REGIONAL JUST TRANSITION INVESTMENT PLAN

CHANDRAPUR-NAGPUR-YAVATMAL

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INTERNATIONAL FORUM FOR ENVIRONMENT, SUSTAINABILITY & TECHNOLOGY

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List of Abbreviations

ASI	Annual Survey of Industries
BESS	Battery Energy Storage Systems
CEA	Central Electricity Authority
CIL	Coal India Limited
CNY	Chandrapur-Nagpur-Yavatmal
CSR	Corporate Social Responsibility
DDP	District Domestic Product
DMF	District Mineral Foundation
EC	Empowered Committee
EDN	Economic Development Node
EV	Electric Vehicle
FGD	Focus Group Discussion
GDP	Gross Domestic Product
GDVA	Gross District Value Added
GHG	Greenhouse Gas
GoM	Government of Maharashtra
GVA	Gross Value Added
HLSC	High-Level State Committee
I-O	Input-Output
ITI	Industrial Training Institute
JTO	Just Transition Office
KII	Key Informant Interview
MDO	Mine Developer Operator
MIDC	Maharashtra Industrial Development Corporation
MPI	Multidimensional Poverty Index
MSDE	Ministry of Skill Development and Entrepreneurship
NOC	No Objection Certificate
NSSO	National Sample Survey Office
OC	Opencast
PLF	Plant Load Factor
RE	Renewable Energy
RJTIP	Regional Just Transition Investment Plan
R&D	Research and Development
SPV	Special Purpose Vehicle
STP	Sewage Treatment Plant
SUT	Supply and Use Tables
SWOC	Strengths, Weaknesses, Opportunities and Challenges
TPP	Thermal Power Plant
UG	Underground
VGF	Viability Gap Funding
WTP	Water Treatment Plant

Summary for Stakeholders

REGIONAL JUST TRANSITION INVESTMENT PLAN: CHANDRAPUR-NAGPUR-YAVATMAL

Unlocking green growth, generating employment, advancing inclusive development

A region in transition with risks of a deepening economic divide.

The Chandrapur–Nagpur–Yavatmal (CNY) region forms the core of Maharashtra's coal economy, accounting for 100% of the state's coal production and nearly 50% of its coal-based power capacity. While this legacy has historically fuelled Maharashtra's industrial growth, the region now faces transition challenges. Ageing coal assets facing resource exhaustion challenges, national decarbonisation commitments, and the rising competitiveness of renewables are triggering rapid structural shifts. By 2035, coal production capacity is projected to decline by approximately 49 million metric tonnes (MMT), a 50% reduction, and coal-based power capacity by 2.8 gigawatts (GW), about a 23% capacity reduction, due to the closure of ageing mines and the retirement of older thermal power units.

These challenges are further exacerbated by the region's uneven green energy trajectory. Despite the emergence of a green industrial base in Nagpur, renewable energy (RE) investments across the broader region remain negligible. This imbalance threatens to deepen spatial disparities, leaving coal-dependent districts and communities particularly vulnerable to the transition and increasing the risk of economic distress.

Employment vulnerability and regional economic disruption.

The coal sector has a very significant economic footprint in the region. An estimated 3.3 lakh workers depend on coal mining, considering direct, indirect, and induced income dependence. Coal-based thermal power supports an additional 2.8 lakh workers across its value chain. Besides, the region has 1,253 operational factories, directly employing about 1.12 lakh people, many of which are in energy-intensive sectors that face growing decarbonisation pressures.

Without proactive planning, this transition could lead to significant impact on employment, and economic distress in the CNY region. Macro-economic modelling results show that, by 2035, the transition could directly impact over 11,700 formal workers from the coal and thermal power sectors and at least twice as many informal workers. Overall, livelihoods and income of about 2.4 lakh workers can be at risk (considering direct, indirect and induced dependence), with a potential regional GDP contraction of about 13.7% if mitigation measures are not implemented.

A regional planning and investment strategy anchored in just transition principles will be critical to driving green and inclusive economic growth.

A successful just transition in coal-dependent regions requires a coherent, strategic, and actionable framework. The 6Rs approach provides a structured guide to government and industry interventions, attracts private and public investment, and drives coordinated action across stakeholders.

The 6Rs include:

1. Restructuring the economy;
2. Repurposing of land and infrastructure for green economic use;
3. Revenue substitution;
4. Reskilling, skilling and workforce transition;
5. Resilient community development through targeted social investments; and,
6. Responsible transition planning, ensuring environmental and social safeguards.

The Regional Just Transition Investment Plan (RJTIP) is based on a comprehensive, data-driven methodology combining sectoral analysis, geospatial analysis, spatial planning, and macroeconomic modelling. Input-output modelling was employed to estimate the wider impacts of the transition on employment and regional GDP. Geospatial tools were used to identify repurposing opportunities of mining land and identify underutilised land

and water bodies with high potential for RE development. Extensive consultations with stakeholders—including workers, industry representatives, government officials, and civil society—ensured the inclusion of ground realities and local perspectives in the planning process.

The plan sets a 10-year implementation horizon from 2025 to 2035, with clearly defined priorities, timelines, and responsibilities.

Investments in green industries around strategic Economic Development Nodes are key to offsetting transition impacts, particularly through repurposing coal mine land.

Repurposing of coal mining land offers a major opportunity to develop green industries and green energy in the region. The plan identifies three strategic Economic Development Nodes (EDNs) across the CNY region—Bhadrawati–Wani, Rajura–Chandrapur, and Umrer—each anchored around clusters of coal mines (11 mines in total) that have reached/about to reach the end of their lives.

These nodes have been selected through a multi-criteria framework that balances the need for targeted transition interventions in highly affected blocks with investment suitability. The criteria include the availability of contiguous land parcels, technical and regulatory closure feasibility, proximity to infrastructure (especially energy and transport), access to water resources, and RE potential.

Together, these nodes represent a major opportunity to convert approximately 3,600 hectares (ha) of repurposed coal mining land into hubs for green industrial development.

a. **Bhadrawati–Wani Node (~2,105 ha):** The largest EDN, spanning across Chandrapur and Yavatmal districts. It includes blocks expected to be most affected by the transition in the next five to 10 years. The site offers largely contiguous land close to road and rail networks, and major surface water bodies such as the Wardha River and Erai Dam. It is highly suited for investments in green hydrogen, green ammonia, and green urea.
b. **Rajura–Ballarpur Node (~1,168 ha):** Located within Chandrapur district, this node also includes blocks facing imminent transition challenges. It benefits from strong infrastructure and water access, making it viable for industries like electric vehicles (EVs), battery manufacturing, and power electronics.
c. **Umrer Node (~332 ha):** Although the smallest in area, the Umrer node holds strategic significance due to its proximity to Nagpur city, an urban hub with robust infrastructure, logistics connectivity, and a well-developed pool of technical and managerial talent. Its location makes it highly suitable for attracting clean-tech, advanced technology, and R&D-intensive industries.

Overall, these nodes serve as anchor zones for a broader just transition strategy in the region. They aim to attract green investments, boost economic growth, and generate new employment opportunities for the local communities.

Realising the region's RE potential is crucial for supporting green growth and jobs, while meeting the state's target of 50% energy from non-conventional sources by 2030.

The CNY region presents a significant opportunity for large-scale RE development, particularly ground-mounted solar, due to the abundance of waste land and high solar insolation. According to the geospatial feasibility assessment, the region has an estimated RE potential of approximately 37.7 GW, encompassing ground-mounted, floating, and rooftop solar options. This positions the region as a critical driver of Maharashtra's green energy transition and its target of sourcing 50% of energy from non-conventional sources by 2030.

Ground-mounted solar accounts for the largest share of this potential, estimated at 23.6 GW across the three districts. Besides, floating solar offers an additional 10 GW of potential, along with 4 GW of rooftop potential in urban areas, particularly in Nagpur.

Targeted investments in RE infrastructure across these segments will be instrumental in unlocking the region's full potential, supporting green industrial development, improving energy access, and establishing CNY as a major clean energy hub for the state.

Green industry and green energy can attract about ₹5.4 lakh crore investments over the next 10 years.

The plan estimates that the CNY region can attract approximately ₹5.4 lakh crore in green industry and clean energy investments over the next decade. These investments are critical enablers of a resilient, future-ready, and prosperous regional economy and drive net-positive GDP growth of around 4% in the region.

For example, green hydrogen and green chemicals present a transformative opportunity to decarbonise hard-to-abate sectors such as steel, fertilizers, and refining, while creating integrated production hubs and downstream value chains. The automotive and EV sector offers investment potential across vehicle assembly, battery manufacturing, component supply chains, and charging infrastructure.

Besides, investments for RE development along with battery storage will underpin the region's transition, providing clean and reliable power to industries and reducing emissions across sectors.

About 3.4 lakh direct jobs can be generated through green investments, which will also require skilling and reskilling the workforce.

The green investments in the CNY region present an opportunity to generate about 3.4 lakh direct jobs over the next decade. This employment potential is not only sufficient to cushion the workforce impacts of mine closures and TPP unit retirements, but also will generate new employment and create opportunities for the local community, youth and women.

To fully realise this potential, targeted investments must be made to build a forward-looking skilling ecosystem. This includes strengthening foundational skills, reorienting technical education, and aligning the curriculum of training institutions with the evolving needs of emerging green sectors.

About ₹33,000 crore will be needed for just transition in the CNY region, with 66% for coal mine land reclamation and repurposing.

The total cost of implementing the plan in the CNY region over the next decade is estimated at over ₹33,400 crore. Nearly 66% of this—approximately ₹22,000 crore—is earmarked for the reclamation, environmental restoration, and productive repurposing of coal mine land, turning legacy assets into engines of economic renewal.

The remaining investment will support foundational infrastructure in emerging economic nodes, targeted skilling and reskilling of the workforce, and building stakeholder capacities to plan, implement, sustain the transition.

Implementing the investment plan will require coordinated action across government, industry, financial institutions, and local stakeholders.

Implementing the investment plan will require coordinated action across government departments, industry, financial institutions, and local stakeholders

The RJTIP delineates a clear set of roles and responsibilities for key actors:

- **State Government:** To lead infrastructure development, institutional planning, workforce skilling, and livelihood support through state budgets, convergence with central schemes, and allocation of District Mineral Foundation (DMF) funds.
- **Coal industry:** To meet statutory mine closure obligations , including reclamation and repurposing measures, and contribute to skilling and community development through Corporate Social Responsibility (CSR) and DMF resources.
- **Power plant operators:** Repurposing energy assets for green energy development and skilling of workers.
- **Private sector:** To drive investments in green industry and clean energy through private capital, enabled by blended finance models, viability gap funding, and supportive regulatory frameworks.

Implementation of the plan will require a robust state-level policy framework and a comprehensive governance architecture.

Implementing the RJTIP will require a robust policy and governance architecture, anchored in a multi-stakeholder, multi-level framework that ensures strategic oversight, inter-departmental coordination, and decentralised execution.

To steer a long-term, low-carbon, climate resilient and inclusive development pathway, a dedicated State Just Transition or Just Transformation Policy needs to be instituted.

In line with this, the following governance architecture may be considered.

a. **High-Level State Committee (HLSC):** The HLSC, chaired by the Chief Minister, will provide political leadership and strategic direction, aligning just transition priorities with state development and climate goals.

b. **Empowered Committee (EC):** The EC chaired by the Chief Secretary, will facilitate inter-departmental coordination, integrating just transition into state policies and schemes.

c. **Just Transition Office (JTO):** The JTO hosted within the nodal department, will function as the technical and administrative backbone, supporting plan execution, fund management, stakeholder coordination, and capacity building.

d. **District Just Transition Cells:** These cells in Chandrapur, Nagpur, and Yavatmal will lead on-ground implementation, engaging local institutions and communities in planning and implementation. These cells will be responsible for executing local investment pipelines, aligning DMF investments with just transition initiatives.

e. **Special Purpose Vehicle (SPV):** The State Government will need to set up a SPV for project aggregation and capital mobilisation. It will aggregate and structure bankable projects, deploy de-risking tools, and crowd in finance through green bonds, blended finance, and public-private partnerships (PPPs).

This architecture will ensure a strong policy and institutional commitment, operational coordination, financial mobilisation, and ground-level implementation capacity for the RJTIP.

The success of this architecture will also depend significantly on active collaboration with non-governmental stakeholders. Industry actors such as Western Coalfields Limited (WCL) and power utilities will be critical in repurposing coal mine lands and retired power plant assets, while also supporting workforce reskilling and redeployment, as noted. Financial institutions and investors will be instrumental in supporting green infrastructure and enterprise development, using tools such as blended finance, green bonds, and concessional lending. Together, this multi-actor, multi-level framework will be essential to ensure that the RJTIP is inclusive, locally rooted, fiscally sound, and aligned with advancing Maharashtra's development and climate goals.

01

Regional Perspective for Just Transition

Need for a regional just transition investment plan

Planning approach

1.1 Context

India is at a pivotal moment in its climate trajectory. As one of the fastest-growing economies, it has both the opportunity and responsibility to drive a decisive response to the climate crisis. The national commitment to net-zero emissions by 2070 articulates a long-term vision for a low-carbon, resilient, and inclusive economy. Realising this vision depends significantly on the leadership of state governments, particularly in regions with high fossil fuel dependence. States are uniquely positioned to integrate climate action with their economic development priorities by advancing decarbonisation measures while safeguarding livelihoods, enabling green job creation, and sustaining growth.

Maharashtra, one of India's most industrialised and economically significant states, will play a vital role in this transformation. The state contributes nearly 10% of India's greenhouse gas (GHG) emissions, owing to its concentration of coal-based thermal power plants, energy-intensive industries, and a rapidly growing transport sector. At the same time, the state ranks among the most climate-vulnerable regions globally. This dual pressure of being both a significant emitter and highly vulnerable to climate impacts demands an urgent and strategic response.[1]

The Chandrapur-Nagpur-Yavatmal (CNY) region is one of the most vulnerable areas in Maharashtra due to its heavy reliance on coal mining and thermal power plants (TPPs), many of which are ageing and whose operations have become economically unviable. In addition, several energy-intensive industries in the region will also need to plan for decarbonisation in the coming years.

The transition of these industrial units will have significant implications for the local workforce and economy. Proactively addressing the prospective employment and economic impacts will be critical to ensuring a just transition of the region that can drive green growth, generate local employment, and foster inclusive development.

1.2 Need for a regional just transition investment plan

A Regional Just Transition Investment Plan (RJTIP) is a strategic framework to manage the economic, social, and environmental impacts of the energy transition in fossil fuel-dependent regions. The plan is essential for addressing the challenges arising from the transition of fossil fuel industries in a comprehensive and integrated manner. It helps identify region-specific vulnerabilities and proposes investments and policy interventions that are aligned with both the economic and social dimensions of the transition.[2]

Figure 1.1: Advantages of a regional plan

Economic inter-dependence	In regions like CNY, industrial value chains and labour markets cross administrative boundaries. A regional plan recognises such interconnections, enabling a more holistic understanding of transition impacts and coordinated policy response.
Inclusive socio-economic transformation	The social impacts of the transition, such as employment and income losses, often spill over district lines. A regional plan ensures these impacts are addressed collectively and equitably, ensuring no worker or community is left behind.
Investment readiness and scale	Investors focused on green infrastructure, RE, and sustainable industries seek scale, coherence, and long-term vision. A regional plan can bundle projects, pool resources, and create integrated investment pipelines that are far more attractive than fragmented district-level efforts. This enhances the region's ability to mobilise both public and private capital at scale.
Institutional efficiency	Facilitates better governance and inter-district coordination, aligning mandates across departments and supporting the state's vision for green growth. It enables integrated planning for land use, energy, infrastructure, education, and employment, ensuring more efficient and effective delivery of transition objectives.

Overall, the RJTIP provides a blueprint for building a new regional economy that enhances opportunities of green growth and green jobs in a time-bound manner and through targeted investments. With the right design and execution, the plan signals that the area is transition-ready and investment-friendly, which in turn helps to mobilise public investments and unlock private capital.

1.3 Planning approach

The RJTIP for the CNY region is based on a comprehensive, data-driven methodology that combines secondary data analysis, geospatial mapping, spatial planning, and macroeconomic modelling. The key components of the methodology are outlined below.

a. **Analysis of secondary datasets:** The study draws on a wide range of secondary data sources, including those related to industrial activity, land use, employment trends, and other socio-economic parameters. These datasets were analysed to map the region's transition landscape, including current dependence on fossil fuel-based sectors, and the potential impact of the energy transition on various sectors and the economy.

b. **Geospatial mapping:** Geospatial analysis (GIS tool) was used to identify critical hotspots in the CNY region where transition risks are most concentrated. The tool was also used to identify and prioritise regions for green investments, such as, key Economic Development Nodes (EDNs) and evaluate renewable energy (RE) potential for augmenting green investments.

c. **Regional SWOC analysis:** A Strengths, Weaknesses, Opportunities, and Challenges (SWOC) analysis was conducted to assess the region's capacity for industrial diversification, workforce adaptability, infrastructure readiness, and environmental constraints.

