opportunities.

The priority areas of intervention include:

i. Developing a State Just Transition Policy;

ii. Developing a green growth plan for DBR;

iii. Revising the Jharkhand DMF Trust Rules to support a just transition in coal districts;

iv. Mobilising diverse financial resources;

v. Setting up dedicated institutional mechanisms;

vi. Enhancing state government and industry engagement; and,

vii. Fostering cooperative federalism.

Taken together, these measures will provide the policy, financial, and institutional foundation to steer DBR's transformation into Jharkhand's flagship green growth region.

8.2 Action agenda

Achieving a just transition in Dhanbad and transforming the DBR region into Jharkhand's green growth corridor will require a clear, phased, and coordinated set of actions. This agenda outlines the core strategic measures—policy reforms, integrated planning, targeted financing, and institutional mechanisms, that collectively will create an enabling environment for sustainable economic diversification. Each measure is designed to not only manage the impacts of a coal transition, but also to proactively build a new growth model that delivers quality jobs, resilient livelihoods, and equitable community benefits.

i. Develop a State Just Transition Policy

To guide district-level just transition planning and promote green growth and employment opportunities, developing a State Just Transition Policy will be essential. The policy should:

- Support planning and economic diversification and restructuring of districts highly dependent on coal mining and fossil fuel-dependent industries.
- Promote the development of green energy and green industries.
- Promote the repurposing of land and infrastructure available with closed and end-of-life coal mines and power plants in coordination between the state government and concerned industry officials for green investments, green growth and employment generation.
- Support workforce transition of both formal and informal workers, engaged in the fossil fuel industries, and ensuring skilling and workforce development.
- Support gender-inclusive transition measures, including, maximising the opportunities of formal jobs for the women workforce, investments in foundational skills, and equal access to skill acquisition for emerging well paid jobs in the green sectors.
- Invest in the climate-resilient physical and social infrastructure in the fossil fuel-dependent regions to strengthen community resilience and promote development.

- Ensure participatory decision-making processes, including social dialogue, to build consensus among government agencies, employers, workers, and communities, on strategies and plans for a just transition.

Besides the development of a State Just Transition Policy, it will also be necessary to integrate just transition principles into relevant state policies, related to RE development, industry, promoting MSMEs, skilling and entrepreneurship, etc.

ii. Develop a green growth plan for DBR

The State Government needs to initiate the development of a green growth plan for DBR in coordination with district administrations, industry representatives, representatives of local institutions, financial institutions, technical agencies, and civil society members. The plan should:

- Integrate multiple development dimensions, including land use planning, RE deployment, industrial diversification, skills development, and infrastructure development, aligned with Jharkhand's industrial, RE, and climate strategies.
- Identify priority sites for industrial clusters and RE deployment to catalyse investments.
- Plan infrastructure development in a coordinated manner, ensuring that power generation and transmission, water supply, transport corridors, and logistics are synchronised to support green industries, SMEs, and the local communities.
- Embed just transition objectives in the planning process, ensuring that green energy and industry projects and infrastructure projects generate local jobs, contribute to local development, and support inclusive outcomes.
- Establish a formal Damodar Valley Regional Development Authority or similar institutional mechanism to lead plan preparation, mobilise investments, and oversee implementation across district boundaries to develop DBR, and later adjoining districts as the green energy and industrial corridor of Jharkhand.

iii. Revise DMF Rules to support a just transition in coal districts

Several old coal-mining districts in Jharkhand, including in DBR, are facing/will face a decline in DMF accruals due to mine closures from resource exhaustion in the coming years. For instance, post-2030, there is likely to be a significant decline in DMF accruals due to the prospective closure of many of the operational mines.

The revised Guidelines for Preparation of Mining Plan and Mine Closure Plan for Coal and Lignite Blocks, notified by the Ministry of Coal in 2025, provide explicit directions for using DMF funds to support just transformation. As noted, "The district administration is to facilitate community engagement to address social and economic impacts of the closure of the mine during the final mine closure period. The district administration may create market mapping of skills, merge income-generating schemes and utilise the DMF funds".[1]

To ensure that DMF resources are effectively leveraged for just transition in affected districts, the State Government needs to:

- Revise the Jharkhand DMF Trust Rules to explicitly align and prioritise just transition investments within district DMF perspective plans, particularly for districts with closed or soon-to-be-closed mines. Priority interventions should include livelihood generation, economic diversification, worker skilling and reskilling, and social development.
- Align district DMF plans with the 2025 Ministry of Coal guidelines, ensuring that social and economic transition measures are fully integrated into mine closure planning.
- Implement robust participatory planning processes so that affected workers, communities, and local institutions have a direct role in shaping DMF-funded transition initiatives.

iv. Mobilise diverse financial resources

Ensuring the implementation of a just transition plan of Dhanbad and the redevelopment of DBR as a green energy and industrial hub will require substantial and sustained financing. Public funds should act as catalytic capital, unlocking far larger flows of private investment.

Some of the key measures may include:

- Establishing a DBR Green Investment Facilitation Cell to prepare bankable projects, conduct investor outreach, and provide transaction support.
- Leveraging blended finance models that combine concessional loans, guarantees, and equity to reduce investment risks for green projects.
- Accessing international climate finance sources through multinational agencies and development institutions, and banks.
- Mobilising CSR contributions and philanthropic funding for pilot projects, skills training, and community-based enterprises, etc.

v. Set up dedicated institutional mechanisms

A successful just transition requires institutions with clear mandates, resources, and authority to coordinate across sectors and districts. Two levels of institutional mechanisms are proposed:

a. District-level Just Transition Cells in Dhanbad, Bokaro, and Ramgarh to plan and monitor transition initiatives, support affected workers, and liaise with state and central agencies.

b. A Damodar Valley Transition Authority to:
   - » Plan and implement cross-district and multi-sector projects.
   - » Maintain and manage a regional land and water resource inventory for green uses.
   - » Coordinate financing and investment promotion for the DBR Green Industry Corridor (GIC).
   - » Drive regional economic diversification through targeted incentives and investment facilitation.

vi. Strengthen state–industry engagement

Proactive and sustained engagement with industry is essential to position DBR as an attractive destination for green investment. The State Government needs to engage with industry partners to:

- Identify and address policy, procedural, and infrastructure bottlenecks.
- Promote DBR's competitive advantages for RE manufacturing, green metals, and other low-carbon industries.
- Secure commitments for local hiring, training, and supply chain development.
- Facilitate joint investments in infrastructure and technology innovation.

vii. Foster cooperative federalism

Implementing and sustaining just transition measures in districts such as Dhanbad, while simultaneously developing the DBR region as Jharkhand's green energy and industrial corridor, will require coordination between the central and state governments. This coordination will include measures of planning, co-financing of priority projects, and streamlined regulatory processes. Given the scale of economic restructuring required, both levels of government will need to play a proactive role in ensuring that the transition is not only socially equitable but also economically competitive.

Robust and predictable policy frameworks, backed by assured multi-year financial commitments, will be essential to provide policy certainty, attract private sector participation, and secure international investment. Public funds should act as catalytic capital to unlock significantly larger flows of private investment, particularly in RE, low-carbon industries, skilling programmes, and green infrastructure. Alongside financing, strengthening institutional capacity at the regional and district levels will be critical to implement multi-sector projects and ensure that the DBR region's shift towards a green, diversified, and resilient economy is both timely and sustainable.

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