

Financing Just Transition Landscape in India



Authors:

Prabhanjan Singh; Himanshu Trivedi; Dhvaj Khattar; Abhishek Kumar, Suranjali Tandon

Research Support:

Sandra Maria Augustian

Design:

Krishn Mathur, Neha Thadani

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Executive Summary

Just Transition, a puzzle in the larger conundrum!

Emerging economies undergo transition perpetually. Careful nurturing of transitions becomes crucial when such economies also undergo profound shifts that indicate new structural changes. In India and globally, fiscal stress has become structural owing to rising inequality, frequent climate fluctuations, geo-political/geo-economic shifts and rapid technological changes; these are a norm rather than an exception. Many of these aspects have now become routine and repetitive, and feed into each other thus worsening the crisis. Ensuring 'Justness' in transitions, therefore, becomes extremely important and requires conscious and concerted action.

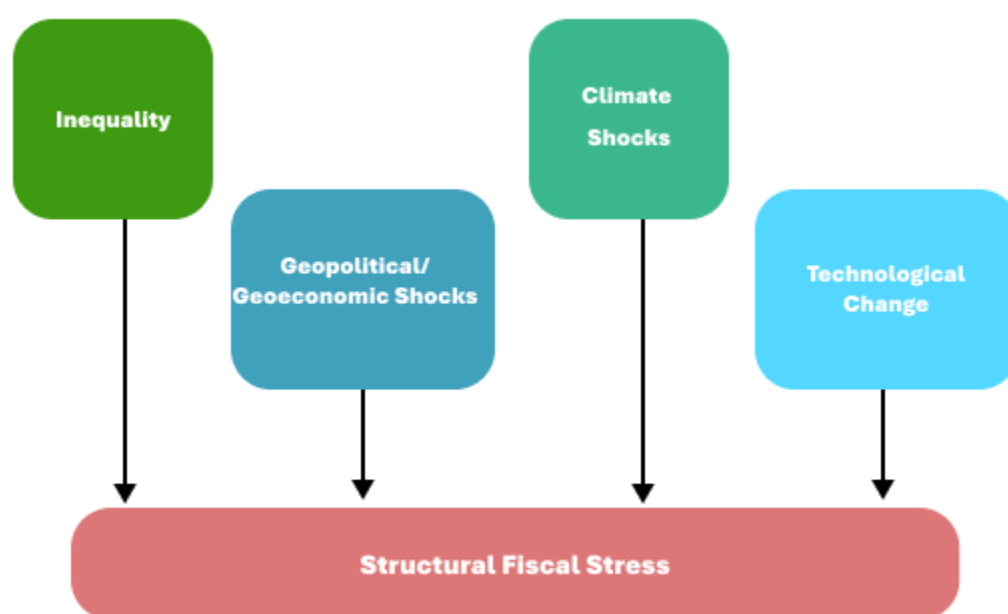


Figure 1: New Structural Shifts Contributing to Fiscal Stress

In the context of decarbonisation, the question of ensuring justice to the workforce has emerged as a wicked issue, particularly in light of the fact that there is now a global fracture towards a unified call to action to fight climate change. This fracture is not merely a question of a few powers pulling out of climate commitments but the disruption that it has caused to the momentum and financing for climate action and just transition. Rapid disruptions, conflicts and continuous perception of security threat along with episodic inflation caused due to these factors further squeeze the much-needed attention on planning and resources for just transition across the world, knock on effects of which can be felt in India as well.

This matters because just transition is heavily contingent on finance. To elaborate further, the construct of just transition at its very core concerns itself with jobs, skills, identity, incomes, agency, social security and a meaningful participation of workers who face displacement or imminent threat of being displaced as decoupling from the carbon economy accelerates, particularly in countries where diversification from carbon economy has become a strategic requirement – India being one of them. This acceleration, if not planned well may deepen underemployment and unemployment. For a consumption-based economy like India, where 60% of GDP comes from consumption, this does not augur well and will add to existing inequality and by implication a sustained fiscal stress.

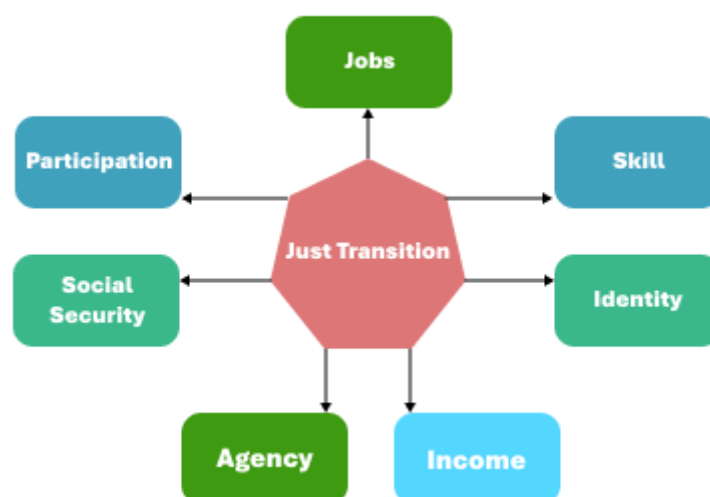


Figure 2: Elements of Just Transition

Table 1: Aspects of Just Transition

Environmental Justice	Social Justice	Fiscal Justice
Reduction of overall emission and pollutant profile	Participation in economy with social security and better incomes. It can be secured when social and economic opportunities are several and provide ample opportunity to enhance capability and social participation.	Participation of people in economy must lead to availability of higher fiscal resources to crowd in more private capital and to service debt

In many ways (except when place-based impacts are locally addressed), many solutions for just transition in the climate economy would not be substantively different from those that will go on to fix inequality and inequity. Therefore, just transition must be construed as a national priority.

Incidentally, it is heartening to see that apex policy institutions in India like NITI Aayog and PM-EAC have put jobs, per capita income and skills as key priorities for the country.¹ But since much of the action will be at the level of states, it matters what states do.

With this in view, this study considers five states namely Andhra Pradesh, Chhattisgarh, Gujarat, Odisha and Tamil Nadu and seeks to identify key research questions that could aid state governments' efforts towards addressing just transition in the climate economy.

In this context, Section 1 deals with key areas where just transition intervention in states is necessary. For this purpose, four sectors have been taken namely Energy, Mobility, Industry and Agriculture. Thereafter, Coal sector has been discussed briefly but in a sui generis manner. This is because of two reasons - first, given Government of India position of 'Higher RE with Higher Coal', the political acceptability for coal transition framework may be low. Second, since two of the five states considered in this report are coal bearing states, there are financing avenues specifically linked to coal economy which can be used for other transition activities in coal specific regions.

Within energy sector the focus is on state public sector generation companies and decentralised renewable energy. The rationale is to build on the strong social obligation of PSUs and high

¹ https://www.business-standard.com/specials/bs-events/labour-intensive-manufacturing-investment-push-key-for-developed-india-by-2047-126022401282_1.html

employment potential of decentralised energy. However, despite these elements ‘justness’ is not a given. First, evidence is required to decelerate new thermal addition which would then become basis of utility level transition planning. On the DRE side, it’s equally important to examine the impact of fundamental shifts that national initiatives aim to bring.

The only other area considered within energy sector is storage. Policy developments at the national level seek to bring paradigm shift in the storage market. Falling costs of storage will be crucial for the scale up of renewable energy and therefore impact of storage as a service at the state level needs to be clearly understood in addition to the operational efficiency it can bring to DISCOMs. Therefore, fundamental research from transition perspective is needed on storage as well.

Within the industry sector, the focus is on clean tech manufacturing. The need for clean tech manufacturing is strategic in nature to reduce India’s reliance on geo-political uncertainties and for creating new employment opportunities with relatively higher order of skills. Amongst the states considered in this report, only Gujarat shows some policy preparedness on clean tech manufacturing despite several national initiatives and incentives. This mandates that a state level assessment to ground central level intent is necessary.

In the mobility sector focus on impact on informal job losses in the electric mobility sector. The Prime Minister of India has laid a significant emphasis on Maintenance, Repair and Operations industry. At the same time, the Union Consumer Affairs Ministry is soon to come up with a right to repair framework in electric vehicle segment. Keeping these priorities in view along with significant impact on a vibrant informal sector on auto repair, some fundamental questions have been identified for further research.

In the agriculture sector, the focus is mainly on Natural Farming scale up. This is essentially because natural farming offers a few advantages which can have far reaching consequences for farmers income as well as for improving food and nutritional security. These advantages manifest in substantive reduction in input costs for farming thus freeing up farmers from indebtedness on input side, savings on account of energy and water subsidy, both of which can potentially be escrowed for transition support or to leverage additional capital. Lastly, it is important to understand the potential of hitherto underdeveloped post-harvest market and retail infrastructure of naturally farmed produce.

With these fundamental questions in the backdrop and the fact that there are many other transition areas competing for resources, Section II deals with a landscape of financial avenues present at the state level for Just Transition. Indicative questions for further research are also presented separately towards the end of this section which can be further aligned to specific transition objectives.

On the basis of the detailed discussion across the sectors on the transition pathways and potential financing mechanisms, the following table enumerates state-wise entry points for research and action, key actors responsible for enabling the transition and potential finance levers.

Table 2: State-wise entry points and key actors responsible

State	Context	Immediate entry points	Key actors	Finance levers
Chhattisgarh	Coal-linked districts, agrarian labour dependence and limited local alternatives outside extraction-linked industry.	DMF review, mine-closure district plans, agricultural-resilience linkages, pilot land-reuse projects and workforce mapping.	State mining and finance departments, district administration, coal companies, labour and agriculture departments.	DMF, cesses, closure escrow, CSR, DFI technical assistance.
Odisha	Large mineral and industrial base with strong DMF accumulation and significant employment-quality issues.	Industrial decarbonisation linked to district livelihoods, formal skilling and restorative agriculture in affected areas.	State industry, mining, finance and skill departments; district administration; major industrial firms.	DMF, blended industrial infrastructure finance, pooled CSR, DFI and MDB support.
Gujarat	Strong manufacturing base and better fiscal capacity, with high MSME relevance.	Supplier transition diagnostics, green MSME finance and clean manufacturing cluster support.	Industry, MSME and finance departments; cluster associations; DFIs and lenders.	Guarantees, DFI lines, bonds, catalytic funds and capital recycling.
Tamil Nadu	Diversified manufacturing and services with strong EV and electronics exposure plus emerging climate institutions.	Supplier-transition fund, public fleet-linked skilling and district pilots through existing climate institutions.	State climate institutions, industry and transport departments, OEMs and fund managers.	Climate funds, blended vehicles, transition-linked credit and bonds.
Andhra Pradesh	Large clean-energy ambition with agrarian and land-use sensitivity plus tighter fiscal space.	Project-development support, land-sensitive clean-energy models, value-chain diversification and climate-resilient agriculture.	Energy, finance, industry, revenue and agriculture departments; nodal clean-energy agencies; district administration.	Blended finance, concessional project support, transmission and storage finance and adaptation-linked lines.

1. Key areas of Just Transition Intervention in States

States selected in this report present different challenges and opportunities. This section deals with them through a sectoral lens.

1.1. Energy

The energy sector remains one of the most crucial sectors for just transition as energy is a critical input for all sectors. The narrative on energy transition in the past decade has seen a significant evolution. It has shifted from a position of conscious de-coupling from fossil sources to energy security pivoted on higher integration of renewable sources along with increase in fossil assets as well. Notably, energy provisioning is also directly related to employment as can be seen in the following figure. Therefore, fundamentally affordable access to energy will be central to ‘Just Transition’ in the energy sector. In this context, the role of public sector enterprises as well as forms of generation (centralised Vs decentralised) become extremely important. This is particularly due to the fact while Public Sector Enterprises are expected to keep social obligations at the core of their business operations, the decentralised systems offer a more direct ownership of people as prosumers.

1.1.1. Generation (State Power Utilities)

Diversification of power generation in state power generation utilities is a trend that can be observed in several states. As electricity generation is a de-licensed activity under Section-7 of the Electricity Act, 2003 and phasing out or retirement of units are best decided by Power

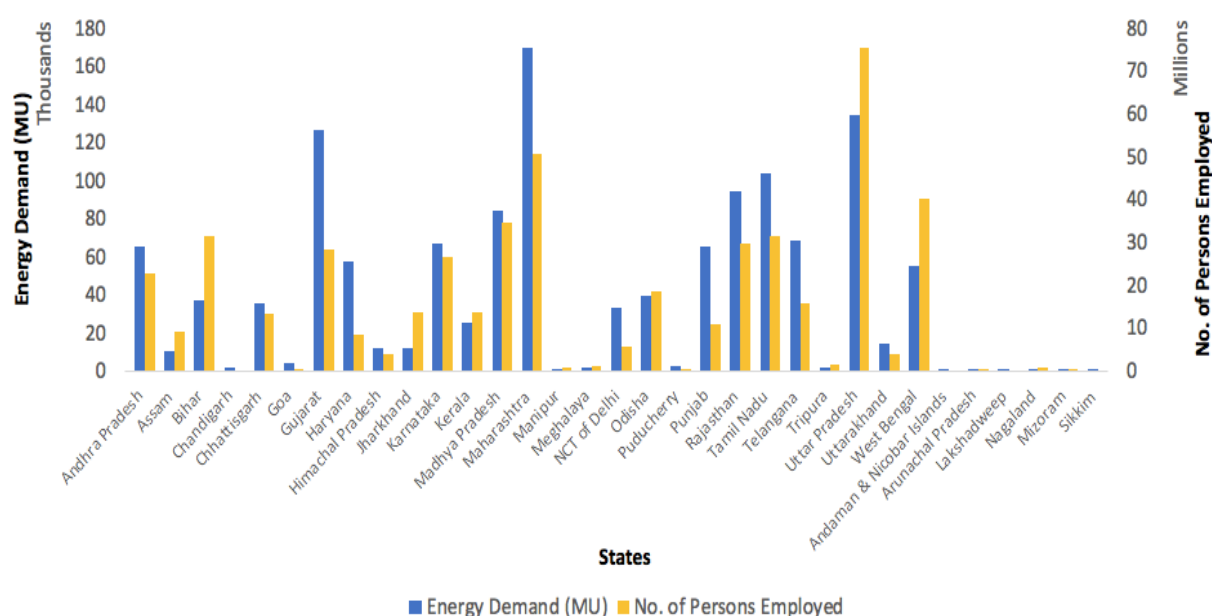


Figure 3: State-wise Energy and Employment

Generating Utilities/Companies based on their own techno-economic, energy demand and environmental reasons, planning for just transition in states will be important particularly for those assets which have completed 25 years of operation. All five states considered in this report have some share of thermal assets which have completed 25 years of life therefore providing an opportunity to repurpose such assets.

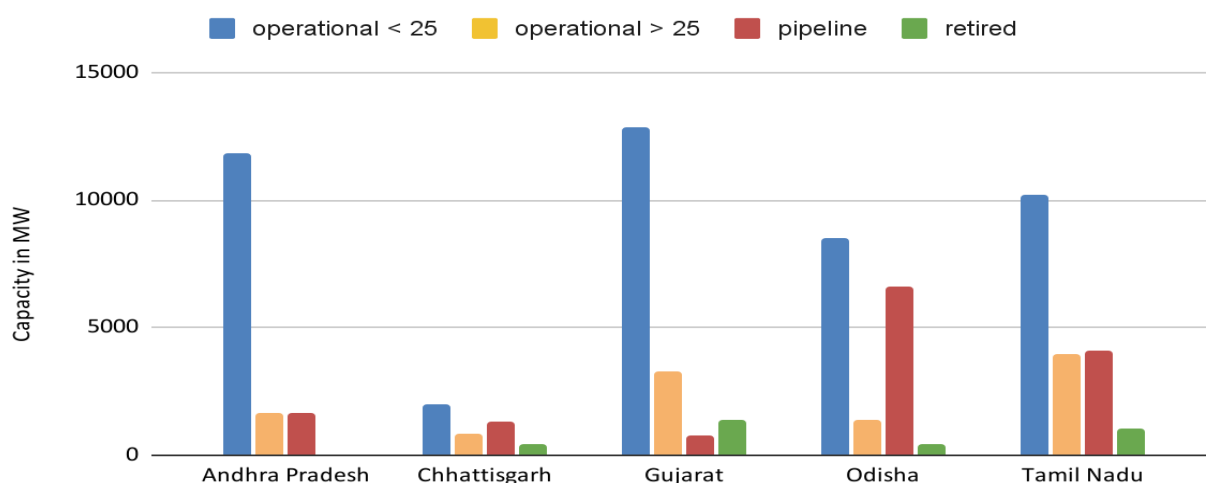


Figure 4: State-wise Thermal Power Plant Profile

In this context it may be noted that earlier in 2023, the Central Electricity Authority had issued an advisory² to all the thermal power utilities not to retire or repurpose their coal-based power stations before 2030. However, the Draft National Electricity Policy (NEP) 2026³ lays emphasis on repurposing of older thermal units for grid support to enable greater renewable energy integration. Given the fact that transmission infrastructure when compared to the installed generation capacity falls short by nearly 40% at the country level, it may make eminent sense to repurpose old thermal units to optimise the existing evacuation infrastructure.

Further, there are mandates by the Ministry of Power (MoP) on Renewable Purchase Obligation (RPO), Renewable Consumption Obligation (RCO) and Renewable Generation Obligation (RGO) nudging the states to diversify into renewable energy.