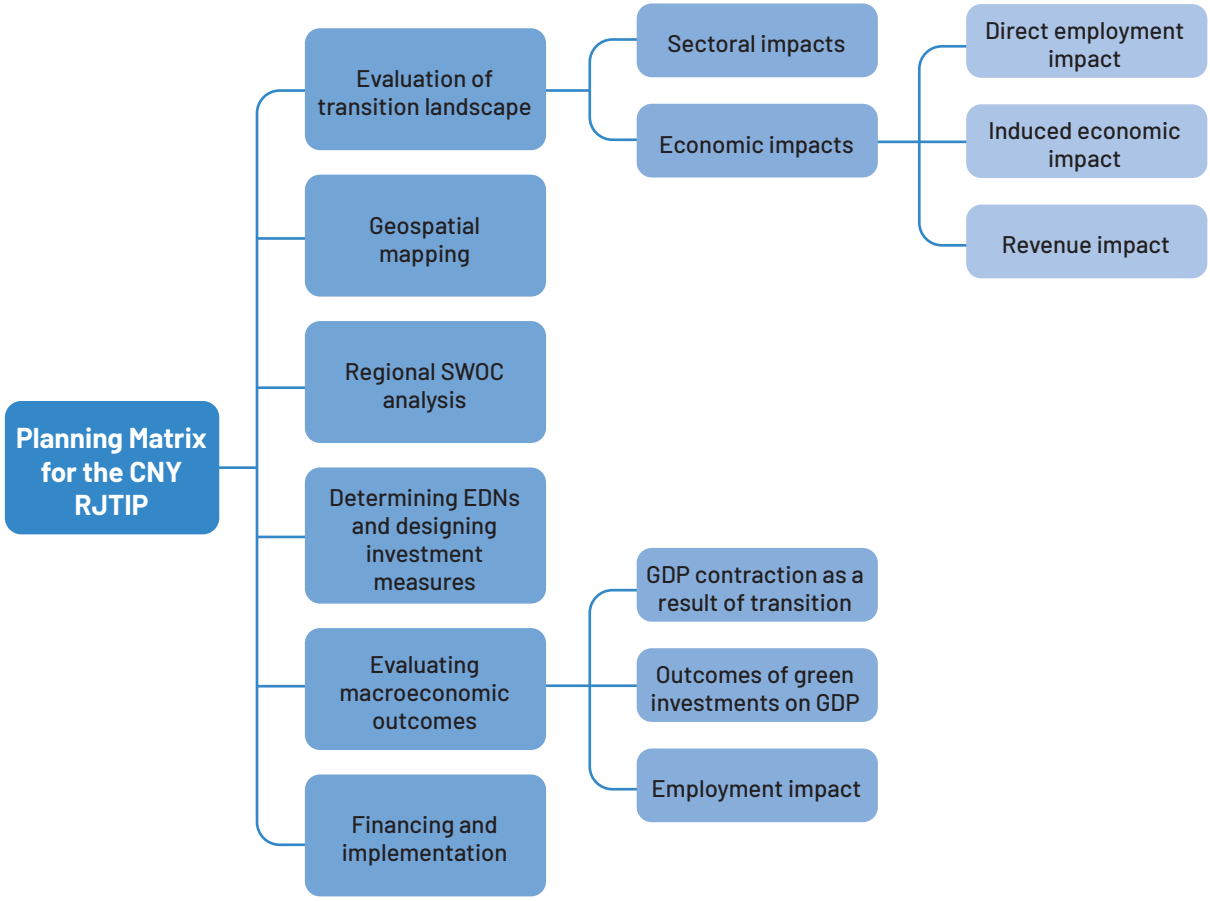
d. **Macro-economic modelling:** The Input-Output (I-O) modelling tool was employed to quantify the macroeconomic impacts of the transition. This included projecting potential economic shocks of the transition and the outcomes of green investments, helping to quantify overall effects on the regional economy.

e. **Cost estimation and financing needs:** Cost estimates were developed for each proposed intervention. This exercise formed the basis for outlining total costs and investments associated with implementing the plan, and identifying potential sources of finance, including public funding and need for private capital mobilisation.

Besides, analysis of secondary datasets, geospatial mapping, spatial planning, and economic modelling, field engagement with concerned stakeholders was undertaken to ensure the inclusion of local perspectives. This involved focus group discussions (FGDs) with the workers, especially those engaged in coal transportation and local businesses, among others. Besides, key informant interviews (KIIs) were also undertaken with government officials, industry representatives, and civil society organizations in the region and at the state level.

This multi-pronged planning approach ensures that the RJTIP for the CNY region is not only analytically rigorous but also contextually grounded. The combination of geospatial analysis, economic impact forecasting, and stakeholder perspectives allows for the identification of priority intervention areas that are economically viable, socially inclusive, and environmentally sustainable. This planning approach creates the foundational base for designing targeted policy measures, attracting investments, mobilising finances, and building institutional capacities.

Figure 1.2: Planning approach



Overall, the objective of the plan is to inform the State Government and other concerned stakeholders in the planning and implementation of RJTIPs. The approach adopted for the CNY region may also serve as a replicable framework for the development of RJTIPs across the state and the country.

02

Transition Impact

Sectoral impacts

Economic impacts

2.1 Overview

To inform the development of the RJTIP, the prospective transition impacts in the CNY region have been evaluated over a 10-year horizon (2025–2035). The assessment focuses on two dimensions:

- **Sectoral impact:** Capturing disruptions across coal, thermal power, and allied industries due to decarbonisation and declining competitiveness; and,
- **Economic impact:** Analysing job losses, revenue implications, and overall impact on the regional GDP.

This analysis forms the basis for identifying priority interventions and investment needs to enable a just and inclusive transition.

2.2 Sectoral impacts

2.2.1 Coal mining

Maharashtra has 43 operational coal mines-36 opencast (OC) and 7 underground (UG) operations-concentrated in Chandrapur, Nagpur, and Yavatmal districts, with a combined production capacity of approximately 90 million metric tonnes per annum (MMTPA). The vast majority of these mines (39) are operated by Western Coalfields Limited (WCL), while three are privately owned, and one is managed by Karnataka Power Corporation. These mines collectively cover a land area of around 37,589 hectares (ha) across the three districts.[3,4]

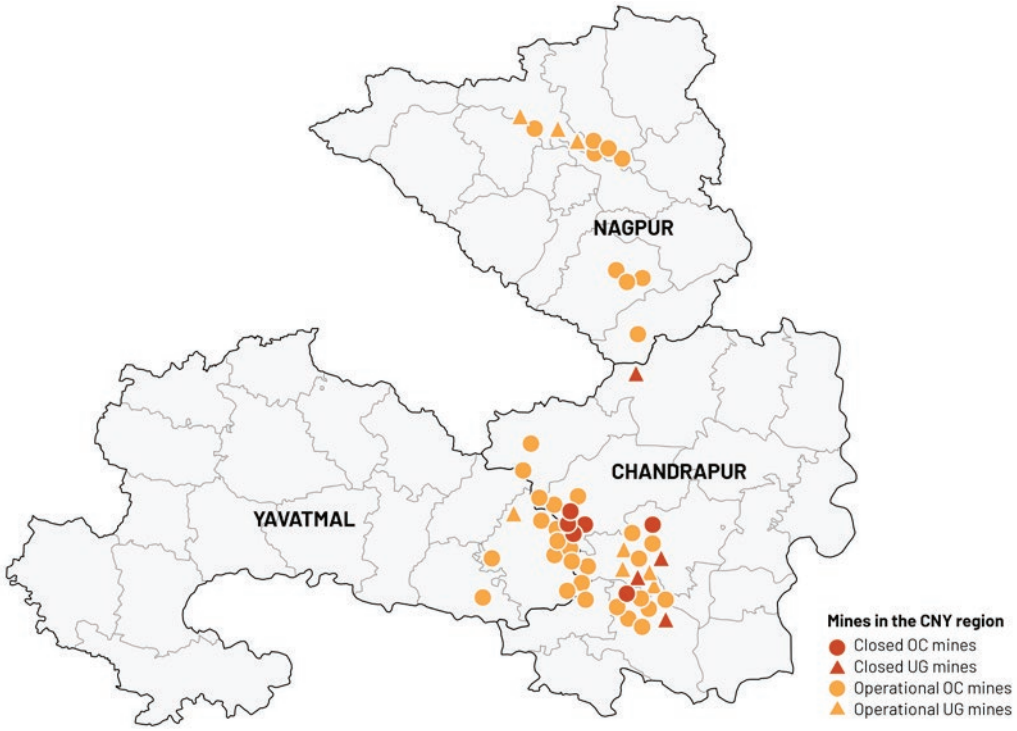
Table 2.1: Block-wise distribution of operational mines

District	Block	OC			UG			Total		
		No. of mines	Production capacity (MMTPA)	Land area (ha)	No. of mines	Production capacity (MMTPA)	Land area (ha)	No. of mines	Production capacity (MMTPA)	Land area (ha)
Chandrapur	Ballarpur	2	2.325	1,543.54	1	0.26	1619.66	3	2.585	3,163.2
	Bhadrawati	3	10.5	3,014.018				3	10.5	3,014.018
	Chandrapur	3	5.465	2,781.53	3	1.42	-	6	6.885	2,781.53
	Korpana	1	6.3	763.06				1	6.3	763.06
	Rajura	4	9.9	4,190.51				4	9.9	4,190.51
	Warora	2	3.57	2,062.95				2	3.57	2,062.95
Nagpur	Parseoni	3	7.9	2,198.51				3	7.9	2,198.51
	Saoner	2	3	941.87	3	2.85	3,720.39	5	5.85	4,662.26
	Umrer	3	13.6	3,242.32				3	9.4	3,242.32
	Bhivapur	1	1.9	756.92				1	1.9	756.92
Yavatmal	Wani	9	20.2	8,051.33	1	0.21	1,695.6	10	20.41	9,746.93
	Zari-Jamni	2	0.54	1,006.42				2	0.54	1,006.42
Total		**35**	**81**	**30,552.98**	**8**	**4.74**	**7,035.65**	**43**	**85.74**	**37,588.63**

Source: CIL, March 2025; WCL, 2024

In addition to active operations, there are 10 closed or mothballed mines (6 OC and 4 UG)—all located in Chandrapur district—occupying about 5,066 ha of land. Most of the closed mines are concentrated in the Bhadrawati block.

Map 2.1: Spatial distribution of closed and operational coal mines

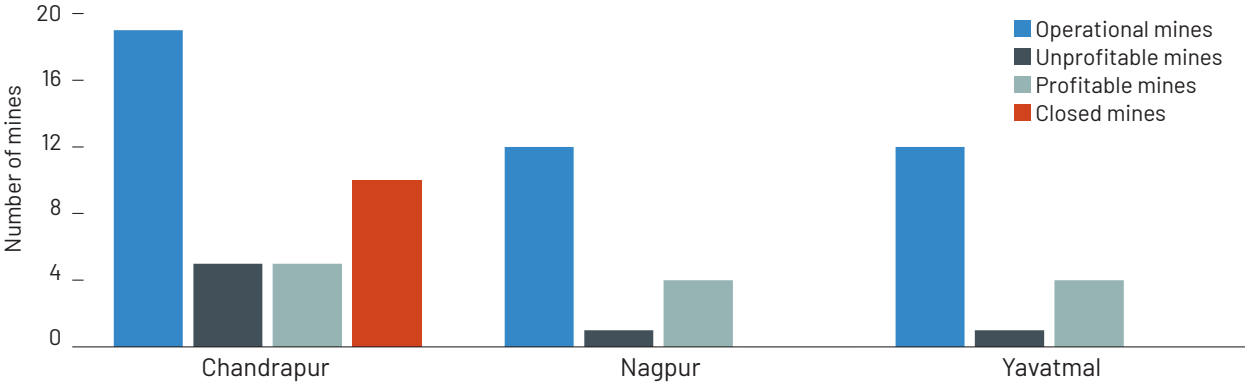


Source: iFOREST analysis.

Potential impact by 2035

There are a significant number of economically unviable and old mines in the CNY region. While WCL has converted some of the low-producing operations into amalgamated mines, however, the region faces challenges of resource exhaustion and potential mine closures in the coming years. Besides, about 40% of the currently operational mines are unprofitable.[5] Among the mines that are projected to close by 2035, 30% are unprofitable.

Figure 2.1: Distribution of profitable and unprofitable mines projected to close by 2035



Source: iFOREST analysis, based on data as obtained from the coal industry and the Ministry of Coal submissions to the Lok Sabha.

Overall, considering the end-of-life and economically unviable mines, in total 23 mines (15 OC and 8 UG) with about 49 MMTPA production capacity are expected to transition by 2035. These mines cover over 17,860 ha of land, of which over 81% (14,550 ha) is with OC mines.

By 2030, 19 coal mines need to start transition planning. These mines have a combined production capacity of 36.5 MMTPA and occupy a total lease area of 15,243 ha. The majority of them are concentrated in Chandrapur district, which accounts for over 50% of these mines.

Table 2.2: Potential mine closures by 2035

District	Block	No. of mines to close by 2030		Land available (ha)		No. of mines to close by 2035		Land available (ha)	
		OC	UG	OC	UG	OC	UG	OC	UG
Chandrapur	Bhadrawati	1		775		1		706	
	Ballarpur	1		243					
	Chandrapur	2	2	1,934	NA*		1		NA
	Rajura	3		2,573					
	Korpana	1		763					
	Chimur								
Nagpur	Saoner		2		3,310				
	Umrer	2		1,702					
	Parseoni	2		1,271					
Yavatmal	Wani	3		2,604		2		1,911	
Total		**15**	**4**	**11,863**	**3,310**	**3**	**1**	**2,618**	**NA**

Source: iFOREST analysis based on evaluation of mine specific documents on mine life, minable reserves, production capacity.
*NA=Data not available

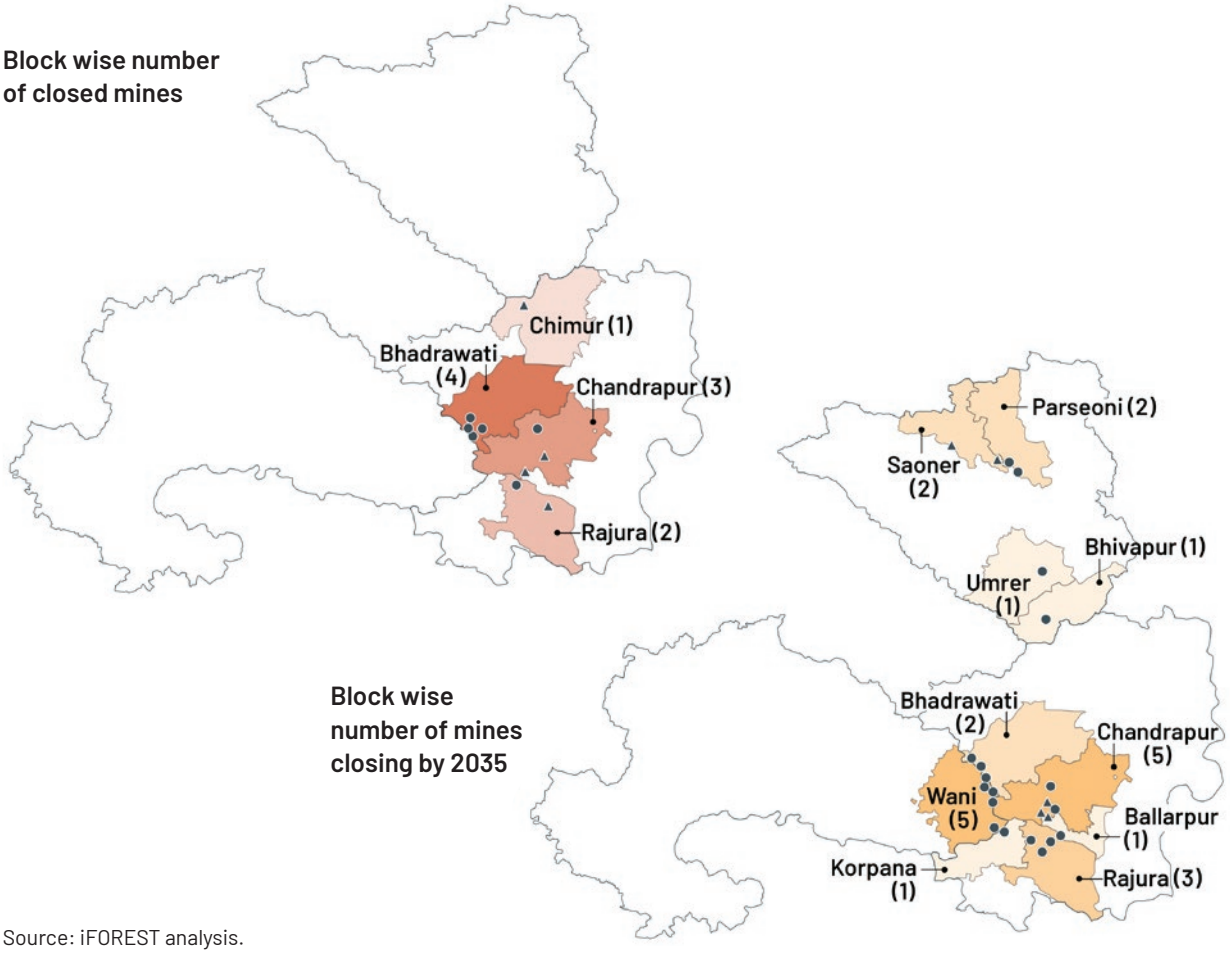
While the potential mine closures are fairly distributed across these districts, certain blocks within these districts are particularly vulnerable due to the combination of already closed mines and a significant proportion of operational mines that will close in the next decade.

For example, in the Chandrapur block, five out of six operational mines are projected to close by 2035, in addition to the three mines already closed. Similarly, in Rajura, three out of the four operational mines are expected to close, and the block already has two closed mines. In Bhadrawati, which has four mines already closed, two out of the remaining three operational mines are likely to close. Several other blocks, including those in Nagpur and Yavatmal districts, also face potential closures of about 50% of their currently operational mines.

The high concentration of mine closures in specific blocks and the pre-existing vulnerability of communities dependent on coal mining, makes it an imperative to prioritise targeted interventions in these high-risk areas. Without timely and well-planned support for economic development and employment generation, these regions may experience rising unemployment, economic stagnation, and social distress.

However, this evolving landscape also presents an opportunity to re-imagine the region's economic future. The availability of land, existing transport and power infrastructure, and human resources can be leveraged to attract green industries, RE projects,foster local resource-based livelihoods, and generate new employment opportunities. Strategic planning and targeted investments can help turn these vulnerable areas into future-ready green growth zones and maintain the economic continuity of the region.

Map 2.2: Hotspot blocks



Source: iFOREST analysis.

2.2.2 Coal-based Thermal Power Plants

Maharashtra currently has 23 operational TPPs (combining 68 units) with a cumulative installed capacity of about 24 GW. Besides utility-scale coal power plants, several captive power plants are operational in the state, catering to various industrial sectors. In total, the state has over 3.3 GW of coal-based captive capacity.[6]

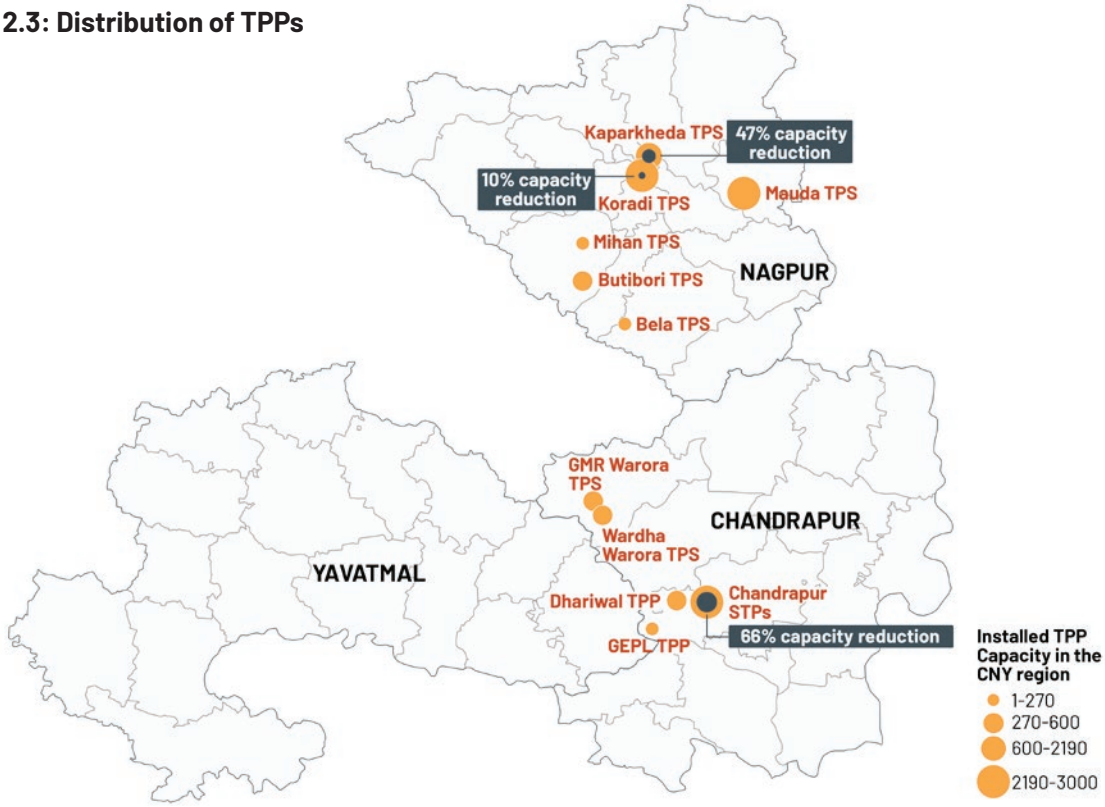
Among the utility-scale plants, five are located in Nagpur district and six in Chandrapur. Overall, the CNY region accounts for approximately 50% (11.7 GW) of the state's coal-based power capacity, which highlights the region's critical role in the state's energy transition.

Table 2.3: Distribution of operational TPPs

District	Block	No. of TPPs	No. of units	Installed capacity (MW)	Land (ha)
Chandrapur	Chandrapur	2	9	3,040	3,606.4
	Warora	3	8	1,740	406.7
Nagpur	Mauda	2	9	3,660	1,582.5
	Kamthi	1	4	2,190	900.5
	Hingana	1	2	600	111.2
	Umrer	1	1	270	140.4
	Nagpur	1	1	246	127.9
Total		**11**	**34**	**11,746**	**6,875.6**

Source: CEA report, 2024.

Map 2.3: Distribution of TPPs



Potential impact by 2035

The prospective transition timeframe for TPP units has been determined by considering the expected end of their design life, typically 35 years, as well as factors such as poor environmental performance and operational inefficiency - Plant Load Factor (PLF). Based on this, a phase-down scenario has been outlined for the coming decade.

By 2035, a total of nine TPP units in the region are expected to be retired, accounting for a combined capacity of about 2.8 GW (2,760 MW). All of these units are operated by Mahagenco. Of the nine, five are located in Chandrapur (within the Chandrapur Super Thermal Power Station), and four are in Nagpur (three at Kaparkheda TPP and one at Koradi TPP). Together, these units occupy approximately 1,675ha of land area.

Table 2.4: Potential retirement of TPP units by 2035

Name of TPP	District	Block	Year of commis-sioning	Unit No. to be potentially closed	Total number of units	Capacity (MW)	PLF (%)	Land area (ha)
Chandrapur STPS	Chandrapur	Chandrapur	1985	3	5	210	27.6	127
			1986	4		210	38.8	127
			1991	5		500	64.6	304
			1992	6		500	48.8	304
			1997	7		500	57.8	304
Kharparkheda	Nagpur	Mauda	1989	1	3	210	39.5	127
			1990	2		210	52.2	127
			2000	3		210	32.6	127
Koradi		Kamthi	1982	6	1	210	NA	127
Total				**9**		**2,760**		**1,675**

Source: iFOREST analysis based on the CEA report, 2024

The blocks to be most affected by the TPP retirements are Chandrapur and Mauda. Chandrapur hosts Mahagenco's largest plant in the region, comprising five units with a total capacity of 1,920 MW. Mauda in Nagpur follows, with three units amounting to 630 MW in capacity. The retirement of the units poses substantial socio-economic risks for local communities, particularly due to job losses and reduced economic activity. This challenge is further compounded in the Chandrapur block, which is also expected to witness a significant number of coal mine closures, making it a critical hotspot for just transition planning and focused intervention.

2.2.3 Factories

Factories across various industrial sectors are central to Maharashtra's economy. According to the Annual Survey of Industries, the state has about 25,883 factories, of which over 82% were operational during the reference year. The CNY region accounts for approximately 5.9% (1,253) of the operational factories in the state.[7]

Potential impact

The ongoing energy transition is expected to impact different industries in varying degrees. Based on a multi-criteria analysis developed by iFOREST, affected industries are categorised into high, moderate, and low-impact sectors. This classification is based on energy intensity, measured as the share of energy costs in total input costs. High-impact sectors are those with energy intensity exceeding 10%, moderate-impact sectors range between 5–10%, and low-impact sectors fall below 5%.

In the CNY region, over 39% (approximately 485) of the factories[8] fall within high-impact sectors, representing 8.2% of the state's total in this category. Although their contribution to Maharashtra's overall industrial output is relatively modest, the localised impact is significant. These high-impact factories collectively employ more than 40,000 people in the region.

Moderate-impact sectors account for about 10% (around 125 factories) in the CNY region. Despite their smaller number, they provide employment to approximately 22,490 individuals, indicating a strong local economic reliance on these industries.

In total, over 1.12 lakh people are employed in these factories underlining its deep dependence on manufacturing for both economic output and employment. This highlights the urgent need for targeted support, including technological upgradation and energy-efficiency measures, to enable a green transition of these industrial units, while safeguarding jobs and sustaining local economies.

Table 2.5: Factories in the CNY region

Parameters		Number
Total Factories		1,508
Factories in Operation		1,253
High-impact factories	No. of factories in operation	485
	Total output	36,32,928
	GVA	6,25,206
	Total no. of persons engaged	40,346
Moderate-impact factories	No. of factories in operation	125
	Total output	6,67,424
	GVA	1,69,111
	Total no. of persons engaged	22,490
Low-impact factories	No. of factories in operation	643
	Total output	29,37,429
	GVA	4,75,074
	Total no. of persons engaged	49,409

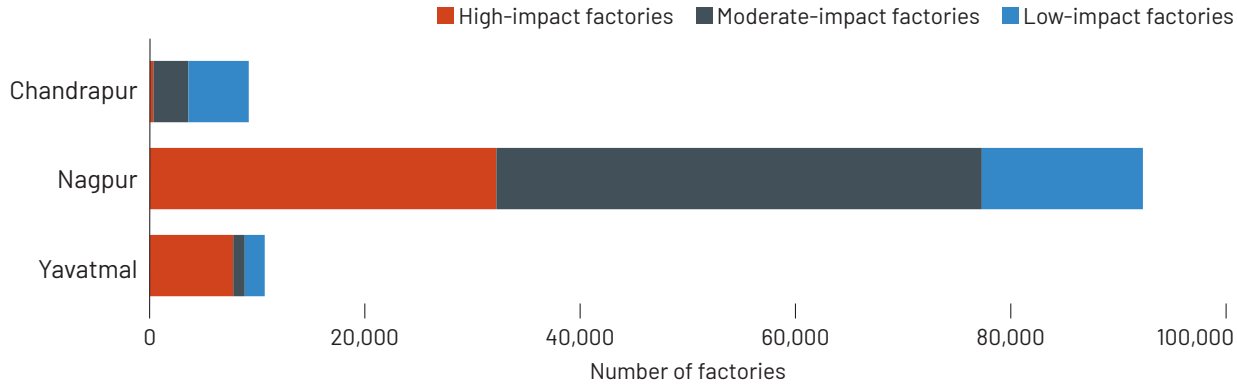
Source: Annual Survey of Industries, 2020-21

A district-wise distribution of factories further reveals the concentration of employment in the region.

Nagpur is the most industrially active district, with over 1,000 factories, of which 409 fall in the high-impact category. Chandrapur, though smaller in overall industrial size, has a high proportion of coal-based manufacturing activities. Yavatmal, on the other hand, has a predominantly low-impact industrial profile.

These patterns also have significance for just transition planning. Nagpur and Chandrapur require targeted strategies to support emission reductions in high-impact sectors through cleaner technologies and energy efficiency. Yavatmal offers opportunities for promoting green enterprise development and industrial diversification, with relatively lower transition risks from the factories.

Figure 2.2: Distribution of factories



Source: iFOREST analysis based on Annual Survey of Industries, 2020-21

2.2.4 Overall observations on sectoral impacts

Overall, the sectoral impact analysis highlights the following issues:

- Coal mining is the single most vulnerable sector in the CNY region, both in terms of scale and timing of transition impacts. By 2035, 23 mines are likely to face transition challenges, resulting in about 55% capacity reduction.
- Districts like Chandrapur are highly vulnerable to any unplanned transition due to already closed mines and a large number of mines likely to close in the next 10 years. For example:
  - » In Chandrapur block, five out of six operational mines are projected to close by 2035, in addition to the three mines already closed.
  - » In Rajura, three of the four operational mines are expected to close, and the block already has two closed mines.
  - » In Bhadrawati, which has four mines already closed, two out of the remaining three operational mines are likely to close.
- For coal-based TPPs, nine units (five in Chandrapur, four in Nagpur) with a combined capacity of about 2.8 GW will reach 35 years of age by 2035, and almost all operating with low PLFs, and are expected to be retired.

The combined effect of coal mine and TPP closures will be highly disruptive for the regional economy, both in terms of employment and regional GDP. However, as noted earlier, there are opportunities to repurpose and redevelop land and energy assets to maintain economic continuity and create employment in the region. Early action and investments must be prioritised in hotspot areas to minimise socio-economic disruption and enhance alternative opportunities.

2.3 Economic impacts

The economic impact of the retirement of coal mines and TPP units in the CNY region in the next 10 years has been evaluated considering three parameters:

- Impact on employment, which includes direct, indirect, and induced impacts;
- Impact on GDP, which includes the cumulative impact on the regional GDP; and,
- Impact of taxes and cess paid by coal companies, including royalty, District Mineral Foundation (DMF) funds, and coal cess.

2.3.1 Employment impacts

The employment dependence on the fossil fuel sectors and fossil fuel-based industries in the CNY region has been evaluated considering the coal mining sector, the coal-based TPPs, and the various factories that are operating in the region. Among these, coal mines and TPPs are most significant as all coal mines and 50% of coal-based power capacity are concentrated in the CNY region.

Coal mining

The coal mining sector has a major employment dependence in the region as all the coal mines in Maharashtra are located here. There are over 29,000 workers formally and at least twice informally dependent on the sector. Chandrapur has the highest number of coal mine workers, accounting for nearly 49% of the workers directly dependent on coal mining. Yavatmal and Nagpur have a share of 27% and 24% respectively.

Overall, more than 87,000 workers are formally and informally employed by the coal mining sector and are directly dependent on it for income.

With all coal mines of the state concentrated in the CNY region, the coal mining sector has a major employment and income dependence, considering direct, indirect, and induced dependence.

Table 2.6: Employment in coal mining

District	Departmental	Contractual	Formal (departmental + contractual)	Informal	Total
Chandrapur	10,348	3,870	14,217	28,434	42,651
Nagpur	5,235	1,835	7,071	14,142	21,213
Yavatmal	5,060	2,741	7,802	15,604	23,406
Total	**20,643**	**8,446**	**29,090**	**58,180**	**87,270**

Source: Western Coalfields Limited 2023 on formal workers; informal workers estimated from district-level studies on average informal dependence on the coal mining sector.

Besides workers directly employed in coal mining, a significant number are engaged across the coal value chain, particularly in transportation and related services. Such dependence has been determined through stakeholder consultations in Chandrapur and Nagpur (including with truckers' associations, coal transport workers, and trade unions), and input-output (I-O) modelling. The I-O model has helped in a systematic estimation of the broader economic footprint of these sectors by capturing direct and indirect inter-industry linkages, as well as induced effects generated through household income and consumption dynamics. This approach comprehensively quantifies the deep economic embeddedness of coal-linked activities within the CNY region.

Overall, the number of indirectly employed workers is estimated at approximately 77,000. In addition, the induced employment dependence—covering local businesses and services supported by coal sector activity—is estimated to exceed 1.6 lakh.

In total, around 3.3 lakh workers are dependent on the coal sector in the region, when accounting for direct, indirect, and induced employment. Notably, the combined indirect and induced employment is nearly four times the direct employment, underscoring the extensive socioeconomic linkages of the sector.