Table 3: An Overview of Renewable Energy Mandates (RPO, RCO and RGO)

Aspect	Renewable Purchase Obligation (RPO)	Renewable Consumption Obligation (RCO)	Renewable Generation Obligation (RGO)
Legal Basis	Electricity Act, 2003 (Section 86(1)(e)) ⁴	Energy Conservation Act, 2001 (amended 2022, Section 14(x)) ²⁷	Tariff Policy 2016 under Electricity Act, 2003. ⁵
Target Entities	Obligated entities (discoms, open access/captive users) without sector thresholds ²³	Designated consumers (specific high-energy sectors like cement/steel, discoms) with consumption thresholds ⁶	New coal/lignite thermal plants (post-2023 COD) ⁷
Core Requirement	Purchase percentage of renewable electricity from total consumption ⁸	Consume minimum share from non-fossil/renewable sources (includes feedstock) ²⁵	Generate/procure RE equivalent to 40% of thermal capacity (voluntary for some) ²⁶
Scope and Fungibility	Limited to electricity purchases; some inter-category fungibility (e.g., wind/hydro) but varies by state ²⁷	Broader (energy/feedstock); fungible across wind/hydro/other RE, non-fungible for DRE shortfalls ²⁵	Generation-focused; allows bundling RE with thermal output, includes subsidiary contributions ²⁴

2 <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2043152®=3&lang=2>

3 <https://iforest.global/wp-content/uploads/2025/09/Press-Release-English-JT-Maharashtra.pdf>

4 <https://www.ceew.in/gfc/quick-reads/explains/what-are-rpo-and-rec>

5 <https://shaktifoundation.in/rgo-for-new-thermal-power-plants/>

6 <https://www.beeindia.gov.in/renewable-consumption-obligations-rco.php>

7 <https://www.eqmagpro.com/clarification-on-renewable-generation-obligation-rgo-eq/>

8 <https://neetiniyaman.com/rco-vs-rpo-energy-conservation-electricity-act/>

Compliance Options	Direct procurement or RECs; no buyout price ²⁷	Direct consumption, RECs, or CERC-fixed buyout price; group aggregation allowed ²⁷	Establish RE capacity or procure/supply equivalent; voluntary per clarifications ²⁶
Enforcement and Penalties	By SERCs, penalties under Section 142 (varies by state) ²⁷	By BEE/MoP; strict penalties under Section 26 (up to ₹10 lakh + daily fines) ²⁷	By MoP; voluntary, no explicit penalties ²⁶

With respect to the states considered in this report, they seem to have also announced plans to add new thermal capacities. Such new additions may be borne out of the necessity for affordable energy/energy security or may have been planned without due cost benefit analysis.

For instance, when in the case of Rajasthan, Rajasthan Urja Vikas and IT Services sought approval of the Rajasthan Electricity Regulatory Commission (RERC) for procurement of 3200 MW RTC power for 25 years from Thermal Power Stations, it was met by cost - benefit analysis of the same which argued other wise and established a case that the people of Rajasthan would likely save more per connection if renewable energy plus BESS is to be installed instead of proposed thermal capacity addition.

Such cost benefit analysis in states considered in this report can make a strong case for moderating or decreasing thermal capacity additions and therefore is important to be part of core research.

Given the above, key research questions would be as follows.

Table 4: Key Research Questions and Rationale - Generation (State Power Utilities)

Key Research Questions	Rationale
Is there an economic and regulatory case (RPO, RGO, RCO compliance) for state government, state generation utilities and State transmission utilities for repurposing assets that have completed 25 years of shelf life?	Regulatory compliance and optimisation of transmission infrastructure costs present a compelling case for repurposing but cost benefit analysis of doing the same must be presented to the state government.
What impact would repurposing have on jobs and competencies at the utility level, plant level and at the level of associated economy which is linked to fossil supply chain and by products of thermal assets? Quantification of impact in terms of actual costs and socio-economic costs is important.	Place based impact can be significant particularly in the context of blue-collar workers, informal workers and associated economic activities thus presenting political-economy lock in. The costs and benefits, therefore, need to be fully understood for a transition to be just.
Has there been a cost benefit analysis of renewable energy integration vs new thermal addition? Would such an analysis enable greater RE penetration? What impact would it have on scaling down thermal plants and by implication on jobs? What costs will be associated with respect to each	In the case of Rajasthan, a cost benefit analysis between new thermal addition and commensurate RE+ BESS addition present a clear case for not adding new thermal capacities
In cases where new thermal capacity additions have been finalised, can asset level workforce be shifted to the new thermal assets particularly where the new assets are in a different or a new location? What added mechanisms may be required for workforce to have good and better jobs in such cases?	There is a possibility that new thermal additions in states may have been planned and finalised already either at the same location where retired thermal capacity exists or a new location may have been identified for new thermal capacity. Therefore, it is important to understand if such assets can absorb displaced workforce from retired thermal assets.

1.1.2. Generation (DRE)

Distributed Renewable Energy (DRE) has emerged as a transformative solution that addresses both energy access challenges and climate goals simultaneously while also supporting employment in many cases. The falling costs of DRE has tipped the scale in favour of its mass adoption⁹ which is being complemented by technological upgrades in distribution utilities to allow a bi-directional flow of energy for better economics.

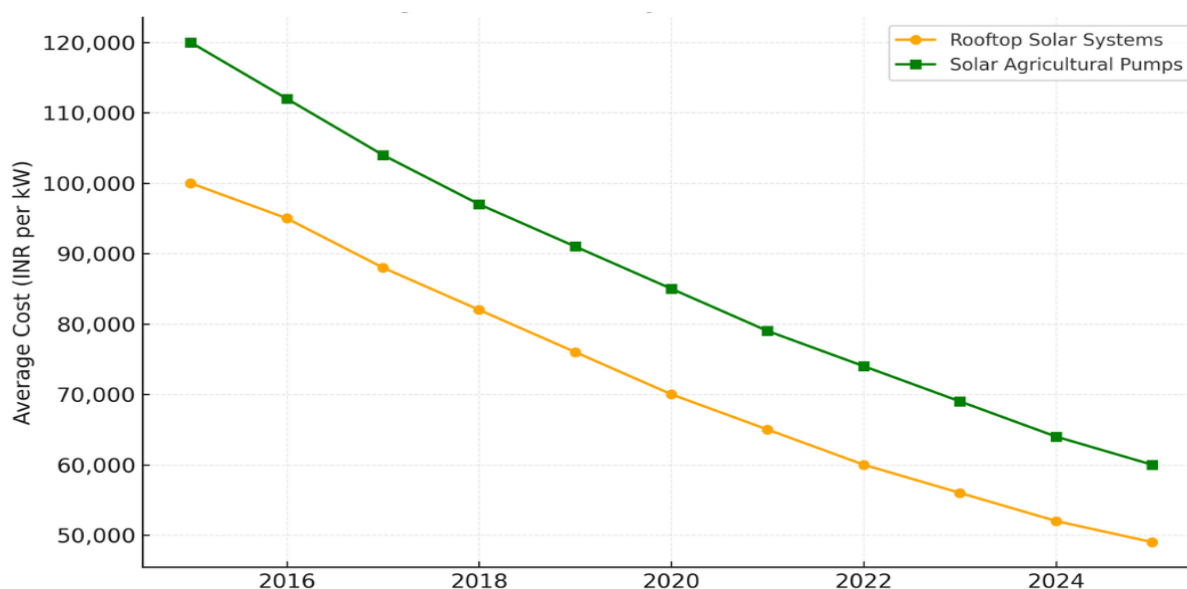


Figure 5: Declining Cost of DRE Systems in India (2015-2025)

Essentially DRE is supported through two national schemes namely the **Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyan (PM-KUSUM)** which aims to add 30.8 GW of solar capacity through 10 GW of decentralized ground-mounted solar plants, Installation of 20 lakh standalone solar pumps and Solarization of 15 lakh grid-connected agricultural pumps; and **Pradhan Mantri Surya Ghar Yojana** which aims to target one crore households with rooftop solar installations by providing subsidy of 40% for systems up to 3 kW, subsidy of 20% for systems between 3-10 kW and low-interest loans through partner banks. The initiative aims to save households up to ₹15,000 annually in electricity bills.

Further, Ministry of New and Renewable Energy has also issued guidelines for a ₹200 crore scheme to fund pilot projects for innovative and decentralised green hydrogen production (e.g. from biomass, wastewater) and utilisation (e.g. in cooking off-grid power generation) with a special focus on startups. By funding pilot projects in decentralised applications, the government aims to foster grassroots innovation, validate new technologies and business models and accelerate the adoption of hydrogen in sectors beyond large-scale industry.

The initiative demonstrates a commitment to R&D and ecosystem building for next-generation clean technologies and strengthens India's position as an innovator showcasing a long-term vision for decarbonising hard-to-abate sectors and building a future hydrogen economy from the

⁹ <https://ibsolar.co.in/distributed-renewable-energy-india/>

ground up¹⁰. Besides, states have articulated their own DRE policies to incentives the DRE uptake. Uptake at the state level provides further insights into how DRE is being scaled up.

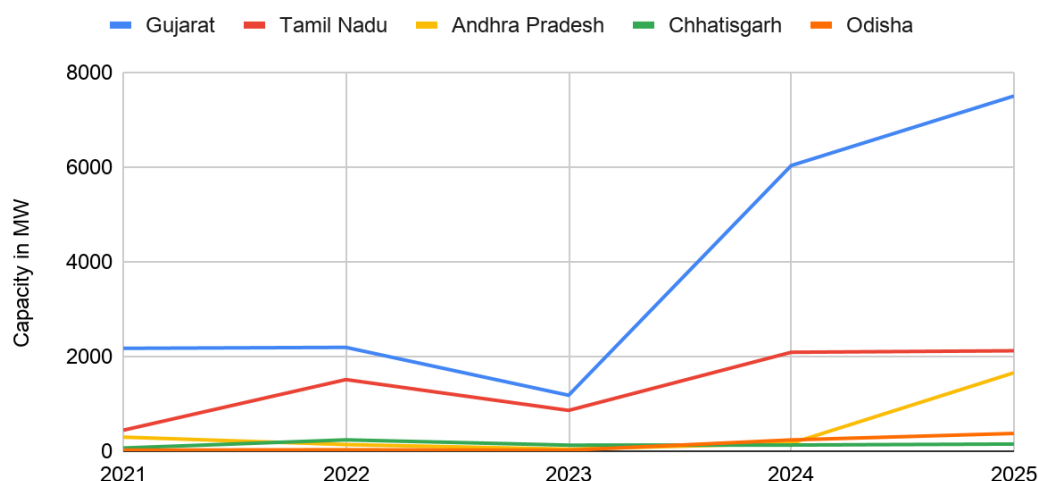


Figure 6: Analytical Progressive Capacity of DRE (MW)

As can be seen in the figure, Gujarat, Tamil Nadu and Andhra Pradesh have registered a significant DRE uptake which could provide further fillip from three national schemes namely PM KUSUM, PM Saurya Ghar and MNRE scheme to fund pilot projects for decentralised green hydrogen production. These schemes could also positively impact DRE uptake in Chhattisgarh and Odisha, which until now have shown comparatively lesser progressive capacity.

Given the above, key research questions are as following:

Table 5: Key Research Questions and Rationale - Generation (DRE)

Key Research Questions	Rationale
What impact does DRE uptake have on boosting employment in general and local employment in particular in five states particularly considering central government schemes and their intended uptake?	Central government schemes and the incentives provided therein are specifically geared to catalyse scale up of DRE application. While there is scholarship available on employment potential of DRE, a granular understanding is not available. Such a granular understanding is needed to estimate new job creation in the decentralised energy sector and the resilience it can bring to economic well being of users. Such a study will feed into net job potential of renewable energy thus speeding up the demand and finance flow.

1.1.3. Storage

From the perspective of state government involvement, the opportunity in storage arises in BESS and PSP in two ways namely where the PPP route is explicitly highlighted and where state government is directly involved. Additionally, several states have also formulated battery recycling policies. This addresses end of life disposal and provides an enabling ecosystem for investment. All three options provide for new job opportunities.

Further, the Ministry of Power has amended the Electricity Rules 2005 to create a formal framework for Energy Storage Systems. The rules allow a wide range of entities including a new category of '**Independent Energy Storage Service Providers**' to own, lease or operate ESS.

10 <https://cdnbbsr.s3waas.gov.in/s3716e1b8c6cd17b771da77391355749f3/uploads/2025/08/20250804721426633.pdf>

Owners will be able to sell, lease or rent storage capacity to any entity enabling a "**Storage-as-a-Service**" model.

Effectively, this could allow broad range of entities to develop, own, lease, or operate ESS, including generating companies, transmission & distribution licensees, consumers (including C&I), system operators and independent energy storage service providers. Selling, leasing, or renting storage capacity, in whole or in part, to any consumer, utility, Load Despatch Centre, or other entity, will create diverse and bankable revenue streams while addressing intermittency of RE generation.

This could also ensure financially stressed Distribution Companies (DISCOMs) to leverage ESS to manage peak loads more effectively, reduce their power purchase costs and improve reliability for end consumers, while also developing a nascent market allowing specialized players to offer ‘**storage-as-a-service**’. In brief, the clear rules on ownership, market access, and commercial models provide the regulatory clarity needed to build robust financial models and deploy capital in a high-growth sector¹¹.

In addition to the above, the Ministry of Power has also released an advisory promoting the co-location of Energy Storage Systems (ESS) with solar power projects. The advisory recommends incorporating a minimum 2-hour co-located ESS (equivalent to 10% of installed solar capacity) in future solar tenders, mitigating intermittency, improving cost efficiency due to potential reduction in power purchase costs during peak hours and increased transmission line utilization by maximizing the use of existing infrastructure¹².

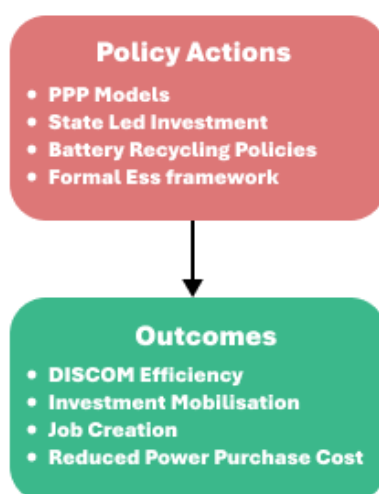


Figure 7: Energy Storage- From Policy to Outcome

Table 6: Key Research Questions and Rationale - Storage

Key Research Questions	Rationale
What impact will 'storage as a service' entail in terms of new jobs? An evaluation of impacts is important in	This provision has the potential of opening a new market segment which can bring down the costs of storage significantly and enhance RE integration

11<https://www.mercomindia.com/government-notifies-rules-to-broaden-energy-storage-ownership-and-usage#:~:text=The%20Ministry%20of%20Power%20has%20notified%20the,as%20part%20of%20generation%2C%20transmission%2C%20or%20distribution.>

content/uploads/notification/2025/02/Advisory_on_colocating_Energy_Storage_System_with_Solar_Power_Projects_to_enhance_grid_stability_and_cost_efficiency.pdf

order to aid a market landscape for the sector to fully flourish.	
How will Storage as a Service Model cut operational losses of discom and how can that enable higher RE integration?	Removing discom inefficiencies and optimising costs can lead to higher and speedier RE integration

1.2. Clean Tech Manufacturing

Clean tech manufacturing is considered as an enabling activity towards green transition and hence qualifies for green finance. The National Manufacturing Mission, announced in 2025, serves as the policy anchor for this transformation. By deepening domestic value addition (DVA), India can secure its energy future, add USD 20-30 billion to its annual GDP by 2030, and create over 1.8 million high-quality jobs¹³.

As per the central thesis of the recently released blueprint on 5th February, 2026, clean energy expansion must translate into tangible industrial capability by capturing a market projected to reach USD 90-135 billion annually by 2030, mitigating geopolitical risks associated with concentrated supply chains (e.g., China's dominance in solar and battery materials), and foster MSME growth and large-scale employment in Tier 2 and Tier 3 cities. This will also lead to potential economic gains of USD 48-68 billion through prevention of cumulative foreign exchange outflows, will contribute towards annual addition of USD 20-30 billion, job creation for 1.8 million people and unlock (USD 1.1-1.7 billion in R&D and innovation).

Table 7: Market Opportunities in Cleantech (2030 projections)

Sector	Current Demand (2025)	Conservative 2030 Projection	Optimistic 2030 Projection
Solar PV	26 GW	80 GW	97 GW
Wind Power	4 GW	10 GW	14 GW
Battery Storage	24 GWh	173 GWh	273 GWh
Electric Vehicles	2.2 M Vehicles	10 M Vehicles	17 M Vehicles
Green Hydrogen	0.01 MMTPA	1.20 MMTPA	3.40 MMTPA
HVDC Transmission	3,000 ckm	12,000 ckm	17,000 ckm

Overall, the transition would require INR 1.85-2.45 lakh crores in catalytic public funding to unlock INR 4.5-7 lakh crores in private investment. Success depends on seamless coordination between the National Manufacturing Mission, line ministries, and the private sector to move from intent to high-speed execution.

As DPIIT lays out the design of the National Manufacturing Mission, together with all the line ministries, the cleantech manufacturing agenda can gather momentum and create new avenues of collaboration. These collaborations will unfold on the back of numerous initiatives by line ministries and regulators.