Table 2.7: Overall employment and income dependence on coal mining

Type of dependence	Total coal mining direct (formal + informal)	Coal transportation and others- workers in the value chain/ indirect	Induced
Estimated number of workers	87,270	77,269	1,60,610

Source: iFOREST analysis based on modelling study

Coal-based TPP

The coal-based TPPs also has a very significant employment dependence, with about 50% of Maharashtra's installed capacity being in the CNY region. Overall, the plants employ about 23,700 workers formally (including departmental and contractual workers) and many more informally. Nagpur has a major dependence on the sector, with about 59% of the workers.

Table 2.8: Employment in TPPs

District	Departmental	Contractual	Formal (departmental + contractual)	Informal	Total
Chandrapur	2,534	7,214	9,748	19,496	29,244
Nagpur	3,822	10,152	13,974	27,948	41,922
Total	**6,356**	**17,366**	**23,722**	**47,444**	**71,166**

Source: Total worker numbers are as provided by company departments for NTPC plants and Chandrapur STPS, and departmental workers are as provided by Mahagenco. For others, estimates are based on the CEA thumb rule of 0.63 persons per MW of installed capacity.
Note: As per information shared by Mahagenco, the number of contractual workers is approximately three times that of total formal workers. The same ratio has been used for TPPs where data was not available.

In addition, modelling studies suggest that the combined indirect and induced employment dependence of the coal TPP sector is nearly four times the direct employment, similar to the coal mining sector. In total, the coal-based TPP sector is estimated to support approximately 2.8 lakh workers across direct, indirect, and induced employment.

Table 2.9: Overall employment and income dependence on TPPs

Type of dependence	Total direct (formal + informal)	Total indirect	Total induced
Estimated number of workers	71,166	80,647	1,33,990

Source: iFOREST analysis based on modelling study

Factories

As noted earlier, the CNY region has about 1,253 operational factories. The factories collectively employ about 1.12 lakh workers directly. The high-impact sectors account for approximately 36% of the total factory workforce, while moderate-impact sectors represent around 20%.

Table 2.10: District-wise distribution of employment in factories

District	High-impact factories		Moderate-impact factories		Low-impact factories		Total
	No of factories	Employment	No of factories	Employment	No of factories	Employment	
Chandrapur	43	7,756	6	1,074	45	1,882	10,712
Nagpur	409	32,224	108	45,100	495	14,987	92,311
Yavatmal	33	3,66	11	3,235	103	5,621	9,222
Total	**485**	**40,346**	**125**	**49,409**	**643**	**22,490**	**1,12,245**

Source: Annual Survey of Industries, 2020-21

The analysis shows that the CNY region has a very significant employment dependence on the coal mining, coal-based TPPs, and factories. A large portion of this workforce is informal, making them especially vulnerable to sectoral transitions. The region's economy, deeply intertwined with these activities, makes it highly sensitive to the energy transition in the absence of proactive measures. This highlights the urgent need for a well-coordinated planning that not only protects existing jobs but also creates new, sustainable employment opportunities for affected workers and communities through green investments.

I-O MODELLING

To assess the broader economic dependence and the potential socio-economic impact of the energy transition in the CNY region, an Input-Output (I-O) analytical framework was constructed specifically for the three coal-bearing districts of Maharashtra. The methodology combined district-level economic data with national I-O structures to build a regionally tailored I-O model capable of estimating direct, indirect, and induced impacts on output, value added, and employment.

The I-O model was constructed using a 13-sector classification that mirrors the structure of district-level gross domestic product reporting. The base structure was derived from the India Supply and Use Tables (SUT) of the Central Statistics Office (CSO), and then aggregated to match the district sectoral configuration. Using concordance mapping, the national SUT's 140 commodity and 65 industry classifications were aggregated into a 13×13 matrix reflecting major sectors such as agriculture, mining, manufacturing, electricity, construction, trade, transport, financial services, and others.

To align these tables to district-level economic realities, value added, output, and tax data for each sector were sourced from Maharashtra's District Domestic Product (DDP) reports. Sector-wise adjustments were made using input-output ratios, cost structures, and tax incidence patterns derived from both state-level data sources (e.g., ASI, NSSO, and Department of Economics and Statistics, Maharashtra) and all-India IO benchmarks. Final demand components—including private consumption, government consumption, capital formation, and net trade—were estimated using district-level population shares and sectoral demand proportions from the national IO model. Further, a balancing procedure was used to ensure consistency between outputs and inputs across the various sectors.

The impact of the energy transition was assessed by simulating changes in coal output and power generation capacity for 2030 and 2035. These changes were then applied to the I-O model to estimate their ripple effects on the wider economy. The model captures direct indirect and induced impacts resulting from the transition in the next 10 years and the overall impact on GDP.

Besides, estimating potential negative impacts/shocks; the IO model has also been used to determine the impact of green investments in the CNY region to offset the negative impacts. The modelling exercise provides an overall understanding of the net macro-economic impacts of the energy transition and green investments in the region over the next 10 years.

EMPLOYMENT AND ECONOMIC IMPACTS

The employment and economic impact has been determined considering direct employment impact, and indirect and induced impact. Direct employment impact refers to the immediate effects on jobs in sectors directly linked to fossil fuel production and use—particularly coal mining, coal-based power generation, and associated industries. In mining-intensive districts like Chandrapur, where mining contributes significantly to both industrial output and employment, and the transition poses considerable risks of job displacement, combining formal and informal workers.

Besides direct impact, there is indirect impact on employment and income which arises due to to inter-industry linkages.

Besides direct and indirect impact, there is significant induced economic impact. The transition of coal mines, TPPs, and the impact on related economic activities have induced effects on output, gross value added and employment which are triggered by the household consumption expenditure.

In order to quantify these indirect and induced benefits, I-O model is a widely used technique which captures the inter-relationships among the production sectors and the household sector of an economy.

Overall employment impact

The workforce impact of the energy transition in the CNY region is expected to be most pronounced in the coal mining sector. The employment impact has been estimated considering a decline about 55% decline in coal production capacity 49 MMT reduction from the current capacity of about 90 MMT (with effective production decline from the current 69 MTPA to about 32 MTPA by 2035). Similarly, the coal-based power capacity will reduce by about 23%, about 2.8 GW reduction from the current about 11.7 GW.

By 2035, over 10,000 formal coal mine workers are projected to be directly affected by the transition. The maximum impact will be in Chandrapur district, with more than 50% of the impacted workers being in the district. For TPPs, approximately 1,600 formal workers will be impacted. Additionally, in both sectors, nearly twice the number of informal workers will be impacted.

Table 2.11: Direct employment impact

Sector	District	Total formal (considering all operational units)	Total informal (considering all operational units)	Potential impact on formal jobs by 2035	Potential impact on informal jobs by 2035
Coal mining	Chandrapur	14,217	28,434	5,265	10,530
	Nagpur	7,071	14,142	2,566	5,132
	Yavatmal	7,802	15,604	2,307	4,614
	Total coal mining	29,090	58,180	10,138	20,276
Electricity (TPP)	Chandrapur	9,748	19,496	1,027	2,054
	Nagpur	13,974	27,948	581	1,162
	Yavatmal	0	0	0	0
	Total electricity	23,722	47,444	1,608	3,216
Total (coal mining + TPP)		**52,812**	**1,05,624**	**11,746**	**23,492**

Source: iFOREST analysis.

Apart from the direct employment effects, the energy transition will trigger substantial indirect and induced impacts on local jobs and the broader regional economy. Given the high degree of economic interlinkages and household income dependence on coal mining and thermal power sectors, modelling estimates indicate that the transition could collectively affect about 2.4 lakh workers over the next decade.

Table 2.12: Overall impact on employment

Parameter	Mining sector	Thermal power sector	Total
Job (numbers)	1,73,177	65,977	2,39,154

Source: iFOREST analysis based on modelling study.

2.3.2 Regional GDP impacts

The economic structure of Chandrapur, Nagpur, and Yavatmal districts reveals distinct patterns of sectoral dependence and economic significance of these sectors. Overall, the tertiary or service sector dominates the regional economy, with Nagpur leading at 64.7% of its Gross District Value Added (GDVA), followed by Chandrapur (49.1%) and Yavatmal (47.3%). The primary sector—which includes agriculture, allied activities, and mining—still plays a significant role in Yavatmal (32.5%) and Chandrapur (30.0%), but is marginal in Nagpur at just 7.7%, highlighting its more urbanised and service-centric profile. The secondary sector, comprising manufacturing, utilities, and construction, contributes a relatively stable share across all three districts, ranging from 20.2% in Yavatmal to 27.6% in Nagpur.[9]

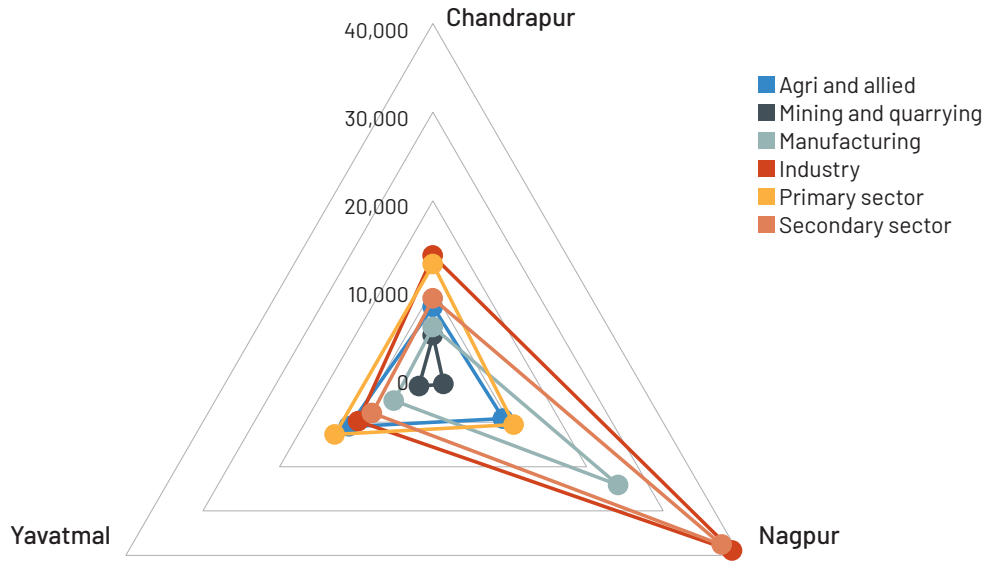
While the service sector has the most significant share in the region's economy, the industrial sector, comprising mining and the broader secondary sector, is also substantial. The industry sector contributes between 22.1% and 28.7% of GDVA. Within the industry sector, the role of mining is most significant in Chandrapur, accounting for about 34.9% of industrial GDVA. Yavatmal has a moderate mining footprint, with mining contributing to about 18.5% of industrial GDVA. Comparatively, Nagpur's industrial sector is more diversified and less coal mining dependent.[10]

Table 2.13: Economic structure of the CNY region

Parameters	GDVA as a share of the district total (%)		
	Chandrapur	Nagpur	Yavatmal
Primary sector (Agriculture and allied + Mining and quarrying)	30	8	32
Secondary sector (Manufacturing, electricity/gas/ water supply, construction)	21	28	20
Tertiary/Service sector	49	65	47
Industry sector (mining + secondary)	32	29	25
Mining	11	1	5
Mining as a share of industrial GDVA	35	4	19

Source: iFOREST Analysis based on District Domestic Product of Maharashtra 2021-22, by Directorate of Economics & Statistics, Government of Maharashtra.

Figure 2.3: Primary and secondary sector GDP contributions in CNY region



Source: District Domestic Product of Maharashtra (2011-12 to 2021-22).

The sectoral patterns are also reflected in the socio-economic performance of the districts, particularly when compared to the Maharashtra state averages. Nagpur leads the region with the highest per capita income, with ₹2.87 lakh, well above the state average of ₹2.48 lakh, and has the lowest share of multidimensionally poor people, which is 1.3%, reflecting robust economic development and improved living standards. Chandrapur performs moderately, with a per capita income of ₹1.98 lakh—above the national but below the state average—and a lower-than-average poverty rate of 5.3%. In contrast, Yavatmal lags significantly, with the lowest per capita income at ₹1.47 lakh and the highest share of multidimensionally poor people at 10.5%, notably higher than the state average of 7.8%.[11,12]

Table 2.14: Income and development indicators

Parameters	Districts			Maharashtra average	India average
	Chandrapur	Nagpur	Yavatmal		
Per capita income (lakhs)	1.98	2.87	1.47	2.48	2.12
Share of multidimensionally poor people (%)	5.3	1.3	10.5	7.8	15

Source: National Multidimensional Poverty Index, 2023 by NITI Aayog ; Government of Maharashtra, 2024.

The closure of coal mines and the retirement of TPP units will have significant impacts on the regional economy, considering economic interlinkages. As per the I-O modelling, the total estimated loss in economic output due to these closures is projected at ₹39,083 crore in real terms (2022–23 prices), representing about a 13.7% contraction in the region's GDP.

Such a contraction highlights the critical role fossil fuel-based industries currently play in the CNY region's economy and underscores the urgency of necessary investments and interventions to mitigate these impacts.

Table 2.15: Estimates of economic loss

Parameter	Mining sector	Electricity sector	Total	Share of total regional GDP
Economic output (₹ crore)	30,738	8,345	39,083	13.68%

Source: iFOREST analysis based on modelling study

2.3.3 Impacts on royalty, DMF and coal cess

Coal mining is a significant contributor to public revenue. The closure of 23 mines with about 49 MMT capacity reduction will also have implications for some of the taxes and cess paid by the coal company, such as, DMF funds, royalty, and coal cess.

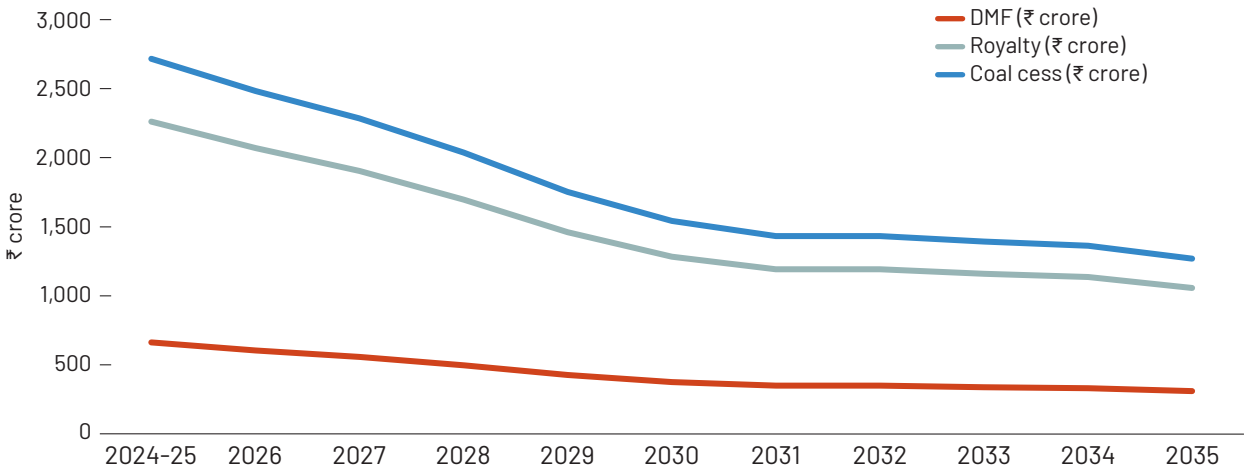
Overall, by 2035, there will be at least a 50% reduction in the total contributions from these sources due to the closure of mines. This will impact some of the social welfare and physical infrastructure investments in the region.

Table 2.16: Impact on royalty, DMF and coal cess

Parameters	2024-25	2030	2035
Coal production (MMT) (considering producing at 80% operational efficiency)	69	39.2	32.2
Estimated DMF (₹ crore)	661.8	376	309
Estimated royalty (₹ crore)	2,261.7	1,284.9	1,056.8
Estimated coal cess (₹ crore)	2,715	1,542.4	1,268.6

Source: iFOREST analysis based on Annual Report of WCL, 2025, and projected coal production as per current capacity and estimated mine life.

Figure 2.4: Year-on-year reduction in royalty, DMF and coal cess



Source: iFOREST analysis. Coal production for 2030 and 2035 was determined considering production at 80% operational efficiency as per current trends.

This decline in funds could severely impact the fiscal capacity of the State Government and the district administrations to fund health, education, infrastructure, and livelihood programs in coal-affected communities. It underscores the importance of planning for revenue substitution mechanisms as part of the just transition strategy to ensure continuity of public welfare investments and minimise socio-economic disruption in the region.