For instance, the Central Electricity Authority (CEA) has launched an initiative to promote domestic manufacturing of 29 critical power sector components that are currently imported, inviting stakeholder collaboration to create a roadmap that could lead to a PLI-like scheme. This policy allows India to frame its climate action within a development-centric model that builds domestic industrial capacity, creates jobs and ensures energy security. It presents a powerful

¹³ Blueprint for India's Cleantech Manufacturing Ambition: Bharat Climate Forum

argument for the Global South that the energy transition must support and not hinder national industrial development.

The Ministry of New and Renewable Energy (MNRE) has also stressed that entire process from "black wafer" to cell in solar manufacturing must occur in India. The idea is to promote investment in upstream higher-value stages of the solar manufacturing supply chain and move beyond simple module assembly to build a fully integrated and self-reliant solar ecosystem reducing dependence on imported components and strengthening the 'Make in India' initiative that ensures long-term energy security and industrial sovereignty.

The Ministry of Heavy Industries too has mandated stricter timelines for the domestic manufacturing of key EV components for e2W, e3W, e-buses, amongst others, prohibiting the import of assembled battery modules and completely knocked down (CKD) kits from a single supplier for certain vehicle categories. This will enable localisation of the EV supply chain compelling manufacturers to move beyond assembly and develop a robust domestic component ecosystem.

The Scheme to Promote Manufacturing of Electric Passenger Cars (SPMEPCI) allows global EV manufacturers committing to a minimum investment of ₹4150 crore (approx. USD 500 million) to import a limited number of cars at a reduced customs duty of 15% in return for achieving 50% Domestic Value Addition (DVA) by the fifth year, making it an aggressive strategy to attract major global EV players and their technology to India.

The Ministry of Heavy Industries has introduced incentives for electric trucks (N2 and N3 categories) under the PM E-DRIVE scheme with a ₹500 crore outlay to support approximately 5600 e-trucks. The incentive is linked to battery capacity and vehicle price with a cap up to ₹9.6 lakh per vehicle. The scheme mandates extensive battery warranties and ties incentives to scrapping old ICE trucks. This is the government's first dedicated scheme targeting the decarbonisation of the high-emission freight sector which accounts for 42% of transport emissions.

Further, the Ministry of Finance amended the Income-tax rules to include lithium-ion batteries for EVs under specific provisions related to income not deemed to arise in India for non-residents, providing tax predictability for non-residents. Greater tax certainty for multinational corporations the government aims to accelerate the development of a domestic battery manufacturing ecosystem critical for the EV industry's success.

Table 8: State-wise clean tech manufacturing targets

	AP	CG	GJ	OD	TN
Solar	20 GW photovoltaic manufacturing capacity	NA	NA	NA	NA
Wind	NA	NA	NA	NA	NA
Battery	Target 5000 MWh of battery manufacturing capacity	NA	NA	NA	NA
Electrolyzer	3000 MW capacity targeted	NA	NA	NA	NA
EV Targets	100 incubation centers focused on e-mobility startups by 2029	NA	NA	NA	NA

A critical consideration towards mobilising the capital for this purpose is the cost of capital. In China, the cost of capital for clean tech manufacturing is around 3–4% while in India, it ranges between 9–14%. In this regard, the Economic Survey 2025-26 argues that economies that generate sustained external surpluses through exports, productivity and financial depth can finance investment cheaply and stably at home. In other words, for the cost of capital to fall

durably, India will need to deepen manufacturing, financial markets and export competitiveness. The domestic clean tech manufacturing provides an immense opportunity in that regard¹⁴.

Additionally, the newly introduced Carbon Credit Trading Scheme (CCTS) can be considered the long-term financing engine needed to build this domestic manufacturing capability. Auctioning of allowances or credits in the CCTS, where one allowance equals one tonne of CO2 emissions, can generate significant revenue for the government. A practical pathway is to establish a Cleantech Manufacturing Fund, capitalised by CCTS revenues and jointly managed by the ministry of finance and the National Manufacturing Mission, with a mandate linked to outcomes such as cost reductions, innovation and supplier upgrades¹⁵. CCTS, however, should be deployed for residual emissions.

Table 9: Key Research Questions and Rationale - Clean Tech Manufacturing

Key Research Questions	Rationale
How can states calibrate their clean tech manufacturing targets and employment targets in line with steps taken by central government line ministries? What kind of tax expenditures/revenue forgone will be entailed towards such a calibration and how to measure their outcomes and net benefits?	As DPIIT lays out the design of the National Manufacturing Mission, together with all the line ministries, the cleantech manufacturing agenda can gather momentum and create new avenues of clean tech manufacturing in states.
For clean tech manufacturing to take off in states, what are the skills that are required and how are respective states placed to impart those skills through their skill training programmes? What cost elements would this entail?	As per the central thesis of the recently released blueprint on 5 th February, 2026, clean energy expansion must translate into tangible industrial capability by capturing a market projected to reach USD 90-135 billion annually by 2030, mitigating geopolitical risks associated with concentrated supply chains (e.g., China's dominance in solar and battery materials), and foster MSME growth and large-scale employment in Tier 2 and Tier 3 cities. This will also lead to potential economic gains of USD 48-68 billion through prevention of in cumulative foreign exchange outflows, will contribute towards annual addition of USD 20-30 billion, job creation for 1.8 million people and unlock (USD 1.1-1.7 billion in R&D and innovation).

1.3. Electric Mobility

One of the considerable transition challenges in the mobility sector is pegged on rising electric vehicles penetration across vehicle categories. However, when viewed across categories in different sectors in states, an interesting trend is visible. There is consistent increase in EV uptake in two and four-wheeler categories, tipping the volumes towards economy of scale in EV maintenance, battery recycling opportunities et al. Prima facie, this may have adverse implication on informal work in the repair economy and post warranty markets, but at the same time new opportunities in areas like battery recycling can open up. Already, industry led battery as a service model exists which can potentially also create new job opportunities. Notably, at the level of Government of India – Right to Repair (RTR) Index is being prepared by Ministry of Consumer Affairs. RTR also applies to electric vehicles and may well also be important area to examine particularly in light of the fact that it seeks to broaden the repairability market beyond OEM service centres.

¹⁴ Blueprint for India's Cleantech Manufacturing Ambition: Bharat Climate Forum

¹⁵ <https://www.hindustantimes.com/ht-insight/climate-change/carbon-credit-trading-scheme-revenues-can-power-india-s-cleantech-future-101760937908699.html>

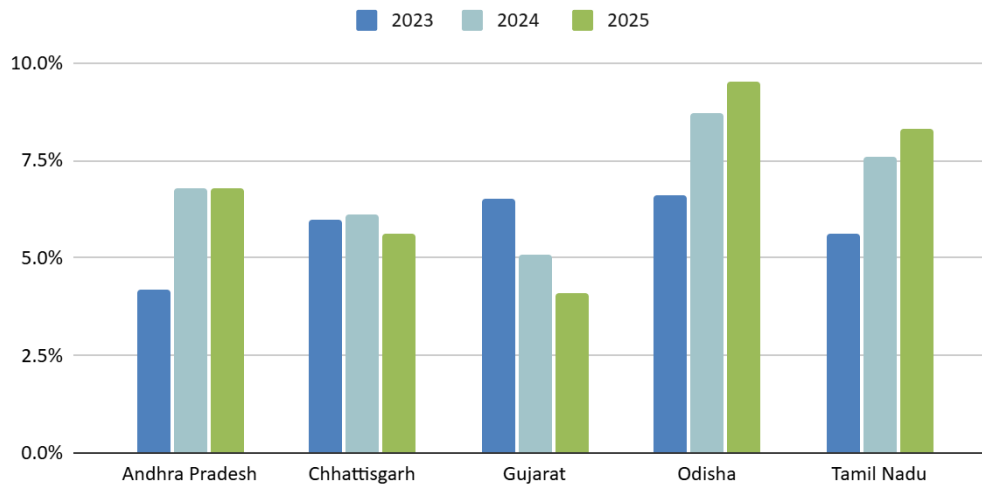


Figure 8: EV Penetration- Two-Wheeler

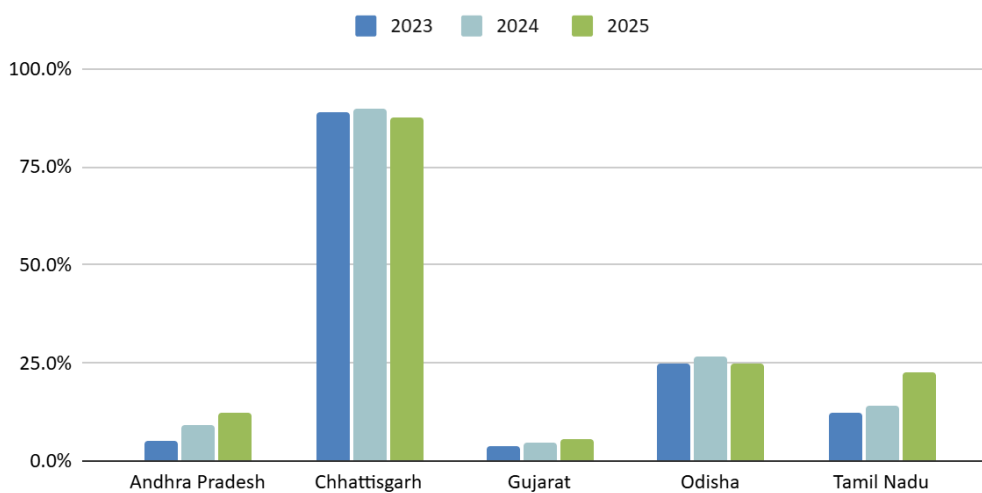


Figure 9: EV Penetration- Three-Wheeler

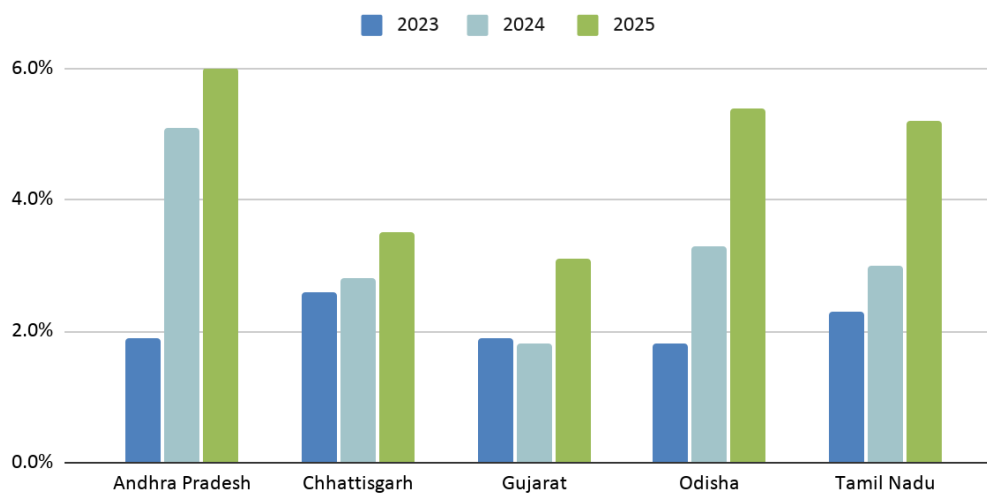


Figure 10: EV Penetration- Four-Wheeler

Further and as discussed above, within the automobile value chain, Maintenance, Repair and Operations (MRO) represents a vulnerable segment due to high degree of informality. Firstly, EVs use substantially less components compared to their ICE counterparts – 200 as opposed to 1400 components⁸ – generating substantially lower MRO demand. Secondly, small garages, mechanics who are reliant on maintenance and repair of ICE vehicles are vulnerable to the shift towards EVs as the engineering is significantly different than traditional ICE models, thereby requiring upskilling. Further, this displacement is not evenly distributed as independent garages and small mechanics suffer acute impact, whilst organised dealer networks can partially retrain their staff.

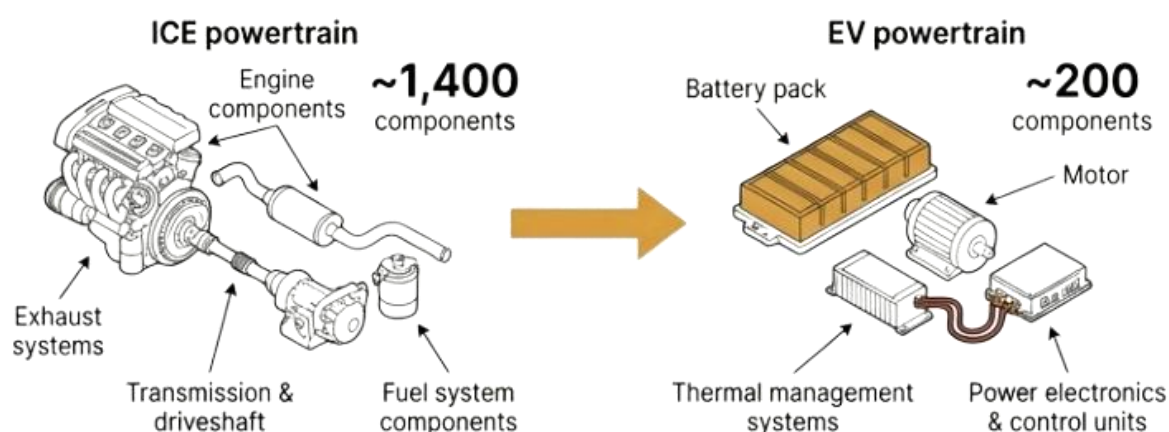


Figure 11: Components Comparison - ICE vs EV

The shift to EVs places 31% of job roles in the automotive sector at risk, while approximately 45-84% of components could go obsolete.¹⁶ The vulnerability is most acute and quantifiable in major automotive centres such as Tamil Nadu. This exposure demands targeted, large-scale reskilling programmes to mitigate the displacement of personnel across the nation's auto workforce, which totals 3.7 million people.¹⁷ This would necessitate a complete restructuring of the workforce landscape, requiring the upskilling of workers in areas such as battery systems, electric drivetrains, charging infrastructure, maintenance & repair, and embedded systems.

For India to attain 30% EV adoption by 2030, estimates suggest the requirement of up to 200,000 skilled professionals, which would require ramping up of the skilling ecosystem as the current institutional capacity manages to train only approximately 15,000 EV-ready workers annually.¹⁸

Tamil Nadu's policy addresses this through targeted reskilling.⁹ The state government has partnered with industry bodies to develop EV-specific training curricula, focusing on high-voltage systems, battery diagnostics and electric motor maintenance.

Table 10: Key Research Questions and Rationale – Electric Mobility

Key Research Question	Rationale
What key job opportunities arise and what jobs may be lost in the maintenance, repair and battery market in different EV segments in states. An evaluation of	With regards to jobs in the EV transition landscape, there are six crucial areas where impact on jobs needs to be mapped. These include automotive ecosystem from the perspective of manufacturers, dealership, charging

16 Tamil Nadu's EV Transition: Applying a Just Transition Framework for Livelihood Protection: Pune International Centre

17 The EV Transition is Reshaping Jobs but are India's Auto Workers Ready? – Outlook Business

18 <https://www.businessworld.in/article/driving-india-forward-mission-to-build-a-future-ready-automotive-workforce-561709-561821>

net jobs number, income loss, skilling gaps and financing in this context is therefore essential.	infrastructure, fleet aggregators, driver union, and industry associations. Each stakeholder will have
As reparability is often associated with spare parts economy, what impact will the transition have on businesses and employment of the MSMEs in the repair economy and what financial, technical, and institutional mechanisms are required for them to navigate this shift?	The shift to EV places, 31% of Job roles in the automotive sector is at risk, while approximately 45% – 84% could go obsolete. Automotive sector is dependent on MSMEs for components, with around 45,000 enterprises producing roughly over 2000 products for the ICEV manufacturers.

1.4. Agriculture

India's food system is placed amidst three mutually reinforcing challenges namely climate change, food security and nutritional security. This implies that systemic stress on agricultural systems perpetuated by standardized and resource heavy monoculture model is ill-equipped to handle the localized and varied impacts of a changing climate.

In this regard, sustainable agriculture has emerged as a key area that addresses the interconnected challenges of the food-energy-water by reducing input costs, conserving resources and enhancing resilience to environmental changes.

Within the umbrella of sustainable agriculture, Natural Farming (NF) has emerged as a scalable model in the Indian context. Accordingly, National Mission on Natural Farming (NMNF), a standalone Centrally Sponsored Scheme was launched in November 2024 to promote chemical-free, ecosystem-based natural farming rooted in traditional knowledge. It is aimed towards improving soil health, restoring ecosystems and reducing input cost to the farmer through scientifically backed approaches to achieve sustainability, climate resilience and safe food.

The other key policy enabler is the PM Programme for Restoration, Awareness Generation, Nourishment, and Amelioration of Mother-Earth (PM-PRANAM). This scheme represents a sophisticated evolution in agricultural policy, moving away from direct, input-based subsidies towards a smarter, outcome-based incentive structure. Instead of simply subsidizing fertilizer sales, a practice that encouraged overuse and created a massive fiscal burden, PM-PRANAM uses fiscal federalism to drive behavioural change.

The scheme's innovative mechanism incentivizes states to reduce their consumption of chemical fertilizers (Urea, DAP, NPK, MOP) compared to previous 3 years' average consumption, by offering them a grant equivalent to 50% of the resulting subsidy savings for the central government. Of this grant, 70% is earmarked for creating infrastructure for alternative fertilizer production, while the remaining 30% can be used to reward farmers, FPOs, and SHGs who contribute to the reduction.

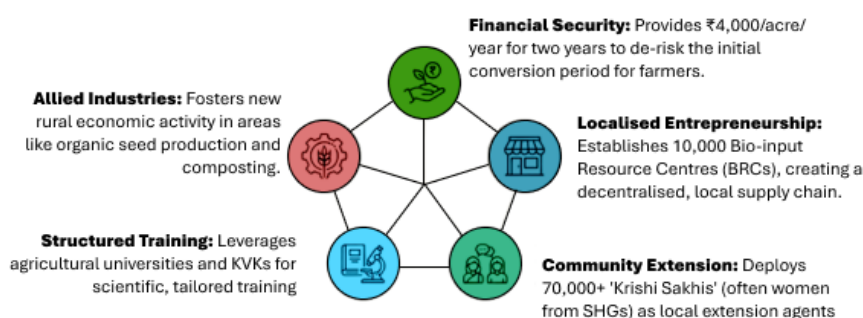


Figure 12: Architecture of National Mission on Natural Farming

This aligns the financial interests of the Centre and the states, empowering states to champion locally suited sustainable practices because they now have a direct financial stake in the outcome. Under PM-PRANAM, 14 states have shown a reduction of 15.14 LMT in consumption of chemical fertilizers during FY 2023-24 as compared to the average consumption of previous 3 financial years¹⁹. However, incentives disbursement to states is yet to be done²⁰.

In addition to the above, financial intermediaries have evolved from traditional credit providers to comprehensive enablers of agricultural sustainability, each leveraging their institutional strengths. NABARD's policy influence and refinance capacity, cooperatives' grassroots outreach, RRBs' rural focus, and NBFCs' innovation creates an integrated ecosystem supporting India's climate-smart agriculture transformation across states.

Most recently, The Reserve Bank of India (RBI) has also proposed to include expenses related to technology innovations like soil testing, real-time weather forecasts, and organic/good agricultural practices certification, to be eligible for farm loans. These will be covered within the 20 per cent additional component currently allowed towards repairs and maintenance of farm assets.

At the state level, several initiatives to promote natural farming are underway, however, unlike some other sectors specific targets are not explicitly stated nor are the details on how states are undertaking the natural farming transformation.

Table 11: State Schemes Related to Sustainable Agriculture

State	Flagship Scheme	Mechanism	Just Transition Impact (Livelihood/Equity)
Andhra Pradesh	AP Community Managed Natural Farming (APCNF)	Knowledge transfer via Self-Help Groups (SHGs); No cash subsidy for inputs. ¹⁶	- Debt Relief: Drastic reduction in cultivation costs. - Inclusion: Landless trained as "Community Resource Persons".¹⁶
Chhattisgarh	Godhan Nyay Yojana	State buys cow dung @ ₹2/kg; SHGs convert to vermicompost. ¹⁸	- Income Transfer: Direct cash to landless/livestock owners. - Circular Economy: Local production of organic fertilizer.
Odisha	Odisha Millets Mission & Samrudhi Policy	Funded by District Mineral Foundation (DMF); PDS integration.	- Restorative Justice: Mining revenues fund tribal agriculture. - Nutritional Security: Millets included in mid-day meals.²¹
Tamil Nadu	Organic Farming Policy 2023	Cluster-based approach; "Nammazhvar Award" for recognition. ²²	- Prestige: Social recognition for organic farmers. - Subsidy for pesticide residue analysis.²³
Gujarat	Cow Based Natural Farming	Monthly stipend (₹900) for indigenous cow maintenance. ²⁴	Cultural-Ecological Link: Supports input generation at the farm level.

Collectively, these state and central initiatives demonstrate that a just transition in agriculture is not solely defined by ecological outcomes, but by the restructuring of agricultural systems in ways that reduce vulnerability, safeguard livelihoods and distribute the benefits of sustainability more equitably. By prioritising locally adapted practices, diversification and farmer-centric

19 <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2116211>

20 https://sansad.in/getFile/loksabhaquestions/annex/187/AU1337_5YMsYk.pdf?source=pqals

institutional support, these interventions offer concrete pathways to reconcile climate action with social justice in a sector that remains foundational to India's economy and employment.

Table 12: Key Research Questions and Rationale - Agriculture

Key Research Questions	Rationale
What is the feasibility of scaling up natural farming in respective states? Amount of financing required for natural farming would depend of such a feasibility study	This question is important as there may be areas which are heavily dependent on chemical fertilisers as well as non-rain fed irrigation.
In areas where natural farming is feasible, what is the impact on energy and water subsidy? What mechanisms can be put in place to escrow benefits and repurpose them for scale up?	Often times, scale of natural farming involves multiple actors and government departments making it difficult to quantify and escrow benefits for scale up
What post-harvest marketing and retail opportunities exist and what kind of job creation can they lead to? What are the barriers to creating post-harvest value chains.	Post harvest value chains in natural farming remains largely weak thereby obstructing the market signal for scale up?

1.5. A Sui Generis Case of Coal

While the preceding sections examines power generation, clean tech, mobility and agriculture the coal economy upstream presents distinct transition considerations. Coal production in the country is concentrated in Chhattisgarh, Odisha and Jharkhand. These states remain heavily reliant on it, contributing 12-30% of their own revenue.²¹ The country surpassed 1 billion metric tons of coal production in FY2024-25.

In Chhattisgarh, coal fuels core industries of power generation and adds substantial value to the state's economy. The industrial base is concentrated in the central plains and northern districts where local economies around Korba are tied to mining and thermal power. Coal accounts for 10.8% of own revenue and petroleum for another 11.3%. The state has used mineral-linked cesses as a fiscal tool, raising its forest cess from ₹15 to ₹57 per tonne, but these revenues track extraction volumes and will evolve alongside production.

In Odisha, the mining economy is embedded in a secondary sector that contributes 46% of GSVA while employing only 26% of the workforce. The state produces 24% of India's coal, 21% of its steel and 54% of its aluminium, concentrated in districts such as Jharsuguda and Angul. Odisha holds the highest DMF accrual in India at over ₹25,858 crore but directs 30.6% of it towards physical infrastructure and 1.2% towards skill development. The state's intended Energy Transition Policy could provide the framework for redirecting these flows towards economic diversification in coal-bearing districts.

Across both states, approximately 70% of workers associated with the coal economy, including transporters, washery operators and service providers, operate outside formal employment structures. SC/ST communities constitute over 39% of the population in both states, and many of them are in mining-affected areas covered under PESA and FRA provisions. The demographic and skill profile of this informal workforce remains inadequately documented.

At the national level, the Ministry of Coal's 2025 Mine Closure Guidelines under the RECLAIM framework have recognised "just transformation" alongside mine closure, directing PSEs to

²¹https://ieefa.org/sites/default/files/202403/Briefing%20note_Navigating%20the%20fiscal%20implications%20of%20a%20just%20transition_Mar2024.pdf

repurpose closed mines for agro-solar, RE parks, green hydrogen and manufacturing. The guidelines mandate that 25% of the five-yearly escrow amount be used for community development with 10% of final mine closure cost earmarked for just transformation. Concurrently, coal CPSUs are diversifying into RE with CIL targeting 3,000 MW of solar and NLCIL having installed 1,380 MW by January 2025. Whether these new assets are sited in coal districts with local hiring commitments will determine if the diversification addresses district-level displacement alongside corporate viability.

Given the above, key research questions are as follows.

Table 13: Key Research Questions and Rationale - Coal

Key Research Questions	Rationale
What is the demographic and skill profile of informal workers in the coal economy in Chhattisgarh and Odisha? What social protection instruments are appropriate for workers who lack formal severance or documented work histories?	Approximately 70% of coal economy workers are informal, their profile remains undocumented, and without it the costs of retraining and social protection cannot be sized.
How should DMF utilisation in coal-bearing districts be reoriented towards economic diversification and skill development, and can accumulated DMF funds serve as guarantee layers to mobilise private capital?	In Odisha, 30.6% of DMF goes to physical infrastructure and 1.2% to skills. Chhattisgarh shows a similar pattern at 28.7% and 2.4% respectively. Using the accrual stream as credit enhancement can unlock larger capital for diversification in affected districts.
For mine repurposing options under RECLAIM (agro-solar, RE parks, green hydrogen, tourism), what business models and ownership structures are realistic in Chhattisgarh's central districts and Odisha's Jharsuguda-Angul belt, and how can they retain employment locally?	The RECLAIM framework mandates repurposing but does not prescribe business models. Whether repurposed mines operate as public assets, PPPs or community cooperatives will determine who benefits, and this requires assessment specific to each state's coal geography.

2. JT finance landscape

Given the existing support from the Union and State level initiatives and schematic flows, financing strategies for just transition need to move beyond traditional mechanisms to address acute regional disparities and contexts. For instance, on examining the states under consideration, states like Odisha and Chhattisgarh possess the majority resource endowment of India in the form of coal reserves while renewable energy potential is limited in these areas compared to the abundant potential in other states.²² These states, historically responsible for industrial growth through carbon-intensive activities, require compensatory and remedial capital to manage the decline of their primary revenue sources. Chhattisgarh derives 22 percent of its total state revenues from the energy sector, of which 80 percent originates from fossil fuels (38 percent from coal and 40 percent from oil and gas). Similarly, Odisha, a top coal producer, emphasizes the need for a just transition due to its large coal reserves.²³

On the other hand, states including Gujarat, Tamil Nadu and Andhra Pradesh represent the future centres of the green economy, requiring catalytic and risk-mitigating capital to accelerate industrial change and green infrastructure development. Both Gujarat and Tamil Nadu are critical hubs for India's automotive sector and large-scale industrial manufacturing. As the vehicle mix shifts toward electric vehicles (EVs), the financial challenge is not geographical decline but sectoral restructuring. The transition risks job losses and stranded assets within the vast ecosystem of MSMEs involved in component supply, repair and refurbishing of conventional internal combustion engine vehicles. Also, Andhra Pradesh, Gujarat and Tamil Nadu have a strong focus on developing utility-scale solar and wind capacities, requiring large scale capital expenditure for green infrastructure. At the same time, these states face the challenge of addressing the gap of specialized engineering, operations and maintenance (O&M) and semi-skilled labour, needed for renewable energy projects.²⁴

The following section identifies key financial instruments, structures and institutions (cumulatively financial mechanisms) that can scale up the flow of finance at the state-level by not only enabling decarbonisation efforts and addressing climate risks but also ensuring contribution to positive social outcomes. In order to address the peculiarities of place-based transitions, specific financial mechanisms can be identified which are most suited to these regions, whereas there exist certain universal mechanisms which can be deployed to scale up the investment flows in India. Since, the five states under consideration fall into two distinct financing typologies based on their economic vulnerability and transition drivers as described above, this paper explores the specific and universal financing mechanisms which can drive the transition.

A. Specific Financial Mechanisms

2.1. Coal-Dependent Phase-Down States (Odisha and Chhattisgarh)

The social dimensions of the phase-down are acute as Odisha and Chhattisgarh, along with Jharkhand host the majority of coal-related jobs in India, estimated at 2.6 million workers,

²²<https://justtransitionfinance.org/commentary/just-transition-is-gaining-momentum-in-india/>

²³<https://teriin.org/sites/default/files/2024-02/Just%20Transition%20Framework%20for%20a%20Sustainable%20Future%20in%20India%E2%80%99s%20Coal%20Mining%20Regions.pdf>

²⁴https://justtransitionfinance.org/wp-content/uploads/2024/05/Just-Transition-Finance-Lab_case-study_Ayana.pdf

approximately 70 percent of whom are employed in the informal sector.²⁵ Since informal workers lack the benefit of formal severance or corporate-funded reskilling, the cost of their social protection, relocation and green reskilling is borne primarily by the public sector (State and Central governments). These mechanisms include:

2.1.1. District Mineral Foundation (DMF) Funds:

The District Mineral Foundation (DMF) funds, accrued from mining royalties, represent the most critical public financing source for localized transition measures. Established under the Mines and Minerals Amendment Act 2015, the DMF aims to finance developmental and welfare projects in mining-affected areas, guided by the Pradhan Mantri Khanij Kshetra Kalyan Yojana (PMKKKY). Odisha holds the maximum DMF accrual in India, exceeding ₹25,858 crore (approximately \$3.1 billion), representing nearly 30 percent of the nation's total accrual.²⁶

These funds are explicitly aligned with public welfare goals and environmental sustainability with the mandate that 70% of the funds need to be allocated to the directly affected areas and high priority sectors. The key challenge is the strategic re-tagging of DMF utilization which requires shifting the focus from general welfare projects to long-term economic diversification and skill development in coal-affected districts.

Odisha's State Energy Transition Policy is intended to provide the necessary strategic framework to formally guide this re-prioritization.^{6,27} The predictable nature of DMF accruals in Odisha means this statutory revenue stream could be innovatively leveraged as a portion of the DMF funds could be strategically designated as a guarantee or first-loss layer. This mechanism would repurpose existing public revenues into a credit enhancement tool, de-risking the external private commercial debt to finance major economic diversification projects.

Table 14: State-wise allocation pattern of DMF

Allocation Patterns of DMF Across Five States (Percent)					
Expenditure Categories	Andhra Pradesh	Chhattisgarh	Gujrat	Odisha	Tamil Nadu
High-priority Areas					
Drinking water supply	22.2	7.3	8.8	23.8	37.9
Environment	0	2.8	0.4	1.8	0.7
Healthcare	2.1	10.1	12.1	10.1	7.7
Education	6.2	22.4	37.5	8.2	4.3
Women and child welfare	5.4	4.3	8	1.7	0.7
Welfare of aged/disabled	0	0.5	0	0	0.2
Skill development	2.2	2.4	13.4	1.2	0.4
Other high priority areas	2.8	11.9	2.2	10.9	1.6
Other Priority Areas					
Physical infrastructure	57.3	28.7	13	30.6	22.6
Irrigation	0.7	3.4	1.3	10.4	21.8
Energy development	0.1	4.2	2.9	1.2	1.7
Other priority areas	0.7	2	0.5	0	0.4

25 https://aigcc.net/wp-content/uploads/2025/09/AIGCC-Place-Based-Just-Transition-Report_2025_v4.pdf

26 <https://iforest.global/wp-content/uploads/2025/10/Just-Energy-Transition-Odisha-Report.pdf>

27 https://iforest.global/wp-content/uploads/2025/11/Press-release_OVC.pdf

2.1.2. Energy and Infrastructure Levies

As states face a declining share of funds from the Union government due to loss of forest cover as a consequence of mining (Share of forest cover increased from 7.5% under the 14th Finance Commission to 10% under 15th Finance Commission, as a criteria for devolution to states), energy cesses serve as crucial public financing tools for mineral-rich states to mobilize resources.

Chhattisgarh, for instance, has been at the forefront of utilizing energy cesses as a crucial tool for resource mobilization, including infrastructure development and environment cess and forest cess.²⁸ The use of these levies supports proactive fiscal planning while anticipating diminishing revenues from these sources.

By utilizing these mechanisms, the state can diversify its revenue streams and invest in new clean energy infrastructure, thereby supporting job growth and economic diversification away from fossil fuel dependency.

Chhattisgarh has increased its infrastructure development and environment cess from INR 7.5 per tonne of mineral output (USD 0.09 per tonne) to INR 11.25 per tonne of mineral output (USD 0.13 per tonne) and its forest cess from INR 15 per tonne of mineral output (USD 0.18 per tonne) to INR 57 per tonne of mineral output (USD 0.68 per tonne). This has resulted in a substantial hike in revenue receipts for the state.