Overall, the analysis highlights the deep socio-economic dependence of the CNY region on coal mining and coal-based industries. The region's economy, employment base, and local welfare revenues are closely tied to these industries, both directly and through widespread indirect and induced linkages. Any transition away from coal will have far-reaching implications—not only for workers, but also for the regional economy.

03

Regional SWOC Analysis

Evaluation of Strengths, Weaknesses, Opportunities and Challenges

Strategic takeaways

3.1 Overview

From a regional perspective, while the CNY region shares a common economic base rooted in coal and allied industries, each district—Chandrapur, Nagpur, and Yavatmal—possesses distinct strengths and vulnerabilities that shape its transition potential. The SWOC analysis (based on various factors as discussed in earlier sections) provides a strategic lens to understand both the challenges and emerging opportunities for advancing green and inclusive growth across the region.

The analysis is structured around seven important pillars that collectively influence investment potential and transition readiness. These include:

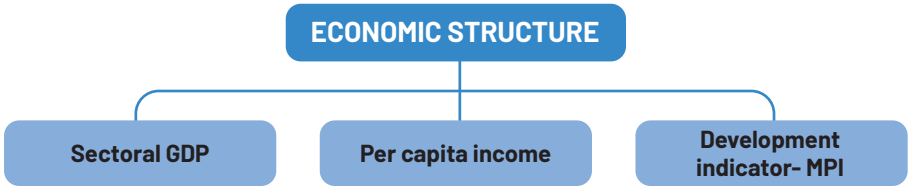
- Economic structure;
- Labour market;
- Workforce readiness;
- Land;
- Infrastructure and amenities;
- Environment and resources; and,
- Policy environment.

Evaluating these pillars is important for determining the region's capacity to plan and attract green investments, generate employment, and ensure an equitable and regionally balanced transition.

The following section highlights the key takeaways under each pillar to inform future planning and investment strategies.

3.2 Evaluation of Strengths, Weaknesses, Opportunities and Challenges

Pillar 1: Economic structure



The composition of the regional 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. Overall, three key indicators has been considered under this pillar. These include, sectoral GDP contributions, per capita income, and development indicator.

Key takeaways

- Chandrapur's economy is dominated by mining and industry, with 29% of district GDP from industrial sectors and 10% from mining alone—mining makes up 35% of its industrial GDP. Major industries include coal mining, cement, and power generation.
- Yavatmal's economy is primarily agrarian, with 25% of its GDP from agriculture and allied activities—the highest in the region. Industrial activity is limited (22% of GDP), and mining plays a smaller role (4%).
- Nagpur has a more balanced economic base, with 25% from industry, 6% from agriculture, and strong service-sector activity. It hosts large logistics, IT, and automobile component hubs.
- Per capita income is highest in Nagpur (₹2.87 lakh), reflecting its diversified economy, while Chandrapur (₹1.98 lakh) and Yavatmal (₹1.47 lakh) lag behind—Yavatmal falls below both state (₹2.48 lakh) and national (₹2.12 lakh) averages.

- Transition sector exposure (mining, manufacturing, electricity) is significant across the region with varying levels of transition risk.
- Economic resilience will require diversification into green energy and industries, value-added agriculture, and service industries, especially in coal-heavy districts like Chandrapur and agriculture-dependent Yavatmal.

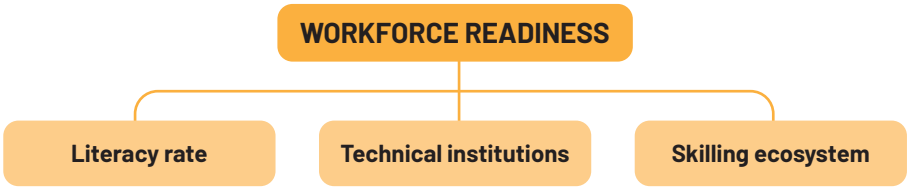
Pillar 2: Labour market

A region's labour profile, employment base, and workforce characteristics is an important factor for its economic growth. Overall, three key indicators has been considered under this pillar. These include, workforce type, unemployment trend, and outmigration.

Key takeaways

- Informal employment dominates across the region, associated with various sectors, such as mining, power production, industrial activities, and agricultural activities.
- Unemployment is over two times higher in Chandrapur and Nagpur than the Maharashtra average (3%), indicating structural labour stress despite industrial presence.
- Outmigration was observed as a challenge in blocks with higher concentrations of closed mines during ground interactions in Chandrapur district. FGDs undertaken with workers and businesses around closed mine areas and evaluation of demographic data showed a 15-20% decline in population in some of the villages with closed mines (such as Telwasa, Kadholi).
- Wage levels and job quality are major concerns—Yavatmal has the lowest per capita income (₹1.47 lakh), indicating underemployment and limited upward mobility.
- To ensure an equitable transition, targeted interventions need to be designed to protect vulnerable workers, formalise existing jobs, and create alternate employment avenues in green economic sectors.

Pillar 3: Workforce readiness



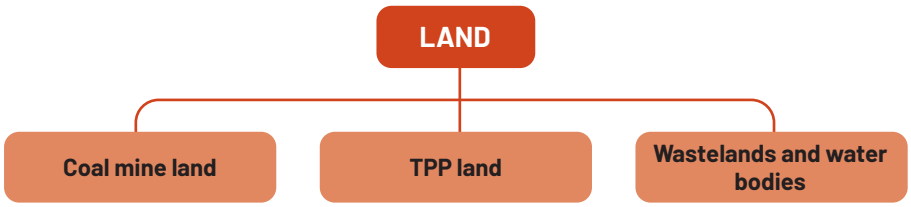
An educated and skilled workforce form the foundation of a region's capacity to transition into new sectors. For green industries, access to an adequately trained workforce is a key determinant of investment. Three indicators has been considered under this pillar. These include, literacy rate, technical institutions, and skilling ecosystem.

Key takeaways

- As per census demographic data, the region's urban areas has a lliteracy rate of about 80%, and for rural areas it is about 72%. This indicatives the availability of a workforce with at least basic education, whose skills can be further strengthened through targeted support an investments.
- Chandrapur and Yavatmal has limited access to quality vocational training and weak institutional presence in remote areas. Out of about 1,038 ITIs in the states, Chandrapur and Yavatmal has 54 and 22 of them respectively (as per Directorate of Vocational Education and Training).

- Nagpur has relatively better infrastructure for technical education but struggles with skill mismatch, especially in emerging sectors like renewables, digital services, and advanced manufacturing.
- Training in green sectors such as solar energy, energy efficiency, agro-processing, EV maintenance, and sustainable construction remains scarce across the region.
- Establishing district-level green skill hubs, modernising ITIs, and integrating training with local industrial needs is essential to enable inclusive green growth.

Pillar 4: Land



The availability of land for developing green industries and RE infrastructure are central to investment. Three indicators has been considered under this pillar. These include, potential of coal mining land, TPP land, and wasteland and water bodies for green industry and green energy development.

Key takeaways

- The region has significant land potential and repurposing opportunities considering the land available with coal mines and TPPs. Assessment of post-closure land use plans of 18 OC mines shows that over 9,000 ha can be planned for repurposing by 2030 for green investments.
- Repurposing and repowering TPP lands, waste lands, and also utilisation of water bodies provide significant potential for green energy development.
- The RE potential of the region is high, estimated at 37.7 GW, including: ground-mounted solar 23.6 GW, floating solar 10.1 GW, rooftop solar: 4 GW (See box: RE potential of CNY region)

RE POTENTIAL OF CNY REGION

The CNY region presents a significant opportunity for large-scale RE development, particularly ground-mounted solar, primarily due to the availability of wasteland and high solar insolation. As per iFOREST analysis of the RE potential of the region, overall, the potential is estimated to be about 37.7 GW. This includes ground-mounted, floating, and rooftop solar options, making the region central to Maharashtra's green energy transition vision.

Among the different RE sources, ground-mounted solar offers the highest potential, estimated at 23.6 GW across the three districts. Yavatmal leads with over 10 GW, followed by Nagpur and Chandrapur, with potentials of over 7 GW and 6 GW, respectively.

In addition, the region holds substantial potential for floating solar by leveraging reservoirs, mine voids, and other water bodies. The total floating solar capacity is estimated at around 10 GW—with Nagpur contributing nearly 5 GW, Yavatmal about 3.4 GW, and Chandrapur approximately 1.7 GW.

Urban areas across the region add further capacity through rooftop solar, with an estimated potential of around 4 GW. Nagpur alone accounts for 2.4 GW, owing to its high urbanisation and building density.

In total, the district-wise RE potential is estimated at approximately 8.6 GW in Chandrapur, 14.4 GW in Nagpur, and 14.8 GW in Yavatmal. Harnessing this diverse and sizeable RE potential can transform the region into a clean energy hub, and unlock new opportunities for green employment, industrial development, and sustainable growth.

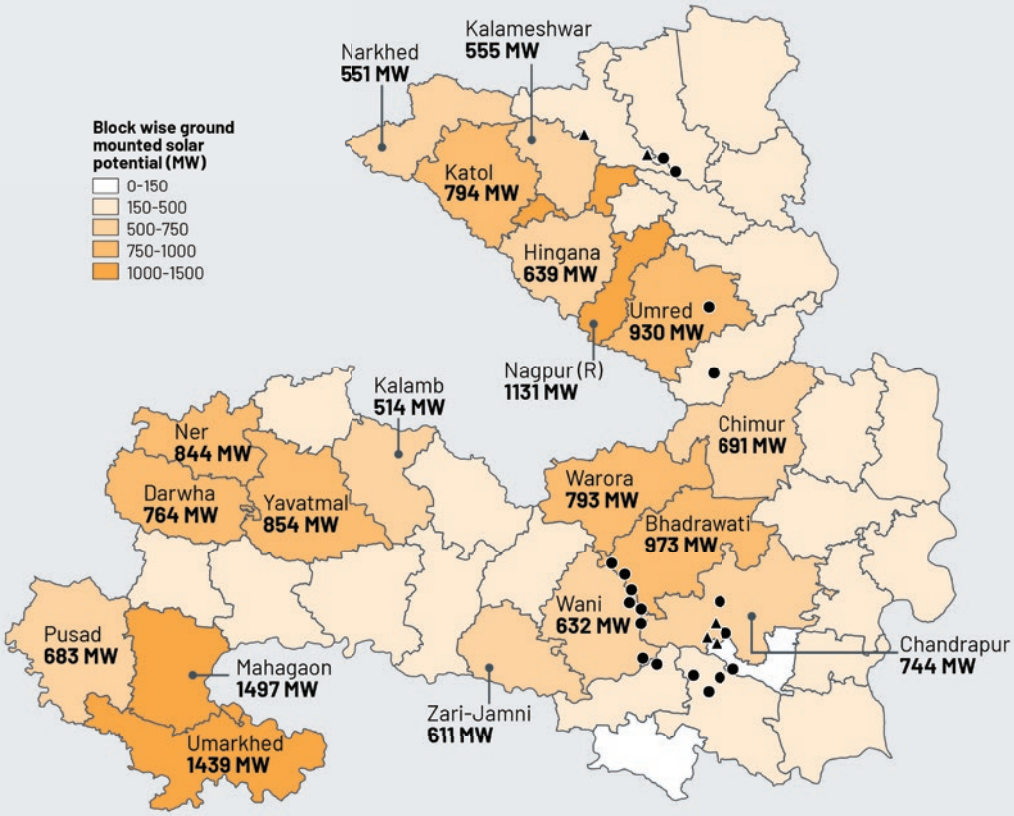
Box continued

Table 3.1: District-wise solar potential

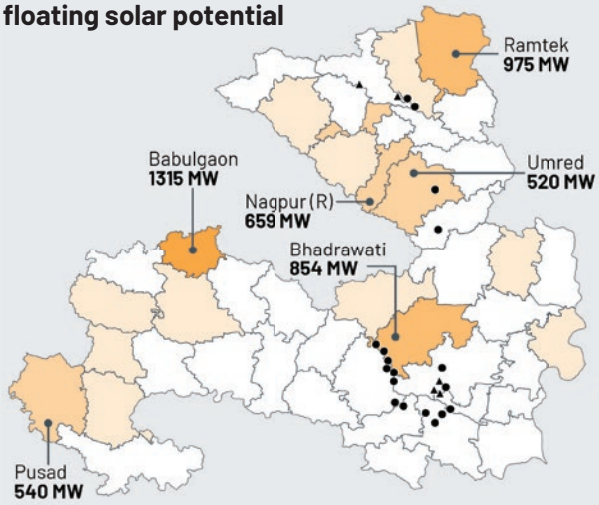
District	Ground mounted (MW)	Floating (MW)	Rooftop (MW)	District total (MW)
Chandrapur	6,106	1,682	806	8,593
Nagpur	7,058	5,003	2,350	14,411
Yavatmal	10,416	3,416	934	14,766
Total potential	**23,580**	**10,100**	**4,090**	**37,770**

Source: iFOREST analysis.

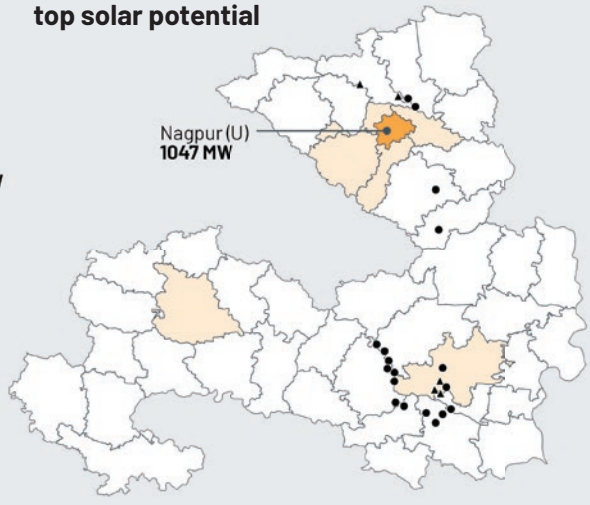
Map 3.1: Block-wise ground mounted solar potential



Map 3.2: District-wise floating solar potential

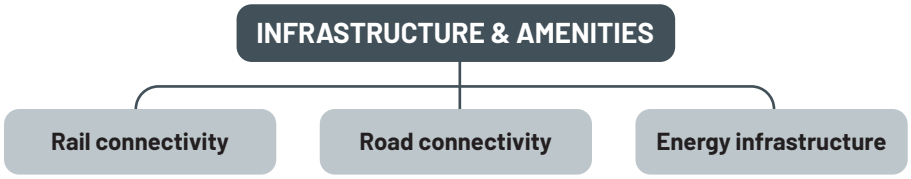


Map 3.3: District-wise roof-top solar potential



Source: Wasteland data sourced from the Wasteland Atlas 2019 (Department of Land Resources, GoI); remote sensing and mapping based on NRSC–ISRO information.

Pillar 5: Infrastructure and amenities



Transport, power, digital connectivity, and access to basic services shape investor confidence and determine whether new industries can be sustained. Two key indicators has been considered under this pillar. These include, rail and road connectivity and energy infrastructure.

Key takeaways

- The region has a strong rail and road network and is well-positioned to support regional growth.
- Nagpur has the most robust infrastructure, with 408.7 km of rail lines, 147 km/km^2 of road density, and robust logistics and digital connectivity, making it ideal as a regional green growth anchor.
- Chandrapur, despite having power infrastructure, suffers from patchy industrial and transport facilities.
- Yavatmal is comparatively underdeveloped and requires targeted intervention
- Strategic infrastructure upgrades—especially around industrial corridors, RE zones, and rural hubs—are essential to catalyse new green investments.

Pillar 6: Environment and resources

Environmental baselines and natural resource availability influence not only 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 for decision on investments. Three indicators, water resources, forest resources, and climate vulnerability have been considered under this pillar.

Key takeaways

- Chandrapur stands out with the highest forest cover (3.8 lakh ha.) accounting for about 11% area of the district). Nagpur and Yavatmal have comparatively lower forest cover.
- Three major rivers are present in the region- Wardha, Penganga, and Wainganga, assuring high availability og surface water. Besides, there are major dams, such as, Gosikhurd and Irai.
- However, despite the availability of an extensive river system, the region is drought-prone, with Nagpur being the most vulnerable.
- Investments should be guided by environmental safeguards, with a focus on circular economy models, reforestation, and ecosystem-based livelihoods.