Figure 15A. Land and forestry revenues in Chhattisgarh, FY 2013–FY 2024

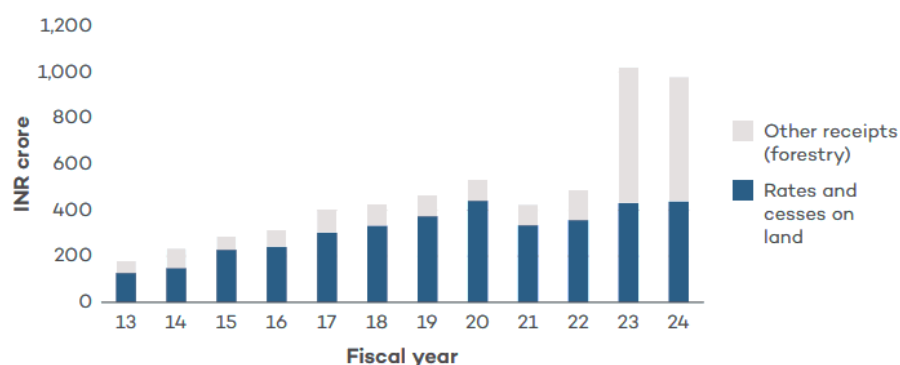


Figure 15B. Infrastructure development and environment cess and forest cess in Chhattisgarh, FY 2013–FY 2024

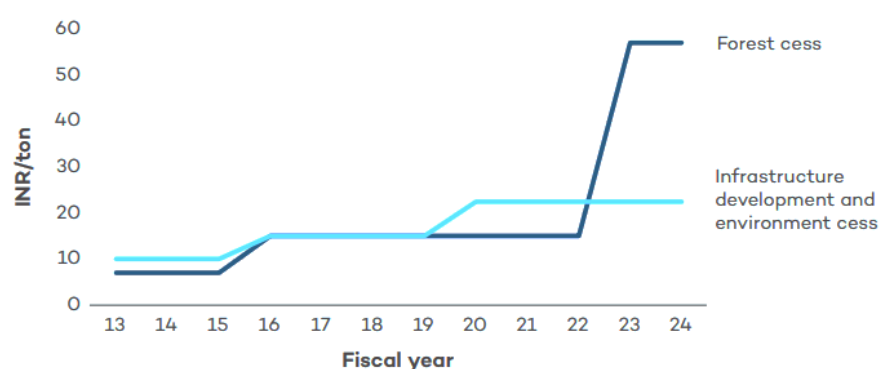


Figure 13: Land and Forest Revenue, & Environment and Forest Cess Collection in Chhattisgarh; Source & Image: IISD

28 <https://www.iisd.org/system/files/2025-09/mapping-india-energy-transition-chhattisgarh.pdf>

2.1.3. Fund Architecture - Mine Closure Funds and CSR Funds

Mine Closure Funds

The Coal Mines Closure Fund requires coal companies to create an escrow account with a bank and designate the Coal Controller Organisation to manage funds for mine closure for required environmental and social rehabilitation. These funds serve as a financial guarantee, and the ultimate responsibility for mine closure lies with the mining company.

RECLAIM framework earmarks a minimum of 25% of the five-yearly escrow amount to be utilised for community development and livelihood-related activities. They also mandate that 10% of this allocation be directed towards socio-economic transition initiatives in consultation with district authorities, local institutions and key stakeholders.²⁹

CSR Funds

Corporate Social Responsibility (CSR) policy, particularly for Coal India Limited (CIL) and its subsidiaries, mandates a financial commitment of a minimum of 2 per cent of the average net profit of the preceding three years towards social welfare activities. The policy strictly directs that 80 per cent of these funds must be utilised within a 25 km radius of the project site/mines/area HQ/company HQ, focusing on community welfare, with the remaining 20 per cent allocated within the state of operation.³⁰

This mechanism specifically calls for implementing special plans for vulnerable populations, emphasizing investment in human development, education and economic diversification to address local needs and aspirations during the transition.³¹

Therefore, where communities are currently facing adaptation costs or there are effects of transition, CSR money can help support. An example of this is the linking of the aspirational districts programme with CSR. Therefore, low or no return projects can be funded by companies through this route.

Table 15: Overview of Instruments for Coal Dependent States

Instrument / structure	How it works	Where it fits	Main actors
District Mineral Foundation (DMF) funds	Statutory mining-area funds that can support skilling, livelihood diversification, local services, and transition planning.	Mining-affected districts and areas with active or legacy extraction.	District administrations, State governments, Ministry of Mines, mining companies, Gram Sabhas.
Energy and infrastructure cesses	State-level levies on mining or energy activity that create a revenue stream for transition-related investment.	States that want extra fiscal space for infrastructure, environmental repair, or local transition support.	State finance departments, legislatures, tax authorities, extractive firms.
Mine closure funds / escrow accounts	Closure money set aside by mine operators; can support site rehabilitation, community development, and post-mining reuse.	Closing or closed mines and nearby communities.	Ministry of Coal, Coal Controller Organisation, mining firms, banks, district authorities.

29<https://coal.gov.in/sites/default/files/2025-08/14-08-2025a-wn.pdf#:~:text=They%20also%20mandate%20that%2010%25%20of%20the,participants%20and%20beneficiaries%20in%20the%20post%2Dmining%20future.>

30<https://archive.coalindia.in/DesktopModules/DocumentList/documents/Modified%20CSR%20Policy%20of%20CIL.pdf>

31 <https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2023/02/Just-Finance-India.pdf>

CSR funds	Corporate social responsibility spending can support skilling, welfare, livelihood pilots, and pooled local programmes.	Areas near mining, energy, or industrial projects.	Corporate CSR teams, PSU and private companies, NGOs, training providers.
Carbon finance / carbon credits	Projects that restore land, cut methane, or enable renewable reuse can create tradable carbon revenue.	Mine reclamation, restoration, renewable reuse, and land repurposing projects.	Project developers, mine operators, carbon-market intermediaries, state agencies.

Carbon Finance and Carbon Credits

Carbon finance instruments, such as the sale of tradable carbon credits, offer a market-based, performance-linked revenue stream to finance just transition projects, particularly those focused on green development and ecosystem restoration. Repurposing initiatives that result in measurable emission reductions or sequestration—such as afforestation, the installation of renewable energy (RE) infrastructure, or methane capture from abandoned mines—can generate carbon credits or offsets. By monetizing these environmental benefits, carbon markets strengthen project bankability, reducing reliance on public funds and incentivising long-term sustainability and ecological accountability in coal-dependent regions³²

ARTHA Framework (Align, Rank, Target, Harness, Adapt)

The ARTHA Framework is a systematic methodology launched by the Coal Controller Organisation to mobilise Green Finance for decoaled mine repurposing. ARTHA (Align – Rank – Target – Harness – Adapt) guides various stakeholders in systematically evaluating planned repurposing interventions, categorizing and prioritizing potential projects based on their technical and financial viability, and aligning them with the most appropriate green financing mechanisms. This five-step approach ensures that repurposing projects not only meet feasibility and bankability standards but are also compliant with the specific requirements of various funding sources, thus accelerating the execution of sustainable land use and transition plans³³

Special Transition Fund

A Special Transition Fund could be primarily dedicated to financing severance instruments and other necessary support for informal workers affected by the decommissioning of coal mines. The establishment of this fund could be targeted to a short-term intervention to address the socio-economic vulnerabilities of informal or indirectly employed labourers who lack traditional social security benefits when mines close. A crucial intervention for dealing with the consequences of informality is the establishment of this fund in conjunction with conducting a comprehensive coal census to estimate the affected population accurately.³⁴

2.2. Financing Instruments for Green Growth and Industrial Restructuring States (Gujarat, Tamil Nadu, and Andhra Pradesh)

2.2.1. State-Level Dedicated Financial Mechanisms

Tamil Nadu has emerged as a frontrunner in developing a structured climate finance ecosystem. The landscape in the figure depicts a continuum of funding instruments - from grants for public-interest projects, through blended and concessional finance for early-stage ventures, to institutional equity and debt funding for growth businesses, and finally capital market access for mature enterprises.

³²<https://documents1.worldbank.org/curated/en/099020824103535115/pdf/P1711941ca3c880a71abd41a00b95dc2184.pdf>

³³<https://www.coalcontroller.gov.in/files/guidelines-acts-documents/arthar--green-finance-for-coal-mines-repurposing.pdf>

³⁴<https://teriin.org/sites/default/files/2024-02/Just%20Transition%20Framework%20for%20a%20Sustainable%20Future%20in%20India%E2%80%99s%20Coal%20Mining%20Regions.pdf>

Climate Funding Landscape

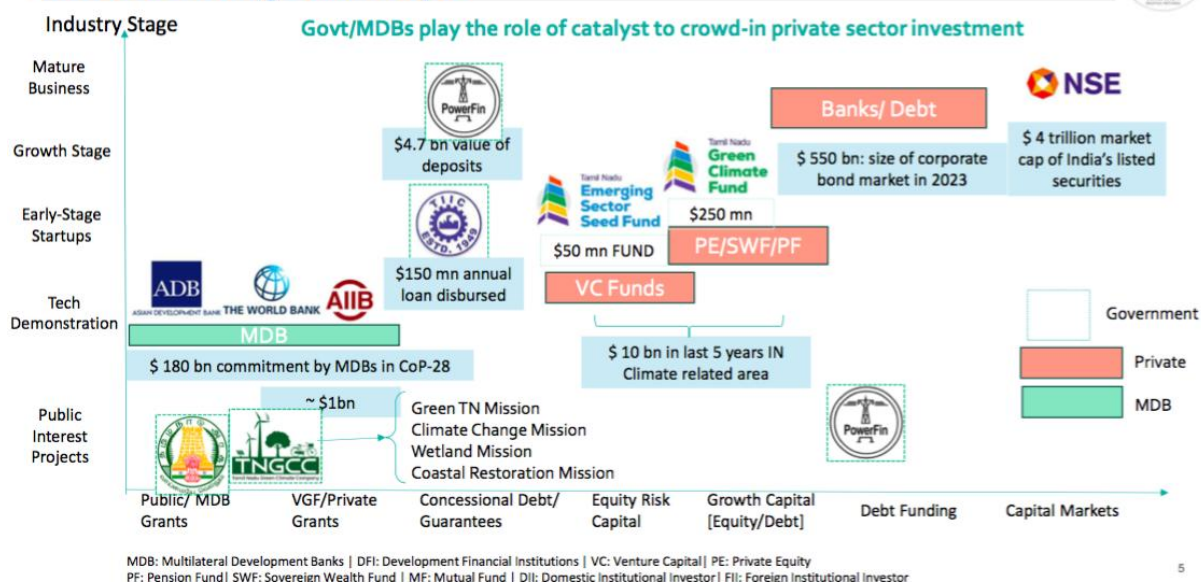


Figure 14: Climate Finance Landscape; Source: TNIFMC

At the bottom are public-interest projects that are not yet commercially viable and therefore require full grant-based support. These are particularly suitable for transition support to communities in the short-term that are at the forefront of facing sectoral transformations.

Building on this foundation, Tamil Nadu has established dedicated equity-based vehicles such as the Emerging Sector Seed Fund (USD 50 million) and the Tamil Nadu Green Climate Fund (USD 250 million), which provide risk capital to startups and growth-stage enterprises.

As projects mature, Tamil Nadu increasingly benefits from India's broader capital market ecosystem, which offers a USD 550 billion corporate bond market and a USD 5 trillion listed equity market. These markets present significant opportunities for scaling climate finance through instruments such as green bonds, ESG-focused equities and large-scale debt financing.

This layered architecture positions the government and MDBs as first movers who de-risk early interventions and crowd in private capital as projects advance. Tamil Nadu's approach ensures that climate initiatives transition from grant and concessional funding to commercially sustainable mechanisms while incorporating transition support in project execution.

With dedicated state-level climate funds, a strong record of investment mobilization and access to deep national capital markets, Tamil Nadu is positioning itself as a leader in climate finance within India and a replicable model for other states seeking to balance climate resilience with inclusive economic growth.

Gujarat has proposed to create a dedicated financial mechanism to address climate change. The Climate Change Fund of Gujarat (CCFG) could function as a catalytic public investment to mobilise climate finance with the objective to promote investment in climate-resilient infrastructure, support research and development in clean energy and facilitate capacity building & community-based adaptation. With initial funding of INR 25 Crores, the CCFG is

designed to act as a key enabler for Gujarat's low-carbon transition, reducing the state's carbon footprint and supporting Public-Private Partnerships (PPPs) in environmental innovation.³⁵

2.2.2. Corporate Initiatives (Public and Private)

The corporate entities could play a defining role in enabling a socially conscious and inclusive transition. They follow sustainability initiatives mandated by SEBI, the Ministry of Corporate Affairs and other regulators, however most of the sustainability measures remain voluntary.

To assess the extent of integration of just transition principles with the net-zero commitments of businesses, the World Benchmarking Alliance (WBA) conducts an assessment of the initiatives by corporate entities. The WBA's comprehensive framework evaluates various factors, including human rights, social dialogue, just transition planning, job creation, retention and retraining programs, social protection and policy advocacy. In its assessment conducted for 2023, it covered 450 companies globally. The findings reveal a significant gap, with the majority of companies failing to demonstrate concrete action on the just transition. However, the WBA's analysis in India did highlight that some domestic companies, specifically Bharat Petroleum, IOC, and GAIL, have implemented explicit policies for stakeholder engagement and have adopted measures to reskill employees and facilitate access to green jobs.

This WBA framework offers a valuable tool for private investors, DFIs, and MDBs in India. They can leverage it as a foundation for shareholder engagement to encourage broader business adoption of just transition principles in corporate strategies and operations.³⁶

Additionally, the SEBI led Business Responsibility and Sustainability Reporting (BRSR) framework, which is a mandatory disclosure framework for the top 1,000 listed companies (by market capitalisation) to report on their [Environmental, Social, and Governance \(ESG\)](#) performance, can incorporate JT leadership indicators. There is also a potential to nudge unlisted entities/MSMEs to undertake a similar reporting, although under a simpler version of BRSR Lite, as proposed by the Committee on Business Responsibility Reporting set up by the Ministry of Corporate Affairs³⁷ through financial incentives and training programmes. Strengthening ESG alignment and embedding JT considerations into broader policy and labour reforms could further scale corporate efforts and unlock financing opportunities.

Corporates are increasingly integrating community and social considerations into their JT planning. Empowering women through targeted skilling in green sectors, supporting local employment through recycling & circular economy initiatives and embedding workforce transition into CSR activities are some of the initiatives that are prevalent.

For instance, Reliance, with its large scale operations in Gujarat has so far highlighted two dimensions of the just transition framework: first, the commitment to universal net zero energy access through its New Energy initiative at Jamnagar and second, the commitment to workforce evolution through the job creation it will deliver to achieve its net zero carbon by 2035 goal.³⁸

35 <https://thesecretariat.in/article/climate-a-sunrise-sector-gujarat-sets-up-fund-to-boost-green-tech>

36 <https://www.lse.ac.uk/granthaminstitute/wp-content/uploads/2023/02/Just-Finance-India.pdf>

37 <https://www.pib.gov.in/newsite/PrintRelease.aspx?relid=214523®=3&lang=2#:~:text=The%20Committee%20comprised%20of%20representatives,Responsibility%2DSustainability%20Index%20for%20companies.>

38 <https://www.inclusivecapitalism.com/organization/reliance-industries-limited/>



Figure 15: Recommendations for Corporate Action on Just Transition Financing

2.2.3. Guarantee/Risk Sharing Facilities

For complex projects, such as the development of grid and port facilities for offshore wind energy in Gujarat and Tamil Nadu, traditional commercial financing is often insufficient. The deployment of MDB-backed Guarantee/Risk Sharing Facilities is necessary to mitigate the risks associated with high capital expenditure and new technology deployment. By providing credit enhancement, these facilities reduce the overall cost of capital, thereby catalyzing the necessary private finance mobilization in these strategically important states.³⁹

INSTRUMENT	DEFINITION	USE CASE
Partial credit guarantee	Covers a portion of debt service in case of default.	Used to enhance the creditworthiness of a borrower and improve terms, like interest rates.
First-loss guarantee	A first-loss guarantee provider assumes the loss first and is subordinated in the recovery proceed distribution. For example, recovery proceeds are allocated in priority first to senior lenders, then to the guarantor.	Mitigates various risks and improves the risk-reward balance. Guarantees make investments more attractive to private investors who might otherwise be unwilling to invest. A risk-sharing facility could facilitate direct or indirect exposure to a portfolio of underlying assets in a particular sector originated by an intermediary (originator and servicer). Part of the first loss would be shared with third parties (for example, donors).
Pooled guarantee	A guarantee structure pooled across a group of investments.	For example, a pooled first-loss guarantee covers losses from defaulted assets fully, on a first-come, first-served basis, until the entire amount of the guarantee is depleted.
Liquidity support guarantee	Provides short-term liquidity to a project or company in case of temporary cash flow issues.	Ensures continuity of operations and payment obligations. Often used in infrastructure projects where the financial sustainability and liquidity position of a sovereign-backed off-taker is weak.

Figure 16: Financial Instruments used for Guarantee; Image Source- IFC

³⁹https://www.cif.org/sites/cif_enc/files/2025-04/ctf_tfc.33_05_rei_india_investment-plan_02072025.pdf

A key national initiative that supports Micro and Small Enterprises (MSEs) across all states is the MSE Green Investment Financing for Transformation (MSE GIFT) Scheme. This scheme, supported by the World Bank, includes a risk-sharing component of ₹125 crores to provide a credit guarantee for institutional finance offered to MSEs, covering loans up to ₹2 crores for adopting clean/green technologies and sustainable business operations.⁴⁰ This credit guarantee mechanism is essential for de-risking lending to smaller firms crucial for supply chain transitions in manufacturing states like Gujarat and Tamil Nadu, or for economic diversification in coal-dependent states like Odisha and Chhattisgarh.

Table 16: Overview of Instruments available for Industrial Growth States

Instrument structure /	How it works	Where it fits	Main actors
State climate or green funds	Dedicated state-backed vehicles that pool public, climate, and development finance for mitigation and adaptation projects.	States building a pipeline of green infrastructure or climate-resilient projects.	State governments, fund managers, DFIs, climate funds, private investors.
Corporate transition initiatives	Firms can build worker-transition, skilling, local hiring, recycling, and community support into their transition plans.	Manufacturing clusters, energy firms, and large business groups in transition.	Corporate management, investors, CSR teams, workers, local partners.
Investor and benchmarking frameworks	Assessment tools help investors identify firms with stronger worker, stakeholder, and community transition planning.	Corporate and investor ecosystems.	Benchmarking bodies, asset managers, DFIs, companies, lenders.