Pillar 7: Policy environment

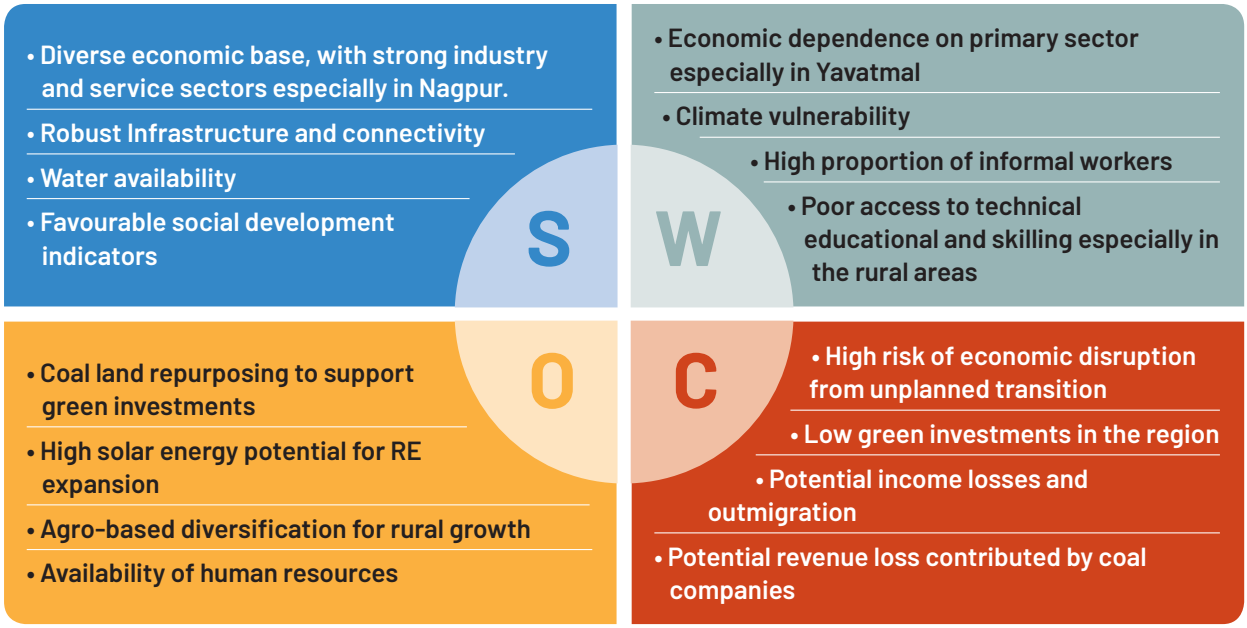
Key takeaways

- While Maharashtra's industrial and sectoral policies formally include provisions for promoting investments in Vidarbha, the effective implementation of these policies[13,14] remains limited in the CNY region.
- Chandrapur and Yavatmal continue to face significant gaps in basic infrastructure, industrial ecosystem development, and investor facilitation. This disconnect between policy design and ground-level execution poses a barrier to sustained private sector engagement.

3.3 Strategic takeaways

The results of the SWOC analysis brings out the overall strengths and opportunities of the region.

Figure 3.1: Overall SWOC



Strengths

- Overall, strong service sector in the region contributing to at least 50% of respective district GDPs. Nagpur contributes 25% to regional GDP through a strong industrial base, while Chandrapur and Yavatmal have a strong primary sector contribution.
- The region has an overall good connectivity of rail and road with Nagpur (408.7 km rail, 147 km/km^2 roads) and Chandrapur (341.2 km rail) have dense rail and road networks, enhancing access to logistics, supply chains, and inter-regional markets.
- Presence of abundant water bodies (Gosikhurd and Irai dams, Wainganga, Wardha rivers etc.) to support agriculture and industrial activities.
- With low multidimensional poverty indicators well below the national average—the region demonstrates strong access to healthcare, education, and basic services.

Weaknesses

- Chandrapur relies heavily on coal mining and TPPs, which constitute ~60% of its GDP, exposing the district to transition risks.
- Yavatmal lacks industrial depth (only 10 sq. km of industrial area) and remains over-dependent on the primary sector.
- Groundwater over-extraction (up to 1.5m/year in places) and industrial pollution affect major rivers across Chandrapur and Nagpur.
- Chandrapur and Nagpur districts are also vulnerable to drought.[15]
- Limited access to skilling and higher education in Chandrapur and Yavatmal is curbing workforce readiness for emerging sectors.
- As per the census demographic information and FGDs, formal female workforce participation is low, with women largely engaged in informal, low-wage sectors—especially in Chandrapur and Yavatmal.

Opportunities

- Repurposing coal mining land post closure offers huge huge opportunity for green investments. In the next 10 years, planning mine land repurposing as part of the mine closure plans will be crucial for reutilisation of this valuable land.
- The region's low rainfall and high insolation make it ideal for solar deployment, contributing to a total renewable energy potential of 37.7 GW—including ground-mounted, floating, and rooftop solar.
- Yavatmal is well-positioned for agro-processing, value chains, and eco-industrial models, which can generate rural jobs and reduce migration pressure.
- The region has the opportunity to develop human resources to make them employable in the green industries and emerging sectors. With Nagpur already having technical institutions and industries, the government and the industry need to work together to develop a skilled workforce.

Challenges

- The coal mines of the region are old and faces the looming challenge of resource exhaustion. The exhaustion of resources of about 23 mines (49 MMT capacity) and prospective retirement of nine TPP units (2.8 GW) by 2035 can potentially impact about lakh workers, including direct, indirect and induced impacts.
- The transition to could lead to over 13% contractions in the regional GDP.
- In absence of pro-active planning, the region will experience significant socio-economic disruption.

The SWOC analysis highlights that with a strong industrial base and service sector, robust connectivity, and access to natural resources, the CNY region is well-positioned to attract green investments and diversify its economy. If strategically leveraged, opportunities around mine land repurposing and RE development can foster a green economic growth pathway in the region. The region's human resources can be skilled and upskilled for emerging green sectors to retain local employment, while generating new opportunities. Strong policy support, targeted investments, and multi-stakeholder collaboration will be essential to harness this opportunity.

04

Regional Just Transition Investment Plan

The 6 Rs for planning

Investment plan

4.1 The 6 Rs for planning

Developing a regional just transition plan calls for coordinated interventions guided by six core pillars—the 6Rs. These include:

i. Restructuring the economy;
ii. Repurposing of land and infrastructure for green economic use;
iii. Revenue substitution to help districts and states manage fiscal transitions;
iv. Reskilling, skilling and workforce transition;
v. Resilient community building through targeted social investments; and,
vi. Responsible transition planning, ensuring environmental and social safeguards.

Interventions designed around these six pillars provide the opportunity to drive sustainable transformation of coal/lignite mines and the mining areas through strategic planning, regionally tailored implementation models, and well-designed institutional mechanisms.

The RJTIP for the CNY region over the next 10 years (2025-2035) is proposed considering these core pillars and simultaneously harnessing the strengths and opportunities of the region as derived from the SWOC analysis.

4.2 Investment plan

The RJTIP of the CNY region focuses on offsetting the potential disruptions from the closure of coal mines due to resource exhaustion, and the retirement of TPPs on employment and income (direct, indirect, and induced), and the regional GDP. To attract investments in a time-bound manner, the plan also has a strong focus on ease of doing business.

4.2.1 Repurposing coal mining land

In the CNY region, coal mine land repurposing offers a key opportunity to transform closed mining lands, or those projected to close in the next 10 years, into diverse economic opportunities such as green industries, RE parks, aquaculture, or eco-tourism areas. This can support economic diversification, restore degraded landscapes, and create alternative livelihoods for local communities.

As noted earlier, the assessment of post-closure land use and progressive mine closure activities undertaken until recently (2022-23) of 18 OC mines shows that over 9,000 ha can be planned for repurposing by 2030 for green investments.

The most suitable coal mining areas for repurposing and green industry investments have been determined based on a structured multi-criteria evaluation framework.

This approach integrates geo-spatial mapping with a set of critical parameters to assess the relative suitability of various sites. This framework assesses and prioritises the coal mine clusters in the CNY region for repurposing post-closure, based on a combination indicators. The analysis systematically evaluates mining areas across four key criteria:

- Land suitability and availability;
- Closure feasibility;
- Proximity to infrastructure and resources; and,
- RE potential.

Figure 4.1: Criteria for determining investment suitability

Land suitability and availability	Closure feasibility	Proximity to infrastructure and resources	RE potential
• Contiguous mine land for repurposing for easier land aggregation & planning for economic diversification. • Proportion of forest land- zero or least amount of forest land enables faster repurposing, as forest clearance or an NOC will not be required.	• Mines that will potentially close in the next 2-5 years leaving ample scope of having a repurposing plan in place by 2030. • Classification of mines by their closure complexity.	• Proximity to TPP, including units considered for retirement. • Access to grid Infrastructure. • Water resource availability for industrial use. • Rail and road connectivity.	• RE potential within a radius of 10 kms from mines/mine clusters and in the blocks.

Each mining area/cluster evaluated against the above indicators using a normalised scoring method. The normalised scores against each indicator is evaluated and the higher values (in darker shades of red) indicate more favourable conditions for mine repurposing. The heatmap indicates that the most favourable clusters for repurposing are mine cluster 2, mine cluster 4 and Umrer mine.

MINE CLUSTER ASSESSMENT FRAMEWORK

To identify the most suitable mine clusters for repurposing in the CNY region, a multi-criteria assessment framework was applied using quantitative indicators across land availability, closure feasibility, infrastructure and resource access, and RE potential.

A heatmap has been used as a scoring matrix to visually compare the performance of each cluster across multiple indicators and variables. This analysis enables data-driven prioritisation of mine clusters, supporting informed decision-making and planning. The variable under each indicator such as land availability by 2030, forest land, closure cost per hectare, proximity to TPPs and substations, water bodies, and RE potential of the blocks were normalised to a common scale using min-max normalisation. For indicators where lower values are preferable—such as forest land, closure cost, and distances—scores were inverted to ensure consistency in suitability interpretation. A composite score for each cluster was then calculated by adding the normalised values, enabling an objective ranking of clusters based on their overall repurposing potential- the higher the aggregate value of the mine cluster from each variable the more suitable the land is for repurposing.

(see Annexure 2: Details of mine clusters for repurposing)

Map 4.1: Location of mine clusters in the CNY region

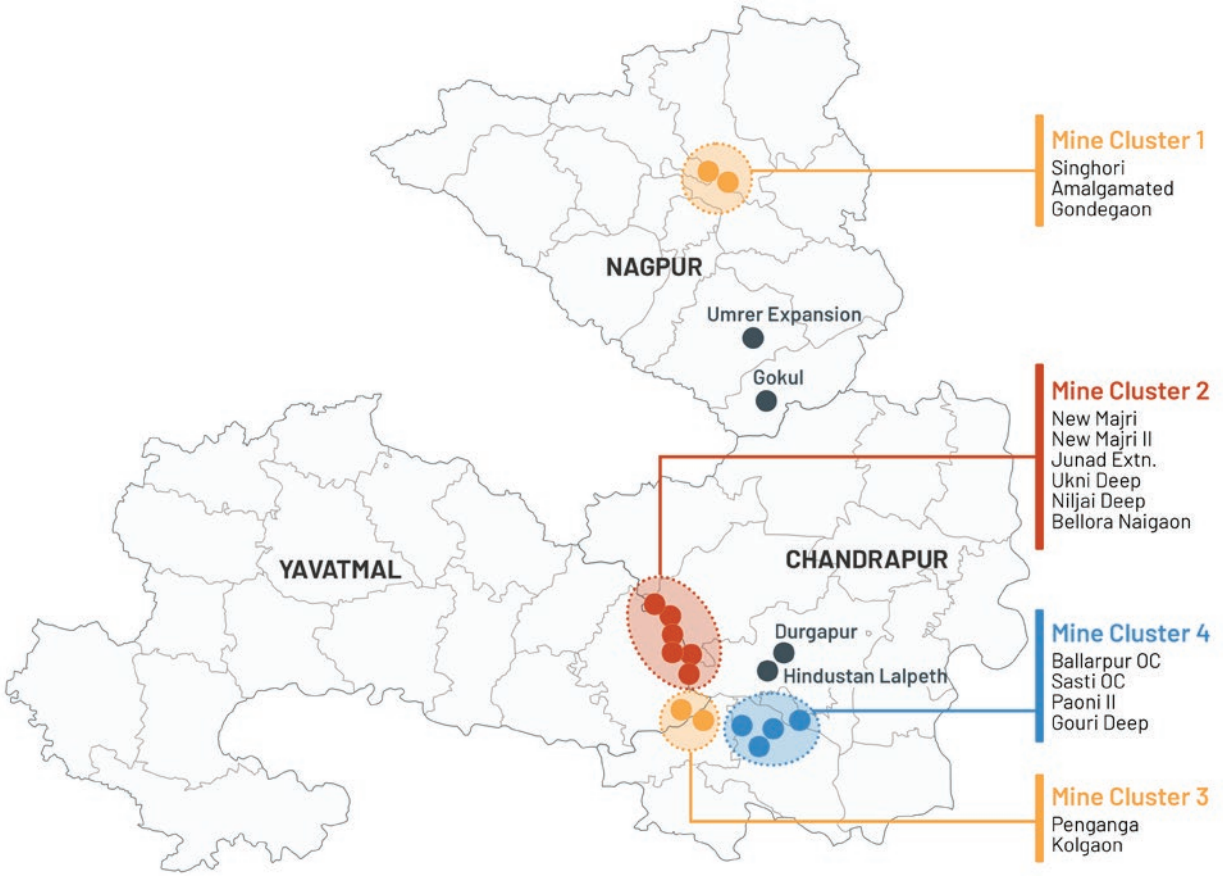


Table 4.1: Heatmap of normalized cluster scores across key indicators

		Mine cluster 1	Mine cluster 2	Mine cluster 3	Mine cluster 4	Stan-dalone mine 1	Stan-dalone mine 2	Stan-dalone mine 3	Stan-dalone mine 4
Land suitability and availability	Area under cluster	0.18	1	0.16	0.47	0	0.25	0.12	0.08
	Forest land	0.96	1	0.88	1	0.81	0	1	0.97
Closure feasibility	Land by 2030	0.39	0.93	0.34	1	0	0.35	0.23	0.23
	Closure cost	0	0.45	0.45	0.25	1	0.9	1	0
Renewable energy	RE potential	0	1	0.27	0.41	0.1	0.1	0.34	0.34
Proximity to infrastructure and resources	TPP distance	1	0.65	0.66	0.68	0.89	0.98	0.31	0
	Substation distance	0.73	0.65	0.95	0.82	0.75	0.9	1	0
	Water body distance	0.59	0.53	0.7	0	0.64	0	1	0.89
	Water capacity	0.65	1	0.19	1	0	1	0.25	0.27
Aggregate of all indicators		**4.5**	**7.2**	**4.6**	**5.6**	**4.2**	**4.5**	**5.3**	**2.8**

Source: iFOREST analysis.

Priority areas for green industry investment

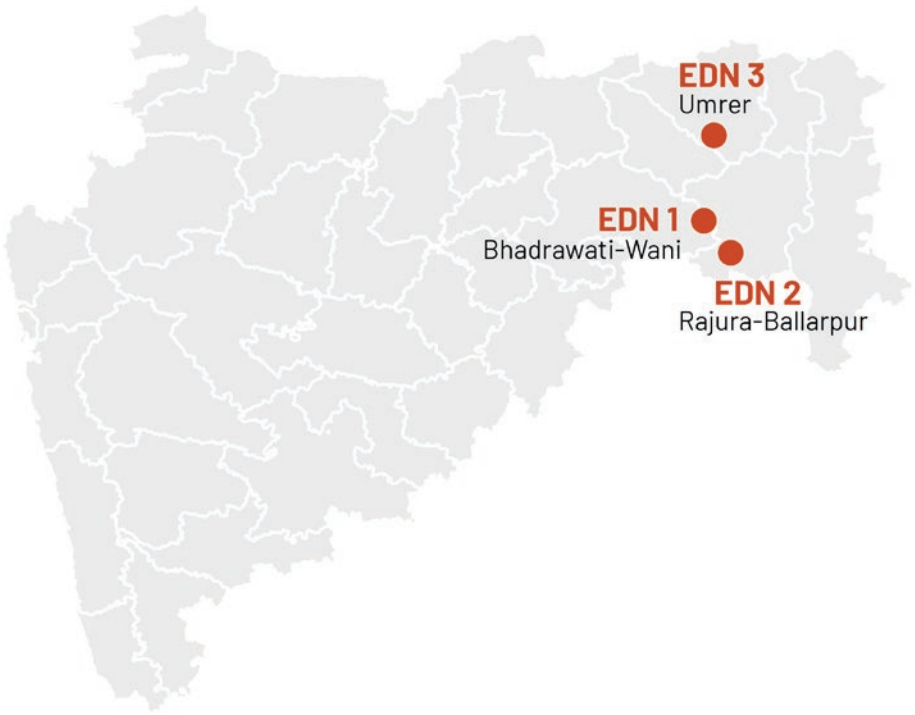
Based on the mine closure analysis and prioritisation exercise, three key Economic Development Nodes (EDN) have been proposed in the following locations:

i. Bhadrawati-Wani (Chandrapur and Yavatmal districts)

ii. Rajura-Chandrapur (Chandrapur district)

iii. Umrer (Nagpur district)

Map 4.2: Location of the Economic Development Nodes



Collectively, around 6,000 ha of land is currently available for the development of these nodes. The Bhadrawati-Wani cluster has over 3,500 ha available for repurposing, Rajura–Chandrapur offers 1,950 ha, and Umrer has 550 ha within the mine lease area identified for economic diversification.