B. Universal Financial Mechanisms:

2.3. Blending Concessional public capital with private lending through revolving funds/JT Funds

Blended finance structures combine public and private capital to fund projects, using public resources/philanthropic funding to mobilize additional private investment. Well-designed instruments exploit the comparative advantages of public and private actors to de-risk transactions, catalyze financing and implement projects that would not be feasible through traditional funding.

MDBs and DFIs are significant blended finance players as they are often able to mobilise co-financing from private institutions alongside the disbursement of public funds.

Blended Finance must serve a dual purpose in the Indian context, which includes addressing risks related to technology and infrastructure (for instance in clean energy deployment) while simultaneously managing the inherent socio-economic and livelihood risks associated with coal phase-down. The necessity for this dual function arises because certain JT activities are not immediately profitable and require a financial cushion that absorbs both credit and technology risks (e.g., in renewable energy acceleration in Andhra Pradesh or Gujarat) and complex

⁴⁰ <https://green.msme.gov.in/msmeGiftScheme>

socioeconomic risks (e.g., supporting social safety nets and worker transition in Chhattisgarh or Odisha).⁴¹

Blended Finance Use Case: Skills Development (Andhra Pradesh)

A distinguishing element of financing for supporting transition is that certain social activities, such as training and safety nets, are not immediately profit-making and require concessional capital. Blended finance models, combining concessional public funding with commercial capital, are vital for de-risking these initiatives.⁴²

The 'Skills for a solarised future' pilot project in Andhra Pradesh, linked to the Ananthapuramu Ultra Mega Solar Park, provides a tangible example. Commercial investors, such as Ayana (backed by NIIFL and GGEF), sought low-cost rural land but faced an acute local shortage of workers skilled in solar O&M. The UK government, through a DFI grant, provided the majority of the funding for the skills training component, targeting local unemployed young people. This grant investment resolved a fundamental market constraint (the skill deficit) for the commercial operator. By making the local workforce available and competent, the public investment in human capital development served as an enabler to ensure the commercial viability and social resilience of the overall project.⁴³

Equity instruments are also vital components of blended finance structures, supporting project development and attracting additional private capital.

- **Catalytic Equity** is structured to accept sub-market terms specifically to absorb early-stage risks in a project. By accepting this higher risk profile, catalytic equity proves especially effective in unlocking broader private investment.²⁷
- **Junior Equity** functions as subordinated equity, providing a critical first-loss cushion. It is structured to be repaid after senior equity, absorbing risks and significantly improving the risk-return profile for senior investors, thus crowding in commercial capital.²⁶
- **Mezzanine Instruments** such as mezzanine loans, represent a hybrid of debt and equity. They provide structural flexibility and appeal to investors who are seeking higher returns than conventional debt, but with a lower risk threshold than pure equity investments.²⁶

These diverse instruments are systematically mapped against the project development risks, technology adoption risks and financial & social risks inherent in the process of transition, ensuring that different components of the transition are suitably supported to achieve market viability.

2.3.1. Circular Finance

The transition to a low-carbon economy requires vast, sustained infrastructure investment, necessitating innovative financial instruments to bridge the substantial funding gap. The real challenge, therefore, lies in the ability to circulate the capital to finance multiple projects over their lifecycle. Instruments such as InvITs and IDFs represent a crucial financial structure in this regard, designed to mobilize long-term, stable capital for infrastructure development by attracting both domestic and foreign investment.

⁴¹https://aigcc.net/wp-content/uploads/2025/09/AIGCC-Place-Based-Just-Transition-Report_2025_v4.pdf

⁴²https://aigcc.net/wp-content/uploads/2025/09/AIGCC-Place-Based-Just-Transition-Report_2025_v4.pdf

⁴³https://justtransitionfinance.org/wp-content/uploads/2024/05/Just-Transition-Finance-Lab_case-study_Ayana.pdf

The Blueprint: Defining Circular Finance

Capital is neither trapped nor static but continuously recycled

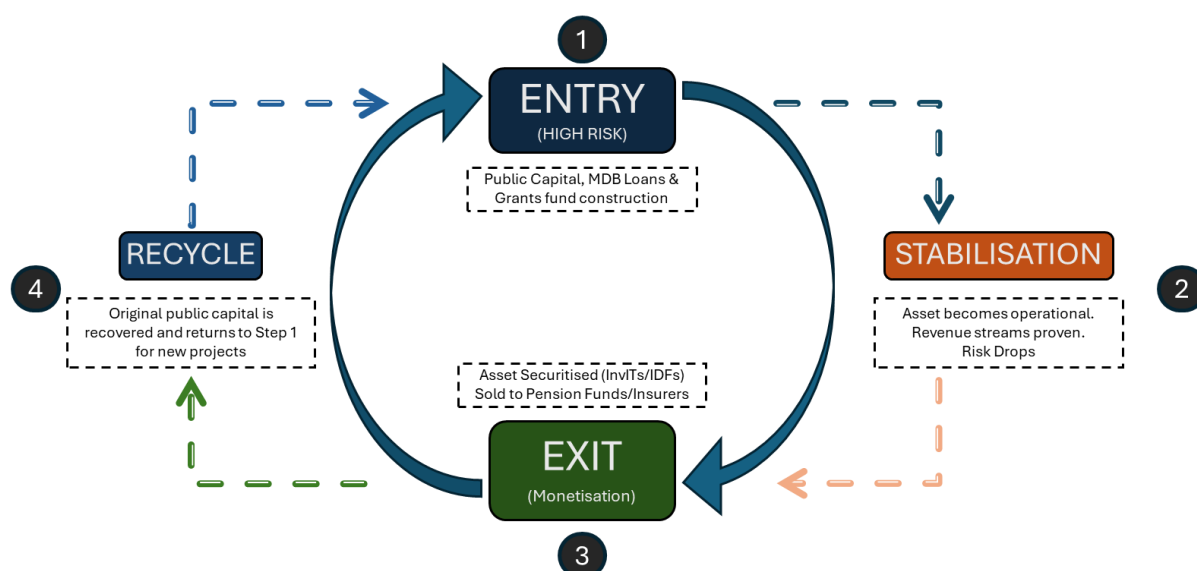


Figure 17: Mechanics of Circular Finance

Although circular finance can generate capital liquidity, realising their potential for social equity requires explicit policy mandates to earmark monetisation proceeds for transition goals.

Andhra Pradesh is a major destination for clean energy investment and has the potential to leverage InvIT/IDF -suitable refinancing structures for large-scale projects.

In the Industrial sector, Gujarat has seen monetization success, such as NDR InvIT's (India's first listed Warehousing and Industrial Parks InvIT) acquisition of a major warehousing park near Surat and Tamil Nadu is planning state-level InvITs to monetize diversified infrastructure.

Completing the circular loop for JT is most crucial in fiscally vulnerable, fossil-fuel-dependent states like Chhattisgarh and Odisha due to their typologies. Realising the potential of circular finance for just transition would require financial regulators and state governments to implement targeted policy interventions including:

- **Mandating Earmarking of Proceeds in Vulnerable States:** State governments in highly fossil-fuel-dependent regions can implement regulations requiring a fixed percentage of all revenue generated from the monetization of stable state-owned assets to be directly allocated to a dedicated, State Just Transition Fund. This ensures that the financial success of asset monetization immediately translates into social stability measures.
- **Integrating JT Metrics into SEBI Disclosures:** SEBI can develop sector-specific guidelines that align InvIT disclosure requirements with the social metrics already present in the BRSR framework, demanding transparency on job creation, local community impact and gender equity. This could provide investors seeking environmental and social impact with verifiable metrics.
- **Standardizing Governance for State-Led InvITs:** Institutions like NaBFID can collaborate with states planning InvITs (such as Gujarat and Tamil Nadu) to standardize governance and structure. This standardization should include explicit provisions for monitoring the

utilization of recycled capital for JT purposes, thereby enhancing the credit profile and investor confidence in state-backed financial instruments.

2.4. ESG based Funds

There are thematic funds that invest in companies based on the performance on ESG indicators. Companies in India report under the Business responsibility and sustainability reporting (BRSR) framework. The reporting provides information on jobs, including on gender inclusivity and pay, enabling the funds to screen investments based on initiatives to ensure that the current workforce is integrated into the new processes. Although this is not infusion of fresh capital for transition it can create more market capital for companies that are aligned with JT through positive signalling and in turn increase potential for raising capital. For this eco-system to support JT there is need for more ratings and transparency in reporting, other than interest among investors. There are initiatives such as Principles of Responsible Investments (PRI) that are shaping this market.

In the market for fresh capital issuances, venture funds focussed on solutions that are socially and environmentally oriented can help provide equity to new firms. Dedicated investment funds, such as Alternative Investment Funds help further bolster this market. For instance, the Samridhi Fund by SIDBI, a category I AIF, has been set up to provide capital to social enterprises which aim to deliver both financial and social return.



Figure 18: Criteria for Social Enterprises

The fund targets the states of Bihar, Uttar Pradesh, Madhya Pradesh, Odisha, Chhattisgarh, Jharkhand, Rajasthan and West Bengal. Emergence of such funds can boost confidence amongst investors about early-stage ventures with a social impact agenda, while also ensuring financial return. This measure can serve as an ideal entry point for JT financing by embedding its principles in the ‘social’ aspect of the venture.

2.5. Bond Financing - GSS+ Bonds, Zero Coupon Bonds, JT Bonds, Skill Impact Bonds

The fixed-income market, specifically utilizing Green, Social, Sustainability and Sustainability-Linked (GSS+) bonds, alongside innovative thematic instruments, is emerging as a vital mechanism to channel private and public capital toward climate action while addressing JT outcomes.

The Sovereign Green Bond framework released by the Department of Economic Affairs incorporates elements in the framework that align with just transition principles. These include inclusion of social co-benefits alongside the environmental benefits of the funded projects and enabling public sector projects that promote employment generation and support for MSMEs, thereby ensuring that the economic transition is inclusive and benefits smaller/local businesses, which are critical for livelihoods.

Globally, GSS+ bond issuances have started to incorporate frameworks that connect the climate aspects with the implications for workers, communities and consumers, ensuring application of just transition principles.⁴⁴

The bond market has a diverse range of issuers (sovereigns, municipalities, public sector entities, private corporations, public financial institutions, amongst others) who can leverage these issuances for mobilising finance for just transition. Investors could encourage and work with issuers in India to start incorporating just transition priorities.

Figure 25 indicates the utilisation of GSS+ bonds for enabling a just transition in terms of use of proceeds, entity-wide measures (such as sustainability-linked bonds [SLBs]) and impact reporting.⁴⁵

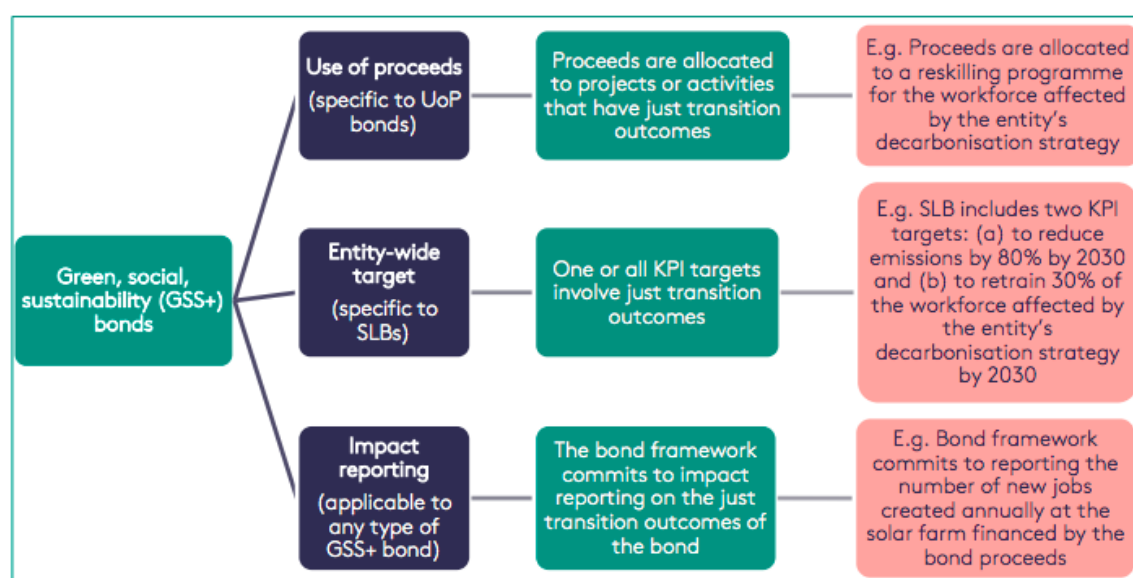


Figure 19: Utilisation of GSS+ Bonds for Just Transition

44 <https://thedocs.worldbank.org/en/doc/2fa215f2779f95d970ef0601aa551cbc-0340012024/original/GSSS-Quarterly-Newsletter-Issue-No-7.pdf>

45 <https://justtransitionfinance.org/wp-content/uploads/2024/07/Sustainable-finance-for-a-just-transition-in-India-Role-of-investors.pdf>

Similarly, SEBI has laid the groundwork for a sustainable capital market, by significantly expanding the definition of sustainable debt instruments to create pathways for financing the complex shift toward a low-carbon economy.⁴⁶ Additionally SEBI has also introduced Transition Bonds, focusing on transition related outcome, as a subset of green bond as well.⁴⁷

This formal inclusion of transition bonds by SEBI provides a specific financial channel for hard-to-abate sectors with a dedicated financing instrument, validating the use of regulated bond markets for systemic transformation.⁴⁸

Furthermore, innovative financial structures, such as outcomes-based instruments, are being deployed to tackle the human cost of climate action. The Skill Impact Bond (SIB) represents a pioneering application of outcomes-based financing dedicated to skills training and job placement. Launched by the National Skill Development Corporation (NSDC), it operates as a development impact bond, committing a USD 14 million fund to benefit 50,000 young people over four years.⁴⁹ Risk investors provide upfront capital, which outcome funders repay only upon the achievement of independently verified employment outcomes, thereby aligning incentives and ensuring measurable social impact.



Figure 20: Mechanism of Skill Impact Bond

This mechanism is particularly relevant to states facing severe transition risks due to concentrated resource endowments. By targeting affected and marginalised individuals, the social impact bond serves as a crucial financial tool for livelihood diversification.

Hence, it can address the social equity goals to mitigate the uneven economic implications resulting from the mismatch between regions losing fossil fuel jobs and those gaining renewable energy capacity.⁵⁰

The **Zero Coupon Zero Principal** bond is another financial instrument to support the social infrastructure through philanthropic capital mobilized via the Social Stock Exchange (SSE). It is issued by Not-for-Profit Organizations (NPOs) registered with the SSE, functioning as a donation

⁴⁶<https://data.sbfnetwork.org/sites/default/files/survey-attachments/2025-05/Expanding%20the%20scope%20of%20Sustainable%20Finance%20Framework%20in%20the%20Indian%20Securities%20.pdf>
⁴⁷ https://www.sebi.gov.in/legal/circulars/may-2023/additional-requirements-for-the-issuers-of-transition-bonds_70937.html

⁴⁸ While a robust regulatory framework has been established for transition bonds in India, no proceeds have been registered yet under this category for domestic markets. The Securities and Exchange Board of India (SEBI) and the International Financial Services Centres Authority (IFSCA) have both introduced frameworks to facilitate their issuance.

⁴⁹ <https://nsdcindia.org/sib>

⁵⁰ <https://justtransitionfinance.org/wp-content/uploads/2024/07/Sustainable-finance-for-a-just-transition-in-India-Role-of-investors.pdf>

rather than a loan. These bonds are issued for specific projects and listed on the NSE, provided they fall under SEBI's eligible activities.⁵¹

First Zero Coupon Zero Principal Bond at Social Stock Exchange

A concrete application of this social finance mechanism is the Unnati ZCZP Bond, issued by the SGBS Unnati Foundation. This was the first such listing on the SSE segment in India, raising funds for vocational training (Unnati and UNXT programs) targeting underprivileged and unemployed youth.⁵² The proceeds of this public issue are directed toward training up to 10,000 graduating youth from government colleges, with targeted beneficiaries explicitly located in multiple states, including Andhra Pradesh and Tamil Nadu and raised Rs 1.8 crore from 4 investors and include brokerage firm Zerodha and National Bank for Agriculture and Rural Development (NABARD). This demonstrates how the capital markets, through ZCZP bonds, can fund localized social transition efforts, providing crucial support for skills development and decent work, independent of whether the region is heavily dependent on fossil fuels.⁵³

2.6. DFIs as market makers - IREDA, PFC, REC, SIDBI, NABARD, NaBFID

Development Finance Institutions (DFIs) are positioned centrally to transform India's climate finance ecosystem. These institutions, including IREDA, PFC, REC, SIDBI, NABARD and NaBFID, serve a crucial function in aligning policy and institutional capital with JT objectives.⁵⁴

The primary function of DFIs in this context is to mobilize and crowd in private capital by deploying various de-risking and credit enhancement instruments. DFIs utilize guarantees to mitigate perceived risks, thereby acting as a first-loss provider - strengthening the ability of financial institutions to lend in under-served markets. This intervention enables FIs to offer more favourable terms to borrowers, thus optimizing economic activity and expanding outreach.⁵⁵ By supporting green jobs and skills development alongside physical asset financing, DFIs can make previously high-risk or low-return social and regional diversification projects financially attractive to private investors.⁵⁶

2.6.1. Interventions in the Energy Sector

Power Finance Corporation (PFC) and Rural Electrification Corporation (REC) are foundational financiers for India's power sector. Traditionally focused on conventional systems, their mandates are evolving to align with India's ambitious decarbonization targets.⁵⁷ However, since PFC and REC are the primary financiers for the power sector and have significant exposure to legacy assets, specific transition finance is required to address the complexities of asset flexibilization, adoption of transition technologies and eventual decommissioning of thermal power plants. The ability of PFC and REC to leverage their deep domain expertise to manage the financing of these complex, high-risk assets is essential for ensuring phased decarbonization while managing regional economic stability in coal-dependent heartlands.