Of the total land available for repurposing within the EDNs, 40% is reserved for common facilities and infrastructure like roads, Sewage Treatment Plants (STPs), Water Treatment Plants (WTPs), fire stations, green spaces, commercial spaces, etc. Hence, the effective land for investment is around 3,600 ha, including all three economic development nodes.

This strategic availability of land presents a significant opportunity to anchor the region's just transition through the development of dedicated economic nodes. With nearly 3,600 ha of effective land earmarked for investment across the EDNs, a blueprint is in place for attracting green industries, sustainable infrastructure, and diversified enterprises. These investments can potentially generate over three lakh direct jobs.

As additional land becomes available in the coming years following the scientific closure of mines, these nodes can be further expanded to accommodate emerging sectors and technologies.

Economic Development Node 1

Bhadrawati- Wani mine cluster

Total land in the cluster	Land available for repurposing	Effective investment area	Proposed investment
5,603 ha	**3,509 ha**	**2,105 ha**	**₹2,63,175 cr**

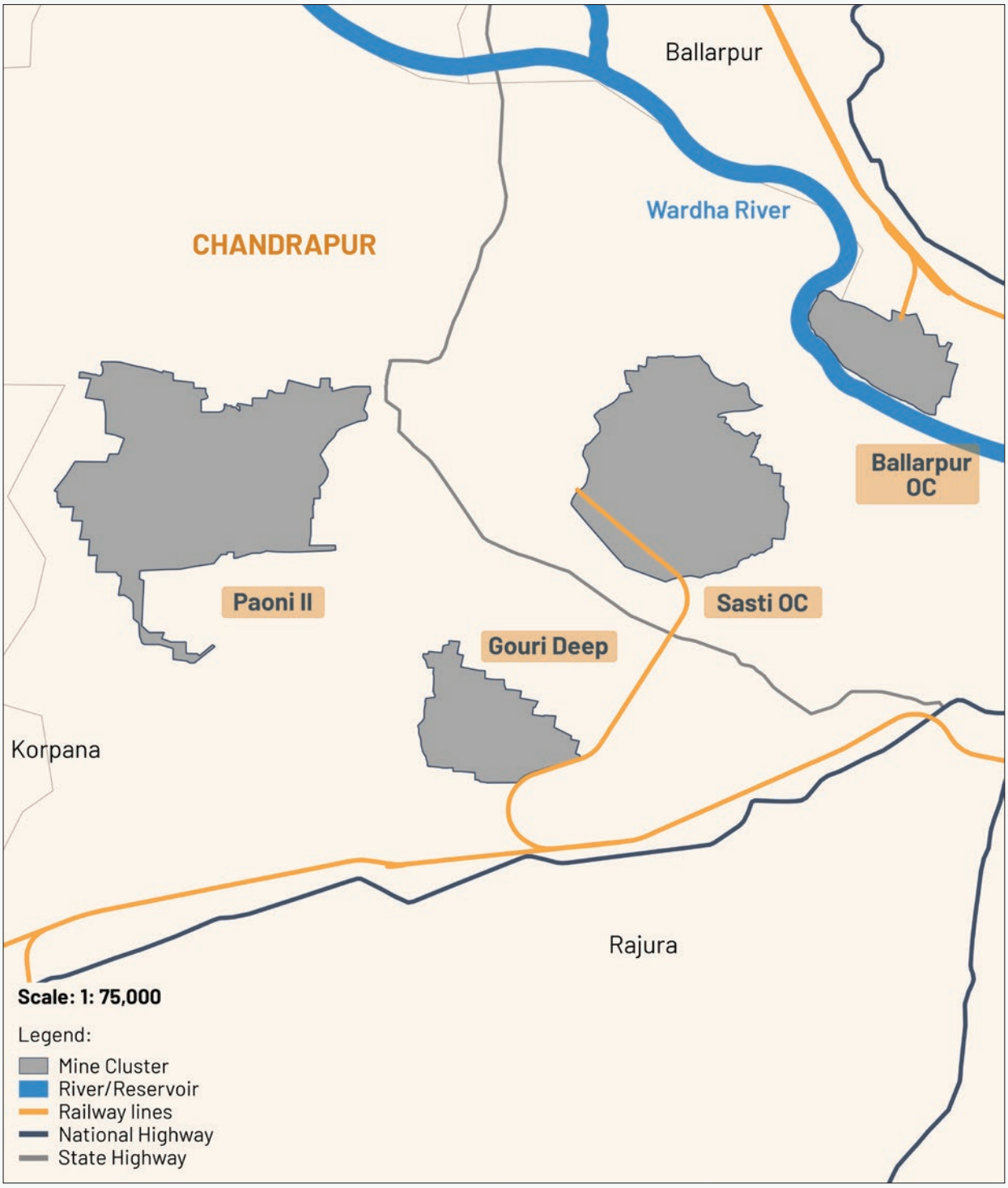
Green hydrogen and green chemicals | Green ammonia | Methanol | Green urea | Value added chemicals

Economic Development Node 2

Rajura- Ballarpur mine cluster

Total land in the cluster	Land available for repurposing	Effective investment area	Proposed investment
2,815 ha	**1,947 ha**	**1,168 ha**	**₹2,04,435 cr**

Automative and EV | EVs and battery manufacturing | Power electronics | Charging infrastructure and solutions



Economic Development Node 3

Umrer mine

Total land in the cluster	Land available for repurposing	Effective investment area	Proposed investment
945 ha	**553 ha**	**332 ha**	**₹16,590 cr**

Semiconductor and advanced technology | Semiconductor fabrication and equipment manufacturing | Automotive and industrial electronics, etc.

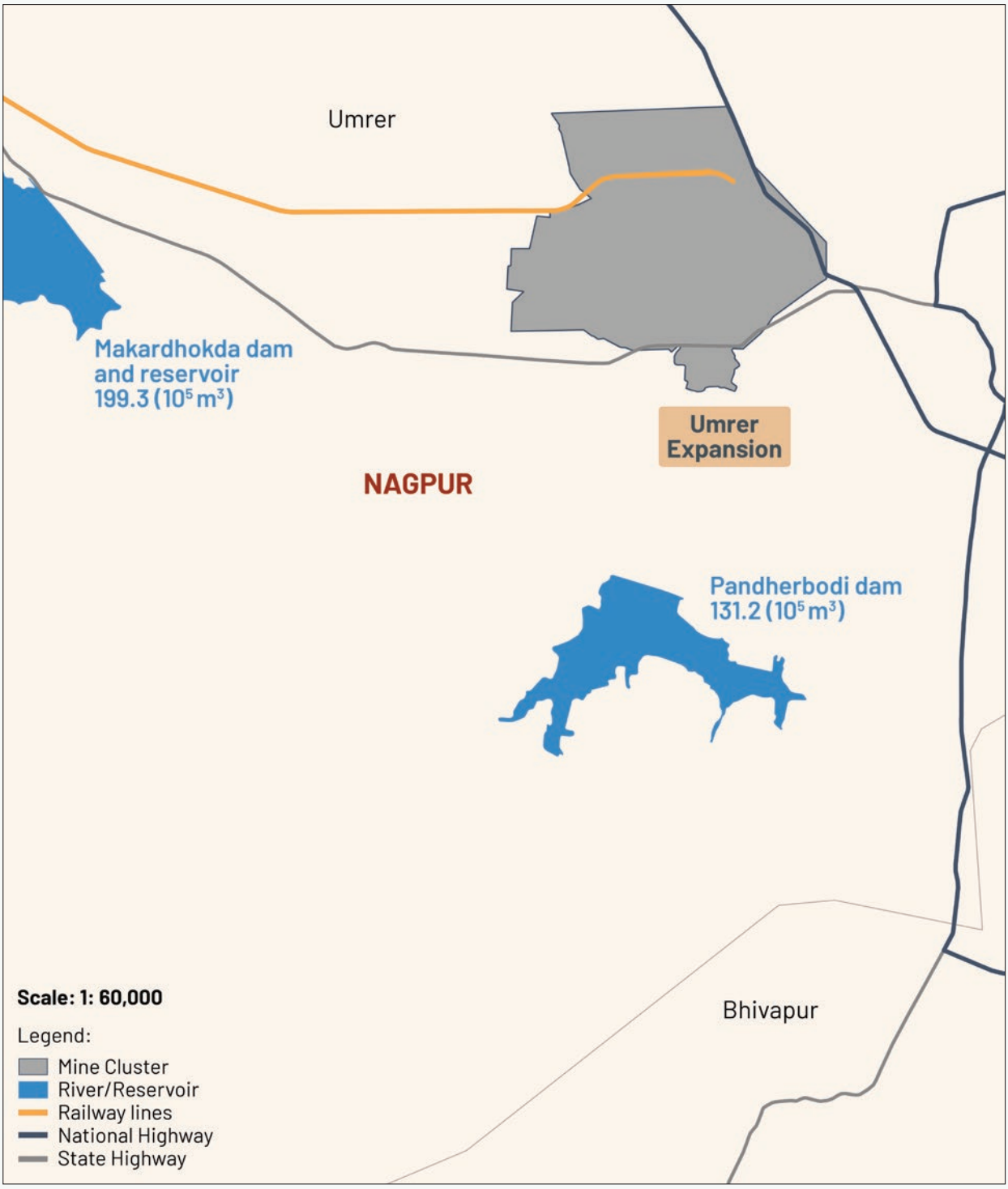


Table 4.2: Economic output, investment and employment of proposed EDNs

Industrial Park	Green Hydrogen and green chemical	Automotive and EV	Semiconductor and advanced tech.
Investment (₹ Cr.)/ha.	125	175	50
Total available area	3,509	1,947	553
Effective (excluding common infrastructure)	2,105.4	1,168.2	331.8
Proposed investment (₹ Cr.)	2,63,175	2,04,435	16,590
Development cost (₹ Cr.)	3,509	1,947	553
Repurposing cost	9,299	5,573	553
Invested capital: Total output ratio	2.1	3.5	2.1
Total yearly economic output (₹ Cr.)	5,52,667.5	7,15,522.5	34,839
Employment factor	0.4	1	0.2
Total employment generated	1,05,270	2,04,435	3,318

Source: iFOREST analysis.

4.2.2 RE development

Besides green industry, significant investments will also be required in RE development to support the transition. At a minimum, to substitute for the coal-based capacity of the TPP units to be potentially retired, approximately 8,280 MW of RE and 24,840 MWh of battery energy storage systems (BESS) will be needed. This estimate is based on a conservative assumption that 3 MW of RE capacity and 9 MWh of BESS are required to replace every 1 MW of coal-based power capacity.

A block-wise assessment indicates that several mining areas expected to be impacted by the transition also hold considerable RE potential—ranging between 1 to 2 GW—mainly through various forms of solar deployment. For instance, Nagpur (Rural) has a technical potential of about 2 GW, Umrer around 1.5 GW, and Bhadrawati close to 1.9 GW, among others *(see Box: RE potential of CNY region).*

Green energy development has the potential to generate approximately 31,000 direct jobs. This includes around 28,500 jobs in solar energy (considering an employment factor of 3.45 jobs per MW) and about 2,500 jobs in the operation and maintenance of BESS (considering an employment factor of 0.4 jobs per MW). However, if full-time employment across the entire BESS value chain—from design and development to construction, commissioning, and operation—is considered, the total job potential in BESS could be nearly 26,000.[16]

In the next 10 years, RE investments, therefore, must be prioritised in these transition blocks to enable timely economic diversification, ensure energy security, create jobs, and support a just and inclusive transition.

Overall, green industry and green energy investments in the region have the potential to generate approximately 3.4 lakh direct jobs and drive net-positive GDP growth of around 4%.

05

Costs, Investments and Financing

Just transition costs

Investments

Financing responsibilities and sources

5.1 Overview

The costs for a just transition in the next 10 years have been determined considering four key components:

- Coal mining land reclamation, and repurposing;
- Basic infrastructure development for green industry investments;
- Skilling of directly impacted workers; and,
- Planning, capacity building, governance.

Besides, the potential investments that the proposed green industry and green energy development can attract has been determined separately.

5.2 Just transition costs

These costs of just transition represent the minimum investment required to ensure that communities, workers, and local economies are not left behind during the transition. The assessment focuses on direct transition costs across the four components.[17]

1. **Coal mining land reclamation and repurposing cost:** Coal mine reclamation is a complex; multi-stage process aimed at restoring the environmental and ecological balance of mined-out areas and enabling their productive reuse. This includes technical closure, biological reclamation, and post-closure monitoring.

   Repurposing refers to additional interventions required beyond mine closure, to make land suitable for social and economic use.

   The cost of associated with this component has been estimated mine-wise for 11 mines across the three priority EDNs. A techno-economic assessment was carried out, factoring in post-closure land use, difficulty of closure, mine gradient, stripping ratio, strike rate, and other technical parameters.

2. **Basic infrastructure development for green industry investments:** To enable industrial diversification and attract green investments, core infrastructure is needed across repurposed mining land. These include, roads, water supply, drainage facilities, street lights. etc. This is considered a direct cost of just transition.

3. **Skilling of directly impacted workers:** The workforce directly impacted by the mine closure and retirement of TPP units must be reskilled to secure employment in emerging green sectors. This requires targeted investments in workforce development, including technical and vocational education, pre-apprenticeship programmes, and higher-order skills training.

   Reskilling support has been considered for all formal and informal workers associated with coal mining activities and TPP units. For coal mines, formal workers below the age of 50 are considered for reskilling if the mine is scheduled to close by 2030, and those below 45 if closure is expected by 2035. For TPPs, formal workers below 50 years are eligible for reskilling. For informal workers, the number is estimated as at least twice the number of formal workers. Based on this, it is estimated that approximately 35,000 workers will require skilling support: 10,000 formal coal mining workers, 1,600 formal TPP workers, and about 23,200 informal workers. A six-month training duration is assumed for all skilling interventions.

4. **Planning, capacity building, governance:** Managing the transition process entails capacity development, planning, and administrative and managerial costs. These include costs for the following:

   - **Technical and administrative capacity:** Implementation of just transition action plans requires investments in offices, councils and advisory bodies dedicated to the purpose, as well as strengthening the technical and administrative capacity of the local (state and district) administration in terms of knowledge, skills, and human resources.
   - **Communication and outreach:** Just transition requires a broad-based stakeholder engagement to build consensus and support of various stakeholders on the transition process.

- **Capacity building:** This includes costs for building the capacity of various stakeholders, such as officials, civil society organisations, and industry actors, to engage with the just transition process, including the development of plans and implementation.

Overall, the total costs associated with all the four components is over ₹33,000 crore.

Table 5.1: Just transition costs

Cost components	Unit	Cost (₹ Cr.)	Methodology/assumption for determining the cost
Coal mining land reclamation, and repurposing	9,015 ha	22, 018 (for 11 mines in 3 priority clusters, cost is about 15,000)	Mine reclamation cost is estimated by iFOREST for six categories of OC mines and for the UG mines.
Basic infrastructure development for green industry investments	9,015 ha	9,015	Based on MIDC investments and project reports in Vidarbha, an average land development cost of ₹ 1 crore per hectare has been assumed. This includes roads, water supply, sewage treatment, etc.
Skilling of directly impacted workers	35,000 (formal 11,600; informal 23,200)	812	The reskilling costs for informal workers have been estimated based on current norms under the Ministry of Skill Development and Entrepreneurship (MSDE), Government of India. As per the MSDE's Common Cost Norms (2022), which include costs for itraining delivery, assessment, certification, and basic support.
			For departmental and contractual workers, reskilling costs have been benchmarked against internal training expenses reported by private coal companies and Mine Developer Operators (MDOs). These costs are substantially higher due to the specialised nature of skills and longer duration of training. On average, these are nearly five times higher than costs for informal workers
			Overall, the cost of reskilling departmental and contractual workers is considered as ₹ 5 lakh/ person; and for informal workers at ₹ 1 lakh/ person.
Planning, capacity building, governance	Lump sum cost	1,592	Considered as 5% of the total other costs, excluding green energy and green industry investments.
Total Just Transition cost		**33,437**	

Source: iFOREST analysis.