The Indian Renewable Energy Development Agency (IREDA) provides a comprehensive set of financial products and services spanning the entire lifecycle of RE projects, from conceptualization to the post-commissioning stage, including equipment manufacturing.

51https://www.sebi.gov.in/legal/gazette-notification/jul-2022/declaration-of-zero-coupon-zero-principal-instruments-as-securities-under-the-securities-contracts-regulation-act-1956_60875.html

52<https://www.thehindubusinessline.com/blexplainer/all-about-unnati-zero-coupon-zero-principal-bond/article67634781.ece>

53 <https://www.weforum.org/stories/2025/08/india-just-transition-ecosystem-finance-inclusive-future/>

54<https://www.niti.gov.in/sites/default/files/2022-02/AIM-NITI-IPE-whitepaper-on-Blended-Financing.pdf>

55 <https://justtransitionfinance.org/wp-content/uploads/2024/01/Just-Finance-India.pdf>

56<https://www.climatepolicyinitiative.org/transforming-indias-climate-finance-through-sector-specific-financial-institutions-part-3/>

A significant component of IREDA's mandate involves ensuring equitable access to finance for the expanding RE sector, particularly for Micro, Small & Medium Enterprises (MSMEs). To address the obstacle MSMEs face in securing loans at reasonable interest rates, IREDA has launched a Retail Subsidiary which implements faceless loan sanctions and disbursements, reducing processing cycles and expanding its geographical reach across the country.⁵⁷

2.6.2. Interventions in Industry and Mobility

SIDBI has significantly scaled its green financing offering, expanding its portfolio by a remarkable 4.5 times in the fiscal year 2023-24. SIDBI's approach to Green Finance operates on three pillars: providing financial assistance at competitive rates, encouraging climate-resilient measures and inspiring other financial institutions to fund energy-efficient projects. Key financial interventions include the End-to-End Energy Efficiency (4E) financing and the Green Finance Scheme (GFS). These schemes provide concessional financial assistance to MSMEs for investments in energy-efficient machinery/technologies and RE projects such as solar and wind.⁵⁸

To further incentivize adoption, SIDBI is the implementing agency for schemes like the MSE Green Investment and Financing for Transformation (MSE GIFT) and MSE Scheme for Promotion and Investment in Circular Economy (MSE-SPICE), which offer concessional financial assistance, including interest subventions or subsidies, for green technology investments in MSEs. Furthermore, SIDBI undertakes cluster-level interventions, having initiated handholding support for 100 MSME clusters across India to adopt green and clean initiatives, aiming for significant long-term reductions in energy consumption and Greenhouse Gas (GHG) emissions.⁵⁹

WE-LEAD Programme (Odisha, Gujarat, Tamil Nadu)

SIDBI has proactively engaged in social inclusion through the Women Entrepreneurship - Livelihood Enhancement and Development (WE-LEAD) programme. This initiative is designed to empower women entrepreneurs across five states, including the target states of Odisha, Gujarat, and Tamil Nadu. The program provides essential training, skill development and business support services to over 37,000 women entrepreneurs. In FY2024, the program facilitated EDP training for over 18,000 women and provided skill training and credit linkages to 10,000 women members of Self-Help Groups (SHGs) or Joint Liability Groups (JLGs) to help them establish their enterprises.⁶⁰

By targeting vulnerable population (women entrepreneurs) in states facing diverse JT challenges—ranging from coal vulnerability in Odisha to complex industrial shifts in Gujarat and Tamil Nadu—SIDBI is deploying financial assistance to build micro-level economic resilience and facilitate livelihood diversification. This proactive approach aligns financial mechanisms explicitly with the social equity goals that conventional climate finance often overlooks.

2.6.3. Interventions in Agriculture

The National Bank for Agriculture and Rural Development (NABARD) plays a dominant role in enabling the transition towards promoting climate resilience and sustainable practices in the agriculture sector. In order to foster inclusive and equitable rural development, NABARD prioritises investments that can enable sustainable livelihoods. It further leverages international and national climate finance mechanisms such as Adaptation Fund and National Adaptation Fund for Climate Change (NAFCC) to support adaptation, disaster risk reduction, ecosystem restoration as well as Green Climate Fund focuses on mitigation initiatives.

57 <https://www.ireda.in/images/pressrelease/CoP-english.pdf>

58 <https://www.sidbi.in/annualreport/AnnualReport202324/pdf/Sidbi-AR-English-Part-I.pdf>

59 <https://www.sidbi.in/annualreport/AnnualReport202122/green-finance.php>

60 <https://www.sidbi.in/annualreport/AnnualReport202324/pdf/Sidbi-AR-English-Part-I.pdf>

NABARD's mandate supports Climate Resilient Agriculture for specific crops in vulnerable areas, coupled with climate proofing to address endemic drought-prone regions.⁶¹ For instance it has partnered with Food and Agricultural Organisation (FAO) to develop innovative financing mechanisms for supporting sustainable agriculture, agri-food transformation and rural development. Further, it is actively involved in formulating the National Adaptation Plan, the India Climate Finance Taxonomy and the implementation framework for voluntary carbon markets (VCMs) in agriculture, fisheries and aquaculture sectors.

Furthermore, a dedicated Green Lending Facility (NGLF) has been launched which is accessible to stakeholders ranging from the state governments to start-ups engaged in rural green initiatives and other green finance products have been developed targeting areas including climate-resilient dairy systems, rural electric mobility and energy efficiency in agricultural value chains.

In addition to the above, NABARD has undertaken initiatives including the Landscape-based Regenerative Resilient Rainfed Ecosystem Development Programme (LREDP) to enhance soil and water conservation, improving agricultural productivity and enabling climate resilient livelihoods for smallholders and tenant farmers in rainfed and degraded landscapes. Another key intervention has been the Tribal Resilience Initiative for Building Environmentally Sustainable Livelihoods (TRIBES) under which Tribal Development Fund (TDF) operates, focusing on Particularly Vulnerable Tribal Groups and aspirational districts. Through the TDF, NABARD allocates concessional refinance for agroecological practices to enhance resilience and sustainable livelihoods.⁶²

Hence, while DFIs such as SIDBI and NABARD demonstrate concrete actions to integrate social dimensions, the overall flow of finance for the same remains limited and fragmented across the country. The current action of DFIs, heavily reliant on guarantees and concessional loans, has been highly effective in de-risking technology adoption and mitigating credit default risks for green MSME and RE projects. However, in coal-vulnerable states like Chhattisgarh and Odisha, where the need for financing skill development, safety nets, and regional economic diversification is identified as acute, the DFI-led mechanisms are limited. This would require specialised financial instruments leveraging public finance to mobilize capital for social equity goals, thereby acting as social de-risking tools.

2.7. MDB led financing for Just Transition

MDBs, including the World Bank and the Asian Development Bank (ADB), have committed to supporting a just transition globally, having signed onto high-level principles to articulate a common understanding and guide their operations.⁶³ This collective commitment mandates support for economic diversification and the inclusion of vulnerable groups, including women and marginalized communities. The ADB, for example, launched a Just Transition Support Platform at COP27 to build the capacity of its developing member countries (DMCs) to plan, implement and finance JT strategies, aiming to maximize the gender, social and economic outcomes of climate action.

61 <https://www.nabard.org/auth/writereaddata/careernotices/0310184401APRO%20Revised%20Climate%20change%20Sustainable%20agriculture%20practices-Final.pdf>

62 <https://www.nabard.org/pdf/2025/Investing-in-a-Sustainable-Tomorrow.pdf>

63 <https://www.worldbank.org/en/news/press-release/2023/06/29/world-bank-approves-1-5-billion-in-financing-to-support-india-s-low-carbon-transition>

MDBs usually utilise a range of sophisticated financial instruments to provide both commercial lending and concessional support for Just Transition initiatives. In mobilizing broader private capital, MDBs deploy their capital and expertise to introduce blended finance solutions which are essential tools for de-risking investment in socially focused transition initiatives, often carrying higher perceived risks or offering lower initial returns compared to commercial projects. By providing concessional financing or guaranteeing a portion of the risk, MDBs perform the vital function of absorbing this specific social risk, thereby making these critical inclusive projects viable and attractive for conventional commercial capital to participate, ultimately achieving the mobilization goals.

MDB support extends beyond direct lending to encompass critical Technical Assistance (TA) and capacity building initiatives, particularly essential for states undertaking complex policy reforms. For instance, ADB's Just Transition Support Platform and World Bank's specialised technical assistance and policy engagement estimate the gross and net impacts on direct, indirect and induced jobs associated with the transition. Furthermore, MDBs focus on capacity building for government officials, which is necessary for achieving and implementing policy targets integrated into policy-based financing agreements.

	1. Foundational Safeguards	2. Social & Economic Inclusion	3. Climate Resilience & Adaptation	4. Direct Transition Support
Andhra Pradesh	 VCIC (Resettlement/Livelihood Mitigation)	 Rural Inclusive Growth  Rural Roads (Market Access)	 Integrated Irrigation  Drought Mitigation	 Green Energy Corridors
Chhattisgarh	 State Roads (Safeguards)	 District Rural Poverty Reduction  Tribal Livelihood Diversification	 Dam Rehab. & Improvement	 Sustainable Urban Transport
Gujarat	 State Highway (Resettlement)	 Forestry (Pro-poor Livelihoods)  Rural Roads (Poverty Reduction)	 Resilient School Design	 Green Energy Corridors  Solar Power (jobs/skills)  Ship Recycling (cleaner tech)
Odisha	 ODRP (Safeguards for vulnerable)	 PVTG Empowerment  TRIPTI (SHG for women)  Livelihood Enhancement	 Disaster Recovery  Climate Resilient Agriculture	 Transmission System Improvement
Tamil Nadu	 CKIC (Safeguards)	 Empowerment & Poverty Reduction  Inclusive Housing	 Resilient Housing for Urban Poor  Climate Adaptation in Vennar Subbasin	 Chennai Metro Rail  Green/Emerging Sector Investment

Figure 21: The Just Transition Matrix- A Consolidated View of MDB Approaches in India

Table 17: Overview of Universal Financing Mechanism

Instrument / structure	How it works	Where it fits	Main actors
Blended finance	Combines concessional public or philanthropic capital with private finance to de-risk projects that are socially necessary but not fully commercial.	Skills, diversification, local transition facilities, and clean infrastructure.	MDBs, DFIs, philanthropies, state agencies, private lenders.
Guarantees and risk-sharing	Public or concessional actors absorb part of the downside risk so banks and investors can lend into harder projects.	MSME transition, clean infrastructure, local diversification, storage, and supply chains.	MDBs, DFIs, climate funds, banks, state agencies.
Circular Finance	Monetise operating infrastructure assets and recycle capital into new	States or sponsors with mature revenue-	Sponsors, institutional investors, SEBI, state governments, NaBFID.

	projects; can be linked to transition funds if designed that way.	generating infrastructure assets.	
ESG-based funds and AIFs / social impact funds	Pool capital into companies or enterprises that meet environmental and social criteria, including social-enterprise and transition goals.	Corporate transition, MSMEs, social enterprises, and early-stage solutions.	Fund managers, SEBI, SIDBI, investors, social enterprises.
Green / social / sustainability-linked bonds	Bond issuance raises large-scale capital and can be tied to climate and worker or community outcomes.	Public issuers, PSUs, municipalities, and corporates with financing needs.	Governments, PSUs, corporates, investors, banks, regulators.
Climate taxonomy, reporting, and priority-sector alignment	Common definitions and reporting rules help banks and investors identify eligible activities and scale lending.	Bank-led and market-led finance across sectors.	Ministry of Finance, RBI, SEBI, banks, investors, listed firms.

Key Insights

- Green, social, sustainable, and sustainability-linked (GSS+) bonds present a promising opportunity to attract JT aligned funds, building on India's growing experience with GSS+ issuance. There is a need to develop frameworks that explicitly correlate climate impacts with direct benefits for workers, communities and consumers.*
- India's Climate Finance Taxonomy framework can consider the inclusion of social objectives to ensure the 'justness' of the intended transition, in line with global best practices such as EU sustainable finance framework.*
- Social impact bonds tailored for outcomes such as worker retraining and green job creation, could attract funds earmarked explicitly for just transition initiatives.*
- Scaling up opportunities for skilling workers in clean tech manufacturing such as renewable energy equipment or electric vehicles, is limited by inability to use CSR funds directly for the benefit of the investing company. This would require innovative approaches to integrate the just transition priorities into CSR spending programs. There is also scope for innovation through Buddy corporate programs and pooled CSR programs to fund initiatives that can scale up the skilling and training programs.*
- Reporting frameworks such as the SEBI mandated BRSR framework can function as an enabler for just transition through promoting transparency and accountability in industry efforts. Metrics within BRSR can directly link to just transition goals, such as job creation, worker rights, community engagement, gender inclusivity and environmental impact mitigation. Such transparency in reporting facilitates access to financing and ensures effective tracking of progress towards just transition.*
- Building awareness among retail investors, who constitute a significant portion of the market, about the opportunities and benefits of investing in companies and projects aligned with a just transition is crucial as it can increase their participation due to specific focus on promoting social equity and environmental sustainability.*

3. Research Agenda for Just Transition Financing & Way Forward

This landscape study identified critical areas where further research is essential to operationalise just transition financing at the state level. The following problematiques represent priority domains where targeted inquiry can yield actionable insights for policymakers, financial institutions and international development partners. The primary focus is on scoping financial mechanisms, instruments and structures that can mobilise capital for equitable transition outcomes whilst addressing the material realities of transition-affected workers and communities.

The problematiques are organised across three domains: governance and public finance effectiveness, financial mechanism design & architecture and sectoral transition financing pathways. Each problematique articulates the context and key research questions focused on financing approaches, instrument design and resource mobilisation.

3.1. Priority Research Problematiques

A: GOVERNANCE AND PUBLIC FINANCE EFFECTIVENESS

Problematique A1: District Mineral Foundation Fund Utilisation and Governance for Just Transition

District Mineral Foundation funds represent substantial accumulated capital in mining states, with Odisha holding Rs 25,858 crore representing nearly 30 per cent of national accumulations. Current utilisation patterns show that Gujarat and Chhattisgarh allocate substantial funds towards education (37.5 per cent and 22.4 per cent respectively), which can help align skills of future generations with a diversified economy. However, Odisha allocates only 1.2 per cent to skill development whilst Andhra Pradesh directs 57.3 per cent to physical infrastructure. There are also instances of under-utilisation of accumulated funds. DMF is collected from mining lease holders as a percentage of royalty and represents dedicated public finance available during operational stages of mining activity. The ability to repurpose these funds for economic diversification rather than only visible infrastructure requires thorough understanding of fund allocation and disbursement mechanisms permissible under law, alongside exploration of additional revenue instruments such as infrastructure development and environment cesses that states can deploy. The proper assessment of transition costs at operational and closure stages remains inadequate.

Indicative Research Questions:

- What legal, fiscal and administrative mechanisms are permissible under the Mines and Minerals Development and Regulation Act, 2015 and PMKKKY guidelines for repurposing DMF accruals as first-loss or guarantee layers to mobilise private capital for economic diversification projects, and what frameworks are needed to ring-fence DMF for guarantees whilst pricing first-loss appropriately?
- For districts with DMF collections under Rs 10 crore that are not required to establish Endowment Funds, what threshold-based financing mechanisms including pooled

endowments, state-level matching contributions or credit enhancements would ensure small-collection districts have access to long-term transition finance?

- What role can civil society organisations, worker representatives and community-based organisations play in DMF governance to ensure accountability and alignment with ground-level transition needs?
- PMKKKY requires Gram Sabha participation, particularly in Scheduled Areas: how do we design participatory, gender-sensitive and time-bound investment plans so Gram Sabhas can meaningfully approve socio-transition proposals without slowing fund disbursement?

Problematic A2: Mine Closure Fund Allocation and RECLAIM Framework Operationalisation

The 2025 Mine Closure Guidelines under the RECLAIM framework mandate that 25 per cent of five-yearly mine closure escrow amounts be utilised for community development and livelihood activities, with 10 per cent of final mine closure costs earmarked specifically for just transformation. This represents dedicated public finance available at closure stage of mining activity. However, operational questions remain regarding how districts define eligible activities under these allocations to ensure funds finance genuine economic diversification including skill development, livelihood programmes and business incubation rather than only infrastructure projects. The RECLAIM framework references mine repurposing for agro-solar deployment, renewable energy parks, green hydrogen production and tourism, but the business models, capital structures and ownership arrangements that would minimise job leakage from local communities require assessment. Furthermore, the guidelines mandate consultative processes involving Gram Sabhas, particularly in Scheduled Areas under PESA and FRA provisions, but the design of participatory, gender-sensitive and time-bound investment planning that enables meaningful community approval without creating fund disbursement bottlenecks requires investigation.

Indicative Research Questions:

- How should districts define eligible activities under the 25 per cent community development and 10 per cent just transformation allocations to ensure funds finance economic diversification, and for each proposed mine repurposing option including agro-solar, renewable energy parks and tourism, what business models including public ownership, public-private partnership, community cooperative or energy service company structures are realistic in coal districts with capital structures that ensure local employment and procurement?
- How can mine closure funds, DMF resources and Coal Public Sector Undertaking land assets be captured as collateral or equity contributions in large renewable energy projects whilst ensuring binding local procurement and hiring commitments?
- For each proposed mine repurposing option including agro-solar, renewable energy parks, green hydrogen and tourism, what business models including public ownership, public-private partnership, community cooperative or energy service company structures are realistic in coal districts and what capital structures will ensure local employment and procurement?

Problematic A3: Fiscal Transition Pathways for Coal-Dependent States

Chhattisgarh and Odisha derive significant own revenues from coal-related activities. As coal production and thermal power generation evolve, these states face revenue erosion that impacts their capacity to finance public services and development expenditure. The ability to add more taxes without substantially altering costs to business is a consideration that states must weigh carefully. Conversely, states demonstrate differentiated fiscal situations, with Andhra Pradesh showing weak capital expenditure at 1.4 per cent of GSDP whilst Tamil Nadu maintains a stronger revenue base at 68.6 per cent own revenues. Understanding how state just transition financing mixes should differ based on fiscal capacity, whether prioritising redirection of existing revenues, market borrowing, leveraging DMF and escrow accounts or accessing concessional finance, requires assessment.

Indicative Research Questions:

- What multi-year fiscal transition pathways exploring phased revenue substitution through earmarked transition cesses or ring-fenced capital expenditure will close projected budget gaps in coal-dependent states whilst financing just transition priorities?
- Given differentiated fiscal situations at state level, how should state just transition financing mixes differ, specifically which states should prioritise redirecting existing revenues versus market borrowing versus leveraging DMF and escrow funds versus accessing concessional multilateral development bank finance?

Problematic A4: Informal Worker Census and Social Protection Liability Assessment

Approximately 70 per cent of workers associated with the coal economy operate outside formal employment structures, including transporters, washery operators, service providers and household-based enterprises. In the automotive sector, contractual and informal workers constitute 75 to 80 per cent of total engaged manpower. The demographic profile, skill composition and geographic distribution of informal workers remain inadequately documented, creating challenges for sizing compensation, retraining and social protection liabilities. Furthermore, contractual workers and pensioners face exposure as coal assets scale down, requiring assessment of appropriate social protection bridges including wage insurance, pension portability, targeted pension top-ups and health cover, alongside determination of which entities bear long-term liabilities.

Indicative Research Questions:

- What metrics and data collection approaches including household economic surveys, employment registries and pensioner mapping must be established immediately to size compensation, retraining and social protection liabilities for informal workers in coal-dependent states?
- What social protection bridges including wage insurance, pension portability, targeted pension top-ups and health cover are required for contractual workers and pensioners exposed by scale-down of coal assets, and which entities including central government, state governments, public sector undertakings or dedicated transition funds should bear long-term liabilities?

B: FINANCIAL MECHANISM DESIGN AND ARCHITECTURE

Problematic B1: Corporate Social Responsibility Pooling Mechanisms for Transition Finance

Corporate Social Responsibility funds represent significant pools of philanthropic capital but face structural limitations. Scaling up opportunities for skilling workers in clean technology manufacturing is constrained by inability to use CSR funds directly for benefit of the investing company. Renewable energy companies cannot allocate CSR funds to skill their own staff on operations and maintenance aspects. This necessitates innovative approaches including buddy corporate programmes where companies fund skills development for other entities or pooled CSR programmes that aggregate resources across multiple corporates to achieve scale. CSR can be linked to activities that are impact oriented, and when combined with philanthropic capital and public finance, can be used to fund outcome-based programmes. The potential to pool CSR funds with DMF, state capital expenditure and multilateral development bank concessional finance to create blended finance vehicles for local diversification projects including agro-solar parks and green manufacturing requires exploration.

Indicative Research Questions:

- How can special funds be created through pooled CSR mechanisms across multiple corporates to achieve scale needed for worker reskilling programmes, and what governance structures would enable CSR pooling with DMF, state capital expenditure and multilateral development bank concessional finance to create blended finance vehicles for local diversification projects?
- What innovative financial instruments can be designed through pooled CSR funds to support skilling and training programmes with broader sectoral impact?
- How can buddy corporate programmes be structured to enable companies to fund skills development for workers in other entities without violating direct benefit restrictions?
- How can CSR funds be pooled with DMF, state capex and MDB concessional finance to create blended finance vehicles for local diversification projects (e.g., agro-solar parks, green manufacturing)?

Problematic B2: Multilateral Development Bank and Development Finance Institution Concessional Finance Structuring

Capital can be borrowed from multilateral development banks and development finance institutions at sub-market rates of return for government programmes or off-budget for state entities. Concessional loans or guarantees can be pooled strategically for commercial activities that create additional jobs in upcoming sectors, especially where small or new enterprises are encouraged. The Tamil Nadu Green Climate Fund with Rs 2,000 crore corpus provides risk capital to start-ups and growth-stage enterprises, whilst the Skills for Solarised Future programme in Andhra Pradesh demonstrates blended finance application. Understanding state-level commercial priorities, fiscal health and resource requirements can inform how much capital can be allocated using such pooling structures. Furthermore, analysing return expectations and costs of multilateral development bank financing alongside lending guidelines can identify which sectors and activities qualify for concessional support at each state level, enabling

recommendations on state-level action by multilateral development banks and blending options available. As shown in the report, few states have fiscal bandwidth and more reliance will need to be placed on additional levies and pooling for projects with commercial aspects, which must then be linked to just transition priorities.

Indicative Research Questions:

- What understanding of state-level commercial priorities, fiscal health and resource requirements is needed to assess how much capital can be allocated using pooled concessional finance structures, and what analysis of multilateral development bank financing costs and lending guidelines is required to identify which sectors and activities qualify at each state level?
- How can concessional loans or guarantees from multilateral development banks and development finance institutions be pooled strategically for commercial activities that create jobs whilst addressing just transition priorities in states with limited fiscal bandwidth?

Problematic B3: First-Loss Mechanisms and Guarantee Structures for Private Capital Mobilisation

Multilateral development bank-backed guarantee and risk-sharing facilities are critical for mega renewable energy projects and green infrastructure. However, the potential for DMF or coal closure escrow funds to serve as local currency first-loss mechanisms requires assessment. Determining appropriate size and tenor of guarantees needed to crowd in commercial debt, alongside legal and fiscal frameworks for ring-fencing public funds for guarantee purposes, remains unexplored. Furthermore, the broader question of how finance recycling through mechanisms such as Infrastructure Investment Trusts can expand the scope of just transition financing by unlocking value and equity simultaneously requires investigation.

Indicative Research Questions:

- Can DMF or coal closure escrow funds serve as first-loss mechanisms to support multilateral development bank-backed guarantee and risk-sharing facilities for renewable energy projects, and what size and tenor of guarantee would be needed to crowd in commercial debt?
- How can finance recycling through Infrastructure Investment Trusts and other asset monetisation vehicles be used as a mechanism to expand the scope of just transition financing by unlocking value and equity simultaneously, and what legal and fiscal frameworks enable earmarking of monetisation proceeds for state-level just transition funds?

Problematic B4: Green and Sustainability-Linked Bonds with Co-Benefits Integration

For commercial projects, sustainability-linked bonds or green issuances with co-benefits approaches may be necessary. Green, social, sustainable and sustainability-linked bonds present opportunities to attract transition-aligned funds, building on India's growing experience with such issuance. However, frameworks that explicitly correlate climate impacts with direct benefits for workers, communities and consumers require further development. Social impact bonds tailored for outcomes such as worker retraining and green job creation could attract funds earmarked explicitly for just transition initiatives but remain underutilised in the Indian context.

The integration of just transition metrics into bond frameworks and the development of co-benefits measurement approaches require assessment.

Indicative Research Questions:

- What frameworks can explicitly correlate climate impacts with direct benefits for workers, communities and consumers in green and sustainability-linked bond issuances to ensure co-benefits approaches that support just transition outcomes?
- How can social impact bonds be tailored for outcomes such as worker retraining and green job creation to attract funds earmarked explicitly for just transition initiatives in the Indian context?

Problematic B5: Priority Sector Lending Alignment with Just Transition Objectives

Limits are already prescribed for lending to sectors defined as priority, including agriculture, MSMEs and renewable energy. It is possible to identify activities within these sectors that would be aligned with just transition objectives and recommend the use of bank finance for such activities. Scheduled commercial banks maintain committees on sustainability which define sets of activities to be screened and prioritised. Studying such frameworks can enable understanding of potential for commercial lending that is better aligned with just transition. Furthermore, clear definition of social aspects under a nationally recognised taxonomy such as the Climate Finance Taxonomy under development could enable the Reserve Bank of India to guide scheduled commercial banks and other regulated financial institutions towards investments aligned with job creation and social equity where market forces alone have limited scope for directing investment.

Indicative Research Questions:

- How can clear definition of social aspects under nationally recognised taxonomy enable the Reserve Bank of India to guide scheduled commercial banks towards priority sector lending investments aligned with job creation and social equity as part of just transition financing?
- How can the Reserve Bank of India build upon existing Priority Sector Lending directions to identify just transition-aligned activities within current categories including MSMEs, renewable energy and agriculture, and what guidance mechanisms can enable scheduled commercial banks to prioritise such investments?

Problematic B6: Metrics, Measurement and Reporting Systems for Just Transition Investment

Aligning, allocating and accelerating finance for just transition necessitates greater technical clarity around defining specific metrics to measure attributes of just transition, linking them to qualitative factors to enable assessment of impact and progress of investments. This transparency and accountability can help attract more investments as investors can see tangible social and economic benefits of their contributions, ensuring funds effectively support sustainable and inclusive transition.

Reporting frameworks such as the SEBI-mandated Business Responsibility and Sustainability Reporting framework can function as enablers for just transition through promoting transparency and accountability in industry efforts. Metrics within BRSR can directly link to just transition goals

including job creation, worker rights, community engagement, gender inclusivity and environmental impact mitigation.

Evidence suggests that companies voluntarily disclosing sustainability practices through BRSR tend to have lower weighted average cost of capital due to investor interest in proactive management of environmental, social and governance risks. However, standardisation of just transition metrics, establishment of verification systems and integration into investment decision-making processes require development.

Indicative Research Questions:

- What specific metrics can be defined to measure attributes of just transition in investment contexts, how can these be linked to qualitative factors to enable impact assessment, and what standardisation frameworks can ensure comparability across sectors and states?
- How can the Business Responsibility and Sustainability Reporting framework be enhanced to explicitly capture just transition metrics including job creation, worker rights and community engagement?

C: SECTORAL TRANSITION FINANCING PATHWAYS

Problematic C1: District-Level Transition Scenarios and Finance Requirements for Coal and Power Sectors

Chhattisgarh (over 90 per cent thermal installed capacity) and Odisha (over 75 per cent thermal installed capacity) face concentrated transition risks. District-level transition scenarios exploring rate of thermal power plant retirement, timing of coal mine phase-down and required renewable energy plus storage investment need to be mapped to expected fiscal and employment outcomes. Understanding what finance is needed under each scenario, including capital requirements, timeline and sources, remains inadequate. Furthermore, analysis of how renewable energy deployment can generate employment-ready workforce if installations and manufacturing follow current market trends requires assessment of financial instruments and structures needed.

Indicative Research Questions:

- What is the finance requirement for different district-level transition scenarios exploring rate of thermal power plant retirement, timing of coal mine phase-down and required renewable energy plus storage investment map to expected fiscal and employment outcomes in Chhattisgarh and Odisha?

Problematic C2: Production-Linked Incentive Scheme Integration with Transition Financing

The Production-Linked Incentive scheme for Advanced Chemistry Cell batteries (40 gigawatt-hours awarded with Rs 225 crore per gigawatt-hour investment requirement) and Automotive PLI scheme create high-value jobs in upstream value chains. However, these schemes impose domestic value addition requirements and bank guarantees without explicit provisions for supporting workforce transition in legacy manufacturing hubs. The potential to mandate PLI beneficiaries to allocate a share of incentives to transition funds financing reskilling and MSME conversion in internal combustion engine hubs requires exploration.

Indicative Research Questions:

- How can Production-Linked Incentive beneficiaries be mandated or incentivised to allocate a share of incentives to transition funds financing reskilling and MSME conversion in internal combustion engine manufacturing hubs?
- What complementary financial instruments including seed capital and technical assistance should be designed to help component manufacturers meet domestic value addition requirements and switch production towards electric vehicle components?

Problematic C3: Maintenance, Repair and Operations Ecosystem Transition Financing

The maintenance, repair and operations market will undergo significant transformation as electric vehicles with approximately 200 parts replace internal combustion engine vehicles with 1,400 parts. The current informal MRO ecosystem including independent mechanics and small workshop operators faces acute vulnerability. Targeted financing instruments including micro-grants, concessional loans and fast Recognition of Prior Learning certification subsidies that would enable transition to electric vehicle charging and battery servicing require design and piloting.

Indicative Research Questions:

- What targeted financing instruments including micro-grants, concessional loans and Recognition of Prior Learning certification subsidies would enable the current informal maintenance, repair and operations ecosystem to transition to electric vehicle charging and battery servicing?
- What standardised Recognition of Prior Learning financing architecture exploring voucher per worker, employer co-financing or DMF co-funded training would rapidly certify informal workers in maintenance, repair and operations and mining communities to make them employable in new green roles?

Problematic C4: Public Transport Fleet Electrification and Workforce Transition Financing

Union Government schemes such as PM-eBus Sewa integrate training funds within procurement, demonstrating potential for embedding just transition provisions in public procurement processes. However, standardisation of contract clauses in State Transport Undertaking procurement exploring performance-linked training spend, local recruitment targets and, operations and maintenance localisation remains inadequate to secure just transition outcomes across states. For states that exert direct control over State Transport Undertakings including Andhra Pradesh, Odisha, Tamil Nadu and Chhattisgarh, financial models exploring state Special Purpose Vehicle equity, annuity structures, Payment Security Mechanism and training escrow arrangements that ensure long-term revenue for the Special Purpose Vehicle whilst allocating stable funds for workforce reskilling require design. **Indicative Research**

Indicative Research Questions:

- How should contract clauses in State Transport Undertaking procurement be standardised to incorporate performance-linked training spend, local recruitment targets and operations and maintenance localisation to secure just transition outcomes, and what financial models

exploring state Special Purpose Vehicle equity, annuity structures and training escrow ensure long-term revenue whilst allocating stable funds for workforce reskilling?

- Who shall finance the scale-up of training capacity and what collaboration frameworks between public and private sectors can enable this expansion?

Problematic C5: MSME Supply Chain Transition Finance Tools

MSMEs constitute approximately 75 per cent of enterprises in automotive component manufacturing. When electric vehicle component demand displaces substantial internal combustion engine demand, these firms require transition finance tools including matching grants for retooling, low-interest long-tenor loans and credit guarantees tied to domestic value addition to enable their transition. The design of appropriate instruments, determination of subsidy levels and establishment of credit enhancement mechanisms require assessment.

Indicative Research Questions:

- What are appropriate subsidy levels, loan tenors and credit guarantee coverage ratios that balance fiscal sustainability with MSME accessibility for transition finance instruments?

3.2. Research Sequencing and Implementation Considerations

The problematiques require sequencing based on urgency of transition impacts and feasibility of data collection and stakeholder engagement. Coal-dependent states including Chhattisgarh and Odisha face near-term mine closures and thermal plant retirements, making research on DMF governance, mine closure fund allocation, informal worker census and fiscal transition pathways immediate priorities. Industrial transition states including Tamil Nadu and Gujarat require research on MSME transition finance, Production-Linked Incentive scheme integration and maintenance, repair and operations ecosystem support. Cross-cutting mechanisms including CSR pooling, multilateral development bank blended finance structuring and procurement-based integration can be developed in parallel. A phased approach spanning 18 to 24 months is recommended, with detailed terms of reference to be developed for each problematic based on stakeholder consultations and institutional capacities.

Table 18: Areas for Future Research and Enablers

Question cluster	Primary responsibility	Co-owners	Enablers
Transition trajectory & timing	Ministry of Power, Ministry of Coal	NITI Aayog, State Energy Depts	Research institutions, MDBs
Fiscal exposure & revenue decline	State Finance Depts	MoF, CAG	MDBs, DFIs
Scale of transition finance	Ministry of Finance	States, PSUs	MDBs, climate funds, Philanthropies
Institutional architecture	State governments	District administrations	Technical assistance providers
Labour & livelihoods	Ministry of Labour	States, PSUs	NSDC, training institutions
PSU obligations	Ministry of Coal / Heavy Industries	PSUs	MoF, regulators
Financing instruments	MoF, States	SEBI, RBI	DFIs, impact investors, Philanthropies
Metrics & accountability	NITI Aayog	States	Independent auditors, Regulators