5.3 Investments

In addition to the direct costs of just transition, significant investments are envisioned to catalyse green economic growth in the region. These include investments in green industries, RE and storage infrastructure, and nature-based economic activities such as aquaculture and ecotourism. Together, these represent the long-term economic opportunity essential for job creation, industrial and economic diversification diversification, and sustainable development.

Overall, potential green industry investments in the three EDNs are estimated at ₹4,84,200 crore. This estimate is based on the Maharashtra Industrial Development Corporation's (MIDC) unit costs for various

industrial park typologies and land development requirements. These investments cover sectors such as green hydrogen projects, green manufacturing, electric mobility, advance technology clusters, etc.

Additionally, green energy investments are projected at ₹52,661 crore, associated with the development of 8.3 GW of RE capacity—primarily solar—along with 24.8 GWh of BESS. The costs are based on benchmark unit rates of ₹3 crore per MW of solar capacity and ₹1.12 crore per MWh for BESS.[18]

Nature-based livelihood investments, including aquaculture and ecotourism, have also been assessed as part of diversified economic planning. An estimated ₹212 crore would be required to develop such activities across three nodes. The unit investment cost is derived from similar initiatives implemented in Maharashtra, at approximately ₹10.75 lakh per hectare.

Overall, the total potential investment opportunity to enable a green and inclusive transformation across the region amounts to over ₹5,37,000 crore.

Table 5.2: Investments for the proposed EDNs and green energy development

Investment components	Unit	Cost (₹ Cr.)	Methodology/assumption for determining the cost
Potential green industry investments in Economic Development Nodes	3,605 ha of land	4,84,200	As calculated based on MIDC unit costs for various industrial parks
Green energy investment	8.3 GW RE+24.8 GWh BESS	52,661	The cost for setting up solar is 3 crore/ MW, and battery storage is 1.12 crore / MWh
Aquaculture/ Ecotourism	In 1,968 ha of mine void	212	Unit cost derived from similar investment in Maharashtra; Unit cost considered is 10.75 lakh/hectare
Total potential investment		**5,37,073**	

Source: iFOREST analysis.

5.4 Financing responsibilities and sources

Financing a just transition requires alignment of responsibilities across public and private actors, leveraging statutory obligations, public budgets, and market-based capital. The division of responsibility reflects the nature of each intervention and measures that need to be undertaken by each of them.

1. State Government

The State Government plays a central role in enabling the transition by financing public goods, institutional capacity, and social protection measures. This includes:

- **Basic infrastructure development** (e.g., roads, water, sanitation): These are foundational public investments needed to unlock private investment and diversify the economy. Funding should come from public budgets—state, central, or centrally sponsored schemes.
- **Planning, capacity building, and governance:** These are core state functions and must be funded through regular budget allocations. Support of expert institutes/agencies and partners may be leveraged for technical assistance.
- **Skilling and workforce transition:** While industries have a role, the government must ensure that skilling systems, vocational institutions, and employment support schemes are adequately financed. The CSR and DMF funds can supplement government 's budgetary spending.

- **Support for nature-based livelihoods** (e.g., aquaculture, ecotourism): These activities align with government goals for rural development and ecological restoration and can be supported through government programmes, DMF allocations, or convergence with rural livelihoods missions.

2. Private sector

The private sector is expected to lead in driving the economic diversification and green growth agenda. Key responsibilities include:

- **Green industry investments:** As commercially viable ventures, these must be financed by private capital—both domestic and international. Blended finance, viability gap funding, and de-risking instruments can help catalyse investment in first movers and new technologies.
- **Green energy infrastructure (RE + BESS):** Given the maturity of the sector and strong policy momentum, these investments should primarily come from private players or public enterprises operating on commercial terms. Regulatory clarity and grid infrastructure are critical enablers.

3. Coal industry and power plant operators

The coal industry has a crucial role in supporting just transition measures, and contributing to local development. Responsibilities include:

- **Mine reclamation and post-mining land repurposing:** These are statutory obligations to be met through escrow funds deposited during mine operations.
- **Skilling of affected workers:** Companies must support the transition of their workforce, including contractual and informal workers, using CSR funds, internal skilling budgets, or dedicated transition funds.
- **Livelihood support for local communities:** As part of responsible mine closure and just transformation planning (as per the Coal Mine Closure Guidelines, 2025), coal companies need to support such measures for retaining jobs and maintaining economic vitality in these regions.[19]

The power utilities also have similar crucial role in supporting green energy investments and supporting the local community by generating green jobs and skilling the workforce.

Table 5.3: Cost components and financing sources

Cost components	Costs incurred by	Potential financing source/ mechanism
Land reclamation and repurposing	Coal industry	Escrow fund and funds for mine closure
Basic Infrastructure development	State Government	Public funds/Government budget
Green industry investment	Private sector/public enterprise	Private capital/blended finance
Green energy investment	Private sector/public enterprise	Private capital/blended finance
Aquaculture/Ecotourism	Coal industry/State Government	Government budget/CSR Funds/ DMF funds
Skilling of impacted direct workers	Industry/ State Government	Government budget/CSR Funds/ DMF funds
Planning, capacity building, governance	State Government	Government budget

Source: iFOREST analysis

06

Way Ahead

Instituting a state-level policy

Strengthening institutional mechanisms

6.1 Instituting a state-level policy

To steer Maharashtra's long-term low-carbon development, a dedicated State Just Transition (or Just Transformation) Policy must be instituted. This policy should serve as the anchor for guiding green investments, supporting inclusive economic transformation, and ensuring decent job creation across transition-affected regions.

Overall, the policy shall:

- **Institutionalise RJTIPs-** Institutionalise the preparation of RJTIPs to enable proactive, time-bound planning and investments in transition regions.
- **Ensure development alignment:** Integrate RJTIP with the state's macroeconomic strategy, green energy transition, and regional development agenda.
- **Ensure balanced energy transition:** Encourage a geographically balanced transition that bridges regional green investment and development gaps.
- **Enable institutional mechanisms:** Create mechanisms to guide, support, and monitor plan implementation across departments and jurisdictions.
- **Mobilise diversified finance:** Facilitate access to public, private, and international capital to fund green energy, infrastructure, industry, and skill development projects.

The policy should be legislatively anchored or notified through an executive mandate, supported by budgetary and financial allocations.

6.2 Strengthening institutional mechanisms

The success of RJTIP will depend on a multi-stakeholder, multi-level governance framework. A decentralised, coordinated model that integrates government departments and agencies at the state and district levels, industry, skilling agencies, financial institutions, and other concerned stakeholders is essential.

The proposed architecture, as outlined below, combines high-level strategic oversight, inter-departmental coordination, and decentralised implementation to ensure accountability, coherence, and impact across the transition regions.

1. High-level State Committee (HLSC)

The HLSC chaired by the Chief Minister of Maharashtra, will serve as the apex decision-making body, providing strategic oversight and political leadership for the RJTIP. It will be responsible for endorsing the overall just transition planning framework, approving major investment plans, and ensuring alignment with the state's broader development and climate goals. The leadership of the Chief Minister will lend strong leadership to the process and enable high-level coordination across key departments such as energy, industry, employment, and environment, thereby ensuring policy coherence and interdepartmental coordination and convergence.

2. Empowered Committee (EC)

The EC chaired by the Chief Secretary will act as the primary executive body to guide the implementation of RJTIP. Comprising senior officials from relevant departments such as Environment and Climate Change, Energy, Industries, Mining, Planning, Labour, and Finance, it will oversee the operationalisation of RJTIP. It will ensure timely approvals, resolve policy or procedural bottlenecks, and facilitate the integration of just transition priorities into state-level policies, departmental schemes investment plans, and welfare support programmes.

3. Just Transition Office (JTO)

Located within the Nodal Department, the JTO will function as technical and administrative secretariat for implementing the RJTIP. Staffed with sectoral experts, planners, and finance professionals, the office will coordinate plan formulation and execution across geographies. It will manage fund disbursal, support monitoring and evaluation systems, prepare progress reports, and act as a key liaison with external partners including financial institutions, investors, and multilateral agencies. The JTO will also enable capacity building across stakeholders.

4. District-level Just Transition Cells

The district-level Just Transition Cells will anchor the plan at the ground level. Positioned within the District Collectorate or Zilla Parishad structure, these cells will be responsible for executing local investment pipelines, align DMF investments with just transition initiatives (such as, livelihood initiatives, and skilling programmes), and also be engaged in overall monitoring and implementation. They will coordinate with the JTO and the EC on the implementation of the RJTIP.

5. Special Purpose Vehicle (SPV)

The State Government should establish a dedicated SPV focused on project aggregation and capital mobilisation. The SPV will identify bankable projects across various green industry sectors. It will aggregate project pipelines to enable economies of scale and attract large-scale capital investments.

The SPV will work closely with domestic and international financial institutions, leveraging instruments such as green bonds, concessional loans, blended finance, and viability gap funding. It will also support transaction advisory, de-risking mechanisms, and public-private partnerships. Positioned as a state-level project development and finance platform, the SPV will fast-track investment readiness while aligning projects with just transition priorities, including employment generation.

Besides the government-driven institutional architecture, various stakeholders will also play a pivotal role in implementing the RJTIP. The coal industry, led by entities such as WCL, will be central to mine land repurposing, and will be responsible for investment plans in consultation with state and district authorities. Power utilities, as noted earlier, will need to draw up repurposing strategies for retired TPPs, and invest in green energy infrastructure.

Meanwhile, financial institutions and investors will play a catalytic role by deploying capital into high-priority regions, to mobilise private investment and reduce financing risks.

This coordinated, multi-actor approach is essential to support a just and inclusive transition and green economic growth in the CNY region.

Table 6.1: Roles and responsibilities of the stakeholders

Authorities and stakeholders	Roles and responsibilities
High-level State Committee	• Provide strategic direction and political support for the RJTIP. • Approve just transition policies, plans, and major investment proposals. • Ensure alignment with state development and climate goals. • Mobilise inter-departmental cooperation and high-level accountability
Empowered Committee	• Review the progress of the development and implementation of the RJTIP. • Facilitate the integration of just transition provisions in the sector-specific laws/policies and plans to facilitate impletation of the plan. • Facilitate well-coordinated and inter-departmental action across all sectors.

Table 6.1 continued

Authorities and stakeholders	Roles and responsibilities
Just Transition Office	• Facilitate the development and implementation of the RJTIP. • Manage the disbursement of the funds earmarked, track expenditures, and ensure efficient resource allocation for plan implementation as applicable. • Monitor, oversee and develop annual progress reports on the implementation of projects and activities as specified in plans.
District Just Transition Cells	• Execute local components of the investment plan. • Plan and implement skilling, livelihood, and social support programmes. • Coordinate with local institutions, Gram Sabhas, and civil society on implementation. • Track district-level outcomes and ensure community benefit.
SPV	• Identify and prepare bankable green projects across sectors. • Aggregate investments and manage green project pipelines. • Mobilise capital through green bonds, concessional loans, and blended finance. • De-risk private sector investments and enable public-private partnerships. • Interface with national and international financial institutions to support investment and collaboration..
Industry- WCL	• Develop detailed mine land repurposing plans in consultation with the State Government, district authorities, and other concerned stakeholders. • Ensure scientific land reclamation for making the land repurposing ready. • Facilitate leasing of land as applicable for green investments. • Support workforce transition and workforce development through skilling and reskilling measures
Industry- Power utilities	• Develop detailed repurposing plans for the retired units in consultation with the State Government and concerned stakeholders. • Invest in green energy infrastructure. • Support workforce transition and workforce development through skilling and reskilling measures
Financial institutions and investors	• Deploy capital in highly vulnerable transition regions for the development of green energy projects, green manufacturing/ industrial parks, etc. • Offer concessional lending and green bonds to lower the cost of capital. • Use blended finance instruments to de-risk private sector investments. • Enable innovative financing such as viability gap funding (VGF), output-based aid, and performance-linked incentives.

Annexure

Annexure 1: Mines for just transformation and closure planning by 2035

District	Block	Name of the mine	Type of mine	Production capacity (MMTPA)
Chandrapur	Bhadrawati	New Majri-II (A) Expansion	OC	2.5
		New Majri UG to OC	OC	3
	Ballarpur	Ballarpur OC	OC	0.625
	Chandrapur	Durgapur	OC	3
		Hindustan Lalpeth	OC	1
		Nandgaon Incline	UG	0.3
		Manna Incline	UG	0.2
		Durgapur Rayatwari	UG	0.92
	Rajura	Sasti OC	OC	2.5
		Pauni Expn/ II	OC	3.3
		Gouri Deep	OC	0.6
	Korpana	Penganga	OC	6.3
Nagpur	Saoner	Silewara	UG	0.55
		Saoner	UG	2
	Umrer	Umrer Expansion (AMB River Diversion Phase-IV)	OC	4.9
	Bhivapur	Gokul	OC	1.9
	Parseoni	Singhori	OC	1.2
		Amalgamated Ghatrohana (Gondegaon)	OC	3.5
Yavatmal	Wani	Kolgaon	OC	0.6
		Junad Extn	OC	1.5
		Niljai Deep	OC	4.5
		Ukni Deep	OC	3.5
		Bellora-Naigaon Deep	OC	1.25

Source: iFOREST analysis based on information procured from CIL, 2025.

Annexure 2: Details of mine clusters for repurposing

Cluster	Mines	Blocks	Total land in cluster (ha)	Land available for closing by 2030 (ha)	Forest land (ha)	Distance from nearby to be closed TPPs (in km)	Proximity to Sub-station (km)	Proximity to water body (km)	Water body area (km^2)	Water storage capacity (10^3 m3)	RE potential in block (MW), includes GM+Rooftop+floating
C1	Singhori	Parseoni	1270.78	837.46	14.23	2.5 (Kaparkheda)	6.43 (440 KV)	River (<1.5km) Kamthikhairy (22.32 km), Ramtek Lake (23.82 km)	21.16 8.99	126810	895 (Parseoni)
	Amalgamated Ghatrohana (Gondegaon)	Parseoni									
C2	New Majri-II (A) Expansion	Bhadrawati	5602.95	3508.733	40.5	24.5 (Chandrapur STPS)	9.6 (220 KV) 9.1 5.45 7.72 (400 KV)	River (<1-2.8 km), Erai dam (25 km)	43.2	193000	1959 (Bhadrawati), 1052 (Wani)
	Junad Extn	Wani									
	Niljai Deep	Wani									
	New Majri UG to OC	Bhadrawati									
	Ukni Deep	Wani									
	Bellora-Naigaon Deep	Wani									
C3	Penganga	Korpana	1155.73	751.24	46.04	24 (Chandrapur STPS)	5.8 2.84 (400 KV)	River (< 1.71 km), Pakadigud-dam dam (18.625 km), Amalnala dam (17.4 km)	1.817 3.02	37807	417 (Korpana)
	Kolgaon	Wani									1052 (Wani)
C4	Ballarpur OC	Chandrapur	2815.15	1947.15	0	22.5 (Chandrapur STPS)	5 (220 KV) 15	river (<3-8 km), Erai dam (48 km)	43.2	193000	1115 (Chandrapur)
	Sasti OC	Rajura									649 (Rajura)
	Pauni Expn/ II	Rajura									
	Gouri Deep	Rajura									
S1	Hindustan Lalpeth	Chandrapur	311.66	125.095	72.22	9.7 (CSTPS)	6.1 (220 KV)	river (< 1 km), Manora dam (20.3 km)	1.35	1695	1115 (Chandrapur)
S2	Durgapur	Chandrapur	1622.5	756.15	379.35	3.6 (CSTPS)	3.6 (CSTPS)	river (<3-8 km), Erai dam (48 km)	43.2	193000	1115 (Chandrapur)

Annexure 2 continued

Cluster	Mines	Blocks	Total land in cluster (ha)	Land available for closing by 2030 (ha)	Forest land (ha)	Distance from nearby to be closed TPPs (in km)	Proximity to Sub-station (km)	Proximity to water body (km)	Water body area (km^2)	Water storage capacity (10^3 m3)	RE potential in block (MW), includes GM+Rooftop+floating
S3	Umrer Expansion	Umrer	944.65	553.13	0	46 (Koradi)	2.01 (33 KV) 8.98 (220 KV)	River (<1 km), Makardhokada dam (7 km), pandherbodi dam (4.42 km), shivapur lake (8.4 km)	4.86 2.8 1.289	49931	1625 (Umrer)
S4	Gokul	Bhivapur	756.92	536.765	11.9	65.6 (Koradi)	18.3 (220 KV)	river (<2.1 km), Lower Wunna (Nand) dam (11.2 km), Urkundapur dam (9.72 km), bhisi dam at (9.3 km)	16.3 1.51 0.547	53182	1625 (Umrer)

Source: iFOREST analysis

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Notes

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